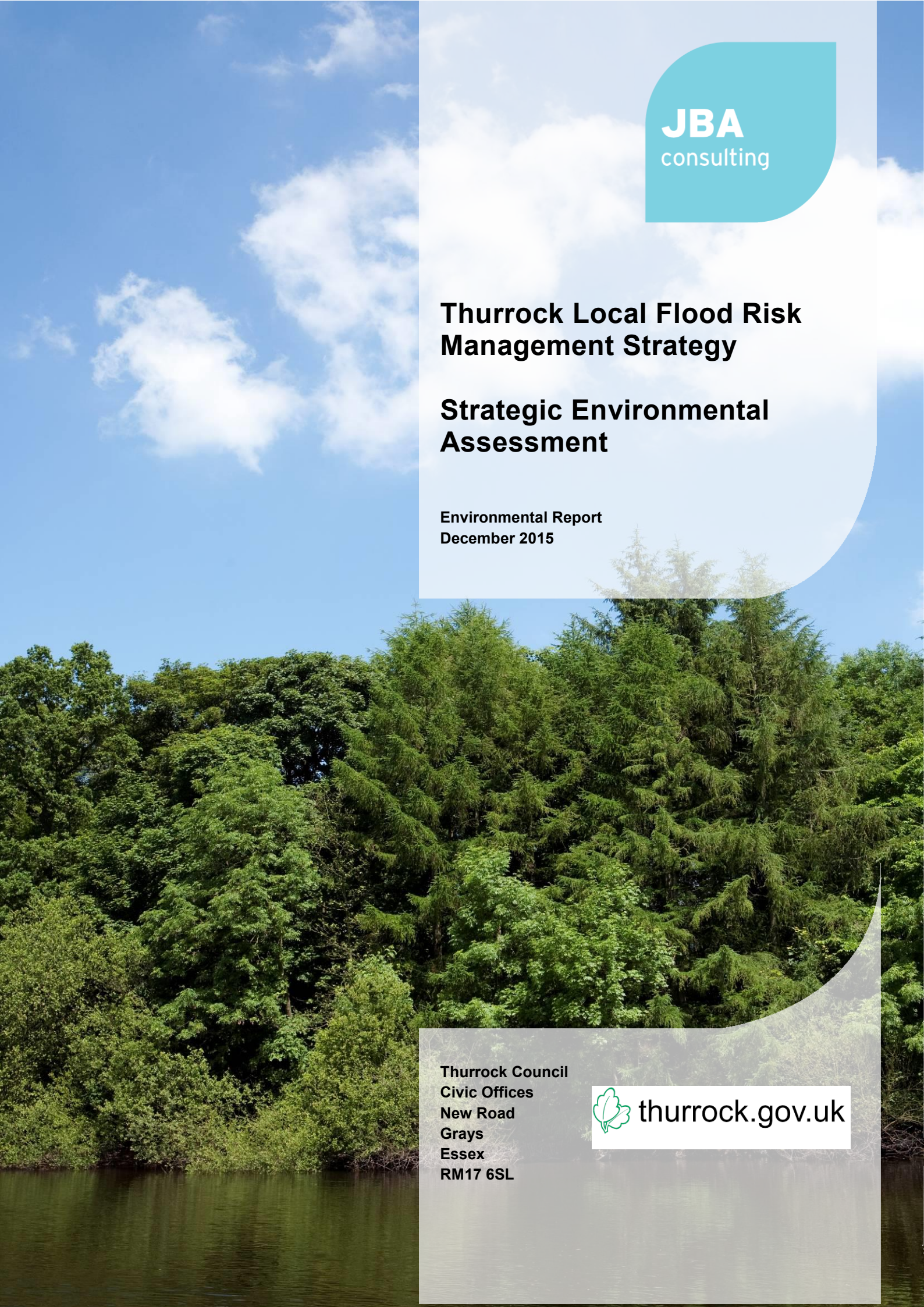

Thurrock Local Flood Risk Management Strategy

Strategic Environmental Assessment

Environmental Report
December 2015

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v1-1 / 29 June 2015		Claire Gardner
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Contract

This report describes work commissioned by Thurrock Council. Rachel Drabble, Anissia Halwyn and David Revill of JBA Consulting carried out this work.

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Purpose

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Non-Technical Summary

The Thurrock Council is currently preparing a Local Flood Risk Management Strategy (LFRMS). As part of this process, the Council is also carrying out a Strategic Environmental Assessment (SEA), which considers the potential environmental effects of the LFRMS. This Environmental Report sets out findings of the SEA. It has been produced to meet the requirements of *The Environmental Assessment of Plans and Programmes Regulations 2004* (hereafter referred to as the 'SEA Regulations') and follows the guidance contained within *A Practical Guide to the Strategic Environmental Assessment Directive* (ODPM, 2005).

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

The SEA Scoping Report for the LFRMS was issued to the statutory consultation bodies in March 2015. A number of comments were received on the scope of the assessment and assessment framework, which were incorporated into the preparation of this Environmental Report.

Assessment of the SEA objectives against three management options ('do nothing', 'maintain current flood risk management regime' and 'manage and reduce local flood risk') was undertaken. This identified the potential effects on the environment associated with these different management actions. The 'do nothing' option is likely to result in a number of significant adverse effects, particularly in relation to people and property, and other environmental assets including historic sites and biodiversity, where increased flooding may create new pathways for the spread of invasive non-native species. Surface water and groundwater quality could also be adversely affected, with increased flooding of contaminated sites leading to greater impacts on water resources. Conversely, increased flood risk may result in greater connectivity between watercourses and their floodplains, offering opportunities for habitat creation to benefit a range of protected and notable species.

The option to 'maintain current flood risk management regime' is likely to result in little or no change in the environmental baseline in the short to medium term as the existing flood risk management regime continues to maintain existing levels of flood protection. However, in the future, as a result of climate change, flood risk will increase, resulting in many of the impacts identified under 'do nothing', although potentially to a lesser extent and significance.

The option to 'manage and reduce local flood risk' has the potential to provide a range of environmental benefits. Flood risk management initiatives, if designed and implemented in an appropriate manner, could provide multiple benefits. This could include reducing flood risk to people and property, contributing to the protection of heritage assets, improvements in water quality, providing new opportunities for habitat creation and the provision of new recreation and amenity assets. Conversely, flood risk management measures, if implemented in an inappropriate manner, could result in adverse effects on a range of environmental features. However, this risk is managed through the preparation of this SEA and through the planning and consenting process, which is likely to require consideration of the sustainability of a project prior to its implementation.

Therefore, it is evident that by doing nothing or maintaining current levels of management, there are likely to be detrimental effects on the SEA objectives, which may be prevented by carrying out active flood risk management as proposed by the LFRMS.

Assessment of the LFRMS objectives and underpinning actions against the SEA objectives has been undertaken. No negative environmental effects have been identified from the LFRMS objectives. Many of the proposed LFRMS objectives have the potential for both direct and indirect environmental benefits. LFRMS objective 7 in particular has potential to provide a positive contribution to all of the SEA objectives and make a significant positive contribution to many of them, as it seeks to encourage design and development that not only reduces flood risk but also seeks to improve environmental quality. In particular, there is opportunity through the LFRMS to achieve a range of biodiversity benefits, including new habitat creation, enhancement of existing habitats and greater habitat connectivity.

In addition, as expected of a strategy for managing flood risk, the majority of objectives within the strategy will contribute to achievement of the SEA objectives that seek to reduce flood risk to people, property and infrastructure. As a result, the LFRMS is likely to have a significant positive effect on reducing flood risk to local communities.

Some of the LFRMS objectives, in particular 1, 3 and 7, are also likely to assist with climate change adaptation. In particular, measures that reduce flood risk, promote better use of water resources, seek to deliver new habitat creation and better connection between existing habitats (such as de-culverting), could make a significant positive contribution to achievement of SEA objective 12.

A detailed assessment of the potential cumulative effects of the LFRMS actions should be undertaken when further details regarding specific project level measures and their implementation are known.

The SEA Regulations require Thurrock Council to monitor the significant environmental effects (positive and negative) upon the implementation of the LFRMS. Key potential environmental effects that require monitoring have been identified together with the monitoring indicators that can be applied to track whether such effects occur.

This Environmental Report will be subject to public consultation for six weeks alongside the draft Thurrock Council LFRMS. All consultation responses received will be reviewed and taken into consideration for the next stage of appraisal process. This will involve the preparation of a Post Adoption Statement (PAS), which will set out how the findings of the Environmental Report and the views expressed during the consultation period have been taken into account as the LFRMS has been finalised and formally approved. The PAS will also set out any additional monitoring requirements needed to track the significant environmental effects of the strategy.

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Abbreviations

ABO ..... Above Ordnance Datum
ALC ..... Agricultural Land Classification
AONB ..... Area of Outstanding Natural Beauty
AQMA ..... Air Quality Management Area
BAP ..... Biodiversity Action Plan
CAMS ..... Catchment Abstraction Management Strategy
CDA ..... Critical Drainage Area
FRM ..... Flood Risk Management
FSA ..... Flood Storage Area
FWMA ..... Flood and Water Management Act
GEP ..... Good Ecological Potential
HAP ..... Habitat Action Plan
HRA ..... Habitats Regulation Assessment
HMWB ..... Heavily Modified Water Body
IMD ..... Index of Multiple Deprivation
LFRMS ..... Local Flood Risk Management Strategy
LGA ..... Local Government Association
LLFA ..... Lead Local Flood Authority
LNR ..... Local Nature Reserve
LWS ..... Local Wildlife Site
NCA ..... National Character Area
NERC ..... Natural Environment and Rural Communities
NGR ..... National Grid Reference
NIA ..... Nature Improvement Area
NNR ..... National Nature Reserve
NPPF ..... National Planning Policy Framework
NVZ ..... Nitrate Vulnerable Zone
ODPM ..... Office of the Deputy Prime Minister
RBMP ..... River Basin Management Plan
rMCZ ..... Recommended Marine Conservation Zone
RMA ..... Risk Management Authority
SAC ..... Special Area of Conservation
SAP ..... Species Action Plan

SEA ..... Strategic Environmental Assessment
SLA ..... Special Landscape Area
SPA ..... Special Protection Area
SPZ ..... Source Protection Zone
SSSI ..... Site of Special Scientific Interest
SuDS ..... Sustainable Drainage Systems
SWMP ..... Surface Water Management Plan
TLSE ..... Test of Likely Significant Effect
UKCP09 ..... UK Climate Projection
WFD ..... Water Framework Directive
WRMU ..... Water Resource Management Unit

1 Introduction

1.1 Background

Thurrock Council is currently preparing a Local Flood Risk Management Strategy (LFRMS). As part of this process, the Council is also carrying out a Strategic Environmental Assessment (SEA), which considers the potential environmental effects of the LFRMS. This Environmental Report sets out findings of the SEA. It has been produced to meet the requirements of *The Environmental Assessment of Plans and Programmes Regulations 2004* (hereafter referred to as the 'SEA Regulations') and follows the guidance contained within *A Practical Guide to the Strategic Environmental Assessment Directive* (ODPM, 2005).

The ODPM guidance sets out a five stage process (A to E) to be followed (see Table 1-1). This report addresses stages B and C of the SEA process wherein LFRMS options and alternatives are identified and the predicted environmental effects of the LFRMS are assessed.

Consultation (Stage D) on this Environmental Report will be conducted as outlined in Section 1.2 of this document, whilst monitoring of the significant effects of the LFRMS (Stage E) will be undertaken in accordance with the outline monitoring programme included in Section 6.3.

Table 1-1: Stages in the SEA process

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

1.2 Strategic Environmental Assessment

SEA is a statutory assessment process required under the *Environmental Assessment of Plans and Programmes Regulations 2004* (the 'SEA Regulations'). These regulations transpose into UK law the requirements of the European Directive 2001/42/EC *on the assessment of the effects of certain plans and programmes on the environment* (the 'SEA Directive')[1]. The SEA Directive requires formal assessment of plans and programmes which are likely to have significant effects (either positive or negative) on the environment. It applies to all plans and programmes which are *'subject to preparation and/or adoption by an authority at national, regional or local level'* or are *'required by legislative, regulatory or administrative provisions'* (ODPM, 2004).

Local Government Association (LGA) guidance (LGA, 2011) on the production of the LFRMS identifies the likely requirement for an SEA, stating that *'the Local [Flood Risk Management] FRM Strategy is likely to require statutory SEA, but this requirement is something the [Lead Local Flood Authority] LLFA must consider'*. A SEA screening process was therefore undertaken and the Council has confirmed the requirement for its LFRMS to undergo SEA.

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

The full range of environmental receptors has been considered through the SEA. This meets the requirements of the SEA Directive, which requires that an assessment identifies the potentially significant environmental impacts on *'biodiversity, population, human health, fauna, flora, soil, water, air, climatic, material assets including architectural and archaeological heritage, landscape and the interrelationship between the above factors'*[1].

[1] Directive 2001/42/EC of the European Parliament and of the Council of 27 June 2001 on the assessment of the effects of certain plans and programmes on the environment

Annex I of the SEA Directive sets out the scope of information to be provided by the SEA. This is described in Table 1-2 below, which also identifies where in the SEA process for the LFRMS that the relevant requirement will be met.

Table 1-2: Stages in the SEA process as identified within Annex I of the SEA Directive

SEA Directive requirements	Where covered in the SEA
(a) an outline of the contents, main objectives of the plan or programme and relationship with other relevant plans and programmes;	Sections 1.1, 1.2, 1.3, 2.2 and Appendix B.
(b) the relevant aspects of the current state of the environment and the likely evolution thereof without implementation of the plan or programme;	Section 2
(c) the environmental characteristics of areas likely to be significantly affected;	Section 2
(d) any existing environmental problems which are relevant to the plan or programme including, in particular, those relating to any areas of a particular environmental importance, such as areas designated pursuant to Directives 79/409/EEC and 92/43/EEC;	Section 1.6, 2.5, 6.4 and Appendix A
(e) the environmental protection objectives, established at international, Community or Member State level, which are relevant to the plan or programme and the way those objectives and any environmental considerations have been taken into account during its preparation;	Section 2
(f) the likely significant effects on the environment, including on issues such as biodiversity, population, human health, fauna, flora, soil, water, air, climatic factors, material assets, cultural heritage including architectural and archaeological heritage, landscape and the interrelationship between the above factors;	Sections 4 and 5
(g) the measures envisaged to prevent, reduce and as fully as possible offset any significant adverse effects on the environment of implementing the plan or programme;	Sections 5 and 6
(h) an outline of the reasons for selecting the alternatives dealt with, and a description of how the assessment was undertaken including any difficulties (such as technical deficiencies or lack of know-how) encountered in compiling the required information;	Section 4
(i) a description of the measures envisaged concerning monitoring in accordance with Article 10;	Section 6.3
(j) a non-technical summary of the information provided under the above headings.	Non-Technical Summary

The first output from the SEA process is the production of a Scoping Report (JBA Consulting, 2015), which outlines the scope and methodology of the assessment. A proportionate approach was adopted towards establishing the scope of the SEA, reflecting the high-level nature of the LFRMS. Consultation with the statutory consultees (Historic England, Natural England and the Environment Agency) was undertaken in March 2015 to confirm the baseline environment of the study area and the assessment framework (see Section 1.5 for further information).

This Environmental Report has now been prepared to set out the likely significant effects on the environment of implementing the LFRMS.

1.3 The Local Flood Risk Management Strategy

The Flood and Water Management Act (FWMA) was passed in April 2010. It aims to improve both flood risk management and the way we manage our water resources. The FWMA creates clearer roles and responsibilities and instils a more risk-based approach to flood risk management. This includes a new lead role for the Council as a Lead Local Flood Authority (LLFA) in managing and leading on local flood risk management from surface water, groundwater and ordinary watercourses.

Under the requirements of the FWMA, the Council must develop, maintain, apply and monitor a LFRMS for local flood risk management in its area. The LFRMS provides a delivery vehicle for improved flood risk management and supports the development of partnership funding and a strategic investment programme.

The LFRMS will set out:

- The roles and responsibilities for each Risk Management Authority (RMA) and their flood risk management functions; and
- Opportunities, objectives and measures for flood risk reduction of existing communities, including ways to minimise the risk from future growth.

Development of the LFRMS provides considerable opportunities to improve and integrate land use planning and flood risk management. It is an important tool to protect vulnerable communities and deliver sustainable regeneration and growth.

1.4 The study area

Thurrock is a unitary authority with borough status located in the county of Essex in south east England, 32km east of central London (see Figure 1-1). The borough is part of the London commuter belt and within the Thames Gateway redevelopment zone. The borough covers an area of approximately 163km^2 and has a population of approximately 157,750 people (2011) (Thurrock Council, 2014). Thurrock is generally low lying and bounded to the south by the Thames Estuary and bordered to the north by the boroughs of Castle Point, Basildon and Brentwood.

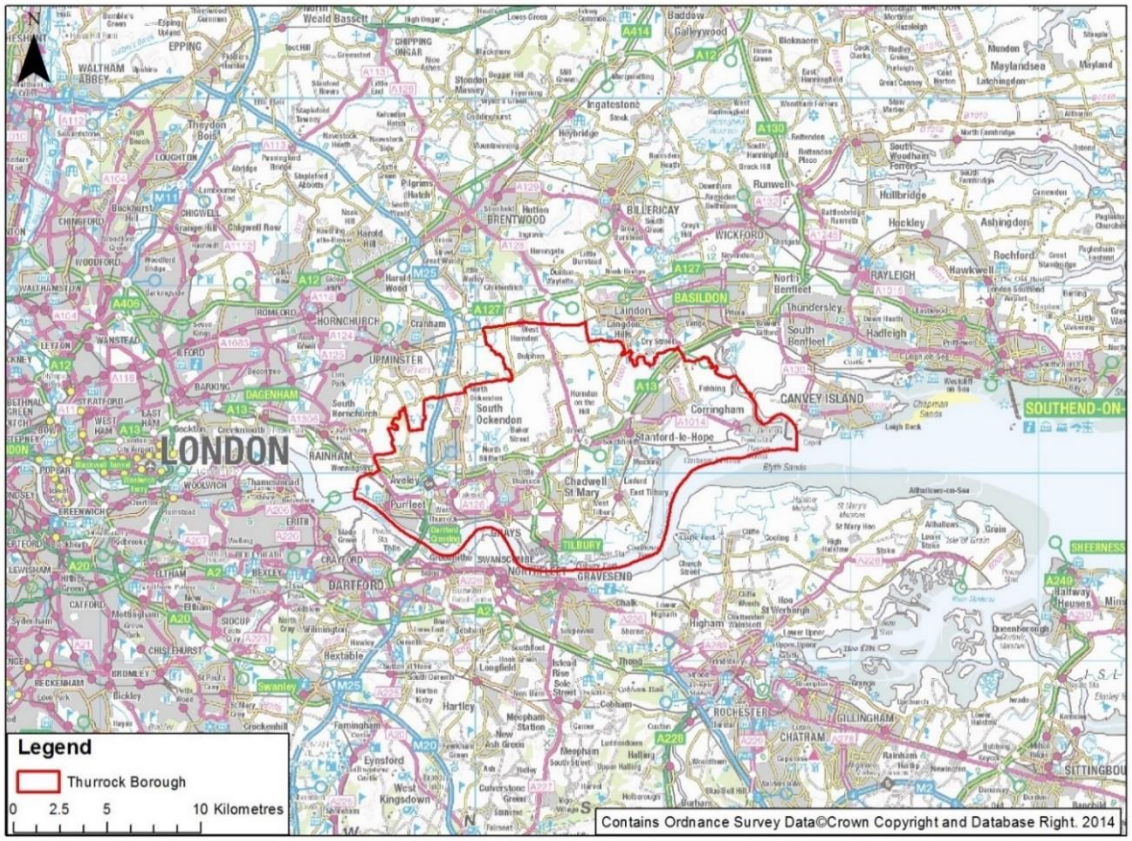

Figure 1-1: Study area

1.5 SEA scoping

The SEA Scoping Report for the LFRMS was issued to the statutory consultation bodies in March 2015. A number of comments were received on the scope of the assessment and assessment framework. Table 1-3 below summarises the comments received and how they have been addressed within this Environmental Report.

Table 1-3: SEA scoping consultation responses

Consultee	Comment received	Action taken
Natural England email dated 17 April 2015	Natural England has reviewed the relevant sections of the Report, and considers that the matters relevant to our remit have generally been adequately identified with appropriate SEA objectives and indicators.	No action required.
	We also note that the scope of the SEA report will include a Habitats Regulations Assessment (HRA), which we support.	No action required.
Environment Agency letter dated 16 April 2015	We are pleased to note that Biodiversity, Flora and Fauna, Water Environment, Soils and Geology and Climate Change have all been scoped into the Strategic Environmental Assessment.	No action required.
	Table 3-2, page 8 [of the Scoping Report], states a key theme to be "better regulation and management of the water environment to benefit water resources and flood risk, and reduce water pollution". We suggest the wording 'and improve water quality' rather than 'reduce water pollution'. Aim should be to promote multifunctional land use, for example river corridor improvements and help towards achieving Water Framework Directive objectives.	This table is not included in the Environmental Report. The Environmental Report has been reviewed to amend wording, however, amendments have not been required. The SEA includes objectives to improve water quality.
	We are happy that the report has considered Water Framework Directive (WFD), protected species, BAP species and designated sites. We are concerned that there is no mention of invasive species and the detrimental effects caused by their introduction to the environment. For example, floating pennywort has been reported from a watercourse in Tilbury and last year we removed a significant amount of the plant from the river.	Invasive species have been considered in Sections 2.5.4 and 2.5.6 of this Environmental Report.
	We believe the SEA should include a short section on reducing the incidence and spread of invasive plant and animal species, which is a legal requirement for species designated under the Wildlife and Countryside Act 1981 (Variation of Schedule 9) (England and Wales) Order SI 2010/609.	Invasive species have been considered in Sections 2.5.4 and 2.5.6 of this Environmental Report.
	Table 3-1, pg. 7. Reference should be made to the following: • Water Act (2014) • South Essex Catchment Flood Management Plan (2009) • Thames Estuary 2100 Plan (2012) not 2002 • Thurrock Council Surface Water Management Plan (SWMP) (2013) • Thames Flood Risk Management Plan (2015 – Draft)	Updated Table 2-1 and Appendix A of this Environmental Report. The Thames Flood Risk Management Plan was not available for review at the time of writing.
	Section 3.2, pg. 8. Whilst Appendix A is acknowledged, an explanation of how these relevant policies, plans and programmes and their relationship with the LFRMS should be provided in this section.	This section is not included in the Environmental Report, therefore has not been updated.
	Section 4.2, pg. 10. Where referring to "natural low points" in the study area, Tilbury should be referred to given it is prone to surface water flooding for this very reason. This should be reflected in the final LFRMS.	Section 2.4 updated to include Tilbury and reads "There are natural low points…in Tilbury, which is due to surface water flooding due to the low ground levels."
	Figure 4-1, pg. 11. Suggest the following: • Label "Purfleet" • Change the legend text to read "Watercourses" rather than "River Network"	Figure 2-1 has been updated with these recommendations.

Consultee	Comment received	Action taken
	Concerning FRM measures and the potential to affect landscape characteristics, we advise that this should be managed via the development of Thurrock Council's proposed Riverside Strategy for the Thames Estuary.	The following text has been included in Section 2.4.1: "The FRM measures could also be managed through the development of the Thurrock Council's proposed Riverside Strategy for the Thames Estuary."
	Section 4.4.1, pg. 22. Refinement of the term "main rivers" in this context is required. If you mean the term "main river" as designated on the main river map held by the Environment Agency, then there are many more than currently referred to in the report. The Thames Estuary is not designated as a "main river" as designated on the main river map held by the Environment Agency for the Thurrock frontage. You should make further reference to "Gobians Sewer" not "Gabbions Sewer". Further explanation is required on the sentence "*These are low flow channels with no additional capacity to accept surface water runoff*". How have you derived this statement?	"Main river" has been updated to "large river", and as such, reference to the Thames as a large river has been kept. Gabbions Sewer has been changed to Gobians Sewer. The sentence "*These are low flow channels with no additional capacity to accept surface water runoff*" has been sourced from information provided in the 'Thurrock Water Cycle Study Scoping Study', Scott Wilson (2009a). A reference has been provided following the statement.
	Section 4.4.5, pg. 23. There is no differentiation between the numerous sources of flood risk in the study area, nor those that the LFRMS will seek to address (surface water, ordinary watercourse, groundwater). There is no brief outline of the roles and responsibilities under the FWMA 2010, which would be of benefit. Thurrock Council Surface Water Management Plan is not referred to at all, surface water is a significant source of flood risk in low-lying areas of the study area, especially Tilbury and Bulphan. This is arguably the most likely flood risk to people and property, although it is acknowledged that the residual risk of flooding from the Thames Estuary poses the biggest consequence. Key flooding risk areas should be referred to.	Additional text has been added to Section 2.6.5 in this Environmental Report to address these comments.
	Section 4.7, pg. 27. There is no indication of the percentage of people currently at risk of flooding, for varying sources of flood risk, within the study area, including those in deprived areas. This information should be provided to given greater context.	Information on percentage of people currently at risk of flooding in deprived areas has been added to Section 2.9.2 of this Environmental Report.
	Section 4.8.2, pg. 29. No reference is made to the existing FCRM infrastructure within the study area, including condition and status. We recommend reference is made to the Thames Tidal Defences, including Tilbury and Fobbing Barriers and Mardyke Sluice amongst others, as well as the Tilbury Flood Storage Area (FSA). This is key infrastructure required to support the study area. An examination of critical infrastructure within the study area also at flood risk is recommended, considering the impacts of climate change.	Additional text on flood defence infrastructure has been included in Section 2.10.2, along with Figure 2-12 showing flood defence assets and their condition.
	Figure 4-11, pg. 29. Detail the location of the FCRM infrastructure as referred to above.	Figure 2-12 shows this information.

Consultee	Comment received	Action taken
	Section 4.10, pg. 30. Reference to the Thurrock Council Surface Water Plan would be beneficial in this section. We also recommend consideration of development planning proposals on floodplain management in line with the National Planning Policy Framework. Our Thames Estuary 2100 plan advocates the following recommendations for the relevant policy units in the study area relevant to this section: • "…a programme of floodplain management including flood warning, emergency planning, and localised flood protection and resilience for vulnerable key sites…" • "…partnership arrangements and principles to ensure that new development in this zone is safe, and flood risk management is factored into the planning process at all levels…"	Text has been added to Section 2.12 to address these comments.
	Section 4.11, pg. 31. Update the existing conclusions in line with the recommended changes.	Changes made where required in Sections 2.10Material Assets and 2.12 Climate Change sections.
	Table 5-2, pg. 34. Population – 9: Suggest "Increasing the resilience of people, property and businesses and critical infrastructure within Thurrock to the risk of flooding".	Wording of SEA objective 9 has been updated.
	Section 6.1, pg. 36. Public consultation is encouraged as a means by which to help set the environmental context and determine the scope of assessment.	Text has been inserted into Section 7.1 regarding public consultation.
	Section 4.4.2. The report states that most of the Mardyke is not designated as Heavily Modified. Whilst this was correct, a number of changes have been made to waterbodies in the South Essex Catchment as part of the 2nd cycle of the River Basin Management Plan (2015-2021), the draft of which is currently out for consultation. As part of these changes, most of the Mardyke is now designated as Heavily Modified for Flood Protection and the lower Mardyke is also designated for Urbanisation. A number of mitigation measures required to achieve Good Ecological Potential are not in place.	Draft RBMPs were not available for review at the time of writing. Therefore, the text in Section 2.6.2 has not been amended, but additional text has been provided with these suggested updates.
	Section 4.4.3. This section mentions the Thames Estuary as well as a number of fluvial/freshwater rivers. It concludes that the Thames Estuary is the main watercourse within Thurrock which may be affected by planned growth, because it will receive effluent from Tilbury Sewage Treatment Works. The report mentions that reduction in flooding could improve water quality. However, little consideration is given to hydromorphology and ultimately ecology. This section seems to focus on chemical water quality and insufficient consideration is given to hydromorphological impacts of modifying and maintaining watercourses, which can have equally significant impacts on ecology and WFD. The scope should be increased to consider FRM activities and urbanisation/growth and development. As the fluvial rivers and estuaries within this catchment have very different characteristics and pressures, it may be worth considering them separately, with greater attention to hydromorphology as well as the water quality impacts.	Text has been added to Sections 2.6.3 and 2.6.6 relating to hydromorphology.
	Section 4.4.6. The SEA states that: "The water bodies in Thurrock currently fail to meet good ecological status/potential under the WFD. This is partly due to the installation of structures for flood conveyance and land drainage. The LFRMS will need	Text has been inserted into Section 2.6.6 to address this comment.

Consultee	Comment received	Action taken
	to consider whether any flood risk management measures will lead to adverse impacts on the watercourses within the borough and whether the LFRMS can help to contribute to achieving WFD objectives and improving water quality." We think it would be worth highlighting that not only the 'installation of structures' which contribute towards the failure to achieve Good Ecological Status. Historical maintenance and modifications to river channels to improve land drainage and flood defence also have a significant impact on the current ecological status of fluvial rivers in the catchment, for example widening, deepening, straightening, re-aligning, silt and vegetation deposits on the bank disconnecting the river from its natural floodplain and extensive removal of bank-side trees in this catchment. Furthermore, current and future maintenance activities, such as improved land drainage, vegetation clearance, de-silting, removing fallen trees from the channel, bank-side tree cutting/removal etc., also have the potential to reduce ecological status of rivers in the catchment, and prevent rivers from reaching good status. The impacts of land use and river maintenance should be considered in the LFRMS, as the strategy could have a significant effect on both land use and river maintenance undertaken by the Council or landowners/managers, and this in turn could impact on ecological status as well as WFD compliance.	
	Section 5. Again, the focus of the objectives and indicators is on water quality, with little consideration given to the environmental impact on morphology.	SEA Objective 5 has been amended to "*Improve the quality and quantity of the water and morphology in the borough's rivers*."
Historic England letter dated 20 April 2015	Historic England recommends that our guidance (2013) on SEA / Sustainability Appraisal and the Historic Environment is used to inform the environmental assessment, available at: http://historicengland.org.uk/images-books/publications/strategic-environ-assessment-sustainability-appraisal-historic-environment/	This guidance has been used to inform preparation of this SEA.
	Historic England advises that the local authority's conservation and archaeological advisers are involved throughout the preparation, assessment and implementation of the strategy.	Comments noted. Advisers will be involved if required.
	Review of Plans, Policies and Programmes Include review of the following: *At a national level*: • The National Planning Policy Framework (NPPF) recognises that the protection and enhancement of the historic environment is integral to achieving sustainable development. • The Flood Risk Regulations 2009 include a requirement to have regard to the desirability of reducing the adverse consequences of flooding for the environment (including cultural heritage). • The Flood and Water Management Act 2010 requires protection of natural and heritage assets and enhancing the environment where it is most degraded. • The National Flood and Coastal Erosion Risk Management Strategy for England includes enhancing and protecting cultural heritage and should avoid damaging the environment, including historic environment. *At a local level:* • Conservation area appraisals and accompanying management plans, particularly for conservation	Relevant plans, policies and programmes have been reviewed for the SEA, as described in Table 2-1.

Consultee	Comment received	Action taken
	areas identified at risk of flooding.	
	The cultural heritage overview of Thurrock in Section 4.3 is useful, including reference to Heritage at Risk.	Comments noted, no action required.
	The following data sources can be particularly useful in providing locally specific information, as for example: • Historic Environment Records • Preliminary Flood Risk Assessments • Historic Characterisation studies.	Where available, this data has been used to provide local information.
	Historic England also recommends that the baseline takes account of areas of archaeological importance and the potential for unrecorded archaeology, including buried, waterlogged archaeological and palaeo-environmental remains of significant interest and fragility that can be associated with river valleys, floodplains and wetland areas.	Text has been inserted into Section 2.8 to highlight the potential for unrecorded archaeology.
	Historic England recommends that, wherever possible, data sets are mapped.	Where available, datasets have been mapped.
	For both designated and non-designated heritage assets, an important consideration is the contribution of their setting to their heritage interest or significance. New development within the setting of a heritage assets may also offer opportunities for enhancing or better revealing its significance.	Text included in Section 2.8.1 addressing this comment.
	Consideration should be given to screening the Heritage at Risk Register to identify if the at risk status is associated with flood risk. Up to date information on this can be found at http://risk.historicengland.org.uk/register.aspx	This has been undertaken in Section 2.8.
	We welcome the discussion of key environmental issues relating to the historic environment in Section 4.6.1.	No action required.
	Historic England recommends the SEA assessment framework includes a specific heading objective for the SEA topic on Archaeology and Cultural Heritage, for example: *"Conserve and enhance the historic environment, heritage assets and their settings."* The current draft SEA objective on page 34 of your report could be amended as above.	Wording has been updated on SEA objective 8 to *"Conserve and enhance the historic environment, heritage assets and their settings."*
	In addition to the headline objective, it can also be beneficial for the SEA framework to include relevant sub-objectives (decision-making criteria) to help ensure that all the key heritage issues are considered and potential effects appropriately assessed. Examples are: • Will the measures reduce the number of heritage assets at risk of flooding? • Will the measures harm the significance of designated and non-designated heritage assets, including their setting? • Will the measures help secure the sustainable use of a heritage asset and/or improve its maintenance? • Will the measures lead to changes in groundwater levels or chemistry that could alter the hydrological setting of water-dependent heritage assets, including palaeo-environmental deposits?	Sub-objectives have not been included as this is a high level strategic assessment of environmental effects from FRM measures.

Consultee	Comment received	Action taken
	• Will the measures involve hydromorphological adaptations comprising the modification/removal of weirs or other in-channel structures and physical changes to rivers including de-canalisation or re-cutting old meanders? • Will the measures conserve and enhance the local character and distinctive of historic townscapes and landscapes? • Will the measures increase public awareness and understanding of appropriate responses for heritage assets affected by flooding and the design and implementation of other measures aimed at risk management or improving resilience? • Will the measures provide opportunities for improved access, understanding and enjoyment of the historic environment?	
	With respect to specific indicators for the strategy, we note and welcome the two shown against the SEA objective for cultural heritage. Additional topic specific indicators might include: • Proportion of conservation area ground at risk from flooding • Number of designated and non-designated heritage assets harmed by flood risk management measures, including impacts on their settings.	Additional indicators have been included in Table 3-2.

1.6 Habitats Regulations Assessment

The European Council Directive on *the Conservation of Natural Habitats and of Wild Fauna and Flora* (92/43/EEC, 'the Habitats Directive') as implemented through the Conservation of Habitats and Species Regulation 2010 (as amended) ('the Habitats Regulations') requires a competent authority to carry out a Habitats Regulations Assessment (HRA) of a plan or project to establish whether it will have a 'likely significant effect' on sites designated for their nature conservation interest at an international level (known as European sites, which include Special Areas of Conservation (SACs), Special Protection Areas (SPAs), and by UK Government policy, Ramsar sites). The LFRMS for Thurrock Borough, as a statutory plan, is subject to the requirements of the Habitats Directive.

Assessing the impacts of a plan under the Habitats Regulations is a separate process to SEA. However, there is overlap between these two types of assessment. A Test of Likely Significant Effect (TLSE) (Screening Assessment) has been undertaken in accordance with the requirements of the Habitats Regulations to determine whether the LFRMS is likely to adversely affect the integrity of a European site (alone or in combination with other plans, policies and projects).

All European sites lying partially or wholly within 15km of the borough boundary were included in the assessment in order to address the fact that measures in the Thurrock LFRMS may affect European sites which are located outside the administrative boundary of the strategy.

Thurrock does support one SPA and Ramsar site; the Thames Estuary and Marshes. There are also nine other European sites within 15km of the borough boundary:

- Benfleet and Southend Marshes SPA
- Benfleet and Southend Marshes Ramsar
- Medway Estuary and Marshes SPA
- Medway Estuary and Marshes Ramsar
- Crouch and Roach Estuaries SPA
- Crouch and Roach Estuaries Ramsar
- North Downs Woodlands SAC
- Peters Pit SAC
- Essex Estuaries SAC

The screening assessment concluded that the LFRMS is not likely to have a significant effect on Benfleet and Southend Marshes SPA and Ramsar, Medway Estuary and Marshes SPA and Ramsar, Crouch and Roach Estuaries SPA and Ramsar, North Downs Woodlands SAC, Peters Pit SAC and Essex Estuaries SAC. After more detailed screening, the LFRMS was also deemed not likely to have a significant effect on Thames Estuary and Marshes SPA and Ramsar site. Only a small number of LFRMS actions could potentially result in physical interventions or construction work, or directly affect water management practices. At this stage, the works under consideration are relatively small-scale and local in impact. Therefore, it is unlikely that hazards will arise on the sensitive interest features as a result of implementation of the LFRMS.

The TLSE concluded that it is not likely that any of these designated sites would be adversely impacted by flood risk management activities undertaken in the Borough and as such, no further assessment is required under the Habitats Regulations. Further details of this assessment are provided in the TLSE screening appraisal included in Appendix A of this report and a summary of its outcomes is provided in Section 6.4.

Consultation with Natural England on the outcomes of this assessment has been undertaken as part of the consultation process outlined in Section 1.5 and it was agreed that the Borough is of a sufficient distance from these sites that no likely significant effect is identified and an Appropriate Assessment is not required.

2 Environmental baseline

2.1 Introduction

The following section presents the findings of the Scoping Report (JBA Consulting, 2015), which identified the context and objectives of the LFRMS and identified and the scope of the assessment.

2.2 Other relevant plans, programmes and environmental protection objectives

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

Identifying these relationships enables potential synergies to be determined, strengthening the benefits that can be gained from implementation of the LFRMS. This information is also used to inform the development of the environmental baseline and the identification of key issues and problems. In addition, any inconsistencies or constraints can be identified, which could hinder the achievement of the environmental protection objectives or those of the LFRMS, and therefore providing a broad appraisal of the strategy's compliance with international, national and local considerations.

The Office of the Deputy Prime Minister (ODPM) SEA guidance recognises that no list of plans or programmes can be definitive and as a result this report describes only the key documents that may influence the LFRMS. These are shown in Table 2-1 and described in more detail in Appendix B.

Table 2-1: Policies, plans and programmes reviewed through this SEA process

Plan, Policy or Programme
International
EU Sustainable Development Strategy (revised 2006)
European Biodiversity Strategy to 2020
EC Birds Directive – Council Directive 2009/147/EEC on the conservation of wild birds
EU Floods Directive – Directive 2007/60/EC on the assessment and management of flood risks
EU Groundwater Directive – Directive 2006/118/EC on the protection of groundwater against pollution & deterioration
EC Habitats Directive – Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna & flora
Urban Wastewater Treatment Directive – Directive 91/271/EEC concerning urban waste water treatment
EU Water Framework Directive – Directive 2000/60/EC of the European Parliament and of the Council establishing a framework for the Community action in the field of water policy
National
Securing the Future – the UK Government Sustainable Development Strategy (2005)
Flood and Water Management Act (2010)
Flood Risk Regulations (2009)
Water for People and the Environment, Water Resources Strategy for England and Wales (2009)
Future Water, The Government's water strategy for England (2008)
Making Space for Water – taking forward a new Government strategy for flood and coastal erosion risk management in England (2005)
The National Flood and Coastal Erosion Risk Management Strategy for England (2011)
Water Act (2003)
Water Act (2014)
Draft Water Bill (2012)
The National Flood Emergency Framework for England (2011)
The Carbon Plan (2011)
Building a Low Carbon Economy – the UK's Contribution to Tackling Climate Change (2008)
Climate Change Act (2008)
Biodiversity 2020: A Strategy for England's Wildlife and Ecosystems (2011)

Plan, Policy or Programme
England Biodiversity Framework (2008)
UK Biodiversity Action Plan (1994)
National Wetland Vision (2008)
Wildlife and Countryside Act (as amended) (1981)
Natural Environment and Rural Communities (NERC) Act (2006)
Salmon and Freshwater Fisheries Act (1975)
Contaminated Land (England) Regulations (2006)
National Planning Policy Framework (2012)
PPS5: Planning for the Historic Environment Practice Guide (2010)
Historic Environment Good Practice Advice in Planning: Historic Environment Records (2014)
Historic Environment Good Practice Advice Guide in Planning: Note 3: The Setting of Heritage Assets.
Regional / Local
Thames Catchment Flood Management Plan (2009)
South Essex Catchment Flood Management Plan (2009)
Thames Estuary 2100 Strategy (2012)
Thames Gateway Delivery Plan (2009)
Managing Water Resources & Flood Risk in the South East (2005)
London Rivers Action Plan (2009)
Thames River Basin Management Plan
Thames Flood Risk Management Plan (2015 – Draft)
Thurrock Council Local Air Quality Action Plan (2004)
Thurrock Environmental Vision and Policy (2013)
Essex County Council Preliminary Flood Risk Assessment (2011)
Thurrock Strategic Flood Risk Assessment Level 1 Report (2009) and Level 2 Report (2010)
Thurrock Transport Strategy 2013-2026 (2013)
Thurrock Local Development Framework Core Strategy and Policies for Management of Development (2011)
Thurrock Council Surface Water Management Plan (2014)
Sustainable Community Strategy Thurrock 2020 (2009)
Essex Biodiversity Action Plan (2011)
Thurrock Biodiversity Action Plan 2007-2012
Essex County Council Adapting for Climate Change – Action Plan (2014)
Open Spaces Strategy 2006 – 2011 (2006)
Riverscapes – An environmental vision for Thurrock 2013-2023 (2013)

2.3 Environmental characteristics and key issues

A search of baseline environmental information was undertaken to identify the key environmental characteristics of the borough. This included details of the environmental status and condition of notable environmental features; current and future predicted trends in the evolution of the environment; and issues and problems currently affecting the environment. The baseline information is used as the basis for predicting and monitoring the effects of the LFRMS implementation.

The information obtained through this desk study is broadly strategic in nature and reflects the high-level objectives of the LFRMS. It has been obtained from a broad range of sources and no new investigations or surveys were undertaken as part of the scoping process. The baseline may require updating throughout the duration of the SEA process as the LFRMS is developed further and new information becomes available.

2.4 Landscape and visual amenity

Much of the riverside area of Thurrock is highly urbanised, with a mixture of industrial and residential development at the western and eastern ends. The landscape character of Thurrock is not uniform, with the main physical feature being the River Thames, which forms the southern border of the borough, with the bank of the Thames being heavily urbanised between Aveley Marshes and Tilbury, and again around Holehaven Creek (Thurrock Council, 2006). The landscape of the borough divides roughly into industrial/urban land south of the A13 and mixed

urban, village and rural land to the north of the A13. Approximately 60% of the borough is open countryside, predominantly agricultural land and dispersed villages. Approximately 70% of Thurrock is designated as Metropolitan Green Belt (URS, 2014).

The built environment of Thurrock is very varied, with redevelopment and renewal of the area creating mainly residential developments along the banks of the Thames. Old industrial sites have also been developed into new housing areas and the Lakeside retail development. Historically, the main urban centres have grown up around the riverbank industries including oil, aggregate, cement works, scrapyards, power stations and docks (Scott Wilson, 2009a). The main settlements include Grays, Stanford-le-Hope, Corringham, South Ockendon and Tilbury (Figure 2-1). Post-war suburban residential areas have expanded and, in some cases, merged with others. Villages in open countryside have not expanded due to Green Belt restrictions, and have therefore retained a small scale and rural character (Thurrock Council, 2006).

Farmland is the major land use in Thurrock, with a mosaic of ditches, hedgerows, woods, ponds, pasture and field margins (Thurrock Council, 2007). There are also the Thames Terraces, of which the Purfleet-Grays ridge rises from the Thames to 25m above sea level, forming a central belt of sands and gravels across the borough (Thurrock Council, 2007).

There are two Special Landscape Areas (SLA) classified for their landscape importance in a regional and countrywide context; the Mardyke Valley and Langdon Hills (Thurrock Council, 2011a). These areas are designated by Thurrock Council to safeguard areas of regional or local landscape importance from inappropriate developments.

The highest elevations of the borough, the Langdon Hills are .in the north-east, where ground levels reach approximately 50m Above Ordnance Datum (AOD). There are natural low points along the fluvial floodplain of the River Mardyke in the north-west, Stanford Brook in the south-east corner, with ground levels between 2 and 6m AOD (URS, 2014) and in Tilbury, which is due to surface water flooding due to the low ground levels.

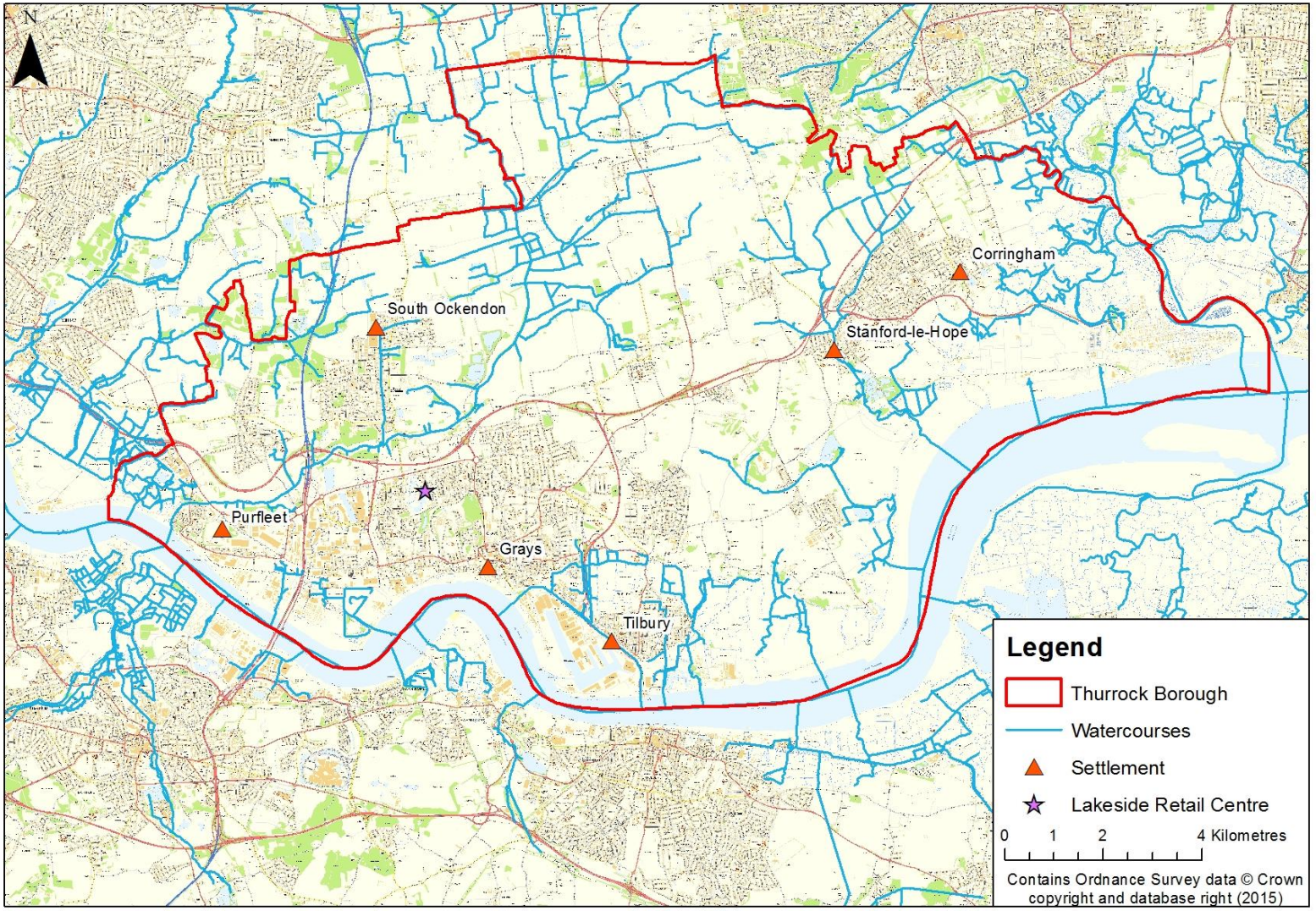

Figure 2-1: Main settlements and river network in Thurrock

There are no Areas of Outstanding Natural Beauty (AONB) or National Parks in the borough of Thurrock. Thurrock is in the Northern Thames Basin (111) National Character Area (NCA), which extends from Hertfordshire in the west to the Essex coast in the east (Natural England, 2013). The countryside has suffered from the effects of mineral working and the landfilling of waste, and continues to be affected by other land use changes associated with urban fringe activities and changing agricultural land management practices (Chris Blandford Associates, 2005). However, there are strategies to improve the landscape character of the borough, such as the South Essex Green Grid Strategy, which was launched in 2008 to create five major green infrastructure projects in South Essex, including the creation of Thurrock Thameside Nature Park in Mucking (Parklands South Essex, 2009).

Thurrock's landscape character can be divided into five distinct types and areas (Thurrock Council, 2006):

- Fenland – North Thurrock around Bulphan.
- Rolling farmland/wooded hills – North Thurrock around Langdon Hills and Horndon on the Hill.
- Marshland – to the east of Thurrock along the Thames Estuary.
- Urban fringe – Thurrock's urban areas apart from Stanford-Le-Hope and Corringham.
- Urban areas – Aveley, Chadwell St Mary, Corringham, Grays, Purfleet, Stanford-Le-Hope, Tilbury and West Thurrock.

The Thames forms a distinctive 'riverscape' along the southern edge of the borough. In the west near Aveley Marshes, the Thames is narrow, widening towards Holehaven Creek in the east. The banks of the river are penetrated by large creeks, smaller inlets and bays. The river bank is heavily industrialised between Aveley Marshes and Tilbury, and again around Holehaven Creek (Chris Blandford Associates, 2005).

2.4.1 Key environmental issues

Key issues and challenges arising from current and anticipated forces for change in the Thurrock landscape are (Chris Blandford Associates, 2005):

- Arresting the further dilution of landscape character resulting from current farming practices.
- Ensuring that any potential new peripheral urban development is sited to minimise impacts on landscape character and visual amenity.
- Improving the transport network in an effort to reduce high traffic levels that create noise intrusion and barriers to movement within the borough.
- Addressing the adverse impacts of small-scale incremental changes on the character and quality of the landscape.

Pressure from new development and associated infrastructure are likely to present significant challenges as the area responds to an increasing population and the demands of economic development and climate change.

Flood risk management measures have the potential to affect the landscape characteristics in the borough. This includes changes to the river corridors, impacts on existing open spaces, and impacts on the setting of local landmarks and landscape features. Many of these aspects are protected through regional and local policies and as such could restrict the implementation of LFRMS objectives if they are shown to present a risk to the quality of the landscape. The FRM measures could also be managed through the development of the Thurrock Council's proposed Riverside Strategy for the Thames Estuary.

2.5 Biodiversity, flora and fauna

2.5.1 Designated nature conservation sites

Thurrock supports internationally designated nature conservation sites. There is one Ramsar and SPA site within the borough, and three Ramsar sites and SPAs within 15km of Thurrock's boundary (Figure 2-2). These sites are all designated as both SPA and Ramsar and are all estuary sites to the east of the borough. The borough does not support any SACs, but there are three within 15km (Figure 2-2). European sites within 15km of Thurrock are described in Table 2-2.

Table 2-2: European sites within 15km of Thurrock borough

Site name	Distance from Thurrock	Qualifying/Interest features
Thames Estuary and Marshes SPA	Within – borders the coastline around Stanford-le-Hope and Tilbury	The site is a complex of brackish, floodplain grazing marsh, ditches, saline lagoons and intertidal saltmarsh and mudflat. The estuary and adjacent grazing marsh areas support an important assemblage of wintering waterbirds including avocet *Recirvirostra avosetta*, hen harrier *Circus cyaneus* under Article 4.1. The site also qualifies under Article 4.2 for support populations of European importance of ringed plover *Charadrius hiaticula*. It is also a wetland of international importance (JNCC, 2005a).
Thames Estuary Marshes Ramsar	Within – borders the coastline around Stanford-le-Hope and Tilbury	The site is a complex of brackish, floodplain grazing marsh, ditches, saline lagoons and intertidal saltmarsh and mudflat. The Ramsar is designated for one endangered plant species (least lettuce *Lactuca saligna*) and at least 14 nationally scarce plants of wetland habitats. The site also supports more than 20 British Red Data Book invertebrates. The site also supports a bird assemblage of international importance, and a variety of bird species occur at levels of international importance. These include the ringed plover *Charadrius hiaticula*; black-tailed godwit *Limosa limosa islandica*; grey plover *Pluvialis squatarola*; red knot *Calidris canutus islandica*; dunlin *Calidris alpina alpina*; and common redshank *Tringa tetanus* (JNCC, 2000).
Benfleet and Southend Marshes SPA	3.6km east	The site comprises an extensive series of saltmarshes, cockle shell banks, mud-flats and grassland that supports a diverse flora and fauna. The site qualifies under Article 4.2 by supporting populations of European importance of the following migratory species: ringed plover *Charadrius hiaticula,* dark-bellied brent goose *Branta bernicla bernicla,* grey plover *Pluvialis squatarola* and knot *Calidris canutus*. The site also qualifies under Article 4.2 by regularly supporting at least 20,000 waterfowl (JNCC, 2005b).
Benfleet and Southend Marshes Ramsar	3.6km east	This site comprises an extensive series of saltmarshes, mudflats and grassland which support a diverse flora and fauna, including internationally important numbers of wintering waterfowl. It is designated for waterfowl assemblages of internationally importance and populations occurring at levels of international importance, including the dark-bellied brent goose *Branta bernicla bernicla*, grey plover *Pluvialis squatarola* and red knot *Calidris canutus islandica* (JNCC, 1994).
Medway Estuary and Marshes SPA	8.6km south-east	The site has a complex arrangement of tidal channels, which drain around large islands of saltmarsh and peninsulas of grazing marsh. The site qualifies under Article 4.1 by supporting populations of European importance of avocet *Recirvirostra avosetta,* little tern *Sterna albifrons* and also qualifies under Article 4.2 for a number of populations of European importance for migratory species (JNCC, 2005c).
Medway Estuary and Marshes Ramsar	8.6km south-east	This site has a complex of rain-fed, brackish, floodplain grazing marsh with ditches, and intertidal saltmarsh and mudflat. The site is designated for its rare plants and animals, with at least 12 British Red Data Book species of wetland invertebrates. There are also waterfowl assemblages of international importance and populations of several bird species at levels of international importance (JNCC, 1993).

Site name	Distance from Thurrock	Qualifying/Interest features
North Down Woodlands SAC	9km south	Designated for two Annex I habitats, *Asperulo-Fagetum* beech forests and yew *Taxus baccata* woods (JNCC, 2014a).
Crouch and Roach Estuaries SPA	10km north-east	The intertidal zone along the Rivers Crouch and Roach is 'squeezed' between sea walls along both banks and the river channel. This leaves a relatively narrow strip of tidal mud which is used by significant numbers of birds. The site qualifies under Article 4.2 by supporting populations of European importance of the dark-bellied brent goose *Branta bernicla bernicla* (JNCC, 2005d).
Crouch and Roach Estuaries Ramsar	10km north-east	The site is designated for its assemblage of rare, vulnerable or endangered species or sub-species of plant and animal including 13 nationally scarce plant species. As with the other sites, there are waterfowl assemblages of international importance and populations at levels of international importance (JNCC, 1998).
Essex Estuaries SAC	10km north-east	Designated for the habitats that exist at the site, for example estuaries, mudflats, sandflats and Atlantic salt meadows, among others (JNCC, 2014d). Epping Forest SAC is approximately 16km north-west of Thurrock. The site has an Annex I habitat that is a qualifying feature; Atlantic beech forests (JNCC, 2014e). This site overlaps the Crouch and Roach SPA and Ramsar.
Peters Pit SAC	12km south	Designated for the presence of the great crested newt *Triturus cristatus*, an Annex II species (JNCC, 2014b).

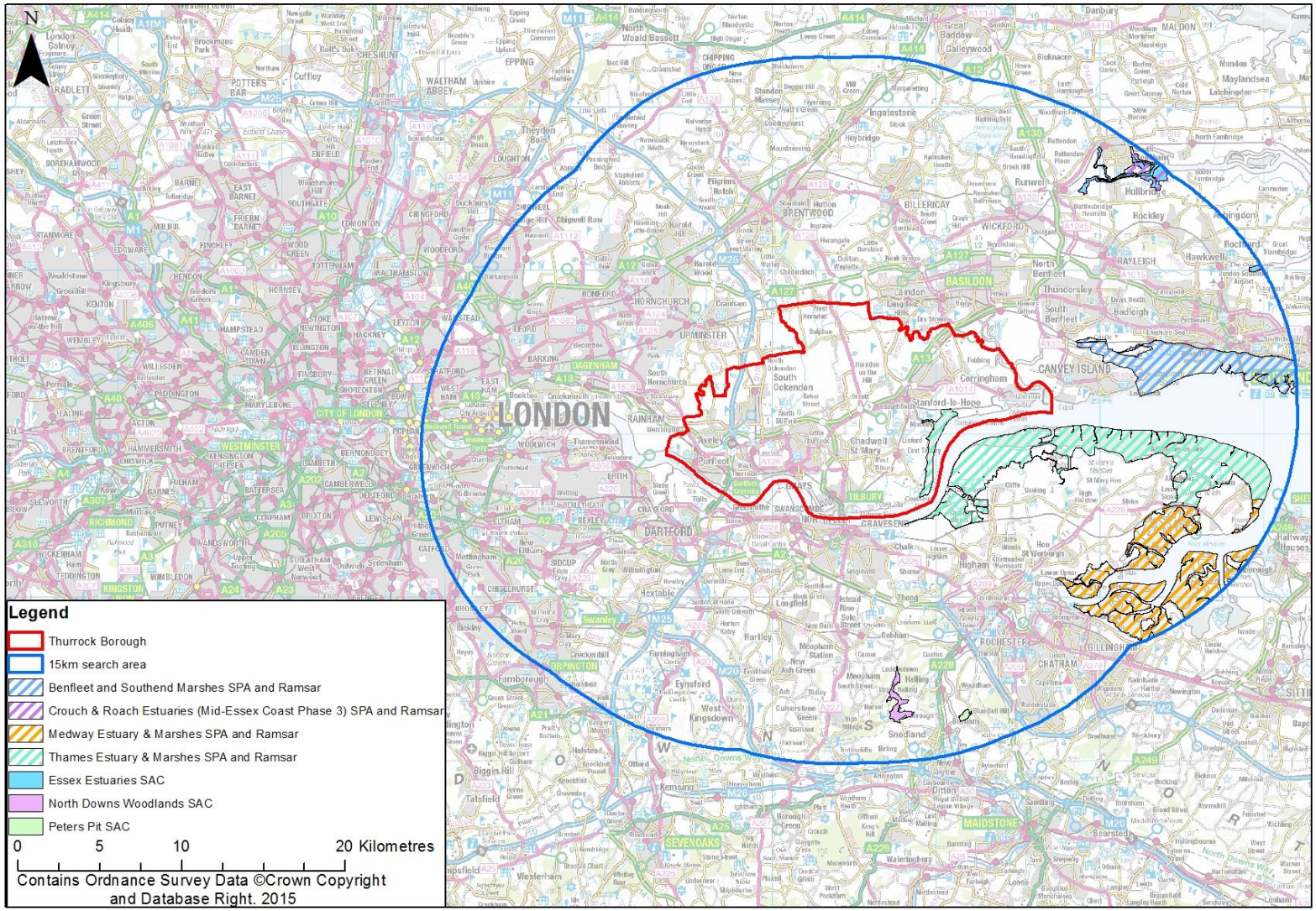

Figure 2-2: European sites within 15km of Thurrock

There are 12 Sites of Special Scientific Interest (SSSI) in Thurrock (Figure 2-3) with 57% of these sites classified by Natural England as in a favourable condition (Thurrock Council, 2011a). Thurrock's SSSIs are described in Table 2-3.

Table 2-3: SSSIs within Thurrock borough

SSSI name	Location	Interest features	SSSI condition
Mucking Flat and Marshes SSSI	South-east. Covers a portion of the Thames Estuary and Marshes Ramsar and SPA.	Waterfowl and estuarine habitats. The mudflats form the largest intertidal feeding area for wintering wildfowl and waders west of Canvey Island.	Favourable (94.13%) Unfavourable – recovering (5.87%)
Holehaven Creek SSSI	Eastern border, extending to the Thames.	Regularly supports nationally important numbers of wintering black-tailed godwit.	Favourable (100%)
Inner Thames Marshes SSSI	Western border, extending to the Thames	Forms the largest remaining expanse of wetland bordering the upper reaches of the Thames Estuary.	Favourable (42.37%) Unfavourable – recovering (17.8%) Unfavourable – no change (5.73%) Unfavourable – declining (31.36%) Destroyed (1.15%)
Vange and Fobbing Marshes SSSI	Eastern border	Unimproved coastal grassland and associated dykes and creeks support a diversity of maritime grasses and herbs.	Favourable (85.69%) Unfavourable – recovering (14.31%)
West Thurrock Lagoon and Marshes SSSI	Borders the Thames close to Grays	One of the most important sites for wintering waders and wildfowl on the Inner Thames Estuary.	Unfavourable – no change (33.31%) Unfavourable – declining (66.69%)
Basildon Meadows SSSI	North-east	Three unimproved herb-rich meadows lying on neutral soils, among the few areas of old pasture known to remain in Essex.	Favourable (100%)
Gray's Thurrock Chalk Pit SSSI	Grays	Active mineral extraction which ceased in the 1920s has led to a natural colonisation of the pit with woodland, scrub and calcareous grassland habitats important for assemblage of invertebrate fauna.	Unfavourable – recovering (100%)
Purfleet Chalk Pits SSSI	West	Contains complex lithostratigraphical and biostratigraphical evidence indicates the importance of evolution of Thames and Northern European interglacial sequences.	Favourable (56.57%) Unfavourable – declining (35.48%) Destroyed (7.96%)
Lion Pit SSSI	Grays	Exhibits a complex sequence of Pleistocene Thames deposits, which have yielded molluscs, ostracods and pollen.	Favourable (100%)
Purfleet Road, Aveley SSSI	West	Aveley silts and sands have yielded important assemblages of molluscs, insects, pollen and mammal remains which are indicative of temperate, or interglacial, conditions.	Favourable (23.75%) Unfavourable – no change (76.25%)
Globe Pit SSSI	Grays	An important site for the interrelationship of archaeology with geology, since it provides correlation of the Lower Palaeolithic chronology with Pleistocene Thames Terrace sequence.	Favourable (100%)
Hangman's Wood Deneholes SSSI	Grays	Contains remains of medieval chalk mines, which provide the most important underground hibernation site for bats in Essex, with three species of bat recorded. Hangman's Wood is an area of semi-natural habitat in which bats can feed and is a relict fragment of ancient woodland and is a scheduled monument	Favourable (100%)

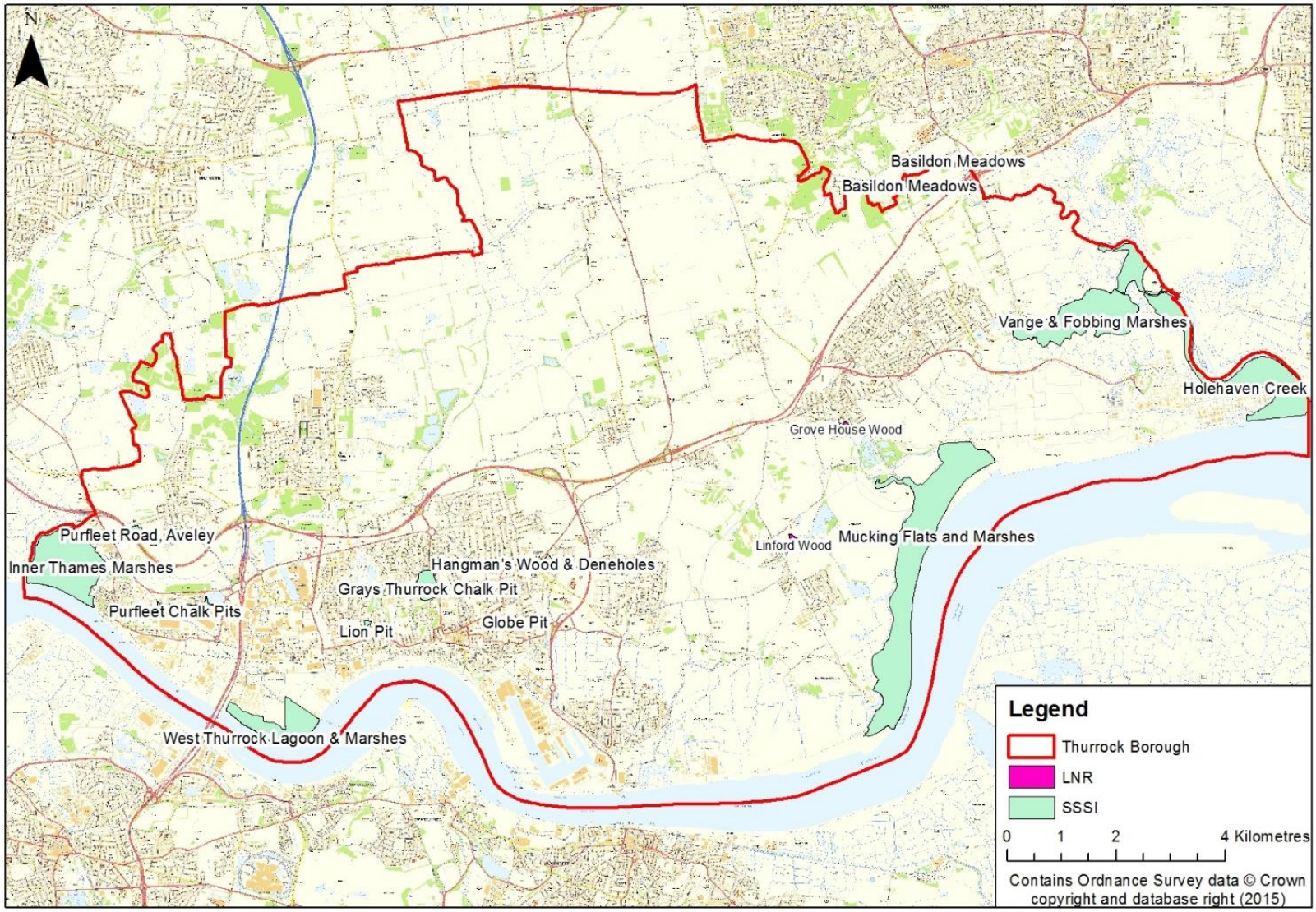

Figure 2-3: SSSIs and LNRs in Thurrock

There are no National Nature Reserves (NNR) in Thurrock, but three NNRs within 15km (Table 2-4).

Table 2-4: NNRs within 15km of Thurrock

Site name	Distance from Thurrock	Qualifying and Interest features
Swanscombe Skull Site NNR	2km south	Site is of national importance because of the prehistoric fossils discovered here, including one of the oldest human skulls ever found in the UK.
Leigh NNR	5km east	The flats at Leigh NNR support a wide variety of birds, particularly migratory species.
High Halstow NNR	6km south-east	The NNR is a complex mosaic of scrub and woodland habitat, dominated by hawthorn scrub and ancient oak woodlands, with regenerating elm woodland. The most important feature of this site is the heronry, which has over 200 pairs, making it the largest heronry in Britain.

Thurrock borders the Thames Estuary recommended Marine Conservation Zone (rMCZ), a site that is proposed to be designated for the many fish species that breed in the river, including eel and smelt (The Wildlife Trusts, 2012).

Part of the Thurrock borough is also located within the Greater Thames Marshes Nature Improvement Area (NIA), one of 12 areas funded by the Government to bring key partners together to plan and deliver significant improvements for wildlife and people. The NIA covers over 50,000ha of marshland and estuarine habitat (Greater Thames Marshes, 2015). The biodiversity of the NIA is considered to be underperforming as biodiversity is in decline and struggling to compete with the increasing pressures of climate change and development (Natural England, 2014).

There are only two Local Nature Reserves (LNR) within the borough (see Figure 2-3). These are Linford Wood LNR and Grove House Wood LNR, both of which are within the eastern half of the borough. Linford Wood LNR is primarily a woodland site that includes areas of hedgebank, mixed woodland willow plantation, ditches and an open area, and is surrounded by arable farmland. Grove House Wood LNR contains a mix of habitats including reedbeds, a pond and a brook as well as woods, and is an important local habitat for wildlife.

2.5.2 Local designated sites

There are 70 Local Wildlife Sites (LWS) (Thurrock Council, 2011a). These are sites that are of local importance and are designated by the local authority; however, they have no statutory protection. The LWSs include ancient woodland, hedgerows and green lanes, post-industrial brownfield sites, reedbeds and chalk grassland. Of the 70 LWSs, 33 sites have management plans in place (URS, 2013).

There are six nature reserves managed by the Essex Wildlife Trust in Thurrock, mainly in the east of the borough. Fobbing Marsh nature reserve, in the east of the borough, is one of the few remaining Thameside grazing marshes, part of which was dammed in the aftermath of the 1953 floods. It also support the nationally rare least lettuce *Lactuca saligna* (Essex Wildlife Trust, 2014a). Also in the east is Thurrock Thameside Nature Park which includes a landfill site that is being transformed into a Living Landscape with views over Mucking Flats SSSI and Thames Estuary SPA (Essex Wildlife Trust, 2014b). Stanford Warren nature reserve is located adjacent to the River Thames, and consists of one of the largest reedbeds in Essex. The reeds provide habitat for many birds over the year (Essex Wildlife Trust, 2014c). Hornden Meadow is also in the east of the borough; whilst less than one hectare in size, it contains around 80 species of wildflowers (Essex Wildlife Trust, 2014d). Chafford Gorges nature reserve in Greys is the only site in the west of Thurrock. The park provides green space for wildlife and the population of Chafford Hundred and overlooks Warren Gorge (Essex Wildlife Trust, 2014e).

2.5.3 Notable habitats and species

As described above, Thurrock has a variety of habitats, including ancient woodland and coastal and floodplain grazing marsh. Ancient woodland does not cover a large amount of Thurrock, being mainly fragmented in the west and north (see Figure 2-4).

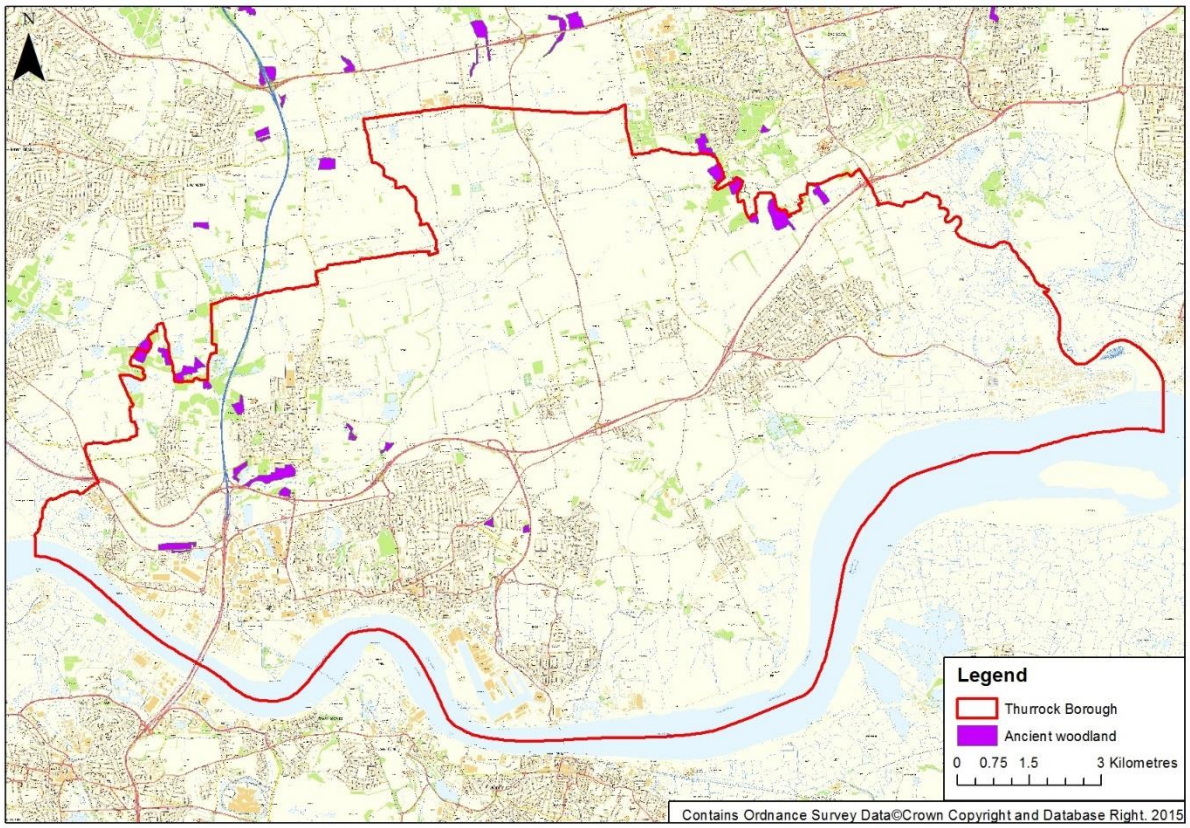

Figure 2-4: Ancient woodland in Thurrock

Coastal and floodplain grazing marsh data was provided by Thurrock Council. This marsh is periodically inundated pasture, or meadow, usually mesotrophic, with ditches which maintain water levels and contain standing brackish or fresh water. This habitat type is generally present along watercourses, and is particularly prevalent in the east of the borough (Figure 2-5). These ditches are especially rich in plants and invertebrates. Grazing marshes are particularly important for breeding waders such as snipe *Gallinigo gallinigo*, lapwing *Vanellus vanellus* and curlew *Numenius arquata*.

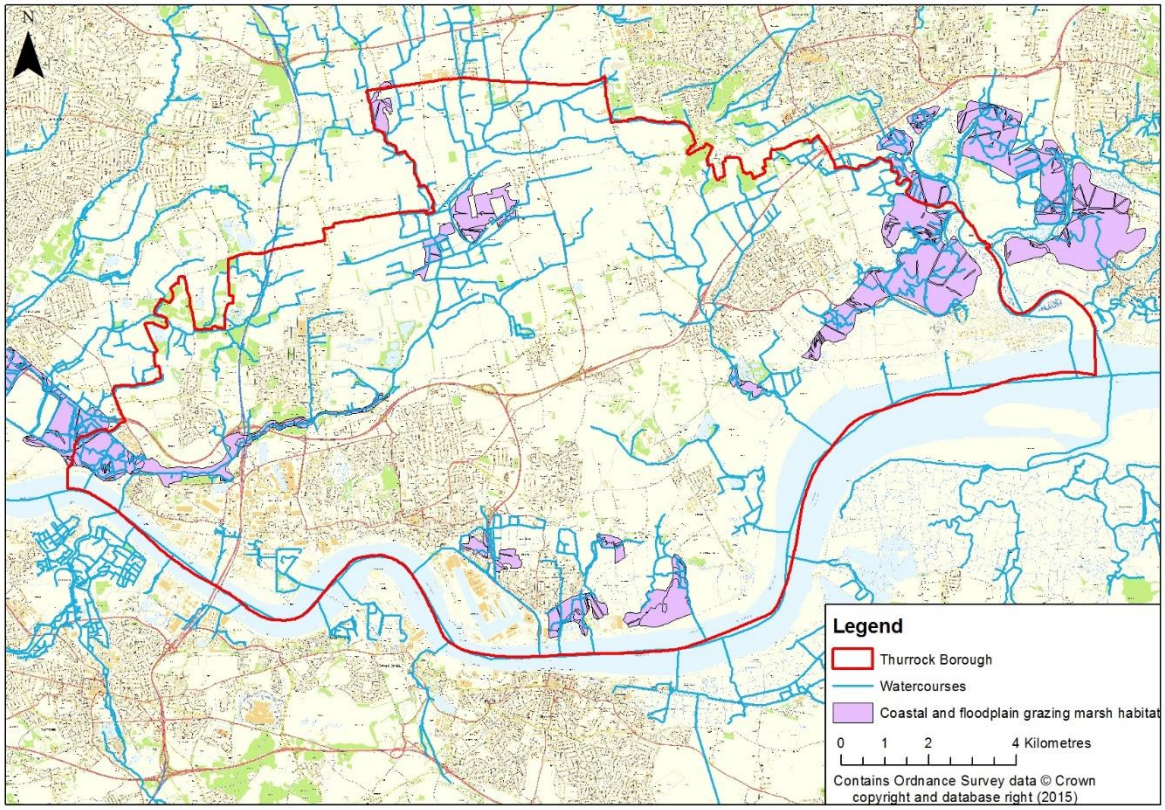

Figure 2-5: Coastal and floodplain grazing marsh in Thurrock (Source: Thurrock Council)

Priority Biodiversity Action Plan (BAP) habitats that are present include wet woodland, grassland, reedbeds, purple moor grass rush pastures, mudflats, lowland meadows and lowland heath. These habitats are mainly present in the east and south of the borough (see Figure 2-6).

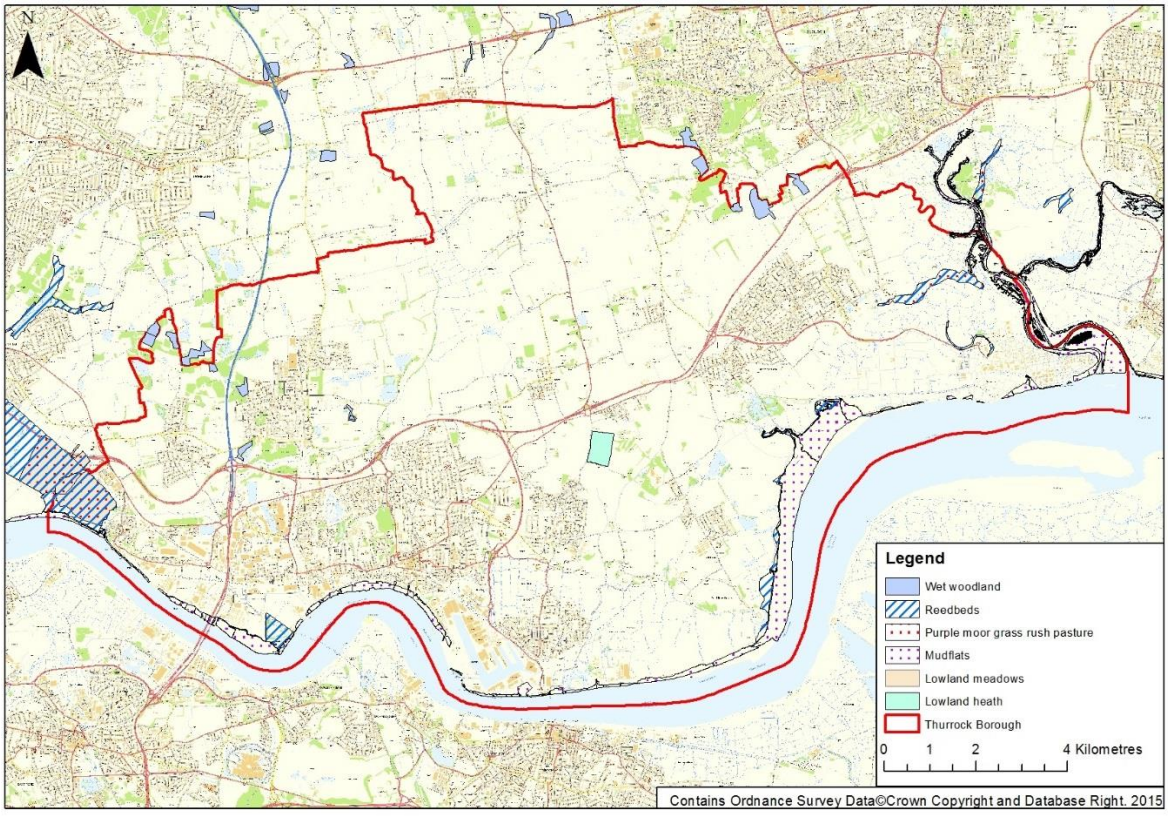

Figure 2-6: BAP Priority Habitats in Thurrock

The following priority habitats are listed as part of the Essex BAP, which sets out the species and habitats that should be protected and enhanced within the borough. Each habitat has an independent Habitat Action Plan (HAP) (Essex Biodiversity Project, 2012a):

- Arable field margins
- Hedgerows
- Traditional orchards (and Essex Apple varieties)
- Lowland dry acid grassland
- Lowland meadows
- Lowland heathland
- Ponds
- Floodplain and coastal grazing marsh
- Lowland raised bog
- Reedbeds
- Coastal saltmarsh

More locally, key habitats for Thurrock include (URS, 2013):

- Estuarine: coastal areas from Corringham to East Tilbury provide nationally important feeding grounds for a wide variety of over-wintering waders and wildfowl.
- Farmland: as the major land use within Thurrock, sympathetic management of farmland is considered to be vital to the conservation of the areas wildlife and landscape.
- Thames terraces: the Purfleet-Grays ridge rises from the Thames, forming a central belt of sands and gravels across the borough, where short acidic grassland can develop.
- Woodland: there are many semi-natural broad-leaved woods in the north of the borough, covering 2% of the land area.

The coastal zone supports some of Thurrock's most important wildlife sites, particularly at Stanford and Corringham which provide national important feeding grounds for a wide variety of over-wintering waders and wildfowl. The estuarine habitat in Thurrock borough supports a complex of coastal grassland, watercourses and fringing saltmarsh that supports numerous invertebrates, birds and nationally rare plants (Thurrock Council, 2007).

On the Thames Terraces, where the soils remain unimproved or the underlying minerals are exposed due to extraction, short acidic grasslands can develop. These areas of grassland and short scrub support nationally important assemblages of insects (Thurrock Council, 2007).

Semi-natural broad-leaved woodlands cover about 2% of the land area in Thurrock, mostly in the north of the borough. Most of these are former coppice woods that were managed to produce an annual harvest of wood. Typically, the woodlands are hazel, hornbeam or sweet chestnut coppice with pedunculate oak and ash standards (Thurrock Council, 2007).

The following priority species are listed as part of the Essex BAP and each species has an independent Species Action Plan (SAP) (Essex Biodiversity Project, 2012b):

- Badger *Meles meles*
- Barn Owl *Tyto alba*
- Bats
- Nesting birds
- Dormouse *Muscardinus avellanarius*
- Great Crested Newt
- Invertebrates
- Otter *Lutra lutra*
- Reptiles
- Water Vole *Arvicola amphibius*

- White-clawed Crayfish *Austropotamobius pallipes*
- Wildflowers.

White-clawed Crayfish however are not present in within the Borough, and the last known river-based population in Essex is at risk (Essex Rivers Hub, undated).

2.5.4 Invasive species

Invasive species can have detrimental effects on local species and habitat and the wider environment, and are of particular cause for concern due to certain species' ability to spread along the river network. Floating pennywort has been reported in a watercourse in Tilbury (Environment Agency, 2015). Many invasive species have been recorded in Essex. Himalayan balsam has been recorded on at least 35 river banks in north east Essex and Signal crayfish in every Essex river. Japanese knotweed has also been recorded at many sites (Essex Biodiversity Project, 2012c).

The incidence and spread of invasive plant and animal species should be reduced in accordance with the Wildlife and Countryside Act 1981 (Variation of Schedule 9) (England and Wales) Order SI 2010/609.

2.5.5 Fisheries

Problems with water and habitat are believed to be the main contributory factors to poor fish stocks in the Mardyke (Scott Wilson, 2009a). However, the River Mardyke retains its designation as a cyprinid freshwater fishery. There are many species of fish occur in the Mardyke river valley, the most common are roach *Rutilus rutilus*, carp *Cyprinus carpio*, eel *Anguilla anguilla*, perch *Perca fluviatilis* and chub *Squalius cephalus* in the upper reaches, with tench *Tinca tinca*, rudd *Scardinius erythropthalmus* and flounder *Platichthys flesus* mainly restricted to lower river sections (Scott Wilson, 2009a).

2.5.6 Key environmental issues

The rural areas within Thurrock are under increasing pressure from development and changes in land use, particularly as a result of changes in farming practice, alternative uses for buildings in the countryside and pressure for outdoor recreation, leisure and commercial uses. Development pressure is arising from the Thames Gateway, which is developing marshland. Some brownfield land has high biodiversity value, and promoting development on brownfield land that is sympathetic to biodiversity is a key challenge. Other pressure, particularly related to biodiversity in river networks, is due to the increase in invasive species in the area.

A large number of designated sites, particularly those within the NIA, are under pressure from climate change and development. These are dependent on underlying hydrological conditions and are therefore vulnerable to flooding and changes in hydrology. These sites support a number of species that are reliant on tidal habitat, and are subsequently are at risk from flooding events, poor water quality, changes to hydrological/tidal regimes and habitat changes.

Future incidences of flooding could potentially damage and change the nature of habitats and supporting species composition within the designated nature conservation sites both within and outside the borough. The LFRMS will need to consider whether any flood risk management measures will lead to adverse impacts on the water bodies within the borough and whether the LFRMS can help contribute to delivering any mitigation measures such as through improvements to fish passage. Implementation of the LFRMS may also provide opportunity to enhance or create new habitats within the borough.

Flooding and flood risk management has the potential to significantly impact on a number of species of note in the borough. Some, such as water vole, are dependent upon aquatic and riparian habitats, and are sensitive to changes in habitat conditions, changes in water quality, flow, vegetation cover and bank profile. Great crested newt, a species protected under national and European law, are water dependent species found in the borough.

2.6 Water environment

2.6.1 Water resources

The East of England is the driest region in England and is one of the fastest growing in terms of development, and consequently water resource availability is limited, with supply-demand issues in parts of the region. There is little or no water available from existing sources within Thurrock and

therefore future development will be served by the increase in storage at Abberton Reservoir near Colchester, which was completed in 2014 (URS, 2013). Water supply in Thurrock is supplemented via the Thames Water Utilities raw water bulk supply from Lea Valley reservoirs to Chigwell Water Treatment Works, along with two local water supply boreholes in Thurrock itself at Linford and Stifford (Scott Wilson, 2009a).

Thurrock is part of the fully integrated Essex water resources zone, which is controlled by Essex and Suffolk Water. There are no identified pressure or capacity issues in the water supply infrastructure, with local reinforcements provided within Thurrock (Scott Wilson, 2009a).

Chalk is the principal underlying aquifer of the region (Scott Wilson, 2009a). However, the impermeable London Clay precludes infiltration of rainfall over large areas of the chalk aquifer in the north of the district and beyond, thereby restricting its use in water resource development. Despite this, the aquifer is unconfined and chalk groundwater is utilised for public water supply (Scott Wilson, 2009a).

In some areas of the borough, groundwater levels are rising in response to the cessation of long-term water abstraction in the 1970s (Scott Wilson, 2009a). This has not caused an increase in flood risk from groundwater.

Large rivers in Thurrock include:

- Mardyke, located in the west of the borough, running from the north, before flowing westwards to where it enters the Thames at Purfleet. It is a fenland stream system, with two main sources at Langdon Hills and Cranham. The Mardyke catchment is 111.6km^2 and has a main river length of 18.5km (Scott Wilson, 2009a).
- Tidal River Thames flowing along the southern boundary of the borough, and is entirely tidal along this stretch.

In addition to the two major river systems, there are several smaller watercourses, ditches and drains within the borough:

- Stanford Brook, Manor Way Creek and Fobbing Creek in the east of borough.
- Gobians Sewer, Stone House Sewer, East Tilbury Dock Sewer and West Thurrock Sewer. These are low flow channels with no additional capacity to accept surface water runoff (Scott Wilson, 2009a).

Water resources within a catchment are assessed and monitored by the Environment Agency within a Catchment Abstraction Management Strategy (CAMS). There are two water resource management units (WRMU) covering the Thurrock area; The Mardyke and Thameside Chalk. Throughout the Mardyke catchment, London Clay heavily confines the chalk aquifer resulting in a lack of hydraulic connection between river and aquifer. Abstraction in the Mardyke has developed significantly and water is utilised for a range of purposes. Agriculture is the dominant sector in the upper reaches of the catchment, while industrial abstraction dominates the lower reaches (Scott Wilson, 2009a).

The Thameside Chalk catchment is exposed at or near the ground surface near Thurrock, with flow from other areas of the Upper Chalk likely to be a significant source of recharge. The unit has been assessed as having no water available for further abstractions (Scott Wilson, 2009a).

2.6.2 Water Framework Directive

Thurrock is covered by the Thames River Basin Management Plan (RBMP), which identifies the current quality of water bodies in the borough and sets objectives for making further improvements to the ecological and chemical quality.

The River Mardyke drains a significant proportion of the borough and flows south and then south--west through Thurrock to its confluence with the River Thames at Purfleet. The Mardyke catchment is generally low-lying with low channel gradients and is predominantly agricultural. The Mardyke is generally not designated as a Heavily Modified Water Body (HMWB), and has an overall status of Moderate under the WFD (Environment Agency, 2009a). One of the key objectives under the WFD is the requirement to prevent deterioration in the current status of water bodies, whilst HMWB must achieve 'good ecological potential' (GEP) within a set deadline. If an activity has the potential to impact on the ecology or morphology of the water body, the risk of causing deterioration in the status must be assessed. The Mardyke generally has a Moderate ecological status, however, the Mardyke (West Tributary) and Mardyke (East Tributary) have a Poor overall status and Poor ecological status, although it is not designated as a HMWB. The Mardyke and Fobbing water body is designated as a

HMWB and has Moderate ecological potential under the WFD. Overall, Mardyke and Fobbing are classed as Moderate. Issues to the WFD status of the Mardyke catchment arise from its significant physical modifications to facilitate flood conveyance and land drainage (Environment Agency, 2009a).

The section of Thames south of Thurrock extending east to Stanford-le-Hope is classed as the 'Thames Middle' water body, and is designated as a HMWB, with a current overall potential of Moderate. The Thames Lower water body runs east from Stanford-le-Hope and is also designated as a HWMB, with an ecological and overall status of Moderate.

Currently, a second cycle of RBMPs (2015 – 2021) are undergoing consultation. As part of the updates, most of the River Mardyke is designated as Heavily Modified for Flood Protection and the lower Mardyke for urbanisation. A number of mitigation measures required to achieve GEP are not in place.

2.6.3 Surface water quality

Water quality within the lower stretches of the River Mardyke, which flows through Thurrock's south western urban area, is currently moderate to poor quality and fails to meet 'good ecological status' under the WFD (URS, 2013). The very shallow gradient and low river flows exacerbates the poor water quality (Scott Wilson, 2009a).

Chemical water quality of the River Mardyke in the years 2005-2007 has been recorded as poor or bad, whilst the biological value has been recorded as good or fairly good. Nitrates are moderately low to moderate and phosphates are excessively high (Scott Wilson, 2009a). The lower reaches of the Mardyke have a history of suffering from low dissolved oxygen levels as a result of 'ponding' which occurs when the tidal flap at the outfall is closed on the highest tides and freshwater begins to back up. In some cases, saline water enters the freshwater system and exacerbates the problem (Scott Wilson, 2009a).

The Thames Estuary is the main watercourse within Thurrock that will be affected by the planned growth within the area, as it is the receiving watercourse for the effluent discharge from Tilbury waste water treatment works. Additionally, there is poorly managed surface water runoff from Purfleet, West Thurrock and Lakeside, Tilbury and London Gateway. Further upstream of the Thames, water quality monitoring observations show levels of Ammonia, Total Organic Nitrogen and Dissolved Oxygen decrease downstream, with no evidence suggesting that surface water inputs from Thurrock increases these parameters (Scott Wilson, 2010).

Much of northern Thurrock is within a surface water Nitrate Vulnerable Zone (NVZ). These zones are designated where land drains and contributes to the nitrate found in 'polluted' waters. Thurrock is not covered by a drinking water safeguard zone.

Hydromorphology is another factor that could affect water quality, and could also affect the ecological quality of the waterbodies in Thurrock. FRM activities and urban development can affect hydromorphology, which leads to potentially detrimental ecological effects.

2.6.4 Groundwater quality

Groundwater provides vital resources for public water supply in the borough. Impacts on groundwater are broadly related to land use, with agricultural areas representing a major source of nitrates. There are two main risks that affect aquifers in Thurrock; salinity and nitrate. The main source of nitrate is from agricultural inputs in the northern part of Thurrock, and excessive pumping from groundwater may also increase salinity as a result of drawing poorer quality water up from depth (Scott Wilson, 2010).

Groundwater quality in the Thameside Chalk is generally good in Thurrock, with recent infiltration to the aquifer, but becomes poor to the north and east of the WRMU where older water containing high concentrations of chloride and sodium can be found within the confined chalk (Scott Wilson, 2009a).

Thurrock is within the South Essex Thurrock Chalk groundwater body for WFD, with a current quantitative quality of good, but a chemical quality rated poor (and deteriorating). This results in a current overall status of poor (Environment Agency, 2009a).

The Lakeside area and the area between Grays, Tilbury and Stanford-le-Hope are covered by groundwater source protection zones (SPZ). These zones show the risk of contamination from any activities that might cause pollution in the area. Thurrock also lies within a groundwater vulnerability zone, which highlights the importance of groundwater resources in the area.

2.6.5 Flooding

There are numerous sources of flooding with Thurrock, such as surface water, ordinary watercourses and groundwater. Sources of flooding for Thurrock from rivers are the River Thames Estuary, River Mardyke, the Stanford Brook and the arterial drainage network which drains low lying areas of Thurrock. The most significant events tend to be storm surges coupled with high spring tides, as the Thames Estuary poses the greatest flood risk to Thurrock. River Mardyke poses some fluvial flood risk in the northern part of the district, however the area is predominantly rural, therefore there are few population centres under threat from flooding from this river (Scott Wilson, 2009b).

Under the FWMA 2010, there are many different roles and responsibilities with regards to flood management, and therefore relevant to the LFRMS. The responsibilities are as follows (Defra, 2014):

- Environment Agency – responsible for taking a strategic overview of the management of all sources of flooding and coastal erosion. The Environment Agency has operational responsibility for managing the risk of flooding from main rivers, reservoirs, estuaries and the sea.
- Lead Local Flood Authorities – responsible for developing, maintaining and applying a strategy for local FRM and maintaining a register of flood risk assets.
- District Councils – key partners in planning local flood risk management and can carry out FRM works on minor watercourses.
- Highway Authorities – responsible for providing and maintaining highway drainage and roadside ditches and must not ensure that road projects do no increase flood risk.
- Water and sewerage companies – responsible for managing the risks of flooding from water and foul or combined sewer systems providing drainage from buildings and yards.
- Regional Flood and Coastal Committees – responsible for ensuring coherent plans are in place for identifying, communicating and managing flood and coastal erosion risks across catchments and shorelines.
- Department of Communities and Local Government – ensure flood risk is appropriately taken into account in the planning process.

Thurrock Council's SWMP deals with flooding from sewers, drains and groundwater, and the runoff from land, watercourses and ditches that can follow heavy rainfall. The plan includes 14 Critical Drainage Areas (CDA), which are areas most at risk of surface flooding. These are largely concentrated in urban areas, where the greatest depths of surface water flooding are predicted to be in Stanford-le-Hope and Grays. Tilbury is also an area at risk, as surface water from the north of Thurrock flows towards the Tilbury Marshes (Thurrock Council, 2014b).

2.6.6 Key environmental issues

Within the Thames RBMP, high population densities cause a number of pressures on the water environment, such as discharges from sewage networks and high demand for water. Diffuse pollution is a major pressure on the water environment, coming from urban and rural areas. Specific pressures include abstraction and artificial flow regulation; organic pollution; pesticides; phosphate; and urban and transport pollution (Environment Agency, 2009a). Thurrock has particular pressures relating to development within the Thames Gateway area, therefore increasing pressure on water resources and also increasing risk of pollution incidents and declines in water quality.

Flooding has the potential to create pathways through which potential contamination sources (e.g. sewage treatment works) could result in pollution. Conversely, the LFRMS could help protect these sites and improve water quality.

The water bodies in Thurrock currently fail to meet good ecological status/potential under the WFD. This is partly due to the installation of structures for flood conveyance and land drainage, which affect the hydromorphology of the watercourse. Historical maintenance and modifications to river channels to improve land drainage and flood defence also have a significant impact on the current ecological status, for example widening, deepening, straightening, re-aligning, silt and vegetation deposits on the bank disconnecting the river from its natural floodplain and extensive removal of bank-side trees in this catchment. Future activities, such as improved land drainage, vegetation clearance and de-silting, etc. could also have the potential to reduce the ecological status of rivers in the catchment and prevent rivers from reaching good status. The LFRMS will need to consider whether any flood risk management measures will lead to adverse impacts on the watercourses within the borough and whether the LFRMS can help contribute to achieving WFD objectives and improving water quality.

2.7 Soils and geology

Chalk underlies the whole of Thurrock, and is near to ground surface in the south-west of the borough. This chalk dips southward beneath the Thames and northward beneath deep deposits of London Clay (Scott Wilson, 2009a).

There are three main soil types in Thurrock, which include groundwater dominated gley soils. Gley soils are characteristically a mixture of coarse and fine loamy permeable soils affected by groundwater. In the north-east of the borough brown soil dominates, except within flood zones. These soils are loamy or clayey with reddish or reddish mottled, clay-enriched soil.

The soils along the coastal zone are predominantly alluvial with a significant clay content and are periodically or permanently waterlogged, whereas the soils inland are predominantly clay but also exhibit a loamy characteristic making them more suitable for cultivation (Scott Wilson, 2009a). Generally the soils are fertile with the majority classified under the Agricultural Land Classification (ALC) as Grade 3 or above under agricultural land classification, where Grade 1 is 'excellent quality' (see Figure 2-7).

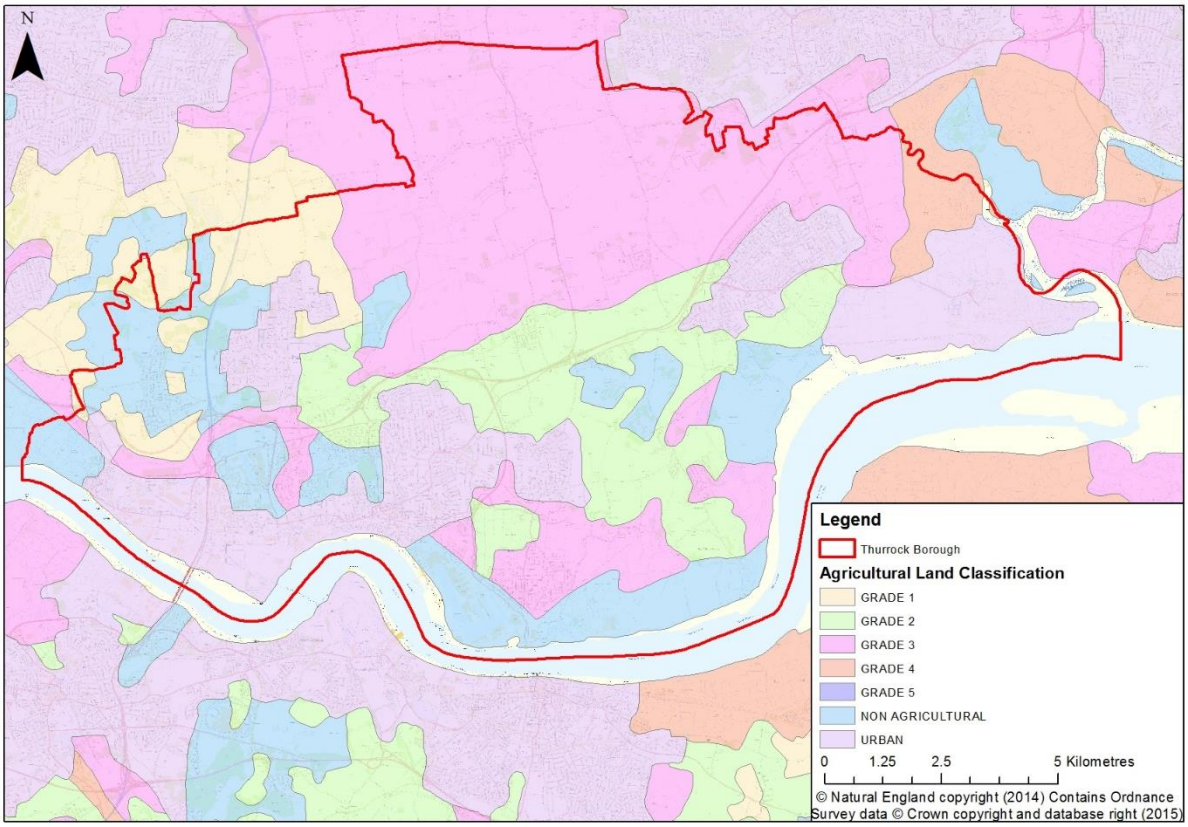

Figure 2-7: Agricultural Land Classification map for Thurrock

The underlying geology of Thurrock is Chalk and Red Chalk, with a band to the north comprising Oldhaven, Blackheath, Lambeth Group and Thanet Beds (Figure 2-8). To the north of the A13, these layers are overlain by London Clay (Scott Wilson, 2009a). The surface geology of the borough has been strongly influenced by the natural migration of the River Thames (Chris Blandford Associates, 2005).

Adjacent to the shores of the River Thames and the Mardyke is low lying floodplain dominated by groundwater gley soils, whereas the north of the borough is seasonally waterlogged slowly permeable surface water gley soils intersected by a network of drainage ditches (Chris Blandford Associates, 2005).

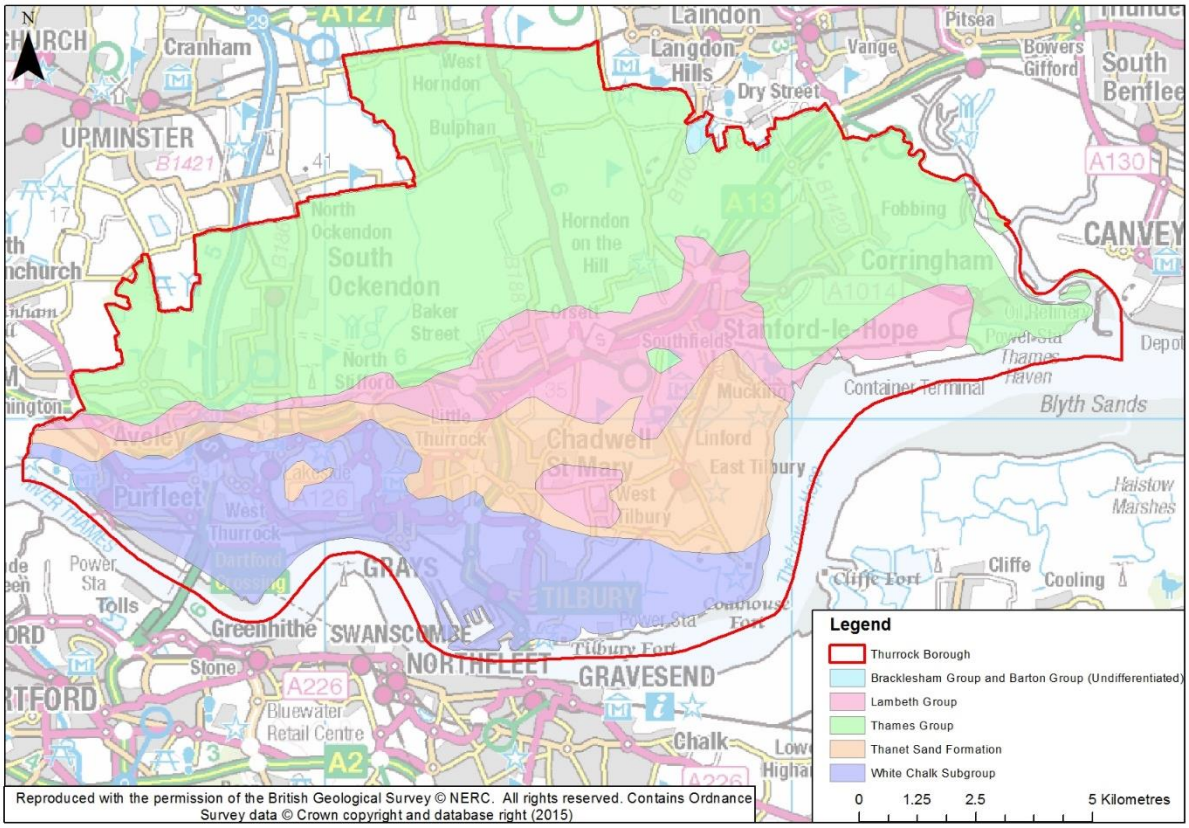

Figure 2-8: Bedrock geology of Thurrock

The drift deposit geology consists of alluvium in the south of the borough. Alluvium is also present within the floodplain of River Mardyke in the northern part of Thurrock. Alluvium consists of clays, silts, sands and gravels and the permeability can be highly variable depending on the exact composition of the material (Scott Wilson, 2010).

There are no Local Geological Sites (GeoEssex, 2015) with the borough, however there are five SSSIs that have a geological interest: Gray's Thurrock Chalk Pit SSSI; Lion Pit SSSI; Globe Pit SSSI; Purfleet Road, Aveley SSSI; and Purfleet Chalk Pits SSSI, as discussed above.

2.7.1 Key environmental issues

Flood risk management could alter the extent or duration of flooding and therefore the LFRMS will need to consider implications for soil quality and the underlying geology. Impacts on soil quality could affect other environmental receptors, such as nature conservation sites that are reliant on the underlying soil characteristics. Impacts on soil quality could affect other environmental receptors, such as nature conservation sites that are reliant on the underlying soil characteristics.

There is a need for the protection and maintenance of the integrity of the designated geological SSSIs.

2.8 Historic environment

There is evidence that people first began to settle in the area 300,000 years ago. Thurrock was a favoured area due to the rich and fertile river valleys. This history moves on to Roman times, where some fields retain prehistoric and Roman field systems. Roman settlement was centred on the Roman road towards Tilbury (Chris Blandford Associates, 2005). The name Thurrock is thought to derive from the Saxon word 'turruc', which described the bottom of a ship where water collects. The 17th century marked a new threshold in the architectural development of manor houses, consequently Thurrock has a rich and diverse historic environment ranging from prehistoric sites, medieval buildings and Tudor and Victorian forts. Historic assets in the borough (Figure 2-9) include:

- 16 scheduled monuments: these are historic sites of national importance and include Tilbury Fort and a crop mark complex.
- 241 listed buildings: these are statutorily designated and include 13 which are Grade I. These are all churches, with the exception of Government powder magazine, the only survivor of a group of five magazines built 1763-5.

- One registered park and garden: Belhus Park, designed by Capability Brown.
- Seven conservation areas: Horndon-on-the-Hill; Corringham; Orsett; Fobbing; Purfleet; West Tilbury; and East Tilbury (Thurrock Council, 2011a).

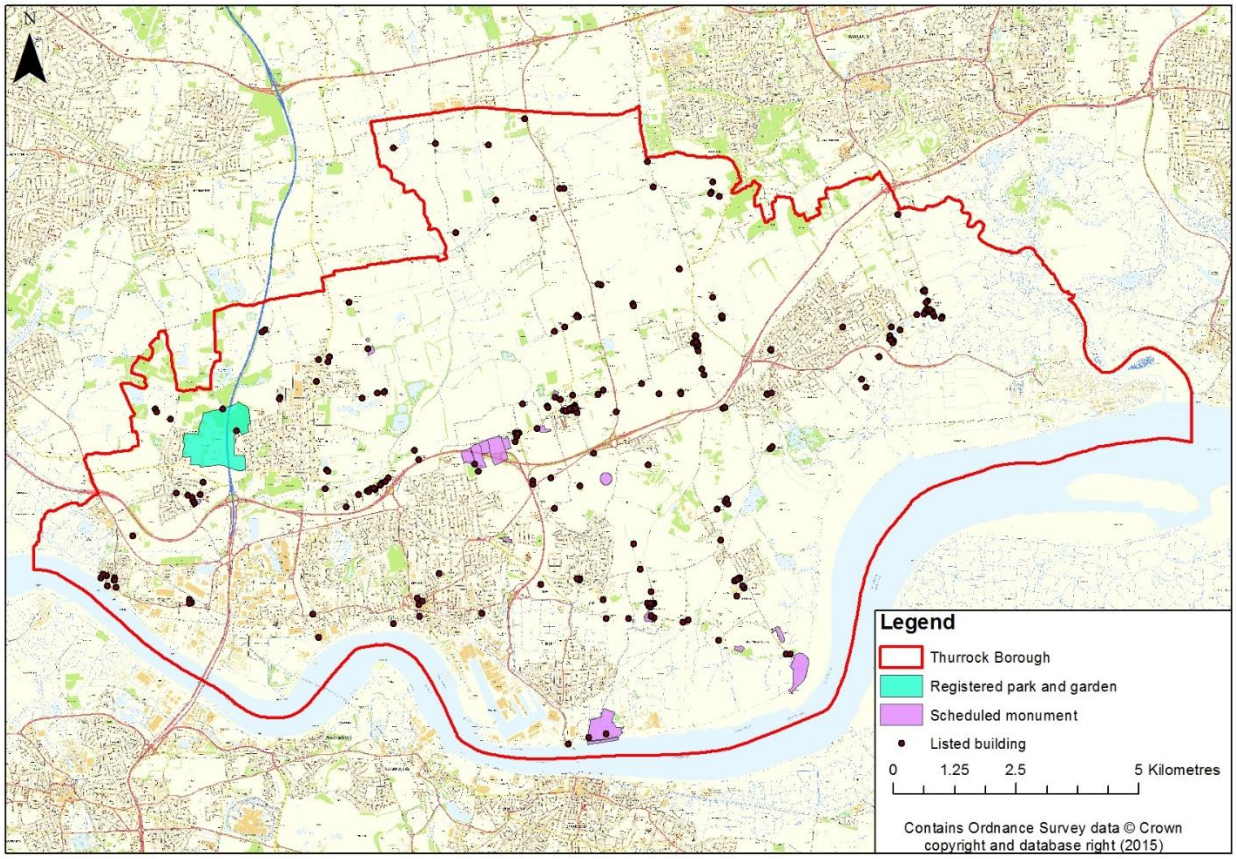

Figure 2-9: Historic assets in Thurrock

Historic England's 'Heritage at Risk Register' (Historic England, 2014) identifies two buildings, two archaeology entries and one conservation area as at risk. The archaeological entries are scheduled monuments, although they are not at risk from flooding. East Tilbury conservation area is described as in a 'very bad' condition. The listed buildings are not described as at risk by flooding, however Coalhouse Fort, Tilbury has a problem of water ingress to casemates (Historic England, 2014).

There is also the potential for unrecorded archaeology, including buried, waterlogged archaeological and palaeo-environmental remains of significant interest and fragility that can be associated with river valleys, floodplains and wetland areas.

There are many heritage assets within Thurrock, including designated and non-designated heritage sites. Non-designated heritage assets' protection is a requirement of the NPPF, therefore should be considered during implementation of the LFRMS actions.

2.8.1 Key environmental issues

Thurrock contains a wealth of historic assets. However, some of the most important of these sites are currently assessed as being under threat. There is a risk that adverse impacts upon aspects of Thurrock's cultural heritage could arise from flooding and increased flood risk in the future, whilst the construction and implementation of the flood risk management options selected by the LFRMS could also have adverse effects. Potential benefits may also arise from reduced flood risk to assets as a result of implementation of the LFRMS. However, new development within the setting of heritage assets is at risk of damaging the setting. Conversely, new development may offer opportunities for enhancing or better revealing heritage asset significance.

2.9 Population

The population of Thurrock is currently 157,705 (2011) (Thurrock Council, 2013) and is predicted to reach 183,200 in 2031, an increase of 34,300 (23%) over a 25 year period from 2006 (Thurrock Council, 2011a). This rapidly growing population is partly influenced by international immigration (Thurrock Council, 2011b).

Thurrock is expected to experience a significantly ageing population, as the proportion of people aged over 65 will increase by 13,800 people (75% increase) and people aged over 85 will more than double (141% increase) (Thurrock Council, 2011a). However, compared to the rest of England and Wales, Thurrock has a relatively young population, with an average age of 36, it is the eighth youngest in the east of England (Thurrock Council, 2014a). As a result of this younger age structure, Thurrock has a higher birth rate than the national and regional average of 14.8 births per 1000 population compared to 12.5 nationally and 11.62 regionally (Thurrock Council, 2013).

Thurrock has lower proportions of people from minority ethnic communities than the national average (Thurrock Council, 2011a). However, the ethnic profile of Thurrock has changed dramatically since 2000, as in the 2001 census the ethnic minority population was 4.7%, but in 2011 had increased to 19.1%. The largest minority group were Black/African/Caribbean/Black British comprising 7.8% of the local population (Thurrock Council, 2013).

2.9.1 Health

Estimated levels of adult smoking and obesity are worse than the England average, with the rate of smoking related deaths worse than the England average (Public Health England, 2014). Life expectancy is similar to the England average, however it is 8.2 years lower for men and 7.7 years lower for women in the most deprived areas of Thurrock in comparison to the least deprived areas (Public Health England, 2014). Life expectancy is rising for both men and women in Thurrock, as well as a reduction in early deaths (Public Health England, 2014). Obesity among children is an issue in Thurrock, with approximately 20.3% of Year 6 children classified as obese (URS, 2013).

There is an identified lack of a major centre providing integrated medical services, with the Core Strategy (Thurrock Council, 2011a) stating that the network of health centres throughout Thurrock needs to be progressively extended and upgraded. This critical social infrastructure, along with residential and nursing homes, would be put under more pressure if flood risk increased.

2.9.2 Deprivation

The Index of Multiple Deprivation (IMD) provides a measure of relative deprivation across England and was most recently published in 2010. Thurrock is ranked 146th out of 354 councils in England in 2010 (Department for Communities and Local Government, 2014), where one is the most deprived. This is an increase from 2007, where Thurrock was 124th. Pockets of deprivation are evident in some wards, with the most deprived being Tilbury St Chads, Grays, Belhus, Chadwell St Mary, Ockendon and West Thurrock (Thurrock Council, 2011b) (Figure 2-10). These areas represent 12% of Thurrock's population. Although deprivation is lower than average, about 22% (7,500) children live in poverty (Public Health England, 2014). Over 16% of Thurrock's working age population have no qualifications, compared with 10% nationally.

West Thurrock and South Stifford Ward has the highest percentage of properties with a high risk of flooding of all wards in Thurrock, where 5.3% of properties are at high risk. Grays Riverside Ward has 5.2% of properties with a high risk of flooding. Tilbury St Chads Ward has the highest percentage of properties with high IMD that have a high risk of flooding (3.3%). This rises to 23.5% with a medium risk of flooding in the ward. Grays Riverside Ward has the highest number of properties with high IMD at a high risk of flooding (141 properties). West Thurrock and South Stifford Ward and Tilbury Riverside and Thurrock Park Ward also have a high number of properties with high IMD and high flood risk. Remaining wards in Thurrock do not have any properties with high IMD with a high flood risk. High flood risk was determined by National Assessment of Flood Risk (NAFRA), where high (significant) flood risk is determined as more than 1.3% chance of flooding in any year at the location, or one in 75 chance of flooding in any given year (Environment Agency, 2009b).

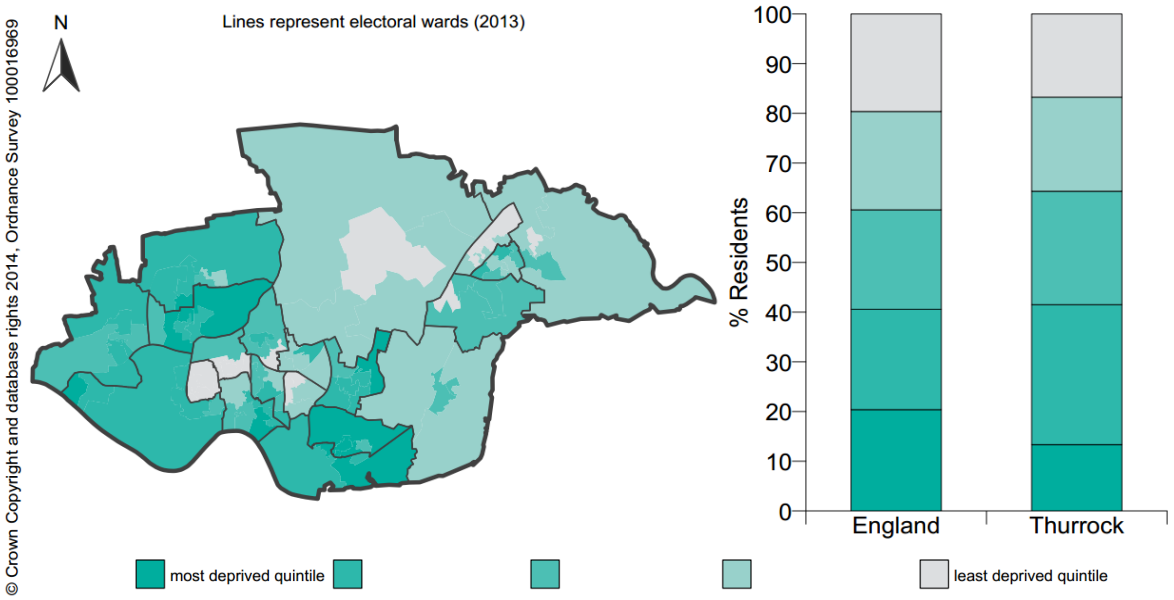

Figure 2-10: Thurrock deprivation (source: Public Health England, 2014). The chart shows the percentage of population in England and Thurrock who live in each of these quintiles.

2.9.3 Key environmental issues

The population of Thurrock is set to increase in the future and is predicted to comprise a significantly larger proportion of older people. The general health of the population is generally good, with increased life expectancy leading towards an ageing population. Health levels do vary across the borough, with poorer health linked to areas of higher social deprivation.

The growing population will have a substantial need for further housing and improved social, green and transportation infrastructure, as well as increased demand for water. Pressure on this infrastructure also arises from increased flood risk.

This growing population will place increased demand on a range of resources and the borough's water and sewerage infrastructure, which could be exacerbated by the effects of climate change. Linked to this may be increased demands for development and pressure on the existing housing provision, which may result in greater need for development in areas at risk of flooding.

2.10 Material assets

2.10.1 Economy

Historically, Thurrock was prosperous due to its riverfront, which became a strategic point for trade and industry. The decline in traditional industry has affected Thurrock, but regeneration, such as Thames Gateway, is presenting more opportunities (Thurrock Council, 2011b). Thurrock is within the Thames Gateway, which is the biggest of four growth areas outlined in the UK Government's Communities Plan 'Building for the Future', launched in 2003 (Thurrock Council, 2011a). The Thames Gateway is a national priority area for social and economic regeneration.

The employment rate for working age residents of Thurrock for 2008/2009 was 74.6%, which is in line with regional and national rates. Employment in Thurrock was projected to fall slightly between 2008 and 2013, but grow over the ten year period to 2018 (Thurrock Council, 2011b). In 2008, Thurrock had a distinctive jobs profile, with distribution, hotels and restaurants (including retail) providing almost 29% of employment in Thurrock. Public administration, education and health account for the second largest proportion with over 22%.

In 2012, the jobs profile had changed significantly with distribution, hotels and restaurants (including retail) provided almost 40% of employment, primarily due to the distribution functions centred at Tilbury and the retail located at Lakeside. There are 16.6% of people employed in public administration, education and health (URS, 2013).

2.10.2 Infrastructure

Thurrock occupies a strategic position in the East of England and enjoys good transport access to London (Figure 2-11). The M25 motorway and A13 road act as strategic cross roads 'of national importance' (Thurrock Council, 2011a). Regular rail services operate between London and Southend on Sea, serving seven stations and the Channel Tunnel Rail Link also passes through Thurrock. The Port of Tilbury provides international connections for both passengers and freight. Waste sites and utility services are also importance infrastructure within the borough, to which there is a risk of flooding.

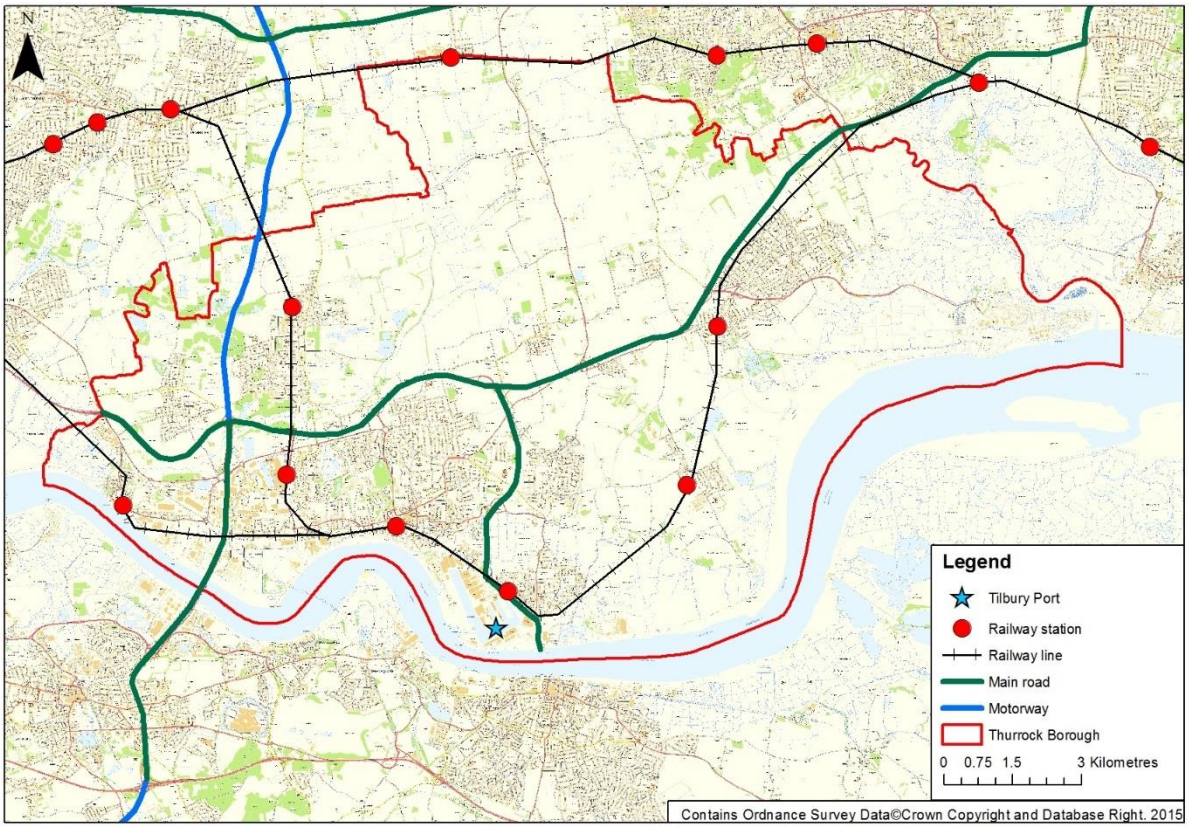

Figure 2-11: Transport infrastructure

There are a range of flood defences in Thurrock, both tidal and fluvial (Figure 2-12). Tidal defences mainly consist of raised reinforced concrete walls, steel walls or earth embankments. Fluvial flood defences includes small watercourse channels that provide protection. As shown on Figure 2-12, the majority of flood defences are Grade 2 or 3. Many of the defences that are in very poor condition (Grade 5) are close to Tilbury. Other defences of note are the Tilbury and Fobbing Barriers and Mardyke Sluice, along with the Tilbury Flood Storage Area. These flood defences are important flood infrastructure reducing the risk of flooding to Thurrock.

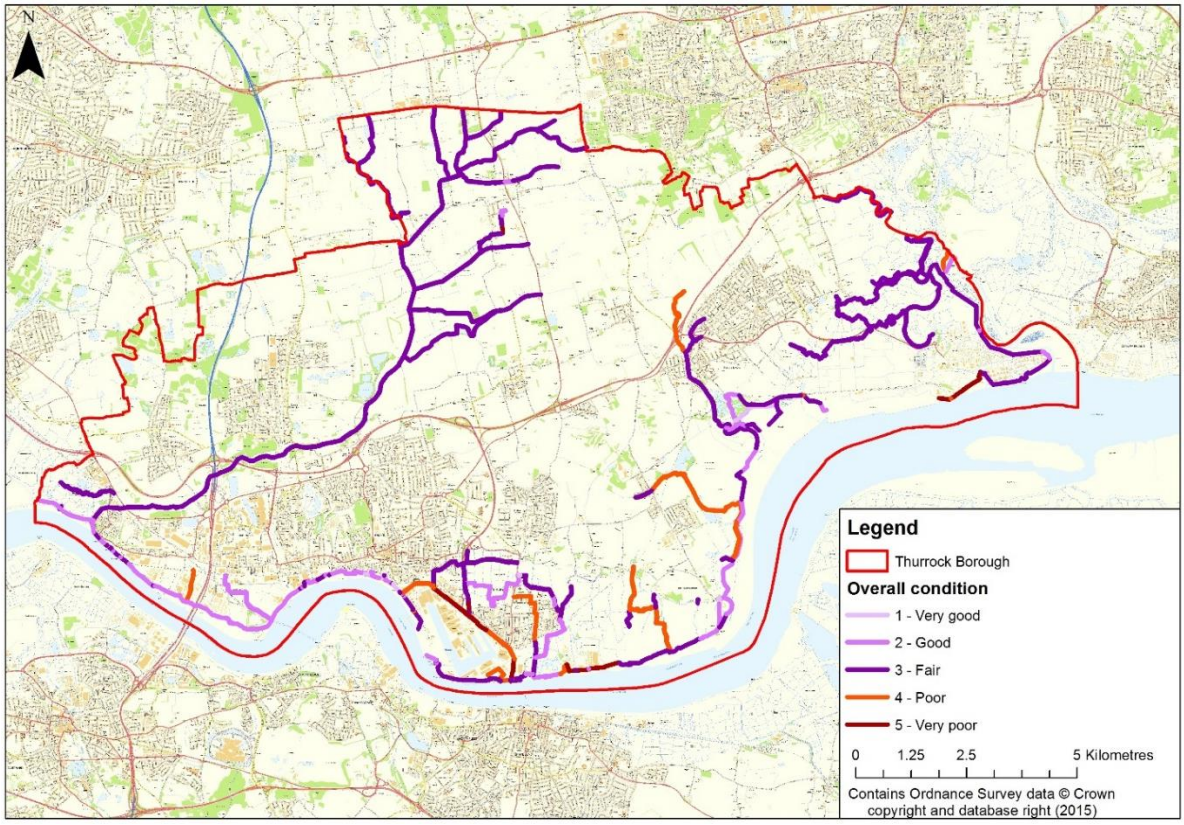

Figure 2-12: Flood defence locations and condition

2.10.3 Green infrastructure

Thurrock has more than 60% of its land in the Green Belt (Thurrock Council, 2011a). In 2007/8, only 59% of residents were satisfied with parks and open spaces in the borough, however, in March 2011 the area of green space was 515.9ha, compared to 80.9ha in 2010 (URS, 2013).

The South Essex Green Grid Strategy, which aims to create five green infrastructure projects in South Essex, includes the Thurrock Thameside Nature Park. Footpaths and cycleways are present in the park, which currently has an area of 49ha, although this will expand to 342ha once complete, likely to be 2016 (Essex Wildlife Trust, 2014b).

2.10.4 Key environmental issues:

The borough has good internal and external transport links, with further improvements planned. Predicted population increases and an ageing population will place greater pressure on the transport network, which could be exacerbated by an increase in future development pressure. In addition, development and commercial pressures are set to place increased demand on land availability, which will in turn affect the existing transport network.

The effects of a changing climate are predicted to result in increased disruption to transport infrastructure, waste sites and utilities services. Possible impacts include significant deterioration of road surfaces and reduced capacity of rail network due to hot track conditions (URS, 2013).

In addition, opportunities to create and enhance green infrastructure assets could be incorporated into flood risk management measures implemented as part of the LFRMS.

2.11 Air quality

Thurrock has identified areas where air quality objectives are exceeded, which have been designated air quality management areas (AQMA). There are 15 AQMAs in Thurrock, where air pollution levels from roads, industry and property is monitored. Traffic emissions, especially those from heavy goods vehicles, are the major contributor to poor air quality in most of these areas, despite the presence of large scale industry (Thurrock Council, 2015). These are found in the west of the borough, close to busy roads. These have been declared as a result of heavy traffic, primarily for nitrogen dioxide, with four AQMAs also included for PM_{10} as well (Essex Air, 2011).

Generally, air quality is not improving at the rate at which it was expected, due to increasing numbers of vehicles on the road (Essex Air, 2011).

2.11.1 Key environmental issues

Air quality in Thurrock is poor, particularly along major roads. Greater pressures on air quality may occur in the future through increases in the population of the borough, greater development and increased traffic congestion. This could lead to the designation of additional AQMAs to address local impacts on air quality. However, the LFRMS is not likely to impact on air quality in the borough, and any impacts, such as through increased flood risk management activity, are unlikely to be significant.

2.12 Climate

The climate of Thurrock is one of low rainfall, averaging about 600mm, with evapotranspiration averaging 380mm. Evapotranspiration mostly occurs during the summer months and exceeds rainfall totals over this period. However, winter rainfall and recharge provides the water required to offset this seasonal imbalance (Scott Wilson, 2009a).

Grays experiences a temperate climate with average maximum winter temperatures of eight degrees Celsius (°C) and minimum winter temperature of 1.6°C. Average maximum summer temperatures are 22.2°C, minimum 10.5°C. On average, winter rainfall in the region is between 36.7mm and 53.8mm, and summer rainfall between 41.1mm and 52.5mm (Met Office, 2015).

The UK Climate Projection (UKCP09) provides probability-based projections of key climate variables, such as temperature and rainfall at a higher geographic resolution than has previously been available. Projections are based on the Intergovernmental Panel on Climate Change's 'business as usual' emissions scenario. UKP09 projects that London's sea level will rise by 8.2cm by 2020 under a low emission scenario, rising to 11.5cm under a high emission scenario (UK Climate Projections, 2014).

Current projections point to significant and more variable temperature and rainfall levels in future, with greater peak temperatures and prolonged hot periods forecast. In general, Essex can expect warmer, wetter winters and hotter and drier summers, with extreme events more frequent. The low-lying land and geographical location on the Thames Estuary makes Essex and Thurrock vulnerable to various natural hazards, such as flooding and drought (Essex County Council, 2014).

Climate changes can affect local flood risk in several ways with impacts depending on local conditions. Wetter winters may increase river flooding with more intense rainfall leading to more surface runoff, increasing localised flooding and erosion. In turn, this may increase pressure on drains, sewers and water quality. Rising sea or river levels may also the increase local flood risk inland or away from major rivers because of interactions with drains, sewers and smaller watercourses.

With rainfall frequency and intensity set to significantly increase in the coming decades, the likelihood of river flooding and overwhelming of drains and sewers will rise due increased surface runoff. This in turn will lead to localised flood events and increased erosion. To accommodate the increased likelihood of such events, the LFRMS must implement measures aimed at coping with them.

The LFRMS options, could potentially, both directly and indirectly, lead to an increase in greenhouse gas emissions as a result of construction and maintenance activities. Emissions could be reduced by selecting, sustainable building practices and materials. The NPPF states that local authorities should take account of climate change over the longer term, including flood risk and coastal change. Any new development should be planned to avoid increased vulnerability to the range of impacts arising from climate change, and as such, development should be directed away from areas at highest risk from flooding. Thurrock's SWMP (Thurrock Council, 2014b) assesses scenarios that include climate change, enabling the council to determine areas at a higher risk of flooding due to climate change.

Tidal flooding is included under the Thames Estuary 2100 Plan (Environment Agency, 2012), which advocates the following recommendations for the relevant policy units in Thurrock:

- "…a programme of floodplain management including flood warning, emergency planning, and localised flood protection and resilience for vulnerable key sites…"
- "…partnership arrangements and principles to ensure that new development in this zone is safe, and flood risk management is factored into the planning process at all levels…"

2.12.1 Key environmental issues

With rainfall frequency and intensity set to significantly increase in the coming decades, the likelihood of river flooding and overwhelming of drains and sewers will rise due increased surface runoff. This in turn will lead to localised flood events and increased erosion. To accommodate the increased likelihood of such events the LFRMS must implement measures aimed at coping with them.

If such climate change projections are realised, the adverse risk and impact toward Thurrock's infrastructure, public health and the natural environment has the potential to be great. With regard to the natural environment changing climate, mainly that of changing temperatures poses the biggest threat. Species and habitat abundance and richness will become threatened as a result of changing habitats, drier soils and increased competition from non-native invasive species throughout the borough's watercourses. Particularly vulnerable to climate change is the borough's wetland habitats, which are protected under a range of European designations.

Flooding derived from increased rainfall and storm events of greater severity is expected to result in significant adverse impacts on utility, residential and transport infrastructure with subsequent economic consequences. Damage to infrastructure at the forecasted extent will inevitably incur large economic costs as well as social and public health implications as a result of the distress and risk to disruption caused.

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

2.13 Scoping conclusions

Following a review of this environmental baseline data it was possible to scope out air quality as an SEA issue as it is unlikely that there will be a significant environmental impact on air quality in the borough from implementation of the LFRMS. A summary of the scoping conclusions are given in Table 2-5 below.

Table 2-5: SEA scoping assessment summary

Receptor	Scoped In / Out	Conclusion
Landscape and visual amenity	In	The landscape qualities and integrity of the borough could be affected by changes to flood risk or land use/management, including new development, whilst increased flood risk could impact on locally important urban and rural landscapes and landscape features. Flood risk management could potentially impact on local landscape features, potentially within the rural areas and other locally important landscape areas.
Biodiversity, flora and fauna	In	National and locally important biodiversity sites and species within the Borough, including SPA, Ramsar, SSSI, LNR and BAP habitats and species may be affected by the water environment and flooding. There is one SPA and Ramsar, a number of SSSIs and LNRs within Thurrock at risk from flooding or are water dependent. Future incidences of flooding could potentially change the underlying nature of habitats and the LFRMS policies may present opportunities for biodiversity gain. LFRMS measures could improve the river channel by removal of blockages, which would be of benefit to fish passage. Habitat creation or enhancement could also be incorporated into LFRMS measures, for example through the implementation of more natural flood risk management measures.
Water environment	In	Flooding has the potential to impact on water availability, the water quality of the watercourses within the borough and WFD objectives. There is the potential for indirect impacts on water dependent designated sites/species. Flood risk management measures could potentially affect the water environment both positively and negatively. The LFRMS could give rise to changes in flood risk and water quality, and could affect provision of water resources.
Soils and geology	In	Changes to flood risk could affect soil quality and underlying geology, which supports six geological SSSIs. Subsequent erosion of these lands could give rise to pollution pathways, increasing the risk of an adverse effect on other environmental receptors. Thurrock contains a significant percentage of high grade agricultural land. Flooding has the potential to erode soils and cause waterlogging impacting on agricultural productivity. Impacts on soil quality could then affect other aspects of the environment such as biodiversity and water quality.
Historic environment	In	Changes to flood risk could have positive or negative impacts on historic sites including scheduled monuments and listed buildings. This includes damage to the fabric of the structures through waterlogging or drought and impacts on their historic value or setting. There are a large number of historic assets in the borough that could be affected by changes to flooding and flood risk management measures. Opportunities may exist to protect important sites or negative impacts could occur due to increased flood risk to vulnerable sites.

Receptor	Scoped In / Out	Conclusion
Population	In	A range of socio-economic characteristics of the borough including social deprivation levels, health and wellbeing, access and recreation, and employment opportunities influence vulnerability to flooding. Critical social infrastructure, including hospitals, schools, and residential and nursing homes could benefit from reduced flood risk. The LFRMS has the potential to provide significant positive benefits to the population of the borough through reduced levels of flood risk to population generally and also vulnerable groups, and increased community resilience.
Material assets	In	Critical infrastructure including the transport network, waste sites, utilities services and emergency services could benefit from reduced flood risk. Conversely, increased flood risk to these sites could cause significant disruption to the borough, impacting on human and economic activity and the environment. Material assets could benefit from reduced flood risk, but the borough could be significantly affected by increased flood risk to these assets. Other assets include flood defence assets, which are required to be of a sufficient standard, which the LFRMS will address.
Air quality	Out	The LFRMS is not likely to have a significant effect on air quality in the borough due to the localised nature of any potential impacts.
Climate	In	Changes in flood risk could affect resilience to the potential impacts of future climate change. This could have knock-on effects on a range of environmental aspects including biodiversity, water resources, the local landscape and population, particularly deprived areas. Flood risk management measures could also result in increased carbon emissions associated with new development or increased management activities. The LFRMS may include mitigation, resilience and adaption responses and measures that could contribute to addressing the future impacts of climate change effects. Opportunities to improve climate change adaptation will be considered in the SEA.

3 SEA assessment framework

3.1 Introduction

The SEA framework is used to identify and evaluate the potential environmental issues associated with the implementation of the LFRMS. The framework comprises a set of SEA objectives that have been developed to reflect the key environmental issues identified through the baseline information review. These objectives are supported by a series of indicators, which are used as a means to measure the potential significance of the environmental issues and can also be used to monitor implementation of the LFRMS objectives. These LFRMS objectives are tested against the SEA assessment framework to identify whether each option will support or inhibit achievement of each objective. Table 3-1 below summarises the purpose and requirements of the SEA objectives and indicators.

Table 3-1: Definition of SEA objectives and indicators

	Purpose
Objective	Provide a benchmark 'intention' against which environmental effects of the plan can be tested. They need to be fit-for-purpose.
Indicator	Provide a means of measuring the progress towards achieving the environmental objectives over time. They need to be measurable and relevant and ideally rely on existing monitoring networks.

3.2 SEA objectives and indicators

SEA objectives and indicators have been compiled for each of the environmental receptors (or groups of environmental receptors) scoped into the study (see Table 2-5). The SEA objectives used to assess the LFRMS are given in Table 3-2 below.

Table 3-2: SEA objectives and indicators

Receptor	Objective		Indicator
Landscape	1	Protect the integrity of the Borough's urban and rural landscapes, and promote the key characteristics of the SLAs and Green Belt.	Changes in the condition and extent of existing characteristic elements of the landscape. The condition and quality of new characteristics introduced to the environment. Percentage of open countryside.
Biodiversity, flora and fauna	2	Protect and enhance designated and BAP habitats and species in the borough.	Area of designated sites adversely affected by flooding. Monitoring of reported status of designated nature conservation sites. Percentage of land designated as nature conservation sites as a result of LFRMS measures. Area of habitat created as a result of implementation of the LFRMS (e.g. flood storage areas creating wetland habitat). Number of barriers to fish migration removed.
	3	Maintain and enhance habitat connectivity and wildlife corridors within the borough.	
	4	Maintain existing, and where possible create new, riverine and estuarine habitat to benefit migratory and aquatic species and fisheries, and maintain upstream access.	
Water environment	5	Improve the quality and quantity of the water and morphology in the borough's rivers.	Water quality and morphology of the borough's watercourses. Number of pollution incidents. Number of SuDS (Sustainable Drainage Systems) schemes installed as part of the LFRMS. Number and volume of Environment Agency licensed abstractions. Numbers of sites with high pollution potential (e.g. landfill sites, waste water treatment works) at risk from flooding.
	6	Do not inhibit achievement of the WFD objectives and contribute to their achievement where possible.	Achievement of WFD objectives. Percentage of water bodies achieving 'Good' ecological status/potential. No deterioration in WFD status.

Receptor	Objective		Indicator
Soils and geology	7	Reduce the risk of soil erosion and pollution.	Area of agricultural, rural and greenfield land affected by flooding or LFRMS measures. Numbers of sites with high pollution potential (e.g. landfill sites, waste water treatment works) at risk from flooding.
Archaeology and Cultural Heritage	8	Conserve and enhance the historic environment, heritage assets and their settings.	Number of heritage assets at risk from flooding, and assessment of impact. Number of vulnerable heritage assets protected from flooding by implementation of the LFRMS. Proportion of conservation area ground at risk of flooding. Number of designated and non-designated heritage assets harmed by FRM measures, including impacts on their settings.
Population	9	Increasing the resilience of people, property and businesses and critical infrastructure within Thurrock to the risk of flooding.	Number of residential properties at risk of flooding. Number of key services (e.g. hospitals, health centres, residential/care homes, schools etc.) at risk from flooding.
	10	Increase the use of SuDS, particularly in all new developments.	Number of SuDS schemes installed as part of the LFRMS.
Material assets	11	Minimise the impacts of flooding to the borough's transport network and key critical infrastructure.	Length of road and rail infrastructure at risk from flooding. Number of key infrastructure assets at risk from flooding.
Climate	12	Reduce vulnerability to climate change impacts and promote measures to enable adaptation to climate change impacts.	Number of residential properties at risk of flooding. Number of key services (e.g. hospitals, health centres, residential/care homes, schools etc.) at risk from flooding. Area of habitat created as a result of implementation of the LFRMS (e.g. flood storage areas creating wetland habitat). Number of barriers to fish migration removed.

4 Strategy alternatives

4.1 Developing alternatives

The SEA Directive requires an assessment of the plan and its 'reasonable alternatives'. In order to assess reasonable alternatives, different strategy options for delivering the LFRMS have been assessed at a strategic level against the SEA objectives, and the environmental baseline as detailed in Section 2. The results of this assessment will be used to inform the decision-making process in choosing a preferred way of delivering the LFRMS.

4.2 Appraisal of actions to improve flood risk

The LFRMS has the purpose of managing and reducing local flood risk in the Thurrock Borough. The strategy objectives have been assessed against the SEA objectives for each of the following options as shown in Table 4-1.

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

Table 4-1: Assessment of the strategy and alternative options against the SEA objectives

SEA Objectives		Options and Effects		
		Do Nothing	Maintain current flood risk management regime	Manage and reduce local flood risk
1	Protect the integrity of the Borough's urban and rural landscapes, and promote the key characteristics of the SLAs and Green Belt.	Potential negative effect resulting from no management that could adversely impact on sensitive urban landscape character. However, abandonment of assets may allow for the development of a more natural watercourses, which may enhance the local landscape character of the borough, particularly in rural areas.	Little/no change to the baseline in the short to medium term. However, with increasing flood risk, negative effects could occur on sensitive urban landscape character, whilst positive effects may occur in rural areas as the borough's watercourses increasingly reconnect to their floodplain.	Potential for managing and promoting this objective through sensitively designed flood risk management schemes, which enhance local landscape character, historic assets and Green Belt land. Conversely, inappropriate management schemes could damage key landscape features and characteristics.
2	Protect and enhance designated and BAP habitats and species in the borough.	Potential for both adverse and beneficial impacts. For example, abandonment of assets may allow for the development of a more natural watercourse (enhancing certain notable species and habitats). However, there would be an increased risk of spreading non-native invasive species and potential impacts on water quality through increased flooding.	Little/no change to baseline in the short to medium term. Increased flooding in the future may provide opportunities for new habitat creation, but may also result in the spread non-native invasive species or adversely impact on habitats intolerant of increased inundation or changes in water quality.	Potential for both adverse and beneficial impacts as a result of active management. Opportunities may arise to enhance habitats and species through the implementation of multi-functional flood risk management measures, such as the provision of new green infrastructure.
3	Maintain and enhance habitat connectivity and wildlife corridors within the borough.	Potential for both adverse and beneficial impacts. Abandonment of assets would allow for corridors to develop that would be unrestricted by flood risk assets. However, the increased risk of spreading non-native invasive species would inhibit the biodiversity value of wildlife corridors.	Little/no change to baseline in the short to medium term. Increased flooding in the future may provide opportunities for new habitat creation, but may also result in the spread of non-native invasive species or adversely impact on habitats intolerant of increased inundation or changes in water quality.	Potential for both adverse and beneficial impacts as a result of active management. Opportunities may arise to enhance habitats and species through the implementation of multi-functional flood risk management measures, such as the provision of new green infrastructure.

SEA Objectives		Options and Effects		
		Do Nothing	Maintain current flood risk management regime	Manage and reduce local flood risk
4	Maintain existing, and where possible create new, riverine and estuarine habitat to benefit migratory and aquatic species and fisheries, and maintain upstream access.	Potential for both adverse and beneficial impacts. For example, existing habitat may deteriorate as a result of increased flooding (however, this will often depend on what the site is designated for) and blockages may occur due to the movement of sediment. However, abandonment of assets may allow a more natural riverine system to develop.	Little/no change to baseline. However as a result of increased flooding in the future due to climate change new habitats may be created or existing wetland habitats enhanced. However, habitats intolerant of increased inundation or changes in water quality may be adversely affected.	Potential for both adverse and beneficial impacts as a result of active management. Significant opportunities may exist for habitat creation as a result of implementing measures to reduce local flood risk. Conversely, the introduction of new assets may damage riverine habitat and introduce blockages for fish access to upstream watercourses if not implemented appropriately.
5	Improve the quality and quantity of the water in the borough's rivers.	Potential for both adverse and beneficial impacts. For example, abandonment of assets may allow for the development of a more natural watercourse and fewer assets are likely to reduce constrictions on water flow and hence water availability and quantity. However, there would be no management of water quality issues such as run-off, whilst flood risk to contaminated sites may increase, leading to increased surface and groundwater contamination.	Little/no change to baseline levels in the short to medium term. However, increased flood risk in the future may result in a reduction in surface water and groundwater quality due to contamination from surface water runoff or from contaminated sites.	Management of watercourses allows water quality to be monitored and potentially improved. Taking further action to reduce local flood risk may also improve water quality through reduced flood risk to potentially contaminated sites. However, the introduction of further flood risk assets to watercourses may result in constrictions to water flow, reducing water availability. Careful design and management of such assets can prevent these adverse effects.
6	Do not inhibit achievement of the WFD objectives and contribute to their achievement where possible.	Potential for both adverse and beneficial impacts. For example, abandonment of assets may allow for the development of more natural watercourses. However, there would be an increased risk of spreading non-native, invasive species through flooding and pollution to watercourses could become more widespread.	Little/no change to current measures to meet WFD objectives.	Potential for both adverse and beneficial impacts depending upon the specific statuses and objectives of the waterbody as identified in the RBMP. Opportunities for achieving WFD objectives may arise through the implementation of measures to reduce local flood risk.
7	Reduce the risk of soil erosion and pollution.	Potential negative effect on soil quality, particularly in areas of high land quality, resulting from increased erosion of soils from flooding and no management of land contamination risks and subsequent effects.	Little/no change to baseline. However, in the future, as a result of climate change, adverse impacts may arise through erosion and land contamination from increased flooding.	Potential for managing and promoting this objective through reduced flood risk.
8	Preserve and where possible enhance important historic and cultural sites in the borough.	Potential for both adverse and beneficial impacts. Historic environment assets and cultural heritage assets may be exposed to greater damage and deterioration through increased flood risk. Conversely, increased water inundation may help preserve some assets dependent on waterlogging, whilst the declining condition of flood risk management assets from no management and greater connectivity to the floodplain could improve the setting of historic assets.	Little/no change to baseline. However, in the future historic environment assets and cultural heritage may be exposed to increased flooding and damage due to climate change.	Potential for both adverse and beneficial impacts as a result of active management, for example through increased protection to vulnerable historic environment assets or improvements to their settings.

SEA Objectives		Options and Effects		
		Do Nothing	Maintain current flood risk management regime	Manage and reduce local flood risk
9	Minimise the risk of flooding to communities and social infrastructure.	Increased exposure to flood risk from a combination of no management and climate change. This could lead to a greater number of people and their properties at risk of flooding, causing greater damage and disruption, and increases in social exclusion, deprivation and health risks.	No improvements to health and well-being as existing risk maintained and risk may increase in the future as a result of climate change.	Active management to reduce local flood risk should help to protect residential properties and key social infrastructure services from flooding. This has the potential to create a range of social benefits including reducing associated health impacts and social deprivation.
10	Increase the use of SuDS, particularly in all new developments.	This option would result in no increase in the use of SuDS in the future. Surface runoff volumes would be likely to increase, further exacerbating flood risk events. In addition, the declining condition from no management of existing SuDS schemes and lack of additional schemes may reduce the ability to manage future impacts of climate change.	Little/no change to the baseline in the short to medium term. However, with increasing flood risk, the lack of additional SuDS schemes may reduce the ability to manage future impacts of climate change.	Active management to reduce flood risk may incorporate the greater use of SuDS schemes to reduce the rate and volume of surface water runoff. This will contribute to climate change mitigation and adaptation initiatives and can provide a range of other environmental benefits, including biodiversity enhancements and the provision of new recreation and amenity opportunities.
11	Minimise the impacts of flooding to the borough's transport network and key critical infrastructure.	This option is likely to result in increased flood risk to key infrastructure, which would cause significant disruption to the borough, impacting on human and economic activity and the environment.	This option would maintain the current risk levels, although risk may increase in the future as a result of climate change.	Flood risk management options may reduce flood risk to key critical infrastructure, reducing disruption during flood events and enabling a more effective response.
12	Reduce vulnerability to climate change impacts and promote measures to enable adaptation to climate change impacts.	This option would result in no active adaptation or response to climate change (specifically, flood risk management). This would lead to a risk of adverse impacts to all receptors in the short, medium and long-term. However, the loss of existing flood risk management assets may result in a greater reconnection of the river to its floodplain, which could benefit a range of habitats and species.	No adaptation or response to climate change in terms of flood risk management. High risk for adverse impacts to all receptors in the short, medium and long-term.	The LFRMS includes full consideration of climate change adaptation in terms of flood risk management. This will reduce the overall risk of flooding and the potential for flood damages in the short, medium and long-term future, benefiting both people and property.

The assessment described in Table 4-1 indicates that Option 1 (do nothing) is likely to result in a number of significant adverse impacts, particularly in relation to people and property, and other environmental assets including historic assets and biodiversity, where increased flooding may create new pathways for the spread of invasive non-native species. Surface water and groundwater quality could also be adversely affected, with increased flooding of contaminated sites leading to greater impacts on water resources. Conversely, increased flood risk may result in greater connectivity between watercourse and their floodplains, offering opportunities for habitat creation of benefit to a range of protected and notable species.

Option 2 (maintain current flood risk management regime) is likely to result in little or no change in the environmental baseline in the short to medium term as the existing flood risk management regime continues to maintain existing levels of flood protection. However, in the future, as a result of climate change, flood risk will increase, resulting in many of the impacts identified under Option 1, although potentially to a lesser extent and significance.

Option 3 (manage and reduce local flood risk) has the potential to provide a range of environmental benefits. Flood risk management initiatives, if designed and implemented in an appropriate manner, could have multiple benefits. This could include reducing flood risk to people and property, contributing to the protection of heritage assets and improvements in water quality, and providing new opportunities for habitat creation and the provision of recreation and amenity assets. Conversely, flood risk management measures, if implemented in an inappropriate manner, could result in adverse effects on a range of environmental features. However, this risk is managed through the preparation of this SEA and through the planning and consenting process, which is likely to require consideration of the sustainability of a project prior to its implementation. Therefore, it is evident that by doing nothing or maintaining current levels of management, there are likely to be detrimental effects on the SEA objectives, which are likely to be prevented by carrying out active flood risk management as proposed by the LFRMS.

4.3 Strategy objectives and measures

The following draft LFRMS objectives have been developed:

- Objective One: Reduce the likelihood and consequence of flooding, particularly from surface water, groundwater and ordinary watercourses.
- Objective Two: Identify any gaps where further studies are required so we can get a better understanding of the causes and effects of local flooding.
- Objective Three: Reduce the vulnerability of Thurrock, its residents and visitors to the detrimental effects of flooding.
- Objective Four: Establish clear roles, powers and responsibilities for Thurrock RMAs.
- Objective Five:
    i. Provide improved communication of clear information on local flood risk, appropriate responses and the responsibilities for us and our partners.
    ii. State what we and other RMAs cannot take responsibility for, and facilitate engagement of the public and stakeholders to take action.
- Objective Six: Improve co-operative working between all RMAs, including across administrative boundaries.
- Objective Seven: Improve natural habitat and the social environment through flood management schemes which provide multiple benefits.
- Objective Eight: Establish a strategic funding plan and programme so we identify priorities, secure funding for measures that are affordable and that wherever possible include provisions for contributions by those who benefit.

A number of actions have also been developed, these are contained in Table 5-4. The SEA appraises these objectives and actions to determine whether they would inhibit achievement of the SEA objectives, or conversely, contribute to their delivery.

5 Appraisal of LFRMS objectives to improve flood risk

5.1 Impact significance

The unmitigated impacts of the LFRMS objectives and actions on achieving the SEA objectives were identified through the analysis of the baseline environmental conditions and use of professional judgement. The significance of effects was scored using the five point scale summarised in Table 5-1. If a high level of uncertainty regarding the likelihood and potential significance of an impact (either positive or negative) was identified, it was scored as uncertain.

Table 5-1: SEA appraisal codes

Impact significance	Impact symbol
Significant positive impact	++
Minor positive impact	+
Neutral impact	0
Minor negative impact	-
Significant negative impact	--
Uncertain impact	?

Throughout the assessment the following approach was applied:

- Positive, neutral and negative impacts are assessed, with uncertain impacts highlighted.
- The duration of the impact are considered over the short, medium and long term.
- The reversibility and permanence of the impact are assessed (e.g. temporary construction impacts, impacts which can be mitigated against/restored over time or completely irreversible changes to the environment).
- In-combination effects are also considered.

5.2 LFRMS impacts assessment

Table 5-2 and Table 5-4 provide a summary of the outcomes of the environmental assessment of the draft LFRMS objectives and actions respectively. Table 5-3 shows the results of the assessment of cumulative effects of the LFRMS objectives on achievement of the SEA objectives, whilst Table 5-5 assesses the cumulative effects associated with the LFRMS actions.

These are qualitative assessments that identify the range of potential effects that the LFRMS may have on delivering the SEA objectives. Where a particular LFRMS objective is underpinned by a series of actions, each of which may give rise to a range of environmental effects, an overall impact has been identified for each SEA objective.

Table 5-2: Assessment of LFRMS objectives against SEA objectives

LFRMS objective ID	LFRMS objectives	SEA objective												Comments
		1	2	3	4	5	6	7	8	9	10	11	12	
1	Reduce the likelihood and consequence of flooding, particularly from surface water, groundwater and ordinary watercourses.	+	+	0	0	0	0	0	0	++	+	++	++	This objective provides a significant positive effect on SEA objectives 9, 11 and 12 due to the increased protection it will provide from flooding on people and material assets, and as a result of reducing the risk of flooding will reduce vulnerability to climate change. There will be additional benefits to the population by decreasing the risk of health problems that arise from flooding, such as stress, and will also assist in the reduction of deprivation. There is a positive effect on SEA objective 10, as to achieve this objective it is likely that the use of SuDS will increase. Reducing the likelihood of flooding to the landscape will provide benefit to SEA objective 1, as it will protect the integrity of the borough's urban landscapes, and potentially to the rural landscapes. From this protection, there is potential for a positive effect on biodiversity, as reduction of flooding will reduce the amount of pollution entering the watercourses, therefore having favourable effect on habitats, particularly riverine BAP habitats and species. Although scored neutral due to the high level nature of the objective leading to a lack of information about how and where the objective will be delivered, there is potential for a positive effect on soils and geology, since reducing flooding will reduce the risk of soil erosion and pollution that flood waters can cause and mobilise. Scored neutral for reasons as explained above for SEA objective 7, the historic environment has the potential to be positively affected, and this LFRMS objective could provide particular benefit to the listed building Coalhouse Fort, which has a problem of water ingress to casemates. There is unlikely to be a negative effect on the historic environment, as no heritage assets that require waterlogged conditions have been identified. If there are these assets, negative effects can be mitigated by not protecting these from flooding, or providing the correct water levels. There is, however, the potential for negative effects on SEA objective 4, as FRM measures could reduce upstream access, therefore impacting on migratory and aquatic species, although it has been scored neutral due to the high level nature of the LFRMS objective. Risks can be mitigated through considerate design, such as fish passes. Another negative effect could arise from this LFRMS objective on SEA objectives 5 and 6, as increasing flood defences in, and potential modification of, watercourses could inhibit the achievement of WFD objectives for the watercourses as there may be a negative effect to the morphology of the watercourses. However, a reduction in flooding has the potential to reduce risks to water quality.
2	Identify any gaps where further studies are required so we can get a better understanding of the causes and effects of local flooding.	0	0	0	0	0	0	0	+	+	0	+	+	Improving the understanding of local flood risk across the borough has the potential to contribute to objectives 8, 9, 11 and 12 which focus on the reduction of flood risk to the built environment and communities, and adaptation to climate change effects. There is likely to be a neutral impact in relation to all other SEA objectives. Opportunities may exist in the future, as with better understanding and cooperation the natural environment could benefit from flood alleviation schemes that enhance biodiversity.
3	Reduce the vulnerability of Thurrock, its residents and visitors to the detrimental effects of flooding.	0	0	0	0	0	0	0	+	++	0	++	++	There is a significant positive effect on SEA objectives 9 and 11 as reducing vulnerability will directly lead to a reduction in risk of flooding to communities and assets at a strategic scale, which will also reduce the risk of flooding to historic assets. There is the potential to reduce economic and social effects since reducing vulnerability to flooding will reduce the chance of damage to property. Socially, this will reduce stress and anxiety. Reducing vulnerability to flooding will also assist in achieving a significant positive effect on SEA objective 12, as it will reduce Thurrock's vulnerability to the increase in risk of flooding caused by climate change.
4	Establish clear roles, powers and responsibilities for Thurrock RMAs.	0	0	0	0	0	0	0	0	+	0	+	+	This objective seeks to define roles, which will help to achieve effective FRM, therefore there is a positive effect on SEA objectives 9, 11 and 12. However, this is unlikely to have a direct effect on the remaining SEA objectives at a strategic scale, as the objective does not involve direct intervention.
5(i)	Provide improved communication of clear information on local flood risk, appropriate responses and the responsibilities for us and our partners.	0	0	0	0	0	0	0	+	+	0	+	+	This LFRMS objective contributes positively towards SEA objectives 8, 9, 11 and 12 because it minimises the risk of flooding by improving the co-ordination of response and recovery from flooding. There are neutral effects on the remaining SEA objectives as the objective does not aim to construct new flood defences, therefore the objective does not have an effect on the borough's environment.
5(ii)	State what we and other RMAs cannot take responsibility for, and facilitate engagement of the public and stakeholders to take action.	0	0	0	0	0	0	0	0	+	0	+	+	This objective seeks to improve public awareness of flooding and encourage people to be proactive in managing their own risk. It will therefore have a positive effect in relation to SEA objectives 9, 11 and 12. All other SEA objectives are unlikely to be affected by the objective.
6	Improve co-operative working between all RMAs, including across administrative boundaries.	0	0	0	0	0	0	0	0	+	0	+	+	This LFRMS objective contributes positively towards SEA objectives 9, 11 and 12 because it minimises the risk of flooding by improving the co-ordination of response and recovery from flooding. There are neutral effects on the remaining SEA objectives as the objective does not aim to construct new flood defences, therefore the objective does not have an effect on the borough's environment.
7	Improve natural habitat and the social environment through flood management schemes which provide multiple benefits.	+	++	++	++	++	++	+	+	++	+	++	++	There are positive effects towards all of the SEA objectives, as this reduces the risk of flooding to communities and the borough through schemes that will benefit biodiversity, which in turn will lead to an improvement in water quality and morphology.
8	Establish a strategic funding plan and programme so we identify priorities, secure funding for measures that are affordable and that wherever possible include provisions for contributions by those who benefit.	0	0	0	0	0	0	0	0	+	0	+	+	It is not clear what outcomes this LFRMS objective would be likely to deliver. However, it appears to support FRM actions that are more likely to be achievable due to affordability, and therefore reduce the risk of flooding to the borough and vulnerability to climate change, therefore having a positive effect on SEA objectives 9, 11 and 12. However, there is a risk that affordable measures are prioritised over measures that provide benefit to the wider environment such as biodiversity. Currently the remaining SEA objectives are neutral as the measures are not likely to have a strategic effect.

Table 5-3: Cumulative effects of the LFRMS objectives on SEA objectives

Receptor	SEA objective		Assessment score	Justification	Timescale, probability and permanence of effects
Landscape	1	Protect the integrity of the Borough's urban and rural landscapes, and promote the key characteristics of the SLAs and Green Belt.	+	Although most of the LFRMS objectives have a neutral effect on this SEA objective, positive effects have been identified from LFRMS objectives 1 and 7. There are no negative effects in relation to the LFRMS objectives. LFRMS objectives 1 and 7 seek to deliver improvements to the environmental quality of the borough through reducing flooding and increasing FRM scheme's scopes to include wider benefits.	These effects are likely to happen if FRM schemes are implemented in a way that give consideration to these LFRMS objectives, particularly LFRMS objective 7. The timescale and permanence of effects are dependent on the implementation of flood risk schemes, and type, scale and specific location of them. Effects may be limited, depending on the scale of the schemes. However, through influencing the type of FRM schemes that include wider benefits, effects could be long term and permanent rather than short term.
Biodiversity, flora and fauna	2	Protect and enhance designated and BAP habitats and species in the borough.	0	There is a generally a neutral effect on these SEA objectives, as most of the LFRMS objectives are concerned with communication and data gathering, therefore not having a direct impact on the natural environment. LFRMS objective 7 aims to improve the natural habitat, and therefore there are significant positive effects on SEA objectives 2, 3 and 4. There is potential for one negative effect on SEA objective 4 from LFRMS objective 1, which is concerned with reducing the likelihood of flooding, as FRM measures could reduce upstream access, therefore impacting on migratory and aquatic species. However, there is the potential for benefits to the riverine environment by installing sustainable FRM measures with fish passes and other measures. LFRMS objective 1 also has the potential for a positive effect on SEA objective 2, as reducing flood risk in urban areas and promoting better management of surface water runoff are likely to benefit water quality and water resources in the borough, by reducing the risk of contaminated materials, fuels, chemical and sediments from entering local watercourses.	The effects are likely to occur over a range of timescales, as it depends on the implementation of FRM measures. The LFRMS may influence development proposals in the short term and in the longer term, and the outcomes of this may be both temporary and permanent depending upon the location and scale of effects that are achieved. At this stage, the scale and permanence of any effects is generally uncertain as the LFRMS objectives encourage good design rather than expressly inhibiting bad design. This means that development could be consented that does not improve environmental quality. There are also many variables on the type of development, from geographic scale and location to the type of environmental receptors of the development. For positive effects to be more certain, a robust planning process that considers the LFRMS objectives is required.
	3	Maintain and enhance habitat connectivity and wildlife corridors within the borough.			
	4	Maintain existing, and where possible create new, riverine and estuarine habitat to benefit migratory and aquatic species and fisheries, and maintain upstream access.			
Water environment	5	Improve the quality and quantity of the water and morphology in the borough's rivers.	0	There is a generally a neutral effect on these SEA objectives, as most of the LFRMS objectives are concerned with communication and data gathering, therefore not having a direct impact on the natural environment. There is potential for a negative effect on SEA objective 6 from LFRMS objective 1, as constructing flood defences in, and potential modification of, watercourses could inhibit the achievement of WFD objectives. However, there is the potential for this to be balanced by LFRMS objective 7 which aims to improve the natural habitat, which would contribute towards WFD objectives.	
	6	Do not inhibit achievement of the WFD objectives and contribute to their achievement where possible.			
Soils and geology	7	Reduce the risk of soil erosion and pollution.	+	The LFRMS objectives have a generally neutral effect, however there is the potential for positive effects on this SEA objective as the LFRMS aims to reduce the risk of flooding to the borough. Reducing the risk of flooding will reduce the risk of contaminated materials, fuels, chemicals and sediments from entering watercourses, therefore having a positive effect on this SEA objective.	The effects are likely to occur over a range of timescales, as it depends on the implementation of FRM measures. The LFRMS may influence development proposals in the short term and in the longer term, and the outcomes of this may be both temporary and permanent depending upon the location and scale of effects that are achieved.
Archaeology and Cultural Heritage	8	Conserve and enhance the historic environment, heritage assets and their settings	+	The LFRMS objectives have a generally positive effect on this SEA objective as the LFRMS aims to reduce risk of flooding to the Borough. A reduction in risk of flooding within the Borough generally will reduce the risk of flooding to important historic and cultural assets, now and in the future. There are no LFRMS objectives that specifically aim to protect and enhance historical and cultural assets, which lessens the positive impact on this SEA objective, and therefore an overall minor positive effect has been identified. However, any FRM measure that is likely to impact on a historic or cultural asset should be fully assessed, as some assets may require waterlogged conditions for protection. Any development proposed should also be assessed individually as the development itself could affect the fabric or setting of a known or unknown historic asset.	The effects of the LFRMS are likely to occur over a range of timescales. However, the LFRMS seeks to deliver long-term flood risk benefits and so any historic assets protected may benefit in the longer term. The permanence of any effects will depend upon the specific details of the FRM measure being implemented and the nature, scale and location of this intervention.
Population	9	Increasing the resilience of people, property and businesses and critical infrastructure within Thurrock to the risk of flooding.	++	The LFRMS is likely to provide a significant positive effect in relation to this SEA objective. The majority of objectives seek to deliver improved FRM for local people, with LFRMS objectives 1, 3 and 7 perhaps the objective most focused on achieving this. Improving FRM and reducing flood risk across the borough could deliver a range of benefits to the local community including alleviating the cost and disruption associated with flooding, whilst reducing stress and anxiety associated with the risk of flooding. In addition, wider societal benefits could be achieved by reducing flood risk and improving the environmental quality of the borough. Benefits could include reduced social deprivation and greater community cohesion.	Most of the LFRMS objectives directly seek to reduce flood risk and therefore it is very likely that positive effects will occur. Given the range of objectives, it is also likely that effects will occur over a range of timescales and will include both temporary and permanent effects.
	10	Increase the use of SuDS, particularly in all new developments.	+	Although not specifically addressed within the LFRMS objectives, SuDS is likely to play an important role in achieving a number of the objectives to reduce flood risk, promote better land management and influence the quality of new development.	SuDS may play a role in the delivery of a number of the LFRMS objectives, particularly in relation to influencing the design and new development, and therefore it is likely that the LFRMS will contribute towards achieving this SEA objective. The timescale for achieving this is likely to vary depending upon the scale of development proposals and the resources available to deliver the LFRMS actions. The effects are likely to be permanent if SuDS schemes can be successfully incorporated into these new development proposals.
Material assets	11	Minimise the impacts of flooding to the borough's transport network and key critical infrastructure.	++	The LFRMS objectives are likely to have a significant positive effect on this SEA objective as many of the LFRMS objectives are aimed at reducing the risk of flooding to people and property, particularly LFRMS objectives 1, 3 and 7. Implementing FRM measures will reduce the risk of flooding to the borough, which will include a reduction in the risk of flooding to the Borough's transport networks.	The LFRMS includes a number of objectives to reduce flood risk and therefore it is very likely that positive effects will occur. Given the range of relevant LFRMS objectives, it is likely that effects will occur over a range of timescales.
Climate	12	Reduce vulnerability to climate change impacts and promote measures to enable adaptation to climate change impacts.	+	FRM measures that are introduced as a result of this LFRMS will consider climate change in their design, providing a positive effect on this SEA objective. However, measures to enable adaptation to climate change could be more expressly promoted within the LFRMS. Therefore the LFRMS only has a minor positive effect on this SEA objective.	The nature of the effects will be influenced by a wide range of factors outside the direct control of the LFRMS. Therefore it is difficult to predict at this stage the likely timescale, probability or permanence of effects. It is likely that effects will be achieved over a variety of timescales and their significance will be linked to the scale and nature at which climate change occurs. However, the LFRMS will promote better FRM and will reduce flood risk across the borough and there are significant drivers requiring climate change considerations to be built into these FRM actions. Therefore it is likely that the LFRMS will provide an important means for monitoring the flood risk effects of climate change and implementing actions to address these effects.

Table 5-4: Assessment of LFRMS actions against SEA objectives

Action				SEA objective												Comments
ID	What?	How?	Ward	1	2	3	4	5	6	7	8	9	10	11	12	
1	Raise **awareness of Areas of Critical Drainage (AoCD)** amongst Planners and influence planning policies to prevent the creation of new risk areas	Include Planners and planning policy influencers in awareness raising activities. Ensure AoCD information is clear and accessible.	All	0	0	0	0	0	0	0	0	+	0	+	0	These actions are focused on raising awareness of flooding amongst the population of Thurrock, including those that make or influence decisions on planning applications, therefore providing them with an understanding on how a development could potentially be affected by flooding. Raising awareness of flooding within the community will make the borough more resilient to flooding. The effects are likely to be small scale and localised, but will help to increase the resilience of people, property, business and infrastructure within Thurrock to the risk of flooding, therefore contributing to SEA objectives 9 and 11. In relation to other SEA objectives, the effects at a strategic scale are likely to be neutral as FRM actions are planned under these actions.
2	**Community awareness**	Increase awareness of flooding within communities at risk through newsletters, website, drop-in surgeries etc. To include information on who to contact during flooding, flood warning services and how to access them, how to prepare for flooding, as well as the role of Thurrock as LLFA.	All	0	0	0	0	0	0	0	0	+	0	+	0	
3	**Community awareness**	Update Council webpages to highlight the impact of fly tipping on flood risk.	All	0	0	0	0	0	0	0	0	+	0	+	0	
4	**Community awareness**	Provide information on Council webpages regarding importance of good drainage practice / drainage maintenance and promote to local landowners.	All	0	0	0	0	0	0	0	0	+	+	0	0	This action promotes the use of SuDS, therefore benefiting SEA objective 10. Promoting good drainage practices to local landowners will increase the resilience of Thurrock to flooding, thereby having a positive effect on SEA objective 9. However, the effects are likely to be localised, therefore the action likely to have a neutral effect on the remainder of the SEA objectives.
5	**Implement a standardised Asset Register**	Implement a standardised asset register. Educate departments involved in filling in the register Ensure everyone involved understands the register, its purpose and the methodology.	All	0	0	0	0	0	0	0	0	+	0	0	0	These actions are likely to have a neutral effect on all of the SEA objectives with the exception of a small scale positive effect on SEA objective 9, as it will increase the resilience of the borough to flooding. The effect will come from the asset register being up to date, which will increase understanding of how flooding is prevented in Thurrock and will also ensure assets are in good condition, therefore increasing resilience to flooding. However, such actions could have a range of effects on the natural environment, both positive and negative, depending upon the activities they deliver, and they should be subject to thorough environmental assessment at a project stage to ensure they are sustainable and are delivered in accordance with the wider objectives of the LFRMS. For example, biodiversity requirements should be considered to influence management actions, i.e. not clearing gullies if there is potential for biodiversity benefit.
6	**Implement a standardised Asset Register**	Undertake asset surveys. Check outfall conditions to local ditches to check whether they are clear or silted, sufficient size etc. Create GIS layer to highlight the location of all assets in the Borough, including areas acting as flood storage areas, and establish ownership/maintenance agreements.	All	0	0	0	0	0	0	0	0	+	0	0	0	
7	Improved **maintenance of drainage network**	Information from the asset surveys and register should be used to create a maintenance regime that prioritises key assets and drainage areas within budgets available.	All	0	0	0	0	0	0	0	0	+	0	0	0	
8	Ensure **drainage systems are operating at capacity** in AoCD	Review existing gully clearance / maintenance schedules and revise if necessary.	All	0	0	0	0	0	0	0	0	+	0	0	0	
9	Implement a **standardised flood incident log.**	Revise the incident log as required to incorporate more information. Develop a GIS/web-based database to create a spatial representation of the incidents logged	All	0	0	0	0	0	0	0	0	+	0	0	0	These actions aim to improve understanding of flood risk within the borough, and as such, this information will ultimately be used to inform FRM activities that are likely to increase resilience of Thurrock to flooding. The effects will be fairly localised. Potential effects on other SEA objectives relating to natural environment features are not clear at this stage.
10	**Investigate flooding records** and if necessary provide improvements to highways drainage.	Documented site visits following flood events. Data sharing with partners.	All	0	0	0	0	0	0	0	0	+	0	0	0	
11	**Runoff rates and volumes** for new small and large scale major developments (i.e. >10 dwellings, >1,000m2 built area) to be controlled.	For all new developments: The peak runoff rate for the 1 in 1 year and 1 in 200 year runoff must not exceed the peak greenfield runoff rate for the same event. The runoff volume for the development site in the 1 in 200 year, 6 hour rainfall event must not exceed the runoff volume for the same event.	All	0	0	0	0	+	0	+	0	+	++	0	0	These actions aim to reduce runoff in new developments, which is likely to be implemented by SuDS, therefore providing a significant benefit to SEA objective 10. Through implementing SuDS, there is the potential to have biodiversity benefits by providing new aquatic habitats. However, SEA objective 4 has been scored neutral due to no information about the new developments being available at present. Reducing the runoff is likely to increase the resilience of the borough to flooding in localised areas, having a positive effect on SEA objective 9. Reducing urban runoff will also benefit SEA objectives 5 and 7 as it will reduce pollution and therefore help to improve water quality. Introducing green roofs has the potential to provide new habitat, therefore having a beneficial effect on biodiversity. Green roofs may also add an interesting landscape feature, and therefore has the potential to protect the integrity of the borough's urban and rural landscapes (SEA objective 1). However, these objectives have been scored neutral as detail of these are unknown, as is the scale which may not be strategic.
12	**Runoff from development on previously developed sites** for small and large scale major developments (i.e. >10 dwellings, >1,000m2 built area) to be restricted to greenfield levels.	For previously developed sites the peak runoff rate (1 in 1 and 1 in 100 year) and volumes (1 in 100 year, 6 hour rainfall event) must not exceed the equivalent greenfield rates.	All	0	0	0	0	+	0	+	0	+	++	0	0	
13	**Green roofs/areas.**	Investigate opportunities to introduce green roofs/areas as and when sites become available for development.	All	0	0	0	0	0	0	0	0	+	++	0	0	
14	**Drainage infrastructure improvement**: rural roads.	Identify rural roads with no highways drainage and investigate installation of drainage ditches at the roadside to capture runoff.	All	0	-	0	0	0	0	0	0	0	0	0	0	This action aims to introduce drainage ditches on rural roads. There is a risk that it will be at the expense of hedgerows, which border the rural roads, therefore having a negative effect on SEA objective 2, which aims to protect and enhance designated and BAP habitats. Hedgerows are a designated BAP habitat under the Essex BAP. Effects are likely to be localised rather than strategic and significant, therefore it is a minor negative effect. However, this risk could be mitigated through the creation of new ditch habitat. It is unlikely that there will be any effects on the remaining SEA objectives, including SEA objective 9, as rural roads are not critical infrastructure.
15	**Drainage improvements**: planning policy.	Use planning policy and advice regarding paving of driveways, using residential soakaways, water butts etc. Develop policy to resist the paving over of driveways.	All	0	0	+	0	0	0	0	0	+	++	0	0	These actions aim to improve drainage in the borough by implementing SuDS, therefore providing a significant benefit to SEA objective 10. Stopping the reduction in the amount of green space available in the borough and introducing green verges will have a positive benefit on biodiversity, although minor due to the small scale. A way to strengthen positive effects on biodiversity will be to educate home owners on the benefit of having a front garden and how to improve their biodiversity potential. Reducing the runoff is likely to increase the resilience of the borough to flooding in localised areas, having a positive effect on SEA objective 9.
16	**Drainage improvements**: preferential flow paths.	Identify programme of potential preferential flow path works e.g. contoured grass verges.	All	0	0	0	0	0	0	0	0	+	++	0	0	

Action				SEA objective												Comments
ID	What?	How?	Ward	1	2	3	4	5	6	7	8	9	10	11	12	
17	Determine whether **current emergency response** to borough-wide surface water flooding is appropriate.	Review the Multi-Agency Flood Plan in the context of the SWMP mapping outputs with key partners including the Highways Agency and Network Rail	All	0	0	0	0	0	0	0	0	0	0	+	0	These actions aim to improve understanding of surface water flooding within the borough. With the key partners of the Highways Agency and Network Rail, there is a benefit to SEA objective 11, which aims to minimise the impacts of flooding to the borough's transport network. Providing the outputs to critical service providers will also minimise the impacts of flooding on the borough's key critical infrastructure, an aim of SEA objective 11.
18	Determine whether **services** (e.g. power, telecommunications) **are resilient to surface water flooding**.	Provide outputs from SWMP to critical service providers and meet to discuss the overall resilience of service across the Borough.	All	0	0	0	0	0	0	0	0	0	0	+	0	
19	Look for opportunities to **reduce flood risk to critical infrastructure** whilst upgrading the existing drainage infrastructure.	Review SWMP outputs in relation to critical infrastructure	All	0	0	0	0	0	0	0	0	0	0	+	0	
20	**Developers to demonstrate compliance with National Planning Policy**	Development control policy to ensure developers demonstrate compliance with NPPF by ensuring development will remain safe and will not increase risk to others, using more detailed integrated hydraulic modelling if required.	All	0	0	0	0	0	0	0	0	0	0	0	0	Overall, this action does not have any effect on the SEA objectives as it does not include any specific activities to reduce flood risk. It is likely to eventually lead to a positive effect on SEA objectives 9 and 11 increasing resilience of the borough to flooding, however this is not included as an effect the SEA objectives due to the uncertain nature and timescales at which benefits will occur. However, any FRM activities arising from this action could have a range of effects on the natural environment, both positive and negative, depending upon the activities they deliver, and they should be subject to thorough environmental assessment at a project stage to ensure they are sustainable and are delivered in accordance with the wider objectives of the LFRMS.
Areas of Critical Drainage (AoCD) Specific Actions																
21	**A13 drainage capacity.**	Highways Agency / Anglian Water to check on pumps and network at A13 to confirm condition. Confirmation of maintenance regime to Thurrock Borough Council.	Aveley & Uplands	0	0	0	0	0	0	0	0	0	0	+	0	There is likely to be a positive effect on SEA objective 11 as these actions aim to minimise impacts from flooding on the borough's transport network and other critical infrastructure through undertaking reviews from which activities can be based. The action is not expected to have an effect on the remaining SEA objectives.
22	**A13 emergency diversion procedures.**	Highways Agency to confirm A13 emergency diversion procedures.	Aveley & Uplands	0	0	0	0	0	0	0	0	0	0	+	0	
23	**Improvements to drainage infrastructure**: Purfleet Industrial Park / Milehams Yard.	Survey of the series of 300mm and 225mm diameter culvert crossings at Purfleet Industrial Park and Milehams Trading Estate.	Aveley & Uplands	0	0	0	0	0	0	0	0	0	0	+	0	
24	**Improvements to drainage infrastructure**: Purfleet Industrial Park / Milehams Yard.	Thurrock Council to liaise with RSPB at Aveley Marshes to establish water levels in the marsh. RSPB to show that any changes in levels will have no impact on local surface water regime.	Aveley & Uplands	0	0	0	0	0	0	0	0	0	0	0	0	This action has scored neutral on SEA objectives 1, 2, 4 and 5, as detail about this action is currently unknown. This also applies to the other SEA objectives. However, there is potential for this action to provide the opportunity to better manage water levels within the marshes in a way that will benefit biodiversity.
25	**Improvements to drainage infrastructure**: Purfleet Industrial Park / Milehams Yard.	Commission drainage studies to confirm where there are alterations in ground levels which may be causing the local gravity system to fail. Results to be used to confirm a way forward e.g. maintenance of existing system or installation of a new drainage network.	Aveley & Uplands	0	0	0	0	0	0	0	0	+	0	0	0	This action is likely to provide a positive effect on increasing flood resilience of the borough, although these effects are likely to be localised. It is unlikely that this action would immediately cause any effects on the other SEA objectives at a strategic scale. However, any FRM activities arising from this action could have a range of effects on the natural environment, both positive and negative, depending upon the activities they deliver, and they should be subject to thorough environmental assessment at a project stage to ensure they are sustainable and are delivered in accordance with the wider objectives of the LFRMS.
26	Ensure any development at the Ponds Farm Development provides a **betterment on the existing drainage system.**	Planning policy and information on SuDS.	Aveley & Uplands	0	0	0	0	0	0	0	0	+	+	0	0	This action could be implemented by the introduction of SuDS into the Ponds Farm development, therefore having a positive effect on SEA objective 10. Improved drainage will also increase resilience to flooding by the local businesses, providing benefit to SEA objective 9. However, any FRM activities arising from this action could have a range of effects on the natural environment, both positive and negative, depending upon the activities they deliver, and they should be subject to thorough environmental assessment at a project stage to ensure they are sustainable and are delivered in accordance with the wider objectives of the LFRMS.
27	**Emergency plan for AoCD003**	Highways team liaise with Emergency Planning team to ensure that an emergency plan is in place for road closures at this location.	West Thurrock & South Stifford	0	0	0	0	0	0	0	0	+	0	0	0	This action is likely to increase the borough's resilience to flooding, having a positive effect on SEA objective 9. It is not expected that there will be any effects on the remaining SEA objectives as this action does not include specific activities that will affect the natural environment.
28	**Drainage investigation** at the A126 junction.	Thurrock Council to liaise with Anglian Water and Lakeside re the A126 flood risk area. If under capacity, investigate options to install pumps or soakaways to alleviate flood risk.	West Thurrock & South Stifford	0	0	0	0	0	0	0	0	+	0	+	0	It is likely that this action will lead to a reduction in flood risk in the A126 flood risk area, therefore having a positive effect on SEA objectives 9 and 11. The effect is not expected to be significant due to the relatively small area that will be effected. It is unlikely FRM activities as a result of this action would have a negative effect on the natural environment in this location as it is already a developed urban area. However, any activities should be assessed if there were to be a negative effect on the natural environment, such as habitat corridors that may be present.
29	Ensure any development at Hadley Avenue provides a **betterment on the existing drainage system**	Planning policy and information on SuDS.	West Thurrock & South Stifford	0	0	0	0	0	0	0	0	+	+	0	0	This action could be implemented by the introduction of SuDS into the Ponds Farm development, therefore having a positive effect on SEA objective 10. Improved drainage will also increase resilience to flooding by the local businesses, providing benefit to SEA objective 9. However, any FRM activities arising from this action could have a range of effects on the natural environment, both positive and negative, depending upon the activities they deliver, and they should be subject to thorough environmental assessment at a project stage to ensure they are sustainable and are delivered in accordance with the wider objectives of the LFRMS.
30	**Drainage maintenance**: AoCD004	Liaise with Network Rail to review their maintenance programme for drainage ditches in their ownership running alongside the railway line.	West Thurrock & South Stifford	0	0	0	0	0	0	0	0	0	0	+	0	This action is likely to lead to an improvement in flood risk to transport assets within the borough, therefore scoring a positive effect on SEA objective 11.

Action				SEA objective												Comments
ID	What?	How?	Ward	1	2	3	4	5	6	7	8	9	10	11	12	
31	**Drainage investigation**: AoCD004.	Liaise with Anglian Water to confirm network capacity within this AoCD. If there is capacity, Thurrock Council to consider adding more gullies to increase the volume of water entering the network during a storm event.	West Thurrock & South Stifford	0	0	0	0	0	0	0	0	+	0	0	0	This action increases the resilience to flooding within the borough by removing flood waters from affected areas quickly, therefore having a positive effect on SEA objective 9. Adding more gullies within the borough has the potential to have a negative effect on SEA objective 7, as it could change or increase erosion. This could lead to a negative effect on habitats within the borough, by creating gullies in important habitat connectivity areas. There is also potential for a negative effect on SEA objective 5, as increasing runoff from areas could reduce the quality of water and morphology of the borough's rivers, particularly if it were to lead to more contaminated surface run off from roads entering the river network. It has been scored as neutral as it is unknown how this action will be implemented, and therefore what the effects will be. There is however an opportunity to create wildlife corridors within the gullies by creating more natural gullies. Due to the balance between potential risks and opportunities, the SEA objectives have been scored neutral.
32	**Preferential flow paths**: Hathaway Road.	Investigate the use of swales/French drains to attenuate and infiltrate runoff along Hathaway Road and reduce volumes of water ponding behind the rail embankment.	Chafford & North Stifford	0	0	+	0	0	0	0	0	+	++	+	0	The use of swales would provide a significant benefit to SEA objective 10, as it will directly introduce SuDS. The use of swales will provide new habitat opportunities, and therefore SEA objective 3 has been scored positive. If French drains were to be used, it would provide less of a positive effect as they are not as natural as swales. The introduction of improved drainage will increase resilience of the area and transport network to flooding, therefore having a positive effect on SEA objectives 9 and 11, although the effects are localised. It is unlikely that there will be any effects on the remaining SEA objectives as the area is urban, thereby reducing the amount of natural environment in the area. However, opportunity arises to improve water quality of runoff through the use of swales.
33	**Storage Area**: Grays Park.	Undertake a detailed drainage study at Grays Park to confirm potential to create preferential flow paths and water storage in the park.	Chafford & North Stifford	0	+	+	+	0	0	0	0	+	+	0	0	Providing water storage in the park also presents benefits to SEA objectives 2, 3 and 4, as there is opportunity to possibly create new habitat that could benefit estuarine or migratory species and ponds are a HAP within the Essex BAP. This will also enhance habitat connectivity. There is a risk of negative effects on the BAP mudflats that are present on the waterside edge of the park if any activities are undertaken. Introducing water storage will mean an introduction of SuDS, while also increasing resilience of the local community to flooding.
34	**Capital scheme**: storage area on recreation ground near to Stifford Primary School.	Undertake feasibility study to investigate the potential to create a small storage area on recreation ground near to Stifford Primary School to help reduce flows to the south that pool behind the railway embankment.	Chafford & North Stifford	0	+	+	0	0	0	+	0	+	+	0	0	Creating a storage area on the recreation ground provides the opportunity to improve BAP habitat, habitat connectivity and wildlife corridors within the borough, therefore having a positive effect on SEA objectives 2 and 3. This action is also likely to reduce erosion and pollution within the area, therefore having a positive effect on SEA objective 7. There will be benefits to SEA objectives 9 and 10 by reducing the risk of flooding and potential implementation of SuDS.
35	**Preferential maintenance regime**: AoCD006 (west).	Implement a preferential maintenance regime along roads to the west of the AoCD (including Roseberry Road, Castle Road & Belmont Road) to ensure that all flow is entering the drainage channels and not flowing over the road surface.	Chafford & North Stifford	0	0	0	0	0	0	0	0	+	0	0	0	This action is localised and small-scale, therefore there are neutral effects on all of the SEA objectives with the exception of SEA objective 9, as this action is likely to increase the local community's resilience to flooding and therefore have a positive effect.
36	**Drainage maintenance and improvement**: Florence Close.	Thurrock Council to liaise with Anglian Water to investigate potential to increase capacity of local drainage network in the vicinity of Florence Close by increasing gulley numbers. Need to confirm if there is capacity within the network and preferred approach.	Chafford & North Stifford	0	0	0	0	0	0	0	0	+	0	0	0	This action increases the resilience to flooding within the borough by removing flood waters from affected areas quickly, therefore having a positive effect on SEA objective 9. There is potential for a negative effect on SEA objective 3, as the construction of gullies could damage the limited amount of habitat surrounding Florence Close. However, the habitat in this area is not designated as BAP, therefore the effect would not be significant. There is also potential for a negative effect on SEA objective 5, as increasing runoff from areas could reduce the quality of water and morphology of the borough's rivers, particularly if it were to lead to more contaminated surface run off from roads entering the river network. There is however an opportunity to create wildlife corridors within the gullies by creating more natural gullies. Due to the balance between potential risks and opportunities, the SEA objectives have been scored neutral.
37	**Storage Area**: Hollowfield Avenue.	Thurrock Council to investigate potential for storage areas on land located within school playing field and sports ground.	Little Thurrock Rectory	0	+	+	+	0	0	+	0	+	+	0	0	Creating a storage area on the sports ground provides the opportunity to improve BAP habitats, habitat connectivity, wildlife corridors and increase aquatic habitat within the borough, therefore having a positive effect on SEA objectives 2, 3 and 4. This action is also likely to reduce erosion and pollution within the area, htereby having a positive effect on SEA objective 7. There will be benefits to SEA objectives 9 and 10 by reducing the risk of flooding and potential implementation of SuDS.
38	**Improvements to drainage infrastructure**: Hollowfield Avenue.	Increase the number of gullies connecting to Anglian Water Drainage network (there is a 1350mm diameter pipe in this location which may have the potential to alleviate flooding.	Little Thurrock Rectory Little Thurrock Blackshots Grays Thurrock	0	0	0	0	0	0	0	0	+	0	0	0	This action will increase resilience of the local area to flooding. There is a risk of a negative effect on SEA objective 3, as the construction of gullies could damage the limited amount of habitat surrounding Hollowfield Avenue. There is deciduous woodland BAP 175m to the east of Hollowfield Avenue, located within the cemetery. If construction was to be carried out close to this habitat there is potential for an adverse effect on biodiversity.
39	**Preferential flow paths**: Balfour Road / Whitehall Road.	Creation of preferential flow paths to control overland flow.	Little Thurrock Rectory Little Thurrock Blackshots Grays Thurrock	0	0	+	0	0	0	0	0	+	+	0	0	This action will enhance the resilience of Thurrock to flooding, however only at a localised scale. There are neutral effects on this action as there is no detail on how the preferential flow paths will be created. However there are no sensitive features in this area, reducing the likelihood of any effects from this action. Creating preferential flowpaths could be achieved through the introduction of SuDS, therefore having a positive effect on SEA objective 10. SuDS has the potential to create new habitat opportunities, therefore having a positive effect on SEA objective 3.
40	**Drainage infrastructure improvement**: AoCD008.	Thurrock Council to liaise with Anglian Water to investigate possibilities of connection to 1500mm diameter pipe to alleviate standing water problems.	Tilbury Riverside & Thurrock Park	0	0	0	0	0	0	0	0	+	0	0	0	This action has a neutral effect on the majority of the SEA objectives as it is unknown where the pipe will be installed and therefore what effects there will be. There is a positive effect on SEA objective 9 as this action will reduce the risk of flooding to people and property.

Action				SEA objective												Comments
ID	What?	How?	Ward	1	2	3	4	5	6	7	8	9	10	11	12	
41	**Confirm and map ownership and maintenance and identify 'mis-connections'** to the highway drainage.	Reference to Council records, liaison with Environment Agency, Anglian Water and landowners. Process will be used to obtain information and potentially enforce maintenance of drainage assets.	Tilbury Riverside & Thurrock Park	0	0	0	0	0	0	0	0	+	0	0	0	These actions are likely to have neutral effect on all of the SEA objectives with the exception of a small scale positive effect on SEA objective 9, as it will increase the resilience of the borough to flooding. The effect will come from the asset register being up to date, which will increase understanding of how flooding is prevented in Thurrock and will also ensure assets are in good condition, therefore increasing resilience to flooding. However, such actions could have a range of effects on the natural environment, both positive and negative, depending upon the activities they deliver, and they should be subject to thorough environmental assessment at a project stage to ensure they are sustainable and are delivered in accordance with the wider objectives of the LFRMS.
42	**Improvements to drainage infrastructure**: AoCD009	Undertake assessment of drainage infrastructure outfalling to local drainage ditches. If there is not sufficient capacity within the system the potential for on-line attenuation prior to outfall into the watercourses should be investigated.	Tilbury St Chads East Tilbury Chadwell St Marys Little Thurrock Rectory	0	0	0	0	0	0	0	0	+	0	0	0	
43	**Improvements to drainage infrastructure**: AoCD009	Thurrock Council to provide support to residents through creation of preferential flow paths or property level protection where local ground levels have altered and changed the flow regime.	Tilbury St Chads East Tilbury Chadwell St Marys Little Thurrock Rectory	0	0	0	0	0	0	0	0	+	0	0	0	This action will increase Thurrock's residents' resilience to flooding by providing property level protection. However, the action is only small scale, and therefore will not have a significant effect on SEA objective 9. It is not expected that the measures will have an effect on the remaining SEA objectives due to the small scale of the action.
44	**Network rail culverts**: AoCD009	Liaise with Network Rail to ensure culverts are appropriately sized and are being maintained.	Tilbury St Chads East Tilbury Chadwell St Marys Little Thurrock Rectory	0	0	0	0	0	0	0	0	0	0	+	0	Ensuring culverts are functioning properly will help to minimise the impact of flooding on the railway network, therefore having a positive effect on SEA objective 11. Introduction of additional culverts could have a negative effect on biodiversity, however at this early stage it is not clear if the action will involve additional culverts.
45	**Anglian Water adoption of foul and surface water sewer network** in this AoCD	Thurrock Council and Anglian Water to meet to discuss adoption of both foul and surface water sewer network in this AoCD. Ensure a separate surface water and foul water system is provided as part of any new development and is adopted by Anglian Water.	East Tilbury	0	0	0	0	+	0	+	0	+	0	0	0	There is likely to be a positive effect on SEA objectives 5 and 7 as segregation of sewer networks will improve water quality and reduce pollution. This action will also have positive effect on SEA objective 9 as it will reduce the risk of flooding. There is a concentration of listed buildings on Bata Avenue in East Tilbury, therefore consideration should be given to these buildings before any construction begins.
46	**Asset survey of surface water ditch**: AoCD010.	Surface water ditch in the south eastern corner of East Tilbury contains all of the town's surface water drainage; ownership and maintenance responsibilities are unknown. If ownership cannot be confirmed, Thurrock Council to consider adopting this network.	East Tilbury	0	0	0	0	0	0	0	0	0	0	0	0	This action has a neutral effect on all of the SEA objectives as it does not include specific action to reduce flood risk or intervention within the environment.
47	**Source control SuDS**: north A13.	Investigate potential for detention basin on farmland to the north of the A13.	Orsett	0	+	+	0	0	0	0	0	+	0	+	0	Creating water storage on farmland provides the potential to create new BAP habitat that will benefit the habitat and wildlife connectivity of the borough, while also providing positive effects on reducing flood risk to community and the transport network. However, creation of the detention basin should avoid the BAP habitats of deciduous woodland and traditional orchards in the area.
48	**Surface water network capacity improvements**: AoCD01.	Ensure new development in AoCD11b invests in the local surface water network which is currently at capacity.	Stanford-le-Hope West Orsett	0	0	0	0	0	0	0	0	+	+	0	0	This action will increase the local area's resilience to flooding, and has the potential to introduce SuDS, therefore having a positive effect on SEA objectives 9 and 10. However, due to the proximity of the Thames Estuary and Marshes SPA and Ramsar, such actions could have a range of effects on the natural environment, both positive and negative, depending upon the activities they deliver, and they should be subject to thorough environmental assessment at a project stage to ensure they are sustainable and are delivered in accordance with the wider objectives of the LFRMS.
49	**Asset survey and maintenance responsibilities**: Prospect and Valmar Avenues	Liaise and educate residents of Prospect and Valmar Avenue regarding their riparian responsibilities regarding the culvert/ditch to the rear of their properties.	Stanford-le-Hope West	0	0	0	0	0	0	0	0	+	0	0	0	This action will help to reduce flood risk for these residents, therefore the effect is localised. There is an opportunity to include responsibilities that will benefit the habitats that may be present in the ditch at the rear of the properties, and care should be taken to reduce negative effects from the maintenance of the ditch.
50	**Improvements to drainage infrastructure**: Runnymede Road recreation ground	Identify recreation ground as a surface water flood storage area in asset register. Complete condition survey of the outfall from the recreation ground and confirm how it reconnects to the Stanford Brook. Undertake any required remedial action.	Stanford-le-Hope West	0	0	0	+	0	0	0	0	+	0	0	0	The majority of Runnymede recreation ground is designated as deciduous BAP habitat, therefore any action to introduce surface water would need to avoid an adverse effect on this BAP habitat. New water storage will provide benefit to biodiversity through the introduction of a new wildlife habitat, therefore having a positive effect on SEA objective 4. Due to the risks and benefits from this action, SEA objectives 2 and 3 have been scored neutral. This action will increase resilience of the local area to flooding, having a positive effect on SEA objective 9.
51	**Source control SuDS**: Butts Lane	Liaise with local landowners to confirm maintenance regime of the brook flowing west-east to the north of the built up area and south of the A13 junction. Consider options to slow the flow of the channel. Investigate the creation of a bund to contain water in the open land, reducing overland flow and flooding on Butts Lane.	Stanford-le-Hope West	0	0	0	+	0	+	0	0	+	+	0	0	This action will help to reduce flood risk for these residents (SEA objective 9), therefore the effect is localised. There is an opportunity to include responsibilities that will benefit the habitats that may be present in this ditch at the rear of the properties, and care should be taken to reduce negative effects from the maintenance of the ditch. Creating a storage area will also reduce the risk of flooding, while also providing the potential to create new riverine habitat, therefore having a positive effect on SEA objective 4. There is also a positive effect on SEA objective 6 as this action could naturalise the river channel, therefore contributing towards improving the WFD status of the waterbody and achievement of the WFD objectives. There is also a positive effect on SEA objective 10 from the implementation of SuDS.

Action				SEA objective												Comments
ID	What?	How?	Ward	1	2	3	4	5	6	7	8	9	10	11	12	
52	**Asset register**: open land in Stanford-le-Hope	Open land in Stanford-le-Hope and Runnymede recreation ground act as flood storage areas; these should be identified as such in the asset register and highlighted to development control teams. Any development in these areas would require level for level floodplain compensation.	Stanford-le-Hope West Orsett	0	0	0	+	0	0	0	0	+	+	0	0	The majority of Runnymede recreation ground and open ground near Chantry Crescent is designated as deciduous BAP habitat, therefore any action to introduce surface water would need to avoid an adverse effect on this BAP habitat. New water storage will provide benefit to biodiversity through the introduction of a new wildlife habitat, therefore having a positive effect on SEA objective 4. Due to the risks and benefits from this action, SEA objectives 2 and 3 have been scored neutral. This action will increase resilience of the local area to flooding, having a positive effect on SEA objective 9. There is also a positive effect on SEA objective 10 from the implementation of SuDS.
53	**Improvements to drainage maintenance**: Victoria Road Brook	Confirm with EA the maintenance regime for Victoria Road Brook. If low priority, work with local community to help maintain the brook.	Stanford-le-Hope West	0	0	0	0	0	0	0	0	+	0	0	0	This action will help to reduce flood risk for these residents, therefore the effect is localised. There is an opportunity to include responsibilities that will benefit the habitats that may be present in this ditch at the rear of the properties, and care should be taken to reduce negative effects from the maintenance of the ditch.
54	**Improvements to drainage infrastructure**: Southend Road	Introduction of extra gully connections to the Anglian water system along Southend Road, to reduce pooling at the Bypass Junction at Manorway.	The Homesteads Stanford East & Corringham Town	0	0	0	0	0	0	0	0	+	0	0	0	This action increases the resilience to flooding within the borough by removing flood waters from affected areas quickly, therefore having a positive effect on SEA objective 9. Adding more gullies within the borough has the potential to have a negative effect on SEA objective 7, as it could change increase erosion. This could lead to a negative effect on habitats within the borough, by creating gullies in important habitat connectivity areas. There is also potential for a negative effect on SEA objective 5, as increasing runoff from areas could reduce the quality of water and morphology of the borough's rivers, particularly if it were to lead to more contaminated surface run off from roads entering the river network. There is potential for a negative effect on SEA objective 3, as the construction of gullies could damage the habitat around Southend Road, particularly the deciduous woodland that is present along some of the road. This action will increase resilience of the local area to flooding. There is however an opportunity to create wildlife corridors within the gullies by creating more natural gullies. Due to the balance between potential risks and opportunities, the SEA objectives have been scored neutral.
55	**Source control SuDS**: Southend Road	Undertake drainage survey where Southend Road crosses the Manorway, investigating the potential to provide a detention basin in existing green spaces.	The Homesteads Stanford East & Corringham Town	0	0	0	0	0	0	0	0	+	+	0	0	Creating water storage on open land provides the potential to create new habitat that will benefit the habitat and wildlife connectivity of the borough, while also providing positive effects on reducing flood risk to community and the transport network. However, there is potential for a negative effect on SEA objective 3, as the construction of gullies could damage the habitat around Southend Road, particularly the deciduous woodland that is present to the south of the junction. However, it has been scored neutral as details of the action are currently unknown. This action will increase resilience of the local area to flooding (SEA objective 9). There is also a positive effect on SEA objective 10 from the implementation of SuDS.
56	**Emergency planning**: Southend Road	Ensure an emergency plan and traffic management plan is in place for Southend Road underpass during flood events.	The Homesteads Stanford East & Corringham Town	0	0	0	0	0	0	0	0	+	0	+	0	This action will increase the resilience of the local population and transport network to flooding by creating an emergency plan. There are no effects on the remaining SEA objectives as there is are no direct interventions in the area.
57	**South control SuDS**: A13 / railway	Investigate two flow paths from farmland in the north and northeast of the AoCD to determine the effects of providing storage in the north of the catchment.	Orsett	0	+	+	0	0	0	0	0	+	+	+	0	Creating a storage area on the recreation ground provides the opportunity to improve BAP habitat, habitat connectivity and wildlife corridors within the borough, therefore having a positive effect on SEA objectives 2 and 3. This action is also likely to reduce erosion and pollution within the area. There will be benefits to SEA objectives 9, 10 and 11 by reducing the risk of flooding and potential implementation of SuDS.
58	**Source control SuDS**: Hassen Brook	Feasibility study into the potential creation of a storage area between the A13 and railway line with a flow control limiting surface water flow entering the Hassen Brook from the north of the catchment.	The Homesteads Corringham & Fobbing	0	0	0	0	0	0	0	0	+	+	+	0	
59	**Improvements to drainage infrastructure**: Bramleys and Russet Close	Provision of extra gullies along Bramleys and Russet Close to Anglian Water System. Investigate the impact this would have on flooding in the Dunstable Road area.	The Homesteads	0	0	0	0	0	0	0	0	+	0	0	0	This action increases the resilience to flooding within the borough by removing flood waters from affected areas quickly, therefore having a positive effect on SEA objective 9. Adding more gullies within the borough has the potential to have a negative effect on SEA objective 7, as it could change increase erosion. This could lead to a negative effect on habitats within the borough, by creating gullies in important habitat connectivity areas. There is also potential for a negative effect on SEA objective 5, as increasing runoff from areas could reduce the quality of water and morphology of the borough's rivers, particularly if it were to lead to more contaminated surface run off from roads entering the river network. There is potential for a negative effect on SEA objective 3, as the construction of gullies could damage the habitat around Bramleys and Russet Close, although it is not designated as BAP habitat. This action will increase resilience of the local area to flooding. There is however an opportunity to create wildlife corridors within the gullies by creating more natural gullies. Due to the balance between potential risks and opportunities, the SEA objectives have been scored neutral.
60	**Flood storage**: Balstonia Recreation Gardens	Investigate potential for flood storage in Balstonia Recreation Gardens to reduce the impact of flooding on Bramley.	The Homesteads	0	+	+	+	0	0	0	0	+	+	0	0	Creating a storage area on the recreation gardens provides the opportunity to improve BAP habitats, habitat connectivity, wildlife corridors and increase aquatic habitat within the borough, therefore having a positive effect on SEA objectives 2, 3 and 4. This action is also likely to reduce erosion and pollution within the area. There will be benefits to SEA objectives 9 and 10 by reducing the risk of flooding and potential implementation of SuDS

Action				SEA objective												Comments
ID	What?	How?	Ward	1	2	3	4	5	6	7	8	9	10	11	12	
61	**Improvement to drainage infrastructure**: Wharf Road pumps	Confirm ownership and maintenance of pumps at Wharf Road and Stanford-le-Hope Industrial Park. Investigate potential to increase size/capacity of pumps, potentially sourcing funding from users of the industrial estate.	Stanford-le-Hope West	0	0	0	0	0	0	0	0	+	0	0	0	This action will increase the resilience of the local business to flooding, by introducing better pumps. However, Wharf Road leads to Thames Estuary and Marshes SPA and Ramsar and Mucking Flats and Marshes SSSI, therefore any actions to increase the capacity of pumps should be assessed for impacts on these designated sites. There is also a range of BAP habitat in the area. The effect has been scored neutral as the exact location of the pumps are unknown, as is the magnitude of the effect.
62	**Improvements to drainage infrastructure**: AoCD012	Investigate 'misconnections' and educate homeowners on responsibilities regarding property drainage.	Bulphan	0	0	0	0	0	0	0	0	+	0	0	0	This action will have a small scale, localised positive effect on SEA objective 9, as it will increase the homeowners' resilience to flooding. There are also no direct FRM actions contained within this action, therefore there are no effects on the remaining SEA objectives.
63	**Improvements to drainage infrastructure**: main river alleviation schemes	Liaise with Environment Agency regarding need and opportunities for flood defence schemes on Main Rivers located across the AoCD.	Bulphan	0	0	0	0	0	0	0	0	0	0	0	0	These actions do not include any direct FRM actions that are able to be assessed, therefore having a neutral score on all of the SEA objectives. However, if direct FRM actions arise from the liaison with the Environment Agency, there could be a range of effects on the natural environment, both positive and negative, depending upon the activities they deliver, and they should be subject to thorough environmental assessment at a project stage to ensure they are sustainable and are delivered in accordance with the wider objectives of the LFRMS.
64	**Improvement to drainage infrastructure**: Bulphan	Investigate where larger capital projects, such as increasing the size of the local sewer network or providing storage, may be required by looking at Anglian Water drainage network plans and RAG capacity plans.	Bulphan	0	0	0	0	0	0	0	0	0	0	0	0	
65	**Planning Policies**: Ford site	Control development at the Ford site by ensuring developers provide a new separate drainage system. The current surface water system rejoins a combined system which has insufficient capacity.	Ockendon Belhus	0	0	0	0	0	0	0	0	+	+	0	0	This action will provide increased resilience for the area against flooding, therefore having a positive effect on SEA objective 9. The action could also include the introduction of SuDS, which would have a positive effect on SEA objective 10.
66	**Improvements to drainage infrastructure**: Buckles Lane	Thurrock Council to consider adopting highway drainage from Buckles Lane, and reinstate and maintain drainage ditches.	Belhus	0	0	0	0	0	0	0	0	+	0	+	0	This action increases the resilience of the area and the transport network to flooding, therefore having a positive effect on SEA objectives 9 and 11. However, such maintenance actions could have a range of effects on the natural environment, both positive and negative, and the maintenance should be subject to thorough environmental assessment at a project stage to ensure they are sustainable. For example, the precise location and effects of the drainage ditches should be assessed, as the eastern end of Buckles Lane has a deciduous woodland BAP habitat. Biodiversity requirements should be considered to influence management actions, i.e. not clearing ditches if there is potential for biodiversity benefit.
67	**Improvement to drainage capacity:** AoCD015	Investigate drainage capacity due to increased pressure from future development in this area. Where there is limited capacity, development policy should ensure development invests in the surface water drainage network.	Aveley & Uplands	0	0	0	0	0	0	0	0	0	0	0	0	There are no effects from this action on the SEA objectives as it does not include direct FRM activities, although there is opportunity to introduce SuDS into the development policy and therefore into development proposals.
68	**Improvements to drainage infrastructure:** AoCD015	Thurrock Council to undertake asset survey and consider adopting maintenance of ditches that fall into 'no-man's land' to ensure future maintenance responsibilities.	Aveley & Uplands	0	0	0	0	0	0	0	0	0	0	0	0	This action does not have any effects on the SEA objectives as it does not include direct FRM activities, however, consideration should be given to the types of maintenance to encourage enhancing of any habitat features that may be present in the ditches.

Table 5-5: Summary of impacts of LFRMS actions on SEA objectives

Receptor	SEA Objective		Summary of impacts	Mitigation requirement
Landscape	**1**	Protect the integrity of the Borough's urban and rural landscapes, and promote the key characteristics of the SLAs and Green Belt.	The majority of LFRMS actions are focused upon undertaking investigations into local flood risk issues and developing appropriate solutions. Given the local scale of the investigations and lack of information at this stage regarding the type or scale of FRM interventions that might take place, these actions have been scored as neutral for most of the SEA objectives, and in particular those associated with the natural environment. However, these actions could have a range of environmental effects, both positive and negative, depending upon the activities they deliver, and they should be subject to thorough environmental assessment at a project stage to ensure they are sustainable and are delivered in accordance with the wider objectives of the LFRMS. It is particularly important that any potential effects are considered cumulatively across the programme of LFRMS actions as the strategy proposes a large number of actions which together could combine to cause significant effects, particularly if a series of actions affect an individual or connected group of environmental features.	There is a general lack of information at this stage to identify the types of effects that are likely to occur. Therefore it is not possible to make a judgement as to the timescale over which they might occur or their likely probability or permanence. It is reasonable to assume that any environmental effects might occur over a range of timescales and will comprise both temporary and permanent effects. It is important that individual actions are assessed at the project stage to determine their potential environmental impacts and that due regard is made to the LFRMS objectives that seek to protect and enhance the environment.
Biodiversity, flora and fauna	**2**	Protect and enhance designated and BAP habitats and species in the borough.		
	3	Maintain and enhance habitat connectivity and wildlife corridors within the borough.		
	4	Maintain existing, and where possible create new, riverine and estuarine habitat to benefit migratory and aquatic species and fisheries, and maintain upstream access.		
Water environment	**5**	Improve the quality and quantity of the water and morphology in the borough's rivers.		
	6	Do not inhibit achievement of the WFD objectives and contribute to their achievement where possible.		
Soils and geology	**7**	Reduce the risk of soil erosion and pollution.		
Archaeology and Cultural Heritage	**8**	Conserve and enhance the historic environment, heritage assets and their settings		
Population	**9**	Increasing the resilience of people, property and businesses and critical infrastructure within Thurrock to the risk of flooding.	The LFRMS actions seek to further the understanding of and improve local flood risk and provide a mechanism through which appropriate solutions can be developed. These actions are primarily focused on delivering benefits to people and property and each has the potential to contribute positively to these SEA objectives. At this stage there is a general lack of information regarding how these actions may be delivered and what effects they might have, and therefore it is difficult to determine the scale or significance of any environmental benefits that might be achieved. Further assessment is required for each action as it is delivered so that the environmental effects, both positive and negative, in relation to the receptors encompassed by these SEA objectives, can be identified.	
	10	Increase the use of SuDS, particularly in all new developments.		
Material assets	**11**	Minimise the impacts of flooding to the borough's transport network and key critical infrastructure.		
Climate	**12**	Reduce vulnerability to climate change impacts and promote measures to enable adaptation to climate change impacts.		

6 Conclusion and recommendations

6.1 Conclusions

The LFRMS aims to promote objectives and actions that seek to enable a more detailed understanding of flood risk within the borough, whilst providing a mechanism through which appropriate FRM activities can be delivered. It is an important tool to protect vulnerable communities and help deliver sustainable regeneration and growth.

This SEA has been undertaken to identify the likely significant environmental effects of implementation of the LFRMS. A proportionate approach was adopted towards establishing the scope of the SEA, reflecting the high-level nature of the LFRMS.

A range of different strategy options for delivering the LFRMS have been assessed at a strategic level against the SEA objectives. These alternatives include the 'do nothing' scenario, where no action is taken and existing assets and ordinary watercourses are abandoned, and the 'maintain current flood risk' scenario, where existing assets and watercourses are maintained as present in line with current levels of flood risk.

The assessment indicates that the 'do nothing' approach is likely to result in a number of significant adverse effects, particularly due to increased flood risk to people and property, and effects on other environmental assets including water quality, historic assets and biodiversity, where increased flooding may create new pathways for the spread of invasive non-native species. These impacts would be likely to increase over time as responsible bodies will be unable to incorporate precautionary measures in existing or new developments in a response to climate change pressures. Conversely, increased flood risk may result in greater connectivity between watercourses and their floodplains, offering opportunities for habitat creation/enhancement of benefit to a range of protected and notable species.

The option to 'maintain current flood risk' is likely to result in little or no additional impact on the environment in the short to medium term as the existing FRM regime continues to maintain existing levels of flood protection. However, in the future, as a result of climate change, flood risk will increase, resulting in many of the impacts identified under the 'do nothing' scenario, although potentially to a lesser extent and significance.

Therefore, the SEA identifies that implementation of the LFRMS to 'understand and manage flood risk from localised sources' is the only realistic approach to be employed by the Thurrock Council as it has the potential to provide a range of environmental benefits and offers a pro-active approach to managing flood risk.

6.1.1 LFRMS objectives

Assessment of the LFRMS objectives against the SEA objectives has been undertaken (see Table 5-2). No negative environmental effects have been identified from the LFRMS objectives. Many of the proposed LFRMS objectives have the potential for both direct and indirect environmental benefits. LFRMS objective 7 in particular has potential to provide a positive contribution to all of the SEA objectives and make a significant positive contribution to many of them, as it seeks to encourage design and development that not only reduces flood risk but also seeks to improve environmental quality. In particular, there is opportunity through the LFRMS to achieve a range of biodiversity benefits, including new habitat creation, enhancement of existing habitats and greater habitat connectivity.

In addition, as expected of a strategy for managing flood risk, the majority of objectives within the strategy will contribute to achievement of the SEA objectives that seek to reduce flood risk to people, property and infrastructure. As a result, the LFRMS is likely to have a significant positive effect on reducing flood risk to local communities.

Some of the LFRMS objectives, in particular 1, 3 and 7, are also likely to assist with climate change adaptation. In particular, measures that reduce flood risk, promote better use of water resources, seek to deliver new habitat creation and better connection between existing habitats (such as de-culverting), could make a significant positive contribution to achievement of SEA objective 12.

At present, the potential effects associated with several of the LFRMS measures are neutral. These are largely neutral as they are data gathering and communication objectives rather than environmental objectives. There is a potential that to achieve these LFRMS objectives it may result in physical interventions that could affect achievement of several of the SEA objectives, depending upon how they are implemented. These risks are directly associated with the type and scale of development or measures to achieve the social objectives, and their location in relation to important or sensitive environmental features. However, given that the LFRMS includes objective 7 which seeks to deliver a range of environmental improvements, such interventions, if delivered in an inappropriate manner, would be likely to conflict with delivery of the LFRMS. Therefore, the LFRMS should ensure integration of its objectives across all underpinning actions so that delivery of individual measures does not conflict with achievement of the wider strategy objectives, but instead seeks to contribute towards these objectives at all stages of the strategy's implementation. Achievement of reducing flood risk can also help to achieve the LFRMS's social objectives as it would alleviate the cost and disruption associated with flooding, while also reducing the stress and anxiety associated with the risk of flooding.

A detailed assessment of the potential cumulative effects of the LFRMS actions should be undertaken when further details regarding specific project level measures and their implementation are known.

6.1.2 LFRMS actions

Assessment of the LFRMS actions against the SEA objectives was undertaken (Table 5-4). Some negative and positive environmental effects have been identified, with the majority having a neutral effect. The two negative effects are both minor, and arise from the actions that require the installation of culverts and some gullies.

Many of the LFRMS actions have a neutral effect as they are reviews and research actions focused on improving understanding of local flood risk rather than implementation of FRM measures. They will generally have fairly local effects, but primarily contribute towards the SEA objectives that aim to reduce flood risk within the borough. Actions to reduce flood risk could have a range of effects on the natural environment, and have the potential for indirect environmental benefits. LFRMS actions that provide water storage in green spaces such as parks, open spaces and road verges have the potential to provide a positive contribution to the SEA objectives concerned with biodiversity through the introduction of new wildlife habitat.

In addition, as expected of a strategy for managing flood risk, the majority of actions within the strategy will contribute to achievement of the SEA objectives that seek to reduce flood risk to people, property and infrastructure. As a result, the LFRMS is likely to have a positive effect on reducing flood risk to local communities. The opportunity to include SuDS is reflected in the actions, especially 11, 12, 13, 15, 16 and 32, where a significant positive effect has been assessed.

The increased understanding of flood risk that many of the LFRMS actions will provide will indirectly contribute towards SEA objective 12 by increasing understanding of the effects of climate change. This increased understanding has the potential to lead to development and implementation of management measures that will reduce vulnerability to climate change.

The physical interventions that could come as a result of the LFRMS actions could affect the achievement of the SEA objectives, depending on how the actual FRM measures are implemented. These risks are directly associated with the type and scale of the FRM and their location in relation to environmental features. Therefore the LFRMS should ensure that delivery of these measures does not adversely affect the achievement of the SEA objectives. These physical interventions should be subject to a thorough environmental assessment at the project stage to ensure they are sustainable and are delivered in accordance with the LFRMS objectives.

6.2 Recommendations

The assessment of the LFRMS objectives and actions has identified a number of areas where the LFRMS could be strengthened to ensure delivery of a sustainable approach. These areas are associated with communication aspects regarding flood risk, and not directly aiming to implement FRM measures. Specifically, these apply to the following LFRMS objectives/measures:

- Objective 2 – *Identify any gaps where further studies are required so we can get a better understanding of the causes and effects of local flooding.*
- Objective 4 – *Establish clear roles, powers and responsibilities for Thurrock RMAs.*

- Objective 5(i) – *Provide improved communication of clear information on local flood risk, appropriate responses and the responsibilities for us and our partners.*
- Objective 5(ii) – *State what we and other RMAs cannot take responsibility for, and facilitate engagement of the public and stakeholders to take action.*
- Objective 6 – *Improve co-operative working between all RMAs, including across administrative boundaries.*
- Objective 8 – *Establish a strategic funding plan and programme so we identify priorities, secure funding for measures that are affordable and that wherever possible include provisions for contributions by those who benefit.*

Although many of these objectives have a positive effect on SEA objectives 9 and 11 to minimise the risk of flooding to the Borough, there are neutral effects on the other SEA objectives. Therefore, while achieving these LFRMS objectives there is an opportunity for the LFRMS to implement FRM measures that also consider the SEA objectives as a whole, and therefore produce a sustainable FRM programme which enhances biodiversity, historic assets and landscape character.

In order to ensure that the LFRMS does not result in adverse effects, all strategy objectives should be integrated so that delivery of individual actions does not conflict with achievement of the wider strategy objectives. In addition, development and implementation of these actions should be effectively managed by ensuring that, where necessary, proposals are assessed to determine their potential environmental effects (positive and negative) in advance of their implementation and that appropriate mitigation measures are built into their delivery as required.

In addition, LFRMS objective 7 (*Improve natural habitat and the social environment through flood management schemes which provide multiple benefits*) has the potential to deliver significant environmental benefits. The LFRMS should seek to maximise the potential environmental benefits associated with delivery of this objectives and actions. This can be best achieved through the integration of LFRMS objectives and through close partnership working, so that appropriate resources and funding are effectively allocated.

Table 6-1 summarises the recommendations made by the SEA and shows how the recommendations have been responded to in the LFRMS.

Table 6-1: How the environmental report has been taken into account in the LFRMS

SEA recommendation	Final decision
LFRMS to be strengthened by considering the SEA objectives as a whole to ensure delivery of a sustainable approach/	The LFRMS has been updated to take account of the SEA objectives to ensure that LFRMS actions will be delivered in a sustainable way.
LFRMS objectives should be integrated so that delivery of individual actions do not conflict with achievement of the wider strategy objectives.	LFRMS actions will be undertaken with consideration of the wider Strategy objectives.
Proposals should be assessed to determine their potential environmental effects (positive and negative) in advance of implementation and appropriate mitigation measures are built into their delivery as required.	As actions identified in the strategy are investigated in more detail, further environmental assessment will be undertaken during the feasibility stages to identify what appropriate mitigation measures may be required for their delivery.
LFRMS should seek to maximise the potential environmental benefits associated with delivery of the objectives and actions.	LFRMS has been updated to include more explicit reference to WFD and the environment and how the Strategy will seek to maximise environmental benefits during deliver of the objectives and actions.

6.3 Monitoring

The SEA Regulations require Thurrock Council to monitor the significant environmental effects (positive and negative) upon the implementation of the LFRMS. Key potential environmental effects that require monitoring are listed in Table 6-2. Several of these monitoring requirements are likely to require a partnership approach to effectively track the effects of the strategy. Possible partners for monitoring responsibility are therefore highlighted.

The monitoring indicators will enable the LFRMS to be monitored and any problems or shortfalls to be highlighted and remedied at an early stage. If failings are evident, it will be necessary for the LFRMS to be revised so that the achievement of the SEA objectives is not compromised. Of note, it is unlikely

that any effects negative or otherwise will be seen immediately and that the relative time scale for monitoring will vary for each indicator/target.

Table 6-2: SEA monitoring framework

LFRMS objective / action	SEA objective(s)	Potential significant effects	Monitoring indicator	Possible monitoring and/or delivery partners
Objective 1 *Reduce the likelihood and consequence of flooding, particularly from surface water, groundwater and ordinary watercourses.*	9, 11 and 12	Introducing FRM measures with the objectives of reducing flood risk, therefore reducing harm to people, economy and society assists with the achievement of all these SEA objectives.	Number of residential properties at risk of flooding. Number of key services (e.g. hospitals, health centres, residential/care homes, schools etc.) at risk from flooding. Length of road and rail infrastructure at risk from flooding. Number of key infrastructure assets at risk from flooding. Area of habitat created as a result of implementation of the LFRMS (e.g. flood storage areas creating wetland habitat). Number of barriers to fish migration removed.	Thurrock Council Anglian Water Environment Agency Highways Agency
Objective 3 *Reduce the vulnerability of Thurrock, its residents and visitors to the detrimental effects of flooding.*	9, 11 and 12	Introducing FRM measures with the objectives of reducing flood risk, therefore reducing harm to people, economy and society assists with the achievement of all these SEA objectives.	Number of residential properties at risk of flooding. Number of key services (e.g. hospitals, health centres, residential/care homes, schools etc.) at risk from flooding. Length of road and rail infrastructure at risk from flooding. Number of key infrastructure assets at risk from flooding. Area of habitat created as a result of implementation of the LFRMS (e.g. flood storage areas creating wetland habitat). Number of barriers to fish migration removed.	Thurrock Council Anglian Water Environment Agency Highways Agency
Objective 7 *Improve natural habitat and the social environment through flood management schemes which provide multiple benefits.*	2, 3, 4, 5, 6, 9, 11 and 12	Improving FRM systems with the objectives of improving the environment as well as reducing harm to people, economy, environment and society assists with the achievement of all the SEA objectives.	Area of designated sites adversely affected by flooding. Monitoring of reported status of designated nature conservation sites. Percentage of land designated as nature conservation sites as a result of LFRMS measures. Area of habitat created as a result of implementation of the LFRMS (e.g. flood storage areas creating wetland habitat). Number of barriers to fish migration removed. Water quality and morphology of the borough's watercourses. Number of pollution incidents. Number of SuDS schemes installed as part of the LFRMS. Number and volume of Environment Agency licensed abstractions. Numbers of sites with high	Thurrock Council Anglian Water Environment Agency Highways Agency

LFRMS objective / action	SEA objective(s)	Potential significant effects	Monitoring indicator	Possible monitoring and/or delivery partners
			pollution potential (e.g. landfill sites, waste water treatment works) at risk from flooding. Achievement of WFD objectives. Percentage of water bodies achieving 'Good' ecological status/potential. No deterioration in WFD status. Number of residential properties at risk of flooding. Number of key services (e.g. hospitals, health centres, residential/care homes, schools etc.) at risk from flooding. Length of road and rail infrastructure at risk from flooding. Number of key infrastructure assets at risk from flooding.	
Action 11 **Runoff rates and volumes** for new small and large scale major developments (i.e. >10 dwellings, >1,000m2 built area) to be controlled. *For all new developments:* *The peak runoff rate for the 1 in 1 year and 1 in 200 year runoff must not exceed the peak greenfield runoff rate for the same event.* *The runoff volume for the development site in the 1 in 200 year, 6 hour rainfall event must not exceed the runoff volume for the same event.*	10	Increase of SuDS schemes within the Borough through introducing ways to manage runoff.	Number of SuDS schemes installed as part of the LFRMS.	Thurrock Council Anglian Water Environment Agency
Action 12 **Runoff from development on previously developed sites** for small and large scale major developments (i.e. >10 dwellings, >1,000m2 built area) to be restricted to greenfield levels. *For previously developed sites the peak runoff rate (1 in 1 and 1 in 100 year) and volumes (1 in 100 year, 6 hour rainfall event) must not exceed the equivalent greenfield rates.*	10	Increase of SuDS schemes within the Borough through introducing ways to manage runoff	Number of SuDS schemes installed as part of the LFRMS.	Thurrock Council Anglian Water Environment Agency
Action 13 **Green roofs/areas.** *Investigate opportunities to introduce green roofs/areas as and when sites become available for development.*	10	Increase of SuDS schemes within the Borough through introducing ways to manage runoff	Number of SuDS schemes installed as part of the LFRMS.	Thurrock Council Anglian Water Environment Agency
Action 15 **Drainage improvements**: planning policy. *Use planning policy and advice regarding paving of driveways, using residential soakaways, water butts etc. Develop policy to resist the paving over of driveways.*	10	Increase of SuDS schemes within the Borough through introducing ways to manage runoff	Number of SuDS schemes installed as part of the LFRMS.	Thurrock Council Anglian Water Environment Agency
Action 16 **Drainage improvements**: preferential flow paths. *Identify programme of potential preferential flow path works e.g. contoured grass verges.*	10	Increase of SuDS schemes within the Borough through introducing ways to manage runoff	Number of SuDS schemes installed as part of the LFRMS.	Thurrock Council Anglian Water Environment Agency

LFRMS objective / action	SEA objective(s)	Potential significant effects	Monitoring indicator	Possible monitoring and/or delivery partners
Action 32 **Preferential flow paths**: Hathaway Road. *Investigate the use of swales/French drains to attenuate and infiltrate runoff along Hathaway Road and reduce volumes of water ponding behind the rail embankment.*	10	Increase of SuDS schemes within the Borough through introducing ways to manage runoff	Number of SuDS schemes installed as part of the LFRMS.	Thurrock Council Anglian Water Environment Agency

6.4 Habitats Regulations Assessment

A Test of Likely Significant Effect (screening assessment) has been prepared in accordance with the requirements of the Habitats Regulations to determine whether the LFRMS is likely to adversely affect the integrity of a European site (alone or in combination). This is summarised in Section 1.6 and described in Appendix A. The screening assessment concluded that the LFRMS is not likely to have a significant effect on any of the European sites.

Consultation with Natural England on the outcomes of the screening assessment was undertaken as part of the SEA scoping consultation exercise. Natural England confirmed that the LFRMS is not likely to have a significant effect on the European sites.

Following development of the draft strategy objectives and measures, the screening assessment was reviewed to determine whether the LFRMS would be likely to have a significant effect on the European sites. It was agreed with Natural England that the Borough is of sufficient distance from these sites that no likely significant effect and an Appropriate Assessment is not required.

The outcomes of this revised screening assessment are documented in A of this report. The screening assessment concludes that the LFRMS is not likely to have a significant adverse effect on a European site.

Consultation with Natural England on the outcomes of this assessment has been undertaken as part of the consultation process outlined in Section 7.

7 Consultation on draft Environmental Report

The consultation on the draft Environmental Report lasted for a period of six weeks, beginning on 3 August 2015. Responses were received from Environment Agency, Natural England and Historic England. Additionally, Natural England provided comments on the HRA. The responses were mainly supportive of the approach to the SEA and included a variety of comments ranging from specific queries and details to general comments, mainly in relation to biodiversity and flooding. Appendix C shows how the consultation responses have been taken into account in the final plan.

No further comments were received during the preparation of the final Environmental Report.

Due to the relatively local scale and nature of the LFRMS, no trans-boundary consultations were undertaken or comments received under regulation 14 of the SEA Regulations.

All consultation responses received were reviewed and taken into consideration for the next stage of appraisal process. This involved the preparation of a Post Adoption Statement (PAS), which sets out how the findings of the Environmental Report and the views expressed during the consultation period have been taken into account as the LFRMS has been finalised and formally approved. The PAS will also set out any additional monitoring requirements needed to track the significant environmental effects of the strategy.

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A Appendix A: Habitats Regulations Assessment

Test of Likely Significance

A.1 Record of Assessment of Likely Significant Effect on a European/International Site (SAC/SPA/Ramsar)

This assessment identifies and considers the likely adverse effects of the LFRMS, either individually or in combination with other plans or projects, upon a European site and considers whether these impacts are likely to be significant. It comprises a series of tables that identify the European sites of relevance to this assessment (Table A-1); the potential hazards associated with the LFRMS objectives and measures and their relevance to these European sites (Tables A-2 and A-3); and the likelihood that these hazards would cause a significant adverse effect on a European site (Table A-4 and A-5).

Table A-1: Assessment scope

Type or permission/activity	Local Flood Risk Management Strategy (LFRMS)
Project/File Ref. Number	Thurrock Borough
National Grid Reference (NGR)	TQ 585 787
Brief Description of the project	The LFRMS is a requirement under the Flood and Water Management Act (2010). The Act outlines the responsibility of the lead local flood authority to 'develop, maintain, apply and monitor' a strategy for local flood risk management. It notes that the strategy must identify or outline the following: • The risk management authorities in the area; • The flood and coastal erosion risk management functions that may be exercised by those authorities in relation to the area; • The objectives for managing local flood risk (including any objectives included in the authority's flood risk management plan prepared in accordance with the Flood Risk Regulations 2009; • The measures proposed to achieve those objectives; • How and when the measures are expected to be implemented; • The costs and benefits of those measures, and how they are to be paid for; • The assessment of local flood risk for the purpose of the strategy; • How and when the strategy is to be reviewed; and • How the strategy contributes to the achievement of wider environmental objectives.
European Site Name and Status	**North Downs Woodlands SAC**
Distance to European/International Site	9km south
Site EU Reference Number	UK0030225
Site Centre NGR	TQ 674 629
List of Site Interest Features	Designated primarily for the Annex 1 habitats that this site comprises, namely *Asperulo-Fagetum* beech forests (9130) and *Taxus baccata* woods of the British Isles (91J0). Other qualifying habitats within the SAC are semi-natural dry grasslands and scrubland facies on calcareous substrates (*Festuco-Brometalia*) (6210)
European Site Name and Status	**Peters Pit SAC**
Distance to European/International Site	12km south
Site EU Reference Number	UK0030237
Site Centre NGR	TQ 717 628
List of Site Interest Features	The Annex 2 species Great Crested Newt *Triturus cristatus* (1166) is the primary reason for the selection of the site.

European Site Name and Status	**Essex Estuaries SAC**
Distance to European/International Site	10km NE
Site EU Reference Number	UK0013690
Site Centre NGR	TM 103 048
List of Site Interest Features	**Designated primarily for the following Annex 1 habitats:** 1130 Estuaries 1140 Mudflats and sandflats not covered by seawater at low tide 1310 *Salicornia* and other annuals colonising mud and sand 1320 *Spartina* swards (*Spartinion maritimae*) 1130 Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) 1420 Mediterranean and thermos-Atlantic halophilous scrubs (*Sarcocornetea fruticosi*) **Other qualifying feature within the SAC:** 1110 Sandbanks which are slightly covered by sea water all the time
European Site Name and Status	**Thames Estuary and Marshes SPA**
Distance to European/International Site	Within – borders coastline around Stanford-le-Hope and Tilbury
Site EU Reference Number	UK9012021
Site Centre NGR	TQ 718 789
List of Site Interest Features	This site qualifies under Article 4.1 of the Directive (79/409/EEC) by supporting populations of European importance of the following species listed on Annex I of the Directive: Over winter: - Avocet *Recurvirostra avosetta*, 276 individuals representing at least 21.7% of the wintering population in Great Britain (5 year peak mean 1991/2 - 1995/6) - Hen Harrier *Circus cyaneus*, 7 individuals representing at least 0.9% of the wintering population in Great Britain (5 year mean 93/4-97/8) This site also qualifies **under Article 4.2 of** the Directive (79/409/EEC) by supporting populations of European importance of the following migratory species: On passage: - Ringed Plover *Charadrius hiaticula*, 559 individuals representing at least 1.1% of the Europe/Northern Africa - wintering population (5 year peak mean 1991/2 - 1995/6) Over winter: - Ringed Plover *Charadrius hiaticula*, 541 individuals representing at least 1.1% of the wintering Europe/Northern Africa - wintering population (5 year peak mean 1991/2 - 1995/6) The area qualifies **under Article 4.2 of** the Directive (79/409/EEC) by regularly supporting at least 20,000 waterfowl
European Site Name and Status	**Thames Estuary and Marshes Ramsar**
Distance to European/International Site	Within – borders coastline around Stanford-le-Hope and Tilbury
Site EU Reference Number	UK9012021
Site Centre NGR	TQ 718 789
List of Site Interest Features	**Ramsar criterion 2 -** The site supports one endangered plant species and at least 14 nationally scarce plants of wetland habitats. The site also supports more than 20 British Red Data Book invertebrates **Ramsar criterion 5 -** Assemblages of international importance: 45118 waterfowl (5 year peak mean 1998/99-2002/2003) **Ramsar criterion 6 –** Species/populations occurring at levels of international importance: - Ringed plover *Charadrius hiaticula*, Europe/NW Africa

	(595 individuals, representing an average of 1.8% of the GB population) - Black-tailed godwit *Limosa limosa islandica*, Iceland/W Europe (1640 individuals, representing an average of 4.6% of the population) - Grey plover *Pluvialis squatarola*, E Atlantic/W Africa (1643 individuals, representing an average of 3.1% of the GB population) - Red knot *Calidris canutus islandica*, W & Southern Africa (7279 individuals, representing an average of 1.6% of the population) - Dunlin *Calidris alpina alpine*, W Siberia/W Europe (15171 individuals, representing an average of 1.1% of the population) - Common redshank *Tringa totanus tetanus* (1178 individuals, representing an average of 1% of the GB population) Noteworthy flora: - *Lactuca saligna* - *Alopecurus bulbosus* - *Bupleurum tenuissimum* - *Carex divisa* - *Chenopodium chenopodiodes* - *Hordeum marinum* - *Inula crithmoides* - *Polypogon monspeliensis* - *Puccinellia fasciculate* - *P. rupestris* - *Salicornia pusilla* - *Trifolium glomeratum* - *T.squamosum* - *Zoastera angustifolia* - *Z. noltei* Noteworthy fauna: Birds – - Little grebe *Tachybaptus ruficollis ruficollis* - Little egret *Egretta garzetta* - Ruff *Philomachus pugnax* - Common greenshank *Tringa nebularia* - Common shelduck *Tadorna tadorna* - Gadwall *Anas strepera strepera* - Northern shoveler *Anas clypeata* - Water rail *Rallus aquaticus* - Pied avocet *Recurvirostra avosetta* - Spotted redshank *Tringa erythropus* Invertebrates – - *Bagous longitarsis* - *Henestaris halophilus* - *Bagous cylindrus* - *Polystichus connexus* - *Erioptera bivittata* - *Limnophila pictipennis* - *Hybomitra expollicata* - *Lejops vittata* - *Poecilobothrus ducalis* - *Pteromicra leucopeza* - *Philanthus Triangulum* - *Lestes dryas* - *Anisodactylus poeciloides* - *Aulacochthebius exaratus* - *Berosus fulvus* - *Cercyon bifenestratus* - *Hydrochus elongates* - *H. ignicollis* - *Ochthebius exaratus* - *Hydrophilus piceus* - *Malachius vulneratus* - *Philonthus punctus* - *Telmatophilus brevicollis* - *Campsicnemus magius* - *Haematopota bigoti* - *Stratiomys longicornis* - *Baryphyma duffeyi*

European Site Name and Status	**Benfleet and Southend Marshes SPA**
Distance to European/International Site	3.6km east
Site EU Reference Number	UK9009171
Site Centre NGR	TQ 832 861
List of Site Interest Features	This site qualifies under Article 4.2 of the Directive (79/409/EEC) by supporting populations of European importance of the following migratory species: On passage: - Ringed Plover Charadrius hiaticula, 800 individuals representing at least 1.6% of the Europe/Northern Africa - wintering population (5 year peak mean 1991/2 - 1995/6) Over winter: - Dark-bellied Brent Goose Branta bernicla bernicla, 3,819 individuals representing at least 1.3% of the wintering Western Siberia/Western Europe population (5 year peak mean 1991/2 - 1995/6) - Grey Plover Pluvialis squatarola, 3,789 individuals representing at least 2.5% of the wintering Eastern Atlantic - wintering population (5 year peak mean 1991/2 - 1995/6) - Knot Calidris canutus, 8,850 individuals representing at least 2.5% of the wintering Northeastern Canada/Greenland/Iceland/Northwestern Europe population (5 year peak mean 1991/2 - 1995/6) The area qualifies under Article 4.2 of the Directive (79/409/EEC) by regularly supporting at least 20,000 waterfowl
European Site Name and Status	**Benfleet and Southend Marshes Ramsar**
Distance to European/International Site	3.6km east
Site EU Reference Number	UK9009171
Site Centre NGR	TQ 832 861
List of Site Interest Features	**Ramsar criterion 5 –** Assemblages of international importance: 32867 waterfowl (5 year peak mean 1998/99-2002/2003) **Ramsar criterion 6 –** Species/populations occurring at levels of international importance: - Dark-bellied brent goose *Branta bernicla bernicla* (4532 individuals, representing an average of 2.1% of the population) - Grey plover *Pluvialis squatarola*, E Atlantic/W Atlantic (1710 individuals, representing an average of 3.2% of the GB population) - Red knot *Calidris canutus islandica*, W & Southern Africa (6307 individuals, representing an average of 1.4% of the population) Species/populations identified subsequent to designation for possible future consideration under criterion 6: - Dunlin *Calidris alpina alpine*, W Siberia/W Europe (17591 individuals, representing an average of 1.3% of the population) Noteworthy flora: - *Hordeum marinum* - *Bupleurum tenuissimum* - *Trifolium squamosum* - *Chenopodium chenopodioides* - *Limonium humile* - *Inula crithmoides* - *Spartina maritima* - *Zostera marina* - *Zostera noltei*

	Noteworthy fauna: Birds – - Little egret *Egretta garzetta* - Common greenshank *Tringa nebularia* - Ringed plover *Charadrius hiaticula* Amphibians – - *Triturus cristatus* Invertebrates – - *Myopites bloti* - *Lestes dryas*
European Site Name and Status	**Medway Estuary and Marshes SPA**
Distance to European/International Site	8.6km south east
Site EU Reference Number	UK9012031
Site Centre NGR	TQ 850 726
List of Site Interest Features	This site qualifies under Article 4.1 of the Directive (79/409/EEC) by supporting populations of European importance of the following species listed on Annex I of the Directive: During the breeding season: - Avocet *Recurvirostra avosetta*, 28 pairs representing at least 4.7% of the breeding population in Great Britain (5 year mean, 1988-1992) - Little Tern *Sterna albifrons*, 28 pairs representing at least 1.2% of the breeding population in Great Britain (5 year mean, 1991-1995) Over winter: - Avocet *Recurvirostra avosetta*, 314 individuals representing at least 24.7% of the wintering population in Great Britain (5 year peak mean 1991/2 - 1995/6) This site also qualifies under Article 4.2 of the Directive (79/409/EEC) by supporting populations of European importance of the following migratory species: On passage: - Ringed Plover *Charadrius hiaticula*, 1,337 individuals representing at least 2.7% of the Europe/Northern Africa - wintering population (5 year peak mean 1991/2 - 1995/6) Over winter: - Black-tailed Godwit *Limosa limosa islandica*, 957 individuals representing at least 1.4% of the wintering Iceland - breeding population (5 year peak mean 1991/2 - 1995/6) - Dark-bellied Brent Goose *Branta bernicla bernicla*, 3,205 individuals representing at least 1.1% of the wintering Western Siberia/Western Europe population (5 year peak mean 1991/2 - 1995/6) - Dunlin *Calidris alpina alpina*, 25,936 individuals representing at least 1.9% of the wintering Northern Siberia/Europe/Western Africa population (5 year peak mean 1991/2 - 1995/6) - Grey Plover Pluvialis squatarola, 3,406 individuals representing at least 2.3% of the wintering Eastern Atlantic - wintering population (5 year peak mean 1991/2 - 1995/6) - Pintail *Anas acuta*, 697 individuals representing at least 1.2% of the wintering Northwestern Europe population (5 year peak mean 1991/2 - 1995/6) - Redshank *Tringa totanus*, 3,690 individuals representing at least 2.5% of the wintering Eastern Atlantic - wintering population (5 year peak mean 1991/2 - 1995/6) - Ringed Plover *Charadrius hiaticula*, 768 individuals

	representing at least 1.5% of the wintering Europe/Northern Africa - wintering population (5 year peak mean 1991/2 - 1995/6) - Shelduck *Tadorna tadorna*, 4,465 individuals representing at least 1.5% of the wintering Northwestern Europe population (5 year peak mean 1991/2 - 1995/6) The area qualifies under Article 4.2 of the Directive (79/409/EEC) by regularly supporting at least 20,000 waterfowl
European Site Name and Status	**Medway Estuary and Marshes Ramsar**
Distance to European/International Site	8.6km south east
Site EU Reference Number	UK9012031
Site Centre NGR	TQ 850 726
List of Site Interest Features	**Ramsar criterion 2 –** The site supports a number of species of rare plants and animals. The site holds several nationally scarce plants, including sea barley *Hordeum marinum*, curved hard-grass *Parapholis incurva*, annual beard-grass *Polypogon monspeliensis*, Borrer's saltmarsh-grass *Puccinellia fasciculata*, slender hare`s-ear *Bupleurum tenuissimum*, sea clover *Trifolium squamosum*, saltmarsh goose-foot *Chenopodium chenopodioides*, golden samphire *Inula crithmoides*, perennial glasswort *Sarcocornia perennis* and one-flowered glasswort *Salicornia pusilla*. A total of at least twelve British Red Data Book species of wetland invertebrates have been recorded on the site. These include a ground beetle *Polistichus connexus*, a fly *Cephalops perspicuus*, a dancefly *Poecilobothrus ducalis*, a fly *Anagnota collini*, a weevil *Baris scolopacea*, a water beetle *Berosus spinosus*, a beetle *Malachius vulneratus*, a rove beetle *Philonthus punctus*, the ground lackey moth *Malacosoma castrensis*, a horsefly Atylotus latistriatuus, a fly *Campsicnemus magius,* a solider beetle, *Cantharis fusca*, and a cranefly *Limonia danica*. A significant number of non-wetland British Red Data Book species also occur. **Ramsar criterion 5 –** Assemblages of international importance: 47637 waterfowl (5 year peak mean 1998/99-2002/2003) **Ramsar criterion 6 –** Species/populations occurring at levels of international importance: - Grey plover *Pluvialis squatarola*, E Atlantic/W Africa (3103 individuals, representing an average of 1.2% of the population) - Common redshank *Tringa totanus tetanus* (3709 individuals, representing an average of 1.4% of the population) - Dark-bellied brent goose *Branta bernicla bernicla* (2575 individuals, representing an average of 1.1% of the population) - Common shelduck *Tadorna tadorna*, NW Europe (2627 individuals, representing an average of 3.3% of the GB population) - Northern pintail *Anas acuta*, NW Europe (1118 individuals, representing an average of 1.8% of the population) - Ringed plover *Charadrius hiaticula*, Europe/Northwest Africa (540 individuals, representing an average of 1.6% of the GB population) - Red knot *Calidris canutus islandica*, W & Southern Africa (3021 individuals, representing an average of 1% of the GB population) - Dunlin *Calidris alpina alpina*, W Siberia/W Europe (8263 individuals, representing an average of 1.4% of the GB population) Species/populations identified subsequent to designation for possible future consideration under criterion 6: - Black-tailed godwit *Limosa limosa islandica*, Iceland/W Europe (721 individuals, representing an average of 2% of the population)

	Noteworthy flora: - *Hordeum marinum* - *Parapholis incurva* - *Polypogon monspeliensis* - *Puccinellia fasciculate* - *Bupleurum tenuissimum* - *Trifolium squamosum* - *Chenopodium chenopodioides* - *Inula crithmoides* - *Sarcocornia perennis* - *Salicornia pusilla* Noteworthy fauna: Birds – - Mediterranean gull *Larus melanocephalus* - Black-headed gull *Larus ridibundus* - Sandwich tern *Sterna (Thalasseus) sandvicensis sandvicensis* - Common tern Sterna hirundo hirundo - Little tern *Sterna albifrons albifrons* - Great cormorant *Phalacrocorax carbo carbo* - Little egret *Egretta garzetta* - Pied avocet *Recurvirostra avosetta* - Whimbrel *Numenius phaeopus* - Eurasian curlew *Numenius arquata arquata* - Common greenshank *Tringa nebularia* - Ruddy turnstone *Arenaria interpres interpres* - Northern shoveler *Anas clypeata* - Eurasian oystercatcher *Haematopus ostralegus* ostralegus - European golden plover *Pluvialis apricaria apricaria* Invertebrates – - *Polystichus connexus* - *Cephalops perspicuous* - *Peocilobothrus ducalis* - *Anagnota collini* - *Baris scolopacea* - *Berosus spinosus* - *Malachius vulneratus* - *Philonthus punctus,* - *Malacostoma castrensis* - *Atylotus latistriatus* - *Campsicnemus magius* - *Cantharis fusca* - *Limonia Danica* - *Lestes dryas* - *Hydrochus ignicollis* - *Hydrophilus piceus* - *Dicranomyia Danica* - *Lejops vittata*
European Site Name and Status	**Crouch and Roach Estuaries SPA**
Distance to European/International Site	10km north east
Site EU Reference Number	UK9009244
Site Centre NGR	TQ 834 960
List of Site Interest Features	This site qualifies under Article 4.2 of the Directive (79/409/EEC) by supporting populations of European importance of the following migratory species: Over winter: - Dark-bellied Brent Goose *Branta bernicla bernicla*, 3,074 individuals representing at least 1.0% of the wintering Western Siberia/Western Europe population (5 year peak mean 1991/2 - 1995/6)
European Site Name and Status	**Crouch and Roach Estuaries Ramsar**
Distance to European/International Site	10km north east
Site EU Reference Number	UK9009244
Site Centre NGR	TQ 834 960
List of Site Interest Features	**Ramsar criterion 2 –** Supports an appreciable assemblage of rare, vulnerable or

	endangered species or subspecies of plant and animal including 13 nationally scarce plant species: slender hare's ear *Bupleurum tenuissimum*, divided sedge *Carex divisa*, sea barley *Hordeum marinum*, golden-samphire *Inula crithmoides*, laxflowered sea-lavender *Limonium humile*, curved hard-grass *Parapholis incurva*, Borrer's saltmarsh grass *Puccinellia fasciculata,* stiff saltmarsh grass *Puccinellia rupestris*, spiral tasselweed *Ruppia cirrhosa*, one-flowered glasswort *Salicornia pusilla*, small cord-grass *Spartina maritima*, shrubby seablite *Suaeda vera* and sea clover *Trifolium squamosum*. Several important invertebrate species are also present on the site, including scarce emerald damselfly *Lestes dryas*, the shorefly *Parydroptera discomyzina*, the rare soldier fly *Stratiomys singularior*, the large horsefly *Hybomitra expollicata*, the beetles *Graptodytes bilineatus* and *Malachius vulneratus*, the ground lackey moth *Malacosoma castrensis* and *Eucosoma catoprana*. **Ramsar criterion 5 –** Assemblages of international importance: 16970 waterfowl (5 year peak mean 1998/99-2002/2003) **Ramsar criterion 6 –** Species/populations occurring at levels of international importance: - Dark-bellied brent goose *Branta bernicla bernicla* (2103 individuals, representing an average of 2.1% of the GB population) Noteworthy flora: - *Bupleurum tenuissimum* - *Carex divisa* - *Hordeum marinum* - *Inula crithmoides* - *Limonium humile* - *Parapholis incurve* - *Puccinellia fasciculata* - *Puccinellia rupestris* - *Ruppia cirrhosa* - *Salicornia pusilla* - *Spartina maritima* - *Suaeda vera* - *Trifolium squamosum* Noteworthy fauna: Birds – - Little egret *Egretta garzetta* - Ruff *Philomachus pugnax* - Whimbrel *Numenius phaeopus* - Spotted redshank *Tringa erythropus* - Common greenshank *Tringa nebularia* - Hen harrier *Circus cyaneus* - Black-tailed godwit *Limosa limosa islandica* Invertebrates – - *Graptodytes bilineatus* - *Hybomitra expollicata* - *Lestes dryas* - *Malachius vulneratus* - *Malacosoma castrensis* - *Parydroptera discomyzina* - *Stratiomys longicornis* - *Eucosma catoptrana*
Is this proposal directly connected with or necessary to the management of the sites for nature conservation?	No

Table A-2: Potential hazards and effects to European sites associated with the LFRMS

Hazards and Effects in reference to the individual elements and consented activities of the project. Describe any hazards or effects with potential to give rise to impacts on the European Site (either alone or in combination with other plans or projects).		
Sensitive Interest Features	**Potential Hazard(s)**	**Potential Exposure to hazard and mechanism of effect/impact if known**
Forests North Downs Woodlands SAC Peters Pit SAC	None	The SAC sites are located a significant distance (9km; 12km, respectively) from the boundary of Thurrock. The sites are not hydrologically linked with the borough. The LFRMS seeks to implement flood risk management measures in the district and does not aim to influence flood risk or flood risk management activities at a wider regional level. Flood risk management activities introduced by the LFRMS will therefore have a local impact and will not extend a significant distance beyond the boundary of the Borough. No hazards will arise on the sensitive interest features as a result of implementation of the LFRMS. **Therefore, no likely significant effects are predicted.**
Dry grassland and scrub North Downs Woodlands SAC Peters Pit SAC	None	The SAC sites are located a significant distance (9km; 12km, respectively) from the boundary of Thurrock. The sites are not hydrologically linked with the borough. The LFRMS seeks to implement flood risk management measures in the district and does not aim to influence flood risk or flood risk management activities at a wider regional level. Flood risk management activities introduced by the LFRMS will therefore have a local impact and will not extend a significant distance beyond the boundary of the Borough. No hazards will arise on the sensitive interest features as a result of implementation of the LFRMS. **Therefore, no likely significant effects are predicted.**
Bogs, fens and wet habitats Peters Pit SAC	None	The SAC site is located a significant distance (12km) from the boundary of Thurrock. The site is not hydrologically linked with the borough. The LFRMS seeks to implement flood risk management measures in the district and does not aim to influence flood risk or flood risk management activities at a wider regional level. Flood risk management activities introduced by the LFRMS will therefore have a local impact and will not extend a significant distance beyond the boundary of the Borough. No hazards will arise on the sensitive interest features as a result of implementation of the LFRMS. **Therefore, no likely significant effects are predicted.**
Vertebrate species: amphibians Peters Pit SAC Benfleet and Southend Marshes Ramsar	None	The SAC site is located a significant distance (12km) from the boundary of Thurrock. The site is not hydrologically linked with the borough. The LFRMS seeks to implement flood risk management measures in the district and does not aim to influence flood risk or flood risk management activities at a wider regional level. Flood risk management activities introduced by the LFRMS will therefore have a local impact and will not extend a significant distance beyond the boundary of the Borough. No hazards will arise on the sensitive interest features as a result of implementation of the LFRMS. **Therefore, no likely significant effects are predicted.**
Estuarine and intertidal habitats Essex Estuaries SAC Thames Estuary and	Changes in water levels or table Changes in water chemistry	Essex Estuaries SAC, Benfleet and Southend Marshes SPA & Ramsar, Medway Estuary and Marshes SPA & Ramsar and Crouch and Roach Estuaries SPA & Ramsar sites are located a significant distance (10km; 3.6km; 8.6km; 10km,

Marshes SPA & Ramsar Benfleet and Southend Marshes SPA & Ramsar Medway Estuary and Marshes SPA & Ramsar Crouch and Roach Estuaries SPA & Ramsar	Surface water flooding changes Toxic contamination	respectively) from the boundary of Thurrock. The LFRMS seeks to implement flood risk management measures in the district and does not aim to influence flood risk or flood risk management activities at a wider regional level. Flood risk management activities introduced by the LFRMS will therefore have a local impact and will not extend a significant distance beyond the boundary of the Borough. **Therefore, no likely significant effects on Essex Estuaries SAC, Benfleet and Southend Marshes SPA & Ramsar, Medway Estuary and Marshes SPA & Ramsar and Crouch and Roach Estuaries SPA & Ramsar sites are predicted.** Thames Estuary and Marshes SPA and Ramsar site are located within Thurrock Borough and lie within the Thames Estuary. Potential effects linked to the hazards identified associated with the LFRMS comprise the following: • Changes to surface and groundwater flow in the Borough, which could impact water availability in the SPA and Ramsar site. • Physical modifications to watercourses in the Borough or changes in surface runoff from land that could affect water quality in the SPA and Ramsar site. Depending on the exact location and nature of such schemes there is the potential for indirect impacts on the sites including physical damage or habitat loss. Assessment of each LFRMS objective and its underpinning actions has been undertaken to identify any potential likely significant effects on the Thames Estuary and Marshes SPA and Ramsar sites.
Birds of estuarine habitat Thames Estuary and Marshes SPA & Ramsar Benfleet and Southend Marshes SPA & Ramsar Medway Estuary and Marshes SPA & Ramsar Crouch and Roach Estuaries SPA & Ramsar	Changes in water levels or table Changes in water chemistry Surface water flooding changes Toxic contamination	Benfleet and Southend Marshes SPA & Ramsar, Medway Estuary and Marshes SPA & Ramsar and Crouch and Roach Estuaries SPA & Ramsar sites are located a significant distance (3.6km; 8.6km; 10km, respectively) from the boundary of Thurrock. The LFRMS seeks to implement flood risk management measures in the district and does not aim to influence flood risk or flood risk management activities at a wider regional level. Flood risk management activities introduced by the LFRMS will therefore have a local impact and will not extend a significant distance beyond the boundary of the Borough. **Therefore, no likely significant effects on Essex Estuaries SAC, Benfleet and Southend Marshes SPA & Ramsar, Medway Estuary and Marshes SPA & Ramsar and Crouch and Roach Estuaries SPA & Ramsar sites are predicted.** Thames Estuary and Marshes SPA and Ramsar site are located within Thurrock Borough and lie within the Thames Estuary. Potential effects linked to the hazards identified associated with the LFRMS comprise the following: • Changes to surface and groundwater flow in the Borough, which could impact water availability in the SPA and Ramsar site. • Physical modifications to watercourses in the Borough or changes in surface runoff from land that could affect water quality in the SPA and Ramsar site. Depending on the exact location and nature of such schemes there is the potential for indirect impacts on the sites including physical damage or habitat loss. Assessment of each LFRMS objective and its underpinning actions has been undertaken to identify any potential likely significant effects on the Thames Estuary and Marshes SPA and Ramsar sites.

Table A-3: Potential hazards to the Thames Estuary SPA and Ramsar site associated with the LFRMS objectives and actions (Key: X = no potential hazard; ✓ = potential hazard)

LFRMS Action	LFRMS Objective	Potential hazards			
		Changes in water levels or table	Changes in water chemistry	Surface water flooding changes	Toxic contamination
Borough wide actions					
Raise awareness of AoCD amongst Planners and influence planning policies to prevent the creation of new risk areas	1,5	X	X	X	X
Community awareness	3, 5	X	X	X	X
Implement a standardised Asset Register	1-6, 8	X	X	X	X
Improved maintenance of drainage network	1, 3	✓	✓	✓	X
Ensure drainage systems are operating at capacity in AoCD	1, 3	X	X	X	X
Implement a standardised flood incident log	2, 5, 6	X	X	X	X
Investigate flooding records and if necessary provide improvements to highways drainage	1-3, 5, 6	✓	✓	✓	X
Runoff rates and volumes for new small and large scale major developments (i.e. >10 dwellings, >1,000m2 built area) to be controlled	1, 3	X	X	X	X
Runoff from development on previously developed sites for small and large scale major developments (i.e. >10 dwellings, >1,000m2 built area) to be restricted to greenfield levels	1, 3	X	X	X	X
Green roofs/areas	1-3	X	X	X	X
Drainage infrastructure improvement: rural roads	1-3, 6	X	X	X	X
Drainage improvements: planning policy	1-3, 6	X	X	X	X
Drainage improvements: preferential flow paths	1, 3	✓	✓	✓	X
Determine whether current emergency response to borough-wide surface water flooding is appropriate	1-3, 6	X	X	X	X
Determine whether services (e.g. power, telecommunications) are resilient to surface water flooding.	3, 5, 6	X	X	X	X
Look for opportunities to reduce flood risk to critical infrastructure whilst upgrading the existing drainage infrastructure.	1, 3, 5, 6	✓	✓	✓	X
Developers to demonstrate compliance with National Planning Policy	1, 3	X	X	X	X

LFRMS Action	LFRMS Objective	Potential hazards			
		Changes in water levels or table	Changes in water chemistry	Surface water flooding changes	Toxic contamination
Areas of Critical Drainage (AoCD) Specific Actions					
A13 drainage capacity	1,3, 6	X	X	X	X
A13 emergency diversion procedures	3, 6	X	X	X	X
Improvements to drainage infrastructure: Purfleet Industrial Park / Milehams Yard	1-3, 6, 8	X	X	X	X
Ensure any development at the Ponds Farm Development provides a betterment on the existing drainage system.	1, 3, 6	X	X	X	X
Emergency plan for AoCD003	3, 6	X	X	X	X
Drainage investigation at the A126 junction.	1-3, 6	X	X	X	X
Ensure any development at Hadley Avenue provides a betterment on the existing drainage system	1, 3, 6	X	X	X	X
Drainage maintenance and investigation: AoCD004	1, 3, 6	X	X	X	X
Preferential flow paths: Hathaway Road	1-3	X	X	X	X
Storage Area: Grays Park	1-3	X	X	X	X
Capital scheme: storage area on recreation ground near to Stifford Primary School	1-3	X	X	X	X
Preferential maintenance regime: AoCD006 (west)	1-3	X	X	X	X
Drainage maintenance and improvement: Florence Close	1-3, 6	X	X	X	X
Storage Area: Hollowfield Avenue	1-3, 6	X	X	X	X
Improvements to drainage infrastructure: Hollowfield Avenue	1-3, 6	X	X	X	X
Preferential flow paths: Balfour Road / Whitehall Road	1, 3	X	X	X	X
Drainage infrastructure improvement: AoCD008	1-3, 6	X	X	X	X
Confirm and map ownership and maintenance and identify 'mis-connections' to the highway drainage	1, 2, 6	X	X	X	X
Improvements to drainage infrastructure: AoCD009	1-3, 5	X	X	X	X
Network rail culverts: AoCD009	1-3, 6	X	X	X	X
Anglian Water adoption of foul and surface water sewer network in this AoCD	1-3, 6	X	X	X	X
Asset survey of surface water ditch: AoCD010	1-3	X	X	X	X
Source control SuDS: north A13	1-3	X	X	X	X
Surface water network capacity improvements: AoCD011b	1, 5	X	X	X	X
Asset survey and maintenance responsibilities: Prospect and Valmar Avenues	1, 3, 5	X	X	X	X

Improvements to drainage infrastructure: Runnymeade Road recreation ground	1-3, 8	X	X	X	X
Source control SuDS: Butts Lane	1-3, 5	X	X	X	X
Asset register: open land in Stanford-le-Hope	1, 3	X	X	X	X
Improvements to drainage maintenance: Victoria Road Brook	1, 3, 5	✓	✓	✓	✓
Improvements to drainage infrastructure: Southend Road	1-3, 6	X	X	X	X
Source control SuDS: Southend Road	1-3	X	X	X	X
Emergency planning: Southend Road	3, 6	X	X	X	X
South control SuDS: A13 / railway	1-3, 8	X	X	X	X
Source control SuDS: Hassen Brook	1-3, 7, 8	X	X	X	X
Improvements to drainage infrastructure: Bramleys and Russet Close	1-3, 6	✓	✓	✓	✓
Flood storage: Balsonia Recreation Gardens	1-3, 7	X	X	X	X
Improvement to drainage infrastructure: Wharf Road pumps	1-3, 6, 7	X	X	X	X
Improvements to drainage infrastructure: AoCD012	2, 5	X	X	X	X
Improvements to drainage infrastructure: main river alleviation schemes	1, 2, 6	X	X	X	X
Improvement to drainage infrastructure: Bulphan	2, 6, 8	X	X	X	X
Planning Policies: Ford site	1, 3, 5	X	X	X	X
Improvements to drainage infrastructure: Buckles Lane	1, 3	X	X	X	X
Improvement to drainage capacity: AoCD015	2, 5	X	X	X	X
Improvements to drainage infrastructure: AoCD015	1, 2	X	X	X	X

Table A-4: Assessment of likely significant effects on the Thames Estuary SPA and Ramsar site associated with relevant LFRMS actions

Relevant LFRMS actions	Potential hazards	Potential for likely significant effect
Borough wide actions		
Improved maintenance of drainage network	• Changes in water levels or table • Changes in water chemistry • Surface water flooding changes • Toxic contamination	This action aims to decrease the regularity of flooding and reduce the risks associated with flooding to highways and properties. The risk and extent to which potential adverse effects are likely to occur is directly linked to the implementation of this action; in particular, the scale and location of any proposed works or changes in water management practices. Present investigations into potential drainage infrastructure and maintenance works are located over 5km from the Thames Estuary SPA and Ramsar site. Investigations are also planned to be conducted on Bramleys Close, Russet Close and Victoria Road, which are located approximately 2km from the site boundary. The planned works are relatively small-scale and local in impact. Therefore, it is unlikely that hazards will arise on the sensitive interest features as a result of implementation of the LFRMS. On implementation, these schemes are likely to be subject to further authorisations, either through the planning process and/or another consenting process. Before any physical works or water management actions are implemented, they will be subject to the requirements of the Habitats Regulations as a matter of law and government policy. An Appropriate Assessment would be required where such works/actions are likely to have a significant adverse effect on the integrity of a European site. Therefore, it can be reasonably concluded at this stage that implementation of this measure is not likely to have a significant adverse effect on the SPA or Ramsar site. **Conclusion: No likely significant effect on the Thames Estuary SPA and Ramsar site.**
Investigate flooding records and if necessary provide improvements to highways drainage	• Changes in water levels or table • Changes in water chemistry • Surface water flooding changes • Toxic contamination	This action aims to reduce the flood risk to highways through documented site visits following flood events and data sharing with partners. This action is an investigation into physical interventions, construction works or changes in water management, and so at present is not likely to have a significant adverse effect on the interest features of the SPA or Ramsar site However, on implementation, these schemes are likely to be subject to further authorisations, either through the planning process and/or another consenting process. Before any physical works or water management actions are implemented, they will be subject to the requirements of the Habitats Regulations as a matter of law and government policy. An Appropriate Assessment would be required where such works/actions are likely to have a significant adverse effect on the integrity of a European site. Therefore, it can be reasonably concluded at this stage that implementation of this measure is not likely to have a significant adverse effect on the SPA or Ramsar site. **Conclusion: No likely significant effect on the Thames Estuary SPA and Ramsar site.**
Drainage improvements: preferential flow paths	• Changes in water levels or table • Changes in water chemistry • Surface water flooding changes • Toxic contamination	This action aims to identify programme of potential preferential flow path works e.g. contoured grass verges. This action is an investigation into physical interventions, construction works or changes in water management, and so at present is not likely to have a significant adverse effect on the interest features of the SPA or Ramsar site. However, on implementation, these schemes are likely to be subject to further authorisations, either through the planning process and/or another consenting process. Before any physical works or water management actions are implemented, they will be subject to the requirements of the Habitats Regulations as a matter of law and government policy. An Appropriate Assessment would be required where such works/actions are likely to have a significant adverse effect on the integrity of a European site. Therefore, it can be reasonably concluded at this stage that implementation of this measure is not likely to have a significant adverse effect on the SPA or Ramsar site. **Conclusion: No likely significant effect on the Thames Estuary SPA and Ramsar site.**

Relevant LFRMS actions	Potential hazards	Potential for likely significant effect
Look for opportunities to reduce flood risk to critical infrastructure whilst upgrading the existing drainage infrastructure.	• Changes in water levels or table • Changes in water chemistry • Surface water flooding changes • Toxic contamination	This action aims to review Site Waste Management Plan (SWMP) outputs in relation to critical infrastructure. This action is an investigation into physical interventions, construction works or changes in water management, and so at present is not likely to have a significant adverse effect on the interest features of the SPA or Ramsar site. However, on implementation, these schemes are likely to be subject to further authorisations, either through the planning process and/or another consenting process. Before any physical works or water management actions are implemented, they will be subject to the requirements of the Habitats Regulations as a matter of law and government policy. An Appropriate Assessment would be required where such works/actions are likely to have a significant adverse effect on the integrity of a European site. Therefore, it can be reasonably concluded at this stage that implementation of this measure is not likely to have a significant adverse effect on the SPA or Ramsar site. **Conclusion: No likely significant effect on the Thames Estuary SPA and Ramsar site.**
Areas of Critical Drainage (AoCD) Specific Actions		
Improvements to drainage maintenance: Victoria Road Brook	• Changes in water levels or table • Changes in water chemistry • Surface water flooding changes • Toxic contamination	The majority of planned investigations into potential drainage infrastructure and maintenance works are located over 5km from the Thames Estuary SPA and Ramsar site. However, this action aims to confirm with the Environment Agency the maintenance regime for Victoria Road Brook, which is located approximately 2km from the site boundary. As this action is an investigation into physical interventions, construction works or changes in water management, and any potential works will be relatively small-scale and local in impact, at present it is not likely to have a significant adverse effect on the interest features of the SPA or Ramsar site. Therefore, it is unlikely that hazards will arise on the sensitive interest features as a result of implementation of the LFRMS. On implementation, these schemes are likely to be subject to further authorisations, either through the planning process and/or another consenting process. Before any physical works or water management actions are implemented, they will be subject to the requirements of the Habitats Regulations as a matter of law and government policy. An Appropriate Assessment would be required where such works/actions are likely to have a significant adverse effect on the integrity of a European site. Therefore, it can be reasonably concluded at this stage that implementation of this measure is not likely to have a significant adverse effect on the SPA or Ramsar site. **Conclusion: No likely significant effect on the Thames Estuary SPA and Ramsar site.**
Improvements to drainage infrastructure: Bramleys and Russet Close	• Changes in water levels or table • Changes in water chemistry • Surface water flooding changes • Toxic contamination	The majority of planned investigations into potential drainage infrastructure and maintenance works are located over 5km from the Thames Estuary SPA and Ramsar site. However, this action aims to investigate the impact of extra gullies along Bramleys and Russet Close on flooding in the Dunstable Road area, which is located approximately 2km from the site boundary. As this action is an investigation into physical interventions, construction works or changes in water management, and any potential works will be relatively small-scale and local in impact, at present it is not likely to have a significant adverse effect on the interest features of the SPA or Ramsar site. Therefore, it is unlikely that hazards will arise on the sensitive interest features as a result of implementation of the LFRMS. On implementation, these schemes are likely to be subject to further authorisations, either through the planning process and/or another consenting process. Before any physical works or water management actions are implemented, they will be subject to the requirements of the Habitats Regulations as a matter of law and government policy. An Appropriate Assessment would be required where such works/actions are likely to have a significant adverse effect on the integrity of a European site. Therefore, it can be reasonably concluded at this stage that implementation of this measure is not likely to have a significant adverse effect on the SPA or Ramsar site. **Conclusion: No likely significant effect on the Thames Estuary SPA and Ramsar site.**

Table A-5: Assessment conclusions

In reference to the site interest features and their conservation objectives, describe any likely direct, indirect or secondary effects from the uncompleted and/or continuing consented activities of the project (either alone or in combination with other plans or projects) likely to give rise to significant effects on the European/Ramsar Site.	The LFRMS seeks to promote more sustainable flood risk management and includes objectives that aim to reduce the impacts of surface water flooding, promote better management of water resources and deliver a range of wider environmental benefits including new wetland habitat creation. Only a small number of LFRMS actions could potentially result in physical interventions or construction work, or directly affect water management practices. At this stage, the works are still under investigation and are relatively small-scale and local in impact. Therefore, it is unlikely that hazards will arise on the sensitive interest features as a result of implementation of the LFRMS. Until these measures are developed further, it is not possible to reasonably predict whether any potential adverse effects are likely to occur. Nonetheless, implementation of any measures that could result in significant adverse effects on a European site would therefore conflict with the objectives of the LFRMS. Therefore, it can be reasonably concluded at this stage that the LFRMS is not likely to have a significant adverse effect on the Thames Estuary SPA and Ramsar site. This conclusion does not preclude the need for further HRA at subsequent stages of the development and implementation of the LFRMS.
Is the project likely to have a significant effect 'alone'?	No
If there is no likely significant effect 'alone', are there other projects or plans that in-combination with the project being assessed could affect the site?	No
Is the project likely to have a significant effect 'in-combination'?	No
List of agencies consulted (Contact name and telephone/email address)	
NE Consultation response comments: **NE Signature:**	

A.1 References

http://jncc.defra.gov.uk

B Appendix B: Review of policies, plans and programmes

Plan/Policy/Programme	Overview	Relevance to LFRMS	Conflict with LFRMS	Primary SEA topic
International				
EU Sustainable Development Strategy (revised 2006)	Outlines the need for economic growth to support social progress and respect the environment to achieve sustainable development.	The strategy aims to limit climate change and manage natural resources more responsibly, issues which are directly relevant to flood risk. Provides direction for the LFRMS in the managing of natural resources for flood risk	The LFRMS should seek to promote objectives that deliver sustainable FRM and sustainable development.	• Biodiversity, flora and fauna • Water environment
European Biodiversity Strategy to 2020	Outlines strategy to halt the loss of biodiversity and ecosystem services in the EU by 2020.	Aims include the provision of better protection for ecosystems and fish stocks, promotion of green infrastructure and tighter controls on invasive alien species.	The LFRMS may contribute to the aims of the strategy through the provision of new green infrastructure to manage flood risk. In contrast, the strategy may limit certain FRM objectives if they are shown to be likely to adversely affect biodiversity or ecosystem services.	• Biodiversity, flora and fauna
EC Birds Directive – Council Directive 2009/147/EEC on the conservation of wild birds	Provides for protection of all naturally occurring wild bird species and their habitats, with particular protection of rare species.	Designates Special Protection Areas (SPAs) to protect birds and their habitats. The LFRMS objectives should avoid any significant adverse effect on these sites and supporting features. Requires LFRMS to be assessed for potential impact.	May restrict certain FRM objectives if they are shown to be likely to have a significant effect on a SPA.	• Biodiversity, flora and fauna
EU Floods Directive – Directive 2007/60/EC on the assessment and management of flood risks	Aims to reduce and manage the risk of flooding and associated impacts on the environment, human health, heritage and economy. Principle requirement is the preparation of FRM plans at River Basin District level, together with preliminary flood risk assessments and hazard/risk maps.	Provides strategic direction to reduce impacts of flooding and promote enhanced FRM. The LFRMS will need to demonstrate compliance with the requirements of the Directive.	None likely as the LFRMS will seek to contribute to achieving the Directive.	• Water environment • Climate
EU Groundwater Directive – Directive 2006/118/EC on the protection of groundwater against pollution and deterioration	Establishes a regime that sets underground water quality standards and introduces measures to prevent or limit inputs of pollutants into groundwater. Implemented in the UK through the Environmental Permitting Regulations (2010).	Water quality is relevant to the LFRMS as flooding is linked to water pollution and a reduction in surface water and groundwater quality.	Improved FRM may benefit groundwater quality by reducing the risk of water pollution during a flood event. LFRMS objectives would need to consider potential impacts on groundwater and may be restricted if they contribute to an adverse impact.	• Water environment
EC Habitats Directive – Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora	Principle aim is to promote the maintenance of biodiversity by requiring Member States to take measures to restore habitats and species to favourable conservation status. Introduces robust protection for habitats and species of European importance. Enables the creation of Special Areas of Conservation (SACs) in order to establish a coherent ecological network of protected sites. Encourages protection and management of flora and fauna and supporting landscapes through planning and development policies.	Designates SACs to protect and promote biodiversity. The LFRMS objectives should avoid any significant adverse effect on these sites and supporting features. Requires LFRMS to be assessed for potential impact.	May restrict certain FRM objectives if they are shown to be likely to have a significant effect on a SAC.	• Biodiversity, flora and fauna
Urban Wastewater Treatment Directive – Directive	Aims to protect the environment from the adverse effects of urban waste water discharges and discharges from certain industrial sectors.	Defines requirements for the collection and treatment of waste water in line with the population equivalent. LFRMS would need to	The LFRMS could support the aims of the Directive by reducing the risk of flooding to water treatment sites. However, LFRMS objectives	• Water environment

Plan/Policy/Programme	Overview	Relevance to LFRMS	Conflict with LFRMS	Primary SEA topic
91/271/EEC concerning urban waste water treatment		consider potential impact of FRM objectives on water treatment sites.	may be restricted if they are shown to be likely to effect on wastewater discharges during flood events.	
EU Water Framework Directive – Directive 2000/60/EC of the European Parliament and of the Council establishing a framework for the Community action in the field of water policy	Establishes framework for protection of inland surface waters, transitional waters, coastal waters and groundwater to prevent pollution, promote sustainable water use, protect the aquatic environment, improve the status of aquatic ecosystems and mitigate the effects of floods and droughts.	Member states must prepare River Basin Management Plans and programme of measures for each River Basin District that sets out a timetable approach to achieving the WFD objectives. Places requirements on all relevant authorities to ensure their actions do not contravene the objectives of the Directive.	May restrict certain FRM options if likely to inhibit achievement of WFD objectives and detailed programme of measures. FRM options may be strengthened if they actively contribute to meeting the WFD requirements.	• Biodiversity, flora and fauna • Water environment
National				
Securing the Future – the UK Government Sustainable Development Strategy (2005)	Establishes a broad set of actions and priorities to support the achievement of sustainable development. It includes measures to enable and encourage behaviour change, measures to engage people, and ways in which the Government can promote sustainability.	Includes high level aims to promote sustainable development and sets out how local authorities can contribute to delivering this and the improvement of the local environment.	The LFRMS can contribute to sustainable development through the promotion of better FRM to benefit people, the economy and the environment.	• Population • Material assets
Flood and Water Management Act (2010)	Designates Lead Local Flood Authorities (LLFAs) who *'must develop, maintain, apply and monitor a strategy for flood risk management in its area'.* Applies to ordinary watercourses, surface runoff and groundwater.	Provides key driver for production of LFRMS and sets strategic direction.	None	• Water environment • Climate
Flood Risk Regulations (2009)	Implements the requirements of the EU Floods Directive, which aims to manage the risk of flooding and associated socio-economic and environmental impacts. Requires LLFAs to manage flooding from surface runoff.	Key driver for implementing FRM strategies at the local level.	None	• Water environment • Climate
Water for People and the Environment, Water Resources Strategy for England and Wales (2009)	Sets out the approach to sustainable water resources management throughout England and Wales to 2050 and beyond to ensure that there will be sufficient water for people and the environment.	FRM measures are linked to wider water resources management issues and both aspects can actively contribute to achieving corresponding objectives.	None	• Water environment • Population • Climate
Future Water, The Government's water strategy for England (2008)	Future Water defines future objectives for the water sector by 2030 and implementation steps on achieving the objectives. It includes objectives to reduce flood risk from rivers and the coast; improve the sustainable delivery of water supplies; improve the quality of the water environment through greater protection; and more effective management of surface water , which includes the promotion of SuDS, water reuse and above-ground storage;	The strategy includes provisions that seek to better manage surface water drainage and reduce flood risk, and the LFRMS could actively contribute to achieving these objectives.	The strategy promotes greater protection of the water environment, reduced water pollution and enhanced ecological quality of watercourses. The strategy may restrict certain FRM options if they are likely to inhibit achievement of these wider environmental objectives.	• Water environment
Making Space for Water – taking forward a new Government strategy for flood and coastal erosion risk	Aims to provide strategic direction to deliver sufficient space for water and enable more effective management of coastal erosion and flooding to benefit both people and the economy. The aim being to address these issues to mitigate their impact and to achieve environmental and social benefits.	National guidance regarding FRM is directly relevant to the LFRMS. The LFRMS can contribute to its aims, including promoting greater land management and land use	None	• Water environment • Population • Climate

Plan/Policy/Programme	Overview	Relevance to LFRMS	Conflict with LFRMS	Primary SEA topic
management in England (2005)		planning, and integrated urban drainage management.		
The National Flood and Coastal Erosion Risk Management Strategy for England (2011)	Provides strategic direction to manage and monitor flood and coastal erosion risks in England. It sets out responsibilities of different organisations including local authorities to reduce risks and sets out the requirements for LLFAs to develop LFRMS.	Key driver for implementing FRM strategies at the local level.	None	• Water environment • Population • Climate
Water Act (2003)	Sets out the framework for abstraction licensing, impoundments, water quality standards and pollution control measures, and includes measures for drought management and flood defence work in England and Wales.	FRM is one of the themes addressed by the LFRMS.	The strategy promotes greater protection of water resources and may restrict LFRMS objectives if they are likely to adversely affect water quality or sustainable resource management.	• Water environment
Water Act (2014)	Sets out the framework for abstraction licensing, impoundments, water quality standards and pollution control measures, and includes measures for drought management and flood defence work in England and Wales. Key reforms from the Water Act (2003) are the introduction of market reform.	Flood insurance is one of the themes addressed by the Water Act, therefore relevant to the LFRMS.	The strategy promotes greater protection of water resources and may restrict LFRMS objectives if they are likely to adversely affect water quality or sustainable resource management.	• Water environment
Draft Water Bill (2012)	Emerging national strategy aimed at improved regulation of the water industry, whilst increasing its resilience to natural hazards such as drought and floods. It includes provisions to better manage sustainable water abstraction and encourage the use of SuDS.	Aims to promote better management of water resources and reduce the risks of flooding.	The strategy promotes greater protection of water resources and may restrict LFRMS objectives if they are likely to adversely affect water quality or sustainable resource management.	• Water environment
The National Flood Emergency Framework for England (2011)	Sets out a strategic approach to emergency response planning to reduce the impacts of flooding and improve resilience.	The framework sets out organisational responsibilities and promotes a multi-agency approach to managing flooding events.	None	• Water environment
The Carbon Plan (2011)	The carbon plan sets out a vision for Britain powered by cleaner energy used more efficiently, with more secure energy supplies and stable energy prices and benefits from jobs and growth that a low carbon economy will bring. Key areas are electricity generation, eating homes and businesses and travel.	Carbon emissions, and the resulting climate change impacts, are highly relevant to the issue of FRM due to the likely increased flood risk resulting from climate change.	None	• Climate change
Building a Low Carbon Economy – the UK's Contribution to Tackling Climate Change (2008)	Puts forward a framework for adapting to climate change and associated threats as well as a case for increased resilience to climate change.	Emphasises the commitment to sustainable development and consideration of the potential impacts of climate change, including increased flooding.	The LFRMS may contribute to the aims of the strategy through the provision of measures to adapt to an increase in flood risk due to future climate change.	• Climate change
Climate Change Act (2008)	Establishes a definite target to reduce UK national carbon emissions by 80% by 2050, relative to a 1990 baseline. Requires the government to publish five yearly carbon budgets starting with the period 2008-2012. Sets targets to reduce	Emphasises the commitment to sustainable development.	The LFRMS will need to consider the carbon implications of its objectives and should seek to minimise emissions whilst promoting sustainable FRM.	• Climate change

Plan/Policy/Programme	Overview	Relevance to LFRMS	Conflict with LFRMS	Primary SEA topic
	greenhouse gases, and puts in place funding and mechanisms to reduce and alter activities which contribute to the emission of these gasses.			
Biodiversity 2020: A Strategy for England's Wildlife and Ecosystems (2011)	Sets out the Government's strategy for improving biodiversity in England up to 2020.	Flooding can have adverse impacts on biodiversity. However there may be opportunities for the LFRMS to provide for biodiversity enhancements, as well as reducing risks to habitats and species from flood events.	The strategy could restrict LFRMS objectives if they are shown to have a significant adverse impact on water quality or local biodiversity.	• Biodiversity, flora and fauna • Water environment
England Biodiversity Framework (2008)	The framework encourages a number of conservation aspects including the adoption of an ecosystem approach and to embed climate change adaptation principles in conservation action.	The LFRMS may include measures that would result in biodiversity enhancements across landscapes and restoring / improving habitats.	The strategy could restrict LFRMS objectives if they are shown to have a significant adverse impact on water quality or local biodiversity.	• Biodiversity, flora and fauna • Water environment
UK Biodiversity Action Plan (1994)	The UK BAP aims to maintain and enhance biological diversity within the UK and contribute to the conservation and enhancement of global diversity.	The LFRMS will need to consider the potential impacts of measures within it on important species and habitats that are within the District, including the various Sites of Special Scientific Interest.	The strategy could restrict LFRMS objectives if they are shown to have a significant adverse impact on water quality or local biodiversity.	• Biodiversity, flora and fauna • Water environment
National Wetland Vision (2008)	The Wetland Vision is of a future where wetlands are a significant feature of the landscape in which wildlife can flourish. It will be a future in which wetland heritage is recognised and safeguarded; where everyone can enjoy wetlands for quiet recreation and tranquillity. Vitally, it will be a future where wetlands are valued both for the roles they play in helping us deal with some of the challenges of the 21st century and in improving and sustaining our quality of life.	Preserving and restoring wetlands such as peatlands, rivers and lakes will help regulate surface water run-off, store flood water and recharge groundwaters. These actions that are part of the wetland vision could potentially link with measures within the LFRMS.	May restrict certain FRM objectives if they are shown to be likely to have a significant effect on wetland habitats within the Borough.	• Biodiversity, flora and fauna • Water environment
Wildlife and Countryside Act (as amended) (1981)	The Act is the principle mechanism for legislative protect of wildlife in Great Britain. The Act deals with the protection of birds, other animals and plants.	The Act provides for the notification of Sites of Special Scientific Interest and their protection and management. Any potential impacts of the LFRMS, including on SSSIs, will need to be considered through the SEA.	May restrict certain FRM objectives if they are shown to be likely to have a significant effect on a SSSI.	• Biodiversity, flora and fauna • Water environment
Natural Environment and Rural Communities (NERC) Act (2006)	Provides guidance for the protection and enhancement of important habitat and species.	Requires the Secretary of State to publish a list of habitats and species which are of principal importance for the conservation of biodiversity in England.	May restrict certain FRM objectives if they are shown to be likely to have a significant effect on priority species or habitats.	• Biodiversity, flora and fauna • Water environment
Salmon and Freshwater Fisheries Act (1975)	Aims to regulate practice relating to freshwater fisheries and salmon fishing.	The Act's main purpose is to protect fish species. However, it does indirectly affect flood risk. Restricting the obstruction to passage of fish may have implications for flood risk, as this will prohibit the use of fish weirs and mill dams.	May restrict certain FRM objectives if they are shown to be likely to have an adverse effect on fish passage or compromise a waterbody from achieving Good status under the WFD.	• Biodiversity, flora and fauna • Water environment

Plan/Policy/Programme	Overview	Relevance to LFRMS	Conflict with LFRMS	Primary SEA topic
Contaminated Land (England) Regulations (2006)	Sets out provisions relating to the identification and remediation of contaminated land. The regulations identify contaminated land issues and pathways to pollution of surface, ground, estuarine and coastal water environments.	Although there is no heavy industry in Bromley, other light industries may have contaminated the land.	Flooding of contaminated land can have adverse impacts on factors such as biodiversity, water and soils	• Biodiversity, flora and fauna • Water environment • Soils
National Planning Policy Framework (2012)	The National Planning Policy Framework (NPPF) has replaced the set of national planning policy statements and national planning policy guidance notes, bringing them into one document. It sets high level national economic, environmental and social planning policy and includes a new presumption in favour of sustainable development.	The NPPF has replaced PPS25 along with the other PPSs and PPGs, and so comprises the national policy framework in relation to planning in areas of higher flood risk. The NPPF restricts development that would adversely affect sites European sites, designated sites, including Green Belt, Sites of Special Scientific Interest (SSSIs) and Areas of Outstanding Natural Beauty (AONB), as well as locations at risk of flooding or coastal erosion.	The strategy could restrict LFRMS objectives if they are shown to have a significant adverse effect on sensitive ecological and landscape sites in the Borough.	• Biodiversity, flora and fauna • Water environment • Landscape • Historic environment • Population • Soils
PPS5: Planning for the Historic Environment Practice Guide (2010)	The guide assists local authorities, owners, applicants and other interested parties in implementing the policy *Planning Policy Statement 5 (Planning for the Historic Environment)*.	Provides guidance on how to conserve historic assets. This will provide advice on how to develop around historic assets, as well as ways best to conserve them from flooding.	May restrict certain FRM objectives if they are shown to be likely to have an adverse effect on historic assets in the Borough.	• Historic environment.
Historic Environment Good Practice Advice in Planning: Historic Environment Records (2014)	Provides information on good practice to assist local authorities, planning and other consultants, owners, applicants and other interested parties in implementing historic environment policy in the NPPF. Assists with access to Historic Environment Records.	Guide helps to assist in sustainable development, in helping with access to Historic Environment Records which has information about various historic assets.	None.	• Historic environment
Historic Environment Good Practice Advice Guide in Planning: Note 3: The Setting of Heritage Assets.	Provides information on good practice to assist local authorities, planning and other consultants, owners, applicants and other interested parties in implementing historic environment policy in the NPPF. Provides advice on the setting of historic assets, and how to understand the setting.	Understanding the setting of a historic assets will assist in design development of FRM measures.	May restrict certain FRM objectives if they are shown to be likely to have an adverse effect on historic assets in the Borough.	• Historic environment
Regional / Local				
Thames Catchment Flood Management Plan (2009)	The CFMP provides an overview of the flood risk in these catchments and set out the preferred surface water management strategy for future years. They outline the wider context for managing flood risk in London.	The CFMP provides important context for the LFRMS and set the strategic direction for managing flood risk from main rivers.	None	• Water environment
South Essex Catchment Flood Management Plan (2009)	The CFMP provides an overview of the flood risk in these catchments and set out the preferred surface water management strategy for future years. They outline the wider context for managing flood risk in South Essex.	The CFMP provides important context for the LFRMS and set the strategic direction for managing flood risk from main rivers.	None	• Water environment
Thames Estuary 2100 Strategy (2012)	Provides recommendations for FRM for London and the Thames Estuary.	Provide important context for the LFRMS.	None	• Water environment

Plan/Policy/Programme	Overview	Relevance to LFRMS	Conflict with LFRMS	Primary SEA topic
Thames Gateway Delivery Plan (2009)	Europe's largest regeneration project, which stretches along the Thames Estuary. The plan provides a structure for positive change in the area, a strong economy, improvements in quality of life and development of the Gateway as an eco-region.	Developing an eco-region could include water courses and wetland areas.	The LFRMS will need to consider development policies set out in the plan. May restrict certain FRM options if likely to inhibit achievement of the strategy objectives.	• All
Managing Water Resources & Flood Risk in the South East (2005)	Provides levels of strategic assessment of flood risk across the region.	Provide broad context for the LFRMS.	None	• Water environment
London Rivers Action Plan (2009)	A tool to help restore rivers for people and nature. Provides guidance regarding improving the wildlife and amenity value of London rivers. Key aspirations include the improvement of flood management using more natural processes; reducing the likely negative impacts of climate change; reconnecting people to the natural environment through urban regeneration; and enhancing habitats for wildlife.	The watercourses within Bromley and surface water flooding are a key feature of the LFRMS.	The LFRMS will need to consider these aspirations in a local context and should seek ways	• Water environment • Biodiversity, flora and fauna
Thames River Basin Management Plan	The Thames River Basin Management Plan (RBMP) has been prepared to meet the requirements of the EU Water Framework Directive. It focuses on actions to address the protection, improvement, sustainable use of water and other pressures facing the water environment in the Thames River Basin.	Water quality and quantity is linked to the LFRMS as flooding events can lead to water pollution and changes in water levels.	May restrict certain FRM options if likely to inhibit achievement of WFD objectives and detailed programme of measures. FRM options may be strengthened if they actively contribute to meeting the WFD requirements.	• Water environment
Thames Flood Risk Management Plan (2015 – Draft)	Unable to be reviewed as the draft has been closed to consultation.			
Thurrock Council Local Air Quality Action Plan (2004)	Details how Thurrock Council intends to improve air quality within its fifteen AQMAs.	Provides information on regional policies to improve air quality in the borough.	None	• Air quality
Thurrock environmental Vision and Policy (2013)	Sets the high level framework for the Council's work to deliver the Community Strategy priority for promoting and protecting our clean and green environment.	Provides information on environmental priorities and vision.	The LFRMS may need to consider environmental policies, which may restrict certain FRM options.	• Biodiversity, flora and fauna • Water environment
Essex County Council Preliminary Flood Risk Assessment (2011)	Provides a high level review of flood risk from surface water, groundwater and ordinary watercourses across the county.	The flood risk assessment provides an important local context for the LFRMS.	None	• Water environment
Thurrock Strategic Flood Risk Assessment Level 1 Report (2009) and Level 2 Report (2010)	Provides a review of flood risk across the borough, steering all development towards areas of lowest risk.	The flood risk assessment provides an important local context for the LFRMS.	None	• Water environment
Thurrock Transport Strategy 2013-2026 (2013)	Sets out the aims, objectives and a series of policies for delivering transport improvements in Thurrock.	Important transport infrastructure may be at risk of flooding and the LFRMS offers potential benefits through better FRM.	None	• Material assets • Population • Air quality

Plan/Policy/Programme	Overview	Relevance to LFRMS	Conflict with LFRMS	Primary SEA topic
Thurrock Local Development Framework Core Strategy and Policies for Management of Development (2011)	The policies cover spatial development issues in relation to education, health, community safety, energy management, sustainable development, climate change and flood management.	The strategy provides direction for the future development of the Borough, and includes policies relating to flooding.	The LFRMS will need to consider development policies set out in the strategy. May restrict certain FRM options if likely to inhibit achievement of the strategy objectives.	• All
Thurrock Council Surface Water Management Plan (2014)	Considers flooding from sewers, drains, groundwater and runoff from land, small watercourses and ditches that occurs as a result of heavy rainfall.	The management plan identifies measures to help alleviate surface water flooding. The LFRMS will also provide measures that alleviate surface water flooding.	The LFRMS will need to consider the measures outlined in the management plan.	• Water environment
Sustainable Community Strategy Thurrock 2020 (2009)	Sets out how Thurrock will achieve its ambitions of a sustainable community.	The strategy provides direction for the future development of the Borough, particularly regeneration.	The LFRMS will need to consider development policies set out in the strategy.	• All
Essex Biodiversity Action Plan (2011)	Details the priorities for habitats and species and offers practical measures which can be implemented to achieve the conservation of the areas biodiversity heritage. The content of the plan is informed and guided by national targets so that its implementation is firmly linked to national priorities.	Objectives include the improvement of water quality, removal of barriers to aquatic species and enhancement of wetland and riverine habitats and connectivity and the issue of invasive species.	Objectives of the Essex BAP are linked to those of the WFD to enhance biodiversity and improve water quality status.	• Biodiversity, flora and fauna
Thurrock Biodiversity Action Plan 2007-2012	Identifies key biodiversity habitats and species for Thurrock and aims to raise awareness, outline an action programme and encourage developers to integrate biodiversity.	Objectives include maintain existing areas of habitats and to ensure habitats are managed and maintained.	Objectives of the Thurrock BAP are linked to WFD measures to enhance biodiversity.	• Biodiversity, flora and fauna.
Essex County Council Adapting for Climate Change – Action Plan (2014)	Highlights the types of severe climatic events possible in the future and the impact these could have on services. Sets out measures to adapt and build resilience to these types of events.	FRM actions can contribute to the provision of adaptation measures to benefit people and biodiversity. FRM activities will generate carbon emissions.	The LFRMS will need to demonstrate that it can deliver improved FRM whilst minimising the level of associated carbon dioxide emissions.	• Climate

C Appendix C – Consultation Responses

Consultee	Comment received	Response / Action
Environment Agency (7 September 2015)	Page 6. It mentions a section 2.6.7 which has been inserted that should contain further detail on installation of structures and WFD. This new section is absent from the SEA on pages 28-29.	Page 6 has been amended to read section 2.6.6, which addresses the scoping consultation comment.
	Page 25. White-clawed crayfish are mentioned as present in the Borough. To our knowledge there are no white-clawed crayfish populations in Thurrock or most of the rest of Essex, see http://www.essexrivershub.org.uk/index.php/recent-news/492-last-known-population-of-white-clawed-crayfish-in-essex-could-be-in-trouble Therefore there is no need to mention them further in the document, unless ark sites are to be created for them in the Borough.	The reference to White-clawed crayfish has been retained as it is included in Essex Biodiversity Project's Species Action Plan. A sentence has been included on page 25: *White-clawed Crayfish however are not present in within the Borough, and the last known river-based population in Essex is at risk.* Reference to White-clawed Crayfish has been removed from page 25.
Natural England (7 September 2015)	Overall, we note that the Actions listed in the LFRMS are generally investigative or communicative in their nature, and as such (and at this stage) do not comprise many activities on the ground which could lead to environmental impacts (whether positive or negative). This is told out by the largely neutral appraisal of LFRMS objectives, especially with respect to SEA Objectives linked to the natural environment / biodiversity.	No action required.
	The Environmental Report makes reference to some projects requiring works on the ground to alleviate flooding hot spots, and we considered that these are sufficiently localised and distant from designated sites of nature conservation interest to not present significant impacts. The Report carries the intention to defer much of the assessment of environmental impacts of its projects to later stages of assessment, and so the Council needs to ensure that these are carried out, and appropriately audited, to ensure its aims and objectives are fully realised and reported.	No action required.
	We are satisfied with the objectives and indicators proposed, and have no specific comments to make.	No action required.
	Habitats Regulations Assessment We have reviewed the HRA integrated within the Environmental Report. The scope of the HRA is precautionary (15km from the authority boundary) and therefore encompasses (and rules out) impacts to European sites some distance from the source of impact. We consider that the "hazards and effects" are appropriately considered. It is not always clear what the implications of some LFRMS Actions are for European sites without further interrogation of the LFRMS itself (outside the scope of this consultation), however we are generally satisfied with the consideration of impacts to European sites, and overall agree with the conclusion reached, that the LFRMS is not likely to have a significant effect to European sites (and in particular the Thames Estuary and Marshes Special	No action required.

Consultee	Comment received	Response / Action
	Protection Area and Ramsar site).	
Historic England (1 September 2015)	We welcome the clarification and amendments to the baseline information specifically: • Inclusion at 2.8 relating to unrecorded archaeology, including buried archaeology, waterlogged archaeological and palaeo-environmental remains. • The use of Figure 2.9 which highlights designated heritage assets and their locations in Thurrock. • Consideration of Heritage at Risk at Section 2.8 on page 31.	No action required.
	It is recommended that the consideration of non-designated heritage assets is made clear in this section. The Historic Environment of Thurrock is more than just the sum of its designated heritage assets; non-designated assets make up an important and valued part of this and it is important that they are acknowledged as their protection is required by the NPPF. Therefore non-designated heritage assets should be acknowledged and their consideration reflected clearly within the baseline of the SEA.	A paragraph on page 32 has been included: *There are many heritage assets within Thurrock, including designated and non-designated heritage assets. Non-designated heritage assets' protection is a requirement of the NPPF, therefore should be considered during implementation of the LFRMS actions.*
	SEA Framework Our concerns however remain with regard to the non-inclusion of the recommended sub-objectives. Sub-objectives are considered important to achieve consistency and clarity and to ensure that all key heritage issues are appropriately considered and potential effects appropriately assessed.	Sub-objectives have not been included as this is a high level strategic assessment of environmental effects from FRM measures.
	It should be noted that we have not had the opportunity to look into impacts on the Historic Environment of individual Flood Risk Management methods and proposals, as outlined within the Thurrock LFRMS itself. Historic England there reserves the right to comment on or formally object to individual proposals as they arise.	No action required.
	Please note that any reference to 'English Heritage' within the document should be changed to 'Historic England'.	English Heritage has been amended to Historic England.

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