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Isle of Axholme Flood Risk Management Strategy

Strategic Environmental Assessment:
Scoping Consultation Document

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Summary

We are preparing the Isle of Axholme Flood Risk Management Strategy (FRMS) to set out how we manage flood risk from the River Torne and the River Idle in the low lying Isle of Axholme area. The Isle of Axholme FRMS covers an area of 514km², of which approximately 376km² is artificially drained low lying land. The Strategic Environmental Assessment (SEA) Study Area has been developed based on our assessment of the likely flood extents which would occur if we ceased operation and maintenance of the existing flood risk management assets plus areas that are outside the flood risk area but hydrologically linked to the watercourses within the flood risk area. The SEA Study Area and the flood risk boundary are shown in Figure 1, Appendix A and is bounded by the River Ouse to the north, the River Trent to the east, high ground to the south and high ground and the River Don to the west.

A heavily engineered and complex network of pumps and drains/watercourses has been developed over time to manage water levels and drain the Isle of Axholme and surrounding low lying areas. The system is managed by a combination of the local Internal Drainage Boards (IDBs) and the Environment Agency. Long term management of the system will require both the maintenance and replacement of assets, some of which have relatively short residual lives. How this will be achieved in the face of the increasing challenges of climate change is the key objective for the Isle of Axholme FRMS.

The Strategy will consider flood risk in the local area, and will give a clear presentation of the present and future flood-risk and its consequences. It will identify what flood risk management activities are required for the short (0-20 years), medium (20-50 years) and long (50-100 years) term, including identification of what needs to be done and who can contribute. The Strategy will include a costed action plan identifying how flood risk management is going to be delivered. We are preparing to consult on the draft Isle of Axholme FRMS in 2010.

As part of the Strategy development, we are undertaking a Strategic Environmental Assessment (SEA). This will ensure that we make decisions regarding the management of flood risk in a way that considers environmental concerns.

SEA has two main stages:

Scoping – establishes the existing key environmental conditions and issues in the Study Area and how the assessment will be undertaken.

Assessment – identifies the likely significant effects of the options considered and the recommended Isle of Axholme FRMS. The assessment also makes recommendations to avoid or reduce adverse effects.

This SEA Scoping Consultation Document outlines what we have found during the scoping stage so far. It presents the information we have compiled to date for the Isle of Axholme FRMS and provides details about how we intend to assess the effects of the flood risk management options on the environment.

Statutory consultees and other organisations have already provided us with valuable feedback on the strategic environmental baseline/context from our previous consultation on the Trent Catchment Flood Management Plan (CFMP). Re-consultation on the Catchment Flood Management Plan is currently being undertaken. We now want to focus on environmental issues and influences relevant to the local area of the Isle of Axholme FRMS. We have started scoping the SEA and - from the information gathered so far - we have identified the key environmental issues we think it needs to focus on; these are outlined in the table overleaf.

However, we would like consultees to tell us whether there are more local issues/opportunities – or available environmental information - relevant to the Isle of Axholme SEA Study Area.

Please share with us your views on our identified key environmental issues and opportunities by the 12th March 2010. Comments should be returned to John Pygott (Environment Agency Project Manager):

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Isle of Axholme Flood Risk Management Strategy	
Environmental Receptor	Key Issues and Opportunities
Human Beings	<p>Managing the flood risk to urban and rural communities.</p> <p>Critical transport and power infrastructure associated with Robin Hood Airport and Keadby power station and associated distribution centre as well as national road and rail networks within the Study Area.</p> <p>Public access and green space opportunities in relation to flood risk management options.</p>
Flora and Fauna	<p>Conserving and enhancing the special interest features of the Special Areas of Conservation (SACs), Special Protection Areas (SPAs) and Sites of Special Scientific Interest (SSSIs).</p> <p>Opportunities to enhance biodiversity, including Biodiversity Action Plan (BAP) habitat creation and less intensive land management.</p>
Air and Climate	Planning for climate change impacts.
Water	Existing point source and diffuse pollution affecting water quality. Heavy modification of water bodies throughout the Study Area. Opportunities to improve water environment.
Landscape	Protection and enhancement of areas of high landscape quality.
Historic Environment	A number of Scheduled Monuments are located within the Study Area. The towns of Crowle and Thorne are historic market towns.
Soils, Geology, Land Quality and Land Use	Large areas of high quality and versatile agricultural land at flood risk.
Natural Resources	Potential for future exploitation of sand and gravel extraction.

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1 Introduction

1.1 Introduction to the Isle of Axholme Flood Risk Management Strategy

We are the Environment Agency and we are responsible for managing the risk of flooding from rivers and the sea. The Isle of Axholme Flood Risk Management Strategy (FRMS) will set the direction for an overall flood risk management approach to the strategic Study Area by defining what will be done to manage flood risk in the future.

We take a three-staged approach to flood risk management. Table 1.1 describes these three stages, highlighting the hierarchy and relationship between each stage and where the Isle of Axholme FRMS sits within this. Each stage requires an understanding of flood risk in the area concerned, alongside an appreciation of the associated environmental issues and planning framework that needs to be worked within. Each stage must do this at a level of detail that is appropriate to the stage and the scale of the area being considered.

Table 1.1 The Flood Risk Management Framework

Policy/Project	Purpose	Level of detail	Current Status	Timetable
River Trent Catchment Flood Management Plan (CFMP)	To provide a high level understanding of flooding across the whole River Trent catchment and to develop policies for the FRM strategies	An understanding of catchment process and an overview assessment of current and future flood risks, environmental constraints and objectives	Consultation on revised Trent CFMP, January to April 2010.	Final report to be produced in late 2010
Isle of Axholme Flood Risk Management Strategy	To implement the policies drawn from the CFMP by defining FRM options specific to the Study Area	Detailed understanding of flood processes, appraisal of alternatives and selection of preferred management measures	Strategy currently in development	Draft Strategy due in 2010
Flood Risk Management Projects	Projects to implement the results of the FRM strategy	Detailed appraisal of specific measures, design, selection and implementation	No current timetable – This will be determined by the outcomes of the Isle of Axholme FRMS	

In 2007 into 2008, we prepared and consulted on the draft Catchment Flood Management Plan (CFMP) for the River Trent catchment. This large-scale plan identifies strategic flood risk issues throughout the catchment and identifies draft broad policies to manage these risks through a high level assessment of opportunities and constraints. The plan separated the River Trent catchment into a number of policy units based on a range of criteria including hydraulic characteristics, topography, geology and drainage characteristics, land use, links to other plans and opportunities for future flood risk management. The Isle of Axholme FRMS Study Area is within CFMP Policy Unit 1. Through our work to date in developing this strategy, we have further developed our understanding of both the flooding mechanisms and the likely extent of flooding within the Isle of Axholme area. Based on this more detailed assessment, we propose to amend the CFMP flood risk management policy for this unit. We will be consulting on the policy

amendment simultaneously with this Scoping Consultation Document. Consultation on the policy amendment will run until April 2010.

The Isle of Axholme FRMS will add greater local detail to the CFMP, and will establish the needs, solutions and level of investment for management of future flood risks. The Strategy will include a clear presentation of the present and future flood risk, and its consequence. It will identify what flood risk management activities are required for the short (0-20 years), medium (20-50 years) and long (50-100 years) term, including identification of what needs to be done and who can contribute.

1.2 The Study Area

The Isle of Axholme FRMS covers an area of 514km², of which approximately 376km² is artificially drained low lying land. As shown on Figure 1 in Appendix A the SEA Study Area is bounded by the River Ouse to the north, the River Trent to the east, high ground to the south and high ground and the River Don to the west. The SEA Study Area has been developed based on our assessment of the likely flood extents which would occur if we ceased operation and maintenance of the existing flood risk management assets and includes areas that are outside the flood risk area but hydrologically linked to the watercourses within the flood risk area. The SEA Study Area and the flood risk boundary are shown in Figure 1, Appendix A.

A heavily engineered and complex network of pumps and drains/watercourses has been developed over time to manage water levels and drain the Isle of Axholme and surrounding low lying areas. The drainage system has modified the landscape from what was once marshland to what is now high grade agricultural land. Predominantly constructed in the 17th century, the drainage network has significantly altered the route of the Rivers Torne and Idle, the two main rivers which flow across the low lying land.

The modified Rivers Torne and Idle ultimately discharge into the River Trent through a system of combined gravity outfalls and pumping stations located at Keadby and West Stockwith. These pumping stations are owned and operated by the Environment Agency. In addition to these two large pumping stations there are fourteen inland pumping stations which are also owned by the Environment Agency. Over forty further pumping stations are either owned or operated by the local Internal Drainage Boards (IDBs) or are in private ownership. These pumping stations transfer water from the drainage network into either the modified Rivers Torne and Idle or other significant watercourses. A number of these pumping stations and gravity outfalls discharge smaller sub-catchment drainage systems directly into the River Trent.

A small number of the pumping stations are funded by the Coal Authority under statute to address mining subsidence and this will limit our options in relation to these. There are proposals in the strategy area for continued mining and the impacts of subsidence will need to be taken into account throughout the life of the strategy.

In conjunction with the pumping stations, water levels are managed by means of over 90km of flood defence embankments and 1km of floodwall extending along the Rivers Torne and Idle and associated drainage channels. Adjacent to the River Idle there are also significant lengths of minor embankments, designed to overtop at lower flood events and inundate the washlands behind them. Linear flood defences also extend along the River Trent, the River Ouse and the River Don providing flood protection to the area from these rivers. The Environment Agency manages all the embankments and linear defences within the SEA Study Area.

1.3 Flood Cells

By considering the different types of land use and how different areas might be affected by flooding, we would normally look to split the SEA Study Area into smaller units for analysis. These areas are commonly referred to as flood cells. A flood cell could potentially be affected by flooding independently from other flood cells, either due to topography or because of obstructions such as roads or embankments that might affect how water would move across the floodplain.

The Isle of Axholme is made up of a number of individual pumped catchments which are hydraulically separate under normal operation and, under this scenario; they fit the normal definition of flood cells. However, as the area is very flat, these areas become hydraulically linked either during floods or if the pumping is changed (eg. by the removal of a pumping station). The complexity and connectivity of the Isle of Axholme system means that we will need to apply an approach specific to this strategy when appraising options, which will differ from our normal approach to appraising options on a simpler system. At a high level, this will follow the Trent CFMP. Beneath this, we plan to consider the management of flood risk management assets (floodbanks, pumping stations, etc) based on both location and function within this linked system. This will enable us to examine the system both in a holistic fashion and also consider individual or groups of pumped drainage catchments where it appropriate to do so.

1.4 Developing a FRM Strategy

In undertaking our flood risk management responsibilities we are able to carry out capital works or maintenance to address flood risk to people, property and the environment. To do this we must make best use of limited public funds and are therefore required to prioritise those funds to achieve the maximum public benefit.

In order to achieve this we have set national public service targets referred to as Outcome Measures, listed in Table 1.2.

We are also developing further Outcome Measures to:

- Improve the take up of our flood warning service.
- Improve contingency planning by emergency responders.
- Avoid inappropriate development in flood risk areas.
- Introduce long term flood risk management policies and action plans.

Table 1.2 National Flood and Coastal Erosion Risk Management public service targets to 2011

Outcome Measures	Details
Economic Benefit	We have set targets that ensure the cost of providing flood risk management does not outweigh the benefits. Flood risk management measures that provide the greatest economic benefit for the least cost will be prioritised.
Households at risk	We have set a target to improve the standard of protection against flooding for 145,000 households, with particular focus on improving protection for 45,000 households significantly at risk.
Deprived households at risk	We have set a target to improve the standard of protection for those households in the most deprived 20% of areas significantly at risk from flooding.
UK Biodiversity Action Plan habitats	We have set targets to create 800ha of BAP habitats by March 2011.

To develop a flood risk management strategy we are required to follow government guidance (Defra, 2001) by carrying out technical, economic and environmental assessments of a range of potential options. With this guidance in mind we have set the following objectives for the Isle of Axholme FRMS:

- To provide the most cost effective approach for land drainage and flood risk management.
- To demonstrate resilience in the face of extreme events and or/future change.
- To maximise the overall sustainability of the options considered.
- To improve the management of existing biodiversity assets and incorporate biodiversity gains where possible.
- To ensure that the strategy is agreed and supported by key stakeholders and the wider community.

Our strategy will be developed by considering how flood risk might be managed using a range of different options. This approach will allow us to take a strategic view of flood risk, ensuring that work to manage flooding in one area does not increase the risk of flooding to people and property in other parts of the Study Area.

1.5 Flood Risk Management Options

We are currently developing several strategic options for managing flood risk within the Study Area. The government Foresight Future Flooding Report (Office of Science & Technology, 2004) has developed an exhaustive list of flood risk management measures (see Appendix B) which can be split into the following themes:

- Managing the rural landscape
- Managing the urban fabric
- Managing flood events
- Managing flood losses; and
- Engineering interventions

We have reviewed these measures (see section 5.4) to produce a number of potential standards of service which may be applied, these are set out in Table 1.3. In accordance with Defra guidance, we will consider the benefits, costs and environmental impacts of each option by comparing the option with what would happen if nothing further was done to manage flood risk. We call this the Do Nothing scenario, this is a theoretical “option” which assumes that nothing would be built, pumping operations would cease, no maintenance would be carried out on existing pumps, flood defences or structures and no flood warnings system would be put in place.

Table 1.3 Standards of service that will be considered in the development of the Isle of Axholme FRMS

Option	Description
Do Minimum	This option provides for the continued maintenance and operation of existing flood defences, pumping stations and other flood risk management assets such as outfalls and channels until the end of their useful life. Other existing measures such as flood warning would continue. Under this option defence breaches would be repaired as they occur. No new flood risk management measures would be implemented.
Sustain Flood Risk Management Assets	This option provides for continued operation of existing flood defences, pumping stations and other flood risk management assets such as outfalls and channels. In contrast to the Do Minimum option, assets would be replaced once they had reached the end of their useful life. Replacement would provide the same defence height and pumping regime as currently designed but would not allow for the effects of climate change such as changes in river flows. No new flood risk management measures would be implemented.
Sustain Standard of Service of Flood Risk Management Assets	This option is similar to the Sustain Flood Risk Management Assets option, but replacement of assets would take account of climate change (and other pressures such as development) over the strategic appraisal period.
Increase Standard of Service	This option provides for continued operation of flood defences, pumping stations and other flood risk management assets. Where feasible a consideration would be made to increase the standard of service provided either through the construction of new assets or through improving existing assets.
Withdrawal of Maintenance	This option is extremely unlikely as an overall policy for the whole Study Area but it may be appropriate in localised circumstances. Under this option, after an appropriate period of consultation, unviable flood risk management assets would cease to be maintained.

We have reviewed these themes to produce a number of measures which will be considered in the development of the Isle of Axholme FRMS. These are set out in Table 1.4.

Table 1.4 Measures that will be considered in the development of the Isle of Axholme FRMS

Foresight Response Group & Intervention Option	Description
Foresight Report Response Theme: Managing Flood Events	
Forecasting & Warning: <i>Flood Warning</i>	These measures would involve providing forecasting and warning to provide sufficient time for people and organisations to take effective mitigating actions prior to floods arriving.
Foresight Report Response Theme: River & Coastal Engineering - Fluvial Defences	
Floodwater Transfer: <i>Pumping Stations</i>	These measures would involve making changes to the existing pumping stations either individually or in combination with the rest of the system. Options are likely to include; increasing or decreasing pump capacity, introducing or increasing gravity bypasses (either in combination or in place of existing pumps), modifying the pump operating regime (for example, operating rules, pumping levels, etc), constructing new pumping stations or removing and combining pumping stations.
River Defences: <i>Linear Flood Defences</i>	These measures would involve constructing new linear defences or improving existing flood walls or embankments to reduce the level of flood risk. Options for managed realignment of defences would also be considered, which would involve setting back a current line of flood defence.
Floodwater Transfer: <i>Outfalls</i>	These options would involve either replacing existing structures, increasing/decreasing capacity or removing outfalls.
River Conveyance: <i>Channels</i>	These options would involve either making changes to existing channels through dredging, widening (including two-level channels) or making changes to the existing maintenance regime. Also, where appropriate we would consider providing new channels or combining existing channels. We would also consider channel restoration. This would involve the restoration of the channel to a more natural state and making environmental enhancements.
Engineered Flood Storage: <i>Floodplain / Wetland Storage</i>	This measure would involve using areas of land adjacent to the river to store water in suitable locations during floods. We would also consider floodplain restoration. This option would involve allowing the river to flood its natural floodplain once again by removing river defences.

The options considered by the Isle of Axholme FRMS are likely to be made up of a combination of these different measures.

Also, we will consider options for how best to manage the system in a sustainable and cost effective manner. This will include consideration of aspects such as:

- determining which organisation is best placed to operate the asset;
- what is the most carbon efficient method of operation; and
- what is the most appropriate technology.

Other flood risk management measures listed by the Foresight Report are not appropriate for assessment as part of this Strategy but are suitable for consideration by the Environment Agency in their wider role, for example, rural infiltration. The Foresight Report measures are listed in Appendix B.

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2 Strategic Environmental Assessment

2.1 Overview

As part of the development of the Isle of Axholme FRMS, we will be undertaking a Strategic Environmental Assessment (SEA).

SEA is a process that ensures that the environmental issues and opportunities relevant to the Study Area are considered as we develop the options for managing flood risk. The SEA will be undertaken in parallel with the development of the Isle of Axholme FRMS, allowing for the environmental effects of options to be considered from an early stage.

The SEA process will enable us to understand the environmental effects and identify opportunities where we can improve the existing environment. We know that flood risk management options can have adverse environmental effects and we want to avoid or reduce these potential impacts. We also want the SEA to identify opportunities where flood risk management options can lead to additional environmental enhancements. By doing this we can ensure the protection of the environment and promote sustainable development.

The stages of the SEA process and how it integrates with the development of the Isle of Axholme FRMS are highlighted in Table 2.1.

The UK SEA Regulations¹ do not require us to undertake SEA for the Isle of Axholme FRMS. However, it is our policy to undertake SEA for flood risk management strategies as best practice and we intend to meet the requirements of the regulations throughout. Consultation will also be conducted with all interested parties, including the statutory consultees.

The outputs of the SEA process are:

- This Scoping Consultation Document which will be formalised into a Scoping Report on the receipt of feedback.
- An Environmental Report – published with consultation on the draft Isle of Axholme FRMS. The Environmental Report documents the assessment of the draft strategy and the reasonable alternatives considered.
- A SEA Statement – published on adoption of the final Isle of Axholme FRMS and which documents how it has been influenced by the findings of the SEA.

¹ The Environmental Assessment of Plans and Programmes Regulations 2004 (Statutory Instrument 2004 No 1633)

Table 2.1: Stages of the SEA Process

FRM Strategy Stage	SEA Stage	Objective	Purpose
Data collection and analysis	Scoping	To gather information to identify the key environmental issues relevant to the area and FRMS.	The information is used to identify opportunities for flood risk management options that can also improve the environment. Environments that are sensitive to change or could be adversely affected by the strategy are identified.
	Scoping Consultation	To consult on the scope and level of detail required for the SEA.	The feedback is used to refine the understanding of key environmental issues affecting the area and how the FRMS may influence these.
Develop strategic options	Assessment	The strategy will identify a number of potential FRM options which will be assessed for their environmental effects. Mitigation and enhancement measures will be developed to avoid or reduce the negative impacts or maximise the positive impacts. The selection of the preferred strategy options is informed by the results of this assessment.	To identify whether any FRM options are likely to have adverse environmental effects, with the aim of developing alternative options or measures to mitigate the effects. This information influences the strategy and how it can be improved to better protect and enhance the environment. Assessment of the possible flood risk options in detail to fully understand their environmental effects before selecting the preferred options.
Produce draft Strategy & public consultation	SEA Environmental Report	To consult with the relevant bodies and the public on the draft Strategy and the results of the SEA.	The feedback is taken into account whilst producing the final Strategy.
Strategy adoption	SEA Statement	To adopt the strategy and show how the environmental issues and consultation feedback has been taken into account.	The results of the assessment help to implement the preferred options.
Project planning and implementation	SEA informs project development	To develop and implement the flood risk management schemes and operations identified in the Strategy.	Information in the SEA forms the basis for more detailed environmental assessment of flood risk management schemes or operations.
Strategy progress and review	Monitoring	To monitor the environmental effects of the Strategy and its implementation.	Monitoring is used to confirm the environmental effects of the strategy, how any mitigation measures are working and provide a better understanding of the environment.

2.2 SEA and Consultation

We are now at the scoping consultation stage for the SEA. The purpose of this report is to compile and present information on the Study Area at an early stage and to explain how we intend to carry out the environmental assessment. We will consult on the draft Isle of Axholme FRMS at a later stage of the programme.

The aims of the scoping stage of the Isle of Axholme FRMS SEA are to:

- Set out the aims of the Isle of Axholme FRMS.
- Identify the area that the Isle of Axholme FRMS has the potential to affect (the Study Area).
- Understand the relationship between the Isle of Axholme FRMS and other plans and strategies which influence the environment in the Study Area.
- Describe what we think the environment is like now and how it is likely to develop in the future.
- Consult statutory authorities and other relevant organisations to identify any additional information which will be useful in developing the strategy and discuss the scope and the level of detail of our SEA.

Question 1

Sections 1 and 2 set out the objectives of the Isle of Axholme FRMS and the environmental assessment and provides an overview of the FRM options that will be considered.

Do you have any comments on these objectives?

Do you have any comments on the options being considered?

Question 2

Section 2 describes the SEA process and how it will be applied to the development of the Isle of Axholme FRMS.

Do you have any comments on the process or the consultation stages of the Isle of Axholme FRMS?

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3 Legislation, Policy and Guidance

3.1 Introduction

The Isle of Axholme FRMS is not the only strategy relevant to the area. We have already described in Section 1 how the strategy fits with other strategic flood risk management plans. However, we also want to understand how it interacts with other policies, plans, guidance and strategies relevant to the area.

These documents include:

- European Directives
- UK legislation and policy
- English legislation and policy
- Defra policy and guidance
- Environment Agency policy and guidance
- Regional and local authority policy and documents
- Local studies and reports

3.2 Statutory Responsibilities

We are responsible for managing the flood risk arising from rivers and the sea. However, the legislation covering management of flood risk and coastal erosion is permissive in nature (i.e. it permits us to carry out works but there is no obligation on us to do so). Flood defences remain the responsibility of the relevant landowner unless they are adopted by an operating authority, such as us. A large number of flood defences are therefore privately owned and maintained.

Under the relevant sections of the Environment Act 1995 and the Land Drainage Act 1994, we are required to contribute to the conservation and enhancement of flora and fauna, natural beauty, geological and physiographical features, heritage and recreation when carrying out flood risk management functions under the relevant Acts (Defra, 2001). Consequently, the Isle of Axholme FRMS must meet these requirements.

The Isle of Axholme FRMS may have the potential to affect Natura 2000 sites - areas designated by the UK Government as being of European importance for their biodiversity. Where there are potential effects we are required to assess them in a way set out in the Habitats Regulations. If required, we will undertake this process separately but in parallel with the SEA. This Habitats Regulations Assessment (HRA) will be reported on separately but will be referred to and summarised in the SEA Environmental Report.

3.3 National and Regional Policies and Plans

We have very recently consulted on the draft Trent CFMP, which is due for a further period of consultation from January to April 2010 before it is adopted. As described in Section 1, the Trent CFMP informs the development of this strategy and has also been subject to SEA. The Trent CFMP and SEA have already considered the strategic policy context of other UK and regional plans and strategies in developing its draft policies. We

have therefore concentrated on the local policy issues and influences relevant to the Study Area.

Appendix C details all of the policies and plans that have been reviewed during the production of the draft Trent CFMP and highlights those plans that will need to be considered for this strategy.

The approved Humber Flood Risk Management Strategy incorporates the defences along the northern and eastern (south as far as Keadby bridge) boundaries of the Isle of Axholme FRMS strategic area. The Isle of Axholme FRMS will consider and take account of the policies identified in the Humber Flood Risk Management Strategy.

3.4 Relevant Local Policies and Plans

The following sections provide an overview of the plans and policies which are relevant to the Isle of Axholme FRMS at the local level. The key issues associated with local level plans and policies that will require detailed consideration at the next stage of the Isle of Axholme FRMS are described in Table 3.1 below.

3.4.1 Local Planning & Policy

The Isle of Axholme FRMS covers the Regional Administrative boundaries of the Government Office for Yorkshire and Humberside and the Government Office for the East Midlands. The Study Area covers areas within the boundaries of North Lincolnshire Council, East Riding of Yorkshire Council, Nottinghamshire County Council, Doncaster Council and Bassetlaw District Council.

Under the new planning framework the current Local Plans are being replaced by a Local Development Framework (LDF), which consists of a number of documents rather than one large document. LDFs are currently being developed by North Lincolnshire, Doncaster, Bassetlaw and East Riding of Yorkshire. In addition, the Nottinghamshire Structure Plan will be replaced by the East Midlands Regional Development Plan.

Until the adoption of the LDFs is finalised the current Local Plans still apply however certain policies have already been disregarded in the development of the LDFs. Table 3.1 shows the current Regional and Local Planning policies taking into account the emerging LDFs. Continued monitoring of the LDF development will occur throughout the SEA process to ensure that all new and continued planning proposals are considered.

Strategic Flood Risk Assessments are being prepared by the four local authorities and these are at different stages of completion. The results of the Isle of Axholme FRMS will potentially feed the future development of the Strategic Flood Risk Assessments.

Table 3.1 Regional and Local Planning Items in the Study Area

Plan or Strategy	Key Relevant Proposals/Policies
Yorkshire and the Humber Regional Spatial Strategy (2008)	<ul style="list-style-type: none"> • Protect and enhance the Humber estuary biodiversity and landscape character. • Reduce the depletion of the Sherwood Sandstone aquifer.
East Midlands Regional Plan (2009)	<ul style="list-style-type: none"> • Regeneration focus on Bassetlaw as identified as 'economically lagging' by the Government's Rural Strategy.
North Lincolnshire Local Plan (2003)	<ul style="list-style-type: none"> • Area classed as an area of high historic/landscape value. • High Grade agricultural land to be protected from all development unless there is an overriding requirement for said development. • Proposed industrial developments in Keadby. • Proposed new school and industrial developments in Ealand. • Numerous housing developments within population centres including Crowle and Keadby.
Boothferry Borough Local Plan (1999)	<ul style="list-style-type: none"> • Entire expanse of Study Area within Boothferry Borough classed as a flood risk area. • Residential developments proposed in Swinefleet.
East Riding of Yorkshire Council Local Plan (1999)	<ul style="list-style-type: none"> • The Plan indicates that tourism will be an essential tool in diversifying the local economy. • The Plan aims to encourage the growth within the tourism sector, particularly to develop the tourism infrastructure outside of the traditional coastal resorts, with particular emphasis placed upon historic and environmental locations.
Nottinghamshire Structure Plan (2006)	<ul style="list-style-type: none"> • No proposals within Study Area.
Nottinghamshire Minerals and Waste Development Scheme (2007)	<ul style="list-style-type: none"> • Two proposed areas for future mineral working within the Study Area.
Doncaster Unitary Development Plan (1998)	<ul style="list-style-type: none"> • Construction of a 900MW carbon capture and storage coal-fired electricity plant in Hatfield after a grant awarded by the European Union. • Doncaster designated as Countryside Policy Area. • Road improvements at the forefront of planning – M18, M18/A641 Link Road, M180, A18 Thorne Road, A630 West Moor Link Road. • Sites for industrial and business development identified on M18 Junction 4 with Armthorpe, M18 Junction 6 with Thorne and a number of sites within Hatfield, Stainforth and Thorne. • A number of proposed Protected Public Open Spaces within Thorne, Hatfield and Moored.
Bassetlaw District Council Local Plan (2001)*	<ul style="list-style-type: none"> • Proposed mixed development in West Stockwith. • Proposed residential development in Misson and Misterton.

*This is not a statutory document therefore Bassetlaw District Council are currently utilising the East Midlands Regional Plan to justify planning proposals.

3.4.2 Water Management Planning

In addition to flood risk management plans there are a number of other water management plans relevant to the Study Area.

The European Water Framework Directive (Directive 2000/60/EC) (WFD) sets out a number of principles and targets for how Member States (including the UK) should aim to protect and enhance the water environment to ensure the sustainable use and development of water resources for economic and social development.

Under our commitment to the WFD, the UK must aim to reach good chemical and ecological potential in inland and coastal waters by 2015. Furthermore, the WFD seeks to:

- enhance the status and prevent further deterioration of aquatic ecosystems and associated wetlands;
- promote the sustainable use of water;
- reduce pollution of water; and,
- ensure progressive reduction of groundwater pollution.

These principles have been set out for the Study Area in the following plans:

- Humber River Basin Management Plan (RBMP) 2009
- Idle and Torne Catchment Abstraction Management Strategy (CAMS)
- Trent Corridor CAMS.

These have developed policies which seek to preserve and improve water quality and water environments within their catchments. It will, therefore, be necessary for the Isle of Axholme FRMS to maintain the water quality status of water bodies within the Study Area. There are opportunities for contributing positive measures to help achieve WFD targets e.g. installing fish passes while re-constructing existing pumping stations and outfalls to improve passage of fish and eels.

Under the Water Resource Management Plan Regulations 2007, water companies in England and Wales are required to set out how they plan to manage water supplies over the next 25 years. Yorkshire Water and Severn Trent Water have both produced draft Water Resource Management Plans (2008) which set out a programme of measures to use and improve existing water supply network and services and reduce leakage to meet present and future demand. It will be necessary for the Isle of Axholme FRMS to ensure that any potential effects on the water supply network are fully considered and addressed.

In addition, the Tidal Trent Outfalls Scheme and the Lower Trent Outfalls Refurbishment Scheme are being undertaken simultaneously with the Isle of Axholme FRMS and will be linked in with the Strategy at a later stage in the SEA process.

3.4.3 Biodiversity Plans

There are numerous environmental and biodiversity plans relevant to the Study Area both at a national and a local level. Due to the level of detail of the FRM Strategy, we think that the local plans, which incorporate requirements of higher level strategic plans, are of most relevance to the Isle of Axholme FRMS. Such local plans and strategies include:

- Local Biodiversity Action Plans (LBAPs)
- Water Level Management Plans (WLMPs)

Relevant LBAPs for our strategy are those for Nottinghamshire, East Riding of Yorkshire and Lincolnshire and these identify the species and habitats for which action plans have been prepared. In addition the Yorkshire and Humber Regional Biodiversity Strategy sets

out how biodiversity aims are to be integrated into regional and national policy within the area.

WLMPs are required for all areas which have a conservation interest, with priority given to Sites of Special Scientific Interest (SSSIs), where the control of water is important for biodiversity. WLMPs are a means of balancing water level management for a range of land uses and activities within an area, including agriculture, angling, flood risk and conservation. WLMPs are presently being developed for a number of sites within the Study Area, notably the River Idle Washlands where some pilot water management works are being undertaken at present.

A number of other initiatives promoting the enhancement of biodiversity and creation of wetland sites are currently being promoted in the Study Area. These include:

- Wetlands Vision Project (WVP) – a national project led by Natural England, the RSPB, the Environment Agency, English Heritage and local wildlife trusts. The aim is to increase the coverage of wetland habitats throughout the UK over the next 50 years. In our Study Area the WVP is being led by the OnTrent Initiative which aims to create a number of wetlands along the Trent and provide opportunities to improve the local economy and local people's quality of life.
- North East Regional Habitat Creation Programme – our programme for delivery of BAP habitat creation in the Yorkshire and Humber region. This programme will take on the delivery of any potential BAP creation opportunities identified by the Isle of Axholme FRMS.
- The Isle of Axholme Greenway Project - aims to develop a Greenway Network, possibly using a disused railway corridor, to create a multi-user pathway that will provide and maintain access to the Isle and its historic landscapes.

Some habitats/species are susceptible to changes in flood frequency, floodwater chemistry, groundwater levels and drainage system maintenance. The Isle of Axholme FRMS will therefore need to consider the specific water level, water quality and habitat requirements during the development of options to maintain and enhance priority species and habitats, promoting new areas of habitat and improving quality.

Question 3

Appendix C identifies the policies, plans and strategies that we will take into account as we develop the Isle of Axholme FRMS. It also includes those that we have scoped out of consideration. Are there any other plans or strategies that you think we should include?

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4 Environmental Baseline

In this chapter we have provided a broad overview of the existing environment in the Study Area (our baseline). It is important for us to understand what the baseline conditions are so that we can predict how the different options considered in the development of Isle of Axholme FRMS might change that environment.

In order to provide structure to our assessment, we have split the different features of the environment into different 'receptor' categories. This will enable us to consider the potential constraints and opportunities associated with the different environmental receptors. We have undertaken a review of existing data, reports and local plans to inform this exercise.

A summary of the existing environmental baseline is provided for each receptor along with information on likely future trends, where the information exists.

4.1 Human Beings

This receptor category includes consideration of:

- Populations and communities at flood risk.
- Human health and recreation.
- Material assets and critical infrastructure.

Flooding events can have significant effects on communities through damage to homes and businesses and in extreme cases may result in significant injury and/or death. In addition they are known to lead to health impacts (both physical and mental), including stress and trauma, sometimes months or years after the flood event, or whenever flooding appears likely to occur (Tapsell et al, 2002).

4.1.1 Populations and Communities at flood risk

Our economic analysis has shown an estimated 27,771 residential properties and 2,627 non-residential properties located within the flood risk area. In addition, approximately 26% of the residential properties in the Study Area are classed as deprived. The main population centres are Thorne and Crowle in the north of the Study Area and Epworth and Belton to the south east.

The rest of the Study Area is predominantly rural with scattered communities and farms spread throughout. There are numerous small villages including Reedness, Whitgift and Ousefleet located on the northern boundary on the bank of the Ouse; Keadby, West Butterwick and Owston Ferry on the eastern boundary along the Trent; and Haxey, Misterton and Misson in the southern half of the Study Area.

Not all communities in the Study Area are at immediate risk of being flooded, however, during a flood event they could be entirely cut off as infrastructure becomes inundated.

4.1.2 Human Health and Recreation

Table 4.1 highlights the health status of the population within the Isle of Axholme FRMS Study Area. The health status of the Yorkshire & Humber region and the North Lincolnshire region as a whole is relatively similar to the national average as the figures below demonstrate. However, the percentage of people in "Not Good Health" is slightly higher than the national average in Bassetlaw and Doncaster East.

Table 4.1 Indicative Health Status within the Isle of Axholme FRMS Study Area

Health Status	Percentage of Population						
	Axholme North	Axholme South	Doncaster East	Bassetlaw	North Lincolnshire	Yorkshire & Humber	England
Good Health	65	67	66	65	66	67	69
Fairly Good Health	25	23	23	24	24	23	22
Not Good Health	10	10	11	11	10	10	9

Source: ONS, 2001 Census

The Study Area does not currently contain any national cycle routes; however; there are numerous Public Rights of Way that may be vulnerable to flooding and therefore cause subsequent disruption to users.

In addition, as mentioned in Section 3.4.3, the Isle of Axholme Greenway Project aims to work with local residents to create a multi-user footpath within the Study Area to improve access to the features of the Isle.

4.1.3 Material assets and critical infrastructure

Locations of key infrastructure features are shown in Appendix A, Figure 2.

The two motorways at flood risk are the M18 that runs down the western boundary of the Study Area and the M180 that bisects the Study Area running between Scunthorpe and the M18 just north of Doncaster. In addition, there are a number of important 'A' roads including the A161, which runs the length of the Study Area parallel to the eastern boundary, and the A18, which runs parallel to the M180.

There are major railway routes that run between Doncaster and Scunthorpe and Lincoln and Scunthorpe and a small number of local services, stations and tracks within the Study Area. There are five railway stations within the Study Area; two in Thorne and one in Stainforth, Ealand and Keadby.

Keadby Power Station, a 750MW rated power station, and its associated distribution centre are both located on the eastern boundary of the Study Area. Linking both the power station and distribution centre to the National Grid are a significant number of overhead transmission lines supported by pylons and substations throughout the Study Area. The distribution centre is critical for power provision in the area. Without it, it is not possible to provide electricity to the areas north and east of its location.

The current gas storage facility at Hatfield is the fourth largest, in terms of percentage storage, of the nine major gas storage facilities in the UK. The facility, commissioned in February 2000, is owned by Scottish Power and stores Liquefied Natural Gas (LNG) in a depleted gas field, a layer of porous sandstone about 440 metres underground. The gas stored in Hatfield may also be used for electricity generation at the company's gas-fired power stations. Scottish Power is currently applying to extend the storage capacity at Hatfield.

In October 2009, funding was awarded to Powerfuel Power for a 900MW coal-fired electricity plant that uses carbon capture and storage technology to be constructed on the old Hatfield Colliery site on the western boundary of the Study Area. This proposed

structure and its associated infrastructure will be considered during the strategic assessment process.

Robin Hood Airport is located just outside the south west corner of the Study Area. Although it is not within the Study Area it is possible that the drainage network established at the airport at the time of construction relies on the current drainage regime within the Study Area and therefore any change could have a negative impact on the airport.

The Study Area also contains Major Accident Hazard (MAH) pipelines, High Pressure Gas Pipelines and aviation fuel pipelines. The aviation fuel pipelines feed Robin Hood Airport. These pipelines are important to the local, regional and national economies.

There are six sewage treatment works and one water treatment works within the Study Area. Floodwater inundation to any of these sites would cause severe disruption to their operation, and potential contamination of the surrounding areas with sewage.

In addition, there are two large prisons within the Study Area, HMP Lindholme and HMP Moorland. Due to limited capacity in the current UK prison system these facilities are considered to be critical infrastructure in a national context.

4.2 Flora and Fauna

Under Sections 6 and 7 of the Environment Act 1995 we have a duty to promote and further the conservation of flora and fauna, notably that dependent on the aquatic environment.

We have undertaken an ecological data collection process to aid the scoping study. This has included a desk based search for protected species and designated sites.

This Section highlights statutory and non-statutory designations within the Isle of Axholme Study Area and considers the biodiversity associated with these protected areas. The locations of all these statutory and non-statutory designations are shown in Appendix A, Figure 3.

4.2.1 National and International Nature Conservation Designations

Humber Estuary (SAC, SPA, SSSI, Ramsar site)

The Humber Estuary is located outside the northern boundary of the flood risk area and covers over 37,000 hectares and as a result is the largest macro-tidal estuary on the British North Sea Coast. It is hydrologically linked to the watercourses within the flood risk area and therefore cannot be scoped out at this stage of the assessment.

The area covers an extensive list of internationally and nationally important habitats including mudflats, sandflats, saltmarsh and reedbeds. It also provides habitat for a number of internationally and nationally important species such as grey seals *Halichoerus grypus*, Eurasian golden plover *Pluvialis apricaria* and common redshank *Tringa totanus*.

Hatfield Moors and Thorne, Crowle and Goole Moors (SAC, SPA, SSSI, NNR)

Thorne, Crowle and Goole Moors and Hatfield Moors are located in the western half of the Study Area and cover over 3000 hectares in total.

Thorne, Crowle and Goole Moors and Hatfield Moors are the two largest remaining naturally regenerating raised bogs in lowland England. This is an Annex 1 Habitat under the EC Habitats Directive and the primary reason for their selection as SACs. Both areas

have been restored due to active management of water levels and rely on continual management to maintain them.

Both provide habitat for an internationally important population of European nightjar *Caprimulgus europaeus*, a bird listed on Annex 1 of the EC Wild Birds Directive and the reason the areas became designated SPAs.

Both sites are also designated as SSSIs, and National Natures Reserves (NNR) as they make up sections of the Humberhead Peatlands. A number of invertebrate species listed in the Red Data Book also inhabit both areas.

Other SSSIs

In addition to the above three SSSIs, there are a further twelve SSSIs within the Isle of Axholme FRMS Study Area. These are detailed in Appendix D. Of these, nine are dependent on water levels in order to maintain their condition. A further five are designated due to their geological interest. All will be considered further in the strategy.

4.2.2 Local Nature Conservation Designations

Local Nature Reserve (LNR) is a statutory designation made by principal local authorities under Section 21 of the National Parks and Access to the Countryside Act 1949. LNRs are places with wildlife or geological features that are of special interest locally.

There are two LNRs within the Study Area. Axholme Line covers an area of approximately 7.2 hectares along a disused railway line from Haxey village to Burnham Beck and contains neutral calcareous grassland. Owston Ferry Castle located in Owston Ferry Village contains a wildflower meadow and provides habitat for a number of bird and butterfly species.

Sites of Importance for Nature Conservation (SINCs) are places considered to be of importance for their wildlife in a county and local council context and include a variety of habitats. They are not the subject of statutory conservation designations but instead rely on the sympathetic management practices of landowners who may apply for grant aid to assist with the costs associated with conservation management. Some level of protection is afforded to these sites by Local Planning Authorities in Local Plans. All the SINCs within the Study Area will be considered further in the SEA Environmental Report.

4.2.3 Biodiversity Action Plan (BAP) Habitats

All counties covered within the Isle of Axholme FRMS support several of the UK priority habitats and the majority of these are associated with the existing designated sites. The Lincolnshire Local Biodiversity Action Plan (LBAP), the Nottinghamshire LBAP and the Yorkshire and Humber Regional Biodiversity Strategy include action plans for the following priority habitats which are present within the Isle of Axholme FRMS Study Area:

- Cereal field margins
- Eutrophic standing waters
- Fens
- Lowland calcareous grassland
- Lowland heathland
- Reedbeds
- Lowland meadows
- Lowland raised bog.

LBAP species relevant to the Study Area include:

- Water vole *Arvicola amphibious*
- Otter *Lutra lutra*
- Brown hare *Lepus europaeus*
- Natterjack toad *Bufo calamita*
- Freshwater white-clawed crayfish *Austropotamobius pallipes*
- Song thrush *Turdus philomelos*
- Nightjar *Caprimulgus europaeus*
- Pipistrelle bat *Pipistrellus pipistrellus*.

4.2.4 Protected Species (Habitats Directive, Wildlife & Countryside Act)

There are a number of species protected by international and national legislation within the Isle of Axholme FRMS Study Area. Species known to be present include the water vole, otter, numerous bat species and the great crested newt *Triturus cristatus*.

Some of the habitats and species described above depend on a particular water management regime and require a specific environment if their unique characteristics are to be maintained. The presence of such sites and species will influence the type and nature of flood management works that can be undertaken. The implementation of flood risk management works may offer the opportunity for enhancement.

4.2.5 Fisheries

All watercourses within the Study Area are classed as cyprinid waters. Species found are primarily typical of lowland populations throughout the UK and include stone loach (*Barbatula barbatula*), silver bream (*Blicca bjoerkna*), chub (*Squalius cephalus*) and minnow (*Phoxinus phoxinus*). These common species are often interspersed with non native species such as zander (*Sander lucioperca*).

The River Torne, River Idle, Stainforth and Keadby Canal and Warping Drain all support thriving fish populations and are classed as locally important fisheries. All these watercourses are utilised by numerous angling clubs and therefore provide important recreational opportunities.

The only migratory fish found in the Study Area is the eel (*Anguilla anguilla*). The International Council for the Exploration of the Sea (ICES) has highlighted the eel population is below safe biological limits in Europe and therefore national management plans have been produced. The Humber Eel Management Plan identifies a number of obstructions to eel migration within the Study Area including Keadby Sluice and Adlingfleet outfall. Furthermore, The Eels (England and Wales) Regulations 2009 SI 2009/3339, due in early 2010, will enforce the provision of eel passage through any obstruction on populated watercourses. This will be considered further during the preparation of the Isle of Axholme SEA.

4.3 Air and Climate

4.3.1 Air Quality

Air Quality Management Areas (AQMAs) are declared by Local Authorities to help identify areas where the air quality needs to be improved. The Study Area does not currently contain any AQMAs. This is likely to be a direct result of the lack of densely populated towns and their associated infrastructure.

4.3.2 Climate

Met Office data indicates that from 1971 – 2000 the annual average rainfall over the Study Area was 400 – 700mm meaning that the area is relatively dry. Annual mean temperature from 1971 – 2000 was 9 – 10.5°C.

Recent scientific studies indicate that climate change in this area is likely to include warmer temperatures, wetter winters, drier summers and rising sea levels. The Isle of Axholme FRMS will explicitly consider the implications of climate change on flood risk and follow Defra guidance on the level and nature of increasing flood risk over the 100 year life time of the strategy. Our policies are therefore aiming to help society to adapt to climate change. Relevant effects of climate change (e.g. changes in the range of the plant/animal species), will be considered under each appropriate receptor.

Whilst the flood risk management options will have the potential to release varying levels of greenhouse gases, these will not be at levels significant, in isolation, to influence local climate conditions. However, we still need to consider the Strategy's contribution to emissions, particularly through maintenance of options.

4.4 Water

4.4.1 Surface Water

The catchment within the Study Area is dominated by the River Trent, which runs the length of the eastern side of the Study Area. The River Ouse flows along the northern boundary of the Study Area and the River Don flows along a section of the western and northern boundary until its confluence with the River Ouse in Goole. The Rivers Idle and Torne and the Stainforth and Keadby Canal run in a north easterly direction across the Study Area. The Idle meets the Trent at West Stockwith. The Torne joins the River Trent at Keadby.

In addition there are more than 50 pumping stations across the Study Area which, along with a network of ditches and agricultural channels, drain the surrounding land into the Trent.

4.4.2 Water Quality

Under the Water Framework Directive, a draft River Basin Management Plan for the Humber (including the Idle and Torne catchments) is currently awaiting approval from Ministers. The plan describes the current status of waters within the Humber Basin and proposes methods to increase the quality of the water environment over the next two decades.

There are several significant water management issues within the Isle of Axholme Study Area which are relevant to the Isle of Axholme FRMS:

- Point source pollution – The Idle and the Torne are used by sewage treatment works outflows leading to high levels of nutrients within the water.
- Physical modification – undertaken as a result of land drainage issues, for flood protection measures and for recreational purposes.
- Abstraction – the Sherwood Sandstone aquifer is currently over used as an aquifer resulting in declining water quality.
- Diffuse pollution – agricultural run off and acidification affect the catchment as it is situated within a rural landscape.

The River Idle and River Torne, as well as their tributaries, are defined as being either “Heavily Modified” or “Artificial” as a result of the artificial drainage of the whole Study Area. The assessments for the tributaries within the Study Area are shown in Table 4.2.

Table 4.2 Water quality assessments for the River Idle, River Torne and their tributaries

Watercourse	Current Ecological Quality	Predicted 2015 Ecological Quality	Current Chemical Quality	Predicted 2015 Chemical Quality
Adlingfleet Drain	Moderate	Moderate	Moderate	Pass
Paupers Drain	Moderate	Moderate	Moderate	Pass
South Level Engine Drain/Upper Warping Drain	Moderate	Moderate	Moderate	Not yet assessed
Ferry Drain/Warping Drain	Moderate	Moderate	Moderate	Pass
River Idle from River Ryton to River Trent	Poor	Poor	Moderate	Fail
North Soak Drain	Moderate	Moderate	Moderate	Pass
River Torne/Three Rivers from mother Drain to River Trent	Poor	Poor	Moderate	Pass
Hatfield Waste Drain	Moderate	Moderate	Moderate	Pass

Source: Environment Agency 2010

4.4.3 Groundwater

The Groundwater Vulnerability Maps of the area show the Sherwood Sandstone to be a Major Aquifer, some of the Superficial Deposits to be Minor Aquifers and the Mercia Mudstone and the remainder of the Superficial Deposits to be Non-Aquifers.

Groundwater can be particularly vulnerable to pollution and as such is protected by legislation such as Section 85 of the Water Resources Act 1991 and the EC Directive on the Protection of Groundwater Against Pollution (2006/118/EC). Protection is achieved through the evaluation of vulnerability and risk; with vulnerability being a function of the presence and nature of the overlying soils and drift, the geology and depth to water table.

The variety of Superficial Deposits overlying the bedrock means that different parts of the site are considered to be of different vulnerabilities. The areas classed as high vulnerability are mainly located at the western boundary of the site, just east of Doncaster, where the Sherwood Sandstone is overlain by superficial granular deposits such as River Terrace Deposits. In these locations there is potential for the migration of contamination from the surface or near surface into the groundwater of the Sandstone aquifer.

The majority of the eastern side of the Study Area, where the Mercia Mudstone is present, is classed as a non aquifer or minor aquifer of variable vulnerability. Given the classification and that the Mercia Mudstone is of low permeability, contamination of groundwater is unlikely to be a major issue in this area.

Nitrate Vulnerability Zones (NVZ) are catchments where nitrate concentrations in sources of public drinking water exceed, or are likely to exceed, nitrate concentrations greater than 50mg/l (Defra, 2007b). The western boundary of the Study Area is located within a large NVZ, which is highly susceptible to damage as a result of changing flood management techniques.

Source Protection Zones (SPZ) are designated to protect sources of drinking water. There is one Total Catchment Zone on the western boundary of the Study Area with five inner SPZs protecting a number of individual boreholes which abstract potable water from the Sherwood Sandstone aquifer.

Overall groundwater quality on the eastern side of the Study Area is classified as “Good” quality. However on the western side it is classified as “Poor” and there is an deteriorating chemical trend, possibly due to the industrial land uses within Doncaster.

4.4.4 Water Resources

Water Supply

The Study Area lies within the jurisdiction of Yorkshire Water and Severn Trent Water. Potable water supplied to the area is provided through an extensive water grid which distributes water from upland reservoirs, groundwater stores and river transfers to homes and businesses within the Study Area.

Water Availability

The water resources within the Study Area are covered by the Idle and Torne Catchment Abstraction Management Strategy (CAMS) and the Trent Corridor CAMS. The CAMS have identified three water resource management units (WRMU) within the Study Area:

- The River Idle WRMU;
- The River Torne WRMU; and,
- The Tidal Trent WRMU.

Currently the River Idle and River Torne WRMUs are both classed as being “over-abstracted” meaning that existing practices are causing irreparable damage to the groundwater supplies, although water may still be available during high flows. The target for 2010 for both WRMUs is the status of “over-licensed” (i.e. to reduce actual abstraction of both surface and groundwater sources within the catchment by reducing the number of new licences being issued and reducing the amount currently being abstracted under existing licences).

The Tidal Trent WRMU still has further water available for abstraction and therefore licence applications are still being accepted.

Wastewater Discharges

There are numerous combined sewer overflows and discharge points from industrial and wastewater treatment works, as well as pumping stations used for land drainage and for pumping flood water from the Study Area into the River Idle and River Torne and ultimately into the River Trent. Unprotected sections of the banks at these localised discharge points may be subject to erosion. Eroded sediment can then potentially deposit downstream, increasing the risk of flooding.

4.5 Landscape

4.5.1 Landscape Character

Natural England has produced a map of England which categorises areas with similar landscape character and wildlife as National Character Areas (NCAs). The Study Area lies entirely within the Humberhead Levels NCA. This comprises a large expanse of flat, low lying land characterised by large river plains, parts of which are now below sea level. There are significant areas of heath and peat bog as well as vast areas of artificially drained farmland.

In addition to the general characterisation of the Study Area’s landscape, Doncaster Council and East Riding of Yorkshire Council have produced full Landscape Character

Area assessments. Lincolnshire County Council and Nottinghamshire County Council are yet to complete the process. We will review these assessments and consider them in the assessment of potential flood risk management options that might lead to landscape issues.

There are no sites with any statutory designations for landscape within the Isle of Axholme Study Area.

4.6 Historic Environment

There are a number of sites recognised for the historic and archaeological importance within the Study Area.

There are ten Scheduled Monuments within the Isle of Axholme Study Area (Appendix A, Figure 4). These comprise:

- Hall Garth Moated Site, associated drainage channels and fish ponds;
- Adlingfleet Medieval Rectory, 60m south of All Saints Church;
- Keadby Lock;
- Axholme Carthusian Priory and Post - Dissolution Garden Earthworks, Melwood Park;
- Kinaird Mott and Bailey Castle;
- Market Cross at Junction of High Street, Low Street and Haxey Lane in Haxey;
- Mowbray Cross, Green Hill, Church Street in Haxey;
- The Lady Mowbray Stone Cross Base, East of Church of St. Nicholas in Haxey;
- Moated Site and fishpond east of Misson Village; and,
- Roman Fort and Roman Road 350m North West of Holly House Farm near Everton.

Five of these Scheduled Monuments are located on high ground within Haxey and to the west and north of Owston Ferry. The rest are, however, potentially at risk from any changes in the current flood risk management regime. Further details regarding these sites can be found in Appendix E.

There are five Conservation Areas within the Study Area at Crowle, Epworth, West Stockwith, Thorne and Hatfield High Street. There are large numbers of Listed Buildings throughout the Study Area in villages such as Haxey, Low Burnham and Belton as well as in the historic market towns of Crowle and Thorne (Appendix A, Figure 4).

Non-designated historic environment assets

Other nationally important features may be known and recorded on the County Historic Environment Record (HER) but not designated. Additionally, there may be unknown features of significant interest, especially buried archaeological and palaeoenvironmental remains. Data from the HER have not been considered in the Isle of Axholme FRMS as they are too detailed for this stage in the environmental assessment. However, these data will be considered in association with English Heritage and the local authority archaeological officers at the design (Scheme) stages of flood risk management planning.

Rivers, lakes, wetlands and alluvium-covered areas can be important in terms of archaeology because of the types of archaeological features likely to be present and the possibility of anaerobic conditions permitting the preservation of organic materials. Water levels may be critical to preserving remains, as an increase may result in erosion and a decrease may lead to the deterioration of previously waterlogged deposits.

4.7 Soil, Geology and Hydrogeology

4.7.1 Soil and Geology

The 1:50,000 scale British Geological Survey maps of the area (Sheet 88, Doncaster, 1969 and Sheet 101, East Retford, 1967) indicate that the bedrock underlying the western half of the site comprises the Sherwood Sandstone, whilst the eastern half is underlain by the Mercia Mudstone. The boundary between these follows an approximate north-south trend with the transition along the eastern boundary of the Misson East site on the River Idle in the south of the Study Area and Dirtness Bridge in the north of the Study Area.

A large variety of Superficial Deposits overlie the bedrock across the site and these comprise the older Glacial Till and fluvioglacial Sands and Gravels and more recent deposits of Alluvium, River Terrace Deposits, Head Deposits, Blown Sand and Peat.

In addition, there are five recorded Regionally Important Geological and Geomorphological Sites (RIGS) within the Study Area (Appendix A, Figure 3). These are:

- Melton Quarry;
- Melwood Quarry;
- Cove Farm Quarry, Haxey;
- Crowle Moor Peat Works; and,
- Axholme railway cutting.

The RIGS generally comprise two types:

- Integrity sites: These are sites whose scientific or educational value lies in the fact that they contain finite and limited deposits or landforms that are irreplaceable if destroyed.
- Exposure sites: Sites whose scientific or educational value lies in providing exposures of a deposit, which are extensive or plentiful, underground (e.g. cuttings, cliffs, outcrops and mines).

4.7.2 Contaminated Land

There are numerous areas of contaminated land within the Study Area. These are mostly due to active and historical landfill sites, railway land, industrial works and land subject to mining and quarrying activities.

4.7.3 Land Use

The Isle of Axholme FRMS Study Area is predominantly rural with large areas of land that are uninhabited. The main settlements within the Study Area include Crowle, a historic market town, Hatfield, Thorpe, Epworth, Belton and Haxey. In addition, there are numerous small villages and hamlets as well as isolated farmhouses.

Agriculture is the most common land use within the Study Area. The majority of land has been reclaimed through drainage methods. The Agricultural Land Classification (ALC) provides a method for assessing the quality of farmland to enable informed decisions to be made about its future use within the planning system. Grades 1, 2 and 3 are considered to be the best and most versatile land by policy guidance (PPS7, 2004). This is the land which is most flexible, productive and efficient in response to inputs and which can best deliver future crops for food and non-food uses. These areas are used to supplement the UK supply of a number of crops including potatoes and agricultural sugar beet.

Excluding the two large nature conservation sites of Hatfield Moors and Thorne, Crowle and Goole Moors the majority of the Study Area is made up of Grade 1 and 2 agricultural

land (see Appendix A, Figure 5). There are sections of Grade 3 agricultural land on the western boundary of the Study Area and a large section to the west of Epworth and Belton.

Across the UK large areas of land have been converted from grassland for arable production which has led to the deterioration of the landscape, ecology and historical value of many areas. To counter these threats the Environmental Stewardship scheme was introduced by Defra in 2005, which superseded the Environmentally Sensitive Areas and Countryside Stewardship Schemes. Environmental Stewardship provides funding to farmers and other landowners who deliver effective environmental management on their land. Large sections of the Study Area are currently covered by entry level agreements. These are voluntary agreements offering a monetary incentive to encourage farmers to deliver environmental management techniques on their land.

4.8 Natural Resources

4.8.1 Coal Mining, Minerals and Aggregates

The western side of the Study Area contains a large number of extraction activities and as a result is a significant contributor to the UK totals of aggregates, coal, peat, sand and gravel. Local plans indicate that there are three further areas proposed for future mineral extraction within the Study Area; one in Haxey and two on the outskirts of Misson.

4.8.2 Waste Management

The EU Directive 2008/1/EC of Integrated Pollution Prevention and Control (IPPC) requires that all sites with a high pollution production potential require a permit. There are two active IPPC sites within the Study Area as well as 22 other active waste management sites. These include Bootham Lane Landfill, located between Hatfield and Stainforth, which is classified as hazardous (Appendix A, Figure 3). There are also a number of historic landfill sites within the Study Area.

4.9 Interactions between the above receptors

SEA provides better opportunities to identify cumulative effects than at the project level. The Isle of Axholme FRMS will give consideration to how the impacts of options might affect more than one type of receptor though direct, indirect, and or combined effects resulting from the options, either alone or in combinations with other plans and strategies. Following our review of available information we have considered the potential for links between the different receptors within the Study Area to allow us to start to consider how cumulative effects might occur. Table 4.5 provides a summary of the potential receptor interactions within the Study Area.

Table 4.5 Receptor interaction table

	Communities/ Public Health	Humber Estuary	Hatfield Moors (SAC/SPA/SSSI)	Thorne, Crowle & Goole Moor, (SAC/ SPA/ SSSI)	Other SSSIs	LNRs/SINCS	BAP Habitats and Species	Power station	Road Network	Rail Network	Stainforth and Keadby Canal	Robin Hood Airport	Water Abstractions	WTWs/WwTWs*	Contaminated Land	Historical Features	Operational Washland	Agriculture	Landscape Character Areas
Communities/Public Health	✓																		
Humber Estuary	✓	✓																	
Hatfield Moors (SAC/SPA/SSSI)	✓	✓	✓																
Thorne, Crowle & Goole Moors (SAC/SPA/SSSI)	✓	✓	✓																
Other SSSIs	✓	✓	-	-															
LNRs/SINCS	-	✓	-	-	✓														
BAP Habitats & Species	✓	✓	✓	✓	✓	✓													
Power Station	✓	-	-	-	-	-													
Road Network	✓	-	-	-	-	-		✓											
Rail Network	✓	-	-	-	-	-		✓	-										
Stainforth & Keadby Canal	✓	-	-	-	-	-	✓	-	-										
Robin Hood Airport	✓	-	-	-	-	-	✓	✓	✓	✓									
Water Abstractions	✓	✓	✓	✓	✓	✓	✓	✓	-	-	-								
WTWs/WwTWs*	✓	-	-	-	-	-	-	-	✓	-	-	-							
Contaminated Land	✓	-	-	-	-	-	✓	-	-	-	-	-							
Historical Features	✓	-	-	-	-	-	-	-	✓	-	-	-							
Operational Washland	✓	-	-	-	✓	-	✓	-	-	-	-	-	✓						
Agriculture	✓	-	✓	✓	✓	✓	✓	-	✓	-	-	-	✓	-	-	✓	✓		
Landscape Character Areas	✓	✓	✓	✓	✓	✓	✓	-	-	-	-	-	-	-	-	✓	✓	✓	

Note: Read across and down to determine the likely interaction between receptors.

* Wastewater Treatment Works

Question 4

Section 4 outlines the baseline environmental information and the key issues and opportunities for the FRM Strategy.

Are there further key issues or baseline information that we should be considering?

5 SEA Methodology

5.1 Introduction

This chapter outlines the method we will use to identify, predict and compare the potential environmental impacts of the flood risk management options considered in the development of the Isle of Axholme FRMS.

5.2 Stages of Assessment

We will adopt a two-stage approach to our environmental assessment of the options;

- a high level assessment of the full range of options; and,
- a more detailed assessment of the practicable options (our shortlisted options).

Our high level assessment will allow us to develop a short list of reasonable alternatives from which we can identify our preferred flood risk management strategy. By undertaking a high level assessment we will be able to rule out environmentally unacceptable options at an early stage and focus our attention on the detailed assessment of more reasonable alternatives.

Our more detailed assessment will focus on identification and consideration of the significant effects that each of the shortlisted flood risk management options might lead to. This will allow us to consider how we can avoid, reduce or offset any adverse effects and allow us to make the most of any potential opportunities to enhance the environment as part of the option.

5.3 Focussing the Assessment

Both levels of assessment will consider the potential impact the Isle of Axholme FRMS may have on the receptors identified in Section 4. These influences, their nature and the potential exposure to changes in the environment brought about by the Isle of Axholme FRMS options on the receptors are summarised in Table 5.1, which provides our initial views on the scope of the environmental assessment. By considering these influences we will be able to focus on the receptors which are mostly likely to be affected by the Isle of Axholme FRMS (ie. identifying those receptors to be included in the assessment and excluding those which will not).

Table 5.1 Assessment topics to be included within the Isle of Axholme FRMS SEA.

Receptor	Isle of Axholme FRMS influence	Scoped in
Human Beings		
Population and Flood Risk	The Isle of Axholme FRMS and the options considered in its development will seek to manage flood risk for the benefit of the population within the Study Area.	Yes
Human Health, Well Being	The Isle of Axholme FRMS options considered may affect public access to recreational features, goods and public services that can make a material difference to their Quality of Life. The perceived level of flood risk that communities are exposed to may also affect levels of stress and impact on Quality of Life.	Yes
Material Assets and critical infrastructure such as residential and commercial property, agricultural land, utility company assets etc.	The Isle of Axholme FRMS options will seek to manage flood risk to critical infrastructure and material assets within the Study Area. The implementation of options has the potential to disrupt critical transport infrastructure (such as road or rail networks), utilities (such as clean water) or access to community care facilities (hospitals or health centres). The location of such infrastructure may influence the range of available options.	Yes
Flora and Fauna		
Biodiversity, Designated Nature Conservation Sites & BAP Habitats and Species	Isle of Axholme FRMS options may include construction, land use change, changes in flood risk, frequency or changes in water levels that have the potential to adversely affect nature conservation and biodiversity features. Alternatively, such changes may present opportunities to improve the condition of existing habitats or create new biodiversity features.	Yes
Noise		
Noise from machinery, site traffic and construction	Noise associated with construction activities is only likely to be an issue in localised areas for a temporary period. These are better assessed and managed at the project level.	No
Air and Climate		
Air Quality	The Isle of Axholme FRMS options are unlikely to significantly change air quality within the Study Area. Although emissions associated with construction activities can lead to localised and temporary effects on air quality, these are better assessed and managed at the project level.	No
Climate	The flood risk options may provide the opportunity to address any potential increase in flood risk due to climate change. The Isle of Axholme FRMS options also have the potential to lead to an increase in greenhouse gas emissions e.g. through intensive maintenance. Alternatively, options may provide an opportunity to reduce emissions by adopting more sustainable approaches to flood management.	Yes
Water		
Water Quality	Construction, changes in flood risk to areas of potentially contaminated land and changes in flood frequency associated with the Isle of Axholme FRMS options could lead to changes in the waterbodies within the Study Area. Such changes may affect a waterbody's ability to achieve and / or maintain good ecological potential.	Yes

Receptor	Isle of Axholme FRMS influence	Scoped in
Water Resources	The Isle of Axholme FRMS options are unlikely to affect water supply within the Study Area, however, the options may affect that way in which major groundwater reserves are exploited within the Study Area.	Yes
Landscape		
Landscape	The Isle of Axholme FRMS options have the potential to lead to construction activities and land use change which may alter the character and quality of the existing landscape. The options may also provide opportunities to improve landscape quality through the creation or enhancement of landscape features.	Yes
Historic Environment		
Cultural Heritage & Archaeology	The Isle of Axholme FRMS options may involve construction activities, land use changes or alterations to flooding regimes that can adversely affect historic environment sites and their settings. The options may also manage the flood risk to heritage features or lead to improved access to historic environment sites. Although an assessment will be undertaken the nature of data available on the historic environment does not lend itself to the appraisal of flood risk easily and therefore thorough assessment of these impacts can only be undertaken at a project level.	Yes
Soils, Geology, Land Quality and Land Use		
Soils, Geology & Land Quality	The Isle of Axholme FRMS options may have the potential to degrade or compromise soil quality and/or function and, as a result, what that land can be used for, e.g. by increasing the seasonal period during which soil is waterlogged.	Yes
Land Use	The options may change the frequency and extent of flooding leading to consequent changes in the use of land e.g. affecting its versatility and/or productivity.	Yes
Natural Resources		
Natural Resources	The Isle of Axholme FRMS options have the potential to lead to changes in flood risk, which may adversely affect the management or ability to exploit natural resources within the Study Area. The construction of new flood management structures may disrupt activities that make use of current or future natural resources, such as coal mining or aggregate extraction.	Yes

5.4 High Level Assessment

We will assess how each of the broad range of flood risk management options might impact on the environment and social receptors in the Study Area. At this stage we will focus our attention on whether the options might create environmental effects in specific locations within the Study Area that we consider at an early stage to be unacceptable. Where we are not able to rule an option out, but we are able to highlight the potential for significant impacts on the environment, we will start to consider how we might avoid or lessen such effects.

Based on the information currently available, we will consider whether options will potentially lead to environmental change through either:

- increasing or reducing flood risk;
- changing the ability of the areas of land to be used in a certain way; and,

- damage or change caused by the need to construct new flood defences or alter existing flood defence or river structures.

By considering the potential for such changes, we will assess whether options have the potential to affect the following types of receptor:

- people, properties and local communities;
- nationally or internationally protected sites, including SSSIs, SPAs, SACs and Scheduled Monuments;
- exposure of contaminated land;
- water quality and river environment; and,
- land use.

The high level environmental assessment of options will contribute to the development of a practicable shortlist of options that will then be subject to the more detailed environmental assessment. In developing this shortlist we will consider other factors alongside environmental and social issues. These factors include:

- the technical feasibility of potential options;
- the cost required to implement potential options;
- aspects associated with Health and Safety; and,
- consideration of how the option fits in with CFMP policy.

We will also consider how we might work with others to address flood risk in areas where we cannot justify capital works or continuing maintenance of existing flood defences.

5.5 Detailed Assessment

The detailed environmental assessment of the short list of options will consider the environmental effects of each option in relation to each receptor, and whether the likely effect may be significant. We will then use this assessment to evaluate and compare each of the options using 'assessment criteria'.

We have developed draft assessment criteria by considering what we believe to be the key environmental issues that may be influenced by the Isle of Axholme FRMS and how the Isle of Axholme FRMS may affect the environmental objectives of other relevant plans.

5.5.1 Assessment of Significance

Our assessment of significance will take into account the value and vulnerability of the receptors in the Isle of Axholme FRMS Study Area and consider their sensitivity to the changes in the environment resulting from the options. By considering the scale or magnitude of this change we will be able make a judgement on the significance of the effect on the receptor.

When considering the magnitude of change we will be looking at:

- the area or extent of the receptor affected;
- whether the effect is temporary or permanent and if it is short, medium or long term (including the range of years where possible);
- whether the effect directly or indirectly impacts on the receptor; and,
- whether there will be cumulative effects.

Cumulative effects can occur when a number of small effects, which may not be significant on their own, accumulate to create a much greater effect on one or more receptor. In understanding how our options might affect receptors in this way we will consider how different elements of an option might combine to create such effects. We will also consider how other plans or policies might cause changes in the environment which could combine with the effects of the options in the Study Area.

Table 5.2 provides an outline of how the sensitivity of a receptor and magnitude of change define the significance of the effect as major, moderate, minor or not significant. The effect is described as either positive or negative. For example, using the approach shown in Table 5.2, an option which leads to a major reduction in flood risk to a large proportion of a vulnerable urban community would be considered to lead to a high magnitude of change for a highly sensitive receptor. Under such a scenario we would conclude that the significance of the option's environmental effect would be major and positive for the community in question.

Table 5.2 Determining significance of effect

		Magnitude of environmental change			
		High	Medium	Low	Very Low
Sensitivity of Receptor	High	Major positive/negative	Major positive/negative	Moderate positive/negative	Minor positive/negative
	Medium	Major positive/negative	Moderate positive/negative	Minor positive/negative	Not significant
	Low	Moderate positive/negative	Minor positive/negative	Not significant	Not significant

In our assessment we will consider how we might lessen the negative impacts of each option through mitigation. Mitigation can take a number of forms and is very dependent on the nature of the adverse potential environmental change. Mitigation will therefore include consideration of:

- alternative ways we might implement an option which might avoid or reduce its negative effects;
- how the sensitive design of an option might avoid or reduce its negative effects; and,
- how we might offset the effect of an option by replacing what may be lost or damaged elsewhere.

In all cases we will make a judgment on how effective we think mitigation can be.

5.5.2 Options Comparison

Once the significance of the effects on receptors has been evaluated and documented for each option, we will use the results of our assessment to test and compare the options using our assessment criteria. The assessment criteria will be used to demonstrate and record the comparative effects each of the options will have on different types of receptor. The assessment criteria also allow us to test how each of the option might contribute to achieving the environmental objectives of other plans or policies, such as BAP or WFD objectives, which are not directly associated with flood risk management.

Table 5.3 presents the draft assessment criteria we have developed following our review of the key issues associated with flood risk management and the receptors within the Study Area.

Table 5.3 SEA Assessment Criteria and Potential Indicators

Isle of Axholme FRMS Receptors	Assessment Criteria	Potential Indicators
Receptor: Human Beings		
Properties in: Thorne, Crowle, Epworth, Belton, etc.	Will the option increase, decrease or maintain the current level of flood risk to people and property?	Properties at flood risk moved into lower flood risk probability category and number of properties maintained in the low probability flood risk category (less than 0.5% chance of flooding).
Populations and communities referred to above. Recreational interest including: <ul style="list-style-type: none"> • Navigation – Stainforth and Keadby Canal • Chesterfield Canal • River Idle • Nature conservation – e.g. bird watching • Public Rights of Way 	Will the option protect and improve access to recreational infrastructure, facilities and features that contribute to well being and human health?	Proportion of population benefiting from improved health and well being from the option from factors including reduced stress and greater access to public open space and recreational facilities.
Critical transport links, utilities and community infrastructure e.g. power stations, gas pipelines, water treatment facilities, sewage treatment facilities, transport links.	Will the option protect and improve access to key critical infrastructure?	Proportion of critical infrastructure features adversely or beneficially affected by changes in flood risk or through direct impacts due to flood risk management structure or operations.
Receptor: Flora and Fauna		
Designated biodiversity sites: Natura 2000 Sites, SSSIs, regional & local sites, BAP habitats and species.	Will the options lead to improvements in the conservation status of designated and non designated biodiversity features?	Area and value of the site or species subject to adverse or beneficial changes in flood risk or water management.
Receptor: Climate		
Carbon footprint of flood risk management operations.	Will the option lead to sustainable, carbon neutral approaches to flood risk management?	Balance of carbon sinks and sources resulting from the implementation of the option.
Receptor: Water		
Watercourses: River Trent, River Idle, River Torne, Stainforth and Keadby Canal.	Will the option increase or reduce the likelihood of watercourses within the Study Area achieving good ecological potential by 2015 (in line with the WFD)?	Biological Quality Elements of the watercourses in the Isle of Axholme FRMS Study Area.

Isle of Axholme FRMS Receptors	Assessment Criteria	Potential Indicators
Water resources: source protection zones, vulnerable aquifers surface water abstraction sources.	Will the option lead to a change in the availability of water resources?	Water resource features adversely or beneficially affected.
Receptor: Landscape		
Landscape Character, NCAs, Local Landscape Character Areas, landscape characteristics, elements and features.	Will the options lead to the strengthening or degradation of landscape character within the Study Area?	Change in extent, type and condition of key landscape elements and features within the Study Area.
Receptor: Historic Environment		
Historic Environment Features: <ul style="list-style-type: none"> • Scheduled Monuments • Conservation Areas • Listed Buildings • Historic settings. 	Will the options lead to changes that will affect the integrity and setting of key heritage features within the Study Area?	Number of heritage features with improved or maintained integrity and setting due to flood risk management structures and operations.
Receptor: Soils, Geology and Land Quality Land Use		
Urban and Rural and Land Quality Classification and Use.	Will the options lead to a change in the availability of the most versatile and productive use of land within the Study Area?	Area of land subject to improved or reduced versatility of land use due to flood risk management structures and operations.
Receptor: Natural Resources		
Natural resource reserves Mineral and aggregate deposits and waste management sites.	Will the options lead to a change in the availability of natural resources within the Study Area?	Change in availability or access to reserves or natural resources within the Study Area due to flood risk management structures and operations.

Consultation on this scoping document will allow for feedback from consultees on the SEA assessment criteria and the potential indicators we will use to test them. Thus the assessment criteria may be subject to change before we carry out our more detailed stage of the environmental assessment.

5.5.3 Enhancements

As part of the development of the Isle of Axholme FRMS we will seek to build on the work we and our partners have undertaken in the past to identify and deliver opportunities for environmental enhancement. Potential opportunities noted within the Isle of Axholme FRMS Study Area include:

- creation of BAP habitat;
- bankside habitat improvement including channel restoration;
- floodplain restoration;
- creation of network of grass strips providing habitat corridors for a range of species;
- opportunities to improve the conditions and vulnerability of all nature conservations sites within the Study Area;
- improved access and leisure opportunities, and;
- green engineering and low carbon options.

When we develop our shortlist of options we will identify where these or other potential enhancements might be incorporated in to the way an option might be implemented. Where potential enhancements become part of the option we will ensure that we identify the effects on the environment these may bring.

5.6 Monitoring

When we implement the strategy, it is possible that the following effects could occur:

- The predicted significance of an effect is inaccurate.
- Mitigation and enhancement prove to be ineffective.
- A change occurs in the circumstances that affect the assumptions made in the assessment.

To reduce the possibility of these effects occurring, a monitoring plan will be produced and implemented to allow the actual environmental impacts of strategic measures to be tested against the predicted impacts. We will do this by:

- Identifying assessment and monitoring measures that will need to be undertaken where we implement the strategy through individual flood risk management schemes and operations. These will be documented in the scheme level environmental reports and statements.
- Identifying existing or forthcoming monitoring or data collection programmes which might be used to review the findings of the strategy.
- Setting out the mechanisms for monitoring and the responsibilities we and other third parties will take on.

The monitoring process also helps to ensure that mitigation and enhancement are effective, checks whether unforeseen impacts are occurring and that existing arrangements for monitoring are not duplicated. Monitoring can also be used to address gaps in the data or uncertainty highlighted by the assessment and to provide a more comprehensive baseline when the strategy is reviewed. The implementation and findings of the monitoring plan will be reviewed and reported as a component of the review of the strategy.

Question 5

Section 5 outlines how we propose to undertake our environment assessment of the developing Isle of Axholme FRMS and how we have scoped the key environmental issues in the Study Area. This section also highlights a number of potential environmental enhancements that we can consider as part of the Isle of Axholme FRMS.

We would welcome your views on the environmental issues we have scoped in and the assessment criteria we have set for them.

We would also welcome your views on our environmental assessment process.

Are there any additional environmental enhancement we should consider?

6 Consultation and Next Steps

Consultation and engagement are integral to developing the strategy and making sure the SEA is both comprehensive and effective. We would be grateful if you could share your views on our identified key environmental issues and opportunities. You can respond either by email or post to:

John Pygott

Project Manager
Environment Agency
Phoenix House
Global Avenue
Leeds
LS11 8PG

john.pygott@environment-agency.gov.uk

This scoping consultation period ends on 12th March 2010.

Following this, we will collate the responses and incorporate them as appropriate into our assessment. There will be further opportunities for you to provide input into the actual strategy at a later date.

The results of the environmental assessment will be published in an Environment Report at the same time as the public consultation on the draft Isle of Axholme FRMS.

Question 6

Do you want to be involved in the development of the Isle of Axholme FRMS and the SEA?

Do you want to remain on our list of consultees?

Are there any other consultees that you think we should be involving?

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Local Plans

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Bassetlaw District Council (2001) Local Plan

Nottinghamshire County Council (2006) Structure Plan

Nottinghamshire County Council (2007) Minerals and Waste Development Scheme

Doncaster City Council (1998) Unitary Development Plan

North Lincolnshire County Council (2001) Local Plan

8 Appendices

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Appendix A

Figures

Figure 1 – SEA Study Area

Figure 2 – Infrastructure

Figure 3 – Nature Conservation and Geological Sites

Figure 4 – Cultural Heritage

Figure 5 – Agricultural Land Classification

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Appendix B
**Foresight Future Flooding Report: Flood Risk
Management Responses**

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Appendix B Foresight flood risk management responses

Response Theme	Response Group
Managing the Rural Landscape	1. Rural Infiltration: water retention and management of infiltration into the catchment
	2. Catchment-Wide Storage: water retention through storage schemes at all scales
	3. Rural Conveyance: managing conveyance to alter the volume and timing of runoff
Managing the Urban Fabric	4. Urban Storage: increase storage in urban areas
	5. Urban Infiltration: increase infiltration in urban areas
	6. Urban Conveyance: manage conveyance of flood waters through urban areas
Managing Flood Events	7. Pre-Event Measures: to ensure that people and stakeholders are prepared, mitigate negative impacts, and facilitate efficient management of the event
	8. Forecasting and Warning: to provide sufficient time for people and organisations to take effective mitigating actions prior flood water arriving
	9. Flood Fighting: to manage floodwaters and defences during the event
	10. Collective Damage Avoidance Actions: organised or spontaneous removal of people, assets or livestock to a safe location
	11. Individual Damage Avoidance Actions: actions taken by individuals to reduce flood losses including preventing or delaying flood water from entering buildings, and moving people, assets or livestock to safety
Managing Flood Losses	12. Land-Use Management: reduce current exposure to flood loss associated with existing developments
	13. Flood-Proofing: reduce current exposure to flood loss through improved flood resilience
	14. Land-Use Planning: limit increase in exposure to flood loss associated with new developments
	15. Building Codes: limit increase in exposure to flood loss through changing building codes and/or construction practices
	16. Insurance, Share Risk and Compensation: facilitate economic and financial recovery from flood loss
	17. Health and Social Measures: lessen the health, social and practical impacts of flooding
	18. River Conveyance: alter river channel to increase conveyance of flow passed downstream
River and Coastal Engineering	19. Engineered Flood Storage: construct or expand reservoirs, bunds or other impounding structures to increase flood storage
	20. Flood Water Transfer: construct pipes or channels to convey flood waters to an adjacent catchment or drainage system
	21. River Defences: construct or raise linear embankments and build or enhance control structures to contain and manage flood waters
	22. Coastal Defences: construct or raise physical barriers to flooding and coastal erosion
	23. Realignment of Coastal Defences: relocation landwards
	24. Abandonment (managed or unmanaged) of Flood Defences: unmanaged realignment
	25. Reduce Coastal Energy: structures, features or devices to reduce the energy of nearshore waves and currents
	26. Coastal Morphological Protection: allow or encourage changes in coastline to accommodate forcing processes

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Appendix C

Relevant Legislation, Policy and Guidance

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Plan	Strategic Level	Organisation	Considered by CFMP SEA	Review requirements from FRMP SEA	Notes
Land-Use Planning (Regional and Local Government)					
Yorkshire and Humber Regional Spatial Strategy	Regional	Government Office for Yorkshire and the Humber	Y	3	
East Midlands Regional Plan	Regional	Government Office for the East Midlands	Y	3	
North Lincolnshire Local Plan	Lincolnshire	North Lincolnshire Council	Y	2	Adopted May 2003
Boothferry Borough Local Plan	Local	East Riding of Yorkshire Council	N	1	Adopted in April 1999
East Riding of Yorkshire Local Plan	East Riding	East Riding of Yorkshire Council	Y	2	Adopted in 1999
Nottinghamshire Structure Plan	Nottinghamshire	Nottinghamshire County Council	Y	2	Adopted in 2001. Will be replaced by East Midlands Regional Development Plan
Nottinghamshire Minerals and Waste development Scheme	Nottinghamshire	Nottinghamshire County Council	Y	2	Details a move from local waste and transport plans. Submitted to Secretary of State in April 2009
Doncaster Unitary Development Plan	Doncaster	Doncaster Council	Y	2	Adopted in July 2008 and will be replaced by Local Development Framework
Bassetlaw District Council Local Plan	Local	Bassetlaw District Council	N	1	Currently in the process of being replaced by Local Development Framework
Flood Risk Management Planning					
Planning Policy Statement 25: Development and Flood Risk	National	Communities and Local Government	Y	3	High Level Strategic Guidance. Will have been incorporated into low level PPPs
Other Water Management Planning					
Humber River Basin Management Plan	Regional	Environment Agency	Y	1	
Yorkshire Water, Water Resource Management Plan	Regional	Yorkshire Water	N	1	
Making Space for Water	England	Defra	Y	3	Policy considered at CFMP level, no local policy
Water Level Management Plans	Local	Defra	Y	1	

Plan	Strategic Level	Organisation	Considered by CFMP SEA	Review requirements from FRMP SEA	Notes
Future Water Strategy	National	Defra	Y	3	
Foresight Future Flooding Report	National	Office of Science and Technology	Y	1	
The Trent CAMS	Local	Environment Agency	Y	1	
The Idle CAMS	Local	Environment Agency	Y	1	
The Torne CAMS	Local	Environment Agency	Y	1	
Environment/Biodiversity Plans					
Local Biodiversity Action Plans	Local	North Lincolnshire Council, Nottinghamshire Council and East Riding of Yorkshire Council	Y	2	
North East Regional Habitat Creation Programme	Regional	Environment Agency	N	1	
Wetland Vision for Yorkshire and the Humber	Regional	RSPB, Natural England, Environment Agency and Countryside Agency	Y	2	
Other Plans					
Planning Policy Statement 23: Planning and Pollution Control	National	Office of the Deputy Prime Minister	N	1	
CLR 11	National	Environment Agency	N	1	
Environment Agency Outcome Measures	National	Environment Agency	Y	2	
Habitats Regulations	National		Y	2	

1 - Review required for Isle of Axholme FRMS

2 - Strategic context taken from CFMP SEA, Isle of Axholme FRMS review to establish local policy context only

3 - No review required

Appendix D
Nature Conservation Site Detailed Information

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Appendix D – Nature Conservation Sites

MAP REF	NAME	DESCRIPTION/CONSERVATION FEATURE	SSSI UNIT CONDITION (APPROX %)
Natura 2000 Sites			
1	Humber Estuary SAC, SPA, Ramsar and SSSI	The Humber is the second-largest coastal plain estuary in the UK, and the largest coastal plain estuary on the east coast of Britain. It is a muddy, macro-tidal estuary, fed by the Rivers Ouse, Trent and Hull, Ancholme and Graveney. The SAC is designated for a number of important habitats including coastal lagoon, Atlantic salt meadows and mudflats and sand flats not covered by sea water at low tide. In addition, a number of important migratory fish use the estuary including sea lamprey and river lamprey. The SPA is designated as the site supports internationally important bird populations including breeding little tern <i>Sterna albifrons</i> , marsh harrier <i>Circus aeruginosus</i> ; over wintering bar-tailed godwit <i>Limosa lapponica</i> , Bittern <i>Botaurus stellaris</i> and golden plover <i>Pluvialis apricaria</i> . In addition it supports an international assemblage of over 180,000 birds. The Ramsar designation recognises that the site supports the second largest grey seal colony in England and the furthest south regular breeding site on the east coast, plus the most north-easterly breeding site in Great Britain of the natterjack toad <i>Bufo calamita</i> .	Favourable 94.08%, unfavourable recovering 5.13%, unfavourable declining 0.61%, unfavourable no change 0.18%
2	Hatfield Moors SAC, SPA and SSSI	Hatfield Moors is part of what remains of the once-extensive bog and fen peatlands within the Humberhead Levels. It the second-largest area of extant lowland raised bog peat in England which is why it is a designated SAC. The site, along with Thorne Moors is a designated SPA as it supports a population of European importance during the breeding season of nightjar <i>Caprimulgus europaeus</i> .	Unfavourable recovering 88.65%, unfavourable no change 8.05%, unfavourable declining 3.31%
3	Thorne, Crowle and Goole Moors SAC, SPA and SSSI	Thorne, Crowle and Goole Moors are a designated SAC as this area is the largest area of extant lowland peat bog within the Humberhead Levels. Along with Hatfield Moors it has an SPA designation due to the population of European Importance of nightjar <i>Caprimulgus europaeus</i> .	Unfavourable recovering 83.61%, unfavourable no change 7.2%, unfavourable declining 9.19%
Sites of Special Scientific Interest (SSSIs)			
4	Hatfield Chase Ditches	The site consists of three main ditch components - the North Idle Drain, the North Level Engine Drain and the South Level Engine Drain. The ditches contain a huge range of aquatic plants including ivy-leaved duckweed <i>Lemna trisulca</i> , various-leaved pondweed <i>Potamogeton gramineus</i> , intermediate water-starwort <i>Callitriche hamulata</i> and floating clubrush <i>Eleogiton fluitans</i> . The site is also noted for supporting populations of four reed beetles including <i>Donacia clavipes</i> and <i>D. simplex</i> , both of which are nationally scarce. The site also has a large population of water voles <i>Arvicola amphibius</i> .	Unfavourable no change 60.46%, unfavourable declining 39.54%

MAP REF	NAME	DESCRIPTION/CONSERVATION FEATURE	SSSI UNIT CONDITION (APPROX %)
5	Crowle Borrow Pits	Located either side of a disused railway line this site consists of a number of habitats including including alder carr, scrub, fen and open water. These habitats support some uncommon plant species including the nationally rare marsh fern <i>Thelypteris thelypteroides</i> .	Unfavourable no change 58.22%, favourable 29.61%, unfavourable declining 12.17%
6	Epworth Turbary	This is an area of relic low lying peat vegetation and along with Hatfield Moors and Thorne, Crowle and Goole Moors makes the only three known sites of this type within South Humberside. Management has resulted in areas of open heathland and fen and the site supports a number of breeding birds including teal <i>Anas crecca</i> and snipe <i>Gallinago gallinago</i> .	Unfavourable no change 100%
7	Haxey Turbary	This area is a bog which was formerly dug for peat. Management has led to areas of open wet heathland. The site is valued for the occurrence of saw-sedge <i>Cladium mariscus</i> and royal fern <i>Osmunda regalis</i> . The site also supports breeding birds such as grasshopper warbler <i>Locustella naevia</i> and nightingale <i>Luscinia megarhynchos</i> .	Unfavourable declining 86.31%, unfavourable no change 13.69%
8	Misson Training Area	This site is a redundant military bombing range which forms one of the largest tracts of fenland previously typical of the Nottinghamshire and Lincolnshire areas. It supports a number of habitats including standing open water, tall-herb fen, unimproved neutral and acidic grassland, dry oak woodland and wet woodland. The site supports an assemblage of moths, which is seen as exceptional in a local context. Species include nationally rare species such as the Wicken loosestrife neb <i>Monochroa conspersella</i> , and dentated pug <i>Anticollix sparsata</i> . The nationally rare beetle <i>Corticeus unicolor</i> is also known to use the site. The site is important for breeding birds such as the grasshopper warbler and also supports populations of regionally scarce species such as the grass snake <i>Natrix natrix</i> and great crested newt <i>Triturus cristatus</i> .	Unfavourable recovering 74.39%, favourable 25.61%
9	Misson Line Bank	This site offers some of the best remaining areas of eutrophic open water, marsh and base poor fen communities in Nottinghamshire. Part of the site consists of rough grassland, which is favoured as a butterfly feeding area and contains rich populations of insect fauna.	Favourable 70.75%, unfavourable no change 29.25%
10	Haxey Grange Fen	This site is the best known example of high quality fen habitat within South Humberside and is very important for invertebrate communities. There are a number of locally uncommon herb species on site such as purple-loosestrife <i>Lythrum salicaria</i> , yellow iris <i>Iris pseudacorus</i> , wild angelica <i>Angelica sylvestris</i> and skullcap <i>Scutellaria galericulata</i> . The site supports a high diversity of beetle populations including <i>Blethisia multipunctata</i> , <i>Bembidion obliquum</i> and <i>Bembidion gilvipes</i> .	Unfavourable recovering 51.36%, favourable 27.15%, unfavourable no change 21.49%

MAP REF	NAME	DESCRIPTION/CONSERVATION FEATURE	SSSI UNIT CONDITION (APPROX %)
11	Rush Furlong	The site comprises a small strip of hay meadow which provides an example of the Isle of Axholme strip farming system, which is no longer in place, whereby land was divided into very small individually owned strips with few field boundaries.	Favourable 100%
12	Hewson's Field	This site is an area of neutral unimproved grassland which has been managed traditionally for hay and pasturage. Species typical of the grassland include false oat-grass <i>Arrhenatherum elatius</i> , cock's-foot <i>Dactylis glomerata</i> , red fescue <i>Festuca rubra</i> and Yorkshire fog <i>Holcus lanatus</i> . The site also supports a number of herbs including pepper-saxifrage <i>Silau silaus</i> , burnet saxifrage <i>Sanguisorba officinalis</i> , and green-winged orchid <i>Orchis morio</i> .	Unfavourable recovering 100%
13	River Idle Washlands	The site is a good example of a wet grassland plant community and makes up the best remaining washland grasslands within the River Idle floodplain. Grassland species include marsh foxtail <i>Alopecurus geniculatus</i> , ladies smock <i>Cardamine pratensis</i> and great burnet <i>Sanguisorba officinalis</i> . This site is also notified because of the large amount of wintering and breeding wildfowl it supports.	Unfavourable recovering 69.27%, unfavourable declining 25.55%, favourable 5.18%
14	Mother Drain, Misterton	This drain is situated on the alluvial floodplain of the River Trent and runs parallel to the River Idle. The site is made up of open water plant communities and includes species such as common reed <i>Phragmites australis</i> and greater pond sedge <i>Carex riparia</i> . Good water quality and diverse botanical structure have meant that the site supports important populations of water beetles including seven nationally scarce species, dragonflies including hairy dragonfly <i>Brachytron pratense</i> and black darter <i>Sympetrum danae</i> and one rare moth, the marsh carpet moth <i>Perizoma sagittata</i> .	Unfavourable recovering 100%
15	Belshaw	The site is a small piece of land situated along a disused railway line. It is a remnant of neutral grassland that supports a colony of greater yellow-rattle <i>Rhinanthus angustifolius</i> , a nationally rare species that receives protection under Schedule 8 of the Wildlife and Countryside Act, 1981.	Unfavourable recovering 100%

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Appendix E

Historic Environment data

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Site Name	Description	Monument ID	OS Grid Ref
Hall Garth Moated Site, associated drainage channels and fish ponds	Comprises a moated site containing two enclosed islands both containing stone foundations thought to belong to medieval buildings.	26504	SE 8250 2293
Adlingfleet Medieval Rectory, 60m south of All Saints Church	This monument contains the remains of a medieval building known to have been constructed by John le Franceys, the rector of Adlingfleet during the mid 13th Century. The surrounding land is also designated as it is thought to contain further medieval remains.	32636	SE 8435 2094
Keadby Lock	Located on Stainforth and Keadby Canal, this is the oldest working lock in the UK. Funding has recently been commissioned for its refurbishment as it plays a vital role in the drainage of the surrounding area.	NL212	SE 835 113
Axholme Carthusian Priory and Post - Dissolution Garden Earthworks, Melwood Park	The monument consists of the foundations of a Carthusian Priory and those associated with the houses and gardens built on the site after the Dissolution. The site also contains a partly filled moat, the buried remains of a Premonstratensian chapel and a standing building that incorporates medieval fabric.	30119	SE 8060 0192
Kinaird Mott and Bailey Castle	Site contains the remains of a Norman earthworks castle on the western side of Owston Ferry. It has been suggested that the castle was constructed after the Domesday Book was written in order to control traffic between Linsey and the Isle of Axholme over the River Trent.	30124	SE 80520026
Market Cross at Junction of High Street, Low Street and Haxey Lane	This monument consists of the remains of a medieval Market Cross in Haxey. This includes the base and part of the shaft. There are two other crosses in Haxey, all of which are associated with a game known as Haxey Hood, played on the 6th January.	26616	SK 7741 9972
Mowbray Cross, Green Hill, Church Street	This monument is located on Haxey Village Green and consists of a full Medieval Standing Cross that was fully restored during the 19th Century.	26615	SK 7679 9989
The Lady Mowbray Stone Cross Base, East of Church of St. Nicholas	Again located in Haxey village centre, this monument is just a Medieval Cross Base thought to have been used as a mounting block in later times.	26617	SK 7652 9984
Moated Site and fishpond east of Misson Village	The monument consists of trapezoidal moated site and a single filled-in fishpond. The site is smaller than it would have been originally as a modern dyke and a field boundary have now intersected the site.	23217	SK 6929 9427
Roman Fort and Roman Road 350m North West of Holly House Farm	This monument is made up of the buried remains of a Roman Fort and an associated Roman road. The site was first recorded in 1774 but by 1813 it was no longer visible due to agricultural uses. The site was rediscovered from the air as a crop mark in 1944.	29923	SK 6953 9274

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