Babergh & Mid Suffolk Level 1 Strategic Flood Risk Assessment

Final report

August 2020

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Revision History

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S3-P01/June 2020	Draft Report	Matt Deakin
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Contract

This report describes work commissioned by Matt Deakin, on behalf of Babergh & Mid Suffolk District Councils, by an email 21st February 2020. Lucy Archer-Lock and Phil Emonson of JBA Consulting carried out this work.

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Purpose

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Executive summary

Introduction

Babergh District Council & Mid Suffolk District Council (BMSDC) have commissioned a joint Level 1 Strategic Flood Risk Assessment (SFRA) to update the existing Level 1 SFRAs produced in 2008 for Mid Suffolk and 2009 for Babergh. The SFRA will add to the water and flood risk evidence base for the emerging Babergh and Mid Suffolk (B&MS) Joint Local Plan.

SFRA Objectives

The key objectives of the review performed during the preparation of the 2020 SFRA are:

- to provide up to date information and guidance on flood risk for B&MS, taking into account the latest flood risk information (including the probable impacts of climate change), the current state of national planning policy and legislation and relevant studies;
- to provide the basis for applying the flood risk Sequential Test, and if necessary, the Exception Test;
- to provide a comprehensive set of maps presenting flood risk from all sources that can be used as part of the evidence base for the local plan, and
- identify the requirements for site-specific flood risk assessments and the application of Sustainable Drainage Systems

An overarching aim, in meeting these objectives is to put flood risk management policy and practice in place to provide for a strategic approach to the management of flood risk to address the needs of adaptation to climate change effects.

All data in this report is correct as of August 2020. For more information please contact the relevant organisation.

SFRA Outputs

To meet the objectives, the following outputs have been prepared:

- Assessment of all potential sources of flooding
- Mapping of location and extent of the functional floodplain
- Assessment of the potential impact of climate change on flood risk
- Mapping areas covered by Environment Agency (EA) Flood Warnings and Alert areas
- Assessment of standard of protection and condition of existing flood risk management infrastructure within the study area
- Assessment of locations where additional development may increase flood risk elsewhere
- A review of flood risk and historical flood incidents within main settlements
- A screening assessment of potential development sites against different sources of flood risk
- Recommendations of the criteria that should be used to assess future development proposals and the development of a Sequential Test and sequential approach to flood risk
- Guidance for developers including requirements for site specific flood risk assessments and the process for flood map challenges

Table 1: SFRA report contents

Section	Contents
1. Introduction	Provides a background to the study, defines objectives, outlines the approach adopted and the consultation performed.
2. The planning framework and flood risk policy	Includes information on the implications of recent changes to planning and flood risk policies and legislation, as well as documents relevant to the study.
3.The sequential, risk-based approach	Describes the Sequential Approach and application of Sequential and Exception Tests.
4. Sources of information used in preparing the SFRA	Outlines what information has been used in the preparation of the SFRA.
5. Understanding flood risk in B&MS	Introduces the assessment of flood risk and provides an overview of the characteristics of flooding affecting the districts.
6. Flood warning and emergency planning	Provides a background to flood warning and emergency planning in the districts.
7. Climate change	Includes the latest climate change allowances and how these will be included in the SFRA.
8. Flood defences	Provides an overview of flood defences in the districts.
9. Assessment of flood risk in potential development areas	Assesses the site screening for different sources of flood risk, potential for cumulative impact in the districts and cross boundary issues.
10. FRA requirements and flood risk management guidance	Includes information on the requirements for FRAs.
11. Surface water management and SuDS	Advice on managing surface water run-off and flooding and the application of SuDS.
12. Strategic flood risk solutions	Overview of possible strategies to reduce flood risk.
13. Summary	Review of the Level 1 SFRA.
14. Recommendations	Identifies recommendations for the council to consider as part of Flood Risk Management policy.
Appendices	Maps showing flood risk information from all sources

Table 2: Summary of how SFRA meets requirements in guidance

Requirement in guidance	How this is addressed	Section this has been addressed
Assess risk from all sources of flooding	Risk of flooding has been assessed from fluvial, tidal, surface water, groundwater, sewer, reservoir sources. Review of historic flooding incidents. Maps showing the risk of flooding are provided in the appendices. Site summary screening spreadsheet shows the area of each site at risk of fluvial, tidal, surface water and groundwater sources.	Section 5 Appendices
Define functional floodplain	Functional floodplain has been defined using available hydraulic models and Flood Zone 3.	Section 4.2 Appendix C
Cumulative impact that development or changing land use would have on the risk of flooding	Cumulative impact assessment has been undertaken to rank catchments as low, medium and high risk.	Section 9
Effect of climate change on risk	Report outlines latest climate change allowances. Fluvial and tidal models with proposed allocations in have been re-run with the latest climate change allowances.	Section 7 Appendix J and K
Areas of Flood Zone 1 where the sequential test and flood risk assessments will be needed	SFRA provides overview of the circumstances in which the sequential test and flood risk assessment would be required.	Section 3
Opportunities to reduce the causes and impacts of flooding	SFRA outlines section on strategic flood risk solutions, including SuDS, flood storage schemes, naturalisation	Section 12
Flood management and defences, any land likely to be needed for flood risk management features and	Standard of protection, condition and location of defences outlined in report Areas benefitting from	Section 8

Requirement in guidance	How this is addressed	Section this has been addressed
structures	defences identified Local schemes planned in the 6 year capital programme	
Recommendations on how to address flood risk in development	Section on FRA requirements and flood risk management guidance, and guidance on SuDS	Section 10 and 11

Appraisal of flood risk

Flood incidents have been recorded across the study area from a combination of sources. Flood incidents have been derived from an Anglian Water sewer incidents dataset, Environment Agency (EA) historic outlines and the BMSDC flood incident database (which is collected from Suffolk County Council (SCC) flood incident data). The dominant source of flooding based on the quantity of historical records in B&MS has been identified as surface water. Records are found across the districts, notably in Sudbury, Long Melford, Hadleigh, Needham Market, Stowmarket, Claydon, Debenham and Eye. The Risk of Flooding from Surface Water (RoFSW) dataset shows that surface water predominantly follows topographical flow paths of existing watercourses or dry valleys with some isolated ponding located in low lying areas. There have also been significant fluvial flooding events within the districts, and the EA Flood Zones identify that there are many areas in the study area at risk of fluvial flooding. Historic fluvial flood events have taken place along the River Stour, River Gipping, River Waveney and River Deben, and affected settlements including Sudbury, Stratford St Mary, Stowmarket, Needham Market. There is also a risk of tidal flooding along the River Stour and River Orwell.

There are a number of defences in the study area, including along the River Stour, River Orwell and River Gipping. The standard of protection for these defences as well as the condition is outlined within the review in this document. The condition of the defences along the River Brett (Swingleton Green), Chad Brook (Long Melford), River Stour (Sudbury, Great Cornard, Stratford St Mary, Cattawade, Stutton/Holbrook, Shotley Gate) River Orwell (Shotley, Wherstead), River Gipping (Sproughton, Bramford, Bayham, Needham Market, Stowmarket) Rattlesden River (Finborough Road) and River Waveney (Brcokdish) have a condition of ´fair´ in places which means there may be defects that could reduce the performance of the asset. At Shotley Gate, Shotley and Wherstead, the area areas wrhere the condition is poor, which could significantly reduce the performance of the asset. There is potential for these defences to fail or be overtopped, therefore they should be considered as part of a detailed site-specific FRA.

Flood warnings, along with evacuation plans, can inform emergency flood plans or flood response plans. Flood Warnings are supplied via the Flood Line Warnings Directive (FWD) service, to homes and business within Flood Zones 2 and 3. There are currently 6 Flood Warning Areas (FWA) in Mid Suffolk and 11 in Babergh, and 5 Flood Alert Areas (FAAs) in Mid Suffolk and 5 in Babergh.

The study has shown that the most significant sources of flood risk are fluvial (Appendix B) and surface water (Appendix A). The main areas identified to be at risk from these sources are outlined in Table 3 and Appendix L. This shows which sites are at risk from each source of flooding, and whether the site has post base planning permission (PBPP), is not currently a preferred allocation, or is being taken forward to a L2 SFRA.

Table 3: Summary of main sources of flooding

Source of flooding	Areas affected	Sites where greater than 10% of area is at risk of flooding
Fluvial	The primary fluvial flood risk is along the River Stour, Waveney, Dove, Debenham, Gipping and Brett and their tributaries. These present fluvial flood risk to rural communities as well as to the main urban centres in B&MS (including Sudbury, Stowmarket, Needham Market, Debenham and Eye).	Sites with >10% of the area in Flood Zone 3, Flood Zone 2, or in 1 in 100-year + 65% climate change are: SS1288 – Site has PBPP SS0537 – Site has PBPP SS0009 - Site has PBPP SS0227 – Not currently a preferred allocation SS0418 - Not currently a preferred allocation SS1282 - Not currently a preferred allocation SS0919 - Not currently a preferred allocation SS0324- Not currently a preferred allocation SS0909- Not currently a preferred allocation SS0916 - Not currently a preferred allocation SS1154 - Not currently a preferred allocation SS0902 – Considered for L2 SS0065 – Considered for L2 SS1260 - Not currently a preferred allocation SS1177 - Not currently a preferred allocation SS1178- Not currently a preferred allocation SS1223- Considered for L2 SS1020 - Not currently a preferred allocation SS0765- Not currently a preferred allocation SS0264 – Considered for L2 SS0711 – Considered for L2
Tidal	The primary tidal flood risk is along the River Stour and Orwell estuaries in the south east of the study area, where there is risk of flooding in Shotley, Wherstead, Harkstead and Cattawade.	SS1020 – Site has PBPP
Surface water	The Risk of Flooding from Surface Water map shows a number of prominent overland flow routes; these predominantly follow topographical flow paths of existing watercourses or dry valleys with some isolated ponding located in low lying areas. Areas at risk include Hadleigh, Sudbury and Great Cornard, Stowmarket, Needham	Sites with >10% of the area at risk of flooding from surface water in the 100-year event are: SS1056 – has PBPP SS1154 – Not currently a preferred allocation SS0655 – Not currently a preferred allocation SS0575 - Not currently a preferred allocation SS1018 - Not currently a preferred allocation SS0723 – discounted as site considered small SS0668 – considered for L2 SS0227 - Not currently a preferred

Source of flooding	Areas affected	Sites where greater than 10% of area is at risk of flooding
	Market, Eye and Debenham.	allocation SS0537 – Site has PBPP SS1225 – Not currently a preferred allocation SS0502 – Site has PBPP SS0902 - Considered for L2 SS1198 – Considered for L2 SS0009 – Site has PBPP SS0179 – Site has PBPP SS0916 – Not currently a preferred allocation SS1153 - Not currently a preferred allocation SS0861 – Considered for L2 SS0909 – Not currently a preferred allocation SS0096 – Site has PBPP SS0395 - Not currently a preferred allocation SS0478 – Site has PBPP SS0919 - Not currently a preferred allocation
Groundwater	The JBA Groundwater map shows there is generally negligible risk of groundwater flooding in B&MS. In both districts, areas which are at risk of groundwater flooding tend to correspond to the chalk geology and location of watercourses, and in the low lying areas in the south east of Babergh.	Sites with >10% of area at risk of groundwater flooding (0-0.025m): SS0145 – Site has PBPP SS1056 - Site has PBPP SS1268 – Not currently a preferred allocation SS0902 – Considered for L2 SS0916 – Not currently a preferred allocation SS1154 – Not currently a preferred allocation SS1289 – Site has PBPP SS1092 – Not currently a preferred allocation SS0433 - Site has PBPP SS0009 - Site has PBPP SS1177– Not currently a preferred allocation SS1178– Not currently a preferred allocation
Sewer	Historical incidents of sewer flooding for B&MS indicate that there have been 84 incidents of sewer flooding since 2001. Most incidents have been recorded in CO10 (Sudbury), IP14 (Stowmarket) and IP23 (Eye).	Data not provided in format to screen against sites.
Reservoir	The EA Reservoir Flood Map shows there is generally negligible risk of Reservoir Flooding in B&MS. There is some risk in the vicinity of	Data not provided in format to screen against sites.

Source of flooding	Areas affected	Sites where greater than 10% of area is at risk of flooding
	reservoirs located in the districts. Areas at risk of reservoir flooding include Stowmarket (where there are a number of potential allocations located), Needham Market, Hadleigh, Stratford St Mary and parts of River Stour and Orwell.	

Climate change

The National Planning Policy Framework (NPPF) and accompanying Planning Practice Guidance set out how the planning system should minimise vulnerability and provide resilience to the impacts of climate change. The EA published updated climate change guidance on 19th February 2016 (further updated on 3rd February 2017), which supports the NPPF and must now be considered in all new developments and planning applications. The EA has also published guidance to Local Planning Authorities (LPAs) in the application of appropriate climate change allowances when considering climate change effects (updated April 2016 Adapting to Climate Change: Advice for Flood and Coastal Erosion Risk Management Authorities).

When defining the scope of this commission, the climate change allowances are intended to assist with future planning across the combined study area. The climate change allowances used in this SFRA are detailed in Section 7. Climate change modelling for watercourses across the combined study area was undertaken where detailed models were available at the time of preparing this SFRA. In areas where modelling was not available or models could not be run, it has been assumed that Present Flood Zone 2 represents Future Flood Zone 3. It is important that the EA are approached to determine whether updated (more accurate) information is available prior to commencing a site-specific FRA.

The results of the climate change modelling show that for fluvial models, the extent of Flood Zone 3a and Flood Zone 3b will increase as a result of climate change. This increases the flood risk to settlements across both districts, including Stowmarket, Needham Market, Debenham and Stratford St Mary.

The extent of tidal flooding will also increase with climate change along the River Stour and River Orwell, with the tidally influenced areas moving further upstream.

Cross boundary issues and cumulative impact

Under the revised 2019 NPPF, strategic policies and their supporting Strategic Flood Risk Assessments (SFRAs), are required to 'consider cumulative impacts in, or affecting, local areas susceptible to flooding' (para.156). To assess the cumulative impact within B&MS, the surface water flood risk in each catchment and historical flood records were assessed along with the potential change in developed area of each river catchment to identify the catchments at greatest risk. Figure 1 shows the cumulative impact catchments and those identified to be highest risk.

The topography of B&MS means that a number of major watercourses, such as the River Stour and River Waveney, flow through the study area from neighbouring authorities. Major watercourses flow into B&MS from St. Edmunsbury, Braintree and Breckland Districts. There are also catchments draining out of B&MS into surrounding authorities − Ipswich District, Suffolk Coastal District, South Norfolk District and Waveney District. The River Stour flows along the boundary with Tendring District and Colchester District. This means that development in B&MS may have the potential to increase flood risk to neighbouring authorities. In addition to cross-boundary issues regarding flood

risk, there are also cross-boundary issues relating to water quality. It is recommended that B&MS consults neighbouring authorities to identify and review potential cross-boundary issues.

The cumulative impact assessment has identified the highest risk catchments in Babergh as the River Stour, Lavneham Brook, River Brett, Belstead Brook, Stutton Brook and catchments in the vicinity of the River Orwell. In Mid Suffolk, Pakenham Stream, Sapiston, Haughley, River Gipping through Stowmarket, Rattlesden River, Belstead Brook, River Dove, River Waveney and Chickering Beck have been identified as the highest risk catchments. The results of the cumulative impact assessment are shown in Figure 1.

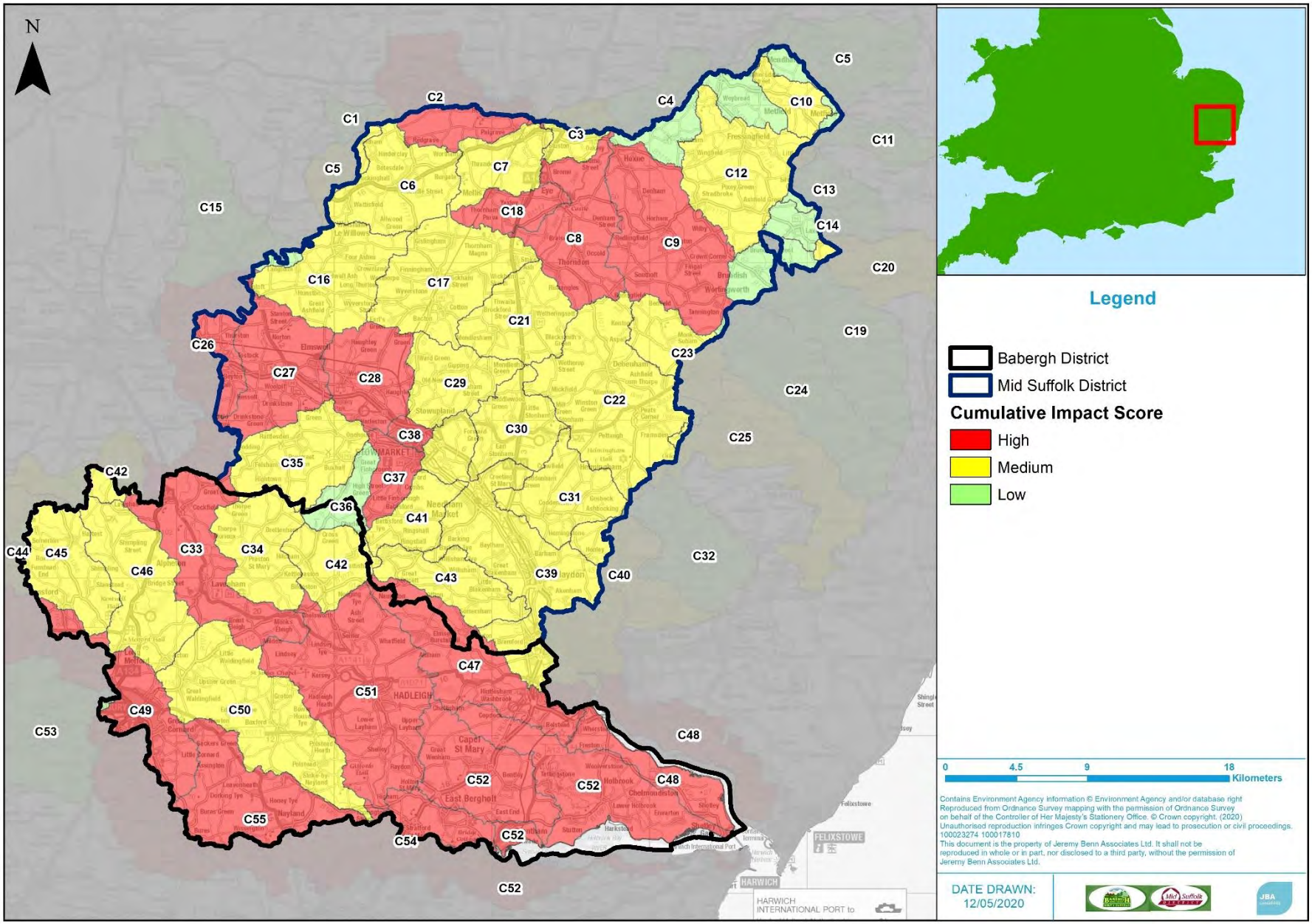

Figure 1 Relative Flood Risk score by WFD catchment

Key strategic planning links

Figure 2 outlines the key strategic planning links for flood risk management and associated documents. It shows how the Flood Risk Regulations and Flood and Water Management Act, have introduced a wider requirement for the mutual exchange of information and the preparation of strategies and management plans.

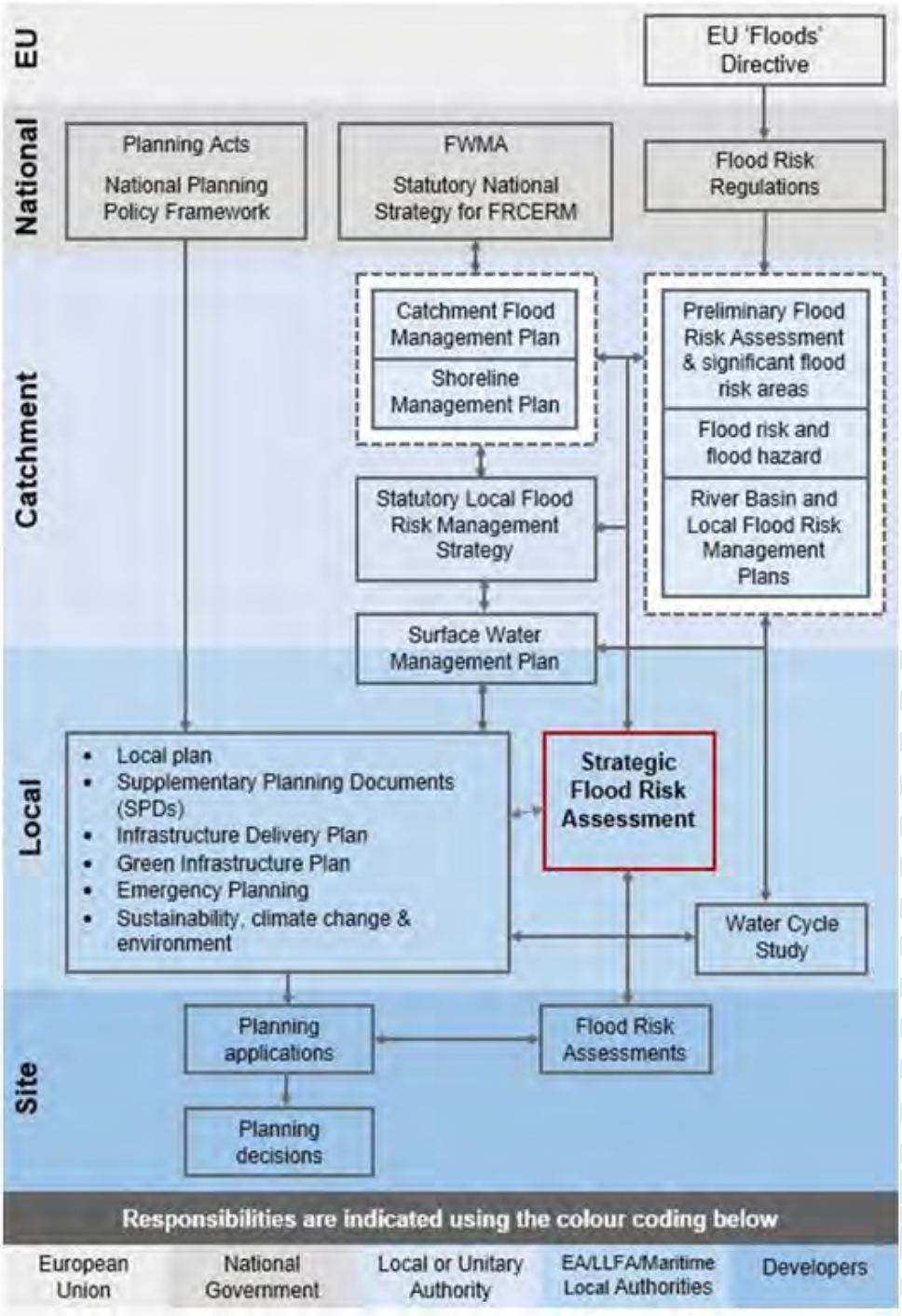

Figure 2: Strategic planning links and key documents for flood risk

Development and flood risk

The Sequential and Exception Test procedures for both Local Plans and Flood Risk Assessments (FRAs) are documented with this SFRA along with guidance for planners and developers throughout this report. Links are provided to various relevant guidance documents and policies published by other Risk Management Authorities, such as the LLFA and the EA. The key findings to note about development and flood risk, relating to the sequential and exceptions tests, site-specific flood risk assessments and SuDs are summarised in the following sections.

Relevant studies

There are many relevant regional and local key studies which complement the SFRA and have been considered, such as the Catchment Flood Management Plan, River Basin Management Plan, the Preliminary Flood Risk Assessment and the Local Flood Risk Management Strategies.

Recommendations

The following policy recommendations are to be considered by B&MS in the development of the Local Plan.

Sequential approach to development

The SFRA has identified the areas of B&MS that are at high risk of flooding from all sources (see Table 3). New development and re-development of land should wherever possible seek opportunities to reduce overall level of flood risk at the site.

The proposed allocations were screened to identify those sites that had greater than 10% of the area at risk of fluvial flooding (including climate change), surface water flooding (1 in 100-year event) and groundwater flooding to consider which sites are at high risk of flooding and may need to go forward to a Level 2 SFRA. This identified that there are 41 sites with >10% of the area at risk of flooding from at least one of these sources. Table 3 identifies these sites and which source of flooding the site is at risk from. Of these 41 sites, the 8 sites which are currently identified as preferred allocations without base post planning permission (PBPP) are to be taken forward to a Level 2 SFRA.

Sequential and exception tests

The SFRA identified that areas of B&MS (and potential allocations) are at risk of flooding from fluvial, tidal, surface water, reservoir and groundwater sources. Therefore proposed development sites will be required to pass the Sequential and, where necessary, Exception Tests in accordance with the NPPF. Developers should consult with BMSDC, the EA and Anglian Water at an early stage to discuss flood risk including requirements for site-specific FRAs, detailed overland flow modelling, consideration of climate change and drainage assessment and design.

Site-specific Flood Risk Assessments

Developers should, where required, undertake more detailed hydrological and hydraulic assessments of the watercourses to verify flood extent (including latest climate change allowances), to inform development zoning within the site and prove, if required, whether the Sequential and Exception Tests are satisfied.

The Flood Zones, whilst generally accurate on a large scale, are not provided for land where the catchment of the watercourses below 3km^2. There are a number of small watercourses and field drains which may pose a risk to development. Therefore, whilst these smaller watercourses may not be shown as having flood risk on the flood risk mapping, it does not necessarily mean there is no flood risk. As part of a site-specific FRA the potential flood risk and extent of flood zones should be determined for these smaller watercourses.

Where a site-specific FRA has produced modelling outlines which differ from the EAs Flood Map for Planning (Rivers and Sea), then a Flood Map Challenge may need to be undertaken. Where the modelling and results are deemed acceptable to the EA, amendments to the Flood Map for Planning (Rivers and Sea) may take place.

Where the watercourses are embanked or there are formal flood defences, the effect of overtopping and breach must be considered and appropriately assessed.

All new development within the 1% Annual Exceedance Probability (AEP) flood extent including an allowance for climate change (for the lifetime of the development) must not normally result in a net loss of flood storage capacity. Annual Exceedance Probability is the probability (expressed as a percentage) of a flood event occurring in any given year. Where possible, opportunities should be sought to achieve an increase in the provision of floodplain storage. Where proposed development results in a change in building footprint, the developer should ensure that it does not impact upon the ability of the floodplain to store or convey water and seek opportunities to provide floodplain betterment. Similarly, where ground levels are elevated to raise the development out of the floodplain, compensatory floodplain storage within areas that currently lie outside the floodplain should normally be provided to ensure that the total volume of the floodplain storage is not reduced.

A revised NPPF was published on 19 February 2019 setting out the Government's planning policies for England and how these are expected to be applied. This revised framework replaces the previous NPPF published in March 2012.

There are also several guidance documents which provide information on the requirements for site-specific Flood Risk Assessments:

- Standing Advice on Flood Risk (Environment Agency)
- Flood Risk Assessment for Planning Applications (Environment Agency)
- Site-specific Flood Risk Assessment: CHECKLIST (NPPG, Defra)

It should be noted that the UK Climate Change Projections 2018 (UKCP18) were published on 26 November 2018. The UKCP18 projections replace the UKCP09 projections as the official source of information on how the climate of the UK may change over the rest of this century. This is likely to result in the Environment Agency climate change allowances being updated in 2020 (these were not available at the time of developing this SFRA). When undertaking an FRA, reference should be made to the most up to date climate change allowances provided by the Environment Agency.

Developers should consult with the relevant LPA (BMSDC), LLFA (SCC), the EA and Anglian Water at an early stage to discuss flood risk including requirements for site-specific FRAs, detailed hydraulic modelling and drainage assessment and design.

Surface water management and SuDS

Planners should be aware of the conditions and local requirements set by SCC, the LLFA, for surface water management for major and minor developments and ensure development proposals and applications are compliant with the LLFA's policy.

Developers should consult SCC's guidance for developers. The guidance provides information on how SuDS proposals for new developments will be considered by the LLFA, when to consult the LLFA, how to screen applications based on local flood risk and records, LLFA standing advice (for Ordinary Watercourse consenting, major development below LLFA thresholds and minor guidance). The technical guidance is split into the following themes:

- Local flood risk guidance
- Drainage hierarchy
- Infiltration testing guidance
- Runoff rates
- Runoff volumes
- Climate change
- Management and maintenance
- Flood exceedance management

All new development should aim to minimise areas of impermeable ground to reduce surface water runoff. Sustainable drainage systems (SuDS) should be used on all new development.

Developers should also refer to the Suffolk SuDS guidance as well as national guidance (the CIRIA C753 SuDS Manual) when considering SuDS schemes for new developments.

BMSDC is working to supplement existing guidance by providing policies relating to SuDS as part of the Local Plan. Developers should also consult this guidance.

It should be demonstrated through a Surface Water Drainage Strategy, that the proposed drainage scheme, and site layout and design, will protect properties and critical infrastructure from surface water flooding in a 1 in 100-year event allowing for climate change both on and off site. The scheme must comply with national sustainable drainage technical standards and Suffolk LLFA requirements, and will be expected to provide multiple benefits in terms of biodiversity, water quality and amenity. A detailed site-specific assessment of SuDS would be needed to incorporate SuDS successfully into the development proposals. All development should adopt source control SuDS techniques to reduce the risk of frequent low impact flooding due to post-development runoff. The 2015 DEFRA non-statutory technical standards for sustainable drainage systems should be followed, alongside the LLFA guidance note (The Local Authority SuDS Officer Organisation (LASOO) Non statutory Technical Standards for Sustainable Drainage - Practice Guidance (2016)) and national guidance.

For proposed developments, geotechnical investigations should be undertaken at the earliest opportunity to determine whether the ground at the site has infiltration potential. This information should be representative of on-site conditions. If the ground at the site is found to have infiltration potential detailed infiltration testing should be undertaken in line with BRE 365 to establish representative infiltration rates.

Development proposals should assess overland flow routes, where new developments might, by their layout, interrupt natural flow paths. As part of the design process exceedance flows routes and events should be considered as part of wider resilience to climate change and the event of failure of the system.

Where sites lie within or close to a Groundwater Source Protection Zone (SPZ) or aquifer, treatment steps may be required ahead of discharge to the ground, sewers etc. Development proposals at sites across the area should assess the pollution risk to receiving waterbodies and include appropriate treatment steps ahead of any discharge to surface or groundwaters. The CIRIA C753 SuDS manual provides further guidance on this issue.

Development

A management and maintenance plan of sustainable drainage and surface water systems covering the lifetime of the development will be required. The developer should provide details of how this will be implemented for the lifetime of the development. Consideration must also be given to the residual risks associated with the use of SuDS. Consideration should also be given to the construction phase of a development to ensure that SuDS schemes are not detrimentally impacted by construction runoff, there is early commissioning of the drainage scheme, and that there are proper mitigation works to prevent pollution and sediment overload of the system.

On 25th October 2019, the Sewerage Sector Guidance (Sewers for Adoption 8th edition), which is referred to as the Design and Construction Guidance, was published and this was implemented on 1st April 2020. This is a guide to the standards that sewers must meet to be adoptable by water and sewerage companies in England and provides guidance on SuDS that can be adopted by Water and Sewerage Companies. This sets out the SUDS features which meet the legal definition of sewer and which are expected to be adopted when they meet the required standard. This will enable Anglian Water to adopt SuDS features as part of a surface water sewer network. SuDS schemes will be required to have full S104 technical approval and full planning approval before construction work begins.

Infrastructure and safe access

Finished floor level guidance has been established through consultation with the EA. Minimum finished floor levels for development should be set to whichever is the higher of the following:

- a minimum of 300mm* above the 1% AEP fluvial event plus an allowance for climate change
- a minimum of 300mm above surrounding ground levels

*A 300mm freeboard is only applicable where detailed modelling is available which is deemed to be reliable. If no detailed and reliable modelling is available, the EA may require a 600mm freeboard to be applied when setting minimum finished floor levels.

If it is not practical to raise floor levels to those specified above, consultation with the EA will be required to determine the suitability of alternative flood mitigation approaches.

Safe access and egress will need to be demonstrated at all development sites. Ideally, access should be situated 300mm above the design flood level and waterproof construction techniques used.

The EA and Association of Directors of Environment, Economy, Planning and Transport (ADEPT) have produced some joint guidance on Flood Risk Emergency Plans for New Development. If safe access and egress cannot be achieved, this should be referred to, to determine the hazard to people posed along the access route. This can also be used to inform a Flood Warning and Evacuation Plan for the site. This is an update from the Defra/ EA Technical Report: FD2320: Flood Risk Assessment Guidance for New Development.

Emergency vehicular access should be possible during times of flood.

Where development is located behind, or in, an area benefitting from defences, consideration should be given to the potential safety of the development, finished floor levels and the potential for safe access and egress in the event of rapid inundation of water due to a defence breach with little warning.

Resistance and resilience measures will be required if buildings are situated in the flood risk area, and as applicable in all cases of flood risk, opportunities to enhance green infrastructure and reduce flood risk by making space for water should be sought. Further information is provided in the publications **"Improving the flood performance of new buildings: flood resilient construction"** and **"Prepare your property for flooding".**

Residual risk

Residual risk is the risk that remains after mitigation measures are considered. The residual risk includes the consideration of flood events that exceed the design thresholds of the flood defences or circumstances where there is a failure of the defences (e.g. flood banks collapse, reservoir failure etc.).

Where the watercourses are embanked, the effect of overtopping and breach must be considered and appropriately assessed. Furthermore, any developments located within an area protected by flood risk management measures, where the standard of protection is not of the required standard, or where the failure of the intended level of service gives rise to unsafe conditions, should be identified. Residual risk could also include risk of poor maintenance particularly where these features are privately managed.

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Abbreviations

AEP	Annual Exceedance Probability
AOD	Above Ordnance Datum
B&MS	B&MS
BMSDC	Babergh District & Mid Suffolk District Council
CFMP	Catchment Flood Management Plan
CIRIA	Company providing research and training in the construction industry
DEFRA	Department of the Environment, Food and Rural Affairs (formerly MAFF)
DTM	Digital Terrain Model
EA	Environment Agency
ESWSL	Extreme Still Water Sea Level
FCERM	Flood and Coastal Erosion Risk Management (R&D programme)
FRA	Flood Risk Assessment
FRMP	Flood Risk Management Plan
FWA	Flood Warning Area
FWD	Flood Warnings Direct
FWS	Flood Warning Service
GIS	Geographical Information System
LIDAR	Light Detection and Ranging
LFRMS	Local Flood Risk Management Strategy
LLFA	Lead Local Flood Authority
LPA	Local Planning Authority
NFF	National Flood Forum
NPPG	National Planning Practice Guidance
NPPF	National Planning Policy Framework
OS	Ordnance Survey
PFRA	Preliminary Flood Risk Assessment
PLP	Property Level Protection
PFR	Property Flood Resilience
PPG	Planning Policy Guidance
RBMP	River Basin Management Plan
RMA	Risk Management Authorities
RoFSW	Risk of Flooding from Surface Water
SCC	Suffolk County Council
SFRA	Strategic Flood Risk Assessment
SHLAA	Strategic Housing Land Availability Assessment
SMP	Shoreline Management Plan
SWMP	Surface Water Management Plan
SSSI	Site of Special Scientific Interest
SuDS	Sustainable Drainage Systems
SuDS SPD	Sustainable Drainage Systems Supplementary Planning Documents
UKCP09	UK Climate Projections (2009)
UKCP18	UK Climate Projections (2018)
WFD	Water Framework Directive

1 Introduction

1.1 Purpose of the Strategic Flood Risk Assessment

> "Strategic policies should be informed by a strategic flood risk assessment and should manage flood risk from all sources. They should consider cumulative impacts in, or affecting, local areas susceptible to flooding, and take account of advice from the Environment Agency and other relevant flood risk management authorities, such as lead local flood authorities and internal drainage boards."
>
> (National Planning Policy Framework (2018), Section 14 paragraph 156)

This Joint Strategic Flood Risk Assessment (SFRA) 2020 for B&MS replaces the previous Level 1 SFRA that was undertaken for Babergh District in 2009 by JBA Consulting and for Mid Suffolk District in 2008 by Scott Wilson. The councils require a new SFRA to add to the water and flood risk evidence base for the emerging B&MS Joint Local Plan.

The SFRA study area is shown in Figure 1-1. The main purpose of the SFRA update is to provide a comprehensive and robust evidence base to support the production of the Local Plan and to support the selection of site allocations.

The SFRA update was also required to be compliant with the latest guidance described in the 2018 update to the National Planning Policy Framework (NPPF), support the selection of site allocations in the Local Plan Review and to provide information and guidance to be used in the preparation of Flood Risk Assessments (FRAs) in support of site specific planning applications. The evidence in this SFRA shall also be used to support the formulation of Neighbourhood Plans.

A revised NPPF was published on 19 February 2019 and sets out Government's planning policies for England and how these are expected to be applied. This revised Framework replaces the previous NPPF published in March 2012.

The key objectives of the 2020 SFRA are:

- to provide up to date information and guidance on flood risk for B&MS, taking into account the latest flood risk information (including the probable impacts of climate change), the current state of national planning policy and legislation and relevant studies;
- to provide the basis for applying the flood risk Sequential Test, and if necessary the Exception Test;
- to provide a comprehensive set of maps presenting flood risk from all sources that can be used as part of the evidence base for the local plan, and
- identify the requirements for site-specific flood risk assessments and the application of Sustainable Drainage Systems.

1.2 Levels of SFRA

The Planning Practice Guidance advocates a tiered approach to risk assessment and identifies the following two levels of SFRA:

1 Level One: needs to be produced by all local planning authorities. This needs to include enough detail to identify whether it is possible to allocate all development outside flood risk areas. The assessment should be sufficiently detailed to allow application of the Sequential Test.

2 Level Two: where land outside Flood Zones 2 and 3 cannot appropriately accommodate all the necessary development creating the need to apply the

NPPF's Exception Test. In these circumstances the assessment should consider the detailed nature of the flood characteristics within a Flood Zone and assessment of other sources of flooding.

This report fulfils the Level One SFRA requirements.

1.3 SFRA outputs

To meet the objectives, the following outputs have been prepared:

- Assessment of all potential sources of flooding
- Mapping of location and extent of the function floodplain
- Assessment of the potential impact of climate change on flood risk
- Mapping areas covered by EA Flood Warnings and Alert areas
- Assessment of standard of protection and condition of existing flood risk management infrastructure within the study area
- Assessment of locations where additional development may increase flood risk elsewhere
- A review of flood risk and historical flood incidents within main settlements
- Recommendations of the criteria that should be used to assess future development proposals and the development of a Sequential Test and sequential approach to flood risk
- Guidance for developers including requirements for site specific flood risk assessments and the process for flood map challenges
- An assessment of all potential sources of flooding for proposed development sites in B&MS to help inform which sites may require a Level 2 SFRA.

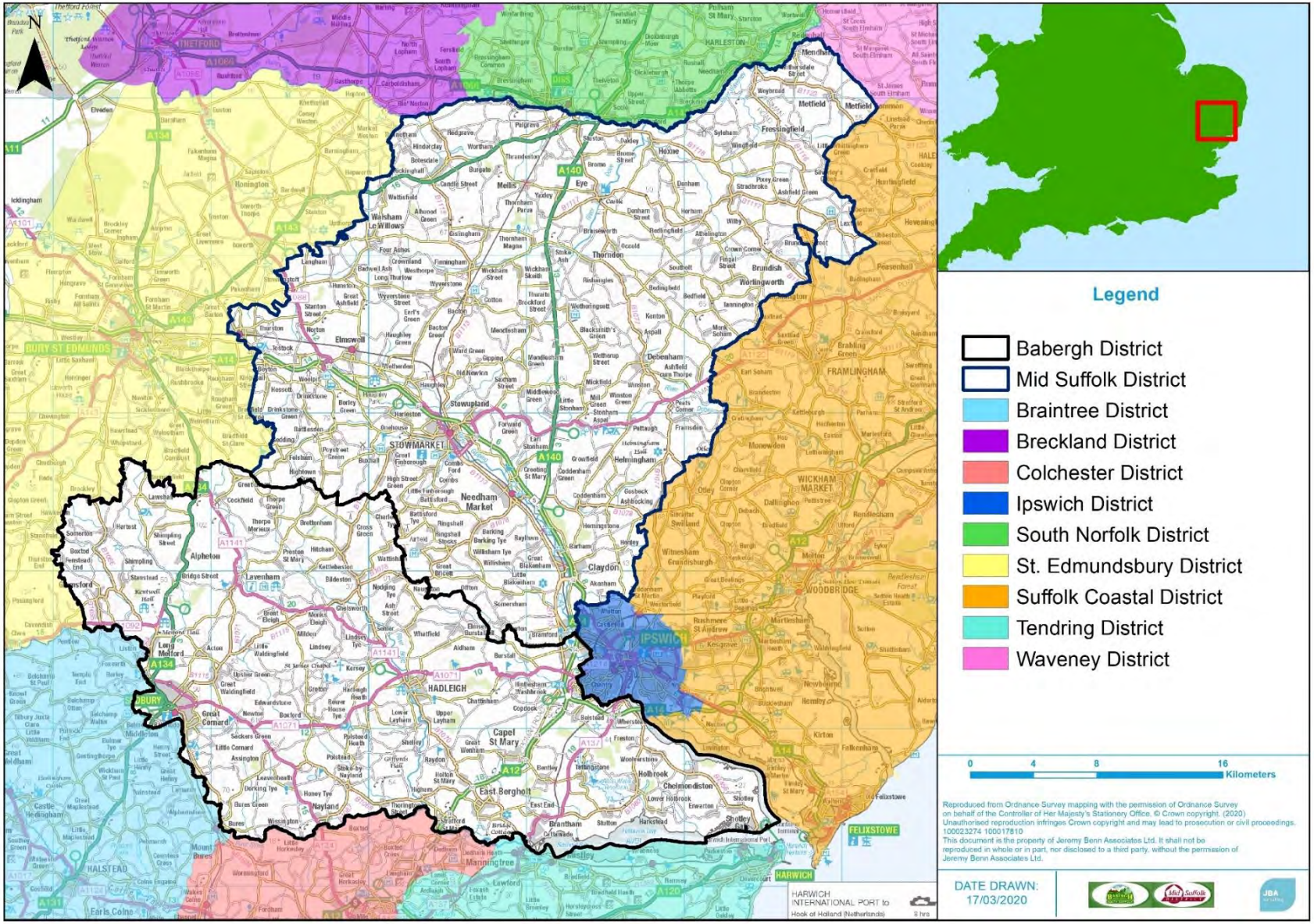


Figure 1-1: Study Area

1.4 SFRA user guide

Table 1-1: SFRA report contents

Section	Contents
1. Introduction	Provides a background to the study, defines objectives, outlines the approach adopted and the consultation performed.
2. The planning framework and flood risk policy	Includes information on the implications of recent changes to planning and flood risk policies and legislation, as well as documents relevant to the study.
3.The sequential, risk-based approach	Describes the Sequential Approach and application of Sequential and Exception Tests.
4. Sources of information used in preparing the SFRA	Outlines what information has been used in the preparation of the SFRA.
5. Understanding flood risk in B&MS	Introduces the assessment of flood risk and provides an overview of the characteristics of flooding affecting the districts.
6. Flood warning and emergency planning	Provides a background to flood warning and emergency planning in the districts.
7. Climate change	Includes the latest climate change allowances and how these will be included in the SFRA.
8. Flood defences	Provides an overview of flood defences in the districts.
9. Assessment of flood risk in potential development areas	Assesses the site screening for different sources of flood risk, potential for cumulative impact in the districts and cross boundary issues.
10. FRA requirements and flood risk management guidance	Includes information on the requirements for FRAs.
11. Surface water management and SuDS	Advice on managing surface water run-off and flooding and the application of SuDS.
12. Strategic flood risk solutions	Overview of possible strategies to reduce flood risk.
13. Summary	Review of the Level 1 SFRA.
14. Recommendations	Identifies recommendations for the council to consider as part of Flood Risk Management policy.
Appendices	Maps showing flood risk information from all sources

1.5 Consultation

The following parties have been consulted during the preparation of this version of the SFRA:

- Environment Agency
- BMSDC

- Anglian Water
- Essex and Suffolk Water
- Suffolk County Council

1.6 Use of the SFRA data

1.6.1 SFRA information and updates

It is important to recognise that SFRAs are high level strategic documents and, as such, do not go into detail on an individual site-specific basis. The SFRA has been developed using the best available information at the time of preparation. This relates both to the current risk of flooding from rivers, and the potential impacts of future climate change.

An SFRA should be a '**living document'**, and as a result should be updated when new information on flood risk, new planning guidance or legislation becomes available. New information on flood risk may be provided by BMSDC. Such information may be in the form of:

- New hydraulic modelling results
- Flood event information following a flood event
- Policy/ legislation updates
- EA flood map updates
- New flood defence schemes etc.

The EA regularly reviews their flood risk mapping, and it is important that they are approached to determine whether updated (more accurate) information is available prior to commencing a detailed Flood Risk Assessment. It is recommended that the SFRA is reviewed internally, in line with the EA's Flood Zone map updates to ensure latest data is still represented in the SFRA, allowing a cycle of review and a review of any updated data by checking with the above bodies for any new information. There are several EA models which are being updated at the time of producing the Level 1 SFRA and the outputs were not available for use. This includes the River Gipping, River Blyth, River Waveney and River Brett models.

2 The Planning Framework

2.1 Introduction

The overarching aim of development and flood risk planning policy in the UK is to ensure that the potential risk of flooding is considered at every stage of the planning process. This section of the SFRA provides an overview of the planning framework, flood risk policy and flood risk responsibilities.

2.2 Flood Risk Regulations (2009) and Flood and Water Management Act (2010)

2.2.1 Flood Risk Regulations (2009)

The Flood risk regulations (2009) translate the current EU Floods Directive into UK law and place responsibility upon all Lead Local Flood Authorities (LLFAs) to manage localised flood risk. Under the Regulations, the responsibility for flooding from rivers, the sea and reservoirs lies with the EA; however, responsibility for local and all other sources of flooding rests with LLFAs. In the instance of this SFRA, the LLFA is SCC.

Figure 2-1 illustrates the steps that have initially been taken to implement the requirements of the EU Directive in the UK via the Flood Risk Regulations.

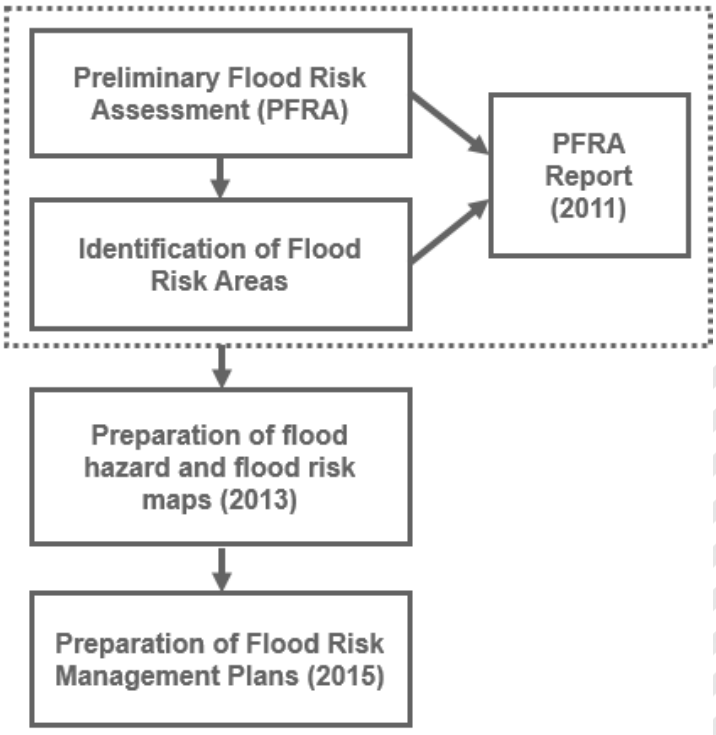


Figure 2-1: Flood Risk Regulation Requirements

2.2.2 Preliminary Flood Risk Assessments

In accordance with the Regulations, LLFAs have the task of preparing a Preliminary Flood Risk Assessment (PFRA) report on a 6-year cycle, the first being prepared and published in 2011.

PFRAs report on significant past and future flooding from all sources except from Main Rivers and reservoirs, which are covered by the EA, and sub-standard performance of the adopted sewer network (covered under the remit of Anglian Water). PFRAs are a high-level screening exercise and consider floods which have significant harmful consequences for

human health, economic activity, the environment and cultural heritage. The document that covers the study area is the SCC PFRA (2011).

There is also an addendum to the 2011 document following a review of the PFRA in 2017.

The PFRA highlights the importance of establishing data recording and sharing protocols between the different authorities and partners and promotes the recording of all flooding incidents from local sources.

2.2.3 Flood Risk Management Plans

Under the Regulations the EA exercised an 'Exception' and did not prepare a PFRA for risk from rivers, reservoirs and the sea. Instead they had to prepare and publish hazard and risk mapping and an FRMP.

The study area is covered by the Anglian River Basin District Flood Risk Management Plan (FRMP) (2016). The FRMP covers the period of 2015-2021. The FRMP draws on policies and actions identified with Catchment Flood Management Plans as well as incorporating information from the Local Flood Risk Management Strategies. A FRMP2 is in the process of being developed for approval in January 2021.

2.2.4 Flood and Water Management Act (FWMA) 2010

Following the 2007 floods, Sir Michael Pitt was appointed to chair an independent review into the floods. The final report was published in June 2008. The Flood and Water Management Act (2010)[1] implements some of Sir Michael Pitt's recommendations and aims to create a simpler and more effective means of managing both flood risk and coastal erosion.

The FWMA established Lead Local Flood Authorities (LLFAs). SCC is the LLFA for the study area.

2.2.5 Suffolk County Council Local Flood Risk Management Strategy (2016)

The LFRMS are used as a means by which the LLFA co-ordinates flood risk management on a day to day basis. The LFRMS also sets measures to manage local flood risk (i.e. flood risk from surface water, groundwater and ordinary watercourses).

SCC is responsible for developing, maintaining, applying and monitoring the LFRMS for BMSDC. SCC's role is to work with organisations, businesses and communities to manage flood risk and, where it is practicable, affordable and sustainable to do so, to reduce risk to life, property and livelihoods that may arise from local surface runoff, Ordinary Watercourse and groundwater flooding.

The LFRMS will seek to implement the following strategic objectives:

- Objective 1: Improve understanding of local flood risk
- Objective 2: To work together (both statutory organisations and the public) to reduce flood and coastal risks
- Objective 3: To prevent an increase in flood risk as a result of development by preventing additional water entering existing drainage systems
- Objective 4: Take a sustainable and holistic approach to flood and coastal management, seeking to deliver wider economic, environmental and social benefits, climate change mitigation and improvements under the Water Framework Directive
- Objective 5: Encourage maintenance of privately owned flood defences, and ordinary watercourses, and minimise unnecessary constrictions in watercourses

1 Flood and Water Management Act (2010): http://www.legislation.gov.uk/ukpga/2010/29/pdfs/ukpga_20100029_en.pdf

- Objective 6: To share information on the latest and best ideas for flood and coastal management
- Objective 7: To ensure that proposals and policies in this strategy are properly integrated with the rest of the Fens area

The LFRMS is currently under review and is waiting on the National Flood and Coastal Erosion Risk Management Strategy completion before it is finalised. Whilst the current adopted Strategy has 7 objectives, the reviewed strategy will have 4 objectives. The draft objectives (subject to change) are as follows:

- Objective 1: Understanding flood risk
- Objective 2: Reduce the risk of flooding
- Objective 3: Resilient planning and development
- Objective 4: Resilient communities

2.2.6 LLFAs, surface water and SuDS

On 18 December 2014 a written ministerial statement laid by the Secretary of State for communities and local government set out changes to the planning process that would apply for major development from 6 April 2015. When considering planning applications, local planning authorities should consult the LLFA on the management of surface water in order to satisfy that:

- The proposed minimum standards of operation are appropriate
- There are clear arrangements for on-going maintenance over the development's lifetime, through the use of planning conditions or planning obligations.
- In March 2015 the LLFA was made a statutory consultee which came into effect on 15 April 2015. As a result, SCC are required to provide technical advice on surface water drainage strategies and designs put forward for new major developments.

  Major developments are defined as:

- Residential development: 10 dwellings or more, or residential development with a site area of 0.5 hectares or more where the number of dwellings is not yet known; and
- Non-residential development: provision of a building or buildings where the total floor space to be created is 1,000 square metres or more or, where the floor area is not yet known, a site area of 1 hectare or more.

2.3 National Planning Policy and Guidance

The Revised National Planning Policy Framework was published in July 2018, and updated in February 2019, replacing the previous version published in March 2012. Key changes in the revised NPPF compared to the 2012 NPPF include:

- Strategic policies should also now consider the 'cumulative impacts in, or affecting, local areas susceptible to flooding' (para 156), rather than just to or from individual development sites. More information on cumulative impacts is found in Section 699;
- Future risk from climate change- the 'sequential approach should be used in areas known to be at risk now or in the future from any form of flooding' (para 158);
- Natural Flood Management - 'Using opportunities provided by new development to reduce the causes and impacts of flooding (where appropriate through the use of natural flood management techniques)' (para 157c);
- 'Major developments should incorporate sustainable drainage systems unless there is clear evidence that this would be inappropriate' (Para 165); and

- Emergency planning - Emergency plans are required as part of a FRA that requires the inclusion of safe access and egress routes (para 163e).

The NPPF sets out the Government's planning policies for England and how these are expected to be applied. The Framework is based on core principles of sustainability and forms the national policy framework in England, also accompanied by a number of Planning Practice Guidance (PPG) notes. It must be taken into account in the preparation of local plans and is a material consideration in planning decisions. National Planning Practice Guidance was originally published in 2014 (and has since been revised / updated) and sets out how the NPPF should be implemented. NPPF: Flood Risk and Coastal Change advises on how planning can account for the risks associated with flooding and coastal change in plan making and the application process. It sets out Flood Zones, the appropriate land uses for each zone, flood risk assessment requirements, including the Sequential and Exception Tests and the policy aims for developers and authorities regarding reach Flood Zone.

Sequential test

"The aim of the sequential test is to steer new development to areas with the lowest risk of flooding. Development should not be allocated or permitted if there are reasonably available sites appropriate for the proposed development in areas with a lower risk of flooding. The strategic flood risk assessment will provide the basis for applying this test. The sequential approach should be used in areas known to be at risk now or in the future from any form of flooding."

If it is not possible for development to be located in zones with a lower risk of flooding (taking into account wider sustainable development objectives), the exception test may have to be applied. The need for the exception test will depend on the potential vulnerability of the site and of the development proposed, in line with the Flood Risk Vulnerability Classification set out in national planning guidance.

(Revised National Planning Policy Framework, Section 14 paragraph 158 and 159)

Exception test

"The application of the exception test should be informed by a strategic or site-specific flood risk assessment, depending on whether it is being applied during plan production or at the application stage. For the exception test to be passed it should be demonstrated that:

a) the development would provide wider sustainability benefits to the community that outweigh the flood risk; and

b) the development will be safe for its lifetime taking account of the vulnerability of its users, without increasing flood risk elsewhere, and, where possible, will reduce flood risk overall.

Both elements of the exception test should be satisfied for development to be allocated or permitted."

(Revised National Planning Policy Framework, Section 14 paragraph 160 and 161)

A description of how flood risk should be accounted for in the preparation of Local Plans is outlined in Diagram 1 contained within the Planning Practice Guidance Flood Risk and

Coastal change (2014), shown in Figure 2-2. The PPG documents will, where necessary, be updated in due course to reflect the changes in the revised NPPF.

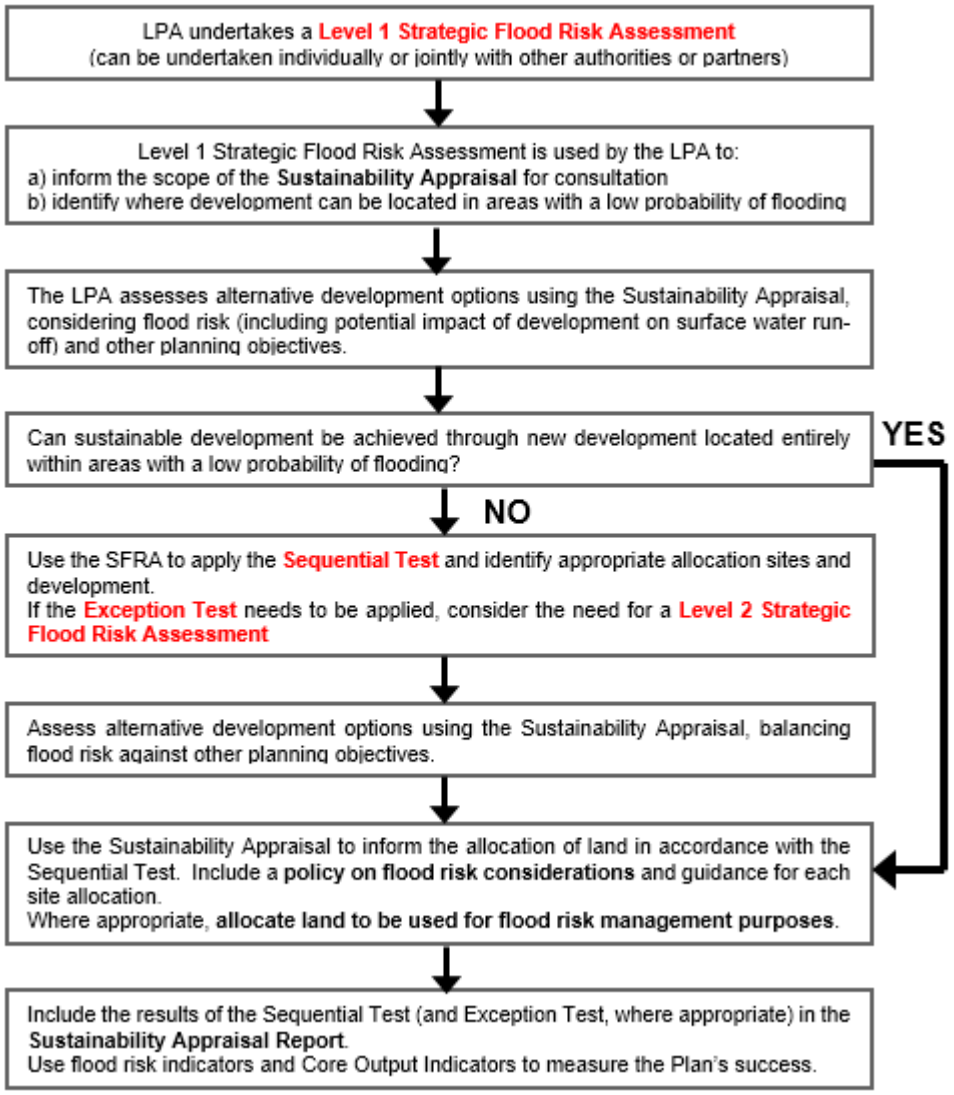


Figure 2-2: Flood risk and the preparation of local plans

2.4 Water Cycle Studies

Climate change is predicted to present unprecedented new challenges, such as more frequent and extreme rainfall events and rising global temperatures, which are expected to exert greater pressure on the existing infrastructure. Planning for water management therefore has to take these potential challenges into account. A large number of new homes for instance may cause the existing water management infrastructure to be overwhelmed which would result in adverse effects on the environment, both locally and in wider catchments.

Water Cycle Studies assist Local Authorities to select and develop sustainable development allocations so that there is minimal impact on the environment, water quality, water resources, and infrastructure and flood risk. This can be achieved in areas where there may be conflict between any proposed development and the requirements of the environment through the recommendation of potential sustainable solutions.

An updated water cycle study for B&MS is being completed by JBA Consulting alongside this Level 1 SFRA.

2.5 Surface Water Management Plans

Surface Water Management Plans (SWMPs) outline the preferred surface water management strategy in a given location. SWMPs are undertaken by LLFAs in consultation with key local partners who are responsible for surface water management and drainage in their area. SWMPs establish a long-term action plan to manage surface water in a particular area and are intended to influence future capital investment, drainage maintenance, public engagement and understanding, land-use planning, emergency planning and future developments.

In the study area, a SWMP has been conducted for Sudbury & Great Cornard.

2.6 Catchment Flood Management Plans

Catchment Flood Management Plans (CFMPs) are a high-level strategic plan providing an overview of flood risk across each river catchment. The EA use CFMPs to work with other key-decision makers to identify and agree long-term policies for sustainable flood risk management.

There are six pre-defined national policies provided in the CFMP guidance and these are applied to specific locations through the identification of 'Policy Units'. These policies are intended to cover the full range of long-term flood risk management options that can be applied to different locations in the catchment.

The six national policies are:

- No active intervention (including flood warning and maintenance). Continue to monitor and advise.
- Reducing existing flood risk management actions (accepting that flood risk will increase over time).
- Continue with existing or alternative actions to manage flood risk at the current level (accepting that flood risk will increase over time from this baseline).
- Take further action to sustain the current level of flood risk (responding to the potential increases in risk from urban development, land use change and climate change).
- Take action to reduce flood risk (now and/or in the future)
- Take action with others to store water or manage run-off in locations that provide overall flood risk reduction or environmental benefits, locally or elsewhere in the catchment.

2.6.1 North Essex Catchment Flood Management Plan (2009)

The North Essex Catchment Flood Management Plan (CFMP) was published by the EA in December 2009. The CFMP covers an area of approximately 3000km² and includes the catchment of four major rivers: the River Chelmer, Blackwater, Colne and Stour. The area is predominantly rural with approximately 60% of the land being used for arable crop production. The main urban areas include Chelmsford, Colshester, Braintree and Sudbury. The policies for the study area within the North Essex CFMP are:

- Blackwater and Chelmer, Upper Reaches and Coastal Streams (Policy 2) – Areas of low to moderate flood risk where we [EA] can generally reduce existing flood risk management actions
- Lower Blackwater, Upper and Mid Tributaries and Mid Colne and Stour (Policy 3) – Areas of low to moderate flood risk where we [EA] are generally managing existing flood risk effectively

2.6.2 East Suffolk Catchment Flood Management Plan (2009)

The East Suffolk Catchment Flood Management Plan (CFMP) was published by the EA in December 2009. The CFMP covers an area of 1595km², including 9 main river catchments such as the Gipping, Deben, Alde-Ore and Blyth. The area is mainly rural with

over half being grade 3 agricultural land. The main urban areas include Ipswich, Stowmarket and Needham Market. The policies for the study area within the East Suffolk CMFP are:

- East Anglian Plain (Policy 2) - Areas of low to moderate flood risk where we [EA] can generally reduce existing flood risk management actions
- Gipping Corridor (Policy 3) - Areas of low to moderate flood risk where we [EA] are generally managing existing flood risk effectively
- Debenham (Policy 5) – Areas of moderate to high flood risk where we [EA] can generally take further action to reduce flood risk

2.6.3 Broadland Rivers Catchment Flood Management Plan (2009)

The Broadland Rivers Catchment Flood Management Plan (CFMP) was published by the EA in December 2009. The CFMP covers an area of approximately 3200km², with 5 main river catchments; the Ant, Bure, Wensum, Yare and Waveney. The area is predominantly rural with over 80% of the land agricultural grade 2 or 3. The main urban areas include Norwich, Great Yarmouth and Lowestoft. The policies for the study area within Broadland CFMP are:

- Fluvial Rivers (Policy 2) - Areas of low to moderate flood risk where we [EA] can generally reduce existing flood risk management actions

2.7 River Basin Management Plans

River Basin Management Plans (RBMPs) are prepared under the Water Framework Directive (WFD) and assess the pressure facing the water environment in River Basin Districts. The study area falls within the Anglian River Basin District.

The updated 2016 Anglian RBMP identified a number of pressures on the water environment and significant water management issues.

The RBMP sets out the current state of the water environment, pressures affecting the water environment, environmental objectives for protecting and improving the waters, programme of measures and actions needed to achieve the objectives and the progress since the 2009 plan. It also informs decisions on land-use planning.

2.8 Essex and South Suffolk Shoreline Management Plan (SMP) (2010)

The Essex and South Suffolk Shoreline Management Plan is a high level policy document in which the organisations that manage the shoreline set their long-term plan. The SMP aims to identify the best ways to manage flood and erosion risk to people and to the developed, historic and natural environment. It also identifies opportunities where shoreline management can work with others to make improvements. The plan identifies an area in Babergh, the Shotley Peninsula, within which development should be restricted due to pressure from coastal erosion.

2.9 Roles and responsibilities of Risk Management Authorities in B&MS

The roles and responsibilities of Risk Management Authorities (RMAs) in B&MS are summarised below.

2.9.1 B&MS District Councils

As Local Planning Authorities, BMSDC assess, consult on and determine whether development proposals are acceptable, ensuring that flooding and other, similar risks are effectively managed. They also have a building control and enforcement function to ensure compliance with planning permissions/conditions.

The council will consult relevant statutory consultees as part of planning applications assessments.

BMSDC are positive promoters on SuDS on all new development sites. The expectation is that all new developments should aim for high quality SuDS and provide some form of betterment to existing conditions.

BMSDC assists and collaborate with the LLFA on all B&MS related flood risk management issues. BMSDC are responsible for management and maintenance of owned assets – some culverted watercourses and small tributaries that fall outside of the LLFA statutory duties.

2.9.2 Suffolk County Council (SCC)

SCC is the Lead Local Flood Authority (LLFA) for the area. As a LLFA, SCC´s duties include:

- Local Flood Risk Management Strategy (LFRMS): LLFAs must develop, maintain, apply and monitor the LFRMS to outline how they will manage flood risk, identify areas vulnerable to flooding and target resources where they are needed most.
- Flood investigations: The need to investigate a particular flood is determined on a case-by-case basis, considering factors such as the likely source of the flood and the number of properties affected (Under Section 19 of the Flood and Water Management Act 2010).
- Register of flood risk features: LLFAs must establish and maintain a register of structures of features which, in their opinion, are likely to have a significant effect on flood risk in the LLFA area.
- Designation of features: LLFAs may exercise powers to designate structures and features that affect flood risk, requiring the owner to seek consent from the authority to alter, remove or replace it.
- Consenting: When appropriate LLFAs will perform consenting of works on ordinary watercourses. Under section 23 of the Land Drainage Act there is a legal requirement to seek consent from the relevant authority before piping/culverting/diverting or obstructing a watercourse, whether permanent or temporary. This is consented by SCC as the LLFA when this is an ordinary watercourse outside an IDB area.
- SCC has the role to manage flood risk from ordinary watercourses and surface water.
- As an LLFA, SCC is a Statutory Consultee on the drainage aspect of major planning applications (10 dwellings and above, greater than 1ha or at risk of surface water flooding). BMSDC as the LPA advises about developments such as extensions, residential and business developments up to 10 dwellings (but not including 10). More information can be found on the SCC website.
- SCC is also the Local Highway Authority and manages highway drainage, carrying out maintenance and improvement woks on an on-going basis, as necessary, to maintain existing standards of protections for highways, making appropriate allowances for climate change. It also has the responsibility to ensure road projects don't increase flood risk. Highways have powers through the use of legislation held within Land Drainage Act 1991.
- It is important flooding incidents are reported by BMSDC to the LLFA and EA. There are also benefits of the public reporting flooding incidents when they occur. Members of the public can report flooding incidents on the SCC website.
- Following the declaration of the climate emergency, SCC is due to updates its current environmental plans and policy in 2020.

2.9.3 Environment Agency (EA)

The EA is responsible for protecting and enhancing the environment and contributing to the government's aim of achieving sustainable development in England and Wales. The EA has powers to work on Main Rivers to manage flood risk. These powers are permissive, which means they are not a duty, and they allow the EA to carry out flood and coastal risk management work and to regulate the actions of other flood risk management authorities on main rivers and the coast.

The EA also has powers to regulate and permit works to Main Rivers. An environmental permit for flood risk activities may be required to do work in, under, over or within 8 metres (m) from a fluvial main river and from any flood defence structure or culvert or 16m from a tidal main river and from any flood defence structure or culvert. The EA also has a strategic overview role across all types of flooding as well as other types of water management matters.

2.9.4 Water and wastewater providers

Water supply in B&MS is provided by Essex and Suffolk Water and Anglian Water. Anglian Water is the sewerage undertaker for B&MS. They have the responsibility to maintain surface, foul and public sewers to ensure the area is effectively drained. When flows (foul or surface water) are proposed to enter public sewers, Anglian Water will assess whether the public system has the capacity to accept these flows as part of their pre-application service. If there is not available capacity, they will provide a solution that identifies the necessary mitigation. Anglian Water also comments on the available capacity of foul and surface water sewers as part of the planning application process. Further information can be found on their website. More information can be found on their website.

Any foul drainage solution identified by Anglian Water to drain flows effectively would be expected be funded by the developer under Anglian Water developer charges.

Applications to water and sewerage companies for connections to water supply and public sewerage networks, under the Water Industry Act 1991, are required if installing water systems, or altering existing systems, is intended.

Sewage Sector Guidance provides guidance in relation to the adoption of sewerage assets and SuDS features which meet the legal definition of sewers by sewerage companies in England.

2.9.5 Internal Drainage Board

An Internal Drainage Board (IDB) is a statutory local public body with responsibilities for flood risk management, land drainage and the environment. An IDB is classified as a Flood Risk Management Authority under the Flood and Water Management Act 2010. IDBs are established in areas of special drainage need under the Land Drainage Act 1991. They are required to exercise a general supervision over all matters relating to the drainage of land, and they have permissive powers to undertake maintenance and improvement works to the watercourse network.

The East Suffolk IDB operates in both B&MS, including areas surrounding the River Gipping, Belstead Brook and River Deben. The IDB aims and policies can be found on their website. The **Board's drainage and water level management infrastructure** consists of watercourses, pumping stations and a number of other water level control structures, however the EA has responsibility for Main river and coastal defences. The IDB has the permissive powers to manage the other infrastructure in the Drainage District.

The Waveney, Lower Yare & Lothingland IDB operates in the north of Mid Suffolk, including the areas surrounding the River Dove. The main function of the IDB is to provide flood protection by coordinating with the EA which is responsible for Main Rivers. The board also works closely with landowners, local authorities, Natural England, wildlife conservation bodies to ensure water levels are managed in a manner that is productive and promotes conservation. More information can be found on the website.

2.10 Key strategic planning links

Figure 2-3 outlines the key strategic planning links for flood risk management and associated documents. It shows how the Flood Risk Regulations and Flood and Water Management Act, have introduced a wider requirement for the mutual exchange of information and the preparation of strategies and management plans.

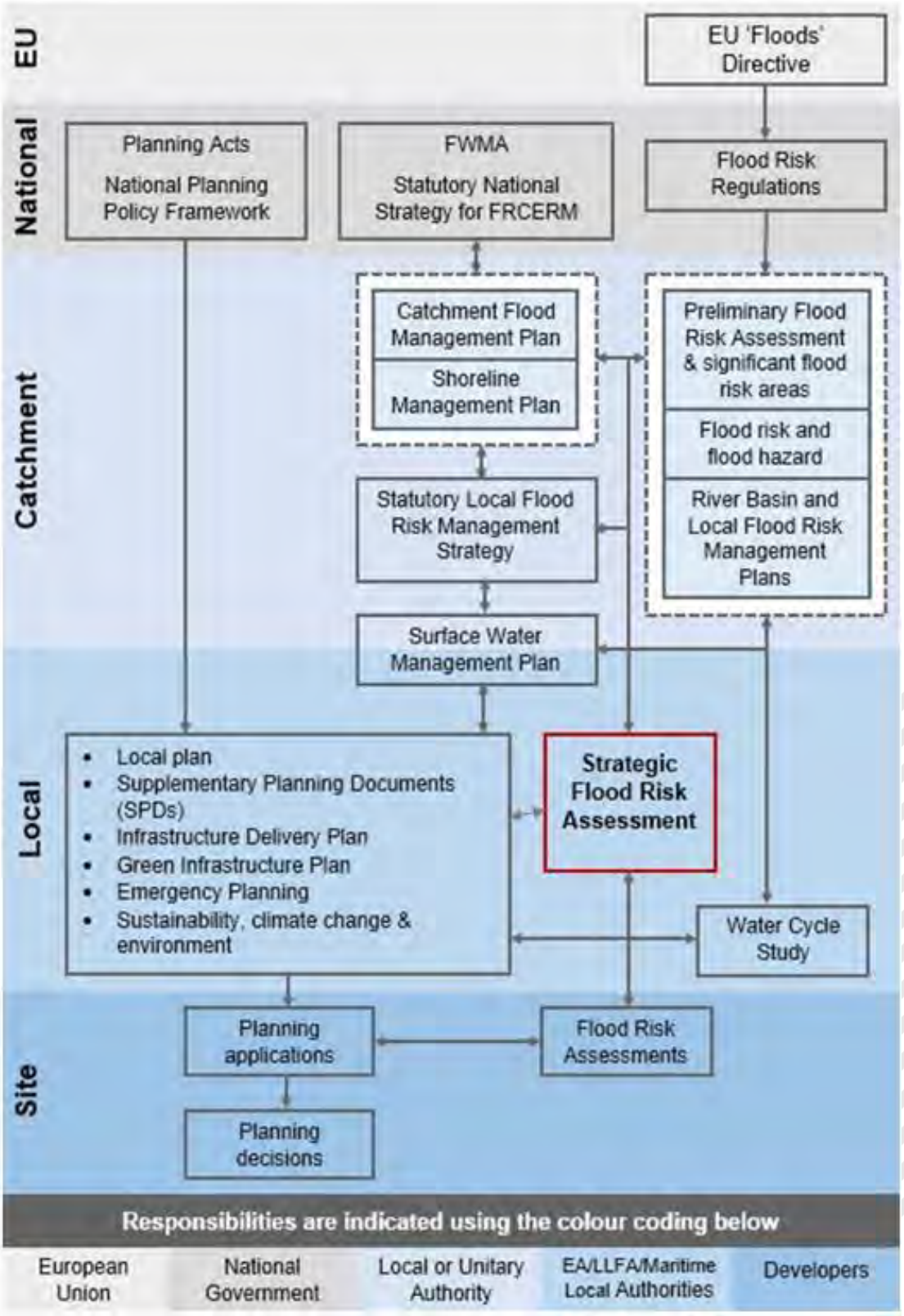


Figure 2-3: Strategic planning links and key documents for flood risk

3 The sequential, risk-based approach

3.1 The sequential, risk-based approach

This approach is designed to ensure areas with little or no risk of flooding (from any source) are developed in preference to areas at higher risk, with the aim of keeping development outside of medium and high flood risk areas (Flood Zones 2 and 3) and other sources of flooding, where possible.

When drawing up a Local Plan, it is often the case that it is not possible for all new development to be allocated on land that is not at risk from flooding. In these circumstances the Flood Zone maps (that show the extent of inundation, assuming that there are no defences) are too simplistic and a greater understanding of the scale and nature of the flood risks is required.

3.1.1 Flood Zones

Table 1 of NPPG Flood Risk and Coastal Change identifies the following Flood Zones. These apply to both Main River and ordinary watercourses. Flood risk vulnerability and flood zone compatibility is set out in Table 3 of the NPPG. Table 3-2 summarises this information and also provides information on when an FRA would be required.

Table 3-1: AEPs and corresponding return periods of interest

AEP (%)	Return period (year)
3.3	30
1	100
0.5	200
0.1	1000

Table 3-2: Flood zone descriptions

Zone	Probability	Description
Zone 1	Low	This zone comprises land assessed as having a less than 1 in 1000 annual probability of river or sea flooding in any year (<0.1% AEP).
		All land uses are appropriate in this zone.
		For development proposals on sites comprising one hectare or above the vulnerability to flooding from other sources as well as from river and sea flooding, and the potential to increase flood risk elsewhere through the addition of hard surfaces and the effect of the new development on surface water run-off, should be incorporated in a flood risk assessment.
Zone 2	Medium	This zone comprises land assessed as having between a 1 in 100 and 1 in 1,000 annual probability of river flooding (0.1% - 1% AEP) or between 1 in 200 and 1 in 1,000 annual probability of sea flooding (0.1% – 0.5% AEP) in any year.
		Essential infrastructure, water compatible infrastructure, less vulnerable and more vulnerable land uses (as set out by NPPF) are appropriate in this zone. Highly vulnerable land uses are allowed as long as they pass the Exception Test.
		All developments in this zone require an FRA.
Zone 3a	High	This zone comprises land assessed as having a greater than 1 in 100 annual probability of river flooding (>1% AEP) or a greater than 1 in 200 annual probability of flooding from the sea (>0.5% AEP) in any year. Developers and the local authorities should seek to reduce the overall level of flood risk, relocating development sequentially to areas of lower flood risk and attempting to restore the floodplain and make open space available for flood storage.
		Water compatible and less vulnerable land uses are permitted in this zone. Highly vulnerable land uses are not permitted. More vulnerable and essential infrastructure are only permitted if they pass the Exception Test.
		All developments in this zone require an FRA.
Zone 3b	Functional Floodplain	This zone comprises land where water has to flow or be stored in times of flood. Local planning authorities should identify, in their SFRA, areas of functional floodplain, in agreement with the EA. The identification of functional floodplain should take account of local circumstances.
		Only water compatible and essential infrastructure are permitted in this zone and should be designed to remain operational in times of flood, resulting in no loss of floodplain or blocking of water flow routes. They must also be safe for users and not increase flood risk elsewhere. Essential Infrastructure will only be permitted if it passes the Exception Test.
		All developments in this zone require an FRA.

3.1.2 Surface water flood risk information

In 2016, the EA, working with LLFAs, produced the Risk of Flooding from Surface Water (RoFfSW) dataset. This superseded the previous Flood Map for Surface Water and Areas Susceptible to Surface Water Flooding maps. The RoFfSW is a national scale map and assesses flooding scenarios as a result of rainfall with the following chance of occurring in any given year. It is intended to provide a consistent standard of assessment for surface water flood risk across England and Wales to help LLFAs, the EA and any potential developers to focus their management of surface water flood risk.

The RoFfSW is derived primarily from identifying topographical flow paths of existing watercourses or dry valleys that contain some isolated ponding locations in low lying areas. They provide a map which displays different levels of surface water flood risk depending on the annual probability of the land in question being inundated by surface water (Appendix A).

Table 3-3: RoFfSW risk categories

Risk	Definition
High	Probability of flooding greater than 1 in 30 (3.3%) each year.
Medium	Probability of flooding between 1 in 100 (0.1%) and 1 in 30 (3.3%) each year.
Low	Probability of flooding between 1 in 1,000 (0.1%) and 1 in 100 (1%) each year.
Very Low	Probability of flooding of less than 1 in 1,000 (0.1%) each year

Although the RoFfSW offers improvement on previously available datasets, the results should not be used to understand flood risk for individual properties. The results should be used for high level assessments such as SFRAs for local authorities. If a particular site is indicated in the EA mapping to be at risk from surface water flooding, a more detailed assessment should be considered to more accurately illustrate the flood risk at a site-specific scale. Such an assessment will use the RoFfSW in partnership with other sources of local flooding information to confirm the presence of a surface water risk at that particular location.

The surface water map is available via the long term flood risk information page on the government's website, and is also provided in Appendix A of this SFRA. In addition to showing the extent of surface water flooding, there are depth and velocity maps for each risk category. These maps should be used when considering other sources of flooding when applying the Sequential and Exception tests.

3.2 Applying the Sequential Test and Exception Test in the preparation of a Local Plan

When preparing a local plan, the local planning authority should demonstrate it has considered a range of site allocations, using SFRAs to apply the Sequential and Exception Tests where necessary using the Zone mapping in the SFRA.

The Sequential Test should be applied to the whole local planning authority area to increase the likelihood of allocating development in areas not at risk of flooding. It is recommended that the Council makes reference to the SFRA climate change maps when applying the Sequential Test for site allocations and windfall sites to understand the potential change in risk over the lifetime of proposed development. The sequential test can be undertaken as part of a local plan sustainability appraisal. Alternatively, it can be demonstrated through a free-standing document, or as part of strategic housing land or employment land availability assessments. NPPG for Flood Risk and Coastal Change describes how the Sequential Test should be applied in the preparation of a local plan (Figure 3-1).

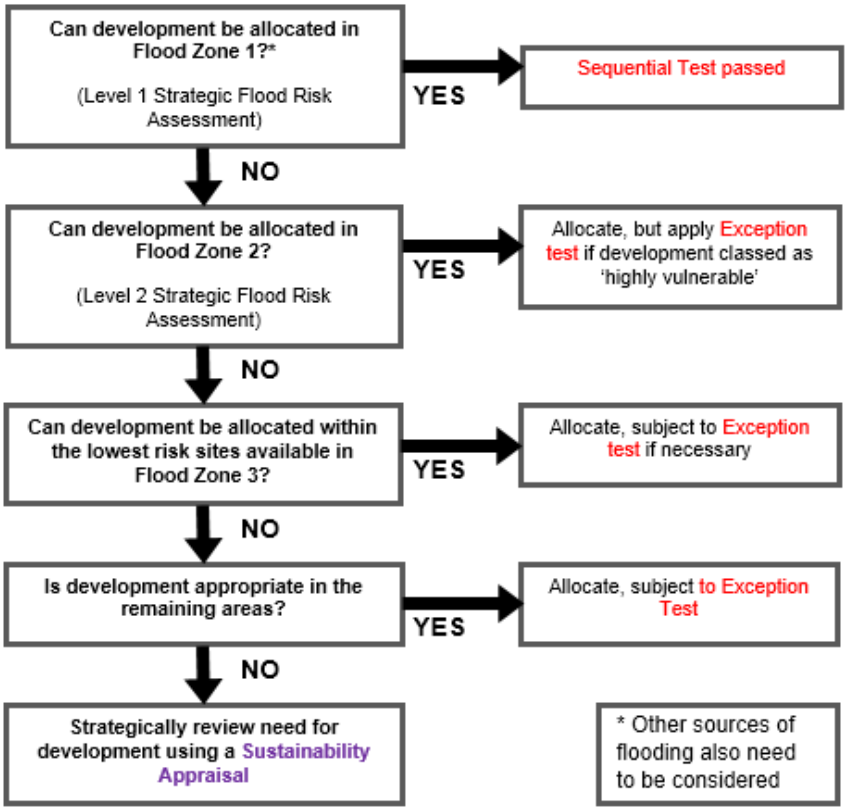


Figure 3-1: Applying the sequential test in the preparation of a local plan

The exception test should only be performed following the application of the sequential test and as set out in Table 3 of the NPPG Flood Risk and Coastal Change. The NPPG describes how the exception test should be applied in the preparation of a local plan.

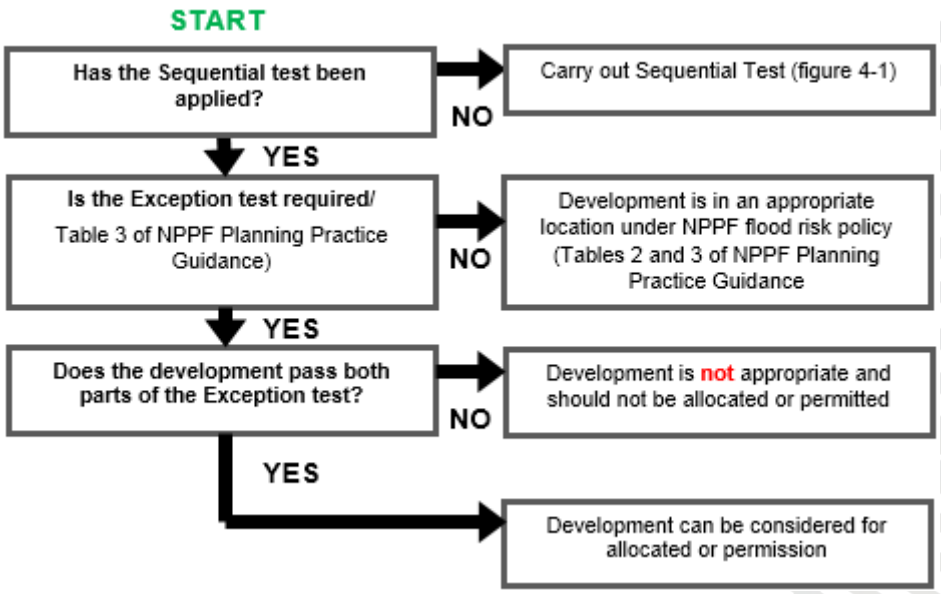


Figure 3-2: Applying the exception test in the preparation of a local plan

3.3 Applying the Sequential Test and Exception Test to individual planning applications

3.3.1 Sequential Test

Local circumstances must be used to define the area of application of the sequential test (within which it is appropriate to identify reasonably available alternatives). The criteria used to determine the appropriate search area relate to the catchment area for the type of development being proposed. For some sites this may be clear, in other cases it may be identified by other local plan policies. A pragmatic approach should be taken when applying the sequential test.

B&MS, with advice from the EA, are responsible for considering the extent to which sequential test considerations have been satisfied and will need to be satisfied that the proposed development would be safe and not lead to increased flood risk elsewhere.

The sequential test does not need to be applied for individual developments under the following circumstances:

- The site has been identified in development plans through the application of the sequential test, and
- Applications for minor development or change of use (except for a change of use to a caravan, camping or chalet site, or to a mobile home or park home site).

It is normally reasonable to presume and state that individual sites that lie in Zone 1 satisfy the requirements of the sequential test. However, consideration should be given to risks from all sources, areas with critical drainage problems and critical drainage areas. Also, care should be taken to provide appropriate information on flood zones at locations where national mapping has not been prepared or published (such as land adjacent to small watercourses and water features that potentially are associated with a flood risk but appear to be in Zone 1 on the basis that no analysis has been performed). In these circumstances the FRA and information submitted should provide information on the flood zones and also evidence that the sequential test has been performed and is satisfied.

3.3.2 Exception Test

If, following application of the sequential test it is not possible for the development to be located in areas with a lower probability of flooding the exception test must then be applied if deemed appropriate. The aim of the exception test is to ensure that more vulnerable uses, such as residential land can be allocated such that subsequent development can be implemented safely and is not located in areas where the hazards and consequences of flooding are inappropriate. For the test to be satisfied, the following has to be addressed:

- It must be demonstrated that the development provides wider sustainability benefits to the community that outweigh flood risk, informed by a SFRA where one has been prepared.

Local planning authorities will need to consider what criteria they will use to assess whether this part of the exception test has been satisfied and give advice to enable applicants to provide evidence to demonstrate that it has been passed. If the application fails to prove this, the local planning authority should consider whether the use of planning conditions and / or planning obligations could allow it to pass. If this is not possible, this part of the exception test has not been passed and planning permission should be refused[2].

- A site-specific flood risk assessment must demonstrate that the development will be safe for its lifetime, taking account of the vulnerability of its users, without increasing flood risk elsewhere, and, where possible, will reduce flood risk overall.

2 NPPF Planning Practice Guidance: Flood Risk and Coastal Change (paragraph 037, Reference ID: 7-056-20140306) March 2014

The site-specific flood risk assessment should demonstrate that the site will be safe, and the people will not be exposed to hazardous flooding from any source for the lifetime of the development, the following should be considered[3]:

- The design of any flood defence infrastructure
- Access and egress
- Operation and maintenance
- Design of the development to manage and reduce flood risk wherever possible
- Resident awareness
- Flood warning and evacuation procedures
- Any funding arrangements required for implementing measures
- The potential effects of climate change and how these can be safely managed
- The NPPF provides detailed information on how the test can be applied.

3.3.3 Actual flood risk

If it has not been possible to allocate land such that all future development can be situated in Zone 1 then a more detailed assessment is needed to understand the implications of locating proposed development in Zones 2 or 3. This is accomplished by considering information on the "actual risk" of flooding. The assessment of actual risk takes account of the presence of flood defences and provides a picture of the safety of existing and proposed development. It should be understood that the standard of protection afforded by flood defences is not constant and it is presumed that the required minimum standards for new development are:

- Residential development should be protected against flooding with an annual probability of river flooding of 1% (1 in 100-year chance of flooding) in any year; and
- Residential development should be protected against flooding with an annual probability of tidal (sea) flooding of 0.5% (1 in 200-year chance of flooding) in any year.

The assessment of the actual risk should take the following issues into account:

- The level of protection afforded by existing defences might be less than the appropriate standards and hence may need to be improved if further growth is contemplated
- The flood risk management policy for the defences will provide information on the level of future commitment to maintain existing standards of protection. If there is a conflict between the proposed level of commitment and the future needs to support growth, then it will be a priority for the Flood Risk Management Strategy to be reviewed so it addresses the identified requirement
- The standard of safety must be maintained for the intended lifetime of the development. Over time the effects of climate change may reduce the standard of protection afforded by flood risk management measures and defences, due to increased river flows and levels, and so commitment is needed to invest in the maintenance and upgrade of measures and defences if the present-day levels of protection are to be maintained and where necessary land secured that is required for affordable future flood risk management measures

3 NPPF Planning Practice Guidance: Flood Risk and Coastal Change (paragraph 038, Reference ID: 7-056-20140306) March 2014

- The assessment of actual risk can include consideration of the magnitude of the hazard posed by flooding. By understanding the depth, velocity, speed of onset, rate of rise and duration of floodwater it is possible to assess the level of hazard posed by flood events from the respective sources. This assessment will be needed in circumstances where a) the consequences of flooding need to be mitigated or b) where it is proposed to place lower vulnerability development in areas of flood risk.

3.4 Residual flood risk

Residual risk refers to the risks that remain after measures have been taken to alleviate flooding (such as flood defences). It is important that these risks are quantified to confirm that the consequences can be safely managed. The residual risk can be

- the effects of a flood with a magnitude greater than that for which the defences or management measures have been designed to alleviate (the 'design flood'). This can result in overtopping of flood banks, failure of flood gates to cope with the level of flow or failure of pumping systems to cope with the incoming discharges; and/or
- failure of the defences or flood risk management measures to perform their intended duty. This could be breach failure of flood embankments, failure of flood gates to operate in the intended manner, or failure of pumping stations.

Should such events occur, it may result in rapid inundation of the local community behind the flood defences and may pose a risk to life.

The assessment of residual risk demands that attention be given to the vulnerability of the receptors and the response to managing the resultant flood emergency. In this instance attention should be paid to the characteristics of flood emergencies and the roles and responsibilities during such events. Additionally, in the cases of breach or overtopping events, consideration should be given to the structural safety of the dwellings or structures that could be adversely affected by significant high flows or flood depths.

There are several formal fluvial and tidal flood defences located within the study area. These include embankments along the River Orwell and River Stour. The majority of defences within both districts are classified as high ground.

There is still potential residual risk in the district from reservoirs.

Surface water flood risk and SuDS, including exceedance flow routes, should also be considered as part of residual risk.

3.5 Cumulative impact of additional development on flood risk

The revised NPPF now includes that strategic policies should now consider the 'cumulative impacts in, or affecting, local areas susceptible to flooding' (para 156).

When allocating land for development, consideration must be given to the potential cumulative impact of development on flood risk. The increase in impermeable surfaces and resulting increase in runoff increases the chances of surface water flooding if suitable mitigation measures, such as SuDS, are not put in place. Additionally, the increase in runoff may result in more flow entering watercourses, increasing the risk of fluvial flooding downstream. This consideration is particularly applicable in circumstances where there is a known flood risk affecting people, property or infrastructure which could be exacerbated by the cumulative effects of upstream development.

Consideration must also be given to the potential cumulative impact of the loss of floodplain as a result of development. The effect of the loss of floodplain storage should be assessed, at both the development and elsewhere within the catchment and, if required, the scale and scope of appropriate mitigation should be identified.

Whilst the increase in runoff, or loss in floodplain storage, from individual developments may only have a minimal impact on flood risk, the cumulative effect of multiple developments may be more severe without appropriate mitigation measures.

The cumulative impact of development should be considered at the planning application and development design stages and the appropriate mitigation measures undertaken to ensure flood risk is not exacerbated, and in many cases the development should be used to improve the flood risk.

4 Sources of information used in preparing the SFRA

4.1 Summary of SFRA mapping for all sources of flood risk

Appendix mapping has been produced as part of this SFRA. BMSDC are also planning to upload files to an online GIS portal as an alternative way of viewing the sources of flood risk for a particular development site.

4.2 Fluvial

Flood Zones 2 and 3a are taken from the EA's Flood Map for Planning. These are updated quarterly with any new detailed hydraulic modelling information, and planners and developers should always refer to the most up to date issue.

Flood Zone 3b comprises land where water has to flow or be stored in times of flood (the functional floodplain). Flood Zone 3b, unlike other Zones, does show flood risk that takes account of the presence of existing flood risk management features and flood defences, as land afforded this standard of protection is not appropriately included as functional flood plain. The mapping in the SFRA identifies this Flood Zone as land which would flood with a 5% chance in each and every year (a 1 in 20-year annual exceedance probability (AEP) defended scenario), where detailed modelling exists. Where the 5% AEP outputs or use of surrogate return periods (e.g. 1 in 25-year defended scenario or the 100-year defended scenario) were not available, then Flood Zone 3a has been mapped as Flood Zone 3b. If a proposed development is shown to be in Flood Zone 3, further investigation should be undertaken as part of a detailed site-specific FRA to define and confirm the extent of Flood Zone 3b. Mapping of these flood zones are displayed in Appendix B. Mapping of functional floodplain is displayed in Appendix C.

The Flood Zone 3b and 3a extent plus climate change provided by the SFRA will not be automatically updated. However, users should be aware that if Flood Zones 3 and 2 have changed, this is an indication that new modelled information is also available which could be used to refine Flood Zone 3b and 3a plus climate change. It is important that the EA are approached to determine whether updated (more accurate) information is available prior to commencing a site-specific FRA.

4.2.1 Climate change

Climate change modelling with the latest specification is being used where available within the study area. Where details models are available, these have been re-run with the latest EA climate change allowances where these were not available. However, where this modelling is not available (or could not be easily run within the confines of this SFRA) the approach adopted is based on the assumption that existing Flood Zone 2 provides a reasonable representation of the assumed future extent of Flood Zone 3.

Where it is required to define Future Flood Zone 2, developers should define this through more detailed modelling, or at locations where this affects proposed allocations then this should be addressed with a Level 2 SFRA.

4.2.2 Potential modelling improvements

At the time of preparing the 2020 SFRA there were several on-going flood modelling studies being conducted by or on behalf of the EA (including River Gipping, River Blyth, River Waveney and River Brett). In a number of cases, the flood modelling studies involve updating existing hydrology and hydraulic models and re-running the models for a suite of return periods. Most importantly these models are being updated with the latest climate change guidance and allowances. It is important that the EA are approached to determine whether updated (more accurate) information is available prior to commencing a site-specific FRA.

4.3 Surface water

Mapping of surface water flood risk in B&MS has been taken from the Risk of Flooding from Surface Water (RoFfSW) published by the EA. These maps are intended to provide a

consistent standard of assessment for surface water flood risk across England and Wales in order to help LLFAs, the EA and any potential developers to focus their management of surface water flood risk.

The RoFfSW is derived primarily from identifying topographical flow paths of existing watercourses or "dry valleys" that contain some isolated ponding locations in low-lying areas. They provide a map which displays different levels of surface water flood risk depending on the annual probability of the land in question being inundated by surface water (Table 4-1).

Table 4-1: RoFfSW risk categories

Category	Definition
High	Flooding occurring as a result of rainfall with a greater than 1 in 30 chance in any given year (annual probability of flooding 3.3%)
Medium	Flooding occurring as a result of rainfall of between 1 in 100 (1%) and 1 in 30 (3.3%) chance in any given year.
Low	Flooding occurring as a result of rainfall of between 1 in 1,000 (0.1%) and 1 in 100 (1%) chance in any given year.
Very Low	Flooding occurring as a result of rainfall with less than 1 in 1,000 (0.1%) chance in any given year.

Although the RoFfSW offers improvement on previously available datasets, the results should not be used to understand flood risk for individual properties. The results should be used for high-level assessments such as SFRAs for local authorities. If a particular site is indicated in the EA mapping to be risk from surface water flooding, a more detailed assessment should be considered to more accurately illustrate the flood risk at a site-specific scale. Such an assessment will use the RoFfSW in partnership with other sources of local flooding information.

4.4 Tidal

The assessment of tidal flood risk has primarily been based on the Environment Agency's Flood Map for Planning (Rivers and Sea) which delineates Flood Zones 2 and 3. This mapping is based on broad-scale modelled flood extents, supplemented with the outputs from detailed modelling studies where available, and is updated regularly by the Environment Agency.

4.5 Groundwater

The risk of groundwater flooding is dependent on local geological/soil conditions at any given time. Groundwater levels rise during wet winter months and fall again in the summer when effective rainfall is low, and extractions are higher. In very wet winters, rising groundwater levels may lead to the flooding of normally dry land, as well as reactivating flows in streams that only flow for part of the year.

The JBA Groundwater Flood Map provides a detailed assessment of the risk of groundwater emergence in a 1 in 100-year event at a 5m resolution. The risk is scaled between 0 and 4, with 0 indicating no risk and 4 identifying groundwater levels either at or very near (within 0.025m of) the ground surface. The groundwater levels are compared against ground surface levels to determine the head difference in metres, with 0m suggesting artesian discharge of groundwater at the ground surface.

The JBA Groundwater Flood Map should be used in combination with other information, such as local data or historic data. It should not be used as sole evidence for any specific flood risk management, land use planning or other decisions at any scale. The data can however help to identify areas for further assessment at a local scale, where finer resolution datasets may exist or more data could be gathered.

4.6 Sewers

Historical incidents of sewer flooding have been provided by Anglian Water. The information displays areas which have suffered flooding on a 4 post code digit basis.

4.7 Reservoirs

The risk of inundation as a result of reservoir breach or failure of a number of reservoirs within the area has been mapped using the outlines produced as part of the National Inundation Reservoir Mapping (NIRIM) study. This data is available on the long term flood risk maps online. The data shows the maximum extent of flooding in the event of reservoir failure or overtopping.

4.8 Other relevant flood risk information

Users of this SFRA should also refer to other relevant information on flood risk where available and appropriate. This information includes:

- Policy documents such as local plan policy and Green Infrastructure Strategy
- EA NFM Map
- SCC Local Flood Risk Management Strategy (2016)
- North Essex Catchment Flood Management Plan (CFMP) (2009)
- East Suffolk Catchment Flood Management Plan (CFMP) (2009)
- Broadland Rivers Catchment Flood Management Plan (CFMP) (2009)

5 Understanding flood risk in B&MS

One of the key purposes of this SFRA is to identify the influential local flood risk issues and to summarise recorded local flood incidents and predicted flood risk to the area. Flood risk can arise from a variety of different sources, as described within this section. Often however, flooding originates from a combination of courses as flood mechanisms are integrated.

5.1 How flood risk is assessed

A flood is now formally defined in the Flood and Water Management Act (2010) as "any case where land not normally covered by water becomes covered by water". The Act also states that a flood, as defined above, can be caused by:

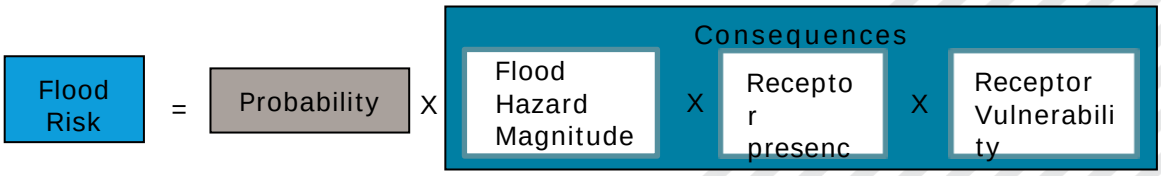
- Heavy rainfall
- A river overflowing, or its banks being breached
- A dam overflowing or being breached
- Tidal waters
- Groundwater
- Anything else (including a combination of factors)

In the context of the FWMA (2010) a flood does not include:

- A flood from any part of a sewerage system, unless wholly or partly caused by an increase in the volume of rainwater (including snow and other precipitation) entering or otherwise affecting the system
- A flood caused by a burst water main (within the meaning given by section 219 of the Water Industry Act 1991)

The FWMA (2010) states that flood risk "means a risk in respect of flood", where risk is "assessed and expressed (as for insurance and scientific purposes) as combination of the probability of the occurrence with its potential consequences".

Thus, it is possible to define and express flood risk as:



5.2 Historical flooding

B&MS have a long history of recorded flood events caused by multiple sources of flooding.

Information collated from the EA recorded flood outlines, BMSDC recorded flood incidents (which are collected from SCC records) and Anglian Water datasets were assessed to understand the historic flooding in the study area. The data shows surface water flooding is the most frequent recorded cause of flooding within B&MS, with recorded incidents across both districts, including in Sudbury, Hadeigh and Stowmarket. This considers the frequency of events rather than severity.

This information was supplemented by information collected from the 2008 and 2009 SFRAs and Flood Investigation reports.

5.2.1 Previously reported flood incidents in the B&MS Level 1 SFRA

Key historical records from the previous Level 1 reports for B&MS are displayed in Table 5-2.

5.2.2 Previous documents and reports describing flood incidents

The SCC website provides a summary of previous flood investigation reports. Reports relevant to the study area include:

The Green, Beyton – February 2019

- Surface water flooding due to significant rainfall event – one property flooded on multiple occasions

Church Road, Beyton – February 2019

- Surface water flooding due to significant rainfall event – one property flooded on multiple occasions

Laxfield Road, Fressingfield – December 2019

- Surface water flooding due to significant rainfall event – 2 properties flooded on multiple occasions

Bergholt Road, Brantham – April 2007

- Surface water flooding due to significant rainfall event – 2 properties flooded on multiple occasions

Bulmer Road, Sudbury – August 2017

- Surface water flooding due to significant rainfall event – one property flooded on multiple occasions

East Street and Elizabeth Court, Sudbury – August 2014

- Surface water flooding due to significant rainfall event – fourteen properties flooded

Bury Road, Lawshall – September 2014

- Surface water and sewer flooding – internal and external flooding to properties and road closures

5.2.3 B&MS Flood Incidents Database

The B&MS Flood Incidents Database holds all records of flooding known to the council since 1967. This data is collected from the SCC flood records. The database contains 3,787 records as of March 2020. The information has been collected from several sources including historic maps, public records and reports from members of the public.

The data shows surface water flooding is the most frequent cause of flooding within B&MS districts. Records are found across the districts, particularly in Sudbury, Long Melford, Hadeigh, Needham Market, Stowmarket, Claydon, Debenham and Eye.

Not all the historic data provided had a source of flooding. Additionally, not all the data provided had dates or a description of flooding recorded.

5.2.4 EA Record Flood Outline dataset

The EA Recorded Flood Outline dataset provides details of all recorded flood incidents by the EA from rivers, sea, groundwater and surface water. This dataset is provided using aerial photography, data from local authorities, surveys carried out by the EA and consultancies and visual accounts.

The dataset provides details of several flood incidents dating back to 1953. The main flood events identified are tidal flooding from the River Stour and River Orwell in 1953 and fluvial flooding from the Little Ouse River and River Stour. The EA recorded flood outlines are displayed in Appendix D.

5.3 Anglian Water

Historical incidents of sewer flooding which have occurred in B&MS since 2001 are displayed in Table 5 1. The most frequently flooded postcodes are C010 (Sudbury), IP14 (Stowmarket) and IP23 (Eye). Appendix E shows the sewer flooding records.

Table 5-1: Anglian Water sewer flooding records

Post Code	Locality	Date of Recorded Flood Incidents
CO10	Boxford, Sudbury	31/05/2016
CO10	Long Melford, Sudbury	11/07/2014 14/04/2016
CO10	Sudbury	12/08/2005 30/06/2014 05/08/2002 05/08/2002 20/12/2010 22/07/2010 28/03/2011 06/04/2011 25/08/2013 08/08/2017
CO10	Acton. Sudbury	13/10/2014
CO10	Great Cornard, Sudbury	23/06/2016
CO10	Glemsford, Sudbury	12/08/2004 18/06/2003 04/05/2011 08/03/2011 18/01/2011 14/07/2012 14/07/2012 18/01/2011 14/07/2012 18/01/2011
CO10	Lavenham, Sudbury	06/10/2019 18/09/2001 20/08/2004 26/08/2015 04/10/2011
CO7	Dedham, Colchester	05/07/2016 31/03/2008
IP14	Bacton, Stowmarket	24/06/2016 27/06/2016 31/05/2016
IP14	Little Stonham, Stowmarket	27/05/2014
IP14	Stowmarket	27/05/2014 31/05/2016 18/09/2015
IP14	Buxhall, Stowmarket	Unknown
IP14	Combs, Stowmarket	17/12/2010 20/04/2011

Post Code	Locality	Date of Recorded Flood Incidents
		31/05/2016
IP14	Harleston, Stowmarket	15/02/2014
IP14	Haughley Green, Stowmarket	02/04/2018
IP14	Finnigham, Stowmarket	25/06/2016 25/06/2016
IP14	Cotton, Stowmarket	01/07/2016
IP14	Debenham, Stowmarket	28/07/2018
IP21	Fressingfield, Eye	01/10/2019
IP22	Botesdale, Diss	Unknown
IP23	Thorndon, Eye	31/05/2016 27/07/2018
IP23	Yaxley, Eye	27/05/2014
IP23	Eye	07/08/2018 25/07/2016 07/10/2019
IP23	Gislingham, Eye	31/03/2009 03/05/2012 07/02/2014
IP30	Elmswell, Bury St Edmunds	03/05/2012 22/12/2019
IP30	Drinkstone, Bury St Edmunds	08/08/2014
IP31	Badwell Ash, Bury St Edmunds	29/06/2014
IP6	Needham Market, Ipswich	10/07/2014
IP7	Hitcham, Ipswich	14/07/2012 13/10/2014
IP9	Stutton, Ipswich	13/10/2014 23/06/2016 13/10/2014 23/06/2016

5.3.1 Summary of historic flood incidents

Key historical incidents of flooding from the EA, previous SFRA and BMSDC records are tabulated in Table 5-2. This indicates that fluvial and surface water are the most common causes of flooding. Due to the quantity of BMSDC records these are mostly displayed in mapping rather than displayed in Table 5-2. Appendix D shows the historic flood events provided by BMSDC.

Table 5-2: Summary of flood records in B&MS

Date	Locations of reports	Source of flooding	Description
04/11/1520	Ballingdon	Fluvial	Bridge swept away/badly damaged
25/08/1595	Boxford	Rainfall	Minor Flooding
11/1762	Sudbury, Ballingdon, Ford Street	Fluvial	Bures bridge swept away on Stour, bridge damaged at Ford Street
1824	Ballingdon	Rainfall	People had to leave homes
19/01/1841	Ballingdon	Unknown	Several houses flooded up to first floor
1870	Ballingdon	Fluvial	Bridge badly damaged
07/1875	Gipping-Blakenham and Claydon	Fluvial	Crops flooded in Gipping Valley
11/1875	Waveney Valley, Upper Ouse catchment	Fluvial	Waveney Valley flooded for 5 weeks, flooding in Walsham-le-Willows
01/1877	Waveney Valley	Fluvial	Prolonged flooding
07/1887	Framsden, Deben	Fluvial	Flooded agricultural land
05/1889	Stour Valley	Rainfall	Many streams flooded
10/1889	Deben Valley	Fluvial	Prolonged flooding
09/1896	Claydon	Surface water and drainage flooding	

Date	Locations of reports	Source of flooding	Description
05/1903	Sudbury	Rainfall	Low-lying meadows in Sudbury flooded
06/1903	Sudbury	Rainfall	Parts of Sudbury flooded
12/1910	Needham Market, Gipping	Fluvial	Properties and land flooded
1912	Stour Valley	Rainfall	Major flood in Stour catchment
01/1918	Stour Valley	Snowmelt	Major flood in Stour catchment specifically at Borley and Ballingdon
1929	Stour Valley	Rainfall/Snowmelt	Major flood in Stour catchment. Borley experienced the most extensive flooding for 30 years
1939	Stour catchment	Rainfall	Major flood in Stour catchment
01/1947	Sudbury, Ballingdon	Unknown	134 premises and streets flooded
11/03/1947	Stour catchment	Snowmelt	Major flood in Stour catchment, including Sudbury
01/1953	River Stour, River Orwell	Tidal – overtopping of defences	Widespread flooding
02/1958	Stour and tributaries (Upper Stour Catchment)	Snowmelt	Flood levels at 29 locations but no serious flooding
06/1958	Stour catchment	Rainfall	Severe flooding in Haverhill, worst since 1903

Date	Locations of reports	Source of flooding	Description
15/09/1968	Little Ouse River River Stour catchment Waveney valley	Fluvial/Rainfall	Major flood event with property flooding recorded in Stratford St Mary, Bures, Henry Street, Ballingdon (Sudbury), Nayland (1 property flooded) and Long Melford (15 properties flooded)
06/05/1978	Stour catchment	Rainfall	Minor flooding
01/02/1979	River Stour and Brett	Rainfall/snowmelt	Property flooding recorded in Long Melford (4), Kersey (1), Monks Eleigh (1)
March 1981	River Stour, Box and Brett	Rainfall	Minor flooding with some road flooding
29/12/1981	Ballingdon, Monks Eleigh, Aldham	Snowmelt	Some property flooding
01/1982	Stour catchment – Cornard and Bures	Snowmelt/rainfall	5 properties affected
08/1987	Stour and tributaries Stowmarket, Needham Market, Gipping	Fluvial	Severe flooding including property flooding in Long Melford, Bures, Boxtead
11/10/1987	Sudbury, Henny, Boxted, Stratford St Mary, Dedham, Monks Eleigh, Hadleigh, Long Melford, Kersey	Rainfall	Major flooding with many properties affected
01/1988	Gipping, Stowmarket, Needham Market	Fluvial	Properties flooded
24/01/1988-02/02/1988	Boxted, Monks Eleigh, Kersey	Rainfall/Fluvial	Property flooding
10/1993	Flatford	Rainfall	Heavy flooding
10/1993	Gipping – Stowmarket, Great Finborough, Combs Ford, Needham Market, Combs, Pips Ford	Fluvial and surface water	Property flooding

Date	Locations of reports	Source of flooding	Description
	Deben – Debenham		
29/10/2000 – 12/11/2000	Monks Eleigh, Boxted	Rainfall	Some property flooding
2001	Thurston, railway station	Groundwater flooding following prolonged rainfall	Localised flooding and minor transport disruption
21-31/10/2001	Henny, Stratford St Mary	Fluvial	Over 700 properties flooded
05/2004	Rattlesden River, Gipping Valley	Fluvial	Roads flooded
11/2005	Wherstead	Unknown	The Strand flooded
12/2005	Wherstead	Tidal	B1456 road flooded
03/2007	Wherstead and Ipswich	Tidal	The Strand flooded (Wherstead) and many roads affected in Ipswich dock area
05/2008	Hadleigh	Surface water	Minor flooding
03/05/2012	B&MS	Fluvial (River Gipping) Surface Water	134 flood incidents recorded – property and road flooding River Gipping over topped banks
05/12/2013	Wherstead Cattawade	Fluvial – channel capacity exceeded	

Date	Locations of reports	Source of flooding	Description
28/06/2014	Sudbury		Residential properties flooded
19/09/2014	Lawshall		Residential properties flooded
06/2016	B&MS	Surface water	Widespread records of flooding.

5.4 Topography, geology and soils

The topography, geology and soil are all important in influencing the way the catchment responds to a rainfall event. The degree to which a material allows water to percolate through it, the permeability, affects the extent of overland flow and therefore the amount of run-off reaching the watercourse. Steep slopes or clay rich (low permeability) soils will promote rapid surface runoff, whereas more permeable rock such as limestone and sandstone may result in a more subdued response.

5.4.1 Topography

The topography of B&MS Districts are shown in Figure 5-1.

In Babergh, the north west corner of the district is the area of highest elevation at approximately 110mAOD. The topography slopes downwards, along river valleys, towards the south east corner of the district where the lowest elevations are found along the River Stour and River Orwell.

In Mid Suffolk, the highest elevations are found in the south west of the district, with the topography sloping downwards along river valleys, notably the River Gipping, River Dove, River Deben and tributaries.

5.4.2 Geology and soils

Figure 5-2 and Figure 5-3 show the geology with B&MS Districts.

In Mid Suffolk, most of the district is underlain by Neogene to Quaternary Rocks composed of gravel, sand, silt and clay. The north and south of the district are underlain by Sussex White Chalk formation.

In Babergh, the geology also largely consists of Neogene to Quaternary Rocks composed of gravel, sand, silt and clay. In the north, parts of the district are underlain by Sussex White Chalk formation, and in the south by London Clay group.

Chalk and sedimentary bedrocks are permeable and allows for the storage and movement of groundwater. Areas which are underlain by chalk and sedimentary rocks are therefore more susceptible to groundwater flooding. Clay tends to have low permeability and is less susceptible to groundwater flooding. In areas of mixed geology, the local geology will influence the catchment response.

In Mid Suffolk, soils across much of the district are slowly permeable seasonally wet, slightly acid but base-rich loamy and clayey soils and lime-rich loamy and clayey soils with impeded drainage. In higher elevations in the south west of the district, slightly acid, loamy and clayey soils are found. Along river valleys, the soils are loamy and clayey floodplain soils with naturally high groundwater[4].

In Babergh, the areas of higher elevation in the north west of the district are largely slightly acid loamy and clayey soils with impeded drainage, lime-rich loamy and clayey soils with impeded drainage and slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils. Along the western and southern parts of the district are covered by freely draining, slightly acid, loamy soils. Along river valleys, the soils are generally loamy and clayey floodplain soils with naturally high groundwater.

4 http://www.landis.org.uk/soilscapes/

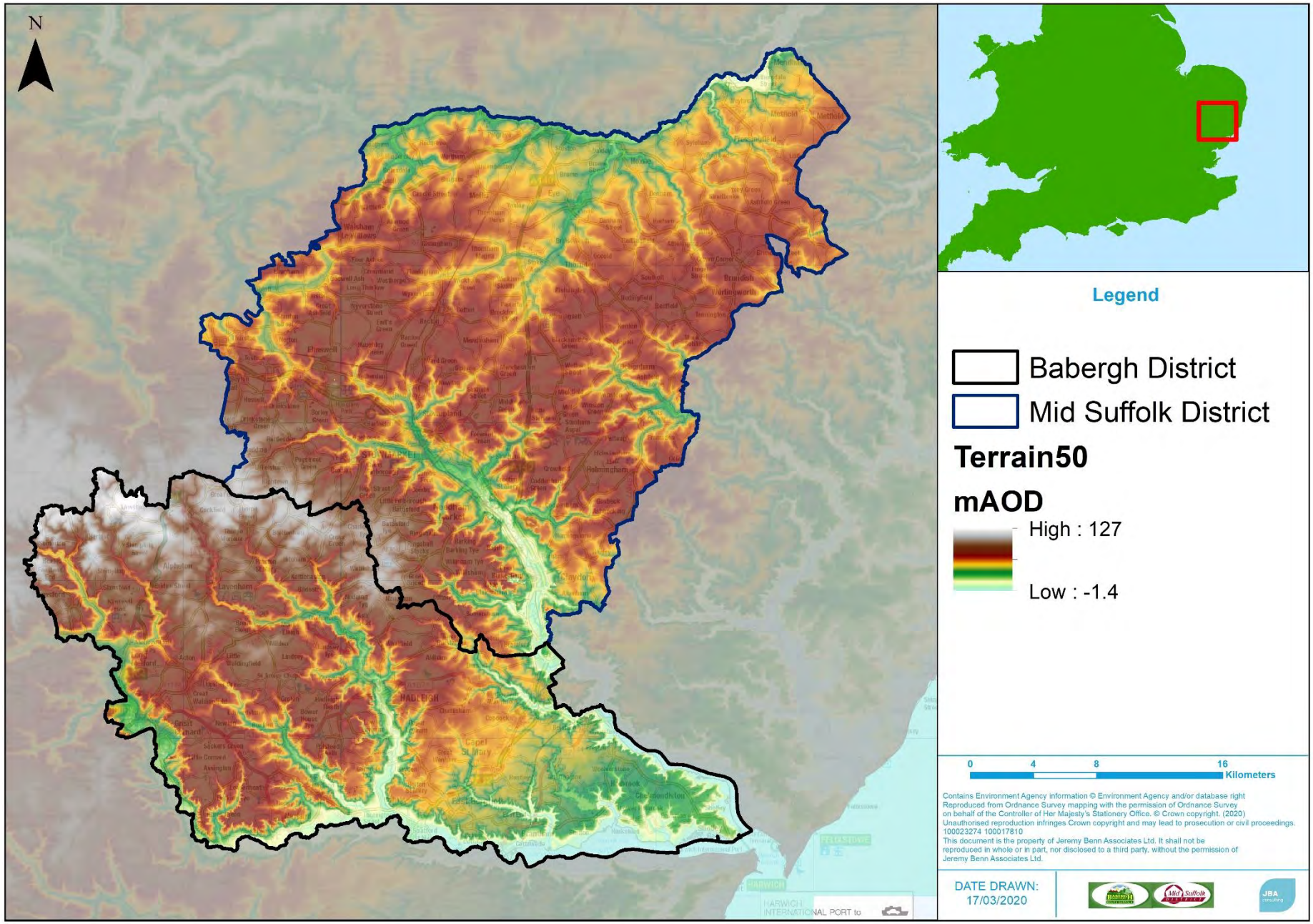


Figure 5-1: Topography in B&MS

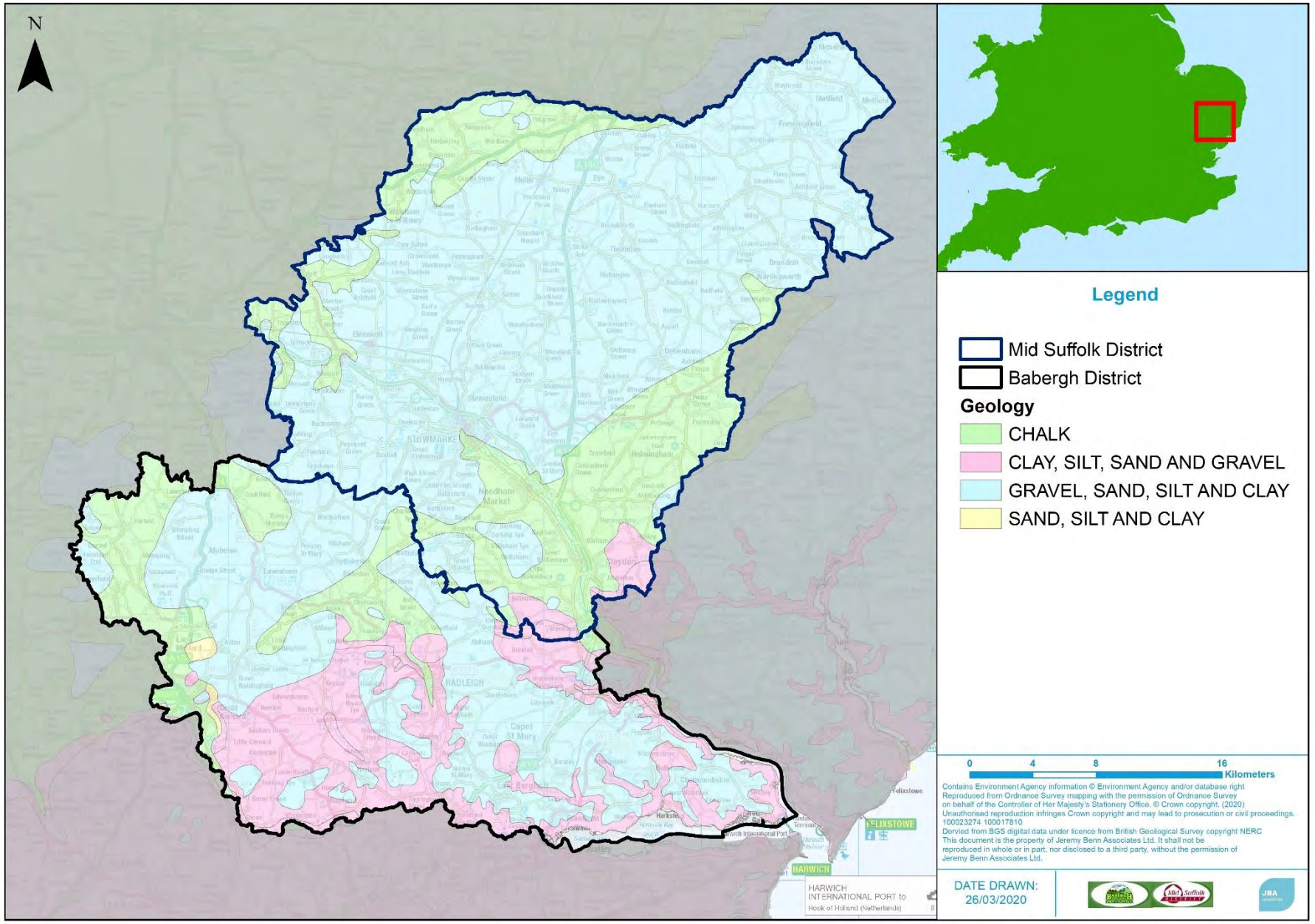


Figure 5-2: Geology in B&MS

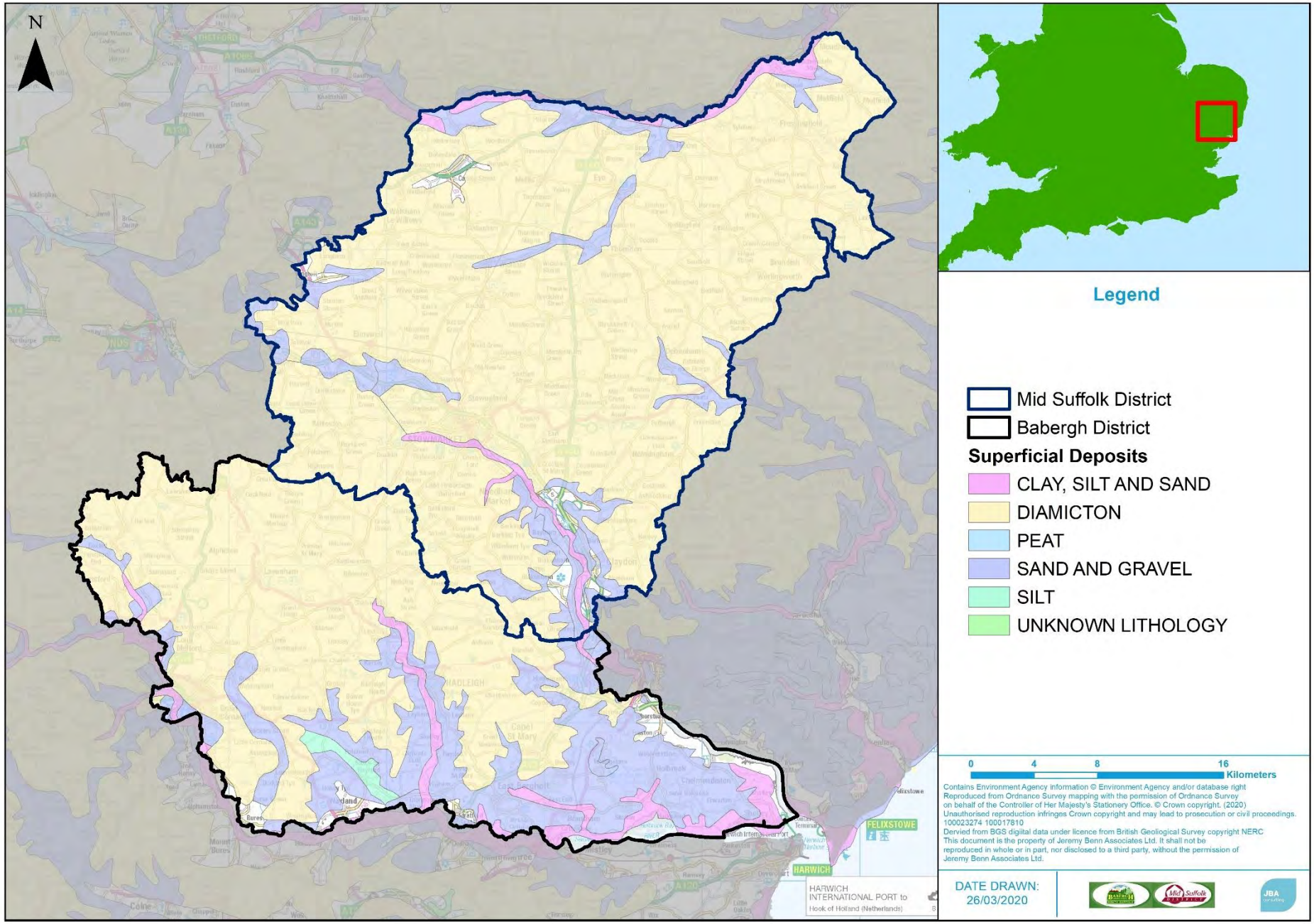


Figure 5-3: Superficial deposits in B&MS

5.5 Hydrology

There are a number of watercourses that flow through the study area. These include main rivers and ordinary watercourses. Appendix F shows the location of Main Rivers and ordinary watercourses in B&MS districts. An outline summary of the principal watercourses in the SFRA study area is provided in Table 5-3.

5.5.1 Main rivers

These tend to be larger streams and rivers, though some of them are smaller watercourses of local significance. The EA has permissive powers to carry out maintenance, improvement or construction work on Main Rivers to manage flood risk. Consultation with the EA will be required for any development projects within 20m of a Main River or flood defence.

5.5.2 Ordinary watercourses

These are all watercourses not designated as Main Rivers or IDB watercourses. An ordinary watercourse is any river, stream, ditch, drain, dyke etc. which is not classified as a Main River. As LLFA, SCC are required to develop a strategy to tackle local flood risks involving flooding from ordinary watercourses. The local authority or IDB has permissive powers to maintain them, but the responsibility lies with the riparian owner.

Table 5-3: Main Rivers in the study area

Watercourse	Classification	Description
Belstead Brook	Main River	Belstead Brook is a named river from just north of Washbrook. It flows in a south easterly direction until it joins the River Orwell.
Chad Brook	Main River	Chad Brook is a named river from the north west of Babergh, and then flows south for approximately 15km until it joins the River Stour.
River Blyth	Main River	The River Blyth rises near Laxfield and flows out of Mid Suffolk District into Suffolk Coastal District.
River Box	Main River	The River Box is a tributary of the River Stour. It rises to the north of Little Waldingfield and flows in a south easterly direction for approximately 20 km.
River Brett	Main River	The River Brett rises north of Brettenham and flows for approximately 36km in a southerly direction through Hadleigh until its confluence with the River Stour.
River Deben	Main River	The River Deben rises to the east of Debenham. It flows in an easterly direction towards Debenham, and then in a south easterly direction until it leaves Mid Suffolk and flows into East Suffolk near Crettingham.
River Dove	Main River	The River Dove rises near Mendlesham and flows in a north easterly direction, through Eye, for approximately 19km until its confluence with the River Waverley.
River Gipping	Main River	The River Gipping rises at Mendlesham Green

Watercourse	Classification	Description
		and flows for 38 km, first in a south westerly direction through Stowmarket and Needham Market and then in a south easterly direction until it flows into Ipswich Borough.
River Glem	Main River	The River Glem flows into Babergh from St Edmundsbury District south of Somerton and flows in a south easterly direction until its confluence with the River Stour.
River Orwell	Main River	The River Orwell is sourced from the tidal limit of the River Gipping in Ipswich and flows in a south easterly direction along the boundary of Babergh district to Harwich Harbour.
River Stour	Main River	The River Stour enters Babergh District from St Edmundsbury District and flows along the eastern boundary through Sudbury and then along the southern boundary to Harwich Harbour.
River Waveney	Main River	The River Waveney enters Mid Suffolk from Breckland and St Edmunsbury District and flows along the length of the northern boundary of the district before flowing into Waveney District.
Stutton Brook	Main River	Stutton Brook rises near Capel St Mary and flows in a southerly direction for approximately 10km before it joins the River Stour.

5.6 Fluvial flood risk

Fluvial flood risk occurs when water levels rise higher than the bank levels within a river channel, causing floodwater to spill onto adjacent land (floodplain). The main reasons for this to occur are:

- Intense and long duration rainfall causing runoff and flow to increase in rivers resulting in flows exceeding the capacity of the river channel. This can be further exacerbated by wet antecedent conditions or where there are significant contributions of groundwater
- Constrictions within the river channel resulting in flood water backing upstream.
- Blockage of structures or within the river channel itself causing flood water to back up upstream.
- High water levels and/or flood gates prevention discharge out the outlet of the watercourse.

Fluvial flooding is significant within B&MS and is prevalent across much of the district. Significant rivers and their tributaries within the district that contribute towards flood risk include but are not limited to the:

- River Stour
- River Gipping
- River Waveney
- River Brett

- River Dove
- River Deben

Mapping of fluvial flood risk can be found on the EA's Flood Map for Planning website. Fluvial flood risk within the study area has been mapped in Appendix B.

5.7 Surface water flood risk

Surface water runoff occurs when rainfall fails to infiltrate to the ground or enter the drainage system, causing water to pond or flow over the ground surface. The likelihood of flooding is dependent on the rate of runoff and the condition of the surface water drainage system.

The Risk of Flooding from Surface Water (RoFSW) dataset shows that surface water predominately follows topographical flow paths of existing watercourses or dry valleys with some isolated ponding in low lying areas. Areas at risk from surface water flooding within B&MS are shown in Appendix A.

5.8 Groundwater flood risk

In comparison to fluvial and tidal flooding, the understanding of the risks posed by groundwater flooding is limited and mapping of flood risk from groundwater sources is in its infancy. Groundwater flooding is often difficult to identify and can be mistaken for surface water flooding or vice versa. The risks and mechanisms of groundwater flooding have traditionally been poorly reported. However, under the Flood and Water Management Act (2010), the LLFA now has powers to undertake risk management functions in relation to groundwater flood risk.

The risk of groundwater flooding is dependent on local conditions at any given time. Groundwater levels rise during wet winter months and fall again in the summer when effective rainfall is low, and extractions are higher. In very wet winters, rising groundwater levels may lead to the flooding of normally dry land, as well as reactivating flow in streams that only flow for part of the year.

The JBA Groundwater Flood Map (Appendix G) shows that across most of B&MS there is negligible risk of Groundwater Flooding.

In Mid Suffolk the areas at risk of groundwater flooding can be found in the north and south of the district, and in areas in the vicinity of some watercourses including the River Dove, River Waveney and River Gipping. The areas at risk of groundwater flooding are generally found where the underlying geology is composed of chalk.

In Babergh, the areas at risk of groundwater flooding also corresponds to the chalk geology, and location of watercourses, including the River Brett and River Stour. The low lying areas in the east of the district are also shown to have a risk of groundwater flooding.

5.9 Tidal flood risk

Flooding from the sea occurs when water levels in the sea rise above ground levels of the coast. This can occur during normal tides, extreme atmospheric events and wind driven action causes water levels of the sea to rise.

Present day Environment Agency flood zones show that the majority of the study area is currently not at risk of tidal flooding. There are several rivers in the study area that are tidally influenced. In Babergh, the south east corner of the district there is a risk of tidal flooding from the Stour and Orwell estuaries, including at Shotley and Wherstead on the Orwell estuary, and Harkstead and Cattawade along the Stour.

Tidal flooding should however be considered for present and the future due to predicted increases in sea level. In particular, sea level rise may impact the low lying areas in the south east of the district. The greatest concern rises from the potential threat of a combined tidal and extreme fluvial event. The probability of this occurring is significantly less than

both events occurring independently. Developers should therefore consider tidal flood risk when making land use planning decisions in respect to the design life of developments.

5.10 Flooding from sewers

Sewers are the underground network of pipes which remove waste-water from properties. They are categorised by the type of waste-water they remove. The categories include:

- Foul sewer
- Surface Water sewer
- Combined sewer

Foul sewers convey waste-water. Surface water sewers convey collected surface runoff and combined sewers convey a mixture of both foul water and surface water.

Rainwater frequently drains into surface water sewers or sewers both containing surface and waste-water – these are known as combined sewers. These sewers can become overwhelmed during storm events and become blocked or are not designed to have adequate capacity, resulting in flooding of the surrounding area until the water can be drained away. This is a particular issue for combined sewers because it runs the high risk of contaminated water flooding a property internally. Whilst surface water has historically drained to the public sewerage network, with the introduction of SuDS the expectation is that this is no longer the default option.

Anglian Water is responsible for the public sewer networks in this area. Anglian Water work in partnership with other risk management authorities to investigate issues where flood risk is apparent from a number of sources.

Any allocated or new development will need to address the impact on the existing capacity of the sewer system, any associated sewage treatment works and ensure close liaison with Anglian Water to agree phasing of improvement works. Surface water strategy must follow the Sustainable Drainage Systems (SuDS) hierarchy. Anglian Water would expect proposals to have followed the surface water hierarchy and only propose a surface water connection to the public sewerage network as a last resort where its has been demonstrated that alternatives are not technically feasible.

Anglian Water has provided a list of sewer flooding incidents to the B&MS area since 2001. These are displayed in Table 5-1. For confidentiality reasons this data has been supplied on a 4 digit postcode basis.

5.11 Flooding from reservoirs

Reservoirs with an impounded volume greater than 25,000 cubic metres are governed by the Reservoir Act 1975 and are listed on a register held by the EA. The level and standard of inspection and maintenance required under the Act means that the risk of flooding from reservoirs is relatively low. Recent changes to legislation under the Flood and Water Management Act require the EA to designate the risk of flooding from these reservoirs. The EA is currently progressing a 'Risk Designation' process so that the risk is formally determined.

Reservoir flooding is very different from other forms of flooding. It may happen with little or no warning and evacuation will need to happen immediately. The likelihood of such flooding is difficult to estimate, but it is less likely than flooding from rivers or surface water. It may not be possible to seek refuge upstairs from floodwater as buildings could be unsafe or unstable due to the force of water from the reservoir breach or failure.

The EA maps represent a credible worst-case scenario. In these circumstances, it is the time to inundation, the depth of inundation, the duration of flooding and the velocity of flood flows that will be most influential.

The risk to development from reservoirs is residual but developers should consider reservoir flooding during the planning stage.

Developers should seek to contact the reservoir owner to obtain information which may include:

- reservoir characteristics: type, dam height at outlet, area/volume, overflow location;
- operation: discharge rates / maximum discharge;
- discharge during emergency drawdown; and
- inspection / maintenance regime.

Developers should apply the sequential approach to locating development within the site. The following questions should be considered:

- can risk be avoided through substituting less vulnerable uses or by amending the site lay-out?
- can it be demonstrated that less vulnerable uses for the site have been considered and reasonably discounted? and
- can layout be varied to reduce the number of people or flood risk vulnerability or building units located in higher risk parts of the site?

Consult with relevant authorities regarding emergency plans in case of reservoir breach.

In addition to the risk of inundation those considering development in areas affected by breach events should also assess the potential hydraulic forces imposed by the rapid flood event and check that the proposed infrastructure fabric can withstand the loads imposed on the structures by a breach event.

The EA Reservoir Flood Outline (Extent) layer was used to assess risk of flooding from reservoirs to B&MS. This indicates that some areas in the districts are at risk of flooding from reservoirs.

On the River Stour and its tributaries, notable areas at risk include areas around Holbrook downstream of Alton Water to Holbrook Bay where the watercourse joins the River Stour. There is also further flooding along an unnamed tributary of the River Stour around Beaumont Hall, and Also around Ballingdon and Stratford St Mary. On the River Brett, there is flooding from a tributary at Almshouse Green, in Hadleigh and downstream to the confluence with the River Stour.

On the River Orwell there are areas at risk of flooding downstream of Ostrick Creek on the confluence with the Belstead Brook, and from a further reservoir on the Freston Brook.

On the River Gipping, the is a risk from just north of Stowmarket to downstream of Needham Market. In Stowmarket, there are several potential allocations downstream of the flood storage reservoir. Also, along the Rattlesden River downstream of Finsborough Road.

The reservoir mapping can be viewed on the EA website.

6 Flood warning and emergency planning

6.1 Emergency planning

Emergency planning is used to help manage flood related incidents. From a flood risk perspective, emergency planning can be broadly split into three phases: before, during and after a flood. The measures involve developing and maintaining arrangements to reduce, control or mitigate the impact and consequences of flooding and to improve the ability of people and property to absorb, respond to and recover from flooding.

6.2 NPPF

In development planning, a number of emergency planning activities are already integrated in national building control and planning policies, for example the NPPF Flood Risk Vulnerability and Flood Zone 'Compatibility' table seeks to avoid inappropriate development in areas at risk from all sources of flooding. However; safety is a key consideration for any new development and includes residual risk of flooding, the availability of adequate flood warning systems for the development, safe access and egress routes and evacuation procedures.

The NPPF Planning Practice Guidance outlines how developers can ensure safe access and egress to and from development to demonstrate that development satisfies the second part of the Exception Test. As part of an FRA, the developer should review the acceptability of the proposed access in consultation with B&MS (where appropriate) and the EA.

There are circumstances where a flood warning and evacuation plan[5] is required and / or advised:

- It is a requirement under the NPPF that a flood warning and evacuation plan is prepared for sites at risk of flooding used for holiday or short-let caravans and camping and are important at any site that has transient occupants (e.g. hostels and hotels) and for essential ancillary sleeping or residential accommodation for staff required by uses in this category [water-compatible development], subject to a specific warning and evacuation plan.
- The EA and DEFRAs standing advice for undertaking flood risk assessments for planning applications states that details of emergency escape plans will be required for any parts of the building that are below the estimate flood level.
- It is recommended that Emergency Planners at B&MS (where appropriate) are consulted prior to the production of any emergency flood plan.
- In addition to the flood warning and evacuation plan considerations listed in the NPPF / PPG, it is advisable that developers also acknowledge the following:
- How to manage the consequences of events that are un-foreseen or for which no warnings can be provided (e.g. managing the residual risk of a breach).
- Proposed new development that places additional burden on the existing response capacity of the Councils will not normally be considered to be appropriate.
- Developers should encourage those owning or occupying developments, where flood warnings can be provided, to sign up to receive them. This applies even if the development is defended to a high standard.
- The vulnerability of site occupants.

5 Flood warning and evacuation plans may also be referred to as an emergency flood plan or flood response plan.

- Situations may arise where occupants cannot be evacuated (e.g. prisons) or where it is safer to remain "in-situ" and / or move to a higher floor or safe refuge area (e.g. at risk of a breach). These allocations should be assessed against the outputs of the SFRA and where applicable, a site-specific Flood Risk Assessment to help develop emergency plans.

Further emergency planning information links:

- 2004 Civil Contingencies Act
- DEFRA (2014) National Flood Emergency Framework for England
- How to register with the EA**'s Flood Warnings Direct service**
- National Flood Forum
- GOV.UK Make a Flood Plan guidance and templates

6.3 Flood Warnings

Flood warnings can be established for particular locations and, along with evacuation plans, can inform emergency flood plans or flood response plans. The EA is the lead organisation for providing warnings of fluvial flooding (for watercourses classed as Main Rivers) and coastal flooding in England. Flood Warnings are supplied via the Flood Line Warnings Directive (FWD) service, to homes and business within Flood Zones 2 and 3. The different levels of warning are shown in Table 6-1.

Table 6-1: EA Warnings explained

Flood Warning Symbol	What it means	What to do
	Flood Alerts are used to warn people of the possibility of flooding and encourage them to be alert, stay vigilant and make early preparations. It is issued earlier than a flood warning, to give customers advance notice of the possibility of flooding, but before there is full confidence that flooding in Flood Warning Areas is expected.	Be prepared to act on your flood plan Prepare a flood kit of essential items Monitor local water levels and the flood forecast on the EA website Stay tuned to local radio or TV Alert your neighbours Check pets and livestock Reconsider travel plans
	Flood Warnings warn people of expected flooding and encourage them to take action to protect themselves and their property.	Move family, pets and valuables to a safe place Turn off gas, electricity and water supplies if safe to do so Seal up ventilation system if safe to do so Put flood protection equipment in place Be ready should you need to evacuate from your home 'Go In, Stay In, Tune In'

Flood Warning Symbol	What it means	What to do
	Severe Flood Warnings warn people of expected severe flooding where there is a significant threat to life.	Stay in a safe place with a means of escape Co-operate with the emergency services and local authorities Call 999 if you are in immediate danger
Warnings no longer in force	Informs people that river or sea conditions begin to return to normal and no further flooding is expected in the area. People should remain careful as flood water may still be around for several days.	Be careful. Flood water may still be around for several days If you've been flooded, ring your insurance company as soon as possible

It is the responsibility of individuals to sign-up to this service to receive the flood warnings via FWD. Registration and the service is free and publicly available. It is recommended that any household considered at risk of flooding signs-up. Developers should also encourage those owning or occupying developments, where flood warnings can be provided, to sign up to receive them. This applies even if the development is defended to a high standard.

There are currently 6 Flood Warning Areas (FWA) in Mid Suffolk and 11 in Babergh and 5 Flood Alert Areas (FAAs) in Mid Suffolk and 5 in Babergh. The locations of these are displayed in Appendix I. A list of the FWA is shown in Table 6-2 and a list of FAAs is shown in Table 6-3.

Table 6-2: Flood Warning Areas within B&MS

District	Flood Warning Code	Flood Warning Name	District
Mid Suffolk	054FWFSF4A	The River Deben, from Debenham to Cretttingham	River Deben
Mid Suffolk	054FWFSF4G	The River Gipping from Needham Market to London Road Bridge, Ipswich	River Gipping
Mid Suffolk	054FWFSF1A	The River Waveney from Diss to Bungay	River Waveney
Mid Suffolk	054FWFSF4D	The Rattlesden River from Rattlesden to Combs Ford in Stowmarket	Rattlesden River
Mid Suffolk	054FWFSF4E	The River Gipping from the A14 at Stowmarket to upstream of Needham Market	River Gipping
Mid Suffolk	054FWFSF4F	The River Gipping through Needham Market	River Gipping
Babergh	054FWFSF5A	The River Box from Boxford to Thorrington Street	River Box
Babergh	054FWFSF5B	The River Brett from Lavenham to Higham	River Brett
Babergh	054FWCDV4B5	The north and south banks of the Stour estuary, from Shotley Gate, to and including Brantham	River Stour
Babergh	051FWEEF2	The River Stour from downstream of Kedington to Sudbury	River Stour
Babergh	051FWEEF3A	The River Stour from Sudbury to Boxted	River Stour
Babergh	054FWCDV4B3a	The tidal River Orwell at Cliff Quay industrial area in Ipswich	River Orwell
Babergh	054FWFSF4G	The River Gipping from Needham Market to London Road Bridge, Ipswich	River Gipping

District	Flood Warning Code	Flood Warning Name	District
Babergh	054FWCDV4B8	The River Stour upstream of Cattawade Barrage to Dedham	River Stour
Babergh	054FWCDV4B2	The tidal River Orwell estuary from Felixstowe to Bourne Bridge in Ipswich	River Orwell
Babergh	051FWFEF3B	The River Stour from Boxted to Dedham	River Stour
Babergh	054FWCDV4B3b	The tidal River Orwell from Bourne Park to Hadleigh Road Industrial Estate	River Orwell

Table 6-3: Flood Warning Areas within B&MS

District	Flood Alert Code	Flood Alert Name	Watercourse
Mid Suffolk	054WAFSF1	The River Waveney from Diss and the River Dove to Ellingham, including Bungay	River Waveney
Mid Suffolk	054WAFSF4FG	The River Gipping, from downstream of Needham Market, to upstream of London Road Bridge, Ipswich	River Gipping
Mid Suffolk	054WAFSF4AC	The Rivers Deben and Lark	River Deben, River Lark
Mid Suffolk	052WAFLOT	Little Ouse River and River Thet in Sufoflk and Norfolk	Little Ouse River, River Thet
Mid Suffolk	054WAFSF4DE	The Rattlesden River and River Gipping, through and including Stowmarket and Needham Market	Rattlesden River, River Gipping
Babergh	054WACDV4B	The Suffolk and Essex coast from Felixstowe to Clacton including Orwell and Stour estuaries	North Sea, River Orwell, River Deben
Babergh	054WAFSF4FG	The River Gipping, from downstream of Needham Market, to upstream of London Road Bridge, Ipswich	River Gipping
Babergh	051WAFEF1	The upper Stour and surrounding tributaries	River Stour, Stour Brook, Bumpstead Brook
Babergh	054WAFSF5	The River Box and Brett	River Box, River Brett
Babergh	054WAFSF4DE	The Rattlesden River and River Gipping, through and including Stowmarket and Needham Market	Rattlesden River, River Gipping
Babergh	051WAFEF3	The River Stour from Sudbury to Stratford St Mary and Dedham	River Stour

6.4 Local arrangements for managing flood risk

Advice for managing flood risk, including reporting flooding, can be found on the SCC and B&MS websites.

There is also information on flood risk emergency planning guidance for new developments.

6.5 Emergency planning and development

6.5.1 NPPF

The NPPF Flood Risk Vulnerability and Flood Zone 'Compatibility' table seeks to avoid inappropriate development in areas at risk from all sources of flooding. It is essential that any development which will be required to remain operational during a flood event is located in the lowest flood risk zones so that, in an emergency, operations are not impacted on by flood water or that such infrastructure is resistant to the effects of flooding such that it remains serviceable/operational during 'upper end' events, as defined in the EA's Climate Change allowances (February 2016). For example, the NPPF classifies police, ambulance and fire stations and command centres that are required to be operational during flooding as Highly Vulnerable development, which is not permitted in Flood Zones 3a and 3b and only permitted in Flood Zone 2 providing the Exception Test is passed. Essential infrastructure located in Flood Zone 3a or 3b must be operational during a flood event to assist in the emergency evacuation process. All flood sources such as fluvial, surface, groundwater, sewers and artificial sources (such as canals and reservoirs) should be considered. In particular sites should be considered in relation to the areas of drainage critical problems highlighted in the SWMP.

The outputs of this SFRA should be compared and reviewed against any emergency plans and continuity arrangements. This includes the nominated rest and reception centres (and perspective ones), so that evacuees are outside of the high-risk Flood Zones and will be safe during a flood event.

6.5.2 Safe access and egress

The NPPF Planning Practice Guidance outlines how developers can secure safe access and egress to and from development in order to demonstrate that development satisfies the second part of the Exception Test. Access considerations should include the voluntary and free movement of people during a 'design flood' as well as for the potential of evacuation before a more extreme flood. The access and egress must be functional for changing circumstances over the lifetime of the development. The NPPF Planning Practice Guidance sets out that:

- Access routes should allow occupants to safely access and exit their dwellings in design flood conditions. In addition, vehicular access for emergency services to safely reach development in design flood conditions is normally required; and
- Where possible, safe access routes should be located above design flood levels and avoid flow paths including those caused by exceedance and blockage. Where this is unavoidable, limited depths of flooding may be acceptable providing the proposed access is designed with appropriate signage etc. to make it safe. The acceptable flood depth for safe access will vary as this will be dependent on flood velocities and risk of debris in the flood water. Even low levels of flooding can pose a risk to people in situ (because of, for example, the presence of unseen hazards and contaminants in floodwater, or the risk that people remaining may require medical attention).

The depth, velocity and hazard mapping from hydraulic modelling should help inform the provision of safe access and egress routes.

As part of an FRA, the developer should review the acceptability of the proposed access in consultation with B&MS and the EA. Site and plot specific velocity and depth of flows should be assessed against standard hazard criteria to ensure safe access and egress can be achieved.

The EA and Association of Directors of Environment, Economy, Planning and Transport (ADEPT) have produced some joint guidance on Flood Risk Emergency Plans for New Development.

6.5.3 Potential evacuations

During flood incidents, evacuation may be considered necessary. The NPPF Planning Guidance states practicality of safe evacuation from an area will depend on[6].

1 the type of flood risk present, and the extent to which advance warning can be given in a flood event;

2 the number of people that would require evacuation from the area potentially at risk;

3 the adequacy of both evacuation routes and identified places that people could be evacuated to (and taking into account the length of time that the evacuation may need to last); and

4 sufficiently detailed and up to date evacuation plans being in place for the locality that address these and related issues.

The vulnerability of the occupants is also a key consideration. The NPPF and application of the Sequential Test aims to avoid inappropriate development in flood risk areas. However, developments may contain proposals for mixed use on the same site. In this instance, the NPPF Planning Practice Guidance states that layouts should be designed so that the most vulnerable uses are restricted to higher ground at lower risk of flooding, with development which has a lower vulnerability (parking, open space etc.) in the highest risk areas, unless there are overriding reasons to prefer a different location[7]. Where the overriding reasons cannot be avoided, safe and practical evacuation routes must be identified.

The EA and DEFRA provide standing advice for undertaking FRAs for planning applications. Please refer to the government website for the criteria on when to following the standing advice. Under these criteria, details must be provided of emergency escape plans for parts of the building that are below the estimated flood level. The plans should show:

- single storey buildings or ground floors that do not have access to higher floors can access a space above the estimated flood level, e.g. higher ground nearby;
- basement rooms have clear internal access to an upper level, e.g. a staircase; and
- occupants can leave the building if there is a flood and there is enough time for them to leave after flood warnings[8].

Situations may arise where occupants cannot be evacuated (e.g. prisons) or where it is safer to remain "in-situ" and / or move to a higher floor or safe refuge area (e.g. developments located immediately behind a defence and at risk of a breach). These allocations should be assessed against the outputs of the SFRA and where appropriate, a site-specific Flood Risk Assessment to help develop appropriate emergency plans.

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6 NPPF Planning Practice Guidance: Flood Risk and Coastal Change (paragraph 057, Reference ID: 7-057-20140306) March 2014
7 NPPF Planning Practice Guidance, Flood Risk and Coastal Change (Paragraph: 053 Reference ID: 7-053-20140306) March 2015
8 EA and DEFRA (2012) Flood Risk Assessment: Standing Advice

6.5.4 Flood warning and evacuation plans

Flood warning and evacuation plans are potentially mitigation measures to manage the residual risk, as stated in the NPPF Planning Practice Guidance.

A flood warning and evacuation plan should detail arrangements for site occupants on what to do before, during and after a flood as this will help to lessen its impact, improve flood response and speed up the recovery process. The EA provides practical advice and templates on how to prepare a flood plan for individuals, communities and businesses (see text box for useful links).

It is recommended that emergency planners at B&MS are consulted prior to the production of any emergency flood plan. The council will provide guidance to help local communities to protect their home and valuables and understand what to do before, during and after a flood.

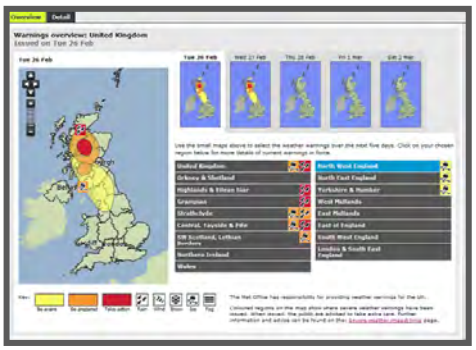
Once the emergency flood plan is prepared, it is recommended that it is distributed to emergency planners at B&MS and the emergency services. When developing a flood warning and evacuation plan, it is recommended that it links in with any existing parish / community level plan.

Guidance documents for preparation of flood response plans

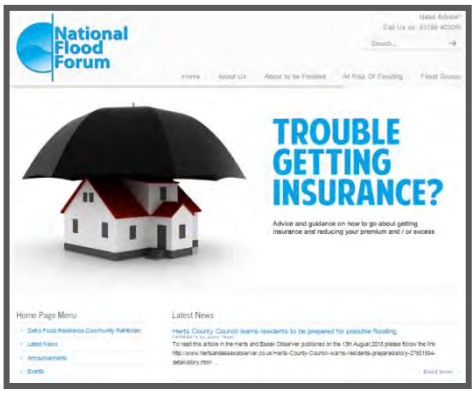
- EA (2012) Flooding – minimising the risk, flood plan guidance for communities and groups
- EA (2014) Community Flood Plan template
- EA Personal flood plans
- **Flood Plan UK 'Dry Run'** - A Community Flood Planning Guide

6.5.5 Other sources of information

As well as being a statutory consultee for new development at risk of flooding, the EA can offer independent technical advice. The EA website contains a breadth of information on flood risk and there are numerous publications and guidance available. For example, the **"flooding from groundwater"** guide has been produced by the EA and Local Government Association to offer practice advice to reduce the impact of flooding from groundwater.

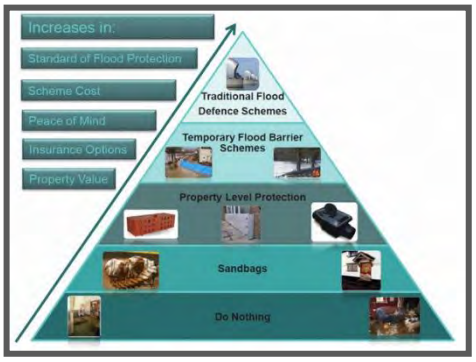


The Met Office provides a National Severe Weather Warning Service about rain, snow, wind, fog and ice. The severity of warning is dependent upon the combination of the likelihood of the event happening and the impact the conditions may have. In simplistic terms, the warnings mean: Yellow: Be Aware, Amber: Be Prepared, Red: Take Action. This service does not provide flood warnings. The Met Office provide many other services and products. For further information, please visit their website.



The National Flood Forum (NFF) is a national charity, set up in 2002 to support those at risk and affected by flooding. The NFF helps people to prepare and recover from flooding as well as campaigning on behalf of flood risk communities, including providing advice on matters such as insurance.

The 'Flood Re' reinsurance scheme, as agreed between the Government and insurance companies, was launched in April 2016. Flood Re is designed to provide homeowners at risk of flooding with access to affordable flood protection cover. Further information is available from http://www.floodre.co.uk. It should be noted that new developments do not qualify for Flood Re.



Individual property flood resilience (PFR) measures are designed to help protect homes and businesses from flooding. These include a combination of flood resistance measures - trying to prevent water ingress – and flood resilience measures - trying to limit the damage and reduce the impact of flooding, should water enter the building. It is important that any measures have the BSI Kitemark. This shows that the measure has been tested and ensures that it meets industry standards. Please visit the Government website: "Prepare for flooding" for more information.

7 Climate change

7.1 Climate change and the NPPF

The 2019 NPPF sets out how the planning system should help minimise vulnerability and provide resilience to the impacts of climate change. NPPF and NPPG describe how FRAs should demonstrate how flood risk will be managed over the lifetime of the development, taking climate change into account.

The updated 2019 NPPF also states that the 'sequential approach should be used in areas known to be at risk now or in the future from any form of flooding' (para 158).

7.2 Climate change guidance and allowances

The Environment Agency published updated climate change allowance on 19 February 2016 (further updated on 15 February 2019), providing information on how climate change should be accounted for when considering development, specifically how allowances for climate change should be included with FRAs. The 2016 climate change guidance includes climate change predictions of anticipated change for peak river flow, sea level rise and peak rainfall intensity. By making an allowance for these climate change predictions it will help reduce the vulnerability of the development and provide resilience to flooding in the future. These allowances are based on climate change projections and different scenarios of carbon dioxide emissions to the atmosphere.

However, at the time of preparing the 2020 SFRA the guidance is being revised in line with the UK Climate Projections 2018 (UKCP18). The UKCP18 projections replace the UK Climate Change Projections 2009 (UKCP09) projections and are the official source of information on how the climate of the UK may change over the rest of this century. The Environment Agency have confirmed that this may result in changes to the climate change allowances in the future. Please contact the Environment Agency for interim guidance if you are preparing a Flood Risk Assessment for a development.

For the purposes of the 2020 Level 1 SFRA the 2016 fluvial allowances have been considered for fluvial flooding. Any changes which impact on this SFRA will be added as an addendum after the release of the updated predictions. If a Level 2 SFRA is required, any changes to the climate change allowances will be considered at that stage.

7.3 Using climate change allowances

To help decide which allowances to use to inform the flood levels that the flood risk management strategy will be based on for a development or development plan allocation, the following should be considered:

- likely depth, speed and extent of flooding for each allowance of climate change over time considering the allowances for the relevant epoch (2020s, 2050s and 2080s)
- vulnerability of the proposed development types or land use allocations to flooding
- 'built in' resilience measures used, for example, raised floor levels
- capacity or space in the development to include additional resilience measures in the future, using a 'managed adaptive' approach

Flood Risk Assessments (FRAs) are required to demonstrate future implications of climate change have been considered, and risks managed where possible, for the lifetime of the proposed development.

The last consideration acknowledges that there may be instances where some flood risk management measures are not necessarily needed now but may be in the future.

The latest guidance on climate change allowances for FRA released by the EA[9] provides predictions of anticipated change. The elements to be considered in FRAs for developments in B&MS's authoritative area are:

- Peak rainfall intensity;
- Peak river flow
- Sea level rise

The EA provides peak rainfall intensity climate change allowances to be considered in FRAs. The guidelines which should be used in FRAs are outlined in the following sections.

7.4 Peak river flows

Climate change is expected to increase the frequency, extent and impact of flooding, reflected in peak river flows. Wetter winters and more intense rainfall may increase fluvial flooding and surface water runoff and there may be increased storm intensity in summer. Rising river levels may also increase flood risk.

The peak river flow allowances provided in the guidance show the anticipated changes to peak flow for the river basin district within which the subject watercourse is located. Once the river basin district has been identified, guidance on uplift in peak flows are provided for three allowance categories, Central, Higher Central and Upper End which are based on the 50th, 70th and 90th percentiles respectively. The allowance category to be used is based on the vulnerability classification of the development and the flood zones within which it is located.

These allowances (increases) are provided, in the form of figures for the total potential changed anticipated, for three climate change periods.

The time period used in the assessment depends upon the expected lifetime of the proposed development. Residential development should be considered for a minimum of 100 years, whilst the lifetime of a non-residential development depends upon the characteristics of that development. Further information on what is considered to be the lifetime of development is provided in the NPPG.

B&MS districts are located in the Anglian River Basin District. The peak river flow allowances should be chosen for the river basin district within which the subject watercourse is located. The allowances for the Anglian River Basin District are provided in Table 7-1.

Table 7-1: Peak river flow allowances for the Anglian River Basin District

Allowance category	Total potential change anticipated **for '2020s' (**2015 to 39)	Total potential change anticipated **for '2050s' (2040 to** 2069)	Total potential change anticipated **for '2080s' (2070 to** 2115)
Upper end	25%	35%	65%
Higher central	15%	20%	35%
Central	10%	15%	25%

7.4.1 High++ allowances

High++ allowances only apply in assessments for developments that are very sensitive to flood risk, for example large scale energy generating infrastructure, and that have lifetimes beyond the end of the century. H++ estimates represent the upper limit of plausible climate projections and would not normally be expected for schemes of plans to be designed to or

9 https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances

incorporate resilience for the H++ estimate. Further information is provided in the EA publication, Adapting to Climate Change: Advice for Flood and Coastal Erosion Risk Management Authorities.

7.4.2 Which peak river flow allowance to use?

The flood zone and flood risk vulnerability classification should be considered when deciding which allowances apply to the development or the plan. Vulnerability classifications are found in the NPPG. The guidance states the following:

Flood Zone 2

Vulnerability classification	Central	Higher Central	Upper end
Essential infrastructure		✓	✓
Highly vulnerable		✓	✓
More vulnerable	✓	✓	
Less vulnerable	✓		
Water compatible	None		

Flood Zone 3a

Vulnerability classification	Central	Higher Central	Upper end
Essential infrastructure			✓
Highly vulnerable	Development not permitted		
More vulnerable		✓	✓
Less vulnerable	✓	✓	
Water compatible	✓		

Flood Zone 3b

Vulnerability classification	Central	Higher Central	Upper end
Essential infrastructure			✓
Highly vulnerable	Development not permitted		
More vulnerable			
Less vulnerable			
Water compatible	✓		

7.5 Peak rainfall intensities

Climate change is predicted to result in wetter winters and increased summer storm intensity in the future. This increased rainfall intensity will affect land and urban drainage systems, resulting in surface water flooding, due to the increased volume of water entering the systems. The table below shows anticipated changes in extreme rainfall intensity in small and urban catchments. These allowances should be used for small catchments and urban drainage sites. For catchments, larger than 5km^2, the guidance suggests the peak river flow allowances should be used.

For flood risk assessments, both the central and upper end allowances should be assessed to understand the range of impact.

Table 7-2: Peak rainfall intensity allowance in small and urban catchments

Applies across all of England	Total potential change anticipated for 2010 to 2039	Total potential change anticipated for 2040 to 2059	Total potential change anticipated for 2060 to 2115
Upper end	10%	20%	40%
Central	5%	10%	20%

7.6 Groundwater

The effect of climate change on groundwater flooding problems, and those watercourses where groundwater has a large influence on winter flood flows, is more uncertain. Milder wetter winters may increase the frequency of groundwater flooding incidents in areas that are already susceptible, but warmer drier summers may counteract this effect by drawing down groundwater levels to a greater extent during the summer months.

In Mid Suffolk the areas at risk of groundwater flooding can be found in the north and south of the district, and in areas in the vicinity of some watercourses including the River Dove, River Waveney and River Gipping. The areas at risk of groundwater flooding are generally found where the underlying geology is composed of chalk.

In Babergh, the areas at risk of groundwater flooding also corresponds to the chalk geology, and location of watercourses, including the River Brett and River Stour. The low lying areas in the east of the district are also shown to have a risk of groundwater flooding.

7.7 Tidal flood risk

In December 2019 the EA updated the sea level rise allowances to reflect the latest climate change projections from UKCP18 which replaces the UKCP09. A range of sea level rise allowances is provided to allow assessment of a range of sea level rise scenarios. The updated sea level rise allowances are based on the 95th and 70th percentiles of RCP 8.5 (high emission scenario equivalent) from the UKCP18 sea level rise projections. For the Anglian river basin district, the sea level rise allowance for 2115 is 1.07-1.42m.

7.8 Adapting to climate change

NPPG Climate Change contains information and guidance for how to identify suitable mitigation and adaptation measures in the planning process to address the impacts of climate change. Examples of adapting to climate change include:

- Considering future climate risks when allocating development sites to ensure risks are understood over the development's lifetime
- Considering the impact of and promoting design responses to flood risk and coastal change for the lifetime of the development
- Considering availability of water and water infrastructure for the lifetime of the development and design responses to promote water efficiency and protect water quality
- Promoting adaptation approaches in design policies for developments and the public realm for example by building in flexibility to allow future adaptation if needed, such as setting new development back from watercourses
- Identifying no or low-cost responses to climate risks that also deliver other benefits, such as green infrastructure that improve adaptation, biodiversity and amenity, for example by leaving areas shown to be at risk of flooding as public open space.

7.9 Modelling outputs

Available hydraulic models and results have been provided by the EA. Details of which models have been run and with which climate change allowances are displayed in Appendix I. For the purposes of this SFRA, the EA models have been re-run with the latest climate change allowances, to consider climate change for future Flood Zone 3, where the latest allowances were not available within the existing model results files. If there were no potential development sites in a model domain, then the model has not been re-run as part of the SFRA. For the rest of the study area it has been assumed that present-day Flood Zone 2 represents future Flood Zone 3a extent, and that present-day Flood Zone 3a represents future Flood Zone 3b extent.

At the time of writing this Level 1 SFRA the EA were in the process of updating several models within the study area, including the River Waveney, River Gipping, River Blyth and River Brett. It is important that the EA are approached to determine whether updated (more accurate) information is available prior to commencing a site-specific FRA. Where a site requires an FRA, developers may be required undertake specific climate change modelling where this is not available.

Future Flood Zone 3a is displayed in Appendix J.

Future Flood Zone 3b (functional floodplain) is displayed in Appendix K.

For the fluvial models, the results show that the extent of Flood Zone 3a and Flood Zone 3b will increase as a result of climate change. This increases the flood risk to settlements across both districts.

The Orwell and Stour tidal model shows that the extent of tidal flooding will increase with climate change. In the 0.5% AEP event with climate change, the tidally influenced area is shown to extend further upstream on the River Stour to upstream of Stratford St. Mary and the tidally influenced area on the River Gipping extends upstream of Sproughton. Along the Belstead Brook, in Pinewood, the area influenced by tidal flooding also extends further upstream.

The effects of climate change are similar in the 5% AEP event, with the extent of tidal flooding increasing along the River Stour and River Orwell, and the tidally influenced areas moving further upstream.

Future Flood Zone 2 has not been considered as part of the Level 1 SFRA and should be considered as part of the Level 2 SFRA or by developers through more detailed modelling as part of a site-specific FRA.

8 Flood Defences

A high-level review of formal flood defences was carried out for this SFRA interrogating existing information that gives their condition and standard of protection. Details of the flood defence locations and condition were provided by the EA for preparing this assessment. The assessment has considered man-made defences and not natural defences which may arise for instance due to the presence of naturally high ground adjacent to a settlement.

The formal defences and their location are summarised in the following sections.

8.1 Defence standard of protection and residual risk

One of the main aims of the SFRA is to outline the present risk of flooding across B&MS including consideration of the effect of flood risk management measures (including flood banks and defences). The modelling that informs understanding of flood risk within the district is typically of a catchment-wide nature, suitable for preparing evidence on possible site options for development. In cases where a specific site risk assessment is required, more detailed studies should be performed to seek to refine the current understanding of flood risk from all sources.

Consideration of the residual risk behind flood defences has been undertaken as part of this study. The residual risk of flooding in a flood event or from failure of defences should also be carefully considered. Developers should also consider the standard of protection provided by defences and residual risk as part of a detailed Flood Risk Assessment (FRA).

8.2 EA defence condition

Formal structural defences are given a rating based on a grading system for their condition[10]. A summary of the grading system used by the EA for condition is provided in Table 8-1.

Table 8-1: Defence asset condition rating

Grade	Rating	Description
1	Very Good	Cosmetic defects that will have no effect on performance.
2	Good	Minor defects that will not reduce the overall performance of the asset.
3	Fair	Defects that could reduce the performance of the asset.
4	Poor	Defects that would significantly reduce the performance of the asset. Further investigation required.
5	Very Poor	Severe defects resulting in complete performance failure.

Source: Condition Assessment Manual – EA 2006

The condition of existing flood defences and whether they will continue to be maintained and/or improved in the future requires consideration as part of the risk based sequential approach and, considering this, whether possible site options for development are appropriate and sustainable. In addition, detailed FRAs will need to thoroughly explore the condition of defences, especially where these defences are informal and demonstrate a wide variation of condition grades. It is important that all these assets are maintained to a good condition and their function remains unimpaired.

10 Condition Assessment Manual, EA (2006)

A review of key defences across B&MS, their condition and standard of protection is included in the following sections. Formal flood defences within B&MS have been derived from the EA Spatial Flood Defences dataset. The type of flood defences in the district have been determined from the asset type field. This SFRA has not considered natural defences (i.e. naturally high ground).

8.3 Standard of protection

The standard of protection of flood defence structures should also be considered.

> Standard of protection
>
> Flood defences are designed to give a specific standard of protection, reducing the risk of flooding to people and property in flood prone areas. For example, a flood defence with a 1% AEP standard of protection means that the flood risk in the defended area is reduced to a 1% chance of flooding in any given year.
>
> Although flood defences are designed to a standard or protection it should be noted that, over time, the actual standard of protection provided by the defence may decrease, for example due to deterioration in condition or increases in flood risk due to climate change

For the purpose of this study, structures which are categorised to be natural banks have not been included within analysis.

The EA manage flood defences as group structures, rather than as individual assets. These are termed 'management units' and are managed through System Asset Management Plans (SAMPS).

8.4 Areas benefitting from defences

The EA has a dataset called "Areas Benefiting from Defences". This dataset for England shows those areas that benefit from the presence of defences in a 1 in 100 (1%) chance of flooding each year from rivers; or 1 in 200 (0.5%) chance of flooding each year from the sea. There are several areas in B&MS that are identified by the EA to benefit from flood defences. In Mid Suffolk, there are several areas along the River Gipping in Stowmarket and Gipping Market. In Babergh, there are areas along the Belstead Brook, River Gipping, River Orwell and River Stour.

8.5 Flood defence structures review

Data provided is based on the EA´s Spatial Flood Defence dataset. This is the most up to date information available at the time of writing.

When high ground is excluded, the flood defences in B&MS mainly consist of embankments and walls. These are mainly fluvial defences, although tidal defences are located along the River Stour and River Orwell estuary. Flood defences in key areas are summarised in Table 8-2 and shown in Figure 8-1, Figure 8-2, Figure 8-3, Figure 8-4 and Figure 8-5, along with the areas benefitting from defences. The standard of protection of these defences varies, as does their condition. Most defences are condition 2,3 and 4.

Figure 8-1 shows flood defences around Sudbury. This consists of a raised embankment along the Chad Brook in Long Melford with a design standard of 11. In Sudbury there is a small flood wall with a design standard of 5 years along the River Stour, and further downstream at Henney Street there is an earth embankment with a design standard of 20 years.

Figure 8-2 shows the flood defences along the River Stour. In Stratford St Mary, the defences consist of embankments and a wall, which in places have a design standard of over 100 years, so there are areas benefiting from defences. In Cattawade, there are fluvial and

tidal embankments and further areas benefitting from defences. There are further defences downstream in Lower Holbrook but this is not an area identified to benefit from flood defences.

Figure 8-3 shows tidal defences along the River Stour and River Orwell estuaries. These largely consist of embankments with a condition of 3 or 4. The standard of protection is not available but is generally not identified as an area benefiting from defences.

Figure 8-4 shows flood defences along the River Gipping/Orwell in the Ipswich area. The Ipswich Flood Defence management strategy, including the Ipswich Tidal Barrier which was opened in 2019, comprises of new and refurbished flood gates and walls along the River Orwell. Whilst the majority of the defence and areas benefitting from defence are within Ipswich Borough, and so outside the study area, it does extend into Babergh. South of Ipswich, on the River Orwell, there are tidal embankments and walls around Wherstead, with areas benefitting from defences shown here and along the Belstead Brook. There are also further defences on the River Gipping, just upstream of where it flows into Ipswich Borough, with areas benefitting from defences from high ground along the River Gipping.

Figure 8-5 shows flood defences along the River Gipping in Needham Market and Stowmarket. These consist of a combination of walls and embankments with varying standards of protection, although there are few areas benefiting from defences.

The Regional Flood and Coastal Committee advises on and gives consent to the Flood and Coastal Erosion Risk Management (FCERM) investment programme ensuring investment is coordinated and takes into account of local priorities and climate change impacts. The 2015-2021 FCERM programme contains details of 1,500 schemes aimed at better protecting the country from flooding. The Environment maintains a list of ongoing and planned schemes on its website[11]. For the study areas this shows the Stowmarket FSR improvements as a completed scheme.

Table 8-2: Summary of main flood defences in Environment Agency Spatial Flood Defences dataset

Watercourse	Location	Type	Design SoP	Condition rating
River Brett	Swingleton Green	Embankment	2	3
Chad Brook	Long Melford	Embankment	11	3
River Stour	Sudbury	Wall	5	3
River Stour	South of Great Cornard	Embankment/Wall	20	3
River Stour	Stratford St Mary	Embankment/Wall	Up to 400	3
River Stour	Cattawade	Embankment/Wall	Up to 200	3
River Stour	Stutton/Holbrook	Embankment/Wall/Cliff	Up to 75	3
River Stour	Shotley Gate	Embankment/Cliff	Unknown	3/4
River Orwell	Shotley	Embankment	Up to 20	3/4
River Orwell	Wherstead	Embankment/Wall	50	2-4
River Gipping	Sproughton	Embankment/Wall	Up to 100	3

11 https://www.gov.uk/government/publications/programme-of-flood-and-coastal-erosion-risk-management-schemes

Watercourse	Location	Type	Design SoP	Condition rating
River Gipping	Bramford	Wall	0	3
River Gipping	Bayham	Wall	0	3
River Gipping	Needham Market	Embankment/Wall	Up to 25	2/3
River Gipping	Stowmarket	Embankment/Wall	Up to 25	2/3
River Gipping	Wetherden	Wall	0	2
Rattlesden River	Finborough Road	Embankment	25	3
River Waverney	Brockdish	Wall	0	3

8.6 Flood risk assessment considerations

Flood Risk Assessments (FRAs) will need to thoroughly explore the condition of defences, especially where any defences are informal and demonstrate a wide variation of condition grades. It is important that all these assets are maintained to a good condition and their function remains unimpaired.

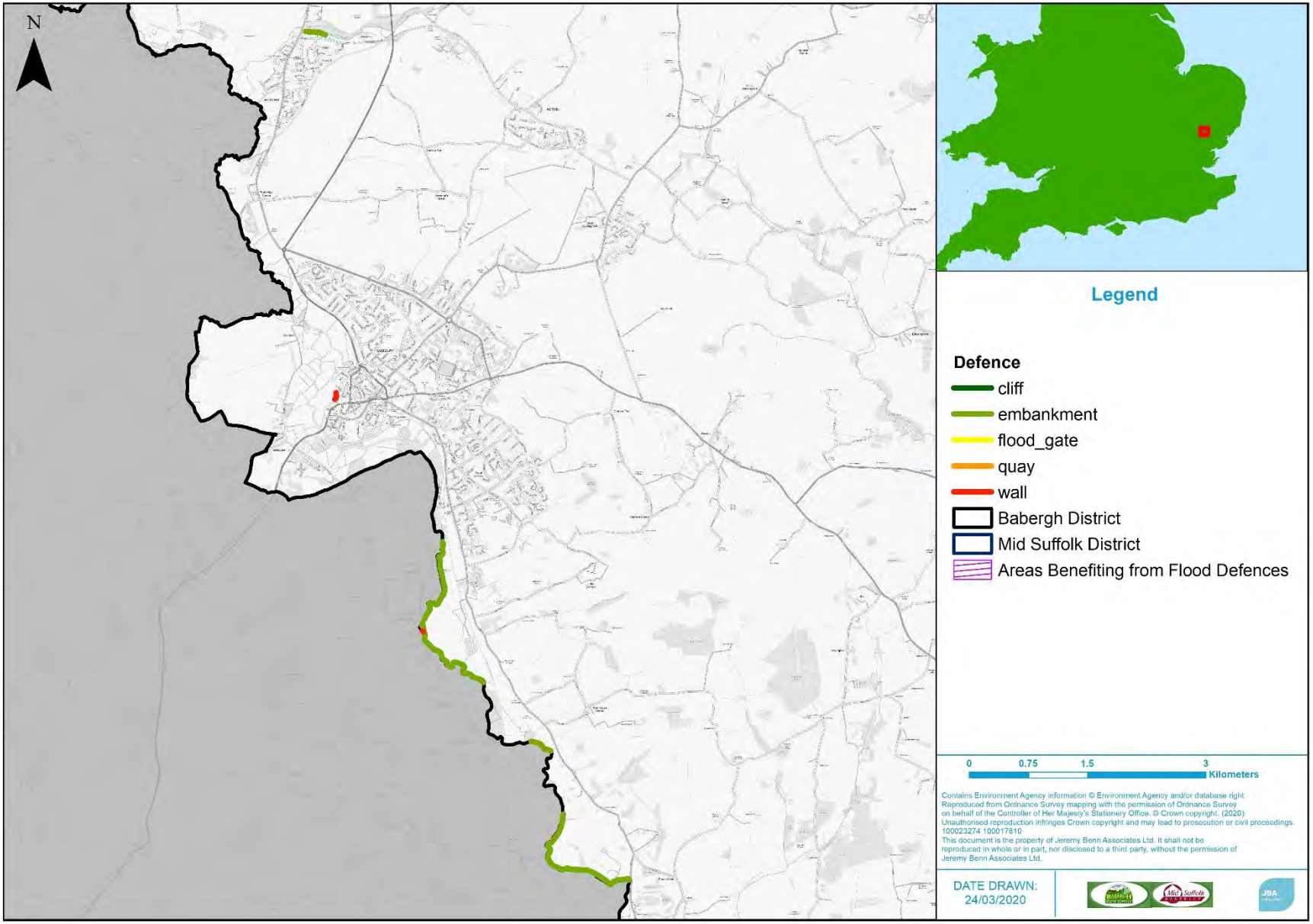


Figure 8-1: Flood defences around Sudbury

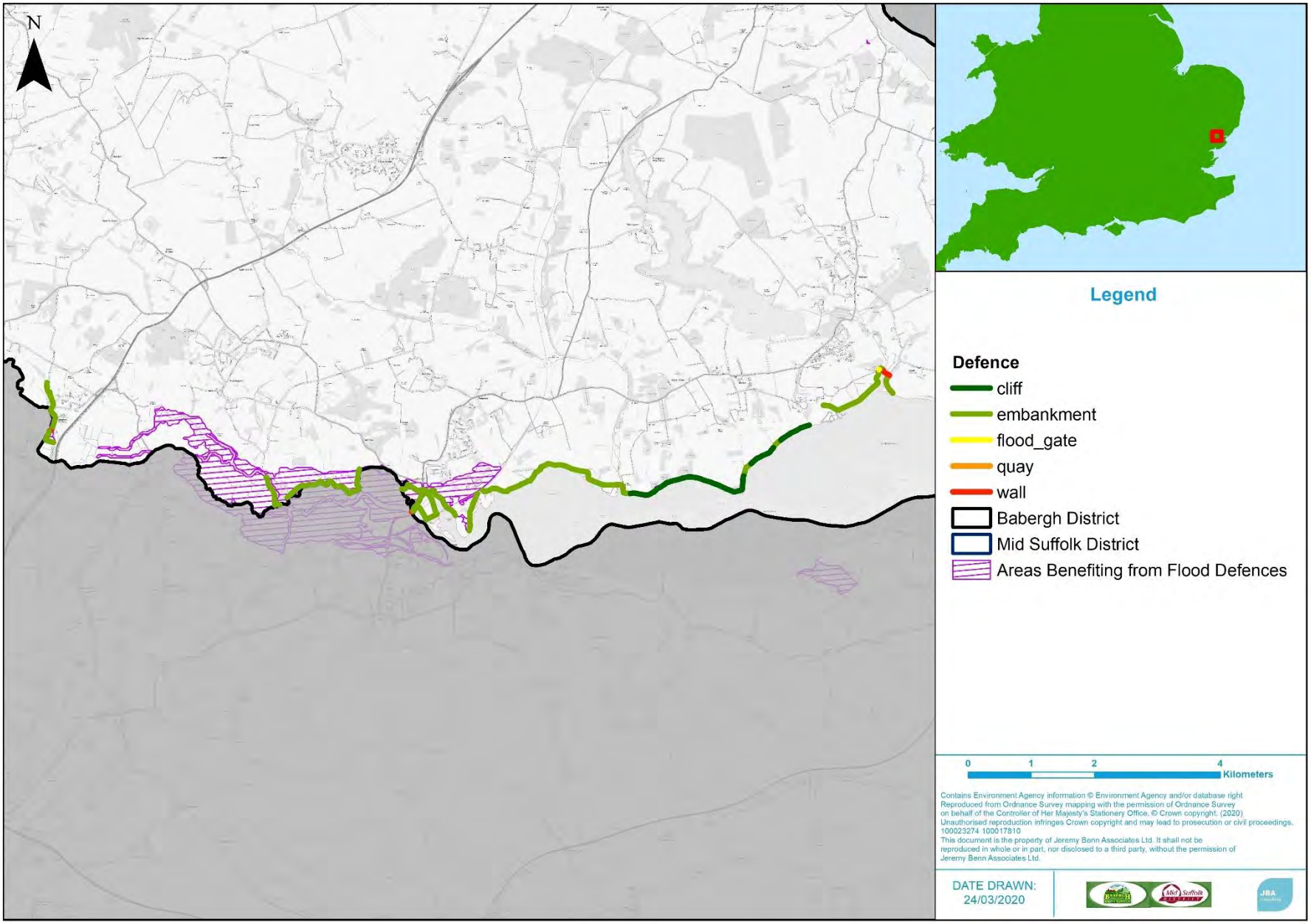


Figure 8-2: Flood defences along River Stour

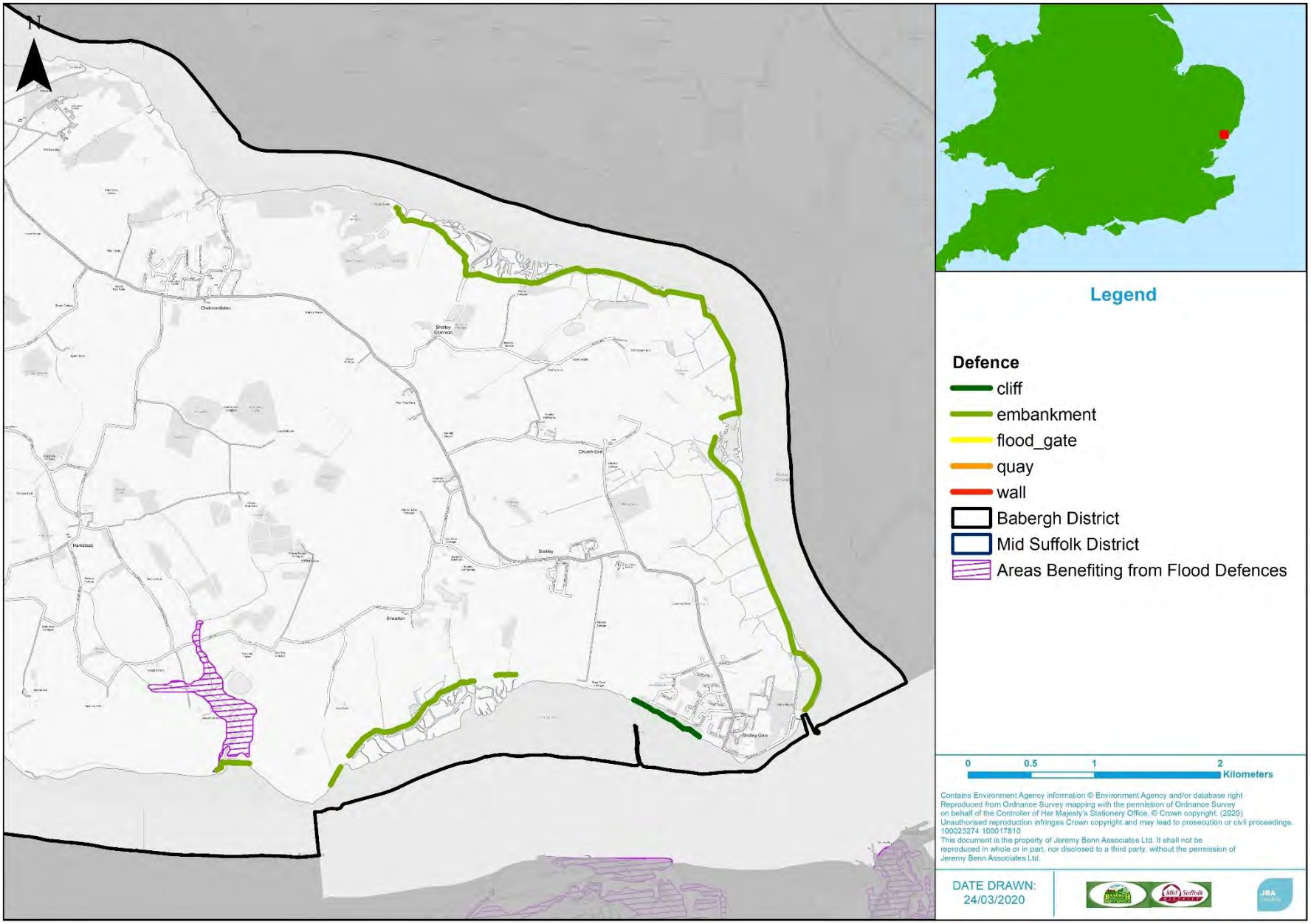


Figure 8-3: Flood defences along River Stour / River Orwell Estuaries

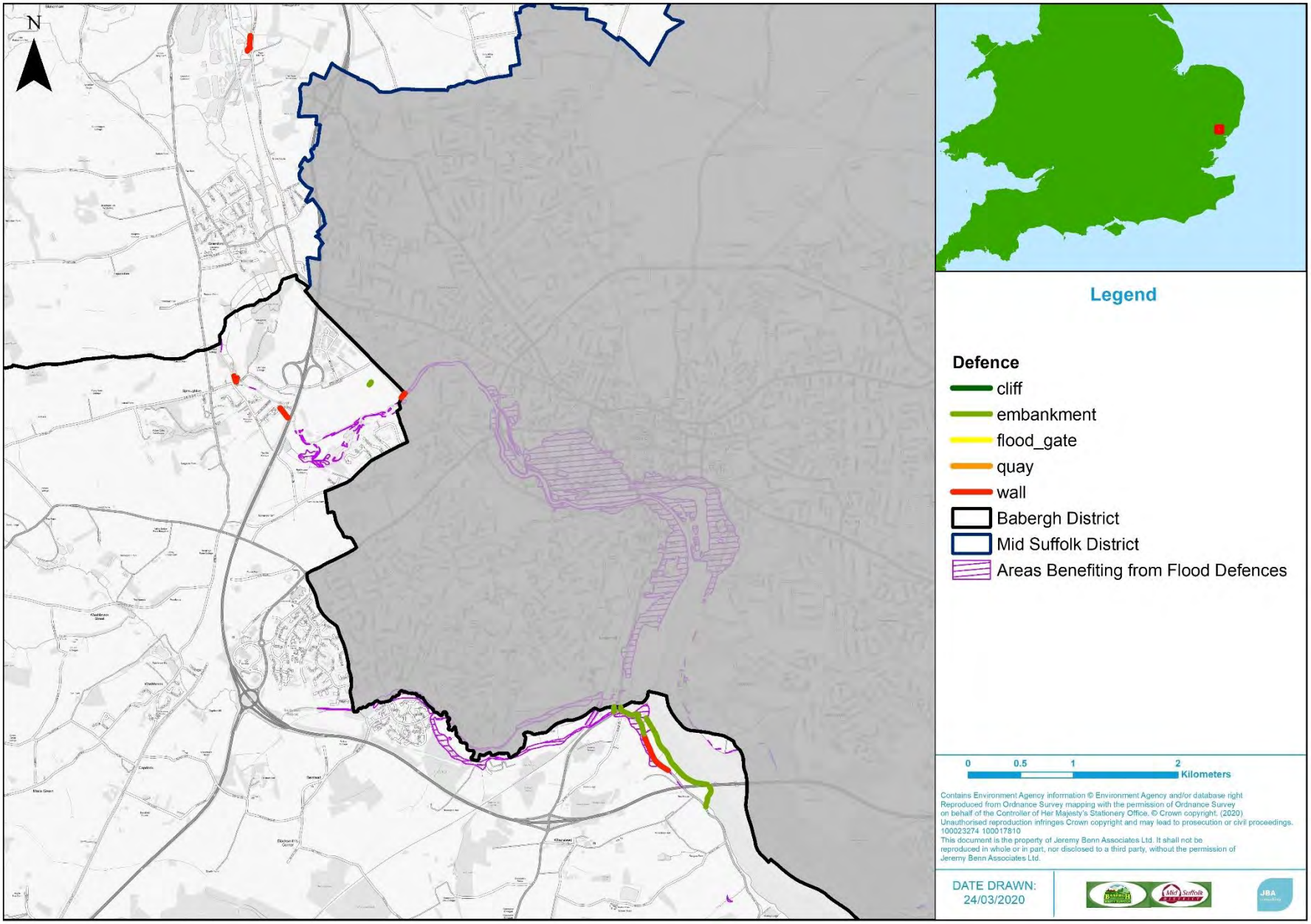


Figure 8-4: Flood defences along River Gipping and River Orwell in Ipswich area

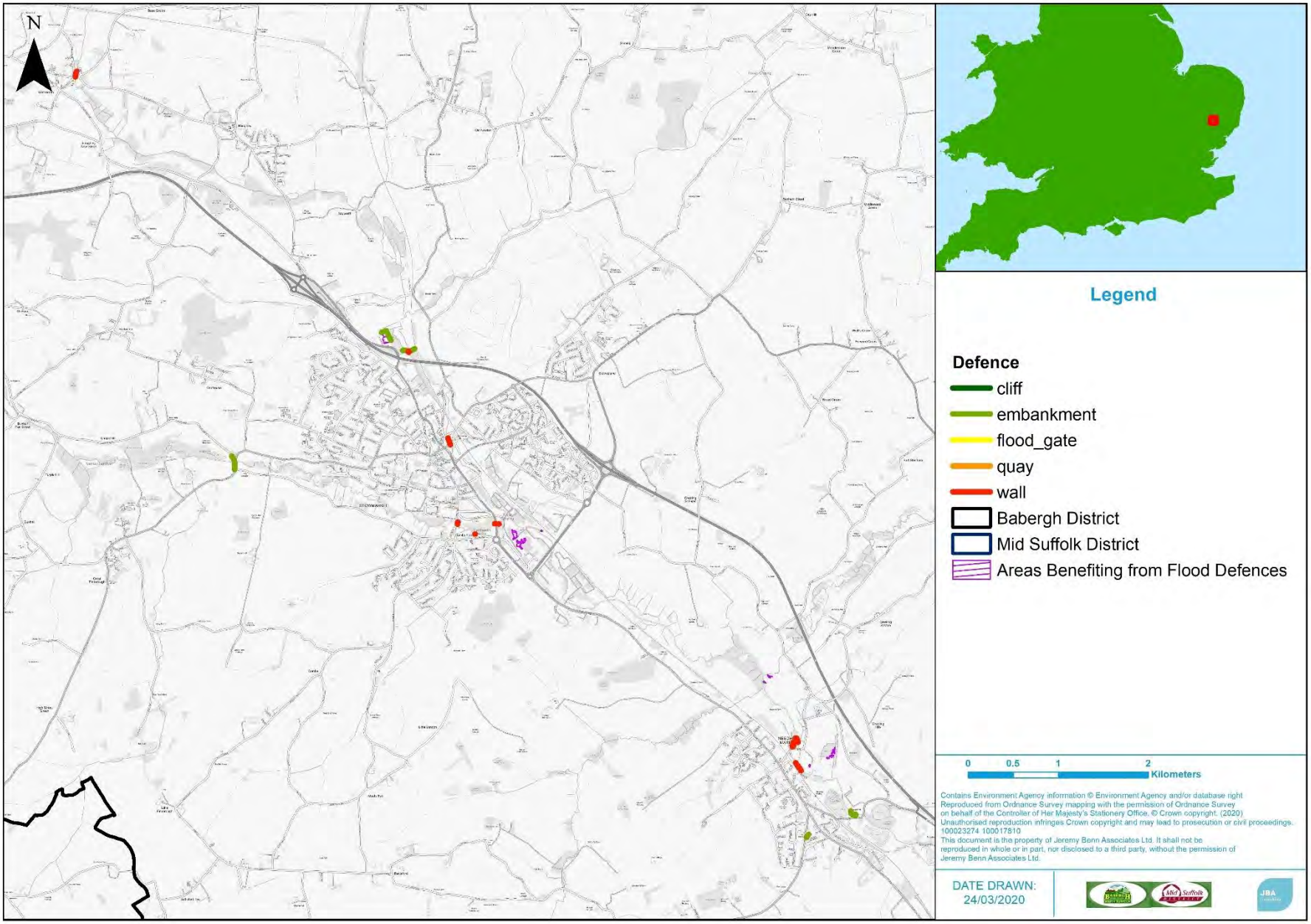


Figure 8-5: Flood defences in Stowmarket and Needham Market

9 Assessment of flood risk in potential development areas

9.1 Introduction

At the time of production of the Level 1 SFRA, BMSDC were undertaking a site screening and selection exercise to identify potential allocations for the Local Plan. GIS boundaries were provided for the sets of sites identified in Table 9-1, in order to enable a comprehensive site screening for flood risk. The sites provided represent the latest available information as of August 2020. B&MS have already narrowed down the SHELAA sites to 312 potential allocation sites. Only the potential allocation sites have been assessed as part of this study and not the sites which have already been designated as not suitable.

Table 9-1 Types of sites

Type of site	Number of sites screened
Strategic Housing and Employment Land Availability Assessment (SHELAA)	901
BMSDC Potential allocation sites 21-05-2020	312

9.2 Site flood risk summary

Flood risk from all sources was assessed for the 312 potential allocation sites. This information is provided in a ´summary sheet´ in Appendix L, and gives more detailed information regarding the risks posed to each development site.

The following information is provided for each potential development area:

- % of site within each Flood Zone (3b, 3a, 3a plus climate change and 2)
- % of site within Risk of Flooding from Surface Water (total % at surface water risk up to 30-year, 100-year and 1000-year).
- Historic flooding (based on the Environment Agency´s Historic Flood Map)
- % of site within JBA Groundwater flood map categories
- Presence of watercourse mapped in Detailed River Network layer (watercourses under 3km^2 may not have Flood Zones)

Appendix L shows that there are some potential allocations that are at risk from fluvial, tidal, surface water and groundwater sources. The sites were screened to identify those sites that had greater than 10% of the area at risk of fluvial flooding (including climate change), surface water flooding (1 in 100-year event) and groundwater flooding to consider which sites are at high risk of flooding and may need to go forward to a Level 2 SFRA. This identified that there are 41 sites with >10% of the area at risk of flooding from at least one of these sources. Table 13-1 identifies these sites and which source of flooding the site is at risk from. Of these 41 sites, the 8 sites which are currently identified as preferred allocations without base post planning permission (PBPP) are to be taken forward to a Level 2 SFRA.

9.3 Cumulative impact of development and cross boundary issues

9.3.1 Introduction

Under the revised 2019 NPPF, strategic policies and their supporting Strategic Flood Risk Assessments (SFRAs), are required to 'consider cumulative impacts in, or affecting, local areas susceptible to flooding' (para.156).

When allocating land for development, consideration should be given to the potential cumulative impact of the loss of floodplain storage volume. Whilst the loss of storage for individual developments may only have minimal impact on flood risk, the cumulative effect of multiple developments may be more severe.

Conditions imposed by B&MS should allow for mitigation measures so any increase in runoff as a result of development is properly managed and should not exacerbate flood risk issues, either within, or outside of the Council's administrative area.

The cumulative impact of development should be considered at the planning application and development design stages and the appropriate mitigation measures undertaken to ensure flood risk is not exacerbated, and where possible the development should be used to improve flood risk. Once preferred options are identified, their cumulative impact can be considered in more detail within a Level 2 SFRA, where necessary. In addition, site-specific FRAs must consider the cumulative impact of the proposed development on flood risk within the wider area.

In consultation with the Environment Agency, conditions set by the Council should support the implementation of SuDS and appropriate flood mitigation measures. As a minimum, development should have a neutral impact on flood risk, and where possible it should improve existing issues, to ensure that flood risk is not exacerbated either within, or outside of, the Council´s administrative area.

9.4 Cross boundary issues

Future large-scale development, both within and outside B&MS, can have potential to affect the flood risk to existing development and surrounding areas. B&MS have boundaries with the following local authorities:

- Braintree District
- Breckland District
- Colchester District
- Ipswich District
- South Norfolk District
- St. Edmundsbury District
- Suffolk Coastal District
- Tendring District
- Waveney District

The WFD catchments within B&MS are shown in Figure 9-1. Figure 9-2 shows the catchment with topography data to indicate the direction of catchment drainage in or out of B&MS for catchments that straddle neighbouring Local Authority boundaries.

The topography of B&MS means that a number of major watercourses, such as the River Stour and River Waveney, flow through the study area from neighbouring authorities. Major watercourses flow into B&MS from St. Edmunsbury, Braintree and Breckland Districts. There are also catchments draining out of B&MS into surrounding authorities – Ipswich District, Suffolk Coastal District, South Norfolk District and Waveney District. The River Stour flows along the boundary with Tendring District and Colchester District. This means that development in B&MS may have the potential to increase flood risk to neighbouring authorities.

It is recommended that B&MS consults neighbouring authorities to identify and review potential cross-boundary issues.

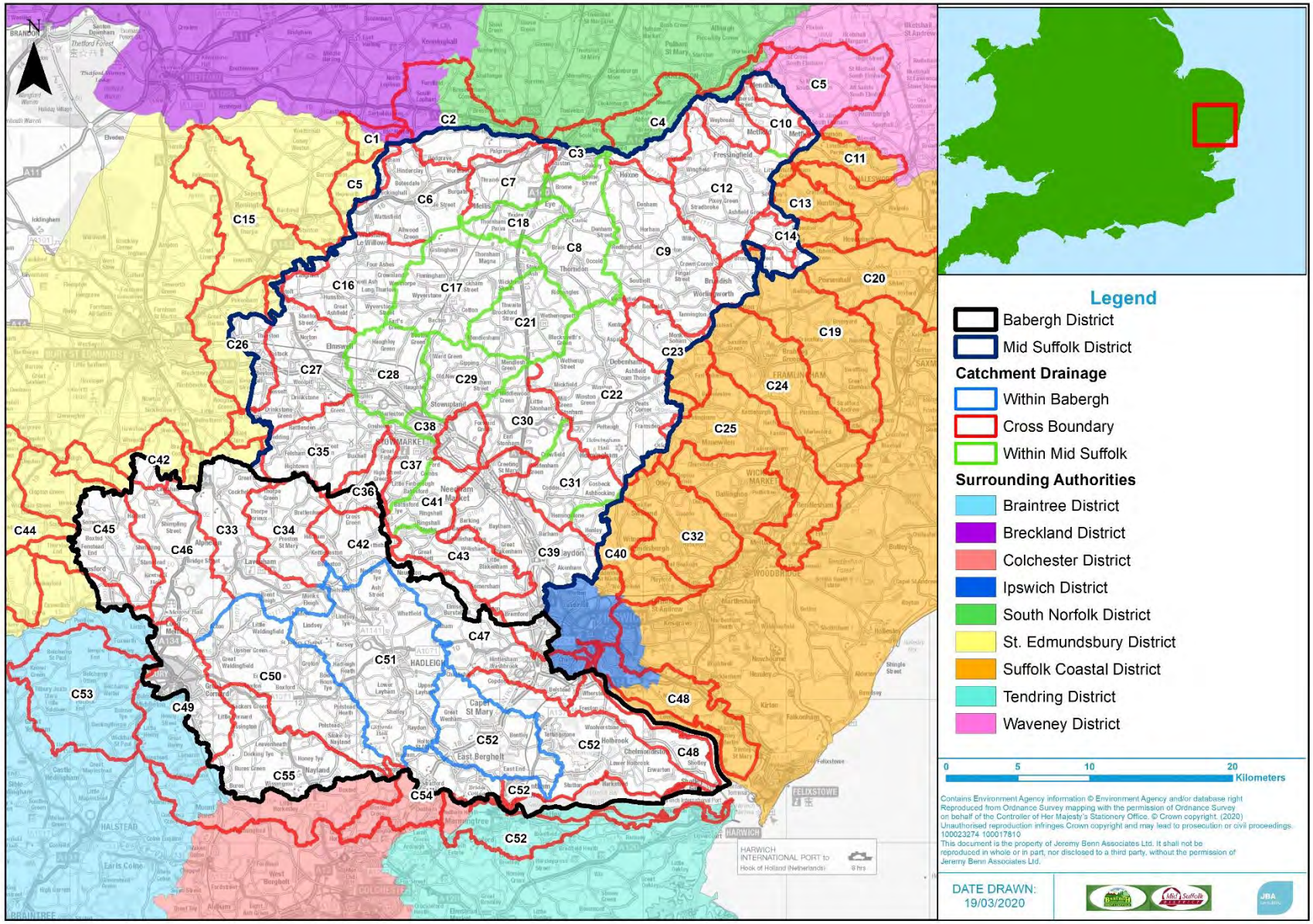


Figure 9-1: River catchments and cross boundary catchments

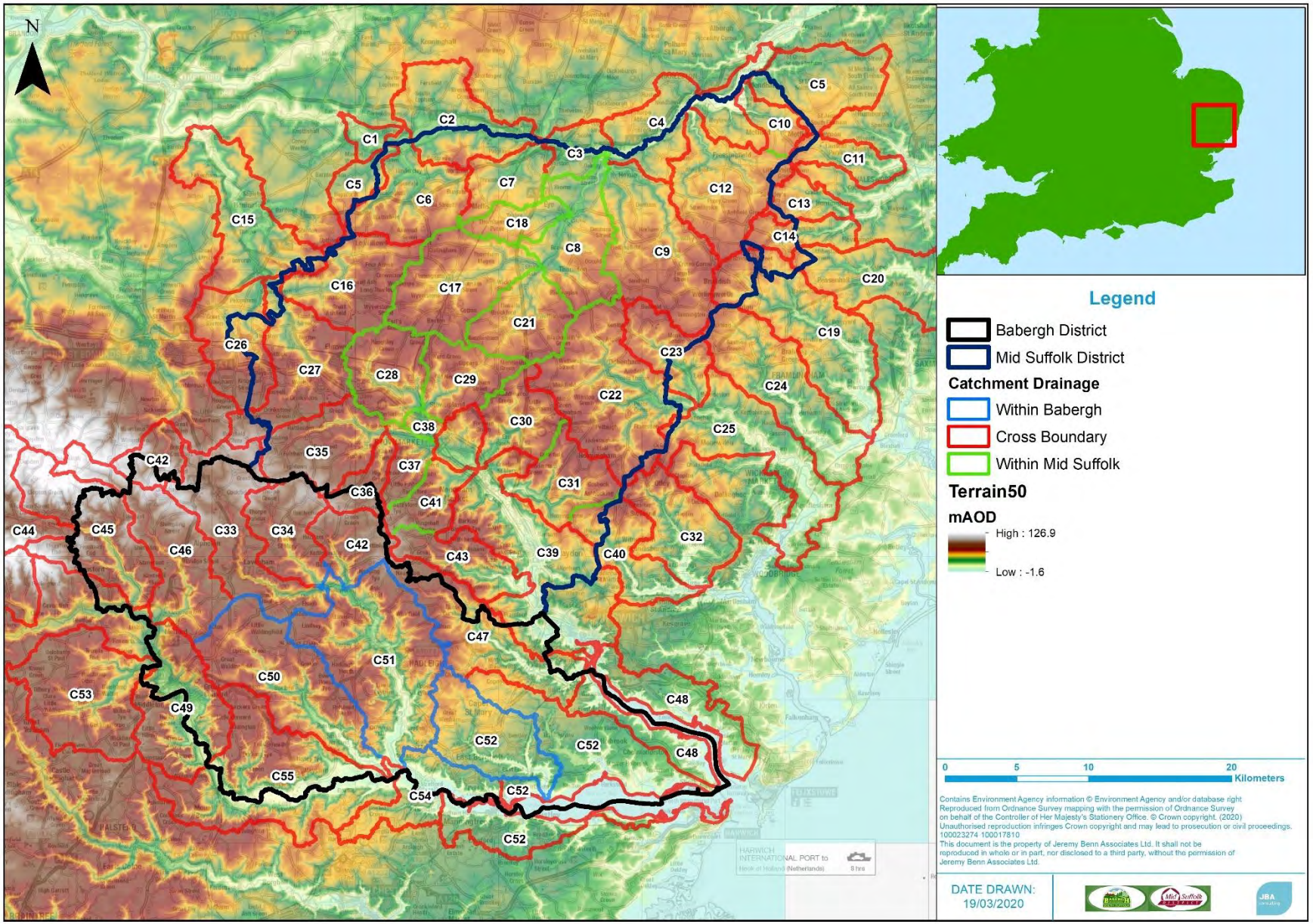


Figure 9-2: Cross boundary catchments and topography

9.4.1 Water quality considerations

In addition to cross-boundary issues regarding flood risk, there are also cross-boundary issues relating to water quality. Development or changes to land management practices in upper catchments of watercourses that flow across boundaries into B&MS can potentially impact on the quality of watercourses within the study area. Development should consider the quality of the water that is released from sites and the impact it may have on the water quality on any receiving waterbodies. Future development should ensure there is no adverse impact on the quality of watercourses within the Council administrative area. Any impacts identified should then be considered in relation to the Water Framework Directive (WFD) ecological, hydromorphological and chemical status of the waterbody and the status objectives. Opportunities to improve the status of watercourses should also be considered.

9.5 Cumulative impact assessment

9.5.1 Method of assessing cumulative impact

To assess the cumulative impact within B&MS, the surface water flood risk in each catchment and historical flood records were assessed along with the potential change in developed area of each river catchment to identify the catchments at greatest risk.

Table 9-2: Summary of datasets used within the Cumulative Impact Assessment

Dataset	Coverage	Source of data	Use of data
Catchment boundaries	B&MS study area	Water Framework Directive (WFD) catchments	Surface water and development flood risk
B&MS potential allocation sites	B&MS study area	B&MS Council	Determining % area of catchment where development has been proposed
Buildings	B&MS study area	OS Open Map Vector	Number of buildings in each catchment
RoFSW	B&MS study area	Environment Agency	Assessing number of properties at risk from surface water flooding in 100-year event and number of properties at risk of flooding as a result of increased runoff from upstream
Historical flood records	B&MS study area	B&MS Council	Determining which catchments have recorded flood events

9.5.2 Assessing existing surface water flood risk

To understand the surface water flood risk in each catchment, the RoFSW dataset was used. The number of buildings in each WFD catchment that intersected the 1 in 100-year RoFSW dataset was calculated to establish the number of properties in each river catchment at risk of surface water flooding. The assessment also compared the percentage increase in the number of properties at risk in a 1 in 100-year outline compared with the number of

properties at risk in a 1 in 1000-year outline. This was used as a simple way to identify vulnerability of properties to an increase in flows as a result of upstream development.

9.5.3 Assessing historic flood risk

The historic flood records provided by BMSDC were used to identify the number of historic flood records in each WFD catchment. Sewer flooding data was not included as the data was provided at 4 digit postcode scale so it was not always possible to identify this in each of the WFD catchments.

9.5.4 Assessing potential future development

BMSDC supplied a list of proposed sites, which identifies land that may be used for development. This data was used to determine the area of potential development within each river catchment, as a potential of the total area of the catchment. This metric was not used as part of the scoring, but is displayed for consideration.

9.5.5 Scoring

A relative risk score of 1 to 3 (low to high) was applied to each flood risk metric (Table 9-3) and summed to give an overall relative flood risk score for each WFD catchment (Table 9-4).

Table 9-3 Individual components of relative flood risk score

Score	Number properties within 1 in 100-year surface water flood extent	% increase in properties flooding in 1 in 100-year and 1 in 1000-year surface water flood extent	Number of historic flood records
1 – Low risk	<25	<150	<25
2 – Medium risk	25-100	150-200	25-75
3 – High risk	>100	>200	>75

Table 9-4 Translating total score to cumulative impact score

Total score	Cumulative impact score
3-4	Low
5-7	Medium
8-9	High

The relative flood risk in each catchment is shown in Table 9-5. The overall analysis provides a context for further appropriate consideration of catchment-scale flood risk issues.

The cumulative impact assessment has identified the highest risk catchments in Babergh as the River Stour, Lavneham Brook, River Brett, Belstead Brook, Stutton Brook and catchments in the vicinity of the River Orwell. In Mid Suffolk, Pakenham Stream, Sapiston, Haughley, River Gipping through Stowmarket, Rattlesden River, Belstead Brook, River Dove, River Waveney and Chickering Beck have been identified as the highest risk catchments.

In addition to the assessment at SFRA level, it is recommended that site-specific FRAs are required to include consideration of the cumulative effects of the proposed development. It should be demonstrated that flood risk downstream will not be made worse by the combination of effects from more than one development allocation.

Table 9-5 Cumulative Impact analysis for each WFD catchment

WFD Catchment	CIA Catchment	Number properties within 1 in 100-year surface water flood extent	% increase in properties flooding in 1 in 100-year and 1 in 1000-year surface water flood extent	Number of historic flood records	Proposed development sites as a % of catchment area	Total Score
Alde	C19	22	150	13	0.0	4
Belchamp Brook	C53	0	0	0	0.0	3
Belstead Brook	C47	147	214	139	1.2	9
Bildeston Brook	C42	99	126	32	0.2	5
Blyth (Huntingfield tributary)	C13	2	100	3	0.0	3
Blyth (Laxfield - Hevingham Hall)	C14	56	79	14	0.3	4
Box	C50	206	147	138	0.4	7
Brett	C51	413	171	187	1.6	8
Chad Brook	C46	130	184	58	0.6	7
Chediston Watercourse	C11	0	100	1	0.0	3
Chickering Beck	C9	191	187	81	0.1	8
Coddenham Watercourse	C31	61	192	62	0.0	6
Deben (Brandeston Bridge - Melton)	C25	0	300	2	0.0	5
Deben (u/s Brandeston Bridge)	C22	234	149	76	0.8	7
Dove	C8	116	220	126	2.2	9
Dove trib - Eye	C18	57	209	28	2.7	7
Dove trib - Finningham	C17	169	155	145	0.6	8
Earl Soham Watercourse	C23	52	169	28	0.0	6
Fynn	C40	9	278	25	0.0	7
Gipping (d/s Stowmarket)	C39	768	129	443	4.7	7

WFD Catchment	CIA Catchment	Number properties within 1 in 100-year surface water flood extent	% increase in properties flooding in 1 in 100-year and 1 in 1000-year surface water flood extent	Number of historic flood records	Proposed development sites as a % of catchment area	Total Score
Gipping (through Stowmarket)	C38	175	202	65	8.2	8
Gipping (u/s Stowmarket)	C29	50	272	49	0.7	7
Glem - Lower	C45	137	130	95	0.1	7
Glem - Upper	C44	0	0	0	0.0	3
Great Finborough Watercourse	C36	24	175	8	0.1	4
Haughley Watercourse	C28	88	218	90	2.1	8
Jordan (East Suffolk)	C30	71	131	48	0.9	5
Lark	C32	4	50	11	0.0	3
Lark (US Hawstead)	C42	7	243	23	0.1	5
Lavenham Brook	C33	126	193	103	0.2	8
Little Ouse (Thelnetham to Hopton Common)	C1	0	0	0	0.0	3
Little Ouse (US Thelnetham)	C6	147	181	73	1.2	7
Mendlesham Stream	C21	144	130	89	2.7	7
Metfield Stream	C10	35	189	26	0.2	6
Minsmere Old River	C20	1	1100	0	0.0	5
Not part of a river WB catchment	C48	51	229	113	0.4	8
Not part of a river WB catchment	C52	133	210	54	1.0	8
Old River Brett	C34	47	168	34	0.0	6
Ore	C24	4	100	1	0.0	3
Pakenham Stream	C26	160	165	123	1.2	8

WFD Catchment	CIA Catchment	Number properties within 1 in 100-year surface water flood extent	% increase in properties flooding in 1 in 100-year and 1 in 1000-year surface water flood extent	Number of historic flood records	Proposed development sites as a % of catchment area	Total Score
Rattlesden River (d/s Gt. Finborough)	C37	147	229	97	2.7	9
Rattlesden River (u/s confluence with Gt. Finborough)	C35	111	125	68	0.1	6
Sapiston	C27	202	155	127	2.9	8
Sapiston River	C15	0	100	1	0.0	3
Somersham Watercourse	C43	123	123	69	0.2	6
Stour (d/s R. Brett)	C54	48	348	80	0.3	8
Stour (Lamarsh - R. Brett)	C55	130	175	97	0.0	8
Stour (Wixoe - Lamarsh)	C49	529	184	243	1.5	8
Stowlangtoft Stream	C16	167	163	60	0.3	7
Stutton Brook	C52	106	184	97	1.2	8
The Beck	C5	12	125	8	0.0	3
Thelnetham Brook	C5	1	1100	6	0.0	5
Tributary of Upper Waveney	C7	42	186	30	1.6	6
Tributary of Waveney	C12	139	194	51	0.4	7
Wattisham Watercourse	C41	41	166	19	0.9	5
Waveney (Frenze Beck to Dove)	C3	6	283	21	0.0	5
Waveney (R Dove - Starston Brook)	C4	63	122	22	0.0	4
Waveney (u/s Frenze Beck)	C2	40	218	76	0.0	8

9.5.6 Planning policy considerations for catchments

In circumstances where there is a high chance of encountering cumulative effects from planned development, this should be specifically addressed within FRAs for proposed development.

9.5.7 Assessment assumptions and limitations

The study has been undertaken using the best available data. This study only took into account the buildings, proposed development sites, surface water flooding and historic located within B&MS and not those in other districts where there are cross boundary catchments. Development in neighbouring authorities can affect flood risk in B&MS, especially if the catchment is draining towards the study area. Development in B&MS has the potential to affect flood risk in neighbouring authorities, especially if there are existing flood risk issues.

For the cross catchments where only a small area of the WFD catchment lies in B&MS these are likely to come out as lower risk. This study has used surface water as a metric of flood risk as this is thought to provide a better representation of smaller tributaries (where catchment area <3km^2), which would not be represented in the fluvial flood zones. In areas where the WFD catchments are large, the catchments may want to be split into smaller sub catchments where more detail is required. This is something that could be considered as part of a Level 2 assessment.

Due to the nature of the assessment, catchments with a very small number of postcode points within the surface water extents, could see skewed results.

For historic flood risk, the dataset represents a location where it is known there has been at least one flood event (however the nature and scale of these flood events varies significantly). The severity of the historic flooding event has not been considered, just the number of recorded flood incidents.

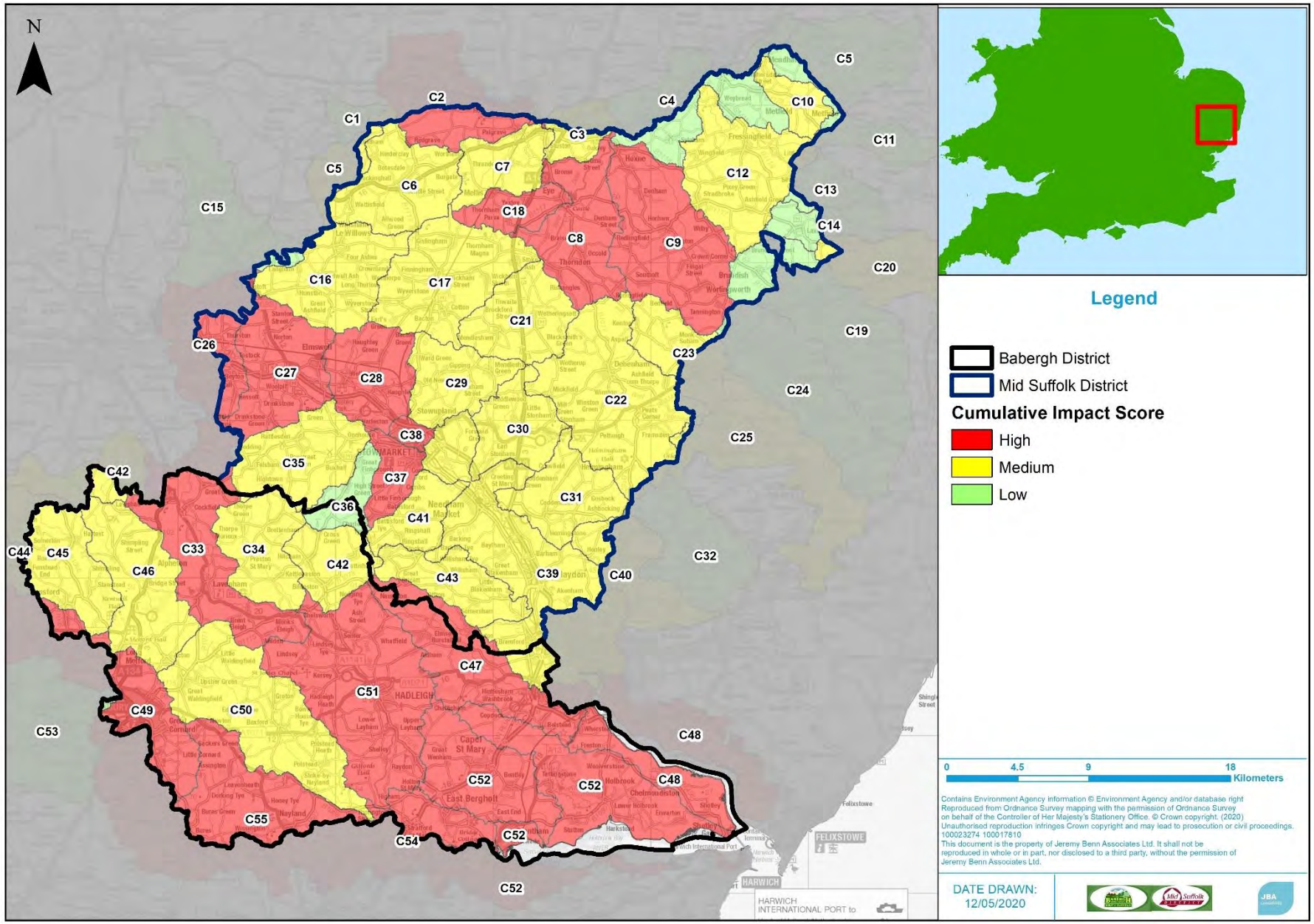


Figure 9-3 Relative Flood Risk score by WFD catchment

10 FRA requirements and flood risk management guidance

10.1 Using SFRA risk information

The SFRA contains information that can be used at strategic, operational and tactical levels as shown in Figure 10-1. The flood risk data contained within this SFRA should be updated following flood events.

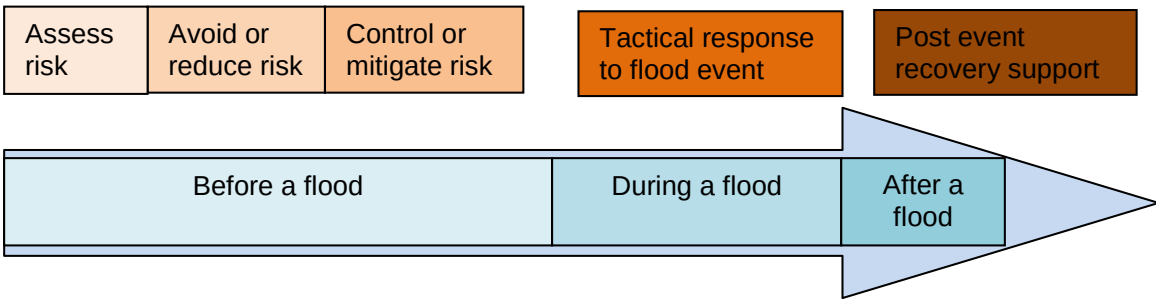


Figure 10-1: Use of SFRA information

10.2 Over-arching principles

This SFRA focuses on delivering a strategic assessment of flood risk within B&MS. Due to the strategic scope of the study, prior to any construction or development, site-specific assessments will need to be undertaken for individual development proposals (where required) so all forms of flood risk at a site are fully addressed. It is the responsibility of the developer to provide an FRA with an application.

It should be acknowledged that a detailed FRA may show that a site is not appropriate for development of a particular vulnerability or even at all. Where the FRA shows that a site is not appropriate for a particular usage, a lower vulnerability classification may be appropriate.

10.3 Requirements for site-specific flood risk assessments

10.3.1 What are site specific FRAs?

Site specific FRAs are carried out by (or on behalf of) developers to assess flood risk to and from a site. They are submitted with planning applications and should demonstrate how flood risk will be managed over the development's lifetime, taking into account climate change and vulnerability of users.

Paragraph 068 of the NPPG Flood Risk and Coastal Change Planning Practice Guidance sets out a checklist for developers to assist with site specific flood risk assessments.

Site specific FRAs are required in the following circumstances:

- Proposals for new development (including minor development and change of use) in Flood Zones 2 and 3
- Proposals for new development (including minor development and change of use) in an area within Flood Zone 1 which has critical drainage problems (as notified to the LPA by the EA)
- Proposals of 1 hectare or greater in Flood Zone 1
- Where proposed development or a change of use to a more vulnerable class may be subject to other sources of flooding
- Proposals of less than one hectare in Flood Zone 1 where they could be affected by sources of flooding other than rivers and the sea (e.g. surface water)

10.3.2 Objectives of site specific FRAs

Site specific FRAs should be proportionate to the degree of flood risk, as well as appropriate to the scale, nature and location of the development. Site specific FRAs should establish:

- whether a proposed development is likely to be affected by current or future flooding from any source;
- whether a proposed development will increase flood risk elsewhere;
- whether the measures proposed to deal with the effects and risks are appropriate;
- the evidence, if necessary, for the local planning authority to apply the Sequential Test; and
- whether, if applicable, the development will be safe and pass the Exception Test.

FRAs for sites located in B&MS should follow the approach recommended by the 2018 NPPF (and associated guidance) and guidance provided by the EA and B&MS. Guidance and advice for developers on the preparation of site specific FRAs include

- Site-specific Flood Risk Assessment: Checklist (NPPF PPG, Defra)
- Standing Advice on Flood Risk (EA)
- Flood Risk Assessment for Planning Applications (EA)
- Guidance on development and flood risk in B&MS

The UKCP18 was published on 26 November 2018. The UKCP18 projections replace the UKCP09 projections and is the official source of information on how the climate of the UK may change over the rest of this century. This is likely to result in the Environment Agency climate change allowances being updated in 2020. When undertaking an FRA, please refer to the most up to date climate change allowances provided by the Environment Agency.

Guidance for local planning authorities for reviewing flood risk assessments submitted as part of planning applications has been published by Defra in 2015 – Flood Risk Assessment: Local Planning Authorities.

10.4 Flood risk management guidance – mitigation measures

Mitigation measures should be seen as a last resort to address flood risk issues. Consideration should first be given to minimising risk by planning sequentially across a site. Once risk has been minimised as far as possible, only then should mitigation measures be considered.

10.4.1 Site layout and design

Flood risk should be considered at an early stage in deciding the layout and design of a site to provide an opportunity to reduce flood risk within the development.

The NPPF states that a sequential, risk-based approach should be applied to try to locate more vulnerable land use away from flood zones, to higher ground, while more flood-compatible development (e.g. vehicular parking, recreational space) can be located in higher risk areas. However, vehicular parking in floodplains should be based on the nature of parking, flood depths and hazard including evacuation procedures and flood warning.

Waterside areas, or areas along known flow routes, can act as Green Infrastructure, being used for recreation, amenity and environmental purposes, allowing the preservation of flow routes and flood storage, and at the same time providing valuable social and environmental benefits contributing to other sustainability objectives. Landscaping should ensure safe access to higher ground from these areas and avoid the creation of isolated islands as water levels rise.

10.4.2 Making space for water

The NPPF sets out a clear policy aim in Flood Zone 3 to create space for flooding by restoring functional floodplain.

All new development close to rivers should consider the opportunity presented to improve and enhance the river environment. Developments should look at opportunities for river restoration and enhancement as part of the development. Options include backwater creation, de-silting, in-channel habitat enhancement and removal of structures. When designed properly, such measures can have benefits such as reducing the costs of maintaining hard engineering structures, reducing flood risk, improving water quality and increasing biodiversity. Social benefits are also gained by increasing green space and access to the river.

The provision of a buffer strip can 'make space for water', allow additional capacity to accommodate climate change and ensure access to the watercourse and structures is maintained for future maintenance purposes.

It also enables the avoidance of disturbing riverbanks, adversely impacting ecology and having to construct engineered riverbank protection. Building adjacent to riverbanks can also cause problems to the structural integrity of the riverbanks and the building itself, making future maintenance of the river much more difficult.

B&MS can use Section 106 agreements of the Town and Country Planning Act 1990 to use planning to manage flood risk; in line with the 'Making Space for Water' concept, Section 106 agreements can be put in place to ensure new SuDS features will be maintained in the future.

Catchment and floodplain restoration

Floodplain restoration represents the most sustainable form of strategic flood risk solution, by allowing watercourses to return to a more naturalised state, and by creating space for naturally functioning floodplains working with natural processes.

Although the restoration of floodplain is difficult in previously developed areas where development cannot be rolled back, the following measures should be adopted:

- Buffer areas around watercourses provide an opportunity to restore parts of the floodplain
- Removal of redundant structures to reconnect the river and the floodplain. There are a number of culverted sections of watercourse located throughout the district which if returned to a more natural state would potentially reduce flood risk to the local area
- Apply the Sequential Approach to avoid new development within currently undefended floodplain.

For those sites considered within the Local Plan and / or put forward by developers, that also have watercourses flowing through or past them, the sequential approach should be used to locate development away from these watercourses. This will ensure the watercourses retain their connectivity to the floodplain. Loss of floodplain connectivity in rural upper reaches of tributaries which flow through urban areas in the Districts, could potentially increase flooding within the urban areas. This will also negate any need to build flood defences within the sites. It is acknowledged that sites located on the fringes of urban areas within the district are likely to have limited opportunity to restore floodplain in previously developed areas.

10.4.3 Raised floor levels

The raising of internal floor levels within a development avoids damage occurring to the interior, furnishings and electrics in times of flood.

If it has been agreed with the EA that, in a particular instance, the raising of floor levels is acceptable finished flood levels should be set a minimum of 600mm above the 1% AEP plus

climate change peak flood level. The additional height that the floor level is raised above the maximum water level is referred to as the "freeboard". Additional freeboard may be required because of risks relating to blockages to the channel, culvert or bridge and should be considered as part of an FRA.

Allocating the ground floor of a building for less vulnerable, non-residential, use is an effective way of raising living space above flood levels.

Single storey buildings such as ground floor flats or bungalows are especially vulnerable to rapid rise of water (such as that experienced during a breach). This risk can be reduced by use of multiple storey construction and raised areas that provide an escape route. However, access and egress would still be an issue, particularly when flood duration covers many days.

Similarly, the use of basements should be avoided. Habitable uses of basements within Flood Zone 3 should not be permitted, whilst basement dwellings in Flood Zone 2 will be required to pass the Exception Test. Access should be situated 600mm above the design flood level and waterproof construction techniques used.

10.4.4 Development and raised defences

Construction of localised raised floodwalls or embankments to protect new development is not a preferred option, as a residual risk of flooding will remain. Compensatory storage must be provided where raised defences remove storage from the floodplain. It would be preferable for schemes to involve an integrated flood risk management solution.

Temporary or demountable defences are not acceptable forms of flood protection for a new development but might be appropriate to address circumstances where the consequences of residual risk are severe. In addition to the technical measures the proposals must include details of how the temporary measures will be erected and decommissioned, responsibility for maintenance and the cost of replacement when they deteriorate.

10.4.5 Modification of ground levels

Modifying ground levels to raise the land above the required flood level is an effective way of reducing flood risk to a particular site in circumstances where the land does not act as conveyance for flood waters. However, care must be taken at locations where raising ground levels could adversely affect existing communities and property; in most areas of fluvial flood risk, raising land above the floodplain would reduce conveyance or flood storage in the floodplain and could adversely impact flood risk downstream or on neighbouring land.

Compensatory flood storage should be provided, and would normally be on a level for level, volume for volume basis on land that does not currently flood but is adjacent to the floodplain (in order for it to fill and drain). It should be in the vicinity of the site and within the red line of the planning application boundary.

Raising ground levels can also deflect flood flows, so analyses should be performed to demonstrate that there are no adverse effects on third party land or property.

Raising levels can also create areas where surface water might pond during significant rainfall events. Any proposals to raise ground levels should be tested to ensure that it would not cause increased ponding or build-up of surface runoff on third party land.

Any proposal for modification of ground levels will need to be assessed as part of a detailed flood risk assessment.

10.4.6 Developer contributions

In some cases, and following the application of the sequential test, it may be necessary for the developer to make a contribution to the improvement of flood defence provision that would benefit both proposed new development and the existing local community. Developer contributions can also be made to maintenance and provision of flood risk management

assets, flood warning and the reduction of surface water flooding (i.e. SuDS). The LFRMS Action Plan reinforces that developers may be required to make necessary contributions to the cost of SuDS and flood risk management activities.

DEFRA's Flood and Coastal Risk Management Grant in Aid (FCRMGiA)[12] can be obtained by operating authorities to contribute towards the cost of a range of activities including flood risk management schemes that help reduce the risk of flooding and coastal erosion. Some schemes are only partly funded by FCRMGiA and therefore any shortfall in funds will need to be found from elsewhere when using Resilience Partnership Funding, for example local levy funding, local businesses or other parties benefitting from the scheme.

For new development in locations without existing defences, or where the development is the only beneficiary, the full costs of appropriate risk management measures for the life of the assets proposed must be funded by the developer.

However, the provision of funding by a developer for the cost of the necessary standard of protection from flooding or coastal erosion does not mean the development is appropriate as other policy aims must also be met. Funding from developers should be explored prior to the granting of planning permission and in partnership with the Council and the EA.

The appropriate route for the consideration of strategic measures to address flood risk issues is the LFRMS. The LFRMS should describe the priorities with respect to local flood risk management, the measures to be taken, the timing and how they will be funded. It will be preferable to be able to demonstrate that strategic provisions are in accordance with the LFRMS, can be afforded and have an appropriate priority.

The EA is also committed to working in partnership with developers to reduce flood risk. Where assets are in need of improvement or a scheme can be implemented to reduce flood risk, the EA request that developers contact them to discuss potential solutions.

The Community Infrastructure Levy (CIL) allows local authorities to raise funds from developers undertaking new building projects in their administrative area. The CIL rate is set locally, within a Charging Schedule. The CIL can be used for a variety of local infrastructure needs arising from new development in the District including flood defences. Financial contributions are sought via a legal (s106) agreement where required in line with national guidance and Local Plan policies. Further information on CIL can be found on the Council's website.

10.5 Flood risk management guidance – resistance measures

Measures designed to keep flood water out of properties and businesses.

There may be instances where flood risk to a development remains despite implementation of such planning measures as those outlined above. For example, where the use is water compatible, where an existing building is being changed, where residual risk remains behind defences, or where floor levels have been raised but there is still a risk at the 1 in 1,000-year scenario. In these cases, (and for existing development in the floodplain), additional measures can be put in place to reduce damage in a flood and increase the speed of recovery. These measures should not normally be relied on for new development as an appropriate mitigation method. Most of the measures should be regarded as reducing the rate at which flood water can enter a property during an event and considered an improvement on what could be achieved with sand bags (these are not recommended for

12 Principles for implementing flood and coastal resilience funding partnerships (EA, 2012)

use as they potentially become contaminated with sewage and require specialist disposal). They are often deployed with small scale pumping equipment to control the flood water that does seep through these systems. The effectiveness of these forms of measures are often dependant on the availability of a reliable forecasting and warning system to user the measures are deployed in advance of an event. The following measures are often deployed:

10.5.1 Permanent barriers

Permanent barriers can include built up doorsteps, rendered brick walls and toughened glass barriers.

Figure 10-2: Permanent flood barriers

10.5.2 Temporary barriers

Temporary barriers consist of moveable flood defences which can be fitted into doorways and/or windows. The permanent fixings required to install these temporary defences should be discrete and keep architectural impact to a minimum. On a smaller scale temporary snap on covers for airbricks and air vents can also be fitted to prevent the entrance of flood water.

10.5.3 Community resistance measures

These include demountable defences that can be deployed by local communities to reduce the risk of water ingress to a number of properties. The methods require the deployment of inflatable (usually with water) or temporary quick assembly barriers in conjunction with pumps to collect water that seeps through the systems during a flood.

10.6 Flood risk management guidance – resilience measures

Wet-proofing

Interior design to reduce damage caused by flooding, for example:

- Electrical circuitry installed higher level with power cables being carried down from the ceiling not up from the floor level.
- Water-resistant materials for floors, walls and fixtures.

If redeveloping existing basements new electrical circuitry installed higher level with power cables being carried down from the ceiling not up from the floor level to minimise damage if the basement floods.

Non-return valves

Non-return valves prevent water entering the property from drains and sewers. Non-return valves can be installed within gravity sewers or drains, within the property's private sewer upstream of the public sewerage system. These need to be carefully installed and should be regularly maintained. The CIRIA publication, 'Low cost options for prevention of flooding from sewers', provides further information. Additionally, manhole covers within the property's grounds could be sealed to prevent surcharging.

Pumps

When redeveloping existing buildings it may be acceptable to install pumps in basements as a resilience measure against surface water or groundwater flooding. However, for new development this is unlikely to be considered an acceptable solution.

10.6.1 Further guidance

The EA recommend that consideration is given to the use of flood proofing measures to reduce the impact of flooding if / when it occurs. To minimise the disruption and cost implications of a flood event the EA encourage development to incorporate flood resilience/resistance measures up to the 1 in 1,000-year (extreme) event plus climate change flood level. Both flood resilience and resistance measures can be used for flood proofing. Further information can be found in the following publications: 'Improving the flood performance of new buildings' and 'Prepare your property for flooding'.

10.7 Reducing flood Risk from other sources

10.7.1 Groundwater

Groundwater flooding has a very different flood mechanism to any other and for this reason many conventional flood defence and mitigation methods are not suitable. The only way to fully reduce flood risk would be through building design (development form), ensuring floor levels are raised above the water levels caused by a 1 in 100-year plus climate change event. Site design would also need to preserve any flow routes followed by the groundwater overland to ensure flood risk is not increased downstream.

Infiltration SuDS can cause increased groundwater levels and subsequently may increase flood risk on or off the site. Developers should provide evidence and ensure that this will not be a significant risk.

When redeveloping existing buildings, it may be acceptable to install pumps in basements as a resilience measure. However, for new development this is not considered an acceptable solution.

10.7.2 Surface water and sewer flooding

Developers should discuss public sewerage capacity with the water utility company at the earliest possible stage. The development must improve the drainage infrastructure to reduce flood risk on site and the wider area. A drainage impact assessment identifies any drainage issues that may arise from a development and a means of storing and discharging surface water without increasing flood risk elsewhere. It is important that a drainage impact assessment shows that this will not increase flood risk elsewhere, and that the drainage requirements regarding runoff rates and SuDS for new development are met.

If residual surface water flood risk remains, the likely flow routes and depths across the site should be modelled. The site should be designed so that these flow routes are preserved and building design should provide resilience against this residual risk.

Development is not expected to address historic flooding issues within the public sewerage network, this is the responsibility of Anglian Water working with other risk management authorities.

When redeveloping existing buildings, the installation of some permanent or temporary flood-proofing and resilience measures could protect against both surface water and sewer flooding. Non-return valves prevent water entering the property from drains and sewers. Non-return valves can be installed within gravity sewers or drains within a property's private sewer upstream of the public sewerage system. These need to be carefully installed and must be regularly maintained. Consideration must also be given to attenuation and flow ensuring that flows during the 100-year plus climate change storm event are retained within the site if any flap valves shut. This must be demonstrated with suitable modelling techniques.

10.7.3 Sustainable drainage systems

Sustainable Drainage Systems (SuDS) aim to mimic the natural processes of greenfield surface water drainage by encouraging water to flow along natural flow routes and thereby reduce runoff rates and volumes during storm events while providing some water treatment benefits. SuDS also have the advantage of providing effective blue and green infrastructure and ecological and public amenity benefits when designed and maintained properly.

The inclusion of SuDS within developments should be seen as an opportunity to enhance ecological and amenity value, and promote green infrastructure, incorporating above ground facilities into the development landscape strategy. SuDs also have wider environmental and community benefits including water quality enhancement. SuDS must be considered at the outset, during preparation of the initial site conceptual layout to ensure that enough land is given to design spaces that will be an asset to the development rather than an after-thought. Advice on best practice is available from the LLFA, EA and the Construction Industry Research and Information Association (CIRIA).

The C753 CIRIA SuDS Manual (2015) (see Section 11.4.1) should be referred to for SuDS guidance.

On 25th October 2019, the Sewerage Sector Guidance (Sewers for Adoption 8th edition), which is referred to as the Design and Construction Guidance, was published and this was implemented on 1st April 2020. This is a guide to the standards that sewers must meet to be adoptable by water and sewerage companies in England and provides guidance on SuDS that can be adopted by Water and Sewerage Companies. This sets out the SUDS features which meet the legal definition of sewer and which are expected to be adopted when they meet the required standard. This will enable Anglian Water to adopt SuDS features as part of a surface water sewer network. SuDS schemes will be required to have full S104 technical approval and full planning approval before construction work begins.

10.8 Environmental Net Gain

Environmental net gain is an approach that aims to leave the natural environment in a better state than beforehand. Environmental net gain can be used for biodiversity and environmental improvements in high flood risk areas as part of a development.

11 Surface water management and SuDS

11.1 What is meant by surface water flooding?

Surface water flooding describes flooding from sewers, drains, and ditches that occurs during heavy rainfall.

Surface water flooding includes

- pluvial flooding: flooding as a result of high intensity rainfall when water is ponding or flowing over the ground surface (overland surface runoff) before it either enters the underground drainage network or watercourse or cannot enter it because the network is full to capacity;
- sewer flooding: flooding that occurs when the capacity of underground water conveyance systems is exceeded, resulting in flooding inside and outside of buildings. Normal discharge of sewers and drains through outfalls may be impeded by high water levels in receiving waters which may cause water to back up and flood around buildings or in built up areas. Sewer flooding can also arise from operational issues such as blockages or collapses of parts of the sewer network; and
- overland flows entering the built-up area from the rural/urban fringe: includes overland flows originating from groundwater springs.

11.2 Role of the LLFA and Local Planning Authority in surface water management

From April 2015 local planning policies and decisions on planning applications relating to major development or major commercial development should ensure that Sustainable Drainage Systems for management of run-off are put in place as the LLFA encourages a sustainable approach to surface water drainage. The approval of sustainable drainage solution lies with the Local Planning Authority. B&MS encourages all developers to consider drainage and flood risk at an early stage and suggests developers consider the Council's Pre Application Advice Service.

SCC is the Lead Local Flood Authority and is a Statutory Consultee for major planning applications and will scrutinise applications in terms of surface water flood risk and sustainable drainage.

Undertaking pre-application discussions with the LLFA is encouraged to ensure drainage requirements are considered at the early stages of a development.

Major developments are defined as

- residential development: 10 dwellings or more, or residential development with a site area of 0.5 hectares or more where the number of dwellings is not yet known; and
- non-residential development: provision of a building or buildings where the total floor space to be created is 1,000 square metres or more or, where the floor area is not yet known, a site area of one hectare or more.

The LLFA may also provide advice on minor development on a non-statutory basis.

When considering planning applications, local planning authorities should seek advice from the relevant flood risk management bodies, principally the LLFA on the management of surface water (including what sort of SuDS they would consider to be reasonably practicable), satisfy themselves that the proposed minimum standards of operation are appropriate and ensure, through the use of planning conditions or planning obligations, that there are clear arrangements for on-going maintenance over the development's lifetime.

Prior to submitting applications for development, B&MS encourages developers to consider the following guidance and legislation:

Surface water drainage guidance for development

- Non-statutory technical standards for sustainable drainage systems (Department for Environment, Food & Rural Affairs, 2015)
- Planning Practice Guidance (Department for Communities and Local Government)
- Guidance on the construction of SuDS (C768) (Ciria, 2017)
- Suffolk FRM Strategy (Appendix A and C) (SCC, 2018)

Surface water drainage policies and legislation for development

- National Planning Policy Framework (Paragraph 103)
- Sustainable drainage systems: Written statement (HCWS161)
- Building Regulations Part H – Drainage and Waste Disposal

Judgement on what SuDS system would be reasonably practicable should be through reference to Defra's 'Non-**statutory technical standards for SuDS' document** and should take into account design and construction costs.

It is essential that developers consider sustainable drainage at an early stage of the development process – ideally at the master-planning stage. This will assist with the delivery of well designed, appropriate and effective SuDS. The National design guidance sets out the characteristics of well-designed places and demonstrates what good design means in practice. Proposals should also comply with the key SuDS principles regarding solutions that deliver multiple long-term benefits. These four principles are shown in Figure 11-1.

Source: The SuDS Manual (C753)

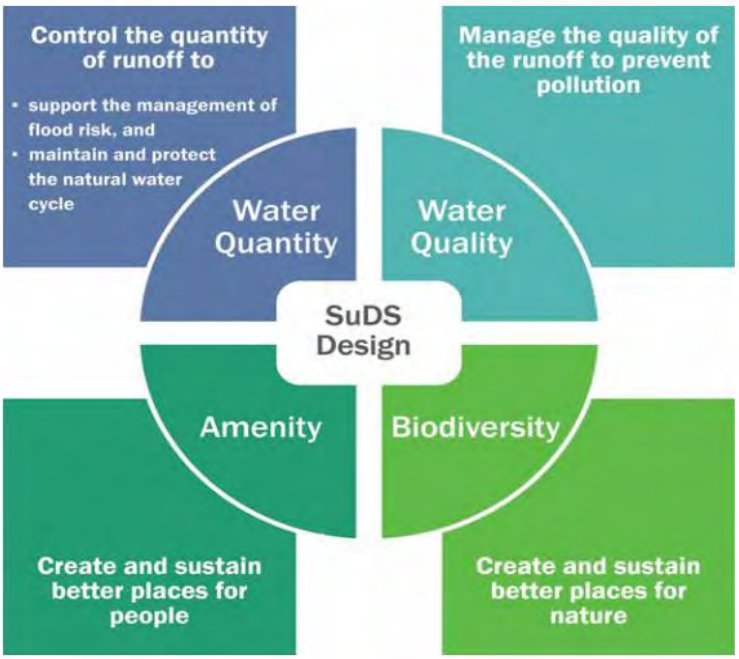


Figure 11-1: Four pillars of SuDS design

It is important that surface water drainage features and able to operate correctly under flood conditions, for example ensuring surface water drainage features are not located within Flood Zone 3.

11.3 Sustainable Drainage Systems (SuDS)

Sustainable drainage systems (SuDS) are drainage solutions that provide an alternative to the direct channelling of surface water through networks of pipes and sewers to nearby watercourses, by mimicking natural drainage regimes.

SuDS mimic nature and typically manage rainfall close to where it falls. SuDS can be designed to transport (convey) surface water, slow runoff down (attenuate) before it enters watercourses, provide areas to store water in natural contours and allow water to soak (infiltrate) into the ground or evaporate from surface water and/ or from vegetation (known as evapotranspiration).

The SuDS philosophy is to replicate, as closely as possible, the natural drainage from a site before development. SuDS is designed within the opportunities and constraints of a site to deliver the most benefits for water quantity, quality, amenity and biodiversity. These '4 pillars' of a sustainable drainage system should be given equal weight through the design process to achieve the maximum possible benefits.

Surface water is a valuable resource and this should be reflected in the way it is managed. It should be considered from the beginning of the development process and throughout, influencing the design and layout of public open space, transport networks, housing and streetscapes etc.

Sustainable drainage includes a variety of components, each having different approaches to managing flows, volumes, water quality and providing amenity and biodiversity benefits.

SuDS are not just traditional soakaways, ponds or wetlands, but are a suite of components working in different ways. The susdrain website provides an overview of the wide variety of SuDS components for review. When selecting SuDS components the site opportunities and constraints need to be fully considered, it is the schemes that provide a combination of approaches that provide the best results and this is what Anglian Water will be looking for in the adoption of SuDS Schemes. SuDS designed to maximise the opportunities and benefits that can be secured from surface water management practices.

SuDS provide a means of dealing with the quantity and quality of surface water whilst offering additional benefits over traditional systems of improving amenity and biodiversity. The correct use of SuDS can also allow developments to counteract the negative impact that urbanisation has on the water cycle by promoting infiltration and replenishing ground water supplies. SuDS if properly designed can improve the quality of life within a development offering addition benefits such as:

- Improving air quality
- Regulating building temperatures
- Reducing noise
- Providing education opportunities
- Cost benefits over underground piped systems

Given the flexible nature of SuDS they can be used in most situations within new developments as well as being retrofitted into existing developments. SuDS can also be designed to fit into the majority of spaces. For example, permeable paving could be used in parking spaces or rainwater gardens into traffic calming measures.

If is a requirement for all new major development proposals to ensure that Sustainable Drainage Systems for management of runoff are put in place. Likewise, minor developments should also ensure sustainable systems for runoff management are provided. The developer is responsible for ensuring the design, construction and future/ongoing maintenance of such a scheme is carefully and clearly defined, and a clear and comprehensive understanding of

the existing catchment hydrological processes and existing drainage arrangements is essential.

In current planning policy, all new development of more than one building and/or where the construction area is 100m² or more, requires sustainable drainage systems (SuDS) for surface water.

It should be demonstrated through a Surface Water Drainage Strategy, that the proposed drainage scheme, and site layout and design, will protect properties and critical infrastructure from surface water flooding in a 1 in 100-year event allowing for climate change, both on and off site. The scheme must comply with national sustainable drainage technical standards and Suffolk LLFA requirements, and will be expected to provide multiple benefits in terms of biodiversity, water quality and amenity.

11.3.1 Types of SuDS System

There are many different SuDS techniques that can be implemented in attempts to mimic pre-development drainage (Table 11-1). Techniques can include soakaways, infiltration trenches, permeable pavements, grassed swales, green roofs, ponds and wetlands and these do not necessarily need to take up a lot of space. The suitability of the techniques will be dictated in part by the development proposal and site conditions. Advice on best practice is available from the EA and the Construction Industry Research and Information Association (CIRIA) e.g. the CIRIA SuDS Manual C753 (2015).

Table 11-1: Examples of SuDS techniques and potential benefits

SuDS Technique	Flood Reduction	Water Quality Treatment & Enhancement	Landscape and Wildlife Benefit
Living roofs	✓	✓	✓
Basins and ponds Constructed wetlands Balancing ponds Detention basins Retention ponds	✓ ✓ ✓ ✓ ✓	✓ ✓ ✓ ✓ ✓	✓ ✓ ✓ ✓ ✓
Filter strips and swales	✓	✓	✓
Infiltration devices Soakaways Infiltration trenches and basins	✓ ✓ ✓	✓ ✓ ✓	✓ ✓ ✓
Permeable surfaces and filter drains Gravelled areas Solid paving blocks Porous pavements	✓ ✓ ✓ ✓	✓ ✓ ✓ ✓	
Tanked systems Over-sized pipes/tanks Storm cells	✓ ✓ ✓		

Whilst tanks and crates are considered a feature within the SuDS Manual, in isolation these below ground features do not provide any additional benefits as defined by the 4 pillars of SuDS. Equal weighting should be afforded to each of these pillars to be consider a good SuDS scheme. We would therefore only accept attenuation tanks where other features have been incorporated upstream to provide the improvements to water quality, biodiversity and amenity. A strong rationale for the discounting of above ground features would need to be provided to the LPA before we would accept tank storage.

11.3.2 Treatment

A key part of the four pillars of SuDS is to provide the maximum improvement to water quality through the use of the "SuDS management train". To maximise the treatment within SuDS, CIRIA recommends[13] the following good practice is implemented in the treatment process:

- Manage surface water runoff close to source: This makes treatment easier due to the slower velocities and also helps isolate incidents rather than transport pollutants over a large area.
- Treat surface water runoff on the surface: This allows treatment performance to be more easily inspected and managed. Sources of pollution and potential flood risk is also more easily identified. It also helps with future maintenance work and identifying damaged or failed components.
- Treat a range of contaminants: SuDS should be chosen and designed to deal with the likely contaminants from a development and be able to reduce them to acceptably low levels.
- Minimise the risk of sediment remobilisation: SuDS should be designed to prevent sediments being washed into receiving water bodies or systems during events greater than what the component may have been designed.
- Minimise the impact of spill: Designing SuDS to be able to trap spills close to the source or provide robust treatment along several components in series.

The number of treatment stages required depends primarily on the source of the runoff. A drainage strategy will need to demonstrate that an appropriate number of treatment stages are delivered.

11.3.3 SuDS Management

SuDS should not be used individually but as a series of features in an interconnected system designed to capture water at the source and convey it to a discharge location. Collectively this concept is described as a SuDS Management Train (Figure 11-2). The number of treatment stages required within the management train depends primarily on the source of the runoff and the sensitivity of the receiving waterbody or groundwater. A drainage strategy will need to demonstrate that an appropriate number of treatment stages are delivered.

13 C753 CIRIA SuDS Manual (2015)

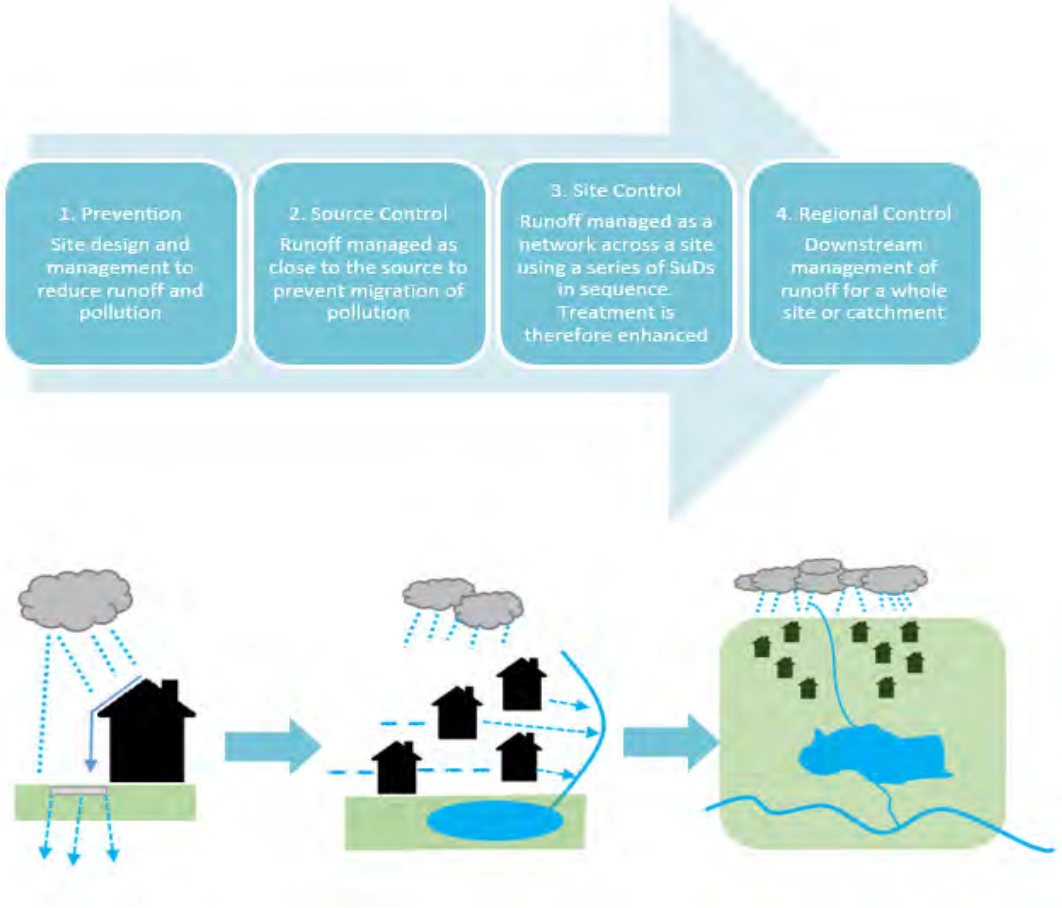


Figure 11-2: SuDS Management Train

SuDS components should be selected based on design criteria and how surface water management is to be integrated within the development and landscaping setting. By using a number of SuDS features in series it is possible to reduce the flow and volume of runoff as it passes through the system as well as minimising pollutants which may be generated by a development.

The surface water hierarchy should be applied for all developments:

1 Surface water runoff is collected for use;
2 Discharge into the ground via infiltration;
3 Discharge into a watercourse or other surface water body
4 Discharge to a surface water sewer, highway drain or other drainage system, discharging to a watercourse or other surface water body;
5 Discharge to a combined sewer (as shown on the public sewer map)

11.3.4 Overcoming SuDS constraints

The design of a SuDS system will be influenced by a number of physical and policy constraints. These should be taken into account and reflected upon during the conceptual, outline and detailed stages of SuDS design. Table 11-2 details some possible constraints and how they may be overcome.

Table 11-2: Example SuDS design constraints and possible solutions

Considerations	Solution
Land availability	SuDS can be designed to fit into small areas by utilising different systems. For example, features such as permeable paving and green roofs can be used in urban areas where space may be limited.
Contaminated soil or groundwater below site	SuDS can be placed and designed to overcome issues with contaminated groundwater or soil. Shallow surface SuDS can be used to minimise disturbance to the underlying soil. The use of infiltration should also be investigated as it may be possible in some locations within the site. If infiltration is not possible linings can be used with features to prevent infiltration.
High groundwater levels	Non-infiltrating features can be used. Features can be lined with an impermeable line or clay to prevent the egress of water into the feature. Additional, shallow features can be utilised which are above the groundwater table.
Steep slopes	Check dams can be used to slow flows. Additionally, features can form a terraced system with additional SuDS components such as ponds used to slow flows.
Shallow slopes	Use of shallow surface features to allow a sufficient gradient. If the gradient is still too shallow pumped systems can be considered as a last resort.
Ground instability	Geotechnical site investigation should be done to determine the extent of unstable soil and dictate whether infiltration would be suitable or not.
Sites with deep backfill	Infiltration should be avoided unless the soil can be demonstrated to be sufficiently compacted. Some features such as swales are more adaptable to potential surface settlement.
Open space in floodplain zones	Design decisions should be done to take into consideration the likely high groundwater table and possible high flows and water levels. Features should also seek to not reduce the capacity of the floodplain and take into consideration the influence that a watercourse may have on a system. Facts such as siltation after a flood event should also be taken into account during the design phase.
Future adoption and maintenance	Local Planning Authority should ensure development proposals, through the use of planning conditions or planning obligations, have clear arrangements for on-going maintenance over the development's lifetime.

For SuDS techniques that are designed to encourage infiltration, it is imperative that the water table is low enough and a site-specific infiltration test is conducted early on as part of the design of the development. Infiltration should be considered with caution within areas of possible subsidence or sinkholes. Where sites lie within or close to groundwater source protection zones (GSPZs) or aquifers, further restrictions may be applicable, and guidance should be sought from the LLFA and the EA.

11.4 Sources of SuDS guidance

SCC have a SuDS guide, policy and protocol available on their website. These are part of the Suffolk Flood Risk Management Strategy and forms the local SuDS guidance for B&MS. Appendix A and C specifically related to SuDS, but these should be read alongside the Strategy document.

Anglian Water´s policy for SuDS is available on their website.

11.4.1 C753 CIRCA SuDS Manual (2015)

The C753 CIRIA SuDS Manual (2015)[14] replaces and updates the previous version (C697) providing up to date guidance on planning, design, construction and maintenance of SuDS. The document is designed to help the implementation of these features into new and existing developments, whilst maximising the key benefits regarding flood risk and water quality. The manual is divided into five sections ranging from a high level overview of SuDS, progressing to more detailed guidance with progression through the document. It is recommended that developers and the LPA utilise the information within the manual to help design SuDS which are appropriate for a development.

The SuDS manual also provides information to support the implementation of water quality management.

11.4.2 Surface Water Advice Note – Using SuDS on New Developments (June 2015)

When considering SuDS as part of a major planning application, local planning authorities need to satisfy themselves that the minimum standard of operation is appropriate for SuDS and ensure through the use of planning conditions that clear arrangements are in place for their ongoing maintenance over the lifetime of the development.

The NPPF expects local planning authorities to give priority to the use of SuDS in determining planning applications. Where SuDS are used, it must be established that these options are feasible, can be adopted and properly maintained and would not lead to any other environmental problems. This is a material planning consideration for all major applications as of the 6 April 2015 and should therefore be given full consideration in an application.

11.4.3 Non-Statutory Technical Guidance, Defra (March 2015)

Non-Statutory Technical guidance has been developed by Defra to sit alongside PPG to provide non-statutory standards as to the expected design and performance for SuDS.

In March 2015, the latest guidance was released providing amendments as to what is expected by the LPA to meet the National standards. The guidance provides a valuable resource for developers and designers outlining peak flow control, volume control, structural integrity of the SuDS, and flood considerations both within and outside the development as well as maintenance and construction considerations. It considers the following: flood risk inside and outside the development, peak flow, volume control, structural integrity, designing for maintenance considerations and construction.

The LPA will make reference to these standards when determining whether proposed SuDS are considered reasonably practicable.

11.5 Other surface water considerations

11.5.1 Groundwater vulnerability zones

The EA published new groundwater vulnerability maps in 2015. These maps provide a separate assessment of the vulnerability of groundwater in overlying superficial rocks and those that comprise the underlying bedrock. The maps show the vulnerability of

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14 C753 CIRIA SuDS Manual (2015):

http://www.ciria.org/Memberships/The_SuDs_Manual_C753_Chapters.aspx

groundwater at a location based on the hydrological, hydrogeological and soil properties within a one-kilometre grid square.

Two maps are available:

- Basic groundwater vulnerability map: this shows the likelihood of a pollutant discharged at ground level (above the soil zone) reaching groundwater for superficial and bedrock aquifers and is expressed as high, medium and low vulnerability
- Combined groundwater vulnerability map: this map displays both the vulnerability and aquifer designation status (principal or secondary). The aquifer designation status is an indication of the importance of the aquifer for drinking water supply.

The groundwater vulnerability maps should be considered when designing SuDS. Depending on the height of the water table at the location of the proposed development site, restrictions may be placed on the types of SuDS appropriate to certain areas. Groundwater vulnerability maps can be found on the magic map webpage.

11.5.2 Groundwater source protection zones (GSPZ)

In addition to the BGS Groundwater data the EA also defines Groundwater Source Protection Zones in the vicinity of groundwater abstraction points. These areas are defined to protect areas of groundwater that are used for potable supply, including public/private potable supply, (including mineral and bottled water) or for use in the production of commercial food and drinks. The Groundwater SPZ requires attenuated storage of runoff to prevent infiltration and contamination. The definition of each zone is shown below:

- Zone 1 (Inner protection zone) – Most sensitive zone: defined as the 50-day travel time from any point below the water table to the source. This zone has a minimum radius of 50 metres
- Zone 1c (Inner zone – subsurface activity only) – Extends Zone 1 where the aquifer is confined and may be impacted by deep drilling activities
- Zone 2 (Outer protection zone) – Also sensitive to contamination: defined by a 400-day travel time from a point below the water table. This zone has a minimum radius around the source, depending on the size of the abstraction
- Zone 2c (Outer protection zone – subsurface activity only) – Extends Zone 2 where the aquifer is confined and may be impacted by deep drilling
- Zone 3 (Total catchment) - Defined as the area around a source within which all groundwater recharge is presumed to be discharged at the source. In confined aquifers, the source catchment may be displaced some distance from the source. For heavily exploited aquifers, the final Source Catchment Protection Zone can be defined as the whole aquifer recharge area where the ratio of groundwater abstraction to aquifer recharge (average recharge multiplied by outcrop area) is >0.75. Individual source protection areas will still be assigned to assist operators in catchment management
- Zone 3c (Total catchment – subsurface activity only) – Extends Zone 3 where the aquifer is confined and may be impacted by deep drilling activities
- Zone 4 (Zone of special interest) – A fourth zone SPZ4 or 'Zone of Special Interest' usually represents a surface water catchment which drains into the aquifer feeding the groundwater supply (i.e. catchment draining to a disappearing stream). In the future this zone will be incorporated into one of the other zones, SPZ 1, 2 or 3, whichever is appropriate in the case, or become a safeguard zone

A number of Groundwater SPZs have been identified through B&MS with the locations of Groundwater SPZs displayed in Figure 11-3. This shows that most of the study area is located in Zone 3.

Where sites lie within or close to Groundwater Source Protection Zones (SPZs) or are underlain by an aquifer, treatment steps may be required ahead of discharge to the ground, sewers etc. Development proposals at sites across the area should assess the pollution risk to receiving waterbodies and include appropriate treatment steps ahead of any discharge to surface water or groundwater. Chapter 8 of the CIRIA SuDS Manual C753 (2015) provides information and guidance on how to design SuDS in areas with particular constraints. Further restrictions may be applicable, and guidance should be sought from the LLFA. Where potentially polluting activities are proposed, the EA should also be consulted.

Where development is located in a SPZ, it is recommended that consultation with the relevant stakeholders (e.g. the EA for pollutant matters and the LLFA for SuDS) is undertaken as early as possible.

11.5.3 Nitrate Vulnerable Zones

Nitrate vulnerable zones (NVZs) are areas designated as being at risk from agricultural nitrate pollution. Nitrate levels in waterbodies are affected by surface water runoff from surrounding agricultural land entering receiving waterbodies. The level of nitrate contamination will potentially influence the choice of SuDS and should be assessed as part of the design process. The definition of each NVZ is as follows:

- Groundwater NVZ – water held underground in the soil or in pores and crevices in rock, which has, or could have if action is not taken, a nitrate concentration greater than 50mg/l.
- Surface Water NVZ – areas of land that drain into a freshwater water body which has, or could have is action is not taken, a nitrate concentration greater than 50mg/l.
- Eutrophic NVZ – bodies of water, mainly lakes and estuaries, that are, or may become, enriched by nitrogen compounds which cause a growth of algae and other plant life that unbalances the quality of the water and to organisms present in the water.

As with Groundwater SPZs, NVZs could affect the suitability of surface water drainage features and the level of treatment required. Most of B&MS is located in a Nitrate Vulnerable Zone. Some areas are also located in drinking water safeguard zones. More information on NVZs and where these are located can be found on the EA website.

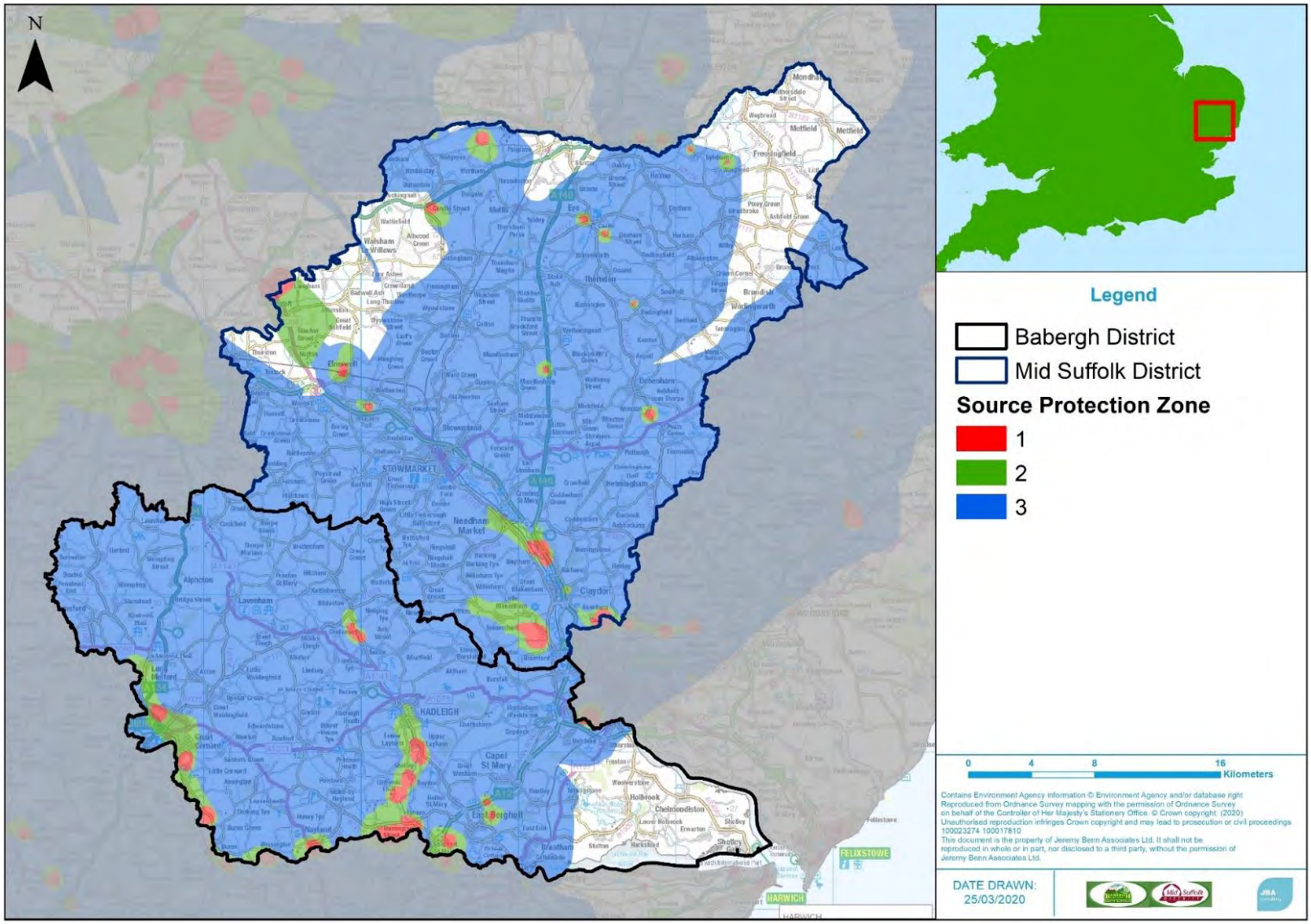

Figure 11-3: Source Protection Zones

12 Strategic flood risk solutions

12.1 Introduction

Strategic flood risk solutions may offer a potential opportunity to reduce flood risk in the district. The following sections outline different options which could be considered for strategic flood risk solutions. Any strategic solutions should ensure they are consistent with wider catchment policy and the local policies set out by B&MS.

12.2 Flood storage schemes

Flood storage schemes aim to reduce the flows passed downriver to mitigate downstream flooding. Development increases the impermeable area within a catchment, creating additional and faster runoff into watercourses. Flood storage schemes aim to detain this additional runoff, releasing it downstream at a slower rate, to avoid any increase in flood depths and/or frequency downstream. Methods to provide these schemes include[15]:

- enlarging the river channel;
- raising the riverbanks; and/or
- constructing flood banks set back from the river.

Flood storage schemes have the advantage that they generally benefit areas downstream, not just the local area.

12.2.1 Promotion of SuDS

Surface water flood risk is present in the area. By considering SuDS at an early stage in the development of a site, the risk from surface water can be mitigated to a certain extent within the site as well as reduce the risk that the site poses to third party land. Regionally SuDS should be promoted on all new developments to ensure the quantity and quality of surface water is dealt with sustainably to reduce flood risk. Given the various policies and guidance available on SuDS, developers should use this information to produce technically proficient and sustainable drainage solutions that conform with the non-statutory standards for SuDS (2015).

The design and implementation of SuDS schemes should, where appropriate take consideration of the potential cumulative effects of land allocated for development and application proposals. This will be particularly relevant if there are locations downstream of proposed development that are already at high risk of flooding, or where the risk could become higher under climate change conditions. In such circumstances the assessment should take account of the cumulative effects and if appropriate identify strategic provisions (or land required) to mitigate potential adverse effects.

12.3 Catchment and Floodplain restoration

Compared to flood defences and flood storage, floodplain restoration represents the most sustainable form of strategic flood risk solution, by allowing watercourses to return to a more naturalised state, and by creating space for naturally functioning floodplains working with natural processes.

Although the restoration of floodplain is difficult in previously developed areas where development cannot be rolled back, the following measures should be adopted:

15 http://evidence.environment-agency.gov.uk/FCERM/en/FluvialDesignGuide/Chapter10.aspx?pagenum=2

Buffer areas around watercourses provide an opportunity to restore parts of the floodplain.

Removal of redundant structures to reconnect the river and the floodplain.

Apply the Sequential Approach to avoid new development within the floodplain.

For those sites considered within the Local Plan and / or put forward by developers, that also have watercourses flowing through or past them, the sequential approach should be used to locate development away from these watercourses. This will ensure the watercourses retain their connectivity to the floodplain. Loss of floodplain connectivity could potentially increase flooding.

12.3.1 Upstream natural catchment management

Opportunities to work with natural processes to reduce flood and erosion risk as well as benefit the natural environment and reduce costs of schemes should be sought, through integrated catchment management. It also requires partnership working with neighbouring authorities, organisations and water management bodies. The EA has developed natural flood management mapping which displays opportunities for NFM.

Consideration of 're-wilding' rivers upstream could provide cost efficiencies as well as considering multiple sources of flood risk; for example, reducing peak flows upstream such as through felling trees into streams or building earth banks to capture runoff, could be cheaper and smaller-scale measures than implementing flood walls for example. With flood prevention schemes, consideration needs to be given to the impact that flood prevention has on the WFD status of watercourses. It is important that any potential schemes do not have a negative impact on the ecological and chemical status of waterbodies.

12.3.2 Structure Removal and/ or modification (e.g. Weirs)

Structures, both within watercourses and adjacent to them can have significant impacts upon rivers including alterations to the geomorphology and hydraulics of the channel through water impoundment and altering sediment transfer regime, which over time can significantly impact the channel profile including bed and bank levels, alterations to flow regime and interruption of biological connectivity, including the passage of fish and invertebrates.

Many artificial in-channel structures (examples include weirs and culverts) are often redundant and / or serve little purpose and opportunities exist to remove them where feasible. The need to do this is heightened by climate change, for which restoring natural river processes, habitats and connectivity are vital adaptation measures. However, it also must be recognised that some artificial structures may have important functions or historical/cultural associations, which need to be considered carefully when planning and designing restoration work.

In the case of weirs, whilst weir removal should be investigated in the first instance, in some cases it may be necessary to modify a weir rather than remove it. For example, by lowering the weir crest level or adding a fish pass. This will allow more natural water level variations upstream of the weir and remove a barrier to fish migration.

12.3.3 Bank stabilisation

Bank erosion should be avoided, and landowners encouraged to avoid using machinery and vehicles close to or within the watercourse.

There are several techniques that can be employed to restrict the erosion of the banks of a watercourse. In an area where bankside erosion is particularly bad and/or vegetation is unable to properly establish, ecologically sensitive bank stabilisation techniques, such as willow spilling, can be particularly effective. Live willow stakes thrive in the moist environment and protect the soils from further erosion allowing other vegetation to establish and protect the soils.

12.3.4 Re-naturalisation

There is potential to re-naturalise a watercourse by re-profiling the channel, removing hard defences, re-connecting the channel with its floodplain and introducing a more natural morphology (particularly in instances where a watercourse has historically been modified through hard bed modification). Detailed assessments and planning would need to be undertaken to gain a greater understanding of the response to any proposed channel modification.

12.4 Flood defences

Flood mitigation measures should only be considered if, after application of the Sequential Approach, development sites cannot be located away from higher risk areas. If defences are constructed to protect a development site, it will need be demonstrated that the defences will not have a resulting negative impact on flood risk elsewhere, and that there is no net loss in floodplain storage.

13 Summary

13.1 Overview

This Level 1 SFRA delivers a strategic assessment of all sources of flooding in B&MS. An overview of policy and guidance is provided for planners and developers. The study area comprises of the administration area of B&MS.

Parts of B&MS are at risk from the following sources: fluvial, surface water, tidal, groundwater, sewers and reservoir inundation. The study has shown that the most significant sources of flood risk are fluvial (Appendix B) and surface water (Appendix A). The main areas identified to be at risk from these sources are outlined in Table 13-1 and Appendix L. This shows which sites are at risk from each source of flooding, and whether the site has post base planning permission (PBPP), is not currently a preferred allocation, or is being taken forward to a L2 SFRA.

Table 13-1: Summary of main sources of flooding

Source of flooding	Areas affected	Sites where greater than 10% of area is at risk of flooding
Fluvial	The primary fluvial flood risk is along the River Stour, Waveney, Dove, Debenham, Gipping and Brett and their tributaries. These present fluvial flood risk to rural communities as well as to the main urban centres in B&MS (including Sudbury, Stowmarket, Needham Market, Debenham and Eye).	Sites with >10% of the area in Flood Zone 3, Flood Zone 2, or in 1 in 100-year + 65% climate change are: SS1288 – Site has PBPP SS0537 – Site has PBPP SS0009 - Site has PBPP SS0227 – Not currently a preferred allocation SS0418 - Not currently a preferred allocation SS1282 - Not currently a preferred allocation SS0919 - Not currently a preferred allocation SS0324- Not currently a preferred allocation SS0909- Not currently a preferred allocation SS0916 - Not currently a preferred allocation SS1154 - Not currently a preferred allocation SS0902 – Considered for L2 SS0065 – Considered for L2 SS1260 - Not currently a preferred allocation SS1177 - Not currently a preferred allocation SS1178- Not currently a preferred allocation SS1223- Considered for L2 SS1020 - Not currently a preferred allocation SS0765- Not currently a preferred allocation SS0264 – Considered for L2 SS0711 – Considered for L2

Source of flooding	Areas affected	Sites where greater than 10% of area is at risk of flooding
Tidal	The primary tidal flood risk is along the River Stour and Orwell estuaries in the south east of the study area, where there is risk of flooding in Shotley, Wherstead, Harkstead and Cattawade.	SS1020 – Site has PBPP
Surface water	The Risk of Flooding from Surface Water map shows a number of prominent overland flow routes; these predominantly follow topographical flow paths of existing watercourses or dry valleys with some isolated ponding located in low lying areas. Areas at risk include Hadleigh, Sudbury and Great Cornard, Stowmarket, Needham Market, Eye and Debenham.	Sites with >10% of the area at risk of flooding from surface water in the 100-year event are: SS1056 – Site has PBPP SS1154 – Not currently a preferred allocation SS0655 – Not currently a preferred allocation SS0575 - Not currently a preferred allocation SS1018 - Not currently a preferred allocation SS0723 – Discounted as site considered small SS0668 – Considered for L2 SS0227 - Not currently a preferred allocation SS0537 – Site has PBPP SS1225 – Not currently a preferred allocation SS0502 – Site has PBPP SS0902 - Considered for L2 SS1198 – Considered for L2 SS0009 – Site has PBPP SS0179 – Site has PBPP SS0916 – Not currently a preferred allocation SS1153 - Not currently a preferred allocation SS0861 – Considered for L2 SS0909 – Not currently a preferred allocation SS0096 – Site has PBPP SS0395 - Not currently a preferred allocation SS0478 – Site has PBPP SS0919 - Not currently a preferred allocation
Groundwater	The JBA Groundwater map shows there is generally negligible risk of Groundwater Flooding in B&MS. In both districts, areas which are at risk of groundwater flooding tend to correspond to the chalk geology and	Sites with >10% of area at risk of groundwater flooding (0-0.025m): SS0145 – Site has PBPP SS1056 - Site has PBPP SS1268 – Not currently a preferred allocation SS0902 – Considered for L2 SS0916 – Not currently a preferred allocation SS1154 – Not currently a preferred allocation

Source of flooding	Areas affected	Sites where greater than 10% of area is at risk of flooding
	location of watercourses, and in the low lying areas in the south east of Babergh.	SS1289 – Site has PBPP SS1092 – Not currently a preferred allocation SS0433 - Site has PBPP SS0009 - Site has PBPP SS1177– Not currently a preferred allocation SS1178– Not currently a preferred allocation
Sewer	Historical incidents of sewer flooding for B&MS indicate that there have been 84 incidents of sewer flooding since 2001. Most incidents have been recorded in CO10 (Sudbury), IP14 (Stowmarket) and IP23 (Eye).	Data not provided at high enough resolution to screen against sites.
Reservoir	The EA Reservoir Flood Map shows there is generally negligible risk of Reservoir Flooding in B&MS. There is some risk in the vicinity of reservoirs located in the districts. Areas at risk of reservoir flooding include Stowmarket (where there are a number of potential allocations located), Needham Market, Hadleigh, Stratford St Mary and parts of River Stour and Orwell.	Data not provided in format to screen against sites.

13.1.1 Flood defences

Several defences are located within the study area to protect these areas from fluvial and tidal flooding. The defences are mainly found along the River Stour, River Gipping and River Orwell. The standard of protection of these defences is outlined within the review in this document. The residual risk of flood defences failing or being overtopped should be considered as part of a detailed site-specific FRA.

13.1.2 Climate change

Climate change impacts will potentially increase the frequency and magnitude of storm events therefore resulting in more frequent and higher magnitude flood events.

The models run as part of this SFRA show that extent of fluvial flooding is likely to increase with climate change. The extent of tidal flooding is also likely to increase, with the tidally influenced areas of the River Stour and River Orwell extending further upstream in Babergh.

This affects settlements in both districts. Areas which are most likely to experience an increase in flood risk in the future due to climate change include Stowmarket, Needham Market, Debenham, Eye, Sproughton, Claydon, Sudbury and Stratford St Mary.

It is important to consider future climate risks when allocating development sites to ensure risks are understood over the developments lifetime. Preferred sites which have been identified to be at risk of flooding with climate change will be taken forward to Level 2 SFRA. Climate change should also be considered in a site-specific FRA.

13.1.3 Key policies

There are many relevant regional and local key policies which have been considered within the SFRA, such as the CFMPs, RBMPs, the PFRA and LFRMS. Other policy considerations have also been incorporated, such as the sustainable development principles, climate change and flood risk management.

13.1.4 Development and flood risk

The Sequential and Exception Test procedures for both Local Plans and FRAs have been documented, along with guidance for planners and developers. Links have been provided for various guidance documents and policies published by other Risk Management Authorities such as the LLFA and the EA.

The Sequential and Exception Test procedures for site-specific FRAs has been documented, along with guidance for planners and developers. Links have been provided for various guidance documents and policies published by B&MS and the EA.

13.1.5 Relevant studies

There are many relevant regional and local key studies which complement the SFRA and have been considered within the writing of this document. These include the PFRA, LFRMSs and CFMPs. Existing hydraulic models for the watercourses within the study area have also been considered. Other policy consideration has also been incorporated, such as sustainable development principles, climate change and flood risk management.

14 Recommendations

A review of national policies has been conducted against the information collated on flood risk in this SFRA. Following this, several recommendations have been made for B&MS to consider as part of Flood Risk Management in the study area.

14.1 Development management

14.1.1 Sequential approach to development

The NPPF supports a risk-based and sequential approach to development and flood risk in England, so that development is located in the lowest flood risk areas where possible; it is recommended that this approach is adopted for all future developments within B&MS.

New development and re-development of land should wherever possible seek opportunities to reduce overall level of flood risk at the site, for example by:

- Reducing volume and rate of runoff through the use of SuDS, as informed by the Water, People, Places: A guide for master planning sustainable drainage into developments, national and local guidance. The revised 2018 NPPF states that: 'Major developments should incorporate sustainable drainage systems unless there is clear evidence that this would be inappropriate' (Para 165).
- Relocating development to zones with lower flood risk
- Consideration must be given to the potential cumulative impact of development on flood risk
- A ground investigation should be considered within the mitigation measures for surface water runoff from potential development and consider using Flood Zones 2 and 3 as public open space.

14.1.2 Site-specific flood risk assessments

Site specific FRAs are required by developers to provide a greater level of detail on flood risk and any protection provided by defences and, where necessary, demonstrate the development passes part b of the Exception Test.

Developers should, where required, undertake more detailed hydrological and hydraulic assessments of the watercourses to verify flood extent (including latest climate change allowances), inform development zoning within the site and prove, if required, whether the Exception Test can be passed. The assessment should also identify the risk of existing flooding to adjacent land and properties to establish whether there is a requirement to secure land to implement strategic flood risk management measures to alleviate existing and future flood risk. Any flood risk management measures should be consistent with the wider catchment policies set out in the CFMP, FRMPs and LFRMS.

14.1.3 Sequential and Exception tests

The SFRA has identified that areas that are at high risk of flooding from multiple sources. Proposed allocations that are identified as at risk of fluvial, tidal, groundwater and surface water flooding are shown in Table 13-1, with further information displayed in Appendix L. Therefore, several proposed development sites will be required to pass the Sequential and, where necessary, Exception Tests in accordance with the NPPF. Developers should consult with BMSDC, the EA and Anglian Water at an early stage to discuss flood risk including requirements for site-specific FRAs, detailed overland flow modelling, consideration of climate change and drainage assessment and design.

14.1.4 Council review of planning applications

The Council should consult the Environment **Agency's** 'Flood Risk Assessment: Local Planning Authorities', last updated 1 March 2019, when reviewing planning applications for proposed developments at risk of flooding.

When considering planning permission for developments, planners may wish to consider the following:

- Will the natural watercourse system which provides drainage of land be adversely affected?
- Will a minimum 8m width access strip be provided adjacent to the top of both banks of any Main River (5m for Ordinary Watercourses, 20m for Commissioner watercourses and 9m for IDB watercourses), for maintenance purposes and is appropriately landscaped for open space and biodiversity benefits?
- Will the development ensure no loss of open water features through draining, culverting or enclosure by other means and will any culverts be opened up?
- Have SuDS been given priority as a technique to manage surface water flood risk?
- Will there be a betterment in the surface water runoff regime; with any residual risk of flooding, from drainage features either on or off site not placing people and property at unacceptable risk?
- Is the application compliant with the conditions set out by the LLFA?

14.1.5 Drainage strategies and SuDS

Planners should be aware of the conditions set by the LLFA for surface water management and ensure development proposals and applications are compliant with the Council's policy. These policies should also be incorporated into the Local Plan. Wherever possible, SuDS should be promoted:

- It should be demonstrated through a Surface Water Drainage Strategy, that the proposed drainage scheme, and site layout and design, will prevent properties from flooding from surface water. A detailed site-specific assessment of SuDS would be needed to incorporate SuDS successfully into the development proposals. All development should adopt source control SuDS techniques to reduce the risk of frequent low impact flooding due to post-development runoff
- For proposed developments, it is imperative that a site-specific infiltration test is conducted early on as part of the design of the development, to confirm whether the water table is low enough to allow for SuDS techniques that are designed to encourage infiltration
- Where sites lie within or close to Groundwater SPZs or aquifers, there may be a requirement for a form of pre-treatment prior to infiltration. Further guidance can be found in the CIRIA SuDS manual on the level of water quality treatment for drainage via infiltration, and the LLFA's SuDS guidance and requirements
- Consideration must also be given to residual risk and maintenance of sustainable drainage and surface water systems
- SuDS proposals should contain an adequate number of treatments stages to ensure any pollutants are dealt with on site and do not have a detrimental impact on receiving waterbodies
- The promotion and adoption of water efficient practices in new development will help to manage water resources and work towards sustainable development and will help to reduce any increase in pressure on existing water and wastewater infrastructure

14.1.6 Residual risk

The risk to development from reservoirs is residual but developers should consider reservoir flooding during the planning stage. They should seek to contact the reservoir owner to obtain information and should apply the sequential approach to locating development within the site. Developers should also consult with relevant authorities regarding emergency plans in case of reservoir breach.

14.1.7 Safe access and egress

Safe access and egress will need to be demonstrated at all development sites and emergency vehicular access should be possible during times of flood. Where development is located behind flood defences, consideration should be given to the potential safety of the development, finished floor levels and for safe access and egress in the event of rapid inundation of water due to a defence breach with little warning. Resilience measures will be required if buildings are situated in the flood risk area. Finished Floor Levels should be 600mm above the 1 in 100-year (1% AEP) flood level, plus an allowance for climate change.

14.1.8 Future flood management

- Development should take a sequential approach to site layout
- Upstream storage schemes are often considered as one potential solution to flooding. However, this is not a solution for everywhere. Upstream storage should be investigated fully before being adopted as a solution
- Floodplain restoration represents a sustainable form of strategic flood risk solution, by allowing watercourses to return to a more naturalised state.

14.1.9 Potential modelling improvements

The EA regularly reviews its flood risk mapping, and it is important that they are approached to determine whether updated (more accurate) information is available prior to commencing a site-specific FRA. This includes when models are climate change allowances are updated.

14.1.10 Updates to SFRA

SFRAs are high level strategic documents and, as such, do not go into detail on an individual site-specific basis. This SFRA has been developed using the best available information, supplied at the time of preparation. This relates both to the current risk of flooding from all sources and the potential impacts of future climate change. The EA regularly reviews its flood risk mapping and it is important that they are approached to determine whether updated (more accurate) information is available prior to commencing a site-specific FRA. Other datasets used to inform this SFRA may also be periodically updated and following the publication of this SFRA, new information on flood risk may be provided by Risk Management Authorities.

Appendices

Offices at

Coleshill
Doncaster
Dublin
Edinburgh
Exeter
Glasgow
Haywards Heath
Isle of Man
Limerick
Newcastle upon Tyne
Newport
Peterborough
Saltaire
Skipton
Tadcaster
Thirsk
Wallingford
Warrington

Registered Office
1 Broughton Park
Old Lane North
Broughton
SKIPTON
North Yorkshire
BD23 3FD
United Kingdom

+44(0)1756 799919
info@jbaconsulting.com
www.jbaconsulting.com
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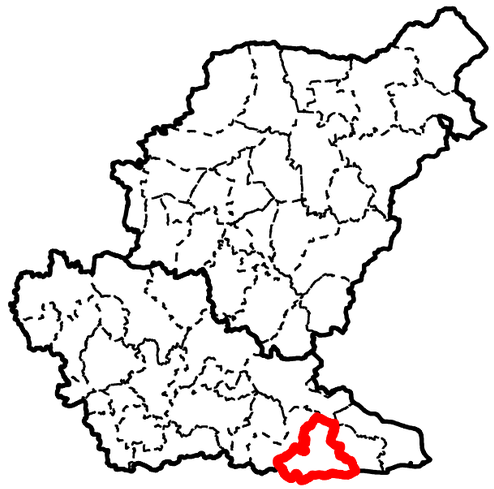
Registered in England 3246693

JBA Group Ltd is certified to:
ISO 9001:2015
ISO 14001:2015
OHSAS 18001:2007

Alton Ward



Legend

- Babergh District
- Mid Suffolk District
- Ward Boundary
- ROFSW 30yr
- RoFSW 100yr
- ROFSW 1000yr

The Risk of Flooding from Surface Water Map (RoFSW) shows the flooding that takes place from the surface runoff geenrated by rainwater (including snow and other precipitation) which:
a) is on the surface of the ground (whether or not it is moving), and
b) has not yet entered a watercourse, drainage system or public sewer.
The RoFSW map will pick out natural drainage channels, rivers, low areas in the floodplain and flow paths between buildings but it will only indicate flooding caused by local rainfall.
Note: The RoFSW map shows predictions of flooded areas but does not show whether individual properties will be affected by surface water flooding or have been affected in the past. The RoFSW map should not be used to predict if individual properties will flood.

0 0.5 1 2 Kilometers

Appendix A - RoFSW

DATE DRAWN:
20/08/2020

Bacton and Old Newton Ward

Legend

- Babergh District
- Mid Suffolk District
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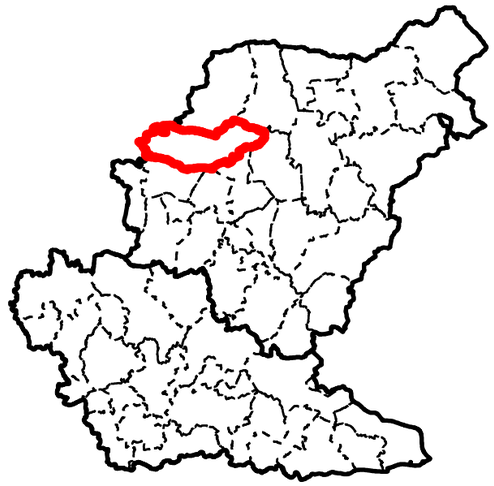
0 0.5 1 2 Kilometers

Appendix A - RoFSW

DATE DRAWN:
20/08/2020

Badwell Ash Ward



Legend

- Babergh District
- Mid Suffolk District
- Ward Boundary
- ROFSW 30yr
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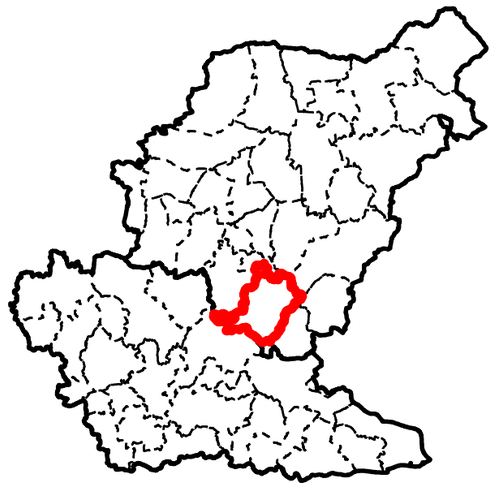
0 0.75 1.5 3 Kilometers

Appendix A - RoFSW

DATE DRAWN:
20/08/2020

Barking and Somersham Ward



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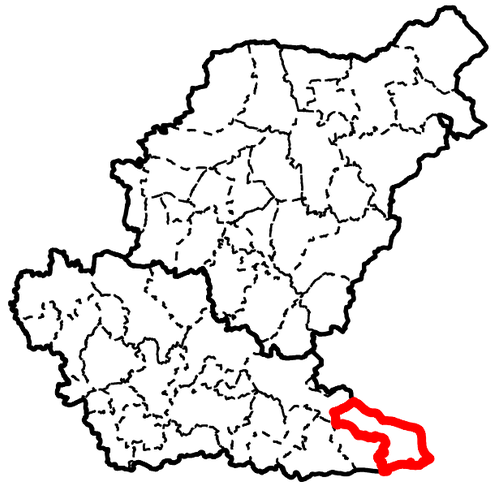
0 0.5 1 2 Kilometers

Appendix A - RoFSW

DATE DRAWN:
20/08/2020

Berners Ward



Legend

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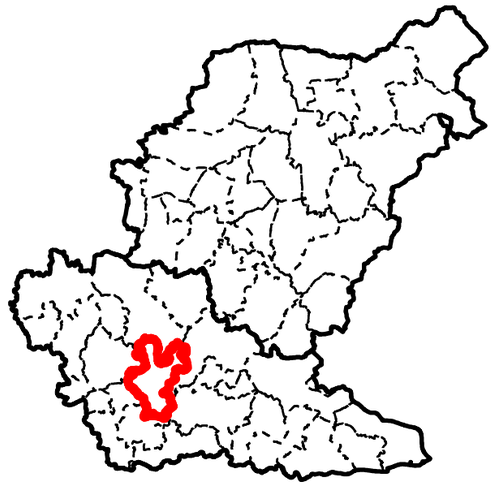
Kilometers

Appendix A - RoFSW

DATE DRAWN:
20/08/2020

Boxford Ward



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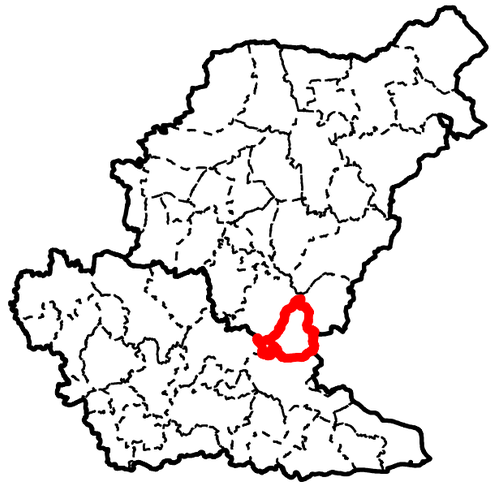
0 0.5 1 2 Kilometers

Appendix A - RoFSW

DATE DRAWN:
20/08/2020

Bramford and Blakenham Ward



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0 0.375 0.75 1.5 Kilometers

Appendix A - RoFSW

DATE DRAWN:
20/08/2020

Brett Vale Ward

Legend

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- ROFSW 1000yr

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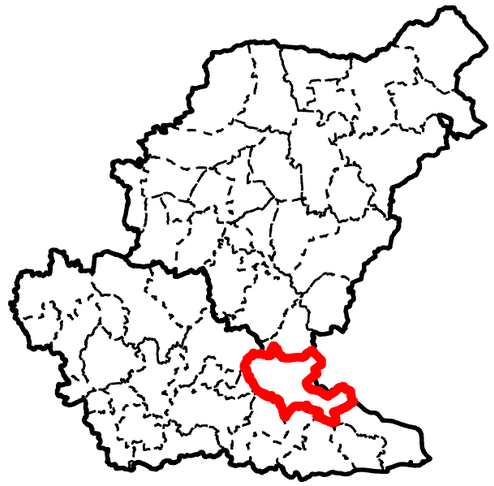
Kilometers

Appendix A - RoFSW

DATE DRAWN:
20/08/2020

Brook Ward

N



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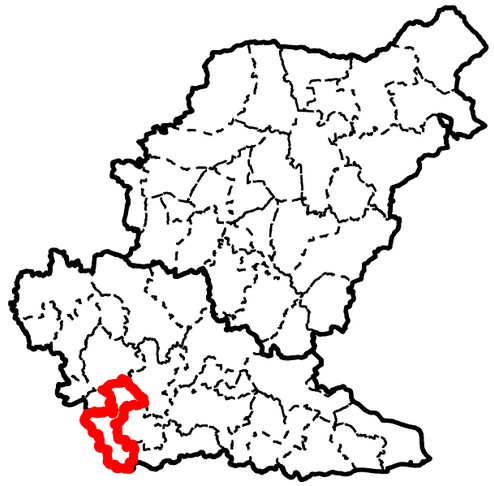
Note: The RoFSW map shows predictions of flooded areas but does not show whether individual properties will be affected by surface water flooding or have been affected in the past. The RoFSW map should not be used to predict if individual properties will flood.

0 0.5 1 2 Kilometers

Appendix A - RoFSW

DATE DRAWN:
20/08/2020

Bures St. Mary Ward



Legend

- Babergh District
- Mid Suffolk District
- Ward Boundary
- ROFSW 30yr
- RoFSW 100yr
- ROFSW 1000yr

The Risk of Flooding from Surface Water Map (RoFSW) shows the flooding that takes place from the surface runoff geenrated by rainwater (including snow and other precipitation) which:
a) is on the surface of the ground (whether or not it is moving), and
b) has not yet entered a watercourse, drainage system or public sewer.
The RoFSW map will pick out natural drainage channels, rivers, low areas in the floodplain and flow paths between buildings but it will only indicate flooding caused by local rainfall.
Note: The RoFSW map shows predictions of flooded areas but does not show whether individual properties will be affected by surface water flooding or have been affected in the past. The RoFSW map should not be used to predict if individual properties will flood.

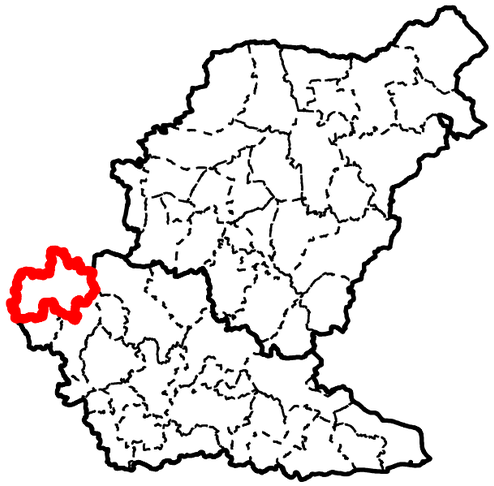
0 0.5 1 2 Kilometers

Appendix A - RoFSW

DATE DRAWN:
20/08/2020

Chadacre Ward

N



Legend

- Babergh District
- Mid Suffolk District
- Ward Boundary
- ROFSW 30yr
- RoFSW 100yr
- ROFSW 1000yr

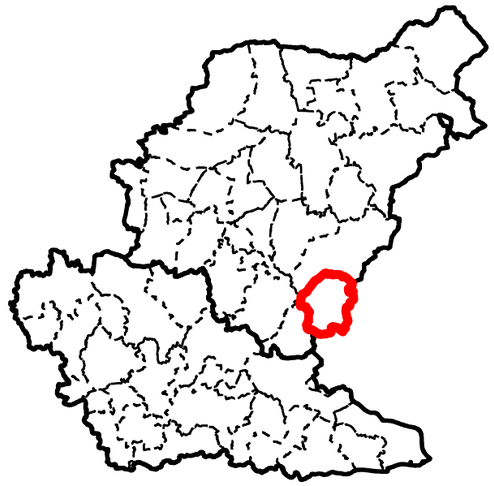
The Risk of Flooding from Surface Water Map (RoFSW) shows the flooding that takes place from the surface runoff geenrated by rainwater (including snow and other precipitation) which:
a) is on the surface of the ground (whether or not it is moving), and
b) has not yet entered a watercourse, drainage system or public sewer.
The RoFSW map will pick out natural drainage channels, rivers, low areas in the floodplain and flow paths between buildings but it will only indicate flooding caused by local rainfall.
Note: The RoFSW map shows predictions of flooded areas but does not show whether individual properties will be affected by surface water flooding or have been affected in the past. The RoFSW map should not be used to predict if individual properties will flood.

0 0.5 1 2
Kilometers

Appendix A - RoFSW

DATE DRAWN:
20/08/2020

Claydon and Barham Ward



Legend

- Babergh District
- Mid Suffolk District
- Ward Boundary
- ROFSW 30yr
- RoFSW 100yr
- ROFSW 1000yr

The Risk of Flooding from Surface Water Map (RoFSW) shows the flooding that takes place from the surface runoff geenrated by rainwater (including snow and other precipitation) which:
a) is on the surface of the ground (whether or not it is moving), and
b) has not yet entered a watercourse, drainage system or public sewer.
The RoFSW map will pick out natural drainage channels, rivers, low areas in the floodplain and flow paths between buildings but it will only indicate flooding caused by local rainfall.
Note: The RoFSW map shows predictions of flooded areas but does not show whether individual properties will be affected by surface water flooding or have been affected in the past. The RoFSW map should not be used to predict if individual properties will flood.

0 0.4 0.8 1.6 Kilometers

Appendix A - RoFSW

DATE DRAWN:
20/08/2020

Debenham Ward

Legend

- Babergh District
- Mid Suffolk District
- Ward Boundary
- ROFSW 30yr
- RoFSW 100yr
- ROFSW 1000yr

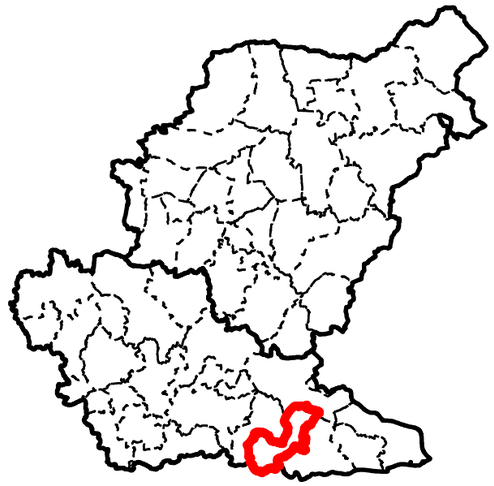
The Risk of Flooding from Surface Water Map (RoFSW) shows the flooding that takes place from the surface runoff geenrated by rainwater (including snow and other precipitation) which:
a) is on the surface of the ground (whether or not it is moving), and
b) has not yet entered a watercourse, drainage system or public sewer.
The RoFSW map will pick out natural drainage channels, rivers, low areas in the floodplain and flow paths between buildings but it will only indicate flooding caused by local rainfall.
Note: The RoFSW map shows predictions of flooded areas but does not show whether individual properties will be affected by surface water flooding or have been affected in the past. The RoFSW map should not be used to predict if individual properties will flood.

0 0.375 0.75 1.5 Kilometers

Appendix A - RoFSW

DATE DRAWN:
20/08/2020

Dodnash Ward



Legend

- Babergh District
- Mid Suffolk District
- Ward Boundary
- ROFSW 30yr
- RoFSW 100yr
- ROFSW 1000yr

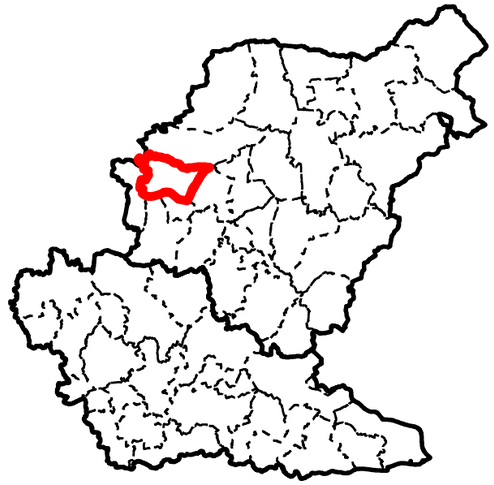
The Risk of Flooding from Surface Water Map (RoFSW) shows the flooding that takes place from the surface runoff geenrated by rainwater (including snow and other precipitation) which:
a) is on the surface of the ground (whether or not it is moving), and
b) has not yet entered a watercourse, drainage system or public sewer.
The RoFSW map will pick out natural drainage channels, rivers, low areas in the floodplain and flow paths between buildings but it will only indicate flooding caused by local rainfall.
Note: The RoFSW map shows predictions of flooded areas but does not show whether individual properties will be affected by surface water flooding or have been affected in the past. The RoFSW map should not be used to predict if individual properties will flood.

0 0.45 0.9 1.8 Kilometers

Appendix A - RoFSW

DATE DRAWN: 20/08/2020

Elmswell and Norton Ward



Legend

- Babergh District
- Mid Suffolk District
- Ward Boundary
- ROFSW 30yr
- RoFSW 100yr
- ROFSW 1000yr

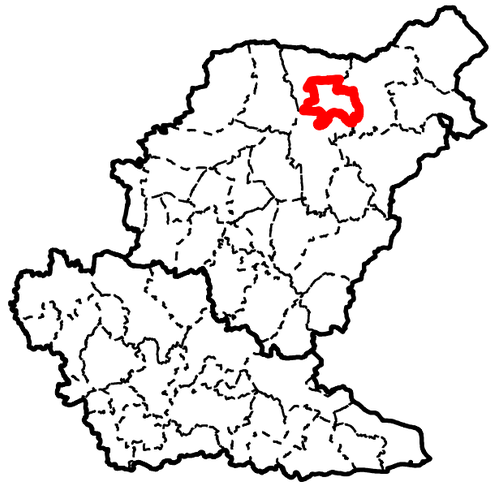
The Risk of Flooding from Surface Water Map (RoFSW) shows the flooding that takes place from the surface runoff geenrated by rainwater (including snow and other precipitation) which:
a) is on the surface of the ground (whether or not it is moving), and
b) has not yet entered a watercourse, drainage system or public sewer.
The RoFSW map will pick out natural drainage channels, rivers, low areas in the floodplain and flow paths between buildings but it will only indicate flooding caused by local rainfall.
Note: The RoFSW map shows predictions of flooded areas but does not show whether individual properties will be affected by surface water flooding or have been affected in the past. The RoFSW map should not be used to predict if individual properties will flood.

0 0.45 0.9 1.8 Kilometers

Appendix A - RoFSW

DATE DRAWN: 20/08/2020

Eye Ward



Legend

- Babergh District
- Mid Suffolk District
- Ward Boundary
- ROFSW 30yr
- RoFSW 100yr
- ROFSW 1000yr

The Risk of Flooding from Surface Water Map (RoFSW) shows the flooding that takes place from the surface runoff geenrated by rainwater (including snow and other precipitation) which:
a) is on the surface of the ground (whether or not it is moving), and
b) has not yet entered a watercourse, drainage system or public sewer.
The RoFSW map will pick out natural drainage channels, rivers, low areas in the floodplain and flow paths between buildings but it will only indicate flooding caused by local rainfall.
Note: The RoFSW map shows predictions of flooded areas but does not show whether individual properties will be affected by surface water flooding or have been affected in the past. The RoFSW map should not be used to predict if individual properties will flood.

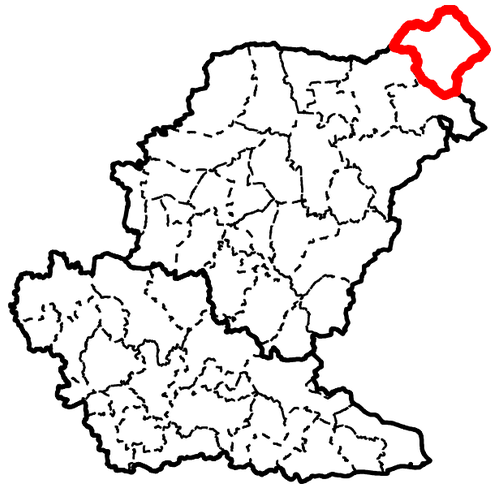
0 0.35 0.7 1.4
Kilometers

Appendix A - RoFSW

DATE DRAWN:
20/08/2020

Fressingfield Ward

N



Legend

- Babergh District
- Mid Suffolk District
- Ward Boundary
- ROFSW 30yr
- RoFSW 100yr
- ROFSW 1000yr

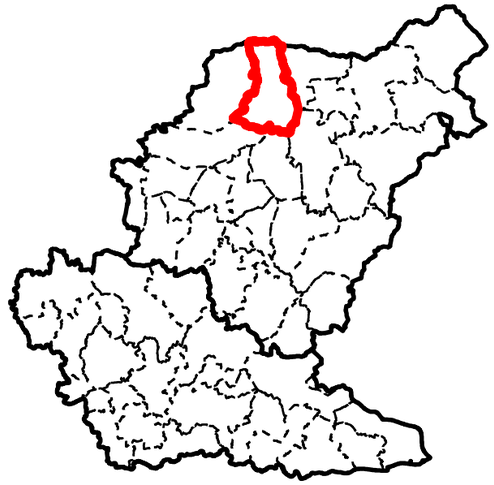
The Risk of Flooding from Surface Water Map (RoFSW) shows the flooding that takes place from the surface runoff geenrated by rainwater (including snow and other precipitation) which:
a) is on the surface of the ground (whether or not it is moving), and
b) has not yet entered a watercourse, drainage system or public sewer.
The RoFSW map will pick out natural drainage channels, rivers, low areas in the floodplain and flow paths between buildings but it will only indicate flooding caused by local rainfall.
Note: The RoFSW map shows predictions of flooded areas but does not show whether individual properties will be affected by surface water flooding or have been affected in the past. The RoFSW map should not be used to predict if individual properties will flood.

0 0.5 1 2 Kilometers

Appendix A - RoFSW

DATE DRAWN:
20/08/2020

Gislingham Ward



Legend

- Babergh District
- Mid Suffolk District
- Ward Boundary
- ROFSW 30yr
- RoFSW 100yr
- ROFSW 1000yr

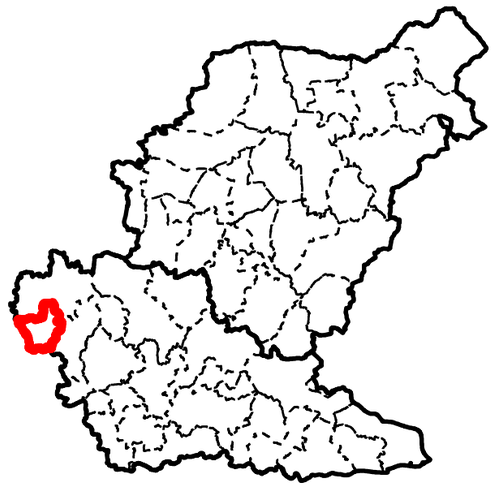
The Risk of Flooding from Surface Water Map (RoFSW) shows the flooding that takes place from the surface runoff geenrated by rainwater (including snow and other precipitation) which:
a) is on the surface of the ground (whether or not it is moving), and
b) has not yet entered a watercourse, drainage system or public sewer.
The RoFSW map will pick out natural drainage channels, rivers, low areas in the floodplain and flow paths between buildings but it will only indicate flooding caused by local rainfall.
Note: The RoFSW map shows predictions of flooded areas but does not show whether individual properties will be affected by surface water flooding or have been affected in the past. The RoFSW map should not be used to predict if individual properties will flood.

0 0.5 1 2 Kilometers

Appendix A - RoFSW

DATE DRAWN:
20/08/2020

Glemsford and Stanstead Ward



Legend

- Babergh District
- Mid Suffolk District
- Ward Boundary
- ROFSW 30yr
- RoFSW 100yr
- ROFSW 1000yr

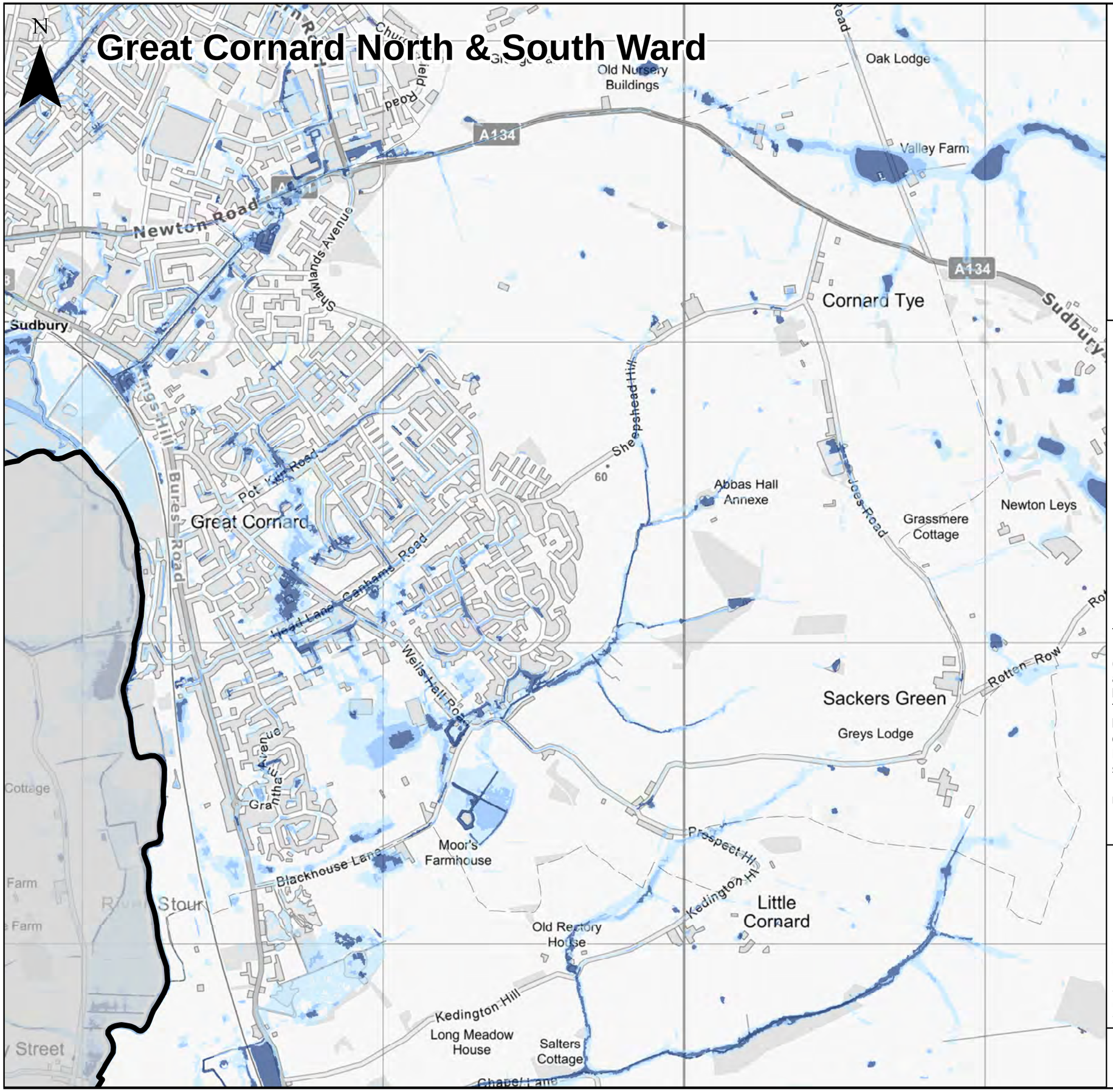
The Risk of Flooding from Surface Water Map (RoFSW) shows the flooding that takes place from the surface runoff geenrated by rainwater (including snow and other precipitation) which:
a) is on the surface of the ground (whether or not it is moving), and
b) has not yet entered a watercourse, drainage system or public sewer.
The RoFSW map will pick out natural drainage channels, rivers, low areas in the floodplain and flow paths between buildings but it will only indicate flooding caused by local rainfall.
Note: The RoFSW map shows predictions of flooded areas but does not show whether individual properties will be affected by surface water flooding or have been affected in the past. The RoFSW map should not be used to predict if individual properties will flood.

0 0.3 0.6 1.2 Kilometers

Appendix A - RoFSW

DATE DRAWN:
20/08/2020

Great Cornard North & South Ward



Legend

- Babergh District
- Mid Suffolk District
- Ward Boundary
- ROFSW 30yr
- RoFSW 100yr
- ROFSW 1000yr

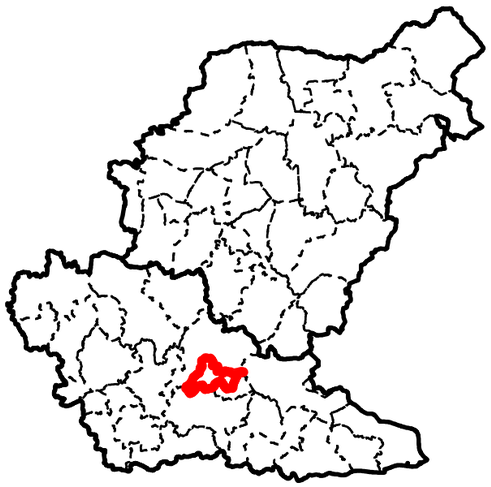
The Risk of Flooding from Surface Water Map (RoFSW) shows the flooding that takes place from the surface runoff geenrated by rainwater (including snow and other precipitation) which:
a) is on the surface of the ground (whether or not it is moving), and
b) has not yet entered a watercourse, drainage system or public sewer.
The RoFSW map will pick out natural drainage channels, rivers, low areas in the floodplain and flow paths between buildings but it will only indicate flooding caused by local rainfall.
Note: The RoFSW map shows predictions of flooded areas but does not show whether individual properties will be affected by surface water flooding or have been affected in the past. The RoFSW map should not be used to predict if individual properties will flood.

0 0.2 0.4 0.8 Kilometers

Appendix A - RoFSW

DATE DRAWN:
20/08/2020

Hadleigh North Ward



Legend

- Babergh District
- Mid Suffolk District
- Ward Boundary
- ROFSW 30yr
- RoFSW 100yr
- ROFSW 1000yr

The Risk of Flooding from Surface Water Map (RoFSW) shows the flooding that takes place from the surface runoff geenrated by rainwater (including snow and other precipitation) which:
a) is on the surface of the ground (whether or not it is moving), and
b) has not yet entered a watercourse, drainage system or public sewer.
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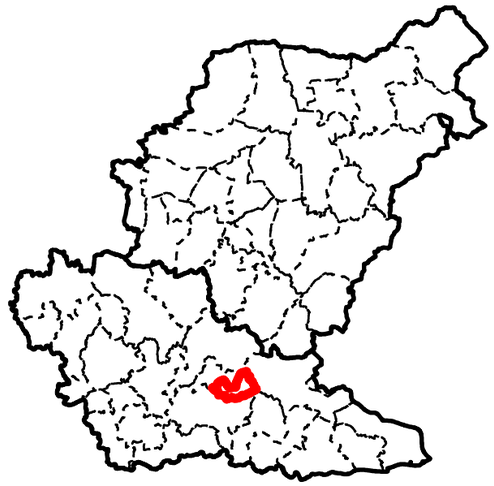
Note: The RoFSW map shows predictions of flooded areas but does not show whether individual properties will be affected by surface water flooding or have been affected in the past. The RoFSW map should not be used to predict if individual properties will flood.

0 0.375 0.75 1.5 Kilometers

Appendix A - RoFSW

DATE DRAWN: 20/08/2020

Hadleigh South Ward



Legend

- Babergh District
- Mid Suffolk District
- Ward Boundary
- ROFSW 30yr
- RoFSW 100yr
- ROFSW 1000yr

The Risk of Flooding from Surface Water Map (RoFSW) shows the flooding that takes place from the surface runoff geenrated by rainwater (including snow and other precipitation) which:
a) is on the surface of the ground (whether or not it is moving), and
b) has not yet entered a watercourse, drainage system or public sewer.
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Note: The RoFSW map shows predictions of flooded areas but does not show whether individual properties will be affected by surface water flooding or have been affected in the past. The RoFSW map should not be used to predict if individual properties will flood.

0 0.275 0.55 1.1
Kilometers

Appendix A - RoFSW

DATE DRAWN:
20/08/2020

Haughley and Wetherden Ward

Legend

- Babergh District
- Mid Suffolk District
- Ward Boundary
- ROFSW 30yr
- RoFSW 100yr
- ROFSW 1000yr

The Risk of Flooding from Surface Water Map (RoFSW) shows the flooding that takes place from the surface runoff geenrated by rainwater (including snow and other precipitation) which:
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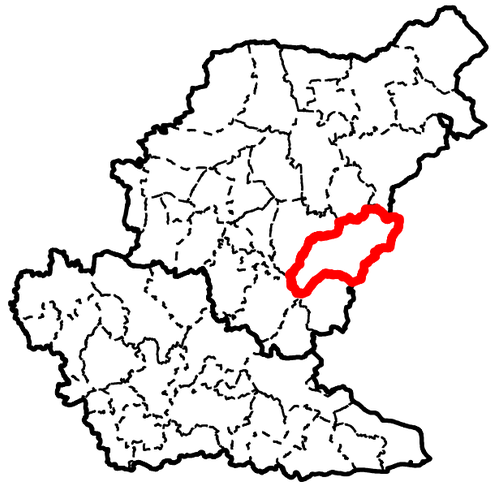
0 0.375 0.75 1.5 Kilometers

Appendix A - RoFSW

DATE DRAWN:
20/08/2020

Helmingham and Coddenham Ward



Legend

- Babergh District
- Mid Suffolk District
- Ward Boundary
- ROFSW 30yr
- RoFSW 100yr
- ROFSW 1000yr

The Risk of Flooding from Surface Water Map (RoFSW) shows the flooding that takes place from the surface runoff geenrated by rainwater (including snow and other precipitation) which:
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0 0.5 1 2 Kilometers

Appendix A - RoFSW

DATE DRAWN:
20/08/2020

Holbrook Ward

Legend

- Babergh District
- Mid Suffolk District
- Ward Boundary
- ROFSW 30yr
- RoFSW 100yr
- ROFSW 1000yr

The Risk of Flooding from Surface Water Map (RoFSW) shows the flooding that takes place from the surface runoff geenrated by rainwater (including snow and other precipitation) which:
a) is on the surface of the ground (whether or not it is moving), and
b) has not yet entered a watercourse, drainage system or public sewer.
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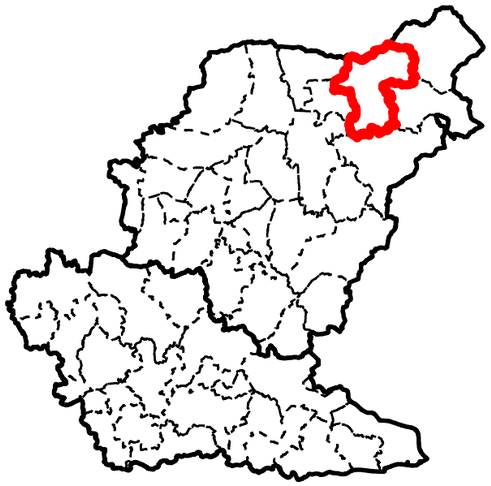
0 0.35 0.7 1.4 Kilometers

Appendix A - RoFSW

DATE DRAWN: 20/08/2020

Hoxne Ward



Legend

- Babergh District
- Mid Suffolk District
- Ward Boundary
- ROFSW 30yr
- RoFSW 100yr
- ROFSW 1000yr

The Risk of Flooding from Surface Water Map (RoFSW) shows the flooding that takes place from the surface runoff geenrated by rainwater (including snow and other precipitation) which:
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0 0.5 1 2 Kilometers

Appendix A - RoFSW

DATE DRAWN:
20/08/2020

Lavenham Ward

Legend

- Babergh District
- Mid Suffolk District
- Ward Boundary
- ROFSW 30yr
- RoFSW 100yr
- ROFSW 1000yr

The Risk of Flooding from Surface Water Map (RoFSW) shows the flooding that takes place from the surface runoff geenrated by rainwater (including snow and other precipitation) which:
a) is on the surface of the ground (whether or not it is moving), and
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Note: The RoFSW map shows predictions of flooded areas but does not show whether individual properties will be affected by surface water flooding or have been affected in the past. The RoFSW map should not be used to predict if individual properties will flood.

0 0.3 0.6 1.2 Kilometers

Appendix A - RoFSW

DATE DRAWN:
20/08/2020

Leavenheath Ward

Legend

- Babergh District
- Mid Suffolk District
- Ward Boundary
- ROFSW 30yr
- RoFSW 100yr
- ROFSW 1000yr

The Risk of Flooding from Surface Water Map (RoFSW) shows the flooding that takes place from the surface runoff geenrated by rainwater (including snow and other precipitation) which:
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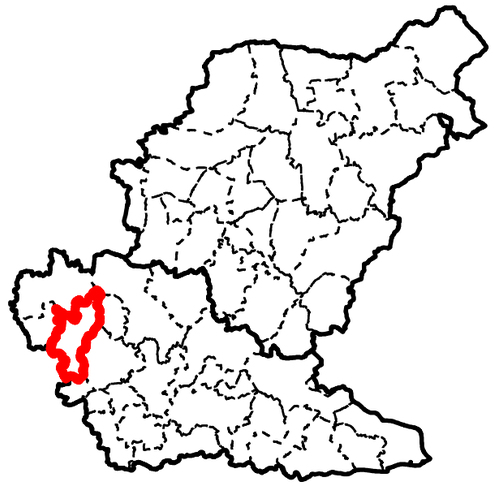
The RoFSW map will pick out natural drainage channels, rivers, low areas in the floodplain and flow paths between buildings but it will only indicate flooding caused by local rainfall.
Note: The RoFSW map shows predictions of flooded areas but does not show whether individual properties will be affected by surface water flooding or have been affected in the past. The RoFSW map should not be used to predict if individual properties will flood.

0 0.325 0.65 1.3 Kilometers

Appendix A - RoFSW

DATE DRAWN: 20/08/2020

Long Melford Ward



Legend

- Babergh District
- Mid Suffolk District
- Ward Boundary
- ROFSW 30yr
- RoFSW 100yr
- ROFSW 1000yr

The Risk of Flooding from Surface Water Map (RoFSW) shows the flooding that takes place from the surface runoff geenrated by rainwater (including snow and other precipitation) which:
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b) has not yet entered a watercourse, drainage system or public sewer.
The RoFSW map will pick out natural drainage channels, rivers, low areas in the floodplain and flow paths between buildings but it will only indicate flooding caused by local rainfall.
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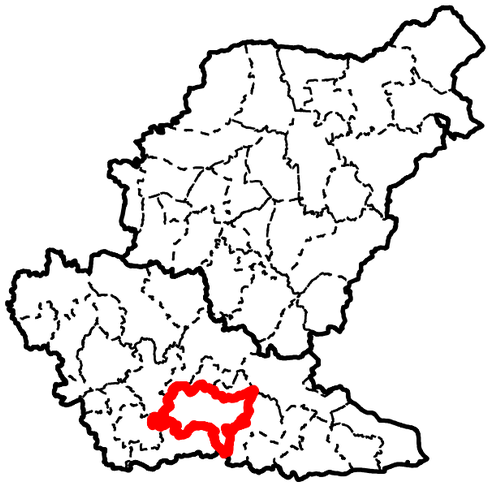
0 0.5 1 2 Kilometers

Appendix A - RoFSW

DATE DRAWN:
20/08/2020

Lower Brett Ward



Legend

- Babergh District
- Mid Suffolk District
- Ward Boundary
- ROFSW 30yr
- RoFSW 100yr
- ROFSW 1000yr

The Risk of Flooding from Surface Water Map (RoFSW) shows the flooding that takes place from the surface runoff geenrated by rainwater (including snow and other precipitation) which:
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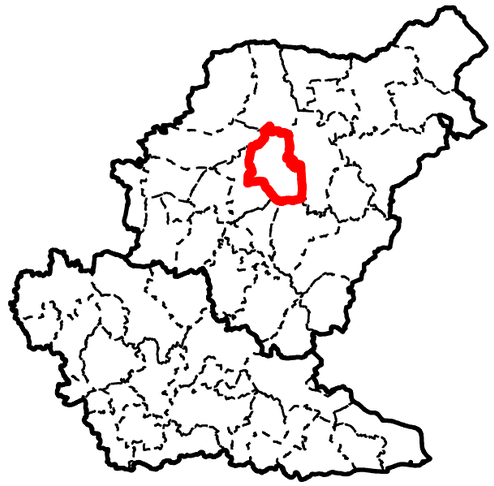
0 0.5 1 2 Kilometers

Appendix A - RoFSW

DATE DRAWN:
20/08/2020

Mendlesham Ward

N



Legend

- Babergh District
- Mid Suffolk District
- Ward Boundary
- ROFSW 30yr
- RoFSW 100yr
- ROFSW 1000yr

The Risk of Flooding from Surface Water Map (RoFSW) shows the flooding that takes place from the surface runoff geenrated by rainwater (including snow and other precipitation) which:
a) is on the surface of the ground (whether or not it is moving), and
b) has not yet entered a watercourse, drainage system or public sewer.
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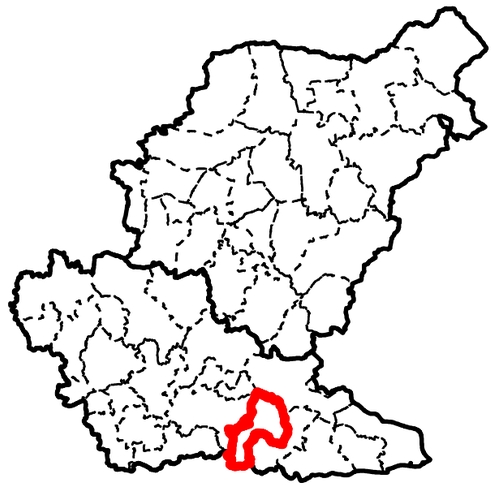
0 0.5 1 2 Kilometers

Appendix A - RoFSW

DATE DRAWN:
20/08/2020

Mid Samford Ward



Legend

- Babergh District
- Mid Suffolk District
- Ward Boundary
- ROFSW 30yr
- RoFSW 100yr
- ROFSW 1000yr

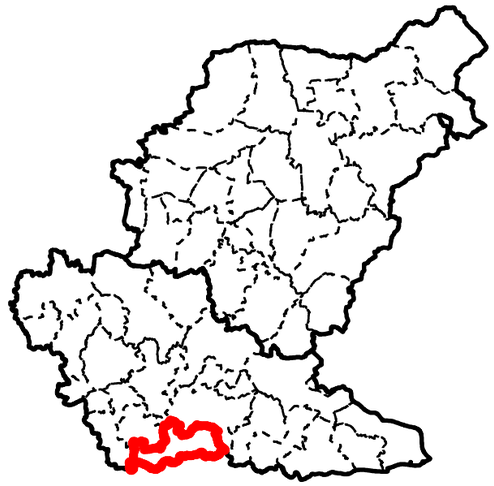
The Risk of Flooding from Surface Water Map (RoFSW) shows the flooding that takes place from the surface runoff geenrated by rainwater (including snow and other precipitation) which:
a) is on the surface of the ground (whether or not it is moving), and
b) has not yet entered a watercourse, drainage system or public sewer.
The RoFSW map will pick out natural drainage channels, rivers, low areas in the floodplain and flow paths between buildings but it will only indicate flooding caused by local rainfall.
Note: The RoFSW map shows predictions of flooded areas but does not show whether individual properties will be affected by surface water flooding or have been affected in the past. The RoFSW map should not be used to predict if individual properties will flood.

0 0.5 1 2 Kilometers

Appendix A - RoFSW

DATE DRAWN:
20/08/2020

Nayland Ward



Legend

- Babergh District
- Mid Suffolk District
- Ward Boundary
- ROFSW 30yr
- RoFSW 100yr
- ROFSW 1000yr

The Risk of Flooding from Surface Water Map (RoFSW) shows the flooding that takes place from the surface runoff geenrated by rainwater (including snow and other precipitation) which:
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0 0.5 1 2 Kilometers

Appendix A - RoFSW

DATE DRAWN:
20/08/2020

Needham Market Ward

Legend

- Babergh District
- Mid Suffolk District
- Ward Boundary
- ROFSW 30yr
- RoFSW 100yr
- ROFSW 1000yr

The Risk of Flooding from Surface Water Map (RoFSW) shows the flooding that takes place from the surface runoff geenrated by rainwater (including snow and other precipitation) which:
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b) has not yet entered a watercourse, drainage system or public sewer.
The RoFSW map will pick out natural drainage channels, rivers, low areas in the floodplain and flow paths between buildings but it will only indicate flooding caused by local rainfall.
Note: The RoFSW map shows predictions of flooded areas but does not show whether individual properties will be affected by surface water flooding or have been affected in the past. The RoFSW map should not be used to predict if individual properties will flood.

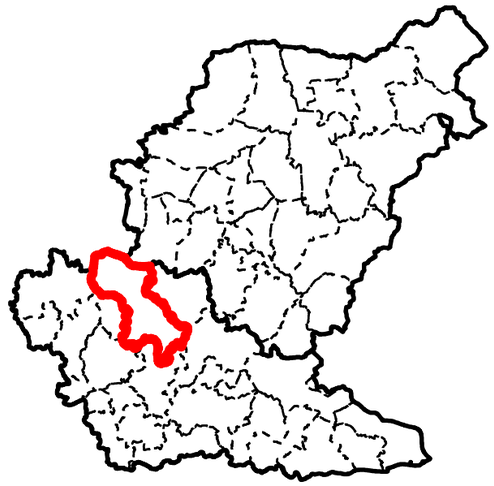
0 0.275 0.55 1.1 Kilometers

Appendix A - RoFSW

DATE DRAWN:
20/08/2020

North Cosford Ward

N



Legend

- Babergh District
- Mid Suffolk District
- Ward Boundary
- ROFSW 30yr
- RoFSW 100yr
- ROFSW 1000yr

The Risk of Flooding from Surface Water Map (RoFSW) shows the flooding that takes place from the surface runoff geenrated by rainwater (including snow and other precipitation) which:
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0 0.5 1 2 Kilometers

Appendix A - RoFSW

DATE DRAWN:
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Onehouse Ward

Legend

- Babergh District
- Mid Suffolk District
- Ward Boundary
- ROFSW 30yr
- RoFSW 100yr
- ROFSW 1000yr

The Risk of Flooding from Surface Water Map (RoFSW) shows the flooding that takes place from the surface runoff geenrated by rainwater (including snow and other precipitation) which:
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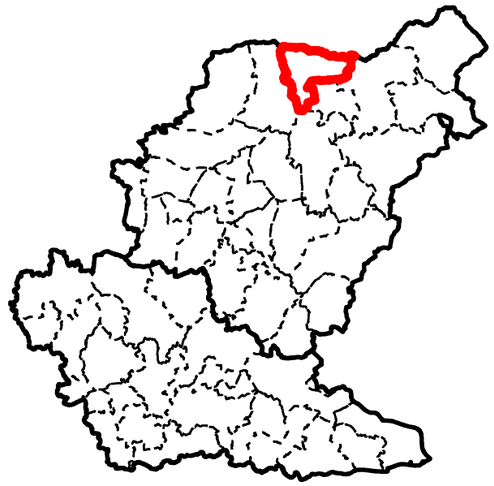
0 0.475 0.95 1.9 Kilometers

Appendix A - RoFSW

DATE DRAWN:
20/08/2020

Palgrave Ward



Legend

- Babergh District
- Mid Suffolk District
- Ward Boundary
- ROFSW 30yr
- RoFSW 100yr
- ROFSW 1000yr

The Risk of Flooding from Surface Water Map (RoFSW) shows the flooding that takes place from the surface runoff geenrated by rainwater (including snow and other precipitation) which:
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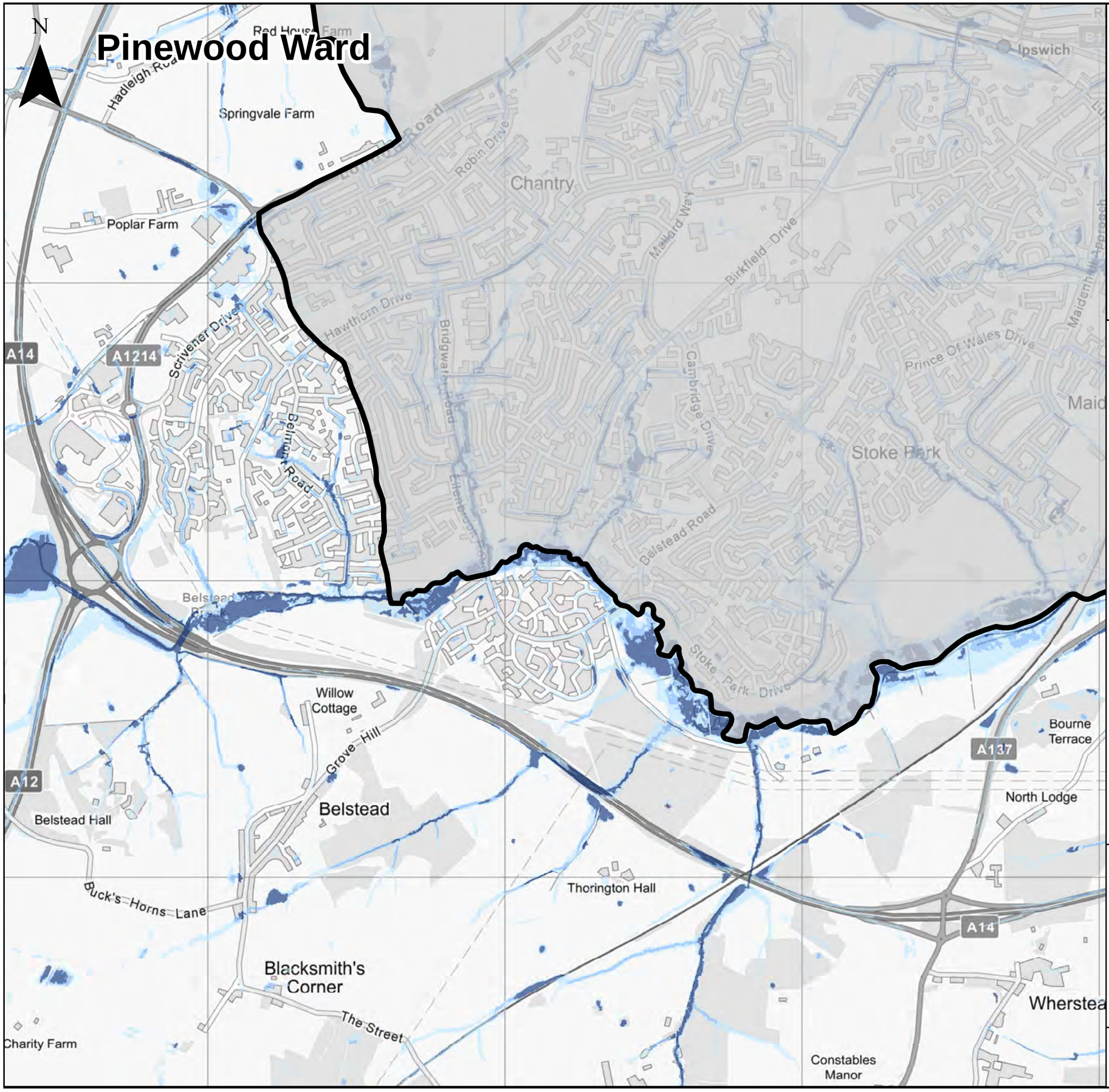
0 0.475 0.95 1.9
Kilometers

Appendix A - RoFSW

DATE DRAWN:
20/08/2020

Pinewood Ward



Legend

- Babergh District
- Mid Suffolk District
- Ward Boundary
- ROFSW 30yr
- RoFSW 100yr
- ROFSW 1000yr

The Risk of Flooding from Surface Water Map (RoFSW) shows the flooding that takes place from the surface runoff geenrated by rainwater (including snow and other precipitation) which:
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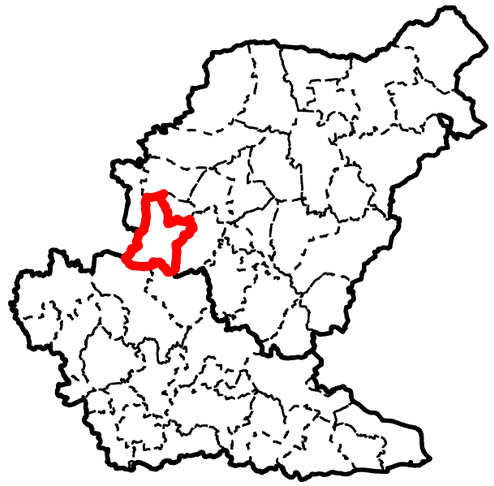
0 0.2 0.4 0.8 Kilometers

Appendix A - RoFSW

DATE DRAWN: 20/08/2020

Rattlesden Ward

N



Legend

- Babergh District
- Mid Suffolk District
- Ward Boundary
- ROFSW 30yr
- RoFSW 100yr
- ROFSW 1000yr

The Risk of Flooding from Surface Water Map (RoFSW) shows the flooding that takes place from the surface runoff geenrated by rainwater (including snow and other precipitation) which:
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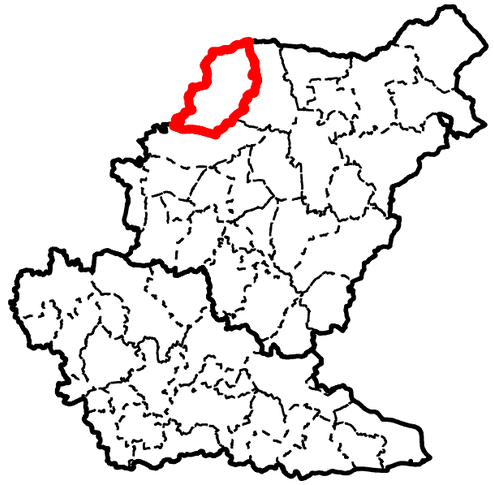
0 0.5 1 2 Kilometers

Appendix A - RoFSW

DATE DRAWN:
20/08/2020

Rickinghall and Walsham Ward



Legend

- Babergh District
- Mid Suffolk District
- Ward Boundary
- ROFSW 30yr
- RoFSW 100yr
- ROFSW 1000yr

The Risk of Flooding from Surface Water Map (RoFSW) shows the flooding that takes place from the surface runoff geenrated by rainwater (including snow and other precipitation) which:
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0 0.5 1 2 Kilometers

Appendix A - RoFSW

DATE DRAWN:
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Ringshall Ward

Legend

- Babergh District
- Mid Suffolk District
- Ward Boundary
- ROFSW 30yr
- RoFSW 100yr
- ROFSW 1000yr

The Risk of Flooding from Surface Water Map (RoFSW) shows the flooding that takes place from the surface runoff geenrated by rainwater (including snow and other precipitation) which:
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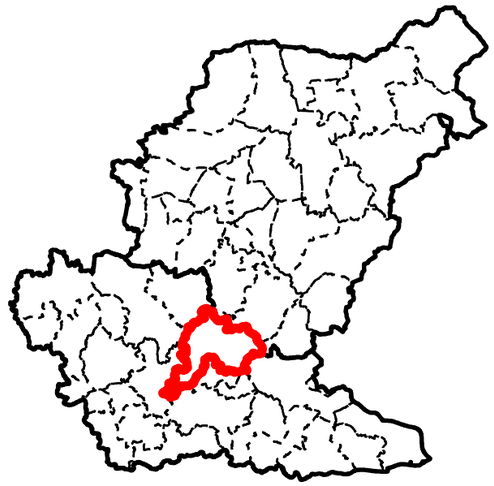
0 0.5 1 2 Kilometers

Appendix A - RoFSW

DATE DRAWN:
20/08/2020

South Cosford Ward

N



Legend

- Babergh District
- Mid Suffolk District
- Ward Boundary
- ROFSW 30yr
- RoFSW 100yr
- ROFSW 1000yr

The Risk of Flooding from Surface Water Map (RoFSW) shows the flooding that takes place from the surface runoff geenrated by rainwater (including snow and other precipitation) which:
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0 0.5 1 2 Kilometers

Appendix A - RoFSW

DATE DRAWN:
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Stomarket North, Central & South Ward

Legend

- Babergh District
- Mid Suffolk District
- Ward Boundary
- ROFSW 30yr
- RoFSW 100yr
- ROFSW 1000yr

The Risk of Flooding from Surface Water Map (RoFSW) shows the flooding that takes place from the surface runoff geenrated by rainwater (including snow and other precipitation) which:
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0 0.2 0.4 0.8 Kilometers

Appendix A - RoFSW

DATE DRAWN:
20/08/2020

Stowupland Ward

Legend

- Babergh District
- Mid Suffolk District
- Ward Boundary
- ROFSW 30yr
- RoFSW 100yr
- ROFSW 1000yr

The Risk of Flooding from Surface Water Map (RoFSW) shows the flooding that takes place from the surface runoff geenrated by rainwater (including snow and other precipitation) which:
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0 0.4 0.8 1.6
Kilometers

Appendix A - RoFSW

DATE DRAWN:
20/08/2020