SEA Environmental Report

Final

South Gloucestershire Council

July 2022

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Non-Technical Summary

A detailed Local Flood Risk Management Strategy (LFRMS) requires developing for South Gloucestershire Council area, encompassing the risks associated from all sources of flooding. This must be maintained and monitored as part of the role as a Lead Local Flood Authority (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 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 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 LFRMS. This option is considered to be the only realistic option for managing flood risk in South Gloucestershire. The objectives and actions as set out in the LFRMS 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 SEA objectives 7 to10. A lack of specific information on location, scale and/or implementation of the actions of the LFRMS, has produced several uncertainties in the assessment, particularly with regards to SEA objectives 1-6. These objectives encompass the following SEA receptors: landscape and visual amenity; biodiversity, flora and fauna; water environment; soils and geology and historic environment. There is opportunity for environmental benefits in relation to these receptors for several of the LFRMS measures if mitigation measures are implemented to prevent a negative effect on the SEA objectives and where possible opportunities for enhancement/improvement are promoted. From the assessment, no potential negative effects on any of the SEA objectives were identified from any of the LFRMS objectives or actions at this stage. However, specific plans under the strategy will likely require a Habitat Regulations Assessment (HRA) to ensure that the integrity of the National Site Network sites located within or adjacent to South Gloucestershire are not compromised.

1 Introduction

South Gloucestershire Council (SGC) is currently in the process of developing a Local Flood Risk Management Strategy (LFRMS) for the district. As Lead Local Flood Authority (LLFA) under the Floods and Water Management Act 2010 SGC are responsible for the management of local flood risk, including from surface runoff, groundwater and flooding from ordinary watercourses (smaller rivers and streams).

The requirement for the Strategic Environmental Assessment (SEA) followed the outcome of a screening process, which identified the need for the South Gloucestershire LFRMS to undergo a full SEA. The purpose of this environmental report is to present the predicted environmental effects of the plan, including alternatives, to be used by decision-makers and in public consultation.

1.1 Purpose of the 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).

1.2 Legislative Regime

The Environmental Assessment of Plans and Programmes Regulations 2004, or SEA Regulations, were originally transposed from the European Directive 2001/42/EC (the SEA Directive) into English Law, prior to the UK’s departure from the EU. The Environmental Assessment of Plans and Programmes (Amendment) Regulations 2020 now apply to this work. These Regulations require a SEA to be undertaken for certain types of plans or programmes that could have a significant environmental effect.

The 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. Detailed practical guidance on these Regulations can be found in the Office of the Deputy Prime Minister (ODPM) Government publication, A Practical Guide to the Strategic Environmental Assessment Directive (ODPM, 2005). This document has been used as the basis for undertaking this environmental report, in conjunction with the SEA Regulations.

This SEA environmental report will address these legislative requirements through the completion of 'Stage C' (see Section 2 SEA Process and Methodology) as referred to within the Practical Guide. It will present the predicted significant environmental effects of the strategy, including alternatives, in a form suitable for public consultation and use by decision-makers, taking into account the objectives and geographical scope of the strategy.

1.3 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, LLFAs have been allocated responsibility for developing independent LFRMSs 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.

South Gloucestershire Council as a LLFA has a responsibility to produce a LFRMS to manage water within the district to address local flooding issues.

1.4 The Study Area

South Gloucestershire Council is a local authority located in south-west England (see Figure 1). It is made up of multiple suburban areas to the north and east of Bristol as well as remote areas away from the coast. The River Severn forms the north-western edge of the area, with a wide coastal plain terminated by an escarpment. To the east lies the River Frome Valley drainage area. The Cotswold Escarpment lies on the eastern boundary of South Gloucestershire whilst the western half of the area is mainly urbanised.

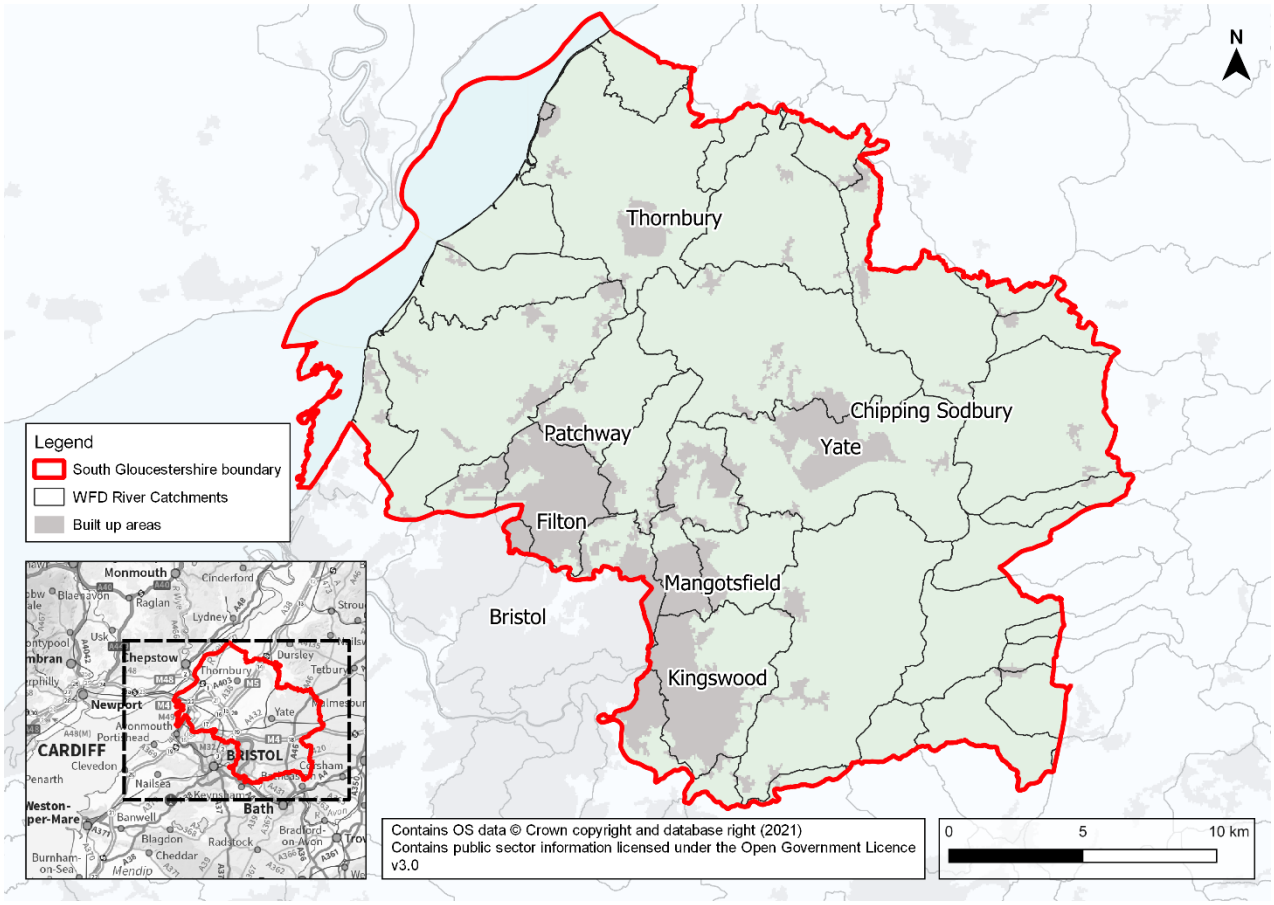

Figure 1 South Gloucestershire Council Location

2 SEA Process and Methodology

2.1 Meeting the Requirements of the SEA Directive

Strategic Environmental Assessment involves the systematic identification and evaluation of the potential environmental impacts of the LFRMS. This information is then used to aid the selection of a preferred option(s) for the strategy, which are those that best meet its economic, environmental and social objectives, and legal requirements.

The full range of environmental receptors has been considered when developing the scope of the SEA. This meets the requirements of the SEA Regulations, which require that an assessment identifies the potentially significant environmental impacts on 'biodiversity, population, human health, fauna, flora, soil, water, air, climatic, material assets including architectural and archaeological heritage, landscape and the interrelationship between the above factors'.

Annex I of the SEA Directive sets out the scope of information to be provided by the SEA. This is described in Table 1 below, which also identifies where in the SEA process for the LFRMS that the relevant requirement will be met.

Table 1 Stages in the SEA Process as Identified within Annex I SEA Directive

SEA Directive Requirements	Where Covered in the SEA Process
a) an outline of the contents, main objectives of the plan or programme and relationship with other relevant plans and programmes;	SEA Scoping Report (Section 3, Section 4 and Section 5)
(b) the relevant aspects of the current state of the environment and the likely evolution thereof without implementation of the plan or programme;	SEA Scoping Report (Section 4)
(c) the environmental characteristics of areas likely to be significantly affected;	SEA Scoping Report (Section 4)
(d) any existing environmental problems which are relevant to the plan or programme including, in particular, those relating to any areas of a particular environmental importance, such as areas designated pursuant to Directives 79/409/EEC and 92/43/EEC;	SEA Scoping Report (Section 4)
(e) the environmental protection objectives, established at international, Community or Member State level, which are relevant to the plan or	SEA Scoping Report (Sections 3 and 4)

SEA Directive Requirements	Where Covered in the SEA Process
programme and the way those objectives and any environmental considerations have been taken into account during its preparation;	
(f) the likely significant effects on the environment, including on issues such as biodiversity, population, human health, fauna, flora, soil, water, air, climatic factors, material assets, cultural heritage including architectural and archaeological heritage, landscape and the interrelationship between the above factors;	SEA Environmental Report (Section 8)
(g) the measures envisaged to prevent, reduce and as fully as possible offset any significant adverse effects on the environment of implementing the plan or programme;	SEA Environmental Report (Section 8)
(h) an outline of the reasons for selecting the alternatives dealt with, and a description of how the assessment was undertaken including any difficulties (such as technical deficiencies or lack of know-how) encountered in compiling the required information;	SEA Environmental Report (Section 7)
(i) a description of the measures envisaged concerning monitoring in accordance with Article 10;	SEA Environmental Report (Section 9.2)
(j) a non-technical summary of the information provided under the above headings.	SEA Environmental Report (Non-technical Summary)

2.2 Stages in the SEA Process

This report has been produced in conjunction with the SEA Regulations and follows the guidance contained within the OPDM *A Practical Guide to the Strategic Environmental Assessment Directive* (ODPM, 2005). 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 Stages in the SEA Process

SEA Stages and Tasks	Purpose	Where Covered in the SEA
Stage A	Setting the context and objectives, establishing the baseline and deciding on the scope	SEA Scoping Report
(A1) Identifying other relevant plans, programmes and environmental protection objectives	To establish how the plan or programme is affected by outside factors, to suggest ideas for how any constraints can be addressed and to help to identify SEA objectives.	SEA Scoping Report
(A2) Collecting baseline information	To provide an evidence base for environmental problems, prediction of effects, and monitoring; to help in the development of SEA objectives.	SEA Scoping Report
(A3) Identifying potential environmental problems	To help focus the SEA and streamline the subsequent problems, prediction of effects, and monitoring; to help in the development of SEA objectives.	SEA Scoping Report
(A4) Developing SEA objectives	To provide a means by which the environmental performance of the plan or programme and alternatives can be assessed.	SEA Scoping Report
Stage B	Developing and refining options and assessing effects	Options development phase
Stage C	**Preparing the Environmental Report**	**SEA Environmental Report**
Stage D	Consulting on the draft LFRMS and the Environmental Report	Consultation phase
Stage E	Monitoring the significant effects of implementing the LFRMS	Monitoring phase

3 Other Relevant Policies, Plans and Programmes

As part of the SEA process, an assessment of the integration of existing policies, plans and programmes on the LFRMS has been undertaken. 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 ODPM SEA guidance recognises that no list of plans or programmes can be definitive. As a result, all policies, plans and programmes which are considered relevant to the development of the LFRMS have been identified in Table 3.

Table 3 Key Policies, Plans and Programmes

Policy, Plan or Programme
International
EU Groundwater Directive – Directive 2006/118/EC on the protection of groundwater against pollution and deterioration, 2006
EU Water Framework Directive - Directive 2000/60/EC, 2000
European Commission, Nitrates Directive 91/676/EEC, 1991
National
Air Quality (Amendment of Domestic Regulations) (EU Exit) Regulations, 2019
Ancient Monuments and Archaeological Areas Act, 1979 (as amended)
Biodiversity 2020: A Strategy for England's Wildlife and Ecosystems, 2011
Cabinet Office, National Strategy Action Plan for Neighbourhood Renewal, 2001
Clean Air Strategy, 2019
Climate Change Act, 2008
Climate Change Adaption Strategy, 2020
Conservation of Habitats and Species Regulations (amendment- EU Exit), 2019
Contaminated Land (England) Regulations, 2006 (as amended)
Water Act, 2014
England Biodiversity Framework, 2008
Environment Act, 1995 (as amended)
Floods and Water (Amendment- EU Exit) Regulations, 2019
Flood and Water Management Act (2010)

Policy, Plan or Programme
Flood Risk Regulations, 2009
Future Water: The Government's water strategy for England, 2008
Heritage Protection for the 21st Century, White Paper, 2007
Invasive Non-Native Species Framework Strategy for Great Britain, 2008 (as amended)
Land Drainage Act 1991 (as amended)
Making Space for Nature: A Review of England's Wildlife Sites and Ecological Network, 2010
Making Space for Water – taking forward a new Government strategy for flood and coastal erosion risk management in England, 2005
National Planning Policy Framework, 2019
Natural Environment and Rural Communities (NERC) Act, 2006
Planning (Listed Buildings and Conservation Areas) Act 1990 Safeguarding our Soils – A strategy for England, 2009
Salmon and Freshwater Fisheries Act, 1975
Securing the Future – the UK Government Sustainable Development Strategy, 2005
The Carbon Plan, 2011
The National Flood and Coastal Erosion Risk Management Strategy for England, 2020
The National Flood Emergency Framework for England, 2011 (as amended)
Water for Life, Water White Paper, 2011
Water for People and the Environment, Water Resources Strategy for England and Wales, 2009
Wildlife and Countryside Act 1981 (as amended)
Regional
Bristol Avon Catchment Flood Management Plan (CFMP), 2012
Severn Tidal Tributaries Catchment Flood Management Plan (CFMP), 2009
River Frome Reconnected Catchment Plan, 2021
Heritage at Risk Register: South West, 2020
South West River Basin District River Basin Management Plan, December 2015
Severn Vale NIA, Nature Improvement Area Programme, 2015
Cotswold Scarp NIA, Nature Improvement Area Programme, 2015
Cotswold Valleys NIA, Nature Improvement Area Programme, 2015

Policy, Plan or Programme
Cotswold Water Park NIA, Nature Improvement Area Programme, 2015
Local
South Gloucestershire Biodiversity Action Plan, 2016
South Gloucestershire Climate Emergency Strategy, 2019
South Gloucestershire Environmental Health Enforcement Policy, 2018
South Gloucestershire Procurement Strategy, 2020

4 Environmental Characteristics and Key Issues

4.1 Introduction

A desk-based study for baseline environmental data (including biological, geological and social) was undertaken to identify the key environmental characteristics within South Gloucestershire Council area. This section presents the findings of the desk-based study in topic specific sections, reflecting the high level of a SEA.

The baseline information may require updating throughout the duration of the SEA process as the LFRMS is developed further and new information becomes available.

4.2 Landscape and Visual Amenity

South Gloucestershire Council falls within four National Character Areas (NCAs) - the Bristol, Avon Valleys and Ridges NCA, the Severn and Avon Vales NCA, the Cotswolds NCA, and the Forest of Dean and Lower Wye NCA. The Bristol, Avon Valleys and Ridges NCA is characterised by alternating ridges and broad valleys, with some steep, wooded slopes and open rolling farmland, it also encompasses the City of Bristol with its historic port (Natural England, 2013a). The Severn and Avon Vales NCA is dominated by the lower valleys of the rivers Severn and Avon, it is characterised by its low-lying open agricultural vale landscape made up of distinct and contrasting vales (Natural England, 2013b). The Cotswolds NCA is characterised by a predominantly oolitic Jurassic Limestone belt that stretches from the Dorset coast to Lincolnshire. The dominant pattern of the Cotswold landscape is of a steep scarp crowned by a high, open wold; the beginning of a long and rolling dip slope cut by a series of increasingly wooded valleys (Natural England, 2013c). The Forest of Dean and Lower Wye NCA is bounded by the Wye Gorge, largely forming the Welsh border, to the west, the plain of South Herefordshire to the north, and the wide valley of the River Severn and Estuary to the south and east, the landscape is a mosaic of woodland and open ground, a characteristic of medieval hunting forests (Natural England, 2012).

The council area also falls partially within the Cotswolds Area of Outstanding Natural Beauty (AONB), where Jurassic limestone gives the Cotswolds their distinctive character, and an underlying unity in its use as a building material throughout the area (Landscapes for Life, 2021). There are no National Parks within the council area.

South Gloucestershire Council is characterised by 21 locally designated Landscape Character Areas (LCA), which are detailed in Table 4 below (South Gloucestershire Council, 2014).

Table 4 LCAs within South Gloucestershire Council

LCA Name	Description
Badminton Plateau	The Badminton Plateau landscape character area is located in the north-east of South Gloucestershire within the Cotswolds AONB. The landscape character of the Badminton Plateau has an open and exposed simple character, arising from its combination of gently sloping and undulating topography together with a lack of significant barriers to the open views.
Marshfield Plateau	The Marshfield Plateau landscape character area is located in the south-east of South Gloucestershire and within the Cotswolds AONB. The Marshfield Plateau area has three principal landform elements which influence its character. These comprise the open plateau/dip slope landscape, the broad shallow and largely open valleys of the upper Broadmead Brook and the smaller scale enclosed lower Broadmead Brook valley to the east of the area.
Ashwicke Ridges	The Ashwicke Ridges landscape character area is located in the south-east of South Gloucestershire within the Cotswolds AONB. The Ashwicke Ridges landscape character area is a varied and complex landscape of plateaux, hilltops, ridges and valleys, with a diverse land cover and very few built elements.
Cotswold Scarp	The Cotswold Scarp landscape character area is a distinct and prominent landform running approximately north-south, defining the western edge of the Cotswolds AONB. The top of the scarp provides the highest vantage point within the South Gloucestershire area and thus allows extensive panoramic views westwards. Its distinct form defines a marked change in character from the plateau/dip slope landscape to the east and the lower undulating ridges and vales to the west.
Wickwar Ridge & Vale	The Wickwar Ridge and Vale landscape character area is located in the north-east of the South Gloucestershire area, to the west of the Cotswold Scarp and is within the Cotswolds AONB. The area is a diverse large-scale landscape, its undulating landform covered with a mix of arable and pastoral fields, commons, two golf courses and large tracts of woodland, as well as smaller, scattered woodlands.
Pucklechurch Ridge & Boyd Valley	The Pucklechurch Ridge and Boyd Valley landscape character area is situated in the east of South Gloucestershire, adjacent to the Cotswold Scarp. This area forms an open plateau, which is a simple, undulating to

LCA Name	Description
	rolling area with the prominent Pucklechurch scarp edge to the west. The intricacies of the enclosed Boyd Valley at Wick and steep profile of the Pucklechurch scarp provide contrast, within an otherwise largely exposed, large scale area.
Falfield Vale	The Falfield Vale landscape character area is located in the north of South Gloucestershire, straddling the M5 corridor. This areas landscape has varied character, largely associated with landform and the historic parkland estates.
Yate Vale	The Yate Vale landscape character area is located in central South Gloucestershire, north-east of Bristol and north of the M4 corridor. The Yate Vale is contained to the east and south by low ridges of the Wickwar Ridge and Pucklechurch Ridge and is distinct from the Tytherington Plain, which has a simpler landform, pattern of land cover and very little settlement.
Tytherington Plain	The Tytherington Plain landscape character area is in central South Gloucestershire, north of Bristol and north-west of Yate. Tytherington Plain comprises a flat open plain to the north and very gently sloping valley of the Ladden Brook to the south. The pattern and location of settlement and built features is limited to higher ground above the floodplain.
Earthcott Vale	The Earthcott Vale landscape character area is located in central South Gloucestershire, to the north-east of Bristol. This landscape character area largely comprises a complex, gently undulating, pastoral and arable landscape, with varying field pattern and landscape structure.
Golden Valley	The Golden Valley landscape character area is located in the south of South Gloucestershire, to the east of the urban area of Bristol, from which it is separated by the Oldland Ridge. This landscape character area is an enclosed, visually contained valley, with broader upper slopes.
Westerleigh Vale & Oldland Ridge	The Westerleigh Vale and Oldland Ridge character area is located along the eastern edge of Bristol. This landscape character area has great variety and distinct landscapes, influenced by Bristol to the west, layers of industrial history and recent built and recreational development over an agricultural landscape, contained to the east by prominent rising ground.
Frome Valley	The Frome Valley landscape character area is located on the south-western boundary of South Gloucestershire. This

LCA Name	Description
	landscape character area is a diverse and intricate area. The concentrations of major settlement and smaller settlement pattern are contained within a rural framework of varying scale and character. The area is defined in part to the south by the urban edge of Bristol. A dense network of road and rail infrastructure cross and segment the area.
Kingswood	The Kingswood landscape character area is located in the south of South Gloucestershire and forms the eastern urban fringe of Bristol. The overall character of this area is dense settlement, with distinct areas comprising former village centres and linear hamlets linked by the road network, phased residential development, concentrations of industrial works and commercial areas, interspersed with a mix of various ages and style of development.
Patchway, Filton and the Stokes	The Patchway, Filton and the Stokes landscape character area is located on the south-western boundary of the South Gloucestershire area and includes the northern fringes of Bristol. Overall, this is a landscape of strategic open spaces and remnant farmland, largely dominated by the urban framework of settlement, roads and high traffic levels.
Avon Valley	The Avon Valley landscape character area is located in the south of the South Gloucestershire area, on the boundary with Bath and North East Somerset Authority and to the east of Bristol. The Avon Valley area has a largely simple rural character comprising floodplain, enclosed wooded valley to the west and open hillsides to the north west, contained by dense settlement.
Rudgeway Ridge & Tytherington Ridge	The Rudgeway and Tytherington Ridge character area extends north eastwards from the M4/M5 interchange (adjacent to the northern edge of Bristol) and is located centrally within South Gloucestershire. The Rudgeway and Tytherington Ridge area is a rural, gently rolling and sloping landscape, its character largely influenced by the ridge/plateau and gentle easterly sloping landform. This rural character remains largely intact, but is influenced variously by roads, a quarry and small settlement clusters.
Severn Ridges	The Severn Ridges landscape character area extends from the northern to south-western boundary of South Gloucestershire, running through its western side. This landscape character area is predominately united through its landform of visually prominent wooded scarps and more complex broad ridges, which extend towards the Severn Estuary, forming a prominent and distinctive rural backcloth to the adjacent Levels.

LCA Name	Description
Oldbury Levels	The Oldbury Levels landscape character area is located in north-west South Gloucestershire. The Oldbury Levels comprise a rural flat, semi-enclosed to open landscape, with a backdrop of the Severn Ridges to the east. The landscape structure is influenced greatly by the pattern of rhines, which in turn largely defines the vegetation structure and the alignment of lanes.
Pilning Levels	The Pilning Levels landscape character area is located on the south western edge of the South Gloucestershire area, to the north west of Bristol. The Pilning Levels comprise a flat, semi-enclosed to fairly open lowland area, with frequent and characteristic views eastwards to the Severn Ridges and more distant views north westwards, towards the Severn Estuary, South Wales and Forest of Dean. Longer distance views south west to the Exmoor coastline are visible in clear weather.
Severn Shoreline & Estuary	The Severn Shoreline and Estuary landscape character area is located along the western edge of South Gloucestershire, extending from the chemical works and Avonmouth to the south, to beyond Oldbury Power Station to the north and extending westwards to include a large proportion of the Estuary. The Severn Shoreline and Estuary landscape character area is a simple, open, expansive area, dominated and influenced by the physical and visual presence of the Severn Estuary, tidal pattern and weather conditions. Its' open and exposed character is variably affected by the two landmark Severn Bridges.

South Gloucestershire Council has a rich and diverse landscape, influenced by a diverse historic environment.

Landscape - Key Environmental Issues

Flood risk management has the potential to affect local landscape characteristics in the South Gloucestershire Council area. This includes impacts on existing character areas and on the setting of local landmarks and landscape features. Many of these aspects are protected through regional and local policies and as such could constrain the implementation of LFRMS objectives if they are shown to present a risk to the quality of the local landscape.

4.3 Biodiversity, Flora and Fauna

4.3.1 South Gloucestershire Local Biodiversity Action Plan (LBAP)

The South Gloucestershire Biodiversity Action Plan (BAP) identifies objectives for the conservation and enhancement of biodiversity within the Council area and describes targets and actions that will help to deliver these objectives. The LBAP aims to: “share biological data to inform decision-making, improve the management for biodiversity of land and buildings owned by South Gloucestershire Council and raise awareness of biodiversity and promote opportunities for formal and informal learning about and understanding of the natural world” (South Gloucestershire Council, 2016).

Numerous priority species listed in Section 41 of the NERC Act are known to be present in South Gloucestershire, and are included in the LBAP, these are: Bullfinch, Dormouse, Great Crested Newt, Hedgehog, Song Thrush, Tassel Stonewort, White Clawed Crayfish and Lesser Horseshoe Bat.

LBAP habitats found in South Gloucestershire are summarised in Table 5 below.

Table 5 South Gloucestershire LBAP Habitats

LBAP Habitats within South Gloucestershire
Lowland Dry Acid Grassland
Lowland Calcareous Grassland
Lowland Meadows
Arable Field Margins
Hedgerows
Traditional Orchards
Coastal and Floodplain Grazing Marsh
Lowland Mixed Deciduous Woodland
Lowland Beech and Yew Woodland
Wet Woodland
Wood Pasture and Parkland
Upland Mixed Ashwoods/ Upland Oakwoods
Coastal Saltmarsh
Intertidal Mudflats
Maritime Cliff and Slopes
Coastal Vegetated Shingle
Ponds
Eutrophic Standing Water

LBAP Habitats within South Gloucestershire
Rivers
Open Mosaic Habitats on Previously Developed Land

4.3.2 Designated Nature Conservation Sites

Several statutorily designated nature conservation sites are located wholly or partially within the boundary of the South Gloucestershire Council area, these are described in Table 6, and shown in Figure 2 below. The sites listed here are those designated for nature conservation, those Sites of Special Scientific Interest (SSSIs) designated wholly for their geological interest are detailed in Table 11.

Table 6 Statutory Designated Sites within South Gloucestershire Council (information online from Natural England and JNCC)

Site	Description
Severn Estuary Ramsar, Special Protection Area (SPA), Special Area of Conservation (SAC) and Site of Special Scientific Interest (SSSI)	The immense tidal range (the second highest in the world) and classic funnel shape make the Severn Estuary unique in Britain and very rare worldwide. The intertidal zone of mudflats, sand banks, rocky platforms and saltmarsh is one of the largest and most important in Britain. The estuarine fauna includes internationally important populations of waterfowl; invertebrate populations of considerable interest; and large populations of migratory fish, including the nationally rare and endangered Allis Shad *Alosa alosa*.
Gorse Covert Local Nature Reserve (LNR)	Gorse Covert LNR contains broadleaved woodland, a pond and ditch and two areas of amenity grassland. The site is located in the heart of Patchway an area of high deprivation. A long standing and active conservation group helps manage the site.
Three Brooks LNR	Three Brooks LNR is located in the middle of Bradley Stoke. The reserve is made up of three bluebell woodlands these are linked by a corridor of habitats including brooks, ponds, rough grassland, hedgerows and a lake. These habitats help to support species such as Reed Bunting *Emberiza schoeniclus*, Skylark *Alauda arvensis*, Great Crested Newt *Triturus cristatus* and Slow Worm *Anguis fragilis*.
Monks Pool and Bradley Brook LNR	Monks Pool and Bradley Brook LNR is made up of three main habitats these being woodland, wetlands and grasslands. The site was designated as a LNR in recognition of their value to the local community as a site of nature conservation importance.

Site	Description
Huckford Quarry LNR	Huckford Quarry LNR has not been used for quarrying for 65 years and in its current form the site has become overgrown with plants which have formed important habitat for many species of wildlife.
Avon Valley Woodland LNR	Avon Valley Woodland LNR is comprised of maturing broadleaved woodland which are home to a variety of wildlife.
Cleeve Wood, Hanham SSSI	Cleeve Wood SSSI is situated on the steep south facing slopes of the River Avon valley near to the City of Bristol. Although much of the wood has been planted with non-native species it contains a very large population of an uncommon plant- Bath Asparagus *Ornithogalum pyrenaicum*. This is the largest and most stable population of this plant nationally.
Willsbridge Valley LNR	Willsbridge Valley LNR is an area rich with wildlife amongst modern housing estates. The valley was once the site of milling, quarrying and a coal dramway. The valley contains many habitats. The woodlands contain bluebells and many bird species. The ponds are important homes for amphibians and invertebrate species. Badgers *Meles meles* also use the valley along with Noctule *Nyctalus noctula* and Greater Horseshoe Bats *Rhinolophus ferrumequinum*.
Wick Golden Valley LNR	Wick Golden Valley LNR contains a variety of habitats along the slopes and bottom of the valley, including a river corridor, woodland and grassland. These habitats have been heavily influenced by the quarrying and production of refined ochre that took place in the 20th century.
Wapley Bushes LNR	Wapley Bushes LNR is located on the outskirts of Yate and Dodington. The reserve contains flower-rich meadows as well as areas of ancient woodland.
Lower Woods SSSI	Lower Woods SSSI is the most extensive ancient woodlands in Avon, which have remained virtually unchanged for 200 years. They are situated on the damp, acid or mildly calcareous clay soils of the Vale of Berkeley.
Bishop's Hill Wood SSSI	Bishop's Hill Wood SSSI consists of species-rich, ancient broadleaved woodland and steeply sloping, neutral-grassland habitats on damp and heavy soils in the north of Avon. Notable species recorded on the site include Adder *Vipera berus* and Nightingale *Luscinia megarhynchos*.

Site	Description
Yarley Meadows SSSI	Yarley Meadows SSSI is an area of unimproved and traditionally managed species-rich meadows supporting a neutral grassland community which is rare throughout Britain. The fields are poorly drained and seasonally waterlogged.

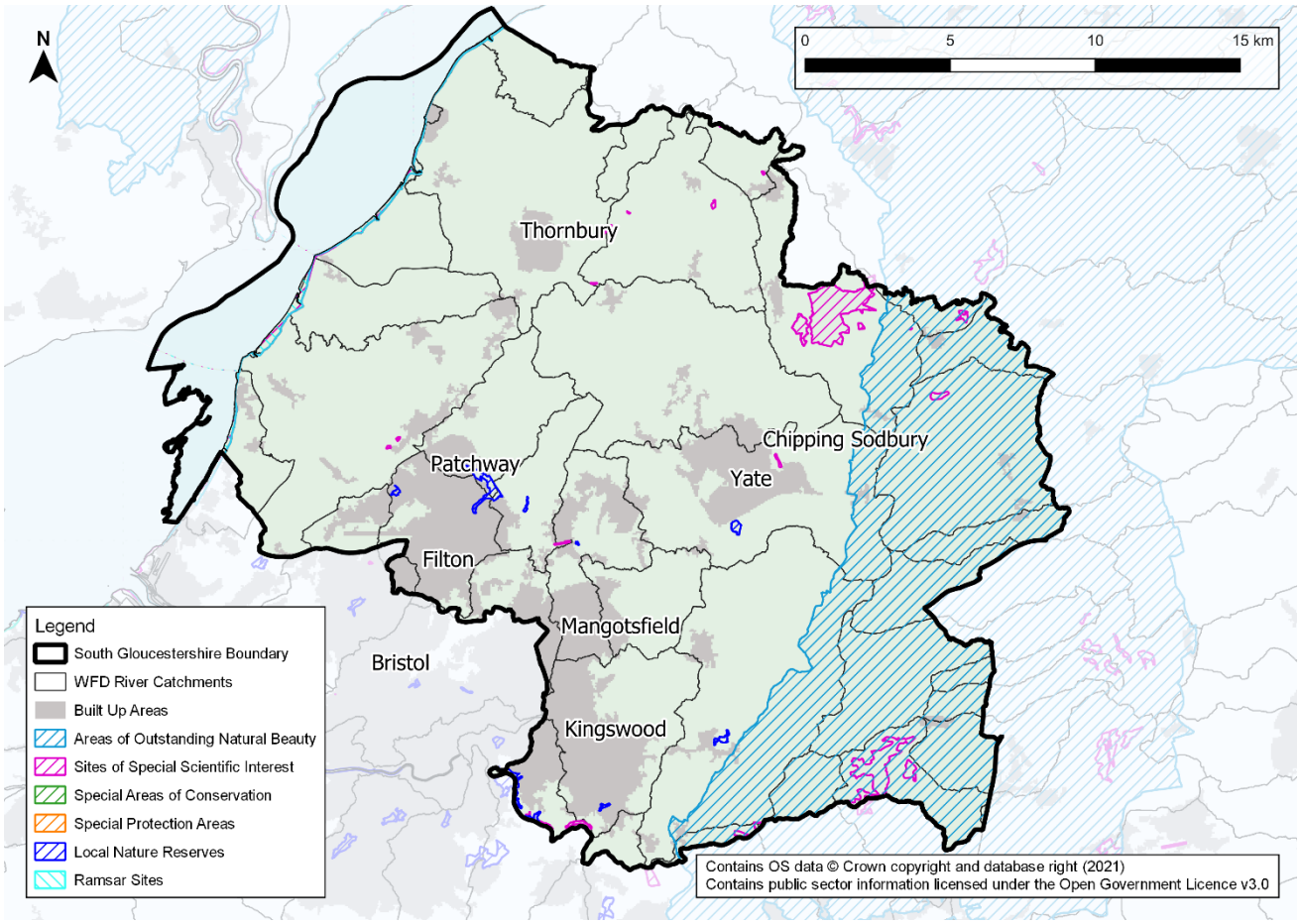

Figure 2 Statutory Designated Sites within South Gloucestershire

In addition to the statutory designated sites, there are numerous locally designated Sites of Nature Conservation Importance (SNCIs) within the South Gloucestershire Council area, these total approximately 350 sites. A full list of the 42 SNCIs that are managed or owned by the council is produced in Table 7 below.

Table 7 Sites of Nature Conservation Importance (SNCIs) Owned or Managed by South Gloucestershire Council

Site	Regional Location	Associated with a River?
Brooklea Open Space (Sidelands) golf course	Bitton	Yes

Site	Regional Location	Associated with a River?
Britannia Wood	Downend	No
Leap Valley	Downend and Bromley Heath	Yes
River Frome (part of) - office, algars manor, frampton end farm, orchard	Frampton and Iron Acton	Yes
Frome Valley, woods opposite lincombe	Frenchay	Yes
River Frome and Oldbury Court Estate (Lincombe)	Frenchay	Yes
Magpie Bottom	Hanham	Yes
Avon Valley, Conham River Park (part)	Hanham	Yes
Avon valley, Hanham Colliery Tip	Hanham	No
Avon Valley,Hencliff Wood	Hanham	No
Avon Valley, Hanham Fields	Hanham	No
Avon Valley, Bickley Wood	Hanham	Yes
Woodwell meadows	Littleton on Severn	No
Leap Woods	Mangotsfield rural	Yes
Cuckoo Lane, Wick wick round-about	Mangotsfield rural	No
Rodway Common (sections of)	Mangotsfield rural, Siston & Kingswood	No
Lincombe Barn Open Space	Mangotsfield rural	Yes
Willsbridge Valley field	Oldland	Yes
Cock Road Ridge	Oldland	No
Barrs Court	Oldland	No
Harnhill	Aust and Olveston	No
Gorse Covert	Patchway	No
Disused railway, Shortwood Farm to Lyde Green Farm	Pucklechurch	No
Earth embankment woods at Tower rd N	Siston	No

Site	Regional Location	Associated with a River?
Part of Dramway, nr st barnabus church	Siston	No
Bridgeyate Common AND Chesley Hill	Siston	No
Siston Common North	Siston	Yes
Webbs Heath Common (managed not ownd)	Siston	No
Warmley Forest Park	Siston	Yes
Mangotsfield Golf Course Marsh cycle path	Siston	No
Siston Common South	Siston	Yes
Parkway P&R	Stoke Gifford	No
Savages Wood	Stoke Gifford	No
Stoke Brook, tributary of the River Frome in 30 Acres	Stoke Gifford	Yes
Webbs Wood and Bradley Stoke Lake	Stoke Gifford	Yes
Huckford Quarry LNR	Winterbourne	Yes
Monks Pool and Bradley Brook (leased)	Winterbourne	Yes
Ridgewoods (managed not owned)	Yate	No
Broad Lane Council Depot	Yate	No
Goose Green	Yate	Yes
Yate Common (leased)	Yate	No
River Frome (part of)- railway, goosegreen, ridgewood, blackhorse pond	Emersons Green	Yes

Many of the statutory and non-statutory designated nature conservation sites within the Council area are dependent on specific hydrological regimes and support water-dependent habitats and species. Flooding and flood risk management therefore has the potential to adversely impact upon water levels and hydrological regimes of these sites. In particular, the Severn Estuary Ramsar, SPA, SAC and SSSI site has the potential to be impacted upon by flooding, as the habitats and species for which these sites are designated are reliant upon the existing tidal patterns and saline

gradients and increases in freshwater inputs have the potential to alter these conditions. However, some sites may also have the potential to be enhanced by the management measures within the LFRMS. Flooding may also introduce contaminated or nutrient enriched waters to designated sites which could adversely impact on interest features.

4.3.3 Habitats Regulations

The Conservation of Habitats and Species (Amendment) (EU Exit) Regulations 2019 provide for the designation and protection of the national site network, the protection of 'European protected species', and the adaptation of planning and other controls for the protection of the national site network. Due to the presence of the Severn Estuary SPA, SAC and Ramsar site in the Council area the LFRMS will also need to be assessed under these regulations.

4.3.4 Fisheries

Watercourses within South Gloucestershire support a range of bony fish species, including the Section 41 priority species European Eel *Angullia anguilla* and Brown Trout *Salmo trutta* (NBN Gateway, 2021). The Severn Estuary supports large populations of migratory fish, including the nationally rare and endangered Allis Shad *Alosa alosa*.

In addition, several water bodies within the council are stocked for recreational and match fishing including Windmill Leisure Lakes, Bagwood Lake and Tortworth Lake.

Flooding of water bodies can displace fish species, including non-native species which is 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.

4.3.5 Non-native Invasive Species

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

Biodiversity - Key Environmental Issues

Several designated nature conservation sites within South Gloucestershire Council are largely dependent upon hydrological conditions and are therefore vulnerable to a change in hydrological regime and water quality that may arise from implementation of the LFRMS. Species of biodiversity importance and habitats identified within the council area may be negatively impacted upon by LFRMS implementation. However, there may be benefits to some species through creation of new habitat and opportunities for habitat enhancement on some sites.

4.4 Water Environment

4.4.1 Watercourses

Watercourses in the council area are not currently heavily managed, and the majority of the watercourses are not subject to water level management. However, there is one Internal Drainage Board (IDB) district in South Gloucestershire, this is the Lower Severn IDB. The Canal and Rivers Trust manage the Kennet and Avon Canal, at the south-eastern edge of South Gloucestershire. The location of the watercourses which are managed by the Lower Severn IDB and the Canal and River Trust waterways are shown in Figure 3 below.

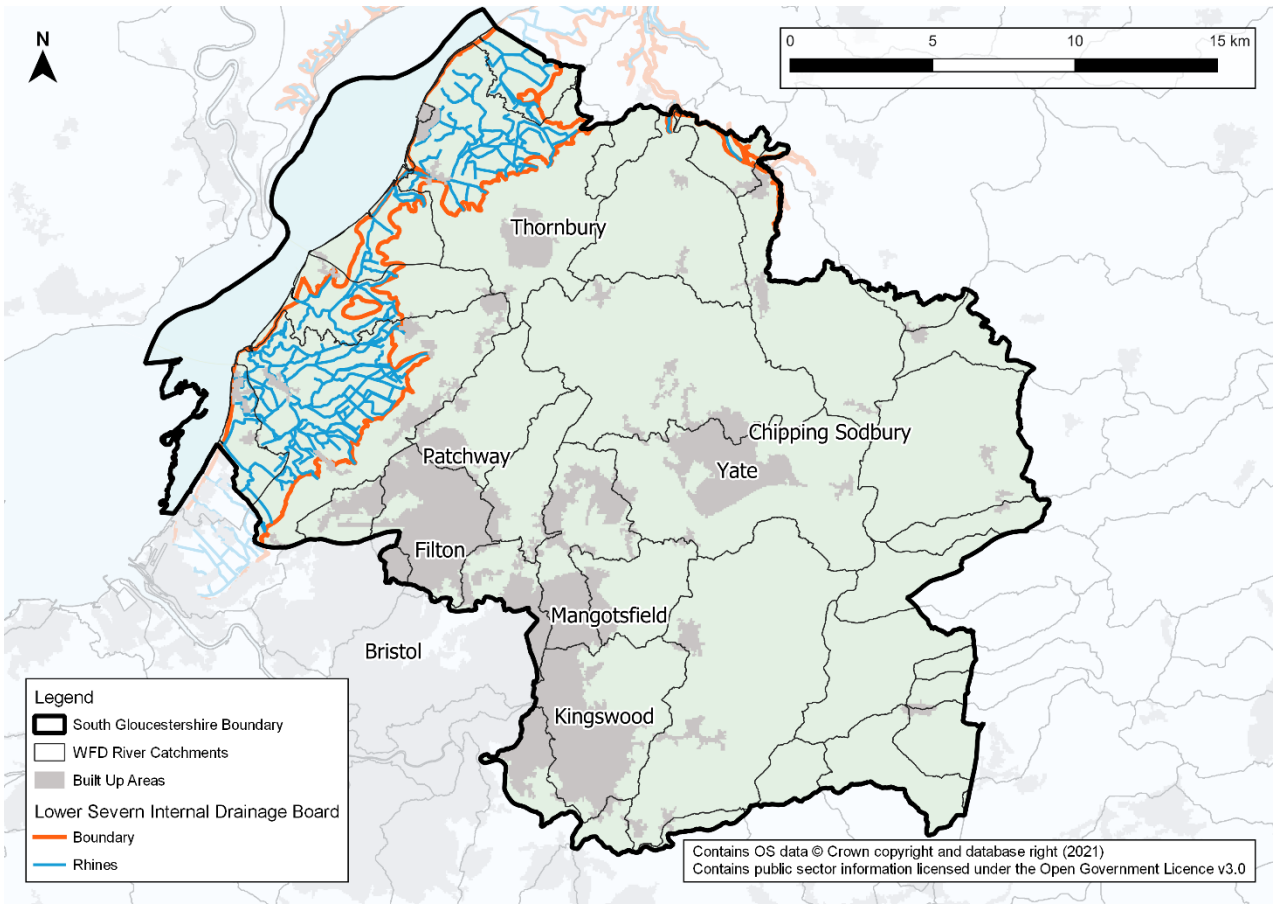

Figure 3 Water Level Management Areas in South Gloucestershire

The largest river whose source lies within the study area is the River Frome. The Frome rises in the grounds of Dodington Park in the Cotswolds in the eastern part of South Gloucestershire, and initially flows north-west and west through Chipping Sodbury and Yate. The Ladden Brook joins the River Frome near Frampton Cotterall, and the River Frome then flows south-west until exiting the study area near Frenchay. Other Main River tributaries of the River Frome include the Bradley, Hortham, Folly, Patchway, and Stoke Brooks.

The River Avon is another major river in the study area, which forms approximately 10km of the southern boundary of the study area between Swineford and Kingwood, where it flows generally north-west-west. Within this area it is joined by two tributaries – the River Boyd and the Siston Brook. The Henbury Trym, or River Trym, is a tributary of the Avon that rises in Filton.

The Little Avon rises within South Gloucestershire to the east of Wickwar, and forms approximately 10km of the northern boundary of the study area, between Wickwar and Avening Green, where it exits the study area.

4.4.2 Water Framework Directive (WFD)

The Water Framework Directive (WFD) is a European Directive which still applies to this work. It 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 through the Water Environment Regulations in 2003 which resulted in the Environment Agency being made responsible for the production of River Basin Management Plans (RBMPs). The South Gloucestershire area is covered by the South West River Basin District RBMP, which identifies the current quality of water bodies in the county and sets objectives for making further improvements to their ecological and chemical quality.

There are a total of 32 WFD river catchments within South Gloucestershire. Those water bodies described in the RBMP that fall within South Gloucestershire are detailed in Table 8 below.

Table 8 WFD Statutes and Objectives for water bodies within South Gloucestershire Council

Water Body	Designation	Current Overall Status	Current Chemical Status	Objectives
Gauze Bk - source to conf R Avon (Brist)	Not designated artificial or heavily modified	Moderate	Fail	Overall Water Body: Good by 2027 Ecological: Good by 2027 Chemical: Good by 2015
Stoke Bk - source to conf Bradley Bk	Heavily modified	Moderate	Fail	Overall Water Body: Good by 2027 Ecological: Good by 2027 Chemical: Good by 2015
Luckington Bk	Not designated artificial or heavily modified	Moderate	Fail	Overall Water Body: Good by 2027 Ecological: Good by 2027 Chemical: Good by 2015
Sherston Avon	Not designated artificial or heavily modified	Poor	Fail	Overall Water Body: Good by 2015 Ecological: Good by 2015 Chemical: Good by 2015
Chew - conf Winford Bk to conf R Avon (Brist)	Not designated artificial or heavily modified	Moderate	Fail	Overall Water Body: Good by 2021 Ecological: Good by 2021 Chemical: Good by 2015
Boyd - source to conf R Avon (Brist)	Not designated artificial or heavily modified	Moderate	Fail	Overall Water Body: Good by 2027 Ecological: Good by 2027 Chemical: Good by 2015

Water Body	Designation	Current Overall Status	Current Chemical Status	Objectives
Trym - source to conf R Avon (Brist)	Heavily modified	Moderate	Fail	Overall Water Body: Good by 2027 Ecological: Good by 2027 Chemical: Good by 2015
Broadmead Bk - source to conf By Bk	Not designated artificial or heavily modified	Moderate	Fail	Overall Water Body: Good by 2021 Ecological: Good by 2021 Chemical: Good by 2015
By Bk - source to conf Broadmead Bk	Not designated artificial or heavily modified	Moderate	Fail	Overall Water Body: Good by 2027 Ecological: Good by 2027 Chemical: Good by 2015
Little Avon - Ozleworth Bk to conf Tortworth Bk	Not designated artificial or heavily modified	Moderate	Fail	Overall Water Body: Good by 2027 Ecological: Good by 2027 Chemical: Good by 2015
Ozleworth Bk - source to conf Little Avon R	Not designated artificial or heavily modified	Moderate	Fail	Overall Water Body: Good by 2015 Ecological: Good by 2015 Chemical: Good by 2015
Little Avon R - source to conf Ozleworth Bk	Not designated artificial or heavily modified	Poor	Fail	Overall Water Body: Good by 2027 Ecological: Good by 2027 Chemical: Good by 2015
Tortworth Bk - source to conf R LIttle Avon	Not designated artificial or heavily modified	Moderate	Fail	Overall Water Body: Good by 2027 Ecological: Good by 2027 Chemical: Good by 2015
Hortham Brook	Not designated artificial or heavily modified	Poor	Fail	Overall Water Body: Good by 2027 Ecological: Good by 2027 Chemical: Good by 2015

Water Body	Designation	Current Overall Status	Current Chemical Status	Objectives
Laddon Bk - source to conf R Frome (Brist)	Not designated artificial or heavily modified	Poor	Fail	Overall Water Body: Good by 2027 Ecological: Good by 2027 Chemical: Good by 2015
Frome (Brist) - source to conf Laddon Bk	Not designated artificial or heavily modified	Moderate	Fail	Overall Water Body: Good by 2027 Ecological: Good by 2027 Chemical: Good by 2015
Bradley Bk - conf Stoke Bk to conf R Brist Frome	Not designated artificial or heavily modified	Poor	Fail	Overall Water Body: Good by 2027 Ecological: Good by 2027 Chemical: Good by 2015
Frome (Brist) - Bradley Bk to conf Floating Hbr	Heavily modified	Moderate	Fail	Overall Water Body: Good by 2027 Ecological: Good by 2027 Chemical: Good by 2015
Lam Bk - source to conf R Avon (Brist)	Not designated artificial or heavily modified	Moderate	Fail	Overall Water Body: Good by 2015 Ecological: Good by 2015 Chemical: Good by 2015
Frome (Brist) - conf Laddon Bk to conf Folly Bk	Heavily modified	Moderate	Fail	Overall Water Body: Good by 2027 Ecological: Good by 2027 Chemical: Good by 2015
Folly Bk - source to conf R Frome (Brist)	Not designated artificial or heavily modified	Moderate	Fail	Overall Water Body: Good by 2027 Ecological: Good by 2027 Chemical: Good by 2015
Oldbury Naite Rhine	Not designated artificial or heavily modified	Moderate	Fail	Overall Water Body: Good by 2027 Ecological: Good by 2027 Chemical: Good by 2015

Water Body	Designation	Current Overall Status	Current Chemical Status	Objectives
St Catherines Bk - source to conf R Avon (Brist)	Not designated artificial or heavily modified	Moderate	Fail	Overall Water Body: Good by 2015 Ecological: Good by 2015 Chemical: Good by 2015
Little Avon - conf Tortworth Bk to mouth	Heavily modified	Moderate	Fail	Overall Water Body: Good by 2027 Ecological: Good by 2027 Chemical: Good by 2015
Chestle Pill	Artificial	Moderate	Fail	Overall Water Body: Good by 2027 Ecological: Good by 2027 Chemical: Good by 2015
Tributary - source to conf By Bk	Not designated artificial or heavily modified	Moderate	Fail	Overall Water Body: Good by 2015 Ecological: Good by 2015 Chemical: Good by 2015
By Brook (Broadmead Bk to Doncombe Bk)	Not designated artificial or heavily modified	Moderate	Fail	Overall Water Body: Good by 2027 Ecological: Good by 2027 Chemical: Good by 2015
Doncombe Bk - source to conf By Bk	Not designated artificial or heavily modified	Poor	Fail	Overall Water Body: Good by 2027 Ecological: Good by 2027 Chemical: Good by 2015
Siston Bk - source to conf R Avon (Brist)	Heavily modified	Moderate	Fail	Overall Water Body: Good by 2027 Ecological: Good by 2027 Chemical: Good by 2027
Bristol Avon (By Bk to Netham Weir)	Heavily modified	Moderate	Fail	Overall Water Body: Good by 2027 Ecological: Good by 2027 Chemical: Good by 2015
By Bk - conf Doncombe	Not designated artificial or	Moderate	Fail	Overall Water Body: Good by 2021 Ecological: Good by 2021

Water Body	Designation	Current Overall Status	Current Chemical Status	Objectives
Bk to conf R Avon (Brist)	heavily modified			Chemical: Good by 2015

4.4.3 Surface Water Quality

Surface water quality within the council area is most at risk from surface run-off of nitrates from agricultural land as a large majority of watercourses within the council area intersect or are adjacent to arable fields and agricultural land. Additionally, run-off from urban areas, including domestic and industrial discharge, and a number of point sources of pollution including sewage treatment works, are likely to put pressure on surface water quality within the council area.

In addition, there are five Nitrate Vulnerable Zones (NVZ) designated under the Nitrates Directive (91/676/EEC) within South Gloucestershire, these are summarised in Table 9 below.

Table 9 Nitrate Vulnerable Zones in South Gloucestershire

NVZ	Description
Feltham Brook NVZ	Feltham Brook NVZ is an area of surface water that could drain into a freshwater water body which has or could have if action is not taken, a nitrate concentration greater than 50mg/l.
Cotswold Jurassic NVZ	Cotswold Jurassic NVZ is an area of water held underground in the soil or in pores and crevices in rock, which has or could have if action is not taken, a nitrate concentration greater than 50mg/l.
Broadmead Brook NVZ	Broadmead Brook NVZ is a catchment designation, agriculture is an important contributor to nitrate pollution in this NVZ.
Doncombe Brook NVZ	Doncombe Brook NVZ is a catchment designation, there are 2 polluted sample points in the water body that designates this NVZ. Water quality has deteriorated, and agriculture is an important contributor to nitrate pollution in this NVZ.
Sherston Avon NVZ	Sherston Avon NVZ is a catchment designation, agriculture is an important contributor to nitrate pollution in this NVZ.

4.4.4 Groundwater Quality

Groundwater is important for public water supply within the council area. Impacts on groundwater are broadly related to land use, with agricultural areas representing a major source of nitrates.

Much of the eastern edge of the council area lies within a Groundwater Source Protection Zone (SPZ), which highlights the importance of the groundwater resources in this area. The council is served by five groundwater sources, detailed in Table 10.

Table 10 WFD Statues and Objectives for Groundwater within South Gloucestershire

Groundwater	Current and Predicted Chemical Status	Current and Predicted Qualitative Status	Current Overall Quality	Overall Objective by 2027
Bristol Triassic	Good	Good	Good	Overall Water Body: Good by 2027 Qualitative Status: Good by 2015 Chemical Status: Good by 2027
Carboniferous Limestone (Alveston)	Good	Poor	Poor	Overall Water Body: Good by 2015 Qualitative Status: Good by 2015 Chemical Status: Good by 2015
Avonmouth Mercia Mudstone	Poor	Good	Poor	Overall Water Body: Good by 2015 Qualitative Status: Good by 2015 Chemical Status: Good by 2015
Inferior Oolite and Bridport Sands	Poor	Good	Poor	Overall Water Body: Good by 2021 Qualitative Status: Good by 2015 Chemical Status: Good by 2021
Bath Oolite	Poor	Poor	Poor	Overall Water Body: Good by 2027

Groundwater	Current and Predicted Chemical Status	Current and Predicted Qualitative Status	Current Overall Quality	Overall Objective by 2027
				Qualitative Status: Good by 2021 Chemical Status: Good by 2027

Groundwater quality of each has been assessed under the WFD, taking into account chemical and qualitative factors. Overall, the groundwater quality is currently classified as poor for four of the five groundwater bodies within the council area. The overall status objectives for these groundwater sources is to achieve Good status by 2027. Of the groundwater sources within the council, only the Bristol Triassic groundwater has shown an upward trend in pollutant concentration and is classified as having both good chemical and qualitative status.

4.4.5 Flooding

Historic flooding data shows the most frequent cause of flooding within South Gloucestershire to be fluvial along main rivers, surface water in inland and urban areas; tidal along the coastline; and a combination of tidal and fluvial flooding in the Severn Estuary-draining tidal plain, particularly in the area of the Lower Severn IDB.

The key historical incidents of flooding identified are summarised as follows:

- 1981 – tidal flooding at Severn Beach resulted in tidal defences being built;
- 2000 – flood defences overtopped in Oldbury-on-Severn;
- 2001 – surface water and river flooding in Emersons Green on the Folly Brook as a result of heavy rainfall;
- 2009 – high surface water runoff combined with reduced rhine capacity and sewer flooding caused internal flooding of properties in Aust;
- 2011 – significant flooding of an ordinary watercourse tributary of the Stoke Brook in Little Stoke due to poor maintenance; and
- Winter 2013/14 -extensive rainfall caused a number of localised flood incidents, the majority associated with main rivers, including the Avon, Frome, and Ladden Brook.

The River Frome, River Avon, Little Avon, Henbury Trym, Stoke Brook, Folly Brook and Ladden Brook have long been associated with fluvial flooding. Other, smaller (‘Ordinary’) watercourses may also pose localised fluvial flood risks but are more difficult to predict. The settlements identified as most at risk of fluvial flooding are Hanham, Swineford, Chipping Sodbury and Yate.

The areas identified most at risk of tidal flooding are Severnside, Severn Beach, New Passage and Oldbury/Sheppardine. In some places along the coastline, such as within the Lower Severn IDB, tidal flooding can occur in combination with fluvial and

surface water sources which can exacerbate flood risk, particularly by reducing the capacity of rhines (drainage channels) discharging to the Severn Estuary which can be tide locked.

The Risk of Flooding from Surface Water (RoFSW) map shows predicted flood extents that predominantly follow topographical flow paths of existing watercourses or dry valleys. Some isolated ponding occurs upslope of topographic features including railway lines and roads.

Although the vast majority of South Gloucestershire is considered at low risk of groundwater flooding, Cromhall and Bitton are identified in the previous LFRMS as having reported historic incidents, and other settlements may be at localised risk.

The settlements most at risk of reservoir flooding are Bitton, due to multiple reservoirs impacting the Avon; Pucklechurch; Filton; and parts of Mangotsfield along the Folly Brook.

Sewer flooding records from April 2004-August 2020 have been provided by Wessex Water, which show all but two incidents of sewer flooding are located in the more heavily urbanised areas of South Gloucestershire bordering Bristol.

Water Environment - Key Environmental Issues

Change in local flood risk as a result of implementation of the LFRMS has the potential to impact on the WFD objectives and must be considered in developing the strategy. Opportunities may arise to help improve water quality and achieve the objectives of the WFD whilst developing the LFRMS.

Increased flood risk in the council area may create additional pathways for pollution from agricultural land and urban areas, which has the potential to detrimentally impact the quality of groundwater.

4.5 Geology and Soils

The geology of a catchment can be an important influencing factor on the way that water runs off the ground surface. This is primarily due to variations in the permeability of the surface material and bedrock stratigraphy.

The bedrock geology of South Gloucestershire is almost completely dominated by sedimentary deposits, with various formations of limestones, sandstones, siltstones, and mudstones covering the vast majority of the area. There is a small band of extrusive mafic tuff and lava in the far north of the area near Tortworth.

Superficial deposits in South Gloucestershire are comprised of a band of alluvium (sand, silt, and mud) running north-east south-west on the coastal plain in the north-west and in various smaller deposits inland; small, isolated deposits of river terrace

(undifferentiated sand and gravel) at various locations inland; and landslip deposits of unknown lithology in the far south.

Soils in South Gloucestershire are generally of a shallow lime-rich type over chalk or limestone in the east of the area, with veins of lime-rich loamy and clayey soils with impeded drainage. In the west of the area soils are generally characterised by having impeded drainage, with isolated pockets of freely draining lime-rich loamy soils.

SSSIs designated for their geological interest are summarised in Table 11 below.

Table 11 Geologically Designated SSSIs in South Gloucestershire

Site	Description
Brinkmarsh Quarry SSSI	Brinkmarsh Quarry is the source of numerous fossils belonging to many phyla, and large numbers of fossils from the quarry are contained within major museum collections throughout the country: for many of these fossils Brinkmarsh is the type-locality, the site from which a particular species was first recognised and described, and it thus occupies a very important place in the study of palaeontology.
Buckover Road Cutting SSSI	Buckover Road Cutting is of particular interest for providing full coverage of the Tortworth Wenlock, as the late 19th century established localities in this higher part of the Brinkmarsh Formation are now no longer available.
Tytherington Quarry SSSI	Tytherington Quarry shows a fissure filling emplaced in Carboniferous Limestone, interpreted as a product of infilling of an underground water course. This is a key site in studies of late Triassic vertebrate biotas.
Slickstones Quarry, Cromhall SSSI	Slickstones Quarry is an outstanding site for its reptilian faunas. The site has yielded four sphenodontid species, including *Clevosaurus hudsoni* and *Planocephalosaurus robinsonae*, as well as a dinosaur and five other reptiles, one of which is stratigraphically the youngest known procolophonid.
Cullimore's Quarry SSSI	Cullimore's Quarry is where Silurian rocks were first studied and later described almost one hundred and seventy years ago. This is a key site for regional interpretations of early Silurian faunas, sedimentation and volcanicity
Damery Road Section SSSI	Damery Road Section is the type locality for the Llandovery Damer Formation, of Telychian age. Its mudstones and sandstones contain a diverse brachipod fauna, and a distinctive acritarch and spore

Site	Description
	flora. This is a key regional site for studies of Lower Silurian biostratigraphy and sediments.
Barnhill Quarry SSSI	Barnhill Quarry is an important site for studying and demonstrating the sediments and facies of the Visean limestones in the northern part of the Carboniferous Limestone outcrop.
Bickley Wood SSSI	Bickley Wood is the most extensive exposure of Carboniferous Downend Group strata in the Bristol Coalfield. This is thus an important site for understanding the geological development of southern Britain during the late Carboniferous.
Winterbourne Railway Cutting SSSI	Winterbourne Railway Cutting shows an exposure of cross-bedded Carboniferous sandstones and occasional shales, belonging to the Mangotsfield Group. The exposure is the best available for the examination of these early Westphalian D beds in the Bristol Coalfield. A nationally important locality for Westphalian stratigraphy.
Aust Cliff SSSI	Aust Cliff is famous for its 'Rhaetic bone bed'. This has been the source of much vertebrate material, which makes this locality the best site for Triassic marine reptiles in Britain. Hundreds of bones have been collected over the past one hundred and fifty years.
Cattybrook Brickpit SSSI	Cattybrook Brickpit SSSI comprises two localities of geological importance, one at the southern end and one at the northern end, exposing rocks of Westphalian age. Of particular interest are unusually complete examples of *Karinopteris*, *Sphenophyllum* and *Lonchopteris* in the crevasse-splay sandstones, providing important information on the form and habitat of these plants. It is the best-known locality for yielding this flora in Britain.

In addition, there are also numerous designated Regionally Important Geological Sites (RIGGS) within South Gloucestershire, these are either managed by the council or on private land.

Geology and Soils - Key Environmental Issues

Impacts on soil quality as a result of flooding or implementation of the LFRMS, for example through increased waterlogging, could affect other environmental receptors, such as nature conservation sites that are reliant on the underlying soil characteristics. Flooding may also result in increased erosion of the Council's soil resource.

4.6 Historic Environment

South Gloucestershire Council area contains a number of historically and culturally valuable sites, reflecting a rich and diverse built and historic environment.

South Gloucestershire contains approximately 2,500 listed buildings, 2.5% of these are Grade I listed buildings, 5.8% are Grade II* and 91.7% of listed buildings in the council area are Grade II listed (South Gloucestershire Council, 2021a). The council area also contains 37 Scheduled Monuments, these are awarded protection against potentially damaging activities, including those associated with development, under the Ancient Monuments and Archaeological Areas Act 1979.

Within the council area there are eight Historic Parks and Gardens, namely: Ashwicke Hall, Badminton Park, Dodington House, Dyrham Park, Stoke Park, Thornbury Castle, Tortworth Court and Warmley House. There is also one historic battlefield in South Gloucestershire- at Lansdown Hill. The locations of these sites are shown in Figure 4 below.

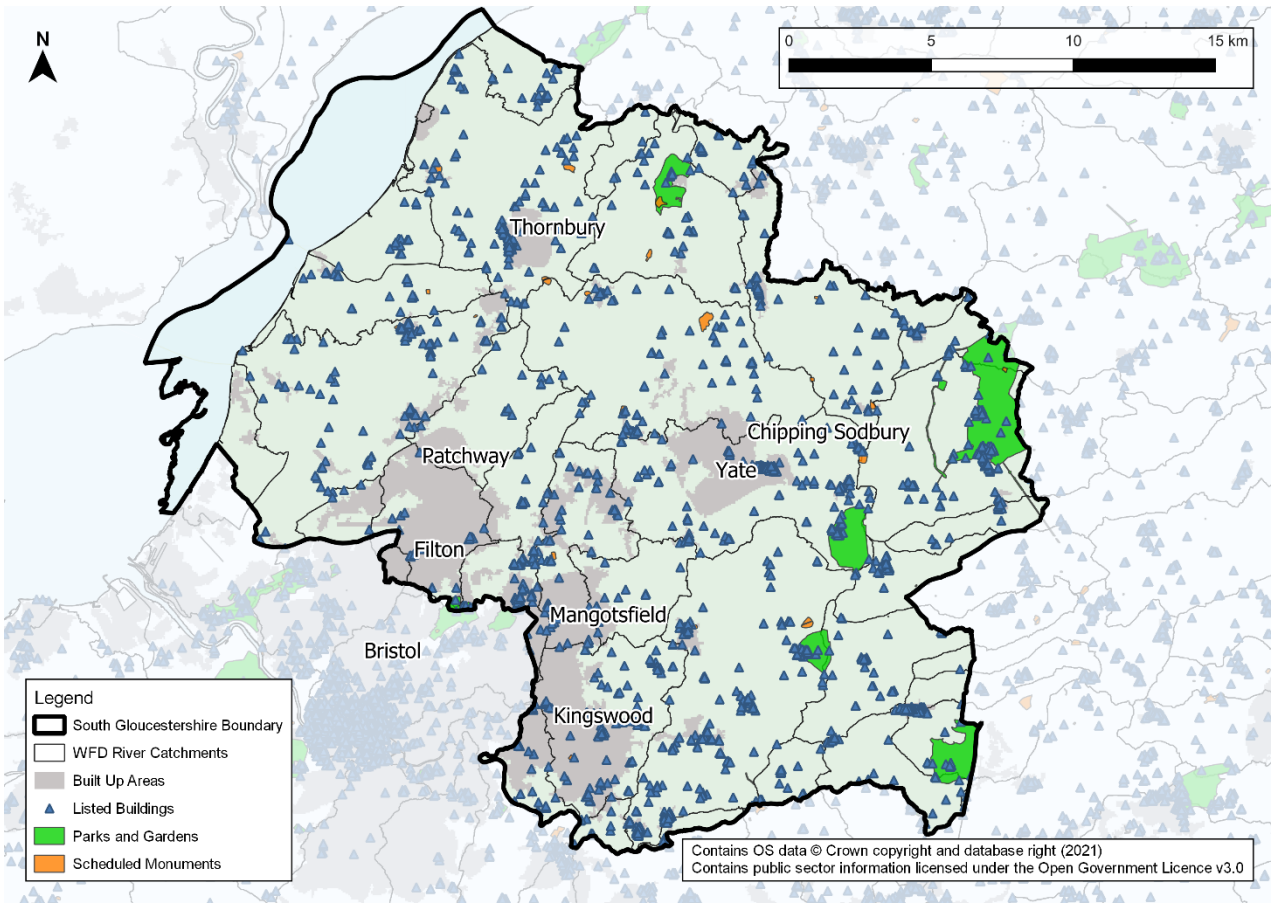

Figure 4 Listed Buildings and Historic Sites within South Gloucestershire

There is also the potential for unknown and undesignated archaeological features to be present within the council area, and when buried in waterlogged soils this can be critical for their maintenance.

Historic Environment - Key Environmental Issues

The council area contains many historically and culturally valuable sites. Flooding may put some of these features at risk, through changed water levels or through the force and inundation of flood waters, and measures to protect the integrity and setting of these cultural assets will need implementing if significant impacts are likely.

4.7 Population

As of mid-2018, the population of South Gloucestershire is estimated to be 282,600 an increase of 3,617 (1.7%) on the 2017 estimate. South Gloucestershire is experiencing positive growth and the population is expected to be 354,300 in 2043, a 25.3% baseline increase on 2018 (South Gloucestershire Council, 2021b).

South Gloucestershire is divided into 28 administrative wards. The approximate population size of each ward is given in Table 12 below.

Table 12 Population Size of Administrative Wards within South Gloucestershire

Administrative Ward	Population
Emersons Green	15,625
Staple Hill & Mansgotfield	15,466
Stoke Gifford	14,516
Frenchay & Downend	12,965
Thornbury	12,883
Hanham	12,845
Frampton Cotterell	12,802
Yate North	11,699
Filton	11,275
Bradley Stoke North	11,238
Dodington	10,727
Bradley Stoke South	10,056
Woodstock	9,992
Longwell Green	9,793
Chipping Sodbury & Cotswold Edge	9,670
Kingswood	9,664
Severn Vale	9,581
Parkwall & Warmley	9,454
Bitton & Oldland Common	9,340
Boyd Valley	9,213
New Cheltenham	8,909
Yate Central	8,117
Winterbourne	7,454
Stoke Park & Cheswick	7,250
Charlton & Cribbs	6,999
Patchway Coniston	5,402
Pilning & Severn Beach	4,972
Charfield	4,737

4.7.1 Health

The general health of the inhabitants within South Gloucestershire is slightly better than that of England and Wales as a whole; 84% of the population are in very good or good health compared to 4.2% that are in bad or very bad health (England and Wales: 81.2% and 5.6% respectively). The life expectancy for women is 84.7 years of age and is higher than that for men who have a life expectancy of 81.2 years (Office for National Statistics, 2013).

4.7.2 Deprivation

South Gloucestershire collectively is a relatively affluent area. It has an Index of Multiple Deprivation (IMD) score of 11.4 and is ranked 274th of 326 local authorities (1st being most deprived and 326th being least deprived). Pockets of deprivation do exist in South Gloucestershire and the most deprived area remains the Pendennis Road area of Staple Hill & Mansgotfield ward which was ranked 4,858 for deprivation nationally in 2019. Two Lower Layer Super Output Areas (LSOAs) (a geographic classification hierarchy designed to improve the reporting of small area statistics) feature in the most deprived 20% of LSOAs nationally for the IMD these are the Pendennis Road area of Staple Hill & Mansgotfield and the New Cheltenham Road area which belongs partially to each of the Kingswood (6%), Woodstock (58%) and the New Cheltenham (36%) wards. The least deprived LSOA in South Gloucestershire is the Brook Way area in Bradley Stoke North. This area is ranked 32,711th nationally for deprivation meaning it is the 133rd least deprived area in England (South Gloucestershire Council, 2019a).

Population - Key Environmental Issues

The population of South Gloucestershire has shown an upward trend and is set to increase in the future. This growing population will place increased demand on a range of resources including the Council's water and sewerage infrastructure, which could be exacerbated by the effects of climate change. Linked to this may be increased demands for development and pressure on the existing housing provision, which may result in greater need for development in areas at risk of flooding.

The general health of the population is good, slightly higher than the national average, with generally low levels of deprivation. However, an increasing population will likely lead to higher demand for health and welfare services within the Council which may become at greater risk of flooding in the future.

4.8 Material Assets

South Gloucestershire contains four motorways including the M32, M4, M5 and M48 including both Severn River Crossings. Additionally, there is also a significant

National Railway network across the district from East to West and South to North. There are six main railway stations with the most notable being Bristol Parkway which offers good connectivity to the rest of the UK.

Several major recreational routes cross the district, and these are the Severn Way, the Cotswold Way and Jubilee Way. Other important inland recreational routes include the Community Forest Path, the Dramway, Frome Valley and Avon Valley Walkways.

Material Assets - Key Environmental Issues

South Gloucestershire Council area benefits from good internal and external rail and road links. Growing population and development are likely to put pressure on these assets and changes to levels of flood risk may impact on their function. Furthermore, flooding places pressures on green infrastructure which has economic, environmental, and social consequences.

4.9 Climatic Factors

South Gloucestershire falls within two climatic regions as classified by the Met Office; The Midlands and South West England. The mean annual temperature range for both regions is between 8-12ºC, which is comparable to the UK mean (6-14ºC). Temperature in both regions follows a seasonal and diurnal variation. January and February are the coldest months with the mean daily minimum 0-5ºC. In the summer months, the regions experience mean maximum temperatures between 19 to in excess of 22ºC, which is comparable with the mean daily maximum in London. Rainfall across both regions is greater in winter (December to February) than summer (June to August).

Part of South Gloucestershire fall within the Midlands region where the number of wet days in winter, where rainfall is greater than 1mm, is 40-45 days, compared to the Somerset and Bristol area of South West England which has 12-13 wet days in winter. In summer The Midlands has an average of 30 days of rain, whereas the Somerset and Bristol area of South West England experiences a drier summer on average, with 12-13 days of rain. The wind speed across the regions varies; the strongest winds in The Midlands are associated with the passage of deep areas of low pressure close to or across the UK. South West England, in comparison is one of the more exposed areas of the UK. The strongest winds are associated with the passage of deep depressions close to or across the British Isles. The frequency and strength of these depressions is far greater in winter and this is when mean speeds and gusts are at their strongest (Met Office, 2013a and Met Office, 2013b).

Climatic Factors - Key Environmental Issues

With precipitation frequency set to significantly increase in winter in the coming decades, the likelihood of river flooding and overwhelming of drains and sewers will rise due to increased surface runoff. This in turn will lead to localised flood events and increased erosion, which will have implications on human health, infrastructure and designated sites. To accommodate the increased likelihood of such events the LFRMS must implement measures aimed at coping with them. However, the LFRMS is unlikely to have a significant impact on climate

Changing climate, mainly that of changing temperatures, poses the biggest threat to the natural environment. Species and habitat abundance and richness will become threatened as a result of changing habitats, localised drier soils and increased competition from non-native invasive species.

4.10 Air Quality

The Environment Act 2005 requires Local Authorities in England and Wales to monitor and record the levels of certain air pollutants within their area. The most recent Annual Status Report for the council for 2019 shows the air quality in the council area is generally good, however some areas are exceeding the annual mean objective for nitrogen dioxide. Three Air Quality Management Areas (AQMA) have been identified (South Gloucestershire Council, 2019b):

- Staple Hill – in the centre around the Broad Street/ High Street/ Soundwell Road/ Victoria Street crossroads and the High Street/ Acacia Road/ Pendennis Road crossroads.
- Kingswood – Warmley – from the Bristol/ South Gloucestershire boundary in Kingswood along the A420 to the junction with Goldney Avenue in Warmley.
- Cribbs Causeway – adjacent to the M5 Junction 17 roundabout (this AQMA was in the process of being revoked in 2019).

All of these AQMA are for nitrogen dioxide pollution as a result of road transport emissions. In general, air quality is improving in South Gloucestershire, with declining trends in nitrogen dioxide levels and only one exceedance of the annual mean objective within the AQMAs (South Gloucestershire Council, 2019b).

Air Quality - Key Environmental Issues

Generally, air quality in the council meets the targets set by the UK Government in the Air Quality Objective (AQO), however there are some areas which require improvement. Greater pressures on air quality may occur in the future through increases in the population of the council, greater development and increased traffic congestion. This could lead to the designation of additional AQMAs to address local impacts on air quality. However, the LFRMS is not likely to impact on air quality and if any impacts arise, they are unlikely to be significant.

5 Scoping Conclusion

Following a review of the environmental baseline data it has been possible to scope out air quality and climate as SEA issues as it is unlikely that there will be a significant impact on either aspect in the Council area from implementation of the LFRMS. A summary of the scoping conclusions are given in Table 13.

Table 13 SEA Scoping Assessment Summary

Receptor	Scoped In?	Conclusion
Landscape and visual amenity	Yes	Local landscape qualities and integrity of the council could be affected by changes to the way watercourses and flood risk is managed in the area. Furthermore, impacts on locally important urban and rural landscapes and landscape features may occur, for example as a result of flood defence construction.
Biodiversity, flora and fauna	Yes	Changes to flooding regimes and flood risk management measures could potentially have impacts on species of biodiversity importance and habitats identified within the council. There is the potential for both positive and negative impacts as a result of the LFRMS. The impacts on species of biodiversity importance and sites must be taken into account throughout development and implementation of the LFRMS.
Water environment	Yes	Flood risk management has the potential to impact on water availability, the water quality of the watercourses within the council and WFD objectives. There is also the potential for indirect impacts on water dependent designated sites/species. Impact on water resources and quality must be considered in developing the strategy.
Soils and geology	Yes	Flooding has the potential to affect soil quality, which supports a number of wetland designated sites within the council area, due to the presence of soils characterised by impeded drainage allowing wetland sites to flourish.

Receptor	Scoped In?	Conclusion
Historic environment	Yes	Changes to flooding regimes and flood risk management measures have the potential to threaten sites and monuments of archaeological and historical importance, including listed buildings and scheduled monuments. Some archaeological features require the maintenance of waterlogged conditions.
Population	Yes	The LFRMS has the potential to provide benefits to the population of the Council area by managing local flood risk.
Material assets	Yes	The Council area contains a number of important infrastructure assets including motorways and railways. Flooding may compromise the function of these assets and the LFRMS must take this into account.
Climate	No	The LFRMS is unlikely to have a significant impact on climate. The impact of climate change on flood risk will be taken into account as part of the LFRMS itself.
Air quality	No	The LFRMS is not likely to have a significant effect on air quality in the council area due to the localised nature of any potential impacts.

6 SEA Framework

6.1 Introduction

The SEA framework, developed at the scoping stage, is used to identify and evaluate the potential environmental issues associated with the implementation of the LFRMS. The framework comprises a set of SEA objectives that have been developed to reflect the key environmental issues identified through the baseline information review. These objectives are supported by a series of indicators, which are used as a means to measure the potential significance of the environmental issues and can also be used to monitor implementation of the LFRMS. These LFRMS objectives are tested against the SEA framework to identify whether each option will support or inhibit achievement of each objective.

Table 14 below summarises the purpose and requirements of the SEA objectives, indicators and targets.

Table 14 Definition of SEA Objectives, Indicators and Targets

	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.

6.2 SEA Objectives and Indicators

SEA objectives and indicators have been compiled for each of the environmental receptors (or groups of environmental receptors) scoped into the study during this phase of the project (see Table 13). The SEA objectives for the LFRMS are given in Table 15 below. These objectives can be refined or revised in light of any additional information obtained during the life of the project.

Table 15 SEA Objectives and Indicators

Receptor	Objective		Indicator(s)	Target(s)
Landscape	1	Protect the integrity of local urban and rural landscapes in the Council area.	Changes in the condition and extent of existing characteristic	No adverse impacts on landscape character of the NCAs, LCAs or other locally important

			elements of the landscape. The condition and quality of new landscape features introduced to the environment (i.e. new flood defences).	landscapes/features as a result of implementation of the LFRMS.
Biodiversity, flora and fauna	2	Protect and enhance protected, important and notable habitats and species and designated nature conservation sites in the Council area.	Area of designated nature conservation sites at risk of flooding and an assessment of the impact. Monitoring of reported conservation status of designated nature conservation sites. Area of designated nature conservation site destroyed, damaged or enhanced as a result of implementation of the LFRMS. Area of habitat created as a result of implementation of the LFRMS. Number of new barriers or obstructions to upstream migration of fish and Eel constructed and/or modified.	No adverse impact on designated nature conservation sites as a result of changes to the current flooding regime. No deterioration in the conservation status of designated sites as a result of implementation of the LFRMS. No adverse impact on designated nature conservation sites as a result of flood risk management measures. Increase in the area of good wildlife habitat as a result of implementation of the LFRMS. No new impediments to fish and eel passage created as a result of LFRMS implementation.
	3	Maintain and enhance habitat connectivity and wildlife corridors, particularly along watercourses.		
Water environment	4	Do not inhibit achievement of the WFD objectives and contribute to their achievement where possible.	Assessment of LFRMS options and their impact on the WFD objectives.	No deterioration to the WFD status of waterbodies within the catchment.

Soils and geology	5	Maintain soil quality within the Council area.	Area of agricultural land at risk of flooding and an assessment of the impact. The condition and quality of soils within the Council area (with emphasis on designated sites).	No increase in flood risk to good agricultural land. No reduction in condition of soils in designated sites within the Council area.
Historic environment	6	Preserve and where possible enhance important historic and cultural sites within the Council area.	Number of designated heritage sites at risk from flooding and an assessment of the impact. Number of designated heritage sites adversely impacted upon by flood risk management measures	No adverse impact on designated heritage sites as a result flooding. No adverse impact on the integrity/setting of designated heritage sites as a result of flood risk management measures.
Population	7	Protect and enhance human health and well-being.	Number of residential properties at risk from flooding.	No increase in number of residential properties at risk from flooding.
	8	Protect key social infrastructure assets and services from flooding as a result.	Number of key services (e.g. hospitals, health centres, residential/care homes, schools etc) at risk from flooding.	No increase in number of key services at risk from flooding.
Material Assets	9	Minimise the impacts of flooding to the Council's transport network and key critical infrastructure.	Length of road and rail infrastructure at risk from flooding. Number of key infrastructure assets at risk from flooding. Number of Green Infrastructure assets at risk from	No increase in length of road and rail infrastructure at risk from flooding. No increase in number of infrastructure assets at risk from flooding. No increase in number of Green Infrastructure assets

			flooding or created/enhanced through implementation of the LFRMS.	at risk of flooding and/or an enhancement of current Green Infrastructure Assets in the Council area.
	10	Minimise the risk of flooding on existing development and amenity land.	Number of commercial businesses and industrial premises at risk of flooding. Number of attractions and recreational assets protected from flooding.	No increase in number of commercial/ industrial properties at flood risk. No increase in number of attractions/ recreational assets at flood risk.

7 Plan Issues and Alternatives

7.1 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 developed and assessed at a strategic level against the above SEA objectives and environmental baseline. The results of this assessment will be used to inform the decision-making process in choosing a preferred way of delivering the LFRMS.

7.2 Appraisal of Reasonable Alternatives

The LFRMS has the purpose of managing and reducing local flood risk in the study area. The LFRMS Actions have been assessed against the SEA objectives for each of the following options: (as shown in Table 16)

- Do Nothing - where no action is taken and existing assets and ordinary watercourses are abandoned.
- Maintain current flood risk strategy - 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.
- Manage and reduce local flood risk - take action to reduce the social, economic and environmental impact due to flooding.

Table 16 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 the integrity of local urban and rural landscapes in the Council area.	Locally important landscape features, including those identified within the LCAs, exposed to damage and deterioration through increased exposure to flood risk.	Little change to baseline, however, in the future, as a result of climate change, adverse impacts on local landscapes may arise.	Potential for managing and promoting this objective through sensitively designed flood risk management schemes which enhance local landscape character.
2	Protect and enhance protected, important and notable habitats and species	Potential for both adverse and beneficial impacts. For example, abandonment of assets may allow	Little/no change to baseline levels; however, as a result of increased flooding in the future due to	Potential for both adverse and beneficial impacts as a result of active management. Opportunities may

	and designated sites in the Council area.	for the development of more natural watercourses and wetland habitat creation/ enhancement through increased inundation. However, there could be an increased risk of spreading non-native, invasive species through flooding and detrimental impacts on habitats intolerant of increased inundation.	climate change, new habitats may be created, or existing wetland habitats enhanced. Although, habitats intolerant of increased inundation or changes in water quality may be adversely affected.	arise to enhance biodiversity and notable habitats within the Council through the implementation of measures to reduce local flood risk.
3	Maintain and enhance habitat connectivity and wildlife corridors, particularly along watercourses.	Potential adverse impacts may arise as existing corridors deteriorate as a result of increased flood risk. As the current condition of the watercourse network changes this may adversely impact upon some species. Blockages/ impediments to fish passage upstream will not be addressed.	Little/no change to baseline levels.	Potential for managing and promoting this objective through the LFRMS, for example through improvements to fish passage, encouraging appropriate management of watercourses by riparian landowners and undertaking watercourse maintenance.
4	Do not inhibit achievement of the WFD objectives and contribute to their achievement where possible.	Potential for both adverse and beneficial impacts. For example, abandonment of assets may allow for the development of more natural watercourses, however, there would be an increased risk of spreading non-native, invasive	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 water bodies as identified in the South West RBMP. Opportunities for achieving WFD objectives may arise through the implementation of

		species through flooding.		measures to reduce local flood risk.
5	Maintain soil quality within the Council area.	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, which will help to protect the Council area's soil resource from erosion and its quality.
6	Preserve and where possible enhance important historic and cultural sites within the Council area.	Historic assets and cultural heritage sites will be exposed to damage and deterioration through increased exposure to flood risk.	Little/no change to baseline, however, in the future, important historic and cultural sites 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 of vulnerable historic and cultural assets or reduced inundation resulting in the desiccation of buried archaeology.
7	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 flood risk is maintained and the risk may increase in the future as a result of climate change.	Managing and reducing local flood risk will help to protect people and residential properties from flooding.
8	Protect key social infrastructure assets and services from flooding as a result.	Increased exposure to flood risk from a combination of no management and climate change,	Maintains the current flood risk levels, although this risk may increase in the future as a result of climate change.	Managing and reducing local flood risk will help to minimise flooding to key social infrastructure services such as schools and hospitals.
9	Minimise the impacts of flooding to the Council's transport network and	Increased exposure to flood risk from a combination of no management and climate change.	Maintains the current flood risk levels, although this risk may increase in the future due to climate change.	Managing and reducing local flood risk will minimise the impact of flooding on roads, railways and other

	key critical infrastructure.			infrastructure assets.
10	Minimise the risk of flooding on existing development and amenity land.	Increased exposure to flood risk from a combination of no management and climate change.	Maintains the current flood risk levels, although this risk may increase in the future as a result of climate change.	Managing and reducing local flood risk will help to minimise flooding to commercial/ industrial properties and recreational/ amenity assets.

Table 16 suggests that the only realistic option is to follow the management strategy, as detailed in the South Gloucestershire Council LFRMS. 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.

8 Appraisal of LFRMS Actions to Improve Flood Risk

8.1 Impact Significance

The unmitigated impacts of the LFRMS Actions on achieving the SEA objectives will be identified through the analysis of the baseline environmental conditions and use of professional judgement. The significance of effects will be scored using the five-point scale summarised in Table 17 below. If there is high uncertainty regarding the likelihood and potential significance of an impact (either positive or negative), it will be scored as uncertain.

Table 17 Impact Significance Key

Impact Significance	Impact Symbol
Significant positive impact	++
Minor positive impact	+
Neutral impact	O
Minor negative impact	-
Significant negative impact	--
Uncertain impact	?

8.2 Assessment Approach

The LFRMS Actions will be evaluated in light of their potential cumulative, synergistic and indirect environmental effects on the different SEA receptors selected for further assessment. The assessment of these environmental effects will be informed by the baseline data collected at the scoping stage, professional judgement and experience with other water level management and flood risk related SEAs, as well as an assessment of national, regional and local trends. In some cases, the assessment will draw upon mapping data and GIS to identify areas of potential pressure, for example due to presence of environmental designations.

Throughout the assessment the following will apply:

- Positive, neutral and negative impacts will be assessed, with uncertain impacts highlighted;
- The duration of the impact will be considered over the short, medium and long term;
- The reversibility and permanence of the impact will be assessed. For example: temporary construction impacts, such as during decommissioning pumping stations; impacts which can be mitigated against/restored over time

such as altered drainage pressures; or completely irreversible changes to the environment; and

- In-combination effects will also be considered.

The significance of effects upon each of the SEA objectives will then be evaluated and used to inform option selection.

Table 18 Assessment of LFRMS Actions Against SEA Objectives

Resilience Theme	LFRMS Actions	SEA Objectives										Comments
		1	2	3	4	5	6	7	8	9	10	
Placemaking	Provide advice and support Local Plan policy and site allocations	O	O	O	O	O	O	+	+	+	+	Providing advice so that new development does not increase, and/or has the opportunity to decrease flood risk, has the potential to provide social and economic benefits.
	Encourage no built development within 8m from of an ordinary watercourse outside of IDB areas within the Local Plan area (in line with EA guidelines). These restrictions are in place for the preservation of the watercourse corridor, wildlife habitat, flood flow conveyance and future watercourse maintenance or improvement	O	+	++	+	O	O	O	+	+	+	Encouraging no development in the immediate watercourse corridor will have direct benefits to ecological receptors and material assets.
	Engage with landowners to discuss influences of the environmental land management scheme on flood risk	O	O	O	O	O	O	O	O	O	O	Engaging with landowners will not have any direct effects on the SEA objectives.

Resilience Theme	LFRMS Actions	SEA Objectives										Comments
		1	2	3	4	5	6	7	8	9	10	
	Review development proposals, ensuring where possible that open channels are maintained within proposed site layouts. Any proposals to alter these watercourses would require Land Drainage Consent from SGC or LS IDB.	O	+	++	+	O	O	O	+	+	+	Encouraging no development in the immediate watercourse corridor will have direct benefits to ecological receptors and material assets.
	Provide responses to statutory consultations on the local flood risk and drainage aspects of major planning applications within deadlines set	O	O	O	O	O	O	O	O	O	O	Providing responses within the deadlines set will not have any direct effects on the SEA objectives.
	Undertake investigations, and enforcement action where necessary, into potential contraventions of the Land Drainage Act	O	O	O	O	O	O	+	+	+	+	Undertaking investigations will not have any identified direct effect on SEA receptors, however investigating potential contraventions of the Land Drainage Act should promote better flood management in the area.
	Equality Impact Assessment and Analysis (EqIAA) will be conducted as appropriate throughout the delivery of this Strategy in order to identify impacts and actions for all communities	O	O	O	O	O	O	O	O	O	O	Equality Impact Assessment and Analysis will not have any identified direct effects on the SEA objectives.

Resilience Theme	LFRMS Actions	SEA Objectives										Comments
		1	2	3	4	5	6	7	8	9	10	
	Address local flood risk appropriately within neighbourhood plans	+	+	+	+	+	+	+	+	+	+	Appropriately addressing flood risk within neighbourhood plans will have an indirect positive effect on all of the SEA objectives.
	Continue to maintain an up-to-date asset register including adding SuDS features to the register where appropriate	O	O	O	O	O	O	O	O	O	O	Asset registers will not have any identified direct effects on the SEA objectives.
	Promote awareness of householder responsibilities and legal obligations of riparian ownership	O	O	O	O	O	O	+	O	O	+	Promoting awareness of responsibilities will not have any identified direct effect on SEA receptors, however this action should promote better flood management in the area improving human wellbeing and minimising risk of flooding on existing developments.
	Maintain and update records of land drainage enquires and ordinary watercourse, Land Drainage Consents	O	O	O	O	O	O	O	O	O	O	Maintaining and updating records will not have any identified direct effects on the SEA objectives.
	Support local communities in understanding the impacts of urban creep	O	O	O	O	O	O	O	O	+	+	Promoting awareness of urban creep should help to reduce the impact of flooding on existing development and amenity land and the Council's transport network and key critical infrastructure.

Resilience Theme	LFRMS Actions	SEA Objectives										Comments
		1	2	3	4	5	6	7	8	9	10	
	In conjunction with the River Frome Reconnected partnership, work with planners to ensure developments, particularly around the Filton area, benefit the water and land environment.	+	+	+	+	+	O	+	+	+	+	Ensuring developments benefit the water and land environment will have a direct positive effect on all of the SEA objectives.
	Ensure that development proposals that discharge into watercourses should incorporate additional surface water storage into the design of the site. This is to ensure that surface water runoff from development can be safely accommodated during tide-locking without increasing flood risk either on or off-site.	O	O	O	O	O	O	O	O	+	+	Ensure that development proposals incorporate additional surface water storage will help to reduce the impact of flooding on existing development and amenity land and the Council's transport network and key critical infrastructure.
	Ensure proposed development demonstrates that there is an appropriate level of commitment to maintain the standards of protection afforded by the flood defences, to ensure the long-term viability.	O	O	O	O	O	O	O	O	+	+	This action will help to reduce the impact of flooding on existing development and amenity land and the Council's transport network and key critical infrastructure.

Resilience Theme	LFRMS Actions	SEA Objectives										Comments
		1	2	3	4	5	6	7	8	9	10	
Protect	Work with SGC Highways Operations Team to ensure the ongoing maintenance of existing assets and review maintenance schedules	O	O	O	O	O	O	O	+	+	+	This action should help to reduce the impact of flooding on existing development and amenity land, key social infrastructure assets and the Council's transport network and key critical infrastructure.
	Assess the adequacy of flood defences within South Gloucestershire and how this sits with the 'Hold the Line Policy' in the Shoreline Management plan.	O	O	O	O	O	O	O	O	O	O	This action will not have any identified direct effects on the SEA objectives.
	Improve awareness and understanding, and promote use of natural processes (such as Natural Flood Management) in catchments to manage local flood risk and improve biodiversity	+	++	++	+	+	+	+	+	+	+	Improving understanding of natural processes will have an indirect positive effect on population, human health and material assets through increased awareness of flooding issues and is likely to result in benefits for habitats and species.
	Identify the best ways of enabling Partnership Funding for resilience and flood risk management schemes	O	O	O	O	O	O	O	O	O	O	Identifying funding streams will not have any direct effects on the SEA objectives.

Resilience Theme	LFRMS Actions	SEA Objectives										Comments
		1	2	3	4	5	6	7	8	9	10	
	Align flood risk management policies and projects with catchment priorities when opportunities arise	O	O	O	O	O	O	O	O	O	O	This action will not have any direct effects on the SEA objectives.
	Support communities to adapt to and manage the impacts of climate change	+	+	+	+	+	+	+	+	+	+	Supporting communities to adapt to climate change will help to ensure that flood risk is managed sustainably and with due consideration to the area's most likely to see impacts on the environment (social, economic and ecological receptors).

Resilience Theme	LFRMS Actions	SEA Objectives										Comments
		1	2	3	4	5	6	7	8	9	10	
	Continue to promote the use of Sustainable Drainage Systems (SuDS) in South Gloucestershire - Planning applications for phased developments should be accompanied by a Drainage Strategy, which takes a strategic approach to drainage provision across the entire site and incorporates adequate provision for SuDS within each phase. SuDS are to be designed so that they are easy to maintain, and it should be set out who will maintain the system, how the maintenance will be funded and should be supported by an appropriately detailed maintenance and operation manual.	O	+	++	+	O	O	O	+	+	+	Promoting the use of SuDS will have direct benefits to ecological receptors and material assets.

Resilience Theme	LFRMS Actions	SEA Objectives										Comments
		1	2	3	4	5	6	7	8	9	10	
	Create a prioritised programme of capital flood risk management works	?	?	?	?	?	?	+	+	+	+	Delivery of a programme of capital flood risk management works will result in reduced risk to the local community for the benefit of population, human health and material assets. However, physical works to install, manage and maintain flood assets may have adverse impacts on designated sites (both ecological and cultural) in the proximity of the works. There is the potential that works will promote positive impacts for these receptors through managing water within the locality for their benefit.
	Promote biodiversity, habitat improvements and Countryside Stewardship schemes to help prevent soil loss and reduce runoff from agricultural land	+	++	++	+	+	+	+	+	+	+	Promoting these measures will have an indirect positive effect on population, human health and material assets through increased awareness of flooding issues and is likely to result in direct benefits for habitats and species.
	Seek to support Environmental Net Gain for development through the implementation of Natural Flood Management and nature-based solutions	+	++	++	+	+	+	+	+	+	+	Supporting use of nature-based solutions will have direct benefits to the ecological receptors and will have an indirect positive effect on landscape, cultural assets, population, human health and material assets

Resilience Theme	LFRMS Actions	SEA Objectives										Comments
		1	2	3	4	5	6	7	8	9	10	
	Continue to work with the Environment Agency, Bristol City Council and Bath and North East Somerset Council to review opportunities and funding for the River Avon Strategy (between Bath and Bristol)	O	O	O	O	O	O	O	O	O	O	Identifying funding streams will not have any direct effects on the SEA objectives.
	Continue to work with neighbouring risk management authorities where there are cross boundary catchments to identify opportunities to reduce flood risk	O	O	O	O	O	O	+	+	+	+	Working with neighbouring authorities will not have any identified direct effect on SEA receptors, however this action should promote better flood management and reduce flood risk.
	Continue working to improve surface water drainage across the county	O	O	O	O	+	O	+	++	++	++	Improving surface water drainage will directly promote better flood management in the area.
	Take the lead on improving the awareness, understanding and delivery of Property Flood Resilience (PFR) measures to manage local flood risk in South Gloucestershire	O	O	O	O	O	O	+	+	+	+	Promoting PFR measures will provide better flood management in the area, ensuring benefits for population and material assets.
	Promote tree planting in areas of known flood risk	+	+	+	+	+	O	+	O	+	+	Promoting tree planting will provide better flood management in the area

Resilience Theme	LFRMS Actions	SEA Objectives										Comments
		1	2	3	4	5	6	7	8	9	10	
	Performance of all flood alleviation/highway improvement works will be annually monitored to show the benefits to the council	O	O	O	O	O	O	O	O	O	O	Assessing the performance of existing flood alleviation / highway improvements works will not have any direct effects on the SEA objectives.
	Work with the River Frome Reconnected partnership, Bristol Avon Rivers Trust, and Farming and Wildlife Advisory Group on the prioritised action plan for NFM interventions, along with landowner advice and guidance in these catchments.	+	++	++	+	+	+	+	+	+	+	Promoting natural flood management will have direct benefits to the ecological and flood risk receptors and will have an indirect positive effect on landscape population, human health and material assets
	Through the Yate Masterplan, work in conjunction with partners to improve floodplain reconnection to reduce flood and coastal erosion risk, by implementing measures that help to protect, restore and emulate the natural functions of catchments, floodplains, rivers and the coast.	+	+	+	+	+	+	+	+	+	+	This action will have an indirect impact on flood risk and the environment (social, economic and ecological receptors).

Resilience Theme	LFRMS Actions	SEA Objectives										Comments
		1	2	3	4	5	6	7	8	9	10	
	Work with the Environment Agency to obtain partnership funding for the Yate and Chipping Sodbury Defence Improvements project.	?	?	?	?	?	?	+	+	+	+	Delivery of the defence improvement project will result in reduced risk to the local community for the benefit of population, human health and material assets. However, physical works to install, manage and maintain flood assets may have adverse impacts on designated sites (both ecological and cultural) in the proximity of the works. There is the potential that works will promote positive impacts for these receptors through managing water within the locality for their benefit.
	Identify opportunities (including ongoing flood risk management work) to reduce surface water flood risk to identified highest risk clusters.	?	?	?	?	?	?	+	+	+	+	Opportunities could result in reduced risk to the local community for the benefit of population, human health and material assets. However, physical works to install, manage and maintain flood assets may have adverse impacts on designated sites (both ecological and cultural) in the proximity of the works. There is the potential that works will promote positive impacts for these receptors through managing water within the locality for their benefit.

Resilience Theme	LFRMS Actions	SEA Objectives										Comments
		1	2	3	4	5	6	7	8	9	10	
	Investigate areas presented in EA NFM mapping with potential for working with natural processes in the catchment, including enhanced floodplain reconnection along the Siston and Warmley Brooks, and additional woodland.	+	++	++	+	+	+	+	+	+	+	Promoting natural flood management will have direct benefits to the ecological and flood risk receptors and will have an indirect positive effect on landscape population, human health and material assets
	Work in conjunction with the Lower Severn IDB to assess options to manage flood risk and assess funding opportunities within the Lower Severn IDB region	?	?	?	?	?	?	+	+	+	+	Opportunities could result in reduced risk to the local community for the benefit of population, human health and material assets. However, physical works to install, manage and maintain flood assets may have adverse impacts on designated sites (both ecological and cultural) in the proximity of the works. There is the potential that works will promote positive impacts for these receptors through managing water within the locality for their benefit.
	Work with Avon Wildlife Trust to identify the feasibility and potential funding opportunities for sites to enhance coastal and marine habitats	+	+	+	+	+	+	+	+	+	+	Opportunities could have the potential to provide enhancements to all SEA objectives.

Resilience Theme	LFRMS Actions	SEA Objectives										Comments
		1	2	3	4	5	6	7	8	9	10	
	Work in conjunction with the Environment Agency where modelling is programmed to take place to improve understanding of flood risk and identifying opportunities to reduce flood risk	O	O	O	O	O	O	O	O	O	O	This action will not have any direct effects on the SEA objectives.
	Work with the River Frome Reconnected partnership to identify opportunities for flood risk management	O	O	O	O	O	O	+	+	+	+	Flood risk management opportunities will lead to better flood management in the area, ensuring benefits for population and material assets.
Respond	Regional liaison on food risk and resilience matters through the Wessex Regional Food and Coastal Committee	+	+	+	+	+	+	+	+	+	+	Encouraging working in partnership 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. Opportunities through partnership working may also arise for the benefit of other receptors (e.g. habitat enhancement, achievement of WFD objectives, protection of cultural heritage assets).

Resilience Theme	LFRMS Actions	SEA Objectives										Comments
		1	2	3	4	5	6	7	8	9	10	
	Work with partner organisations to develop Drainage and Wastewater Management Plans in accordance with the latest national guidance	+	+	+	+	+	+	+	+	+	+	Encouraging working in partnership to develop management plans 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. Opportunities through partnership working may also arise for the benefit of other receptors (e.g. habitat enhancement, achievement of WFD objectives, protection of cultural heritage assets).
	Continue to collect and register records of flood events and share data with partner organisations to enhance understanding of flood risk within South Gloucestershire	O	O	O	O	O	O	+	+	+	+	Collecting and sharing data will not have any identified direct effect on SEA receptors, however this action should promote better flood management in the area.
	Enhance understanding of areas where climate change will most increase the risk of flooding	+	+	+	+	+	+	+	+	+	+	Ensuring climate change is taken into consideration will help to ensure that flood risk is managed sustainably and with due consideration to the area's most likely to see impacts on the environment (social, economic and ecological receptors).

Resilience Theme	LFRMS Actions	SEA Objectives										Comments
		1	2	3	4	5	6	7	8	9	10	
	Continue partnership working with Risk Management Authorities and local stakeholders	+	+	+	+	+	+	+	+	+	+	Encouraging working in partnership 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. Opportunities through partnership working may also arise for the benefit of other receptors (e.g. habitat enhancement, achievement of WFD objectives, protection of cultural heritage assets).
	Periodically review Flood Risk Management Strategy (FRMS)	O	O	O	O	O	O	O	O	O	O	Reviewing the FRMS will not have any identified direct effects on the SEA objectives.
	Annually review FRMS Action plans	O	O	O	O	O	O	O	O	O	O	Reviewing the FRMS will not have any identified direct effects on the SEA objectives.
	Continue preparing for floods with other emergency responders and community stakeholders	O	O	O	O	O	O	++	O	O	O	Increasing preparedness for flooding will benefit population and human health and wellbeing.
	Improve communications between communities and public bodies	O	O	O	O	O	O	O	O	O	O	Improving communications will not have any direct effects on the SEA objectives.

Resilience Theme	LFRMS Actions	SEA Objectives										Comments
		1	2	3	4	5	6	7	8	9	10	
	Increase awareness and promote sign-up to the Environment Agency, Flood Warnings Direct (FWD) within South Gloucestershire	O	O	O	O	O	O	+	+	+	+	Increasing awareness of flood warning systems will not have any identified direct effect on SEA receptors, however this action should promote better flood management in the area.
	Undertake Section 19 Flood Investigations after a 'significant' flood event, taking action if and where possible, independent of whether the location is within the Top 10 Priority Catchments.	O	O	O	O	O	O	+	+	+	+	Undertaking investigations will not have any identified direct effect on SEA receptors, however investigating potential contraventions of the Land Drainage Act should promote better flood management in the area.
	Work with key RMAs to undertake incident response when required	O	O	O	O	O	O	+	O	O	O	Incident response will improve flood resilience, indirectly benefitting human health and wellbeing
	Work with communities to encourage uptake of the Flood Warning / Alert Service where available.	O	O	O	O	O	O	++	O	O	O	Supporting communities to sign up to flood warnings and alerts will benefit population and human health and wellbeing.
	Enhance existing evidence base of surface water flood risk (through, but not limited to; data collection, modelling and flood investigation) to identified clusters.	O	O	O	O	O	O	O	O	O	O	This action will not have any direct effects on the SEA objectives.

Resilience Theme	LFRMS Actions	SEA Objectives										Comments
		1	2	3	4	5	6	7	8	9	10	
	Use the ongoing Environment Agency Kingswood PFR project as a means of promoting awareness and delivery of PFR throughout South Gloucestershire	O	O	O	O	O	O	+	O	O	++	Promoting and delivering Property Flood Resilience will provide benefits to human health and wellbeing and minimise the risk of flooding on existing development.
	Work with the Environment Agency to consider feasibility of introducing flood warnings or alerts in Thornbury to help residents to be more resilient to flooding.	O	O	O	O	O	O	+	O	O	O	This action would lead to benefits to population and human health and wellbeing.
Recover	Support communities and individuals with effective post flood recovery.	O	O	O	O	O	O	++	O	O	O	Supporting communities with post flood recovery will benefit population and human health and wellbeing.
	Provide adequate signposting to available mental health support networks for residents, business owners and communities that have been affected by flooding.	O	O	O	O	O	O	++	O	O	O	Supporting communities with post flood recovery in the form of mental health support will benefit population and human health and wellbeing.

Resilience Theme	LFRMS Actions	SEA Objectives										Comments
		1	2	3	4	5	6	7	8	9	10	
	Investigate mental health training for all SGC staff who attend / deal with flooding (Flood and Water Management Team, Emergency Planning, Operations).	O	O	O	O	O	O	++	O	O	O	Supporting council staff with post flood recovery in the form of mental health support will benefit population and human health and wellbeing.
	Promote services and tools provided by the National Flood Forum and others relating to flood recovery	O	O	O	O	O	O	++	O	O	O	Promoting these services and tools will benefit population and human health and wellbeing.
	Signpost residents to Flood Re for affordable flood insurance	O	O	O	O	O	O	O	O	O	O	This action will not have any direct effects on the SEA objectives.
	Work with Parish Councils to develop emergency plans with an emphasis on flood recovery as well as preparedness	O	O	O	O	O	O	++	O	O	O	Emergency plans will help to protect and enhance human health and wellbeing.

Table 19 Cumulative effects of the actions of the LFRMS on SEA objectives

LFRMS Actions grouped according to Resilience Theme	SEA Objectives									
	1	2	3	4	5	6	7	8	9	10
Placemaking	O	O	O	O	O	O	O	O	+	+
Protect	O	+	+	O	O	O	+	+	+	+
Respond	O	O	O	O	O	O	+	O	O	+
Recover	O	O	O	O	O	O	++	O	O	O

Table 20 Summary of Effects of LFRMS Objectives/Actions on SEA Objectives

Receptor	SEA Objective		Result/ Comment
Landscape	1	Protect the integrity of local urban and rural landscapes in the Council.	No negative effects identified. Several of the LFRMS objectives do not directly contribute to this SEA objective. Uncertainties have been identified in relation to dependency on the location, nature and scale of implementation measures. Partnership working may help to achieve this objective.
Biodiversity, flora and fauna	2	Protect and enhance protected, important and notable habitats and species and designated sites in the Council area.	No negative effects identified. Uncertainties have been identified in relation to dependency on the location, nature and scale of implementation measures. Partnership working may help to achieve these objectives.
	3	Maintain and enhance habitat connectivity and wildlife corridors, particularly along watercourses.	
Water environment	4	Do not inhibit achievement of the WFD objectives and contribute to their achievement where possible.	
Soils and geology	5	Maintain soil quality within the Council.	
Historic environment	6	Preserve and where possible enhance important historic and cultural sites in the Council.	No negative effects identified. Several of the LFRMS objectives do not directly contribute to this SEA objective. Uncertainties have been identified in relation to dependency on the location, nature and scale of implementation measures. Partnership working may help to achieve this objective.
Population	7	Protect and enhance human health and well-being.	No negative effects identified. Either minor positive impacts or significant positive impacts on the

	8	Protect key social infrastructure assets and services from flooding as a result.	SEA objectives are predicted to occur as a result of implementing all LFRMS actions. As expected of a strategy for managing flood risk, all of the actions within the strategy are likely to help achievement of these SEA objectives.
Material Assets	9	Minimise the impacts of flooding to the Council's transport network and key critical infrastructure.	
	10	Minimise the risk of flooding on existing development and amenity land.	

9 Conclusions and Recommendations

The key objective of the LFRMS is to manage flood risk by technically, economically, socially and environmentally appropriate options. 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.

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 of 'Maintain Current Flood Risk Strategy' is unlikely to worsen the current impacts on SEA receptors 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 South Gloucestershire Council is the 'Manage and Reduce Flood Risk' option, which offers more beneficial environmental outcomes and a pro-active approach to flooding pressures.

Many of the proposed measures 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, especially on SEA objectives 7 to 10. 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 the population, human health and material assets. Through promoting a greater understanding of flood risk, encouraging community involvement and promoting self-resilience as well as a coordinated county-wide flood risk management approach, communities and responsible parties will be better placed to effectively minimise the risk of flooding in the South Gloucestershire area.

A detailed assessment of the cumulative impacts of the 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 a 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.

Finally, it is unclear at this stage whether subsequent flood risk planning/strategy activities may require an SEA. South Gloucestershire Council will consider the potential for the Flood Risk Management Plans to be a ‘plan or programme’ requiring SEA under the SEA Regulations. Furthermore, these plans may require Habitats Regulations Assessments due to the presence of European sites within and adjacent to the Council area.

9.1 Recommendations

The assessment of the objectives and actions has identified a couple 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 objectives 1, 4, 5 and 6 do not negatively impact on SEA objectives 1-6, 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 methodology of implementation of the LFRMS actions, however, there is significant potential for positive impacts to arise.
- 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.

9.2 Monitoring

The SEA Regulations require South Gloucestershire Council to monitor the significant environmental effects of the implementation of the LFRMS. Key indicators and targets that require monitoring are listed in Table 21 below 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 the 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.

Figure 5 below illustrates the process that will occur to trigger action when adverse effects of the LMFRS implementation are identified through the proposed monitoring programme detailed below.

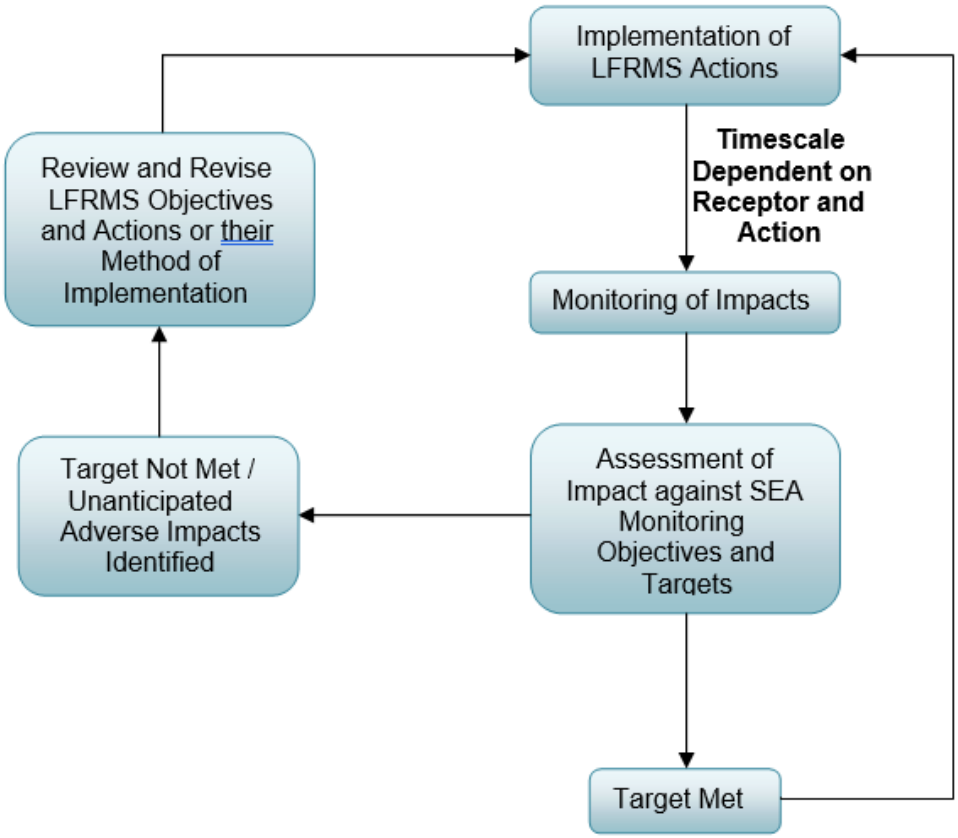

Figure 5 Process for ensuring adverse impacts of LFRMS identified through SEA monitoring framework are mitigated/ rectified

Table 21 Monitoring indicators

Receptor	SEA Objective		Monitoring Indicator	Target	LFRMS Objectives	Possible Monitoring Partners
Landscape	1	Protect the integrity of local urban and rural landscapes in the Council area.	Changes in the condition and extent of existing characteristic elements of the landscape. The condition and quality of new landscape features introduced to the environment (i.e. new flood defences).	No adverse impacts on landscape character of the NCAs, LCAs or other locally important landscapes/features as a result of implementation of the LFRMS.	1 to 6	Environment Agency Natural England
Biodiversity, flora and fauna	2	Protect and enhance protected, important and notable habitats and species and designated sites in the Council area.	Area of designated nature conservation sites at risk of flooding and an assessment of the impact. Monitoring of reported conservation status of designated nature conservation sites.	No adverse impact on designated nature conservation sites as a result of changes to the current flooding regime. No deterioration in the conservation status of designated sites as a result of implementation of the LFRMS.	1 to 6	Environment Agency Natural England Canal and River Trust Internal Drainage Boards Gloucestershire Wildlife Trust
	3	Maintain and enhance habitat connectivity and wildlife corridors,				

		particularly along watercourses.	Area of designated nature conservation site destroyed, damaged or enhanced as a result of implementation of the LFRMS. Area of habitat created as a result of implementation of the LFRMS. Number of new barriers or obstructions to upstream migration of fish and Eel constructed and/or modified.	No adverse impact on designated nature conservation sites as a result of flood risk management measures. Increase in the area of good wildlife habitat as a result of implementation of the LFRMS. No new impediments to fish and eel passage.		
Water environment	4	Do not inhibit achievement of the WFD objectives and contribute to their achievement where possible.	Assessment of LFRMS options and their impact on the WFD objectives.	No deterioration to the WFD status of waterbodies within the catchment.	1 to 6	Environment Agency Natural England Internal Drainage Boards Canal and River Trust
Soils and geology	5	Maintain soil quality within the Council area.	Area of agricultural land at risk of flooding and an	No increase in flood risk to good agricultural land.	1 to 6	Environment Agency Natural England

			assessment of the impact. The condition and quality of soils within the Council area (with emphasis on designated sites).	No reduction in condition of soils in designated sites within the Council area.		Internal Drainage Boards
Historic environment	6	Preserve and where possible enhance important historic and cultural sites within the Council area.	Number of designated heritage sites at risk from flooding and an assessment of the impact. Number of designated heritage sites adversely impacted upon by flood risk management measures	No adverse impact on designated heritage sites as a result flooding. No adverse impact on the integrity/setting of designated heritage sites as a result of flood risk management measures.	1 to 6	Environment Agency Natural England English Heritage
Population	7	Protect and enhance human health and well-being.	Number of residential properties at risk from flooding	No increase in number of residential properties at risk from flooding.	1 to 6	Environment Agency
	8	Protect key social infrastructure assets and services from flooding as a result.	Number of key services (e.g. hospitals, health centres, residential/care homes, schools	No increase in number of key services at risk from flooding.	1 to 6	Environment Agency National Health Service

			etc) at risk from flooding.			
Material Assets	9	Minimise the impacts of flooding to the Council's transport network and key critical infrastructure.	Length of road and rail infrastructure at risk from flooding. Number of key infrastructure assets at risk from flooding. Number of Green Infrastructure assets at risk from flooding or created/enhanced through implementation of the LFRMS	No increase in length of road and rail infrastructure at risk from flooding. No increase in number of infrastructure assets at risk from flooding. No increase in number of Green Infrastructure assets at risk of flooding and/or an enhancement of current Green Infrastructure Assets in the Council area.	1 to 6	Environment Agency Network Rail Highways Agency
	10	Minimise the risk of flooding on existing development and amenity land.	Number of commercial businesses and industrial premises at risk of flooding. Number of attractions and recreational assets protected from flooding.	No increase in number of commercial/ industrial properties at flood risk. No increase in number of attractions/ recreational assets at flood risk.	1 to 6	Environment Agency Internal Drainage Boards

10 Next Steps

Following adoption of the LFRMS, an SEA Statement of Environmental Particulars will be produced outlining how the SEA process has influenced the development of the South Gloucestershire Council LFRMS, how consultation comments were taken into consideration and how the Strategy will be monitored.

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