



Central Bedfordshire Local Flood Risk Management Strategy - Strategic Environmental Assessment

**Strategic Environmental Assessment Environmental
Report**

December 2013

**Central Bedfordshire Council
Priory House
Monks Walk
CHICKSANDS
Bedfordshire
SG17 5TQ**

JBA Project Manager

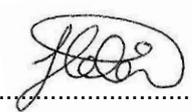
Aberdeen House
 South Road
 HAYWARDS HEATH
 West Sussex
 RH16 4NG

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This report describes work commissioned by Central Bedfordshire Council. Helen Archer, Mike Bradburn, Laura Thomas and Frances Tobin of JBA Carried out this work.

Prepared by  Frances Tobin BSc
 Assistant Ecologist

Reviewed by  Laura Thomas BA MRes MCIEEM
 Senior Ecologist

Purpose

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Abbreviations

AQMA	Air Quality Management Area
AQO	Air Quality Objectives
AONB	Area of Outstanding Natural Beauty
BAP	Biodiversity Action Plan
CAMS	Catchment Abstraction Management Strategy
CWS	County Wildlife Site
GI	Green Infrastructure
JBA	Jeremy Benn Associates
LBAP	Local Biodiversity Action Plan
LFRMS	Local Flood Risk Management Strategy
LLFA	Lead Local Flood Authority
LNR	Local Nature Reserve
ODPM	Office of the Deputy Prime Minister
NCA	National Character Area
NNR	National Nature Reserve
PFRA	Preliminary Flood Risk Assessment
SAB	SuDS Approval Body
SAC	Special Area of Conservation
SEA	Strategic Environmental Assessment
SPA	Special Protection Area
SSSI	Site of Special Scientific Interest
SuDS	Sustainable Drainage Systems
WCS	Water Cycle Strategy

1 Non - Technical Summary

The Pitt Review (2008) highlighted the need for changes to the way that the country is responding to the increased risk of flooding. A focal change was to establish greater clarity in roles and responsibilities and a greater concentration on surface water flood risk. Under the Flood and Water Management Act (2010) Central Bedfordshire Council became a Lead Local Flood Authority (LLFA). The roles, responsibilities, duties and powers of the Central Bedfordshire Council LLFA enables flood risk from localised sources across Central Bedfordshire to be managed. A detailed Local Flood Risk Management Strategy (LFRMS) must be developed, encompassing the risks associated from all sources of flooding. This must be maintained and monitored as part of the role as a LLFA. This strategy document is available for public consultation.

The LFRMS must undergo a Strategic Environmental Assessment (SEA) to identify potentially significant environmental effects created as a result of the implementation of the measures contained within the strategy. This document comprises the Environmental Report process as detailed in Stage C of the SEA Process on the draft LFRMS.

Assessment of the SEA objectives against three management options (Do Nothing, Maintain Current Flood Risk Strategy and Manage and Reduce Local Flood Risk) highlighted the potential impacts on the environment that these options would promote. Doing nothing is likely to cause overall negative impacts on the environment (as assessment through the SEA objectives) and it should be considered irresponsible in terms of managing flood risk. Although maintaining current flood risk management is unlikely to cause significant changes to baseline levels, it is also considered inappropriate as it fails to fully consider adaptation to climate change. The final option encompasses the objectives and actions as stated in the draft LFRMP. This option is considered to be the only realistic option for managing flood risk in Central Bedfordshire. The objectives and actions as set out in the LFRMP have been fully assessed in this report against the SEA objectives to identify aspects of the strategy that may require revising, as a result of potential impacts suggested.

In brief, the assessment of the LFRMS objectives and actions against the SEA objectives suggests a positive effect for Population, Human Health and Material Assets, which covers the SEA objectives 1-3. A lack of specific information on location, scale and implementation of the actions of the LFRMS, has produced several uncertainties in the assessment, particularly with regards to SEA objectives 5-8 and 10-11. These objectives encompass the following SEA receptors: water resources; biodiversity, flora and fauna; fisheries; soils and geology; and landscape and visual amenity and there is significant opportunity for environmental benefits in relation to the majority of these receptors for several LFRMS measures. In these cases, it is important to implement mitigation measures to prevent a negative effect on the SEA objectives and where possible promote opportunities for enhancement/improvement. From the assessment, no potential negative effects on any of the SEA objectives were identified from any of the LFRMS objectives or actions, with the exception of a possible negative impact on the soil resource (SEA Objective 10) as a result of construction of a flood storage area proposed under LFRMS objective 4.

This Environmental Report will be subject to public consultation for 12 weeks alongside the Central Bedfordshire Council Flood Risk Management Strategy.

2 Background

2.1 Background

JBA Consulting was commissioned by Central Bedfordshire Council to undertake a Strategic Environmental Assessment (SEA) Environmental Report for the proposed Central Bedfordshire Local Flood Risk Management Strategy (LFRMS). This report has been produced in conjunction with the SEA Regulations and follows the guidance contained within the ODPM *A Practical Guide to the Strategic Environmental Assessment Directive* (ODPM, 2005). The stages in the SEA process are outlined in Table 2-1. In accordance with the process described in the guidance, this report addresses Stage C of the SEA process; wherein the predicted environmental effects of the plan, including alternatives, are presented, to be used by decision-makers and in public consultation.

Table 2-1: Stages in the SEA process - as identified within ODPM (2005) guidance

SEA Stage	Purpose
Stage A:	Setting the context and objectives, establishing the baseline and deciding on the scope
Stage B:	Developing and refining alternatives and assessing effects
Stage C:	Preparing the Environmental Report
Stage D:	Consulting on the draft plan or programme and the Environmental Report
Stage E:	Monitoring the significant effects of implementing the plan or programme on the environment.

2.2 Purpose of SEA

The aim of the SEA is to identify potentially significant environmental effects created as a result of the implementation of the plan or programme on issues such as “biodiversity, population, human health, fauna, flora, soil, water, air, climate, material assets including architectural and archaeological heritage, landscape and the interrelationship between the above factors” (Annex 1(f), European Directive 2001/42/EC).

2.3 Legislative Regime

The European Directive 2001/42/EC requires that an Environmental Report be produced for those plans or programmes requiring SEA which includes information on the "relationship [of the plan or programme] with other relevant plans and programmes" (Annex I(a)), in addition to relevant "environmental protection objectives, established at international, [European] community or [national] level" (Annex I (e)).

The Directive was transposed into English legislation by the Environmental Assessment of Plans and Programmes Regulations 2004 (the ‘SEA Regulations’). The SEA Regulations form the basis by which all SEAs are carried out to assess the effects and impacts of certain plans and programmes on the environment.

In conjunction with practical guidance on the European Directive 2001/42/EC - Office of the Deputy Prime Minister (ODPM) Government publication, *A Practical Guide to the Strategic Environmental Assessment Directive* (ODPM, 2005) was issued. This SEA Environmental Report will address these legislative requirements through presenting the predicted significant environmental effects of the plan or programme, including alternatives, in a form suitable for public consultation and use by decision-makers, taking into account the objectives and geographical scope of the plan or programme.

2.4 The Local Flood Risk Management Strategy

The Flood and Water Management Act 2010 determined the need for flood risk to be managed within the framework of National Strategies for England and Wales and within Local Strategies for each Local Flood Authority Area. The national strategy for England sets out the principles for flood risk management and which organisations are responsible for implementation.

In accordance with the national strategy for England, Lead Local Flood Authorities (LLFAs) have been allocated responsibility for developing independent LFRMS's to address sources of local flooding. Each LFRMS identifies which local organisation is accountable for managing flood risk

and establishes partnership agreements, as well as undertaking an assessment of flood risk and developing plans / actions, for tackling these risks.

2.5 The Study Area

Central Bedfordshire is a unitary authority located within Bedfordshire in the East of England (see Figure 2-1, below). The Central Bedfordshire area includes a number of towns and villages, including Sandy, Ampthill, Flitwick, Biggleswade, Langford, Shefford, Clophill, Dunstable, Leighton Buzzard, Cranfield and Woburn Sands. Central Bedfordshire Council is the LLFA for this particular unitary area.

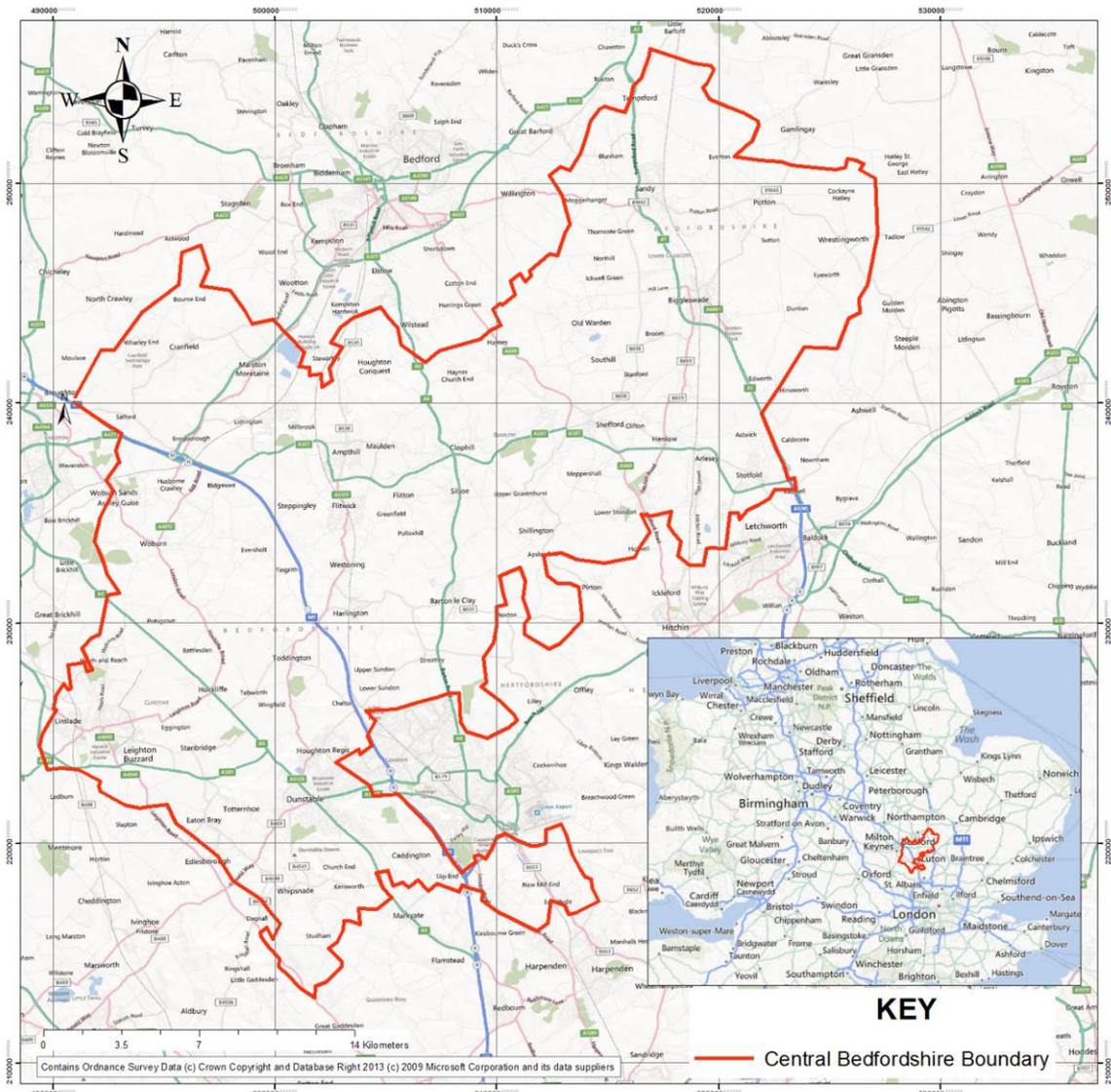


Figure 2-1: Extent of Study Area - Central Bedfordshire

2.6 SEA Scoping

In August 2013 the Scoping Report for the SEA of the Central Bedfordshire LFRMS was issued for a 5-week consultation period to the required consultation bodies (e.g. Natural England, English Heritage and the Environment Agency). The report was also made available on the councils website for the general public. From this consultation period a number of comments were received. The table below summarises the comments received and how they have been addressed within this Environmental Report.

Table 2-2: SEA Scoping Consultation Responses

Consultee	Comment Received	Action Taken
<p>Natural England</p>	<p>We are satisfied that the proposed SEA objectives are appropriate and that they cover the key sustainability issues in Central Bedfordshire and are relevant to the landscape and nature conservation issues associated with flood risk.</p>	<p>No action required.</p>
	<p>The scoping report refers to the 2005 version of the Catchment Abstraction Management Strategy (CAMS). This CAMS was updated in March 2013 and the relevant section should be updated accordingly.</p>	<p>The environmental baseline chapter of this report (see chapter 3), taken from the Scoping Report, has been updated with the new CAMS.</p>
	<p>Although the scoping document makes reference to appropriate indicators of success if the outcomes are met, it does not set a clear monitoring programme. The scoping document also does not include any procedures for addressing adverse effects revealed by monitoring or for remedying problems at an early stage, and does not include procedures for dealing with unforeseen adverse effects caused by the plan. This is a requirement of the SEA Regulations and therefore we recommend that your authority provides this information in the SEA environmental report.</p>	<p>Within the Environmental Report a monitoring programme covering these issues has been included (see section 7.3). Targets have also been included alongside indicators to provide a monitoring framework.</p>
<p>English Heritage</p>	<p>We welcome that cultural heritage has been “scoped in” to the assessment of environmental impacts, as the management of flood risk can have positive and negative impacts on heritage assets.</p>	<p>No action required.</p>
	<p>The draft SEA objective relating to cultural heritage is adequate, and we welcome the related indicator and its reference to tackling heritage assets at risk from flooding. However, there should be a separate indicator referring to flood alleviation measures avoiding direct or indirect harm to heritage assets.</p>	<p>The indicator for the cultural heritage objective states that an assessment of the impact of both flooding and implementation of flood alleviation measures will be undertaken. A specific target stating “no adverse impact on historic assets as a result of implementing flood alleviation measures” has also been included. It is therefore considered that this aspect has already been addressed and that it is not necessary to include a separate objective to assess this.</p>
	<p>In terms of the draft LFRMS itself, a number of the projects mentioned in the Action Plan could have implications for the cultural heritage of Central Bedfordshire. We hope that the SEA Environmental Report will assess such matters, but equally, we hope that the Council’s archaeological and conservation officers are engaged in the emerging LFRMS and its potential heritage issues.</p>	<p>This Environmental Report fully assesses the potential impacts of the LFRMS on cultural heritage.</p>

3 Environmental Baseline

3.1 Introduction

The following section presents the findings of the Scoping Report (JBA Consulting, 2013) which identified the context and objectives of the LFRMS and identified and the scope of the assessment.

3.2 Other relevant plans, programmes and environmental protection objectives

As part of the SEA process, an assessment of the integration of existing policies, plans and programmes on the proposed LFRMS is required. This is to address the requirement within the European Directive 2001/42/EC to determine the "relationship [of the plan or programme] with other relevant plans and programmes" (Annex I (a)), including, "environmental protection objectives, established at international, [European] community or [national] level" (Annex I (e)).

The following subsections highlight the relevant key policies, plans and programmes on International, National, Regional and Local scales.

3.2.1 Key International Policies, Plans and Programmes

Table 3-1: Key International Policies, Plans and Programmes

International
EU Floods Directive - Directive 2007/60/EC on the assessment and management of flood risks, 2007
EU Water Framework Directive - Directive 2000/60/EC of the European Parliament and of the Council establishing a framework for the Community action in the field of water policy, 2000
EC Habitat Directive - Council Directive 92/43/EEC on the Conservation of natural habitats and of wild fauna and flora

3.2.2 Key National Policies and Plans

Table 3-2: Key National Policies, Plans and Programmes

National
Directing the Flow: Priorities for Future Water Policy, 2002
EA Policy: Sustainable Urban Drainage Systems, 2002
Flood and Water Management Act, 2010
Flood Risk Regulations, 2009
Future Water, The Government's water strategy for England, 2008
Land Drainage Act, 1991 (as amended)
Making Space for Water – Taking forward a new Government strategy for flood and coastal erosion risk management in England (2005)
National Planning Policy Framework (2012)
Selecting and reviewing Flood Risk Areas for local sources of flooding - Guidance to Lead Local Flood Authorities (2010)
Surface Water Management Plan Technical Guidance (2010)
The Impact of Flooding on Urban and Rural Communities, 2005
The National Flood and Coastal Erosion Risk Management Strategy for England (May 2011)
The National Flood Emergency Framework For England - DEFRA (2011)
Water Act, 2003
Water for People and the Environment; Water Resources Strategy for England and Wales, 2009
The Climate Change Act, 2008
Pitt Review, 2008

National

Draft Water Bill, 2012

3.2.3 Key Regional Policies and Plans

Table 3-3: Key Regional Policies, Plans and Programmes

Regional

River Basin Management Plan Anglian River Basin District (December, 2009)

Environment Agency, The Upper Ouse and Bedford Ouse Abstraction Licensing strategy (2013)

3.2.4 Key Local Policies and Plans

There are numerous local policies and plans that may be of relevance to the LFRMS and SEA. In particular the SEA will draw on information contained in:

- The Preliminary Flood Risk Assessment (PFRA) [<http://www.bedford.gov.uk/pdf/PFRA.pdf>]
- The Water Cycle Strategy (WCS) for the Bedford and northern area of Central Bedfordshire [http://www.bedford.gov.uk/environment_and_planning/planning_town_and_country/what_is_planning_policy/studies__monitoring/water_cycle_study.aspx]
- The Water Cycle Strategy (WCS) for Luton and South Bedfordshire [http://www.shapeyourfuture.org.uk/documents/LutonandSouthBedsreport_FINALReport_20May2010_Rev3.pdf]

These documents contain the latest review of information prepared on flood risk, as contained in SFRAs and more locally targeted FRAs.

For the purposes of the SEA, it is important to consider and align with the key planning documents.

In accordance with the National Planning Policy Framework and the Planning and Compulsory Purchase Act 2004, Central Bedfordshire Council must produce a local plan for the area. A new Development Strategy for Central Bedfordshire is being prepared. It will be the main planning document setting out the overarching spatial strategy and development principles for the area together with more detailed policies to help determine planning applications. The draft version of the Development Strategy was published in January 2013 for public consultation.

The Development Strategy will replace a number of other existing planning policies contained in the Central Bedfordshire (North): Core Strategy and Development Management Plan Document (2009) and the South Bedfordshire Local Plan (2004). The Central Bedfordshire (North): Site Allocations Development Plan Document (2011) will sit alongside the Development Strategy forming part of the Development Plan for Central Bedfordshire.

Please note - in the south, until a new Development Strategy is adopted, the adopted South Bedfordshire Local Plan (2004) and joint Core Strategy (endorsed for Development Management purposes) will continue to set the planning context for decisions on planning applications.

3.3 Baseline Information

Baseline information outlines the current environmental and social status of numerous potentially vulnerable receptors and assets within Central Bedfordshire. Additionally, it identifies any issues or problems which require addressing in the LFRMS and provides a basis for predicting and monitoring the effects of the LFRMS implementation. The baseline may require updating throughout the duration of the SEA process as new information becomes available. The SEA will also include consideration of the potential inter-relationships where the LFRMS measures could cause secondary or cumulative effects.

3.3.1 Landscape and Visual Amenity

Central Bedfordshire comprises a number of varied landscapes which are highly valued for their intrinsic character. Landscapes protected by designations include the Community Forest of Marston Vale, to north of Central Bedfordshire, and the Chilterns Area of Outstanding Natural

Beauty (AONB) which encompasses part of the distinctive chalk landscape system within the southern part of Central Bedfordshire. AONB designation is the highest level of national landscape protection within Central Bedfordshire and equivalent to the protection conferred on National Parks. The Marston Vale Forest Plan (2000) directs planning, growth and management within the Community Forest. The Chilterns AONB Conservation Board have produced a Management Plan 'Framework For Action 2008-2013' to guide conservation and change within the Chilterns AONB, plus a series guidance documents including a Building Design Guide which may influence the design and implementation of any proposed flood risk management measures.

There is also a substantial proportion of land within Central Bedfordshire which is designated as Green Belt land. This is protected by national and local plans and planning policies which restrict certain development activities within these particular designated areas.

Central Bedfordshire is characterised by four distinct National Character Areas (NCAs). The southernmost character area is the Chilterns NCA, which includes part of the Chilterns AONB, and is noted for the chalk aquifers, springs, and chalk streams which supply water to large population areas in London and the south. The Bedfordshire and Cambridgeshire Claylands NCA is situated across the northern and central extent of Central Bedfordshire and has been defined as a gently undulating plateau with broad river valleys (Natural England, 2013). The Bedfordshire Greensand Ridge NCA is distributed, predominantly, within the Central Bedfordshire boundary. This NCA is described as a narrow escarpment which supports mixed land use, including a high proportion of woodland, heath and pasture. A small proportion of Central Bedfordshire, situated to the north of Letchworth, falls within the East Anglian Chalk NCA and comprises a mainly arable landscape. Given the availability of nationally important and naturalised habitat components, these character areas are likely to have moderate-high sensitivity to certain development and flood risk management activities.

A district scale Landscape Character Assessment (LCA), has been undertaken on behalf of Central Bedfordshire (Land Use Consultants, 2007). The LCAs describe and classifies patterns of features, what makes each part of the landscape distinct and engenders sense of place. The LCA approach considers that all landscapes are valuable and seeks to protect essential character to guide planning and conservation. The Central Bedfordshire LCAs identify ten landscape types within the unitary authority boundary:

- Clay Farmland;
- Clay River Valleys;
- Clay Vales;
- Wooded Greensand Ridge;
- Greensand Valley;
- Clay Hills
- Chalk Escarpments;
- Rolling Chalk Farmland;
- Chalk Dipslopes; and
- Chalk Valleys.

The significance of geology and hydrology and relationship to landscape character, biodiversity, historic and current land uses is clearly identified within the description for each landscape character area. Guidance on landscape management and development considerations include advice on the need for sensitive management of flooding and the safeguarding of floodplains, wetlands and streams / tributary corridors in relation to landscape conservation and enhancement.

3.3.2 Biodiversity, Flora and Fauna

The Bedfordshire and Luton Biodiversity Partnership, which includes Central Bedfordshire as part of its remit, has developed individual plans for priority habitats and species within a Local Biodiversity Action Plan (BAP). The following habitats have been considered as part of the local BAP and each habitat holds an independent Habitat Action Plan (HAP) (Bedfordshire and Luton Biodiversity Partnership, 2013):

- Arable field margins;
- Floodplain grazing marsh;

- Hedgerows;
- Lowland dry acid grassland;
- Lowland calcareous grassland;
- Lowland heathland;
- Lowland meadows;
- Ponds;
- Reedbed;
- Traditional orchards;
- Wet woodland;
- Wood-pasture and parkland; and
- Woodland.

In addition to habitats, the BAP lists the following priority species which are allocated Species Action Plans (SAPs):

- Adder *Vipera berus*;
- Arable Plants;
- Depressed River Mussel *Pseudanodonta complanata*;
- European Otter *Lutra lutra*;
- Great Crested Newt *Triturus cristatus*;
- Hazel Dormouse *Muscardinus avellanarius*; and
- Water Vole *Arvicola amphibius*.

A number of these species are dependent upon aquatic and riparian habitats and are sensitive to changes in habitat conditions, such as those likely to impact upon water quality, flow, vegetation and bank profile. Great Crested Newts utilise standing water bodies for breeding sites whilst Depressed River Mussels occur in lowland rivers and canals, where it is usually found in low density populations. Water Vole and Otter are also reliant upon drains, streams, canals and rivers as well as adjoining riparian habitats. Flooding and flood risk therefore has the potential to significantly impact on these species.

Central Bedfordshire does not support any internationally designated sites, such as Special Protection Areas (SPAs), Special Areas of Conservation (SACs) or Ramsar sites, although there are two SACs within 10 km of the unitary authority border (see Table 3-4). Whilst there are likely to be an increased number of internationally designated sites beyond 10 km of the Central Bedfordshire boundary, these are likely to be disconnected from Central Bedfordshire in terms of hydrology.

Table 3-4: List of SACs within 10 km of the Central Bedfordshire border Internationally Designated Sites

SACs	Proximity to Central Bedfordshire border
Chilterns Beechwoods SAC	Approximately 1.9 km south-west
Eversden and Wimpole Woods SAC	Approximately 6.1 km east

With reference to Table 3-4:

- The Chilterns Beechwoods SAC represents an area of extensive *Aperulo-Fagetum* beech forest habitat which contributes to an important mosaic of grassland, scrub and woodland habitat. This SAC is known to support the nationally rare plant Coralroot *Cardamine bulbifera* and supports a population of Stag Beetles *Lucanus cervus* which qualifies as a secondary designatory feature.
- Eversden and Wimpole Woods SAC, in Cambridgeshire, comprise ancient coppice woodland and high forest which supports a colony of Barbastelle bats *Barbastella*

barbastellus. The SAC contains mature trees which provide summer maternity roosts and foraging habitat for bats.

Central Bedfordshire contains a number of nationally designated nature conservation sites, including a large number of Sites of Special Scientific Interest (SSSIs) and a small number of National Nature Reserves (NNRs). There are also a number of Local Nature Reserves (LNRs). These are listed under Table 3-5 to Table 3-7.

There are also a large number of non-statutory and statutory designated nature conservation sites within Bedfordshire and these are afforded various levels of protection against certain development activities. There are around 400 County Wildlife Sites (CWSs) within Bedfordshire which cover just less than 7% of the total area. In addition to sites containing habitats prioritised under the county BAP, Bedfordshire CWSs comprise those areas which support notable habitats within roadside verges, disused railways and green lanes as well as churchyards.

Table 3-5: List of SSSIs in Central Bedfordshire

Nationally Designated Sites - SSSIs	
Barton Hills	Maulden Church Meadow
Blow's Down	Maulden Heath
Cooper's Hill	Maulden Wood and Pennyfather's Hill
Deacon Hill	Nares Gladely Marsh
Double Arches Pit	Nine Acres Pit
Dropshort Marsh	Potton Wood
Dunstable and Whipsnade Downs	Pulloxhill Marsh
Fancott Woods and Meadows	Sandy Warren
Flitwick Moor	Smithcombe, Sharpenhoe and Sundon Hills
Galley and Warden Hills	Southill Lake and Woods
Houghton Regis Marl Lakes	Sundon Chalk Quarry
Kensworth Chalk Pit	Tebworth Marsh
King's and Baker's Wood and Heaths	Totternhoe Chalk Quarry
Kings Wood and Glebe Meadows, Houghton Conquest	Totternhoe Knolls
Knocking Hoe	Totternhoe Stone Pit
Marston Thrift	Wavendon Heath Ponds

Table 3-6: List of National Nature Reserves in Central Bedfordshire

Nationally Designated Sites - NNRs	
Barton Hills	Knocking Hoe
King's Wood	

Table 3-7: List of Local Nature Reserves in Central Bedfordshire

Locally Designated Sites - LNRs	
Cooper's Hill	Marston Thrift
Cottage Bottom Fields	Maulden Church Meadows
Flitton Moor	The Riddy
Galley and Warden Hills	Totternhoe Knolls
Henlow Common and Langfield Meadows	Stortford Mill Meadows

The majority of SSSIs within Central Bedfordshire have achieved the target of being in "favourable" or "unfavourable, recovering" condition, with Maulden Church Meadow and Nine Acres Pit achieving "unfavourable no change" status. Houghton Regis Marl Lakes has also been assessed as being in "unfavourable" condition and in "declining" condition due to "a lack of water persisting onsite" (Natural England, 2013). Like many other SSSIs within Central Bedfordshire, the status of Houghton Regis Marl Lakes SSSI is largely dependent upon its hydrological condition as it supports open water and canal habitats and accommodates a population of breeding Great Crested Newts. Flood and flood risk management therefore has the potential to adversely impact upon water levels and hydrological regimes, but may also provide opportunity to enhance the condition of some of these sites.

River corridors can also be locations where non-native, invasive species are prevalent, particularly Japanese Knotweed *Fallopia japonica*, Giant Hogweed *Heracleum mantegazzianum* and Himalayan Balsam *Impatiens glandulifera*. Flooding has the potential to cause the spread of these species through the movement of seeds and plant fragments, and flood risk management works in locations with these species could cause their spread, however, it may also provide opportunity for their control/eradication.

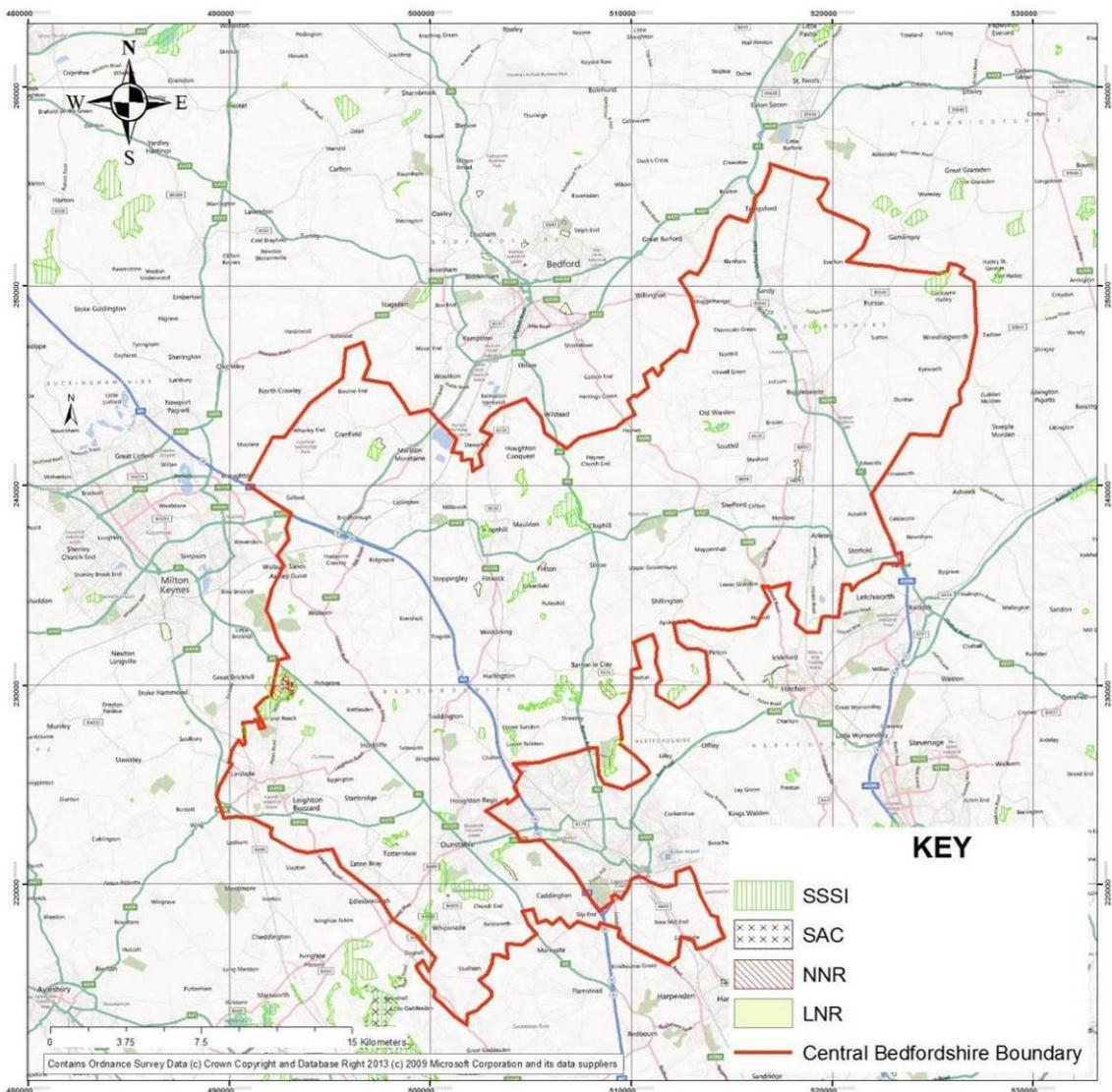


Figure 3-1: Extent of Statutory Designated sites across Central Bedfordshire

3.3.3 Green Infrastructure

Central Bedfordshire is developing a strategic approach integrating, protecting and enhancing the area's natural assets and resources.

Adopted Green Infrastructure (GI) Strategies and Plans set out strategically planned and managed system of green spaces, access routes, wildlife habitats, landscape and historic features. Key GI project areas within Central Bedfordshire have been defined and many make provisions for or are directly associated to the protection and enhancement of water environments including surface water features and groundwater.

3.3.4 Soils and Geology

The geological profile of Central Bedfordshire is composed, predominantly, of chalky boulder clay (glacial till) with Jurassic and Cretaceous Clays. These are typical of the Bedfordshire and Cambridgeshire Claylands NCA which defines a large proportion of Central Bedfordshire (Natural England, 2013). The central extent of Central Bedfordshire is underlain by Cretaceous sands and sandstones which is characteristic of the Greensand Ridge landscape area. In contrast to the surrounding Claylands, Greensand Ridge comprises free-draining soils which are of comparatively low fertility and give rise to heath and mixed woodland habitat. There are also areas of heavy, poorly-drained clay soils where woodland can often be found. The underlying solid geology of the East Anglian Chalk NCA, which represents a proportionately small area to the south-east of Central Bedfordshire, is dominated by Upper Cretaceous Chalk.

Of the SSSI's listed in section 3.3.2 above, three sites, namely Nine Acres Pit, Tottenhoe Stone Pit and Kensworth Chalk Pit are designated for their geological features. Nine Acres Pit contains excellent examples of Carstone and Shenley Limestone, as well as diverse fossil content, unique to the Leighton Buzzard area of the county (Natural England, 2013). Kensworth Chalk Pit contains the best Chalk Rock exposure throughout central England, the top layer of which is extremely fossil rich. The chalk present at Tottenhoe Stone Pit yields high quantities of marine fossils and supports a species-rich chalk grassland, containing orchid species such as the Common Spotted *Dactylorhiza fuchsii*, Fragrant *Gymnadenia conopsea* and Common Twayblade *Neottia ovata* (Natural England, 2013).

There is a significant percentage of high grade agricultural land in Central Bedfordshire which provides a significant economic resource for the unitary area. The value of this resource will be accounted for in the LFRMS and considered in the SEA.

Flooding has the potential to cause erosion and waterlogging of soils, potentially adversely impacting on soil conditions and agricultural productivity.

Minerals extraction is described in the Bedford Borough Council, Central Bedfordshire Council and Luton Borough Council Minerals and Waste Local Development Scheme (2012). Minerals and contamination considerations will be related to specific geographical locations and the LFRMS and SEA will need to consider the potential effects of proposed changes to flooding and flood risk management so that adverse impacts are not introduced or exacerbated. The LFRMS should also seek to secure benefits afforded by restoration and management proposals and these will need to be addressed in the SEA.

3.3.5 Water Resources

Water availability

The Central Bedfordshire area contains a number of major rivers, including the River Ouse, River Hiz, River Ivel, River Upper Lee and River Ouzel.

Central Bedfordshire falls within the Upper Ouse and Bedford Ouse Catchment area and all water abstraction activities within Central Bedfordshire are operational under the Catchment Abstraction Management Strategy (CAMS) for this particular area (Environment Agency, 2013). Water resources are obtained from Chalk and Woburn Sands aquifer which supplies a significant proportion of public water. The northern extent of the chalk aquifer is separated from the southern extent of Woburn Sands aquifer by a layer of Gault Clay. Greensand and Chalk aquifers to the South and west of the Upper Ouse and Bedford Ouse CAMS catchment are the most heavily utilised groundwater sources.

Abstracted water is obtained by Anglian Water Services Ltd (AWS), Affinity Water and Cambridge Water. Approximately 81% of all surface water abstractions in the catchment come from AWS

abstractions, the majority of which is used to fill Grafham Water Reservoir. Other surface water abstractions are for agriculture and industry, including land spray irrigation licenses.

A resource assessment allows effective management of water resources in the area, including an understanding of where and when water is available and the consideration of environmental needs. The resource assessment for the catchment has identified using flow statistics that, at high flow, surface water throughout the catchment is available for licensing; however at moderate and low flows water availability becomes restricted or unavailable for abstraction. As water availability varies with flow, making an assessment of the quantity of water available for abstraction at different flows can help to provide an indication of reliability of abstraction when there is a surplus or deficit of water at the different flows.

The assessment for the whole of the catchment has identified a need for some reduction in abstraction to maintain all aspects of sustainability. Furthermore, the Central Bedfordshire Climate Change Adaptation Report identified in a 2013 report that parts of Bedfordshire have been in drought since April 2011 with Groundwater levels being reported to be 'exceptionally low' (LDA Design, 2013).

Water Quality

There is contaminated land and a number of landfills in Central Bedfordshire, along with water treatment works and sewage treatment works. Flooding of these sites has the potential to introduce potentially contaminative substances into watercourses and create water quality issues. Similarly, mineral extraction sites can also impact upon water quality. Waste, minerals and contamination considerations will be related to specific geographical locations and the LFRMS and SEA will need to consider the potential effects of proposed changes to flooding and flood risk management so that adverse impacts on the quality of water within Central Bedfordshire does not arise.

Flooding

An assessment of flood risk within the Central Bedfordshire area was undertaken to form part of the Upper River Great Ouse Tri Lead Local Flood Authority - Preliminary Flood Risk Assessment for Bedford Borough Council, Central Bedfordshire Council and Milton Keynes Council in June, 2011 (Bedford Group of Drainage Boards, 2011). A high risk of flooding was identified from local sources and, particularly, surface water, with approximately 10,000 properties in Central Bedfordshire considered to be "at risk". The causes of flooding within the Central Bedfordshire have been described as surface water, groundwater, escaping water and river flooding.

3.3.6 Water Framework Directive

The Water Framework Directive (WFD) is a European Directive which requires the introduction of strategic planning measures to manage, protect and improve the water environment and came into force in December 2000. The WFD was transposed into UK legislation in 2003 which resulted in the Environment Agency being made responsible for the production of River Basin Management Plans (RBMPs). Central Bedfordshire is covered by the Anglian RBMP which identifies the current quality of rivers and sets objectives for making further improvements for the river basin district (Environment Agency, 2013a).

The ecological status of the majority of main rivers within Central Bedfordshire are classified as having 'moderate' ecological status. Campton Brook, Chicksands Brook, Cat Ditch and River Ivel have been classified as 'poor' with Stondon Brook and sections of River Ivel classified as having 'good' status.

With regards to the chemical status of water bodies within Central Bedfordshire (with the exception of those that do not require assessment) all rivers were classified as being in 'good' condition.

A number of pressures and risks have been identified for Central Bedfordshire, with some areas deemed either 'at risk' or 'probably at risk'. These include:

- Abstraction and other artificial flow pressures (rivers);
- Abstraction and flow regulation - impact on surface waters, ground water, water balance (ground water) and terrestrial ecosystems (ground water);
- Invasive non-native species (rivers);

- Combined source pressures - total oxidised nitrogen (rivers);
- Diffuse source pressures - nitrates (ground water), phosphate (ground water), phosphorous from agriculture (rivers); and
- Physical or morphological alterations (rivers).

The occurrence of flooding within Central Bedfordshire is expected to have some degree of impact upon all aforementioned pressures and risks identified within the RBMP, whilst flood management structures may be contributable to those risks associated with physical river alterations. However, as part of implementation of flood risk management measures opportunities to help achieve the objectives of the WFD may arise.

3.3.7 Fisheries

Central Bedfordshire supports an abundance of bony fish species and its watercourses are inhabited, predominantly, by coarse fish (Environment Agency, 2005). Fish species within the area include the following:

- Barbel *Barbus barbus*;
- Bleak *Alburnus alburnus*;
- Brown Trout *Salmo trutta*;
- Bullhead *Cottus gobio*;
- Chub *Squalius cephalus*
- Common Bream *Abramis brama*;
- Common Carp *Cyprinus carpio*;
- Crucian Carp *Carassius carassius*;
- Dace *Leuciscus leuciscus*;
- European Eel *Anguilla anguilla*;
- Grass carp *Ctenopharyngodon idella*;
- Gudgeon *Gobio gobio*;
- Minnow *Phoxinus phoxinus*;
- Nine-spined Stickleback *Pungitius pungitius*;
- Orfe *Leuciscus idus*;
- Perch *Perca fluviatilis*;
- Pike *Esox lucius*;
- Rainbow Trout *Oncorhynchus mykiss*;
- Roach *Rutilus rutilus*;
- Rudd *Scardinius erythrophthalmus*;
- Ruffe *Gymnocephalus cernuus*;
- Spined Loach *Cobitis taenia*;
- Stone Loach *Barbatula barbatula*;
- Tench *Tinca tinca*;
- Three-spined Stickleback *Gasterosteus aculeatus*;
- Wels Catfish *Silurus glanis*; and
- Zander *Sander lucioperca*.

The River Ouse and River Ouzel tributary in Central Bedfordshire support a population of Brown Trout, in addition to rheophilic species, such as Barbel, Chub, Dace, Perch, Pike and Roach. Bream is also found occasionally within slower flowing sections of the river. There are active angling clubs established within Ampthill and Shefford.

Flooding along the River Ouse has been known to displace fish species, including large Carp, a non native species, and this has been determined as a particular environmental concern.

However, flood risk management also provides opportunity to improve fisheries habitats, for example through the removal or modification of existing impediments to fish passage.

3.3.8 Cultural Heritage

Central Bedfordshire holds a large number of historically and culturally valuable sites, including Listed Buildings, Conservation Areas and Scheduled Monuments (English Heritage, 2013). Each designation is allocated a degree of protection against potentially damaging activities including those associated with development.

- 1,968 Listed heritage assets within the entirety of Central Bedfordshire;
- 98 Scheduled heritage assets;
- 63 Grade I listed buildings;
- 61 Conservation areas; and
- 16 Historic parks and gardens.

There is a possibility that adverse impacts upon aspects of Central Bedfordshire's cultural heritage could arise from the construction and implementation of the flood risk management options selected by the LFRMS. Construction activities, changes to landscape and land use are expected in fulfilment of the schemes and these could be potentially damaging to heritage assets. Potential benefits may arise from reduced flood risk to assets as a result of implementation of the LFRMS, however it should be noted that some archaeological assets require waterlogged conditions to preserve them.

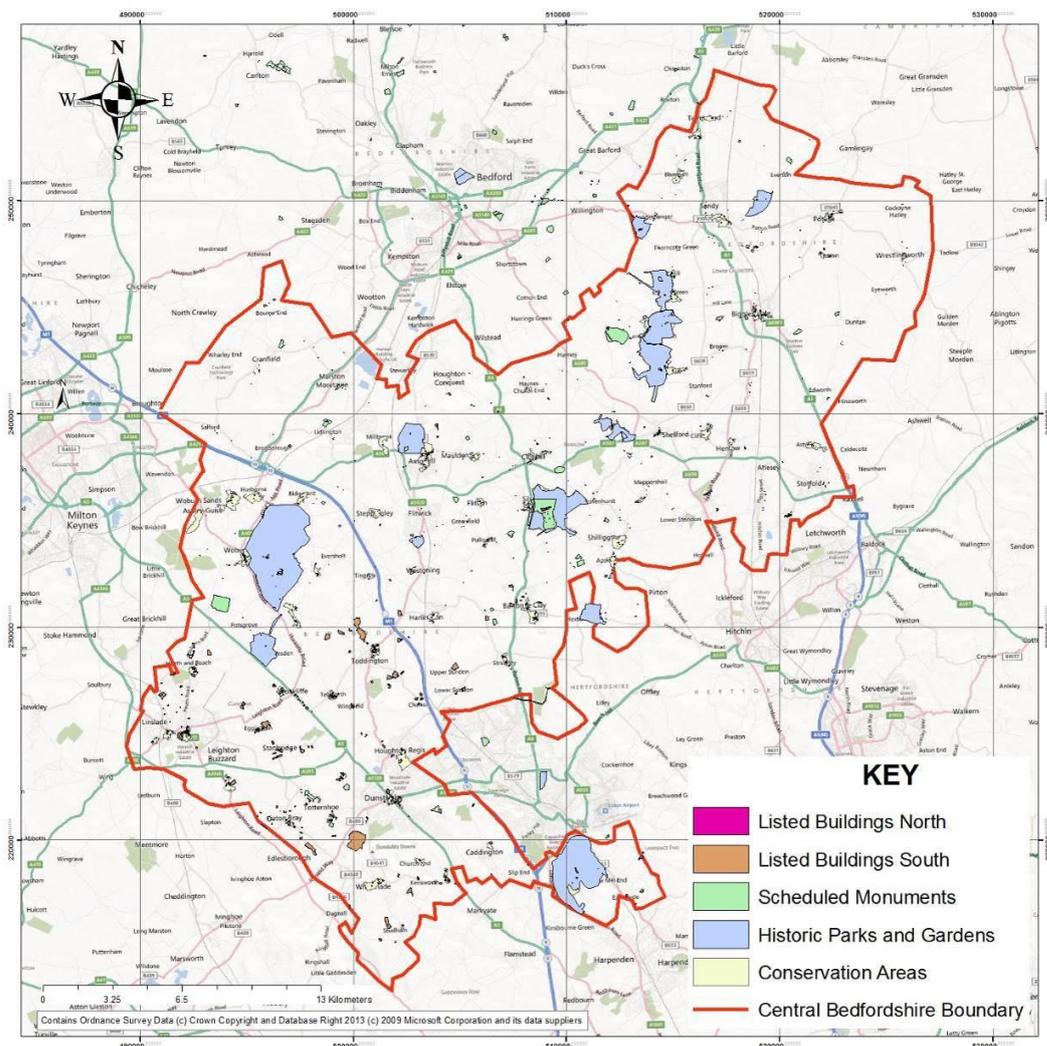


Figure 3-2: Cultural Heritage designations in Central Bedfordshire

3.3.9 Population and Human Health

Central Bedfordshire has an estimated population, at the mid-2008 population estimate, of 255,000 people. Generally, the health of the county's population is considered to be greater than that of the rest of England (Department of Health, 2010).

Deprivation in Central Bedfordshire is significantly lower than England's average and life expectancy is higher. However, approximately 6,800 of children within the county live in deprived conditions and inequality is prevalent with the most deprived families living in the wards of Dunstable and Steppingley. Within Central Bedfordshire's deprived wards life expectancy is estimated to be 7.4 years lower for men and 5.5 years lower for women, than in the county's less deprived areas. Holistically, however, death rates from both smoking related illnesses and cancer are decreasing steadily and child obesity is below that of the national average (Department of Health, 2012).

The proposed plan (for consultation) for future development in Central Bedfordshire anticipates that up to 2031 (Central Bedfordshire Council, 2013):

- Land North of Houghton Regis will provide 5,600 homes and 30 hectares of employment land.
- Land North of Luton will provide 2,900 homes and 20 hectares of employment land.
- Land East of Leighton Linlade will provide 2,500 homes and 16 hectares of employment land.
- A southern extension at Wixams new settlement will provide 500 homes and a country park.
- The Maulden Road Industrial Estate, Flitwick will be extended to provide 18 hectares of land employment development and a country park.
- Land at Sundon Rail Freight Interchange will be developed providing pickup/drop off access to the rail network for freight and 40 hectares of land for employment.
- Supporting infrastructure will be provided for the proposed development and will include more large scale schemes such as new roads, including the A5-M1 Link Road and new Junction 11a and the Woodside connection.

An understanding of the potential effects of future planned development will ensure residential development to house Central Bedfordshire's increasing population and support its growing economy is achieved in suitable and sustainable sites, taking into account the potential risks for flooding. Additionally, this information informs the LMFERS where the greatest numbers of housing and commercial infrastructure will be in future; the strategy can therefore take this into account.

Flood risk can affect health and well being through drowning or exposure to water that can cause harm as a consequence of the depth duration or velocity of the flood water. Additionally contact with flood waters can be harmful to health as a result of contamination or hazardous material being transported during a flood. Communities in properties affected by flooding can have longer term health and rehabilitation problems during the period to recover from a flood event (which can be protracted). Flood risk can result in direct and indirect commercial loss and disruption to business and commerce.

Emergency infrastructure in Central Bedfordshire is, predictably, centred around larger settlements in the Central Bedfordshire, Hertfordshire and Buckinghamshire area, to serve the largest population densities. Within Central Bedfordshire itself, there are two hospitals, situated Flitwick and Biggleswade, whilst Luton also serves Central Bedfordshire. Other neighbouring authorities, provide a further seven hospitals, in Bedford, Hitchin, Harpenden, Milton Keynes, Stoke Mandeville and Lister in Stevenage, which may potentially serve residents of Central Bedfordshire.

Police stations and other similar facilities are situated within the same, large settlements as hospitals, however occur in greater abundance. Police facilities are also found in Letchworth, Dunstable, Luton, Leighton Buzzard and the eastern edges of the Milton Keynes. Fire and ambulance infrastructure almost perfectly mirrors that of the police, occurring in all the same towns at very similar frequencies.

Flooding can place increased demand on emergency infrastructure, particularly when spread over a wide geographical area. It can also hinder provision of services directly through restricting access, blocking routes and increasing response times.

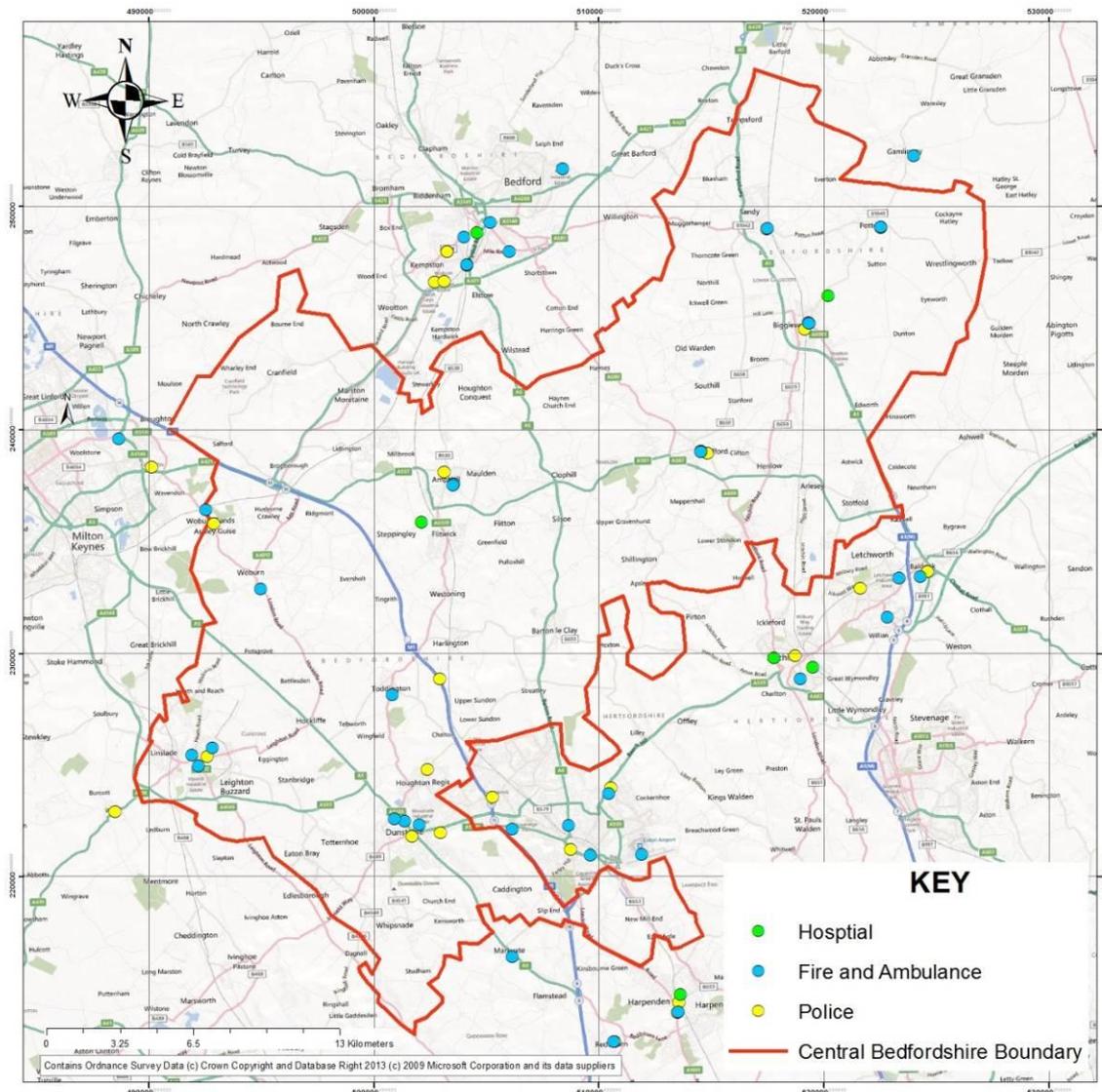


Figure 3-3: Extent of Emergency Infrastructure across Central Bedfordshire

Other essential community infrastructure, namely schools, residential facilities such as nursing and children's homes are found again primarily within the towns and villages of the Central Bedfordshire. Particularly high densities of such facilities are found in Leighton Buzzard, Flitwick, Biggleswade, Sandy and Ampthill. Other dense concentrations of such infrastructure exist in other towns within Bedfordshire and Buckinghamshire which will no doubt serve communities from within the Central Bedfordshire. The greatest densities of social infrastructure assets outside of Central Bedfordshire can be found in Milton Keynes, Bedford, Dunstable and Luton with lower densities in towns such as Letchworth and St. Neots.

Utilities, namely electricity and sewage treatment are also centred around the larger towns where they are in greatest demand (for water supply refer to section 4.5.1). The quantity of electrical infrastructure and sewage works reflect the size and population of the settlement within they occur. The same correlation is true of sewage treatment works; however supplementary works are located according to the presence of the county's main roads, under which the supporting infrastructure runs.

Flooding of these key social infrastructure assets could result in disruptions to the provision of services to communities within the county.

3.3.10 Material Assets

Three major rail lines run through Central Bedfordshire; the East Coast Mainline between London and Scotland, Midland Mainline between London and Sheffield and the West Coast mainline between London and North West England. All three lines call at one or several of Central Bedfordshire's major towns, namely Arlesey, Sandy, Biggleswade (Central Bedfordshire Council, 2013). First Capital Connect Services operate by partially using the Midland Mainline between Peterborough and London and Brighton, calling at numerous towns in the Central Bedfordshire, namely Flitwick and Harlington. London Midland Rail operates, partially using the West Coast Mainline, connecting Birmingham with London Euston, calling at Leighton Buzzard. Southern Rail trains also call at Leighton Buzzard on the service they provide between Milton Keynes and East Croyden (Central Bedfordshire Council, 2013).

Data gathered during the compilation of the Central Bedfordshire Local Transport Plan and the Central Bedfordshire Council Transport Strategy show that the car is the predominant mode of transport, accounting for 77% of journeys, up 6% from 2010. Walking is the next most common form, accounting for around 93% of all trips less than two miles in length. Walking popularity reduces significantly with increasing journey distance. The train is primarily used by commuters for journeys greater than 10 miles in distance and usage increases significantly to 85% for journeys over 20 miles. Cycling is the least popular mode of transportation used by only 3% of the county's population. Flooding and flood risk management has the potential to significantly impact upon this infrastructure (Central Bedfordshire Council, 2011).

Motorways such as the A1 and M1 run through the county, as do many other main roads such as the A421 and the A501 which link the county's towns.

Equally important as the infrastructure discussed above are public green spaces which positively contribute to public health. Within Central Bedfordshire, there are over 2000 hectares of public green space, over half of which are owned and managed by the Central Bedfordshire Council, the remainder of which is owned and managed by the public bodies (Central Bedfordshire Council, 2013).

Flooding of transport assets has the potential to cause disruption to movements of residents, commuters and emergency services, which could have a short-term impact on the local economy, as well as potentially causing damage which could have longer-term impacts as repairs are undertaken.

3.3.11 Climatic Factors

The UK Climate Projection (UKCP09) provides probability-based projections of key climate variables, such as temperature and rainfall at a higher geographic resolution than has previously been available. Projections are based on the Intergovernmental Panel on Climate Change's 'business as usual' emissions scenario.

At present, Central Bedfordshire experiences a temperate climate with average winter temperatures of between 5 and 8 degrees Celsius and average summer temperatures of between 19 and 22.5 degrees Celsius. On average, winter rainfall in the region is between 150 and 250mm and summer rainfall between 105 and 230mm (Met Office, 2013).

However, current projections point to significant and more variable temperature and rainfall predictions in future. Also expected are greater peak temperatures and prolonged hot periods. Summer mean temperatures are predicted to rise, on average, by 4.5 degrees (LDA, 2012). Minimum temperature rise is expected to be no less than 2.4 degrees Celsius and maximum rise is not expected to exceed 7.5. Winter mean temperature is also expected to increase - however by a lesser amount. The average, predicted rise is 3.7 degrees, while the minimum increase expected is 2 degrees and the maximum 5.7 degrees Celsius (LDA, 2012).

Rainfall quantity is expected to increase only marginally. However the amount received in Central Bedfordshire during the summer months is expected to fall and more, prolonged, severe rainfall and storm events are predicted to occur during winter, potentially impacting on flood frequency (LDA, 2012). By 2050, it is projected that 17% more rain will fall during the winter months and 26% more during the winter months of 2080, whereas summer rainfall is set to decrease by 18% by 2050 and 27% by 2080 - indicating the increased intensity and severity of winter storm events (LDA, 2012).

With rainfall frequency and intensity set to significantly increase in the coming decades - the likelihood of river flooding and overwhelming of drains and sewers will rise due increased surface

runoff. This in turn will lead to localised flood events and increased erosion. To accommodate the increased likelihood of such events the LFRMS must implement measures aimed at coping with them.

If such climate change projections are realised, the adverse risk and impact toward Central Bedfordshire's infrastructure, public health and the natural environment has the potential to be great. Previous climate change risk assessments undertaken by LDA Design (2012) assessed risk on such assets on three timescales, assessing risk in 2020, 2050 and 2080, with the following results. Increasing temperatures will result in social implications, leading to exacerbated impacts on natural and economic resources. Summer mortality will increase, cancelling out, if not exceeding the reduced mortality that will occur as a result of milder winters. Green house gas emissions will almost certainly increase as a result due to increased demand for cooling. Economic loss will result from increased absenteeism and lost productivity (LDA, 2012).

With regard to the natural environment changing climate, mainly that of changing temperatures poses the biggest threat. Forest extent will almost certainly be stunted or reduced due to diseases such as needle blight and red band, animal migration patterns may be disrupted and species and habitat abundance and richness will become threatened as a result of changing habitats, drier soils and increased competition from invasive species with an increasing northerly range (LDA, 2012).

Flooding derived from increased rainfall and storm events of greater severity is expected to result in significant adverse impacts on utility, residential and transport infrastructure with subsequent economic consequences. It is expected that the flooding of substations and power stations will be adverse at all three timescales as will the flooding of residential and industrial property (LDA, 2012). Flooding of roads is expected to become more frequent as is the speed and intensity at which road and railway bridges are subject to local scour. Damage to infrastructure at the forecasted extent will inevitably incur large economic costs as well as social and public health implications as a result of the distress and disruption caused (LDA, 2012).

The LFRMS options, could potentially, both directly and indirectly, lead to an increase in greenhouse gas emissions as a result of construction and maintenance activities. Emissions could be reduced by selecting, sustainable building practices and materials.

3.3.12 Air Quality

Generally, air quality in Central Bedfordshire meets the targets set by the government in the Air Quality Objective (AQO). The council conduct obligatory, periodic, reviews of local air quality during which the concentration of potentially harmful substances such as Ground Level Ozone (O₃); Carbon Monoxide (CO) and Sulphur Dioxide (SO₂) are measured and compared against the AQO. Should an area within the authority exceed the set quantities of any such contaminants, hence exceeding the objective, further more detailed assessments are undertaken. If further assessments verify the original finding of excessive contaminant concentrations the area is designated as an Air Quality Management Area (AQMA) for which objective contaminant levels are set and strategies to achieve them drawn up (Central Bedfordshire Council, 2013).

Presently, ozone and polycyclic aromatic hydrocarbons, are managed by central government and therefore such substances remain outside the focus of the local authority.

At present one AQMA is declared in Dunstable and has been designated since 2005. Nitrogen oxide is the contaminant in excess, derived from the heavy traffic concentration in the town. An Air Quality Action Plan is currently being produced in order to reduce the nitrogen oxide concentration back to safe levels (Central Bedfordshire Council, 2013). A second AQMA status applied to the area around the villages of Marston Moretaine, Houghton Conquest and the surrounding countryside. However, this has recently been revoked following the decommissioning of local brickworks, significantly reducing local sulphur dioxide concentrations, of which the majority derived from the works (Central Bedfordshire Council, 2013).

3.4 Scoping Conclusion

Following a review of this environmental baseline data it was possible to scope out air quality as a SEA issue as it is unlikely that there will be significant environmental effects on these receptors arising from implementation of the LFRMS. A summary of the scoping conclusions are given in Table 3-Table 3-8 below.

Table 3-8: Scoping Conclusion Summary

Receptor	Scoped In	Scoped Out	Conclusion
Landscape and Visual Amenity	Yes	No	Flood risk management could potentially impact on local landscape features, potentially within the Chilterns AONB and other locally important landscape areas; consequently this receptor is scoped into further assessment.
Biodiversity, Flora and Fauna	Yes	No	The county contains a number of nationally and locally important sites and also holds populations of protected and BAP species. Flooding and flood risk management has the potential to adversely impact in these receptors, and also potentially bring about a number of benefits; consequently this receptor is scoped into further assessment.
Soils and Geology	Yes	No	Central Bedfordshire has a significant percentage of high grade agricultural land. Flooding has the potential to erode soils and cause waterlogging impacting on agricultural productivity. The SEA should therefore aim to ensure that the LFRMS protects the soil resource of the county; consequently, this receptor is scoped into further assessment. Minerals extraction must also be considered.
Water Resources	Yes	No	The counties rivers and water resources could potentially be impacted upon by flooding and the LFRMS should aim to protect water resources. Potentially contaminative sites (e.g. landfill sites, sewage treatment works) can also introduce pollutants to watercourses throughout flooding. Consequently this factor is scoped into further assessment.
Fisheries	Yes	No	The rivers of the county hold important populations of fish. The LFRMS provides significant potential to improve fish passage and habitat and consequently this receptor is scoped into further assessment.
Cultural Heritage	Yes	No	There are a large number of historic environment assets within the county that could be adversely impacted upon by flooding, or potentially benefit from reduced flood risk as a result of implementation of the LFRMS, consequently this receptor is scoped into further assessment.
Population and Human Health	Yes	No	Central Bedfordshire, with its large urban areas, contains a wide range of social infrastructure assets that could cause significant disruption if flooded; consequently this receptor is scoped into further assessment.
Material Assets	Yes	No	Central Bedfordshire contains considerable transport infrastructure that could cause significant disruption if flooded; consequently this receptor is scoped into further assessment.
Climatic Factors	Yes	No	The LFRMS is likely to include mitigation, resilience and adaption responses and measures that address climate change effects. Opportunities to improve climate change adaptation will be considered in the SEA.
Air Quality	No	Yes	It is proposed that specific consideration of air quality impacts is not relevant to the LFRMS due to the specific and localised nature of any potential impacts.

4 Strategic Environmental Assessment Objectives, Baseline and Context

4.1 Introduction

The key objective of the LFRMS is to manage flood risk by technically, economically, socially and environmentally appropriate options for flood risk management. The SEA Scoping Report identified the environmental baseline and key issues within the unitary authority area, in conjunction with a review of other plans, policies and programmes. The key aim of the SEA Scoping stage was to develop a framework to allow further assessment of environmental issues during the plans development. The SEA framework consists of a set of SEA objectives, indicators and targets. By assessing the LFRMS options against these objectives and criteria, it will be possible to ensure that the policies and proposals selected are environmentally and socially sustainable. The indicators can also be used during plan implementation to monitor success against the targets developed.

Table 4-1 summarises the purpose and requirements of the SEA objectives, indicators and targets.

Table 4-1: Objectives and Indicators

Purpose	
Objective	Provide a benchmark 'intention' against which environmental effects of the plan can be tested. They need to be fit-for-purpose.
Indicator	Provide a means of measuring the progress towards achieving the environmental objectives over time. They need to be measurable and relevant and ideally rely on existing monitoring networks.
Target	Describe the desirable state in relation to each objective in quantifiable terms. They can be devised so that they meet the minimum requirement for each objective or they can be more aspirational in nature. Targets need to be realistic and ideally quantitative.

4.2 SEA Objectives

An outline draft set of SEA objectives, indicators and targets have been compiled for each of the environmental receptors (or groups of environmental receptors) scoped into the study during the scoping phase of the project (see Table 3-8). The SEA objectives for the Central Bedfordshire LFRMS are given in Table 4-2 below, along with indicators and targets that will enable the effectiveness of the strategy to be monitored. These objectives and indicators were consulted on during the consultation phase for the SEA Scoping Report.

Table 4-2: SEA objectives

Receptor	Objective	Indicator	Targets
Population and Human Health and Material Assets	1 Protect and enhance human health and well-being	Number of properties at risk of flooding. Number of residential properties at risk of flooding. The number of key services (e.g. hospitals, health centres, residential/care homes, schools etc) at risk from flooding.	No increase/reduction in number of residential properties at risk from flooding. No increase/reduction in number of key services at risk from flooding.
	2 Minimise the risk of flooding on existing development and amenity	Number of commercial businesses and industrial premises at risk of flooding. Number of attractions and recreational assets protected from flooding.	No increase/reduction in number of commercial/ industrial properties at flood risk. No increase/reduction in number of attractions/ recreational assets at

Receptor	Objective	Indicator	Targets
			flood risk
	3 Ensure the potential impact of flooding existing and future infrastructure is minimised	Length of road and rail infrastructure at risk from flooding, duration of flood event and a qualitative assessment of the impact. Number of key infrastructure assets (e.g. power stations, sub-stations) at risk from flooding.	No increase/reduction in length of road and rail infrastructure at risk from flooding No increase/reduction in number of infrastructure assets at risk from flooding
Water resources	4 Maintain and enhance water resources and quality in Central Bedfordshire	Numbers of sites with high pollution potential (e.g. landfill sites, waste water treatment works) at risk from flooding. Number of sites where SUDS schemes have been installed. Number of SuDS that have demonstrated an improvement in water quality. Number of sites with rainwater capture or re-use of water. Number of dwellings with 'green' roofs or equivalent.	No increase/reduction in flood risk to sites with high pollution potential as a result of implementation of the LFRMS No reduction/increase in number of SuDS that have demonstrated and improvement in water quality. Increase in number of sites with rainwater capture or water re-use. Increase in number of dwellings with 'green roofs' or equivalent.
	5 Aim to achieve the requirements of the WFD through implementation of the LFRMS	Assessment of FRM options and their impact (e.g. disconnection/reconnection with floodplain, in-channel works/dredging, barriers to fish movement, reinstatement/removal of natural morphology). Numbers of sites with high pollution potential (e.g. landfill sites, waste water treatment works) at risk from flooding (to consider potential long-term impact on water quality).	No deterioration to the WFD status of waterbodies within the catchment. No increase/reduction in flood risk to sites with high pollution potential as a result of implementation of the LFRMS
Biodiversity, Flora and Fauna	6 Protect and enhance biodiversity and geodiversity throughout Central Bedfordshire	Area of designated nature conservation sites at risk of flooding and assessment of impact. Area of habitat created as a result of implementation of the LFRMS (e.g. flood storage areas creating wetland habitat). Reported conservation status of designated sites and the potential impact of the LFRMS on this.	No adverse impact on designated site as a result of increased area at risk of flooding. Increase in areas of good wildlife habitat as a result of implementation of the LFRMS. No deterioration in the conservation status of designated sites as a result of implementation of the LFRMS.
	7 Protect existing riverine habitats, and where possible create new habitats, to maintain naturally functioning	Area/length of riverine habitat protected, created or restored as a result of implementation of the LFRMS.	No significant negative impact or deterioration on riverine habitats or species.

Receptor	Objective	Indicator	Targets
	ecosystems		
Fisheries	8 Maintain existing, and where possible create new, habitat supporting fisheries (including Eel), and maintain access upstream	Number of new barriers or obstructions to upstream migration of fish and Eel constructed and/or modified. Area/length of suitable habitat supporting salmonid and other fisheries.	No new upstream barriers or obstructions to migrating fish and Eel passage. Improvement to existing upstream passage for fish and Eel. No loss of suitable habitat for fisheries as a result of implementation of the LFRMS.
Cultural Heritage	9 Maintain and/or enhance the character of townscapes, cultural heritage and historic environment assets within Central Bedfordshire	Number of historic environment assets (e.g. scheduled monuments, Registered Parks and Gardens, listed buildings including their setting and heritage value) at risk for flooding, and assessment of impact (of both flooding and implementation of flood alleviation measures).	No increase/reduction in number of historic assets at risk from flooding. No adverse impact on historic assets as a result of implementing flood alleviation measures. Maintain the character of the townscapes.
Soils and Geology	10 Protect the highest quality soils of Central Bedfordshire	Area of agricultural land affected by flooding or flood risk management measures.	No increase in flood risk to agricultural land.
Landscape and Visual Amenity	11 Protect and enhance the unique landscape setting and character of Central Bedfordshire, including the Chilterns AONB	Positive or negative impact on landscape character of the AONB and other locally important landscapes (e.g. open spaces). Positive or negative impact on river corridor landscape due to implementation of the LFRMS.	No adverse impacts on landscape character of the Chilterns AONB or other important landscapes as a result of implementation of the LFRMS. Maintain the character of the rural landscape. Positive impact on the river corridor landscape.
Climate effects	12 Adapt new and existing development to be resilient to climate change effects	Number of properties resilient and resistant to climate change effects. Infrastructure resilient and resistant to local flood risk climate change effects.	Increased number of properties and infrastructure resilient to climate change effects.

5 Plan Issues and Alternatives

5.1 Developing Alternatives

The SEA Directive requires an assessment of the plan and its 'reasonable alternatives'. In order to assess reasonable alternatives, different strategy options for delivering the LFRMS have been assessed at a strategic level against the SEA objectives, and the environmental baseline as detailed in chapter 3. The results of this assessment will be used to inform the decision-making process in choosing a preferred way of delivering the LFRMS.

5.2 Appraisal of actions to improve flood risk

The LFRMS has the purpose of managing and reducing local flood risk in Central Bedfordshire. The strategy objectives have been assessed against the SEA objectives for each of the following options as shown in Table 5-1.

1. **Do Nothing** - where no action is taken and existing assets and ordinary watercourses are abandoned.
2. **Maintain current flood risk** - where existing assets and watercourses are maintained as present in line with current levels of flood risk. Existing infrastructure is not improved over time and the effects of climate change are not taken into account; and
3. **Manage and reduce local flood risk** - take action to reduce the social, economic and environmental impact due to flooding

Table 5-1: Assessment of the strategy and alternative options against the SEA objectives

SEA Objectives		Options and Effects		
		Do Nothing	Maintain current flood risk strategy	Manage and reduce local flood risk
1	Protect and enhance human health and well-being	Increased exposure to flood risk from a combination of no management and climate change	No improvements to health and well-being as existing risk maintained and risk may increase in the future as a result of climate change	Directly compatible option
2	Minimise the risk of flooding on existing development and amenity	Increased exposure to flood risk from a combination of no management and climate change	Maintains the current risk levels, although risk may increase in the future as a result of climate change	Directly compatible option
3	Ensure the potential impact of flooding existing and future infrastructure is minimised	Increased exposure to flood risk from a combination of no management and climate change	Maintains the current risk levels, although risk may increase in the future as a result of climate change	Directly compatible option
4	Maintain and enhance water resources and quality in Central Bedfordshire	Potential for both adverse and beneficial impacts. For example, abandonment of assets may allow for the development of a more natural watercourse; however, there would be no management of water quality issues, such as run-off and flood risk may increase to potentially contaminative sites	Little/ no change to baseline levels, although in the future flood risk to potentially contaminative sites may increase as a result of climate change potentially resulting in declines in water quality	Management of watercourses allows water quality to be monitored and potentially improved. Taking further action to reduce local flood risk may also improve water quality through reduced flood risk to potentially contaminative sites

SEA Objectives		Options and Effects		
		Do Nothing	Maintain current flood risk strategy	Manage and reduce local flood risk
5	Aim to achieve the requirements of the WFD through implementation of the LFRMS	Potential for both adverse and beneficial impacts. For example, abandonment of assets may allow for the development of a more natural watercourse, however, there would be an increased risk of spreading non-native, invasive species through flooding	Little/no change to current measures to meet WFD objectives	Potential for both adverse and beneficial impacts, depending upon the specific statuses and goals of the waterbody as identified in the Anglian RBMP. Opportunities for achieving WFD objectives may arise through the implementation of measure to reduce local flood risk
6	Protect and enhance biodiversity and geodiversity throughout Central Bedfordshire	Potential for both adverse and beneficial impacts. For example, abandonment of assets may allow for the development of a more natural watercourse, however, there would be an increased risk of spreading non-native, invasive species through flooding	Little/no change to baseline levels	Potential for both adverse and beneficial impacts as a result of active management. Opportunities may arise to enhance biodiversity and geodiversity through the implementation of measure to reduce local flood risk
7	Protect existing riverine habitats, and where possible create new habitats, to maintain naturally functioning ecosystems	Potential for both adverse and beneficial impacts. For example, existing habitat may deteriorate as a result of increased flooding (however, this will often depend on what the site is designated for), however, abandonment of assets may allow a more natural riverine system to develop	Little/no change to baseline, however as a result of increased flooding in the future due to climate change new habitats may be created or existing wetland habitats enhanced. However, habitats intolerant of increased inundation or changes in water quality may be adversely affected	Potential for both adverse and beneficial impacts as a result of active management. Significant opportunities may exist for habitat creation as a result of implementing measures to reduce local flood risk
8	Maintain existing, and where possible create new, habitat supporting fisheries (including Eel), and maintain access upstream	Existing habitat may deteriorate as a result of increased flood risk and any blockages/impediments to fish passage upstream will not be addressed	Little/no change to baseline	Potential for managing and promoting this objective, for example through improvements to fish passage
9	Maintain and/or enhance the character of townscapes, cultural heritage and historic environment assets within Central	Historic environment assets and cultural heritage exposed to damage and deterioration through increased exposure to flood risk	Little/ no change to baseline, however, in the future historic environment assets and cultural heritage may be exposed to increased flooding and damage due to climate change	Potential for both adverse and beneficial impacts as a result of active management, for example through increased protection to vulnerable historic environment assets

SEA Objectives		Options and Effects		
		Do Nothing	Maintain current flood risk strategy	Manage and reduce local flood risk
	Bedfordshire			
10	Protect the highest quality soils of Central Bedfordshire	Potential negative effect resulting from increased erosion of soils as a result of increased flooding and no management of land contamination risks and subsequent effects	Little/ no change to baseline, however, in the future as a result of climate change adverse impacts may arise through erosion and land contamination from increased flooding	Potential for managing and promoting this objective through reduced flood risk
11	Protect and enhance the unique landscape setting and character of Central Bedfordshire, including the Chilterns AONB	Potential negative effect resulting from no management that could adversely impact on landscape character, however, abandonment of assets may allow for the development of a more natural watercourse which may enhance the character of Central Bedfordshire	Little/no change to baseline	Potential for managing and promoting this objective through sensitively designed flood risk management schemes which enhance local landscape character
12	Adapt new and existing development to be resilient to climate change effects	No adaptation or response to climate change	No adaptation or response to climate change	Full consideration of climate change adaptation

5.3 Conclusion

Table 5-1 suggests that the only realistic option is to follow the management strategy, as detailed in the draft Central Bedfordshire Council LFRMS. It is evident that by doing nothing or maintaining current levels of management, there are likely to be detrimental effects on the SEA objectives, which are likely to be prevented by carrying out active flood risk management as proposed by the LFRMS.

6 Appraisal of LFRMS Objectives to improve flood risk

Each of the LFRMS objectives and potential actions were assessed against the SEA framework objectives, the effects of each on the SEA objectives have been presented using appraisal codes as shown in Table 6-1. This cross-check identifies where there are:

- Local Strategy objectives that are likely to contribute to the delivery of wider environmental objectives;
- Uncertainties and potential tensions between the Local Strategy objectives;
- Clear conflicts that should be addressed.

Table 6-1: Appraisal Codes

Code	Effect
+	Positive
0	None Identified
-	Negative
?	Effect Unknown (Positive or Negative)

The cumulative effect of the combination of measures under each LFRMS objective has been assessed against the SEA objectives. The effects of the combination of actions under each objective have been presented as shown in Table 6-2.

Table 6-2: Appraisal Codes for Cumulative Assessment

Code	Effect
++	Strong Positive effect (more than one action as stated in the LFRMS objective has a positive effect on the SEA objective)
+	Positive effect (one action as stated in the LFRMS objective has a positive effect on the SEA objective)
0	No effect Identified
?	Unknown effect, depends on implementation

Table 6-3 shows the results of the assessment of all the actions, as stated in the LFRMS, on the SEA objectives, with brief explanatory comments. Table 6-4 shows the results of the assessment of cumulative effects of the LFRMS objectives on the SEA objectives. An overall summary of the assessments are shown in Table 6-5.

Table 6-3: Assessment of LFRMS objectives against SEA objectives

LFRMS objectives	LFRMS Actions	SEA Objectives												Comments
		1	2	3	4	5	6	7	8	9	10	11	12	
Objective 1: Partnership Working - Establish and maintain effective partnerships within our own organisation, with other Risk Management Authorities, with our neighbouring Lead Local Flood Authorities and with our local communities	Improve the Local Flood Risk Technical Group by bringing together more local partners that have an interest in or a duty to manage local flood risk.	+	+	+	0	0	0	0	0	0	0	0	0	Good working practice promotes positive impacts for social receptors including population, human health and material assets. No direct positive effects for other SEA receptors, although opportunities may arise through partnership working that benefit other receptors.
	Work more closely across all Central Bedfordshire Council departments to provide joined up services that take account of flood risk management so that all our work programmes are based on the Strategy and have opportunities to influence its development.	+	+	+	0	0	0	0	0	0	0	0	0	
	Continue to promote partnership working with Parish Councils and local communities.	+	+	+	0	0	0	0	0	0	0	0	0	
Objective 2: Flood Risk and Development - Ensure that new development looks to reduce the causes and impacts of flooding and that all development uses SuDS as normal practice, and where appropriate safeguard land which is needed for current and future flood management	Establish a SuDS Approval Body (SAB) to approve proposed sustainable drainage systems used as part of new developments.	+	+	+	+	?	?	+	0	0	0	0	0	SuDS may provide a wide range of direct and indirect environmental benefits, particularly to social receptors through reduced flood risk. Sensitive designed SuDS can also provide valuable wetland habitats.
	Ensure Central Bedfordshire Council's Planning policies and development control responses take account of local flood risk management, for example supporting the control of inappropriate development in flood risk areas.	+	+	+	0	0	0	0	0	0	0	0	0	Benefit to population, human health and material assets through lower levels of flood risk. No direct identified effects on other SEA objectives.
	Ensure new developments comply with Central Bedfordshire Council's flood risk management objectives, using sustainable drainage as normal practice.	+	+	+	0	0	0	0	0	0	0	0	+	Benefits to population, human health and material assets and benefits through sustainable practices leading to adaptation to climate change.
	Decide whether new bylaws are needed to ensure that people, who own land, including a watercourse, manage their land responsibly to reduce the risk of flooding for the benefit of the wider community.	+	+	+	+	+	+	+	+	0	+	?	0	Promoting responsible practice will have positive impacts on population, human health and material assets through reduced flood risk. Environmental impacts are likely to be positive where management is undertaken in line with best practice and where habitat enhancements/improvements are incorporated; this may also help achievement of WFD objectives. It should be noted that this assessment only applies if byelaws are introduced that ensure watercourses are managed responsibly.
Objective 3: Local Flood Risk - Develop a greater understanding of local flood risk by identifying where assets may influence the impact of local flood risk, how local flood risk may change in the future and improve local knowledge and recording of flooding incidents	Develop and maintain a record of all known flooding on a parish by parish basis to ensure that local knowledge of flood risk is accessible to all.	+	+	+	0	0	0	0	0	0	0	0	0	Develop and maintaining a record of flooding promotes positive impacts for population, human health and material assets through increased understanding of flooding in area. No direct positive effects for other SEA receptors.
	Develop an asset register of things (e.g. assets such as culverts) or features (e.g. walls, banks) in Central Bedfordshire that have a significant effect on flood risk.	+	+	+	0	0	0	0	0	0	0	0	0	Management strategy, asset registers and plans will not directly affect the environment, but will promote benefits for population, human health and material assets.
	Investigate the things that affect flood risk, such as blockages to culverts, to understand what might be done to reduce the risk of flooding.	+	+	+	0	0	0	0	0	0	0	0	0	
	Continue to develop prioritisation of parishes (through the investment plan process) and use this information to inform and influence updates to the action plan.	+	+	+	0	0	0	0	0	0	0	0	0	
	Investigate local flooding and identify possible solutions, taking enforcement action where appropriate if a landowner has failed in their responsibility to take action to reduce flooding risk.	+	+	+	0	0	0	0	0	0	0	0	0	

LFRMS objectives	LFRMS Actions	SEA Objectives												Comments	
		1	2	3	4	5	6	7	8	9	10	11	12		
	Carry out an assessment to determine where Central Bedfordshire Council may have a responsibility with regards to the risk of flooding from reservoirs and understand the implications of similar assessments prepared by others. Ensure emergency plans are put in place where necessary to counter these risks and keep communities informed of potential risks.	0	0	0	0	0	0	0	0	0	0	0	0	0	An assessment such as this will not have any identified direct effects on the SEA objectives.
	Take steps to better understand local flood risk by preparing Surface Water Management Plans (or undertake a similar assessment) for areas at higher risk of flooding. Currently we anticipate that we will be completing studies for: <ul style="list-style-type: none"> • Arlesey (and Stotfold), • Blunham, • Caddington, • Biggleswade, • Leighton Buzzard and • Southill. 	+	+	+	0	0	0	0	0	0	0	0	0	0	Surface water management plans, or similar plans and assessment, will help in the understanding of flood risk and should lead to benefits for population, human health and material assets if the measures detailed in these plans are implemented.
	As new information becomes available, reassess flooding risks in areas categorised as medium risk and monitor risks in areas categorised as low risk.	+	+	+	0	0	0	0	0	0	0	0	0	0	
Objective 4: Delivery - Establish processes to enable identification of priorities, sources of funding and schemes so that we meet our objectives	Diverting an existing watercourse in the parish of Clifton.	+	+	+	0	?	?	?	?	?	?	?	?	+	Delivery will result in reduced flood risk to the local community for the benefit of population, human health and material assets. The SEA Scoping Stage identified few other environmental receptors in the vicinity of Clifton, however, Henlow Common and Langford Meadows LNR is located adjacent to the parish boundary and within the parish itself there is Clifton Conservation Area and several listed buildings. Diversion of a watercourse has the potential to adversely impact on these receptors through the actual construction works, however benefits may also arise through reduced flood risk to sensitive historic environment assets and through habitat enhancements within the diverted channel; the impact is therefore currently uncertain.
	Installing a new surface water drain in the parish of Caddington	+	+	+	0	?	?	?	?	?	?	?	?	+	Delivery will result in reduced flood risk to the local community for the benefit of population, human health and material assets. The SEA Scoping Stage identified a number of other environmental receptors in the parish of Caddington including Blow's Down SSSI, Cottage Bottom Fields LNR, the Chilterns AONB a SAM (the deserted village west of Zouche's Farm), Caddington Conservation Area and several listed buildings. Whilst installation of a new surface water drain is likely to be a relatively small-scale localised scheme, it does have the potential to adversely impact on these receptors through the actual construction works or through adversely impacting on the integrity and setting of historic environment assets or by changing the hydrological regime of nature conservation sites. However benefits may also arise through reduced flood risk to sensitive historic environment assets and through habitat enhancements as part of the works; the impact is therefore currently uncertain.
	Creating a new flood storage area in the parish of Stondon.	+	+	+	0	?	+	+	+	?	-	?	?	+	Delivery will result in reduced flood risk to the local community for the benefit of population, human health and material assets. The SEA Scoping Stage identified few other environmental receptors in the vicinity of Stondon parish, with the exception of a few listed buildings.

LFRMS objectives	LFRMS Actions	SEA Objectives												Comments	
		1	2	3	4	5	6	7	8	9	10	11	12		
															Creation of a flood storage area has the potential to adversely impact on the integrity and setting of historic environment assets, if located in close proximity. However, beneficial impacts may also arise through reduced flood risk to sensitive assets. Creation of a flood storage area also has the potential to have benefits for biodiversity through the creation of wetland habitats; however, this positive conclusion is dependent on the storage area being sensitively designed and any existing ecological constraints mitigated against. However, the soil resource of the area may be adversely impacted upon by increased waterlogging.
Objective 5: Resource - To take a collaborative approach to reducing flood risk and where appropriate seeking opportunities for packaging work to deliver multiple outcomes. We will aim to use all available resources and funds in an integrated way to support our priority of achieving efficiency savings.	Take advantage of new ways of paying for things that are most needed. We will use an Investment Plan to look at the opportunities to find funding from a variety of organisations, businesses and communities. By working together with our partners we will be able to make best use of the available money.	0	0	0	0	0	0	0	0	0	0	0	0	0	Funding and resource management has no identified effect on the SEA objectives.
	Prioritise what action we can take to minimise flood risk based on this funding.	0	0	0	0	0	0	0	0	0	0	0	0	0	
Objective 6: Local Communities - Limit the effect of flooding on people's normal way of life by taking action with our partners to minimise the impact of local flood risk on our communities and environment, engaging with and empowering affected communities and ensuring that we provide clear and useful information to enhance our local communities' preparedness and resilience to local flood risk.	Encourage local communities to become involved in reducing flood risk by giving those communities that wish to help themselves the training and support to run community response groups. This might see a community take responsibility for recording the level flooding reaches, for instance.	+	+	+	0	0	0	0	0	0	0	0	0	Encouraging working in partnership and community involvement will have an indirect positive effect on population, human health and material assets through increased awareness of flooding issues, preparedness and reduced vulnerability if flooding occurs. No likely effects are identified for the other SEA receptors.	
	Make local communities more aware of the work Central Bedfordshire Council and risk management authorities do.	+	+	+	0	0	0	0	0	0	0	0	0		
	Continue to work with local communities to improve awareness of flood risks and to better understand where help and information can be obtained when flooding occurs or looks likely to occur.	+	+	+	0	0	0	0	0	0	0	0	0		

Table 6-4: Cumulative effects of the actions of the LFRMS on SEA objectives

LFRMS Objectives	SEA Objectives											
	1	2	3	4	5	6	7	8	9	10	11	12
1	++	++	++	0	0	0	0	0	0	0	0	0
2	++	++	++	+	?	?	+	?	0	+	?	+
3	++	++	++	0	0	0	0	0	0	0	0	0
4	++	++	++	0	?	+	+	+	?	?	?	+
5	0	0	0	0	0	0	0	0	0	0	0	0
6	++	++	++	0	0	0	0	0	0	0	0	0

Table 6-5: Summary of Effects of LFRMS objectives/actions on SEA objectives.

Receptor	SEA Objective	Result/Comment	
Population and Human Health and Material Assets	1	Protect and enhance human health and well-being	None of the measures within the LFRMS are considered to have negative effects on this objective; the majority of actions within the strategy are likely to help achievement of this SEA objective.
	2	Minimise the risk of flooding on existing development and amenity	As expected of a strategy for managing flood risk, none of the measures are considered to have negative effects on this objective and the majority of actions within the strategy are likely to help achievement of this SEA objective.
	3	Ensure the potential impact of flooding existing and future infrastructure is minimised	As expected of a strategy for managing flood risk, none of the measures are considered to have negative effects on this objective and the majority of actions within the strategy are likely to help achievement of this SEA objective.
Water Resources	4	Maintain and enhance water resources and quality in Central Bedfordshire	No negative effects identified. Some positive effects may arise through promotion of SuDs and responsible watercourse management.
	5	Aim to achieve the requirements of the WFD through implementation of the LFRMS	No negative effects identified. Uncertainties have been identified largely from dependency on specific scope of the proposed works and the location, nature and scale of implementation measures. Potential for achievement of this SEA objective through promotion of responsible watercourse management.
Biodiversity, Flora and Fauna	6	Protect and enhance biodiversity and geodiversity throughout Central Bedfordshire	No negative effects identified. Uncertainties have been identified largely from a dependency on the location, nature and scale of implementation measures. Creation and enhancement of habitats through watercourse diversions and construction of flood storage areas provides opportunity for achievement of this SEA objective.
	7	Protect existing riverine habitats, and where possible create new habitats, to maintain naturally functioning ecosystems	No negative effects identified. Uncertainties have been identified largely from a dependency on the location, nature and scale of implementation measures. Creation and enhancement of habitats through watercourse diversions and construction of flood storage areas provides opportunity for achievement of this SEA objective, as does promotion of responsible watercourse management.
Fisheries	8	Maintain existing, and where possible create new, habitat supporting fisheries (including Eel), and maintain access upstream.	No negative effects identified. Uncertainties have been identified largely from a dependency on the location, nature and scale of implementation measures. Creation and enhancement of habitats through watercourse diversions and construction of flood storage areas provides opportunity for achievement of this SEA objective, as does promotion of responsible watercourse management.
Cultural Heritage	9	Maintain and/or enhance the character of townscapes, cultural heritage and historic environment assets within Central Bedfordshire	No negative effects identified. Uncertainties have been identified largely from a dependency on the location, nature and scale of implementation measures.
Soils and Geology	10	Protect the highest quality soils of Central Bedfordshire	Negative effects may arise as a result of the creation of a flood storage area at Stondon parish which may increase the waterlogging of soils, preventing achievement of this SEA objective; however, other ecological benefits of this LFRMS action are likely which may outweigh the negative impacts. No other negative effects were identified and uncertainties are largely from a dependency on the location, nature and scale of implementation measures.
Landscape and Visual Amenity	11	Protect and enhance the unique landscape setting and character of Central Bedfordshire, including the Chilterns AONB	No negative effects identified. Uncertainties have been identified largely from a dependency on the location, nature and scale of implementation measures.
Climate Effects	12	Adapt new and existing development to be resilient to climate change effects	No negative effects identified. It is anticipated that the measures within the LFRMS will be sustainably designed and implemented taking into account climate change and so help achievement of this SEA objective.

7 Conclusion and Recommendations

7.1 Conclusions

The key objective of the LFRMS is to manage flood risk by technically, economically, socially and environmentally appropriate options for flood risk management. The intention of the strategy is to set out the roles and responsibilities and to improve local flood risk management so as to minimise the impact of flooding on infrastructure, businesses and properties.

It is foreseen that the 'Do Nothing' approach would promote an overall negative effect on the SEA objectives as a result of abandoning current management practices, increasing the risk of local flooding. This impact would be likely to increase over time as responsible bodies will be unable to incorporate precautionary measures in existing or new developments in a response to climate change pressures. The mid-way option 'Maintain Current Flood Risk Strategy' is unlikely to worsen the current impacts on SEA objectives or have significant change on baseline levels. However, by not fully considering the adaptation to climate change pressures, the current level of flood risk management may be insufficient to prevent detrimental impacts on the environment, socially and ecologically, in the future. The only realistic approach to be employed by Central Bedfordshire is the 'Manage and Reduce Flood Risk' option, which offers more beneficial outcomes and a pro-active approach to flooding pressures.

Many of the proposed measures as detailed in the LFRMS have the potential for direct and indirect environmental benefits. The cross-check assessment of the LFRMS objectives and actions against the SEA objectives highlights positive impacts particularly on SEA objectives 1-3. By actively managing the flood risk and taking actions and initiatives to improve and adapt the way flooding is managed in the area, there will be obvious benefits to population, human health and material assets. Through promoting a greater understanding of the risks, more collaboration and the sharing of resources, communities and responsible parties will be better placed to effectively minimise the risk of flooding in the Central Bedfordshire area. For certain measures within the LFRMS, there is also the potential to benefit other environmental receptors, for example through habitat creation measures as part of construction of a flood storage area and reduced flood risk to vulnerable historic environment assets. However, creation of a flood storage area could have an adverse impact on SEA objective 10 through waterlogging of soils.

A detailed assessment of the cumulative impacts of the Central Bedfordshire County LFRMS actions is ideally suited when specific measures and implementation are known for each action, following consultation. At present some of the LFRMS actions have an unknown effect on the SEA objectives as the location, nature and scale is currently uncertain. Without specific methodology for the implementation of these actions, a precautionary approach must be taken, as there is a potential for a negative impact if appropriate mitigation is not put in place. For example, the parishes of Caddington, Clifton and Stondon will all see flood alleviation strategies being implemented, as outlined in Objective 4. Caddington and Clifton are urban Conservation Areas, thus, mitigation measures are needed to prevent the SEA objectives being compromised as a result of implementation of the LFRMS.

Finally, it is unclear at this stage whether subsequent flood risk planning/strategy activities may require SEA. Central Bedfordshire Council should consider the potential for the Flood Risk Management Plans to be a 'plan or programme' requiring SEA under the SEA Regulations.

7.2 Recommendations

The assessment of the objectives and actions has identified a number of areas where the LFRMS could be strengthened to promote a more sustainable approach.

- Take necessary measures to ensure that impacts of the actions outlined in LFRMS Objective 4 do not have a negative impact on SEA objectives 5-8, 10 and 11, and that all possible environmental opportunities are pursued. The uncertainty of the impacts in this assessment arises from unknown specific information relating to location, scale and implementation of the proposals, however, there is significant potential for positive impacts to arise.
- Ensure that LFRMS Objective 5 is applied in the context of achieving all other objectives and considers the environmental consequences of resources and funding prioritisation.

- Ensure that in the implementation of LFRMS Objective 2 addresses the potential for environmental effects and promotes environmental opportunities.
- Ensure that climatic factors are fully accounted for in developments (existing and new) to ensure that flood risk management is appropriate and adaptable for the future.

7.3 Monitoring

The SEA Regulations require Central Bedfordshire Council to monitor the significant environmental effects of the implementation of the LFRMS. Key indicators and targets that require monitoring are listed in Table 6-1 and are based on those used as part of the SEA framework, together with the main LFRMS objectives that they will help to monitor the achievement of. Some of these are outside the remit of Central Bedfordshire Council and therefore Officers will have to work closely with partners in order to keep up to date with these outputs.

The indicators and associated targets will enable the LFRMS to be monitored and any problems or shortfalls to be highlighted and remedied at an early stage. If failings are evident, it will be necessary for the LFRMS to be revised so that the achievement of the SEA objectives is not compromised. Of note, it is unlikely that any effects negative or otherwise will be seen immediately and that the relative time scale for monitoring will vary for each indicator/target.

Table 7-1: Monitoring indicators

SEA Objective	Monitoring Indicator	Target	LFRMS Objective	
1	Protect and enhance human health and well-being	Number of properties at risk of flooding.	No increase/reduction in properties at risk.	1-6
		Number of residential properties at risk of flooding.	No increase/reduction in residential properties at risk.	1- 6
		The number of key services (e.g. hospitals, health centres, residential/care homes, schools etc) at risk from flooding.	No increase/reduction in key services at risk.	1-6
2	Minimise the risk of flooding on existing development and amenity	Number of commercial businesses and industrial premises at risk of flooding.	No increase/reduction in commercial/ industrial premises at risk.	1-6
		Number of attractions and recreational assets protected from flooding.	No increase/reduction in number of attractions/ recreational assets at flood risk.	1-6
3	Ensure the potential impact of flooding existing and future infrastructure is minimised	Length of road and rail infrastructure at risk from flooding, duration of flood event and a qualitative assessment of the impact.	No increase/reduction in length if rail or road at risk.	1-6
		Number of key infrastructure assets (e.g. power stations, sub-stations) at risk from flooding.	No increase/reduction in infrastructure at risk.	1-6
4	Maintain and enhance water resources and quality in Central Bedfordshire	Numbers of sites with high pollution potential (e.g. landfill sites, waste water treatment works) at risk from flooding.	No increase/reduction in flood risk to sites with high pollution potential as a result of implementation of the LFRMS.	2, 3
		Number of sites where SuDS schemes have been installed.	No reduction in number of SuDS that have demonstrated and improvement in water quality	2, 3
		Number of SuDS that have demonstrated an improvement in water quality.	Increase in number of SuDS demonstrating improved water quality	2, 3
		Number of sites with rainwater capture or re-use of water.	Increase in number of sites with rainwater capture or water re-use	2, 3, 6
		Number of dwellings with 'green' roofs or equivalent.	Increase in number of dwellings with 'green roofs' or equivalent	2, 3, 6
5	Aim to achieve the requirements of the WFD through implementation of the LFRMS	Assessment of FRM options and their impact (e.g. disconnection/ reconnection with floodplain, in-channel works/dredging, barriers to fish movement, reinstatement/ removal of natural morphology).	No deterioration to the WFD status of waterbodies within the catchment	3, 4

		Numbers of sites with high pollution potential (e.g. landfill sites, waste water treatment works) at risk from flooding (to consider potential long-term impact on water quality).	No increase/reduction in number of high pollution potential sites at risk	3, 4
6	Protect and enhance biodiversity and geodiversity throughout Central Bedfordshire	Area of designated nature conservation sites at risk of flooding and assessment of impact.	No adverse impact on designated site as a result of increased area at risk of flooding.	3, 4
		Area of habitat created as a result of implementation of the LFRMS (e.g. flood storage areas creating wetland habitat).	Increase in areas of good wildlife habitat as a result of implementation of the LFRMS.	3, 4
		Reported conservation status of designated sites and the potential impact of the LFRMS on this.	No deterioration in the conservation status of designated sites as a result of implementation of the LFRMS.	3, 4
7	Protect existing riverine habitats, and where possible create new habitats, to maintain naturally functioning ecosystems	Area/length of riverine habitat protected, created or restored as a result of implementation of the LFRMS.	No significant negative impact or deterioration on riverine habitats or species.	3,4
8	Maintain existing, and where possible create new, habitat supporting fisheries (including Eel), and maintain access upstream	Number of new barriers or obstructions to upstream migration of fish and Eel constructed and/or modified.	No new upstream barriers or obstructions to migrating fish and Eel passage.	2-4
		Area/length of suitable habitat supporting salmonid and other fisheries.	No decrease in suitable habitat for fisheries.	2-4
9	Maintain and/or enhance the character of townscapes, cultural heritage and historic environment assets within Central Bedfordshire	Number of historic environment assets (e.g. scheduled monuments, Registered Parks and Gardens, listed buildings including their setting and heritage value) at risk for flooding, and assessment of impact (of both flooding and implementation of flood alleviation measures).	No increase/reduction in number of historic assets at risk from flooding. No adverse impact on historic assets as a result of implementing flood alleviation measures. Maintain the character of the townscapes.	3, 4, 6
10	Protect the highest quality soils of Central Bedfordshire	Area of agricultural land affected by flooding or flood risk management measures.	No increase in flood risk to agricultural land.	2-4
11	Protect and enhance the unique landscape setting and character of Central Bedfordshire, including the Chilterns AONB	Positive or negative impact on landscape character of the AONB and other locally important landscapes (e.g. open spaces).	No adverse impacts on landscape character of the Chilterns AONB or other important landscapes as a result of implementation of the LFRMS. Maintain the character of the rural landscape.	2-4
		Positive or negative impact on river corridor landscape due to implementation of the LFRMS.	Positive impact on the river corridor landscape.	2-4
12	Adapt new and existing development to be resilient to climate change effects	Number of properties resilient and resistant to climate change effects.	Increased number of properties and infrastructure resilient to climate change effects.	2, 3
		Infrastructure resilient and resistant to local flood risk climate change effects.	Increase in resilient infrastructure.	2, 3

8 Next Steps

The next stage of the SEA process (Stage D) involves consulting upon the draft SEA Environmental Report with statutory consultees, stakeholders and the public, and then making any necessary amendments and updates to the documents. Following adoption of the LFRMS and consultation on the SEA Environmental Report, an SEA Statement will be produced outlining how the SEA process has influenced the development of the Central Bedfordshire Council LFRMS, how consultation comments were taken into consideration and how the Strategy will be monitored.

8.1 Consultation

This SEA Environmental Report will be subject to public consultation for 4 weeks (closing date for comments is 17th January 2014). All comments on the content of this Environmental Report should be sent to:

Central Bedfordshire Council
Priory House
Monks Walk
Chicksands
Shefford
Bedfordshire
SG17 5TQ

Iain.Finnigan@centralbedfordshire.gov.uk

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Offices at

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Skipton

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Wallingford

Warrington

Registered Office

South Barn

Broughton Hall

SKIPTON

North Yorkshire

BD23 3AE

t:+44(0)1756 799919

e:info@jbaconsulting.com

Jeremy Benn Associates Ltd

Registered in England

3246693



Visit our website
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