Appendix B

Environmental Baseline
1 Baseline Information

1.1 Introduction

The data collected to characterise the baseline environment of North Somerset has been derived from numerous secondary sources, which are referenced as footnotes in this report. No new investigations or surveys have been undertaken.

In some instances, it has been noted that different secondary sources present conflicting information and it has not been possible to verify which sources are the most accurate. Where this has been identified, the limitations have been noted.

It should be noted that there is an abundance of environmental information available. However, the information presented in this Appendix has been chosen on the basis that it may be influenced or affected by the Local Flood Risk Management Strategy (LFRMS). Steps have been taken to avoid including information which is of no clear relevance to the LFRMS. It may be necessary to collect further data against which to assess the potential environmental effects of the LFRMS with regard to monitoring requirements.

1.2 Population and Human Health

1.2.1 Population

The topic of population is considered first in the baseline information, since the overarching purpose of the LFRMS is to reduce flood risk to people and property. The LFRMS also contains an objective to increase public awareness of flooding and promote individual and community level flood resilience.

North Somerset contains the coastal towns of Weston-super-Mare, Clevedon and Portishead. Inland is the town of Nailsea and numerous smaller villages. The majority of the population live in Weston-super-Mare, Portishead, Clevedon and Nailsea.

Following the extreme flooding events of 2007, the Environment Agency published an assessment of National flood risk and North Somerset was ranked the second out of ten local authorities with the highest number of properties in areas with a significant chance of flooding. A future increase in precipitation, due to climate change, is likely to cause further increases in flood risk for the population of North Somerset, although the nature and extent of this increase remains uncertain.

Sea level rise could also lead to an increased cumulative flood risk when considered alongside LFRMS flood risk sources. The impacts of climate change on flood risk are discussed in Section 1.7.1 of this Appendix.

The top five communities identified in the LFRMS to be most vulnerable to local flood risk in North Somerset are: Wrington; Weston-super-Mare; Nailsea; Winscombe and Claverham. The other communities most at risk are Congresbury, Long Ashton, Backwell, Churchill, Langford, Pill, Hutton, Porthbury and Clevedon East. The Action Plans for these communities in the LFRMS identify specific roads where properties (and therefore human health) is likely to be most at risk.
The South West has recently experienced high levels of population growth (mainly linked to in-migration). Between 2001 and 2007, the population of the south west increased faster than in the UK as a whole, rising by 235,000, or 4.7 per cent (%), compared with 3.1% for the UK. It is projected that the region will have 6.1 million residents by 2026, which is 20% more than in 2006. This is higher than the projected UK increase of 14%.

The population of North Somerset was 212,200 in 2010. By 2033, the population is projected to increase by 40%, higher than the national average of 18%. By 2026 a total of 14,000 homes are due to be built or modified in some form. Two thirds of these are expected to be in Weston-super-Mare and the Weston villages. It is anticipated that over half of all these homes will be built by 2016. This has implications for many other environmental receptors. Population growth is likely to result in increased demand on existing infrastructure and services, such as sewerage networks and local water supplies.

The requirement for additional housing can result in new development, which results in loss of land, visual intrusion, potentially increased flood risk (if development does not incorporate sustainable drainage principles) or development unsympathetic to the surrounding landscape or built heritage. In turn this can increase pressure on biodiversity, ecosystems and recreational facilities. However, new development could also bring opportunities, for example the retro-fitting of Sustainable Drainage Systems (SuDS) to adjacent existing development.

Careful planning and management of flood risk and water management related infrastructure will be required, considering the pressure that population growth and increased tourism will place on the environment.
1.2.2 Human Health

The major hospitals located within the catchment area are Clevedon Hospital and Weston General Hospital. Other health care services within North Somerset include nursing homes, specialist hospitals (e.g. mental healthcare), dentists and health centres. These are numerous and well dispersed throughout the unitary authority area, many of which are located in low-lying areas.

The North Somerset Health Profile shows that health in North Somerset is better than the English average, with higher life expectancy for both men and women. Early death rates from cancer, heart disease and stroke are lower and the area has reduced deprivation levels than both the English and South West averages.

In 2011, North Somerset, for the first time, had areas within both the most deprived 1% nationally and the least deprived 1% nationally. North Somerset has the 7th largest range of inequality of all of the 326 authorities in England. Fifteen of its Lower Super Output Areas (LSOAs) are within the most deprived 25% of areas nationally. All of these areas are within Weston-super-Mare.

Although health in North Somerset is better than the English average, a growing population will potentially increase the number of people at risk from flooding especially when concentrated in high-risk flood areas such as Clevedon and Portishead. As such, it is important that access to healthcare and other emergency services are maintained during flood events.

1.2.3 Recreation

There are a wide variety of recreational resources in North Somerset. These include parks and gardens, footpaths and cycleways, leisure facilities and recreation grounds.

The Framework for Sport in England (Sport England 2004, vision to 2020) envisages a 1% increase year on year in participants in sport, to a target of 70% of the population active by 2020. This has huge implications for the provision of the necessary facilities to enable this to happen. This is supported by The Regional Plan for Sport 2004-2008 (Sport England), with a reduced target of 50% active in sport by 2020.

North Somerset is currently producing local strategies for outdoor and indoor sports facilities (including pitches, courts, bowling greens, multi-use games areas, health and fitness facilities, village and community halls, skate parks, athletics tracks, golf courses and children’s play areas) as well as an open space strategy which will cover less formal provision such as unequipped or unmarked areas of open space and green routes.

North Somerset has a growing network of green and blue infrastructure. Green Infrastructure consists of strategic networks of accessible, multifunctional sites such as parks, woodland, informal open spaces, nature reserves, cemeteries, wildlife corridors for example rivers and large hedgerows, streams and historic sites.

Blue infrastructure includes inland waterways, bodies and courses (urban and rural) that provide opportunities for formal and informal recreation and tourism, contribute to urban regeneration and biodiversity protection/enhancement. Both types of
1.2.4 Influence of the LFRMS on Population, Human Health and Recreation

There are various ways in which the population and their health may be affected by flooding, as outlined by Lancaster et al. (2004):

- Drowning, injuries and falls resulting from direct exposure to deep and/or flowing flood waters, lack of adequate warning and fast flowing water carrying debris;
- Respiratory disease, shock hypothermia and cardiac arrest may occur as a result of flooding;
- Contact with polluted waters and damp conditions can lead to wound infections, dermatitis, conjunctivitis, gastrointestinal illness, ear/nose/throat infections and the possibility of serious waterborne diseases;
- Contamination to water supply from combined sewer overflows and disruption to services such as electricity, gas, public lighting and water; and
- Physical and emotional stress due to loss of property, evacuation and disturbances as a result of injury.

The direct physical risk of flooding to the population of North Somerset is shown in the LFRMS Action Plans for the most vulnerable communities and in Table 3.4 of the LFRMS, which shows the number of residential and non-residential properties that have flooded historically and the number at risk from surface water flooding during a 1:30 year rainfall event.

Actions taken to manage flood risk may have impacts on both individuals and communities and may increase the possibility of waterborne infection as a result of damage to water supply/sewerage systems.

LFRMS measures taken to manage flood risk may have impacts on both individuals and communities and can help to reduce risk to human health from the impacts listed above.

The LFRMS measures could also affect public access to recreational features, goods and public services that can make a material difference to people’s quality of life and help reduce the effects of social deprivation. The perceived level of flood risk and fear of flooding that communities experience may also affect levels of stress and impact on their quality of life.

The LFRMS will need to consider whether any LFRMS measures on the ground will be able to reduce geographical barriers to services rather than increase them, for example through scheme design and access arrangements associated with new schemes.

Growth in North Somerset’s population will lead to increased demand for development land and increased need for flood risk management. It will also increase demand for water resources and will place additional pressure on North Somerset’s sewerage systems.
The requirement for additional housing can result in new development which could potentially result in an increase in impermeable surfaces, with implications for flood risk. However, new development could also bring opportunities, for example, the retro-fitting of SuDS adjacent to or on existing development or installing SuDS on new developments.

The increased pressure on the North Somerset’s water resources and infrastructure are likely to come from two principal sources, as follows:

- **Population growth**: For example, new growth at Weston-super-Mare, and as a result of an ageing population and falling household size;
- **Seasonal tourism**: Influxes, which will increase as a result of general population growth, but at least in the short to medium term are also likely to increase as a result of the increase in UK-based holidays due to the current economic climate. The peak months for tourism in North Somerset between 2001 and 2011 were August and September.

Careful planning and management of flood risk and water management related infrastructure will need to be in the LFRMS, Surface Water Management Plans (SWMPs) and Strategic Flood Risk Assessments (SFRAs), considering the pressure that population growth and increased tourism will place on the environment.

Maintaining or improving access to homes, places of employment and critical infrastructure should be considered by the LFRMS. Areas used for recreation and access to them will also need to be considered in any plans to improve the standard or provision of green or blue infrastructure. North Somerset Council (NSC) could also consider potential funding opportunities to improve some rights of way in conjunction with LFRMS schemes.

### 1.2.5 Likely Evolution of the Baseline Environment without the LFRMS

From a review of the baseline information it appears likely that the direct and indirect risks to population and human health are likely to increase if no further action was taken to reduce flood risk from LFRMS sources.

These risks include the physical risks of flooding, contact with polluted water or damp conditions and physical and emotional stress due to loss of property, evacuation and disturbances as a result of injury. These risks are likely to be especially high in the hotspots of flood risk identified in the LFRMS.

The risks to human health due to flooding from main rivers and the sea are also likely to increase. According to the UK Climate Change Risk Assessment (CCRA), the number of people exposed to a significant likelihood of flooding in the UK (taking population growth into account) will be between 1.3 million and 3.6 million by the 2050s, rising to between 1.7 million and 5 million by the 2080s (an increase of between 400,000 and 2.7 million by the 2050s and between 800,000 and 4.1 million by the 2080s compared to the current figure of 900,000).

The CCRA for the ‘health’ sector also shows the principal impacts of climate change on human health expected to come from changing temperatures, ground-level ozone levels and sunlight.
1.3  **Material Assets**

The term “material assets” is not defined in the SEA Directive. For the purposes of the SEA, the term is used in relation to buildings and infrastructure in North Somerset that could potentially be affected by flooding. However, the LFRMS should also consider whether any of its policy themes or other elements could potentially increase demand for mineral resources or lead to an increase in waste production, for example, during scheme construction at a later stage.

The UK Climate Change Risk Assessment shows that flooding as a result of climate change is likely to pose an increasing threat to critical infrastructure. This includes increased risk to transport networks, water supplies and sewerage treatment, energy supplies, hospital and schools.

There is a high degree of confidence in the ‘significant likelihood of flooding’ risk posed to roads and a medium level of confidence in relation to power stations, hospitals and schools.\textsuperscript{xiii}

1.3.1  **Transport Infrastructure**

North Somerset is heavily influenced by the counties and cities surrounding it. The M5 motorway running between Bristol and Exeter passes through North Somerset and the area also accommodates the region’s largest airport, Bristol Airport, and part of a major west coast port, the Royal Portbury Dock of the Port of Bristol.\textsuperscript{xiv} The A370 and A38 also pass through North Somerset and these include route sections of ‘national priority’.

A mainline railway also runs between Bristol and Weston-super-Mare and from Bristol to the South West. The West of England’s third Joint Local Transport Plan (2011)\textsuperscript{xv} includes several schemes for North Somerset, including:

- The Weston Package, which includes improvements to the A370 and A371;
- The South Bristol Link, passing to the east of Long Ashton;
- Greater Bristol Bus Network route between Bristol and Weston;
- A new Portishead rail corridor; and
- An M5 Junction 21 bypass.

1.3.2  **Other Key Infrastructure**

In March 2012, the Department of Energy and Climate Change (DECC) approved a planning application to build a 150MW renewable energy plant at Portbury Dock.

Within North Somerset, the LFRMS will also need to consider flood risk to sewerage infrastructure, pumping stations, electricity and communications infrastructure health, emergency services, educational facilities, leisure facilities and residential properties.

NSC has formed an Operational Group, which has a stronger focus on operational and ‘on the ground’ issues. The remit of the Operational Group includes monitoring the operation of critical infrastructure and maintenance. The LFRMS also identifies specific critical infrastructure at risk from local flood risk sources.
As well as the assets themselves, the LFRMS needs to consider the flood risk to the access routes to these assets.

### 1.3.3 Influence of the LFRMS on Material Assets

The LFRMS will seek to manage flood risk to transport infrastructure and other critical infrastructure/material assets within North Somerset. However, the implementation of LFRMS measures has the potential to cause temporary disruption to critical transport infrastructure, for example through the construction of schemes and associated impacts on the local environment and road network.

NSC will need to work closely with the Highways Agency and its own Highways team in order to fully understand the principal flood risk issues that relate to transport infrastructure. The construction of new roads, improvement to existing roads or increased urbanisation in general, could all potentially lead to an increase in the rate and volume of surface run-off from impermeable surfaces.

The location of critical infrastructure may influence the range of available LFRMS management options and measures. The location of LFRMS related infrastructure, if any new build is required, will also need to consider access to and use of critical infrastructure.

### 1.3.4 Likely Evolution of the Baseline Environment without the LFRMS

The risk of flooding to key infrastructure, land assets and properties is likely to continue to increase without the LFRMS. This could potentially increase risks to receptors that fall under other SEA topics, for example an increased risk of pollution to soil and water resources from the inundation of contaminated land.

### 1.4 Biodiversity, Flora and Fauna

#### 1.4.1 Wildlife in North Somerset

Natural England has divided England into ‘National Character Areas (NCAs)’; these are locally distinctive areas which can be characterised by their nature conservation interest and landscape character. They encompass and recognise all the habitats, not just those that are designated.

The terrestrial area of North Somerset is covered by a number of different NCAs, of which the largest proportion being the Bristol, Avon Valleys and Ridges NCA, and smaller areas within the Somerset Levels and Moors NCA, the Severn and Avon Vales NCA and the Mendip Hills NCA, with the Severn Estuary NCA covering some of the northern-most part of the North Somerset coast, east of Portishead.

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 is flanked by the Somerset Levels and Moors and the Mendip Hills to the south, the Cotswolds to the east and the Severn and Avon vales to the west, which largely
separates it from the Severn Estuary except for a small stretch of coastline between Clevedon and Portishead. It has a complex geology, being rich in geomorphological features such as the dramatic Avon Gorge, and there are many designated exposures and rich fossil beds.xvi

The Mendip Hills Area of Outstanding Natural Beauty (AONB) extends into the NCA to include the Chew Valley and Blagdon lakes. Species-rich grasslands and ancient woodlands are a feature of the area, with the ancient woodland and limestone grassland habitats of the Avon Gorge supporting many rare and unique species, including the Bristol whitebeam.

The cultural ecosystem services in this NCA provide a strong sense of history. Biodiversity and geodiversity are nationally and internationally important. Food provision, especially dairy farming, is particularly prominent around the Yeo Valley, and water availability, water quality and regulation of water flow are all important ecosystem services in this NCA.

Many wildlife habitats in the district are vulnerable to changing water levels, such as reduced-flow rivers, or threats from flooding, such as tidal inundation of terrestrial habitat.

The Somerset Levels and Moors NCA forms a broad area of low lying farmland divided by low hills and ridges forming the Mid Somerset Hills. The NCA also has a significant stretch of coastline running south from Weston-super-Mare north to Clevedon. The NCA contains a number of National, International and European designated sites, including the Severn Estuary and the Somerset Levels and Moors Special Protection Areas (SPAs) and Special Areas of Conservation (SAC). The NCA is the largest area of lowland wet grassland and associated wetland habitat remaining in Britain, supporting internationally important numbers of waterfowl in winter. Over 65% of the land area of the NCA is designated as a BAP Priority Habitat for coastal & floodplain grazing marsh.xvii

The Severn and Avon Vales NCA is a low lying open agricultural vale landscape, dominated by the lower valleys of the rivers Severn and Avon, and made up of distinct and contrasting vales, including Evesham, Berkeley, Gloucester, Leadon and Avon, with a predominantly flat landscape. The majority of the area is used as agricultural land, woodland is sparse and it is a generally open landscape. The Walmore Common SPA and adjacent Severn Estuary SPA are of international importance for wintering wildfowl. The oolitic limestone outliers of the Cotswolds AONB overlie this area. There are important staircases of fossil deposits bearing river terrace gravels containing evidence of Palaeolithic and Mesolithic human settlement.

Key ecosystem services within this NCA include flood regulation, food production, due to extensive agriculture, and sense of history.xviii

The landform of the Mendip Hills NCA rises abruptly from the flat landscape of the Somerset Levels and Moors to the south. This is a rural area, with only 2% of the land being classified as urban. Over 50% of the area lies within the Mendip Hills AONB. There are four SPA designations and two National Nature Reserves (NNRs). The concentration of 29 geological and mixed-interest Sites of Special Scientific Interest (SSSIs) demonstrates the geological importance of this relatively small NCA. The area is renowned for its tranquillity and inspirational qualities. The NCA is a net
contributor of water, the Mendip aquifer supplying water to Cheddar, Blagdon and Chew Valley lakes, which provide much of the water supply for the Bristol area, and also to the hot springs in Bath.

The NCA provides many recreational opportunities and is particularly of interest to cavers and potholers, with Cheddar Gorge and Wookey Hole being key tourist attractions.

North Somerset also has a series of Strategic Nature Areas, which have been identified as the best areas to conserve, create or connect wildlife habitats at a landscape scale. The mapping of these areas is based on priority habitats and species that have been identified in the UK Biodiversity Action Plan (UKBAP) and takes into account the effects of climate change.

Characteristic wildlife areas of North Somerset include the following:

- The Somerset Levels and Moors with grazed pastures, seasonal wetlands and linear networks of rhynes (wet ditches) and hedgerows, which support a range of species;
- The Severn Estuary, which includes extensive areas of coastal mudflats and supports internationally important populations of wintering and migratory wading birds and wildfowl, invertebrates and migratory fish. The estuary has international nature designations (see Section 1.4.3.1 of this Appendix);
- A site designated for its internationally important, rare greater horseshoe bats (which also supports lesser horseshoe bats) (see Section 1.4.3.1). Linear features such as hedges are particularly important to support these bat species as well as livestock grazing and features such as ponds, wetlands and woodland edges; and
- The Mendip limestone grasslands, which support a high diversity of plants and invertebrates, are also internationally designated (see Section 1.4.3.1).

1.4.2 Designated sites

1.4.2.1 International Nature Conservation Sites

The preliminary screening for the Habitats Regulations Assessment (HRA), which is being carried out in tandem with this SEA found that there are six sites of international importance, covering three designation types within and around North Somerset:

- Special Areas of Conservation (SAC): Severn Estuary, North Somerset and Mendip Bats, Mendip Limestone Grasslands, Avon Gorge Woodlands; and
- SPAs and Ramsar sites: Severn Estuary.

In addition, Chew Valley Lake, which supplies water to Bristol, is designated as a Special Protection Area (SPA) and lies within five kilometres of North Somerset’s borders.

Under the Conservation of Habitats and Species Regulations 2010 (the “Habitats Regulations”) (SI No. 2010/490, as amended 2012) there is a legal requirement to assess whether there are any likely significant effects of plans and/or programmes on
Natura 2000 (SACs and SPAs) and Ramsar Sites. This will be undertaken as part of the LFRMS HRA process, as described in Section 1.4 of the SEA Environmental Report.

The international designations are shown in the maps provided in Appendix E.

### 1.4.2.2 National and Local Nature Conservation Sites

In addition to internationally designated conservation sites, there are also nationally and locally designated sites within North Somerset, also shown in the maps of Appendix E, as follows:

- Two National Nature Reserves (NNR) (Gordano Valley and Leigh Woods), covering 191ha;
- 86 Sites of Special Scientific Interest (SSSI);
- Thirteen Local Nature Reserves (LNRs); and
- A large number of County Wildlife Sites (CWS) (sometimes referred to as Local Wildlife Site (LWS)).

Finally, there are important geological and geomorphological designations in the district, including:

- Numerous Local Geological Sites (LGS) (Burrington Coombe; section through Devonian sandstones and Carboniferous limestone; Sand Bay; intercalated limestones and tuffs, and altered basaltic pillow lava)
- Three Geological Conservation Review (GCR) sites, designated for geological and nature conservation reasons (Bleadon Hill and Burrington Combe SSSIs and North Somerset and Mendip Bats SAC).

The LGS are shown in the maps of Appendix E.

### 1.4.3 Priority Habitats and Species

The priority habitats listed in the North Somerset BAP are shown in Table B3;

<table>
<thead>
<tr>
<th>Priority habitat</th>
<th>Examples in North Somerset</th>
</tr>
</thead>
<tbody>
<tr>
<td>Woodland</td>
<td>• Ancient semi-natural woodland e.g. Kings Wood</td>
</tr>
<tr>
<td></td>
<td>• Wet woodland e.g. Gordano Valley NNR</td>
</tr>
<tr>
<td></td>
<td>• Veteran trees and parkland e.g. Ashton Court</td>
</tr>
<tr>
<td>Boundary and linear features</td>
<td>• Ancient and/or species-rich hedgerows, e.g. Wrington, Chelvey</td>
</tr>
<tr>
<td></td>
<td>• Road verges e.g. Long Ashton</td>
</tr>
<tr>
<td></td>
<td>• Stone walls e.g. Dundry, Mendip Hills AONB</td>
</tr>
<tr>
<td>Species-rich grassland</td>
<td>• Neutral meadows e.g. Ubley area</td>
</tr>
<tr>
<td></td>
<td>• Calcareous grassland e.g. Middlehope</td>
</tr>
<tr>
<td></td>
<td>• Acid grassland e.g. Felton Common</td>
</tr>
<tr>
<td></td>
<td>• Limestone heath e.g. Dolebury Warren</td>
</tr>
<tr>
<td>Fen, marsh and swamp</td>
<td>• Mire e.g. Max Bog</td>
</tr>
<tr>
<td></td>
<td>• Reed beds e.g. Blagdon Lake</td>
</tr>
<tr>
<td>Coastal and floodplain grazing marsh</td>
<td>• Rhynes/ditches e.g. Gordano Valley</td>
</tr>
<tr>
<td></td>
<td>• Seasonally wet grassland e.g. Biddle Street SSSI</td>
</tr>
</tbody>
</table>
Open water

Standing water: ponds, eutrophic lakes; includes Blagdon and Backwell lakes

Rivers and streams

Examples include:
- River Banwell
- River Yeo
- River Kenn
- Markham Brook

Estuary

- Coastal saltmarsh e.g. Portishead
- Coastal mudflats e.g. Clevedon
- Coastal sand dunes e.g. Sand Bay
- Maritime cliff and slopes e.g. Clevedon
- Sabellaria reefs e.g. Birnbeck
- Vegetated shingle e.g. North of Middlehope

Urban

- Gardens
- Brown field sites
- Public open spaces and park- includes: Weston-super-Mare, Clevedon and Nailsea

Traditional orchards

includes: Kingston Seymour, Hewish, Kenn

Table B3: BAP habitats in North Somerset

Species Action Plans have also been completed for otter, water vole, greater horseshoe bats and the water shrew. xxv

In addition to the North Somerset BAP, the Avon BAP also has Habitat Action Plans for the following key habitats.

- Species-rich grassland;
- Arable farmland;
- Purple moor grass and rush pasture action statement;
- Hedgerows;
- Woodland;
- Wood pasture and parkland;
- Standing open water;
- Reedbeds and sedgebeds;
- Watercourses and floodplain;
- Coastal and floodplain grazing marsh; and
- Estuary.

The LFRMS needs to ensure that LFRMS measures do not affect flow levels to water dependent habitats or increase levels of pollution reaching aquatic environments, for example through highway runoff.

The Severn Estuary SAC/SPA/Ramsar, could potentially be vulnerable to contaminated pollutant runoff or sewerage overflow.

1.4.4 Influence of the LFRMS on Biodiversity, Flora and Fauna

The LFRMS measures may include land use change, changes in flood risk, frequency or changes in water levels that have the potential to adversely affect habitats or
species at designated sites. The LFRMS needs to ensure that LFRMS measures do not adversely affect the flow volume to water dependent habitats or increase levels of pollution reaching aquatic environments, for example through highway runoff or inundation of contaminated land.

Many habitats, including coastal, heathland and river valleys, are very sensitive to water flow regime change, and water quality changes, which are the specific issues that the SEA needs to recognise and the LFRMS needs to address. The LFRMS also needs to ensure that LFRMS measures do not increase the risk of spreading invasive species, for example through the provision of new culverts.

In addition to protecting wildlife sites in North Somerset, the LFRMS has potential to improve biodiversity on the ground, either through creating new biodiversity areas or restoring existing ones, as well as linking up biodiversity sites as part of plans for improving green infrastructure and fostering ‘living landscapes’, as promoted by the UK wildlife trusts.

The LFRMS may also have the potential to improve local biodiversity areas, such as Wildlife Sites. Biodiversity enhancement opportunities are described in Chapter 7 of the main Environmental Report.

1.4.5 Likely Evolution of the Baseline Environment without the LFRMS

Trends in biodiversity can be due to a wide variety of factors, including climate change and land management activities. Water dependant habitats will come under increasing pressure as demand for water increases alongside population increase.

Climate change is likely to affect all habitats, for example through sea level rise, changes in flood risk from all sources, changes in the frequency of flooding or flow volumes to water dependant habitats. The proliferation of invasive species is also likely to continue.

1.5 Soil, Geology and Geomorphology

1.5.1 Soils

The type of soil and underlying geology influence the likelihood of surface and groundwater flooding in an area. In addition, due to the difference in soil structures, vulnerability to erosion varies.

Soil erosion is an increasing problem throughout the UK. The South West Observatory’s “State of the South West 2009” identifies among its priority issues that “Soil erosion and field run-off’ that is linked to agricultural land management practices is currently one of the biggest issues for the region. It is leading to impacts on water quality, aquatic wildlife and bathing waters as well as the cause of a large proportion of surface water flooding incidents.”

North Somerset area shows an extremely diverse range of soil types along an east-west direction with the western half of the area dominated by alluvial soils. The eastern half is dominated by clay rich heavy soils and shallow chalk and limestone.
Figure B1 shows the broad soil types of North Somerset and their respective risk of runoff due to agriculture:

Figure B1: Broad soil landscapes and their inherent risk of enhanced run-off due to agriculture.

Source: South West Observatory
1.5.2 Geology and Geomorphology

North Somerset’s geology is greatly varied and covers 400 million years of earth history, from the Devonian to the present Quaternary period. This includes the:

- Devonian Period (408-362 million years BP) (outcrops in the Portishead and Tickenham ridges and in the Winscombe Valley to the south);
- Carboniferous Period (362-290 million years BP);
- The Permo-Triassic Period (290 – 208 million years BP) (e.g. rocks of the cliffs between Clevedon and Portishead);
- The Jurassic Period (208 – 145 million years BP) (e.g. rocks found at Locking, Banwell and on top of Broadfield Down);
- The Quaternary: Pleistocene (1.64 million to 10,000 year BP) (e.g. wave cut platforms at Middle Hope and Spring Cove); and
- The Quaternary: Holocene (10,000 years ago to the present). Regression of the sea lead to the build up of peat beds in the inland sections of the moors, including the Gordano Valley and during this period, thick deposits of Blown Sand accumulated at Weston and Sand Bays.

Designated Geological Sites

As discussed in Section 1.4.3 of this Appendix, there are three Geological Conservation Review sites and various Local Geological Sites in North Somerset. There are also 15 geological SSSIs and an additional three mixed biological/geological SSSIs in North Somerset (see Table B4). These include scientifically important geological sections exposed in quarries, roads and railway cutting sequences and geomorphological sites such as swallet holes.

<table>
<thead>
<tr>
<th>Geological SSSI</th>
<th>Grid Ref</th>
<th>Reason for Designation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Avon Gorge</td>
<td>ST560743/564 740</td>
<td>The site shows the complete local succession of Carboniferous Limestone and important for the study and development of stratigraphy.</td>
</tr>
<tr>
<td>Banwell Caves</td>
<td>ST383588</td>
<td>The caves contain barite deposits, which are found in greater abundance and variety here than at any other site in the Mendip Hills.</td>
</tr>
<tr>
<td>Bleadon Hill</td>
<td>ST351574</td>
<td>An important site for delineating the southern margins of the Quaternary glaciation, although further research is still needed to fully understand this enigmatic site.</td>
</tr>
<tr>
<td>Brean Down</td>
<td>ST284590</td>
<td>A promontory off the Somerset coast and a continuation of the Mendip hills.</td>
</tr>
<tr>
<td>Clevedon Shore</td>
<td>ST406714</td>
<td>Interesting due to coastal cliffs and foreshore, finite site and mineral collecting.</td>
</tr>
<tr>
<td>Court Hill</td>
<td>ST436722</td>
<td>Of fundamental importance for our understanding of the direction and limit of ice sheet encroachment during the Pleistocene. The only example of this type of glacial landform in southern England.</td>
</tr>
<tr>
<td>Crook Peak to Shute Shelve Hill</td>
<td>ST385555 to ST430560</td>
<td>Important for cave deposits and well-stratified sequence of deposits and faunas.</td>
</tr>
<tr>
<td>Geological SSSI</td>
<td>Grid Ref</td>
<td>Reason for Designation</td>
</tr>
<tr>
<td>-------------------------------------</td>
<td>-----------</td>
<td>------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Hartcliff Rocks Quarry</td>
<td>ST534662</td>
<td>The site demonstrates the disseminated type of iron mineralisation that is commonly found in the Dolomitic Conglomerate of the Bristol District and is particularly valuable in demonstrating the lateral variation in intensity of mineralisation.</td>
</tr>
<tr>
<td>Holly Lane</td>
<td>ST419727</td>
<td>One of the best Pleistocene mammalian localities in south west England and of considerable importance as an example of ‘cold-stage’ sedimentation in terrestrial environments.</td>
</tr>
<tr>
<td>Kenn Church, Kenn Pier and Yew Tree Farm</td>
<td>ST415689</td>
<td>A complex sequence of Pleistocene sediments, including coarse glacial outwash gravels at the base overlain by a complex sequence of interglacial freshwater, estuarine and marine sands. The sequence is then capped by aeolian (windblown) cover sands and Holocene silts.</td>
</tr>
<tr>
<td>Middle Hope</td>
<td>ST325662</td>
<td>A sequence of Carboniferous Limestone. Limestone, thick volcanic tufts and lavas are exposed, affording some of the finest Tournaisian carbonate sections in South West England. The site contains a Pleistocene aged fossil cliff and shore platform.</td>
</tr>
<tr>
<td>Nightingale Valley</td>
<td>ST449751</td>
<td>The site has considerable potential importance for the understanding of the Pleistocene sequence in Avon and Somerset.</td>
</tr>
<tr>
<td>Portishead Pier to Black Nore</td>
<td>ST474778</td>
<td>The Portishead Pier Section is of great interest for helping understand the palaeogeography of the time. Portishead Point is the best locality for detailed examination of the geological structured developed at the eastern end of the visible Variscan orogenic belt in Britain. Portishead shows important exposures of the Devonian sequence and the southward thickening of the Old Red Sandstone. The whole section also contains fossil interest.</td>
</tr>
<tr>
<td>Spring Cove Cliffs</td>
<td>ST310625</td>
<td>Of importance due to the stratigraphic and igneous features which are displayed.</td>
</tr>
<tr>
<td>Weston-in-Gordano</td>
<td>ST452744</td>
<td>The site forms an important piece of evidence in reconstructing the magnitude and pattern of sea level change during the middle to late Pleistocene.</td>
</tr>
</tbody>
</table>

Table B4: Geological SSSIs in North Somerset and the reason for their designation

The geology of North Somerset contributes to flood events as the high run-off from the impermeable rocks in uplands flows down to the water logging clay Somerset Levels and Moor below, which are prone to winter floods of fresh water and occasional salt water inundations. However the only influence of the LFRMS on the local geology will be through the protection of the geological SSSIs listed above.

1.5.3 Influence of the LFRMS on Soil, Geology and Geomorphology

The type of soil and underlying geology influence the likelihood of surface and groundwater flooding in an area. In addition, due to the difference in soil structures vulnerability to erosion varies.

Soil erosion is an increasing problem throughout the UK, for example through inappropriate land management or agricultural practices. Floodwater can also
remove soil from areas, for example through surface water flash flooding. Compaction, sealing, nutrient enrichment and pollution can also affect soils.

Soil quality and quantity is affected by changes in land use, groundwater levels and susceptibility to flood risk, all of which the LFRMS may have an influence on. There is therefore potential for the LFRMS to enhance as well as protect soil resources in North Somerset.

The LFRMS and lower tier plans should aim to protect or enhance geological designated sites. Areas of contaminated land will also need to be taken into account when considering the location of LFRMS schemes, in order to reduce the potential risk of contaminating the soil or water environment.

1.5.4 Likely Evolution of the Baseline Environment without the LFRMS

It is likely that soil erosion will continue, due to surface water flash flooding and other causes. Compaction and sealing will also continue to occur, for example through an increase in developed areas and impermeable surfaces.

Catchment sensitive farming (as detailed in Section 1.6.2.4) should help to reduce nutrient enrichment of soil and help to maintain or improve soil quality.

1.6 Water

1.6.1 Overview

The LFRMS needs to ensure that, by improving drainage and reducing flood risk in the district, there are no adverse impacts on water quality or the hydrological regime of aquatic habitats. It also needs to ensure that drinking water quality, groundwater and human health are protected.

Information on flood risk from pluvial and fluvial flooding is presented in Section 4.2 and is taken from the PFRA and the CFMP respectively. Flood risk is also described in sections 1.2 and 1.3 of this Appendix in relation to human health and material assets respectively. The following sections therefore focus on water quality and availability.

The quality status of water bodies in terms of the Water Framework Directive is dependent upon various underlying factors, as shown in Figure B2:
With this in mind, the SEA needs to provide an objective that assesses whether the LFRMS is likely to have any impact on the chemical or ecological status of water bodies.

There are various impact sources that could affect ecological status. The most relevant to the LFRMS are shown in Table B5:

<table>
<thead>
<tr>
<th>Reason for failure</th>
<th>Key elements impacted</th>
</tr>
</thead>
<tbody>
<tr>
<td>Point source water industry sewerage works</td>
<td>Ammonia, phosphate, dissolved oxygen</td>
</tr>
<tr>
<td>Physical modification urbanisation</td>
<td>Fish, invertebrates</td>
</tr>
<tr>
<td>Diffused source mixed urban run-off</td>
<td>Dissolved oxygen, invertebrates, phosphate, benzo (ghi) perelyene and indeno (123-cd) pyrene</td>
</tr>
<tr>
<td>Diffuse source agricultural</td>
<td>Ammonia (phys-chem), dissolved inorganic nitrogen, dissolved oxygen, fish, invertebrates, macrophytes, phosphate, phytothenthos, phytoplankton, total phosphorus</td>
</tr>
<tr>
<td>Physical modification barriers to fish migration</td>
<td>Fish</td>
</tr>
<tr>
<td>Physical modification land drainage</td>
<td>Dissolved oxygen, fish</td>
</tr>
<tr>
<td>Physical modification flood protection</td>
<td>Fish, invertebrates</td>
</tr>
<tr>
<td>Physical modification water storage and supply</td>
<td>Fish</td>
</tr>
</tbody>
</table>

Table B5: Main reasons for surface water bodies not achieving good ecological status or potential

Source: Adapted from Environment Agency, 2009; Severn River Basin Management Plan.

The LFRMS will need to consider whether any modifications to ordinary water courses, or the way in which surface or groundwater is managed, will lead to any adverse impacts on the receptors listed in Table 5, in terms of water quality impacts on biodiversity. The quality of water in rivers, streams, and rhynes in the district (strategic level) could potentially be directly affected by:

- Redirected ordinary water courses or drainage water containing pollutants reaching new receptors; and
• New surface water conveyance over contaminated land, enabling pollutants to enter water courses.

1.6.2 Baseline conditions

1.6.2.1 Flood risk from main rivers and the sea (non-LFRMS sources)

The PFRA showed that there are potentially cumulative impacts of surface water flooding with tidal and/or fluvial flooding in Weston, Clevedon, Portishead, Hutton, Wrington and Pill.

According to the North and Mid Somerset Catchment Flood Management Plan (CFMP), more than half of the people and properties at risk from flooding within the catchment from a 1% annual probability river flood are located in Weston-super-Mare. The CFMP states that in 2009 there were around 7000 people and 3000 commercial and residential properties in the catchment at risk from a 1% annual probability river flooding taking into account current flood defences, meaning that 2.5% of the total population living in the catchment are currently at risk from flooding.

According to projections in the UK Climate Projections (UKCP09), sea levels in the Severn Estuary are estimated to be 30-40cm higher by the 2080s than they are at present, based on a medium greenhouse gas emissions scenario. This in itself poses serious issues as much of the coastline around the estuary is at or close to current sea level. Extreme waves are also expected to increase in the Severn Estuary. Storm surge heights are also expected to increase by 0.8mm per year in the next 50 years.

The PFRA states that by far the most significant risk in North Somerset is the risk of tidal flooding. Sea levels generally are a contributory factor in surface water flooding as much of the North Somerset area relies on land draining into the sea. High tides can create tide locked conditions which if combined with heavy rainfall can result in flooding from modest rainfall events. Tidal flooding and rainfall events such as those modelled by the Environment Agency Flood Map for Surface Water (FMfSW) and those used in the Weston-Super-Mare SWMP are far greater than the sewerage network can manage. For these types of flooding event it is therefore likely that the public sewerage network would be overwhelmed. This could lead to an increased risk of contamination and pollution of the urban and natural environment from foul sewers.

1.6.2.2 Groundwater quality

One of the most problematical and widespread groundwater contaminants is nitrates. Nitrates are regularly found in groundwater in some areas at concentrations exceeding the drinking water limit as established in the European Commission’s Directive on Drinking Water (80/778/EEC).

Agriculture is thought to be the primary source of nitrate presence in groundwater, although other sources of nitrate include waste, particularly through old landfills, septic tanks and leaking sewers.

Within North Somerset, there is a small area designated as a Nitrate Vulnerable Zone (NVZ) with no areas of deferred slurry storage. The NVZ is located in the south east of North Somerset in the approximate area of Winford (see endnote references).
NVZ regulations came fully into force on 1st January 2012, except in deferred Slurry storage areas, which had until 1st January 2013.

The majority of NVZs in the West of England have been declared due to risk of ground water pollution, although there are also considerable areas considered vulnerable to surface pollution, or both surface and ground water pollution.\(^{xxxv}\)

1.6.2.3 Source Protection Zones

The Environment Agency defines Source Protection Zones (SPZs) for groundwater sources such as wells, boreholes and springs used for public drinking water supply. These zones show the risk of contamination from any activities that might cause pollution in the area. The closer the activity, the greater the risk of pollution.

Figure B3 shows the location of SPZs in North Somerset:

![Source Protection Zones in North Somerset](image)

The following information on SPZs is taken from the Environment Agency Policy and Practice for the Protection of Groundwater\(^{xxxvi}\):

- SPZ1 (Inner protection zone) – Defined as the 50 day travel time from any point below the water table to the source. This zone has a minimum radius of 50 metres;
• SPZ2 (Outer protection zone) – Defined by a 400 day travel time from a point below the water table. This zone has a minimum radius of 250 or 500m around the source, depending on the size of the abstraction; and

• SPZ3 (Source catchment protection zone) – Defined as the area around a source within which all groundwater recharge is presumed to be discharged at the source. In confined aquifers, the source catchment may be displaced some distance from the source. For heavily exploited aquifer, the final Source Catchment Protection Zone can be defined as the whole aquifer recharge area where the ration of groundwater abstraction to aquifer recharge (average recharge multiplied by outcrop area) is >0.75. There is still the need to define individual source protection areas to assist operators in catchment management.

In the future, SPZs may also form the basis of Safeguard Zones under the Water Framework Directive.

1.6.2.4 Catchment Sensitive Farming

Catchment Sensitive Farming (CSF) gives advice on dealing with diffuse pollution from agriculture and the impact on water courses.

CSF is a voluntary initiative, whereas NVZs are a statutory obligation. CSF looks at: best practice on manure and pesticide usage; Promoting good soil structure; protecting watercourses from run-off and best practice on stock management.

There is one Catchment Sensitive Farming project in North Somerset. This is the Somerset Levels and Bridgwater Bay, which covers an area of 2,535km$^2$. The LFRMS would need to consider any potential effects of FRM measures on catchment sensitive areas, in terms of pollution risk, for example, FRM measures that relate to the sewerage network.

1.6.2.5 Rivers and river water quality

There are 20 river water bodies within North Somerset. The principal rivers listed in the North and Mid Somerset Catchment Flood Management Plan that are located in North Somerset are the rivers Axe, Congresbury Yeo, Land Yeo, Banwell and Portbury Ditch. The rivers and streams flow from their source in the Mendips in the east of the catchment; in a westerly direction through low-lying coastal plain, before flowing out into the Severn Estuary through tidal exclusion sluices.

The Environment Agency’s 2011 assessment of North Somerset’s rivers classified 5% as poor, 75% as moderate and 20% as good. This was one of the better results for West of England Unitary authorities. The main reasons for less than good status include higher levels of nutrients e.g. ammonia, phosphate.

1.6.2.6 Water availability in North Somerset

North Somerset is covered by the Bristol Avon, Axe and North Somerset Streams Catchment Abstraction Management Strategy (CAMS). There are many abstractions within this catchment. Resources in the Land Yeo and Congresbury Yeo are currently fully stretched at low flows. In these cases, this is mainly due to public water supply abstractions. On the River Axe and Whitelake, the available resource is greater but still impacted by significant industrial and water supply abstractions.
1.6.3 Influence of the LFRMS on Water Resources

The LFRMS will need to consider whether any LFRMS measures will lead to adverse impacts on the water bodies within North Somerset and whether the LFRMS can contribute to delivering some of the mitigation measures set out within the River Basin Management Plans (RBMP’s) Programme of Measures e.g. through improvement to fish passage.

Water resources within the LFRMS area are likely to be under increasing pressure from a growing population and increased demand for wastewater treatment and drinking water over the duration of the strategy. Consequently, strategic measures proposed by the LFRMS will need to consider these issues. The LFRMS should also have regard to NVZs and ground water SPZs.

1.6.4 Likely Evolution of the Baseline Environment without the LFRMS

The UK CCRA for the water sector\(^{\text{iii}}\) shows that climate change is likely to cause the following impacts on water nationally:

- **River flows.** By the 2080s, reductions in summer river flows may be significant across the UK, with the largest decreases in southern and eastern England;

- **Water supply.** By the 2080s almost the whole UK population may be living in areas affected by a supply-demand deficit unless significant action is taken. Maintaining supplies may become particularly challenging in south- east England and the Midlands, unless further action is taken both to reduce the demand for water and to increase supplies. By the 2050s, there may be a significant decrease in the number of rivers where sustainable water abstraction is possible and this situation may grow more severe by the 2080s:

- **Water quality.** This depends to a large extent on water volume and is therefore influenced by river flows. For example, pollutants are less likely to be diluted by lower summer flows. Higher water temperatures may also contribute to changes in water quality; and

- **Assets and Infrastructure.** Many UK sewers are part of combined systems that carry both sewerage and surface water runoff. When their carrying capacity is exceeded by heavy rainfall, or they become blocked, they overflow or ‘spill’. Although heavily influenced by socio-economic factors (e.g. population change), significant increases in spill frequency may result from climate change due to changes in rainfall patterns (e.g. more heavy winter downpours).

There are also likely to be continuing pressures on the water environment as demand for water increases alongside population increase. However, the Environment Agency is aiming to improve water quality to ensure water bodies meet Good Ecological Status in line with the WFD, for example through catchment and river basin management planning. Catchment sensitive farming and the wider implementation of SuDS should also continue to improve water quality.
1.7 Climate change adaptation

1.7.1 Overview

The UK Climate Impacts Programme (UKCIP) has carried out modelling that shows detailed climate probability for each 25km\(^2\) of land in the UK. The latest (UKCP09) projections confirm that North Somerset is likely to experience:

- Hotter/drier summers;
- Warmer/wetter winters;
- Sea level rises; and
- More weather extremes.

UK Local Climate Impacts Profiles (LCIPs) for various local authorities are available on the UKCIP website.\(^{xliii}\)

In North Somerset, increased precipitation will increase the risk of inland surface water flooding, which may be exacerbated by blockages in culverts, gutters and drains (sometimes due to inadequate maintenance). Along the Severn Estuary, there is expected to be a rise of approximately one metre over the next 100 years.

This poses a real risk of flooding and increased coastal erosion within the 60km of coastline of North Somerset. If no action is taken and defences are not maintained or improved, much of this land will flood several times a year, making it difficult to continue present land uses.\(^{xliv}\)

North Somerset’s LCIP \(^{xlv}\) shows the following key findings for the district to date:

- Frost/ice/snow events have had the biggest impact on Council services, closely followed by excessive rainfall/flooding events between January 2005 and May 2010; and
- One single excessive rainfall/flooding event caused £176,296 in property insurance claims from schools.

The North Somerset LCIP is due to be updated. If the results of the update are ready in time, they will be included in the Environmental Report.

In addition to the information contained in the LCIP, North Somerset has also experienced more recent flooding. In August and September 2012, scores of homes were flooded following heavy rain. Nailsea was particularly affected but many other areas were also flooded.

In addition to the flooding of scores of households, excessive rainfall also caused a landslide in Portbury in August and submergence of the rail track in Nailsea in September.

1.7.2 Influence of the LFRMS on Climate Change Adaptation

Climate change could potentially impact on most SEA topic areas in a variety of different ways. Figure B4 shows some of these potential interactions.
The LFRMS should assist North Somerset in becoming better adapted to the impacts of climate change, particularly in relation to flood risk. However, there may also be opportunities, through LFRMS measures, to improve the resilience of biodiversity to climate change, for example by creating or improving flood storage areas for wildlife potential.

The LFRMS could also potentially facilitate the migration of habitats and species, especially in coastal areas where some habitats and species are under pressure from coastal squeeze as well as other impacts. For example, new flood storage areas could effectively expand the amount of wetland habitat. Tree planting at the location of LFRMS measures could also contribute to cooling and shading.

Opportunities to link up green and blue infrastructure and improve its resilience to climate change impacts should also be explored.
1.7.3 Likely Evolution of the Baseline Environment without the LFRMS

As described in section 1.7.1, North Somerset is likely to experience hotter and drier summers, warmer and wetter winters, sea level rise and more weather extremes. NSC and other organisations will work, for example, through the West of England Local Enterprise Partnership, to help the region become more resilient and better adapted to climate change.

1.8 The Historic Environment

1.8.1 Overview

This section covers buried archaeological remains, scheduled monuments, listed buildings and bridges, historic parks and gardens, the historic landscape including hedgerows and other land boundaries, buildings of historical significance, towns and villages, and industrial features.

1.8.1.1 Designated Heritage Assets

Table B6 details the various heritage features present in North Somerset and indicates the number at risk of collapse, decay or loss and that need urgent repair. All heritage assets will require attention when developing and implementing the LFRMS to ensure that they are protected not only against flood events but also from any flood risk measures put in place to prevent or control flooding.

Where there is an existing flood risk to heritage assets, this risk may need managing in order to reduce the threat to either the assets themselves or their setting. This particularly applies to features indicated as being at risk.

<table>
<thead>
<tr>
<th>Designated Assets</th>
<th>Total in NS</th>
<th>Total at Risk</th>
<th>Asset on EH Register of Heritage at Risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Listed Buildings (all)</td>
<td>1,068</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Grade I</td>
<td>36</td>
<td>1</td>
<td>Ashton Court</td>
</tr>
<tr>
<td>Grade II*</td>
<td>79</td>
<td>2</td>
<td>Bimbeck Pier; Tyntesfield Orangery</td>
</tr>
<tr>
<td>Grade II</td>
<td>953</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Scheduled Monuments</td>
<td>68</td>
<td>1</td>
<td>Elms Colliery, Nailsea</td>
</tr>
<tr>
<td>Registered Parks and Gardens</td>
<td>8</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Grade I</td>
<td>-</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Grade II*</td>
<td>3</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Grade II</td>
<td>5</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Conservation Areas*</td>
<td>35</td>
<td>5</td>
<td>Beach Lawns, W-s-M; Clevedon Triangle; Bimbeck, W-s-M; Melrose/Grove Park, W-s-M; Boulevard/Montpelier</td>
</tr>
<tr>
<td>Registered Battlefields</td>
<td>-</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>

Table B6: Heritage Sites in North Somerset (Sites and Monuments Record)\(^{\text{IV}}\)

Archaological heritage of the study area also encompasses non-designated and unrecorded archaeological sites and historic landscape in addition to the identified features. Archaeological resource in the study area may remain undiscovered or lie underwater in rivers and wetland areas. River corridors are often archaeologically
rich and are likely to result in discoveries, should works be carried out within the river corridor.

As detailed in Table B6 and shown in the Cultural Heritage map of Appendix E, North Somerset is rich in archaeology, some of which depends on waterlogged conditions for its preservation.

The Cultural Heritage map of Appendix E shows Scheduled Monuments, Registered Parks and Gardens and Historic Battlefield sites. North Somerset’s online Historic Environment Record (HER) also shows Conservation Areas, Listed Buildings, unregistered Parks and Gardens.

The main issue regarding cultural heritage is the potential for some possible flood risk management options to impact on unknown sites of cultural heritage and underwater archaeology. The ownership of land and weirs may become an issue if purchase/acquirement of these is required to carry out certain flood defence options. EIA or HRA for some options may be required before implementation.

1.8.1.2 Undesignated Heritage Assets

The South West Bristol Green Belt Assessment, undertaken by North Somerset Council, also highlights the importance of the historic characteristics of Bristol and Long Ashton, including historic and landscape setting, prominent views to and from the settlements and the gateways and approaches.

The setting includes the Ashton Court Estate, important topographical and natural features, as well as landmark buildings, such as Dundry and Long Ashton churches. North Somerset’s Historic Landscape Characterisation (HLC) also shows a wide variety of character types. These are not described in detail here, as the HLC is better illustrated on the interactive map on the council website. However, the broad character types identified in the HLC are:

- North Somerset Levels;
- Broadfield Down;
- Kingswood ‘Fringe’; and
- Cotswold Edge

1.8.2 Influence of the LFRMS on the Historic Environment

The issues that arise that the LFRMS might need to address can be divided into four areas.

- The impact of flooding on heritage assets.

Flooding damage to structures, such as buildings, bridges, culverts, sluices to historic settlements, to archaeological sites and to palaeo-environmental survival. Flood damage to the setting of the assets.

- The role of historic structures within water and flood management
The degree to which flooding and its control might be impacted (positively or negatively) by the management of historic structures. For example maintenance of existing systems, utilisation of water meadows as flood capacity.

- **The impact of historic structures on water management**

The degree to which the historic environment might inform or constrain the options available, such as bridge maintenance or adaptation, Conservation Areas, and Listed or Scheduled structures associated with watercourses.

- **Impact of flood prevention and mitigation on the historic environment.**

The physical impact of flood risk management structures and their operation on the heritage, buildings, archaeological sites and palaeo-environmental remains. In this regard, consideration must be taken for the potential ‘drying out’ of heritage assets due to the implementation of flood risk management schemes, in particular wetland sites which are likely to contain preserved organic remains. The LFRMS also needs to consider the potential impact of flood structures on the setting of buildings, towns and monuments; for example, the impact of a flood barrier adjacent to an iconic building or the influence that a Conservation Area has on the location and design of a structure.

The LFRMS may be able to reflect historic landscape character as an influence on scheme design, for example utilising orientation and patterns of existing drainage, or reflecting local landscape character traits.

The LFRMS may also be able to utilise aspects of the historic environment in relation to flood control, in particular identifying areas of the landscape that have historically been used to accept flood water.

The LFRMS will need to maintain or improve the condition or setting of cultural heritage as well as access routes to these resources.

Under LFRMS Objective 2, *Develop plans and policies to manage these risks sustainably*, the LFRMS has an anticipated outcome of ‘flood risk management measures which offer additional benefits such as education, recreation or cultural heritage will be promoted, leading to social and economic benefits for local communities. Flood risk management activities will seek to improve the built environment.’

### 1.8.3 Likely Evolution of the Baseline Environment without the LFRMS

Cultural heritage is likely to face a continuation of the same threats it currently faces. These include direct impacts, such as loss or damage of important features, as well as indirect impacts, such as change of water table levels which may affect the preservation of archaeological and built heritage in situ. Threats include inadequate management of features, landscapes or nearby resources, neglect and inappropriate development within or near historic features or landscapes.

Air pollution, physical or chemical erosion and pressure from tourists can also pose threats to cultural heritage. However, the positive effects of cultural heritage management and restoration are also likely to continue in the absence of the LFRMS.
1.9 Landscape

1.9.1 Landscape Character

The European Landscape Convention (ELC) adopts a broad definition of landscape:

“landscape means an area, as perceived by people, whose character is the result of the action and interaction of natural and/or human factors”.

The ELC concept of landscape applies to all landscapes everywhere and in any condition – land, inland water, inter-tidal, marine, natural, rural, urban and peri-urban, outstanding, ordinary and degraded.

The Bristol, Avon Valleys and Ridges NCA, which covers most of North Somerset and is designated for its landscape and nature conservation interest, is described in Section 1.4.1 of this Appendix.

North Somerset has a varied landscape ranging from the flat lowlands of the levels and moors to the steep slopes of the Mendip Hills. A large part of the district is characterised by alternating ridges and broad valleys with some steep wooded slopes and open rolling farmland.

Extensive areas of coastal mudflats in the Severn Estuary support internationally important populations of wintering and migratory wading birds and wildfowl.

Adjacent areas of low-lying levels and moors are rich in natural and historic heritage with important habitats such as grazing marsh, mudflats, salt marshes, a network of rhynes, hedgerows and old orchards.

The district’s landscapes range from the Carboniferous Limestone uplands of the Mendips to the level, wet pasturelands of the moors.

The North Somerset Landscape Character Assessment divides the landscape character of North Somerset into twelve landscape types:

- Moors: Occupies a broad sweep of low-lying reclaimed wetland on the west side of North Somerset with outlying areas to the north and south separated from the rest of the type by limestone ridges;
- River Flood Plain: Includes two areas of floodplain centred on river courses; one to the north east (Land Yeo and Kenn) and one to the far south (Lox Yeo);
- Settled Coastal Edge: Consists of two areas on the seaward edge; one to the far north near Portishead and one to the south near Weston-super-Mare;
- Limestone Gorges: Comprises a deep ravine with steep slopes cut through limestone. There is only one area with this landscape characteristic and it is found in the north east of North Somerset along the River Avon;
- Limestone Ridges and Combes: Form the backbone and highest part of the district based on the outcrops of carboniferous limestone. The upstanding landform and woodland cover makes this a very visually prominent landscape type;
• Sandstone Uplands: Comprises one area located to the north east of the district based on an outcrop of old red sandstone extending from the western edge of Bristol to Clapton in Gordano;

• Settled Limestone Plateau: Two areas located to the north and east of the district that lie level above the limestone ridges and combs Character Areas;

• Settled Hills: Founded on inferior oolite and features steep slopes while the more gently rolling surrounding areas are on lias. Only one landscape area of this type is present in North Somerset, which is located in the far east of the district;

• Rolling Valley Farmland: Covers a large area of transitional, undulating topography from 10m to 135m, formed predominately on underlying mercia mudstone with head;

• Farmed Coal Measures: Occur where the underlying geology is predominantly formed by the carboniferous coal measures group. There is one major outcrop of this in Nailsea, which forms a distinct upstanding island rising from the surrounding levels, although there are smaller areas of coal measures included within other character areas; and

• Inter-tidal Bays: Occur along the Severn Estuary coast to the west of the district where the areas lie between the mean high water level and the mean low water level and are separated by limestone ridges.

Flood risk management options should be in keeping with the existing landscape character and visual amenity, whether protected or not and there may be opportunities to enhance the existing landscape and/or townscape.

Future restriction on development within areas at risk from flooding such as the moors and river flood plain may help protect the landscape character and views within and from these important landscapes; however, North Somerset Council will need to ensure that any development displaced from these areas does not cause a landscape impact equally or more severe elsewhere.

1.9.2 Landscape Designations and Other Notable Landscape Features

The Mendip Hills in the south of North Somerset are designated as an AONB and is a nationally protected landscape containing important habitats of limestone grasslands.\(^{\text{66}}\)

In addition to the AONB, North Somerset also has 15,530ha of Green Belt. Although Green Belt is a planning rather than landscape designation it ultimately affects the levels and nature of development, which in turn influences the landscape.\(^{1}\)

There are various pockets of ancient woodland and veteran trees in North Somerset, with the largest area of ancient woodland in the south of the district. However, Kings Wood, in the Vale of Winscombe, is the sole example provided in the North Somerset BAP. The Ashton Court Estate and Leigh Woods, south west of Bristol are the principal country park areas of the district. However, there are also examples of large country estates in the district, such as Tyntesfield (which includes a Grade II listed building), near Wraxall, owned by the National Trust. There are also other areas
important for landscape and recreational interest, such as Ham Green, Kingston Seymour fishing lakes and Blagdon Lake.

The AONB, Green Belt, country park and ancient woodland are all shown on the Landscape map in Appendix E.

### 1.9.3 Land Use

Figure 5 shows that North Somerset is predominantly rural. The 78% greenspace accounts for land used for agriculture, quarrying and green belts, including protected and designated sites such as the Mendip Hills AONB.

Ten percent of the land has been developed either as residential properties (domestic buildings and gardens) or as a commercial or municipal site (non-domestic buildings) and 3% of land use is roads.

Land uses in the ‘Other land uses’ section of Figure B5 includes the Royal Portbury Dock developments, Bristol Airport and various tourist attractions, such as the pier at Weston-super-Mare.

#### Landuse (%) in North Somerset

![Pie chart showing land use percentages in North Somerset]

**Figure B5: Land use in North Somerset**

Source: South West Observatory

### 1.9.4 Influence of the LFRMS on Landscape

Local authorities are working with Natural England, who lead on the implementation of the ELC in England. Local authorities can also incorporate landscape objectives into their plans and programmes; for example in North Somerset’s Core Strategy Policy CS5, ‘Landscape and the Historic Environment.’

The LFRMS will need to ensure that and LFRMS measures complement this Policy and take into account database records, such as the HLC (described in Section 1.8.1.2) in terms of maintaining or enhancing landscape character.
The LFRMS measures may include new (or modified) flood risk management structures, land use change, changes in flood risk/frequency or changes in water levels that have the potential to adversely or positively affect existing landscape features or settings, and to create new features, for example flood storage areas.

The LFRMS measures may change the frequency and extent of flooding, leading to consequent changes in the suitability of land for certain uses, for example by affecting its versatility, productivity, soil quality and mineral resources. For instance, construction activities or increasing the seasonal period during which soil is waterlogged could lead to impacts such as these.

1.9.5 Likely Evolution of the Baseline Environment without the LFRMS

North Somerset’s landscape is likely to continue to face threats from inappropriate development or management. However, the AONB Management Plans and land use plans will aim to continue protecting and enhancing the landscape. Biodiversity or recreation amenity enhancements have the opportunity to improve landscape. Environment Agency plans also have potential to improve landscape, for example by creating flood meadows or improving the natural hydromorphology of rivers, in line with WFD requirements.
Footnote References
