# Anglian River Basin District Second Cycle Flood Risk Management Plan- Strategic Environmental Assessment: Environmental Report

For external consultation October 2021

We are the Environment Agency. We protect and improve the environment.

We help people and wildlife adapt to climate change and reduce its impacts, including flooding, drought, sea level rise and coastal erosion.

We improve the quality of our water, land and air by tackling pollution. We work with businesses to help them comply with environmental regulations. A healthy and diverse environment enhances people's lives and contributes to economic growth.

We can't do this alone. We work as part of the Defra group (Department for Environment, Food & Rural Affairs), with the rest of government, local councils, businesses, civil society groups and local communities to create a better place for people and wildlife.

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# Introduction

This environmental report presents the findings of the strategic environmental assessment (SEA) carried out as part of the preparation of the Anglian River Basin District draft second cycle flood risk management plan (FRMP). The SEA assesses the likely effects of the plan on the wider environment and identifies mitigation and enhancement opportunities. This environmental report and a non-technical summary (NTS) must be published with the draft second cycle FRMP so that people can understand and comment on how the environmental effects should be considered in the development of the final FRMP. The non-technical summary can be accessed on the second cycle FRMP consultation page.

# 1. The draft second cycle flood risk management plan

The draft second cycle Flood Risk Management Plan (FRMP) is a plan to manage significant flood risks in designated Flood Risk Areas (FRAs) within the Anglian River Basin District (RBD). Producing the plan for these areas is a requirement of the Flood Risk Regulations (2009). It is recognised that there are areas at risk of flooding outside of these FRAs. The Environment Agency and other Risk Management Authorities (RMAs) will continue to plan for and manage the risk of flooding to all communities. This is regardless of whether they are in an FRA or not.

The draft second cycle FRMP measures for the Anglian RBD cover all sources of flood risk and have been developed with contributions from other RMAs.  Whilst the ambition of the plan is to be a strategic place-based plan that covers all sources of flood risk, there may be places and flood risk management activities that are not included. This is due to the strategic nature of the second cycle FRMP and does not change anything planned for those places. All RMAs across the Anglian RBD will continue to plan for and manage the risk of flooding as appropriate.

This draft plan focusses on what is planned in FRAs during the second cycle.  It also shows what has happened across the RBD since the first cycle FRMPs were developed. The first cycle of FRMPs covered the period 2015 to 2021.

The Environment Agency and other RMAs, in particular Lead Local Flood Authorities (LLFAs) worked together to develop the first cycle FRMP. This was in order to create a plan to manage the risk from all sources of flooding. The second cycle FRMP will build on this approach, focussing on the areas with the highest risk of flooding. The FRMP is a strategic plan that is closely aligned with the:

- Government's 25 Year Environment Plan
- National Flood and Coastal Erosion Risk Management Strategy for England (FCERM strategy)

The second cycle FRMP will encourage closer ways of working between RMAs that will help to achieve its revised objectives and measures. These revised objectives and measures align with the ambitions of the national FCERM strategy. They also support achieving wider environmental and growth ambitions of society.  The draft FRMP is also aligned with the River Basin Management Plan for the Anglian RBD.  Together, these plans set the strategic goals and approaches to managing water and flood risk within the RBD.

More information on the background to FRMPs, the Flood Risk Regulations and how FRAs were identified is in draft Part A National Overview of Flood Risk Management in England for second cycle FRMPs.

## 1.1. Flood risk management planning

The Flood Risk Regulations 2009 (FRR) set out a statutory process for flood risk planning over a 6 year cycle.

The FRR require the Environment Agency and LLFAs to:

- assess risk from flooding for human health, the economy and environment including cultural heritage
- decide where there is significant risk and identify these areas as flood risk areas (FRAs)
- prepare maps that show the flood hazard and flood risk in FRAs
- prepare FRMPs that set objectives and measures to reduce the risk in FRAs

Alongside flood risk management planning, the Environment Agency works with others to improve the quality of the water environment. It does this through river basin management planning. The Environment Agency aims to co-ordinate the FRMPs and the River Basin Management Plans (RBMPs) so that all organisations can do more for the environment.

By developing the plans together, ways to achieve flood risk management objectives and the water environment and biodiversity objectives can be joined together wherever possible. This is particularly important so that we can achieve the main aim of the Water Environment (Water Framework Directive (WFD) England and Wales) Regulations 2003. This is to establish a framework for the protection of inland surface waters, transitional waters, coastal waters and groundwater.

The Environment Agency has worked with LLFAs and other RMAs to develop joint measures to reduce flood risk and improve the wider water environment. Aligning measures also helps to simplify the delivery of outcomes and make it more efficient.

## 1.2. The Anglian River Basin District

The Anglian River Basin District (RBD) covers 27,900 square kilometres ($km^2$). It stretches from Lincolnshire in the north to Essex in the south, and from Northamptonshire in the west across to the Norfolk and Suffolk coast. Figure 1 shows a map of the RBD.

Main urban centres include:

- Lincoln
- Northampton
- Norwich
- Ipswich
- Cambridge
- Peterborough
- Milton Keynes
- Chelmsford

Over 6.4 million people live and work within the RBD.  A large proportion of the Anglian RBD is part of the Oxford to Cambridge Arc (OxCam Arc). The OxCam Arc is spatial area that spans the five ceremonial counties of:

- Oxfordshire
- Northamptonshire
- Buckinghamshire
- Bedfordshire
- Cambridgeshire

4 of the 5 counties that make up the OxCam Arc are within the RBD.  The Government's aim is to support long-term sustainable transformational economic growth across the area; help to make the area a brilliant place to live, work and travel in – for existing residents and future communities alike; and support lasting improvements to the environment, green infrastructure and biodiversity.

The RBD is a predominantly rural area. Farming plays a central role in the local economy and more than half of the land is used for agriculture and horticulture. Tourism is also an important economic sector for the coastal communities and the Broads.

The landscape of the RBD ranges from gentle chalk and limestone ridges in the west, to the extensive lowlands of the Fens and coastal estuaries and marshes of East Anglia. A significant number of sites within the RBD have legal protection due to the rare habitats,

wildlife and iconic landscapes. The Wash, where the majority of the rivers in the Anglian RBD discharge, is the largest Site of Special Scientific Interest (SSSI) in England. The Broads is Britain's largest nationally protected wetland. Freshwater habitats within the RBD are very important for wintering wildfowl. Reservoirs and watercourses support important fisheries. Otters have returned to all catchments. Many invertebrate populations and populations of rare birds depend upon these freshwater wetlands.

The RBD also has a rich heritage with many buildings and structures listed for their historic importance. Many of these are located close to rivers, lakes and the coast. The peat of the Fens helps to preserve archaeology. There have been many important archaeological treasures unearthed in this area.

The RBD is divided into 14 management catchments of which 3 are transitional estuarine catchments. A management catchment is an area with several, often interconnected, water bodies. The waterbody catchments are grouped into management units, of a scale that suits management and planning. The water body types within these management catchments comprise:

- rivers
- canals
- lakes
- estuarine and coastal waters
- groundwater bodies

Rivers and streams flow from the high chalk and limestone hills through the very low-lying fenland areas, before finally reaching the sea. Some catchments are in a more natural state. Others have been significantly altered by man. The waterways of the Fens and the Broads are examples of changes made for navigation, flood protection and drainage purposes.

Water management is one of the biggest challenges facing the RBD. Parts of the RBD are extremely dry, receiving only two-thirds of the UK's average rainfall, while flooding is a major concern for many communities.


**Figure 1: Map of the Anglian River Basin District**

## 1.3. Overview of the objectives of the plan

18 nationally consistent draft objectives have been agreed for this second cycle of flood risk planning.

In setting the draft objectives, RMAs considered the Flood Risk Regulations' desire to:

- reduce the adverse consequences of flooding for human health, economic activity and the environment
- reduce the likelihood of flooding

RMAs also examined climate change when developing these objectives.

The objectives are consistent with the FCERM strategy ambitions of:

- climate resilient places
- today's growth and infrastructure resilient in tomorrow's climate
- a nation ready to respond and adapt to flooding and coastal change

The 18 draft objectives have been grouped under headings from the FCERM strategy and the FRRs.

See a full list of the draft objectives in the draft Part A National Overview of Flood Risk Management in England for Second Cycle FRMPs.

## 1.4. Overview of measures in the plan

The RMAs considered several different factors in working out the proposed measures for the draft FRMP. The main ones are outlined in the draft Part A National Overview of Flood Risk Management in England for Second Cycle FRMPs.

The Environment Agency has developed a new interactive mapping tool called flood plan explorer for this second cycle of flood risk management planning. You can use flood plan explorer to find out information about all the plan's proposed measures.

This information mainly includes:

- where the measure is
- a description of the measure and what it's hoping to achieve
- which objectives the measure will help to achieve
- who is responsible for putting the measure into action
- when the measure is planned to be implemented

You can view the locations of the FRAs, management catchments, strategic areas and RBD in the interactive mapping tool.

The proposed measures in the draft FRMP fall under the following elements of flood risk management:

- preventing – avoiding putting people or the environment at risk of flooding
- preparing – taking actions that prepare people for flooding
- protecting – protecting people from the risk of flooding
- recovery and review – learning from flood incidents

There are 45 national level measures all of which were scoped into the detailed assessment of measures. Of these 27 are Environment Agency measures and 18 are LLFA measures. The majority of the measures are categorised as protecting and preventing measures (14 and 17 respectively). Five measures are categorised as preparing and five as recovery and review. The remaining four measures are categorised as other.

In total, 416 measures have been developed for the Anglian RBD. This includes measures that the Lead Local Flood Authorities (LLFAs) have developed for their FRA. More than half of the local measures are in the protecting category. 22% are in the preventing category. A similar amount, 19% are preparing type measures. Only a small proportion, 2% are categorised as recovery and review measures.

Measures have been developed by the Environment Agency in collaboration with partners. Most measures are for Flood Risk Areas or Management Catchments. 53% (221) are for FRAs and 31% (127) are at a Management Catchment level. Developing measures for the FRAs is a legal requirement for FRMPs. RBD-scale measures reflect high level strategic challenges and opportunities within the Anglian RBD.

80% (333) of measures have been screened into the SEA. Of those measures screened into the assessment, 17% (56) will be implemented in the short to medium term to 2023. The majority will be delivered in the period to 2027 or later.

## 1.5. Current flood risk

Many areas across the River Basin District are at risk of flooding from a variety of different sources. Flood risk is detailed in the FRMP and includes risk from

- rivers and sea
- surface water
- ground water

- sewers
- canals
- reservoirs

**Flood Risk Areas:**

Sixteen FRAs are identified as being at significant risk of flooding from main rivers and the sea. These are all new since the first cycle FRMP. Nine FRAs are at risk of tidal flooding. Seven FRAs are at risk of fluvial flooding from main rivers.

Lincoln, Horncastle and Northampton all have upstream flood storage areas to manage flows through the FRA. Channel constrictions within the FRAs can play a notable role in exacerbating flooding issues. FRAs at risk from overtopping or breaching of coastal and tidal defences include:

- Boston
- Great Yarmouth
- Hunstanton
- King's Lynn
- Mablethorpe
- Skegness
- Spalding
- Wisbech

At present, there are no formal flood defences in the Lowestoft FRA, so the area is reliant on the deployment of temporary flood barriers.

South Essex was identified as a FRA for surface water flooding in the first cycle FRMP. It remains a surface water FRA in this second cycle FRMP. Eleven further surface water FRAs have been identified for this second cycle FRMP.

**Land management and flood risk management**

Land use and land management is important to flood risk management. Improved land drainage increases flood risk by increasing the rate that water enters rivers. Conversely impeding drainage to hold water on the land helps to manage the flood risk. Land management practises can help control erosion, increase soil moisture and reduce the transport of nutrients in field runoff.

**Coastal erosion**

Coastal erosion occurs along the length of the River Basin Districts.  Examples of where the coastline is retreating include parts of north-east Norfolk and parts of Suffolk. Local authorities have operational powers under the Coast Protection Act 1949 and the Flood and Water Management Act 2010 to lead on coastal risk management activities. Works on sea flooding and coastal erosion are undertaken in collaboration with the Environment Agency.

Whilst the draft second cycle Anglian FRMP has considered coastal erosion, it is covered in more detail within Shoreline Management Plans (SMPs).  The FRMP has considered high level links with SMPs, in particular where coastal erosion risk is closely linked to managing flood risk from the sea.

## 1.6. Flood risk management policies, plans and programmes

### 1.6.1 National policies, plans and programmes

FRMPs are guided by legislation, policy and local priorities. They are one of many important steps in achieving the ambitions of the National Flood and Coastal Erosion Risk Management Strategy for England (FCERM strategy) and the government's 25 year environment plan – A Green Future: Our 25 Year Plan to Improve the Environment (25 YEP). They also support the direction set by government policy, which includes its FCERM policy statement.

The Environment Agency published the updated national FCERM strategy in 2020. The strategy's long-term vision is for: a nation ready for, and resilient to, flooding and coastal change – today, tomorrow and to the year 2100.

The FCERM strategy has 3 long-term ambitions. These are:

- climate resilient places
- today's growth and infrastructure resilient in tomorrow's climate
- a nation ready to respond and adapt to flooding and coastal change

The strategy provides a framework for guiding the operational activities and decision making of practitioners. It supports the direction set by government policy which includes its FCERM policy statement. The strategy sets out the long-term objectives the nation should take over the next 10 to 30 years. It also includes shorter term practical measures RMAs should take working with partners and communities.

The 25 YEP commits to producing an updated FCERM strategy. It sets out aims for improving the environment within a generation and leaving it in a better state than we found it.

Goals of the plan include to:

- bring a thriving natural environment with cleaner air and water
- reduce harm from hazards such as floods and drought
- improve sustainable use of natural resources

This is in the context of climate change, increasing populations and ambitious goals for economic growth and prosperity.

### 1.6.2 Local policies, plans and programmes (PPPs)

The Anglian River Basin Management Plan is currently being updated based on a 6 year cycle. It sets out the current state of the water environment and objectives for improvement. The FRMP plan of action interacts closely with the river basin management plan (RBMP) programme of actions towards sustainable management of water at a catchment level. Catchment Flood Management Plans within the Anglian RBD are long term, looking at ways of managing flood risk over the next 50 to 100 years.

Over the long term, the Shoreline Management Plans assess coastal processes and change. SMP3 through SMP8 are relevant for the east coast. The SMPs propose appropriate management, particularly related to flood risk over the next century. They include the policy of managed realignment along parts of the coast. Titchwell Marsh on the North Norfolk coast is an example. Here the sea has been allowed to breach defences, moving the coastline inland. The SMPs are currently being refreshed as a third cycle review to ensure the plans remain current in light of new information and new legislation. No policy changes will be undertaken as part of this review period. Coastal Management Plans (CMP), such as the new Hunstanton Coastal Management Plan are local level plans for the management of the coastline built on local knowledge, aspirations and capacity.

The Thames Estuary 2100 Plan developed by the Environment Agency sets out recommendations to manage tidal flood risk in the Thames Estuary until the end of the century. The eastern extent of the planning area includes south Essex to Shoeburyness which falls within the Anglian RBD. The plan takes a multi-partner approach to managing flood risk. Adaptation is at the heart of the plan. There is some overlap but no conflict with the Essex and South Suffolk SMP.

Local level Flood Risk Management Strategies, such as Suffolk Flood Risk Management Strategy and Rutland Flood Risk Management Strategy set out how the Lead Local Flood Authority will manage flood risk. Roles and responsibilities of key stakeholders such as community groups, landowners and households are identified within the plans. Funding sources are examined, with an emphasis on partnership funding.

Surface Water Flood Management Plans have been developed in high risk areas. They give an understanding of local flood risk and how to manage it. Common themes

throughout the region include community awareness and partnership in flood management. Sustainable drainage systems which work with natural processes are also promoted.

The 1st cycle of the Anglian FRMP sought to bring LLFA and stakeholders together to manage flood risk. This move towards partnerships and integrated working is common to policies and plans for the area. A number of groups have been established to provide a coordinated and collaborative approach to flood and water management. These include:

- the Broadlands Catchment Partnership
- Cambridgeshire and Peterborough Flood and Water Partnership
- Lincolnshire Flood Risk and Water Management Partnership
- Suffolk Flood Risk Management Partnership

In general within the RBD PPPs, there is a push towards flood management that seeks environmental enhancement. For example, through natural flood management.

Multiple NFM pilot projects are currently underway within the RBD, including:

- a community and landowner driven project in Roxwell to help slow the flow of water
- the Swaton Eau NFM project in the Witham catchment, which is working directly with local farmers
- Alconbury Brook pilot NFM project in the Upper and Bedford Ouse catchment (led by the Environment Agency) which includes leaky dams and field management measures.
- Leckhamptstead pilot NFM project in the Upper and Bedford Ouse catchment (led by Buckinghamshire County Council)
- Finchingfield Brook in Essex, where the Environment Agency and public and private partners have come together to combine leaky dams with the reintroduction of beavers as a way of slowing flows.

Data being collected through the NFM projects will play a key role to inform approaches to flood risk in the future.

PPPs are supporting localised approaches. They seek to empower communities, business and industry to be resilient to climate effects. Property level resilience (PLR) measures are supported across the region by Anglian Water, Local Authority grants and the Environment Agency.

Local Authorities undertake Strategic Flood Risk Assessment (SFRA) and modelling to understand flood risk in support of Local Plans. SFRAs map functional floodplain and climate change flood extents. Climate change predictions are a key consideration within

decision making.  Local Plans developed by local planning departments are increasingly looking to spatial planning solutions to manage flood risk.

Long term initiatives to combat tidal flooding across the area include:

- Ipswich tidal barrier which opened in 2019 and protects 1,600 homes and 400 businesses
- Boston Barrier- under construction to defend 14,000 Lincolnshire homes from tidal flooding over the next century.
- Saltfleet to Gibraltar Point strategy - a 100 year plan of action to protect the hard defences of this part of the Lincolnshire coast that includes beach nourishment, combined with rock structures to work with natural processes to slow erosion and build the beach.

### 1.6.3 Considerations for the second cycle FRMP

To summarize, main themes of the PPPs relevant to flood risk include:

- an integrated approach to flood risk management
- sustainable flood management that seeks environmental enhancement and multiple benefits
- evidence based decision-making
- resilience and adaptation to climate change

The second cycle FRMP will interact with these plans in the areas of:

- investment planning
- evidence
- flood awareness
- ways of working
- shared responsibility

## 1.7. How flood risk is likely to change in the future

**Changes in flood risk due to climate change**

Projections suggest that the impact of climate change on flooding is likely to be significant during the 21st Century. Increases in the frequency and intensity of rainfall events may result in an uplift in peak river flows due to greater surface runoff. Current scenarios for the Anglian RBD suggest that the increase in peak river flows may be up to 65%.

Although the implications of the UK Climate Impacts Programme 2018 (UKCP18) projections are to be determined, initial assessments suggest that the changes in river flow are broadly similar to those under UKCP09. Other sources of flood risk may also be exacerbated by climate change. For example, surface water flood risk will increase with the increased intensity of rainstorms.

Sea level rise resulting from thermal expansion, glacier melt and isostatic adjustment will increase the likelihood of sea defences being overtopped. Sea level rise will also affect the way in which the tide influences the free discharge of river flows into the sea. There is an increased likelihood of tide-locking in the Norfolk Broads and other tidal rivers. High fluvial flows coinciding with high sea levels will mean rivers cannot discharge. Many of the main rivers in the Anglian RBD gravity discharge into the sea. Increased sea levels will present a challenge for discharge and require large schemes, such as pumping stations to overcome this.

Properties not currently at risk may become at risk due to increased river flooding. Existing defences may be overwhelmed.

**Changes in flood risk due to population growth**

The population of England is predicted to be the largest in Europe by 2050. Growth is projected to continue to 65 million people in 2026. This will place increasing demands on the agricultural sector to increase production. Increased agriculture, if not managed sustainably, can increase erosion and siltation of the rivers, reducing the flood storage capacity of waterways.

Government has committed to build 300,000 homes a year until the mid-2020s. For the next decade, population growth in the Anglian RBD is predicted to be above the national average as a large proportion of the Anglian RBD is part of the OxCam Arc. The Ministry of Housing, Communities and Local Government are currently developing a Spatial Framework for the Oxford-Cambridge Arc with local partners which will support long-term plans for sustainable growth in the Arc to 2050.

Towns and urban areas will continue to expand. There will be increased pressures to use rural and agricultural land for residential development. Competing demands for agricultural land and use for housing may prompt development within natural floodplains and high risk areas.

Urbanisation is a huge issue for flood risk. Sewer and drainage systems will face increased pressure and may exceed capacity, exacerbating surface water flooding. High density of housing and increased land use for agricultural production may result in a reduction in trees and wooded areas. Trees and hedgerows can increase rainwater absorption and slow water flow, reducing flood risk. Rainwater soaks into the ground up to 60 times faster in wooded areas than on arable land.

Increased transportation links, services and utilities will need to support the growing population. This has the potential to increase the critical infrastructure such as roads, bridges, hospitals and power stations at risk of flooding.

**Changes in flood risk due to existing plans, programmes and policies**

Progress has been made to reduce flood risk to vulnerable areas. Flood risk is now a key consideration in all local development plans, with emphasis on ensuring development is sustainable and seeking opportunities to reduce flood risk. There is an ambition for development that creates a better place, for example through biodiversity net gain (BNG). New approaches have been adopted that work with natural processes. Land has been safeguarded for future flood management and functional flood plains have been recreated. Communities and individuals are taking action to reduce their risk and plan their response.

**Changes in flood risk due to the first cycle FRMP**

The measures of the first cycle FRMP for the Anglian RBD intend to:

- better prepare for flood risk
- prevent floods from happening
- protect people, property and wildlife
- assist in flood recovery

Many are ongoing and remain relevant.

The first cycle of the FRMP focussed on maintaining the hard infrastructure, but also embraced actions to deliver broader social and ecological benefits. As a result of the first cycle FRMP, local authorities have greater access to improved modelling and forecasting. A broader evidence base now exists to support future planning.

Future flood risk remains a critical issue. The pressure from a growing population and a changing climate continue to increase the challenge of flood risk management for the region.

# 2. Why we are doing a strategic environmental assessment

In this section, we've provided an overview of why we're undertaking Strategic Environmental Assessment (SEA) and its role in contributing to the promotion of sustainable development and environmental protection. We also describe the purpose of this environmental report which we're publishing with the draft second cycle Flood Risk Management Plan (FRMP) for consultation.

## 2.1. Assessing environmental effects of our plans

The Environment Agency must carry out Strategic Environmental Assessment (SEA) of some of our plans. This is to meet the legal requirements of the Environmental Assessment of Plans and Programmes Regulations (England) (SI 2004 1633) - the 'SEA Regulations'. SEA makes it possible for us to develop plans that'll lead to better and more sustainable environmental outcomes.

We must carry out an SEA for the second cycle FRMP to meet the requirements of the SEA regulations. We've assessed the likely significant effects of measures on the environment as we've developed the second cycle FRMP. This has let us make changes to the plan to protect the environment by avoiding or reducing harmful effects. It has also let us make the most of opportunities to enhance our environment.

## 2.2. Link to other assessments

### 2.2.1 Habitats regulations assessment

The HRA for the Anglian FRMP is an essential component of plan making. The Conservation of Habitats and Species Regulations 2017 (as amended) requires that the plan considers the potential for direct and indirect effects on the integrity of sites designated for their international importance. These sites are collectively referred to as European sites because they contain species and habitats that are the best examples at a European scale.

The regulations apply to the following designations:

- Special Areas of Conservation (SACs) and candidate SACs (cSACs)
- Special Protection Areas (SPAs)
- Sites of Community Importance (SCIs)

HRA also applies, as a matter of government policy, to:

- potential Special Protection Areas (pSPAs)
- Ramsar sites (sites designated under the 1971 Ramsar Convention for their internationally important wetlands)

The draft second cycle Anglian FRMP helps to deliver the FCERM strategy. The HRA therefore uses the same method as the HRA for the National FCERM Strategy 2010 and is being prepared in discussion with Natural England. The HRA of the National Strategy concluded that there are sufficient measures to provide mitigation and any unavoidable impacts, such as coastal squeeze, could be managed at plan or project level.

The HRA of the national strategy systematically analysed the potential for interaction between the possible FCRM actions and the generic environmental conditions required by the habitats and species that contribute to the integrity of the European sites. This analysis is being reapplied at the plan level for the FRMP, screening out those European sites that are unlikely to be affected by the plan, due to their location.

We are adopting a precautionary approach, so we've included the worst-case scenario to avoid any detrimental environmental impacts during subsequent project planning. The HRA also helps to identify those plan level decisions that might predetermine a project level outcome that will have unavoidable detrimental outcomes for European site integrity.

The HRA is being undertaken alongside the consultation on the draft second cycle FRMP. Comments received during consultation will be used to inform the HRA and in turn the HRA will inform the FRMP as it is finalised. A report of the HRA will be published alongside the final second cycle FRMP

### 2.2.2 Water Environment (WFD) Assessment

The main aim of the Water Environment (Water Framework Directive) (England and Wales) Regulations 2017 is to establish a framework for the protection and improvement of inland surface waters, estuaries, coastal waters and groundwater. You can find more information about this in the draft River Basin Management Plans (RBMPs). The Environment Agency has co-ordinated the development of the FRMPs and the RBMPs. By developing the plans together, ways to achieve objectives for flood risk management and the water environment and biodiversity have been joined together wherever possible. The Environment Agency has worked with LLFAs and other RMAs to develop joint measures to reduce flood risk and improve the wider water environment. Aligning measures also helps to simplify the delivery of outcomes and make it more efficient.

The assessments of biodiversity and water impacts included within the SEA, although not formal WFD assessments, have considered the effect of the plan on water quality and ecology. Under the water environment (WFD) regulations any works, arising from the FRMP, which could affect the ecology, water quality or hydro-morphology of any classified

waterbody requires an assessment. The purpose of this assessment is to demonstrate how any adverse impacts will be mitigated and, where possible, the status of the waterbody enhanced to achieve the required objective. Where the implementation of individual measures has the potential to negatively affect a waterbody, WFD assessment will be undertaken at a project level and reported on at that time.

## 2.3. The Environmental Report

### 2.3.1 General purpose and content

This environmental report provides a brief description of the SEA process that we've followed and the decisions we've taken during this. It identifies other policy and legislation that should be considered. It also identifies environmental issues and trends that provide a strategic context for the draft second cycle FRMP.

The environmental report sets out the assessment of the potential significant environmental effects of implementing the draft second cycle FRMP and of reasonable alternatives. The environmental report also details relevant mitigation actions and enhancement opportunities and proposals for monitoring the significant environmental effects of the implementation of the draft second cycle FRMP.

This environmental report and the SEA process aim to be proportionate in the context of the draft second cycle FRMP by focussing on strategic issues and opportunities. Local and project level issues will be addressed by subsequent Environmental Impact Assessment (EIA) or equivalent at a scheme level as the measures are implemented. This approach avoids duplication of other assessments that may be carried out.

### 2.3.2 Regulatory requirements

The SEA has been undertaken to fulfil the requirements of the SEA regulations detailed in section 2.1. The SEA regulations set out requirements for an environmental report. Below is an outline of how these requirements are addressed in this report.

The regulations require:

- an outline of the contents and main objectives of the draft second cycle FRMP and its relationship with other relevant plans and programmes
    - section 2 sets out the main objectives and contents of the draft second cycle FRMP
    - section 5 sets out the key themes which have come from a review of relevant plans and programmes
    - Annex A and B set out a full list of plans and programmes reviewed

- identification of the current state of the environment and the likely evolution of it without implementation of the second cycle FRMP

    - section 5 provides an overview of the current strategic environmental context for the plan area and how this might evolve in relation to each of the environmental topics

- identification of the environmental characteristics of areas likely to be significantly affected

    - section 5 describes the environmental characteristics likely to be significantly affected

- identification of any existing environmental problems which are relevant to the draft second cycle FRMP

    - section 5 provides this information. This includes identifying environmental problems relating to any areas of particular environmental importance. This includes areas designated under the Conservation of Habitats and Species Regulations 2017 (as amended)

- consideration of the environmental protection objectives established at international, EU or national level, which are relevant to the draft second cycle FRMP. The way those objectives and any environmental considerations have been considered during its preparation is also required

    - section 5 provides a summary of environmental protection objectives as part of the review of relevant plans and programmes under each environmental topic

- a description of the likely significant effects on the environment of the draft second cycle FRMP

    - sections 5 and 6 describe the likely significant effects on the environment. These include short, medium and long-term effects, permanent and temporary effects, positive and negative effects and secondary, cumulative and synergistic effects

- measures expected to prevent, reduce and as fully as possible offset any significant adverse effects on the environment of implementing the draft second cycle FRMP

    - mitigation actions and opportunities for additional environmental improvements are provided in Sections 5 and 6

- an outline of the reasons for selecting the alternatives dealt with and a description of how the assessment was undertaken, including any difficulties encountered in compiling the required information
    - section 4 sets out the alternatives considered. Sections 3 and 6 outline the technical difficulties encountered during the assessment process
- proposals for monitoring significant environmental effects of implementing the draft second cycle FRMP
    - these are provided in Section 7
- a non-technical summary of the information provided to meet the above requirements
    - there is a non-technical summary (NTS) which is available as a separate document

### 2.3.3 Structure

A summary of the structure of this environmental report:

- **non-technical summary**: An accessible overview of the information provided in this environmental report
- **section 1**: Introduction to the draft FRMP
- **section 2**: An overview of why we are doing SEA, including the purpose of the Environmental Report and this consultation process
- **section 3**: An outline of the assessment methodology used to assess the likely significant environmental effects of the draft second cycle FRMP
- **section 4**: An outline of how alternatives have been considered and assessed in the development of the draft second cycle FRMP
- **section 5**: A review of the context including key plans, policies, programmes and objectives relevant to the draft second cycle FRMP. An overview of the environmental baseline and existing environmental issues and how it's likely to change in the future and an assessment of the measures organised by each environmental topic
- **section 6**: An overview of the environmental effects of the draft second cycle FRMP, including key spatial areas, different types of measures and the draft plan overall. This includes cumulative effects and a summary of mitigation actions and enhancement opportunities
- **section 7**: An overview of the proposed monitoring measures

- **section 8**: The next steps in finalising the draft second cycle FRMP and details of the SEA statement of environmental particulars

## 2.4. This consultation

### 2.4.1 Who we're consulting

We've prepared this environmental report to consult with interested parties, in particular the statutory SEA consultation bodies, on the results of the SEA process.

In England the SEA consultation bodies are: Natural England, Historic England and the Environment Agency. We're also consulting with the Marine Management Organisation.

### 2.4.2 How we're communicating our results

We've published this environmental report with the draft second cycle FRMP for consultation. The environmental report sets out the results of the SEA. It:

- provides information on the current condition of the environmental topics that the draft second cycle FRMP could affect
- outlines how the plans and programmes we've reviewed could affect the draft second cycle FRMP
- provides a commentary on how we've integrated the SEA with the development of the draft second cycle FRMP and how it has influenced it
- sets out the strategic options that we've evaluated and the reasons for the selection of the proposed approach
- sets out the environmental effects of the draft second cycle FRMP
- suggests additional mitigation or management actions to further improve the environmental outcomes
- provides a description of the monitoring proposed to identify any unforeseen adverse effects

This environmental report will be available for comment with the draft second cycle FRMP.

We'll use any comments and information we receive to update the draft second cycle FRMP and reconsider our assessment of the environmental effects.

Once the plan is adopted, we'll publish a post-adoption statement (an advertisement) stating where the public can view the adopted plan and its environmental report.

We'll also document an explanation of how the environment's been considered throughout the plan-making process in a statement of environmental particulars.

This will include:

- how environmental considerations have been integrated into the plan
- how the environmental report and consultation responses have been considered
- the reasons for choosing the plan as adopted in light of other reasonable alternatives considered by the SEA
- the measures to be taken to monitor the significant environmental effects of implementing the plan

### 2.4.3 Your Views

To help with this consultation, we've set out some specific consultation questions below on which we would welcome your views:

**Question 1:** Do you agree with the conclusions of the environmental assessment? (yes / no)

If not, please explain why.

**Question 2:** Are there any further significant environmental effects (positive or negative) of the draft second cycle FRMP which you think should be considered? (yes / no)

If yes, please describe them.

**Question 3:** Are there further mitigations for potential negative effects or opportunities to achieve positive effects that should be considered for the final second cycle FRMP? (yes / no)

If yes, please give details.

The consultation on this environmental report is open for 12 weeks, from 22 October 2021 to 21 January 2022.

You can view the consultation documents and questions online on the consultation pages

Please submit your response online. This will help us gather and summarise responses quickly, accurately and cost-effectively.

However, if you prefer, you can submit your response by email or post using our response form. You can download the response form using the above link. Please submit by email to: enquiries@environment-agency.gov.uk

Or by post to:

**Environment Agency**
**Draft second cycle flood risk management plans consultation**
**National Customer Contact Centre**
**PO Box 544**
**Rotherham**
**S60 1BY**

You can also request a printed version of the document and response form using these contact details or by phone to **03708 506 506**

# 3. Our assessment methodology

In this section, we've summarised the approach to the assessment process. We've also highlighted how the assessment has fed into the plan-making process for the draft second cycle flood risk management plan (FRMP).

The assessment process consisted of a number of iterative steps. We have considered different types of measures to include in the draft plan. This section describes how we decided on the scope of our assessment and which measures to assess.

The approach to the assessment of alternatives is described along with our approach to;

- assessing the significance of environmental effects
- assessing cumulative effects
- identifying mitigation actions and enhancement opportunities
- deciding what monitoring is needed

## 3.1. Our approach to assessment

### 3.1.1 Nature of the second cycle FRMP

The draft second cycle FRMPs are complex plans. The plans operate at different levels from the very strategic (headline objectives) through to the specific (individual measures). They are both a strategy for the river basin district (RBD) and a programme of measures to implement this strategy. They cover both RBD-wide measures and the strategy for measures in specific spatial locations (for example, flood risk areas). They include measures being led by the Environment Agency and by other risk management authorities (RMA). These complexities influence the approach adopted in the assessment.

### 3.1.2 Purpose of the assessment

The main aim of the assessment is to identify, describe and evaluate the environmental effects of the draft second cycle FRMP, as well as reasonable alternatives to the draft plan, to assess their significance. Wherever possible we've used the assessment to improve the environmental performance of the plan.

We did the assessment at the same time as the draft second cycle FRMP was being developed. This was to make sure any environmental effects identified could be used to influence the refinement of the draft plan. As a result of the assessment, we prepared this environmental report which is the main public consultation tool setting out the draft second cycle FRMP's potentially significant environmental effects. Mitigation actions and opportunities have been identified through the SEA process to improve environmental outcomes in the delivery of the plan and these are documented within the environmental report.

### 3.1.3 Key components of the assessment

We adopted a tiered approach to the assessment as the draft second cycle FRMP operates at different levels and geographical scales.

It considered the following components:

- an assessment of the reasonable alternatives to the draft second cycle FRMP (see Section 4)
- a detailed assessment of the effects of individual measures that have the potential to result in physical 'on the ground' changes and direct environmental effects (refer to section 5)
- an assessment of national measures (see Section 6.1)
- a high-level strategic assessment of the whole plan, including its overall approach and objectives and the effects of all the measures included within the FRMP, including the intra cumulative effects
- an assessment of the effects of collections of measures concentrated within the key locations of flood risk areas (FRAs) (see Section 6.2).
- an assessment of the effects of different types of measures delivered by the draft plan (see Section 6.3)
- an assessment of the cumulative effects of the interactions between the draft second cycle FRMP and other relevant policies, plans and programmes (the inter cumulative effects assessment - see Section 6.6)

## 3.2. How we decided on the scope of our assessment

### 3.2.1 Understanding the environmental context

We looked at the environmental context of the plan for each of the environmental topics:

- biodiversity, flora and fauna
- population and human health
- soil
- water
- climatic factors
- material assets
- cultural heritage
- landscape
- interrelationships between the above topics

We first established the current baseline for each environmental topic. We then looked at how this may change in the future.

### 3.2.2 Reviewing policies, plans and programmes

In preparing to manage flood risk over the next 6 years, we've considered other policies, plans and programmes. These include those produced by the government, government agencies and local authorities.

These policies, plans and programmes could:

- have a significant effect on how we manage flood risk so we need to think about how we adapt our draft second cycle FRMP
- conflict with measures we want to include in the plan
- inform us of the main environmental objectives and issues that we should consider
- provide more environmental information to inform our baseline
- help us to identify opportunities to take forward measures that meet the objectives of more than one plan
- help us to identify potential cumulative effects of the second cycle FRMP with other plans

We identified the main trends and issues arising from the policies, plans and programmes we reviewed, for each of the environmental topics.

### 3.2.3 Identifying which environmental topics to assess

The objectives and measures included in our draft second cycle FRMP may lead to economic, social and environmental effects. In our assessment we focussed on significant effects that the draft second cycle FRMP is likely to have on the environmental topics listed above. A significant effect is one that would result in noticeable change (both positive and negative) to people's lives and the environment.

We identified the likely significant effects of the draft second cycle FRMP on each environmental topic, based on our understanding of the RBD. We then decided whether we needed to assess the potential effects of the draft second cycle FRMP on the environmental topic as part of the SEA. This was based on our knowledge and experience of flood risk management.

At the scoping stage we scoped air quality out of the SEA. While individual actions may have a small, localised effect on air quality, at a strategic level it's very unlikely that the draft second cycle FRMP would have a significant effect on air quality within the RBD.

### 3.2.4 Consulting on the scope of the assessment

We produced a scoping report which describes the proposed approach to the assessment and states which environmental topics would be scoped into our assessment. We explained our reason for including or excluding each topic from the scope of the assessment.

We consulted with the statutory SEA consultation bodies on the scope of the SEA. We took their views into account before we finalised the scope of our assessment. The regulations require us to consult with the statutory SEA consultation bodies for the country in which the RBD lies. For the Anglian RBD we consulted with Natural England and Historic England.

### 3.2.5 Results of consultation on scoping report

We did not receive any responses to the consultation on the scoping report, therefore no changes were necessary to the scope of the SEA or the approach to the assessment.

## 3.3. Deciding which measures to assess

We categorised measures into one of three categories. For each category we considered whether measures should be included as part of the assessment or screened out. We also considered whether measures should be included in the detailed assessment of individual measures or considered as part of the overall assessment of the plan including a cumulative assessment.

Categories of measures include:

- **transitional measures** – these are measures carried over from the first cycle FRMP not yet implemented that have not changed significantly and will have already been included as part of the previous SEA. These were not included in the detailed assessment of individual measures as they have previously been through the SEA process. These measures were considered as part of the overall and cumulative assessment
- **agreed measures** - these are measures which are already being implemented and/or are under construction. These measures should have already been included in the SEA of a separate plan and/or a more detailed project assessment process and the SEA cannot influence these measures. We did not consider these measures as part of the assessment. These issues were considered as part of the existing baseline
- **proposed measures** – these are new measures which are being consulted on for the first time as part of the draft second cycle FRMP. These were potentially included in the detailed assessment of individual measures as well as the overall and cumulative assessment

The assessment also considered National Measures - the Environment Agency's and Lead Local Flood Authority's (LLFA's) National Measures were assessed once nationally and the findings were included in each FRMP assessment.

We considered the nature of the activity involved to decide if a measure potentially needed to be included in the detailed assessment of individual measures. The detailed assessment focused on the measures that are likely to result in physical 'on the ground' activities that have the potential to have direct environmental impacts. Other measures were considered as part of the overall assessment.

We considered the type of work to help understand if the measure has the potential to have direct environmental impacts on the ground; the types of work are divided into one of four main categories:

- **preventing** – by avoiding putting people or the environment at risk of flooding
- **preparing** – by taking actions that prepare people for flooding
- **protecting** – by protecting people from the risk of flooding
- **recovery and review** – by learning from flood incidents

Protecting types of work are most likely to involve physical on the ground activities, whereas preparing types of work are unlikely to involve physical on the ground activities as they tend to be concerned with activities such as awareness raising and planning.

## 3.4. Assessing alternatives

The SEA regulations require ‘reasonable alternatives’ to be assessed.  In considering alternatives within the SEA a tiered approach has been adopted that reflects the regulatory requirements of the FRMPs and the SEA. We first considered strategic alternatives focused on the process and approach used in the development of the draft second cycle FRMPs. This included consideration of the ‘do nothing’ option, defined as the likely evolution of the baseline environment in the absence of the second cycle FRMP. We then considered place based alternatives. This information influenced our decision making, the development of the plan and the measures we needed to include in the draft second cycle FRMP. This was an iterative process.

Section 4 explains the assessment of ‘reasonable alternatives’ in more detail.

## 3.5. Assessing significance of environmental effects

We assessed the likely effects of the draft plan and the relevant measures in the draft second cycle FRMP against the environmental topics using one of five categories:

- significant positive effects
- positive effects
- neutral – no effect
- negative effects
- significant negative effects

We used examples to help define what a significant positive or negative effect of a measure might include, such as:

- measures that are likely to result in an effect, positive or negative, on the integrity of features or assets of national or international value or features of importance at the RBD scale
- measures that are likely to result in a demonstrable change, positive or negative, to the extent, condition or value of features or assets of national or international value or features of importance at the RBD scale
- measures that are likely to conflict with or reinforce environmental legal objectives, targets or duties at the international, national or local scale, including in relevant plans and strategies in the RBD
- measures that are likely to result in a demonstrable change, positive or negative, in the health and/or social or economic wellbeing of communities, particularly including vulnerable people within the RBD

We used the baseline information, review of policies, plans and programmes and identification of effects relevant to the specific RBD to work out which effects are likely to be significant under each environmental topic. We considered, where possible, the duration of the potential effects and reversibility / permanence in deciding if effects are significant.

We also identified positive and negative effects that were not considered to be significant based on the criteria listed above but which may be significant. The significance could be due to the interrelationship between effects, and which were potentially important for identifying potential cumulative effects.

The strategic nature of the draft plan and many of the relevant measures mean that we'll need to investigate to decide the nature and extent of flood risk management activity at a project level. Once we've completed these investigations, we'll know the action which will need to be taken and the associated environmental impacts. At a strategic level this limits the level of confidence in our assessment. We know from previous experience that negative environmental effects can occur as a result of some flood risk management activity. Therefore, measures will be in place to manage environmental risks at a project level. The assurance of project proposals provides additional safeguards that make sure environmental implications are considered in the implementation of the draft second cycle FRMP. Where effects are uncertain this is noted. Where project level environmental assessment and management is needed to manage environmental risk, this is also noted. All business cases from flood risk management projects are subject to environmental assurance and scrutiny.

## 3.6. Our assessment framework

We used the assessment framework below to test the effects of the plan on each of the environmental topics. We also looked at the inter-relationships between environmental topics.

We based the criteria on our review of the environmental context of the RBD. This included our review of the environmental baseline and of plans, policies, and programmes.

We used the framework to identify both the positive and negative effects of the draft plan. We've also identified ways to avoid or reduce negative effects and to enhance positive effects. The individual criteria formed a framework and focus for our assessment. Where relevant wider effects on these environmental issues were considered and these are noted in sections 5 and 6.

### 3.6.1 Biodiversity, including fauna and flora

**SEA question**

Does the plan protect and recover nature?

**Assessment criteria**

Does the plan:

- conserve and protect species and habitats?
- support opportunities to restore and create new habitats?

### 3.6.2 Population and human health

**SEA question**

Does the plan improve health wellbeing and equality?

**Assessment criteria**

Does the plan:

- improve the health and wellbeing of communities?
- seek opportunities to reduce social deprivation and inequality?

### 3.6.3 Soil

**SEA question**

Does the plan improve and sustain resources?

**Assessment criteria**

Does the plan:

- protect and conserve soils and improve resilience to degradation?

### 3.6.4 Water

**SEA question**

Does the plan protect and improve the water environment?

**Assessment criteria**

Does the plan:

- support delivery of Water Framework Directive objectives?
- contribute to the sustainable management of water resources?

### 3.6.5 Climatic factors

**SEA question**

Does the plan help to mitigate and adapt to climate change?

**Assessment criteria**

Does the plan:

- support adaptation to the wider effects of climate change e.g. drought, low flows, etc?
- provide a carbon benefit for example  carbon sequestration? (we're looking at the effect of the plan on greenhouse gas emissions here)

### 3.6.6 Material assets

**SEA question**

Does the plan support sustainable communities and a prosperous economy?

**Assessment criteria**

Does the plan:

- protect and improve the resilience of communities and the economy?
- protect and improve the resilience of important infrastructure?
- protect and conserve the best and most productive agricultural land?
- reduce waste and promote the recovery, reuse and recycling of materials?

### 3.6.7 Cultural heritage

**SEA question**

Does the plan conserve and enhance the historic environment?

**Assessment criteria**

Does the plan:

- consider the contribution of historic places to landscape character?
- support opportunities to enhance the historic environment?

### 3.6.8 Landscape

**SEA question**

Does the plan conserve and enhance landscape and seascape character?

**Assessment criteria**

Does the plan:

- conserve existing landscape and seascape character?
- support opportunities to enhance the quality of landscapes?

### 3.6.9 Inter-relationships

**SEA question**

Does the plan have implications for the relationship between the environmental topics?

**Assessment criteria**

Does the plan:

- have effects on individual environmental topics that could interact and affect the significance of the impact?

## 3.7. Assessing cumulative effects

We assessed the potential cumulative effects of the draft FRMP.

We assessed the potential 'intra-plan' and 'inter-plan' effects:

- ‘Intra-plan’ effects occur as a result of inter-relationships between different environmental topics. We also considered the interaction between ongoing and agreed measures with proposed measures. These measure categories are defined in section 3.3 above. The outcome of this assessment can be found in section 6 below
- 'Inter-plan' effects occur due to interactions between the draft second cycle FRMP and other plans, programmes or policies. The outcome of this assessment can be found in section 6 below

## 3.8. Identifying mitigation actions and enhancement opportunities

We identified opportunities to mitigate the predicted negative effects of the draft FRMP. We also identified opportunities to enhance the predicted positive effects of the draft FRMP. These opportunities were recorded. Where practicable, these will be undertaken during the implementation phase of the draft second cycle FRMP for example, at project level.

As outlined in section 3.5 uncertainty over the on the ground actions that'll occur as a result of implementing the draft second cycle FRMP results in uncertainty over the assessment of environmental effects. Therefore, we have identified a range of future environmental assessment requirements to incorporate in taking forward proposed measures across the river basin district. This management measure provides additional safeguards to make sure that the environmental implications are considered locally to implement the draft second cycle FRMP.

## 3.9. Deciding what monitoring is needed

We've proposed monitoring to understand the significant effects the flood risk management plan is having on the environment during its implementation. The water environment is subject to considerable monitoring activity by the Environment Agency and others so we propose an approach that makes use of this existing activity.

We've proposed monitoring indicators or identified existing monitoring, required to observe the significant effects of the plan. These need to be practical, cost-effective and strategic and must relate to the effects of the plan itself, rather than wider trends. Significant effects of individual projects will be monitored according to environmental action/monitoring plans devised during project level environmental impact assessment.

# 4. Our assessment of alternatives

## 4.1. Introduction

In this section, we've provided our assessment of reasonable alternatives to the draft plan. The Strategic Environmental Assessment (SEA) Regulations (the environmental assessment of plans and programmes Regulations 2004) require that an environmental report should consider reasonable alternatives taking into account the stage of the plan or programme in the decision-making process and whether certain matters are more appropriately assessed at different levels in the process in order to avoid duplication.

In this case, the draft second cycle FRMPs operate at different levels, from the strategic (headline objectives) through to the specific (individual measures). They are therefore both a strategy for the river basin district (RBD) and a programme of measures to implement this strategy. They cover RBD-wide measures and measures in specific places (for example, flood risk areas). They include measures being led by the Environment Agency and by other risk management authorities (RMAs). As individual measures are implemented in specific places, alternatives will be considered as part of business case appraisal and development and any future environmental assessments.

The consideration of alternatives in this environmental report therefore takes a tiered approach that reflects both the strategic and place based elements of the plan.

## 4.2. Reasonable alternatives to the plan

The Flood Risk Regulations 2009 (FRRs) require FRMPs to be prepared for identified flood risk areas (FRAs) and published for each RBD. Our objectives for updating the first cycle FRMPs are framed by the legal requirements set out in FRRs. The FRRs set out a statutory process for assessing, mapping and developing plans to manage flood risk over a 6 year cycle. The second cycle FRMPs (2021 to 2027) are to be strategic, place-based plans. They include objectives and measures closely aligned to the ambitions and goals of the National Flood and Coastal Erosion Risk Management Strategy for England and the 25 Year Environment Plan. They also aim to support achieving wider environmental and growth ambitions of society. They aim to show what's happening to address flood risk in identified FRAs and across the river basin district. The second cycle FRMPs encourage RMAs to work closer together to achieve the objectives and measures.

## 4.3. The 'do nothing' alternative

We considered a 'do nothing' alternative. The 'do nothing' alternative is defined in terms of the likely evolution of the baseline environment in the absence of second cycle FRMPs. The 'do nothing' alternative assumes no action is taken to review and refresh the published first cycle FRMPs and that as a result the first cycle FRMP would continue to be implemented.

The FRRs require the FRMPs to be reviewed and revised every 6 years. Therefore, we have not considered the "do nothing" alternative further.

## 4.4. Strategic Alternatives

The strategic alternatives were focused around options for development of the FRMPs. During the preparation of the first cycle FRMPs a 3 month consultation on how the plans should be developed was undertaken. The consultation was an E-consultation held in 2012, with questions posed on our website. We also held meetings with individual organisations and invited RMAs and national stakeholders to contribute their views. The consultation sought views on the scale at which the plans are prepared and the level of co-ordination or integration across plans for different sources of flooding. The consultation presented three strategic options relating to development of the FRMPs including:

- Option A- Lead Local Flood Authorities (LLFAs) prepare FRMPs for flood risk areas covering local sources of flood risk. The Environment Agency prepares FRMPs for main rivers, the sea and reservoirs. The Environment Agency would co-ordinate the plans at a river basin district scale by sign-posting the individual plans (similar to the approach adopted for Preliminary Flood Risk Assessments).
- Option B- A consolidated FRMP is produced by the Environment Agency in partnership with others by bringing together information from separate plans.

Information from Catchment Flood Management Plans would be used as a foundation, with information on sea flooding, reservoirs and local flood risks added from relevant plans. This could be achieved using a web-based system. The FRMP would be a partnership plan and the separate plans would still exist and be owned by the relevant authority.

- Option C- A FRMP is developed in partnership through one integrated process covering all sources of flood risk. The consultation invited participants to explain how they thought this could be achieved.

As a result of the consultation option B, to develop a consolidated plan in partnerships with LLFAs, was adopted. The consultation concluded that many of the issues raised in support of each of the three options were similar in nature, with respondents reflecting on the importance of effective partnership working, the need to ensure appropriate ownership of flood risk issues and the need to ensure appropriate co-ordination across all sources of flood risk. The pragmatism of the preferred option was highlighted as perhaps providing some middle ground between two extremes: enabling local ownership of relevant flood risk (e.g. by LLFAs) while pooling this information with others into one place so it can be shared more effectively with communities. The difference between the three options is largely related to the approach taken to developing the FRMP, rather than the content of the plan, and as such the three options are not expected to have significantly different environmental effects. It follows that by being joined up and working together with our partners, co-ordinating across all sources of risk and enabling local ownership, we can more effectively achieve all the objectives of the plans including the environmental ones. The preferred approach is likely to result in the delivery of better environmental outcomes.

The final first cycle FRMPs were published in 2016. These were joint, consolidated plans published at an RBD scale. They were prepared by the Environment Agency in partnership with LLFAs. They brought together information at different spatial scales, and included information provided by LLFAs regarding their FRAs so that it could be considered together within the larger RBD.

Considering the need for the second cycle FRMPs to review, update and build on the first cycle plans, the same strategic approach has been taken to develop the second cycle FRMPs.

## 4.5. Place based alternatives

At the individual plan level, the approach to developing and agreeing the objectives and the measures to be included in the draft FRMP differed between RBDs. Some held face to face or virtual workshops while others developed and refined measures via technical correspondence. In all cases the views of environmental and SEA specialists were central to this process, helping to shape and influence the plans and the measures which they

comprise. Furthermore, the draft SEA assessment framework was consulted upon alongside the scope of the SEA and where appropriate, this framework was amended.

During stakeholder workshops held to explore the development of the proposed FRMP measures of the draft second cycle FRMP for the Anglian river basin district, environmental opportunities and constraints were identified. Sustainability issues, adaptation and climate resilience was also considered. Place specific discussions looked at alternative ways to achieve flood risk management objectives for the FRAs with the least adverse effect on the environment. For example, benefits of small natural measures for flood storage were discussed as an alternative to large scale engineered structures. The potential for NFM and environmental land management was discussed as preferred approaches. This highlighted a need for increased awareness and capacity building around ELMs.

The proposed measures of the draft FRMP for the Anglian river basin district aim to build on first cycle FRMPs in setting out the future flood risk management needs. At the RBD scale they tend to set preliminary actions for the future investigation and development of business case appraisals and options. As such, further planning processes and supporting environmental assessments will focus on alternatives at these programme and project levels. Therefore, the focus of alternatives for this FRMP SEA is limited. It has concentrated on elements where the environmental assessment has identified that significant adverse environmental effects are likely from proposed flood risk management measures. This is described in sections 5 and 6.

# 5. Our assessment by each environmental topic

In this section, we've provided an overview of the strategic context in the Anglian River Basin District organised by environmental topic. It includes information on the current environment, the national and local policy context, key relevant environmental objectives and issues and how the environment of the RBD is likely to change in the future. Additional information is included in Annexes:

- Annex A lists national policies, plans and programmes reviewed.
- Annex B lists local policies, plans and programmes reviewed.
- Annex C lists sources of information consulted to provide the environmental context.

We have assessed the likely significant effects of the measures in the draft plan on each environmental topic. We have identified mitigation measures and enhancement opportunities.

# 5.1. Biodiversity, including fauna and flora

## 5.1.1 Current baseline

The Anglian RBD supports a wide range of habitats and high diversity of wildlife. It is the richest region in the UK for wetland wildlife. The abundant water bodies and wetland areas within the RBD support many protected species. These include otters, seals and water voles, as well as priority species listed in the UK Biodiversity Action Plan including white-clawed crayfish and bittern.

Many sites are internationally recognized as Special Areas of Conservation (SACs) and Special Protection Areas (SPAs). In total there are 36 SACs and 28 SPAs within the RBD and all are water dependant. The extensive and varied coastline includes a third of the UK's saltmarsh habitat. 28 sites are Ramsar wetlands of international importance. Coastal RSPB nature reserves, such as Frampton and Freiston Marshes and Local Wildlife Trust sites, such as Cley Marshes, are important functional habitat for the birds of the internationally designated sites.

There are many areas of specific habitat significance. The Wash is one of the top 5 overwintering bird sites in the world. The intertidal mudflats and saltmarshes of The Wash are important winter feeding areas for waders and wildfowl. The Wash also supports 90% of the English population of common seals in the UK. Four key rivers within the RBD feed into the Wash. These are the Welland, the Nene, the Great Ouse and the Witham.

Farmland bird species have suffered a 48% decline nationally since the 1970s. The uptake of countryside stewardship schemes and nature friendly farming initiatives have been positive for farmland birds. The Fens is a stronghold for some of the most heavily impacted species such as turtle dove and tree sparrow. Although less than 1% of the original fenland habitats remain, the Fens support a diversity of unique wildlife. Over 13,000 species were recorded in a recent audit.

Chalk rivers are important habitats that support a diversity of aquatic flora, invertebrates and fish. Key protected species include otter, water vole, brown trout, brook lamprey and white-clawed crayfish. Of the 200 chalk rivers in the world approximately three quarters are found in the south and east of England. The River Wensum in Norfolk is a representative example, of great value for its wildlife, angling and landscape features.

Reservoirs and watercourses throughout the RBD support important recreational fisheries and populations of eel, salmonids and coarse fish.

There are 3 designated Marine Conservation Zones (MCZ) in the Anglian RBD. MCZs allow economic activities to continue while protecting marine habitats and species. Blackwater, Crouch, Roach and Colne Estuary Marine Conservation Zone (MCZ) located off the Essex coast has large areas of important coastal habitat. It is an important

spawning ground and nursery for several fish species and one of the most important areas for both wild and cultivated native oyster. The Cromer Shoal Chalk Beds and the Holderness Inshore Marine Conservation Zone were designated in January 2016.

Areas of conservation importance include 563 Sites of Special Scientific Interest (SSSI) and 55 National Nature Reserves (NNR). More locally there are 185 Local Nature Reserves (LNR) and 2 Nature Improvement Areas: the Nene Valley, and the Greater Thames Marshes. The majority of SSSIs in the RBD are in favourable condition. Key sites do face individual challenges, for example the Ouse Washes is 80% unfavourable. Flooding and coastal erosion are among the key threats to SSSI condition across the RBD, as well as abstraction and general water shortage.

Around 2.67% of the total land in the RBD is woodland. The woodland and grassland habitats are mainly found in the upper RBD where the steeper slopes and clay soils are less suitable for arable use. Thetford Forest is a notable woodland area alongside large pockets of natural grassland north of Bury St Edmunds, Suffolk.

Invasive species such as signal crayfish are present in over half the water bodies in the RBD. In some areas, the legacy of drainage works on large stretches of rivers and dykes has created a poor habitat. Weirs and flood defence works prevent some species of fish and eels from migrating and spawning. Redundant flood risk management structures across the RBD continue to obstruct fish and eel passage.

There are significant habitat pressures within the Anglian RBD. Coastal squeeze and loss of salt marsh are particular issues. Trial projects implemented along the Essex coast have explored approaches to saltmarsh regeneration and improved coastal resilience. Managed realignment has contributed to creation of saltmarsh, but the loss of reedbed and freshwater grazing marsh. This freshwater habitat loss has been compensated for in the past through the Environment Agency led Anglian Habitat Creation Programme.

The cumulative impact of asset maintenance programmes has resulted in adverse effects on overall biodiversity of the river network. Species specific impacts from maintenance activities are affecting water vole, spawning fish (including salmonid), and aquatic invertebrates. Maintenance programmes include grass cutting, weed cutting, tree removal, ‘repairs’ to banks, removal of shoals, berms and woody material. Works to sluices and weirs impact fish and eel passage.

### 5.1.2 National plans, programmes and policies

The UN Sustainable Development Goals (SDGs) include goals to:

- conserve and sustainably use the oceans, seas and marine resources for sustainable development (SDG 14)

- protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification and halt and reverse land degradation. It also includes goals to halt biodiversity loss (SDG 15), this includes freshwater ecosystems

The Defra group will contribute to the SDGs to encourage thriving plants and wildlife.

These include actions to:

- make sure our seas are cleaner, healthier, safer, more productive and biologically diverse. Defra will do this by carrying out the UK Marine Strategy and increasing the proportion of protected and well-managed seas
- mainstream biodiversity net gain for developments requiring planning permission
- develop a Nature Recovery Network, including creation or restoration of 500,000 hectares of wildlife rich habitat as part of the new Nature Strategy
- protect, improve and expand England's woodlands
- implement the English Trees Action Plan, which sets out how we intend to use a natural capital approach to rural and urban forestry to maximise the biodiversity, water, climate, noise and other benefits trees can provide
- implement the English Peat Action Plan, which sets out plans to restore, sustainably manage and protect our peatlands. Restored upland peatland reduces flood risk, storing water and releasing it over a longer period of time and reducing high flows downstream during rainstorms making it relevant to the draft FRMP.

Local government and businesses across the RBD will increasingly need to show how they're working to achieve the UN Sustainable Development Goals.

'Biodiversity Net Gain' (BNG) is gaining increased acceptance as a way of better protecting wildlife. All development, including infrastructure to manage flood risk and coastal change, will need to show how it contributes to biodiversity net gain. Requirements around BNG are being driven by adoption of the Environment Bill which at the time of writing is expected to gain Royal Assent in autumn 2021.

The revised National Planning Policy Framework states that most new development will need to deliver biodiversity gains. Local authorities will adopt BNG principles as they update their plans and policies to make sure that new developments improve biodiversity.

The government's 25 Year Environment Plan calls for a greater use of flood risk management approaches that work with natural systems. This includes creating natural habitats that can have a flood risk benefit, such as woodland and saltmarsh and restoring peatland.

The plan includes policies for:

- embedding an ‘environmental net gain’ principle for development
- using and managing land sustainably
- supporting large scale woodland creation
- protecting and recovering nature
- greening our towns and cities and creating more green infrastructure
- securing clean, healthy, productive and biologically diverse seas and oceans
- enhancing sustainability

The National FCERM Strategy for England encourages the achievement of wider environmental objectives, including improving biodiversity. This supports the 25 Year Environment Plan. The strategy also encourages approaches that work with natural processes which can contribute to improving biodiversity.

Measures for managing flood risk and coastal change can have a significant effect on the biodiversity of wetland and coastal environments. They have the potential to make positive improvements for habitats and wildlife as well as have potential negative effects.

The National FCERM Strategy includes measures to:

- embrace and embed adaptive approaches to enhance the resilience of our environment to future flooding, coastal change and drought
- work with natural processes, such as natural flood management, sustainable drainage systems and sustainable land management
- support environmental net gain and contribute to enhancing the natural environment so we leave it in a better state for the next generation
- identify how habitat improvements can help to manage flood risk and coastal change
- improve the condition of water bodies
- achieve biodiversity net gain in all programmes and projects

Many designated sites of national, European and international conservation value are associated with freshwater, wetland, estuarine and coastal/marine habitats. The Conservation of Habitats and Species Regulations 2017 require assessments to work out whether FRMP measures are likely to adversely affect the integrity of European sites and need any compensatory habitat. See section 2.2.1 for details of the Habitats Regulation Assessment (HRA) we are completing of this draft second cycle FRMP.

### 5.1.3 Local plans, programmes and policies

Numerous local level Plans, Programmes and Policies (PPPs) influence biodiversity within the Anglian RBD. (Appendix B).

Local partners (Local Planning Authorities (LPAs) and Local Enterprise Partnerships (LEPs) across the Oxford Cambridge Arc (OxCam Arc) recognise the value of the natural environment. Through the joint declaration between government and local partners for the Arc they have committed to embody the 25 Year Environment Plan goals and deliver environmental outcomes including embedding a local natural capital planning (LNCP) approach. Their aim is to meet economic and housing ambitions while improving, rather than degrading, the overall environment within the Arc. An Arc-wide local environment board has been established which is forming connections and ways of working. Environment principles have been developed that seek to secure practical ways to increase nature and manage natural resources endorsed by the Arc Leadership Group. This LNCP approach helps de-risk growth and deliver the ambitious vision for the Arc through prioritising opportunities for investing in the environment. It helps to understand the current state of the environment, (helping to avoid or minimise, negative impacts on key environmental assets), and seek/identify opportunities and leverage resources to invest in and enhance environmental assets.

Threatened areas of high biodiversity tend to be isolated. Therefore, there is a general drive towards restoring connectivity and reversing habitat fragmentation. Green infrastructure networks in both urban and rural areas are being encouraged. The Green Infrastructure strategy for Waveney, East Suffolk highlights opportunities to improve the quality and value of green space. It includes enhancement of riverine habitat and green corridors along ditches and waterways.

In Fenland the main rivers and waterways form the corridors for wildlife. Improved biodiversity is at the core of The Fens Biosphere project. The project aims to apply for UNESCO Biosphere status for the fens. The aim is to create stronger partnerships across the area, to improve natural resource management and quality of life in the fens. It includes reed bed habitat establishment and catchment sensitive farming. It is championed by conservation bodies, farmers representatives, food suppliers, and academic and research organisations.

The Great Fen is a 50 year habitat restoration project at a landscape scale. It is led by the Wildlife Trust for Cambridgeshire, Bedfordshire and Northamptonshire with the partnership of the EA, NE, Middle Level Commissioners and Huntingdonshire County Council. The plans have targeted actions to meet biodiversity goals for threatened and priority species and habitats. Ditches and drains within the Great Fen are being managed by restoring habitat and retaining water instead of draining water.

The Nenescape Landscape Partnership Scheme has also adopted landscape scale conservation approaches to improve biodiversity. It is supported by the public, private and voluntary sectors including The Environment Agency, Northampton University, Northamptonshire University, Peterborough City Council and the RSPB among others. The Nene Valley Nature Improvement Area implemented under this scheme aims to reverse the decline in biodiversity across a network of ecological sites in the Nene Valley.

The Nine Chalk Rivers project includes 16 restoration projects spread across 9 unique chalk rivers in Norfolk. The project involves communities within catchment level planning and delivery, funded through the Environment Agency's Catchment Restoration Scheme. Partners included the Norfolk County Council, Norfolk Coast AONB, and the Wild Trout Trust.

Local development planning currently provides for the protection and conservation of priority species and habitats. Local Plans also seek opportunities for increasing species populations. For the future BNG is likely to be included within local level plans.

Across the RBD farming policy is changing to address declining biodiversity. Farming practices that seek biodiversity benefit and habitat creation have been adopted across the RBD. Measures include reduced pesticide use, hedgerow planting and wildflower banks. Catchment sensitive farming methods have reduced erosion and run-off into the waterways. The uptake of farming initiatives that deliver biodiversity gain is likely to increase at a local level, driven by the new Agricultural Bill promoting payment for public goods.

Local Forest Plans of the Forestry Commission aim to increase species diversity to improve climate resilience. A particular goal is to protect and enhance priority habitats and species.

The SMPs identify the need for managed realignment schemes to create compensatory saltmarsh habitats along the east coast, some of which have been delivered. But coastal squeeze continues to be a significant threat to coastal habitat.

### 5.1.4 Considerations for the second cycle FRMP

To summarize, the main themes that will interact with the second cycle FRMP include:

- Flood management approaches that work with natural processes.
- Restoring ecological processes by removing or adapting existing flood risk management structures that are affecting the ecological status of waterbodies
- Increased connectivity of green space and wildlife corridors at a landscape scale
- Mandated biodiversity net gain for all development
- “Greener” design approach to engineering

- Protection of locally important species and habitats as well as international prioritised species
- Promote increased species diversity to strengthen ecosystem health and resilience.
- Recognising natural capital value in decision-making.

### 5.1.5 Future baseline

Biodiversity threats in the Anglian RBD have been evident for decades. With population rise, comes a greater demand for land for development. Natural areas and their habitats will continue to be replaced with urban environments. New trends emerging following the Covid 19 pandemic have seen a move from urban to rural areas. This may present increasing pressures on areas such as the Anglian region. Increasing pollution and waste pose a threat to natural habitats and vulnerable species.

Given the predominance of productive land (Grade 1 agricultural land) in the fens, the RBD will continue to be a nationally significant area for agricultural development. Pressures to expand agricultural productivity in the region will continue to threaten the loss of fenland habitat and species. However, "greening" agriculture and wildlife friendly farming is a policy trend for the future. This is likely to encourage changes in farming methods with a positive effect on biodiversity. Research and interest in agroecology is growing. This is likely to lead to wider application of farming methods which maintain a healthy and diverse environment, while increasing yield.

Tourism visitation within the area has provided economic benefits to support nature conservation. As the trend towards nature-based holidays grows, this benefit is likely to continue, particularly in rural East Anglia. Adverse effects on habitats and species may also occur if visitor numbers, activities and behaviours are not managed. The Covid pandemic has sparked an increase in outdoor recreation and with it, increased visitor management impacts on the natural environment. Growth in water-based recreation may impact negatively on the inland waterways. Increased pollution events and heightened spread of invasive species may result. But enjoyment of the water environment can catalyse action to protect and conserve it. The Upper Nene Valley Gravel Pits mitigation strategy aims to reduce the impact of increased visitors on the SPA.

The effects of climate change will impact biodiversity in the region. Saltwater flowing up the rivers during tidal surges threatens river ecology. This is particularly relevant to the Broads. Increased storms and extreme weather conditions will result in continued loss of coastal habitats and exacerbate coastal squeeze. Ongoing loss of salt marsh is taking place, particularly along the Essex coastline.

Flood events can introduce sedimentation and pollutants into water bodies for example through increased run-off from agricultural and urban areas. This may impact the ecological balance of aquatic systems. The future health of the aquatic ecosystems may

diminish as flood events increase in number, size and duration. Wildlife may suffer displacement or loss of food source through flooding. Breeding bird populations within the wash lands are at increasing risk from floods. Summer flood events are already destroying the nests of lapwing and snipe within the Ouse Washes. Flooding over prolonged periods of time can result in habitat change.

Predicted hotter temperatures may also impact species diversity. Bird and fish migration patterns may change. If temperatures increase by 2 degrees key pollinator species will be affected. Biodiversity research on Norfolk-based species predicts higher temperatures of 3.2 degrees to be unsuitable for 13 Bumble bee species, 24 birds, and 270 species of moth. Prolonged periods of dry weather will also result in a rise in wildfires, algal blooms and fish kills. In these changing conditions invasive species are predicted to thrive. They will often out-compete sensitive native species.

Biodiversity Net Gain (BNG) is at the heart of the 25 Year Environment Plan. The Environment Agency eMission targets include an ambition of 20% BNG. The draft National FCERM Strategy looks to ensure BNG provision within flood risk management programmes. For the future the push will be for developments to give more than just protection of natural habitats. The goal will be to improve the environment and increase biodiversity.

Measures from the River Basin Management Plan to improve water body status may help mitigate biodiversity threats. Local level management strategies and plans outlined above are also contributing to localized biodiversity gains.

Local management plans and strategies are adopting flood risk solutions which work with natural processes. For example, the River Wensum Restoration Strategy aims to restore the river to a more natural environment and flow regime. This includes reconnecting the river to its surrounding flood plain. Adopting nature-based approaches to flood risk supports habitat improvement and biodiversity. In 2018, Anglia Water invested in its first water treatment wetland on the River Ingol, Norfolk. Future renewal of the Environment Agency Habitat Creation Programme will create opportunity for targeted biodiversity net gain. As will the developing OxCam Arc LNCP, by embedding natural capital thinking into growth plans, testing approaches and sharing learning from them, and applying project outputs such as ecosystem service mapping.

The continued roll out of first cycle FRMP will provide mitigation to minimise impacts to biodiversity. There may still be some localised negative effects. Natural flood management (NFM) schemes should impact positively on species and ecosystems.

### 5.1.6 Scope and assessment framework

The assessment is focussed on whether the plan protects and recovers nature. The main concerns being the conservation and protection of species and habitats as well as opportunities to restore and create new habitats (see section 3.6).

The nature conservation sites within the RBD play a key role in biodiversity protection and recovery of nature. The assessment considers potential positive and negative effects on these sites, their species and their habitats.

The assessment looks at the creation of wetlands, restoration of more natural flows, and re-connections with flood plains which could improve water quality to the benefit of biodiversity. Other NFM measures such as riparian planting, and leaky barriers may also have positive effects on habitats and species. Localised measures to enhance green space and interconnectivity of habitat through green corridors should positively impact pollinators and key BAP species. Promotion of native species planting and heightened control of invasive species should result in the positive effect of increased species diversity.

### 5.1.7 Significant effects of the draft plan

**Significant effects of national measures**

National measures included in the draft plan could result in both positive and negative effects on biodiversity. Measures which intend to prevent flood and coastal erosion risk and to respond and recover to flood and coastal erosion events have the greatest potential to affect biodiversity, both negatively and positively.

The draft plan includes measures to adopt nature-based solutions to manage flood risk and measures that require flood risk management projects to achieve biodiversity net gain and wider environmental benefits. We expect that this will benefit biodiversity, with the scale of positive impact increasing over time as these ways of working embed and the planning and delivery of flood and coastal risk management improves.

Despite the draft second cycle FRMPs clear intent to increasingly adopt a nature first approach to manage flood risk there'll still be a need for new or improved infrastructure so that flood risk can be effectively managed. Without mitigation these infrastructure projects can have negative effects on protected habitats and species. This can include the loss, damage or fragmentation of habitats through construction activities or loss of ecological connectivity. This can lead to impacts on species abundance and diversity.

Flood response activity, for example deploying temporary barriers can negatively affect biodiversity. Measures to plan, prepare and exercise for future flood scenarios and to take a risk based and whole life approach to management of assets will help to

identify the biodiversity risks related to flood response. This will allow any risks to be minimised and managed better.

**Significant effects of local measures**

No significant negative effects on biodiversity, flora and fauna are anticipated from the measures within the plan and almost half of the measures are expected to result in a positive or significant positive effect.

The detailed assessment of measures for on the ground physical protection works shows an overall positive effect on biodiversity is likely.

The coastal extent of the RBD is characterized by conservation designations with multiple RSPB interests. Measures that re-wet grassland, creating scrapes and ponds, will provide biodiversity benefit. Improved habitat diversity and increase in plant and vertebrate species is important for key wader species of conservation concern. Thus **a significant positive effect** is likely from these.

Measures are proposed for the fens which focus on habitat creation. Given the existing poor national status of lowland fenland habitats, habitat creation is likely to result in a **significant positive effect** on biodiversity, flora and fauna, particularly at a species level.

Proposed localized interventions which focus on land management, river restoration and habitat diversity are likely to have an overall positive effect. Habitat fragmentation along the Nene floodplain and poor water quality is an issue likely to benefit from this type of initiative, resulting in a positive effect. Localized on the ground NFM interventions such as this are likely to have small-scale local positive effects. Only one measure specifically addresses opening-up fish passage which remains a priority for numerous waterways within the catchment.

Measures that focus on maintenance activity to sustain levels of protection in specific areas within the RBD are also for the most part likely to result in positive effect. Channel conveyance management may involve more traditional forms of control such as sediment management, and vegetation management with potentially adverse effects on the aquatic environment through physical damage and habitat removal. However, given EAs BNG targets and increased interest in adaptive management approaches that work with natural processes, positive impacts on the ecology, flora and fauna are more likely to result. Maintenance works to embankments are likely to involve vegetation management, including INNs management, which is likely to have a positive effect on biodiversity. Erosion protection and repair work may involve hard engineered solutions, however given Environment Agency policy drivers and targets around sustainability and Biodiversity Net Gain it is likely that options will favour softer solutions in the long term, with overall benefit to species such as water vole, otter and fish. Compliance to WFD and HRA maintenance assents with respect to designated sites should also assist in mitigating any negative

effects of maintenance works on the conservation status of the designated sites. Maintaining sluices and tidal flood defence infrastructure to sustain the standard of service is not likely to have any overall significant effects, only temporary construction impacts.

The River Nene has been highly modified throughout history for industry, navigation and flood defence purpose, which has reduced its ecological function as an aquatic habitat. Proposed measures to restore the backchannels will improve habitat condition, control INNs, and enhance fish nursery and refuge with an overall positive effect on biodiversity.

There are a number of measures within the detailed assessment which are not likely to have a positive or a negative effect on biodiversity, flora and fauna. These include property level resilience (PLR) measures such as those proposed for Northamptonshire. The installation of PLR is unlikely to result in positive or negative ecological effects on biodiversity, flora fauna, soil, or water as they will be carried out on existing buildings and structures. There may be some minor effects associated with construction activity, but these will be negligible and are likely to be temporary.

The Middle Level Area is dominated by rural agricultural fenland, with most areas below sea level and few natural watercourses. The Ouse Washes and Nene washes are important wetland designations, particularly for overwintering, breeding and passage birds. Impacts on biodiversity are likely to result during construction activities associated with bank raising and replacement of culverts. Both positive and negative effect may result depending on the design solutions, hence overall effect is uncertain.

A negative effect and positive effect is anticipated from new coastal hard engineered infrastructure such as floodwalls and tidal barriers. Details of the works within the Great Yarmouth FRA are uncertain but temporary adverse effects are likely from construction. Exploring NFM type measures upstream that will contribute to BNG and enhancement of habitats within the Broads will likely have a positive effect but actual on the ground measures are unknown and therefore impacts remain uncertain. Construction impacts associated with the Lowestoft tidal barrier may lead to permanent loss of intertidal and benthic habitat hence negative effects on biodiversity. Construction activities may entail dredging and piling activity and over a long duration, with potential impacts on fish migration, spawning and the overall aquatic environment. The Environment Agency BNG target is likely to drive positive outcomes for BNG. But specific species impacts are likely to be negative and any compensatory measures may not be within the immediate locality. Closure of the barrier in extreme tidal events will be of benefit to the flora and fauna of the Broads as severe saline incursion into the Broadland SAC/SPA will be prevented. When it remains open and non-operational, the barrier will not prevent the increase in saline conditions currently being experienced due to rising sea levels.

Approximately 20% of measures screened out of detailed assessment are appraisal and assessment measures looking at future opportunities to carry out protecting type works. Almost half of these are focussed on schemes that explore opportunities for NFM, habitat

restoration or positive outcomes for the environment. These measures all involve partnership working. For example, between 2021 and 2027, the Environment Agency will investigate opportunities to support Lincolnshire Wildlife Trust to develop a project at Bourne North Fen Wetland. The scheme will aim to improve biodiversity and water quality. Also within the Welland catchment, the Environment Agency will seek to support the Welland Rivers Trust to re-create wetland habitats. Along the Lincolnshire coast the Environment Agency seeks opportunities to support habitat improvements within the Lincolnshire Coastal Country Park while sustaining the level of flood protection in the area. Environment Agency will also work across East Anglia with Natural England and Local Authorities to link flood risk management projects with the development of nature recovery networks. Given the adaptive approach taken, actual work may or may not be implemented within this cycle of the FRMP. Hence on the ground impacts are uncertain. The partnership approach and integration of FCRM with conservation and environmental improvement sets out a positive foundation for future delivery.

Activities for the other appraisal and assessment type measures are not as well defined and it is not clear what approach will be taken forward. It is therefore not possible to determine any potential effects from these appraisal type activities at this stage. Specific environmental impacts to biodiversity, fauna and flora will be addressed through the appraisal process at the project level.

Other effects on biodiversity, flora and fauna which may or may not deliver on the ground effects during this plan include planning and development related measures. There is a common approach across the River Basin District which seeks to work with the LPAs and developers to avoid inappropriate development. If adopted, this approach will set the framework for positive outcomes for biodiversity in the future.

The implementation of the other prevention type measures such as improved modelling and mapping are not likely to have any significant effect. These activities can inform future planning of NFM and nature-based solutions and will therefore have a long term indirect beneficial effect. Direct effect on the restoration and recovery of nature during the life of this plan is considered neutral.

Approximately 20% of all other measures are preparing type activities such as public awareness and improved flood forecasting and warning systems. Improved flood warning can help protected areas managers better prepare for extreme events and take action where needed. The overall effect on biodiversity by these types of measures is considered neutral.

No significant positive or significant negative effects on biodiversity are considered likely for any key location at a Flood Risk Area scale, Management Catchment scale or Strategic Area. In general, both positive effects and negative effects are identified within key locations. Measures for certain locations show an overall thrust towards environmentally positive schemes which enhance and protect nature. For example, within the Combined

Essex Management Catchment there is an over-riding theme across the measures for nature-based solutions, and options which deliver positive environmental outcomes, including improved water quality, and environmental benefit. In this location there is a specific strategic measure that relates to the resilience of designated sites. 2/3 of the Environment Agency measures within the Nene Management Catchment are partnership orientated projects supporting NFM and habitat restoration and which aim to achieve positive outcomes for Water Environment (Water Framework Directive) Regulations 2017 (WFD) and biodiversity. In Alconbury Flood Risk Area, a third of the measures are protecting measures. A combined positive effect on biodiversity is also considered likely for Alconbury. Future capital works will take a catchment approach and aim to deliver BNG and include NFM.

FRAs which may see potential adverse effects on biodiversity from the combination of measures include Boston FRA, Great Yarmouth FRA and Lowestoft FRAs where protecting measures are focussed on tidal defences. Hard engineered solutions are likely to impact adversely on priority habitats and species, particularly during construction. However, Environment Agency policy regarding BNG delivery and project level assessment is likely to influence long term positive outcomes. Preventing measures for these FRAs also explore potential NFM and Environmental Land Management scheme (ELMS) initiatives upstream, with likely positive effect on the aquatic environment if delivered.

## 5.18 Mitigation actions

For those projects delivered through the Environment Agency, mitigation of ecological effects will be addressed through project level assessment. Environmental assessment is conducted hand in hand with design on all Environment Agency projects, except those of low risk. This will enable negative impacts to be identified early and designed out. At the same time environmental opportunities are identified and enhancements designed into projects. Evidence of this design evolution will be provided within the Environmental Statement or Environmental Report.

At the construction stage, Environment Agency projects will follow an Environmental Action Plan (EAP) which clearly identifies ecological risk and measures needed to mitigate and manage them. An environmental clerk of works may be employed to actively ensure the EAP is implemented where risk is higher.

Operating instructions setting out the Environment Agencies approach to assurance, environmental assessment and management for capital projects are well established and reviewed regularly to ensure they are current. Adherence to MTRs for environmental design and management is a contractual obligation

Legal compliance to the Habitat Regulations Directive and Countryside and Public Rights of Way Act will ensure mitigation measures are applied to any likely significant effect to designated sites.

For capital maintenance works project teams are encouraged to work with land managers to find alternatives to desilting. For example, exploring methods to reduce soil erosion and sediment transfer. Maintaining green buffers to waterways is a simple mitigation. An adaptive management approach is also recommended.

Due regard to obligations under the Eel regs should be followed on all schemes to improve fish and eel passage when working on any impounding structure. Installation of fish friendly infrastructure should be considered while carrying out remedial works on pumping stations.

Soft solutions for embankments, and coastal solutions which work with nature should be explored in the first instance as the default. Gaining an understanding of the rich diversity of invertebrates and botanical species present along the coastal defences should be included in survey work, to mitigate impacts, as well as identifying opportunities to improve biodiversity.

Exploring water attenuation as a flood risk option presents the opportunity to work with stakeholders to integrate potential ELM schemes, especially in areas where agriculture is dominant. The bias should be towards nature-based attenuation as the preferred option, although recognizing that adverse impacts can result from NFM measures during both construction and operation phases. For example, reconnecting areas of floodplain may result in conflicts with recreational use. When considering pond creation through ELMs and as features of NFM, site selection is important and pond creation on land of existing high conservation value should be avoided. NFM effectiveness may also vary based on environmental factors such as soil type, topography and climate.

There is a national impetus towards nature recovery, and there may be opportunity to link into funding opportunities through the Nature Climate Fund and other incentives related to the Environment Bill, to support the NFM initiatives being explored.

For measures which include tree planting, it is important to select the right trees for the right place. The positive effects on biodiversity can be enhanced through species selection with careful attention to appropriate provenance.

Careful programming of works to take into consideration the risk of disturbance to over wintering and nesting birds is important to consider in areas within the RBD with the presence of SPA and SAC designations.

### 5.1.9 Enhancement opportunities

Consideration can be given to green design elements that promote native planting, habitat for invertebrates and pollinators.

BNG targets are not likely to be applied to investigative works, however opportunities for small scale habitat/species specific enhancements could be considered through conversations with land managers, particularly of local and international conservation designations.

Reinstatement work for compound areas and any above ground public areas should consider the inclusion of small environmental enhancements such as pollinator seed mixes, and hedgerow planting where appropriate.

Assessment and design work related to culverts should take into consideration WFD and the Environment Agency culvert policy which states "wherever practical the Agency will seek to have culverted watercourses restored to open channels". Improved designs that provide opportunities for enhanced fish passage and resolve sedimentation issues should be key objectives when replacing culverts within the Middle Level Area.

## 5.2. Population and human health

### 5.2.1 Current baseline

Over 7.7 million people live in the Anglian RBD. There is a large rural population, and many urban areas have developed close to rivers and within flood plains. To the south of the area satellite towns such as Luton have grown up around London.

Overall the population is growing. From 2013 to 2018 many areas were among the higher growth levels in the country. Colchester experienced an 8.1% increase, Central Bedfordshire 7.5%, and Peterborough 6.7%. Growth across the region is not uniform. Populations in the Fens have seen lower growth rates. North East Lincolnshire has had a decline of 0.08% since 2018.

By 2026 the East is predicted to experience the UKs second highest population growth after London. A third of the population increase is estimated to result from an increasing birth rate. The remaining increase is attributed to migration into the area. The agriculture and tourism industries also attract temporary workers leading to seasonal population increase in certain areas.

Across the RBD there is a growing aging population. The places with the highest proportion of people aged 65 or over are all located in coastal communities.

Nationally the structures of families are changing and this is likely to be reflected regionally. There is a rise in multigenerational families living together and an increasing number of young adults are living with their parents.

Many towns are planning significant housing growth along with the creation of jobs and services. There are several urban areas in the RBD which are rapidly expanding. These include Milton Keynes, Northampton, Cambridge (which are also part of the OxCam Arc) and Lincoln. The Causeway area in Maldon is a focus for employment, supported by housing growth at Maldon & Heybridge. Other urban areas are undergoing extensive regeneration, such as the redevelopment schemes of Great Yarmouth and Lowestoft. Colchester, Chelmsford & Ipswich all have significant levels of growth proposed. Many of these growth areas are in areas of flood risk.

Many of the economic sectors in the RBD rely on flood risk management activities to help support continuous economic growth. Significant agriculture-based industry dominates the RBD. More than half of the land is in use for agriculture and horticulture. This is due to the high quality soil, particularly in the Lincolnshire and Cambridgeshire Fens. Over one third of England's vegetables are grown in the Fens. Agriculture in these low lying areas is dependent on pumped drainage from ditches and drains and control by sluices at high and low tides. Washlands provide good seasonal grazing for livestock.

Tourism is also a key economic sector throughout the region with growing visitor numbers each year. There are many popular visitor and recreational attractions which support overnight and day visitation. Coastal communities such as Skegness, Cromer, Hunstanton and Clacton are established seaside and beach destinations. Holiday resorts, caravans and chalet-style parks are widespread along the Anglian coast. The Norfolk Broads National Park also has a thriving tourism economy. It provides over 200 miles of lock-free and easy to navigate waterways for water recreation. The Great Ouse, Fenland watercourses, Middle Level Navigations and the Grand Union Canal also provide a further 250 miles of navigable waterways. The reservoirs of Rutland Water and Grafham Water provide sailing, trout fishing and bird watching. Walking, cycling and other water sports also attract visitors to these man-made reservoirs.

Economic opportunity is also driven by major ports on the East coast, including Felixstowe and Harwich. Other important economic sectors are research and development centres in and around Cambridge, and manufacturing industries across the RBD. Cambridge is a key University city. The 'knowledge economy' is the core of the economic growth ambitions for the OxCam Arc. There are local planning authorities, a mayoral combined authority and a number of Local Enterprise Partnerships (LEPs) which play an important role in attracting investment and encouraging growth and regeneration across the RBD. Fishing, which was once a major industry all along the east coast of England, has declined significantly in recent years. Offshore wind energy projects are a significant driver for economic growth along the east coast. Wells-next-to-the-Sea for example has experienced economic benefit as a result of a rise in offshore wind farms. There is also a joint Lowestoft and

Great Yarmouth enterprise zone, established to promote economic growth in the offshore wind industry.

The current population in Norfolk, Suffolk and Cambridgeshire is healthier and lives longer than the national average. But, in some communities there are widening health inequalities, particularly in more deprived areas. There are a few areas of high level deprivation within the larger urban areas of Luton, Norwich and Ipswich. The smaller deprived urban areas are primarily located on or close to the coast and within the fens. These include Boston, King's Lynn, Peterborough, Great Yarmouth, Lowestoft, Clacton‑on-Sea and Southend-on-Sea. The most deprived neighbourhood in England is in the Jaywick area 2 miles west of Clacton on Sea. In general, lower levels of deprivation are seen in Cambridgeshire and Bedfordshire and the outskirts of Norwich.

### 5.2.2 National plans, programmes and policies

The UN SDGs include goals to:

- ensure healthy lives and promote well-being for all ages (SDG 3)
- promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all (SDG 8)
- make cities and human settlements inclusive, safe, resilient and sustainable (SDG 11)

The Defra group will contribute to the SDGs to encourage thriving rural economies and communities.

- These include actions to:
- make sure the UK Shared Prosperity Fund will help rural businesses and communities
- work with other government departments on business support, digital connectivity, broadband, housing, education, healthcare, transport and crime in rural areas
- strengthen rural communities
- install rural proofing across government so policies take proper account of the needs of rural businesses and communities
- reduce geographic inequalities
- The government's 25 Year Environment Plan includes policies for:
- embedding an 'environmental net gain' principle for development, including housing and infrastructure
- improving health and wellbeing by providing access to green spaces, creating more green infrastructure and planting more trees in and around towns and cities

- enhancing sustainability

The National FCERM Strategy includes measures to:

- achieve environmental net gain as part of strategic development proposals
- contribute positively to local economic regeneration and sustainable growth through investments in flood risk and coastal change projects
- improve the resilience of homes and business and enable people to be more resilient to flooding and coastal change

The National Infrastructure Delivery Plan supports large scale housing supply and new rail and road links to support UK population growth. Large scale development presents challenges for flood risk management.

The revised NPPF has a presumption in favour of sustainable development. It directs planning decisions towards sustainable solutions through which economic, social and environmental objectives can be met.

### 5.2.3. Local plans, programmes and policies

The Strategic Economic Plans drive development within the Anglian River Basin Management Plan (RBMP). They identify growth priorities and strategic hubs for development. A common theme to the local economic plans is sustainable growth. The New Anglia Strategic Economic Plan for example focuses on growth within a green economy: meaning low carbon, natural capital benefits and support for social capital.

Resilience is a key aspect of strategic development plans across the region. Water resource management is placed at the heart of all plans. A quality environment is also a common theme: maintaining sustainable economic growth and well-being. The PPPs advocate for integrated working and joined up-planning.

Local Plans create the spatial framework for development. There is now clear guidance on how local planning should be supported by a Strategic Flood Risk Assessment.

Urban regeneration, such as the Jaywick Place Plan, will continue to be seen as a tool to create economic growth and improved quality of life. In the Nene and Ouse catchments, a major new development scheme is proposed across Oxfordshire, Northamptonshire, Bedfordshire, Cambridgeshire (and 'north Bucks'). The OxCam Arc aims to build up to a million new homes across the Arc by 2050 to tackle the severe housing affordability issues faced by many and unlock the Arc's full potential.

### 5.2.4. Considerations for the second cycle FRMP

The challenge of the second cycle FRMP will be to address conflicts between population growth and increasing demand for housing and ancillary services, with flood management and protection.

The main themes relevant to the second cycle FRMP include:

- Place-based planning to build resilient communities
- Sustainable, low carbon growth with social and natural capital benefits
- Urban regeneration as a tool to boost improved quality of life
- Recognized benefits of nature to better health and wellbeing
- Promotion of technology and innovation to support growth

### 5.2.5 Future baseline

Significant economic and housing growth in the Anglian RBD area is anticipated over the long term to 2050.The central area of the RBD (specifically the Great Ouse and River Nene catchments) will experience unprecedented change and environmental pressures as a result of growth ambitions such as those associated with the OxCam Arc. New infrastructure development is required to mitigate against negative social and environmental impacts. For the future, development will be required to provide BNG and growth brought forward through the OxCam Arc will be brought forward in line with the government's 25 Year Environment Plan.  With the need to develop new communities comes the opportunity to build resilient places and create environmental betterment.

An increased population at risk from flooding will be compounded by more frequent flooding events from the sea and rivers. These events are also likely to be of greater scale and result in damage to property. Properties along the east coast will continue to be lost to coastal erosion.  There will be an adverse impact on the health and wellbeing of affected persons.  Increased exposure to climate related events will heighten climate awareness across the RBD and is likely to continue to prompt climate action. Local Authority guidance such as Cambridge City Councils "Greening your home" and heightened awareness of climate change impacts is likely to result in improved household resource efficiencies.

Mental health is currently high on the national and local political agenda. Continued research such as that carried out by the University of East Anglia) (Twohig-Bennett, C; Jones A;(2018))  that links health and wellbeing to the enjoyment of open space is likely to further influence positive attitudes towards nature and green space.

Without intervention many of the coastal areas will be at greater risk of breaches in coastal defences. Beaches and riverside areas popular for tourism will be subject to increased

flooding. Navigation along the waterways may also be adversely impacted due to an increased rate of flow.

The continued roll out of the measures within the first cycle FRMP will manage flood risk to support the maintenance of the tourism industry. There will be social benefits by preventing flooding to homes, properties and important infrastructure. Communities and local authorities will be better empowered to take action.

The challenge of the second cycle FRMP will be to address conflicts between population growth and increasing demand for housing and ancillary services, with flood management and protection.

The main themes relevant to the second cycle FRMP include:

- Place-based planning to build resilient communities
- Sustainable, low carbon growth with social and natural capital benefits
- Urban regeneration as a tool to boost improved quality of life
- Recognized benefits of nature to better health and wellbeing
- Promotion of technology and innovation to support growth

### 5.2.6 Scope and assessment framework

A reduction in flood risk to properties, infrastructure and services should result in positive effects on livelihoods, wellbeing and health. An integrated flood management approach may also positively affect social cohesion and wellbeing through environmental enhancements and amenity improvement.

Agriculture and tourism are key industries supporting the economy and livelihoods within the Anglian RBD. Positive effects on agricultural production can result from catchment sensitive farming and land management. Reducing run-off may prevent nutrient loss and increase productivity of cultivated land and semi natural grasslands. Increased water availability through ponds and storage may counteract a decrease in overall rainfall due to climate change. Some areas of productive land however may be lost to accommodate measures. Also, pests may benefit from wetter land with a negative effect on livestock. A multi-benefit approach to flood risk management can impact positively on tourism and recreation but there may also be some adverse effects, particularly in coastal areas.

The assessment will explore the positive and negative impacts on population through implementation of the measures. It will look at whether the plan improves health and wellbeing of communities and seeks to reduce social deprivation and inequality (see assessment criteria in section 3.6)

## 5.2.7. Significant effects of the draft plan

**Significant effects of national measures**

Flooding and coastal erosion has significant impacts on communities and businesses and negatively affects people's health and wellbeing.

The draft second cycle FRMP will deliver significant benefits for population and human health by helping to deliver climate resilient places and a nation ready to respond and adapt to flooding and coastal change. National measures aim to improve preparedness, prevention, recovery and protection from flood and coastal erosion and overall, these measures should result in positive effects for people, property and business.

Allowing people and communities to understand the level of flood risk they live and work with can reduce the potential consequences of a flood or coastal erosion event.

We expect that the plan will help alleviate the anxiety and stress of experiencing or being at risk of flooding.

Key aspects to support this include:

- making sure new development is resilient to flooding and coastal change by influencing the planning process and standards for building and materials
- making sure the infrastructure people rely upon is resilient to flooding
- delivering a programme of flood risk management projects to reduce the consequences of flooding
- raising awareness and supporting communities to increase their resilience to flooding
- working together to support communities through the recovery phase of significant flood events

Some deprived communities or neighbourhoods can be more vulnerable to flooding and the associated impacts. The partnership funding arrangements partially address this by increasing the grants available for flood risk management projects for these communities.

The potential to fund surface water flooding schemes has also been improved. This is important as a third of ‘flood disadvantaged neighbourhoods’ are affected by surface water flooding. However, vulnerability to flooding is influenced by other personal, social and environmental factors so support mechanisms for awareness and recovery work with these communities will remain important.

**Significant effects of local measures**

The plan is likely to have an overall **significant positive** impact on the population and health of the communities within the Anglian RBD and specifically those vulnerable individuals at high risk of flooding.

The detailed assessment shows that catchment scale maintenance programmes, are likely to have **significant positive** impacts particularly within low lying fenland and coastal communities. Existing tidal defences, embankments and pumping stations offer critical protection to thousands of properties within these low-lying towns and villages. Hectares of prime agricultural land within the Fens is also protected. Sustaining the level of protection in these lowland areas has significant benefits to wellbeing, livelihoods and local economies. Given the importance of the agricultural land to the national food supply these benefits extend nation-wide.

Localized interventions which focus on land management, NFM, river restoration and habitat diversity, such as those in the Nene Management Catchment, are likely to have an overall positive effect by improving amenity and potentially educational value of the areas. This is particularly relevant to partnership working with conservation organizations across the RBD such as the RSPB and Wildlife Trusts. Improving amenity space and enhancing the natural environment has a knock-on effect for improved mental and physical health.

A small percentage of measures (3%) seek to improve flood risk modelling and mapping, a small percentage (6%) focus on better flood warning and forecasting services, and a similar number of measures are public flood risk awareness and preparedness activities. These preventative measures are being implemented on a wide scale, over large areas of the RBD. For example, improved flood warning measures, cover 9 management catchments and 17 FRAs. This proactive approach that includes improved modelling, mapping, sharing of information, a greater understanding of flood risk and improved preparedness should result in a **significant positive** effect on the population across the RBD.

Potential negative effects on population are for the most part likely to be temporary and small scale and related to construction activities such as disruption and noise related impacts. Bank raising may require land-take resulting in permanent negative impacts although these effects will be at an individual level.

A very small percentage of measures are specifically focussed on water attenuation. The approach to attenuation remains an unknown. Large engineered structures of significant scale could potentially heighten flood risk to downstream communities in the event of a breach, although risk of occurrence would be low. This potentially **negative** effect would be considered through EIA at a project level.

There is a general push towards partnership and joined up ways of working. This should impact positively on the population by unlocking opportunities for schemes to deliver multiple benefits. Planning related measures which work with developers and provide

guidance on appropriate development have the potential to support greener residential communities and create built environments which contribute to improved quality of life.

At an FRA level FCRM schemes are seeking to contribute to urban regeneration, which will have **significant positive** effects within communities such as Lowestoft and Boston, and will assist in economic revival, improved investor confidence and a better quality of urban living. Flood and coastal risk interventions are targeted for some of the most deprived areas of the Anglia RBD. Parts of Lincolnshire's coastline such as areas around Mablethorpe and Skegness are among some of the most deprived areas of the country. These areas are heavily dependent on tourism and preparing and preventing measures target the tourism sector as well as the local community, strengthening the economic resilience of these areas.

**Mitigation**

There are no potential significant negative effects associated with the implementation of the plan. Adverse impacts on population will for the most part be related to the Protecting measures and occur during construction. These will be addressed at a project level, and mitigated through the application of the EIA process, adherence to environmental legislation and implementation of good practice.

**Enhancement opportunities**

The application of CEEQUAL on Environment Agency schemes and similar schemes that promote responsible and considerate practice in construction should drive additional community benefit at a local level.

Water attenuation schemes in the Cam and Ely Ouse management catchment have the potential to link into initiatives related to development in Cambridgeshire and the OxCam arc and provide multiple benefits. Opportunities to link flood defence works in general with urban regeneration and amenity improvements throughout the RBD should be explored. There are potential opportunities to integrate wider environmental benefit through close links with local ambitions such as sustainable transport routes, multiple use flood storage, and recreation. SuDs can green urban areas to improve quality of the urban environment and reconnect nature and people for wellbeing benefit.

Optimizing opportunity requires closer liaison and partnerships with local authorities at an early stage in the appraisal process. Likewise, early conversations with local nature conservation groups can identify opportunities which will result in long term amenity and educational benefit.

# 5.3. Soil

## 5.3.1 Current baseline

There is great variation in soil type across the Anglian RBD. Loose packed, sandy, silty soils across Bedfordshire, Suffolk and areas of Essex allow water to drain away from the surface. Areas of chalky soil across Norfolk, Lincolnshire and Cambridgeshire allows water to infiltrate the ground where it is stored as groundwater. The soils across Essex and Northamptonshire are tightly packed layers of clay soils. These absorb less rainwater and are more susceptible to surface water flooding. The Fens and the Broads have some of the largest tracts of highly fertile silt and peat in the UK. This includes 58% of the country's grade 1 and grade 2 agricultural land.

Erosion has reduced the top soils in the higher elevations of the RBD which lowers water retention. This potentially increases more sediment load into the rivers. This is particularly evident in the Fens where intensive agriculture may have caused significant topsoil loss.

The bedrock geology of the RBD is characterised by sandstone, mudstone, limestone chalk and clay. In some places the surface geology features peat, clays, sands, silts and gravels laid over the bedrock. In other areas the bedrock remains exposed or lies immediately beneath the soil. Many SSSIs within this area are designated for geological reasons. For example, Gibraltar Point in Lincolnshire and the cliffs at Gedgrave in Suffolk.

A band of underlying Cretaceous (135 million years ago) chalk runs diagonally across the RBD across North Norfolk and some parts of Suffolk, Lincolnshire and Cambridgeshire. This gives many of the rivers a relatively stable, predictable change of flow which shows little seasonal variation. This is because surface water run-off does not dominate flows.

In Essex, Bedfordshire and Northamptonshire, silts and sands from the Palaeogene period (600 million years ago) and London clay, is overlain with Quaternary (2.6 million years ago) gravel deposits left behind as glaciers retreated. This geology leads to a rapid rise in river levels following heavy or prolonged rainfall.

The Suffolk, east Norfolk and Essex coastline is made up of gravels, sands, silts and clay easily eroded by the sea. Over the past 500 years the area has lost villages to the sea. The soft dunes and cliffs continue to erode, some at an average of 1 metre per year. At Happisburgh, Norfolk over 35 properties have been lost to the sea in the past 20 years. The Lincolnshire coast includes wide inter-tidal sand flats. The sand flats between Grimsby and Donna Nook are currently accreting. Sand dunes are characteristic of many sandy beaches along the Anglian coast.

## 5.3.2 National plans, programmes and policies

The UN SDGs include goals to:

- end hunger, achieve food security and improved nutrition and promote sustainable agriculture (SDG2). This includes an indicator for improving soil quality
- protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, halt and reverse land degradation and halt biodiversity loss (SDG 15)

The Defra group will contribute to the SDGs to use resources from nature more sustainably and efficiently.

This includes actions to:

- develop a new Environmental Land Management system
- implement the England Peat Action plan as a key part of delivering improved soil management

The Defra group will also contribute to the SDGs to manage exposure to chemicals. This includes actions to:

- work with HSE to implement a pesticides and chemicals regulatory regime following EU exit that safeguards human health and the environment
- clean up contaminated land and mine water

The government's 25 Year Environment Plan includes policies for:

- using and managing land sustainably
- improving soil health and restoring and protecting our peatlands
- implement an 'environmental net gain' principle for development

The National FCERM Strategy includes measures to:

- work with natural processes, such as natural flood management, sustainable drainage systems and sustainable land management
- achieve environmental net gain

Agriculture has a major role in helping to manage flooding and coastal change. The new Environmental Land Management Scheme places greater emphasis on the provision of environmental services. It also provides opportunities to promote natural flood management.

### 5.3.3 Local plans, programmes and policies

The Anglian RBMP is focused on improving the quality of the water environment. Managing soil erosion and run off is intrinsically linked to pollution of waterways. Land management that retains soil and nutrients on the land, is a key objective within the plan.

Countryside stewardship schemes address soil management and sedimentation issues through land use change and agricultural practice.

The Fens for the Future Strategy recognises the opportunities presented through soil protection. It promotes improved soil quality through land management. Peat soils in particular are targeted for their valuable functions. The strategy was developed by the Fens for the Future Partnership consisting of public, private and voluntary sector organizations.

Fenland has been one of the areas suffering greatest from topsoil erosion. The State of the Environment 2019 report warns of the loss of soil fertility in the Fenlands in particular. Peat soils in 1987 covered 24,000ha of Fenland. They are still being eroded through drainage and cultivation at a rate of 2.0cm a year and releasing CO2 into the atmosphere. The National Farmers Union has reported a growing interest in and adoption of soil conservation practices by Fenland farmers. The farming industry has engaged in soil management initiatives that reduce soil compaction. New techniques such as contour farming and direct drilling are being adopted to increase infiltration and reduce the erosion. The Water Friendly Farming project is working with farmers to test soil management actions in the upper River Welland catchment to manage flood risk downstream.

Catchment Sensitive Farming programmes led by Natural England, the Environment Agency and DEFRA have improved soil conservation. Many fen farmers are committed to enhancing the environment. The Ely Nature Farming Project is demonstrating how farming can work with nature.

National policies on carbon and ecosystem services are driving a better understanding of the value of peat soils. Initiatives such as the Great Fen Project, which is part of the broader Fens Biosphere vision, are opening doors for alternative development of these landscapes.

Identification and management of Flood Risk Areas are also helping to address erosion and flood risk. Local plans are pushing the use of sustainable drainage systems (SuDS) in urban and rural areas. Green space policies have also contributed to reduced erosion in urban areas.

### 5.3.4 Considerations for the second cycle FRMP

Soils play a role in flood management. Their functions at filtering and storing water can be reduced or enhanced through land management practice. Coastal soil types influence erosion and protection of the coast. There will be interaction with the second cycle FRMP when addressing erosion, sedimentation and run-off issues.

Common themes include:

- Improved land management and NFM to slow water run-off rates

- Improvements to soil quality to improve natural function
- Working with natural processes to control erosion

### 5.3.5 Future baseline

Population growth will bring increased demand for land development and agriculture. Land clearance and urbanization will increase rainfall run-off and lead to higher sediment loads into drains and waterways.

Climate change will bring more intense periods of rainfall. Fluvial flooding events will increase, particularly in Essex, Bedfordshire and Northamptonshire where the geology will lead to high river flows. Future sea level rise is likely to cause more erosion of the beaches placing increased pressure on the hard defences and dunes. Droughts increase sedimentation of the tidal rivers such as the Great Tidal Ouse as the tide draws silt from the sea with the tide and not all is scoured out when heavy flows return. Rising bed levels may reduce the standard of protection. As sea levels rise, silt level management in the Great Tidal Ouse is likely to become more challenging.

Soil fertility is decreasing and there is increased awareness of the long term effects of climate change on soil and water management. This has contributed to a recent shift in policy direction away from intensive farming techniques. The science of soil and crops is being researched. Sustainable soil management methods are being tested across the RBD. Uptake of catchment sensitive agriculture and eco-friendly soil management systems is likely to increase in the future with positive effects. Ongoing implementation of the first cycle FRMP measures will result in increased drive towards the use of Sustainable Drainage Systems (SuDs) at a local level. This will also help to alleviate erosion and flooding issues caused by increased urbanization. Piloted NFM measures such as Wooton Brook, in the River Nene catchment near Northampton, will assist with upper catchment erosion and improved farming practice. A better understanding of the carbon value of fenland peat may also drive future initiatives to conserve areas of peat fen

### 5.3.6 Scope and assessment framework

FCRM activities have the potential for localised effects on soil and impacts at a landscape scale along the coast. NFM and measures that use alternatives to hard engineering, control soil erosion rates and prevent loss of soil with positive outcomes. Localised changes in downstream sedimentation may result from holding back water in storage areas with positive or negative effects. Increased functionality of washlands may have positive effects on soil quality. Localised measures restoring wetlands in areas of peat soil will potentially have a positive effect, preventing the drying out of the peat. Coastal schemes which work with nature will protect and restore dune systems and beaches.

The SEA assessment looks at impacts to soil related to its conservation and resilience (See Section 3.6.5) and whether the resource will be sustained and improved.

### 5.3.7 Significant effects of the draft plan

**Significant effects of national measures**

National measures included in the draft plan have the potential to result in both positive and negative effects on soil. Measures which plan to reduce flood and coastal erosion risk and to respond and recover to flood and coastal erosion events have the greatest potential to impact soil. The draft plan includes measures to adopt nature-based solutions to manage flood risk and measures that require flood risk management projects to achieve biodiversity net gain and wider environmental benefits. We anticipate that these measures will help protect and conserve soils and improve resilience to degradation. The scale of positive impact should increase over time as these ways of working embed and the planning and delivery of flood and coastal risk management improves. However, there will still be a need for new or improved infrastructure to manage flood risk and without mitigation these can result in the degradation of soils.

**Significant effects of local measures**

No significant effects are anticipated, and overall, the plan is likely to have both positive and negative effects on soil. Protecting measures which have on the ground interventions are likely to have an effect on soil. Preventing and Preparing, and Recovery and review type measures are unlikely to have any direct or indirect effect on soil quality or health.

The detailed assessment of measures show a predominantly neutral effect on soil. Measures that sustain the levels of protection to the tidal waterways of the Fens prevent saltwater inundation impacting high grade agricultural soil. Specific NFM, land management and catchment sensitive farming interventions are likely to contribute positively to protecting and conserving the soils within the RBD and improving resilience to degradation. Habitat restoration and rewetting the fens will be beneficial to soil quality. Areas which have been arable fields in the past have unnaturally high levels of nutrients following continuous enrichment through application of fertilizers. This requires specific management intervention. A positive change to achieve nutrient levels that will be able to support native wild species and rebuild fenland habitat will be a gradual period of change over the long term. Working with land managers through the ELMs to reduce upstream erosion and run-off and achieve more efficient use of washlands will have a positive effect on soil. Catchment sensitive farming undertaken in conjunction with FCRM to reduce runoff is likely to employ methods which allow increased permeability of soil and reduced compaction. An increase in hedgerow planting on agricultural land will prevent windblown loss of topsoil.

More traditional FCRM delivery, surface water management and maintenance schemes, (particularly for channel maintenance) are likely to result in topsoil loss due to increased erosion and run off. For a large percentage of the protecting measures the focus is on appraisal and viability, and actual delivery of works remains uncertain. Therefore, the

effect on soil is also uncertain. Construction activities do have the potential for negative impact on soil through pollution incidents.

**Mitigation actions**

Implementation of the plan will not have any significant adverse effect on soil. Any effects may need to be addressed at a project EIA level. It is assumed that any construction impacts will be adequately managed through standard pollution preventing measures. Also, good practice techniques will be employed for stripping, stockpiling and spreading soil and sustainable sourcing of materials.

**Enhancement opportunities**

When considering options for flood risk management in the Fens and low-lying agricultural areas, soft engineering and nature-based approaches would result in better outcomes for soil. Risk Management Authorities (RMAs) are encouraged to work with land managers to find alternatives to de-silting. Methods to reduce soil erosion and sediment transfer should be explored such as maintaining green buffers to waterways.

# 5.4. Water

## 5.4.1 Current baseline

The East of England is one of the driest regions in the country. The Anglian RBD only receives 600mm of rainfall per year. This is less than 70% of the national average. St Osyth, a village near Clacton-on-Sea, receives only 513mm of rain a year. The majority of rain falls in the north and the west of the RBD. As a result, the management of water resources is particularly critical and has led to a long history of human intervention to secure reliable water supplies.

Within the Anglian RBD there are 14 management catchments. The major catchments are the Witham, Welland, Nene and Great Ouse. These larger catchments all drain into The Wash. There are 631 surface waterbodies comprising of rivers, lakes, estuarine waters and canals, as well as 31 groundwater bodies. Nearly 70% of surface water bodies are designated as artificial or heavily modified. The 2016 WFD assessment found 53 of the surface water bodies to be at good ecological status and 598 at good chemical status.

The RBMP (2015) notes that physical modifications affect 51% of water bodies in the RBD. 10% are affected by changes to the natural flow and level of water. Pollution from wastewater affects 50% of water bodies, pollution from rural areas affects 47 % and pollution from towns, cities and transport affects 10% of water bodies in the RBD. Negative effects of non-native invasive species affect 6% of water bodies in the Anglian RBD.

Rivers outside of the Fens are fed by underground aquifers. The principal aquifers in the Anglian RBD are chalk in the east; limestone in the north and west; sandstone ridge through the centre and the crag in the east. Other smaller aquifers affect the catchment locally. These aquifers depend on winter rainfall for recharge. This makes them susceptible to winter droughts along with the rivers they supply. An increase in land drainage and channel deepening in the RBD has lowered the shallow aquifer. Water is transported off land faster and time available for recharge has reduced.

Within Lincolnshire there is a type of groundwater artesian spring found only in the coastal margins of this county. The health of the chalk streams and blow holes is influenced by groundwater abstraction. Demand for water in the 1960's reduced groundwater pressure so much in the chalk aquifer that there was little or no flow from the blow wells.

The Anglian RBD has numerous reservoirs and water support schemes to ensure a reliable public water supply. These support the network of surface and groundwater abstractions. Rutland Water near Oakham is the largest manmade reservoir in the UK. Others include Grafham Water; Pitsford Reservoir; Hanningfield Reservoir; and Abberton Reservoir.

There are 2 major water transfer schemes in the Anglian RBD. These are the Ely Ouse to Essex Transfer Scheme, and the Trent-Witham-Ancholme Transfer Scheme, which starts in the Humber. There are also several river support schemes operated by the Environment Agency, water companies and other abstractors. The aim is to mitigate the environmental impacts of their abstractions on the environment. Schemes include the Great Ouse Groundwater Scheme; Waveney Augmentation Groundwater Scheme; Stour Augmentation Groundwater Scheme and the River Hiz Support Scheme.

Agriculture in the RBD depends upon secure access to water for irrigation. The droughts of 2018 resulted in abstraction restrictions and irrigation bars in parts of the Fens. A shortage of sustainable freshwater for agriculture is a common problem across East Anglia. Suffolk County Council has participated in a pilot freshwater augmentation project FRESH4Cs. The project funded the construction of water management infrastructure to bring drainage water that would have drained out to sea, inland for irrigation.

Cumulative effects of Environment Agency asset maintenance programmes has adversely affected gravel and sediment movement within the river network.

### 5.4.2 National plans, programmes and policies

Maintaining clean and sustainable supplies of water is vital to support sustainable communities and a prosperous economy. It's necessary to reduce the damaging abstraction of water and groundwater and improve water quality to protect the water environment and the services it provides as a key natural asset.

The UN SDGs include goals to:

- make sure there is availability and sustainable management of water and sanitation for all (SDG 6)
- conserve and sustainably use the oceans, seas and marine resources for sustainable development (SDG 14)
- protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification and halt and reverse land degradation. It also includes goals to halt biodiversity loss (SDG 15), this includes freshwater ecosystems

The Defra group will contribute to the SDGs to make sure there is clean and plentiful water, including:

- taking preventative action to avoid deterioration of the water environment and reversing deterioration when it occurs
- creating a strategic framework for water sector planning and investment and a strengthened regulatory framework
- working with Ofwat to deliver agreed outcomes from the 2019 price review

The Defra group will contribute to the SDGs to reduce risk of harm from other environmental hazards including an action to:

- make sure there is a water infrastructure and water environment that can cope with extreme events by producing national and local resilience and incident response plans. This will include drought plans

The Defra group will contribute to the SDGs to manage exposure to chemicals, including actions to:

- work with HSE to implement a pesticides and chemicals regulatory regime following EU exit that safeguards human health and the environment
- clean up contaminated land and mine water

The government's 25 Year Environment Plan includes policies for:

- using and managing land sustainably
- reducing pollution
- securing clean, healthy, productive and biologically diverse seas and oceans
- embedding an 'environmental net gain' principle for development

The National FCERM Strategy includes measures to:

- embrace and embed adaptive approaches to enhance the resilience of our environment to future flooding and drought

- have better alignment of long-term planning for flood risk and coastal change with water company business planning cycles to identify opportunities for managing both floods and droughts
- contribute to improving the natural environment by helping to make sure that 75% of all water bodies are in natural or near-natural condition within 25 years
- achieve environmental net gain as part of strategic development proposals

### 5.4.3 Local plans, programmes and policies

Water management within the Anglian RBD of relevance to the FRMP is addressed in several policies, plans and documents (Annex B). Improving water quality in all water bodies is central to the Anglian RBMP. Many of the PPPs related to water have been recently updated. Current plans are proactive. They look at future demands, climate change and innovative solutions. PPPs are seeking to address the growing pressures on water resources. Particular focus in on increased water efficiency and smarter more sustainable usage. This means meeting the demands on water supply for public and commercial use while managing impacts to aquatic life. The agricultural industry is one sector targeted to receive guidance on water management practice. Implementation of NFM projects to assist with water storage and management are being adopted. Strategies and plans to improve water efficiency are becoming increasingly important. Fair sharing of the water resource is also an underpinning theme.

The 2017 publication of the Environment Agency/Defra Abstraction Plan sets out how water abstraction will be managed sustainably to protect the environment and improve access to all. Working to achieve abstraction reform, four priority catchments are identified where unmet demand for water is evident. Potential use of innovative approaches to help meet this demand and facilitate sustainable abstraction are identified. Two of these initial priority catchments which are subject to heavily abstracted surface and ground water, are located in East Anglia: the Cam & Ely Ouse and East Suffolk. The Environment Agency is working with partners, stakeholders and abstractors to create a collaborative approach to water resource sustainability.

A stronger integration of water resource management with food, land, energy and waste is encouraged. The Water Resources East strategy seeks to balance energy and climate demands, with agriculture and industry, and customers and the environment. It is taking an approach to unite flood control with water supply needs. Drainage authorities are being encouraged to capture water for reuse instead of pumping it out of the system. Increased floodwater storage is being explored for reuse to reduce pressure on existing aquifers. Other emerging strategies include desalination at key locations on the coast and a network of water transfers across sectors.

### 5.4.4 Considerations for the second cycle FRMP

To summarise, common themes across the PPPs include:

- improving water quality and meeting WFD objectives.
- increased water efficiency and sustainable water use
- fair sharing of water
- integration of water resource management with other sectors and uniting with flood management
- extending water resources in response to climate change

Interactions with the second cycle FRMP include the delivery of flood risk management measures which will directly impact water quality. This includes impacts from improvement activities that modify structures, divert or store water and change water flows. NFM and soft engineering can provide opportunities for flood risk management to support the delivery of WFD objectives.

### 5.4.5. Future baseline

By 2050 the demand for water from population growth and development will exceed supply in several UK water catchments. The Anglian region is already an area of high water-stress.

High population growth in the region is predicted for areas where environmental resilience is low and waterways are already over-licensed for abstraction. An example of this is Cambridgeshire.

Climate change is making water availability less predictable. Growing demand for water, and a reduced consistency of availability due to climate change will mean abstraction pressures on already over-abstracted catchments will increase. Periods of summer drought have caused significant water shortage to the agricultural industry in the east. This has resulted in the need to flex abstraction licenses and widen abstraction areas. It is likely to become a recurrent event in future unless alternative solutions are found.

Removal of trees also has a potential impact on warming waters within the river network. Without the actions and measures of the PPPs in place water quality is likely to decrease with the effects of climate change. Heavier rainfall and increased run-off increases pollution levels within the waterways. In coastal and tidal areas, declining ground water levels due to over abstraction can result in sea water intrusion.

Ongoing measures within the first cycle FRMP will help to ease these threats. These measures include SuDS, the development of surface water management plans and reconnecting rivers with the floodplains. In the future there will be a greater need to put in

place measures that increase flood storage capacity for future reuse. There is scope to reconnect wetlands and reduce land drainage along with changes in farming management. This would improve aquifer recharge on limestone and chalk geology. Water transfer schemes could also become more attractive propositions.

### 5.4.6 Scope and assessment framework

FCRM schemes involve the management of water. Positive effects can result from:

- controlling the flow of surface water run-off in urban areas;
- improved agricultural practices and water management;
- slowing the flow of rivers and increasing infiltration through NFM;
- naturalization of rivers and their reconnection with flood plains;
- attenuation ponds which act as sediment traps hence improving water quality.

The delivery of new hard engineered river banks has the potential for negative impact by changing water flow and quality. Maintenance of existing hard engineered structures is likely to result in little or no effect.

The SEA objective is to protect and improve the water environment. This assessment considers impacts on water in relation to delivery of WFD objectives and sustainable water management. (See Section 3.6.5)

### 5.4.7 Significant effects of the draft plan

**Significant effects of national measures**

National measures included in the draft plan have the potential to result in both positive and negative effects on water.

The adoption of nature-based solutions to manage flood risk and measures that require flood risk management projects to achieve biodiversity net gain and wider environmental benefits will be likely to contribute to the sustainable management of water resources. They can also support the delivery of Water Environment Regulations objectives for example, by restoring naturally functioning watercourses and reconnecting them with a functioning flood plain and habitat creation. In coastal areas for example, the development of saltmarsh can also reduce the need for constructing and maintaining engineered solutions and can help to take the energy out of tidal zones. We anticipate that the scale of positive impact will increase over time as these ways of working embed.

The plan includes measures that will result in new or improved infrastructure to manage flood risk. Projects which focus on reducing the risk of flooding and coastal change can conflict with Water Environment Regulations (WFD) objectives. Without mitigation they can

have negative effects on the status of a water body(s) for example, by altering the natural functioning of a watercourse and separating it from its flood plain. However, flood risk management measures can also benefit the water environment for example, by reducing the likelihood of flooding or erosion of historic landfill sites or wastewater facilities. This would reduce the likelihood of pollutants being released.

The nature of flood response work means that pumps and generators are used to move water around. This results in potential impacts to the water environment and species and habitats in the areas affected by any flooding.

Measures proposed to improve, plan, prepare and exercise for future flood scenarios and to take a risk based and whole life approach to management of assets will help to identify risks to the water environment associated with flood response. This will allow the risks to be minimised and managed better.

**Significant effects of local measures**

No significant positive or significant negative effects are anticipated on the water environment from implementation of the plan. Both negative and positive effects are likely. The drive to deliver BNG and explore nature-based solutions at a local level is likely to support the delivery of WFD and will contribute to the sustainable maintenance of water resources.

The detailed assessment shows a predominantly neutral effect. As with national measures some positive and some negative effects are likely. Management catchment level measures along the Nene and in East Suffolk aim to improve WFD as well as reducing flood risk. Reconnection of the river to the floodplain and holding back water will help to improve ground water recharge. Improvement to water quality is likely to result through increased filtration and slower run-off. Tree planting measures in the upper catchments in Essex should benefit water quality by slowing the flow of transported sediments. Leaf litter should improve the soil structure and this will also reduce surface water run-off. Working with land managers through the ELMs to reduce upstream erosion and run-off as well as more efficient use of washlands, is likely to result in better ground water recharge and improved water quality. Sustained tidal defence will also prevent saltwater inundation of the freshwater coastal habitats within the RBD. Many of these areas have international conservation designations for unique features related to the freshwater environment.

Negative impacts on WFD are likely to result from the construction of hard engineered structures in the coastal and estuarine environments. Maintaining and installing culverts in urban areas may also impact adversely on WFD. Lime which is the main component of construction cement and concrete dissolves easily in water and can be extremely toxic to aquatic life.

Preparing type measures are likely to have a neutral effect on water quality.

Surface water management measures are planned within 11 FRAs. Details of the approach and types of measures are not specified for many. In this case, effects are uncertain. If urban SuDs are the default option, then there are likely to be positive effects on the water environment. Traditional approaches which aim to move rainwater away as quickly as possible, could potentially result in negative effects from increased sediment and pollution run-off into the waterways.

Planning measures are likely to support the integration of flood risk with more sustainable water resource management. Improved water resource management is likely to help to alleviate some of the pressures on the water environment, such as water abstraction for agriculture.

Adverse impact on water quality from agriculture is a common issue for many of the rural agricultural management catchments. Measures across almost half of the management catchments should help to mitigate run off and erosion issues within the agricultural areas resulting in positive effects.

**Mitigation actions**

Mitigation for potential adverse effects is likely to take place at a project level. Good practice application of pollution prevention standards and legal compliance with the Water Framework Directive should help to mitigate any adverse effects on the water environment. A preference should be given for soft engineered solutions for embankments. Erosion Protecting measures should allow for fast growth of vegetation.

**Enhancement opportunities**

In urban environments Lead Local Flood Authority (LLFA) measures to address surface water should prioritize green innovation and consider SuDs to enhance the water environment. Examples include permeable urban surfaces, green roofs, and street trees etc. Rural SuDs should also be prioritized for agricultural environments as part of a systematic approach to reduce run-off and diffuse pollution.

Where hard coastal or riverine structures are the only viable solution, the designs should incorporate natural elements where possible. There are numerous case studies for integrated green grey infrastructure (IGGI), that can be evidenced within business cases to contribute to partnership funding and ultimately result in better outcomes for the water environment.

# 5.5. Climatic Factors

## 5.5.1 Current baseline

Variations in temperature depend on both altitude and proximity to the coast. The altitude of much of the Anglian RBD is below 60 metres. The Fens has the largest area of low-lying, flat land in the UK. The highest ground is in the southwest of the region where parts of the Chiltern Hills reach over 200 metres, continuing as the East Anglian Heights. The East of England is one of the warmest places in the UK. The mean annual temperature over the area varies from around 9.5 °C to just over 10.5 °C. This is within the upper range for the country. Many of the UK maximum temperature records are held by stations in Eastern England. The highest known temperature is 38.7C (101.7F) recorded in Cambridge in July 2019. January and February are the coldest months with mean daily minimum temperatures across the region close to 1 °C. Winter temperatures range from just above 0 °C on the Lincolnshire Wolds to 2 °C or a little higher near the coast. Mean daily maximum temperatures are around 7 degrees in the winter and 21 °C in the summer. Low cloud from the North Sea can affect the coast, limiting hours of sunshine.

Across most of the region the winter period averages about 30 rain days of rainfall greater than 1 mm. The East is one of the driest regions in the country. From June to August there are around 25 rain days on average. Areas with higher altitudes, like the Lincolnshire Wolds, experience higher rainfall. In 2018, a village near Clacton-on-Sea, Essex received little more than 500mm of annual rainfall a year making it one of the UK's driest places. During the heatwave that year, the region suffered long periods of drought and areas of Cambridgeshire had essentially no rainfall in June. Although rainfall is generally low, there have been some noteworthy severe storms in the RBD. In a recent storm event in August 2019, Wainfleet, Lincolnshire experienced over two months of rainfall in one day, causing severe flooding. In December 2020 and January 2021, some parts of Cambridgeshire were hit by flooding 3 times in just over a month.

Eastern England is one of the more sheltered parts of the UK, experiencing less wind impacts from Atlantic storms than the Northwest. Yet, the area has the greatest frequency of tornadoes in the UK. The longest track tornado as well as the largest outbreak of tornadoes in the UK occurred in Eastern England.

Peat soils store carbon. Agriculture and drying out of the Fens has caused significant loss of organic carbon to the atmosphere as carbon dioxide. Coastal wetlands and saltmarsh also capture and store atmospheric carbon dioxide in greater quantities per unit area than terrestrial forests. Carbon stored by coastal and marine ecosystems is known as blue carbon. The coastal and marine ecosystems of the RBD have an important role in mitigating global warming and the effects of climate change. Damaging or degrading these coastal areas releases CO2 into the atmosphere contributing to climate change.

### 5.5.2 National plans, programmes and policies

Climate change is unavoidable and will increase the risk of flooding and coastal erosion. Flooding and coastal erosion are natural processes and many landscapes have evolved based on regular flood and erosion patterns.

Managing the risk of flooding and coastal change requires consideration of long-term climate change. Action is needed to adapt to a changing climate and accommodate future sea level rise, increased rainfall intensity and more frequent flood events. The UK government is committed to climate action. Climate change issues are entrenched within national policy.

The UN SDGs includes a goal to take urgent action to combat climate change and its impacts (SDG 13). Climate related issues underpin several of the SDGs, particularly regarding making people and places resilient to climate change.

These include:

- SDG1 has a target relating to reducing the vulnerability of the poor to climate related events
- SDG2 has a target which refers to making food production systems resilient and adaptable to climate change
- SDG11 has a target which refers to cities and settlements mitigating and adapting to climate change
- SDG12 has an indicator which refers to educating people about sustainable lifestyles

The Defra group will contribute to the SDGs to mitigate and adapt to climate change. These include actions to:

- deliver statutory climate adaptation obligations under the UK Climate Change Act
- drive delivery of the National Adaptation Plan to strengthen resilience to climate change
- contribute to delivery of the Clean Growth Strategy to reduce greenhouse gas emissions

The 25 Year Environment Plan intends to improve the environment within a generation at a national level, with a focus on mitigating and adapting to climate change. Alongside increasing trends to incorporate the UN SDG's into plans and policies this provides a framework for reducing our impact on climate change and increasing our understanding of the measures for adaptation.

The 25 Year Environment plan commits to taking all possible action to mitigate the effects of climate change and adapt. Targets are in place to cut greenhouse emissions and all policies and programmes should account for projected changes in climate expected up to the year 2100. Climate change is likely to increase the risk of flooding and coastal erosion. The National FCERM Strategy for England emphasises the urgency of tackling climate change. It recommends that flood risk management proposals take an adaptive approach to planning for flood and coastal resilience across a range of climate futures to create climate resilient places. The strategy encourages the use of risk management solutions that have lower carbon footprints, such as the use of natural flood management. The strategy views climate change as a significant risk to the economy, environment, health and our way of life. Its approaches to adapt to flood risk and coastal change are based on a 4 degree C rise in average global temperature, which is consistent with current emission trends.

The Clean Growth Strategy aims to create jobs and economic growth while cutting emissions. The Environment Agency has recently committed to a target of net zero carbon by 2030.

A second National Adaptation Programme and third strategy for climate change reporting sets out actions to adapt to climate change to 2023. It identifies six areas of climate change risk, including flooding and coastal erosion risks to communities and businesses. This is recognised as a high risk now and is expected to remain high in the future.

Defra recently launched a policy statement on nature for people, climate and wildlife which includes a Peat Action Plan and a Trees Action Plan for England. It aims to restore nature and tackle the climate crisis.

### 5.4.3. Local plans, programmes and policies

Climate change is embedded within many of the PPPs of the Anglian RBD. This includes plans across multiple sectors.

By January 2020, Cambridgeshire County Council, Northamptonshire County Council, and Suffolk County Council had declared a climate change emergency. They have clear climate change strategies in place. Numerous District, City, Town and Village Councils have also declared a climate change emergency.

The Anglian Water revised draft Drought Plan of 2019 aims to ensure public water supply infrastructure is resilient to climate change. There has been a shift in policy approach from prevention and protection, to resilience and adaptation. The serious adverse effects and urgency of response needed is evident across the PPPs Benefits of climate change are not well documented.

### 5.5.4. Considerations for the second cycle FRMP

Common themes of the PPPs with respect to climate change issues that will interact with the FRMP include:

- The UK is experiencing a warmer climate and sea levels are rising but extent of future climate risks is uncertain
- Increased flooding and increased coastal erosion will result from climate change
- Adaptation needs to be viewed over the long term but started early.
- Raised awareness and community empowerment is needed to manage climate change risks and adapt

### 5.5.5. Future baseline

The global climate is changing and will have a significant impact on flood and coastal erosion risk. The effects of climate change are already being experienced throughout the UK and particularly in the Anglian region.

Global temperatures are rising, and a warmer atmosphere holds more moisture with the potential for more torrential and prolonged rainfall. United Kingdom Climate Impacts Programme 18 (UKCIP18) predicts that median temperatures throughout the year will be 1-2 degrees C higher. Under a high emission scenario summer temperatures could be up to 5.4% hotter by 2070. It is predicted that the UK will experience warmer winters with a 35% increase in precipitation over the winter period by 2070. More intense rainfall is likely to increase flood risk from surface water that is unable to infiltrate into the ground. The capacity of sewer and drainage systems will be placed under increasing duress from rainfall events. The increased volume and flow of water caused by heavier rainfall events will also increase flood risk from rivers and watercourses.

While winters will be wetter, summers are likely to be hotter and drier. Average summer rainfall for the UK is predicted to decrease by half in the next 50 years. Short periods of heavy rainfall are less effective of recharging aquifers than long periods of steady rain. Groundwater stores may not be replenished sufficiently with the potential that levels will continue to fall. The Anglian RBD is already the driest area in the UK. Increasing periods of drought will have significant adverse impacts. In particular the agricultural sector will be impacted. Farmers in East Anglia, Lincolnshire and Northamptonshire have already reported facing significant irrigation pressures.

Sea levels are rising. An increase in sea level of between 0.4m and 1m is predicted for the UK by 2100. The low lying coastal areas of East Anglia and the Fens are the most vulnerable parts of the UK to sea level rise. Inland areas as well as coastal areas will be affected as the tidal reach of many of the rivers in East Anglia extends several km inland. Undefended settlements along the fluvial and tidal watercourses will be more at risk from

future flooding. For example, communities within the Broadland Rivers catchment have experienced an increase in both severity and frequency of existing flooding problems and communities that have not flooded previously have been affected in recent years.

Continued drying and use of the fenland soils will continue to release carbon into the atmosphere.

UK actions to reduce greenhouse emissions will not prevent the effects of climate change for the immediate future. Policies, plans and actions will contribute to reducing flood risk to some properties and businesses. By 2021 the goal is for 300,000 homes to be better protected. Measures from the FRMP have provided an evidence base upon which future decisions can be made. Ongoing measures and the second cycle FRMP should continue to empower communities to better prepare for flood risk and coastal erosion events and work together to react and recover.

### 5.5.6 Scope and assessment framework

The plan has the potential to significantly influence the ability of places across the RBD to adapt to climate change and to improve the resilience of communities and the economy in a positive manner. It may also contribute positively to climate change mitigation through encouraging low carbon approaches for managing flooding and coastal change.

The assessment criteria used to identify the effects of the proposed plan measures on climatic factors are given under Section 3.6.5

### 5.5.7. Significant effects of the draft plan

**Significant effects of national measures**

The draft FRMP is likely to make a significant positive contribution to adapting to climate change by helping to deliver climate resilient places and prepare a nation to be ready to respond and adapt to flooding and coastal change. Collectively, the national measures proposed convey the urgency needed in taking action to manage and adapt to the flooding and coastal change risks associated with climate change.

Key aspects of this include:

- supporting communities to increase their resilience to flooding
- issuing and maintaining guidance on taking climate change into account for flood risk decision making
- avoiding inappropriate development in areas at risk of flooding
- making sure all new developments are resilient to flooding and coastal change

Measures associated with the delivery of flood and coastal erosion risk management activities and solutions are also likely to have a significant and positive effect on adapting to climate change.

Flood risk management approaches can include land management and natural flood management. As described in the topics on water, biodiversity and soils, these approaches can contribute to restoring and improving natural capital and improve its resilience to future climate change. A healthy natural environment is an important element of climate resilient places.

The assessment identified positive and negative effects relating to climate mitigation and greenhouse gas reductions. Flood risk management actions that involve new or improved infrastructure will add to greenhouse gas emissions due to the embodied carbon within engineered solutions, the use of pumped systems and emissions generated during construction. Other risk management solutions that work with natural processes are likely to have lower carbon footprints than traditional engineered solutions. This can include solutions that reconnect watercourses with their flood plain, managed realignment, habitat creation and the use of natural flood management approaches.

Flood risk management tools that include habitat creation can also contribute to carbon sequestration at the local level such as through peatland restoration, woodland planting or saltmarsh creation. Also, carbon emissions associated with recovery from flooding for example, drying out and repairs should be reduced as flood risk is decreased for properties and infrastructure.

We anticipate significant progress during the lifespan of the plan towards net zero carbon in line with UK greenhouse gas reduction targets. If we can achieve this progress, the effect on climate mitigation will be negative. However, if the anticipated progress towards net zero carbon is not achieved over the lifetime of the plan the effect on climate mitigation is likely be significantly negative (considering the climate crisis and the urgent need to reduce carbon emissions.

**Significant effects of local measures**

The detailed assessment has identified negative and positive effects across the RBD. Considering the current climate crisis and the urgent need to reduce carbon emissions any negative effect was considered Significant Negative.

A potential negative effect is likely from large scale marine construction of tidal barriers and coastal flood defences. Given the proposed completion date of 2026, there is less confidence that the Lowestoft tidal barrier scheme would achieve the Environment Agency 2030 carbon target of net zero without significant investment in offsetting. The construction phase will require heavy construction machinery and transportation of construction materials. Construction materials utilized within tidal barrier schemes

traditionally consist of large amounts of concrete and steel. The manufacture of these materials generates high levels of carbon dioxide emissions.

Effects associated with ground investigation and exploratory works across the Great Ouse Catchment are likely to have a negative effect on the climate. Although potentially small scale and mainly related to workforce travel and plant, cumulatively over the life of the plan there is likely to be an adverse impact.

A similar minor negative effect is likely from maintenance programmes carried out across the RBD. Future capital works carried out by the Environment Agency will aspire to achieve net zero carbon targets. Measurement of carbon footprint may not be monitored as effectively on small scale field maintenance activities or minor maintenance works. If large quantities of material need to be transported for embankment works, carbon offsetting is likely to be needed to achieve net zero.

Local NFM and habitat restoration type measures that involve planting activities, or creation of saltmarsh will impact positively on the climate. Trees and vegetation are beneficial to the climate due to their cooling effect and ability to absorb carbon dioxide. Saltmarsh sequesters carbon at higher rates than terrestrial ecosystems. Peatland ecosystems are even better at storing carbon. Measures within the fens that aim to restore peatland and re-wet the fens will therefore have a positive effect. At a key location level, measures for the Fens and Strategic Lowland are could have a **significant positive** effect on climate from carbon sequestration and storage connected with the habitat restoration work. If pumping station works also includes alternative energy solutions, there will be a significant reduction in current operational impacts on carbon across the fenland area.

Other measures such as planning and development controls, modelling, building resilience within the communities and recovery and review actions support the adaptation to climate change. Public awareness type measures that link flood risk to climate change, may help support positive behaviour change, that reduce impacts to climate at an individual level.

**Mitigation actions**

The Environment Agency Emission 2030 will support the push for net zero carbon targets to be met. Considerable progress has been achieved through Emission 2020 implementation and this is likely to continue. The Environment Agency Sustainability Plans for the Midlands and the Eastern hubs will also support a positive change to sustainability around energy, resources and carbon.

Contractors are already taking steps to alleviate carbon impacts on FCRM schemes. Low carbon fuel options, such as biofuel, are available to reduce or eliminate impacts from constructions operations and are likely to become standard policy in the short term to meet net zero targets. Energy choices for compound and welfare unit facilities should be driven

by low carbon/climate neutral preference. Similarly, net zero carbon ambitions should be applied across the supply chain, and to all transport and travel decisions.

Cement production is the third ranking producer of man-made CO2 after transport and energy. The design stage should aim to design out the need for materials that impact heavily on the environment. Alternatives to traditional concrete for maintenance and capital works are needed. The Environment Agency has made changes to the minimum technical requirements which will support the transition to cement free low carbon alternatives.

The Association of Drainage Authorities plans to develop existing carbon calculator tools to help the internal drainage boards with carbon emissions reduction. The Environment Agency and Local Authorities have set their own ambitious carbon targets and have refined measuring and assessment tools. The Carbon Tool is embedded within the project assurance process within the Environment Agency.

There is some uncertainty that within the life of this plan the appropriate mechanisms will be fully in place to effectively measure and mitigate operational and whole life carbon impacts. Thus, mitigation for large scale schemes with likely significant effects may need to focus on carbon offsetting in the short term.

**Enhancement opportunities**

Works to pumping stations could include a switch to green energy sources across the programme to reduce adverse operational impacts on climatic factors. Designs of capital works should not only aim to reduce and mitigate adverse impacts but should also aim to incorporate elements within the design which will improve the overall carbon footprint. For example, protecting type measures such as flood walls and tidal barriers could consider green infrastructure elements. There is a general opportunity to embed opportunities to improve sustainability within ways of working. For example, local sourcing of materials for embankment works, (subject to archaeology checks) and alternative energy sources for automation of sluices.

# 5.6. Material assets

## 5.6.1 Current baseline

Infrastructure within the Anglian RBD includes many railways, motorways and primary roads. There are direct rail and road links connecting major ports in the East to the Midlands and the rest of the country. The ports of Felixstowe and Harwich on the east coast provide a gateway to international trade. There are several airports including Stansted, Norwich, Cambridge, Luton and Southend. The RBD is also home to numerous Royal Air-Force and US Airforce bases.

In addition to the main transport links, the waterways and coast within the RBD are important for leisure craft. Numerous marinas are found along the inland waterways, and up and down the coast. Significant flood risk management assets are located along the coast and inland waterways. The Ipswich Tidal Barrier is operational, protecting 1600 homes and 400 businesses.  Fenland is dependent on a complex system of pumped drainage infrastructure.  Major assets include over 280 pumping stations.

There are some existing nationally and locally important powers stations within the RBD including Sizewell B and Bradwell A nuclear power stations. New nuclear power stations - Sizewell C and Bradwell B - are proposed next to these existing stations. Should Sizewell C receive the necessary permissions and consents, the construction of the power station is expected to take between 9 and 12 years.  Off the coast of Eastern England the offshore wind farm Scroby Sands sandbank has led the development of offshore renewable energy in the UK. Consultation has recently started for a substantial development of three interconnected solar farms on the Suffolk-Cambridgeshire border at Newmarket.

The RBD has approximately 1,300 licensed waste sites, and 2,000 historic landfill sites, many located near rivers and the coast in areas of flood risk. There are also numerous wastewater treatment plants at risk of flooding. Other key material assets include water treatment plans, hospitals, schools, and community centres.

### 5.6.2 National plans, programmes and policies

Material assets have been defined to include homes, businesses, infrastructure, agricultural land and existing flood and coastal change risk management assets.

The UN SDGs include goals to:

- end hunger, achieve food security and improved nutrition and promote sustainable agriculture (SDG 2)
- make sure everyone has access to affordable, reliable, sustainable and modern energy (SDG 7)
- build resilient infrastructure, promote inclusive and sustainable industrialisation and foster innovation (SDG 9)
- make sure there’s sustainable consumption and production patterns (SDG 12)

The Defra group will contribute to the SDGs to use resources from nature more sustainably and efficiently.

These include an action to:

- develop a new environmental land management system

The Defra group will also contribute to the SDGs to minimise waste, including actions to:

- tackle plastic pollution. This will include delivering the policies and commitments in the Resources and Waste Strategy
- take forward measures to reform Extended Producer Responsibility for packaging

The government's 25 Year Environment Plan includes policies for:

- using and managing land sustainably
- increasing resource efficiency and reducing pollution and waste
- maximising resource efficiency and minimising environmental impacts at end of life
- improving management of residual waste
- enhancing sustainability
- embedding an 'environmental net gain' principle for development

The National FCERM Strategy plans to achieve "today's infrastructure – resilient for tomorrow's climate". This means building flood risk management works and infrastructure that will remain functional in a changing world. Using innovation that will allow infrastructure to withstand extreme events. Building sustainable infrastructure which reduces carbon and traditional energy use.

The National FCERM Strategy includes measures to:

- improve the long-term resilience of homes, businesses and infrastructure
- work with farmers, landowners and others to identify opportunities for using agricultural practices to manage flooding and coastal change
- achieve environmental net gain as part of strategic development proposals

The National Planning Policy Framework states that planning for new housing, economic growth and sustainable communities needs to take account of the future implications of climate change. Managing and adapting to the risk of flooding and coastal change will contribute to a sustainable economy and resilient communities.

Agriculture has a major role in helping to manage flood risk and coastal change. The new Environmental Land Management Scheme places greater emphasis on the provision of environmental services and provides opportunities to promote natural flood management.

The National Infrastructure Delivery Plan is a strategy to deliver core economic infrastructure projects to 2021. It prioritises critical programmes for transport, energy, communications, flood risk management, water, waste, and science sectors.

The Industrial Strategy includes a major upgrade to UK's infrastructure as one of the five foundations towards economic prosperity. 'Build back better: our plan for growth', the UK Governments policy paper which sets out plans to support economic growth through

investment in infrastructure, skills and innovation recognises the importance of flood risk management infrastructure in achieving economic growth.

### 5.6.3 Local plans, programmes and policies

Flood risk is the most significant threat to infrastructure within the UK. Across the Anglian RBD Local Plans aim for robust spatial planning. Infrastructure development directed away from flood risk is favoured in Local Plans. Recent trends include a move towards adaptation. If infrastructure cannot be positioned away from flood risk, resilience is achieved through design and material choices.

Local transport plans also seek new infrastructure which is resilient to adverse weather.

Blue Green infrastructure options are encouraged across many local plans.

The Boston Barrier Scheme and delivery of beach management works from the Saltfleet to Gibraltar Point strategy are two priority projects for flood defence within the Anglian RBD.

A large proportion of the Anglian RBD is part of the OxCam Arc. Government's ambition for the OxCam Arc is to support transformational sustainable economic growth across the area in the long term.

Some regions include hot spots for potential growth which have not been modelled in this analysis. The OxCam Arc is an example of this. In 2017, the National Infrastructure Commission published Partnering for Prosperity: a new deal for the Cambridge-Milton Keynes-Oxford Arc, which identified that up to one million new homes may be needed by 2050 if the OxCam Arc is to achieve its full economic potential. Government responded to the National Infrastructure Commission in 2018, and in March 2019 published a statement of government ambition, and a joint declaration between Government and local partners. Government's ambition for the Arc presents an exciting opportunity, but one that would have implications for integrated water resource management. To prepare for this, the Environment Agency will continue to collaborate with central government, Water Resources East and Water Resources South East and local partners as plans for growth develop.

The East Inshore and East Offshore Marine Plans recognize the opportunity provided by alternative energy.  They point to offshore wind farms, to help achieve the UK carbon reduction goals. Offshore wind is seen as viable marine-based economic growth, providing job creation. Crown Estates Leasing Round 4 opens the potential for offshore wind projects on a much larger scale.

### 5.6.4. Considerations for the second cycle FRMP

Key themes which will interact with the draft second cycle FRMP include:

- promotion of sustainable economic growth which recognizes social and environmental objectives
- flood risk management and green infrastructure are key for adaptation
- Public-Private partnership working and financing is needed for large scale infrastructure flood protection

### 5.6.5. Future baseline

Roll out of the current first cycle FRMP will provide short term protection to existing material assets. Flood risk management assets are currently ageing. Flood and coastal erosion is a key risk to large scale material assets. For existing assets this risk will be heightened by climate change in the future. A major injection of funds is needed to increase standards of protection and explore new technologies and approaches. Alternative funding sources are needed.

New assets to meet population growth will need to explore innovative measures of flood resilience and adaptation. Existing PPPs will consider flood risk within any planning development approvals for any material asset new build. This will ensure a level of resilience of new infrastructure to future flood and erosion risk. For the future it is likely that large scale developments will need to identify opportunities to deliver flood alleviation measures. In the case of the OxCam Arc this will cover many catchments allowing for a more strategic approach: work is underway to identify strategic interventions to manage future flood risk across these catchments, alongside work (the OxCam Flood Risk Investment Study) to identify future investment needs on flood resilience in the context of future climate change and development scenarios.

### 5.6.6. Scope and assessment framework

There is a high potential for flood defence schemes to have a significant positive effect on property, infrastructure and ancillary services. Implementation of measures which promote improved modelling, new technology, and innovation has the potential to improve emergency response systems and increase resilience of these assets to flooding events.

The assessment will consider whether implementation of the plan is likely to support sustainable communities and a prosperity. The criteria for the assessment (see section 3.6) are based around important material assets and economic drivers, including agriculture, which is central to the Anglia RBD.

### 5.6.7 Significant effects of the draft plan

**Summary of national measures**

The draft plan recognises the damaging impacts flooding and coastal change can have on communities and businesses and the key infrastructure both depend on. It is anticipated

the draft plan will have a predominantly positive effect on supporting sustainable communities and a prosperous economy.

Measures associated with preparing for and recovering from flooding are considered likely to have a **significant positive** effect. Flood resilience tools, such as property level resilience, enable people to return to their homes and businesses more quickly after a flooding event. The introduction of flood resilience techniques can also contribute to improving the resilience of key infrastructure.

Other measures are also likely to be beneficial, including improved flood warning and the planning and coordinated work of all organisations involved in responding to and recovering from an event. Measures supporting greater awareness, engagement and collaborative working are considered likely to have a positive effect. By increasing awareness of the risk and impacts of flooding and coastal change, it is envisaged this will inspire people and businesses to act.

The assessment identified similar potential negative effects as those identified for population and human health. Some deprived communities or neighbourhoods can be more vulnerable to flooding and the associated impacts. As mentioned above the partnership funding arrangements partially address this through enhancing grants available for flood risk management projects for these communities. The potential to fund surface water flooding schemes has also been improved. This is important as a third of 'flood disadvantaged neighbourhoods' are affected by surface water flooding[2]. However, vulnerability to flooding is influenced by other personal, social and environmental factors and so it will remain important that support mechanisms for awareness and recovery work with these communities.

**Summary of Local Measures**

There are no significant negative effects likely. Measures are predominantly anticipated to have a positive effect across the RBD.

**Significant positive** effects are likely from measures that protect prime agricultural land important to the national food supply. For example, land within the Middle Level and Great Ouse catchment, the Welland and the Witham. In coastal areas, protecting and preparing measures will benefit economies that depend on tourism, alternative energy and international port activities. Key material assets that support these industries will be protected from physical damage resulting from tidal and fluvial flooding. The impacts on these industries and their supporting critical infrastructure are likely to be **significant positive.** FCRM measures such as those proposed for Lowestoft are integrated with urban regeneration. Implementation is likely to have a positive effect, contributing to the overall positive development of the town and its economy. Current economic growth is perceived to be constrained by flood risk, impacting property prices, business opportunity and growth.

Where it is uncertain whether measures will result in on the ground activity, the effects are also uncertain.  Measures which are investigation or appraisal type measures will have a neutral effect. Preparing measures which improve public awareness of flooding are unlikely to have an overall positive or negative effect on material assets across the RBD.

The small percentage of measures which improve flood forecasting and warning is likely to have a minor positive effect on material assets by improving the timing and effectiveness of response. A similar outcome is also anticipated from measures which digitize FCRM asset operations.

**Mitigation actions**

Any potential negative effect on material assets from measures which consider large scale water attenuation should be explored at a project level within the appraisal process and appropriate mitigation considered.

**Enhancement opportunities**

There are opportunities to use improved modelling and flood risk data as a platform for discussions with private sector partners to invest in flood risk planning and protecting measures.

# 5.7. Cultural heritage

## 5.7.1 Current baseline

The Anglian RBD contains a wealth of cultural heritage and archaeological remains, with more than 2,700 Scheduled Ancient Monuments (SAMs).  These include cemeteries, abbeys, priories, village crosses, ancient settlements and castles. The area has a rich Anglo-Saxon, Viking and Roman heritage. The largest Anglo-Saxon ship burial ever discovered, was unearthed at Sutton-Hoo in Suffolk. The town of Colchester is the oldest recorded Roman town in Britain.  There are numerous listed buildings, registered parks and gardens, and archaeological sites.  A substantial number of mills, bridges, weirs and other water related heritage infrastructure in the RBD, have listed status.

The preservation properties of the peat in the Fens contributes to the archaeological heritage of the area. The peat deposits in the Fen Basin overlie internationally important prehistoric remains, such as Bronze Age sites and boats. Flag Fen, in Peterborough, is one of the finest Bronze Age sites in Northern Europe and the only site in England where the remains can be seen in-situ.  Nationally important prehistoric metalwork has been retrieved from the River Witham and its flood plain during the development of farm boundaries, railway constructions and flood defence works. More recently, flood embankment improvement works near Fiskerton (5 miles east of Lincoln) uncovered an

Iron Age Log boat. There are large areas of land where there is little or no knowledge of what might be beneath the topsoil.

### 5.7.3 National plans, programmes and policies

The UN SDGs include goals to:

- Ensure healthy lives and promote well-being for all at all ages (SDG 3)
- Make cities and human settlements inclusive, safe, resilient and sustainable (SDG 11)

The Defra group will contribute to the SDGs to enhance beauty, heritage and engagement with the natural environment, including an action to connect people with the environment to improve health and wellbeing. The government's 25 Year Environment Plan includes a policy for embedding an 'environmental net gain' principle for development which includes both natural and cultural heritage.

The National FCERM Strategy includes a measure to contribute to enhancing the historic environment and achieving environmental net gain. The draft strategy encourages RMAs to contribute to improving the historic environment through their investments.

The Culture White Paper sets out the approach for public support of art and culture. It identifies the trend in increased appetite for culture and how to harness these opportunities. There are potential interactions with the FRMP where measures create opportunities to enhance art and culture and access to them through the wider programme delivery aims.

Heritage planning recognises flood risk and climate change as significant threats to heritage sites. The Heritage Statement 2017 explains the importance of cultural heritage to the economy, to individual well-being and to communities. It recognises that UK heritage is facing challenges and requires careful protection. Heritage legislation such as the Ancient Monuments and Archaeological Areas Act 1979 aims to provide this protection.

The Heritage Statement builds on the Culture White Paper and sets the priorities for protecting England's heritage over the coming years. Heritage is an important economic driver for the tourism industry. The economic value for heritage in 2016 was £987 million.

### 5.7.3 Local plans, programmes and policies

Cultural heritage is recognised as an important theme within many plans, programmes and policies across the Anglian RBD, such as Local Plans (including supplementary planning documents which focus on archaeology and heritage) and heritage strategies.

Local strategies and plans that specifically address cultural heritage have been widely developed within the RBD such as The Heritage Strategy for the Borough of Boston and

Tendrings Heritage Strategy.  County wide heritage strategies have been developed for Suffolk. The PPPs are based on understanding the local heritage, recognizing its value, identifying risks and safeguarding its future.  There is a focus on place-making, local participation, inclusion and active conservation. The potential economic value of heritage through tourism opportunity is a common theme as is the importance of heritage to local identity and pride.

The existing FRMP will have both positive and negative effects on cultural heritage. Whilst it will provide flood risk protection to some heritage assets, the implementation of schemes may also affect other heritage features. Many schemes can, for example, involve excavating undeveloped areas to create new channels and flood storage areas. Other measures include habitat creation, channel realignment, and creating bunds and dams. There is the potential for excavation works associated with any flood risk management scheme to encounter buried archaeological remains, and in many instances these sites will be unknown and un-designated. There may also be localised impacts, both physical and visual, on a broad variety of historic structures and sites including weirs, mills, historic buildings, upstanding and buried archaeological sites.

### 5.7.4. Considerations for the draft second cycle FRMP

The National Planning and Policy Framework states the need to conserve and enhance cultural heritage within the Area of Natural Beauty (AONB) and the Broads National Park. There is an integral link between heritage and landscape.  This is reflected within the respective management plans which include strategies to conserve and enhance local heritage. The many benefits derived from historic conservation are highlighted. Considerations for the second cycle FRMP

FCERM measures interact extensively with heritage and can contribute to heritage conservation and enhancement. There are opportunities to engage local communities to learn about and appreciate heritage.  Common themes to pick up on in the PPPs include:

- Importance of heritage to creating community pride and identity
- Value of heritage to personal wellbeing and development
- Role of heritage in creating a visual identity and landscape character
- Heritage is for everyone and there is a need for greater access for all

### 5.7.5 Future baseline

Pressures of population growth may increase risk to heritage sites and buildings. But recognition of wellbeing and heritage linkages is growing. Increasingly the value of heritage conservation for personal enrichment and social cohesion is considered in development decisions. Heritage conservation will continue to play an important role in urban regeneration across the area.

Climate change is putting heritage at increasing risk. SAMs and Listed structures along the coast are threatened with scour damage from increased tidal events overtopping defences. Destruction and collapse due to eroding coastlines are possible. Historic buildings and heritage assets can be damaged by flooding. If flood water remains standing for long periods, the damage will be more pronounced. Changing and extreme temperatures from climate change can also cause structures to lose their integrity preventing their continued use. Historic parks and gardens may also suffer deterioration due to other climate change effects such as invasive species. Buried archaeological and paleo-environmental remains can be impacted adversely. For example, if the peat in the Fens dries during periods of drought it loses its ability to preserve the archaeology. Drying/shrinking of the peat can destroy archaeological remains. Wooden artefacts and environmental evidence (plants, seeds etc that can inform about archaeological context) are particularly at risk.

Technology is improving non-intrusive methods of archaeological investigation. Evidence of past floods and river channels can help inform future flood management decisions.

A continued programme of investment in flood defence is needed for the low-lying RBD. Flood risk measures can damage undesignated heritage assets during excavation works. Flood risk management infrastructure may also impact negatively on the setting of historic places and heritage sites. For example, raised embankments and large manmade structures can change viewpoints and historical context.

The existing Anglian FRMP is likely to have both positive and negative effects on heritage. It will provide flood risk reduction to some existing heritage assets. Any scheme that requires excavation work is a threat to buried archaeology.

## 5.7.6. Scope and assessment framework

Protection of heritage structures from erosive high energy floodwaters is a potential significant positive effect. Works on these structures can have direct adverse effects. Many of the sluice gates, bridges and pumping stations within the Anglia RBD are heritage structures. Heritage can also be subject to impacts from the design and location of flood risk management schemes which may indirectly impact negatively on the setting of historic places. Buried archaeology and paleochannels common within the Fens, may also be impacted negatively or positively by FCRM schemes.

This assessment considers whether the plan conserves or enhances the heritage environment (see section 3.6).

## 5.7.7. Significant effects of the draft plan

**Significant effects of national measures**

National measures included in the draft plan have the potential to result in both positive and negative effects on cultural heritage. Measures relating to the planning and delivery of flood and coastal risk management have the greatest potential to affect cultural heritage both negatively and positively.

The approach taken to manage and reduce flood risk will vary from place to place. Many historic places are associated with the water environment. Some approaches to flood risk management, such as new or improved permanent infrastructure can have negative effects on historic places. This by association can have implications for the character of both urban and rural spaces and landscapes. At the local level, for example, this could include the introduction of permanent structures within sensitive historic townscapes with the potential to affect their character and setting above ground and harm below ground archaeology.

Flood risk management interventions can also alter the water regime of places. This could negatively affect the archaeological interest, but also might positively enhance a landscape aesthetically designed to include water or where ‘wetting up’ a landscape improves the longer-term conservation of archaeological remains. When applying the mitigation hierarchy where harm is anticipated, as informed by cultural heritage assessments, surveys and monitoring, potential negative effects can be reduced at the local level.

In addition, new infrastructure can also serve to reduce the risk of flooding or coastal change to historic places, support sustained management, encourage the reuse of “old” assets and reduce the risk of buildings or sites becoming redundant. New infrastructure can support the conservation of the historic environment supporting the place making agenda and helping people to positively value their homes, communities and local environment.

The draft plan includes measures that encourage risk management authorities to contribute to improving the historic environment, through their flood risk management plans and projects. When done well this is anticipated to have a significant positive impact on cultural heritage at a local level. Heritage is an unrepeatable, often diminishing resource with new histories being added. If a project is poorly implemented or undertaken without public support, it’s difficult or impossible to undo the harm.

Other measures are also likely to be beneficial for cultural heritage. This includes improved flood warning and the planning and coordinated working of all organisations involved in responding to and recovering from an event. Measures supporting greater awareness, engagement and collaborative working are considered likely to have a positive effect. We anticipate that increasing awareness of the risk and impacts of flooding and coastal change to cultural heritage will inspire owners and occupiers of historic properties and owners of personal and public archives and landscapes to protect their ‘valuables’ and increase resilience. It will help them identify when they need to put

measures in place to manage flooding and sustain the historic environment. Measures include putting flood doors/boards up, protecting valuables, archives, assets and places, managing excess water, managing visitor numbers and keeping those visitors safe.

**Significant effects of local measures**

Overall, the effect of the plan on cultural heritage is likely to be uncertain. It is advised that potential effects on the historic environment be assessed at the project level through cultural heritage assessments as the proposed measures to reduce flood risk develop.

Local measures relating to the planning and delivery of flood and coastal risk management have the greatest potential to effect cultural heritage.

The majority of FRMP specific measures are considered likely to have either a neutral or uncertain effect on cultural heritage. This is due to the uncertainty of the works proposed at this stage. The FRAs list the number of conservation areas, listed buildings, scheduled monuments and historic parks and gardens at risk of flooding. These include the areas of:

- Alconbury
- Boston
- Cambridge
- Chelmsford
- Colchester
- Great Yarmouth
- Horncastle
- Hunstanton
- Huntingdon
- Ipswich
- Kings Lynn
- Lincoln
- Lowestoft
- Mablethorpe
- March
- Market Harborough
- Norwich
- Northampton
- Oakham

- Oakington
- Saffron Walden
- Skegness
- Spalding
- South Essex Anglian
- Wisbech

In addition, the following management catchments areas also identify heritage assets at risk of flooding:

- Broadland Rivers
- Cam and Ely Ouse
- Combined Essex
- East Suffolk
- Nene
- Great Norfolk
- North West Norfolk
- Upper Bedford and Ouse
- Welland
- Witham

Negative effects of the plan can include PLR measures which can have a negative visual effect on listed buildings and buildings of local interest. However, if it is temporary or carried out in keeping with the building PLR can be positive to the long term protection of the property.

Some protecting measures could have the potential for negative effects on the historic environment as a result of the building of new flood infrastructure or improvements to existing infrastructure. Negative effects can arise from impacts on the setting and character of historic places, or through ground disturbance with potential implications on unrecorded archaeological remains. Any excavation work that involves groundworks has the potential to uncover or destroy archaeological remains. These effects are currently uncertain and will depend on the heritage sensitivities of the local area likely to be affected.

Some positive effects are likely in particular for proposed maintenance type measures such as repair and sustain projects, which clearly provide protection to heritage assets and

reduce the risk of a negative impact from flooding while causing little adverse impact. This is also the case for Flood Risk Areas such as Louth and Alconbury.

Preparing measures such as flood warnings and public awareness will likely result in a positive effect by improving flood response.

**Mitigation actions**

The assessment of potential effects on the historic environment will be undertaken as part of the project level environmental assessment and inform mitigation requirements. Protecting measures involving physical 'on the ground' activities will require a heritage baseline to be established early on to understand the historic significance of areas to be impacted. The need for mitigation would be determined by the assessment of the baseline for potential impacts on any identified heritage assets. The mitigation hierarchy should be adopted as a design principle during development of the proposed Protecting measures with avoidance of areas of historical sensitivity as far as possible.

**Enhancement opportunities**

Opportunities to seek enhancements to the historic environment could include the following actions at project level:

- Improvement in the management or conservation of designated and non-designated heritage assets.
- Integrating and linking up recreational and/or environmental improvements with historic places – working in partnership with other organisations
- Identifying nationally designated heritage assets on the heritage at risk (HAR) register that might benefit from measures to reduce flood risk and the damaging effects of flooding
- Reducing the number of conservation areas, listed buildings, scheduled monuments and historic parks and gardens at risk of flooding
- Undertake early geoarchaeological assessment and investigative work as well as deposit modelling where possible
- Actively disseminate the results of any archaeological works. This could be in the form of reports, publications, site visits, talks, interpretation boards.

# 5.8. Landscape

## 5.8.1. Current baseline

The landscape of the Anglian RBD is a mosaic of natural and manmade environments. Its characteristics are moulded by the geology, topography and historic land-use.

The urban environment varies greatly throughout the RBD. There are well-developed towns and merging suburbs in Essex, Bedfordshire and Cambridgeshire. The towns and villages of Suffolk, Norfolk and Lincolnshire are generally more rural. The coast is also dotted with rural villages and seaside towns.

The natural environment also varies in character. Chalk hills extend from Hertfordshire through central East England to Suffolk, and also form the uplands of Lincolnshire. Fields, hedgerows and woodland dominate these landscapes. The Fens and the coastal estuaries of East Anglia feature marshland and agricultural fields. Rivers, streams and watercourses are common elements of these lowland landscapes. The Broads National Park is a distinctive area with many unique landscape features dominated by water. The coastline is equally varied with sand dunes, shingle ridges and eroding cliffs. In North Norfolk and Suffolk the coast is declared “Heritage Coast” to protect the distinct scenic and environmental value.

There are more than 25 Landscape Character Areas identified within the Anglian RBD. Each profile identifies the common features such as topography, landscape and land use, which combine to give a unique character. Waterbodies and wetlands are important character features of this region.  The boundaries of a NCA follow natural lines in the landscape and overlap RBD boundaries.

Much of the natural environment in the Anglian RBD is recognized for its landscape value. There are five Areas of Outstanding Natural Beauty. The low hills and valleys of the Lincolnshire Wolds is an AONB. In Norfolk, there is the coastal and agricultural land of the Norfolk Coast AONB and in Suffolk, the Suffolk Coast and Heath with its dramatic scenery and rich wildlife. Northwest of London the chalk escarpment of the Chilterns has AONB status. Dedham Vale is a lowland area and AONB on the Suffolk-Essex border, featured in paintings by famous artists. The Lincolnshire Wolds AONB is aligned with the boundaries of NCA 43. Dedham Vale AONB, is a small area within the South Suffolk and North Essex Clayland NCA (NCA 86).

There are countless Conservation Areas within the cities, towns, and rural areas. As areas of special architectural or historic interest they form part of the local identity and sense of place.

### 5.8.2 National plans, programmes and policies

The UN SDGs include goals to:

- ensure healthy lives and promote well-being for all at all ages (SDG 3)
- make cities and human settlements inclusive, safe, resilient and sustainable (SDG 11) - this also covers townscapes and heritage
- protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and

halt biodiversity loss (SDG 15). This has the potential to positively impact on landscape character when delivered at a landscape scale

The Defra group will contribute to the SDGs to enhance beauty, heritage and engagement with the natural environment. It will include actions to:

- improve public access to the countryside and public forest estate, continue to increase the legally secure rights of way around the coast, and maintain navigable waterways for safe and open access for users
- connect people with the environment to improve health and wellbeing
- publish and respond to the independent Glover Review of protected landscapes, ensuring Areas of Outstanding Natural Beauty and National Parks continue to meet 21st century needs whilst recognising the value of historic character and aesthetic values to visitors and local people

The government's 25 Year Environment Plan includes policies for:

- recovering nature and conserving and enhancing the natural beauty of landscapes
- embedding an 'environmental net gain' principle for development

The National FCERM Strategy includes a measure to contribute to enhancing the natural, built and historic environments and achieve environmental net gain.

Other policy that provides important context to understanding the landscape effects of flood risk management planning includes:

- Natural England National Character Area (NCA) landscape studies with particular reference to the statements of environmental opportunities they provide
- National Park and Areas of Outstanding Natural Beauty (AONB's) Management Plans
- Historic England's recognition of importance and treatment of landscapes contained on the Register of Historic Parks and Gardens of Special Historic Interest and Registered Historic Battlefields.
- Arboricultural policies with regards to timber, tree health and amenity value of tree stock at a national and local level including The Town and Country Planning (Tree Preservation)(England) Regulations 2012

### 5.8.3. Local plans, programmes and policies

NCAs provide a baseline and are useful for monitoring change across a landscape. National Character Areas (NCAs) are used in local planning decisions and policy development. Development should be in keeping with the local character as per the character profiles.

Within the RBD there are several Green Belt policies which form part of the planning decision making. The Cambridge Green Belt is a non-statutory environmental policy. Green Belts are designated to safeguard the countryside, constrain urban sprawl and preserve the historic and landscape setting. Reviews of Green Belt boundaries are supported in order to meet regional development needs. Local spatial development strategies also address public space. The Green Space Strategy for East Lincolnshire recognizes the value of high quality public space to a townscape. It seeks to improve the setting of the urban environment through parks, squares and open green space. Future green space should benefit the environment and enhance quality of life. The South Essex Strategic Green and Blue Infrastructure Study (2020) will contribute to the Joint Strategic Plan and guide Local Plans. It sets out a vision of world class productive landscapes which are connected to form the South Essex Estuary Park. Peterborough's Green Infrastructure & Biodiversity SPD (2018) has a vision for protecting and enhancing its network of green infrastructure and associated biodiversity for the next 20 years. It provides practical guidance to include green infrastructure in decision-making and appreciate its value.

The management plans of the AONBs and the Broads Plan recognize the inherent value and sensitivity of the unique landscapes present. The ecosystem services they provide is acknowledged, along with the need to conserve and protect them. The positive influence of these natural spaces on health and wellbeing is increasingly promoted. The contribution of these landscapes to tourism is noted. Habitats play a significant part in creating the sense of place. Management plans seek to enhance these habitats. This includes improvements to water quality.

Landscape features have been shaped by land management over generations. This includes drainage, waterway navigation, and flood management regimes. The complex system of drainage and agriculture has shaped the present day character of the Fens. In the case of the Broads, flooding has helped to shape this unique water-based landscape, however flooding can also cause significant landscape damage. Flood management is therefore addressed within the Broads Plan.

### 5.8.4. Considerations for the second cycle FRMP

FCERM measures have the potential to impact landscape features by changing or improving land management. There is an opportunity to restore and enhance landscape features such as hedgerows and habitats through FCERM.

To summarise, key themes within the PPPs and opportunities for consideration within the second cycle FRMP include:

- The value of landscapes to wellbeing and local identity
- The economic contribution of unique landscapes through tourism and recreational activity

- The importance of habitats and biodiversity to landscape character

### 5.8.5. Future baseline

The value of the AONBs to health, wellbeing and biodiversity is being recognized through ongoing research and evidence. Nonetheless the pressures faced from development will be ever present. For example, consultation is looking at the impact of constructing Sizewell C nuclear power station. Proposed windfarm development is also placing extra pressures on landscape within the region.  Pressure for housing will continue to place pressures on Green Belt areas and the need to review boundaries.

Climate change may impact negatively on visual character. Prolonged periods of drought and intense rain may also affect landscape condition through deterioration of their habitats and features. First cycle FRMP measures have contributed to enhanced landscape character in the Anglian RBD through measures such as improved functioning of the washlands. Most effects have been at a local level: planting trees and hedgerows and enhancing natural flows. Continuation of first cycle FRMP will seek to reduce adverse landscape effects into the future.  Wider benefits of catchment scale planning will be realised over the long term.

### 5.8.6. Scope and assessment framework

FCRM measures can have a range of impacts on the landscape environment. Large scale flood interventions can affect overall setting by immediate visual change.  The flat landscapes of the Anglian RBD increases this potential.

Positive landscape change can result from FCRM schemes within rural and urban settings, with opportunities to deliver multiple benefits. The naturalization of rivers within urban environments and inclusion of street trees can potentially enhance landscape character. The addition of hedgerows; small, wooded areas; and corner ponds into agricultural landscapes as an NFM measure will also create a positive visual change. Improving amenity and public space alongside flood schemes may benefit visual elements and sense of place.

The assessment considers whether the plan contributes to the landscape and seascape character of the Anglian RBD and provides opportunities for enhancement (see section 3.6 for assessment criteria).

### 5.8.7. Significant effects of the draft plan

**Significant effects of national measures**

National measures in the draft strategy could result in positive and negative effects on the character of urban and rural landscapes. As with cultural heritage, measures linked to the

planning and the delivery of flood risk management activities and solutions have the greatest potential to effect landscape character.

Flood risk management projects have the potential to both negatively and positively affect landscape character. They can help to protect existing landscapes from the effects of flooding and coastal change. New or improved infrastructure, however, can also result in the loss of landscape features that contribute to the character of a place and its use by people. In urban areas, for example, schemes can affect areas of green space used for informal or formal sport and recreation. With mitigation, as informed by landscape character assessments, potential negative effects can be reduced at the local level. Such interventions can also provide opportunities to enhance the quality of landscapes at a greater scale, by improving or extending blue and green infrastructure networks or enhancing the public realm. This in turn can serve to improve people's connection with the water environment. This could include enhancing views of watercourses or enabling better physical access such as walking and cycling networks. Flood risk management tools that work with natural processes can also enhance landscape character for people and nature. This includes schemes that re-naturalise modified watercourses, create wetland habitats and enable managed realignment in coastal areas.

The draft plan includes measures to adopt nature-based solutions to manage flood risk and measures that require flood risk management projects to achieve biodiversity net gain and wider environmental benefits and it is anticipated that this has the potential to contribute to the conservation and enhancement of urban and rural landscapes.

At a wider scale, change in rural land management to promote flood risk management, for example increased afforestation, could lead to both positive and negative landscape effects. This should be guided by landscape character assessment and landscape management plan studies. It is anticipated that the scale of positive impact will increase over time as these ways of working embed.

**Significant effects of local measures**

The overall impact of the plan on landscape is likely to be neutral. No significant negative impacts are likely to be associated with implementation of the overall plan. The assessment of key locations is showing mainly positive or neutral effects on landscape.

Positive effects on the landscape are a likely result of partnership work to continue to progress the Ouse Washes habitat creation project in the Great Ouse Fens. The measure creates an opportunity to explore historic character and to develop a project that references the evolution of the landscape. Partnership working arrangements could deliver benefits such as improved access, links to existing rights of way, education and information.

The assessment identified that tree planting in the upper reaches of the Essex watercourses has the potential for positive effects on landscape character. It will help restore the landscape framework, which is often fragmented as a result of hedge and tree removal associated with the amalgamation of fields into large units. The measure can potentially deliver the Statements of Environmental Opportunity for the South Suffolk and North Essex Clayland National Character Area. Partnership working with the RSPB in East Suffolk Management Catchment to implement nature based solutions will have a positive landscape effect, with the potential to enhance landscape character and provide associated recreational and amenity benefits. Significant positive effects on landscape are likely from the implementation of measures within the Nene Management Catchment. These focus on habitat biodiversity, land management and river restoration using natural flood management principles. The measures are likely to enhance the local landscape and visual character and reinforce the setting of Registered Parks and Gardens associated with the river valley landscapes. They have the potential to improve access to and along the Nene tributaries in the Pitsford and Lamport area.

Positive effects are likely at Alconbury, where the capital works look to implement blue/green infrastructure and NFM along with more traditional approaches. Blue-green infrastructure projects are generally landscape-led and can provide multiple benefits to people, wildlife and water management. This type of measure can improve the functioning of the landscape and contribute to Environmental Net Gain.

In urban areas, expanding the use of SuDS has the potential to have positive landscape and visual effects. This measure can contribute to a network of green spaces that enhance quality of life in the community and improve ecological functions. The Protecting and Preventing measures described for Chelmsford have the potential for positive landscape effects. The ambition is to improve the quality of SuDS measures and consider green infrastructure. Several opportunities have been identified that link FCRM interventions to the delivery of local ambitions for landscape that would support a more positive impact.

**Mitigation actions**

The assessment of potential effects on landscape and townscape character will be undertaken as part of the project level environmental assessment and inform mitigation requirements. The mitigation hierarchy should be adopted as a design principle during development of the proposed Protecting measures with avoidance of areas of landscape sensitivity and designations as far as possible. Visual effects on people living, working or visiting the local area should also be considered when developing proposals at the project level.

At a project level, consideration should be given to the relevant published landscape character assessments at a national, county and local level, where applicable. These

assessments identify the key sensitivities, and often include management recommendations and opportunities for restoration or enhancement**.**

**Enhancement opportunities**

The delivery of new flood risk management schemes has the potential to restore and enhance landscape character. The Statements of Environmental Opportunity for each of the National Character Areas in the RBD, make recommendations for enhancements at a landscape scale within catchments, which the schemes could help deliver. They also provide opportunities for extending or enhancing green infrastructure networks and improving access to green space.

The National FCERM Strategy includes the recommendation that the scope for delivering net environmental gain include the provision of recreation and amenity as well as green space.  Examples include new or extended footpaths and cycle ways and provision of public seating.  In urban areas, blue/green infrastructure projects can support the enhancement of views to watercourses and improve connection with the water environment for people and wildlife.

The Protecting measure of better management and control of invasive non-native species in watercourses and on river banks can be positive for enhancing the landscape character of the water environment.

In rural areas, encouraging the delivery of natural flood management interventions at a catchment scale can contribute to restoring landscape features such as hedgerows and field patterns, enhancing landscape character in the process.

# 6. Overview of the environmental effects of the draft plan

In this section, we've provided an overview of the environmental effects of the draft second cycle Flood Risk Management Plan (FRMP), including cumulative effects and a summary of mitigation actions and enhancement opportunities.

This section covers:

- the significant environmental effects of national measures
- the significant environmental effects of collections of measures in key locations
- the significant environmental effects of different types of measures
- the significant environmental effects of draft plan overall
- summary of mitigation actions and enhancement opportunities

- cumulative effects of the interactions between the draft plan and other relevant policies, plans and programmes

## 6.1. The significant environmental effects of national Measures

On balance the national measures in the plan are assessed as having **significant positive** effects on population and human health, with effects on biodiversity assessed as potentially negative and all other environmental issues assessed as neutral.

The assessment recognises the potential for individual national measures to have positive and/or negative environmental effects as described in the sections above. The actual environmental effects will depend on the nature and extent of the actions that arise from the national measures and local environmental conditions.

Given the widely acknowledged global climate and nature emergencies, environmental issues are increasingly important in a strategic context. It is therefore important that national measures are actively implemented in a way that gives due consideration to their environmental consequences. The Environment Agency's well-established approach to assessing and managing environmental risk and opportunity at a programme and project level will play an important role in minimising negative effects and maximising positive effects from these actions as they are implemented. It is anticipated that Lead Local Flood Authority's (LLFA's) will have similar controls in place.

The balance of negative and positive effects associated with national measures is likely to skew more strongly towards positive over the duration of the plan as the Environment Agency and LLFA's make progress towards net zero carbon and environmental net gain targets and as nature first ways of working are embedded in standard practices.

The plan aims to contribute to the delivery of climate resilient places and a nation ready to respond and adapt to flooding and coastal change among other objectives. National measures included in the plan, illustrating how these objectives will be achieved include:

- measures to forecast flooding and warn and inform those at risk
- measures to plan, prepare and exercise for future flood scenarios
- measures to take a risk based and whole life approach to management of assets
- measures to increase resilience to flooding
- measures to plan for and deliver projects that reduce the risk of flood and coastal erosion

Collectively, national measures are likely to have a **significant positive** effect on population and human health by improving preparedness for and recovery from flooding and coastal erosion, helping adapt to climate change and reducing the risk of flooding.

The national measures illustrate a clear intent to adopt a nature-based approach to flood and coastal erosion risk management where possible.

National measures include:

- commitments to reduce carbon emissions
- biodiversity net gain
- wider environmental benefits
- the use of natural flood management approaches

Collectively these measures are likely to result in positive effects across all environmental topics. Key to success here will be taking a systems approach to flood and coastal risk management that enables solutions that deliver multiple benefits across a range of environmental and social issues to be achieved. The significance of positive effects is anticipated to increase over the lifetime of the plan as these ways of working embed.

Despite the intention to adopt a nature-based approach where possible, the plan anticipates a need for new or improved infrastructure to manage flood risk. New and improved infrastructure can impact the environment positively and negatively across a wide range of issues. Given the strategic sensitivity surrounding the climate and nature emergencies a precautionary assessment concludes that new and improved infrastructure could have a negative effect on climate mitigation and biodiversity and a positive effect on climate adaptation.

The Environment Agency has a rigorous and well-established approach to environmental assessment and management across its capital programme and it seems reasonable to assume LLFAs will adopt similar approaches. In delivering new or improved infrastructure, programme and project level environmental assessment will allow opportunities to enhance the environment and reduce anticipated negative effects. These will include effects on climate mitigation and biodiversity and will result in more sustainable infrastructure.

It’s important to involve people with suitable experience and expertise in environmental and social issues early in planning and delivering many of the national measures. This will enable achievement of wider environmental and social targets set out in relevant policy and strategy, for example in the 25 Year Environment Plan. For issues such as carbon, biodiversity, landscape and cultural heritage for example, the earlier they are considered in the project lifecycle the more influence we have over the nature and extent of the impact.

## 6.2. The significant environmental effects of collections of measures in key locations

Flood Risk Areas have been defined by the Environment Agency due to the high risk of flooding from rivers and sea and by the LLFA for risk of flooding from surface water. There are 16 Environment Agency FRAs within the Anglian RBD and 12 LLFA FRAs. Three FRAs span across RBD boundaries. The London and Thames Estuary FRA for river and sea flooding is within both the Anglian and Thames RBDs. It is described solely within the second cycle Thames draft FRMP. The Dunstable surface water FRA spans both the Anglian and Thames RBDs. It is described solely within the second cycle Thames draft FRMP. The Louth FRA for rivers and sea flooding spans both the Anglian and Humber RBDs. It is described solely within the second cycle Humber draft FRMP. Detailed descriptions of the FRA including their environmental context is provided within the FRMP. The location and boundaries of the FRAs are also shown and are represented on Flood Plan Explorer

Strategic Areas are areas with a similar geography where it is important to consider flood risk across administrative boundaries. There are 2 strategic areas within the Anglian RBD. These are the Fens and Lowlands strategic area and the Oxford to Cambridge Arc. The Oxford to Cambridge Arc spans both the Anglian and Thames RBDs and is described in both FRMPs. The Fens and Lowlands Strategic Area spans both the Anglian and Humber RBDs and is described in both FRMPs.

Measures are also proposed at a Management Catchment Scale based on the management catchments within the Water Framework Directive. There are 10 management catchments within the Anglian FRMP. Note all measures that would have been developed for the Old Bedford and Middle Level management catchment have been included in the Fens and Lowland strategic area.

There are 2 FRAs for which all measures have been screened out of this assessment. These are March and Market Harborough. Measures were screened out as they have already had an SEA applied during a prior process. All of the measures for March FRA are transitional from the first cycle FRMP and are already being implemented.

### 6.2.1 FRA assessment

**Alconbury Weston (RoFRS)**

Alconbury Weston is a small rural village in Cambridgeshire. The main cause of flooding is from a brook that runs through the village. There are no local wildlife sites or sites with statutory conservation designation within the FRA. Agricultural land lies on the periphery of the village.

9 measures for Alconbury Weston are screened into the overall assessment. The majority will be implemented by 2023. More than half are preparing measures contributing to greater public awareness around flood risk, and improved flood warning systems. There is a continued emphasis on community empowerment and flood risk management partnerships, building on the existing Partnership Group. An evidenced based approach is being taken by the Environment Agency. Decisions are informed by a better understanding of fluvial processes and impacts of climate change are considered across the catchment. A third of the measures are Protecting type measures. Future capital works aim to deliver Biodiversity Net Gain (BNG) and wider benefits. Works are likely to include natural flood management (NFM) and will be informed by catchment level investigation.

The measures for Alconbury Weston are likely to result in a positive environmental effect overall. Capital works programmes, even of a traditional nature are likely to deliver BNG benefit in the future. Requirements under the upcoming Environment Act and Environment Agency E-Mission 2030 targets to achieve 20% BNG will drive this forward. NFM type works are specified within the capital program. These are likely to deliver positive impacts for biodiversity in the long term operational phase. Carbon net zero requirements will also be a consideration across all Environment Agency capital schemes going forward, with overall climate benefit. There is potential for landscape benefits in line with the Statements of Environmental Opportunity for National Character Area 88: Bedfordshire and Cambridgeshire Claylands. For example:

- ‘SEO 1: Maintain and manage a sustainable and productive claylands arable landscape, while managing, expanding and linking woodlands, hedgerows and other semi-natural habitats to benefit biodiversity, improve soil and water quality’
- ‘SEO 2: Protect aquifers and enhance the quality, state and structure of the River Great Ouse, its valley and tributaries, habitats, waterbodies and flood plain by seeking to enhance their ecological, historical and recreational importance while taking into account their contribution to sense of place and regulating water flow, quality and availability.’

Improvements associated with the capital works could include tree planting, improving physical access, public amenity improvements such as improving footpaths and signage, specification of seed mixes for pollinators, etc.

There are 9 listed buildings and a number of scheduled monuments in the locality with 8 at high risk of flooding. Any measures which reduce this risk should be seen as a positive. It is considered that any groundworks have the potential to uncover/destroy archaeological remains. PLR can have a negative visual effect on listed buildings and buildings of local interest. However, if it is temporary or carried out in keeping with the building it can be positive to the long term protection of the property. Use of materials should be in keeping with any listed structure. This will be addressed during the necessary consent process. The results of any archaeological works should be made available to the public. This could

be in the form of reports, site visits, talks, interpretation boards etc. Works could affect the historic landscape character of the area and this should be taken into consideration.

The overall strategic approach to flood risk management for this FRA is one based on evidence; it is community orientated and focused on strong partnership working which is likely to result in wider benefits to the community with positive impacts on mental health and well-being. The improved community preparedness likely to result from the softer measures is also likely to have an overall positive effect on mental health and wellbeing.

**Alconbury**

Alconbury is a small rural community south east of Alconbury Weston. The principal source of flood risk is Alconbury Brook. Agricultural land, residential properties, a SAM and listed buildings are at risk from flooding. There are no other statutory or local conservation designations within the area at risk of flooding.

10 measures are screened into the overall assessment. For the short term to 2022, the focus for Alconbury FRA is on preparing measures including flood warnings and awareness around PLR. 40% of the measures are preparing measures. 30% are protecting measures, 30% prevention and there is one recovery and review measure. Capital works on the ground look to implement blue/green infrastructure and NFM along with more traditional approaches. The strategic approach is at a catchment level with an emphasis on partnership working, including opportunities associated with private sector development.

The measures are likely to result in an overall positive environmental effect across the topic areas. Capital works will incorporate BNG and consider NFM and blue/green infrastructure. Hence, they are likely to benefit water quality through reduced run off and habitat improvement and creation. By exploring opportunities to work with developers, Preparing measures should provide mental health benefits for those community members at risk or previously experiencing flooding in the community. There is the potential for a landscape-led approach to define a vision for the catchment. This has the beneficial effect of close working with the community and partners. Capital works, which may include both natural flood management and traditional flood risk management options, have the potential to deliver the Statements of Environmental Opportunity for the National Character Area 88: Bedfordshire and Cambridgeshire Claylands. There are 10 listed buildings and a number of scheduled monuments in the locality. Any measures which reduce the risk of flooding should be seen as a positive. Groundworks have the potential to uncover/destroy archaeological remains. The results of any archaeological works should be made available to the public. This could be in the form of reports, site visits, talks, interpretation boards etc. PLR can have a negative visual effect on listed buildings and buildings of local interest. However, if it is temporary or carried out in keeping with the building it can be positive to the long term protection of the property.

**Boston**

The Boston FRA is urban and includes residential, business and amenity areas. It has a rural setting. It extends to include Wyberton in the south-west of the FRA, Frampton Fen to the west and Skirbeck to the east. Good quality agricultural land lies on the periphery. Boston's main historic importance is as a port and a medieval town. The Boston Town Centre Conservation Area is classed as Heritage at Risk. Downstream of the FRA, the Haven discharges into the Wash which is recognized as being of national and international importance for nature conservation.

There are 6 measures screened in for Boston. Half of the measures are preparing measures with protecting measures focussed on the tidal defences between the Boston Barrier and Grand Sluice to deliver long term protection. Monitoring and modelling is a key feature of the measures. Appropriate planning controls will also be explored. Opportunities to reduce fluvial flood risk will look to engage with upstream landowners to adopt a land management approach working with Environmental Land Management schemes (ELMS).

The type of protecting measures considered for the urban centre of Boston downstream of Grand Sluice is not stated. However existing defences include flood walls, piled banks and earth embankments. There are likely to be impacts on priority habitat and potential risk to undesignated heritage from these works. Adverse impacts to fish, other aquatic life and water quality is likely to be of a temporary nature. Given Environment Agency policy re: BNG, overall impacts on biodiversity are likely to be positive. The initial works and development of a long term plan to sustain tidal defences might be enhanced through a strong approach design, providing recreational and tourism benefits. There is also the potential for landscape harm from construction impacts, material movement and tree loss, dependent on works location. Localised adverse effects and impacts to downstream conservation sites, priority species and priority habitats will be mitigated at a project level.

Engagement with landowners to increase environmental awareness and promote sensitive farming through ELMS is likely to result in positive changes to soil and water quality and biodiversity for the future. Initiatives could enhance local landscape and visual character However, the take-up and timeframe for implementation of these protecting measures is uncertain. The preparing measures and additional protection work carried out in the town should result in improved mental health and positive impacts to the economy with reduced flood risk to homes and commercial buildings.

There is opportunity for beneficial landscape improvements, such as improving physical access, incorporating public amenity improvements, and restoring or enhancing local landscape and visual character. Land management measures might include tree planting which could enhance the landscape where features are currently limited and fragmented. Tree planning could support carbon offsetting in the local area. There is an opportunity to

work with partners to explore new means for maintaining and managing the newly created areas of habitat, which might involve working with local groups

Works will be undertaken within the historic core of the town and conservation area. Any works should consider the setting and character of listed buildings. It is uncertain what effect the works would have on archaeological remains. It is considered that any groundworks have the potential to uncover/destroy archaeological remains. Sustaining defences will continue to protect listed buildings to positive effect. The results of any archaeological works should be made available to the public. This could be in the form of reports, site visits, talks, and interpretation boards.

**Cambridge**

Cambridge FRA covers a dense urban area at risk from surface water flooding. Histon Road SSSI, designated for geological interest lies within the FRA. A number of Local Wildlife Sites, Local Nature Reserves (LNRs) and areas of public open space are also within the boundaries of the FRA.

There are two measures screened into the assessment for Cambridge which are planned over the 6 year FRMP cycle. The measures seek to continue works to progress flood resilience. Known areas of flooding will be investigated in order to prioritize investments for the future programme.

Overall impacts are uncertain. There is insufficient information around the flood resilience works to assess the potential ecological effects, although any works that improve flood resilience should result in a positive effect on mental wellbeing. Flood protection works are likely to positively impact roads, homes, and commercial properties by preventing flood damage. The works to investigate an approach to the wet-spots should reference the Cambridge Sustainable Drainage Design & Adoption Guide and are likely to provide benefits to the public realm. There is uncertainty around the impacts to heritage as there is insufficient details of the works. Any groundworks have the potential to uncover/destroy archaeological remains.

**Chelmsford**

The Chelmsford FRA covers the main urban area of the city at risk from surface water flooding. It includes areas of residential development, commercial property, and supporting health, leisure and educational facilities. There are no key conservation site designations within the FRA.

14 measures are screened into the overall assessment. 2 of the measures are Protecting measures, 3 are preparing and the majority are preventing. There is insufficient information on the protecting measures to fully assess the impacts. Protecting measures include property flood resilience funded through a grant scheme for high risk areas, and

maintenance programmes informed by annual asset review. There are no recovery and review measures for Chelmsford.

Effects of maintenance works are likely to be minor and temporary during the construction period only. They are likely to be undertaken in accordance with carbon reduction strategies and the BNG policy of the Council. It is considered that any groundworks have the potential to uncover/destroy archaeological remains. The results of any archaeological works should be made available to the public. Measures are likely to result in positive outcomes for material assets and the wellbeing of those living in high Flood Risk Areas. Grants for property resilience works should consider including minimum requirements for environmental and sustainability performance and preferential scoring/weighting towards those schemes which propose benefits.

The preparing measures are focussed on public awareness and involvement, including the formation of a Community Flood Group. Almost 14% of the population within the FRA are at risk of flooding. The preparing measures should serve to empower local communities and individuals at risk of flooding, impacting positively on health and wellbeing.

The overall prevention approach to flood management looks to joined up working and partnership across the Risk Management Authorities (RMAs). An adaptive approach is adopted across the catchment. There is an emphasis on prevention through implementation of stronger planning policy and measures which work with the developers. Improving the quality of Sustainable Drainage Systems (SuDs), green infrastructure and climate action are particular considerations. The partnership approach and collaboration with developers to improve SuDs is likely to result in positive outcomes with respect to water quality and soil erosion. Potential outcomes include a reduction in surface water flooding and run-off which carry pollutants and sediment into the waterways. The integration of green corridors into the SuDs solution is likely to provide enhanced habitat, BNG, and recreational amenity, with positive effect on climatic factors, due to the potential cooling effect and carbon absorption of trees.

The protecting and preventing measures described have potential beneficial landscape effects given the:

- adaptive approaches
- working with partners and communities
- knowledge exchange around NFM
- training around SuDS delivery
- implementation of Green Infrastructure Strategy recommendations

The measures have the potential to restore and enhance the landscape and visual character of the Chelmsford area. SuDS approaches might include tree planting, which

would support the guidance for the South Suffolk and North Essex Claylands NCA under SEO 2:

- ‘Protect and enhance the area’s ancient woodland cover, river valley plantations and ancient hedgerows, through the planting of new woods, hedgerows and hedgerow trees to benefit landscape character, habitat connectivity and a range of ecosystem services, strengthening the sense of place and history’.

The measures could improve access to the countryside for recreation, reinforce the key qualities of landscapes, and provide a valuable health, education and access resource.

Notwithstanding some uncertainties, the overall effect of all the measures is considered positive across the topics.

**Colchester FRA**

Colchester FRA covers approximately 16km of the main town centre and urban environment. The primary source of flood risk is surface water, however there is also risk from coastal, fluvial and groundwater flooding. The FRA includes Local Wildlife Sites and SAMs including the castle and Benedictine Abbey.

14 measures are screened into the assessment. Around 20% of the measures for Colchester FRA are protecting measures, 20% preparing and 60% are preventing. There are no recovery and review measures for Colchester.

There is insufficient information on the protecting measures to fully assess the potential ecological impacts or heritage impacts of the protecting measures. The protecting measures include property flood resilience funded through a grant scheme for high risk areas, and a maintenance programme informed by annual asset review. Effects of maintenance works are likely to be minor and temporary during the construction period only. It is considered that any groundworks have the potential to uncover/destroy archaeological remains. The results of any archaeological works should be made available to the public. PLR can have a negative visual effect on listed buildings and buildings of local interest. If carried out in keeping with the building it can be positive to the long term protection of the property. Works can also affect the historic landscape character of an area and this should be taken into consideration. The protecting measures are likely to result in positive outcomes for material assets and the wellbeing of those living in high Flood Risk Areas. Grants for property level resilience would benefit from including minimum requirements for environmental and sustainability performance and preferential scoring/weighting towards those schemes which propose positive outcomes.

The preparing measures are focussed on public awareness and involvement, including the formation of a community flood group. Almost 10% of the population within the FRA are at risk of flooding. The preparing measures should serve to empower local communities and individuals at risk of flooding, impacting positively on health and wellbeing.

The overall prevention approach to flood management looks to joined up working and partnership across the RMAs, taking an adaptive approach across the catchment. There is an emphasis on prevention through implementation of stronger planning policy and measures which work with the developers, particularly with respect to improving the quality of SuDs, considering green infrastructure and climate action. This approach and working with developers to improve SuDs, is likely to result in positive outcomes with respect to water quality and soil erosion, with reduced surface water flooding and run-off which carry pollutants and sediment into the waterways. The integration of green corridors into the SUDs solution is likely to provide enhanced habitat, BNG, and recreational amenity. A positive effect on climatic factors is likely, due to the potential cooling effect and carbon absorption of trees. Effects of maintenance works are likely to be temporary due to construction related activities, and as with the capital works are likely to be undertaken in accordance with carbon reduction strategies and BNG policy of the Council.

The protecting and preventing measures described have the potential for beneficial landscape effects, given the implementation of stronger planning measures, SuDs, and opportunities for partnership working. The measures would provide landscape benefits in line with the Statements of Environmental Opportunity for NCA 111: North Thames Basin, specifically SEO 1:

- ‘Manage rivers and river valleys to protect and improve water quality and help to alleviate flooding in the downstream urban areas, while also helping to improve aquifer recharge and provide a sufficient store of water to meet future need, especially with predicted climatic changes. Conserve the riparian landscapes and habitats, for their recreational and educational amenity for their internationally significant ecological value.’

There is an opportunity to support the ambitions of the Green Essex Strategy by developing quality green infrastructure and green spaces. This would also support the Colchester Borough Green Infrastructure Strategy.

Notwithstanding some uncertainties, the overall effect of all the measures within the FRA is considered positive across the topics.

**Great Yarmouth**

The Great Yarmouth FRA covers the urban residential and business areas of the town as well as the coastal frontage. The main risk of flooding is from main rivers and the sea. The measures for this coastal town apply to Great Yarmouth as a whole. Within and adjacent to the FRA are important areas for nature conservation and cultural heritage. This includes the Outer Thames Estuary Special Protection Area (SPA), the Broads National Park, Southern North Sea Special Area of Conservation (SAC), Great Yarmouth North Denes SSSI, 3 Local Wildlife Sites, 58 listed buildings and 0.21 ha SAM. Breydon Water SPA/Ramsar/SSSI lies to the east of Great Yarmouth.

9 measures are screened into the overall assessment. The proposed measures are for the most part a mix of protecting and prevention type activities, with protecting measures focused on sustaining the tidal defences, and improving where necessary. Capital works will be informed by climate change modelling. Approximately half the measures are preventing type measures including a flood risk strategy informed by the BFI strategy and planning guidance and controls. These measures seek partnerships with local conservation organizations and the Broads Authorities and will incorporate BNG and landscape improvements. They also aim to link investment decisions around infrastructure and town centre rejuvenation with flood risk protection investment. There is one preparing measure that focuses on increased public awareness around flood risk.

The preventing measures for Great Yarmouth follow a sustainable approach: seeking flood risk solutions that also provide wider ecological, social and economic benefit. It is unclear if there will be resulting on the ground physical activities within the life of this strategy. The measures will ensure a framework for positive impacts on biodiversity, soil and water for the future. The nature of the proposed capital works is uncertain, hence impacts on ecological receptors are uncertain. It is likely that the proposed capital works will be based on hard engineered structures given the existing hard engineered tidal defences of the FRA. Hard engineered structures would have greater adverse effects on biodiversity and the marine environment. While they would continue to offer protection to habitats on land there would be local impacts from construction. These impacts will be addressed through project level environmental assessment and standard environmental management. An anticipated positive impact on biodiversity, flora and fauna is based on the legal and policy requirements for BNG. Any potential negative impacts to biodiversity, flora and flora and carbon from the construction of hard engineered tidal defences will need to consider mitigation and offsetting in order to meet the Environment Agency targets for BNG and Carbon net zero

The measures seek to protect the local population and infrastructure from tidal flooding and explore opportunities for amenity and socioeconomic improvements. Hence a **significant positive** effect is envisaged on population and human health, and a positive effect on material assets by creating a resilient community. The focus on partnership working with conservation organisations and the Broads Authority, reference to landscape improvements, incorporating environmental net gain and a flood risk strategy informed by the BFI Strategy, ensures that landscape is central to design thinking. The measures are likely to reinforce the key qualities of the downstream end of the Broads National Park, have a positive effect on the Conservation Areas, and deliver some of the objectives in the Town Centre Masterplan. Landscape effects are likely to be positive.

The BFI strategy has adopted an ecosystem services approach, and as this will feed into the proposed FCRM strategy to be developed for the FRA, impacts are likely to be positive across the topic areas. Sustaining and improving the tidal defences might be enhanced through a strong approach design, providing recreational and tourism benefits.

Engagement with landowners to maximise the benefits of net gain and landscape improvements could enhance local landscape and townscape character and improve access to the river frontages in the town.

Works could adversely affect archaeological remains, setting of listed buildings, scheduled monuments, and conservations areas. However, improving defences could have a positive effect on heritage assets through their ongoing protection. It is considered that any groundworks have the potential to uncover/destroy archaeological remains. The results of any archaeological works should be made available to the public.

**Horncastle**

Horncastle is a market town in Lincolnshire with significant Roman heritage. It is at risk from flooding from main river and the sea. The Horncastle FRA covers a large part of the urban centre of the town, with Grade 3 agricultural land to the periphery and includes the Local Wildlife Site, Horncastle Canal Grassland.

A total of 5 protecting, preventing, and preparing measures are screened in across the FRA. Protecting measures target surface water management and investigating NFM opportunity with partners. Preventing measures explore natural solutions to invasive species management. Modelling that accounts for updated climate predictions will support future decision making and inform improved flood warning systems.

Any adverse effect from the measures on the environmental topic areas is unlikely. The majority are under Environment Agency delivery and therefore Protecting measures should be guided by policies for increased BNG and zero net carbon. Modelling and flood warning systems are likely to impact positively on local wellbeing. The LLFA measure to target surface water management is likely to have a positive effect on the local population as well as improved overall flood-risk, although details of the type of works is not specified. LLFA measures to address surface water should prioritize green innovation and consider SuDs such as encouraging permeable urban surfaces, green roofs, and street trees. If NFM is taken forward it is likely to have beneficial impact on water resources, wetland habitats and biodiversity. Water attenuation has the potential to impact positively on the groundwater resource and the Lincolnshire chalk aquifer. The protecting and preventing measures described have potential for beneficial landscape effects given the potential for SuDS design, and opportunities for partnership working to deliver NFM. The measures could provide landscape benefits in line with the Statements of Environmental Opportunity for both NCA 44: Central Lincolnshire Vale and NCA 43 Lincolnshire Wolds. These are focussed on landscape restoration and protecting and enhancing the landscape. This will enhance riverine character, recreational experience and ecological connectivity. Details of works information is insufficient to assess impacts to archaeology and cultural heritage which remain uncertain. Groundworks have the potential to uncover/destroy archaeological remains. The results of any archaeological works should be made available to the public. This could be in the form of reports, site visits, talks, interpretation boards etc

**Hunstanton**

The Hunstanton FRA covers the coastline from Hunstanton town centre to Heacham South Beach. It includes parts of the main urban area of south Hunstanton and parts of Heacham village. The FRA includes residential, business and amenity areas. There are also caravan sites, holiday homes and an important brackish habitat within the FRA. The Norfolk Coast Area of Natural Beauty (AONB) lies to the east. The Greater Wash SPA and the Wash and North Norfolk Coast SAC lie offshore to the east. Flood risk is primarily from the sea. There have been notable flood events in the past from tidal surge and overtopping of the coastal defences.

13 measures are screened into the assessment. 3 measures have been screened out as agreed measures already being implemented. Over a third of the measures are protecting measures. These are delivered through multiple agencies but with a common theme of partnership working. Protecting measures are focused on managing tidal flood risk involving physical works and asset maintenance on existing flood defence structures. They also prioritize surface water management in the FRA. One third of the measures are preventing measures encompassing flood risk policy and planning activities. Planning policy and development control measures target beach huts and caravans. The Wash Coastal Management Strategy forms the basis for preventing measures in the later stage of the FRMP post 2025. There are 2 preparing measures to improve flood forecasting and warning systems and one recovery measure that seeks to establish a community flood group to build community resilience.

Primary tidal defences in Hunstanton are for the most part hard engineered concrete structures with rock revetments and groynes. Maintenance activities are unlikely to have a significant positive or negative effect on biodiversity, flora and fauna. Some adverse impacts are likely during the construction phases. Opportunities for enhancement are limited. Consideration can be given to green design elements that promote native planting, habitat for invertebrates and pollinators. The repair work to the promenade has the potential to improve public access and enhance links with the town. Positive economic effects on local businesses through visitation and tourism are likely. Investigative measures looking at the condition of the secondary embankment are not likely to have significant positive or negative impacts. Effects will be minor and localized can be managed through project level assessment.

The worst-case scenario from protecting measures would be a negative effect on climatic factors. This is likely to result from construction activity even with selection of low carbon materials and use of sustainable plant. Impacts on climatic factors can be mitigated through choice of materials and embedding sustainability and net zero carbon targets into construction activities.

The recommendations of the groyne effectiveness study are unknown at this stage. Hence impacts from implementation of the recommendations are uncertain.

Surface water management, if following a traditional approach that aims to move rainwater as quickly as possible, could potentially result in negative effect to soil, water and biodiversity. If Sustainable Drainage Systems are implemented the effects are likely to be positive.

Planning enforcement measures may impact negatively on individual livelihoods but have an overall positive effect at a community level. Flood evacuation was carried out as recent as 2019. There is an ongoing threat of tidal surge and flooding to properties and caravans. For this reason, collectively, the measures are likely to have an overall significant positive effect on population and mental health. Completion of the promenade works will provide amenity and recreational benefit, with subsequent mental health benefits to the local populace and visitors.

Overall, the protecting and preventing measures offer public benefits by improved public access and enjoyment of the seafront and seascape. Investigation of local landscape and visual character could inform material choice and detailing, and opportunities could be explored for working with local groups for specific design features. There are opportunities for local enhancements to the public realm, achieved through partnership and good design.

Works could adversely affect archaeological remains, and the setting of listed buildings, scheduled monuments, and conservation areas. However, improving defences could have a positive effect by affording ongoing protection. Details at this stage are insufficient to determine a negative or positive effect on cultural heritage. It is considered that any groundworks have the potential to uncover/destroy archaeological remains. The results of any archaeological works should be made available to the public. This could be in the form of reports, site visits, talks, interpretation boards.

**Huntingdon**

Huntingdon is a market town in Cambridgeshire at risk from surface water flooding. Great Stukely Railway crossing SSSI lies to the north of the FRA. It is important for rare orchids and wildflowers of chalky grassland. The northern part of Portholme SAC with important grassland habitats also lies within the FRA boundaries. The FRA also houses several LWS, important infrastructure, agricultural land, and heritage designations.

There are 2 long term prevention and preparing measures around flood risk assessment, prioritization, and critical infrastructure. These measures will provide evidence to inform and prioritize future works. Resulting impacts across the topic areas are uncertain. There is potential for on the ground activity but insufficient details to adequately assess.

This is an evidence-based measure, which will inform mitigation and enhancement actions. It provides an opportunity to review the proposed current interventions; to inform

their effectiveness for the future programme of works; and consider alternative approaches such as NFM or SuDs schemes.

**Ipswich**

Ipswich FRA is at risk from surface water flooding. Ipswich is a historic town and the capital of Suffolk. The town is located where the River Gipping becomes the tidal River Orwell. There are several LWS, and downstream, the Stour and Orwell Estuary is internationally important as a SSSI, Ramsar and SPA.

5 measures are screened into the overall assessment. The measures are mainly prevention or preparing measures with one protecting measure focussing on maintenance of assets upstream of the tidal barrier. The preparing measures involve public awareness and engagement type of activities to increase community resilience. The preventing measures focus on planning policy around sustainable development and flood risk policy directly related to surface water management.

The policy and planning measures will be completed in the short term and are likely to guide more sustainable local development beyond 2024. Development will consider local flood risk priorities, with potential positive impacts across the topics. In terms of surface water management, ecological impacts may be either positive or negative depending on the approach adopted. For example, traditional surface water management that aims to channel water away more quickly versus SuDs. Future asset maintenance is unlikely to have a significant effect across the environmental topics as any positive impacts are likely to be small scale. Construction activity relating to maintenance work is usually of lower environmental risk, and as the ecological receptors within the Flood Risk Area are not considered particularly sensitive the impacts from asset maintenance are likely to be neutral. The works are uncertain with outcome likely to have a neutral effect on culture overall.

Prioritization of SuDs could potentially benefit water quality, carbon impact, and climatic factors through improve cooling effect. The catchment-based approach creates an opportunity to explore NFM and a range of SuDS measures. There is opportunity to deliver localised improvements to the townscape. It is considered that any groundworks have the potential to uncover/destroy archaeological remains. The results of any archaeological works should be made available to the public. This could be in the form of reports, site visits, talks, interpretation boards

**Kings Lynn**

Kings Lynn is a historic market town and port in west Norfolk at risk from flooding from rivers and sea. Tidal flooding is the headline issue. The main extent of the FRA is the urban area of Kings Lynn and West Lynn and parts of the parishes of neighbouring North and South Wootton. It includes residential and commercial properties and a green belt of

mainly agricultural land. The Tidal Great Ouse flows through the FRA towards its estuary in The Wash. The Wash SSSI and SPA and The Wash & North Norfolk Coast SAC are just downstream of the FRA. The River Nar SSSI lies just upstream. The town and upstream rural catchment depend on built defences for flood protection.

11 measures are screened into the overall assessment. There are 2 preventing measures and 2 preparing measures. Almost 2/3 of the measures for Kings Lynn are protecting measures which focus on maintaining existing flood defences and managing flood risk from all sources, as per the adaptive approach of the Future Fens programme and including an immediate look at surface water management up to 2024. A partnership approach is being adopted with the risk management agencies working together to manage flood risk.

It is unlikely that on the ground delivery of new capital works as per the Future Fens programme will take place within this cycle of the FRMP. Efforts for the next decade will mainly focus on baselining and optioneering. The main urban area of Kings Lynn is protected by over 60 flood gates, and flood walls and embankments along the tidal Great River Ouse. A focus on maintaining flood defences at existing levels will have minor temporary adverse impact during construction and is unlikely to have significant overall ecological impacts on biodiversity, water and soil. Positive effects on population and material assets will result from ongoing protection of the defences from flood damage.

A number of flood walls are third-party buildings. Measures seek to obtain a better understanding of third-party asset ownership to monitor damage and repair. Third party land charges will also be considered. These measures should provide long term assurance at a community level of ongoing protection.

Impacts to cultural heritage are uncertain. It is considered that any groundworks have the potential to uncover/destroy archaeological remains. The results of any archaeological works should be made available to the public. This could be in the form of reports, site visits, talks, interpretation boards etc. Maintenance of PLR should be in keeping with the building to avoid a negative visual effect on listed buildings and buildings of local interest and contribute positively to the long-term protection of the property.

The measures to address surface water management may impact positively or negatively on the ecological receptors dependant on the approach taken. Consideration of SuDs would impact positively on water quality, climatic factors and landscape.

Planning policy intervention seeks to integrate urban regeneration and population growth with flood risk management in the long term. Planning policy interventions that integrate urban improvements should improve amenity and economic revival. The intended SPD which focusses on planning, growth and regeneration policies, provides the opportunity to reflect ambitions on sustainability and carbon. Green infrastructure, NFM and SuDS could be embraced as part of the policy with potential to enhance the public realm.

Preparing measures seek to work with the communities for evacuation planning, and improved flood awareness, forecasting and warning methods. This should result in a more resilient community with positive effect on mental health.

**Lincoln**

Lincoln is a cathedral city and capital of Lincolnshire county. It has a rich industrial heritage with its first settlement dating back to the first century BC. There are numerous listed buildings and local wildlife sites within the FRA. Surface water flooding is an issue. High water levels within the waterways are placing increased pressure on existing and stressed build defences in the city.

There are 6 measures screened into the assessment. The protecting measure to refurbish existing defences and control structures under the Lincoln Defences project was screened out as it is under construction. Protecting measures for the Lincoln FRA take a catchment approach and focus on surface water management and upstream sediment management by adopting land management type measures. Preventing measures focus on improved modelling and evidence collection to inform decisions. Preparing measures focus on improved flood warning services, through better forecasting and planning guidance that supports appropriate development and flood risk information. There is one recovery and review measure that aims to increase sign up to the warning system for the immediate short term.

Overall, there is likely to be a positive effect across most of the topic areas. The measures to address surface water management may impact positively or negatively on the ecological receptors dependant on the approach taken. Consideration of SuDs would impact positively on water quality, climatic factors and landscape. Working with land managers through the ELMs to reduce upstream erosion and run-off as well as more efficient use of the Lincolnshire Washlands, is likely to result in better ground water recharge and improved water and soil quality with resulting positive effect on biodiversity. By keeping the wetlands wetter for longer will likely have a positive climate effect through increased carbon storage. Improved flood warning services that reach a larger population within at-risk areas of the city are likely to have positive effects on wellbeing and mental health. Impacts to archaeology remain uncertain. There is insufficient detail on the works which could adversely affect archaeological remains, setting of listed buildings, scheduled monuments, and conservation areas. Continued protection of the archaeological assets within the city from damaging flood waters is positive.

The protecting and preventing measures described have potential beneficial landscape effects, given the catchment approach and identification of potential ELM schemes in the upper Witham. Early engagement with landowners around the potential benefits of the ELM scheme could include high-level goals for landscape restoration and enhancement. Landscape visioning might be a useful tool to help identify these. Standing advice on flood

risk and development could have green infrastructure at its heart. Enhancements to public access and the public realm could be identified and incorporated into plans.

Surface water management options could include SuDS design. SuDs are likely to benefit water quality, biodiversity and climatic factors and enhance the townscape. These schemes could include tree planting to enhance the woodland and hedgerow network. This would improve landscape character, habitat connectivity and a range of ecosystem services as per the Statements of Environmental Opportunity for NCA 48: Trent and Belvoir Vales.

**Louth**

Louth is a market town located on the River Lud in rural Lincolnshire.

There is one protecting type measure for Louth FRA. The goal is to protect properties by addressing surface water flooding. Intended delivery is through partnership working between Lincolnshire County Council and other RMAs.

Surface water management measures are likely to reduce flood risk to homes and businesses resulting in a positive effect on material assets. Reduced flood risk is also likely to have a positive effect on mental health and wellbeing. Lincolnshire County Council aims to cut carbon emissions by 68% to 2025. Therefore, it is unlikely that works will result in a negative effect on climatic factors. Insufficient details are provided in the measure of the type of works and physical activities undertaken to manage surface water. As such, impacts to biodiversity, soil and water are uncertain. Local development policy objectives promote SuDs. If the management and disposal of surface water is carried out with SuDS principles, then the overall effect across the topic areas is likely to be positive.

**Lowestoft**

Lowestoft is a town on the East coast. The FRA includes the coastal frontage and areas around the inland waters of Lake Lothing, Oulton Broad and Kirkley Stream. The area is important for water recreation and traditional beach related tourism. It has several internationally significant sites for nature conservation. The Broads SAC/SPA/SSSI/Ramsar lies on the western edge of the FRA and the Southern North Sea SAC and Outer Thames Estuary SPA borders the coast. There are a number of local wildlife sites within the extent of the FRA. Risk of flooding comes from surface water, rivers and the sea. At present, there are no formal flood defences in the Lowestoft FRA, so the area is reliant on the deployment of temporary flood barriers. A scheme is currently underway to install floodwalls. This has been screened out of the assessment as it has undergone project level environmental assessment.

There are 11 measures screened into the overall assessment. The protecting measure to install flood walls was screened out as it is currently being delivered. The measures for Lowestoft FRA are roughly equally spread across protecting, preventing and preparing

type actions. Protecting measures include a major scheme to install a tidal barrier to reduce the risk of tidal flooding. The main source of fluvial flood risk is from Kirkley Stream. The environmental condition of this waterway is a focus of interventions, seeking to integrate flood risk reduction with environmental betterment and improved Water Environment (Water Framework Directive) Regulations 2017 (WFD) status by working with developers and exploring potential of NFM. Preparing measures focus on public awareness, targeting schools and temporary/transient residents. These measures will help to empower the community to respond in a flood event. The East Suffolk Council preparing measure seeks to understand and explore community engagement and community resilience.

Overall, impact on BNG is likely to be positive in order to meet the Environment Agency E-Mission 2030 ambition of a 20% increase in BNG. Delivery of NFM and improvement actions along the Kirkley Stream will also contribute positively to the flora, fauna, biodiversity and WFD. However, the immediate effect of the tidal barrier at a species level is noted as potentially negative. Undertaking NFM and environmental improvements along Kirkley Stream are likely to produce some climatic benefits, these actions are not certain and the main impacts on climate will arise from the construction of the tidal barrier with adverse effects likely. Currently the town has no tidal defence. The combined impact of the tidal barrier and community engagement is likely to have a **significant positive** effect, with potential increase in property value, increased business opportunity, improved mental health and amenity and increased investor confidence in the local economy. The tidal barrier project and installation of new flood walls presents opportunities for good design, which would enhance the townscape in the currently run-down riverside frontages of Lowestoft. A well designed project could offer regeneration and recreational and tourism benefits. Close working with East Suffolk Council could allow for associated improvements to the public realm. Depending on exact location and final design, there could be either positive or negative impacts on the North Lowestoft and South Lowestoft Conservation Areas, and the 6 Listed Buildings in the local area. The measures are likely to reinforce the key landscape qualities of the downstream end of the Broads National Park.

Environmental impacts resulting from the tidal barrier will be explored and mitigated through project level assessment. WFD compliance, water quality monitoring and best practice pollution measures will mitigate adverse effects on water. The Environment Agency business case process is likely to address sustainability concerns and support solutions that optimize benefits. Whole life carbon will need to be considered for optimal decision making around carbon neutrality, with early consideration for offsetting. This could potentially be tied to marine habitat creation, in addition to green space considerations to add to the regeneration of the town. Landscape Visioning could be a useful tool in enabling a consideration of the multiple benefits of the measures, if considered in a joined-up way. Visioning could identify opportunities associated with NFM and environmental improvements along the Kirkley Brook, provide a visual tool to reflect

the alignment of infrastructure investment with flood risk infrastructure, reflect regeneration and wider development set out in the Town Centre Masterplan, and help identify the opportunities associated with the new tidal barrier and flood walls. It is considered that any groundworks have the potential to uncover/destroy archaeological remains. The results of any archaeological works should be made available to the public. This could be in the form of reports, site visits, talks, interpretation boards etc. In some cases, works can affect the historic landscape character of an area and this should be taken into consideration.

**Mablethorpe**

The Mablethorpe FRA extends along the Lincolnshire coast and is fringed with agricultural land to the east. The FRA encompasses the urban areas of Mablethorpe, Trusthorpe, Sandilands and Sutton on Sea. The area has been a popular seaside destination for centuries and remains largely reliant on tourism as the mainstay to the economy. There are 2 bathing water areas, at Mablethorpe town and Sutton on Sea. Several caravan parks and guest houses provide tourist accommodation. The coastal area has internationally important nature conservation sites. The Greater Wash is a Special Protection Area (SPA), Sandilands golf course and dunes Local Wildlife Site and Sea Bank Clay Pits Site of Special Scientific Interest (SSSI) are partially within the Mablethorpe FRA.

The main flood risk within the FRA is from the sea. The Environment Agency has invested in annual beach nourishment activities since 1994 to hold the line of defence against tidal flooding. This will continue for the life of the FRMP while other approaches are explored.

3 measures have been screened into the overall assessment. The protecting measure of beach nourishment to manage tidal risk has been screened out as it has undergone project level assessment. There is a balanced mix of protecting, preparing and preventing measures for Mablethorpe, each measure spanning the life of the FRMP. The protecting measure in Mablethorpe is focused on an area of coastal frontage from Sandilands to Sutton on Sea and includes the area of the Lincolnshire Coastal Country Park. It aims to enhance the amenity value of the coastal environment and improve habitats, whilst sustaining the level of flood protection. The preparing measure targets the local community and holiday homes, aiming to expand the sign up to the flood warning service, and increase public awareness around flood risk and preparation. Preventing inappropriate development through revised local planning policy is the focus of the prevention measure within Mablethorpe.

Mablethorpe is heavily dependent on tourism. The preventing and protecting measures are likely to have significant positive effects on health and wellbeing and improving economic opportunity. The Lincolnshire Coastal Country Park aims to contribute to the reversal of biodiversity decline. The Protecting measure will support this goal through local partnerships. The range of coastal habitats includes beaches, sand dunes, dune scrub, reedbeds and freshwater grazing marshes. Restoration of these coastal habitats is likely to

support BNG, as well as provide positive benefits to soil, by stabilizing the dune systems hence combatting erosion. Sustained tidal defence will prevent saltwater inundation of the freshwater coastal habitats and improve the condition and quality of the freshwater grazing marsh which will impact positively on overall water quality. Improvements to coastal grassland habitats, and saltmarsh will have a positive effect on climatic factors through improved carbon sequestration. Although work methods are uncertain and may impact negatively on climate during construction, it is considered that the overall benefit from the habitat restoration will offset the carbon impacts over the long term. While the adoption of planning policy revisions is uncertain, the objective to avoid inappropriate development by directing it away from areas of flood risk, would impact positively on population and material assets. Other impacts from planning policy revisions remain uncertain.

Partnership working to support development of the Lincolnshire Coastal Country Park would have beneficial effects for the local and tourist population. It will enhance enjoyment of the undeveloped areas of coast and marsh landscape, features, and wildlife. It would help deliver against the Statements of Environmental Opportunity for NCA 42: Lincolnshire Coast and Marshes. For example, SEO 1: ‘Safeguard, manage and enhance the dynamic coastal landscape producing net gains in extent and quality of habitats including sand dunes, salt marsh, mudflats, saline lagoons, reedbeds and grazing marsh for the wildlife they support, to increase ecological resilience and to increase the landscape’s ability to mitigate flood risk and climate change.’

There is insufficient detail on the works activities to assess the impacts to cultural heritage. Sustained tidal defence will continue to offer protection from damage due to flooding. Any groundworks relating to habitat creation may uncover or destroy archaeological remains. Works can also affect the historic landscape character of an area and this should be taken into consideration. Potential archaeological impacts will be assessed at the project level. The results of any archaeological works should be made available to the public. This could be in the form of reports, site visits, talks, and interpretation boards and would contribute to the tourism value of the area.

**Milton Keynes**

Milton Keynes is the largest town in Buckinghamshire founded in 1967. The River Great Ouse forms its northern boundary. The River Ouzel, which is a tributary, flows through its linear parks and balancing lakes. Development in areas of flood risk has largely been avoided and water courses are buffered within a series of linear parks. This integrated urban water management system was part of the original strategic masterplan and aimed to reduce flood risk to new development and future growth. The masterplan was one of the first examples of a city wide Sustainable Urban Drainage scheme. Approximately 25% of the urban area is parkland or woodland and includes two Sites of Special Scientific Interest (SSSIs). Milton Keynes FRA has been identified because the risk of flooding from surface water is significant.

There are 10 measures screened into the assessment for Milton Keynes. Predominantly preventing and protecting type actions, half will be delivered within the short to medium term to 2024. The Protecting measures include solutions that adopt innovative digital technologies to control water levels. Other protecting measures are investigative type measures seeking to integrate flood management with green space, small scale SuDs and new infrastructure. Preventing measures include strategic policy development to guide flood risk management from all sources. There are targeted strategy interventions for hotspot areas of Coffeehall and Stoke Goldington. Planning policy aims to ensure brownfield developments contribute to reduced flood risk. There is one preparing measure to improve community resilience and recovery through engagement. This engagement will be undertaken by the local council and is likely to have positive effects on wellbeing and mental health.

Urbanization has resulted in restricted flows and channels and Milton Keynes is particularly sensitive to extreme weather events linked to climate change. The system of balancing lakes and associated sluices, weirs and dam embankments controls water levels in Milton Keynes. Digitization of these controls is likely to result in faster response and reduced flood risk. The measure is likely to benefit material assets within the town, including railways, businesses and residential property, with resulting positive benefit to mental health and well-being. Digitized control methods and automation should look to explore opportunities for alternative energy to reduce climate impacts during operations.

Where the measures are exploratory and investigative in nature, effects across the topic areas are likely to be neutral.

The effects of policy change around flood risk from Brownfield development should alleviate flood risk in the long term. However, the effects of this policy change may take time to materialise and development options are currently uncertain. Hence effects are uncertain. Any actions resulting from the strategy development to mitigate flood risk are also currently unknown and given the timeline of 2027 unlikely to result in any effects during this cycle of the plan.

**Northampton**

Northampton lies on the River Nene and is the county town of Northamptonshire. Settlement dates back to the Bronze Age. It is now one of the largest towns in England. Areas of nature designation include several Local Wildlife Sites, and the Upper Nene Valley Gravel Pits SPA located upstream. Heritage designations include Scheduled Ancient Monuments, Parks and Gardens and a historic battlefield. There are over 459 listed buildings within the surface water FRA. An Environment Agency led Flood Risk Area has been identified at risk of flooding from rivers. A surface water FRA has also been identified with management led by the Northamptonshire Council in collaboration with RMAs and stakeholders. Boundaries for the FRAs differ and are detailed in the FRMP.

There are 4 Environment Agency led measures and 3 Local Authority led measures screened into the assessment. More than half of the measures for Northampton are protecting measures. There are 2 prevention type measures and 1 preparing measure. The protecting measures include investigative works and appraisal of flood risk management solutions. An assessment of the positive effects of local NFM work is proposed. Strategic work to inform future capital works schemes related to the structures on the Nene will be carried out in the immediate short term. The preventing measures focus on making the communities and key infrastructure more resilient, through the implementation of surface water flood forecasting. The preparing measure is a policy and planning measure to avoid inappropriate development and reduce flood risk.

The measures are likely to impact positively on human health and population and material assets with neutral impacts on climate and landscape. Overall impacts on biodiversity, soil, and water from implementation of the plan are uncertain.

Options are being explored and opportunities identified for local flood risk management actions in Northampton. It is not clear what approach the schemes will take, although it is notable that climate resilience and climate adaptation will be a key focus. It is therefore challenging to determine the impacts, if any, of these assessment and appraisal type measures. The evidence gained from monitoring and evaluating the success of NFM measures within the catchment may influence future direction with likely benefits across the topics.

The effects of the strategic approach for the navigable structures along the Nene is currently uncertain. Although impacts are not likely to result until after the life of this plan, decisions could result in significant negative impacts particularly as it relates to BNG, cultural heritage and carbon. There is opportunity to explore wider opportunities and sustainable solutions in line with the National Flood and Coastal Erosion Risk Management (FCERM) strategy which would provide positive effects across the topic areas.

The Northampton surface water FRA is mainly urban, including residential, business, industrial and amenity areas, with outlying agricultural land. The preventing measures are likely to impact positively on the mental health and wellbeing of the population at risk.

Benefits through improved protection and resilience of material assets is also likely. The flood risk improvement works, work on local plan policy to avoid inappropriate development, and measures around options for climate change adaption have the potential for beneficial landscape effects. The measures will be able to reference and support the Northampton Green Infrastructure Plan (Fiona Fyfe Ass & the Uni of Northampton) and accompanying interactive map. Improvements to green infrastructure would benefit biodiversity, access and movement, the local economy, flood mitigation, water quality, climate change mitigation, enhancements to cultural heritage assets, landscape and local communities (through improved education and public health).

There are opportunities related to the investment strategy for the structures on the Nene to explore BNG and WFD objectives. This includes opening up fish passage which is a particular issue along the Nene; as well as embedding net zero carbon solutions. Pilot studies have been undertaken to feed into the strategy decision making so it is likely that solutions will have an overall positive outcome.

**Norwich**

Norwich is the county town of Norfolk and lies on the River Wensum. The Norwich FRA is identified due to the risk of flooding from surface water. It incorporates the city of Norwich and several suburban areas on the western, northern and eastern sides of the city. The flood hazard and risk maps show that in the Norwich FRA some 26,136 of the 225,387 people are in areas at risk of flooding from surface water. Of these, 10% are considered to be in areas of high risk. Key infrastructure including The Norwich International Airport is shown to be at risk of flooding.

There are 5 measures screened into assessment. The remainder are transitional and already being implemented. Measures for Norwich FRA are associated with drainage. They will be implemented through either the Lead Local Flood Authority or Norfolk County Council. The measures fall into either Preventing, Preparing or "Other" type categories. Measures implemented in the short to medium term will assign a risk ranking to critical drainage catchments as well as trial innovative technology (gully sensors) to inform maintenance activities. Other innovations being promoted include small scale SuDs such as smart water storage systems, using a partnership approach to funding. There will also be a review and mapping of drainage assets within the Flood Risk Area, including those of new developments.

The majority of the measures will not result in any physical activities on the ground and therefore impacts, either positive or negative are unlikely. Funding allocation to implement small scale urban SuDs is uncertain. If SuDs are implemented, the impact across the topic areas is likely to be positive. SuDs that incorporate greening are likely to have small scale positive impacts on climatic factors due to cooling effects and carbon sequestration. A reduction in flood risk is likely to impact positively on health and wellbeing of the population most at risk from flooding. It will also help to protect major infrastructure such as the airport, railways, parks and gardens and roads. There are 30 listed buildings at risk of flooding. Prevention of damage from flooding would result in positive impacts to heritage.

The pilot use of gully sensors may result in improved maintenance of drainage channels and lead to a reduction in flood risk. Improvements in soil and water quality is unlikely. Erosion and diffuse pollution issues may be exacerbated if run-off is facilitated. Effects on landscape will be neutral. There are opportunities for flood betterment to be integrated with master planning and urban regeneration schemes to positive effect.

The measures have the potential to help deliver the vision of the Greater Norwich Green Infrastructure Strategy (Chris Blandford Associates: Nov 2007), for a multi-functional network of green spaces and green links, providing an environmental life support system for communities and wildlife. They could enhance sites on the upstream extent of the Broads National Park.

**Oakham**

Oakham is a county town to the east of Rutland Water reservoir in Rutland. Rutland Water has SPA, SSSI, and Ramsar designation and extensive good quality land surround the FRA. The FRA also extends to cover parts of Barleythorpe and the rural village of Egleton. Some 1,783 people are in areas at risk of flooding from surface water. Of these, 9% are in areas of high risk.

There is one prevention measure screened into the assessment for Oakham FRA. The prevention measure for Oakham is an investigative measure to be undertaken to 2027 as a partnership between Environment Agency and Rutland County Council to inform future flood management. Details on the type of investigative work being undertaken are unknown, but will likely be based on data analysis, modelling and mapping. It is unlikely that there will be any positive or negative effect across the topic areas from the study. Decisions on future flood risk actions should consider impacts to environmental receptors and opportunities for BNG, carbon net zero, and wider sustainability within the appraisal.

**Oakington**

Oakington is a small village in south Cambridgeshire with a network of watercourses and small drains running through the community. The FRA includes most of the village of Oakington. It includes residential, business and amenity areas surrounded by a green belt of mainly farmland. The main sources of flood risk are surface water flooding when the smaller watercourses and drains are overwhelmed following heavy rainfall and from river flooding. 851 people are in areas at risk of flooding from rivers and the sea of which 49% are in areas of high risk. There are no national or internationally important conservation areas within the local vicinity. Key environmental receptors at risk of flooding from rivers and sea include 28 non-residential properties, 49.758ha of agricultural land and 1 listed building.

There are 7 measures screened into the overall assessment for Oakington. 3 are protecting measures and 4 preparing type measures. The protecting measures include investigation of NFM opportunities and maintenance works on waterways and structures. Measures will also investigate the opportunities for contributions to flood risk from developers. The preparing measures aim to provide an improved evidence base for actions and improved public awareness around flood risk.

Investigation of NFM will explore potential channel works and upstream water attenuation to provide protection from flood risk but on the ground works are not guaranteed at this stage. Positive or negative effects cannot be determined as resulting works post 2025 are uncertain. Exploring opportunities to work with developers on blue green infrastructure initiatives could result in potential benefit across the topic areas in the future. Blue/green infrastructure and NFM approaches to flood management would have positive effects for landscape and communities. They would support the objectives of the Cambridgeshire Green Infrastructure Strategy (LDA Design: June 2011) to:

- reverse the decline in biodiversity
- mitigate and adapt to climate change
- promote sustainable growth and economic development
- support healthy living and well-being

Outcomes however are not guaranteed at this stage. Opportunities for wider benefits by improving public access, and amenity should be considered when discussing blue green infrastructure options. Carbon benefit should also influence decision-making.

Potential for property level resilience measures will also be considered. PLR can have a negative visual effect on listed buildings and buildings of local interest. However, if it is temporary or carried out in keeping with the building it can be positive to the long-term protection of the property.

Details of the maintenance programme are insufficient to assess impacts of the works, but no significant effects are likely. Preliminary investigation works may include GI and there may be some adverse impacts associated with the construction stage. Any minor adverse effects are likely to be managed through standard environmental management. Hence a neutral effect of the investigative work is anticipated across the topic area.

The preparing measures aim to increase understanding of flood risk through improved river gauging and CCTV which should result in improved incident response and recovery. Collectively with the public awareness activities outlined in the measures this should provide positive effects on mental health and contribute to improved asset protection.

**Saffron Walden**

Saffron Walden is a market town in Essex dating to the medieval period. The town has a long history of flooding. River flooding is the main flood risk. There are no formal flood defences in the town. The FRA covers the Slade River network which flows through Saffron Walden town centre and along the outskirts of the town. The FRA includes residential, business and amenity areas which are surrounded by the urban area of Saffron Walden. There are 41 listed buildings at risk of flooding from rivers and sea of which 31 are high risk.

12 measures are screened into the overall strategic assessment. The majority of measures for Saffron Walden are focussed on the Slade River system and the main town centre culvert which is the primary source of flooding. They are a mix of prevention, protecting and preparing type measures with one recovery and review measure which will address flood risk management in the event of failure and collapse of the main culvert. Improvements will also be made to the telemetry and flood warning system in the town. For the short term, to 2023 protecting measures will include repair works undertaken by the Council, more effective Environment Agency maintenance using CCTV, and future funding mechanisms will be explored. Riparian responsibility will be a focus. The Environment Agency and partners will carry out awareness of these responsibilities to upstream landowners. As a wider planning policy intervention for the immediate short term to 2022, the Council will also incorporate blue/green infrastructure ambitions within the local plan. For the long term to 2027 inspection and maintenance of the main culvert will continue, and a wider measure will investigate NFM options along the Slade in the context of climate change.

Overall effects are considered positive across the topic areas with a neutral effect anticipated on climate and heritage. Minor negative effects are anticipated across the topic areas during maintenance work carried out on the main culvert due to construction related impacts, however for the most part it is likely that they can be mitigated through standard environmental management practices, and they will be temporary impacts. The engagement with landowners upstream aims to change behaviours, in particular related to waste and litter within the Slade system which has the potential to create blockages and subsequent flooding downstream. Reduced litter and dumping are also likely to impact positively on the aquatic environment, and water quality. Planning policy changes that promote blue/green infrastructure will impact positively across the topic areas, creating areas of connectivity for wildlife and increased habitat; cooling and carbon sequestration effects; a potential increase in green space for public access; reduced erosion and reduced diffuse pollution and run-off into the waterways. Although NFM is being explored, delivery is not certain, therefore potential benefits to climatic factors, soil, water, and biodiversity are considered neutral at this stage. The measures have the potential for landscape and community benefits, and improvements to the public realm. Depending on exact location and final design there could be either positive or negative impacts on the Conservation Area and Listed Buildings in the local area.

It is considered that any groundworks have the potential to uncover/destroy archaeological remains. The protecting measure proposes the repair of the historic culvert hence no resulting positive or negative effect. The results of any archaeological works should be made available to the public. Interpretation boards could be used to enhance the historic sense of place. Measures which will support continued protection to historic properties within the town is an overall positive effect.

**Skegness**

The Skegness FRA spans 7 communities along the Lincolnshire coast. It is largely urban with non-agricultural land use. Tourism is a key economic activity for the area. There is some agricultural land in the north and south-east of the FRA. The southern extent of the FRA partially covers the Gibraltar Point Site of Special Scientific Interest (SSSI) and the Saltfleetby-Theddlethorpe Dunes and Gibraltar Point Special Area of Conservation (SAC). The Greater Wash SPA also extends along the coastline. 3 local wildlife sites lie partially within the FRA. The main flood risk is from tidal sources.

There are 3 new measures for Skegness planned for the 6 year cycle of the draft second cycle FRMP which are screened into the assessment. The measures are preventing, preparing and protecting type activities. The preventing measure is a planning policy measure undertaken as a collaboration between the Environment Agency and the LPA, which aims to avoid inappropriate development in areas of flood risk. The preparing measure targets residents, visitors, and the tourism businesses to improve awareness and sign-up to the flood warning service. The protecting measure will explore opportunities for partnership to support habitat creation at Chapel St Leaonards. The ongoing beach nourishment work along this part of the coast is screened out. This measure is already agreed and under implementation and forms part of the baseline situation. It has already been subject to project level environmental assessment.

Overall impacts of the measures across the topic areas are positive. Increasing public awareness to flood risk and increasing sign up to the flood warning system is likely to improve community resilience and individual wellbeing in the event of flood events. The adoption of planning policy revisions to avoid inappropriate development by directing it away from areas of flood risk, would also impact positively on population and material assets, although other impacts remain uncertain. If the core principles of the NPPF are followed, then it is likely that the benefits will be positive across the topics. The details of protection works to support development of the Lincolnshire Coastal Country Park are currently unknown. Partnership working to support development of the Lincolnshire Coastal Country Park would have beneficial effects for the local and tourist population. There is potential for enhancing local community and visitor enjoyment of the undeveloped areas along the coast. Progressing the Coastal Country Park will restore and enhance key features of the landscape. This measure would help deliver against the Statements of Environmental Opportunity 1 and 4 for NCA 42, Lincolnshire Coast and Marshes. There is potential for net gains in extent and quality of priority habitats such as sand dunes, salt marsh, mudflats, saline lagoons, reedbeds and grazing marsh. Improving habitats, whilst sustaining levels of flood risk protection will increase ecological resilience. Habitat restoration also has potential mitigate climate change, with positive impact on climatic factors.

**South Essex (RoFSW)**

The South Essex FRA located in south Essex covers the area of Southend on Sea. It was identified as a FRA under the first cycle of the FRMP and remains a surface water FRA for the second cycle.

There are 15 measures screened into the overall assessment for South Essex ROFRA. 60% are preventing type measures, 26% preparing and 13% are protecting. Protecting measures include asset maintenance activities and a delivery of a PLR grant scheme. Preparing measures include public engagement and awareness on flood risk and danger. There is an ambition to mobilise and empower the communities. Measures include the formation of a flood group and improved knowledge of individual riparian responsibilities. Prevention type measures are a mix of flood risk assessment and policy measures. Local planning policy will be strengthened and an overall strategy for local flood risk will be developed. There is a push to act on the recommendations of local green infrastructure policy for multiple benefits. SuDs guidance will be reviewed and training provided. The overall approach to flood management within the FRA is one of partnership and collaboration.

Impacts from the measures are likely to be positive to population and material assets, and neutral or uncertain across the remaining topic areas. Significant positive or significant negative effects are not anticipated. There are obvious benefits to population, material assets and heritage from reduced flood risk.

There is uncertainty around on the ground delivery resulting from these measures. Protecting measures include information sharing and review to inform future delivery of NFM and maintenance works. If NFM works do result it is likely that they will have an overall positive effect on biodiversity, soil and water. Negative effects may also result depending on the sensitivities of the locations and the works. Maintenance works may have minor adverse effects during construction. These can be mitigated through standard environmental management, best practice, and compliance to legislation. A minor negative impact on climate is likely from works activities but may be offset by delivery of NFM and GI actions. Carbon considerations are likely to be incorporated within the appraisal and review process. Actioning Green Infrastructure across the catchment is likely to result in ecological and climate benefit. It is considered that any groundworks have the potential to uncover or destroy archaeological remains. The results of any archaeological works should be made available to the public. This could be in the form of reports, site visits, talks, interpretation boards etc. PLR can have a negative visual effect on listed buildings and buildings of local interest. If it is temporary or carried out in keeping with the building it can be positive to the long term protection of the property. There is opportunity to include sustainability criteria within the award of PLR grants.

The preparing measures will help empower communities to respond to floods. The overall approach to FCRM, is one of collaboration across the catchment. This should serve to build community resilience. The preventing measures are not likely to impact positively or negatively on the environmental receptors. They will create a framework going forward for

FCRM to be integrated into wider benefits for the community and allow for future nature recovery.

**Spalding (RoFRS)**

Spalding is a market town on the River Welland in Lincolnshire. Occupation dates to at least the Roman period when salt was produced in this area. The land mainly comprises of drained and recovered marshland or estuary. The rich Grade 1 agricultural land on the periphery of Spalding is important to the national economy. The FRA covers 4 urban districts of Spalding. The main risk of flooding is from rivers and sea. Since 1947 there have been major engineering works along the waterways of the catchment to manage flood risk.

4 FRMP measures are screened into the overall assessment. These are prevention and protecting type measures, to be undertaken during the life of the plan to 2027. Protecting measures include the implementation of surface water management in Spalding. There is also a focus on management of upstream flood risk assets: developing a sustainable maintenance regime. Opportunities to improve ecological resilience through habitat enhancement and sustaining standards of protection will be explored. The overall approach is collaborative between the Environment Agency, local authorities, professional partners and the Local Planning Authority (LPA). Preventing measures include local planning policy interventions, aiming to avoid inappropriate development in areas of flood risk.

Impacts on population and material assets are likely to be positive, with uncertainty across the other topic areas. This is primarily due to uncertainty around the delivery of the protecting measures. Details of the surface water management measures are not known and therefore effects are uncertain. If SuDs are the default option then there is likely to be positive effects on soil, water, flora and fauna and climatic factors. If a more traditional drainage approach is taken, overall ecological impacts are likely to be negative. Details of the sustainable upstream maintenance regime are also unknown. There are likely to be minor adverse effects of maintenance works during construction activity. These can be managed through the Environment Agency standard environmental management process and compliance environmental legislation. The review of the existing programme will provide the opportunity to incorporate Environment Agency sustainability targets therefore positive impacts to biodiversity are likely for the future long term. Maintenance activities that sustain levels of protection will protect fenland habitats and local biodiversity within LWS in the catchment. The integration of habitat restoration within the appraisal of upstream embankments is also likely to result in positive ecological impacts in the future following delivering. There is the opportunity to build on existing local enhancement works carried out by Environment Agency FBG along Maxey Cut and the partnership projects of the Welland River Trust in Stamford and the Welland Washlands. The appraisal of the Maxey Cut to enhance the river channel could include opportunities to restore and enhance the landscape and visual character of the adjacent fen landscape.

The adoption of planning policy revisions to avoid inappropriate development by directing it away from areas of flood risk, would also impact positively on population and material assets, although other impacts remain uncertain. If the core principles of the NPPF are followed, then it is likely that the benefits will be positive across the topics. The measures could ultimately result in beneficial effects on landscape and for the local community once implemented. Impacts are currently uncertain at the appraisal and policy support stages described. There is a presumption that Local Plan policies to guide appropriate development would be based on, and reinforce, the character of the town and associated landscape setting.

**Wisbech (RoFRS)**

Wisbech is a market town in Cambridgeshire close to the borders of Norfolk and Lincolnshire. Wisbech FRA covers the urban area of Wisbech and four other villages in the Cambridgeshire fens. Some 13,122 people in the FRA are at risk of flooding from rivers and the sea. Of these, none are considered at high risk. The main risk of flooding is tidal.

There are 3 long term preventing measures to 2027. Mapping and modelling of the Tidal Nene considers climate impacts with a view to inform the community. A review of flood risk management assets within the catchment is planned. There is also a collaborative planning type measure whereby planning authorities will amend local plans to avoid inappropriate development.

Overall impacts on the FRA are mainly neutral. Effects on population and material assets are likely to positive. Impacts to cultural heritage is uncertain. A catchment-based approach is being taken that is adaptive to climate change. This is aligned with the national FCRM strategy to promote a healthy water environment. As it is intended that the modelling will inform the community of flood risk to enable better preparedness over time, it is likely that there will be a positive effect on individuals wellbeing and response to flood events. The planning interventions also follow the sustainable approach of the NPPF that prioritizes flood risk reduction. However, as the measures are investigative and the outcomes of the planning measure are currently unknown, the effect across the remaining topic areas are considered neutral. If taken forward to delivery, the measures could ultimately result in potential landscape and community benefits. Delivery of on the ground works is unclear at the appraisal and policy support stages described. Working in partnership with landowners and communities is likely to broaden the range and scale of beneficial effects. There is a presumption that Local Plan policies to guide appropriate development would be based on, and reinforce, the character of the town and associated landscape setting. Partnership working to improve the value of water bodies could include opportunities to restore and enhance the landscape and visual character of the adjacent fen landscape.

## 6.2.2. Strategic Areas

### Fens and Lowlands Strategic Areas

There are 18 measures screened into the strategic environmental assessment. Over 2/3 of the total measures are protecting measures, 1/3 of which will be delivered by the Internal Drainage Boards (IDBs) and focussed on investigating and where viable, progressing pumping station projects in multiple locations across the management catchment. Other protecting measures include asset maintenance works by the Environment Agency, culvert replacement and habitat creation. Policy measures for the short term support the Future Fens strategy with carbon baselining and provide a community vision for assets in the catchment over the long term. The Environment Agency will work collaboratively with RMAs to develop tactical plans by 2025 resulting in a number of flood risk management works being investigated and delivered throughout the catchment by 2027.

The Fens and Lowlands Strategic Area is defended floodplain protected by flood banks, land drainage channels and pumps. Without these interventions the area would revert to marshy fens and lowlands, subject to frequent flooding from both the sea and rivers. Communities would be displaced and given the contribution of this area to national food supply and the economy the impacts of a do nothing approach to population, human health and material assets would be devastating. Hence the overall effect of all measures on population and material assets is considered **significant positive.** The effect of the measures for pumping stations across the topic areas is uncertain, as it is not known if the investigations will result in delivery and what the works will look like. If works result it may be small scale maintenance with negligible effect on the environment. Worse case scenario would be expansion works with a potential **significant negative** impact on climatic factors, negative effect on water quality and minor adverse construction impacts across the categories. Embankment raising is also likely to have minor adverse effects across the topics during construction, but which are likely to be mitigated through standard environmental management measures. Habitat creation will be beneficial across the topic areas and is also likely to contribute positively to climatic factors through carbon storage and sequestration. The broad range of measures are likely to have beneficial effects on the landscape and reinforce the key qualities of the Fens and Lowlands as described in the National Character Area profiles. For example, working with partners to develop a strategic plan for managing future flood risk and identifying options and adaptive approaches could deliver some of the ambitions described in the Statements of Environmental Opportunity for each character area. The measures allow for a strategic approach to Environmental Net Gain and could deliver NFM projects, which would have positive effects on landscape and visual character. Impacts to cultural heritage are uncertain.

Climate considerations will be a major challenge for the management of flood risk in this area for the future. This is particularly relevant to operational carbon of the pumping stations. Performance will also be impacted due to climate change resulting in increased

energy requirements going forward. Cost-effective improvements in energy efficiency of the pumping stations will need to be considered to meet carbon reduction targets. Carbon offsetting may be required in the short term while individual energy analysis is carried out to inform alternative energy solutions. Any upgrades to improve efficiency of the pumping stations and drainage systems should also consider incorporating research and design innovations to improve fish and eel passage and reduce fish kill.

Improvement work to earth embankments should consider local sourcing of materials to reduce potential climate impacts from transportation. Partnership opportunities to link material sourcing with habitat creation projects could be explored.

A landscape-led approach and landscape visioning would be a useful tool to support partnership working and engagement on the Future Fens Flood Risk Management Project, and help identify the vision and potential infrastructure requirements for the fenland landscape. Progressing habitat creation creates the opportunity to research and understand the historic character of the landscape, and develop designs that reference the evolution of the landscape. Existing partnership working arrangements might be broadened to include local groups, to deliver additional benefits for the population in the vicinity of the Ouse Washes. These might include improved access, links to existing rights of way, education and information. The effect of the measures around the Ouse Washes habitat creation project would help deliver the Statements of Environmental Opportunity for the National Character Area 46: The Fens, specifically:

- ‘SEO 2: Manage the core wetland complexes and increase their connectivity by enhancing the main rivers, waterways and their associated riparian habitats and improve recreational access opportunities to the Fens’
- ‘SEO 4: Conserve, manage and enhance the Fens landscape and increase educational opportunities to access its geodiversity, archaeology and cultural heritage to enhance enjoyment and understanding for those who live and work in and visit the Fens’.

**Oxford to Cambridge Arc Strategic Area**

There are 2 preventing measures screened into the assessment. These are planning and development control type measures within the Great Ouse Catchment to be completed by 2025. The focus is partnership working to integrate water resource management with multiple use. Intended outcomes include environmental net gain. The measures include guidance and engagement with developers. 2 preventing measures around partnership engagement and planning are screened out as they are agreed measures already being implemented.

Effects across the environmental topic areas are likely to be neutral. The planning guidance if translated into on the ground actions within the Development Corporation Areas will result in positive environmental effect across the topic areas. However, on the

ground development is not expected within the life of this plan. Implementation is also subject to a successful funding bid so is not guaranteed at this point.

### 6.2.3. Management Catchments

**Broadland Rivers Management Catchment**

The Broadland Rivers catchment includes around two thirds of Norfolk and part of north Suffolk. Much of the area is rural with pockets of urban settlements. The Broadland area to the east of the catchment is generally flat and low-lying. Upstream of Norwich is higher ground and relatively hilly. The management catchment comprises of 4 main watercourses, and numerous tributaries that drain the area. The River Wensum is an important chalk river. The River Waverney is a classic lowland river. The Broads National Park is internationally important wildlife habitat and contributes significantly to local tourism. The area also has a strong farming heritage, with over 80% of the surrounding land used for agriculture.

6 measures are screened out of the assessment as they are already being implemented. Ongoing implementation of actions from the Shoreline Management Plans (SMPs) are included within these. 9 measures are screened into the overall assessment. These measures include a mix of:

- strategy and plan development;
- investigation;
- options development and appraisal;
- engagement and flood forecasting.

The majority are to be implemented within the short to medium term for completion 2023-2025 and include the development of specific flood management options for Beccles, Stalwart and Aylsham. Long term measures to 2027 include flood risk and asset management strategies and working with landowners to develop options for large-scale NFM. Environment Agency measures are partnership driven: working in collaboration with RMAs, Broads authority, NE, landowners and conservation organizations.

Engagement and flood forecasting measures will have a positive effect on the communities. The remaining measures are investigative, strategic, or appraisal type measures with no clear implementation of physical works. Therefore, the effect across the other environmental topics is likely to be neutral. Working in collaboration with farm cluster groups and landowners to develop agri-environmental and NFM schemes is likely to result in long term positive effects across the topic areas. This phase is currently in the planning and preparation stage, hence neutral effects are likely over the life of this plan. Landscape effects are likely to be neutral, given that the measures are at the strategic level. There is the potential for positive effects once these translate to the project level e.g. measures to

manage flood risk in Beccles and Aylsham, where there is the potential to restore and enhance landscape character.

A landscape-led approach and landscape visioning would be a useful tool to support partnership working and engagement on developing a long term integrated flood defence asset management strategy in the Broadland Rivers Management Catchment. The effect of the measures could potentially enhance the key qualities of the Broads National Park, and deliver the Statements of Environmental Opportunity for the National Character Area 80: The Broads e.g. SEO 4: 'Improve opportunities to enhance people's enjoyment of the area while protecting high levels of tranquillity by conserving intimate Broadland valleys and marshland views, which contribute to sense of place, and conserve and promote the geodiversity, archaeology and historical evidence of past human settlement and landscape change.' There is an opportunity to build on natural capital work carried out for the Broads within the appraisal and options development process. Using a natural capital approach will improve the environmental appraisal of options. It will support sustainable outcomes that consider the wider benefits of the Broads natural environment.

**Cam and Ely Ouse Catchment**

The Cam and Ely Ouse Catchment is characterised by the East Anglian Chalklands in the south, Brecklands in the north, and the South Level fenland to the west of the area. The catchment comprises of 4 main tributaries of the River Great Ouse. The land is predominantly low-lying and rural. There is high-grade agricultural land within the South Level fenlands. There are also several large urban centres within the catchment including Cambridge and Ely.

14 measures are screened into the overall assessment for the Cam and Ely Ouse Catchment. Measures will be delivered by Norfolk, Suffolk and Cambridgeshire County Councils and the Environment Agency. Over half of the measures take a partnership approach working collaboratively with other RMAs. The majority are long term measures across the life of the plan, with approximately half of these being implemented across catchment. The remaining interventions are specific to communities and watercourses. There is one recovery and review measure that investigates past flooding. Over half of the measures are also investigative measures: appraising options for NFM; attenuation; groundwater recharge; surface water management and unspecified solutions for flood risk. On the ground delivery will only be undertaken if considered viable. There are 2 preparing measures; seeking to improve flood forecasting throughout the catchment and also engaging with residents in Cambridge on existing PLP interventions. The other prevention measure is specific to chalk streams, trialling methods and investigating resilience to inform future schemes and strategies.

Effects on population and material assets are likely to be positive. The other effects on environmental receptors from delivery of these measures are uncertain.

Improvements in the flood warning system and measures that engage with communities will result in positive benefits to human wellbeing and health, as well as contributing positively to material assets through improved flood response. Piloting approaches on chalk streams to increase their resilience is likely to have positive effects across the topic area. There is a positive bent towards investigating nature-based solutions, and water attenuation. This should have beneficial effects on water quality and soil. These measures can prevent erosion and sedimentation and present opportunities to enhance habitat. It is not certain however, if these options will be taken forward, and the scope of the attenuation features also remains an unknown. Large, engineered attenuation structures, would have a potentially adverse effect on the ecology topics during construction. Flood risk to downstream communities in would be heightened in the event of a breach. The approach to surface water management measures is also not detailed and could potentially have negative or positive effects depending on whether SuDs are taken forward as the design solution. The investigation of opportunities for attenuation, which could include NFM, has the potential to deliver beneficial landscape effects. The measures could potentially support the objectives of the Cambridgeshire Green Infrastructure Strategy (to reverse the decline in biodiversity; mitigate and adapt to climate change; promote sustainable growth, and to support healthy living and wellbeing) and the 2020-2030 vision for the St Edmundsbury GI Strategy.

Exploring water attenuation as a flood risk option presents the opportunity to work with stakeholders to integrate potential ELM schemes, particularly given the dominance of agricultural activity within the catchment. Rural and urban SuDs should be prioritized as a default solution to maximise benefits to water quality and climatic factors. There is a national impetus towards nature recovery, and there may be opportunity to link into funding opportunities through the Nature Climate Fund and other incentives related to the Environment Bill, to support the NFM initiatives being explored. Likewise, the multiple benefits of water attenuation schemes in this area may link into initiatives related to local plans and growth ambitions for the Oxford Cambridge Arc (OxCam Arc). The bias should be towards nature-based attenuation as the preferred option. The measures could potentially restore and reinforce landscape character across the catchment, in line with the Statements of Environmental Opportunity for National Character Areas (The Fens, The Brecks, S Suffolk & N Essex Claylands, and East Anglian Chalk).

**Combined Essex**

The Combined Essex catchment includes most of the county of Essex, and a significant proportion of south Suffolk. It stretched from the Thames Estuary to the south to include the tributaries of the River Stour in the north. The catchment is generally low-lying and comprises 6 main watercourses with numerous tributaries that drain the area. Agricultural land dominates the north and urban centres characterize the southern land use. Annual rainfall for the area is considered lower than the national average.

11 measures have been screened into the overall assessment. All are long term measures to 2027 and predominantly protecting measures. There is one preparing measure for flood risk engagement and emergency planning. The protecting measures adopt a partnership approach to managing flood risk, working with private landowners, RMAs and nature conservation organizations. There is a specific strategic measure that relates to the resilience of designated sites. PLR will be explored for at risk communities across the catchment. Engagement measures should ensure the understanding of potential adverse effects of PLR on listed structures and buildings of local significance. There is an over-riding theme across the measures for nature-based solutions and options which deliver positive environmental outcomes. Improved water quality is a specific goal. Surface water flood risk will be managed across the catchment in partnership with the Local Authorities and Anglian water.

There is an overall drive towards the implementation of schemes which enhance the environment and provide added resilience to climate change. The combined effect of these measures is considered positive across the topic areas. Impacts to cultural heritage is uncertain. PLR can have a negative visual effect on listed buildings and buildings of local interest. However, if it is temporary or carried out in keeping with the building it can be positive to the long term protection of the property.

**East Suffolk Management Catchment**

The East Suffolk catchment includes the Suffolk coast and estuaries from Kessingland to Landguard Point, Felixstowe. It is a predominantly rural catchment and comprises 6 main watercourses that drain to the North Sea. 90% of the land area is used for agriculture. A large part of the coastline is designated as an AONB. The county town of Ipswich is the largest settlement. Nearby Felixstowe is an international port, handling over 40% of national container traffic. Elsewhere, villages predominate with significant coastal resorts and market towns.

4 measures are screened out as they are either already being implemented or are transitional from the first cycle FRMP. The Benacre and Kessingland flood risk management scheme is an example. 8 measures have been screened into the assessment. The measures are predominantly protecting measures with one preparing measure. All measures are long term measures to 2027. The flood warning system will be improved for the management catchment, and investigations and appraisal undertaken to inform flood management work in specific hotspot communities. There are two measures that focus solely on priority habitats and designated sites: one a policy intervention resulting in a strategy for future coastal resilience of protected sites and a partnership to implement nature-based solutions on the floodplain. The Environment Agency will implement measures from the Shoreline Management Plans to manage coastal change.

Insufficient details are provided on the works to be able to assess certain effects across the topic areas. Some measures do not go beyond the strategic or appraisal stage. The

landscape effects are likely to be positive once delivered, but the measures are focussed on investigation and appraisal to inform future measures. It is likely that the measures will have a positive effect on population and material assets overall, given the destructive nature of flooding. Also, the implementation of improved flood warning service should benefit community resilience and response to flooding.

The investigation of measures to manage flood risk could look at the potential for landscape scale enhancements. In particular, enhancements as part of the flood risk management options for Stowmarket would ensure the protection and enhancement of existing landscape features. This would meet the objectives of the Babergh and Mid Suffolk Joint Local Plan "to protect and enhance environmental assets, including designated sites, landscapes, heritage, biodiversity net gains, green spaces and river quality."

**Nene Management Catchment**

The catchment of the river Nene extends eastwards from to its outfall into The Wash. The Nene passes through several large urban centres and rural landscapes to the flat plains of Peterborough. Downstream of Peterborough much of the fens lies below sea level and the river is embanked and heavily modified. IDBs manage much of the land drainage within these low-lying fenland areas.

4 measures for the Nene Management Catchment are screened out and 10 measures are screened in to the overall assessment. Half are prevention type measures with 2 protecting and 2 preparing measures. Two thirds of the measures delivered by the Environment Agency are partnership orientated. They support projects such as NFM and habitat restoration and which aim to achieve positive outcomes for amenity, WFD and biodiversity. One measure seeks to raise community flood awareness and expand participation within the flood warning system. A protecting measure seeks to engage local stakeholders in sustainable maintenance solutions for flood risk assets. Local authority measures are a mix of preparing, preventing and protecting, around flood warning development, surface water management and property level resilience.

Given the bias towards NFM, habitat restoration and schemes that promote positive environmental outcomes the overall impacts are likely to be positive. Preparing measures should support improved wellbeing and response to flood risk. Impacts to cultural heritage are currently uncertain and will depend on the heritage sensitivities of the local area likely to be affected. NFM and works which involve ground disturbance can impact on archaeological features. It is advised that potential effects on the historic environment be assessed at the project level through cultural heritage assessments. A heritage baseline should be established to understand the historic significance of areas to be impacted and to inform mitigation requirements.

**North Norfolk Rivers Management Catchment**

The North Norfolk Rivers catchment stretches from Brancaster in the west to Mundesley in the east. It is predominantly a rural catchment, characterised by small villages and market towns. The management catchment comprises 3 main watercourses, each with tributaries that drain the area. The catchment falls within the Norfolk Coast AONB and borders the international nature designations of the North Norfolk Coast SPA/SAC/SSSI and Greater Wash SPA. Most of the catchment is used for arable crop production. The coastal towns and beaches are popular tourism destinations.

Only 3 of the 7 measures for the North Norfolk Rivers Catchment were screened into the overall assessment. 3 are protecting measures and one is a preparing measure. The preparing measure is for the short term and focusses on engagement and relationship building with the Norfolk Flood Warden Group. The other measures are for the long term life of the plan. They include an appraisal of coastal flood risk and collaboration to implement agricultural land management and upstream NFM which supports flood management.

The measures that include partnership and engagement are likely to provide benefits to the community. This type of relationship building is likely to result in improved buy-in and support for flood risk management and improved community cohesion. Actual delivery from the appraisal of options to mitigate climate change on the coastal village is uncertain. Therefore, impacts are considered neutral at this stage. There is unlikely to be a positive or negative effect until the solutions are fully appraised and delivered. There is also some uncertainty regarding the actual delivery of the NFM, upstream attenuation and land management measures. If opportunities are realized there would likely be positive effects on WFD, biodiversity, landscape, and soil.

**North West Norfolk Management Catchment**

The North West Norfolk catchment area stretches from Denver to the coast at Hunstanton, and west into the Fenland region as far as the River Nene. Large urban areas include King's Lynn, Downham Market and Hunstanton. The management catchment comprises 3 main watercourses and 3 smaller watercourses. Numerous drains connect with the Tidal Great Ouse. The small area of coastline is vulnerable to erosion and tidal surge.

12 of the 15 measures for the management catchment have been screened into the assessment. The majority of the measures are focussed on the stretch of coast from Heacham to Snettisham. Approximately half of the measures are investigative measures to assess and explore protection options, most being implemented by the Environment Agency over the long term. The Environment Agency will also deliver a preparing measure to improve flood forecasting and warnings and engage with the second home market to raise awareness around flood risk. There are a number of policy related interventions, reviewing strategic actions in relation to climate change. Planning policy review will be undertaken in relation to caravans and beach huts. The approach adopted for this part of the coastline is adaptive and considers the effects of climate change.

Actions from the Wash (Gibraltar Point to Old Hunstanton) shoreline management plan will be implemented and will form the context for coastal flood and erosion management.

Awareness and engagement measures are likely to result in a positive effect on population and human health. Other measures are for the most part of an investigative and assessment nature, with no actual effects on the ground at this stage. Hence impacts are considered neutral across the topic areas with positive effects on population. Planning policy revision should provide a framework for positive environmental outcomes in the future.

**Upper and Bedford Ouse Management Catchment**

The Upper and Bedford Ouse catchment includes the river Great Ouse and a number of its tributaries. The catchment stretches from the source of the Great Ouse at Brackley in the south across to Letchworth in the east and Earith in the north. While the catchment is predominantly rural there are several large urban populations.

20 of the 22 measures are screened into the overall assessment. 4 will be carried out in the short to medium term to 2023, with the remainder being implemented to 2027. The majority are prevention and protecting measures with half of the measures delivered by the Environment Agency. 1/3 of the measures explore NFM delivery in sites across the catchment; one measure explores viability of PLR; one explores fish passage improvement and measures for Milton Keynes include investigating options for blue green corridors. 5 measures explore the viability of flood risk management schemes leading to possible implementation in specific locations. Maintenance will be carried out on flood risk assets including floodgates, sluices, embankments and pumping stations to sustain levels of protection. Climate change will be taken into consideration in the development of the maintenance programme. There are also 2 preparing measures that engage with the local communities, establishing flood wardens and improving and the flood warning system. One measure will explore the opportunities for linking flood storage with existing gravel pits.

The thrust of the measures for this management catchment is exploring opportunity for nature-based schemes that result in positive environmental outcomes. It is not known whether these will be taken forward beyond this investigative appraisal stage. Hence impacts across the topic areas from these measures are likely to be uncertain. For the future there are likely to be significant environmental benefits as schemes are implemented on the ground. The capital maintenance works are considered likely to result in an overall positive effect on biodiversity given the current policy environment and drivers within the Environment Agency for BNG and carbon net zero. Any adverse effects during construction is likely to be minor and managed at a project level through standard environmental mitigation. Climatic impacts arising from maintenance works are considered likely to be neutral to negative considering the Environment Agency target for net zero carbon.

**Welland Management Catchment**

The catchment of the Welland extends eastward from Market Harborough through Stamford and Spalding to its outfall into the Wash. The catchment includes the major tributaries of the West Glen and East Glen rivers. Downstream of Stamford the landscape becomes flat and low-lying fens. IDBs manage land drainage through these areas of arable crop production. The fenland rivers have raised embankments for flood defence.

All measures are long term across the life of the plan and will be delivered by the Environment Agency. There are 3 protecting measures 3 preventing measures and one preparing measure. Fluvial and surface flood risk is being addressed. The protecting measures include the development of a sustainable maintenance programme for all main rivers in partnership with stakeholders in the catchment. This process of review would enable wider benefits and carbon impacts to be built into the process. The Environment Agency will also work with external partners to investigate, appraise and develop flood risk management schemes which focus on environmental enhancement, including NFM and integration of ELMS. Habitat restoration and creation of wetlands around Bourne and the Spalding area will be explored. Flood risk assessment will also be carried out for a location in Peterborough as a prevention measure. The preparing measure aims to improve and expand the flood warning service and engage with a wider population.

The focus of the proposed measures to work with the Lincolnshire Wildlife Trust and Welland River Trust is environmental betterment. However, it is uncertain whether these will be taken forward beyond an exploratory stage. Hence impacts across the topic areas from these measures are likely to be uncertain. For the future there are likely to be significant environmental benefits as habitat restoration and ELMS schemes are implemented on the ground. There is an opportunity for a strategic approach to Environmental Net Gain, which could draw together and build on the opportunities arising from the measures for NFM, habitat creation and environmental land management, with positive effects on landscape and visual character. The engagement and preparing measures combined with a maintenance programme that sustains levels of protection are likely to have a significant positive impact to the population at a catchment scale. Maintenance works which continue to protect agricultural land and supporting infrastructure from flooding would have a significant effect on material assets given the importance of this area to the national food supply. Impacts on cultural heritage are considered neutral.

There is an opportunity going forward for the measures to restore and reinforce landscape character across the catchment, in line with the Statements of Environmental Opportunity for National Character Areas (The Fens and Kesteven Uplands). The measures could potentially support the objectives of the Green Infrastructure & Biodiversity Study for Peterborough.

**Witham Management Catchment**

The river Witham is a predominantly rural catchment that extends from Grantham to Lincoln and Boston. It is a key navigation river for the Canal and Rivers Trust. The Lincolnshire Wolds lies to the north-east. Chalk streams drain off the Lincolnshire Wolds into the Witham. The remainder of the catchment is primarily made up of low-lying land. There is fenland between Lincoln and Boston with embanked waterways. IDBs play a key role in draining these lower lying areas and maintaining high-quality arable land.

8 of the 18 measures are screened into the overall assessment. The protecting measures screened out of the assessment include maintenance works and flood resilience schemes for the River Witham and the River Slea. All measures screened in are long term across the life of the plan and will be delivered by the Environment Agency. Almost 3/4 are collaborative and will be undertaken using a partnership approach. More than half are protecting measures. The protecting measures look to identify NFM opportunities. Opportunities for flood storage areas and sediment traps will be explored. Measures will also investigate flood-bank realignment and reconnection to the floodplain. Opportunities for environmental land management and habitat creation will be identified. Chalk river habitats are included for nature improvement. On the coast the Environment Agency will explore potential to work with partners to support development of the Lincolnshire Coastal Country Park. There are two policy related preventing measures to influence local planning so inappropriate development in Skegness and Mablethorpe is avoided. There is also a policy measure seeking to review riparian tenancies along the River Steeping embankments. There is one preparing measure which seeks to engage with the coastal community and particularly the tourism sector, to increase flood risk awareness and sign up to the flood warning system.

The effects of the protecting measures on environmental receptors is uncertain. The measures are investigative and exploratory and actual on the ground delivery is not certain. It should be noted that the focus of the proposed protecting measures is environmental betterment. If taken forward, the resulting on the ground works are likely to impact positively across the topic areas for the future, improving WFD and the aquatic environment. Negative impacts are also likely to occur from the measures. Creation of offline storage areas and flood bank realignment may result in land take and permanently impact upon existing habitats and species. Any ground disturbance can impact on undesignated archaeology. These effects will be addressed at scheme level environmental assessment. One of the protecting measures will seek to provide the data and evidence that can support these assessments. The effects on population and material assets are likely to be positive overall through increased community engagement and awareness. The effect is likely to be significant positive when schemes are taken forward and deliver improved flood risk protection. The combined measures have the potential to deliver beneficial landscape effects with positive effects on landscape and visual character. The measures could potentially support the objectives of the Green

Infrastructure Study for Central Lincolnshire. There is an opportunity for a strategic approach to Environmental Net Gain. This could draw together and build on the opportunities arising from the measures for NFM, habitat creation and environmental land management. The measures could potentially restore and reinforce landscape character across the catchment, in line with the Statements of Environmental Opportunity for National Character Areas (Lincolnshire Coast & Marshes; Lincolnshire Wolds; Central Lincolnshire Vale; The Fens, and South Lincolnshire Edge). The effect of the measures could potentially enhance the key qualities of the Lincolnshire Wolds AONB.

## 6.3. The significant environmental effects of different types of measures

**Protecting measures**

Almost half of those screened into the assessment are categorized as protecting measures. The protecting measures reflect the National Flood and Coastal Erosion Risk Management strategy to continue building and maintaining strong defences. This type of measure can include projects which either improve protection or sustain levels of protection at existing levels. Protecting measures are most likely to have wide reaching environmental effects. They include traditional engineered flood risk management schemes and innovative engineering that works with nature. Within the Anglian FRMP the types of protecting measures include:

- Installation of Tidal Barriers
- Bank raising
- Culvert replacement and repair
- Maintenance works to FCERM assets and structures
- Property Level Resilience
- Pumping station work and interventions
- Surface water management including SuDs
- NFM type activities including tree planting, water attenuation and environmental land management
- River restoration and habitat creation activities
- Flood storage opportunity

A number of measures categorized as protecting within the Anglian FRMP are investigative and appraisal orientated activities. Around half state a preferred approach or bias towards environmentally positive solutions. They aim to identify options which may or may not be taken forward. It may be that capital works will result, but at this stage this is

an unknown.  Where there are clear on-the-ground physical protection works, and sufficient detail is provided to assess potential effects, the measure has been screened into detailed assessment.

PLR measures are being undertaken or investigated on a large scale across East Anglia, the county of Northampton, the combined Essex catchment and localised interventions within FRAs.

A very small number of measures (1%) investigate the opportunities for flood storage. The majority of these are located within the Cam and Ely Ouse management catchment.  They also consider the opportunity for NFM type measures.

Around 5% of measures explore or deliver solutions to manage surface water flood risk. The responsible authorities for delivery include County Councils as well as Anglian Water.

**Preventing measures**

Just over a quarter of the measures screened into the overall assessment are categorized as prevention type measures.  For the Anglian RBD these mainly include:

- mapping and modelling
- flood risk assessment
- flood risk policy related activities
- planning interventions and development control
- working with developers to help ensure developments are appropriate and flood resilient
- Measures relating to FCERM funding and investment

There are a small number of maintenance type preventing works.  For example, activities to keep trash screens clean and digitizing assets.  There are other innovative approaches proposed. For example, research into the use of predatory European Eels to manage invasive signal crayfish that destabilize banks in the Horncastle FRA.

The flood risk modelling and mapping which consider climate change effects are being implemented over large areas of the RBD.  They include East Suffolk management catchment, Gt Ouse catchment, the fens and lowlands strategic area and cities where large scale FCERM interventions have recently taken place.

**Preparing measures**

Almost one fifth of all measures are categorized as preparing measures.  Within the Anglian FRMP the main focus is on:

- building flood risk awareness and understanding within target groups

- community engagement to empower action for example through flood groups
- improved understanding of riparian responsibilities
- improved flood forecasting
- increasing sign up to warning systems.

**Recovery and Review**

Only a very small percentage of the overall measures screened into the assessment are considered recovery and review type activities (2.5%). These include research and recommendations from past flooding and review of known wet spots. Contingency planning and business/community support during and post flooding are also featured in the plan. These cover 2 Flood Risk Areas and communities with flood groups across the whole Gt Ouse catchment. All are timed for short to medium term delivery. For the Anglian FRMP, these measures provide an initial direction of travel for recovery work following winter 20/21 flooding.

**Summary of Effects**

Both negative and positive effects are likely from delivery of the protecting measures. The effects of protecting type works on the environment depend on the nature and scale of the works and the sensitivities of the receiving environment. Protecting measures have the potential to result in negative effects across the topic areas during construction and operational phases. Measures that protect populations, material assets, species, habitats and heritage assets from the damaging effect of floods are likely to result in positive effects across the topic areas. These positive effects are particularly relevant to the low-lying areas of the Fens where breach of the flood defences could result in permanent inundation of the land. Property level resilience measures can have positive or negative effects on cultural heritage. It will have a positive effect on population and may also impact positively on climatic factors if there is less dependence on operational response. The effects of Surface water management measures are mostly uncertain. Where SuDs are prescribed as the preferred approach the effects are likely to be positive across the topic areas. The delivery of natural flood management interventions and habitat creation is likely to have positive effects on biodiversity, soil, water and landscape. Amenity value of the area may also increase offering wider benefits to the population. Green infrastructure and back channel restoration and soft engineering will have similar positive effect. Land management schemes are likely to result positive benefits to the agricultural sector through improved soil and water management and increased pollinators. Catchment sensitive farming has the potential for positive effects on soils through addressing agricultural diffuse pollution and runoff. The reduction of run-off from farmland will impact positively on the water environment by supporting delivery of WFD objectives.

Preventing, preparing and recovery and review measures are unlikely to have positive or negative effect on biodiversity, water, soil or landscape. They will result in considerable benefits to health, wellbeing and material assets.

There is strong evidence that demonstrates the adverse effect on health and wellbeing caused by flooding in addition to potential loss of life. The psychological effects can be very damaging. There are intangible impacts of anxiety and stress during and after a flood event. Floods can result in temporary or permanent loss of housing. Longer lasting impacts include the fear of future flooding and the loss of irreplaceable items. These effects are exacerbated when they affect low income families, the elderly or other vulnerable groups. There are subsequent economic effects on the health care system and businesses whose employees are affected. Preventing measures offer the opportunity to avoid these adverse social and health effects. Preparing and Recovery and review measures provide the mitigation to reduce the severity of effect.

Improved flood warning and flood forecasting measures cover 9 management catchments and 17 FRAs. The provision of, or improvements to, flood warning enables people to act quickly in a flood event. As a result, public safety is improved and property is better protected. This not only reduces the stress of the flooding event but will aid the recovery process.

The planning policy related actions within the Anglian FRMP are being delivered through various bodies to include Environment Agency, local authorities and lead local flood authorities. They include actions to influence local planning and avoid inappropriate developments. Some measures seek to develop detailed local flood planning advice/guidelines. While having no direct effect on the topic areas, these actions should lead to improved outcomes for biodiversity and the water environment in the future. Linking water management and development with flood management opportunities is a common theme. This may result in additional benefits for amenity usage and nature. Monitoring non permitted development that threatens the integrity of flood defences will also result in positive effects by reducing flood risk.

**Mitigation and Enhancement**

EIA processes will support the mitigation of negative effects from protection works at a project level. This is particularly relevant for large more complex schemes such as the tidal barriers. Alternatives should be considered. These may include a hybrid of nature-based options with engineered structures. Negative and positive impacts should be assessed with the mitigation hierarchy adopted as a design principal. Negative environmental effects from the construction phase of maintenance type and minor works can likely be mitigated through standard environmental management and best practice. Consenting and licensing processes will support the mitigation of works impacting designated sites and protected species and habitats.

Embedding sustainability within the appraisal, design and construction process should support solutions that offer wider benefits and drive responsible delivery. Industry tools such as CEEQUAL can be used to this aim.

## 6.4. The significant environmental effects of draft plan overall

Overall, the assessment has found the effects of the plan to deliver flood and coastal risk management to the Anglian RBD predominantly positive or neutral. **Significant positive** effects are likely for population and material assets.

**Table 1: SEA topic, questions and conclusion of assessment**

| Topic | SEA Question | Conclusion of Assessment |
|---|---|---|
| **Biodiversity, including flora and fauna** | Does the plan protect and recover nature? | Predominantly positive. Increasingly positive over time. |
| **Population and human health** | Does the plan improve health, wellbeing and equality? | Significant positive |
| **Soil** | Does the plan improve and sustain resources? | Overall Neutral. Positive and Negative |
| **Water** | Does the plan protect and improve the water environment? | Overall Neutral. Positive and Negative |
| **Climatic factors** | Does the plan help to mitigate and adapt to climate change? | Overall Neutral. Increasingly positive over time |

| Topic | SEA Question | Conclusion of Assessment |
|---|---|---|
| **Material assets** | Does the plan support communities and a prosperous economy? | Significant positive |
| **Cultural heritage** | Does the plan conserve and enhance the historic environment? | Uncertain |
| **Landscape** | Does the plan conserve and enhance landscape and seascape character? | Overall Neutral |
| **Inter-relationships** | Does the plan have implications for the relationship between the environmental topics? | Yes. |

It is anticipated that the scale of positive impact will increase over time as sustainability, environmental net gain and putting nature-based solutions first is embedded into the Environment Agency appraisal process and national planning policy.

The plan is likely to have a **significant positive** impact on the population and health of the communities within the RBD and including those vulnerable and at risk. The assessment of the national measures concludes that a **significant positive** effect is likely to be met. A potential negative effect was identified as implementation of resilience standards could disadvantage certain communities. The detailed assessment shows that significant positive impacts are also likely to be experienced through flood protection interventions in low lying fenland and coastal communities. At a FRA level some FCRM schemes are seeking to achieve urban regeneration, which will have significantly positive effects within communities such as Lowestoft and Boston, and will assist in economic revival and improved investor confidence. Alongside the positive effects of Protecting measures on mental health, Preparing measures are likely to improve community resilience. Improved flood warning sign-up and public awareness is likely to impact positively on the wellbeing of individuals. The fact that improved flood warning sign up and flood forecasting measures cover 9 management catchments and 17 FRAs increases the significance of this effect across the RBD. Likewise, public awareness measures are identified for multiple key locations increasing the magnitude of the positive effect. Some localized negative

effects on communities will result from delivery of the plan but these can be managed at a project level and are not likely to impact at a RBD level.

The overall effect of the plan on material assets is likely to be significant positive.

The national measures identified a significant positive effect from protecting communities and key industries from flooding and coastal change. Measures are protecting areas of prime agricultural land within the Middle level and Great Ouse catchment which supports the national food supply. In coastal areas, protecting and preparing measures are likely to benefit economies with critical infrastructure. For example, alternative energy and international port activities. Tourism dependant economies which are particularly volatile are also targeted.

On balance, the effects of the plan on biodiversity, flora and fauna is likely to be positive. This is in part due to the wider policy drivers around biodiversity requiring development projects to demonstrate Biodiversity Net Gain, and adverse effects being appropriately managed through legislation and best practice policies and guidance. Positive outcomes are dependant on the delivery of BNG on development schemes. National measures included in the draft plan have the potential to result in both positive and negative effects on biodiversity. No significant negative effects on biodiversity, flora and fauna are anticipated from the detailed assessment. There is potential for negative effect during construction activity. Almost half of these measures are likely to result in a positive or significant positive effect overall. For example, given the poor national status of lowland fenland habitats, habitat creation is likely to result in a significant positive effect on biodiversity, flora and fauna. Hard engineered solutions are proposed, primarily for coastal defence projects such as Lowestoft proposed tidal barrier and improved flood defence in Great Yarmouth. These are likely to result in adverse effects requiring mitigation at a project level. At a FRA level effects are likely to be positive, neutral or uncertain. Common themes for appraisal type measures include nature-based solutions and environmental positive schemes delivered in partnership. These align strongly with the national and local policy context.

No significant effects are anticipated on soil or the water environment. Overall, the plan is likely to have both positive and negative effects on both soil and water. The national level assessment has concluded both negative and positive effect, while the detailed assessment of measures is predominantly neutral. Specific NFM, environmental land management and catchment sensitive farming interventions are likely to contribute positively to protecting and conserving the soils within the RBD and improving resilience to degradation. These activities are also likely to reduce run-off and improve water quality and groundwater recharge. Habitat restoration and rewetting the fens will also be beneficial. There is interaction between topic areas from these types of measures, linking improved soil, WFD delivery and nature recovery. More traditional FCRM delivery, surface water management and maintenance schemes are likely to result in a negative effect on both soil and water.

Collectively the national measures convey the urgency needed to manage and adapt to the flooding and coastal risks related to climate change. Positive and negative effects were identified with the national measures. The detailed assessment also identified negative and positive effects across the RBD. Positive effects on climatic factors are associated with peatland restoration in the fens and other local NFM and habitat restoration type measures. There are obvious intra-plan effects of measures that enhance biodiversity, flora, fauna and soil with climatic factors. Measures that support green infrastructure and habitat creation are also likely to enhance carbon sequestration. Other preventing measures such as planning and development controls and modelling support the adaptation to climate change.

The overall effect of the plan on cultural heritage is uncertain. The national measures included in the draft plan have the potential to result in both positive and negative effects on cultural heritage. The majority of FRMP specific measures are considered likely to have either a neutral or uncertain effect on cultural heritage. PLR can have a negative visual effect on listed buildings and buildings of local interest. If temporary or carried out in keeping with the building it can be positive to the long-term protection of the property. Any measure that involves groundworks has the potential to uncover/destroy archaeological remains and hence a negative effect. Some positive effects are likely. An example is maintenance type measures such as repair and sustain projects. These can provide protection to heritage assets while causing little adverse impact. This is the case for Flood Risk Areas such as Louth and Alconbury. Preparing measures such as flood warnings and public awareness will likely result in a positive effect from improved response to flood events.

The overall impact of the plan on landscape is likely to be neutral. Significant negative impacts associated with plan implementation are unlikely. Landscape impacts should be considered at a project level. The assessment of national measures shows the potential for both positive and negative effects on the character of urban and rural landscapes. Predominantly positive or neutral effects have been identified associated with the measures screened into detailed assessment within the Anglian RBD. Significant positive effects on landscape are likely from the implementation of measures within the Nene Management Catchment, which focus on habitat biodiversity, land management and river restoration. The assessment of key locations is also showing mainly positive or neutral effects on landscape. If taken forward to delivery, NFM and green infrastructure type measures will support the delivery of the Statements of Environmental Opportunity for respective character areas. Opportunities have been identified that link FCRM interventions to the delivery of local ambitions for landscape that would support a more positive impact. There are intra-plan relationships with landscape across many of the topic areas. Measures impacting conservation areas such as in Boston show interactions between cultural heritage topics and landscape. This intra-plan effect is also apparent for measures that enhance local landscapes which also support biodiversity, recreation and well-being. An example would include the measure for the Lincolnshire coastal park. A

natural capital approach used during the appraisal process would enable these intra-plan benefits to be optimized.

## 6.5. Summary of mitigation actions and enhancement opportunities

Specific mitigation and enhancement actions are detailed within the above assessments in Section 5, by topic, key location, and type of measure.

Ways of working and actions undertaken at project level assessment will influence the mitigations of impacts and optimization of opportunities across the FCERM programme. A summary of key processes and actions are described below:

**eMission targets**

The EA's sustainable business strategy eMission 2030, makes significant commitments to deliver Environmental and Biodiversity net gain across its operations. The aim is to achieve net zero carbon by 2030 and 20% BNG. The strategy looks to optimise resource use and benefit people and communities. eMission 2030 is ambitious in the targets it sets and there are no guarantees that all targets will be achieve. The Environment Agency track record of action on carbon and resource use indicates that significant progress is likely over the life of the plan. Delivering schemes that result in multiple benefits across a range of issues will be key to success. Recognizing the intra-plan interactions and adopting a natural capital approach would enable progress.

**Independent assurance of EMS to ISO14001**

The Environment Agency's environmental management system is certified to ISO14001:2015. This gives a level of independent assurance that our approach to recognising and managing environmental issues and continual improvement of our environmental performance will continue to deliver for the environment.

**EAs Area Sustainability Plans**

Sustainability Plans have been adopted by the Area hubs seeking to embed sustainable development principles within the design and delivery of FCERM schemes. The plans link back to the UN Sustainability Development Goals, the 25 Year Plan and Emission 2030. Practical locally based targets have been set for BNG, carbon and wider benefits to communities. CEEQUAL has been adopted as the evidence based tool to measure and drive results. Involvement of environmental and sustainability experts early in the project lifecycle will help to achieve these wider environmental and social targets. The Environment Agency have a well established and embedded approach to learning and development. This should support the development of individuals with the opportunity to the knowledge and skills needed to deliver these sustainable outcomes.

**Partnership Working**

Partnership working is a common theme throughout the Anglian FRMP on both Environment Agency led and LLFA led schemes.

The Environment Agency has a track record of working with risk management authorities and partners to reduce flood risk and deliver a range of wider environmental and social benefits. To ensure the positive environmental effects anticipated are delivered the Environment Agency will need to continue to strengthen these relationships and partnerships to deliver flood risk management in a sustainable way that reflects the global and local environmental, social and economic threats and opportunities.

Partnerships are particularly important to support delivery of local ambitions. Local Authorities have begun to develop Local Nature Recovery Strategies (LNRS) in preparation for changes under the Environment Act. Biodiversity hotspots, wildlife corridors and other nature opportunity areas will be spatially identified. This will be a key tool for partnership working to direct investment and local action to support nature recovery. Empowering local communities to participate in FCERM will also contribute to wider place-based benefits.

**Environmental assessment and management of capital programme and projects**

The Environment Agency has an established, robust approach to environmental assessment and management across its capital programme. At a project level it seems reasonable to conclude that opportunities to enhance the environment and reduce anticipated negative effects should be realised. Environmental assessment is conducted hand in hand with design to enable negative environmental impacts to be identified early and designed out. At the same time environmental opportunities are identified and enhancements are designed in Evidence of this design evolution will be provided within the Environmental Statement or Environmental Report. Water Framework Directive (WFD) assessment should be undertaken for Protecting measures, where required, to demonstrate compliance with the WFD objectives at a water body scale. HRA screening and appropriate assessment as needed will ensure mitigation of effects to designated sites.

At the construction stage, with the exception of the lowest risk projects, all projects will have an Environmental Action Plan (EAP) produced. The EAP will clearly identify the environmental risks present on site and the measures needed to mitigate and manage them. Where risks dictate an environmental clerk of works may be employed to actively ensure the EAP is implemented. Where an environmental clerk of works isn’t needed the site manager is responsible for implementing the measures in the EMP.

**Assurance of capital projects**

The delivery of flood projects is subject to rigorous assurance, with levels of assurance increasing as the scale and value of the project increases. The Integrated Assurance and

Approval Strategy and the operational instructions that flow from it establish an approach to assurance that provides confidence based on evidence that projects deliver the desired outcomes. All assurance activity includes appropriately qualified environmental experts. Assurance is advisory but will flag projects that present a significant risk.

**Environmental baselines**

An understanding of robust environmental baselines early in the appraisal process is key to informing potential opportunities and reducing environmental risk. Use of biodiversity metrics will be important to ensure delivery on BNG goals. Establishing early heritage baseline for Protecting measures is important to inform archaeological significance of a site. Geoarchaeological assessment can be included at early stages of ground investigation. Use of lidar and review of paleochannels can inform early desk-based evidence. A natural capital approach and applying Natural Capital Indicators to projects would support delivery of multiple benefits. An early understanding of the local SEOs from the Landscape Character Assessments for an area will also highlight wider opportunities.

**Landscape Visioning**

Landscape visioning is a useful tool to identify high level goals for landscape restoration and enhancement. It can support early engagement with partners to establish potential benefits. For the Anglian FRMP it is especially relevant to environmental land management schemes and schemes with potential for amenity benefit.

## 6.6. Cumulative effects of the interactions between the draft plan and other relevant policies, plans and programmes

An assessment of the key potential cumulative effects of the interactions between the draft FRMP for the Anglian RBD and other relevant policies, plans and programmes has been undertaken for the SEA. Possible interactions are included below.

**A Green Future: Our 25 year plan to improve the environment**

The 25 year environment plan aims to deliver cleaner air and water, protect threatened species and provide richer wildlife habitats. It calls for an approach to agriculture, forestry, land use and fishing that puts the environment first. It also aims to expand the use of natural flood management solutions and make at risk properties more resilient to flooding. In relation to development, it encourages the use of embedding an environmental net gain principle for development. The draft strategy aligns with these principles. National measures show a clear intent to adopt nature based first principles. Local Protecting measures include land management and natural flood management approaches.

**National Planning Policy Framework (NPPF)**

The draft strategy supports economic growth and the development of sustainable communities. It embeds an 'environmental net gain' principle for development. The measures within the draft FRMP for the Anglian RBD are aligned with the NPPF. Local measures within the draft FRMP include the integration of urban regeneration plans with FCERM schemes. There is also a theme to influence sustainable development outcomes within local level planning guidance. BNG is a stated outcome within some of the Protecting measures. Proposals at the local level will need to comply with requirements for environmental assessment and planning policy.

**The National FCERM Strategy**

The Anglian FRMP was developed in direct alignment with the National FCERM Strategy. Seven themes were developed around the three core ambitions of the strategy. These included:

- Flood Resilient Places
- Adaptive Pathways
- Environmental Enhancement
- Growth and Development
- Infrastructure Resilience
- Ready to respond
- Recovery

Measures were developed to fit these objectives to ensure alignment with the National strategy.

Major policies, plans and proposals relevant at the RBD scale include:

**Anglian River Basin Management Plan (RBMP)**

A joined-up approach was adopted by the Environment Agency for the update of the river basin management plan (RBMP) and the FRMP to ensure alignment. The RBMP and FRMP share stakeholders thus enabling this approach. The FRMP will help achieve the environmental objectives set out in the RBMP.

NFM and environmental land management type measures within the FRMP will support the objectives of the RBMP. Delivery of WFD objectives have also been specified as outcomes of some measures within the plan. Measures which involve hard engineered structures are likely to result in adverse effects on the water environment. WFD compliance will be undertaken at a project scale in order to inform appropriate mitigation and or alternatives.

**Shoreline Management Plans (SMP3 - SMP8)**

The FRMP has considered high level links with SMPs, in particular where coastal erosion risk is closely linked to managing flood risk from the sea. Implementation of actions from the SMP are included within certain measures for coastal FRAs such as Hunstanton. A refresh of the SMPs is currently underway. SMP policy units such as Bulldog Bank on the Lincolnshire Coast which has experienced tidal breach of the embankment may undergo a change in policy position. An overarching measure within the plan also considers potential revisions for the SMPs to ensure the implications of any changes to SMP policy are considered.

**OxCam Arc**

The OxCam Arc Spatial Framework seeks to address inadequacies in infrastructure, housing, transport, and utilities to deliver new well-planned infrastructure which integrates natural capital, while supporting economic and population growth Measures have been incorporated within the FRMP for the strategic area of the OxCam. The measures for the OxCam Arc are assessed as having an overall neutral effect. The focus is on early engagement with the development of the Spatial Framework and working in partnership to integrate water resource management with multiple use. Future intended outcomes have a bias towards environmental net gain. Interactions between the draft FRMP and the developing Spatial Framework are likely to be positive and with common goals related to water management, biodiversity and flood risk. Ambitions are that the OxCam Arc should deliver net gain and betterment for the environment.

**Boston to Peterborough Wetland Corridor (previously The Fens Waterway Link)**

The Boston to Peterborough Wetland Corridor partnership has identified that the addition of approximately 12 miles of new channel will connect with 50 miles of current waterways to create a significant new wetland corridor. This project aims to connect the River Welland in the north to the River Nene in the south. The scheme is being executed by the Inland Waterways Association and is currently a business case proposal. The proposal could potentially result in flood relief for the area and contribute to wider benefits. There would be clear interactions with the measures in the FRMP for Boston and Spalding FRAs and the wider Witham and Welland catchments.

**Anglian Water, Water Resources Management Plan 2020-2045.**

The Water Resources Management Plan (WRMP) sets out how Anglian Water intends to maintain the balance between supply and demand for water to 2045. The plan is a statutory requirement and has undergone SEA. Pre-planning has begun for supply side schemes that may be required for delivery during the life of the FRMP. The strategic options being focussed on as an adaptive strategy include:

- Reservoir storage options in South Lincolnshire in the vicinity of Spalding
- Reservoir storage options in North Fenland to the east or west of the Ouse Washes

- Trading with Severn Trent Water
- Desalination at Felixstowe, and
- Water reuse and river augmentation schemes in Ipswich and Kings Lynn

Interactions of the plans with the FRMP are likely in relation to increased flood risk to the South Lincolnshire and North Fenland areas from reservoir storage options. In particular the Spalding FRA and Fens and Lowlands Strategic Area. Water reuse and river augmentation schemes will have implications for river levels and abstraction. Flood risk assessment and environmental assessment will explore this further at a project level but may not take place within the life of this FRMP. There is potential to integrate water resource management with flood risk planning and wider benefits.

The measures for the FRMP have been developed in consultation with Anglian Water as external stakeholders.

**Anglian Water Drainage and Wastewater Management Plan**

The Drainage and Wastewater Management Plan (DWMP) will cover the period 2025-2050. Implementation will begin in the latter stage of the FRMP cycle. The plan takes a joined up approach to enable a co-created vision for the region and considers risks from climate change. A long term measure has been included within the FRMP for EA to work together with Anglian water to develop and implement strategic plans such as the DWMP. The overall ambition is to create a combined vision and joint strategies for future flood risk management. Interactions during the execution of the FRMP will be centred on engagement with little or no cumulative effects on the environment.

# 7. Monitoring Significant Effects on the Environment

The SEA Regulations require significant environmental effects of the final FRMP to be monitored. This section outlines the actions we expect to take to monitor the significant environmental effects of the second cycle FRMP. Whilst it is feasible to monitor the significant effects of the second cycle FRMP, it will not be possible to determine whether any changes can be directly attributed to the second cycle FRMP. This is because there are too many other influences on environmental change for a direct relationship to be identified. Nevertheless, it is reasonable to monitor environmental changes to determine whether adaptations to the second cycle FRMP are required. This might be needed to further reduce potential conflicts or make a greater contribution to achievement of environmental objectives.

The proposals make use of monitoring that is already undertaken or planned and reflects the effects identified as significant by the SEA process. No monitoring is proposed to

address the following topics as no significant effects were identified for these as summarised in section 5:

- soil
- cultural heritage
- landscape

The environmental topics we are proposing to monitor are identified below. Although the SEA only concluded significant effects are likely on population and human health, given the uncertainty we have acknowledged in this report over the likely impacts of the plan on other environmental topics we are proposing to monitor a wider range of topics. In particular the overall positive effect on biodiversity, flora and fauna is dependent on delivery of BNG on development schemes. Regular review and monitoring of this delivery is fundamental.

The measures propose a mix of engineered and NFM projects for further appraisal. It would be useful if future review of FRMP measures implementation also documents the type of on the ground activities which were taken forward as viable and captures the timings for delivery. This would support the monitoring of environmental outcomes which could be very different dependant on the solutions.

In addition to the monitoring proposed below, the process of business case approval and assurance, associated with Flood and Coastal Risk Management Grant in Aid funding, will help to ensure management, mitigation and monitoring occurs at a project level.

**Population and Human Health**

The Environment Agency is required to periodically report to the Minister about flood and coastal erosion risk management outcomes. Data on the changes in the number of households and businesses at risk of flooding and those better protected from flooding is already collected and would provide a good indicator for the effects of the plan. We recommend this data continues to highlight changes in flood risk for deprived communities as this will indicate whether more needs to be done to enable flood risk management to better support the levelling up agenda.

Strategic objective 1.1 of the National Flood and coastal erosion risk management strategy for England action plan states that ‘between now and 2050 the nation will bolster its resilience to flooding and coastal change’ and outlines a number of actions to help deliver it. Monitoring conducted to understand the extent to which this objective is achieved will be relevant also to understanding the extent to which second cycle FRMP resilience objectives and the respective benefits for people and human health are being achieved across RBD’s.

**Biodiversity, flora and fauna**

Annual monitoring is already undertaken to determine the length of rivers improved to help show progress toward meeting Water Framework Directive objectives. Over the lifetime of the plan we would expect to see the number of rivers reduce where flood risk management is a contributing factor in a rivers failure to achieve good status or potential. Furthermore, for Outcome Measure 4 (OM4) we report on;

- km of waterbody improved,
- hectares of habitat improved
- hectares of habitat created.

Additional monitoring associated with the implementation of biodiversity net gain (as set out in the 25 Year Environment Plan and included in the forthcoming Environment Bill is expected and, where appropriate, these will be included as additional metrics.

**Water**

The Environment Agency undertakes monitoring of the water environment to meet the requirements of the Water Environment Regulations. This monitoring shows overall changes in water quality, which the plan is unlikely to significantly alter. Annual monitoring is already undertaken to determine the length of rivers improved to help show progress toward meeting Water Framework Directive objectives. Indicators used include water quality. Over the lifetime of the plan, we would expect to see the number of rivers where flood risk management is a contributing factor to its poor status reduce.

**Climatic factors**

The second cycle FRMP include measures that aim to help adapt to and increase resilience to climate change. General reporting and monitoring on implementation of these measures and their effectiveness will form a good indicator of progress here. Furthermore, under the Climate Change Act 2008 the Environment Agency is required to report to Defra on climate change adaptation. Elements of the report that are relevant to FRMP include:

- Work with our customers and partners to adapt
- Climate resilient investment
- Building the evidence base

Tools and methods, such as carbon budgets, are being developed by the Environment Agency to manage the reduction of carbon emissions to contribute to the Environment Agency's ambition to be a net zero carbon organisation by 2030. While a significant number of local authorities have declared a climate emergency and might be expected to manage down their carbon emissions there is no consistent method of monitoring this. It is therefore likely the Environment Agency data will be used as an indicator of the performance of the wider programme.

**Material Assets**

Risk to property and infrastructure is currently covered under the general reporting requirements. Much of the monitoring proposed for people and human health will also act as a good indicator for material assets. In particular data on the changes in the number of households and businesses at risk of flooding.

# 8. Next steps

In this section, we have provided an overview of the next steps in finalising the FRMP and details of the SEA statement of environmental particulars.

## 8.1. Finalising the FRMP

The FRMP sets out how we will continue to develop the plan taking into account responses to this consultation. As the plan evolves, we will consider any implications this might have for effects on the environment as part of our SEA requirements. In particular, if additional flood risk measures are included in the final plan that were not available for the draft plan we will carry out a screening exercise to consider if they are likely to have significant environmental effects and require assessment or further consultation.

- It is anticipated adopted flood risk management plan will be published in October 2021. This will be accompanied by a statement of environmental particulars. This document will provide:
- a summary of how environmental considerations have been integrated into the final FRMP
- a summary of how consultation responses to the draft FRMP and environmental report have been taken into account
- a summary of how the final plan has changed since the draft FRMP
- what the above means in terms of changes to the environmental effects that were reported in the environmental report
- the reasons for choosing the final FRMP as adopted in the light of alternatives
- the measures to be adopted to monitor the effects of the FRMP

# Annex A: National plans, policies and programmes reviewed

Listed below are national plans, policies and programmes we have reviewed and key legislation which may influence the FRMPs or our assessment of environmental effects.

**General Plans, Policies and Programmes**

National Flood and Coastal Erosion Risk Management Strategy for England (Environment Agency, 2019)

A Green Future: Our 25 Year Plan to Improve the Environment (Defra, 2018)

Agenda 2030: The UK Government's approach to delivering the Global Goals for Sustainable Development at home and around the world (Department for International Development, 2017)

National Planning Policy Framework (Ministry of Housing, Communities and Local Government, 2018)

National Policy Statements (various: Overarching Energy, Renewable Energy, Fossil Fuels, Oil and Gas Supply and Storage, Electricity Networks, Nuclear Power, Ports, National Networks, Airports, Hazardous Waste, Waste Water treatment, Water Resources Infrastructure (consultation draft, Nov 2018) (Various UK Government departments, 2011-18)

Natural Environment and Rural Communities Act 2006 (HM Government, 2006)

Planning Policy Wales (Edition 10) (Welsh Government, 2018)

Scottish National Planning Framework (Scottish Government, 2014)

Scottish Planning Policy (Scottish Government, 2014)

Welsh National Development Framework: Issues, options and preferred option consultation document (Welsh Government, 2018)

**Biodiversity**

Biodiversity Strategy 2020: A strategy for England's Wildlife and Ecosystem Services (Defra, 2011)

Coastal Squeeze: Implications for flood management. The requirements of The European Birds and Habitats Directives. Defra policy guidance (Defra, 2005)

Conservation of Habitats and Species Regulations 2017 (as amended) (HM Government, 2018 and 2019)

Eels (England and Wales) Regulations 2009 (as amended) (HM Government, 2011)

Government Forestry and Woodlands Policy Statement (Defra and Forestry Commission, 2013)

Marine and Coastal Access Act 2009 (as amended) (HM Government, 2011)

Natural Environment White Paper: The Natural Choice: Securing the Value of Nature (Defra, 2012)

Salmon and Freshwater Fisheries Act 1975 (as amended) (HM Government, 1975) (HM Government, 2015)

The Great Britain Invasive Non-native Species Strategy (Defra, Scottish Government and Welsh Government, 2015)

UK Forestry Standard: The Government's approach to sustainable forestry (Forestry Commission, 2017)

UK Marine Policy Statement (HM Government, Scottish Government and Welsh Government, 2011)

Wildlife and Countryside Act 1981 (as amended) (HM Government, 2016)

**Population and Human Health**

Equality Act 2010 (as amended) (HM Government, 2012)

Strategic Plan for the next 4 years: Better Outcome by 2020 (Public Health England, 2016)

The Equality Strategy: Building a fairer Britain (HM Government, 2010)

**Soil**

Our Waste, Our Resources: A Strategy for England (HM Government, 2018)

Safeguarding our Soils: A Strategy for England (Defra, 2011)

The Clean Growth Strategy: Leading the way to a low carbon future (HM Government, 2018)

The Environmental Permitting (England and Wales) Regulations 2016 (as amended) (HM Government, 2018)

UK Peatland Strategy 2018-2040 (International Union for the Conservation of Nature, 2018)

Waste (England and Wales) Regulations 2011 (as amended) (HM Government, 2014)

**Water**

Control of Pollution Act (HM Government, 1974)

Creating a great place for living - Enabling resilience in the water sector (Defra, 2016)

Delivering sustainable flood risk management (Second edition) (Scottish Government, 2019)

Environment Act 1995 (HM Government, 1995)

Flood and Water Management (England and Wales) Act 2010 (HM Government, 2010)

Flood Risk Management (Scotland) Act 2009 (Scottish Government, 2009)

Future Water, The Government's water strategy for England (vision to 2030) (Defra, 2008)

Land Drainage Act 1994 (HM Government, 1994)

National Flood Risk Assessment for Scotland (SEPA, 2018)

National Flood Risk Assessment for Wales (Natural Resources Wales, 2013)

Reservoirs Act (HM Government, 1975)

River basin planning Strategy for the Scotland River Basin District (SEPA, 2016)

The Urban Waste Water Treatment (England and Wales) Regulations 1994 (as amended) (HM Government, 2003)

The Water Supply (Water Quality) Regulations 2016 (as amended) (HM Government, 2018)

Water Abstraction Plan (Defra, 2018)

Water Act 2014 (HM Government, 2014)

Water Environment (Water Framework Directive [WFD]) (England and Wales) Regulations 2017 (HM Government, 2017)

Water Industry Act 1999 (HM Government, 1999)

Water Resources Act 1991 (as amended) (HM Government, 2009)

Water Strategy for Wales: Supporting the sustainable management of our natural resources (Welsh Government 2015)

## Climatic factors

Clean Growth Strategy (HM Government, 2017)

Climate Change Act 2008 (HM Government, 2008)

Land Use: Reducing emissions and preparing for climate change (Climate Change Committee, 2018)

Managing the Coast in a Changing Climate (Climate Change Committee, 2018)

The National Adaptation Programme and the Third Strategy for Climate Adaptation Reporting (Defra, 2018)

### Material Assets

Industrial Strategy: building a Britain fit for the future (HM Government, 2017)

National Infrastructure Delivery Plan 2016-2021 (Infrastructure and Projects Authority, 2016)

### Cultural Heritage

Ancient Monuments and Archaeological Areas Act 1979 (HM Government, 1979)

Culture White Paper (Department for Digital, Culture, Media and Sport, 2016)

Planning (Listed Buildings and Conservation Areas) Act 1990 (HM Government, 1990)

The Heritage Statement (Department for Digital, Culture, Media and Sport, 2017)

### Landscape

Countryside and Rights of Way Act 2000

National Parks and Access to the Countryside Act 1949 (HM Government, 1949)

# Annex B: Local policies, plans and programmes reviewed

Listed below are local plans, policies and programmes we have reviewed that may influence the FRMP or our assessment of environmental effects.

## Biodiversity

Local development plans and strategies

Local area-based conservation and biodiversity action plans such as the Nature Strategy; The Wash Biodiversity Action Plan; Fens for the Future

Areas of Outstanding Natural Beauty Management Plans.

Shoreline Management Plans (SMP3 - SMP8)

East onshore and offshore Marine Plans

Local Forest Plans and Woodland Management plans

Internal Drainage Boards- Biodiversity Action Plans

Eel Management Plan- River Basin District

Area of Natural Beauty (AONB) Management Plans

Broads Plan 2017

Fens for the Future Strategy 2012

## Population and Human Health

Local Plans includes ‘Neighbourhood Plans’ and other ‘Supplementary Planning Documents’.

Local Management Plans and Strategies

Lead Local Flood Authority (LFA) Core Strategies

Strategic Economic Plans (ie. New Anglia, South Essex 2050, The Growth Plan)

Local regeneration plans (ie Jaywick Place Plan)

Strategic Spatial Frameworks (Peterborough and Cambridgeshire)

## Soil

Fens for the Future

Delivering for Britain, Food and Farming in the Fens, National Farmers Union (NFU)

## Water

Anglia River Basin District Management Plan

Water Resource Management Plan, Anglian Water

Water level Management Plans

Drought plans;

Local Flood Risk Management Strategies

Local Surface Water Management Plans

Catchment Flood Risk Management Plans

Catchment Abstraction Plans

Great Ouse Tidal River Strategy
Anglia Water -25 year strategy

Water Resources East Strategy

Shoreline Management Plans (SMP3 - SMP8)

## Air

AQMA Plans

## Climate

Flood Risk Management Plan

Local Plans

## Material assets

Regional Transport Plans

Regional Economic Strategy for East England

Local Economic Plans

East Inshore and East Offshore Marine Plans

The Oxford Cambridge Growth Corridor and Expressway strategic outline business case

Partnering for Prosperity: a new deal for the Cambridge-Milton Keynes-Oxford Arc

## Cultural heritage

Heritage at Risk

Local Plans

Local Cultural Heritage strategies

## Landscape

Broads Plan 2017

Area of Natural Beauty (AONB) management plans (Norfolk Coast, Lincolnshire Wolds, Suffolk Coast and Heaths)

Green Infrastructure Strategy

Local tree Strategies

National Character Profiles (42 Lincolnshire Coast and Marshes, 43 Lincolnshire Wolds; 46 The Fens, 80 the Broads; 82 Suffolk Coast and Heaths; 85 The Brecks.)

Local Green Belt policies (Cambridge Green Belt)

Local strategies for public space: (Green Spaces Strategy, North East Lincolnshire District Council)

# Annex C: Sources for the environmental context

## General

Draft National Flood and Coastal Erosion Risk Management Strategy for England: Amended Strategic Environmental Assessment (SEA) Environmental Report 2019 - Environment Agency

River Basin Management Plan for South West River Basin District: SEA Environmental Report 2014 - Environment Agency

Flood Risk Management Plan SEA Environmental Report 2014 - Environment Agency

## Biodiversity

Climate Change causes rapid changes in the distribution and site abundance of bird in winter

Washed Away- Ouse Washes (RSPB)

## Population and Human Health

Overview of the UK population: November 2018 (Office for National Statistics)

Population of the Anglia Region Grows 70,000 in a year

Why Farming Matters in the Fens (National Farmers Union 2008)

The Health benefits of the Broads: a systematic review and metanalysis of the green space exposure and health outcomes. 2018 (Twohig-Bennett, C; Jones A;)

## Soil

Fenland Farmers Unite for Nature (Rupert Masefield 25 May 2018, RSPB)

A revised estimate of peat reserves and loss in the East Anglian Fens (Holman et al. Cranfield University 2011)

## Water

Catchment Data Explorer, data update 16 January 2019, Environment Agency

## Air

Air Pollution in the UK 2016 (2017 DEFRA)

## Climate

Eastern England Climate (UK Met Office 2016)

English indices of Deprivation 2015 (Ministry of Housing, Communiities and Local Governance Sept 2015)

UKCP18 Derived Projections of Future Climate over the UK (November 2018, Met Office)

## Material assets

Add Oxford to Cambridge Expressway, Strategic Study Stage 3 report (Dept. of Transport; Highways England 2016)

Suffolk County Council Cabinet Report, 12 March 2019

# List of abbreviations

| | |
|---|---|
| **AONB** | Area of outstanding natural beauty |
| **AQMA** | Air Quality Management Area |
| **BAP** | Biodiversity Action Plan |
| **BNG** | Biodiversity Net Gain |
| **CFMP** | Catchment Flood Management Plan |
| **DEFRA** | Department for Environment, Food and Rural Affairs |
| **EAP** | Environmental Action Plan |
| **ELMS** | Environmental Land Management scheme |
| **FCERM** | Flood and coastal erosion risk management |
| **FRMP** | Flood risk management plan |
| **IDB** | Internal Drainage Board |
| **LEP** | Local enterprise partnership |
| **LLFA** | Lead Local F\|lood Authority |
| **LNCP** | Local natural capital planning |
| **LNR** | Local Nature Reserve |
| **LPA** | Local planning authority |
| **NFM** | **Natural Flood Management** |
| **NNR** | National Nature Reserve |
| **OxCam Arc** | Oxford to Cambridge Arc |
| **PPP** | Plans, programmes and policies |
| **RBD** | River basin district |
| **RBMP** | River basin management plan |
| **RMA** | Risk management authority |

| | |
|---|---|
| **SAC** | Special area of conservation |
| **SEA** | Strategic Environmental Assessment |
| **SFRA** | Strategic flood risk assessment |
| **SMP** | Shoreline management plan |
| **SPA** | Special protection area |
| **SuDs** | Sustainable Drainage Systems |
| **SSSI** | Site of special scientific interest |
| **WFD** | Water Environment (Water Framework Directive) Regulations 2017 |
| **UKCIP** | United Kingdom Climate Impacts Programme |

# Glossary

**Air quality management area (AQMA):** Area defined by the local authority as an area requiring management because air quality levels do not meet national air quality objectives

**Ancient Woodland:** Land continuously wooded since 1600 in England and Wales or 1750 in Scotland.

**Aquifer**: An underground layer of rock with water storage capability.

**Area of Outstanding Natural Beauty (AONB):** Areas formally designated under the National Parks and Access to the Countryside Act (1949) to protect parts of the countryside of high scenic quality that cannot be selected for National Park status as they do not have opportunities for outdoor recreation. The Countryside Agency is the government agency responsible for designating AONBs and advising the government.

**Baseline**: A description of the present state of the environment with the consideration of how the environment would change in the future in the absence of the plan/programme/project as a result of natural events and other human activities.

**Biodiversity Action Plan (BAP):** An agreed plan for a habitat or species, which forms part of the UK's commitment to biodiversity in response to the Convention on Biological Diversity, Rio de Janeiro 1992

**Brownfield development**: using a site which has been previously developed and is now vacant/unused, often a disused factory site or previously industrial area.

**Catchment**: A surface water catchment is the total area that drains into a river. A groundwater catchment is the total area that supplies the groundwater part of the river flow.

**Catchment Flood Management Plan (CFMP):** A high level plan carried out by the Environment Agency in order to manage the risk of flooding to people, property and the environment in an integrated way. These plans form the basis of future flood risk management proposals.

**CEEQUAL**: CEEQUAL is an evidence-based sustainability assessment, rating and awards scheme for civil engineering, infrastructure, landscaping and works in public spaces.

**Character area**: An area of land with distinctive landscape features resulting from an interaction of wildlife, landforms, geology, land use and human activity as defined by the Countryside Agency.

**Conservation Area**: An area designated under the Town and Country Planning Act, 1990 to protect its architectural or historic character.

**Countryside and Rights of Way (CRoW) Act 2000**: This Act applies to England and Wales and has five parts: -

- Access to the countryside
- Public rights of way and road traffic
- Nature conservation and wildlife protection
- Areas of outstanding natural beauty
- Miscellaneous and Supplementary

This act increases the protection of SSSIs. Environment Agency plans/programmes/projects must gain consent for works in or near SSSIs using a CRoW form.

**Cumulative Impacts**: The combined impacts of several projects within an area, which individually are not significant, but together amount to a significant impact.

**Department for Environment, Food and Rural Affairs (DEFRA):** The government department responsible for flood management policy in England

**Environmental Action Plan (EAP):** A standalone report or section within another environmental impact assessment document which ensures that constraints, objectives and targets set in the main Environmental Report/Statement are actually carried out on the ground. Actions are separated into those to be carried out before, during and after construction.

**Environmental Impact Assessment (EIA)**: EIA is an assessment process applied to both new development proposals and changes or extensions to existing developments that are likely to have significant effects on the environment. The EIA process ensures that potential effects on the environment are considered, including natural resources such as water, air and soil; conservation of species and habitats; and community issues such as visual effects and impacts on the population. EIA provides a mechanism by which the interaction of environmental effects resulting from development can be predicted, allowing them to be avoided or reduced through the development of mitigation measures. As such, it is a critical part of the decision-making process.

**Environmental Land Management Scheme** (ELMS): The Environmental Land Management scheme is the cornerstone of the government's new agricultural policy. Founded on the principle of 'public money for public goods', ELMS will provide a powerful way of achieving the goals of the 25 Year Environment Plan and commitment to net zero emissions by 2050, while supporting the rural economy.

The scheme means farmers and other land managers may be paid for delivering public goods such as clean air, clean and plentiful water, thriving plants and wildlife, protection

from environmental hazards, beauty, heritage and engagement with the environment, reduction of and adaptation to climate change, and agricultural policy.

**Environmental Report**: (1) The document produced for projects that do not require statutory environmental impact assessment, but where environmental impact assessment has been carried out. This includes projects that require planning permission from the local authority but the effects of the proposal will not be significant. An Environmental Report usually follows the same template as an Environmental Statement, but is less detailed.

(2) The document produced to describe the strategic environmental assessment process carried out for strategies. This report can be standalone or contained as an appendix to a strategy.

**Environmental Statement**): The document produced to describe the environmental impact assessment process where statutory environmental impact assessment is required.

**Flood alleviation scheme** Scheme designed to reduce the risk of flooding in a given area

**Flood Cell**: A discrete area subject to flooding from failure of defences at a specific point or length.

**Flood defence**: A structure (or system of structures) that reduce flooding from rivers or the sea

**Floodline:** Environment Agency flood warning system, accessible by telephone or internet and updated every 15 minutes

**Flood risk management strategy (FRMS):** A long term (50 years or more) plan for coastal or river management to reduce the risk of flooding and carry out. They are more detailed than CFMPs.

**Habitats Directive**: EC Directive (92/43/EEC) on the Conservation of natural habitats and of wild flora and fauna. Implemented (with the Birds Directive (79/409/EEC)) in the UK as the Conservation (Natural habitats and wild flora and fauna) Regulations (1994). This establishes a system of protection of certain flora, fauna and habitats considered to be of International or European conservation importance. Sites are designated as Special areas of conservation (SACs), special protection areas (SPAs) and/or Ramsar sites. Any developments in or close to these designated areas are subject to the Habitat Regulations for approval of English Nature. Together these sites are referred to as the Natura 2000 network.

**Habitats Regulations** -The Conservation of Habitats and Species Regulations 2017 implement the Habitats and Birds directives in England and Wales.

**Historic England**: We are the public body that helps people care for, enjoy and celebrate England's spectacular historic environment. We protect, champion and save the places that define who we are and where we've come from as a nation. We care passionately about the stories they tell, the ideas they represent and the people who live, work and play among them.

Working with communities and specialists we share our passion, knowledge and skills to inspire interest, care and conservation, so everyone can keep enjoying and looking after the history that surrounds us all. Historic England are the government statutory advisor on the historic environment and are funded largely by the Department for Digital, Culture, Media and Sport.

**Internal Drainage Boards:** a public body that manage water levels in an area, known as an internal drainage district, where there is a special need for drainage.

**Local Nature Partnerships**: Local Nature Partnerships were one of the key proposals made in the June 2011 Natural Environment White Paper. Their purpose is to bring a diverse range of individuals, businesses and organisations together to create a vision and plan of action about how the natural environment can be taken into account in decision making in that area.

**Local Nature Reserve (LNR):** Nature reserves designated under the National Parks and Countryside Act (1949) for locally important wildlife or geological features. They are controlled by local authorities in liaison with English Nature.

**Main river**: A watercourse designated by DEFRA. The Environment Agency has permissive powers to carry out flood defence works, maintenance and operational activities on main rivers. Responsibility for maintenance rests on the riparian owner.

**Mitigation measures**: Actions that are taken to minimise, prevent or compensate for adverse effects of the development.

**National Nature Reserve** (NNR): Nature reserves designated under the National Parks and Countryside Act (1949) for nationally important wildlife or geological features (these may be the best examples in the country). They are controlled by English Nature.

**Natural England**: Natural England is an Executive Non-departmental Public Body responsible to the Secretary of State for Environment, Food and Rural Affairs. Their purpose is to protect and improve England’s natural environment and encourage people to enjoy and get involved in their surroundings. Their aim is to create a better natural environment that covers all of our urban, country and coastal landscapes, along with all of the animals, plants and other organisms that live with us.

**Natural Flood Management:** implementation of natural measures which help to alleviate the risk of flooding

**Nature Improvement Areas**: 12 new nature zones in England covering hundreds of thousands of hectares receiving Government funding to create wildlife havens, restore habitats and encourage local people to get involved with nature.

**Ordinary water course**: A watercourse not designated as main river. The local authority or Internal Drainage Board has permissive powers to maintain them.

**Ramsar site**: Wetland site of international importance listed under the Convention on Wetlands of International Importance under the Conservation of Waterfowl Habitat (Ramsar) Convention 1973.

**River Basin District:** A river basin district is an area as defined by the Water Framework Directive, Directive 2000/60/EC used for co-ordinating the management of the water environment.

**Riparian**: Area of land or habitat adjacent to rivers and streams

**Risk Management Authority (RMA):** the collective of organisations who are responsible for flood and coastal risk management in England, including the Environment Agency, Lead Local Flood Authorities, district councils and Internal Drainage Boards**Scheduled monument**: Nationally important historic sites, buildings or monuments identified by English Heritage and designated by the Secretary of State for Culture, Media and Sport. Any work affecting a scheduled monument must gain consent from English Heritage under the Ancient Monuments and Archaeological Areas Act (1979).

**Scoping**: The process of deciding the scope or level of detail of an EIA/ SEA. During this stage the key environmental issues (likely significant effects) of a project/strategy are identified so that the rest of the process can focus on these issues. Issues may result from the proposal itself or from sensitivities of the site.

**Screening**: (1) For environmental impact assessment, the process of deciding which developments require an environmental impact assessment to be carried out and whether this will be statutory.

(2) For strategic environmental assessment, the decision on which plans, strategies or programmes require strategic environmental assessment to be carried out and whether this will be statutory.

**Screening opinion**: Statutory opinion from the competent authority as to whether a proposed project requires statutory environmental impact assessment according to the Environmental Impact Assessment Regulations.

**SEA Directive**: European Directive 2001/42/EC “on the assessment of the effects of certain plans and programmes on the environment”

**SEA Regulations**: The Environmental Assessment of Plans and Programmes Regulations 2004 are the regulations transposing the SEA Directive into UK law**Site of Special Scientific Interest (SSSI):** Nationally important sites designated for their flora, fauna, geological or physiographical features under the Wildlife and Countryside Act (1981) (as amended) and the Countryside Rights of Way (CRoW) Act (2000).

**Special Area for Conservation (SAC):** Sites of European importance for habitats and non bird species. Above mean low water mark they are also SSSIs.

**Special Protection Area (SPA**) **and proposed Special Protection Area (pSPA):** An area designated for rare or vulnerable birds, or migratory birds and their habitats, classified under Article 4 of the EC Directive on the Conservation of Wild Birds (79/409/EEC). They are also SSSIs. Proposed sites receive the same protection as fully protected sites

**Standard of protection (SoP):** The level of protection from flooding, for example an SoP of 1 in 100 means that the flood defences in an area provide protection from floods up to a size of flood with a probability of occurring of 1 in 100 in any year

**Strategic Environmental Assessment (SEA):** SEA is a process designed to ensure that significant environmental effects arising from proposed plans and programmes are identified, assessed, subjected to public participation, taken into account by decision-makers, and monitored. SEA sets the framework for future assessment of development projects, some of which require Environmental Impact Assessment (EIA). SEA is carried out according to the requirements of the SEA Directive 2001/42/EC

**Strategy**: See Flood Risk Management Strategy

**Sustainable development**: A concept defined by the Brundtland Report (1987) as “Development that meets the needs of the present without compromising the ability of future generations to meet their own needs”

**Sustainable urban drainage systems (SuDs):** A system of controlling the quality and quantity of water run-off so as to prevent flooding or pollution.

**Washland**: Area of land adjacent to a watercourse, which is allowed to flood when the watercourse overtops its banks.

**Water Environment (Water Framework Directive) Regulations 2017 (WFD)-** The WFD sets out environmental objectives for water status based on ecological and chemical parameters, common monitoring and assessment strategies, arrangements for river basin administration and planning and a programme of measures in order to meet the objectives.

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