Runnymede 2030
Strategic Flood Risk **Assessment (SFRA)**

January 2018

Runnymede BOROUGH COUNCIL

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EXECUTIVE SUMMARY

Introduction (Chapter 1)

This 2018 Strategic Flood Risk Assessment (SFRA) provides an update to the Council's 2009 SFRA carried out by ENTEC and seeks to provide a robust assessment of flood risk across the Borough from all sources of flooding.

The report seeks to take into account updates in modelling available, planning policy and legislation since the 2009 SFRA was produced.

Policy background (Chapter 2)

The NPPF establishes a presumption in favour of sustainable development, where development that accords with a Borough's development plan (or when judged against the policies in the NPPF if the development plan for an area is absent, silent or relevant policies are out of date) should be approved without delay. It requires each Council to produce a Local Plan for its area that addresses the spatial implications of economic, social and environmental change. The NPPF states that a Local Plan should also set out the strategic priorities for the area.

The NPPF also confirms that each local planning authority should ensure that its Local Plan is based on adequate, up-to-date and relevant evidence about the economic, social and environmental characteristics and prospects of its area. Paragraph 100 goes on to state that, 'Local Plans should be supported by Strategic Flood Risk Assessment and develop policies to manage flood risk from all sources, taking account of advice from the Environment Agency and other relevant flood risk management bodies, such as lead local flood authorities and internal drainage boards'. This SFRA will form part of the evidence base that underpins the Council's new Runnymede Local Plan.

One of the key aims of the NPPF in relation to flooding and flood risk is to ensure that flood risk is taken into account, both in the plan making and decision taking processes to deliver sustainable development. Central to the NPPF is a sequential risk-based approach to flood risk which aims to steer new development to areas with the lowest probability 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 probability of flooding (from any form of flooding). The NPPF states in paragraph 101 that a Council's SFRA should provide the basis for applying this sequential test.

The NPPF sets out the need to consider all sources of flood risk (such as groundwater, surface water and foul sewer flooding) in addition to the main fluvial and tidal sources in a SFRA. The implications of climate change on flood risk also require consideration so as to ensure that the Local Plan properly takes into account future risk and promotes sustainable development. When considering this point further, it is worthy of mention that the Government has also published legislation on climate change in the form of The Climate Change Act (2008), legislating for climate change mitigation and adaption. The Act imposes a duty on the UK for carbon emissions to be reduced by 80 percent by 2050 from a 1990 baseline.

To be balanced against the need to direct development to areas at the lowest risk of flooding, is the requirement of the NPPF to boost significantly the supply of housing and promote sustainable

economic growth. LPAs are being tasked with making provision for the delivery of a wide choice of high quality homes, widening opportunities for home ownership and creating sustainable, inclusive and mixed communities.

There is a range of other policy documents at National, County and Local level that are considered relevant in the preparation of this SFRA. The Environment Agency has also published a number of relevant documents. A comprehensive summary of the most relevant documents can be found in chapter 2 of the main document.

Local context (Chapter 3)

Runnymede is located in North West Surrey and is split into 14 wards. It contains three main towns; Addlestone, Egham and Chertsey, alongside a range of smaller settlements at Englefield Green, Virginia Water, New Haw, Woodham, Ottershaw, Lyne, Longcross and Thorpe (the last three settlements listed are all located in the Green Belt). In total approximately 79% of the Borough is located in the Green Belt. The remainder of the Borough including its town centres is located in the Urban Area.

The topography in the Borough ranges from approximately 5-15m AOD along the eastern edge of the Borough in the floodplain of the River Thames. Levels very across the Borough rising to a high point of approximately 80AOD in the vicinity of Englefield Green in the north western corner.

The predominant bedrock geology in Runnymede is the Bagshot Formation (which underlays approximately two thirds of the borough). It is also noteworthy that Egham and parts of Thorpe are underlain by the London Clay Formation (Clay). There is a covering of superficial deposits across approximately 50% of the Borough. This is mainly in the eastern half of the Borough although pockets also exist in the Englefield Green and Virginia Water areas.

The bedrock underlying the majority of the borough (with the exception of the north eastern quadrant of the borough which covers the Egham and Thorpe areas) is defined as a secondary A aquifer. The remaining north eastern quadrant of the Borough is designated as unproductive strata.

The superficial deposits present in the Borough are classified in places as principal aquifers and in others, secondary aquifers (primarily Secondary A aquifers but in some places Secondary (undifferentiated) aquifers).

There are 12 main rivers that run through Runnymede. The River Thames is the principal main river within the Runnymede administrative area. Its main tributaries within this area are the River Wey and the Chertsey Bourne and the Addlestone Bourne, all main rivers. There are an additional 8 main rivers which are, in turn, tributaries of these latter three rivers. Subsidiary to the main rivers there is an extensive network of ordinary watercourses across Runnymede. These watercourses drain into the main rivers. The detailed river network in Runnymede can be viewed in figure 8.

Overview of fluvial flood risks in Runnymede (Chapter 4)

Fluvial flooding from the River Thames and its main tributaries; the Chertsey Bourne, the Addlestone Bourne and River Wey, are the primary sources of flooding in Runnymede. The floodplain of the River Thames is fairly extensive on its eastern side within Runnymede, due to the flat, low lying

nature of the land, and presents the greatest fluvial flood risk for the Borough. Areas potentially at risk from flooding from the Bourne and the River Wey include Woodham, New Haw, Addlestone and Hamm Moor.

Other sources of fluvial flooding include the Hurst Ditch, Meadlake Ditch and the Moat which are all tributaries of the Chertsey Bourne system that flow southwards through Egham, Egham Hythe and Thorpe. Although the risk of flooding is more constrained within these river valleys, because their floodplains are much less extensive and carry smaller volumes of flow, where the Hurst Ditch flows parallel to the Chertsey Bourne near Thorpe, the combined flood zone extents create a larger area of potential flood risk. Meadlake Ditch and the Moat also lie within the floodplain of the River Thames. Furthermore, there are thought to be integrated flood risks from the tributaries of the Chertsey Bourne and River Thames, due to backing up effects as well as high groundwater levels when the Thames is high. The ditches in the Egham Hythe to Chertsey area therefore not only present a risk of flooding due to local rainstorms but also from flood water backup from the Thames/Chertsey Bourne.

The Borough contains no formal flood defences; a formal defence being classified as a structure that is specifically built for the purposes of flood defence. Informal flood defences include structures that may act to contain flood water but were not originally constructed for that purpose. While there are certain structures such as the M3 and M25 motorways and railway lines in the Borough that could act as informal flood defences, they are not widely recognised as flood defences themselves as they were not constructed for the purpose of protecting properties from flooding.

There is a long record of flooding from rivers in the Borough, and in particular from the River Thames. Major recorded flood events occurred in 1898, 1947, 1968, 2003 and late 2013-early 2014. The EA also holds records of fluvial flooding in Runnymede for the years 1929, 1954, 1974, 1988, 1990 and 2000. Mapping of the historic flood events in figures 10 a, b, c and d demonstrates that much of Thorpe Park experiences flooding and is an important area of the Thames floodplain. Furthermore the urban areas that have been most affected include parts of Egham Hythe and Chertsey from the Thames and the Chertsey Bourne, and New Haw from the Addlestone Bourne. As well as flooding from the Thames, other watercourses in the Borough have been sources of flooding mainly after heavy rainfall and as a result of culverting.

The PPG defines 4 different flood zones. These refer to the probability of river and sea flooding, ignoring the presence of defences and not accounting of the possible impacts of climate change and consequent changes in the future probability of flooding.

The fluvial flood zones can be defined as follows:

Flood Zone	Definition
Zone 1-low probability	Land having a less than 1 in 1,000 (0.1%) annual probability of river flooding in any given year. (Shown as 'clear' on the EA Flood Map – all land outside Zones 2 and 3)
Zone 2-Medium probability	Land having between a 1 in 1,000 (0.1%) and 1 in 100 (1%) annual probability of river flooding in any

	given year. (Land shown in light blue on the EA Flood Map)
Zone 3A-High probability	Land having a 1 in 100 or greater annual probability of river flooding in any given year (Land shown in dark blue on the EA Flood Map)
Zone 3B-The 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 Strategic Flood Risk Assessments areas of functional floodplain and its boundaries accordingly, in agreement with the Environment Agency (not separately distinguished from Zone 3a on the Flood Map)

The Environment Agency's Flood Map for Planning (Rivers and Sea) shows the extent of flood zones 1, 2 and 3 in Runnymede (the flood map for Planning is reproduced at figure 11 of this SFRA. It is for Local Authorities to define the extent of the functional floodplain that exists in their areas. In this regard, the functional floodplain in Runnymede is defined as follows:

Functional floodplain (Flood Zone 3b) in Runnymede (see figure 13)

Land with an annual probability of flooding of 5% (1 in 20 year) in the Borough will be used by Runnymede Borough Council when defining the functional floodplain. Where detailed modelling is not available, flood zone 3 as defined by the Environment Agency in their Flood Map for Planning (rivers and sea) will be relied upon to show other parts of the Borough which potentially also fall within the functional floodplain, and where further detailed modelling by an applicant will be required.

The functional floodplain as defined in this SFRA by Runnymede Borough Council comprises undeveloped land within the 5% annual probability (1 in 20 year) flood outline. These areas should be safeguarded from any development. Where Water Compatible or Essential Infrastructure cannot be located elsewhere, it must:

- Remain operational and safe for users in times of flood;
- Result in no net loss of flood storage;
- Not impede water flows; and
- Not increase flood risk elsewhere.

Within the 5% annual probability (1 in 20 year) flood outline there are also areas of existing developments that are prevented from flooding by the

presence of existing infrastructure or solid buildings. In these developed areas, existing building footprints, where it can be demonstrated that they exclude floodwater, will not be defined as functional floodplain and the planning requirements associated with Flood Zone 3B will not apply.

The land surrounding these buildings forms important flow paths and flood storage areas and properties within these areas will be subject to frequent flooding; therefore such open space within developed areas will continue to be treated as functional floodplain.

Where redevelopment is proposed in developed areas, schemes must not increase the vulnerability classification of the site or the number of residential units. All schemes should result in a net reduction in flood risk and ensure that floodplain storage and flow routes are not affected. This can be achieved through a combination of on and off-site measures including:

- Reducing the land use vulnerability;
- Seeking opportunities to ensure there is no increase in the number of people at risk (e.g. avoiding conversions and rebuilds of properties that result in an increase in the number of residential dwellings); or achieving a reduction where possible.
- Maintaining or reducing built footprint
- Raising finished floor levels;
- Reducing surface water runoff rates and volumes from the site;
- Increasing floodplain storage capacity and creating space for flooding to occur by restoring functional floodplain;
- Reducing impedance to floodwater flow and restoring flood flow paths;
- Incorporating flood resilient and/or resistance measures;
- Ensuring development remains safe for users in time of flood (this may refer to the timely evacuation of properties prior to the onset of flooding in accordance with an individual Flood Warning and Evacuation Plan for the site).

Proposals for the change of use or conversion to a use with a higher vulnerability classification will not be permitted.

Basements, basement extensions, conversions of basements to a higher vulnerability classification or self-contained units will not be permitted.

Where minor development is proposed, schemes should not affect floodplain storage or flow routes through the incorporation of raised finished floor levels, voids and where possible the provision of direct or indirect floodplain compensation, flood resilience measures, the removal of other non-floodable structures or replacement of impermeable surfaces with permeable, improved surface water drainage through the implementation of SuDS

features such as water butts/rainwater harvesting, living roofs, infiltration trenches/soakaways and below ground attenuation tanks in line with CIRIA guidance on SuDS.

The consideration of whether a site is 'developed' or 'undeveloped' will be considered on a case-by-case basis as part of the planning application process, having regard to the presence of existing buildings on the site and the existing routing of floodwater through the site during times of flood.

The aim of the NPPF is that the most vulnerable development types should be located in the lowest flood risk zones. Vulnerability classifications are specified in the PPG as well as the alignment of vulnerability and risk. The relevant tables are reproduced at tables 8 and 9 of this SFRA.

The EA's Flood Map for Planning principally covers the areas at risk from flooding from the designated main rivers in Runnymede. It should be recognised that other watercourses generally have a floodplain, which usually incorporates a functional flood plain, and a risk of flooding therefore exists in the vicinity of these watercourses. For smaller developments it is probably not practical to undertake an in depth assessment of the flood risk from these un-modelled watercourses. However, for major developments the Council will require the flood risk from such watercourses to be fully assessed by the developer within the site specific flood risk assessment. Early consultation with the Council on the flood risk from these un-modelled watercourses is recommended. It should also be noted that within 8 metres of an ordinary watercourse in the borough, consent from Runnymede Borough Council will be required before commencing any works.

In addition to the above it should be noted that there are a number of dry islands in Runnymede which are areas in flood zone 1 or 2 surrounded by land which has a higher risk of flooding. To plot dry islands in Runnymede the 1 in 100 (plus 20% on river flows) flood models provided by the Environment Agency have been used to map all such areas that are greater than 0.5 hectares. This shows that there are a number of dry islands in the eastern part of the Borough. In the urban area there are a number of dry islands in Egham Hythe and two in Chertsey. The remaining dry islands are generally located in the Green Belt. The location of the dry islands in the borough can be seen in figure 12.

Chapter 4 of the SFRA also considers the impact of climate change on flood risk. It should also be remembered that addressing climate change is one of the core land use planning principles which the NPPF expects Local Authorities to underpin both plan-making and decision-taking. Climate change may increase peak rainfall intensity and river flow, which could result in more frequent and severe flood events. The SFRA seeks to provide an indication of the effects that climate change could have in different parts of the Borough. In this regard, the Council has relied on the Environment Agency's climate change modelling for the Addlestone Bourne (2007 model), Chertsey Bourne (2005 model), Lower Wey (2009 model) and Lower Thames Reach 3 (2009 model). These are 1 in 100 AP flood outlines with a 20% allowance for climate change. However it must be noted that the Environment Agency released new climate change allowances in February 2016, the impact of which it has not been possible to quantify in this SFRA. Reliance on the 1 in 100AP +20% allowance for climate change models is intended to be indicative only of potential impacts of climate change in

different parts of the borough, but it is recommended that applicants contact the Environment Agency for further advice on the new allowances when designing a development proposal as for certain types of development (for example housing in flood zone 3a, climate allowances of 35% and 70% would need to be tested).

The impacts of climate change should be considered across the lifetime of a development. More detail on this is provided in chapter 7 of the SFRA.

Other sources of flooding (chapter 5)

The NPPF is clear that when assessing flood risk, all sources of flooding should be considered and not just the risks posed by fluvial flooding.

Surface water flooding: Surface water flooding occurs when rainfall intensity is greater than the infiltration rate of the soil resulting in overland sheet flow. Flooding from surface water sewers can also be caused, and is influenced by, the capacity and condition of the surface drainage network, and rates of surface runoff are influenced by rainfall and extent of impermeable area. Runnymede Borough Council and Surrey County Council have both received reports of surface water flooding at various locations across the Borough. The Environment Agency's 'Risk of Flooding from Surface Water' mapping has helped the Council gain a better understanding of the areas of Runnymede which may be at greater risk from surface water flooding. This can be viewed at figure 14. What can be ascertained from the data is that each ward in Runnymede has some areas that are likely to be at some risk from surface water flooding including parts of each of the Borough's main urban centres at Egham, Chertsey and Addlestone. Unsurprisingly perhaps it is clear that a number of areas at risk from surface water flooding are located adjacent to the Borough's smaller watercourses and other waterbodies.

Sewer flooding: Climate change, population growth, and the paving over of green spaces that provide natural drainage are stated by Thames Water as being factors that are putting increasing pressure on the sewerage network, particularly after heavy rain. During the production of this SFRA Thames Water, the sewerage provider for the Borough, was contacted to request records of sewer flooding in Runnymede. These records show that the areas of the Borough most affected by sewerage flooding in the last 10 years are in the TW20 8 postcode area (9 reports) which covers Thorpe, Thorpe Lea, Thorpe Green, Pooley Green, Hurst Lane and parts of Egham Hythe, and the KT16 8 postcode area (9 reports) which covers Penton Hook, Laleham Burway and parts of Chertsey (eastern side). The TW20 9 postcode area had 8 reports. This postcode area covers the majority of Egham and part of Englefield Green (south of the A30). In each case, most of the reports (23) relate to external sewerage flooding and of these, the majority are one off occurrences (18 out of 23). Indeed, across all three postcode areas, there have been only 3 reports of internal sewerage flooding over this period (all one off occurrences). It should be noted that records only appear on the DG5 register where they have been reported to Thames Water, and as such they may not include all instances of sewer flooding.

Groundwater flooding: Flooding from groundwater can happen when the level of water within the rock or soil that makes up the land (known as the water table) rises. In Runnymede, areas at risk of groundwater flooding predominantly lie within the floodplain of the Thames where it is underlain by the Thames Gravels. The water table in the drift deposits are a reflection of river levels, therefore

the risk of groundwater flooding generally occurs when there is also a risk of flooding from the Thames.

Flooding from groundwater has been reported in various parts of the Borough. For example during the 2013/2014 flood event incidences of groundwater flooding were reported in Staines upon Thames and Egham in particular although these groundwater flooding reports are believed to have been closely linked with the fluvial flood event that was occurring in the Borough at the same time. The Surrey Flood Risk Partnership is seeking grant to undertake a study into predicting groundwater flooding. One of the proposed study areas is Egham.

The BGS Susceptibility to Groundwater Flooding dataset shows where groundwater flooding could occur (defined by the term susceptibility) but does not indicate risk, which is the likelihood that it will occur. This dataset identifies that there is some potential for groundwater floodwater in almost the entire borough. The potential for groundwater flooding is the greatest in the Egham and Thorpe. In Chertsey the risk is lower and in the remainder of the Borough, generally speaking there is considered to be limited potential for groundwater flooding to occur although pockets with higher potential or no potential can be observed.

Flooding from impounded waterbodies: A number of reservoirs are located within Runnymede, most notably Virginia Water lake near the western boundary. Such bodies of water have the potential to cause flooding in the Borough. There are also a number of reservoirs in the boroughs surrounding Runnymede.

Generally risk of dam failure on reservoirs is considered extremely low and there is no record of reservoir flooding in Runnymede. Furthermore, there has been no loss of life in the UK from reservoir flooding since 1925. However failure, if it occurred, could have major consequences, including loss of life. With on-going flood assessments and statutory management plans prepared by reservoir undertakers, the probability of a flood event or breach is very small. Any flood risk that exists from reservoir failure is therefore considered to be a residual risk.

The Basingstoke Canal/Wey Navigation is located on the southern boundary of the borough. As with reservoirs, the flood risks from canals and raised water bodies are considered to be residual. There is no known history of canal flooding in Runnymede Borough

Tidal flooding: There is no risk of tidal flooding to occur in Runnymede Borough.

Other relevant sources of data: When building a picture of historic flood incidents across the Borough more widely, the Council has considered the 'wetspot' data provide by Surrey County Council. 'Wetspot' is a term used by SCC to describe the location of a flood incident that has been reported (this relates to a surface water, groundwater and ordinary watercourses flood incidents). The wetspot data for the Borough can be viewed in figure 21. This figure does not differentiate between the different types of flood event reported however the data shows that in general there are more flooding reports in the eastern side of the Borough. It should be noted that given the localised and site specific nature of these recorded flooding incidents, each incidentis assessed on a case by case basis by Surrey County Council rather than being assessed in detail at the strategic level in this SFRA.

Level1 assessment of flood risk in Runnymede Borough (chapter 6)

In this chapter of the SFRA, a strategic assessment of the flood risk from all sources has been undertaken for each of the 14 wards within Runnymede. It is recommended that the reader refers to the ward of the Borough that is relevant to them for further detailed information.

Avoiding flood risk (including guidance on the application of the sequential and exception tests (chapter 7)

This chapter provides advice on how the Sequential Exception Tests will be applied in the plan-making and development management processes in Runnymede Borough and when these tests need to be applied.

The sequential test

The NPPF states that the aim of the Sequential Test is to steer development to areas with the lowest probability of flooding, steering development to flood zone 1 where ever possible. Where there are no reasonably available sites in Flood Zone 1, the PPG advises that LPAs should take into account the flood risk vulnerability of land uses and consider reasonably available sites in Flood Zone 2, applying the Exception Test if required (this will be discussed in more detail later in this chapter). Only where there are no reasonably available sites in Flood Zones 1 or 2 should the suitability of sites in Flood Zone 3 be considered, taking into account the flood risk vulnerability of land uses and again, applying the Exception Test if required. Within each flood zone, surface water and other sources of flooding also need to be taken into account in applying the sequential approach to the location of development.

The steps that should be considered when applying the sequential test in both the decision taking and plan making processes are outlined in chapter 7. This includes specific guidance on the approach that the Council will take when dealing with windfall sites.

The exception test

The Exception Test is a method to demonstrate and help ensure that flood risk to people and property will be managed satisfactorily, while allowing necessary development to go ahead in situations where suitable sites at lower risk of flooding are not available. If, following the application of the Sequential Test, it is not possible, consistent with wider sustainability objectives, for a development to be located in zones with a lower probability of flooding (whether through the plan making or development management process) the Exception Test may need to be applied. For the Exception Test to be passed:

1. It must be demonstrated that the development provides wider sustainability benefits to the community that outweigh flood risk, informed by a Strategic Flood Risk Assessment where one has been prepared; and

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.

Both elements of the test must be passed for development to be allocated (in the case of plan making) or permitted (in the case of the development management process).

In order to assess whether part 1 of the exception test can be passed, applicants should assess their scheme against the relevant decision aiding criteria relating to the objectives within the Sustainability Appraisal Framework for the Local Plan. These objectives are set out in chapter 7 of the SFRA.

In order to assess whether part 2 of the exception test can be passed, within the site specific FRA, the measures presented within Chapter 8 of this SFRA (and any others considered relevant) should be utilised wherever possible. In particular issues relating to flood warnings and evacuation need to be considered in detail.

Lifetime of development

In line with advice in the PPG, in Runnymede Borough residential development should be considered for a minimum of 100 years, unless there is specific justification for considering a shorter period, for example; where a development is controlled by a time-limited planning condition.

For non residential developments, the lifetime will depend on the characteristics of a particular development. Planners should use their experience within their locality to assess how long they anticipate the development being present for. Developers should justify why they have adopted a given lifetime for the development when they are formulating their flood risk assessment. Generally speaking, the Council will consider a minimum lifetime of 75 years for commercial / industrial developments.

Chapter 8: Flood risk management and mitigation

This chapter provides advice on mitigation and management techniques to reduce flood risk in new developments that are located in areas at risks from flooding. Guidance is provided on:

-*Finished floor levels:* Generally speaking, where development within flood zones 2 and 3 is unavoidable, they should be designed to have an internal finished floor level (FFL) 300mm above the known or modelled 1 in 100 annual probability flood level including an allowance for climate change wherever possible to help mitigate flood risk to people and property in a flood event

-*Flood resistance and resilience techniques:* Guidance is provided on measures that can be incorporated in existing properties and new properties.

-*Safe access and egress*: In particular this chapter outlines that it is considered acceptable for the access/egress route to be wet in Runnymede so long as the flood hazard is no greater than Very Low Hazard – Caution along the full length of the access/escape route. The route should also be along publically accessible roads or paths. Currently limited hazard mapping is available in Runnymede. As such, until the River Thames Scheme modelling is issued with its associated hazard mapping, the Council will take the approach that where it is anticipated that the velocity of flow is likely to be low then the depth should not exceed 250mm.

-*Flood compensation storage:* This must be provided on a level for level, volume for volume basis on land which does not already flood and should be within the site boundary. Where land is not within the site boundary, it must be in the immediate vicinity, in the applicant's ownership and linked to the site (in terms of hydrological connectivity). Floodplain compensation must be considered in the

context of a 1% annual probability (1 in 100 year) flood level including an allowance for climate change. When designing a scheme, flood water must be able to flow in and out freely and must not pond. An FRA must demonstrate that there is no loss of flood storage capacity and include details of an appropriate maintenance regime to ensure mitigation continues to function for the lifetime of the development.

-*Flood voids:* The use of under-floor voids with adequate openings beneath the raised finished floor levels can be considered for development in Flood Zones 2 and 3. They are generally considered to provide mitigation, but not compensation for loss of floodplain storage. The use of under-floor voids will typically require the submission of a maintenance plan which will detail how it will be ensured that the voids will remain open for the lifetime of the development.

Void openings should be a minimum of 1m long and open from existing ground levels to at least the 1% annual probability (1 in 100 year) plus climate change plus freeboard of 300mm. By setting finished floor levels at 300mm above the design flood level, there is therefore usually enough space for voids below. There should be a minimum of 1m of open void length per 5m length of wall. Void openings should be provided along all external walls of the proposed building/extension. If security is an issue, 10mm diameter vertical bars set at 100mm centres can be incorporated into the void openings.

Guidance is also provided on:

- Flood warning and evacuation plans;

-The Environment Agency's floodline direct service;

-Surface water flood risk management;

-The River Thames Scheme; and

-Emergency planning

Guidance for site specific FRAs (chapter 9)

A site-specific flood risk assessment (FRA) is carried out by (or on behalf of) a developer to assess the flood risk which impacts on a development site. Where necessary, the assessment should accompany a planning application submitted to the local planning authority. The assessment should demonstrate to the decision-maker how flood risk will be managed now and over the development's lifetime, taking climate change into account, and with regard to the vulnerability of its users.

A FRA should also be appropriate to the scale, nature and location of the development. For example, where the development proposed is an extension to an existing house (for which planning permission is required) which would not increase the number of people/households present in an area at risk of flooding, the Council will generally need a less detailed assessment to be able to reach an informed decision on the planning application. For a new development comprising a greater number of houses in a similar location, or one where the flood risk is greater, the Council will need a more detailed assessment.

Chapter 9 contains a flood risk assessment checklist to assist applicants when the preparation of such a document to support their planning application is necessary.

The Environment Agency is able to provide an applicant with a range of products which can inform a Flood Risk Assessment including:

- product 1: Flood Map, including flood zones, defences and storage areas and areas benefiting from flood defences;
- product 3: Basic Flood Risk Assessment Map, including flood zones, defences and storage areas, areas benefiting from defences, statutory main river designations and some key modelled flood levels;
- product 4: Detailed Flood Risk Assessment Map, including flood zones, defences and storage areas, areas benefiting from defences, statutory main river designations, historic flood event outlines and more detailed information from our computer river models (including model extent, information on one or more specific points, flood levels, flood flows);
- product 5: reports, including flood modelling and hydrology reports and modelling guidelines;
- product 6: Model Output Data, including product 5;
- product 7: Calibrated and Verified Model Input Data (CaVMID), including product 5;
- product 8: Flood Defence Breach Hazard Map including, maximum flood depth, maximum flood velocity, maximum flood hazard;

More information on flood risk assessment for planning applications can be found at: https://www.gov.uk/guidance/flood-risk-assessment-for-planning-applications. This page provides details on how to order the above products from the Environment Agency.

Surrey County Council in its role as LLFA can also provide information for site specific FRAs including information on the level of surface water and groundwater risk and any recorded historic flood events and locally known wetspots.

Flood risk policy and development management approach (chapter 10)

This chapter provides policy recommendations for each flood zone that applicants should consider when they are preparing a planning application.

In addition the following types of development are given consideration:

Cumulative impact of minor and permitted development

In parts of Runnymede there is potential for both minor development as well as schemes constructed under permitted development to be considered to be having a cumulative impact on flood risk in the local area as a result of impacts on local flood storage capacity and flood flows.

It is possible that the Council could consider making an Article 4 direction to remove national permitted development rights for land within Flood Zone 3 where cumulative impact is considered to be a problem. The removal of permitted development rights would ensure that a planning application and site-specific FRA will be required for any development in these areas.

FRAs for all minor development within Flood Zone 3 should demonstrate that the proposal is safe and will not increase flood risk elsewhere by not impeding the flow of flood water, reducing storage capacity of the floodplain or increasing the number of properties at risk of flooding. Details of flood mitigation measures proposed to reduce the impact of flooding on the proposed development itself and which demonstrate that the proposed development would not result in an increase in maximum flood levels within adjoining properties should be provided.

Changes of use

Where a development undergoes a change of use and the vulnerability classification of the development changes, there may be an increase in flood risk.

For change of use applications in Flood Zone 2 and 3, applicants must submit a FRA with their application. Whilst most changes of use are not subject to the sequential and exception tests, an FRA should demonstrate how the flood risks to the development will be managed so that it remains safe through its lifetime including provision of safe access and egress and preparation of Flood Warning and Evacuation Plans where necessary.

Basement developments

Over the past few years it has become increasingly popular to construct basements which extend beyond the footprint of the host property and under the surrounding amenity area in Runnymede. This is most commonly seen in the Virginia Water area.

Applications for basements or basement extensions in flood zones 2, 3a and 3b should be supported by a FRA (and on sites of 1ha or more in flood zone 1). The FRA must provide details of an appropriate sustainable urban drainage system for the site and investigation to determine whether a perimeter drainage system or other suitable measure is necessary to ensure any existing sub-surface water flow regimes are not interrupted.

Furthermore, basement development may affect groundwater flows, and even though the displaced water will find a new course around the area of obstruction this may have other consequences for nearby receptors e.g. buildings, trees. The Council may therefore require a groundwater survey to be submitted where there is a high water table and an assessment of the cumulative impact on ground water conditions should be included. This should be discussed with the Council prior to the submission of a planning application.

Chapter 11: Summary and review process for the SFRA

Summarises the key points from the document and confirms the review mechanism for the SFRA which is as follows:

Over the coming months and years it is likely that modelling will be improved or updated and Government policy and guidance may change. As such a periodic review of the Runnymede SFRA

is considered to be imperative. The following key questions should be addressed as part of the SFRA review process:

Question 1

Has any flooding been observed within the Borough since the previous review? If so, the following information (where known) should be captured as an addendum to the SFRA:

- What was the mapped extent of the flooding?
- Over what dates did the flooding occur?
- What was the perceived cause of the flooding?
- What was the indicative statistical probability of the observed flooding event? (i.e. how often, on average, would an event of that magnitude be observed within the Borough?)
- If the flooding was caused by overtopping of the riverbanks, were the observed flood extents situated outside of the current Zone 3a? If it is estimated that the frequency of flooding does not exceed, on average, once in every 100 years then the flooded areas (from the river) should be incorporated into Zone 3a to inform future planning decision making.

Question 2

Have any amendments to the NPPF or the PPG been released since the previous review? If so, the following key questions should be asked:

- Does the revision to the policy/guidance alter the definition of the Flood Zones presented within the SFRA?
- Does the revision to the policy/guidance alter the decision making process required to satisfy the Sequential Test?
- Does the revision to the policy guidance alter the application of the Exception Test?
- Does the revision to the policy/guidance alter the categorisation of land use vulnerability, presented within Table 2 of the Flood Zone and Flood Risk tables in the PPG? If the answer to any of these core questions is 'yes' then a review of the SFRA recommendations in light of the identified policy change should be carried out.

Question 3

Has the Environment Agency issued any amendments to their flood risk mapping and/or guidance since the previous policy review? If so:

- Has any further detailed flood risk mapping been completed within the Borough, resulting in a change to the 1 in 20, 1 in 100 year or 1 in 1000 year flood outlines? If yes then the relevant flood outlines should be updated accordingly.

- Has the assessment of the impacts that climate change may have upon rainfall and/or river flows over time altered? If yes, then a review of the impacts that climate change may have upon the Borough is required.

- Do the development management recommendations provided in Chapter 10 of this SFRA in any way contradict emerging EA advice with respect to (for example) the provision of emergency access, the setting of floor levels and the integration of sustainable drainage techniques? If yes, then a discussion with the EA is required to ensure that the development management recommendations remain appropriate.

- Have any new/updated surface water or other sources of flooding maps been produced and published?

The Environment Agency reviews the Flood Zone Map on a quarterly basis and sends the updated shapefiles to the Council's GIS team. If this results in a change in the flood zone boundaries in the Borough, the updated Flood Zones will be automatically updated on the Council's interactive mapping system which is known as rMaps. Any material amendments to the flood zone boundaries will be discussed in any review of the SFRA including the implications for the Council's spatial strategy.

Question 4

Has the implementation of the SFRA within the spatial planning and/or development management functions of the Council raised any particular issues or concerns that need to be reviewed as part of the SFRA process?

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CHAPTER 1: INTRODUCTION AND OVERVIEW OF APPROACH

Introduction

1.1 In May 2009, ENTEC completed the Runnymede Strategic Flood Risk Assessment (SFRA) (levels 1 and 2), referred to hereafter as the 2009 SFRA. The 2009 SFRA provided a robust assessment of flood risk across the Borough of Runnymede, and in particular, the flood risks associated with areas being considered for future development as part of the emerging Local Plan Core Strategy (LPCS). This was required to meet the requirements of Planning Policy Statement 25 (PPS25): Development and Flood Risk.

1.2 This 2018 SFRA seeks to build on this previous work; however this updated version reflects current and (as far as it is possible to do so) emerging national and local policy. It also takes into account any relevant legislation enacted since the original version was published in May 2009. Any relevant legislative changes which occur after the production of the 2018 SFRA will be reflected in future updates.

1.3 This 2018 SFRA reflects the intention noted in Chapter 1 of the 2009 SFRA to review and update the document on a regular basis as it is a live document which needs to be updated to reflect changes in modelling information available as well as changes to the planning policy framework that the Council operates within.

1.4 In particular, this update was necessary for the following reasons:

- The Environment Agency has commissioned a re run of the 2007 Lower Thames model since the production of the original SFRA. This updated modelling was published in 2009 and will be utilised in this updated SFRA;
- The Flood Risk Regulations have been enacted (December 2009) which transpose the EU 'Floods Directive' into UK law;
- The Flood and Water Management Act 2010 has been enacted;
- Surrey County Council became the Lead Local Flood Authority (LLFA) in 2010 and has since published the Surrey Preliminary Flood Risk Assessment (PFRA) in June 2011 and its Local Flood Risk Management Strategy (LFRMS) in 2014. Surrey County Council also became a statutory consultee on major planning applications in relation to surface water drainage from 15th April 2015 following an amendment to Schedule 4 of the Development Management Procedure Order;
- The Localism Act was enacted in 2011;
- The National Planning Policy Framework (NPPF) and its accompanying Technical Guidance were published in March 2012, replacing PPS25. The Government subsequently introduced new Planning Practice Guidance (PPG) in March 2014 which replaced the Technical Guidance to the NPPF.
- The South East Plan was partially revoked on 25th March 2013, leaving only one policy remaining which is relevant to Runnymede. This is policy NRM6 which relates to the Thames Basin Heaths Special Protection Area.
- The Council withdrew its Local Plan Core Strategy (LPCS) in July 2014 and then commenced work on a new Local Plan which is to be known as Runnymede 2030.

- The Environment Agency produced updated surface water flooding mapping in 2013 which will be utilised in this updated SFRA;
- New climate change allowances were published in February 2016.

1.5 In addition to the bullet points above, it should also be noted that the Council has also been advised that the Environment Agency has commissioned modelling of the River Thames from Hurley to Teddington which is expected in 2018. The Chertsey Bourne and River Wey are also currently being remodelled as well as the Rive Ditch, the latter of which has been commissioned by Surrey County Council. The release date for these modelling outputs is not currently known. This modelling will replace all existing modelling and tie in with the River Thames Scheme (this scheme, which seeks to reduce flood risk from Datchet to Teddington is discussed in more detail in chapter 8 of this report). Given the proposed timescale for the publication of this new modelling, it has not been available for consideration in this SFRA. Instead, this updated modelling (and any other relevant updates) will be considered in any future iteration of the Runnymede SFRA.

Overview of approach

1.6 Flood risk is just one of many factors to consider when making decisions relating to land use. The overarching planning policies/guidance for considering flood risk are contained in the National Planning Policy Framework (NPPF) and its accompanying Planning Practice Guidance (PPG). The NPPF and the PPG will be discussed in more detail in chapter 2 of this SFRA.

1.7 In brief however, in line with the requirements of national planning policy, this SFRA has been undertaken to assess flood risks in Runnymede Borough. It should be noted that Runnymede is one of the top 10 Local Authorities in England for flood risk[1], and flood risk in the Borough is significantly greater than the national average.

1.8 There are two levels of SFRAs as described in the PPG;

Level One: A Level 1 Assessment should be carried out in local authority areas where flooding is not a major issue and where development pressures are low. The Assessment should be sufficiently detailed to allow application of the Sequential Test to the location of development and to identify whether development can be allocated outside high and medium flood risk areas, based on all sources of flooding, without application of the Exception Test.

Level Two: Where a Level 1 Assessment shows that land outside flood risk areas cannot appropriately accommodate all the necessary development, it may be necessary to increase the scope of the Assessment to a Level 2 to provide the information necessary for application of the Exception Test where appropriate. A Level 2 Strategic Flood Risk Assessment should consider the detailed nature of the flood characteristics within a flood zone including:

- flood probability;
- flood depth;

[1] Flooding in England: A national assessment of flood risk (2009) https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/292928/geho0609bqds-e-e.pdf

- flood velocity;
- rate of onset of flooding; and
- duration of flood

1.9 This document includes a general update and review of the 2009 SFRA, and the Level 1 assessment as required by the PPG. A more detailed assessment of allocations included in the emerging Runnymede 2030 Local Plan will then be carried out to form the Council's level 2 assessment, if required. The purpose of the Level 1 and Level 2 assessments which will form the Runnymede SFRA, is to collate and present the most up to date flood risk information for use by Runnymede Borough Council to inform the preparation of robust planning documents as part of the Runnymede 2030 Local Plan. The document also has a role in ensuring prudent decision-making by Development Management officers on a day-to-day basis. In order to achieve this, the SFRA will inform the application of the Sequential and Exception Tests, as required by the NPPF, taking into account all sources of flooding.

1.10 National planning policy, other relevant legislation and Environment Agency plans have been considered throughout the production of this SFRA, as well as the plans produced by Surrey County Council in their role as LLFA for Surrey. The document has been prepared in close consultation with the Environment Agency, Surrey County Council, as well as Runnymede Borough Council's emergency planner and drainage department.

The Duty to Co-operate

1.11 The Council is very mindful of the fact that under the Localism Act 2011, there is now a legal duty on LPAs to co-operate with one another, County Councils and other prescribed bodies to maximise the effectiveness within which certain activities are undertaken as far as they relate to a strategic cross boundary matters. The Council is of the opinion that flooding and flood risk are strategic cross boundary matters and as such the requirement for cooperation is engaged. The PPG lists the public bodies that are subject to the Duty (as prescribed in the Town and Country Planning (Local Planning) (England) Regulations 2012). A summary of the bodies consulted as part of the production of this SFRA (including the prescribed public bodies considered to be relevant to this piece of work) are contained in table 1 below:

Table 1: List of organisations consulted during the preparation of the Runnymede SFRA 2018

Body/organisation	General roles and responsibilities	Input into the Runnymede 2018 SFRA
Runnymede Borough Council (prescribed body)	Runnymede Borough Council (RBC) has a responsibility to consider flood risk both in decision making on planning applications and when developing its Local Plan. The NPPF requires Local Planning Authorities (LPAs) to undertake a SFRA and to use its findings, and those of other studies, to inform strategic land use planning decisions including the application of the Sequential Test which seeks to steer development towards areas of lowest flood risk prior to consideration of areas of greater risk. The SFRA will also have a role to play in the Council's emergency planning functions.	-Responsible for producing the 2018 SFRA. -Responsible for consultation with neighbouring Councils, Surrey County Council and other relevant bodies on the content of the SFRA.
Environment Agency (EA)(prescribed body)	The EA has the following key roles and responsibilities: - Managing flooding from main rivers and the sea; -Having a responsibility to provide a strategic overview for all flooding sources and coastal erosion; -Providing technical advice to LPAs and developers on how best to avoid, manage and reduce the adverse impacts of flooding. Part of this role involves advising LPAs on the preparation of spatial plans and sustainability appraisals as well as the evidence base documents underpinning Local Plans, including SFRAs; -Undertaking systematic modelling and mapping of fluvial flood risk associated with all main rivers, as well as producing mapping of surface water flood risk; Ensuring their water management and flood and coastal risk management activities protect and improve the biological and chemical quality of waterbodies, in order to achieve the objectives of the Water Framework and Habitat Directives, e.g. through the restoration of wetlands and removal of artificial barriers to fish migration.	-Supply of available datasets and other relevant information for use within the SFRA. -Carrying out a technical review of the SFRA at various stages in the process and provision of critical friend advice.

Body/organisation	General roles and responsibilities	Input into the Runnymede 2018 SFRA
Surrey County Council (SCC)(prescribed body)	As the LLFA under the Flood and Water Management Act (FWMA), SCC has a duty to take the lead in the coordination of local flood risk management, specifically defined as flooding from surface water, groundwater and ordinary watercourses. SCC is the consenting authority for structural changes to watercourses and also became a statutory consultee on major planning applications in relation to surface water drainage from 15th April 2015. SCC is also the Highways Authority for the County and therefore has responsibilities for achieving effective drainage of surface water from adopted roads insofar as ensuring that drains, including kerbs, road gullies and ditches and the pipe network which connects to the sewers, are maintained.	-Supply of available datasets relevant to the assessment of local sources of flooding (surface water, groundwater and ordinary watercourses). -Carrying out a technical review of the SFRA at various stages in the process and provision of critical friend advice. -Potentially involved in the implementation of any policy outcomes recommended in the SFRA which are subsequently taken forward by RBC that arise with respect to sustainable drainage, groundwater and/or ordinary watercourse risk management.
Thames Water Utilities Ltd (TWUL)	TWUL is responsible for surface water drainage from development via adopted sewers and for maintaining public sewers into which much of the highway drainage connects.	-TWUL will be requested to provide data on past sewer flooding in the Borough. -The Council will provide TWUL with the opportunity to comment on the SFRA at draft stage.
Highways England	Highways England (formerly the Highways Agency) is responsible for the construction and maintenance of motor-ways and major trunk roads in England. Highways England has sole responsibility and powers for managing the quantity and quality of road runoff that is col-lected within its network.	-Highways England will be requested to provide details of any known historic and recent flood risks along the motorways and major trunk roads in the Borough, details of areas that are susceptible to flooding, flood mitigation measures that have already been put in place, maintenance regimes and details of any planning future works in the borough. -The Council will provide Highways England with the

Body/organisation	General roles and responsibilities	Input into the Runnymede 2018 SFRA
		opportunity to comment on the SFRA at draft stage.
Network Rail	Network Rail run, maintain and develop Britain's rail tracks, signalling bridges, tunnels, level crossings, viaducts and 19 key stations.	-Network Rail will be requested to provide details of any known historic or recent flooding that has occurred across their infrastructure routes in the Borough, areas that are susceptible to flooding, flood mitigation measures that have already been put in place and maintenance regimes. -The Council will provide Network Rail with the opportunity to comment on the SFRA at draft stage.
The Office of Rail and Road (ORR) (prescribed body)	The Office of Rail and Road is the independent safety and economic regulator for Britain's railways. From 1st April 2015, ORR has also been the independent monitor of Highways England	-The Council will provide the Office of Rail and Road with the opportunity to comment on the SFRA at draft stage.
Basingstoke Canal Authority (BCA)	The Basingstoke Canal is jointly owned by Surrey and Hampshire County Councils. The BCA was set up in 1992 to manage the Basingstoke Canal as a maintaining agent on behalf of the two County Councils.	-The Council will provide the Basingstoke Canal Authority with the opportunity to comment on the SFRA at draft stage.
Natural England (prescribed body)	Natural England leads on the conservation, enhancement and management of the natural environment by: • Ensuring a healthy, well-functioning natural environment; • Inspiring more people to enjoy, understand and act for the natural environment; • Making the use and management of the environment more sustainable; and • Influencing decisions which secure the future of the natural environment.	-The Council will provide Natural England with the opportunity to comment on the SFRA at draft stage.
Neighbouring/nearby	The planning authorities in	-The Council will provide its

Body/organisation	General roles and responsibilities	Input into the Runnymede 2018 SFRA
Planning Authorities (prescribed bodies)	neighbouring/nearby councils have the same roles and responsibilities as outlined for RBC above.	neighbouring LPAs, and other LPAs as appropriate with the opportunity to comment on the SFRA at draft stage.

1.12 It should be noted that prior to finalising this SFRA, Runnymede Borough Council consulted its Duty to Cooperate partners on the draft document. This consultation was undertaken in late April 2016. The Council's Duty to Cooperate partners for flooding issues are listed in the Council's October 2015 Duty to Cooperate Scoping Framework. Seven responses were received in response to this consultation. A summary of the comments received and the Council's response to them can be viewed in appendix 7.

Data which has inputted into this SFRA

1.13 A considerable amount of existing information exists in respect of flooding and flood risk which has been inputted into this SFRA. This information includes (but is not limited to):

- Historical river flooding information;
- Information relating to localised flooding issues (surface water, groundwater and/or sewer related);
- Detailed flood risk (and zone) mapping;
- Topography (LiDAR).
- Geology

1.14 This data has been collated from a range of the sources, including from a number of the organisations listed in the table above, and together form the core dataset that has informed the SFRA process. An overview of the data collated, including their source, can be found in Appendix 1.

CHAPTER 2-POLICY CONTEXT

Background

2.1 Planning is driven by legislation and guidance developed at a national, (regional) and local level. The '*Making Space for Water*' report published by DEFRA (2005), identified that the severe flooding in mainland Europe in 2000 acted as a catalyst for the Government to provide robust guidance for flood risk management. Furthermore, a new approach to managing surface water and promoting sustainable drainage through better coordination and planning was presented in the '*Future Water*' publication by DEFRA (2008). The principles and recommendations were set out in the Pitt Review of the 2007 floods. The Review promoted a risk based approach to investment in flood risk management and urged the Government to commit to a strategic long term approach to such investment, planning up to 25 years ahead. The Review also promoted natural processes to manage surface water. These documents led to the enactment of the Flood and Water Management Act 2010.

2.2 This Act, together with the Flood Risk Regulations, which were introduced to implement the provisions of the European Floods Directive have led to major changes in responsibilities for the management of flood risk in England, in particular the management of surface water and groundwater flood risk. They have led to the creation of Lead Local Flood Authorities (LLFAs), who now have strategic responsibility for all flooding which is not associated with main rivers.

2.3 The high-profile flood events across the United Kingdom in 2007, the floods in Cumbria in 2009, the record breaking rainfall and extensive flooding in 2012 and the extensive flooding in December 2013/January 2014 have kept flood risk in the public eye and have made effective consideration of flood risk in the planning process even more important.

2.4 The most relevant planning policies/documents which are considered pertinent to this SFRA are summarised as follows:

NATIONAL PLANNING POLICY

The NPPF and PPG

2.5 When the Coalition Government came to power in 2010, it set about making substantial changes to the planning system. In particular, the Coalition Government changed the national planning guidance with the aim of making planning simpler and more accessible, reducing over 1,000 pages of national planning policies down to around 50 in the National Planning Policy Framework (NPPF) which came into force in March 2012. The NPPF replaced all the previous Planning Policy Statements (PPSs) and Planning Policy Guidance Notes (PPGNs), including PPS25: Development and Flood Risk, as well as other planning guidance. Alongside the NPPF is its accompanying PPG which provides further detailed guidance on the policies contained in the NPPF including policy on flooding (it should be noted that the PPG replaced the PPS25: Development and Flood Risk Practice Guide (2009) and the Technical Guidance to the NPPF (2012)). This 2018 SFRA has been produced in line with the policies in the NPPF and the guidance contained in the PPG.

2.6 The NPPF establishes a presumption in favour of sustainable development, where development that accords with a Borough's development plan (or when judged against the policies in the NPPF if the development plan for an area is absent, silent or relevant policies are out of date) should be approved without delay. It requires each Council to produce a Local Plan for its area that addresses the spatial implications of economic, social and environmental change. The NPPF states that a Local Plan should also set out the strategic priorities for the area.

2.7 The NPPF also confirms that each local planning authority should ensure that its Local Plan is based on adequate, up-to-date and relevant evidence about the economic, social and environmental characteristics and prospects of its area. Paragraph 100 goes on to state that, *'Local Plans should be supported by Strategic Flood Risk Assessment and develop policies to manage flood risk from all sources, taking account of advice from the Environment Agency and other relevant flood risk management bodies, such as lead local flood authorities and internal drainage boards*'. This SFRA will form part of the evidence base that underpins the Council's Runnymede 2030 Local Plan.

2.8 One of the key aims of the NPPF in relation to flooding and flood risk is to ensure that flood risk is taken into account, both in the plan making and decision taking processes to deliver sustainable development. Central to the NPPF is a sequential risk-based approach to flooding which aims to steer new development to areas with the lowest probability 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 probability of flooding (from any form of flooding). The NPPF states in paragraph 101 that a Council's SFRA should provide the basis for applying this sequential test.

2.9 The NPPF sets out the need to consider all sources of flood risk (such as groundwater, surface water and foul sewer flooding) in addition to the main fluvial and tidal sources in a SFRA. The implications of climate change on flood risk also require consideration so as to ensure that the Local Plan properly takes into account future risk and promotes sustainable development. When considering this point further, it is worthy of mention that the Government has also published legislation on climate change in the form of The Climate Change Act (2008), legislating for climate change mitigation and adaption. The Act imposes a duty on the UK for carbon emissions to be reduced by 80 percent by 2050 from a 1990 baseline.

2.10 To be balanced against the need to direct development to areas at the lowest risk of flooding, is the requirement of the NPPF to boost significantly the supply of housing and promote sustainable economic growth. LPAs are being tasked with making provision for the delivery of a wide choice of high quality homes, widening opportunities for home ownership and creating sustainable, inclusive and mixed communities. As such, over the plan period, it is expected that there will be significant pressure to deliver an increased level of new homes in the Borough. The Council as well as completing its level 1 assessment for this SFRA, published its Strategic Housing Market Assessment (SHMA) in November 2015 which has identified the level of housing need in Runnymede (and Spelthorne) up to 2033. A Green Belt Review has

also been carried out which has identified pieces of land within the Green Belt in Runnymede which no longer meet the purposes of including land in the Green Belt or which only weakly fulfil the purposes of including land within the Green Belt and which could be returned to the Urban Area to help meet the level of housing need identified in the SHMA (it should be noted that some of this land could also be used to help meet other identified development needs such as employment needs). Any potential allocations proposed through the Local Plan process will be considered in more detail in the level 2 assessment if any parts of these sites are located in flood zones 2 or 3.

Sustainable drainage systems: Regulatory regime and non-technical standards

2.11 On the 18th December 2014 the Secretary of State for Communities and Local Government made a written statement to the House of Commons regarding sustainable drainage systems. It stated that the Government expects local planning policies and decisions on planning applications relating to major development - developments of 10 dwellings or more; or equivalent non-residential or mixed development (as set out in Article 2(1) of the Town and Country Planning (Development Management Procedure) (England) Order 2010) to ensure that sustainable drainage systems for the management of run-off are put in place, unless demonstrated to be inappropriate.

2.12 Further the statement said that in considering major planning applications, local planning authorities should consult the relevant lead local flood authority on the management of surface water; 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 in place for ongoing maintenance over the lifetime of the development. The sustainable drainage system should be designed to ensure that the maintenance and operation requirements are economically proportionate.

2.13 As a part or these regulatory changes the Government introduced non-regulatory technical guidance for SuDS on 23rd March 2015 for the design, maintenance and operation of sustainable drainage systems. These non-technical standards should be read in conjunction with the NPPF and PPG, the latter of which contains national guidance on SuDS including the statement that new developments should only be considered appropriate in areas at risk of flooding if priority has been given to the use of sustainable drainage systems (paragraph: 079 Reference ID: 7-079-20150415).

2.14 The regulatory changes relating to SuDS came into effect on 6 April 2015. More information about SuDS can be found in chapter 8 of this SFRA.

OTHER NATIONAL LEGISLATION

The Development Management Procedure Order 2015

2.15 The Development Management Procedure Order (DMPO) 2015 describes the statutory bodies (including the Environment Agency) that a Local Authority must consult with before the grant of planning permission for certain types of development.

The Water Framework Directive

2.16 In October 2000 'Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy', in short the Water Framework Directive (WFD), was adopted and came into force in December 2000. The purpose of the Directive is to establish a framework for the protection of inland surface waters (rivers and lakes), transitional waters (estuaries), coastal waters and groundwater. It aims to ensure that all aquatic ecosystems and, with regard to their water needs, terrestrial ecosystems and wetlands, meet 'good status' by 2015. Where this has not been possible and subject to the criteria set out in the Directive, the aim is to now achieve good status by 2021 or 2027. Furthermore, WFD aims to prevent deterioration in the status of surface waters and groundwater. For heavily modified and artificial water bodies, the aim is to achieve good ecological potential and good surface water chemical status.

2.17 The Directive requires Member States in the EU to establish river basin districts and for each of these, a river basin management plan (RBMP). Runnymede is in the Thames River Basin District and the Thames River Basin District RBMP is discussed in more detail later in this chapter. The Directive envisages a cyclical process where river basin management plans are prepared, implemented and reviewed every six years. There are four distinct elements to the river basin planning cycle: characterisation and assessment of impacts on river basin districts; environmental monitoring; the setting of environmental objectives; and the design and implementation of the programme of measures needed to achieve them.

2.18 Transposition into national law in England and Wales occurred through the Water Environment (Water Framework Directive) (England and Wales) Regulations 2003 (Statutory Instrument 2003 No. 3242).

COUNTY LEVEL PLANNING POLICY

2.19 Since the 2009 SFRA was produced, SCC has become the LLFA for Surrey. This is following the enactment of the Flood and Water Management Act in 2010. The County Council's main duties include:

- Application and monitoring of a Local Flood Risk Management Strategy for Surrey. This will be guided by the EA's National Flood and Coastal Risk Management Strategy;
- Cooperation with other 'Risk Management Authorities', which in Surrey include the 11 district and borough councils, the water utility companies and the EA;
- Maintenance of a register of local structures and features that are likely to have a significant effect on flood risk;
- In the event of a significant flood, investigation to an appropriate level as to whether the relevant flood risk management functions were exercised correctly;
- Contribution towards sustainable development when exercising a flood risk management function.

2.20 In addition to the above, since 15th April 2015, as mentioned above, LLFAs have also been a statutory consultee on major planning applications in relation to surface water drainage. This

requires them to assess surface water drainage proposals including sustainable drainage and provide LPAs with technical knowledge and expertise on such matters.

Surrey Preliminary Flood Risk Assessment (PFRA) and Local Flood Risk Management Strategy (LFRMS)

2.21 The Surrey PFRA was adopted in June 2011. This document has been prepared to help SCC meet their duties to manage local flood risk and deliver the requirements of the Flood Risk Regulations 2009 in their role as a LLFA. The aim of the PFRA is to provide a broad overview of flooding over the administrative area of Surrey so that along with information from other unitary and county councils, a national picture of flooding can be developed by the EA.

2.22 SCC has also produced its LFRMS. The document was first published in 2014 following endorsement by the Surrey Flood Risk Partnership Board, and became a statutory document, which Surrey's local authorities, water companies and internal drainage boards must have regard to. The document was refreshed in 2017.

THE DEVELOPMENT PLAN FOR RUNNYMEDE

2.23 The NPPF is clear that under the terms of the Planning and Compulsory Purchase Act (2004), applications for planning permission must be determined in accordance with the development plan unless material considerations indicate otherwise.

2.24 For Runnymede, at the current time, the development plan is formed by the saved policies within the Runnymede Borough Local Plan, Second Alteration (April 2001), the adopted waste and minerals plans produced by Surrey County Council and the South East Plan. It is important to note however that the South East Plan (the regional spatial strategy for the South East) was partially revoked on 25th March 2013 and the only policy which remains and which is relevant to Runnymede is NRM 6 which relates to new residential development proposed near the TBHSPA. As such, whilst policy NRM 6 still forms part of the development plan for Runnymede, it is considered that this remaining regional policy is not relevant in the preparation of this SFRA, other than in highlighting the potential constraint that the TBHSPA places on development within Runnymede (as Runnymede Is located in close proximity to the Chobham Common SPA).

2.25 Of particular relevance, the 2001 Runnymede Borough Local Plan includes saved policies on Land Drainage (SV1), Flooding (SV2) and Water Quality protection (SV2A). Policy SV2 manages development so that it does not:

- Impede the flow of flood water;
- Reduce the capacity of the flood plain to store water; and
- Increase the number of people or properties at risk from flooding.

2.26 Up until July 2014, the Council was progressing its Local Plan Core Strategy. This plan was proposed to cover the period 2013-2028 and would have contained a set of strategic policies which would have guided development in the Borough over this period. The Council formally

withdrew this Plan in July 2014 following concerns being raised by the Council's independently appointed Inspector that the Council's evidence with regard to housing need and provision was insufficiently robust. The Inspector also found that the requirements of the Duty to Co-operate had not been fulfilled.

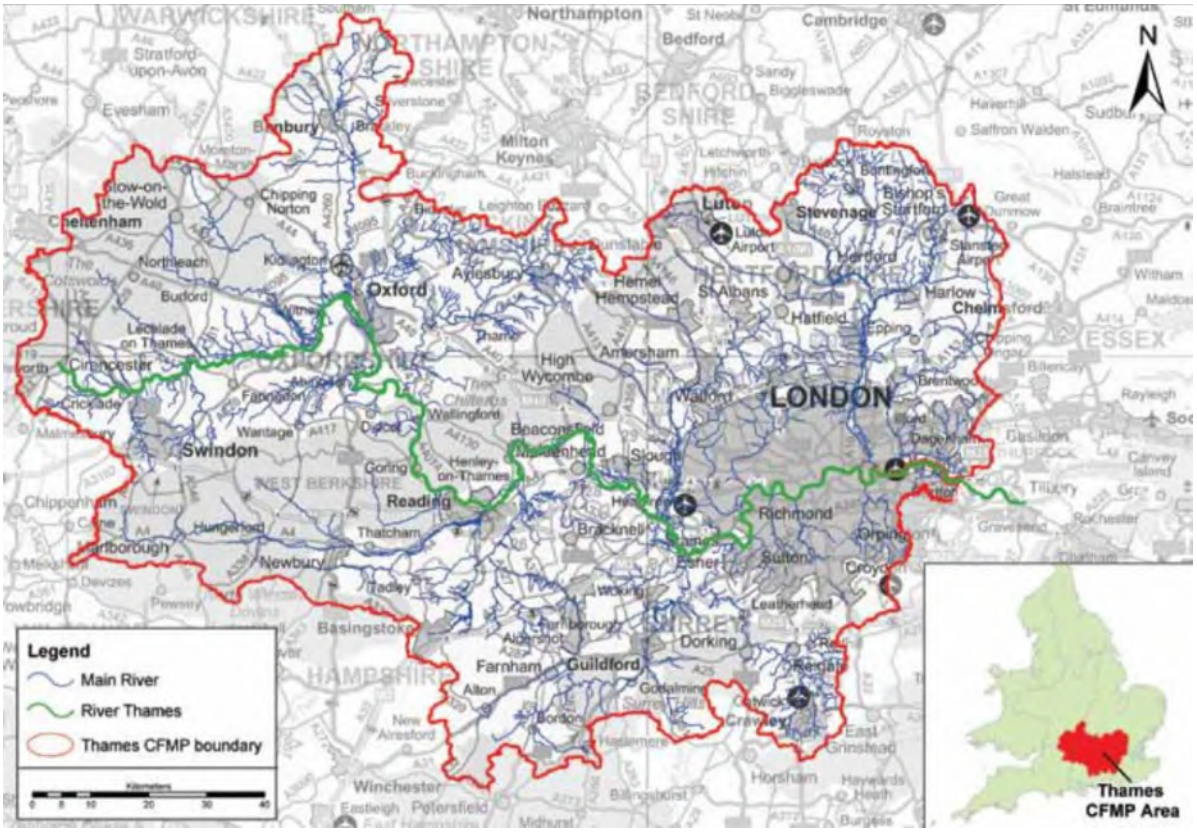
2.27 A new Local Plan – to be known as 'Runnymede 2030' is currently being prepared – this will contain all policies (both strategic policies and more detailed Development Management level polices), and all land use allocations necessary to guide development in the Borough up to 2030.

ENVIRONMENT AGENCY PLANS

The Thames Catchment Flood Management Plan (2009)

2.28 Runnymede is identified as being located within the Thames Catchment area. There are over 135,000 properties in the Thames Catchment that have more than a 1% chance of flooding in any one year from rivers. Runnymede is one of only 4 Local Authorities within the catchment that has over 5000 properties at risk of flooding. The extent of the Thames catchment can be seen in Figure 1 below.

Figure 1: extent of the Thames Catchment



Source: Environment Agency Thames Catchment Flood Management Plan, summary report, December 2009

2.29 Within the Thames CFMP the following contextual information is provided on the Thames CFMP area which is relevant to Runnymede:

'Towards the east, the region is more urban in character [than the west]. Outside of London through Hertfordshire, Buckinghamshire and Surrey most of the rivers are still in a largely natural state. In London, the majority of rivers have been highly modified to carry water efficiently through artificial and straightened channels. There are nine major tributaries of the River Thames in London. Most of their floodplains have been heavily developed and flooding can happen very quickly. Thames has a mixed geology, consisting of chalk, limestone, gravel, sand and clay. In the chalk areas (for example Chilterns, Berkshire Downs) and limestone areas (Cotswolds) water soaks into the ground and is released at a slow rate into the rivers. In contrast to this, the clay catchments (London, Thame), respond much quicker. This is because clay is impermeable and more rainfall runs directly into the rivers, quickly affecting water levels.

Water levels in the River Thames rise slowly after rainfall. But the response of the smaller rivers that flow into the Thames varies depending on factors such as the size of the catchment area, geology, slope and land use'.

2.30 The Thames CFMP is one of 10 CFMPs prepared for England and Wales. Within the CFMPs, all types of inland flood risk/flooding have been assessed including flooding from rivers, ground water, surface water and tidal flooding. The role of CFMPs is to help gain a better understanding of the scale and extent of flooding now and in the future and establish flood risk management policies which will deliver sustainable flood risk management for the long term.

2.31 The Thames catchment is split initially into 43 different geographical areas. These areas have then been grouped together into 9 categories (known as sub areas) which contain geographical areas that have similar physical characteristics, levels of risk and proposed policy recommendations. Appendix 2 summarises the different sub areas that are located in Runnymede (3 in total), and then the vision and preferred policies for the wider categories in which they are located.

Flood risk management plans (FRMPs): 2015-2021

2.32 The FRMPs were published in their final form on the Government's website in March 2016. These plans highlight the hazards and risks of flooding from rivers, the sea, surface water, groundwater and reservoirs, and set out how Risk Management Authorities (RMAs) work together with communities to manage flood risk.

Thames River Basin District River Basin Management Plan (RBMP) (2015)[2]

2.33 The Thames river basin district covers over 16,200km^2. It encompasses all of Greater London and extends from north Oxfordshire southwards to Surrey and from Gloucester in the west to the Thames Estuary and parts of Kent in the east.

2.34 This plan highlights that there are 4 key roles in managing the water environment and local authorities have a role to play in each:

- Regulator - regulates and enforces the activities of operators.
- Operator - undertakes activities that could potentially influence either directly or indirectly the quality of the water environment. Many of these activities are regulated.
- Influencer - educates, influences or advises others on how to reduce their impact on the water environment.
- Undertakes projects - undertakes environmental improvement projects (for example, habitat restoration) to reduce the damage caused by others, usually in partnership with other groups.

2.35 The document contains a number of environmental objectives to drive improvements in the water environment by 2021 and highlights particular issues that exist in the River Basin District alongside recommendations for how these issues can be managed.

2.36 It is important to note that developers have a responsibility to avoid deterioration of the ecological and chemical quality of watercourses and improve it where possible. There is potential to align flood alleviation proposals with measures outlined in the River Basin Management Plan which relate to addressing WFD objectives, by working in partnership. For example, the Wey Landscape Partnership, currently hosted by the Surrey Wildlife Trust, was set up to inform the River Basin Management Plan process and help implement WFD measures at a local level by:

- providing local evidence
- targeting and coordinating action
- identifying and accessing funding for improvements in the catchment
- incorporating river basin management planning into the wider environmental management of the catchment"

2.37 The catchment based approach advocated by the RBMP aims to encourage groups/organisations to work together more effectively to deal with environmental problems in a more integrated and holistic way. The Wey Landscape Partnership is currently in the process of developing its own catchment restoration strategy. This includes developing its interaction with local flood forums, and championing natural approaches to flood risk

2

https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/500548/Thames_RBD_Part_1_river_basin_management_plan.pdf

alleviation through floodplain habitat restoration and also via SuDS with its local authority partners.

CHAPTER 3-LOCAL CONTEXT

3.1 This section provides a description of the physical study area of Runnymede to inform the remainder of the SFRA.

Location

3.2 Runnymede is located in north west Surrey. It is bordered by 5 local authorities; Windsor and Maidenhead to the north, Spelthorne and Elmbridge to the east, Woking to the south and Surrey Heath to the south west. The Borough contains three main towns; Addlestone, Egham and Chertsey, alongside a range of smaller settlements at Englefield Green, Virginia Water, New Haw, Woodham, Ottershaw, Lyne, Longcross and Thorpe (the last three settlements listed are all located in the Green Belt). In total approximately 79% of the Borough is located in the Green Belt. The remainder of the Borough including its town centres is located in the Urban Area. In total the borough is split into 14 wards which are as follows:

- Addlestone Bourneside
- Addlestone North
- Chertsey Meads
- Chertsey South and Rowtown
- Chertsey St Anns
- Egham Hythe
- Egham Town
- Englefield Green East
- Englefield Green West
- Foxhills
- New Haw
- Thorpe
- Virginia Water
- Woodham

3.3 Figure 2 is a contextual plan of the Borough showing the extent of the Green Belt, the location of the neighbouring local authorities, the ward boundaries and the location of the main rivers which flow through the Borough (as described in more detail below).

Topography

3.4 Figure 3 shows the topography of the Borough. The River Thames flows along the eastern edge of the Borough where the land is low lying at levels of approximately 5-15m above Ordnance Datum (AOD). In the south western quadrant of the Borough the topography ranges from approximately 25-60m AOD but averaging around 40m AOD in the main. Land at the lower end of this range is observed in the river corridors and in the Woodham and New Haw area, rising to in the region of 40m AOD around Longcross and Ottershaw and continuing to generally rise as one moves further north, with land rising in the north west quadrant of the Borough especially in the vicinity of Englefield Green to 85 AOD at its highest point.

Geology

3.5 Figures 4 and 5 show the superficial and bedrock geology across the Borough.

3.6 The geology of the Borough comprises a covering of superficial deposits over approximately 50% of its area. This is mainly in the eastern half of the Borough although pockets also exist in the Englefield Green and Virginia Water areas.

3.7 The superficial deposits in the area include river terrace deposits, alluvium and head. The main gravels terraces in the eastern side of the Borough are from the Kempton Park Gravel Formation and the Shepperton Gravel Formation with large areas of alluvium and silt also observed. In Addlestone and its suburbs are also pockets of gravel from the Lynch Hill Gravel Formation.

3.8 On the western side of the Borough in the Virginia Water area is an isolated pocket of gravel from the Taplow Gravel Formation. In and around Englefield Green in particular are sizeable areas of river terrace deposits.

3.9 The predominant bedrock geology is the Bagshot Formation (which underlays approximately two thirds of the borough). Egham and parts of Thorpe are underlain by the London Clay Formation (Clay). On the western side of the Borough are also areas underlain by the Windlesham Formation. A sizable pocket of Claygate member (sand) can be observed in the central/eastern area of the Borough under part of Thorpe Village.

3.10 The London Clay comprises clayey silt beds grading to silty fine-grained sand. This is found beneath the superficial deposits in the northern part of the Borough. The upper sandier part of the London Clay Formation is known as the Claygate Member to distinguish its coarser-grained nature. This is present in the central part of Borough in the Thorpe area. In the Englefield Green, Virginia Water, Addlestone and Chertsey areas, the Claygate Member is overlain by Bagshot Formation. This formation is characterised by fine grained yellow orange brown quartz sand with frequent clay laminations and some silt layers, and flint pebble beds in the upper horizons.

Aquifers

3.11 The bedrock underlying the majority of the borough (with the exception of the north eastern quadrant of the borough which covers the Egham and Thorpe areas) is defined as a secondary A aquifer. The remaining north eastern quadrant of the Borough is designated as unproductive strata.

3.12 The superficial deposits present in the Borough are classified in places as principal aquifers and in others, secondary aquifers (primarily Secondary A aquifers but in some places Secondary (undifferentiated) aquifers).

3.13 The Environment Agency defines aquifers and unproductive strata in the following way:

Principal aquifers: These are layers of rock or drift deposits that have high intergranular and/or fracture permeability - meaning they usually provide a high level of water storage. They may support water supply and/or river base flow on a strategic scale. In most cases, principal aquifers are aquifers previously designated as major aquifer.

Secondary A aquifers: permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers.

Secondary B aquifers: predominantly lower permeability layers which may store and yield limited amounts of groundwater due to localised features such as fissures, thin permeable horizons and weathering. These are generally the water-bearing parts of the former non-aquifers (none found in Runnymede Borough).

Secondary undifferentiated aquifers: Assigned in cases where it has not been possible to attribute either category A or B to a rock type. In most cases, this means that the layer in question has previously been designated as both minor and non-aquifer in different locations due to the variable characteristics of the rock type.

Unproductive strata: These are rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow.

3.14 Aquifer maps for Runnymede Borough (both looking at superficial drift deposits and bedrock) can be found at figures 6 and 7.

Main Rivers

3.15 In England the river systems are divided into two categories, main rivers and ordinary watercourses. Main rivers are designated as such and are shown on the statutory map of main rivers. All other rivers, streams and watercourses are referred to as ordinary watercourses. Main Rivers fall under the direct supervision of the EA whereas ordinary watercourses fall under the supervision of the respective LLFA.

3.16 The River Thames is the principal main river within the Runnymede administrative area. Its main tributaries within this area are the River Wey, the Chertsey Bourne and the Addlestone Bourne, all main rivers. There are an additional 8 main rivers which are, in turn, tributaries of these latter three rivers. All of the main rivers that run through Runnymede can be seen on the context map in figure 2 and are listed as follows:

The River Thames: The River Thames flows along the north eastern boundary of the Borough. The **Abbey River**, is effectively a subsidiary stream of the Thames that connects between Penton Hook and just downstream of Chertsey Weir.

The Chertsey Bourne: The Chertsey Bourne flows from Virginia Water Lake in the west through Chertsey to join the Thames at Hamm Court.

The Moat flows from Thorpe Lea, passing through St. Ann's Lake in Thorpe Park to join the Chertsey Bourne just above Hampertone Bridge in Chertsey.

The Ripley Springs watercourse flows from Royal Holloway, University of London in Englefield Green through to join the Moat at Clock House Lane West.

The Hurst Ditch flows between Stroude Road and Hurst, connecting into the Moat at Thorpe Green.

The Meadlake Ditch flows south from Tinsey Close in Pooley Green, through the Fleet and Abbey Lakes in Thorpe Park to join the Moat in St. Ann's Lake.

The Rutherwyk Road Ditch flows from north of the railway line at Rutherwyk Road through to the Chertsey Bourne in Gogmore Farm Park.

The River Wey: The River Wey flows along the south eastern boundary of the Borough. The catchment of the Wey lies within Hampshire and Surrey and has a total area of approx. 904 km2. It falls approximately 190m in level, and is approximately 104 km in length from its source in Hampshire to the confluence with the Thames near Weybridge urban centre. The Lower Wey is navigable from its confluence with the Thames up to Godalming. It includes a number of navigation channels separate from the Main River, with water levels regulated by structures such as locks and weirs.

The Addlestone Bourne is a tributary of the Wey with it upper catchments at Chobham and Bagshot. Within the Borough it flows from just upstream of Dunford Bridge on the A320 in Ottershaw through Addlestone to join the Wey at Weybridge. It should also be noted that between the Addlestone Bourne and the Chertsey Bourne is the **Woburn Park Stream** which is also a main river.

The Rive Ditch which drains from Sheerwater in Woking, flows along the south side of the Basingstoke Canal through to Byfleet and New Haw Station and then joins the River Wey near to Nine Arches Bridge.

Ordinary Watercouses, Highway Drainage Ditches and Canals

3.17 Subsidiary to the main rivers there is a network of ordinary watercourses that drain into them. Figure 8 shows the detailed river network in Runnymede which includes the locations of the ordinary watercourses which have been mapped. There is also a network of roadside ditches, which either connect into the watercourse system or soak into the ground water. The responsibility for these ditches generally belongs to the adjacent landowner but come under the supervision of Surrey County Council in its capacity as the local highway authority or as LLFA.

3.18 In addition to the above, the Borough also contains part of the Basingstoke Canal and Wey Navigation, Virginia Water Lake and Obelisk Pond which are classified as impounded water bodies. Flooding from these sources will be discussed in more detail in Chapter 5.

CHAPTER 4-OVERVIEW OF FLUVIAL FLOOD RISKS IN RUNNYMEDE

General overview

4.1 This chapter of the report provides an overview of the identified fluvial flood risks across the Borough and describes historic flooding events that have occurred. The chapter also confirms the extent of the flood zones which exist in Runnymede and the types of development which may be permissible in each zone (in line with national planning policy). Flood risks from other sources of flooding, and a qualified assessment of the risk they pose in Runnymede are addressed in Chapter 5.

4.2 Fluvial flooding from the River Thames and its main tributaries; the Chertsey Bourne, the Addlestone Bourne and River Wey, are the primary sources of flooding in Runnymede. The Chertsey Bourne and Addlestone Bourne are connected in the south by the Woodham Park Stream, but have separate outfalls into the River Wey, which subsequently outfalls into the River Thames. Areas potentially at risk from flooding from the Bourne and the River Wey include Woodham, New Haw, Addlestone and Hamm Moor.

4.3 Other sources of fluvial flooding include the Hurst Ditch, Meadlake Ditch and the Moat which are all tributaries of the Chertsey Bourne system that flow southwards through Egham, Egham Hythe and Thorpe. Although the risk of flooding is more constrained within these river valleys, because their floodplains are much less extensive and carry smaller volumes of flow, where the Hurst Ditch flows parallel to the Chertsey Bourne near Thorpe, the combined flood zone extents create a larger area of potential flood risk. Meadlake Ditch and the Moat also lie within the floodplain of the River Thames. Furthermore, there are thought to be integrated flood risks from the tributaries of the Chertsey Bourne and River Thames, due to backing up effects as well as high groundwater levels when the Thames is high. The ditches in the Egham Hythe to Chertsey area therefore not only present a risk of flooding due to local rainstorms but also from flood water backup from the Thames/ Chertsey Bourne.

4.4 The floodplain of the River Thames is fairly extensive on its eastern side within Runnymede, due to the flat, low lying nature of the land, and presents the greatest fluvial flood risk for the Borough. The Thames Catchment Flood Management Plan (CFMP) identifies this area in Runnymede as developed floodplain with no formal built flood defences. To clarify, a formal defence is classified as a structure that is specifically built for the purposes of flood defence. Informal flood defences include structures that may act to contain flood water but were not originally constructed for that purpose. While there are certain structures such as the M3 and M25 motorways and railway lines in the Borough that could act as informal flood defences, they are not widely recognised as flood defences themselves as they were not constructed for the purpose of protecting properties from flooding.

4.5 The Environment Agency has provided an extract from the Asset Information Management System (AIMS) which contains details of flood risk management assets associated with Main Rivers in Runnymede. The data shows that these assets include a number of different structures, including weirs, outfalls, trash screens etc. The location of these flood risk management assets can be seen in figure 9 and are described in more detail in appendix 3.

4.6 The mechanism for flooding from the River Thames is generally prolonged episodes of heavy rainfall, which affords good time for flood warnings to be issued. However, smaller tributaries of the River Thames within Runnymede, such as the Chertsey and Addlestone Bournes, will have considerably less time for warnings to be issued in advance of an expected flood incident.

Historic records of flooding in the Borough

4.7 There is a long record of flooding from rivers in the Borough, and in particular from the River Thames. Major recorded flood events occurred in 1898, 1947, 1968, 2003 and late 2013-early 2014. A flood warning was also issued for the area in the summer of 2007. Although property flooding did not occur during this event the Thames did overtop its banks in places (well above the flood alert threshold at Bell Weir Lock). The EA also holds records of fluvial flooding in Runnymede for the years 1929, 1954, 1974, 1988, 1990 and 2000. The maximum extents of historical fluvial flooding incidents that have been recorded in the Borough are presented in figures 10 a, b, c and d (with the exception of the 1898 flood event). This demonstrates that much of Thorpe Park experiences flooding and is an important area of the Thames floodplain. Furthermore the urban areas that have been most affected include parts of Egham Hythe and Chertsey from the Thames and the Chertsey Bourne, and New Haw from the Addlestone Bourne. As well as flooding from the Thames, other watercourses in the Borough have been sources of flooding mainly after heavy rainfall and as a result of culverting.

2013-2014 flood event

4.8 In the most recent 2013-14 flood event which took place from a few days before Christmas 2013 until the end of February 2014, the UK was battered by a series of unprecedented storms that brought trees down, severed power lines, broke through coastal flood defences and caused inland flooding in many areas. Over the winter months in 2013-14 there was 446 mm of rainfall across the South East of England. The rainfall levels were the highest ever recorded. The overall winter rainfall in Surrey was 560mm or 275% of the long term average. The EA has indicated that over a 66 day period during this period, some 2,015 million tonnes of water flowed along the Thames. Over the same timescale, this compares with 1,525 million tonnes in 1947 and 1,270 million tonnes in 1894, although the peaks of both these earlier significant events were over a shorter timescale and had higher peak flow levels.

4.9 In Runnymede, the River Wey was the first of the Borough's rivers to react to the heavy rainfall that occurred in December 2013. A Flood Warning was issued on 24th December 2013 at Godalming and Guildford. The flood warning on the River Wey at Weybridge was issued on 25th December 2013 which remained in place until 27th December (appendix 4 contains the Environment Agency's publication: Flood Warnings-what they are and what they do). Residents from Wey Meadows were evacuated on 25th December by Surrey Fire and Rescue. Further concerns of significant flooding on the Lower Wey were expressed by the Environment Agency on 4th January 2014. Fortunately, the peak of the flood was lower than anticipated and there was no significant flooding from the Wey within Runnymede.

4.10 Flood Warnings were issued for the full length of the Thames in Runnymede from Windsor Road to Hamm Court in early January 2014 (4th - 8th) and these remained in force until 14th – 16th January. In Chertsey, a Flood Warning was in place in respect of the River Bourne from the 7th – 11th January. During this period, only properties closest to the River Thames were surrounded by floodwater and this affected Windsor Road, Laleham Reach and Hamm Court.

4.11 There was a further period of heavy rainfall at the beginning of February. This, combined with the fact that the river flow was still high due the raised groundwater levels and a saturated catchment meant that the levels again rose on the Thames. The EA predicted that the river would rise to at least 2003 levels (1 in 20 year event) and could be as high as the 1947 flood levels (1 in 50 year event). They estimated that the peak levels would occur around 12th – 13th February. On 9th February 2014 the Environment Agency, in consultation with the Local Resilience Forums, issued Severe Flood Warnings and a Major Incident was declared. At Staines, the highest level was achieved on the afternoon of 11th February, which was maintained into much of 12th.

4.12 Between 8th – 9th February, the Thames, which was already out of bank, rapidly spread from roads off Chertsey Lane, Staines within Runnymede such as Bundy's Way, Cooper's Close, Timsway, Mayfield Gardens and Temple Gardens. It also started to impact on Penton Hook (where there is a large mobile home park) and further into Hamm Court. The Thames continued to rise and flooded from Chertsey Lane into areas such as Bowes Road, Wapshott Road, Green Lane, Aymer Close, Aymer Drive, Blackett Close and Norlands Lane. By 11th February, flood water had poured into the Meadlake Ditch, which flows north south/ south east through Pooley Green and Egham Hythe. This caused extensive flooding in Albany Place, Ayebridges Avenue, Bishop's Way, Conifer Lane, Holland Gardens, Mullens Road, Oak Avenue, Park Avenue, Pooley Green Road, Roundway, South Avenue, Vicarage Road and Vicarage Crescent.

4.13 Overall in Runnymede, during the late 2013-early 2014 flood event it is estimated that 742 households flooded internally. Several thousand households were surrounded by deep floodwater. Approximately 60 businesses directly impacted applied for grant relief with the overall number of businesses affected directly and indirectly estimated to be considerably higher.

4.14 In Chertsey, flooding from the River Thames affected Dockett Eddy, Chertsey Meads, Bridge Road, Bridge Wharf and Chaseside Gardens. Whilst the Chertsey Bourne did burst its banks during the flood event, the damage caused was less extensive than occurred in 2003 (over 100 properties were flooded by the Chertsey Bourne in 2003 compared to less than 20 in 2013/14). Even so, roads closest to the Bourne were flooded. These included Eastworth Road, Bramley Close, Fordwater Road, St Ann's Road and Twynersh Avenue.

Definition of fluvial flood zones

4.15 The PPG defines 4 different flood zones. These refer to the probability of river and sea flooding, ignoring the presence of defences and are described in more detail in table 2 below. The Flood Zones described throughout this SFRA are based on the flood extent datasets held

by the EA. Flood zones 1, 2 and 3 are shown on the EA's Flood Map for Planning (rivers and sea) which is available on the EA's website[3] and this same data is also shown on the Council's interactive mapping system known as rMaps[4]. The Flood Map for Planning has been in the public domain in its current form since 7th October 2004 and was developed using national generalised modelling (JFLOW). Since its initial publication, the EA has routinely updated and revised the Flood Map using the results from their programme of catchment studies, entailing topographic surveys and hydrological and/or hydraulic modelling. The EA provides the Council with quarterly updates of this data which is reflected on rMaps. The Flood Map for Planning as it appeared at the time of producing this study can be viewed at figure 11. Post publication of this SFRA, applicants and their agents should check the most up to date flood map on either the Environment Agency's website or on the Council's rMaps system. The breakdown of flood zones 3A and 3B cannot be determined when looking at the Flood Map for Planning. It is for a Local Authority to define the extent of the functional floodplain (flood zone 3B) in their area. This is discussed later in this chapter. When the Flood Map for Planning is uploaded on the Council's interactive mapping system rMaps it is possible to distinguish between flood zones 3A and 3B as the extent of flood zone 3B also has its own layer. It is only the remaining part of flood zone 3 as shown on the Flood Map for Planning which is defined as flood zone 3A in Runnymede.

4.16 The Flood Zones shown on the Environment Agency's Flood Map for Planning do not take account of the possible impacts of climate change and consequent changes in the future probability of flooding. The impact of climate change on flood risk in Runnymede Borough is considered in more detail in the next section of this chapter.

Table 2: Fluvial Flood Zones (as reproduced from information in the PPG-table below only considers river flooding as sea flooding is not relevant to Runnymede Borough)

Flood Zone	Definition
Zone 1-low probability	Land having a less than 1 in 1,000 (0.1%) annual probability of river flooding in any given year. (Shown as 'clear' on the EA Flood Map – all land outside Zones 2 and 3)
Zone 2-Medium probability	Land having between a 1 in 1,000 (0.1%) and 1 in 100 (1%) annual probability of river flooding in any given year. (Land shown in light blue on the EA Flood Map)
Zone 3A-High probability	Land having a 1 in 100 or greater annual probability of river flooding in any given year (Land shown in dark blue on the EA

[3] http://maps.environment-agency.gov.uk/wiyby/wiybyController?x=357683.0&y=355134.0&scale=1&layerGroups=default&ep=map&textonly=off&lang=_e&topic=floodmap#x=489498&y=170825&lg=1,2,10,&scale=5

[4] http://maps.runnymede.gov.uk/website/rmaps/main.html#

	Flood Map)
Zone 3B-The 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 Strategic Flood Risk Assessments areas of functional floodplain and its boundaries accordingly, in agreement with the Environment Agency (not separately distinguished from Zone 3a on the Flood Map)

Source: Planning Practice Guidance, Paragraph: 065, Reference ID: 7-065-20140306

4.17 It should be noted that in addition to the data provided by the Environment Agency in their quarterly updates of the Flood Map for Planning, during the production of this SFRA, the Environment Agency also provided the Council with detailed model extents which consider different flood events e.g. 20%, 5%, 1%, 1% + climate change and 0.1%. These additional datasets have been relied upon in the production of this SFRA as necessary. As noted earlier in this document, a summary of the data that has been used in the production of this SFRA is contained in appendix 1.

4.18 The Environment Agency's Risk of Flooding from Rivers and Sea map confirms the risk of flooding across Runnymede. This categorisation has been reproduced at table 3 below. This mapping output is produced using different data to that used to produce the Flood Map for Planning (rivers and sea) and includes flood defences (which the Flood Map for Planning does not). The different categorisations of risk as shown on this map are as follows:

Table 3: categories of risk-risk of flooding from rivers and sea

Category of risk	Risk
High	Greater than 1 in 30 (3.3%) chance of flooding in any given year.
Medium	Less than 1 in 30 (3.3%) but greater than or equal to 1 in 100 (1%) chance of flooding in any given year.
Low	Less than 1 in 100 (1%) but greater than or equal to 1 in 1,000 (0.1%) chance of flooding in any given year
Very low	Less than 1 in 1,000 (0.1%) chance of flooding in any given year

Source: Produced using information from the Environment Agency Risk of Flooding from Rivers and Sea map

Dry islands

4.19 The definition of what constitutes a dry island is not clear cut. Neither the NPPF nor the PPG specifically mention dry islands and do not provide any criteria to indicate what constitutes one. However, the NPPF and PPG do highlight the need for consideration of safe access and

escape routes for developments in flood risk areas. In simple terms dry islands are areas of land either in flood zone 1 or 2 that are surrounded by land at a higher risk of flooding.

4.20 To plot dry islands in Runnymede, the 1 in 100 (plus 20% on river flows) flood models provided by the Environment Agency have been used to map all such areas that are greater than 0.5 hectares, and these areas are presented in figure 12. This figure shows that there are a number of dry islands in the eastern part of the Borough. In the urban area there are a number of dry islands in Egham Hythe and two in Chertsey. The remaining dry islands are generally located in the Green Belt.

4.21 It should also be noted that the Environment Agency modelling used to plot the dry islands for the purpose of this SFRA relates to the Lower Thames, Lower Wey, Chertsey Bourne and Addlestone Bourne. There may however be dry islands within Runnymede that are created as a result of other watercourses which are not modelled.

4.22 The issue of safe access and escape routes for developments in dry islands is discussed in chapter 8.

Climate change

4.23 Addressing climate change is one of the core land use planning principles that the NPPF expects Local Authorities to underpin both plan-making and decision-taking. A considerable amount of research is being carried out worldwide in an endeavour to quantify the impacts that climate change is likely to have on flooding in future years.

4.24 In planning for climate change, it is important that applicants consider the potential impacts of climate change over the lifetime of a development during the design stage, and in any supporting Flood Risk Assessment. This will help to minimise vulnerability and provide resilience to flooding in the future. Guidance is clear that the impact of climate change must also be carefully considered in the production of Strategic Flood Risk Assessments.

4.25 The Environment Agency produces climate change allowances to assist in this regard and recommends that they are factored in when considering the potential impacts of climate change. The climate change allowances that were introduced by the Environment Agency in 2013 have recently been withdrawn and new allowances were issued on 19th February 2016. The climate change allowances are predictions of anticipated change for:

- peak river flow by river basin district
- peak rainfall intensity
- sea level rise(not relevant in Runnymede)
- offshore wind speed and extreme wave height (not relevant in Runnymede)

4.26 They are based on climate change projections and different scenarios of carbon dioxide (CO2) emissions to the atmosphere. There are different allowances for different epochs or periods of time over the next century.

4.27 The application of these allowances means that a site currently in a lower flood risk zone (for example zone 2) could in the future be in a higher risk zone (for example flood zone 3A). This could affect the type of development that is appropriate according to its vulnerability to flooding.

Peak river flow allowances by river basin district

4.28 As noted in chapter 2 of this document, the Borough is located in the Thames river basin district.

Table 4: peak river allowances for the Thames river basin district (use 1961 to 1990 baseline)

Allowance category	Total potential change anticipated for '2020s' (2015 to 39)	Total potential change anticpated for '2050s' (2040 to 2069)	Total potential change anticipated for '2080s' (2070 to 2115)
Upper end	25%	35%	70%
Higher central	15%	25%	35%
Central	10%	15%	25%

Source: Gov.uk webpage 'Flood Risk Assessments: climate change allowances[5]

4.29 The life span of the development being proposed will be the deciding factor in determining which of the above timeframes will be relevant when assessing the impact of a climate change (more information on suggested lifetimes for different types of development is included in chapter 7) . Once this factor has been determined consideration must be given to the flood zone and type of development being proposed. A summary of what allowances should be used when the relevant timeframe has been determined is provided in the table below:

Table 5: Peak river flow allowances that should be relied upon for flood risk assessments for different vulnerabilities of development

Flood zone	Allowances that should be relied upon
Flood zone 2	•essential infrastructure – use the higher central and upper end to assess a range of allowances •highly vulnerable – use the higher central and upper end to assess a range of allowances •more vulnerable – use the central and higher central to assess a range of allowances •less vulnerable – use the central allowance •water compatible – use none of the allowances
Flood zone 3a	•essential infrastructure – use the upper end allowance •highly vulnerable – development should not be permitted •more vulnerable – use the higher central and upper end to assess a range of allowances •less vulnerable – use the central and higher central to assess a range of allowances •water compatible – use the central allowance
Flood zone 3b	•essential infrastructure – use the upper end allowance

[5] https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances

	•highly vulnerable – development should not be permitted •more vulnerable – development should not be permitted •less vulnerable – development should not be permitted •water compatible – use the central allowance

Source: Gov.uk webpage 'Flood Risk Assessments: climate change allowances[6]

4.30 If (exceptionally) development is considered appropriate when not in accordance with flood zone vulnerability categories, then it would be appropriate to use the upper end allowance.

Peak rainfall intensity allowance

4.31 For flood risk assessments and strategic flood risk assessments, peak rainfall increase also needs to be considered and it is recommended that the central and upper end allowances, as shown in table 6 below are assessed to understand the possible range of impact in either type of document. Again the lifetime of the development being proposed must be determined before considering the level of potential impact (see chapter 7 for more information).

Table 6: peak rainfall intensity allowance in small and urban catchments (use 1961 to 1990 baseline)

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%

Source: Gov.uk webpage 'Flood Risk Assessments: climate change allowances[7]

4.32 This SFRA seeks to factor in the impact of climate change when considering the extent of fluvial flood risk that may be experienced in the Borough in the future (up to 2030). In this regard, as can be seen in Appendix 1, an allowance for climate change is available for the Addlestone Bourne (2007 model), Chertsey Bourne (2005 model), Lower Wey (2009 model) and Lower Thames Reach 3 (2009 model) although only for the 1 in 100 flood event. The climate change allowance factored in to these models sees an additional 20% being added to the 1% (1 in 100) outline, based on the 2013 climate change allowances. This is not in line with the newly released climate change allowances released by the Environment Agency, however the Council is not aware of any other modelling studies that respond to the scenarios in the tables above at the current time. As such in chapter 6 of this document the 1 in 100 + climate change scenarios will be discussed to give applicants an idea of the potential impact with a 20% allowance factored in. **However it must be stressed that this is only intended to be indicative and it is recommended that applicants contact the Environment Agency for further advice on the new allowances when designing a development proposal as for certain types of development (for example, for housing in flood zone 3a, climate allowances of 35% and 70% would need to be tested).**

[6] https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances
[7] https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances

4.33 This SFRA will be updated at regular intervals over the Plan period and future updates of the SFRA will include any amended modelling which includes allowances for climate change in line with the percentages recommended above to bring the SFRA fully in line with the current Environment Agency recommendations.

4.34 Overall it is important to recognise that there are likely to be more properties in Runnymede in the coming years that will be at risk of flooding even if they have not previously. Furthermore, properties that are already known to be at risk from flooding may be susceptible to more frequent, more severe flooding in future years. It is essential therefore that the development management process (influencing the design of future development within the Borough) helps to mitigate against the potential impact that climate change may have upon the risk of flooding to a property wherever possible.

4.35 For this reason, all of the development management recommendations set out in chapter 10 of this report require access routes, drainage systems and flood mitigation measures to be designed with an allowance for climate change. This is considered to provide a robust and sustainable approach to address the potential impacts that climate change may have in the Borough over Plan period and beyond, ensuring that future development is considered in light of the possible increases in flood risk over time.

Runnymede Flood Zone 3B (Functional Floodplain): Definition

4.36 In this SFRA, in order to meet the requirements of the NPPF, an agreed definition of the functional floodplain in the Borough of Runnymede is required between the Council, SCC in its role as LLFA and the EA to assist with future site allocations and to ensure that planning applications are determined in a consistent way having regard to EA advice. The PPG states that the identification of functional floodplain should take account of local circumstances and not be defined solely on rigid probability parameters. However, land which would naturally flood with an annual probability of 1 in 20 (5%) or greater in any year, or is designed to flood (such as a flood attenuation scheme) in an extreme (0.1% annual probability) flood, should provide a starting point for consideration. The guidance goes on to state that 'areas which would naturally flood with an annual probability of 1 in 20 or greater, but are prevented from doing so by existing infrastructure or solid buildings will not normally be defined as functional floodplain'.

4.37 The parts of the Borough covered by the Flood Map for Rivers and Sea that benefit from detailed modelling (Addlestone Bourne, Chertsey Bourne Lower Wey and Lower Thames) and which have 1 in 20 (5%) flood extents have been delineated in figure 13. This forms the extent of the functional floodplain in those parts of Runnymede where detailed modelling exists. Within this outline, undeveloped areas, where water has to flow or be stored in times of flood, are defined as functional floodplain and protected from non-compatible development. In Runnymede there are some areas within the 1 in 20 (5%) or greater flood extent that are already developed and are prevented from flooding by the presence of existing infrastructure or solid buildings. Whilst these areas will be subject to frequent flooding, some development through replacement buildings/structures may be acceptable although care must be given to

the future sustainability of such development. As such, and in accordance with the PPG, existing building footprints, where they can be demonstrated to exclude floodwater, will not be defined as functional floodplain. The land surrounding these buildings are important flow paths and flood storage areas; therefore areas of open space within developed areas will be treated as functional floodplain.

4.38 It should however be noted that there are a number of areas in Runnymede which are covered by the Flood Map for Rivers and Sea but where detailed modelling does not exist. This includes Ripley Springs, along the Rive Ditch and the tributaries of the Chertsey Bourne. Where detailed modelling does not exist, the whole extent of flood zone 3 as shown on the Flood Map for Rivers and Sea will be used to define the extent of the functional floodplain in these areas until such a time that an applicant is able to provide detailed modelling to show that a site is not within the 5% AEP (flood zone 3B) flood extent.

4.39 The approach to development within the functional floodplain as outlined below recognises the importance of pragmatic planning solutions that will not unnecessarily blight areas of existing development, whilst highlighting the importance of maintaining the undeveloped land surrounding them for storing flood water. There may also be opportunities to reinstate areas which can operate as functional floodplain through redevelopment to provide space for flood water and to reduce risk to new and existing development. In this regard, it should be noted that 2 of the Borough's 8 Biodiversity Opportunity Areas (BOA); R04 River Wey (& tributaries), and R06 River Thames (tow-path & islands), have boundaries which effectively align with their respective Flood Zones 3. All BOA have a set of objectives and targets to 2020, including for restoration and creation of 'priority' (ie. NERC Act S.41) habitats. Floodplain reinstatement is an obvious opportunity for achievement of such targets in respect of the functional floodplains of the Rivers Wey and Thames.

Table 7: Definition of the functional floodplain in Runnymede

Functional floodplain (Flood Zone 3b) in Runnymede (see figure 13)
Land with an annual probability of flooding of 5% (1 in 20 year) in the Borough will be used by Runnymede Borough Council when defining the functional floodplain. Where detailed modelling is not available, flood zone 3 as defined by the Environment Agency in their Flood Map for Planning (rivers and sea) will be relied upon to show other parts of the Borough which potentially also fall within the functional floodplain, and where further detailed modelling by an applicant will be required. The functional floodplain as defined in this SFRA by Runnymede Borough Council comprises undeveloped land within the 5% annual probability (1 in 20 year) flood outline. These areas should be safeguarded from any development. Where Water Compatible or Essential Infrastructure cannot be located elsewhere, it must: • Remain operational and safe for users in times of flood;

- Result in no net loss of flood storage;
- Not impede water flows; and
- Not increase flood risk elsewhere.

Within the 5% annual probability (1 in 20 year) flood outline there are also areas of existing developments that are prevented from flooding by the presence of existing infrastructure or solid buildings. In these developed areas, existing building footprints, where it can be demonstrated that they exclude floodwater, will not be defined as functional floodplain and the planning requirements associated with Flood Zone 3B will not apply.

The land surrounding these buildings forms important flow paths and flood storage areas and properties within these areas will be subject to frequent flooding; therefore such open space within developed areas will continue to be treated as functional floodplain.

Where redevelopment is proposed in developed areas, schemes must not increase the vulnerability classification of the site or the number of residential units. All schemes should result in a net reduction in flood risk and ensure that floodplain storage and flow routes are not affected. This can be achieved through a combination of on and off-site measures including:

- Reducing the land use vulnerability;
- Seeking opportunities to ensure there is no increase in the number of people at risk (e.g. avoiding conversions and rebuilds of properties that result in an increase in the number of residential dwellings); or achieving a reduction where possible.
- Maintaining or reducing built footprint
- Raising finished floor levels;
- Reducing surface water runoff rates and volumes from the site;
- Increasing floodplain storage capacity and creating space for flooding to occur by restoring functional floodplain;
- Reducing impedance to floodwater flow and restoring flood flow paths;
- Incorporating flood resilient and/or resistance measures;
- Ensuring development remains safe for users in time of flood (this may refer to the timely evacuation of properties prior to the onset of flooding in accordance with an individual Flood Warning and Evacuation Plan for the site).

Proposals for the change of use or conversion to a use with a higher vulnerability classification will not be permitted.

Basements, basement extensions, conversions of basements to a higher vulnerability classification or self-contained units will not be permitted.

Where minor development is proposed, schemes should not affect floodplain

storage or flow routes through the incorporation of raised finished floor levels, voids and where possible the provision of direct or indirect floodplain compensation, flood resilience measures, the removal of other non-floodable structures or replacement of impermeable surfaces with permeable, improved surface water drainage through the implementation of SuDS features such as water butts/rainwater harvesting, living roofs, infiltration trenches/soakaways and below ground attenuation tanks in line with CIRIA guidance on SuDS.

The consideration of whether a site is 'developed' or 'undeveloped' will be considered on a case-by-case basis as part of the planning application process, having regard to the presence of existing buildings on the site and the existing routing of floodwater through the site during times of flood.

4.40 The discussion above about the extent of the different flood zones in the Borough is crucial in informing the application of the Sequential Test, further detail of which is included in chapter 7.

DEVELOPMENT AND FLOOD ZONES

4.41 The aim of the NPPF is that the most vulnerable development types should be located in the lowest flood risk zones. Vulnerability classifications are specified in the PPG as well as the alignment of vulnerability and risk. In table 8 below the flood risk vulnerability classifications for different types of development, as defined in the PPG are set out. In table 9, the alignment of flood risk vulnerability and flood zone 'compatibility' are shown, again, in line with the information contained in the PPG. The notes attached to this table in the PPG are also reproduced. After applying the Sequential Test, the flood risk vulnerability of a proposed development should be checked for compatibility with the resultant flood zone it is within, in accordance with this table.

Table 8: Flood risk vulnerability classification (as reproduced from information in the PPG)

ESSENTIAL INFRASTRUCTURE

- Essential transport infrastructure (including mass evacuation routes) which has to cross the area at risk.
- Essential utility infrastructure which has to be located in a flood risk area for operational reasons, including electricity generating power stations and grid and primary substations; and water treatment works that need to remain operational in times of flood.
- Wind turbines.

HIGHLY VULNERABLE

- Police stations, ambulance stations and fire stations and command centres and telecommunications installations required to be operational during flooding.
- Emergency dispersal points.
- Basement dwellings.
- Caravans, mobile homes and park homes intended for permanent residential use.
- Installations requiring hazardous substances consent. (Where there is a demonstrable need

to locate such installations for bulk storage of materials with port or other similar facilities, or such installations with energy infrastructure or carbon capture and storage installations, that require coastal or water-side locations, or need to be located in other high flood risk areas, in these instances the facilities should be classified as “essential infrastructure”).

MORE VULNERABLE

- Hospitals.
- Residential institutions such as residential care homes, children’s homes, social services homes, prisons and hostels.
- Buildings used for dwelling houses, student halls of residence, drinking establishments, nightclubs and hotels.
- Non–residential uses for health services, nurseries and educational establishments.
- Landfill and sites used for waste management facilities for hazardous waste.
- Sites used for holiday or short-let caravans and camping, subject to a specific warning and evacuation plan.

LESS VULNERABLE

- Police, ambulance and fire stations which are **not** required to be operational during flooding.
- Buildings used for shops, financial, professional and other services, restaurants and cafes, hot food takeaways, offices, general industry, storage and distribution, non–residential institutions not included in “more vulnerable”, and assembly and leisure.
- Land and buildings used for agriculture and forestry.
- Waste treatment (except landfill and hazardous waste facilities).
- Minerals working and processing (except for sand and gravel working).
- Water treatment works which do *not* need to remain operational during times of flood.
- Sewage treatment works (if adequate measures to control pollution and manage sewage during flooding events are in place).

WATER-COMPATIBLE DEVELOPMENT

- Flood control infrastructure.
- Water transmission infrastructure and pumping stations.
- Sewage transmission infrastructure and pumping stations.
- Sand and gravel working.
- Docks, marinas and wharves.
- Navigation facilities.
- Ministry of Defence defence installations.
- Ship building, repairing and dismantling, dockside fish processing and refrigeration and compatible activities requiring a waterside location.
- Water-based recreation (excluding sleeping accommodation).
- Lifeguard and coastguard stations.
- Amenity open space, nature conservation and biodiversity, outdoor sports and recreation and essential facilities such as changing rooms.
- Essential ancillary sleeping or residential accommodation for staff required by uses in this category, subject to a specific warning and evacuation plan.

Source: Planning Practice Guidance, Paragraph: 066 Reference ID: 7-066-20140306

Table 9: Flood risk vulnerability and flood zone ‘compatibility’ (reproduced from information contained in the PPG)

Flood risk vulnerability classification (see table 2)		Essential infrastructure	Highly vulnerable	More vulnerable	Less vulnerable	Water compatible
Flood zone (see table 1)	**Zone 1**	Yes	Yes	Yes	Yes	Yes
	Zone 2	Yes	Exception Test required	Yes	Yes	Yes
	Zone 3a	Exception Test required[8]	No	Exception Test required	Yes	Yes
	Zone 3b functional floodplain	Exception Test required	No	No	No	Yes[9]

Source: Planning Practice Guidance, Paragraph: 067 Reference ID: 7-067-20140306

Key

Yes = Development is appropriate.

No = Development should not be permitted.

Notes to table 9:

- This table does not show the application of the Sequential Test which should be applied first to guide development to Flood Zone 1, then Zone 2, and then Zone 3; nor does it reflect the need to avoid flood risk from sources other than rivers and the sea;

- The Sequential and Exception Tests do not need to be applied to minor developments (definition provided at paragraph 7.14) and changes of use, except for a change of use to a caravan, camping or chalet site, or to a mobile home or park home site;

- Some developments may contain different elements of vulnerability and the highest vulnerability category should be used, unless the development is considered in its component parts.

Other fluvial flood risk

4.42 The NPPF states that inappropriate development in areas at risk of flooding should be avoided by directing development away from areas at highest risk, but where development is

[8] In Flood Zone 3a essential infrastructure should be designed and constructed to remain operational and safe in times of flood.

[9] In Flood Zone 3b (functional floodplain) essential infrastructure that has to be there and has passed the Exception Test, and water-compatible uses, should be designed and constructed to:

- remain operational and safe for users in times of flood;
- result in no net loss of floodplain storage;
- not impede water flows and not increase flood risk elsewhere.

necessary, making it safe without increasing flood risk elsewhere. The EA's Flood Map for Planning principally covers the areas at risk from flooding from the designated main rivers in Runnymede. It should be recognised that other watercourses generally have a floodplain, which usually incorporates a functional flood plain. The risk of flooding from these un-modelled watercourses needs to be considered where development is proposed within their vicinity as they also present fluvial flood risk.

4.43 The Council's Land Drainage byelaws require that there should be an 8 metre buffer zone from the top of the bank of any ordinary watercourse where no works or planting should take place without consent. Furthermore, under the terms of the Environmental Permitting (England and Wales) (Amendment) (No. 2) Regulations 2016, the prior written consent of the Environment Agency is required for any proposed works or structures, in, under, over or within 8 metres of the top of the bank of a main river. Some activities are also now excluded or exempt. An environmental permit is in addition to and a separate process from obtaining planning permission. Further details and guidance are available on the GOV.UK website: https://www.gov.uk/guidance/flood-risk-activities-environmental-permits.

4.44 Whilst it is considered that it would not be appropriate to add this 8 metre buffer zone for ordinary watercourses to the definition of the functional floodplain in Runnymede, applicants considering development/works within this 8 metre buffer zone in Runnymede should note that for main rivers, an environmental permit for flood risk activities will be required from the Environment Agency prior to commencement. For ordinary watercourses, consent from Runnymede Borough Council will be required before commencing any works.

4.45 For smaller developments it is probably not practical to undertake an in depth assessment of the flood risk from these un-modelled watercourses. However, for major developments the Council will require the flood risk from such watercourses to be fully assessed by the developer within the site specific flood risk assessment. Early consultation with the Council on the flood risk from these un-modelled watercourses is recommended.

CHAPTER 5-OTHER SOURCES OF FLOODING

5.1 The NPPF is clear that when assessing flood risk, all sources of flooding should be considered and not just the risks posed by fluvial flooding. As such this chapter will consider the risks posed by the following forms of flooding:

- Surface water flooding
- Sewer flooding
- Groundwater flooding
- Flooding from impounded water bodies
- Tidal flooding

5.2 Whilst this chapter considers different types of flooding individually it should be noted that sometimes during a flood event, different types of flooding can be experienced and are often related. For example during the flood event in the borough during Winter 13/14 there were reports of sewer, groundwater and surface water flooding in the Borough even though the event was considered to be a fluvial flood event primarily.

SURFACE WATER FLOODING

5.3 Broadly speaking, surface water flooding occurs when rainfall intensity is greater than the infiltration rate of the soil resulting in overland sheet flow. Flooding from surface water sewers can also be caused, and is influenced by, the capacity and condition of the surface drainage network, and rates of surface runoff are influenced by rainfall and extent of impermeable area.

5.4 Flooding incidents are usually isolated and difficult to predict owing to the complex interaction of local infrastructure and local conditions. In heavy rainfall events where water 'ponds' in low lying areas it is likely that there will be overland flow from areas of ponded surface water towards local low points in the topography, which would typically be a river channel. The risk of flooding from overland flow after heavy rainfall is increased where there are low permeability soils, areas of hardstanding, or where impermeable surfaces are combined with slopes.

5.5 The likelihood of surface water flooding occurring may change over time due to increases in development; changing the extent of impermeable areas draining to a sewer, and climate change affecting rainfall patterns. As a result, flooding related to surface water may become more frequent in the future.

5.6 In Runnymede, south of the M3, drainage has traditionally been served by surface water sewers in the urban areas of Addlestone, Woodham and Ottershaw. To the north of the M3, there are virtually no adopted public surface water sewers. Here, drainage is controlled by Sustainable Drainage Systems (SUDS) that allow infiltration into the ground (detailed information on SuDS can be found in chapter 8). The difference in drainage approach stems from the former administrative areas that made up the Borough: Chertsey Urban District

Council and Egham Urban District Council. In the urban areas of Runnymede there are also sections of culverted watercourses along the tributary channels.

Historic records of surface water flooding

5.7 It should be noted that Highways England was also consulted during the course of the SFRA and was asked to provide information on incidents relating to flooding, standing water and ponding on the Highways England network. No response was provided to the Council's request.

Current flood mapping for surface water

5.8 In 2013 the Environment Agency, working with LLFAs produced mapping to show the risk of flooding from surface water (previously known as the updated Flood Map for Surface Water (uFMfSW)). The mapping is available to view on the Environment Agency's website[10], however the Environment Agency has also provided the Council with the corresponding GIS layers to assist the Council in gaining a better understanding of areas in Runnymede which may be at risk from surface water flooding (see figure 14 for more information) for the purpose of this document. The mapping shows areas with either a low, medium or high risk of surface water flooding. The probability of such flooding occurring is summarised in table 10 below. It should be noted however that whilst this mapping is based on a number of factors including ground levels and drainage, this type of flooding is difficult to predict, much more so than river flooding as it is hard to forecast exactly where or how much rain will fall in any storm. It should be noted that the latest 'risk of flooding from surface water' dataset is from December 2015 although given the size of the dataset given to the Council it has not been possible to fully analyse for this SFRA.

Table 10: Probability of surface water flooding occurring as described in the Environment Agency's 'risk of flooding from surface water' mapping

Risk of surface water flooding	Probability of flooding occurring
Low	Low means that each year, the area in question has a chance of flooding of between 1 in 1000 (0.1%) and 1 in 100 (1%).
Medium	Medium means that each year, the area in question has a chance of flooding of between 1 in 100 (1%) and 1 in 30 (3.3%).
High	High means that each year, the area in question has a chance of flooding of greater than 1 in 30 (3.3%).

[10] https://flood-warning-information.service.gov.uk/long-term-flood-risk/map?easting=505151&northing=164584&address=10002019804&map=RiversOrSea

Source: Information obtained from the Environment Agency 'risk of flooding from surface water map'

5.9 In November 2013, the Environment Agency published a document entitled, 'What is the updated Flood Map for Surface Water?'[11] to be read alongside the updated mapping. This document confirms that the mapping provides information on the extent, depth, velocity (including flow direction at maximum velocity) and hazard (as a function of depth and velocity) for each flooding scenario. Along with the mapping is also information about the source of the data (i.e. whether it was from the nationally produced modelling or locally produced modelling) and the confidence in the data outputs.

5.10 The mapping is considered to be much improved from previous surface water mapping produced by the Environment Agency in 2008 and 2010 due to improvements to the modelling techniques and the data used. The strengths of the map include:

- 2 metre model grid used, so many small ground features are taken into account;
- High quality ground level information, which was enhanced to better represent buildings and roads, with manual editing to "flyover features";
- A wide range of storm scenarios were modelled using three flood probabilities (1:30, 1:100 and 1:1,000);
- The influence of land use and soil type were taken into account;
- More accurate local mapping provided by LLFAs was incorporated where it was compatible (it is understood that Surrey County Council did provide the EA with data to feed into their 'risk of flooding from surface water' mapping ;
- Complex processing which reflects LLFA preferences to make the maps as clear as possible, for example in filtering out particularly small areas of flooding whilst retaining potentially significant flooded areas;
- Depth, velocity, flow direction and hazard maps have been produced.

5.11 The 'What is the updated Flood Map for Surface Water' document also confirms however that the mapping has the following limitations:

- A single drainage rate for all urban areas was assumed unless LLFAs were able to provide better local data. This is a limitation as modelled flood extents are particularly sensitive to the way drainage is taken into account. Omitting large subsurface drainage elements such as flood relief culverts and flood storage can also significantly affect the modelled pattern of flooding;
- The nationally produced modelling assumes a free outfall and so does not take into account tide locking or high river levels which may prevent surface water from draining away freely;
- Limited recorded surface water flood data exists for LLFAs, so in many places LLFAs were not able to validate this nationally produced modelling.
- As with many other flood models:

11 https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/297432/LIT_8988_0bf634.pdf

- The input information, model performance and modelling that has been used to create the nationally produced modelling vary for different areas. For example, in many areas, the ground level data is based on detailed LIDAR information, but where this is not available ground levels are much less accurate. Similarly, models of this type tend to perform better in steeper rural areas than in flat urban areas. These variations affect the reliability of the mapped flood extents and, in turn, the suitability for different applications.
- The mapping does not take individual property threshold heights into account so the map shows areas that may potentially flood but cannot accurately predict the impacts on individual properties.
- The flood extents show predicted patterns of flooding based on modelled rainfall. The patterns of flooding from two similar storm events can vary due to many local circumstances.

5.12 As a result of the above listed limitations, the Environment Agency's risk of flooding from surface water mapping cannot definitively show that an area of land or property is, or is not, at risk of flooding, and the maps are not suitable for use at an individual property level.

5.13 When considering how the surface water mapping has taken climate change into account, it is noted that a specific scenario to determine the impact of climate change on the risk of surface water flooding has not been included. However a range of three annual exceedance probability events have been undertaken (3.3%, 1% and 0.1%) and therefore it is considered appropriate to use the 0.1% AEP event as a substitute dataset to provide an indication of the implications of climate change.

5.14 The surface water mapping for Runnymede is only suitable for providing a high level overview of the risk that different areas in the Borough face from surface water flooding. This is because the majority of the Borough has been mapped using data which only allows for comparison of risk between towns and counties. What can be ascertained however from the data is that each ward in Runnymede has some areas that are likely to be at some risk from surface water flooding including parts of each of the Borough's main urban centres at Egham, Chertsey and Addlestone. Unsurprisingly perhaps it is clear that a number of areas at risk from surface water flooding are located adjacent to the Borough's smaller watercourses and other waterbodies.

SEWER FLOODING

5.15 Climate change, population growth, and the paving over of green spaces that provide natural drainage are stated by Thames Water as being factors that are putting increasing pressure on the sewerage network, particularly after heavy rain[12].

[12] https://www.thameswater.co.uk/help-and-advice/drains-and-sewers/sewer-flooding-who-to-contact/what-causes-sewer-flooding

5.16 The following types of event can cause flooding from the sewers:

1) Rainfall exceeds the capacity of the sewer system/drainage system causing flooding.

2) The system becomes blocked by debris or sediment. This can be caused by people putting unsuitable products down the sink or toilet or by road gullies and drains becoming blocked from fallen leaves, build-up of sediment and debris (e.g. litter).

3) The system surcharges due to high water levels in receiving watercourses. Within the borough there is potential for surface water outlets to become submerged due to high river levels. When this happens, water is unable to discharge. Once storage capacity within the sewer system itself is exceeded, the water will overflow into streets and potentially into houses. Where the local area is served by 'combined' sewers i.e. containing both foul and storm water, if rainfall entering the sewer exceeds the capacity of the combined sewer and storm overflows are blocked by high water levels in receiving watercourses, surcharging and surface flooding may again occur but in this instance floodwaters will contain untreated sewage.

5.17 The likelihood of sewer flooding may change over time; due to increases in development, changing the extent of impermeable areas draining to a sewer, and climate change affecting rainfall patterns. As a result, sewer flooding may become more frequent in the future.

Historic records of sewer flooding in Runnymede

5.18 Thames Water, the sewerage provider for the Borough, was contacted to request records of sewer flooding in Runnymede. Thames Water has provided an extract from their DG5 Flood Register for the Borough (data provided April 2017). Due to data protection requirements the data has not been provided at individual property level; rather the register comprises the number of properties within 4 digit postcode areas that have experienced sewer flooding either internally or externally within the last 10 years. Data has also been provided for instances of sewerage flooding which occurred in excess of 10 years ago but less than 20 years ago although this part of the data return has not been analysed in detail for the purposes of this SFRA given the age of the data. Although as a general observation, when the number of reports of sewerage flooding over 10 years ago but less than 20 years ago is contrasted with the data from the last 10 years, it is clear that the number of reports to Thames Water has decreased significantly from 118 reports to 47 over these two ten year periods.

5.19 Figures 15 and 16 show that the areas of the borough most affected by sewerage flooding in the last 10 years are in the TW20 8 postcode area (9 reports) which covers Thorpe, Thorpe Lea, Thorpe Green, Pooley Green, Hurst Lane and parts of Egham Hythe, and the KT16 8 postcode area (9 reports) which covers Penton Hook, Laleham Burway and parts of Chertsey (eastern side). The TW20 9 postcode area had 8 reports. This postcode area covers the majority of Egham and part of Englefield Green (south of the A30). In each case, most of the reports (23) relate to external sewerage flooding and of these, the majority are one off occurrences (18 out of 23). Indeed, across all three postcode areas, there have been only 3 reports of internal sewerage flooding over this period (all one off occurrences). Outside of these three postcode areas, the instances of sewerage flooding reports drops sharply, with each of the remaining 10 postcode areas in Runnymede reporting between 0 and 4 instances

of sewerage flooding over the 10 years. It should be noted that records only appear on the DG5 register where they have been reported to Thames Water, and as such they may not include all instances of sewer flooding.

5.20 The information provided by Thames Water tallies (in part) with the Council's local knowledge of areas affected by sewer flooding during the late 2013/early 2014 flood event in particular. During this flood event floodwater inundated the sewers, especially in the Egham and Egham Hythe areas. Hundreds of properties were affected from having intermittent problems with drainage to having no toilet facilities at all for long periods. Even after river levels fell in March, high groundwater levels meant that problems with sewerage continued.

GROUNDWATER FLOODING

5.21 Groundwater flooding is defined by the British Geological Survey as the emergence of groundwater at the ground surface away from perennial river channels or the rising of groundwater into man-made ground, under conditions where the 'normal' ranges of groundwater level and groundwater flow are exceeded. The main settings that have been identified in the UK where significant groundwater flooding can occur are: Unconfined major aquifers, and Shallow unconsolidated sedimentary aquifers. The highly permeable sand and gravel sediments along the Lower Thames's floodplain that overlie the London Clay fit within the definition of a "Shallow unconsolidated sedimentary aquifer". This fact means that there are areas in Runnymede that are subject to this type of flooding.

5.22 LLFAs are responsible for managing the risk of flooding from groundwater. The Environment Agency has a strategic overview for all sources of flooding including groundwater. They supply information in the form of monitored groundwater levels.

5.23 In some areas that have historically experienced groundwater flooding, the Environment Agency provides a groundwater alert or warning service. In Surrey, one of these areas is Egham. The Environment Agency publishes monthly groundwater situation reports[13] which monitor groundwater levels in different parts of the country. The West Thames report covers the County of Surrey and reports on the groundwater level in Egham.

Historic records of groundwater flooding in Runnymede

5.24 Flooding from groundwater has been reported in various parts of the Borough. For example during the 2013/2014 flood event incidences of groundwater flooding were reported in Staines upon Thames and Egham in particular although these groundwater flooding reports are believed to have been closely linked with the fluvial flood event that was occurring in the Borough at the same time.

5.25 The Surrey Flood Risk Partnership is seeking grant to undertake a study into predicting groundwater flooding. One of the proposed study areas is Egham.

[13] https://www.gov.uk/government/collections/groundwater-current-status-and-flood-risk

Potential for groundwater flooding in Runnymede

5.26 The Council has referred to the BGS Susceptibility to Groundwater Flooding dataset to ascertain the parts of the Borough considered to be most susceptible to groundwater flooding. It should be noted that this dataset shows where groundwater flooding could occur (defined by the term susceptibility) but does not indicate risk, that is the likelihood that it will occur. For their dataset, BGS define groundwater flooding as 'the emergence of groundwater at the ground surface away from perennial river valleys or the rising of groundwater into man-made ground under conditions where the 'normal' range of groundwater levels and groundwater flows is exceeded'. More information on the modelling that has fed into the dataset can be found on the BGS website[14].

5.27 This dataset presents three different scenarios which are as follows:

- Potential for groundwater flooding to occur at the surface: This relates to areas with the highest potential for groundwater flooding;
- Potential for groundwater flooding of property situated below ground level: This could relate to properties with basements for example.
- Limited potential for groundwater flooding to occur. Those areas with the lowest potential for groundwater flooding to occur.

5.28 A map of Runnymede showing the BGS data can be found at figure 17 and identifies that there is some potential for groundwater flooding in almost the entire Borough. The potential for groundwater flooding is the greatest in the Egham and Thorpe. This ties in with the geology and topography of the Borough as discussed in chapter 3 and which shows that the land in Egham and Thorpe is generally lower lying and underlain by Thames Gravels. In Chertsey the risk is lower and in the remainder of the Borough, generally speaking there is considered to be limited potential for groundwater flooding to occur although pockets with higher potential or no potential can be observed.

Groundwater source protection zones

5.29 The Council has also reviewed information on Groundwater Source Protection Zones. The Environment Agency defines Source Protection Zones (SPZ) around all major public and private water supply abstractions in order to safeguard groundwater resources from potentially polluting activities. The location and extent of SPZs can be viewed on the Environment Agency website[15] and the information that is relevant to Runnymede has been mapped at figure 18. Due to the strategic nature of this report, EA records of smaller abstractions have not been reviewed. The Environment Agency mapping shows that in Runnymede there is a groundwater source protection zone in the eastern side of the Borough.

5.30 Having an understanding of potentially vulnerable groundwater sources can be important when selecting appropriate SuDS for a particular area. Surface water management is considered in more detail in chapter 8 of this report.

[14] http://www.bgs.ac.uk/research/groundwater/datainfo/GFSD_methodology.html
[15] EA Groundwater Source Protection Zone maps

FLOODING FROM IMPOUNDED WATER BODIES

Flooding from reservoirs

5.31 A number of reservoirs are located either within Runnymede (most notably Virginia Water lake on the western boundary) or in the adjacent Local Authority areas. Such bodies of water have the potential to cause flooding in the Borough. The reservoirs within Runnymede are shown in figure 19. This figure also shows those reservoirs closest to Runnymede in the adjoining boroughs, which also have the potential to cause flooding in the Borough. A more comprehensive list of the reservoirs in Runnymede is set out in table 11 below. Figures 20a, b and c show the areas of the Borough that could potentially be affected if one of the reservoirs in, or in the vicinity of the Borough was to suffer a breach. Figure 20a shows the general extent of the area anticipated to be at risk from reservoir flooding, figure 20b shows the anticipated flood depths within the extent shown in 20a, and figure 20c shows the expected flood speed within the extent shown in 20a.

5.32 The Environment Agency publication 'Reservoir Flood Maps (RFM) Guide: Explanatory note on reservoir flood maps for Local Resilience Forums-Version 5-September 2016 [16]' provides further explanation of the reservoir flood maps, including information about their production, accuracy and appropriate use. In particular, the document notes that, 'the maps may be used for indicative purposes to identify areas where detailed analysis of the risk of reservoir flooding might be required. However, as some areas shown as not at risk from reservoir flooding may be at risk under different breach assumptions or using a different digital terrain model, they should not be relied upon as the sole information source for this purpose'. It should also be recognised that the maps do not indicate or relate to any particular probability of dam breach flooding, and do not show the risk to individual properties. These points should be borne in mind if the maps are being relied upon in the production of any site specific FRAs.

Table 11: Reservoirs located in or in proximity to Runnymede Borough

Reservoir name	Reservoir owner	Reservoir location (grid reference)
Queen Mary	Thames Water Ltd	508310, 169750
Coxe's Mill Pond	The National Trust	506186, 164103
Wraysbury	Thames Water Ltd	503030, 175640
Queen Mother	Thames Water Ltd	501297, 177727
Virginia Water	The Crown Estate	497857, 168523
King George VI	Thames Water Ltd	504170, 174260
Great Pond, Sunninghill	The Crown Estate	493787, 169809
Queen Elizabeth II	Thames Water Ltd	512410, 167770
Staines North	Thames Water Ltd	505060, 174180
Staines South	Thames Water Ltd	505938, 173021
Chertsey Settling	Affinity Water	503524, 167307
Obelisk Pond	The Crown Estate	497968, 170220

[16] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/558441/LIT_6882.pdf

Source: Information contained in the table above has been obtained from the Environment Agency's website[17]

Historic records of reservoir flooding in Runnymede

5.33 Generally risk of dam failure on reservoirs is considered extremely low and there is no record of reservoir flooding in Runnymede. Furthermore, there has been no loss of life in the UK from reservoir flooding since 1925. However failure, if it occurred, could have major consequences, including loss of life.

Summary

5.34 Overall with on-going flood assessments and statutory management plans prepared by reservoir undertakers, the probability of a flood event or breach is very small. Any flood risk that exists from reservoir failure is therefore considered to be a residual risk.

Flooding from canals and other artificial sources

5.35 The Basingstoke Canal/Wey Navigation is located on the southern boundary of the Borough. Its location can be seen in figure 19. As with reservoirs, the flood risks from canals and raised water bodies are considered to be residual. The flood mechanisms identified from canals are breaching and overtopping. The control of flow in canals via weirs and gates means that the levels should not be overtopped from a fluvial flood event. There remains, however, a residual risk that flood water could be conveyed down the canal should the appropriate measures fail. At locations where embankments are perched there lies a residual risk of breaching, however the probability of a breach is very small as there is a regime of regular maintenance and inspections.

5.36 Water levels are controlled by staff at the Basingstoke Canal Authority through a series of weirs, locks and sluices along the canal's length which also maintain control over flow rates. A 24 hour standby system operates and there is a clear set of protocols for water level control. Furthermore, the regular interval of locks along the canal results in the ability to confine any residual risk of breach or failure to small localised sections. The consequences of canal flooding if it occurred, would therefore be much less severe than from a reservoir.

5.37 The mechanisms described above remain the responsibility of the Canal Authority acting in accordance with its duty to the Canals' Joint Owners, in this case Surrey and Hampshire County Councils, with whom liability rests.

Historic records of flooding from canals and other artificial sources in Runnymede Borough

5.38 There is no known history of canal flooding in the Runnymede area however in the 1968 flooding, an area south of Runnymede between the railway line and Parvis Lane flooded,

[17] https://flood-warning-information.service.gov.uk/long-term-flood-risk/map?easting=505151&northing=164584&address=10002019804&map=RiversOrSea

possibly as a result of fluvial floodwater getting into the canal. Although not in Runnymede, the event highlights the residual risk present from the canal.

Tidal Flooding

5.39 This SFRA seeks to consider all forms of flooding. However given the location of Runnymede Borough which is located a significant distance from the coast, Runnymede is not affected by this form of flooding and as such tidal flooding will not be considered further in this SFRA.

OTHER RELEVANT SOURCES OF DATA

Surrey County Council wetspot data

5.40 When building a picture of historic flood incidents across the Borough more widely, it should be noted that SCC has provided a GIS layer of 'wetspots' throughout the Borough. 'Wetspot' is a term used by SCC as the LLFA to describe the location of a flood incident that has been reported (this relates to a surface water, groundwater and ordinary watercourses flood incidents). The wetspot database is continually updated to produce a comprehensive map and record of all the identified wetspots in Surrey. Information from Surrey risk management authorities informs the database.

5.41 Surrey County Council's website[18] confirms that the focus of flooding investigations in the County remains:

- To understand the main causes of flooding in Surrey;
- To identify and review where the main wetspot sites are in the County; and,
- To identify, through the Flooding Task Group (FTG) Action Plan, opportunities to investigate, collaborate and act in order to mitigate a range of flooding problems in the short, medium and longer terms.

5.42 A number of factors are taken into account when assessing each wetspot site, but the key points that contribute to a high score are:

- Safety;
- internal property flooding;
- disruption to critical services;
- social and economic impacts; and,
- duration and frequency of flooding.

5.43 The assessment system is used to both understand where the most significant flooding locations in the county are and prioritise drainage improvements across the highway network in Surrey. By completing these assessments over recent years it has become apparent that some of the highest scoring wetspots are actually caused, to varying degrees, by the failure of

[18] http://new.surreycc.gov.uk/roads-and-transport/road-maintenance-and-cleaning/drainage-and-flooding/flooding-and-wetspots

third party, non-highway drainage systems. These systems can and do discharge large volumes of water onto the network, that overwhelm the existing highway drains because they were never designed to accept this volume of water. In these instances Surrey County Council will work with development planners and other third parties to minimise the effects wherever possible.

5.44 The wetspot data for the Borough can be viewed in figure 21. This figure does not differentiate between the different types of flood event reported however the data shows that in general there are more flooding reports in the eastern side of the Borough. It should be noted that given the localised and site specific nature of these recorded flooding incidents, each incident is assessed on a case by case basis by Surrey County Council rather than being assessed in detail at the strategic level in this SFRA.

Summary

5.45 This chapter provides a strategic overview of the flood risks that are present in Runnymede. Chapter 6 seeks to consider these risks in more detail at ward level.

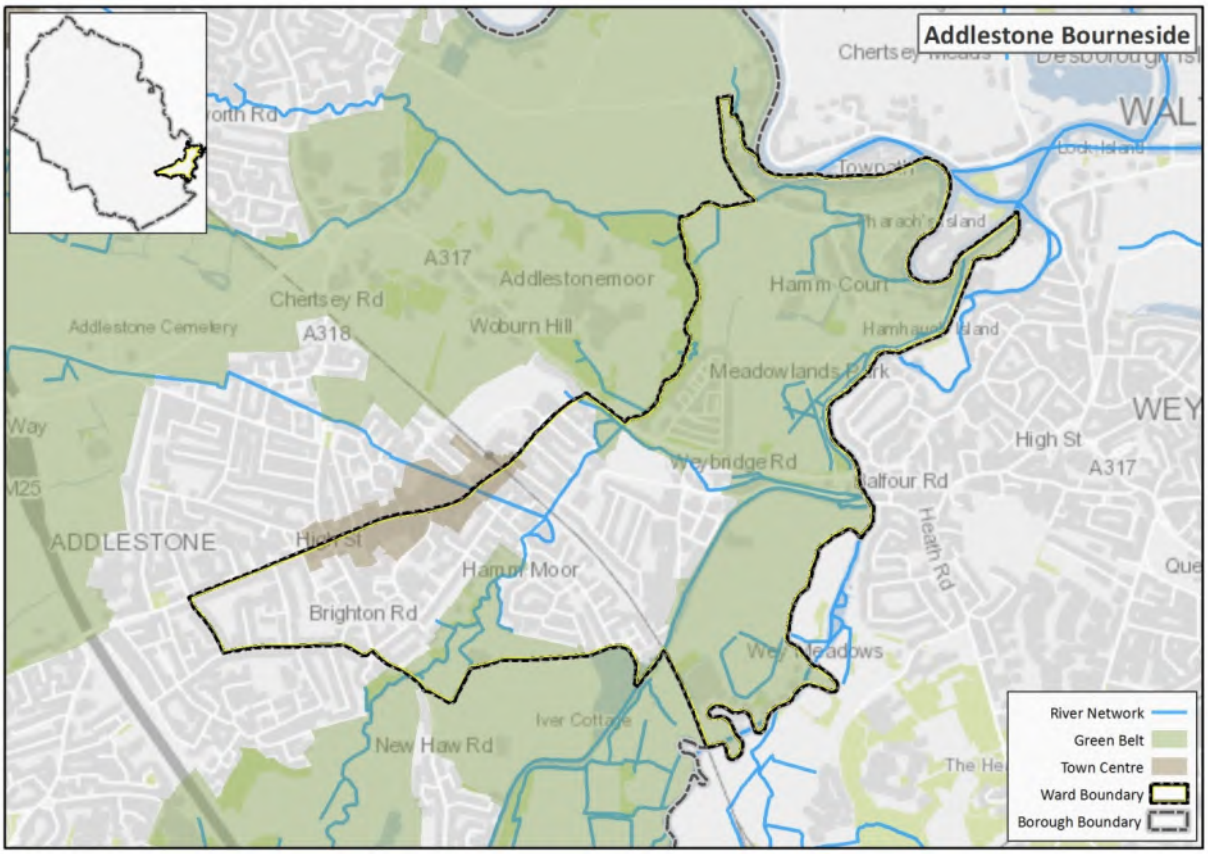
CHAPTER 6: LEVEL 1 ASSESSMENT OF FLOOD RISK

6.1 Using the information gathered in chapters 4 and 5 of the SFRA, a strategic assessment of the flood risk from all sources has been undertaken for each of the 14 wards within Runnymede. The findings are presented in the following pages.

6.2 The wards have been assessed in alphabetical order. As such the order of assessments is as follows:

- Addlestone Bourneside
- Addlestone North
- Chertsey Meads
- Chertsey South and Rowtown
- Chertsey St Anns
- Egham Hythe
- Egham Town
- Englefield Green East
- Englefield Green West
- Foxhills
- New Haw
- Thorpe
- Virginia Water
- Woodham

Addlestone Bourneside



General information		
Area	Addlestone Bourneside covers an area of 2.2 sq.km comprising 64% Green Belt and 36% Urban Area.	Figure 2
Character	The Addlestone Bourneside ward is located on the eastern side of the borough. The portion of the ward which is located in the urban area is located in the western half of the ward and forms part of the wider Addlestone urban area. There is a mix of uses within the urban area given that this ward contains part of the designated Addlestone Town Centre where a mix of retail, business and residential uses can be found. In particular, a large mixed used town centre redevelopment scheme[19] is currently under construction on land adjacent to the Council offices. Furthermore, the urban area contains the Weybridge and Bourne Business, Park and the Waterside Trading Estate which comprise a mix of employment uses. There are also large areas of residential development. The Green Belt area of the ward contains the Wey Meadow Caravan Park, Meadowlands Caravan site	-

[19] RU.14/0435 for the demolition of the existing buildings and erection of 213 residential apartments (class C3), hotel (Class C1) 101 beds, retail accommodation (class A1 to A5) 6,966 sqm, cinema 2,705 sqm, parking (total 445 spaces), and space for energy centre of 115 sqm, with associated plant, road infrastructure including new access road to west of Civic Offices, open space and landscaping.

	and the Hamm Court Estate-a private residential estate on the banks of the River Thames, and intersected by the Bourne.	
Topography	Similar height for the whole ward (10-15m AOD)	Figure 3
Geology	Superficial-The entire ward is underlain by superficial deposits, either Kempton Park Gravel Formation (sand and gravel), or by Alluvium, silt or Shepperton gravel member (sand and gravel). Bedrock-the entire ward is underlain by Bagshot Formation (Sand).	Figures 4 and 5
Aquifer type	The superficial deposits are classified as a principal aquifer in part of the ward and a secondary A aquifer in other areas. According to Environment Agency definitions, a principal aquifer has high intergranular and/or fracture permeability - meaning that they usually provide a high level of water storage, and can support water supply and/or river baseflow on a strategic scale. A secondary A aquifer is defined as a permeable layer capable of supporting water supplies at a local rather than strategic scale and in some cases forms an important source of base flow to rivers. The underlying bedrock is also classified as a secondary A aquifer.	Figures 6 and 7
Groundwater vulnerability classification and source protection zone	The superficial deposits give the ward a 'major aquifer high' category of risk vulnerability for the majority of the area. A small part of the ward also has a 'major aquifer intermediate' category of risk vulnerability. There is a shallow water table across much of the ward. The EA defines Source Protection Zones (SPZ) around all major public and private water supply abstractions in order to safeguard groundwater resources from potentially polluting activities. The western part of the ward is in zone 3 of a groundwater source catchment. This is defined as the area around a source within which all groundwater recharge is presumed to be discharged at the source. The EA records of smaller abstractions have not been reviewed at this stage.	Figures 18 and 22
Main rivers	Addlestone Bourne Woburn Park Stream River Wey River Thames	Figure 2
Ordinary watercourses	Figure 8 shows the location of the ordinary watercourses that run through this ward.	Figure 8

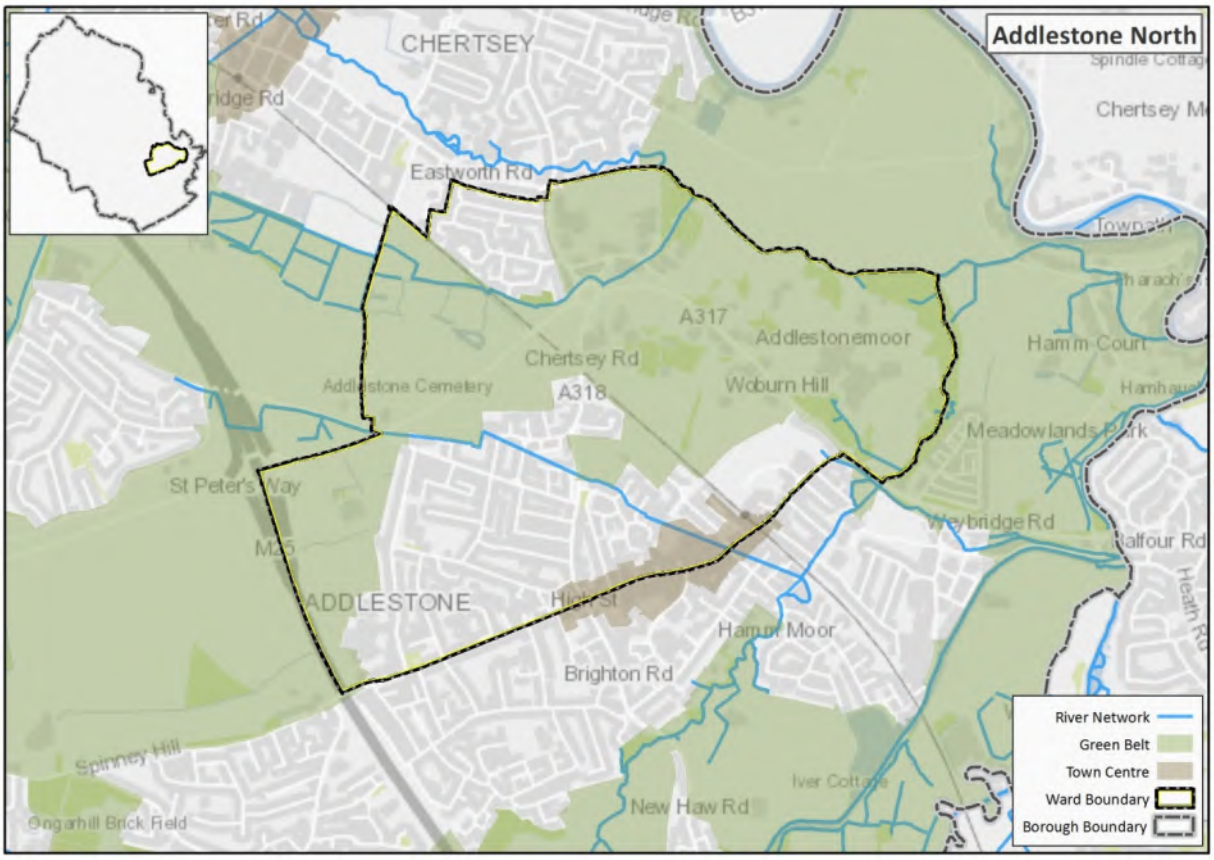
Addlestone Bourneside		
Strategic assessment of flood risk		
Flooding from rivers	*Flood zones* Zone 1 Only: 0.6 sq.km (25%) Zone 2 Only: 0.7 sq.km (33%) Zone 3 Only: 1 sq.km (42%) Zone 2 or 3: 1.7 sq.km (75%) 75% (1.7sq.km) of the ward is within Flood Zones 2 or 3, of which 75% is in the Green Belt and 25% is located in the Urban Area. The Urban Area within these Flood Zones includes a number of employment sites off Hamm Moor Lane and a large part of the residential area to the south east of Crockford Park Road.	Figure 11
	Functional floodplain 25% of the ward (0.57 sq.km) is shown to be at risk during a 5% (1 in 20 year) annual probability flood event. This comprises very little land within the ward's urban area and is mainly limited to land in close proximity to the Addlestone Bourne in Water's Edge, Pitson Close, Bois Hall Road and Bourneside Road. The remainder of the functional floodplain in this ward is in the Green Belt. Hamm Court is the only significant area of residential properties within the functional floodplain in the Green Belt.	Figure 13
	Climate change When the Environment Agency's 1 in 100 models are contrasted with the 1 in 100 + 20% climate change models it can be seen that the only part of the ward that would experience a notable increase in the area at risk from flooding is in the vicinity of Hamm Court Farm and the open land to the south. As noted in Chapter 4 however, the Environment Agency has recently released new climate change allowances which its current models do not comply with. This section therefore seeks to provide an indication of the potential impact of climate change in the ward although it is likely that further detailed modelling will be required to support development proposals coming forward.	
	Historic records Runnymede Borough Council and the Environment Agency hold records of substantial areas of land in this ward being subject to fluvial flooding in the Bois Hall Road/Bourneside Road area, Hamm Court, Wey Meadows and a large area of land to the south of the Weybridge Road which includes the Weybridge and Bourne Business Park.	Figures 10a, b, c and d

	Flood defences No formal flood defences. The Environment Agency Asset Information Management Systems (AIMS) identifies a number of flood risk management assets within this ward.	Figure 9 and appendix 3
Surface water flooding	The Environment Agency's 'risk of flooding from surface water' mapping identifies a higher risk of surface water flooding in a number of areas including parts of Garfield Road, Corrie Road, Crockford Park Road, Caselden Close, Station Road, Brighton Close and Addlestone Park. Surface water is also shown to pond adjacent to the Bourne.	Figure 14
Flooding from groundwater	The BGS dataset 'Susceptibility to Groundwater Flooding' shows that large parts of the ward have limited potential for groundwater flooding to occur. Two pockets exist in the ward where the potential for groundwater flooding is greater. One of these pockets is adjacent to the River Thames and the other is in and around Addlestone Town Centre.	Figure 17
Flooding from sewers	During the last 10 years sewer flooding has affected up to 2 properties in the KT15 2 postcode area (external flooding) and up to 1 property in the KT15 1 postcode area (external flooding) according to Thames Water's DG5 register[20]. There are no records of internal sewer flooding.	Figures 15 and 16
Flooding from reservoirs, canals and other artificial sources	The River Wey Navigation runs through this ward. The control of flow in this canal via weirs and gates means that the levels should not be overtopped from a fluvial flood event. There remains, however, a residual risk that flood water could be conveyed down the canal should the appropriate measures fail. There are no other large surface water bodies within the ward. The Queen Mary Reservoir is located to the north of the ward in Spelthorne Borough. Coxes Mill Pond is located adjacent to the southern boundary of the ward. The Environment Agency dataset 'risk of flooding from reservoirs' shows that land within the Addlestone Urban Area in the vicinity of Hamm Moor Lane could be flooded if one of these reservoirs were to fail and release the water it holds as well as a large area of green belt land within this ward including the Wey Meadows Caravan Park and the majority of the land to the north of the A317 Weybridge Road, including much of the Hamm Court Estate.	Figures 19 and 20a, b and c
Wetspot data	SCC has identified part of Church Road as a known 'wetspot'. The northern ward boundary runs down the middle of Church Road and as such this road will also feature in the entry for Addlestone North, the adjoining ward.	Figure 21

[20] Post codes areas and ward boundaries are not aligned. As such there cannot be complete accuracy when determining the number of properties that have been affected by sewerage flooding at ward level. For the benefit of this assessment the total number of properties that have reported across the postcode area has been noted. It is not known from the data provided the exact number of these properties that are located in this ward.

Dry Islands	There are three dry islands on the eastern side of the ward which are over 0.5ha in area. Two of the 3 dry islands predominantly cover open areas of land although the third covers a large part of the Hamm Court estate which is a residential area within the Green Belt.	Figure 12
Managing and mitigating flood risk		
Flood warning areas	'Addlestone Bourne at Addlestone', 'River Wey at Weybridge', 'River Thames at Hamm Court', 'Areas of Chertsey closest to the Chertsey Bourne', 'Chertsey Bourne at Chertsey', Properties closest to the Addlestone Bourne at Addlestone.	-
SuDS suitability	Across the majority of the ward, the BGS drainage summary indicates that there are opportunities for bespoke infiltration SuDS, although due to the shallow water table in large parts of the ward, infiltration SUDs would need to be kept as shallow as possible in such areas. Only a small part of the ward on its eastern side is shown to have very significant constraints.	Figure 23
Site specific SFRA guidance	Chapter 8 provides detailed guidance on measures to manage and mitigate flood risk, and Chapter 9 provides guidance on preparation of site-specific FRAs.	Chapters 8 and 9
Policy recommendations	Chapter 10 provides spatial planning and development management recommendations for the Borough.	Chapter 10

Addlestone North



General information		
Area	Addlestone North covers an area of 2.7 sq.km comprising 65% Green Belt and 35% Urban Area.	Figure 2
Character	The Addlestone North ward contains part of the Addlestone urban area to the south of the ward. This is a primarily residential area, with pockets of employment, most notably at Aviator Park and within Addlestone town centre, part of which is located in the ward and which contains a mixture of uses including the Tesco superstore. To the north of the ward is part of the Chertsey Urban Area. This part of the urban area is predominantly residential in character. The green belt surrounding the urban areas contains large areas of open land. Notable exceptions include St George's College and the Woburn Park Farm site where a large area of hard standing and open storage are observed.	-
Topography	Area of higher ground around St Georges College in the east (average 25m AOD), rest of the ward averages 10-20m AOD.	Figure 3
Geology	Superficial-The majority of the ward is underlain by superficial deposits, with the largest areas being underlain by Kempton Park Gravel Formation (sand and gravel). Small areas of alluvium, silt and Lynch Hill	Figures 4 and 5

	Gravel Member (sand and gravel) are also observed. In some areas of the ward, no superficial deposits are present. Bedrock-the entire ward is underlain by Bagshot Formation (Sand).	
Aquifer type	The superficial deposits are classified as a principal aquifer in parts of the ward and a secondary A aquifer in other areas. According to Environment Agency definitions, a principal aquifer has high intergranular and/or fracture permeability - meaning they usually provide a high level of water storage, and can support water supply and/or river baseflow on a strategic scale. A secondary A aquifer is defined as a permeable layer capable of supporting water supplies at a local rather than strategic scale and in some cases forms an important source of base flow to rivers. There are areas in the ward where there are no superficial deposits. These areas will be directly underlain by the Bagshot Formation, and designated as a secondary aquifer. The underlying bedrock is also classified as a secondary A aquifer.	Figures 6 and 7
Groundwater vulnerability classification and source protection zone	The superficial deposits give the ward the following categories of risk vulnerability in different areas: -'major aquifer high' (north and south of the ward) -'major aquifer low' (eastern side of the ward) -'minor aquifer high' (central part of the ward) -'minor aquifer low' (central part of the ward) The EA defines Source Protection Zones (SPZ) around all major public and private water supply abstractions in order to safeguard groundwater resources from potentially polluting activities. A large part of the ward is in zone 3 of a groundwater source catchment. This is defined as the area around a source within which all groundwater recharge is presumed to be discharged at the source. Part of the ward is also located in zone 2 which is defined by a 400 day travel time from a point below the water table. The EA records of smaller abstractions have not been reviewed at this stage.	Figures 18 and 22
Main rivers	The Woburn Park Stream forms part of the eastern boundary of the ward from Weybridge Road through to the Chertsey Bourne.	Figure 2
Ordinary watercourses	Figure 8 shows the location of the ordinary watercourses that run through this ward.	Figure 8

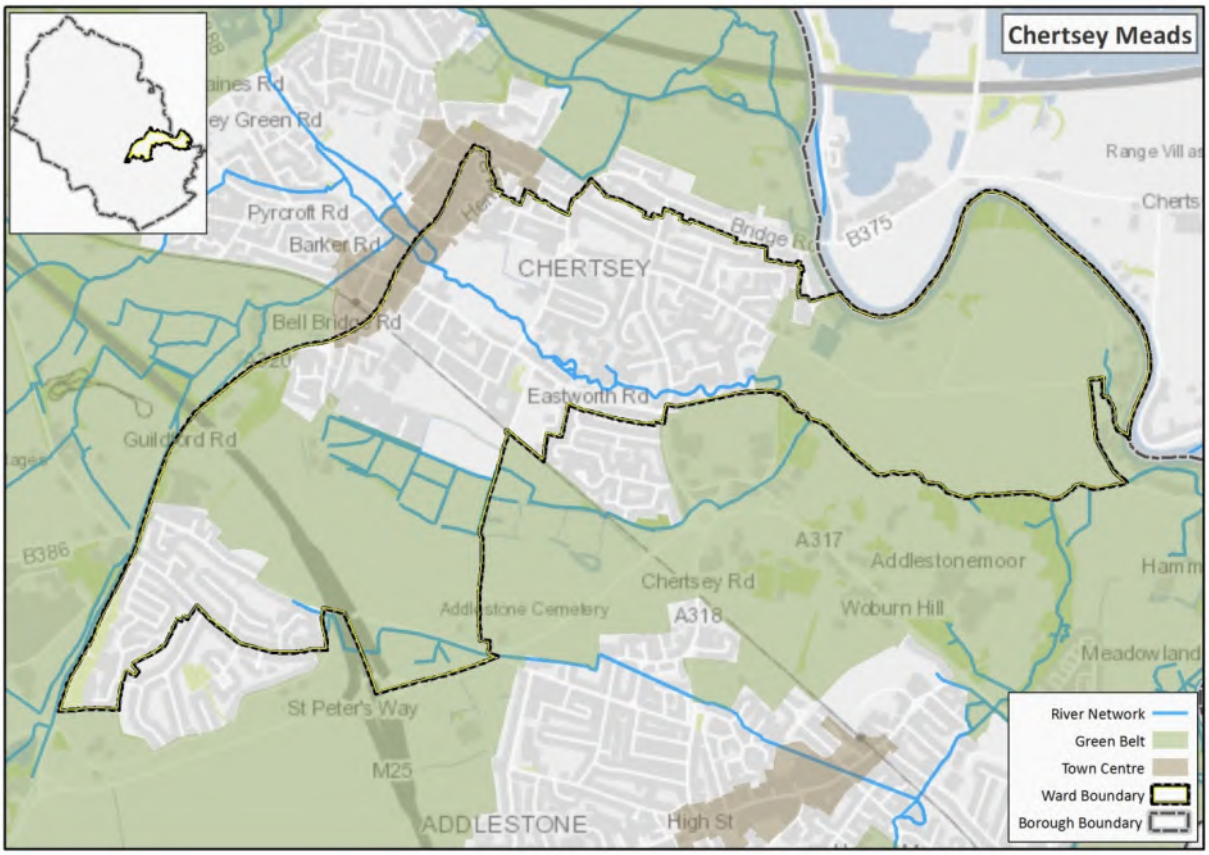
Addlestone North		
Strategic assessment of flood risk		
Flooding from rivers	*Flood Zones* Zone 1 Only: 2.3 sq.km (88%) Zone 2 Only: 0.2 sq.km (8%) Zone 3 Only: 0.1 sq.km (4%) Zone 2 or 3: 0.3 sq.km (12%) 12% (0.3sq.km) of the ward is within Flood Zones 2 or 3, of which 97% is in the Green Belt and 3% is located in the Urban Area. Very little land within the Urban Area is at risk of fluvial flooding and this is limited to land at Burn Close and a small area at the junction of Woburn Hill and Station Road. *Functional floodplain* 3% of the ward (0.08 sq.km) is shown to be at risk during the 5% (1 in 20 year) annual probability flood event. This is limited to Green Belt land in the north east of the ward. The land is undeveloped with the exception of a small area of land at the rear of Woburn Park Farm which appears to be used for open storage. *Climate change* When the Environment Agency's 1 in 100 models are contrasted with their 1 in 100 + 20% climate change models, it can be seen that there is a negligible increase in the areas of the ward that would be at risk from flooding. As noted in Chapter 4 however, the Environment Agency has recently released new climate change allowances which its current models do not comply with. This section therefore seeks to provide an indication of the potential impact of climate change in the ward although it is likely that further detailed modelling will be required to support development proposals coming forward. *Historic records* There are limited records of fluvial flooding occurring in this ward. Between 1920 and 1940 flooding was reported in the Princess Mary's Road/Finlay Gardens area. *Flood defences* There are no formal flood defences in the ward. The Environment Agency Asset Information Management Systems (AIMS) identifies that there is a passive monitoring system in the south eastern corner of the ward (on the boundary with Addlestone Bourneside).	Figure 11 Figure 13 Figures 10a, b, c and d Figure 9 and appendix 3
Surface water flooding	The Environment Agency's 'risk of flooding from surface water' mapping identifies a higher risk of surface water flooding in a number of areas including parts of Green Lane, Prairie Road, Douglas Road, Rickman Crescent, Princess	Figure 14

	Mary's Road (and the roads surrounding).	
Flooding from groundwater	The BGS dataset 'Susceptibility to Groundwater Flooding' shows that the majority of this ward has limited potential for groundwater flooding to occur. One pocket exists at the south of the ward where the potential for groundwater flooding is greater. This is located in and around Addlestone Town Centre. In this part of the ward there is shown to be potential for groundwater flooding of property below ground level which is indicative of a shallow water table in this location.	Figure 17
Flooding from sewers	During the last 10 years sewer flooding has affected up to 2 properties in the KT15 2 postcode area (external flooding) and up to 1 property in the KT15 1 postcode area (external flooding) according to Thames Water's DG5 register[21]. There are no records of internal sewer flooding.	Figures 15 and 16
Flooding from reservoirs, canals and other artificial sources	There are no large surface water bodies with the ward although there are a number of small ponds at the Abbeymoor Golf Club. The Wraysbury, King George VI, Queen Mary, Queen Elizabeth II, Queen Mother and Staines South reservoirs are located to the north and east of the ward in the adjoining boroughs of Spelthorne, RBWM and Elmbridge. The Environment Agency dataset 'risk of flooding from reservoirs' shows that part of the land on the far east of the ward could be flooded if one of these reservoirs were to fail and release the water it holds. This could encompass part of the land at the edge of St George's College.	Figures 19 and 20a, b and c
Wetspot data	SCC has identified part of Church Road, a short stretch along the High Street and the Addlestonemoor roundabout are known 'wetspots'. The southern ward boundary runs down the middle of Church Road and as such this road will also feature in the entry for Addlestone Bourneside, the adjoining ward to the south.	Figure 21
Dry islands	There are no dry islands with a size of 0.5ha or greater in this ward.	Figure 12
Managing and mitigating flood risk		
Flood warning areas	'Chertsey Bourne at Chertsey', 'Addlestone Bourne at Addlestone', Properties closest to the Addlestone Bourne at Addlestone.	-
SuDS suitability	Across the majority of the ward, the BGS drainage summary indicates that there are opportunities for bespoke infiltration SuDS. A sizable area to the east of the railway line is also shown to be highly compatible for infiltration SuDS. However in parts of the ward where the water table	Figure 23

[21] Post codes areas and ward boundaries are not aligned. As such there cannot be complete accuracy when determining the number of properties that have been affected by sewerage flooding at ward level. For the benefit of this assessment the total number of properties that have reported across the postcode area has been noted. It is not known from the data provided the exact number of these properties that are located in this ward.

	is shallow, infiltration SUDs should be kept as shallow as possible. Only a very small part of the ward is shown to have very significant constraints for SUDs.	
Site specific SFRA guidance	Chapter 8 provides detailed guidance on measures to manage and mitigate flood risk, and Chapter 9 provides guidance on preparation of site-specific FRAs.	Chapters 8 and 9
Policy recommendations	Chapter 10 provides spatial planning and development management recommendations for the Borough.	Chapter 10

Chertsey Meads



General information		
Area	Chertsey Meads covers an area of 3.1 sq.km comprising 55% Green Belt and 45% Urban Area.	Figure 2
Character	This ward contains a large part of the Chertsey Urban Area including part of the designated Chertsey town centre which contains a mix of commercial, retail, leisure and residential uses. The urban area also includes both the Hanworth Lane Trading Estate and the Fordwater Trading Estate. The remaining urban area is characterised predominantly by residential development with other uses interspersed. The Green Belt area on the eastern side of this ward is dominated by Chertsey Meads which is a Local Nature Reserve on the banks of the River Thames which is used for outdoor recreation. An area of largely open Green Belt land on the western side of the ward separates the Chertsey Urban Area from the Chertsey South Urban Area.	-
Topography	South west area 20-25m AOD around Pannells Farm / Green Lane, rest of ward averages 10m AOD.	Figure 3
Geology	Superficial-Parts of the ward are underlain by alluvium (silt), Kempton Park Gravel Member (sand and gravel), Shepperton Gravel Member (sand and gravel) and Lynch Hill Gravel Member (sand and gravel). In some	Figures 4 and 5

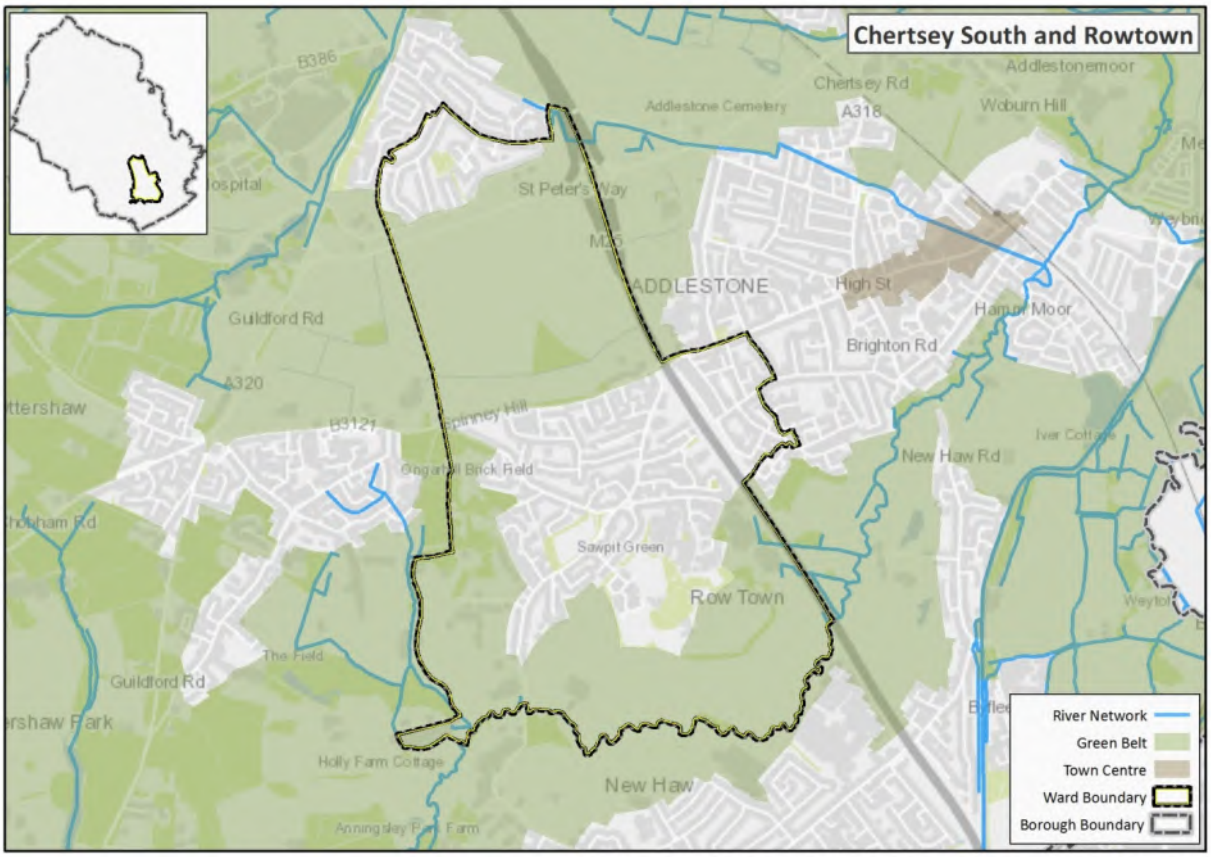
	areas of the ward, no superficial deposits are present. Bedrock-the entire ward is underlain by Bagshot Formation (Sand).	
Aquifer type	The superficial deposits are classified as a principal aquifer in parts of the ward and a secondary A aquifer in other areas. According to Environment Agency definitions, a principal aquifer has high intergranular and/or fracture permeability - meaning that they usually provide a high level of water storage, and can support water supply and/or river baseflow on a strategic scale. A secondary A aquifer is defined as a permeable layer capable of supporting water supplies at a local rather than strategic scale and in some cases forms an important source of base flow to rivers. There are areas in this ward where there are no superficial deposits. These areas will be directly underlain by the Bagshot Formation, and designated as a secondary aquifer. The underlying bedrock is classified as a secondary A aquifer.	Figures 6 and 7
Groundwater vulnerability classification and source protection zone	The superficial deposits give approximately ¾ of the ward a 'major aquifer high' category of risk vulnerability (eastern side of ward). The western side of the ward also contains small areas with the following risk vulnerabilities: -'minor aquifer intermediate' -'major aquifer intermediate' -'minor aquifer high' The EA defines Source Protection Zones (SPZ) around all major public and private water supply abstractions in order to safeguard groundwater resources from potentially polluting activities. Part of the ward is in zone 3 of a groundwater source catchment. This is defined as the area around a source within which all groundwater recharge is presumed to be discharged at the source. Part of the ward is also located in zone 2 which is defined by a 400 day travel time from a point below the water table. Just beyond the northern boundary of the ward is zone 1 where groundwater is particularly vulnerable to contamination. The EA records of smaller abstractions have not been reviewed at this stage.	Figures 18 and 22
Main rivers	Chertsey Bourne River Thames	Figure 2
Ordinary watercourses	Figure 8 shows the location of the ordinary watercourses that run through this ward	Figure 8

Chertsey Meads		
Strategic assessment of flood risk		
Flooding from rivers	*Flood Zones* Zone 1 Only: 1.4 sq.km (47%) Zone 2 Only: 0.3 sq.km (9%) Zone 3 Only: 1.3 sq.km (44%) Zone 2 or 3: 1.6 sq.km (53%) 53% (1.6sq.km) of the ward is within Flood Zones 2 or 3, of which 56% is in the Green Belt and 44% is located in the Urban Area. The Urban Area within the Flood Zones includes much of the area to the north of the Eastworth Road (A317). This includes part of Chertsey Town Centre. *Functional floodplain* 32% of the ward (1 sq.km) is shown to be at risk during the 5% (1 in 20 year) annual probability flood event. In the Green Belt this comprises the majority of Chertsey Meads and Dockett Eddy. In the Urban Area significant areas of land to the north of the Eastworth Road are located in this zone including parts of Drill Hall Road, Bramley Close, Pound Road, Free Prae Road and Flemish Gardens. *Climate change* When the Environment Agency's 1 in 100 models are contrasted with their 1 in 100 + 20% climate change models, it can be seen that there is a negligible increase in the areas of the ward that would be at risk from flooding. As noted in Chapter 4 however, the Environment Agency has recently released new climate change allowances which its current models do not comply with. This section therefore seeks to provide an indication of the potential impact of climate change in the ward although it is likely that further detailed modelling will be required to support development proposals coming forward. *Historic records* Runnymede Borough Council and the Environment Agency hold records of extensive fluvial flooding occurring in this ward from the Chertsey Bourne and the River Thames in the area surrounding Mead Lane; including Chertsey Meads itself and Dockett Eddy, in the Bramley Close/Fordwater Close area, in the residential area accessed off Drill Hall Road/Galsworthy Road/Heriot Road and in the Eastworth Road area. *Flood defences* No formal flood defences exist in the ward. The Environment Agency Asset Information Management	Figure 11 Figure 13 Figures 10a, b, c and d Figure 9 and appendix 3

	Systems (AIMS) identifies that a passive monitoring system exists in the south eastern corner of the Borough on the boundary with the Addlestone Bourneside ward.	
Surface water flooding	The Environment Agency's 'risk of flooding from surface water' mapping identifies a higher risk of surface water flooding in a number of areas including in Green Lane, Lyndhurst Way, Little Green Lane, Gordon Road, Gordon Drive, Hamilton Close, Fairway, Free Prae Road, Bramley Close, Fordbridge Close, Springfields Close, Marina Close. Surface water is also shown to pond adjacent to the Bourne.	Figure 14
Flooding from groundwater	The BGS dataset 'Susceptibility to Groundwater Flooding' shows that the majority of this ward has limited potential for groundwater flooding to occur. Two pockets exist where there is shown to be potential for groundwater flooding of property below ground level, this includes the part of Chertsey Town Centre that is located in the ward.	Figure 17
Flooding from sewers	During the last 10 years sewer flooding has affected up to 9 properties in the KT16 8 postcode area (external flooding), up to 3 properties in the KT16 9 postcode area (external flooding) and up to 2 properties in the KT15 2 postcode area (external flooding) according to Thames Water's DG5 register[22]. There are no records of internal sewer flooding.	Figures 15 and 16
Flooding from reservoirs, canals and other artificial sources	The ward contains a man-made marina which is accessed from the River Thames. The Wraysbury, King George VI, Queen Mary, Queen Elizabeth II, Queen Mother and Staines North and South reservoirs are located to the north and east of the ward in the adjoining boroughs of Spelthorne, RBWM and Elmbridge. The Environment Agency dataset 'risk of flooding from reservoirs' shows that the open land at Chertsey Meads (Green Belt) and much of the land to the north of Eastworth Road which is located in the Urban Area and which is a predominantly residential area could be flooded if one of these reservoirs were to fail and release the water it holds.	Figures 19 and 20a, b and c
Wetspot data	SCC has identified parts of the following roads as known 'wetspots': Paddocks Way, Fordbridge Close, Bramley Close, Fordwater Road, Eastworth Road, Free Prae Road, Drill Hall Road, Pound Road, Green Lane, Little Green Lane (part of the area affected also located in Chertsey South and Rowtown), and Guildford Road, including the roundabout at the junction of Green Lane and Guildford Road (part of the area affected also located in Foxhills).	Figure 21
Dry islands	This ward contains a number of dry islands. The largest by some margin is the more well known 'Chertsey dry island' at	Figure 12

[22] Post codes areas and ward boundaries are not aligned. As such there cannot be complete accuracy when determining the number of properties that have been affected by sewerage flooding at ward level. For the benefit of this assessment the total number of properties that have reported across the postcode area has been noted. It is not known from the data provided the exact number of these properties that are located in this ward.

	the north of the ward which is relatively substantial in size and which is located in the urban area of Chertsey and covers part of the town centre. A second dry island has been identified in the urban area to the east of Heriot Road which is much smaller in scale, but which is located in the a residential area. Part of the residential development at Bridge Wharf is also located in a dry island. The remaining dry islands in this ward are located in the Green Belt.	
Managing and mitigating flood risk		
Flood warning areas	'River Thames at Chertsey', 'Areas of Chertsey closest to the Chertsey Bourne', 'Chertsey Bourne at Chertsey'	-
SuDS suitability	Across the majority of the ward, the BGS drainage summary indicates that there are opportunities for bespoke infiltration SuDS. In parts of the ward where a shallow water table exists, SUDS should be kept as shallow as possible. Infiltration SUDS may not be suitable at all if the water table is very shallow. In the northern part of the ward which is close to zone 1 of a source protection zone extra pollution prevention measures may be required for SUDS.	Figure 23
Site specific SFRA guidance	Chapter 8 provides detailed guidance on measures to manage and mitigate flood risk, and Chapter 9 provides guidance on preparation of site-specific FRAs.	Chapters 8 and 9
Policy recommendations	Chapter 10 provides spatial planning and development management recommendations for the Borough.	Chapter 10

Chertsey South and Rowtown		
		
General information		
Area	Chertsey South and Rowtown covers an area of 3.2 sq.km comprising 63% Green Belt and 37% Urban Area.	Figure 2
Character	This ward contains two separate parts of Urban Area- the first is Row Town to the south of the ward which is a largely residential area of mixed housing to the west of the M25 with local shops and recreational open space. The second piece of urban area is to the north of the ward and contains part of the Chertsey South, which is almost entirely residential in character, set in a gently undulating landscape and surrounded by extensive mature trees and hedging. It is separated from the main part of the Chertsey Urban Area to the north east, and Addlestone to the south by open Green Belt countryside.	-
Topography	Row Town 40-45m AOD, rest of ward 20-30m AOD.	Figure 3
Geology	Superficial-The majority of this ward is not underlain by superficial deposits although notable areas of Lynch Hill Gravel Member (sand and gravel) and Kempton Park gravel member (sand and gravel) exist. Small areas of head (diamicton) and alluvium (silt) are also observed.	Figures 4 and 5

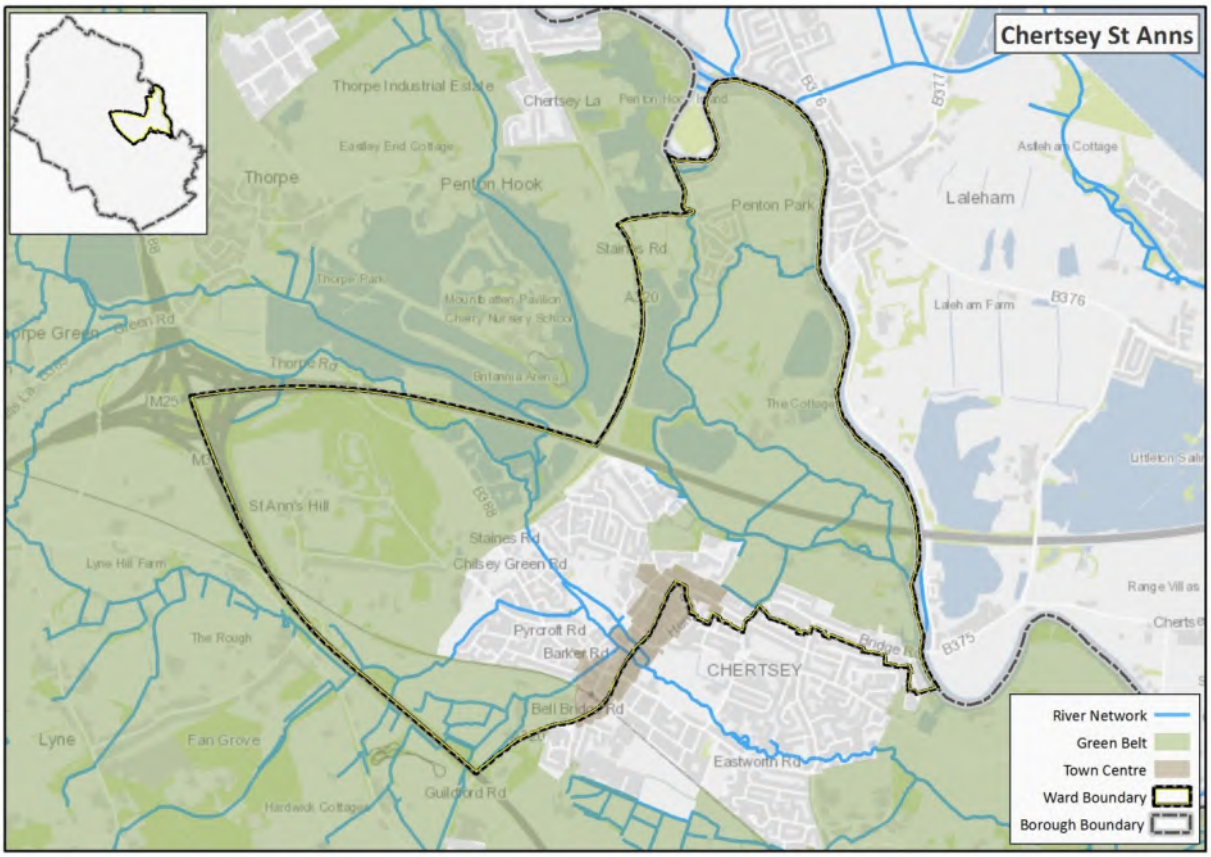
	Bedrock-the entire ward is underlain by Bagshot Formation (Sand).	
Aquifer type	Where superficial deposits exist in this ward they are classified as a principal aquifer in some areas and a secondary A aquifer in others. According to Environment Agency definitions, a principal aquifer has high intergranular and/or fracture permeability - meaning that they usually provide a high level of water storage, and can support water supply and/or river baseflow on a strategic scale. A secondary A aquifer is defined as a permeable layer capable of supporting water supplies at a local rather than strategic scale and in some cases forms an important source of base flow to rivers. There are areas in this ward where there are no superficial deposits. These areas will be directly underlain by the Bagshot Formation, and designated as a secondary aquifer. The underlying bedrock is classified as a secondary A aquifer.	Figures 6 and 7
Groundwater vulnerability classification and source protection zone	In the majority of the ward, the superficial deposits give the ward either a 'minor aquifer intermediate' category of risk vulnerability (at the north and south of the ward) or a 'minor aquifer high' category of risk vulnerability (central part of the ward). The EA defines Source Protection Zones (SPZ) around all major public and private water supply abstractions in order to safeguard groundwater resources from potentially polluting activities. The majority of the ward is not located in a Source Protection Zone. The exception is a small area of land in the north eastern corner of the ward which is located in zone 3 of a groundwater source catchment. This is defined as the area around a source within which all groundwater recharge is presumed to be discharged at the source. The EA records of smaller abstractions have not been reviewed at this stage.	Figures 18 and 22
Main rivers	The Addlestone Bourne runs along the entire length of the southern boundary of the ward.	Figure 2
Ordinary watercourses	Figure 8 shows the location of the ordinary watercourses that run through this ward.	Figure 8

Chertsey South and Rowtown		
Strategic assessment of flood risk		
Flooding from rivers	*Flood Zones* Zone 1 Only: 3.1 sq.km (96%)	Figure 11

	Zone 2 Only: <0.1 sq.km (2%) Zone 3 Only: <0.1 sq.km (2%) Zone 2 or 3: 0.15 sq.km (4%) 4% (0.15sq.km) of the ward is within Flood Zones 2 or 3, of which all is in the Green Belt and none is located in the Urban Area. *Functional floodplain* 2% of the ward (0.06 sq.km) is shown to be at risk during the 5% (1 in 20 year) annual probability flood event. No land in the Urban Area in this ward is within this zone. The limited land in the functional floodplain is located at the south of the ward on the banks of the Addlestone Bourne. This is mainly open land. *Climate change* When the Environment Agency's 1 in 100 models are contrasted with their 1 in 100 + 20% climate change models, it can be seen that there is a negligible increase in the areas of the ward that would be at risk from flooding. As noted in Chapter 4 however, the Environment Agency has recently released new climate change allowances which its current models do not comply with. This section therefore seeks to provide an indication of the potential impact of climate change in the ward although it is likely that further detailed modelling will be required to support development proposals coming forward. *Historic records* Runnymede Borough Council and the Environment Agency hold records of fluvial flooding occurring in this ward from the Addlestone Bourne. This has been limited to the southernmost part of the ward. *Flood defences* There are no formal flood defences in this ward. The Environment Agency Asset Information Management Systems (AIMS) identifies that there a no flood risk management assets in this ward.	Figure 13 Figures 10a, b, c and d Figure 9 and appendix 3
Surface water flooding	The Environment Agency's 'risk of flooding from surface water' mapping identifies a higher risk of surface water flooding in a number of areas including in parts of St Peters Way, Coombe Drive, Liberty Rise and Coombelands Lane and Row Town.	Figure 14
Flooding from groundwater	The BGS dataset 'Susceptibility to Groundwater Flooding' shows that the whole of this ward has limited potential for groundwater flooding to occur.	Figure 17
Flooding from sewers	During the last 10 years sewer flooding has affected up to 1 property in the KT15 1 postcode area (external flooding) and up to 4 properties in the KT16 0 postcode area (external	Figures 15 and 16

	flooding) according to Thames Water's DG5 register[23]. There are no records of internal sewer flooding.	
Flooding from reservoirs, canals and other artificial sources	There are no large surface water bodies within this ward and the Environment Agency dataset 'risk of flooding from reservoirs' shows that none of the land in this ward would be flooded if one of the reservoirs in the Borough or in the vicinity of the Borough were to fail and release the water it holds.	Figures 19 and 20a, b, c
Wetspot data	SCC has identified parts of the following roads as known 'wetspots': Old Road and Little Green lane (part of the area affected also located in Chertsey Meads).	Figure 21
Dry islands	There are no dry islands with a size of 0.5ha or greater in this ward.	Figure 12
Managing and mitigating flood risk		
Flood warning areas	''Addlestone Bourne at Woodham'	-
SuDS suitability	The majority of the ward is shown by the BGS drainage summary to be highly compatible for infiltration SuDS, although some smaller areas are shown to have opportunities for bespoke infiltration SuDS. There are two areas in the ward where very significant constraints are indicated.	Figure 23
Site specific SFRA guidance	Chapter 8 provides detailed guidance on measures to manage and mitigate flood risk, and Chapter 9 provides guidance on preparation of site-specific FRAs.	Chapters 8 and 9
Policy recommendations	Chapter 10 provides spatial planning and development management recommendations for the Borough.	Chapter 10

[23] Post codes areas and ward boundaries are not aligned. As such there cannot be complete accuracy when determining the number of properties that have been affected by sewerage flooding at ward level. For the benefit of this assessment the total number of properties that have reported across the postcode area has been noted. It is not known from the data provided the exact number of these properties that are located in this ward.

Chertsey St Anns		
		
General information		
Area	Chertsey St Anns covers an area of 5.4 sq.km comprising 82% Green Belt and 18% Urban Area.	Figure 2
Character	The majority of this ward is located in the Green Belt, which contains the residential caravan park known as Penton Park and riverside dwellings along the banks of the Thames in Penton Hook on its eastern side. The Green Belt in this ward also contains a number of sites which have previously been used for gravel extraction, the golf course at Laleham Burway and one of the Borough's SANGS at St Ann's Hill. The ward also contains part of the Chertsey Urban Area including part of its town centre which contains a mix of commercial, retail, leisure and residential uses. The remainder of the Urban Area is largely residential in character.	-
Topography	St Anns Hill in north west of ward 50-70m AOD, rest of ward 10-15m AOD	Figure 3
Geology	Superficial-Areas of alluvium (silt), Shepperton gravel member (sand and gravel), Kempton Park gravel member (sand and gravel), head (diamicton) and Lynch Hill Gravel Member(sand and gravel) as well as a small area of sand and gravel of unknown age. In some areas of the ward, no superficial deposits are present.	Figures 4 and 5

	Bedrock-the majority of this ward is underlain by Bagshot Formation (sand). Isolated pockets of Windlesham Formation (sand), 1 small area of St Ann's Hill Pebble Member (conglomerate) and 1 small area of Claygate Member(sand) are also observed.	
Aquifer type	The superficial deposits are classified as a principal aquifer in parts of the ward, a secondary A aquifer in other areas, and in some limited parts as a secondary (undifferentiated) aquifer. According to Environment Agency definitions, a principal aquifer has high intergranular and/or fracture permeability - meaning that they usually provide a high level of water storage, and can support water supply and/or river baseflow on a strategic scale. A secondary A aquifer is defined as a permeable layer capable of supporting water supplies at a local rather than strategic scale and in some cases form an important source of base flow to rivers. Secondary undifferentiated aquifers are designated where it has not been possible to attribute either category A or B to a rock type. This classification is often indicative of the variable characteristics of the rock type. There are areas in this ward where there are no superficial deposits. These areas will be directly underlain by the bedrock described above, and designated as a secondary aquifer. For the great majority of this ward, the underlying bedrock is classified as a secondary A aquifer. In a small area in the north eastern corner, the underlying bedrock is classified as unproductive strata. According to EA definitions, unproductive strata are rock strata or drift deposits with low permeability that have negligible significance for water supply or river base flow.	Figures 6 and 7
Groundwater vulnerability classification and source protection zone	The superficial deposits give approximately ¾ of the ward a 'major aquifer high' category of risk vulnerability. On the western side of the ward in the vicinity of St Ann's Hill the superficial deposits give a 'minor aquifer intermediate' category of risk vulnerability to a sizable area. The EA defines Source Protection Zones (SPZ) around all major public and private water supply abstractions in order to safeguard groundwater resources from potentially polluting activities. The majority of this ward is located in a Source Protection Zone with parts of the ward being located in zone 1, 2, and 3. Zone 1 is defined as the 50 day travel time from any point below the water table to the source. This zone has a	Figures 18 and 22

	minimum radius of 50 metres, zone 2 is defined by a 400 day travel time from a point below the water table. Zone 3 is defined as the area around a source within which all groundwater recharge is presumed to be discharged at the source. The EA records of smaller abstractions have not been reviewed at this stage.	
Main rivers	River Thames Chertsey Bourne The Moat The Rutherwyck Road Ditch Abbey River	Figure 2
Ordinary watercourses	Figure 8 shows the location of ordinary watercourses in that run through this ward.	Figure 8

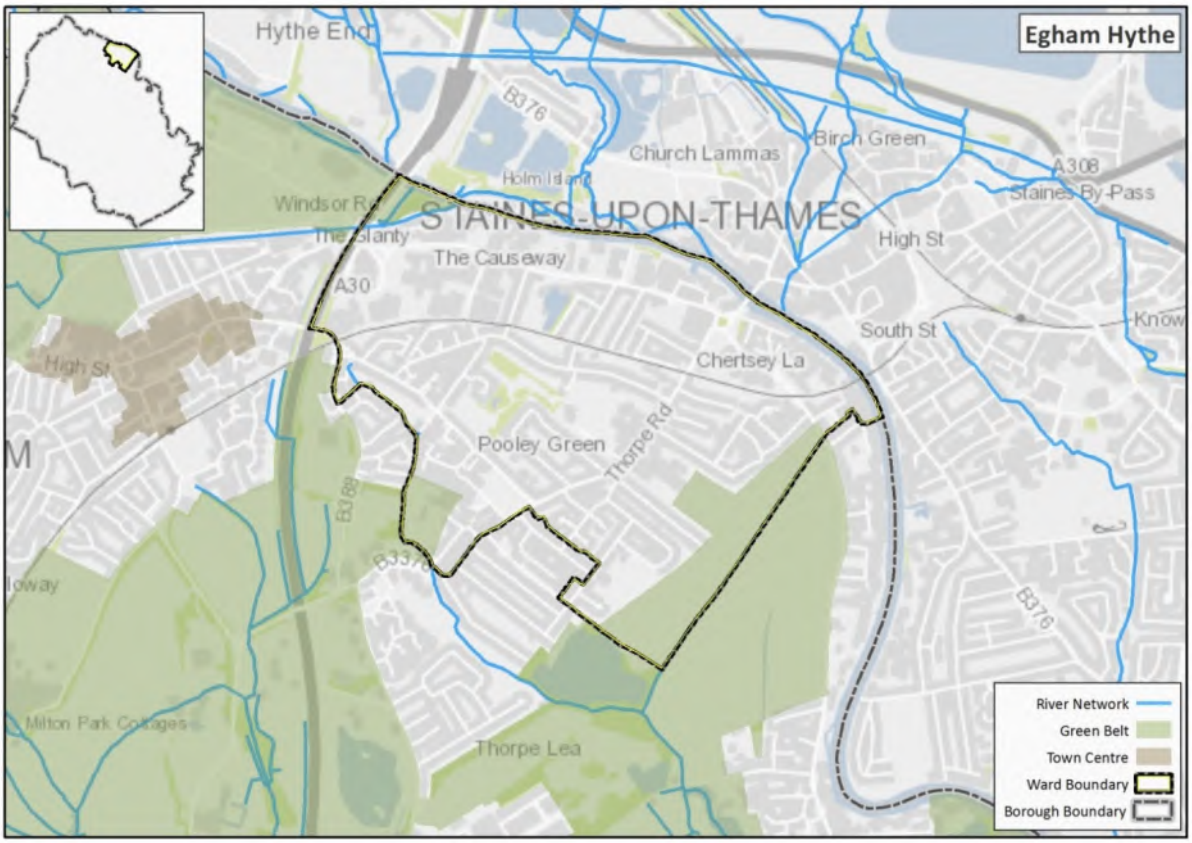
Chertsey St Anns		
Strategic assessment of flood risk		
Flooding from rivers	*Flood Zones* Zone 1 Only: 1.7 sq.km (31%) Zone 2 Only: 1 sq.km (18%) Zone 3 Only: 2.8 sq.km (51%) Zone 2 or 3: 3.8 sq.km (69%) 69% (3.8sq.km) of the ward is within Flood Zones 2 or 3, of which 80% is in the Green Belt and 20% is located in the Urban Area. The Urban Area within the Flood Zones is extensive and includes part of Chertsey Town Centre.	Figure 11
	Functional floodplain 37% of the ward (2 sq.km) is shown to be at risk during the 5% (1 in 20 year) annual probability flood event. This comprises mainly Green Belt land including Laleham Reach and parts of Penton Park. In the Urban Area, this zone includes parts of a number of roads including Brookside, Pyrcroft Road, Frithwald Road, Twynersh Avenue and Grove Road.	Figure 13
	Climate change When the Environment Agency's 1 in 100 models are contrasted with their 1 in 100 + 20% climate change models, it can be seen that there is a relatively modest increase in the areas of the ward that would be at risk from flooding although where new areas would be at risk, these tend to be in the Urban Area (in the vicinity of St Ann's Road, Cowley Avenue and Riversdell Close in particular). As noted in Chapter 4 however, the Environment Agency has recently released new climate change allowances which its current models do not comply with. This section therefore seeks to provide an indication of the potential impact of	

	climate change in the ward although it is likely that further detailed modelling will be required to support development proposals coming forward. *Historic records* Runnymede Borough Council and the Environment Agency hold records of extensive fluvial flooding occurring in this ward including the majority of the land to the north of the M3 Motorway including Laleham Reach and Penton Park, Bridge Road, Bridge Wharf, Twynersh Avenue, Chaseside Gardens, St Ann's Road and also a large area surrounding Chertsey Football Club. *Flood defences* There are no formal flood defences in this ward. The Environment Agency Asset Information Management Systems (AIMS) identifies a number of flood risk management assets within this ward.	Figures 10a, b, c and d Figure 9 and appendix 3
Surface water flooding	The Environment Agency's 'risk of flooding from surface water' mapping identifies a higher risk of surface water flooding in a number of areas including in parts of Brookside, the M25 motorway, Frithwald Road and Masonic Hall Road.	Figure 14
Flooding from groundwater	The BGS dataset 'Susceptibility to Groundwater Flooding' shows that the western most part of this ward has limited potential for groundwater flooding to occur. The majority of the ward is however classified as having potential for groundwater flooding of property below ground level or potential for groundwater flooding to occur at the surface. This includes the part of Chertsey Town Centre that is located in the ward.	Figure 17
Flooding from sewers	During the last 10 years sewer flooding has affected up to 9 properties in the KT16 8 postcode area (external flooding), up to 3 properties in the KT16 9 postcode area (external flooding) and up to 4 properties in the KT16 0 postcode area (external flooding) according to Thames Water's DG5 register[24]. There are no records of internal sewer flooding.	Figures 15 and 16
Flooding from reservoirs, canals and other artificial sources	A reservoir is located in the ward which was built in the early 1970s. The reservoir is a pumped storage reservoir which holds 432MI when full[25]. The site also contains the Chertsey Water Treatment Works which contains a number of tanks. To the east and north of the ward in neighbouring local authorities are the Wraysbury, Queen Mary, Queen Mother, King George VI, Chertsey Settling, Staines North and Staines South reservoirs.	Figures 19 and 20a, b, c

[24] Post codes areas and ward boundaries are not aligned. As such there cannot be complete accuracy when determining the number of properties that have been affected by sewerage flooding at ward level. For the benefit of this assessment the total number of properties that have reported across the postcode area has been noted. It is not known from the data provided the exact number of these properties that are located in this ward.

[25] Information from RU.10/0719

	The Environment Agency dataset 'risk of flooding from reservoirs' shows that much of the land to the east of the A320 and north of Eastworth Road could be flooded if one of these reservoirs were to fail and release the water it holds, this could include the residential area surrounding Chertsey Football Club.	
Wetspot data	SCC has identified parts of the following roads as known 'wetspots': Almners Road, Ruxbury Road, Bell Bridge Road, Chilsey Green Road, roundabout at the junction of Thorpe Road, Staines Road, Saint Ann's Road and Chilsey Green Road, St Ann's Road, Longbourne Way, Grove Road, Drill Hall Road, London Street, roundabout at junction of Mixnams Lane and Staines Road (part of this roundabout also located in Thorpe ward).	Figure 21
Dry islands	A small part of the 'Chertsey dry island' is located in this ward. This dry island includes mostly the urban area including part of Chertsey Town Centre. There is also a dry island to the south of the A320 in the vicinity of St Ann's Road. The remainder of the dry islands located in this ward, are located within the Green Belt and either cover open land or areas of sparse development.	Figure 12
Managing and mitigating flood risk		
Flood warning areas	'Area of Chertsey closest to the Chertsey Bourne', 'Chertsey Bourne at Chertsey', 'River Thames at Laleham', 'River Thames at Chertsey'	-
SuDS suitability	According to the BGS drainage summary, large areas of this ward have very significant constraints on the use of SUDs due to the fact that almost the entire zone 1 of a Source Protection Zone (SPZ1) is located within this ward. This will have a significant constraint on the use of SUDs. The SPZ1 is designated to product the drinking water abstraction and therefore there are limits on what can be discharged to ground. Only roof water should discharge to ground within the SPZ1.Whilst this is true for the majority of the ward, there is a sizable area on the western side of the ward which is shown to be highly compatible for infiltration SuDS. Parts of the ward are also shown to have opportunities for bespoke infiltration SuDS.	Figure 23
Site specific SFRA guidance	Chapter 8 provides detailed guidance on measures to manage and mitigate flood risk, and Chapter 9 provides guidance on preparation of site-specific FRAs.	Chapters 8 and 9
Policy recommendations	Chapter 10 provides spatial planning and development management recommendations for the Borough.	Chapter 10

Egham Hythe		
		
General information		
Area	Egham Hythe covers an area of 1.9 sq.km comprising 16% Green Belt and 84% Urban Area.	Figure 2
Character	This predominantly urban ward has the River Thames running along its northern boundary and is bordered by the M25 motorway along its western boundary. The ward contains one of the Borough's established employment areas, made up of the Causeway and at the Pine Trees Business Park. The remainder of the ward is largely residential in character. The Egham Hythe Conservation Area is located in the north eastern corner of the ward. This is a compact conservation area, centred on a small enclave of properties adjoining the River Thames. The 18th century style cottages back on to the Thames towpath (wharf) and together with the 17th Century Swan Hotel front the ancient road which leads to the original bridging place of the Thames.	-
Topography	Similar height for whole ward (15m AOD).	Figure 3
Geology	Superficial-The entire ward is underlain by superficial deposits made up of areas of alluvium (silt), Shepperton gravel member (sand and gravel) and Langley silt member (silt). Bedrock-the entire ward is underlain by London Clay Formation (clay).	Figures 4 and 5

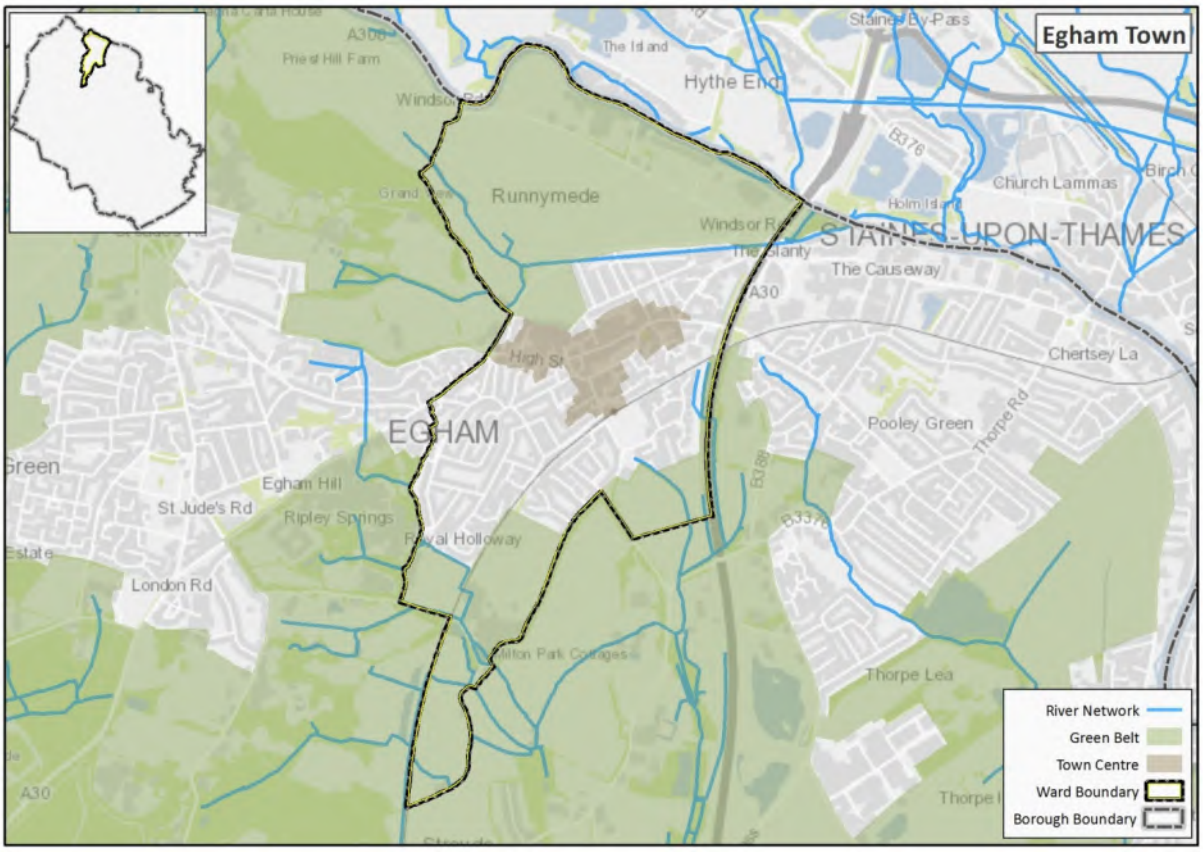
Aquifer type	The superficial deposits are classified as a principal aquifer in parts of the ward and a secondary A aquifer in other areas. According to Environment Agency definitions, a principal aquifer has high intergranular and/or fracture permeability – meaning that they usually provide a high level of water storage, and can support water supply and/or river baseflow on a strategic scale. A secondary A aquifer is defined as a permeable layer capable of supporting water supplies at a local rather than strategic scale and in some cases form an important source of base flow to rivers. There are areas in this ward where there are no superficial deposits. These areas will be directly underlain by the London Clay, and designated as a secondary aquifer. The underlying bedrock is classified as unproductive strata. According to EA definitions, unproductive strata are rock strata or drift deposits with low permeability that have negligible significance for water supply or river base flow.	Figures 6 and 7
Groundwater vulnerability classification and source protection zone	The superficial deposits give the ward a 'major aquifer high' category of risk vulnerability. The EA defines Source Protection Zones (SPZ) around all major public and private water supply abstractions in order to safeguard groundwater resources from potentially polluting activities. The whole of this ward is located in zone 3 of a groundwater source catchment. Zone 3 is defined as the area around a source within which all groundwater recharge is presumed to be discharged at the source. The EA records of smaller abstractions have not been reviewed at this stage.	Figures 18 and 22
Main rivers	River Thames Meadlake Ditch Ripley Springs watercourse	Figure 2
Ordinary watercourses	Figure 8 shows the location of ordinary watercourses that run through this ward.	Figure 8

Egham Hythe		
Strategic assessment of flood risk		
Flooding from rivers	*Flood Zones* Zone 1 Only: 0 sq.km (0%) Zone 2 Only: 0.8 sq.km (43%) Zone 3 Only: 1.1 sq.km (57%) Zone 2 or 3: 1.9 sq.km (100%) 100% (1.9sq.km) of the ward is within Flood Zones 2 or 3, of which 13% is in the Green Belt and 87% is located in the Urban Area.	Figure 11

	Functional floodplain 32% of the ward (0.6 sq.km) is shown to be at risk during the 5% (1 in 20 year) annual probability flood event. This comprises a number of roads in the Urban Area including Holbrook Meadow, Pooley Green Road, Charta Road, Rowan Avenue, Roundway, Hythe Park Road, Glebe Road, Field View, Huntingfield Way, Bishops Way, Barons Way, Lacey Close, Coopers Close, Riverside Drive, Boleyn Close, Farm Close, Bowes Road and Wapshott Road. *Climate change* When the Environment Agency's 1 in 100 models are contrasted with their 1 in 100 + 20% climate change models, it can be seen that there is a notable increase in the areas of the ward in the Urban area that would be at risk from flooding, including but not limited to Chandos Road, Claremont Road, Avenue Road, Hythe Road, Hythe Park Road, Pond Road, Vicarage Crescent, Green Lane, Pooley Avenue, Alexander Road and Mullens Road. As noted in Chapter 4 however, the Environment Agency has recently released new climate change allowances which its current models do not comply with. This section therefore seeks to provide an indication of the potential impact of climate change in the ward although it is likely that further detailed modelling will be required to support development proposals coming forward. *Historic records* Large areas of this ward have been affected by fluvial flooding historically including Hythe Park and the surrounding area, a number of residential roads to the south of The Causeway, the Hythe and the now residential area to the south of the Magna Carta School. In the 2013/14 flood event Wapshott Road, Bishops Way, Bowes Road, Pooley Green Road, Roundway, Mullens Road, Coopers Close, Conifer Lane, Vicarage Crescent and Vicarage Road were affected. *Flood defences* There are no formal flood defences in the ward. The Environment Agency Asset Information Management Systems (AIMS) identifies that there is a passive monitoring system on the Mead Lake Ditch at the southern edge of this ward (on the boundary with the Thorpe ward)	Figure 13 Figures 10a, b, c and d Figure 9 and appendix 3
Surface water flooding	The Environment Agency's 'risk of flooding from surface water' mapping identifies a higher risk of surface water flooding in a number of areas including in parts of Hawthorne Road, Claremont Road, Avenue Road, Holbrook Meadow, Huntingfield Way, Bishops Way and Roundway.	Figure 14
Flooding from	The BGS dataset 'Susceptibility to Groundwater Flooding'	Figure 17

groundwater	shows that the majority of the ward is classified as having potential for groundwater flooding to occur. There is however observed to be an 'island' immediately adjacent to the M25 motorway which is not shown to not be susceptible to groundwater flooding.	
Flooding from sewers	During the last 10 years sewer flooding has affected up to 1 property in the TW18 3 postcode area (external flooding), up to 9 properties in the TW20 8 postcode area (3 internal flooding and 6 external flooding) and up to 8 properties in the TW20 9 postcode area (external flooding according to Thames Water's DG5 register[26].	Figures 15 and 16
Flooding from reservoirs, canals and other artificial sources	There are no large surface water bodies within this ward. In the adjoining boroughs of Spelthorne and RBWM are the Wraysbury, King George VI, Queen Mother, Queen Mary and Staines North and South reservoirs. The Environment Agency dataset 'risk of flooding from reservoirs' shows that the entire ward could be flooded if one of these reservoirs were to fail and release the water it holds.	Figures 19 and 20a, b, c
Wetspot data	SCC has identified parts of the following roads as known 'wetspots': Chertsey Road, the Hythe, Pooley Green Road, Vicarage Road (part of the area affected also located in Thorpe ward), Hythe Park Road and Roundway.	Figure 21
Dry islands	There are a number of dry islands in this ward, all of which are located in the urban area. The largest of these dry islands are located in the vicinity of the Causeway.	Figure 12
Managing and mitigating flood risk		
Flood warning areas	'River Thames at Staines and Egham', 'Properties closest to the River Thames between Runnymede Pleasure Grounds, Stains and Penton Hook' and 'Colne Brook at Colnbrook'	-
SuDS suitability	According to the BGS drainage summary, a large part of this ward has very significant constraints for the use of SUDs. There is however a sizable area on the north western side of the ward which is shown to have opportunities for bespoke infiltration SuDS. In this part of the ward the infiltration SUDs should be kept as shallow as possible due to the shallow water table.	Figure 23
Site specific SFRA guidance	Chapter 8 provides detailed guidance on measures to manage and mitigate flood risk, and Chapter 9 provides guidance on preparation of site-specific FRAs.	Chapters 8 and 9
Policy recommendations	Chapter 10 provides spatial planning and development management recommendations for the Borough.	Chapter 10

[26] Post codes areas and ward boundaries are not aligned. As such there cannot be complete accuracy when determining the number of properties that have been affected by sewerage flooding at ward level. For the benefit of this assessment the total number of properties that have reported across the postcode area has been noted. It is not known from the data provided the exact number of these properties that are located in this ward.

Egham Town		
		
General information		
Area	Egham Town covers an area of 2.6 sq.km comprising 58% Green Belt and 42% Urban Area.	Figure 2
Character	The northern part of this ward, north of the A30 Egham bypass is located in the Green Belt and contains part of the Runnymede Meadows and the Runnymede Pleasure Grounds-a public open space adjacent to the River Thames. In the central part of the ward is part of the Egham Urban Area which contains Egham Town Centre and the Egham Town Conservation Area. Strodes College is also located in the town centre. In early 2015 a new development containing a Waitrose supermarket and Travel Lodge hotel opened in the town centre. Outside the town centre but within the urban area, are a range of different types and sizes of residential dwelling with some commercial and retail uses interspersed. The southern part of the ward is again located in the Green Belt with areas of open land being observed as well as the more built up area at Rusham Park which is one of the Council's Major Developed Sites (MDS) in the Green Belt. Part of the Royal Holloway MDS is also located in the southern part of the ward.	-
Topography	Similar height for whole ward (15m AOD).	Figure 3

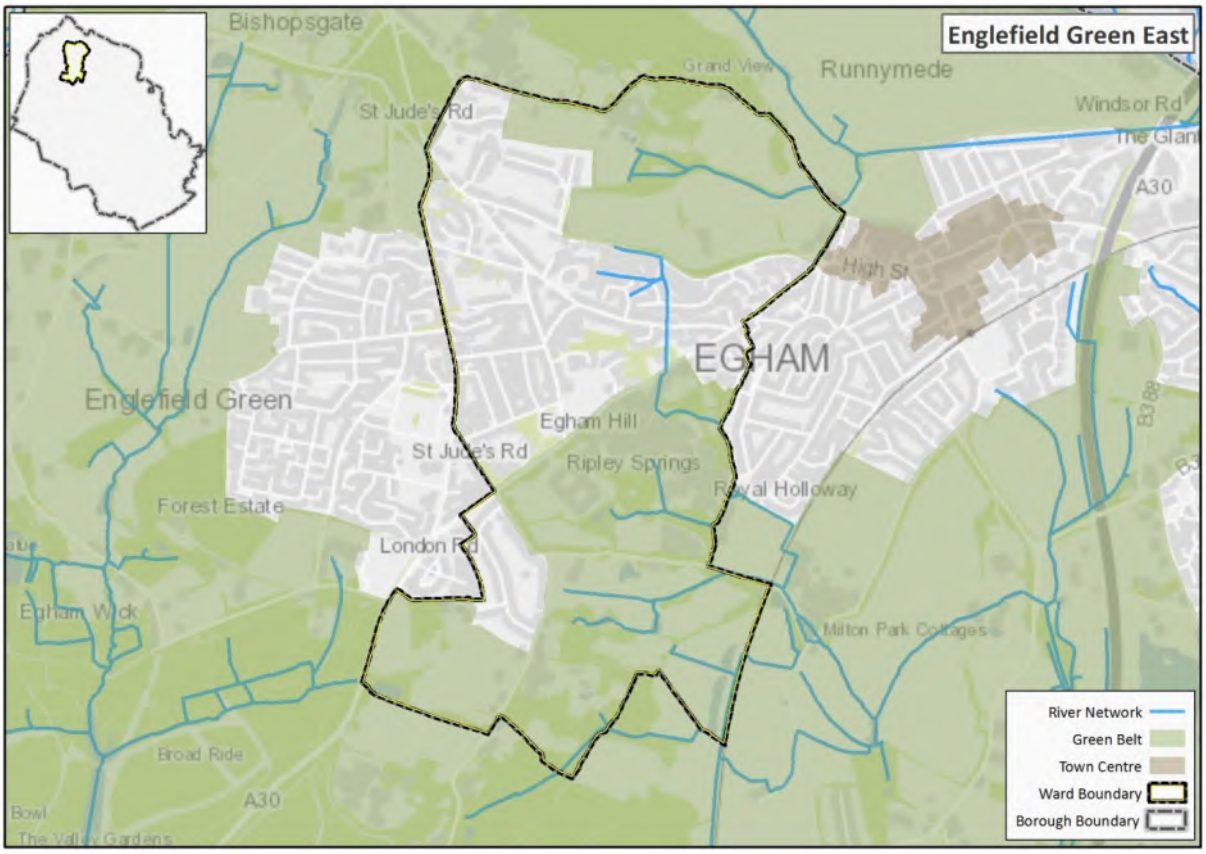
Geology	Superficial-The majority of the ward is underlain by superficial deposits with notable areas of alluvium (silt), Shepperton gravel member (sand and gravel) and Kempton Park Gravel Formation (sand and gravel) observed as well as one small area on the eastern side of the ward of Langley silt member (silt). In some parts of the ward, superficial deposits are not present. Bedrock-the entire ward is underlain by London Clay Formation (clay).	Figures 4 and 5
Aquifer type	The superficial deposits are classified as a principal aquifer in parts of the ward and a secondary A aquifer in other areas. According to Environment Agency definitions, a principal aquifer has high intergranular and/or fracture permeability - meaning that they usually provide a high level of water storage, and can support water supply and/or river baseflow on a strategic scale. A secondary A aquifer is defined as a permeable layer capable of supporting water supplies at a local rather than strategic scale and in some cases form an important source of base flow to rivers. The underlying bedrock is classified as unproductive strata. According to EA definitions, unproductive strata are rock strata or drift deposits with low permeability that have negligible significance for water supply or river base flow.	Figures 6 and 7
Groundwater vulnerability classification and source protection zone	The superficial deposits give the ward a 'major aquifer high' category of risk vulnerability in the northern part of the ward. The southern part of the ward has a 'major aquifer intermediate' category of risk vulnerability. The EA defines Source Protection Zones (SPZ) around all major public and private water supply abstractions in order to safeguard groundwater resources from potentially polluting activities. Part of this ward is located in zone 3 of a groundwater source catchment. Zone 3 is defined as the area around a source within which all groundwater recharge is presumed to be discharged at the source. The EA records of smaller abstractions have not been reviewed at this stage.	Figures 18 and 22
Main rivers	River Thames Ripley Springs watercourse	Figure 2
Ordinary watercourses	Figure 8 shows the location of the ordinary watercourses that run through this ward.	Figure 8

Egham Town		
Strategic assessment of flood risk		
Flooding from rivers	*Flood Zones* Zone 1 Only: 0.8 sq.km (28%) Zone 2 Only: 0.9 sq.km (34%) Zone 3 Only: 1 sq.km (38%) Zone 2 or 3: 1.9 sq.km (72%) 72% (1.9sq.km) of the ward is within Flood Zones 2 or 3, of which 69% is in the Green Belt and 31% is located in the Urban Area. The Urban Area within the Flood Zones includes part of Egham Town Centre.	Figure 11
	Functional floodplain 30% of the ward (0.8 sq.km) is at risk during the 5% (1 in 20 year) annual probability flood event. This comprises a large area of Green Belt land to the north of the A30 Egham Bypass including a number of residential properties and businesses accessed off the Windsor Road. However there are parts of the ward where detailed modelling does not exist for the 5% annual probability flood event. In these areas, a cautious approach will be taken and sites will be treated as being within the functional floodplain unless applicants are able to provide modelling to show a site is not within the 5% AEP flood extent.	Figure 13
	Climate change When the Environment Agency's 1 in 100 models are contrasted with their 1 in 100 + 20% climate change models, it can be seen that there is a notable increase in the areas of the ward that would be at risk from flooding. In the urban area this would include, but is not limited to Strode's College, the residential area in the vicinity of Crown Street and Hummer Road, Herndon Close, Manor Farm Lane, and the residential area accessed from Wesley Drive. As noted in Chapter 4 however, the Environment Agency has recently released new climate change allowances which its current models do not comply with. This section therefore seeks to provide an indication of the potential impact of climate change in the ward although it is likely that further detailed modelling will be required to support development proposals coming forward.	
	Historic records Runnymede Borough Council and the Environment Agency hold records of fluvial flooding occurring in the area to the north of the Egham Bypass in particular. Albany Place and Vicarage Road were also affected in the 2013/14 flood event.	Figures 10a, b, c and d

	Flood defences There are no formal flood defences in this ward. The Environment Agency Asset Information Management Systems (AIMS) identifies a number of flood risk management assets within this ward.	Figure 10 and appendix 3
Surface water flooding	The Environment Agency's 'risk of flooding from surface water' mapping identifies a higher risk of surface water flooding in a number of areas including in parts of Nobles Way, Lynwood Avenue, Nightingale Shott, Spring Avenue, the Crescent, Egham Hill, Milton Road, Limes Road and Runnymede Road.	Figure 14
Flooding from groundwater	The BGS dataset 'Susceptibility to Groundwater Flooding' shows that the majority of the ward is classified as having potential for groundwater flooding to occur at the surface. The exception is a slither of land at the western side of the ward (area in the vicinity of Spring Rise) which is not shown to be a risk of groundwater flooding.	Figure 17
Flooding from sewers	During the last 10 years sewer flooding has affected up to 8 properties in the TW20 9 postcode area (external flooding), up to 4 properties in the GU25 4 postcode area (external flooding) and up to 4 properties in the TW20 0 postcode area (2 internal flooding and 2 external flooding)[27].	Figures 15 and 16
Flooding from reservoirs, canals and other artificial sources	There are no large surface water bodies within this ward. In the nearby borough of Spelthorne are the Wraysbury and King George VI reservoirs, in RBWM is the Queen Mother reservoir and to the south west of the ward within the borough of Runnymede is Virginia Water lake. The Environment Agency dataset 'risk of flooding from reservoirs' shows that the majority of the land within this ward could be flooded if one of these reservoirs were to fail and release the water it holds. The exception would be a small area of land on the far west hand side of the ward in the vicinity of Spring Rise/Malt Hill/Danehurst Close.	Figures 19 and 20a, b, c
Wetspot data	SCC has identified parts of the following roads as known 'wetspots': Windsor Road, The Avenue, Moore Grove Crescent, the Crescent, Limes Road and Milton Road.	Figure 21
Dry islands	There is a modest dry island in the vicinity of the Egham Bypass.	Figure 12
Managing and mitigating flood risk		
Flood warning areas	'River Thames at Staines and Egham', 'Coln Brook at Colnbrook', 'properties closest to the River Thames between Runnymede Pleasure Grounds, Staines and Penton Hook'	-

[27] Post codes areas and ward boundaries are not aligned. As such there cannot be complete accuracy when determining the number of properties that have been affected by sewerage flooding at ward level. For the benefit of this assessment the total number of properties that have reported across the postcode area has been noted. It is not known from the data provided the exact number of these properties that are located in this ward.

SuDS suitability	According to the BGS drainage summary, the great majority of this ward has very significant constraints.	Figure 23
Site specific SFRA guidance	Chapter 8 provides detailed guidance on measures to manage and mitigate flood risk, and Chapter 9 provides guidance on preparation of site-specific FRAs.	Chapters 8 and 9
Policy recommendations	Chapter 10 provides spatial planning and development management recommendations for the Borough.	Chapter 10

Englefield Green East		
		
General information		
Area	Englefield Green East covers an area of 2.5 sq.km comprising 64% Green Belt and 36% Urban Area.	Figure 2
Character	To the north of the A30 is part of the ward's Urban Area which contains Englefield Green. This part of the urban area is predominantly residential in character with shops and other local facilities being observed off St Judes Road and Victoria Street in particular. Part of the Englefield Green Conservation Area is located in the north western corner of the borough. The northern most part of the ward is located in the Green Belt as is the majority of the land to the south of the A30 at the bottom of the ward. It is in this part of the ward that that main campus for the Royal Holloway University of London Campus is located. The campus is one of the Council's Major Developed Sites in the Green Belt and contains the Grade I* listed Founders Building. Outline planning permission was granted at the campus in early 2015[28] for the University's masterplan for development up to 2031. This will include the construction of an additional 55,000sqm (net) academic and operational buildings and an additional	-

[28] Planning application reference RU.14/0099

	71,128sqm (net) student accommodation.	
Topography	Most northerly area around Coopers Hill 60-80m AOD, central, western and south western areas 60m AOD, south eastern areas down towards 15m AOD.	Figure 3
Geology	Superficial-Large parts of this ward are not underlain by superficial deposits. On the western side of the ward however are areas of river terrace deposits (7) (sand and gravel) and river terrace deposits (6) (sand and gravel). To the south of the ward is a small area of river terrace deposits (undifferentiated) and an area of Kempton Park Gravel Formation (sand and gravel). Bedrock-The western half of the ward is underlain by Bagshot Formation (sand) and the eastern half of the ward is underlain by London Clay Formation (clay). Between the 2 halves is a narrow strip made up of Windlesham Formation (sand) and London Clay Formation (silty clay).	Figures 4 and 5
Aquifer type	Where superficial deposits do exist in this ward they are classified as a principal aquifer in some areas and a secondary A aquifer in others. According to Environment Agency definitions, a principal aquifer has high intergranular and/or fracture permeability - meaning that they usually provide a high level of water storage, and can support water supply and/or river baseflow on a strategic scale. A secondary A aquifer is defined as a permeable layer capable of supporting water supplies at a local rather than strategic scale and in some cases form an important source of base flow to rivers. There are areas in this ward where there are no superficial deposits. These areas will be directly underlain by the bedrock, and designated as a secondary aquifer. For just over half of this ward (western side), the underlying bedrock is classified as a secondary A aquifer. In the eastern half of the ward, the underlying bedrock is classified as unproductive strata. According to EA definitions, unproductive strata are rock strata or drift deposits with low permeability that have negligible significance for water supply or river base flow.	Figures 6 and 7
Groundwater vulnerability classification and source protection zone	The superficial deposits give the western side of the ward a 'minor aquifer high' category of risk vulnerability. The southern part of the ward has a minor aquifer low category of risk vulnerability. The EA defines Source Protection Zones (SPZ) around all major public and private water supply abstractions	Figures 18 and 22

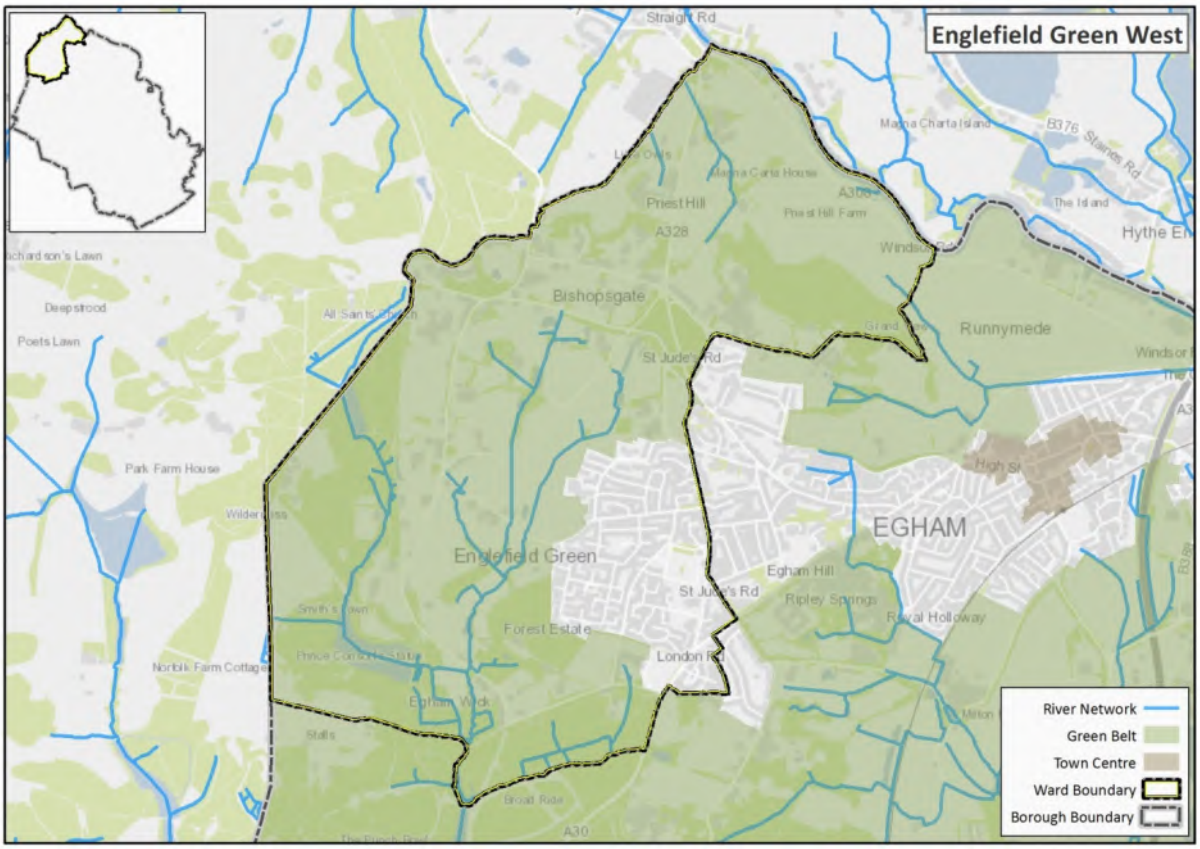
	in order to safeguard groundwater resources from potentially polluting activities. The great majority of this ward is not located in a Source Protection Zone. The exception is the north eastern corner which is located in zone 3 of a groundwater source catchment. Zone 3 is defined as the area around a source within which all groundwater recharge is presumed to be discharged at the source. The EA records of smaller abstractions have not been reviewed at this stage.	
Main rivers	Ripley Springs Watercourse	Figure 2
Ordinary watercourses	Figure 8 shows the location of the ordinary watercourses that run through this ward.	Figure 8

Englefield Green East		
Strategic assessment of flood risk		
Flooding from rivers	*Flood Zones* Zone 1 Only: 2.4 sq.km (95%) Zone 2 Only: 0.1 sq.km (5%) Zone 3 Only: 0 sq.km (0%) Zone 2 or 3: 0.1 sq.km (5%) 5% (0.1sq.km) of the ward is within Flood Zones 2 or 3, of which 100% is in the Green Belt. This affects the south eastern corner of the ward in particular. *Functional floodplain* The Environment Agency's 5% (1 in 20 year) annual probability flood event modelling shows that no part of the ward is located in the functional floodplain. However there are parts of the ward where detailed modelling does not exist for the 5% annual probability flood event. In these areas, a cautious approach will be taken and sites will be treated as being within the functional floodplain unless applicants are able to provide modelling to show a site is not within the 5% AEP flood extent. In reality however this is only likely to affect a very small area at the south of the ward. *Climate change* When the Environment Agency's 1 in 100 models are contrasted with their 1 in 100 + 20% climate change models, it can be seen that there is no increase in the areas of the ward that would be at risk from flooding. As noted in Chapter 4 however, the Environment Agency has recently released new climate change allowances which its current models do not comply with. This section therefore seeks to provide an indication of the potential impact of climate change in the ward although it is likely that further detailed	Figure 11 Figure 13

	modelling will be required to support development proposals coming forward. *Historic records* Runnymede Borough Council and the Environment Agency hold no records of fluvial flooding occurring in this ward. *Flood defences* There are no formal flood defences in this ward. The Environment Agency Asset Information Management Systems (AIMS) identifies a screen on the eastern boundary of the ward (on the boundary with Egham Town).	Figures 10a, b, c and d Figure 9 and appendix 3
Surface water flooding	The Environment Agency's 'risk of flooding from surface water' mapping identifies a higher risk of surface water flooding in a number of areas including in parts of Tite Hill, Alderside Walk, The Retreat, Middle Hill, Harvest Road and the residential area off South Road.	Figure 14
Flooding from groundwater	The BGS dataset 'Susceptibility to Groundwater Flooding' shows that the majority of the ward has limited or no potential for groundwater flooding to occur. There are two small pockets of land at the south of the ward where the potential in increased. This impacts mostly on open land although several properties along Bakeham Lane have the potential to be affected.	Figure 17
Flooding from sewers	During the last 10 years sewer flooding has affected up to 4 properties in the TW20 0 postcode area (2 internal flooding and 2 external flooding), up to 4 properties in the GU25 4 postcode area (external flooding) and up to 8 in the TW20 9 postcode area (external flooding) according to Thames Water's DG5 register[29].	Figures 15 and 16
Flooding from reservoirs, canals and other artificial sources	There are no large surface water bodies within this ward. In the adjoining boroughs of RBWM and Spelthorne there are a number of reservoirs including the Queen Mother and Wraysbury reservoirs. The Environment Agency dataset 'risk of flooding from reservoirs shows that there are 2 small areas within this ward that could be flooded if one of these reservoirs were to fail and release the water it holds; one to the south of Prune Hill to the west of the railway and the other, to the north of the roundabout at the junction of Tite Hill, Egham High Street and the A30.	Figures 19 and 20a, b, c
Wetspot data	SCC has identified parts of the following roads as known 'wetspots': Alder Close, Middle Hill, South Road, Harvest Road, Alexandra Road, Armstrong Road and Albert Road.	Figure 21
Dry islands	There are no dry islands with a size of 0.5ha or greater in this ward.	Figure 12

[29] Post codes areas and ward boundaries are not aligned. As such there cannot be complete accuracy when determining the number of properties that have been affected by sewerage flooding at ward level. For the benefit of this assessment the total number of properties that have reported across the postcode area has been noted. It is not known from the data provided the exact number of these properties that are located in this ward.

Managing and mitigating flood risk		
Flood warning areas	River Thames at Staines and Egham	-
SuDS suitability	According to the BGS drainage summary, large areas of this ward have opportunities for bespoke infiltration SuDS. In the northern part of the ward in particular a sizeable area is shown to be highly compatible for infiltration SuDS or probably compatible for infiltration SuDS. It is only the south eastern corner of the ward which is shown to have very significant constraints.	Figure 23
Site specific SFRA guidance	Chapter 8 provides detailed guidance on measures to manage and mitigate flood risk, and Chapter 9 provides guidance on preparation of site-specific FRAs.	Chapters 8 and 9
Policy recommendations	Chapter 10 provides spatial planning and development management recommendations for the Borough.	Chapter 10

Englefield Green West		
		
General information		
Area	Englefield Green West covers an area of 6.7 sq.km comprising 88% Green Belt and 12% Urban Area.	Figure 2
Character	This ward is located in the north western corner of Runnymede borough and contains part of the Englefield Green Urban Area. The remainder of the ward is located in the Green Belt and contains part of the Grade I listed Windsor Great Park (which is also a registered Park and Garden) on the western side. At the north of the ward is part of the Runnymede Meadows including the Magna Carta and John F Kennedy memorials (the latter of which is grade II listed). The Grade II*listed Air Forces Memorial is located off Coopers Hill Lane. Also within the Green Belt in the northern part of the ward is the Brunel University MDS. In 2012 hybrid planning permission was granted at this site[30] for its redevelopment for housing. The urban part of the ward is primarily residential in character with other uses interspersed.	-
Topography	Very high lying land around Brunel University / Coopers Hill at 80-85m AOD in the highest points. Most north easterly area around Runnymede Meadows 15m AOD. Rest of ward 50-70m AOD.	Figure 3
Geology	Superficial-Whilst there are large areas of the ward where	Figures 4 and 5

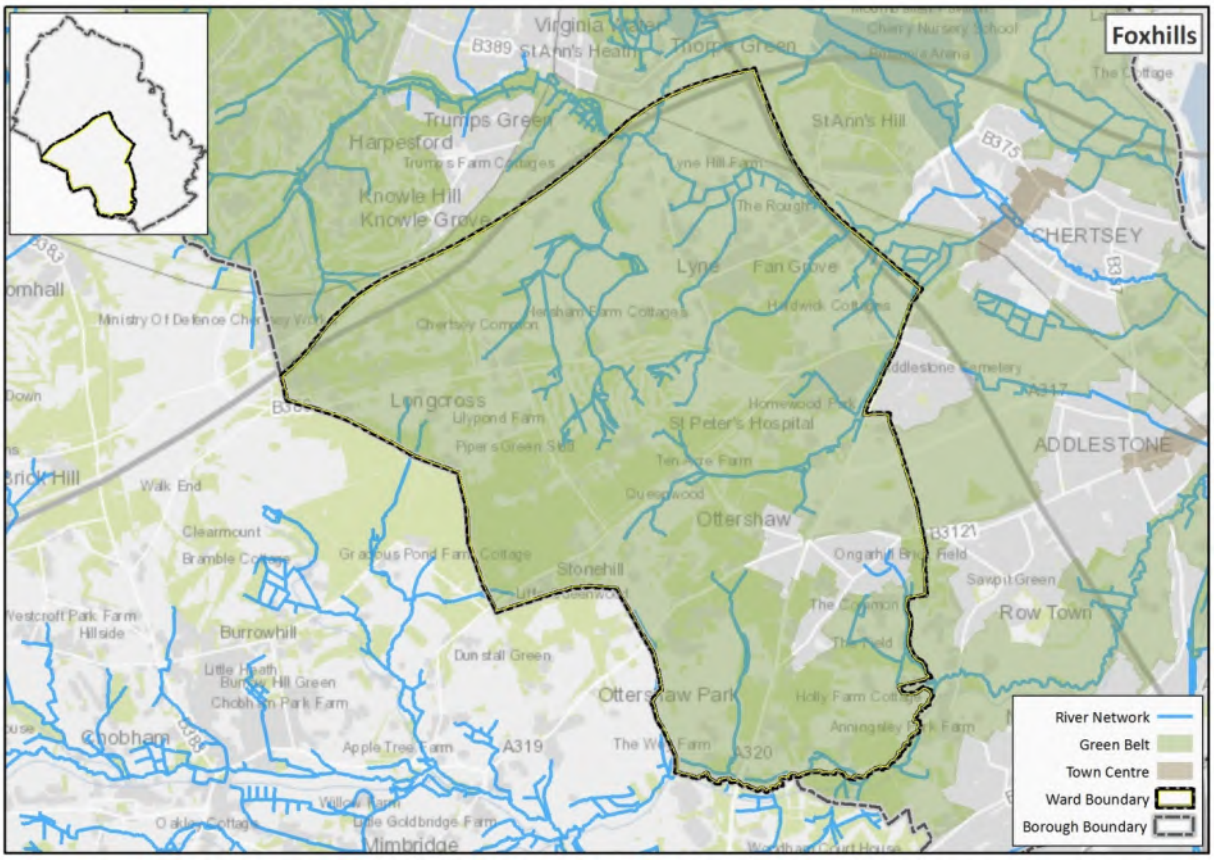
[30] Planning application number RU.11/0207

	superficial deposits are not present, this ward does contain sizeable areas of river terrace deposits (6) (sand and gravel) and river terrace deposits (7) (sand and gravel). Smaller areas of river terrace deposits (undifferentiated), alluvium (silt), alluvium (silt, sand and clay) and Shepperton Gravel Member (sand and gravel) are also observed. Bedrock-A large part of the ward is underlain by Bagshot Formation (sand) although in the northern part of the ward are areas of London Clay Formation (clay) and London Clay Formation (silty clay). In the southern part of the ward is a pocket of London Clay Formation (silty clay) surrounded by an area of Windlesham Formation (sand).	
Aquifer type	Where superficial deposits do exist in this ward, they are classified as a secondary A aquifer. A secondary A aquifer is defined as a permeable layer capable of supporting water supplies a local rather than strategic scale and in some cases forming an important source of base flow to rivers. For the majority of this ward, the underlying bedrock is classified as a secondary A aquifer. In the north eastern part of the ward (and in a small area to the west of the Forest Estate), the underlying bedrock is classified as unproductive strata. According to EA definitions, unproductive strata are rock strata or drift deposits with low permeability that have negligible significance for water supply or river base flow.	Figures 6 and 7
Groundwater vulnerability classification and source protection zone	Where superficial deposits are present, they give these parts of the ward the following categories of risk vulnerability: -'minor aquifer low' (central part of the ward) -'minor aquifer high' (eastern and western most parts of ward) -'minor aquifer intermediate' (southern part of the ward and in western half). The Environment Agency defines Source Protection Zones (SPZ) around all major public and private water supply abstractions in order to safeguard groundwater resources from potentially polluting activities. There are no SPZs within this ward. The Environment Agency records of smaller abstractions have not been reviewed at this stage.	Figures 18 and 22
Main rivers	The River Thames runs along the north eastern boundary of the ward.	Figure 2
Ordinary watercourses	Figure 8 shows the location of the ordinary watercourses that run through this ward.	Figure 8

Englefield Green West		
Strategic assessment of flood risk		
Flooding from rivers	*Flood Zones* Zone 1 Only: 6.2 sq.km (93%) Zone 2 Only: 0.1 sq.km (1%) Zone 3 Only: 0.4 sq.km (6%) Zone 2 or 3: 0.5 sq.km (7%) 7% (0.5sq.km) of the ward is within Flood Zones 2 or 3, of which 100% is in the Green Belt. This predominantly affects land adjacent to the River Thames at the north of the ward. *Functional floodplain* 5% of the ward (0.36 sq.km) is shown to be at risk during the 5% (1 in 20 year) annual probability flood event. This is limited to Green Belt land along the north eastern boundary of the ward in the vicinity of the Windsor Road. *Climate change* When the Environment Agency's 1 in 100 models are contrasted with their 1 in 100 + 20% climate change models, it can be seen that there is a negligible increase in the areas of the ward that would be at risk from flooding. As noted in Chapter 4 however, the Environment Agency has recently released new climate change allowances which its current models do not comply with. This section therefore seeks to provide an indication of the potential impact of climate change in the ward although it is likely that further detailed modelling will be required to support development proposals coming forward. *Historic records* Runnymede Borough Council and the Environment Agency hold records of fluvial flooding occurring in the north eastern part of the ward in close proximity to the River Thames. Windsor Road and the surrounding area has been the most affected. *Flood defences* There are no formal flood defences in this ward. The Environment Agency Asset Information Management Systems (AIMS) identifies that there are no flood risk management in this ward.	Figure 11 Figure 13 Figures 10a, b, c and d Figure 9 and appendix 3
Surface water flooding	The Environment Agency's 'risk of flooding from surface water' mapping identifies a higher risk of surface water flooding in a number of areas including in parts of Blay's Lane, Ilex Close, Larksfield/Bagshot Road, Bond Street, Englemede, Kings Lane and Beauforts.	Figure 14
Flooding from groundwater	The BGS dataset 'Susceptibility to Groundwater Flooding' shows that the majority of the ward has limited or no potential for groundwater flooding to occur. The exception	Figure 17

	is the land adjacent to the River Thames on the eastern side of the ward where potential is identified for groundwater flooding to occur at the surface.	
Flooding from sewers	During the last 10 years sewer flooding has affected up to 4 properties in the TW20 0 postcode area (2 internal flooding and 2 external flooding) according to Thames Water's DG5 register[31].	Figures 15 and 16
Flooding from reservoirs, canals and other artificial sources	Obelisk Pond is the only large man-made water body within the ward which was created in 1750. In addition, the Queen Mother reservoir is located in RBWM to the north of the ward and the Wraysbury and King George VI reservoirs are located to the north east of the ward in the borough of Spelthorne. The Environment Agency dataset 'risk of flooding from reservoirs' shows that if Obelisk Pond was to fail, an area to the east in the Wick Lane area could be affected. This same dataset shows that a stretch of land adjacent to the Thames within this ward could be flooded if one of the other reservoirs mentioned in the paragraph above were to fail and release the water it holds.	Figures 19 and 20a, b, c
Wetspot data	SCC has identified parts of the following roads as known 'wetspots': Priest Hill, Windsor Road, Bishopsgate Road, Wick Lane, Bond Street and Hanover Close.	Figure 21
Dry islands	There are two modest dry islands within this ward along the A308.	Figure 12
Managing and mitigating flood risk		
Flood warning areas	'River Thames at Old Windsor', 'Properties closest to the River Thames at Old Windsor, from Friday Island to Magna Carta Island'	-
SuDS suitability	According to the BGS drainage summary, large parts of this ward are compatible for infiltration SuDS. Other sizable areas are either shown to be probably compatible for infiltration SuDS or offer opportunities for bespoke solutions. It is only a very small area of the ward in the vicinity of Ridgemead Road that is shown to have very significant constraints.	Figure 23
Site specific SFRA guidance	Chapter 8 provides detailed guidance on measures to manage and mitigate flood risk, and Chapter 9 provides guidance on preparation of site-specific FRAs.	Chapters 8 and 9
Policy recommendations	Chapter 10 provides spatial planning and development management recommendations for the Borough.	Chapter 10

[31] Post codes areas and ward boundaries are not aligned. As such there cannot be complete accuracy when determining the number of properties that have been affected by sewerage flooding at ward level. For the benefit of this assessment the total number of properties that have reported across the postcode area has been noted. It is not known from the data provided the exact number of these properties that are located in this ward.

Foxhills		
		
General information		
Area	Foxhills covers an area of 18.4 sq.km comprising 96% Green Belt and 4% Urban Area.	Figure 2
Character	The great majority of this ward is located in the designated Green Belt. The exception is the Ottershaw Urban Area which is located at the south of the ward and which is predominantly residential in character. Within the Green Belt are the Queenswood and Fox Hills golf courses as well as the following MDS's: Hillswood Business Park, St Peter's/Bournewood Health complex, Lyne Sewage Works and part of the DERA site MDS.	-
Topography	Highest points around the centre of the ward at Fan Court and adjacent to Foxhills Golf Course, reaching 60m AOD.	Figure 3
Geology	Superficial-The majority of this ward is not underlain by superficial deposits although small areas of alluvium (silt), Kempton Park Gravel Formation (sand and gravel), head (diamicton), Lynch Hill Gravel Member (sand and gravel), peat and river terrace deposits (undifferentiated) are observed. Bedrock-A large part of this ward is underlain by Bagshot Formation (sand). There is also a sizable area	Figures 4 and 5

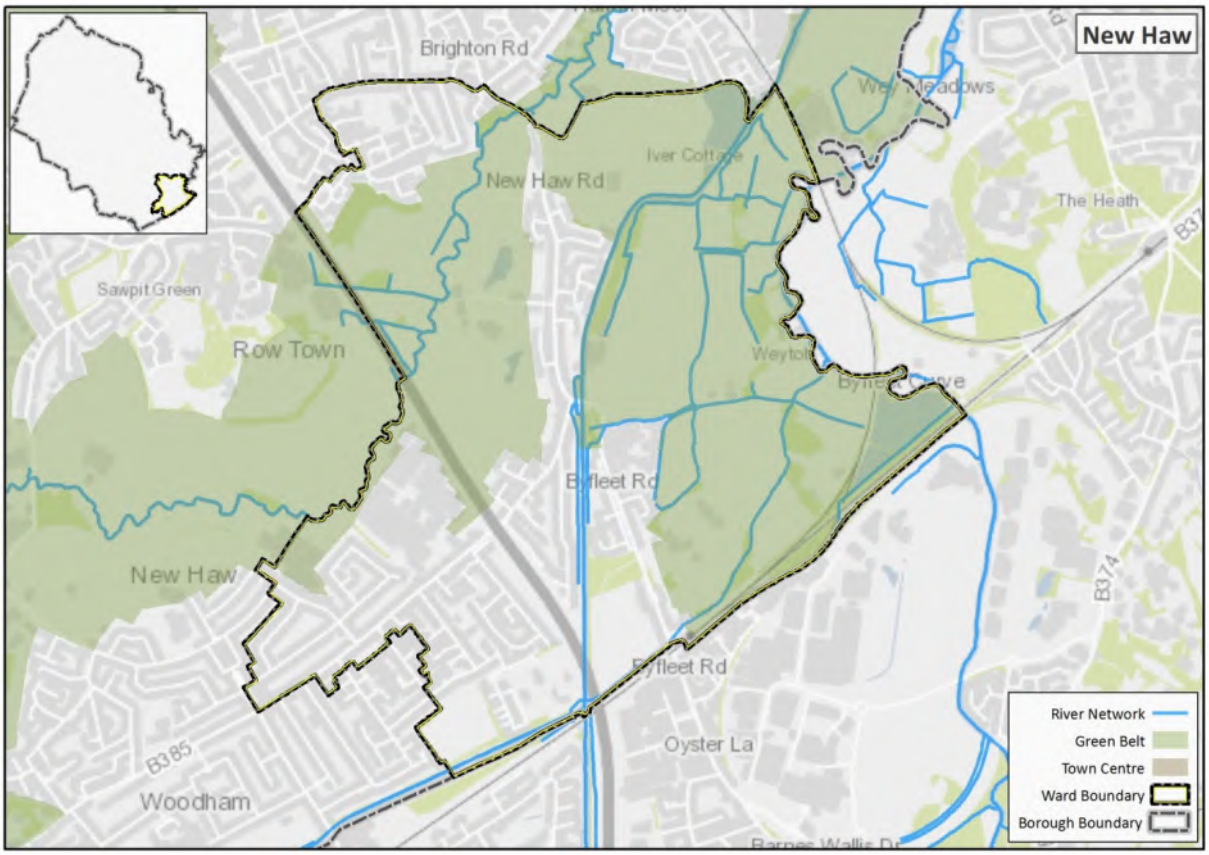
	underlain by Windlesham Formation (sand). A small isolated pocket of Stanners Hill Pebble Bed Member (conglomerate) is also observed; the only area of this bedrock in the Borough.	
Aquifer type	Where superficial deposits do exist in this ward they are classified as a principal aquifer in some parts and a secondary A aquifer or secondary aquifer (undifferentiated) in others. According to Environment Agency definitions, a principal aquifer has high intergranular and/or fracture permeability - meaning they usually provide a high level of water storage, can support water supply and/or river baseflow on a strategic scale. A secondary A aquifer is defined as a permeable layer capable of supporting water supplies at a local rather than strategic scale and in some cases form an important source of base flow to rivers. Secondary undifferentiated aquifers are classified as such where it has not been possible to attribute either category A or B to a rock type. This classification is often indicative of the variable characteristics of the rock type. There are areas in this ward where there are no superficial deposits. These areas will be directly underlain by the bedrock, and designated as a secondary aquifer. The underlying bedrock is classified as a secondary A aquifer.	Figures 6 and 7
Groundwater vulnerability classification and source protection zone	The superficial deposits give a large area of the ward a 'minor aquifer intermediate' category of risk vulnerability. A number of different categories of risk vulnerabilities are also seen in certain areas. The EA defines Source Protection Zones (SPZ) around all major public and private water supply abstractions in order to safeguard groundwater resources from potentially polluting activities. The great majority of this ward is not located in a Source Protection Zone. The exception is an area of land on the eastern side of the ward which is located in zone 3 of a groundwater source catchment. Zone 3 is defined as the area around a source within which all groundwater recharge is presumed to be discharged at the source. The EA records of smaller abstractions have not been reviewed at this stage.	Figures 18 and 22
Main rivers	The Addlestone Bourne runs along the southern boundary of the ward. The Chertsey Bourne enters the ward for a short stretch at the north of the ward.	Figure 2
Ordinary watercourses	Figure 8 shows the location of the ordinary watercourses that run through this ward.	Figure 8

Foxhills		
Strategic assessment of flood risk		
Flooding from rivers	*Flood Zones* Zone 1 Only: 17.6 sq.km (96%) Zone 2 Only: 0.5 sq.km (3%) Zone 3 Only: 0.3 sq.km (1%) Zone 2 or 3: 0.8 sq.km (4%) 4% (0.8sq.km) of the ward is within Flood Zones 2 or 3, of which 100% is in the Green Belt, thus leaving the urban settlement of Ottershaw unaffected.	Figure 11
	Functional floodplain 1% of the ward (0.18 sq.km) is shown to be at risk during the 5% (1 in 20 year) annual probability flood event. This is limited to limited areas of Green Belt land in the vicinity of Lyne Crossing Road at the north of the ward and along the banks of the Addlestone Bourne at the south of the ward.	Figure 13
	Climate change When the Environment Agency's 1 in 100 models are contrasted with their 1 in 100 + 20% climate change models, it can be seen that there is a negligible increase in the areas of the ward that would be at risk from flooding. As noted in Chapter 4 however, the Environment Agency has recently released new climate change allowances which its current models do not comply with. This section therefore seeks to provide an indication of the potential impact of climate change in the ward although it is likely that further detailed modelling will be required to support development proposals coming forward.	
	Historic records Runnymede Borough Council and the Environment Agency hold records of limited fluvial flooding occurring in the vicinity of the two main rivers which run through the ward/along the ward boundary.	Figures 10a, b, c and d
	Flood defences There are no formal flood defences in this ward. The Environment Agency Asset Information Management Systems (AIMS) identifies a simple culvert on the northern boundary of the ward and a passive monitoring instrument along the southern boundary of the ward.	Figure 9 and appendix 3
Surface water flooding	The Environment Agency's 'risk of flooding from surface water' mapping identifies a higher risk of surface water flooding in parts of Almners Road, Fletcher Road, Colebrook, Slade Road, Wheatsheaf Close, Slade Court, Palmer Crescent and Cheshire Close.	Figure 14
Flooding from groundwater	The BGS dataset 'Susceptibility to Groundwater Flooding' shows that the majority of the ward has limited potential	Figure 17

	for groundwater flooding to occur. There are some small pockets of land across the ward where the potential is increased. This impacts mostly on open land and the area with the greatest potential for groundwater flooding to occur at the surface is located in the south western corner of the ward between Guildford and Chobham Road. Part of the Bournewood Health/St Peters Hospital MDS also has the potential to be affected.	
Flooding from sewers	During the last 10 years sewer flooding has affected up to 4 properties in the KT16 0 postcode area (external flooding) and up to 4 properties in the GU25 4 postcode area (external flooding) according to Thames Water's DG5 register[32].	Figures 15 and 16
Flooding from reservoirs, canals and other artificial sources	There are no large surface water bodies within this ward. The Environment Agency dataset 'risk of flooding from reservoirs' shows that if Virginia Water Lake were to fail and release the water it holds it could flood a small area of land in the Bridge Lane/Lyne Lane area to the south east of the M3 motorway. The remainder of the ward would remain unaffected.	Figures 19 and 20a, b, c
Wetspot data	SCC has identified parts of the following roads as known 'wetspots': Longcross Road, Lyne Lane, Almners Road, Hardwick Lane, Guildford Road (part of the affected area is also located in Chertsey Meads), Brox Road and Holloway Hill	Figure 21
Dry islands	There are no dry islands with a size of 0.5ha or greater in this ward.	Figure 12
Managing and mitigating flood risk		
Flood warning areas	'Chertsey Bourne at Thorpe Green', 'Addlestone Bourne at Woodham'	-
SuDS suitability	According to the BGS drainage summary, the majority of this ward is either highly compatible for infiltration SuDS, probably compatible for infiltration SuDS or offers opportunities for bespoke infiltration SuDS. There are however smaller areas of the ward that are shown to have very significant constraints. The larger two of these areas are located to the south of the Ottershaw Urban Area, and at the northern edge of the ward adjacent to the motorway.	Figure 23
Site specific SFRA guidance	Chapter 8 provides detailed guidance on measures to manage and mitigate flood risk, and Chapter 9 provides guidance on preparation of site-specific FRAs.	Chapters 8 and 9
Policy recommendations	Chapter 10 provides spatial planning and development management recommendations for the Borough.	Chapter 10

[32] Post codes areas and ward boundaries are not aligned. As such there cannot be complete accuracy when determining the number of properties that have been affected by sewerage flooding at ward level. For the benefit of this assessment the total number of properties that have reported across the postcode area has been noted. It is not known from the data provided the exact number of these properties that are located in this ward.

New Haw



General information		
Area	New Haw covers an area of 3.6 sq.km comprising 58% Green Belt and 42% Urban Area.	Figure 2
Character	The New Haw Urban Area is located in the south eastern corner of the borough. The portion of the ward which is located in the urban area is predominantly residential in character but contains small pockets of employment use, most notably at the Central Veterinary Laboratory. The ward also contains part of the locally important shopping area in the Woodham Lane/Broadway area. The settlement of New Haw is contiguous with Woodham to the west. The southern edge of the urban area is defined in part by the Basingstoke Canal Conservation Area. The Wey Navigation then runs through the ward fairly centrally from north to south. The River Wey runs along the east of the ward. In terms of the areas of Green Belt land within the ward, large parts remain undeveloped. Notable exceptions include Top Golf, the National Grid substation and Weybridge Garden Centre.	-
Topography	There is an area of higher ground to the north west around Sayes Court Farm Kennels (30m AOD). The rest of the ward averages 10-20m AOD.	Figure 3
Geology	Superficial-The great majority of the ward is underlain	Figures 4 and 5

	by superficial deposits. A large area of Kempton Park Gravel Formation (sand and gravel) is observed as well as smaller areas of Shepperton Gravel Member (sand and gravel), alluvium (silt) and Lynch Hill Gravel Member (sand and gravel). Bedrock-The entire ward is underlain by Bagshot Formation (sand).	
Aquifer type	The superficial deposits are classified as a principal aquifer in the majority of the ward and a secondary A aquifer in limited areas. According to Environment Agency definitions, a principal aquifer has high intergranular and/or fracture permeability - meaning they usually provide a high level of water storage, and can support water supply and/or river baseflow on a strategic scale. A secondary A aquifer is defined as a permeable layer capable of supporting water supplies at a local rather than strategic scale and in some cases forms an important source of base flow to rivers. The underlying bedrock is classified as a secondary A aquifer.	Figures 6 and 7
Groundwater vulnerability classification and source protection zone	The superficial deposits give the majority of the ward either a 'major aquifer high' or a 'major aquifer intermediate' category of risk vulnerability. The EA defines Source Protection Zones (SPZ) around all major public and private water supply abstractions in order to safeguard groundwater resources from potentially polluting activities. The majority of this ward is not located in a Source Protection Zone, however a small part of the ward on its western side is located in zone 3 of a groundwater source catchment. Zone 3 is defined as the area around a source within which all groundwater recharge is presumed to be discharged at the source. The EA records of smaller abstractions have not been reviewed at this stage.	Figures 18 and 22
Main rivers	The Addlestone Bourne runs along part of the northern boundary of the ward and then continues to flow through the ward in a north easterly direction. The River Wey runs along much of the eastern boundary of the ward. The Rive Ditch is also a main river within this ward.	Figure 2
Ordinary watercourses	Figure 8 shows the location of the ordinary watercourses that run through this ward.	Figure 8

New Haw		
Strategic assessment of flood risk		
Flooding from rivers	*Flood Zones* Zone 1 Only: 1.9 sq.km (52%) Zone 2 Only: 1.1 sq.km (32%) Zone 3 Only: 0.6 sq.km (16%) Zone 2 or 3: 1.7 sq.km (48%) 48% (1.7sq.km) of the ward is within Flood Zones 2 or 3, of which 69% is in the Green Belt land and 31% is located in the Urban Area. The Urban Area within the Flood Zones include a large part of the Veterinary Laboratories Agency main site, parts of the residential area to the west of the M25 including large areas of Pinewood Avenue, Cobs Way, Parkside and Heathervale Way, and to the east of the M25 dwellings on Byfleet Road, Birch Close and Little Birch Close. *Functional floodplain* 10% of the ward (0.37 sq.km) is shown to be at risk during the 5% (1 in 20 year) annual probability flood event. This comprises limited areas of mainly open Green Belt land in the vicinity of the River Wey and Addlestone Bourne. However there are parts of the ward where detailed modelling does not exist for the 5% annual probability flood event. In these areas, a cautious approach will be taken and sites will be treated as being within the functional floodplain unless applicants are able to provide modelling to show a site is not within the 5% AEP flood extent. *Climate change* When the Environment Agency's 1 in 100 models are contrasted with their 1 in 100 + climate change models (+20%), it can be seen that there is an increase in the areas of the ward that would be at risk from flooding. These areas are however limited to open land within the Green Belt. As noted in Chapter 4 however, the Environment Agency has recently released new climate change allowances which its current models do not comply with. This section therefore seeks to provide an indication of the potential impact of climate change in the ward although it is likely that further detailed modelling will be required to support development proposals coming forward. *Historic records* Runnymede Borough Council and the Environment Agency has records of fluvial flooding occurring in the vicinity of the Addlestone Bourne which has caused flooding on parts of the New Haw Road, Boundary Road North, Bourne Road and Palace Road. On the eastern side of the ward fluvial flooding has occurred from the River Wey although this has	Figure 11 Figure 13 Figures 10a, b, c and d

	mainly affected open land. *Flood defences* There are no formal flood defences in this ward. The Environment Agency Asset Information Management Systems (AIMS) identifies a number of flood risk management assets in or along the southern boundary of this ward. In particular AIMS shows that there are 4 simple culverts and a screen along the Rive Ditch and also an embankment along the Addlestone Bourne.	Figure 9 and appendix 3
Surface water flooding	The Environment Agency's 'risk of flooding from surface water' mapping identifies a higher risk of surface water flooding in parts of Pinewood Avenue, Loncin Mead Avenue, Holly Avenue, Grange Road and Woodham Lane.	Figure 14
Flooding from groundwater	The BGS dataset 'Susceptibility to Groundwater Flooding' shows that the majority of the ward has limited potential for groundwater flooding. The exception is a small area of land at the north of the ward in the Liberty Lane/Sayes Court/Sayes Court Farm Drive area where there is potential for groundwater flooding of property situated below ground level to occur.	Figure 17
Flooding from sewers	During the last 10 years sewer flooding has affected up to 2 properties in the KT15 3 postcode area (external flooding), up to 1 property in the KT15 1 postcode area (external flooding) and up to 2 properties in the KT15 2 postcode area (external flooding) according to Thames Water's DG5 register[33].	Figures 15 and 16
Flooding from reservoirs, canals and other artificial sources	The Wey Navigation runs through this ward. The control of flow in this canal via weirs and gates means that the levels should not be overtopped in a fluvial flood event. There remains, however, a residual risk that flood water could be conveyed down the canal should the appropriate measures fail. Coxes Mill Pond is another notable man-made feature, dug to serve Coxes Lock Mill after it was purchased by an iron entrepreneur in 1776. The Environment Agency dataset 'risk of flooding from reservoirs' shows that an area to the south east of Coxes Mill Pond within this ward could be flooded if it was to fail and release the water it holds.	Figures 19 and 20a, b, c
Wetspot data	SCC has identified parts of the following roads as known 'wetspots': Mayfield Gardens, Woodham Lane.	Figure 21
Dry islands	There are no dry islands with a size of 0.5ha or greater in this ward.	Figure 12

[33] Post codes areas and ward boundaries are not aligned. As such there cannot be complete accuracy when determining the number of properties that have been affected by sewerage flooding at ward level. For the benefit of this assessment the total number of properties that have reported across the postcode area has been noted. It is not known from the data provided the exact number of these properties that are located in this ward.

Managing and mitigating flood risk		
Flood warning areas	'Addlestone Bourne at Woodham', 'River Wey at Weybridge and 'Addlestone Bourne at Addlestone', 'Properties closest to the Addlestone Bourne at Addlestone'.	-
SuDS suitability	The BGS drainage summary shows that the great majority of this ward has opportunities for bespoke infiltration SuDS. Only a very small area of land to the west of the New Haw Road is shown to have very significant constraints.	Figure 23
Site specific SFRA guidance	Chapter 8 provides detailed guidance on measures to manage and mitigate flood risk, and Chapter 9 provides guidance on preparation of site-specific FRAs.	Chapters 8 and 9
Policy recommendations	Chapter 10 provides spatial planning and development management recommendations for the Borough.	Chapter 10

Thorpe

General information		
Area	Thorpe covers an area of 8.6 sq.km comprising 86% Green Belt and 14% Urban Area.	Figure 2
Character	Thorpe ward contains large areas of Green Belt land including the village of Thorpe itself in the southern half of the ward and Thorpe Park which is one of the Borough's Major Developed Sites (MDS) in the Green Belt. Parts of the ward are also located in the Urban Area including some of the development fronting Chertsey Lane on the eastern side of the ward, the Thorpe Industrial Estate and part of the Egham Urban Area which is located in the northern part of the ward. Part of Thorpe Village and the area to the east is designated as a Conservation Area.	-
Topography	The area to the east of Thorpe Industrial Estate averages 30m AOD. The rest of the ward is approximately 10-20m AOD.	Figure 3
Geology	Superficial-The entire ward is underlain by superficial deposits with areas of alluvium (silt), Shepperton Gravel Member (sand and gravel) and Kempton Park Gravel Formation (sand and gravel) observed. At the northern end of the ward, a small area of Langley silt member is also observed.	Figures 4 and 5

	Bedrock-The northern 2/3 of the ward are underlain by London Clay Formation (clay). The remainder of the ward is underlain by Claygate Member (sand). On the southern ward boundary are two small pockets of Bagshot Formation (sand).	
Aquifer type	The superficial deposits are classified as a principal aquifer in parts of the ward and a secondary A aquifer in other areas. According to Environment Agency definitions, a principal aquifer has high intergranular and/or fracture permeability - meaning they usually provide a high level of water storage and can support water supply and/or river baseflow on a strategic scale. A secondary A aquifer is defined as a permeable layer capable of supporting water supplies at a local rather than strategic scale and in some cases form an important source of base flow to rivers. In the southern third (approx.) of this ward, the underlying bedrock is classified as a secondary A aquifer. In the remainder of the ward, the underlying bedrock is classified as unproductive strata. According to EA definitions, unproductive strata are rock strata or drift deposits with low permeability that has negligible significance for water supply or river base flow.	Figures 6 and 7
Groundwater vulnerability classification and source protection zone	The superficial deposits give the ward either a 'major aquifer high' or a 'major aquifer intermediate' category of risk vulnerability. The EA defines Source Protection Zones (SPZ) around all major public and private water supply abstractions in order to safeguard groundwater resources from potentially polluting activities. The great majority of this ward located in zone 3 of a groundwater source catchment. Zone 3 is defined as the area around a source within which all groundwater recharge is presumed to be discharged at the source. In the south eastern corner of the ward, some of the land is also in zones 1 and 2. Zone 1 is 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 2 is defined by a 400 day travel time from a point below the water table. The EA records of smaller abstractions have not been reviewed at this stage.	Figures 18 and 22
Main rivers	Hurst Ditch The Moat The Meadlake Ditch The River Thames Ripley Springs watercourse	Figure 2

	Chertsey Bourne	
Ordinary watercourses	Figure 8 shows the location of the ordinary watercourses that run through the ward.	Figure 8

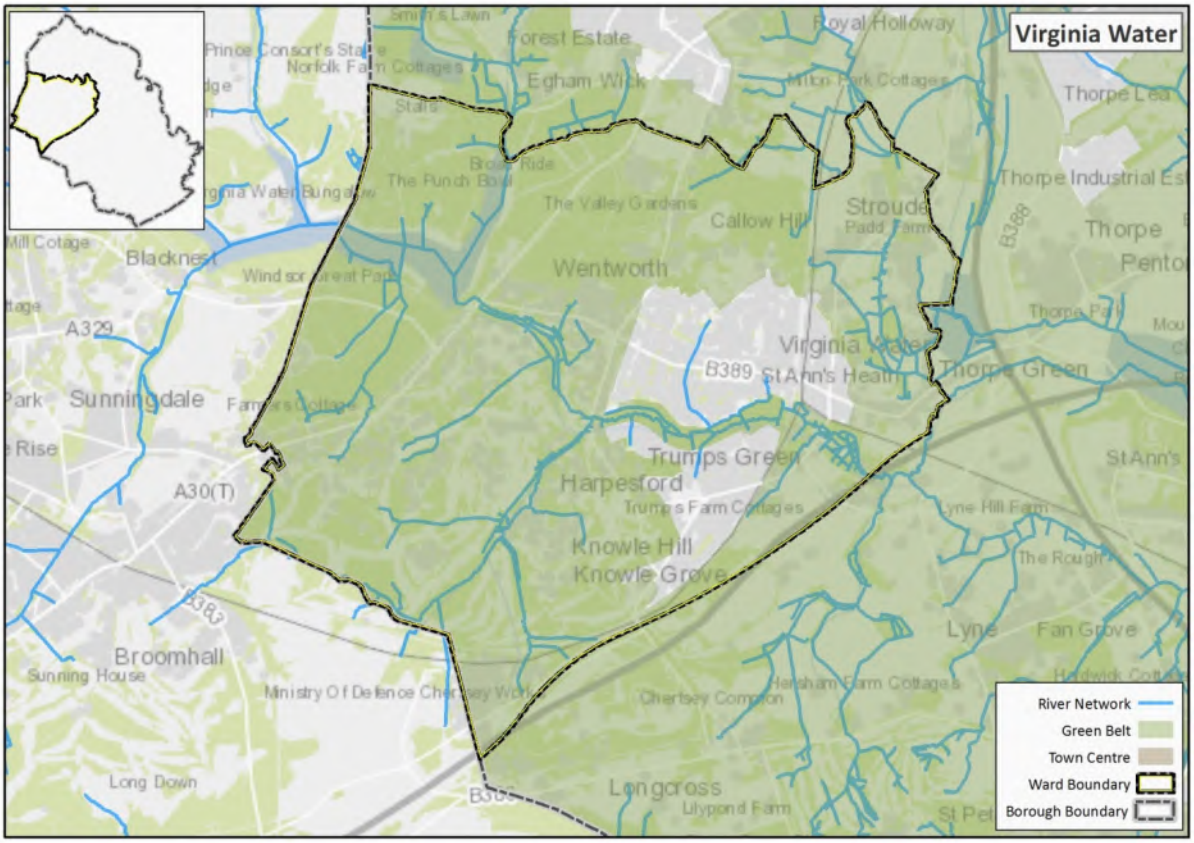
Thorpe		
Strategic assessment of flood risk		
Flooding from rivers	*Flood Zones* Zone 1 Only: 2.2 sq.km (26%) Zone 2 Only: 2.6 sq.km (30%) Zone 3 Only: 3.8 sq.km (44%) Zone 2 or 3: 6.4 sq.km (74%) 74% (6.4sq.km) of the ward is within Flood Zones 2 or 3, of which 85% is in the Green Belt and 15% is located in the Urban Area. The whole extent of the Urban Area which is located in the area surrounding Chertsey Lane to the east is located in flood zone 3 and much of the Thorpe Industrial Estate is located in flood zone 2. A large part of the Egham Urban Area, which is located in the northern part of the ward is also located in flood zone 3. *Functional floodplain* 36% of the ward (3.1 sq.km) is shown to be at risk during the 5% (1 in 20 year) annual probability flood event. This includes Thorpe Park, the majority of the urban land on the eastern side of the ward which is located off Chertsey Lane and part of the Egham Urban Area which is located at the north of the ward including parts of Ayebridges Avenue, Park Avenue, South Avenue, Devils Lane, Stephen Close and Langton Way. Parts of Green Road and Bourne Meadow in are also located in the functional floodplain. However there are parts of the ward where detailed modelling does not exist for the 5% annual probability flood event. In these areas, a cautious approach will be taken and sites will be treated as being within the functional floodplain unless applicants are able to provide modelling to show a site is not within the 5% AEP flood extent. *Climate change* When the Environment Agency's 1 in 100 models are contrasted with their 1 in 100 + 20% climate change models, it can be seen that there is an increase in the areas of the ward that would be at risk from flooding. In the urban area this is mainly in the vicinity of College Avenue, Vicarage Road, Warwick Avenue and Manor Leaze. In the Green Belt this mainly impacts on land to the east of Stroude Road. As noted in Chapter 4 however, the Environment Agency has recently released new climate change allowances which its current models do not comply with. This section therefore seeks to provide an indication	Figure 11 Figure 13

	of the potential impact of climate change in the ward although it is likely that further detailed modelling will be required to support development proposals coming forward. *Historic records* Runnymede Borough Council and the Environment Agency hold records of significant areas of this ward being affected by fluvial flooding especially in the eastern half of the ward in particular Staines Road/Chertsey Lane and the roads leading off this road including Timsway, Bundy's Way, Mayfield Gardens, Ferry Avenue, Craigwell Close, Green Lane, Moorfields Close, Weir Place, Aymer Drive, Aymer Close, Alton Court, Peket Close, Clyve Way, Temple Gardens, Blackett Close, Thorpeside Close, Norlands Lane, Holland Gardens and Redwood. The Thorpe Industrial Estate has also been historically affected by fluvial flooding as well as a number of the residential roads off the Thorpe Lea Road at the north of the ward including Langton Way, Stephen Close, Devils Lane, South Avenue, Park Avenue, Ayebridges Avenue and Oak Avenue. *Flood defences* There are no formal flood defences in the ward. The Environment Agency Asset Information Management Systems (AIMS) identifies that there are a number of simple culverts in and along the boundaries of this ward and two passive monitoring systems along the Meadlake Ditch.	Figures 10a, b, c and d Figure 9 and appendix 3
Surface water flooding	The Environment Agency's 'risk of flooding from surface water' mapping identifies a higher risk of surface water flooding in a number of parts of the ward including along parts of Green Road, Aymer Drive, South Avenue, Stephen Close, Western Avenue, Rosemary Lane and Delta Way.	Figure 14
Flooding from groundwater	The BGS dataset 'Susceptibility to Groundwater Flooding' shows that the majority of the ward has potential for groundwater flooding to occur at the surface.	Figure 17
Flooding from sewers	During the last 10 years sewer flooding has affected up to 8 properties in the TW20 9 postcode area (external flooding), up to 9 properties in the TW20 8 postcode area (3 internal flooding and 6 external flooding), up to 1 property in the TW18 3 postcode area (external flooding) and up to 9 properties in the KT16 8 postcode area according to Thames Water's DG5 register[34].	Figures 15 and 16
Flooding from reservoirs, canals and other	There are a series of man-made lakes which surround Thorpe Park, some of which are former gravel pits. In addition, Penton Hook Marina and the adjoining lake are	Figures 19 and 20a, b, c

[34] Post codes areas and ward boundaries are not aligned. As such there cannot be complete accuracy when determining the number of properties that have been affected by sewerage flooding at ward level. For the benefit of this assessment the total number of properties that have reported across the postcode area has been noted. It is not known from the data provided the exact number of these properties that are located in this ward.

artificial sources	also man-made features. Longside Lake to the west of the M25 motorway is also a former gravel pit. A number of other waterbodies which are former gravel pits can also be observed in the vicinity of the Thorpe Industrial Estate. To the north and east of the ward in the neighbouring authorities are the Wraysbury, King George VI, Queen Mother, Queen Mary, Staines North and South and Chertsey Settling reservoirs. To the west but within the borough of Runnymede is Virginia Water Lake. The Environment Agency dataset 'risk of flooding from reservoirs' shows that much of the land in this ward could be flooded if one of these reservoirs were to fail and release the water it holds.	
Wetspot data	SCC has identified parts of the following roads as known 'wetspots': Mill House Lane, Green Road, Mill Lane, Ten Acre Lane, Delta Way, Chertsey Lane, roundabout at Staines Road (part of this roundabout is also located in the ward of Chertsey St Anns), Bundy's Way, Timsway and Vicarage Road (part of which is also located in Egham Hythe).	Figure 21
Dry Islands	There are a number of dry islands in this ward, the majority of which are located in the vicinity of Thorpe Park in the Green Belt. There is only one dry island in the Urban Area. This is in the north western corner of the ward in the vicinity of Vicarage Avenue and Mead Close. The majority of these dry islands are in the vicinity of Thorpe Park. There is also a dry island in the north eastern corner of the ward. The dry island appears to cover open land.	Figure 12
Managing and mitigating flood risk		
Flood warning areas	'Chertsey Bourne at Thorpe Green', 'River Thames at Laleham', 'River Thames at Staines and Egham', 'Properties closest to the River Thames between Runnymede Pleasure Grounds, Staines and Penton Hook'	-
SuDS suitability	According to the BGS drainage summary, very significant constraints are indicated across the majority of the ward. which is likely to be due, in part, to possible contaminated ground from the many historic and authorised landfills. It should be noted that Infiltration SUDs should not be used is areas of contaminated ground. Furthermore in the southern part of the ward. A small area to the south of Green Lane is however shown to offer opportunities for bespoke infiltration SuDS.	Figure 23
Site specific SFRA guidance	Chapter 8 provides detailed guidance on measures to manage and mitigate flood risk, and Chapter 9 provides guidance on preparation of site-specific FRAs.	Chapters 8 and 9
Policy recommendations	Chapter 10 provides spatial planning and development management recommendations for the Borough.	Chapter 10

Virginia Water



General information		
Area	Virginia Water covers an area of 14.8 sq.km comprising 87% Green Belt and 13% Urban Area.	Figure 2
Character	The Virginia Water Urban Area is split into two parts and contains the Virginia Water train station, three local shopping parades and part of the low density residential area of the private Wentworth Estate which was developed in the 1930s by W G Tarrant. Other notable developments include those at Virginia Park which has seen the restoration of the Grade I listed former Holloway Sanatorium, and a similar development at St Ann's Park. The rest of the ward is located in the Green Belt and contains the remainder of the Wentworth Estate including the world famous Wentworth Golf Club, part of the former Defence Evaluation and Research Agency (DERA) site and Virginia Water Lake which is part of the wider Grade I listed historic park and garden.	-
Topography	Areas of Callow Hill in the north and Knowle Hill in the south reach heights of 65m AOD. Fort Belvedere in the west is at the highest point of 80m AOD. Lower lying land is observed in the north east around Stroude at 15m AOD.	Figure 3
Geology	Superficial-Large areas of this ward are not underlain by superficial deposits however pockets of river terrace deposits (6) (sand and gravel) and river terrace deposits (undifferentiated) are observed. Kempton Park Gravel	Figures 4 and 5

	Formation (sand and gravel), alluvium (silt), Taplow gravel formation (sand and gravel), Lynch Hill Gravel Member (sand and gravel) and peat are also observed. Bedrock-The majority of this ward is underlain by Bagshot Formation (sand) although there are a number of pockets of Windlesham Formation (sand) and one small area on the western side of the ward of London Clay Formation (silty clay).	
Aquifer type	Where superficial deposits do exist in this ward they are classified as a principal aquifer in some areas and a secondary A aquifer in others. According to Environment Agency definitions, a principal aquifer has high intergranular and/or fracture permeability - meaning they usually provide a high level of water storage and can support water supply and/or river baseflow on a strategic scale. A secondary A aquifer is defined as a permeable layer capable of supporting water supplies at a local rather than strategic scale and in some cases form an important source of base flow to rivers. There are areas in this ward where there are no superficial deposits. These areas will be directly underlain by the bedrock, and designated as a secondary aquifer. For the great majority of this ward, the underlying bedrock is classified as a secondary A aquifer. In a small area in the north eastern corner, the underlying bedrock is classified as unproductive strata. According to EA definitions, unproductive strata are rock strata or drift deposits with low permeability that has negligible significance for water supply or river base flow.	Figures 6 and 7
Groundwater vulnerability classification and source protection zone	The superficial deposits give the ward the following categories of risk vulnerability: -'minor aquifer high' (areas in the north and west of the ward) -'minor aquifer intermediate' (large area of within central/western part of the ward) -'minor aquifer low' (within eastern half of the ward) -'major aquifer high' (limited area in central part of the ward) -'major aquifer intermediate' (easternmost part of ward) The EA defines Source Protection Zones (SPZ) around all major public and private water supply abstractions in order to safeguard groundwater resources from potentially polluting activities. The majority of this ward is not located in a Source Protection Zone. The exception is a small area of land on the eastern side of the ward which is located in zone 3 of a groundwater source catchment. Zone 3 is defined as the area around a source within which all groundwater	Figures 18 and 22

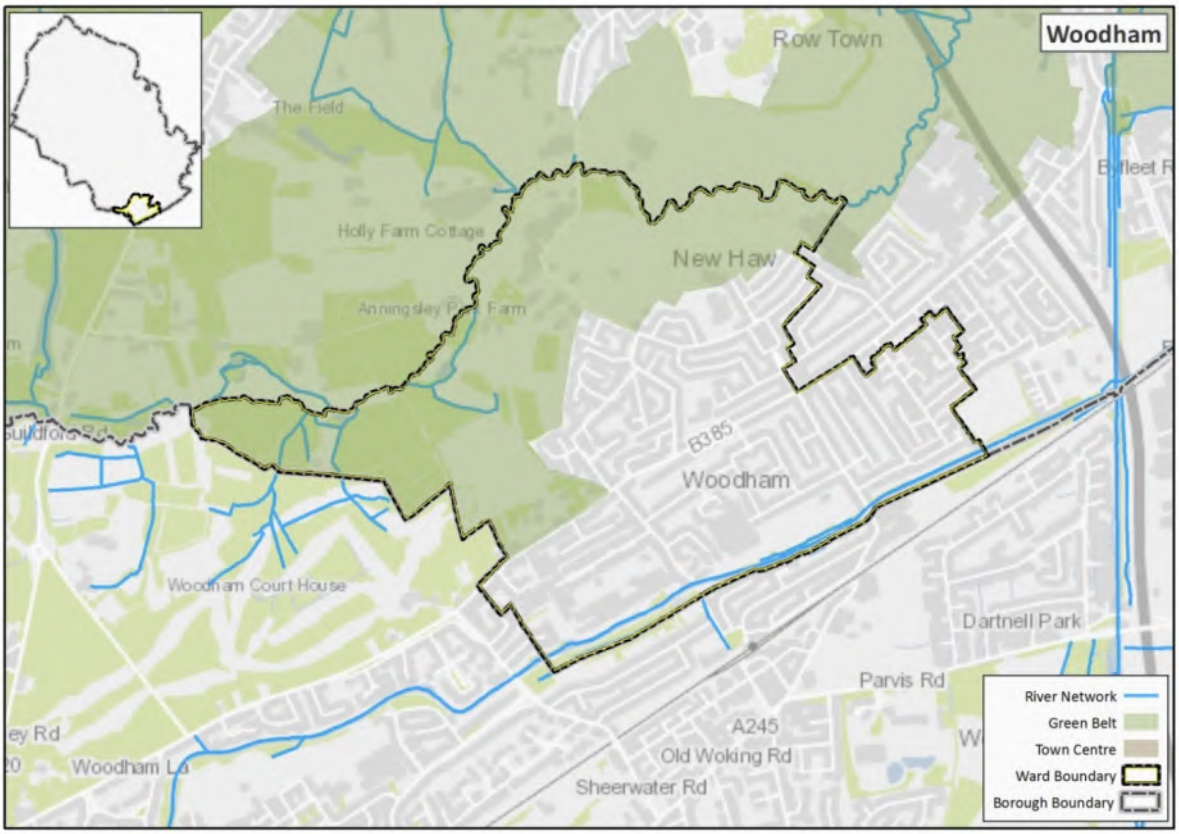
	recharge is presumed to be discharged at the source. The EA records of smaller abstractions have not been reviewed at this stage.	
Main rivers	Chertsey Bourne The Moat Hurst Ditch is located at the ward boundary Ripley Springs Watercourse	Figure 2
Ordinary watercourses	Figure 8 shows the location of the ordinary watercourses that run through this ward.	Figure 8

Virginia Water		
Strategic assessment of flood risk		
Flooding from rivers	*Flood Zones* Zone 1 Only: 13.4 sq.km (90%) Zone 2 Only: 1.3 sq.km (9%) Zone 3 Only: 0.1 sq.km (1%) Zone 2 or 3: 1.4 sq.km (10%) 10% (1.4sq.km) of the ward is within Flood Zones 2 or 3, of which 99% is in the Green Belt and 1% is located in the Urban Area. The Urban Area within the Flood Zones includes some of the rear gardens belonging to properties in Keepers Walk and Nun's Walk. *Functional floodplain* 1% of the ward (0.1 sq.km) is shown to be at risk during the 5% (1 in 20 year) annual probability flood event. This includes Green Belt land along the banks of the Chertsey Bourne. However there are parts of the ward where detailed modelling does not exist for the 5% annual probability flood event. In these areas, a cautious approach will be taken and sites will be treated as being within the functional floodplain unless applicants are able to provide modelling to show a site is not within the 5% AEP flood extent. *Climate change* When the Environment Agency's 1 in 100 models are contrasted with their 1 in 100 + 20% climate change models, it can be seen that there is a negligible increase in the areas of the ward that would be at risk from flooding. As noted in Chapter 4 however, the Environment Agency has recently released new climate change allowances which its current models do not comply with. This section therefore seeks to provide an indication of the potential impact of climate change in the ward although it is likely that further detailed modelling will be required to support development proposals coming forward.	Figure 11 Figure 13

	Historic records Runnymede Borough Council and the Environment Agency have only limited records of fluvial flooding occurring in this ward. This saw two small areas in the north eastern corner of the ward being flooded between 1950 and 1970. *Flood defences* There are no formal flood defences in this ward. The Environment Agency Asset Information Management Systems (AIMS) identifies a number of simple culverts along watercourse within/along the boundaries of this ward.	Figures 10a, b, c and d Figure 9 and appendix 3
Surface water flooding	The Environment Agency's 'risk of flooding from surface water' mapping shows that surface water is shown to pond adjacent to the Chertsey Bourne and The Moat. It also identifies a higher risk of surface water flooding along some of the roads within the ward including along parts of Oak Tree Close, Knowle Grove and Trumpsgreen Road.	Figure 14
Flooding from groundwater	The BGS dataset 'Susceptibility to Groundwater Flooding' shows that the north eastern corner of the ward has potential for ground water flooding to occur at the surface. The remainder of the ward is mostly categorised as having limited potential for groundwater flooding to occur. There are exceptions, the most notable being in parts of Virginia Water in the vicinity of the Chertsey Bourne.	Figure 17
Flooding from sewers	During the last 10 years sewer flooding has affected up to 4 properties in the GU25 4 postcode area (external flooding), up to 4 properties in the KT16 0 postcode area (external flooding), up to 9 properties in the TW20 8 postcode area (3 internal flooding and 6 external flooding), up to 4 properties in the TW20 0 postcode area (2 internal flooding and 2 external flooding) and up to 8 properties in the TW20 9 postcode area (external flooding) according to Thames Water's DG5 register[35].	Figures 15 and 16
Flooding from reservoirs, canals and other artificial sources	This ward contains part of Virginia Water Lake which was first dammed and flooded in 1753. This flows into Wentworth Pond to the south east. The remainder of Virginia Water Lake is located in the Royal Borough of Windsor and Maidenhead to the west. To the north of this is Great Pond (also in RBWM) which was created in 1749. The Environment Agency dataset 'risk of flooding from reservoirs' shows that parts of Virginia Water in the vicinity of the Chertsey Bourne could be flooded if either Virginia Water Lake or Great Pond were to fail and release the water it holds. This would include some parts of the Virginia Water Urban Area.	Figures 19 and 20a, b, c

[35] Post codes areas and ward boundaries are not aligned. As such there cannot be complete accuracy when determining the number of properties that have been affected by sewerage flooding at ward level. For the benefit of this assessment the total number of properties that have reported across the postcode area has been noted. It is not known from the data provided the exact number of these properties that are located in this ward.

	The dataset also shows that reservoir failure from Virginia Water Lake, the Wraysbury or Queen Mother reservoir could also affect an area on the eastern side of the ward, to the east of the railway line. This would affect the Stroude and Hurst Lane areas in particular.	
Wetspot data	SCC has identified a number of known 'wetspots' in this ward This includes: Christchurch Road, Cabrera Avenue, Cabrera Close, Trumpsgreen Road, Oak Tree Close, Tithe Meadows, London Road, Sandhills Road and Stroude Road.	Figure 21
Dry islands	There are no dry islands with a size of 0.5ha or greater in this ward.	Figure 12
Managing and mitigating flood risk		
Flood warning areas	'Chertsey Bourne at Thorpe Green',	-
SuDS suitability	According to the BGS drainage summary, the majority of this ward is either highly compatible for infiltration SuDS, probably compatible for infiltration SuDS or to offer opportunities for bespoke infiltration SuDS. There are however areas of the ward that are shown to have very significant constraints. The largest of these areas is on the eastern side of the ward in the Green Belt area surrounding Stroude Road. This is likely to be due, in part, to possible contaminated ground from the many historic and authorised landfills in parts of this ward. It should be noted that infiltration SUDs should not be used is areas of contaminated ground.	Figure 23
Site specific SFRA guidance	Chapter 8 provides detailed guidance on measures to manage and mitigate flood risk, and Chapter 9 provides guidance on preparation of site-specific FRAs.	Chapters 8 and 9
Policy recommendations	Chapter 10 provides spatial planning and development management recommendations for the Borough.	Chapter 10

Woodham		
		
General information		
Area	Woodham covers an area of 2.4 sq.km comprising 46% Green Belt and 54% Urban Area.	Figure 2
Character	Woodham is located in the south western corner of the borough. The portion of the ward which is located in the urban area is predominantly residential in character but contains an important local shopping parade at The Broadway. The settlement of Woodham is contiguous with New Haw to the east. Woodham Lane acts as the main 'spine' route running east-west centrally through the middle of the Woodham urban area with secondary roads connecting to it, north and south. The southern edge of the urban area is partly defined by the Basingstoke Canal Conservation Area. Green Belt land is located to the north of the Urban Area. Large parts of this land remain undeveloped. Notable exceptions are Charwood Nurseries, the Bourne Valley Garden Centre and a small section of development which is located on the southern side of Woodham Park Road (mix of residential and commercial uses).	-
Topography	The north west and central area of the ward averages 30m AOD, whilst the surrounding area averages 20m AOD.	Figure 3
Geology	Superficial-Whilst parts of the ward are not underlain by superficial deposits, sizeable areas of Lynch Hill Gravel Member (sand and gravel) and Kempton Park Gravel	Figures 4 and 5

	Formation (sand and gravel) are observed as well of smaller areas of head (diamicton) and alluvium (silt). Bedrock-The entire ward is underlain by Bagshot Formation (sand).	
Aquifer type	The superficial deposits in this ward they are classified as a principal aquifer in some areas and as either a secondary A aquifer or secondary undifferentiated aquifer in others. According to Environment Agency definitions, a principal aquifer has high intergranular and/or fracture permeability - meaning they usually provide a high level of water storage and can support water supply and/or river baseflow on a strategic scale. A secondary A aquifer is defined as a permeable layer capable of supporting water supplies at a local rather than strategic scale and in some cases forms an important source of base flow to rivers. Secondary undifferentiated aquifers are classified as such where it has not been possible to attribute either category A or B to a rock type. This classification is often indicative of the variable characteristics of the rock type. There are areas in this ward where there are no superficial deposits. These areas will be directly underlain by the Bagshot Formation, and designated as a secondary aquifer. The underlying bedrock is classified as a secondary A aquifer.	Figures 6 and 7
Groundwater vulnerability classification and source protection zone	The superficial deposits give the ward the following categories of risk vulnerability: -'major aquifer high' (easternmost part of ward) -'minor aquifer high' (central part of the ward) -'minor aquifer intermediate' (northern part of the ward). The Environment Agency defines Source Protection Zones (SPZ) around all major public and private water supply abstractions in order to safeguard groundwater resources from potentially polluting activities. There are no SPZs within this ward. The Environment Agency records of smaller abstractions have not been reviewed at this stage.	Figures 18 and 22
Main rivers	The Rive Ditch runs along the southern boundary of the ward (along the Borough boundary). The northern boundary of the ward is formed by the Addlestone Bourne.	Figure 2
Ordinary watercourses	Figure 8 shows the location of the ordinary watercourses that run through this ward.	Figure 8

Woodham		
Strategic assessment of flood risk		
Flooding from rivers	*Flood Zones:* Zone 1 Only: 2 sq.km (82%)	Figure 11

	Zone 2 Only: 0.3 sq.km (11%) Zone 3 Only: 0.2 sq.km (7%) Zone 2 or 3: 0.5 sq.km (18%) 18% (0.5sq.km) of the ward is within Flood Zones 2 or 3, of which 63% is in the Green Belt land and 37% is located in the Urban Area. The Urban Area within the Flood Zones is located in the south eastern corner of the ward and includes parts of Heathervale Road, Kings Road, Pinewood Grove, Pinewood Park, Hayden Court and Braeside. *Functional floodplain* 5% of the ward (0.13 sq.km) is shown to be at risk during the 5% (1 in 20 year) annual probability flood event. This is limited to Green Belt land at the north of the ward along the banks of the Addlestone Bourne. However there are parts of the ward where detailed modelling does not exist for the 5% annual probability flood event. In these areas, a cautious approach will be taken and sites will be treated as being within the functional floodplain unless applicants are able to provide modelling to show a site is not within the 5% AEP flood extent. *Climate change* When the Environment Agency's 1 in 100 models are contrasted with their 1 in 100 + climate change models (+20%), it can be seen that there is a negligible increase in the areas of the ward that would be at risk from flooding. As noted in Chapter 4 however, the Environment Agency has recently released new climate change allowances which its current models do not comply with. This section therefore seeks to provide an indication of the potential impact of climate change in the ward although it is likely that further detailed modelling will be required to support development proposals coming forward. *Historic Records* Runnymede Borough Council and the Environment Agency hold records of fluvial flooding from the Addlestone Bourne occurring although this has been limited to a relatively narrow strip of land at the northern most part of the ward which follows the length of the river. *Flood defences* There are no formal flood defences in this ward. The Environment Agency Asset Information Management Systems (AIMS) identifies a simple culvert on the southern boundary of the ward in the Rive Ditch.	Figure 13 Figures 10a, b, c and d Figure 9 and appendix 3
Surface water flooding	The Environment Agency's 'risk of flooding from surface water' mapping identifies a higher risk of surface water flooding in a number of places in the ward including along	Figure 14

	parts of Amis Avenue, Scotland Bridge Road, Florence Avenue, Little Orchard, Farleigh Road, and Lindsay Road.	
Flooding from groundwater	The BGS dataset 'Susceptibility to Groundwater Flooding' shows that the majority of the ward has limited potential for groundwater flooding.	Figure 17
Flooding from sewers	During the last 10 years sewer flooding has affected up to 2 properties in the KT15 3 postcode area (external flooding) according to Thames Water's DG5 register[36].	Figures 15 and 16
Flooding from reservoirs, canals and other artificial sources	The Basingstoke Canal runs along the southern boundary of the ward. The control of flow in the canal via weirs and gates means that the levels should not be overtopped during a fluvial flood event. There remains, however, a residual risk that flood water could be conveyed down the canal should the appropriate measures fail. There are no large reservoirs in the vicinity of this ward and the Environment Agency dataset 'risk of flooding from reservoirs' confirms that no part of the ward would be at risk if one of the reservoirs in the Borough, or in one of the adjacent authorities were to fail and release the water it holds.	Figures 19 and 20a, b, c
Wetspot data	SCC has identified parts of the following roads as known 'wetspots': Langshott Close, Scotland Bridge Road, Farleigh Road/Selsdon Road junction, The Broadway and Woodham Lane (parts of these roads are also located in New Haw).	Figure 21
Dry islands	There are no dry islands with a size of 0.5ha or greater in this ward.	Figure 12
Managing and mitigating flood risk		
Flood warning areas	The only Environment Agency Flooding Warning Area relevant to this ward is 'Addlestone Bourne at Woodham'.	-
SuDS suitability	The BGS SuDS drainage summary shows the the whole ward falls within one of the following categories-'highly compatible for infiltration SuDS', 'probably compatible for infiltration SuDS' or 'opportunities for bespoke infiltration SuDS'. No part of the ward is shown to have very significant constraints.	Figure 23
Site specific SFRA guidance	Chapter 8 provides detailed guidance on measures to manage and mitigate flood risk, and Chapter 9 provides guidance on preparation of site-specific FRAs.	Chapters 8 and 9
Policy recommendations	Chapter 10 provides spatial planning and development management recommendations for the Borough.	Chapter 10

[36] Post codes areas and ward boundaries are not aligned. As such there cannot be complete accuracy when determining the number of properties that have been affected by sewerage flooding at ward level. For the benefit of this assessment the total number of properties that have reported across the postcode area has been noted. It is not known from the data provided the exact number of these properties that are located in this ward.

CHAPTER 7: AVOIDING FLOOD RISK

Introduction

7.1 The PPG advises that the broad approach of assessing, avoiding, managing and mitigating flood risk should be followed. The preceding chapters in this document will assist applicants assess flood risk in regard to development sites and proposals across the Borough. The remaining chapters in this SFRA seek to provide guidance on how flood risk can be avoided, managed and mitigated.

7.2 The risk of flooding is most effectively addressed through avoidance, which in very simple terms equates to guiding future development away from areas at risk. The purpose of this chapter is to guide the application of the Sequential Test and Exception Test in the development management and plan-making processes in Runnymede Borough (i.e. to avoid flood risk wherever possible).

What is the aim of the sequential test?

7.3 Paragraph 101 of the NPPF states that 'the aim of the Sequential Test is to steer development to areas with the lowest probability 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 probability of flooding'.

7.4 The PPG states that this general sequential approach to flood risk is designed to ensure that areas at little or no risk of flooding from any source are developed in preference to areas at higher risk. The aim should be to keep development out of medium and high flood risk areas (Flood Zones 2 and 3) and other areas affected by different sources of flooding where possible.

Application of the sequential test in the development management process

7.5 The aim of the sequential test in the development management process is to steer new development to flood zone 1 wherever possible. Where there are no reasonably available sites in Flood Zone 1, the PPG advises that LPAs should take into account the flood risk vulnerability of land uses and consider reasonably available sites in Flood Zone 2, applying the Exception Test if required (this will be discussed in more detail later in this chapter). Only where there are no reasonably available sites in Flood Zones 1 or 2 should the suitability of sites in Flood Zone 3 be considered, taking into account the flood risk vulnerability of land uses and again, applying the Exception Test if required.

7.6 Within each flood zone, surface water and other sources of flooding also need to be taken into account in applying the sequential approach to the location of development.

7.7 The extent of flood zones 2 and 3 are defined by the Environment Agency's Flood Map for Planning (rivers and sea). The extent of the functional floodplain in Runnymede is defined in

this SFRA (see chapter 4 and figure 13 for more information). It is these flood zones that provide the starting point for applying the Sequential Test.

7.8 The following steps should be followed by an applicant when applying the sequential test in Runnymede. It should be noted that the Council has closely followed guidance on application of the sequential test produced by the Environment Agency in April 2012. Whilst this guidance has been archived, it was produced post the adoption of the NPPF and is considered to provide a methodical and clear approach to applying the sequential test as part of the Development Management process.

STAGE 1- STRATEGIC APPLICATION & DEVELOPMENT VULNERABILITY

1. **Clearly set out the proposed location of the development site** (a plan at a scale of 1:1250 or 1:2500 showing the boundaries of the site outlined in red should be provided).

2. **Has the Sequential Test already been carried out for this development at Local Plan level?** If yes, reference should be provided to the site allocation and Local Plan document in question.

3. **Is the flood risk vulnerability classification of the proposal appropriate to the Flood Zone in which the site is located according to tables 1 and 3 of the PPG (in the Flood Risk and Coastal Change section)?** The vulnerability of the development should be clearly stated. *(NOTE: Where development is mixed, the development should be assigned the highest vulnerability class of the developments proposed).*

Finish here if the answer is Yes to BOTH questions 2 and 3. Only complete stages 2 and 3 if the answer to EITHER questions 2 or 3 is 'No'.

STAGE 2- DEFINING THE EVIDENCE BASE

4. **State the geographical area over which the test is to be applied.** *NOTE: It will usually be expected that an applicant will apply the test over the whole of the Local Authority area. It is recognised however that the area of search may be reduced where justified by the functional requirements of the development or relevant objectives in the Local Plan. For example, if regeneration of a particular town centre is a local plan priority, this might mean that the geographical area of search is restricted to a specific part of the Borough. Equally, in some circumstances it may be appropriate to expand the search area beyond the LPA boundary for uses that have a sub-regional, regional or national market.*

   If the area of search is greater or less than the Local Authority area, justify why the geographical area for applying the test has been chosen.

5. **Identify the source of reasonably available sites, either:**

- **background / evidence base documents (state which), or if not available**
- **other sites known to the LPA that meet the functional requirements of the application.**

NOTE: these sites will usually be drawn from the evidence base / background documents that have been produced to inform the emerging Local Plan, for example the Council's most recent Strategic Land Availability Assessment (SLAA). In the absence of background documents, 'reasonably available' sites would include any sites that are suitable, developable and deliverable, and where necessary, meet the Local Plan Policy criterion for windfall development.

Windfall sites

Windfall sites are those which have not been previously identified and which are usually first encountered as development sites when a planning application is submitted (or when pre-application discussions have taken place). For Runnymede, windfalls are usually small-scale developments which are defined as those containing 4 net units or less. The Council will continue to apply the Sequential Test for such sites taking into account reasonably available sites.

6. **State the method used for comparing flood risk between sites, either:**
    - **Environment Agency Flood Map, or**
    - **an up to date Strategic Flood Risk Assessment held by the Local Planning Authority, or**
    - **site specific Flood Risk Assessments where they are suitable for this purpose, or**
    - **another map or sources of flooding information not listed (state which).**

NOTE: Applicants should refer to the Environment Agency Flood Map for Planning (Rivers and Sea) as a starting point. If comparing sites within the same Flood Zone it will be necessary to use this SFRA to see if there is a variation in risk throughout the Flood Zone or site specific Flood Risk Assessments where these are available and suitable for the purpose.

STAGE 3 – APPLYING THE SEQUENTIAL TEST

7. **State the name and location of the reasonably available site options being compared to the application site.**

8. **Indicate whether flood risk on the reasonably available options is higher or lower than the application site (all types of flood risk should be considered).** State the Flood Zone or other type of classification for each site.

9. **State whether the reasonably available options being considered are allocated within the Local Plan.** Confirm the status of the Plan.

10. **State the approximate capacity of each reasonably available site being considered**. This should be based on:

- past performance in this respect (approved planning applications in the vicinity of the site) and/or
- SLAA estimations and/or

- Discussions with Council officers.

11. **Detail any constraints to the delivery of identified reasonably available options; for example, availability within a given a time period or lack of appropriate infrastructure. This part of the test should include recommendations on how these constraints could be overcome and when.**

SEQUENTIAL TEST CONCLUSION

12. **Are there any reasonably available sites in areas with a lower probability of flooding that would be appropriate to the type of development or land use proposed?**

7.9 It is for Runnymede Borough Council, taking advice from the Environment Agency as appropriate, to consider the extent to which Sequential Test considerations have been satisfied where it is required to be applied, taking into account the particular circumstances in any given case. The Environment Agency is generally best placed to provide applicants and the Council with expert advice on the likelihood, scale and impacts of fluvial flooding on different sites. Such information assists the Council in making an informed decision about differences in flood risk across sites submitted for consideration. It is therefore suggested that prior to submitting a planning application, an applicant contacts the Environment Agency to obtain relevant information relating to the likelihood, scale and impacts of fluvial flooding at any site they are considering in the floodplain.

7.10 The Environment Agency is not however well placed to advise applicants in detail on certain aspects of the sequential test including what may constitute a 'reasonably available' alternative site. In this regard applicants should discuss this matter with The Council as part of any pre application discussions that are entered into.

NEXT STEPS

7.11 Exception Test - Where necessary, the Exception Test should next be applied in the circumstances set out by table 1 and 3 in the Flood Risk and Coastal Change section of the PPG. Further advice about the application of the exception test in Runnymede is provided later in this chapter.

Applying the sequential approach at site level

7.12 In addition to the formal Sequential Test, the NPPF sets out the requirement for developers to apply the sequential approach (see NPPF para 103) to locating development within a site.

7.13 Specifically, applicants should ensure that a sequential approach is taken when considering the layout within a new development site as this provides an opportunity to reduce flood risk within a development. To be the most effective it is recommended that flood risk is considered at the early stages of scheme development. This approach is particularly relevant for developments which include a variety of land uses with varying flooding vulnerability classifications. Applying the sequential approach to the layout of a scheme can help ensure that the most vulnerable elements of a development are located in the lowest risk areas (all

sources of flooding should be considered). For example residential elements should be restricted to areas at lower probability of flooding whereas uses with a lower vulnerability (such as commercial uses), parking, open space or proposed landscaped areas can be placed on lower ground with a higher probability of flooding.

7.14 In developing proposals, applicants should therefore consider questions such as:

- Can risk be avoided through substituting with less vulnerable uses or by amending the site lay-out?
- Has the applicant demonstrated that less vulnerable uses for the site have been considered? If a lower vulnerability use has been discounted, what are the reasons for this?
- Can density be varied to reduce the number or vulnerability of units located in higher risk parts of the site?

7.15 However when considering the most suitable layout of a proposed development to minimise flood risk, the Council is aware that other considerations would also need to be weighed in the balance, for example the acceptability of a layout on residential amenity and the streetscene would also be important considerations.

Exceptions where application of the sequential test is not required.

7.16 The sequential test need not be applied in the following scenarios:

- For individual developments on sites that have been allocated in development plans and which have already been subject to the Sequential Test,
- For applications for minor development. Minor development is defined by the Environment Agency as:
    - **minor non-residential extensions:** industrial/commercial/leisure etc. extensions with a footprint of less than 250 square metres.
    - **alterations:** development that does not increase the size of buildings e.g. alterations to external appearance.
    - **householder development:** For example; sheds, garages, games rooms etc. within the curtilage of an existing dwelling, in addition to physical extensions to the existing dwelling itself. This definition excludes any proposed development that would create a separate dwelling within the curtilage of the existing dwelling e.g. subdivision of a house into flats.
- Change of Use applications unless it is for change of use of land to a caravan, camping or chalet site, or to a mobile home site or park home site.
- For development proposals in Flood Zone 1, unless this SFRA, or other more recent information indicates that there may be flooding issues now or in the future (for example, through the impact of climate change (in this regard please see the section on climate change in this SFRA in chapter 4)).
- Redevelopment of existing properties (e.g. replacement dwellings), provided they do not increase the number of dwellings in an area of flood risk (i.e. replacing a single dwelling within an apartment block).

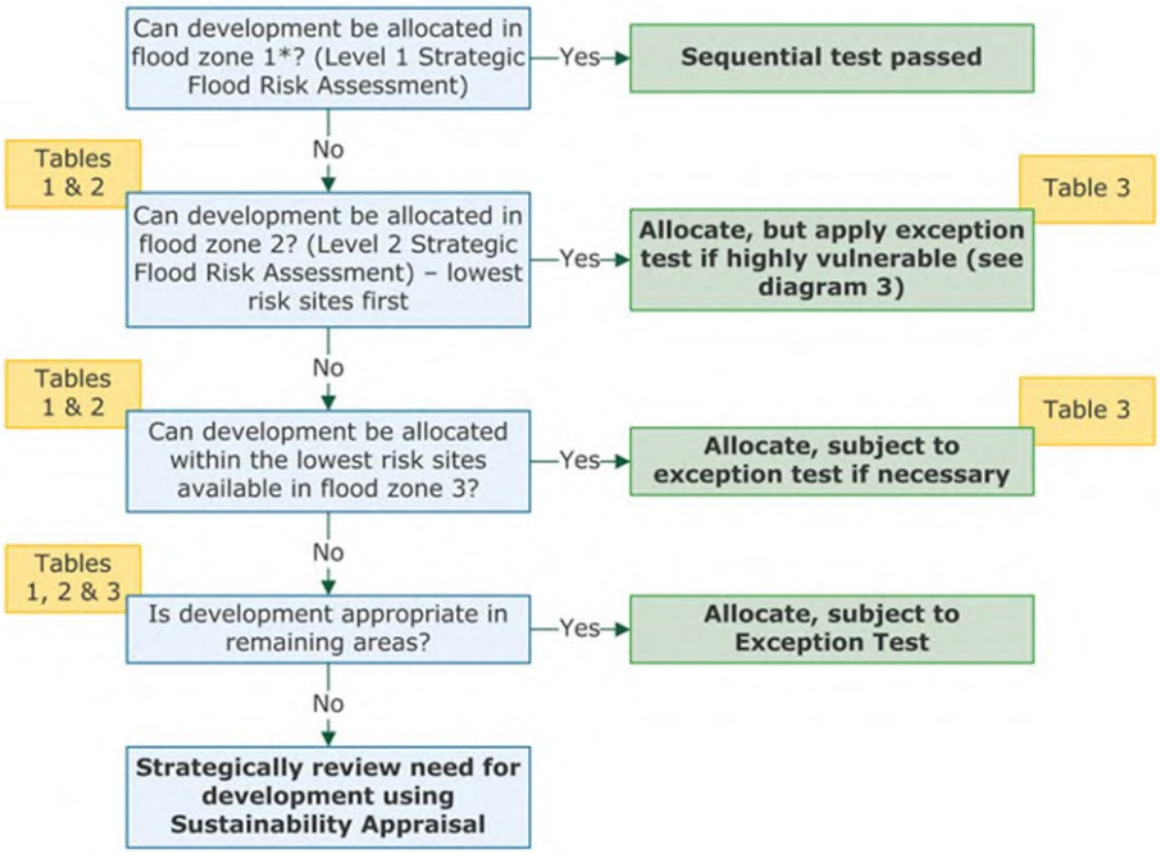
7.17 Within a site specific FRA consideration should be given as to whether the sequential test is required to be undertaken based on the information contained in this SFRA and in the PPG. Even if the sequential test is not required to be undertaken, applicants will still need to consider whether the Exception Test is required to be undertaken in line with table 3 in the Flood Risk and Coastal Change section of the PPG.

Application of the sequential test in the plan making process

7.18 In line with the sequential approach to development in flood risk areas advocated as part of the development management process, the sequential approach to flood risk must also be followed during the preparation of a Local Plan.

7.19 Figure 24 below has been taken from the PPG and summarises how the sequential test should be applied during Local Plan preparation.

Figure 24: Application of the Sequential Test for Local Plan preparation (Paragraph: 021 Reference ID: 7-021-20140306 from the PPG)



* Other sources of flooding also need to be considered at this stage as well.

7.20 The PPG states that the application of the sequential approach in the plan-making process, in particular through the application of the Sequential Test, will help ensure that development can be safely and sustainably delivered. According to the information available, other forms of flooding should be treated consistently with river flooding when determining the vulnerability of different parts of the borough for flooding (based on historic records and the most up to

date modelling available). This approach has been used to apply the strategic sequential test to all submitted SLAA sites, and will continue to be relied upon when considering any other sites that may be submitted to the Council for consideration during the Plan preparation process.

7.21 The PPG is clear that when preparing a Local Plan, the Sequential Test should be applied to the whole local planning authority area to increase the possibilities of accommodating development which is not exposed to flood risk. The Council has followed this approach in the preparation of the Runnymede 2030 Local Plan.

7.22 Local Planning Authorities can also review development options over wider areas in partnership with neighbouring authorities. In this regard, the Runnymede-Spelthorne SHMA identifies that Runnymede is located in a Housing Market Area (HMA) with Spelthorne Borough Council. Furthermore the Council's functional economic area (FEA) analysis indicates that Runnymede has the strongest links with Spelthorne Elmbridge, Woking, Hounslow and Hillingdon (in regard to the latter, this is primarily due to the location of Heathrow Airport in the southernmost part of this Borough). Both the HMA and FEA provide opportunities to work with other Local Authorities to address flood risk over wider areas.

7.23 However at the current time, due to the tight timetable that Runnymede is working to for the preparation of its Local Plan, it is only practical for the Council to apply the strategic sequential test at Borough level. Whilst this may be the case, the Council remains committed to working with its HMA and FEA partners through the Duty to Cooperate during the course of the preparation of the Local Plan to reduce flood risk wherever possible. If an amendment to the Council's approach to the sequential test is agreed in light of these discussions, this SFRA will be amended accordingly to reflect any updated policy approach.

The exception test

7.24 The Exception Test, as set out in paragraph 102 of the NPPF, is a method to demonstrate and help ensure that flood risk to people and property will be managed satisfactorily, while allowing necessary development to go ahead in situations where suitable sites at lower risk of flooding are not available.

7.25 If, following the application of the Sequential Test, it is not possible, consistent with wider sustainability objectives, for a development to be located in zones with a lower probability of flooding (whether through the plan making or development management process) the Exception Test may need to be applied. For the Exception Test to be passed:

1. It must be demonstrated that the development provides wider sustainability benefits to the community that outweigh flood risk, informed by a Strategic Flood Risk Assessment where one has been prepared; and
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.

7.26 Both elements of the test must be passed for development to be allocated (in the case of plan making) or permitted (in the case of the development management process).

7.27 Table 3 in the Flood Risk and Coastal Change section of the PPG confirms the instances when the exception test will need to be applied, once the sequential test has been passed.

7.28 In order to assess whether part 1 of the exception test can be passed, applicants should assess their scheme against the relevant decision aiding criteria set out against the objectives within the Sustainability Appraisal Framework for the Local Plan. The relevant table is set out in the Council's SA Scoping Report and reproduced below.

Table 12: Runnymede Borough Council's Sustainability Appraisal Framework objectives

Proposed SA Objectives	Proposed decision-aiding criteria
SA Objective 1: To conserve and enhance biodiversity, habitats and species	• Will it avoid potential impacts of development on designated sites? • Will it avoid net loss of and achieve enhancement of ecological resources and services? • Will it avoid habitat fragmentation? • Will it lead to development which incorporates biodiversity into the design e.g. linking green corridors, incorporation of habitats etc.?
SA Objective 2: to protect and improve the health and well being of the population and reduce inequalities in health	• Will it help to address pockets of deprivation and child poverty? • Will it improve access to healthcare? • Will it provide for the needs of an ageing population? • Will it facilitate active lifestyles? • Support local sustainable food production, including the provision of allotments and community gardening?
SA Objective 3: to protect soil and minerals resources	• Will it ensure that mineral resources are not sterilised? • Will it avoid environmental effects from mineral abstraction on sensitive receptors? • Will it achieve efficiency in land use and avoid the development of greenfield land over the redevelopment of previously developed land and buildings? • Will it minimise waste arisings and facilitate recycling?
SA Objective 4: to improve water quality and efficiency?	• Will it ensure developments are water efficient? • Will it help to improve water quality?
SA Objective 5: to increase resilience to climate change, including flood risk	• Will it ensure that people, property and businesses are protected from flooding? • Will development incorporate SUDS? • Will it lead to developments which are designed to be resilient to hotter, drier summers and warmer, wetter winters?
SA Objective 6: to reduce air and noise pollution	• Will it ensure that development minimises exposure to poor air quality and noise pollution? • Will it avoid contributing to congestion? • Will it facilitate the incorporation of electric vehicle charging points into new developments or ensuring they can be retrofitted?

SA Objective 7: reduce greenhouse gas emissions	• Will it ensure that new developments are designed to achieve high levels of energy efficiency? • Will it prioritise access to good public transport and safe walking and cycling facilities infrastructure (including segregated cycle lanes), over facilities for private cars? • Will it increase renewable energy generation?
SA Objective 8: to sustain economic growth and competitiveness across the Borough	• Will it support a dynamic and diverse economy? • Will it stimulate economic growth in deprived areas? • Will it support low environmental impact business sectors? • Will it contribute to the provision of opportunities for employment and improvements in educational attainment and skills development
SA Objective 9: to ensure the provision of high quality, sustainable constructed and affordable homes and necessary community infrastructure. **SA Objective 10: to protect and enhance the Borough's historic assets**	• Will it provide viable and deliverable good quality and affordable housing to meet identified needs? • Will it ensure the delivery of necessary community infrastructure? • Will it achieve development that demonstrates sustainable design and construction including efficient use of materials? • Will it ensure that development avoids adverse effects on heritage assets, archaeology and Conservation Areas? • Will it ensure that development is well-designed and is well- related to the surrounding townscape?
SA Objective 11: to protect and enhance open space and the landscape character of the Borough	• Will it protect and enhance landscape character? • Will it ensure the quality of and provision of suitable open space, where need is identified?

7.29 The decision maker will review the applicant's assessment against the objectives above, to weigh whether, on balance, a development is considered to have the wider sustainability benefits to the community that outweigh flood risk, as required by part 1 of the exception test. If a site is assessed to not have wider sustainability benefits when assessed against the criteria above, the Council will consider whether the use of planning conditions and/or planning obligations could make a proposal pass part 1 of the test. Where this is not possible the Council will consider that the Exception Test has not been satisfied.

7.30 In order to assess whether part 2 of the exception test can be passed, within the site specific FRA, the measures presented within Chapter 8 of this SFRA (and any others considered relevant) should be utilised wherever possible. In particular issues relating to flood warnings and evacuation need to be considered in detail.

Dry islands

7.31 It should be noted that for applications in dry islands, whilst the application of the exception test will not always be required in line with guidance in the PPG, as noted in chapter 4 of this document, the NPPF and PPG highlight the need to consider safe access and escape routes for developments in flood risk areas. Dry islands are considered to be flood risk areas. This is because although a dry island itself may not flood, there is potential for properties within a dry island to be affected by loss of key services and by being surrounded by deep floodwater during a flood event. Access and egress from dry islands is therefore an important consideration. Whilst the Borough's dry islands can be mapped (as shown in figure 12) dry, the potential for losing key services is much harder to predict, as flooding elsewhere (outside Runnymede) could coincide with flooding of key infrastructure such as water treatment works or electricity substations. If these are affected by flooding then whole settlements could potentially lose electric power or clean drinking water or be affected by sewage. On a smaller scale, localised water entering the foul sewer can cause backing up, and water supply pipes may become contaminated or localised electricity cables may cut out.

7.32 It should be noted therefore that even if the application of the exception test is not required to support a development proposal in a dry island, the Council will still require a site-specific flood risk assessment to be submitted which must demonstrate that the development within such areas will be safe for its lifetime taking account of the vulnerability of its users. This will include the provision of a safe access and egress route.

Lifetime of development

7.33 Within part 2 of the Exception Test, lifetime of development is mentioned. In line with advice in the PPG, in Runnymede Borough residential development should be considered for a minimum of 100 years, unless there is specific justification for considering a shorter period. For example; where a development is controlled by a time-limited planning condition.

7.34 For non-residential developments, the lifetime will depend on the characteristics of a particular development. Planners should use their experience within their locality to assess how long they anticipate the development being present for. Developers should justify why they have adopted a given lifetime for the development when they are formulating their FRA. Generally speaking, the Council will consider a minimum lifetime of 75 years for commercial / industrial developments. This is on the advice of the Environment Agency.

7.35 Any mitigation measures proposed should be designed to last for the lifetime of the development taking into account the impacts of climate change. The likely increase in river flow over the lifetime of the development should be assessed proportionally using the Environment Agency guidance referred to in chapter 4 of this SFRA (see climate change section in this chapter).

7.36 It is important to remember that the potential impacts of climate change will affect not only the risk of flooding posed to property as a result of river flooding, but it will also potentially increase the frequency and intensity of localised storms in the Borough. This may exacerbate

localised drainage problems, and it is essential therefore that the detailed FRA considers the potential impacts of climate change upon localised flood risks, as well as the risks from river related flooding.

CHAPTER 8: FLOOD RISK MANAGEMENT AND MITIGATION

Introduction

8.1 The sequential approach to flooding as advocated by the NPPF and PPG, and as described in detail in chapter 7 of this SFRA provides a framework for managing flood risk through the spatial planning process. This SFRA has identified that large parts of Runnymede are located in low flood risk zones, predominantly in the west, and that in the east where a number of existing settlements are located, in some parts, the probability of flooding is high, predominantly from the River Thames and its tributaries. Although parts of these areas lie within the 5% annual probability flood extent (which generally sets out the extent of the functional floodplain in the Borough), development in other parts of the Borough is in some instances restricted by other constraints including the Green Belt and the Thames Basin Heath Special Protection Area.

8.2 The key issues for Runnymede are therefore:

1) to ensure that development will be safe if it is found to be necessary to bring development forward in areas of high flood probability; and,
2) to develop robust policies that require new development to reduce flood risk through mitigation and management measures.

8.3 This is important as paragraph 100 of the NPPF acknowledges that there may be some instances where development in areas at risk from flooding may be necessary. In such instances it must be demonstrated that developments would be safe for their lifetime taking account of the vulnerability of its users and the impacts of climate change, without increasing flood risk elsewhere and, where possible, reducing flood risk overall.

8.4 This chapter of the SFRA seeks to provide advice on mitigation and management techniques to reduce flood risk in new developments that are located in areas at risks from flooding

FINISHED FLOOR LEVELS

8.5 Where development within flood zones 2 and 3 is unavoidable, they should be designed to have an internal finished floor level (FFL) 300mm above the known or modelled 1 in 100 annual probability flood level including an allowance for climate change wherever possible to help mitigate flood risk to people and property in a flood event[37].

8.6 In certain situations, for example when an extension is proposed to an existing property with a lower floor level, or when the conversion of a historic/listed building is proposed with limited ceiling heights, it could prove impractical to raise the internal ground floor levels to sufficiently meet the requirement described above. In such cases, Runnymede Borough Council should be approached to discuss whether there is the potential to implement flood resistance measures

[37] Applicants should contact the Environment Agency's Customers & Engagement team prior to submitting a planning application to obtain site specific flood risk information if required, in order to ensure that any raised floor levels are sufficiently high.

to an agreed level instead to ensure that susceptibility to flood risk is reduced overall (or as a minimum to ensure that the existing situation is not worsened). There are also circumstances where flood resilience measures should be considered first. These are described further below.

FLOOD RESISTANCE AND RESILIENCE TECHNIQUES

8.7 There is a range of flood resistance and resilience construction techniques that can be implemented in new and existing developments to mitigate potential flood damage. Flood resilience techniques help to reduce damage caused by any water that gets inside the property, whilst flood resistance techniques help to reduce the amount of water that gets inside a property in the first place.

8.8 It is always preferable to keep floodwater out of buildings but it is not always possible. Water can enter through the junctions of components of construction materials, as well as cracks and joints, and service ducts. Even then, if the water depth is higher on the outside than on the inside of a masonry building (and possibly other types) by about 0.6m there is the possibility that water pressure will cause the structure to collapse (USACE, 1988).

8.9 There is a growing range of simple products for keeping low-level floodwater out of a property (flood resistance measures).Generally speaking such measures can be beneficial when the depth of flood water is unlikely to exceed 0.6m. In areas where flood water is expected to be over 0.6m in depth, as a general rule, flood water should be allowed to enter a property to prevent any structural damage that could be caused by a build-up of water outside. Given these risks, anybody installing flood resistance measures in a property where the depth of flood water is likely to be greater than 0.6m should seek professional advice as to the structural stability of their property where the walls are laterally loaded.

Existing properties

8.10 Retrofitting flooded properties when they are being repaired is common practice and should be actively encouraged. The Association of British Insurers (ABI) has produced a guide on resistant and resilient repair after a flood which has been developed in liaison with the Environment Agency, the National Flood Forum and the Chartered Institute of Loss Adjusters (CILA)[38].

8.11 Flood resilience measures are not necessarily more expensive than conventional flood resistance techniques (such as sandbags, flood boards, bunds) and over repeated flood events can help reduce damage, cost and the time taken to repair flooded properties. They can also help reduce the amount of time that a property is uninhabitable by making the inside of the property more resilient to floodwater damage.

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https://www.abi.org.uk/~/media/Files/Documents/Publications/Public/Migrated/Flooding/A%20guide%20to%20resistant%20and%20resilient%20repair%20after%20a%20flood.pdf

8.12 Potential flood resilience options include:

- Replacing gypsum plaster with more water-resistant material, such as lime plaster or cement render and renovating plaster to help reduce water damage to walls;
- Replacing the usual chipboard kitchen or bathroom units with plastic or steel equivalents (where these are appropriate and cost-effective), e.g. plastic kitchen units with removable, waxed good quality wooden doors to help reduce water damage to fixtures;
- Replacing timber floors with solid concrete (only where appropriate), using tiles and a water-proof membrane to prevent water penetration into concrete to help reduce water damage to floors;
- Removing patio doors and installing conventional doors and windows with brickwork construction underneath;
- Installing one-way valves into drainage pipes to prevent sewage backing up into the house; and,
- Using sump and pump systems to remove water from buildings faster than it enters.
- Re-organising the inside of the property to see if valuable and functional items (including service meters and boiler) could be raised above the likely level of a future flood.

8.13 By using such resilience techniques, ABI and CILA advise that a property can often be cleaned, dried, repaired and re-occupied more quickly, reducing disruption to the occupier. Flood resilient repair can be combined with resistance techniques to attempt to limit the amount of water that enters a property to start with, to help reduce the costs to repair material damage and the amount of time an occupier is out of their home.

Property level products

8.14 The most common individual property level products include aperture protection such as door-guards, and airbrick covers suitable for short duration flooding, and building "skirt systems" that can effectively isolate the whole property when flooding is more prolonged. These can only protect a property up to a certain depth of water. Brick-walls will usually only keep the floodwater at bay for a short period between 20 - 60 minutes but they can buy valuable time. There may also be some landscaping options for the outside of the property, including bunding, walls and gates with seals, extra ditches for drainage and garden landscaping.

New properties

8.15 When constructing new properties, permanent flood resistance measures (e.g. use of low permeability materials, raising of a property above the design flood level) are always preferable to temporary measures as they do not require intervention by the property occupants. Applicants should consider the guidance in this chapter and other relevant guidance on the ABI, CILA and Environment Agency[39] websites.

[39] https://www.gov.uk/flood-risk-assessment-standing-advice

SAFE ACCESS AND EGRESS

8.16 Safe access and egress from a development is required to enable the evacuation of people in a flood event, provide the emergency services with access to the development during times of flood and enable flood defence authorities to carry out any necessary duties during periods of flood.

8.17 A safe access/egress route should allow occupants to safely enter and exit buildings and be able to reach land outside the flooded area (e.g. within Flood Zone 1) using public rights of way without the intervention of emergency services or others during design flood conditions, including climate change allowances.

8.18 In order to determine whether a safe access/egress route exists, one must first understand the hazard ratings that exist along different parts of any planned route. In this regard, applicants are directed to:

- the Lower Thames river model provided by the Environment Agency,
- the methodology set out in the joint EA/DEFRA R&D Technical Report FD2321 'Risks To People' (March, 2006),
- the supplementary note on flood hazard ratings and thresholds for development planning and control purpose – clarification of the table 13.1 of fd2320/tr2 and figure 3.2 of fd2321/tr1 which was issued in May 2008 and which presents the hazard mapping slightly differently to the March 2006 document noted in the bullet point above.

8.19 The method involves combining the depth outputs with flow velocity outputs, taking account of potential debris within the flood water to provide a hazard rating across flood zones (see appendix 5 for more information).

8.20 In line with advice in the PPG, access and egress must be designed to be functional for changing circumstances over the lifetime of the development. As such access routes should allow occupants to safely access and exit buildings based on a 1 in 100 flood event + climate change. Vehicular access to allow the emergency services to safely reach the development during design flood conditions will also normally be required.

8.21 It is considered acceptable for the access/egress route to be wet in Runnymede so long as the flood hazard is no greater than Very Low Hazard – Caution along the full length of the access/escape route. The route should also be along publically accessible roads or paths. Currently limited hazard mapping is available in Runnymede. As such, until the River Thames Scheme modelling is issued with its associated hazard mapping, the Council will take the approach that where it is anticipated that the velocity of flow is likely to be low then the depth should not exceed 250mm.

Dry islands

8.22 Safe access and egress is also required to be demonstrated when development is proposed in a dry island in the Borough by producing flood warning and evacuation plans in the site specific FRAs. See the section on flood warning and evacuation plans below for more information.

When considering the Chertsey dry island specifically, historically, the Council has been satisfied that safe access and egress in a flood event has existed for people on foot and for Council and Emergency Services vehicles (even in a 1% + climate change AP event). This identified route runs along Guildford Street which according to the Lower Thames and Chertsey Bourne models provided by the Environment Agency would only be flooded to 0.2 metres for approximately 160 metres of its length where it crosses the Chertsey Bourne.

8.23 However, it should be noted that this route has not been reassessed according to the Government's current climate change allowances. Furthermore, if re-modelled flood water levels were to be slightly higher than with the current modelling it could have a large impact on the consideration of safe access for the Chertsey dry island. Applicants proposing development in the Chertsey dry island should therefore be aware of these issues and contact the Environment Agency for the latest information when preparing their application to check that a safe access/egress route out of the dry island continues to exist.

8.24 On receipt of the new Lower Thames modelling that will accompany the River Thames Scheme in 2018 (and which will model the latest February 2016 climate change allowances), the safe means of access and egress from the Chertsey Dry Island will be reassessed and plotted in any update to this SFRA.

FLOODPLAIN COMPENSATION STORAGE

8.25 All new development within the 1 in 100 (plus 20% on river flows) flood extent (flood zone 3a) plus climate change must not result in a net loss of flood storage capacity. Where possible, opportunities should be sought to achieve an increase in the provision of floodplain storage.

8.26 Where proposed development results in a change in building footprint, the applicant must ensure that it does not impact upon the ability of the floodplain to store water, and should seek opportunities to provide betterment with respect to floodplain storage.

8.27 Similarly, where ground levels are proposed to be elevated to raise the development out of the floodplain, compensatory floodplain storage must be provided outside the floodplain to ensure that the total volume of the floodplain storage is not reduced.

8.28 Floodplain compensation must be provided on a level for level, volume for volume basis on land which does not already flood and should be within the site boundary. Where land is not within the site boundary, it must be in the immediate vicinity, in the applicant's ownership and linked to the site (in terms of hydrological connectivity). Floodplain compensation must be considered in the context of a 1% annual probability (1 in 100 year) flood level including an

allowance for climate change. When designing a scheme, flood water must be able to flow in and out freely and must not pond. An FRA must demonstrate that there is no loss of flood storage capacity and include details of an appropriate maintenance regime to ensure mitigation continues to function for the lifetime of the development. Guidance on how to address floodplain compensation is provided in Appendix A3 of the CIRIA Publication C624.

8.29 The requirement for no loss of floodplain storage means that it is not possible to modify ground levels on sites that lie completely within the floodplain (when viewed in isolation), as there is no land available for lowering to bring it into the floodplain. In some cases it may be possible to provide off-site compensation within the local area e.g. on a neighbouring or adjacent site, however, this would be subject to detailed investigations and agreement with the Environment Agency to demonstrate (using an appropriate flood model where necessary) that the proposals would improve and not worsen the existing flooding situation.

FLOOD VOIDS

8.30 The use of under-floor voids with adequate openings beneath the raised finished floor levels can be considered for development in Flood Zones 2 and 3. They are generally considered to provide mitigation, but not compensation for loss of floodplain storage. The use of under-floor voids will typically require the submission of a maintenance plan which will detail how it will be ensured that the voids will remain open for the lifetime of the development. Such a maintenance plan will usually be tied to a planning consent using a legal agreement or planning condition. Sole reliance on the use of under-floor voids to address the loss of floodplain storage capacity is generally not acceptable on undeveloped sites.

8.31 Should it not be possible to achieve all the level for level compensation required, the Environment Agency may consider that the remainder be provided through the use of under-floor voids instead. The amount of level for level compensation would need to be maximised and any under-floor voids would need to be appropriately designed and kept clear to enable them to function effectively.

8.32 Void openings should be a minimum of 1m long and open from existing ground levels to at least the 1% annual probability (1 in 100 year) plus climate change plus freeboard of 300mm. By setting finished floor levels at 300mm above the design flood level, there is therefore usually enough space for voids below. There should be a minimum of 1m of open void length per 5m length of wall. Void openings should be provided along all external walls of the proposed building/extension. If security is an issue, 10mm diameter vertical bars set at 100mm centres can be incorporated into the void openings.

SIGNING UP TO THE ENVIRONMENT AGENCY FLOODLINE WARNINGS DIRECT SERVICE

8.33 The Environment Agency's flood warning service, 'Floodline Warnings Direct' (FWD) covers parts of Egham, Egham Hythe, Thorpe, Chertsey, Addlestone and Hamm Moor. The flood

warning areas can be identified on the Environment Agency website[40]. In addition, the Environment Agency flood warning areas are also outlined by ward in the level 1 assessment in this document. The EA endeavours to provide flood warnings at least two hours before flooding happens. In Runnymede, there is likely to be good warning of fluvial flooding from the River Thames. This is because there is a large lag time between rain falling on the catchment and the flood flow peak in the river (because it has a large catchment). However, with the other watercourses within Runnymede there is a much shorter lag time because of their smaller catchments.

8.34 It is recommended that all new developments in Flood Zones 2 and 3 sign up to the Environment Agency's flood warning service, particularly if they are located in isolated properties within the 5% AP flood extent, as waters are likely to rise rapidly and safe access/egress routes may become cut off quickly.

Flood warning and evacuation plans

8.35 For all developments (excluding minor developments) proposed in Flood Zone 2 or 3, a Flood Warning and Evacuation Plan should be prepared to demonstrate what actions site users will take before, during and after a flood event to ensure their safety, and to demonstrate that a development will not impact on the ability of the local authority and the emergency services to safeguard the current population. This includes for change of use applications if the vulnerability of the use is being increased.

8.36 For sites in Flood Zone 1, it may also be necessary to prepare a Flood Warning and Evacuation Plan in cases where the area surrounding the site and/or any potential egress routes away from the site may be at risk of flooding during the 1% annual probability (1 in 100 year) flood event including an allowance for climate change. This is particularly true if a site is located in a dry island. The most notable dry islands in the Borough of Runnymede are located in Chertsey and Egham Hythe. More information on dry islands can be found in chapters 4 and 6 and the location of the dry islands in the Borough can be viewed in figure 12.

8.37 Flood Warning and Evacuation Plans should include information relating to:

<u>How flood warning is to be provided, such as:</u>

- availability of existing flood warning systems;
- where available, rate of onset of flooding and available flood warning time; and
- how flood warning is given.

<u>What will be done to protect the development and contents, such as:</u>

- How easily damaged items (including parked cars) or valuable items (important documents) will be relocated;
- How services can be switched off (gas, electricity, water supplies);

[40] http://apps.environment-agency.gov.uk/wiyby/37835.aspx

- The use of flood protection products (e.g. flood boards, airbrick covers);
- The availability of staff/occupants/users to respond to a flood warning, including preparing for evacuation, deploying flood barriers across doors etc.; and
- The time taken to respond to a flood warning.

Ensuring safe occupancy and access to and from the development, such as:

- Occupant awareness of the likely frequency and duration of flood events, and the potential need to evacuate;
- Safe access route to and from the development;
- If necessary, the ability to maintain key services during an event;
- Vulnerability of occupants, and whether rescue by emergency services will be necessary and feasible; and
- Expected time taken to re-establish normal use following a flood event (clean-up times, time to re-establish services etc.)

8.38 There is no statutory requirement for the Environment Agency or the emergency services to approve Flood Warning and Evacuation Plans. Runnymede Borough Council will consider the acceptability of plans submitted in consultation with its drainage engineers and/or emergency planning staff. Where they are considered to be acceptable, the plans will be tied to the planning consent using a planning condition or legal agreement.

8.39 The Gov.uk website also contains guidance on flood plans and a template for creating a Personal Flood Plan[41]. The Plan comprises a checklist of things to do to prepare for a flood and provides a place to record important contact details. It is recommended that businesses (and other institutions such as schools, care homes and hospitals), and residents living in a flood risk areas produce a flood plan.

SURFACE WATER FLOOD RISK MANAGEMENT

Categorisation of Development Type for Flood Risk Management Purposes

8.40 In accordance with the Town and Country Planning (Development Management Procedure) (England) Order 2015 and the NPPF , the categories of development referred to in this Section are as follows:

Table 13: Categorisation of Development Type for Flood Risk Management Purposes

Category	Dwellinghouses	Buildings
Major Development	10 or more dwellings	Buildings where the floor space is 1000 square metres or more.
Other Development	1 – 9 dwellings	Buildings other those categorised as major or minor development.

[41] https://www.gov.uk/prepare-for-a-flood/make-a-flood-plan

Minor Development	Householder development	Industrial/commercial/leisure etc. extensions with a footprint less than 250 square metres.

8.41 With respect to surface water flood risk management, there are specific requirements imposed on the determination of planning applications for major developments. These requirements are covered in the text below.

8.42 All development that increases the area of impermeable surfacing will, if not appropriately drained, increase flood risk. Whereas major development will potentially drain to new drainage infrastructure, smaller scale development is likely to be in areas where there is existing drainage infrastructure that is already operating near to or above its capacity in storm conditions. Runnymede Borough Council therefore requires that, where reasonably practical, sustainable drainage systems should be implemented for all development other than minor development.

8.43 The Council does not require full scale SuDS to be implemented for minor development. However the requirements of Approved Document H of the Building Regulations should be complied with. Developers and applicants should also note the general requirement of the Paragraph 029 of the Planning Practice Guide that they need to consider flood risk to and from the development site.

SURFACE WATER MANAGEMENT TECHNIQUES

8.44 Even in areas with no historic drainage capacity or surface flooding problems, the potential for new developments to be susceptible to, or to increase, surface runoff should be considered and mitigated. Furthermore, the DEFRA and HM Government publication 'Future Water- the Government's water strategy for England' (16th June 2011) notes that with climate change, winter rainfall could increase in some regions by as much as 30% by the 2080s, while rainfall intensity could increase both in winter and summer. The rising risks of flooding and diffuse pollution from a drainage system ill equipped to cope with more intense rainfall are particularly important considerations in adapting to climate change. The magnitude, impacts and costs of rainfall events could rise sharply in the future. The Foresight Future Flooding report[42] (2004) estimates that the number of properties at very significant risk from surface water flooding could rise to 300,000-400,000 per year by the 2080s, potentially leading to several billion pounds worth of economic damage each year (see chart 2.3 within the document).

8.45 One of the overarching principles and core planning principles in the NPPF is to encourage sustainable development, taking into account all sources of flood risk, and the impacts of climate change. These principles, to account for all sources of flooding, were reinforced by the Secretary of State's the written statement of the 18 December 2014 regarding the use of sustainable drainage systems. In order to deal effectively with all sources of flooding, one

[42] https://www.gov.uk/government/publications/future-flooding

must assess surface water flooding and this includes development in Flood Zone 1, which could have implication downstream due to increase runoff from the development site and within the site itself due to increase runoff. Two aspects of runoff require consideration:

High Runoff Potential

8.46 Cranfield Soil and Agrifood institutes have produced an online mapping system, Soilscapes, which conveys a summary of the broad regional differences in the soil landscapes of England and Wales. This can be found at http://www.landis.org.uk/soilscapes/. The classification of soils into "Freely Draining", "Slightly Impeded Drainage", "Impeded Drainage", and "Naturally Wet" give some indication as to whether there is a high or low potential for runoff from the natural soil.

8.47 In catchments where the underlying soil types have a low infiltration potential (i.e. a high runoff potential), there will be an inherent risk of surface flooding or ponding in flat or low-lying areas of the catchment. This may be reflected in historic flooding records. The potential for surface runoff is determined by the soil type and groundwater depth. The figure shows that a large proportion of the Borough has soils with a high runoff potential due to a combination of: naturally high water tables (particularly on the Thames floodplain); low permeability clay soils; and underlying geology. Conversely, areas of high runoff potential will have a low potential for infiltration. The main urban areas affected by soils with high runoff potential are Chertsey and Addlestone.

8.48 The runoff potential from a site is increased where impermeable soils or areas of hardstanding are located on slopes. The effects of baked, saturated or frozen soil can also increase the run-off potential. The most notable area where hill slopes are contributing to surface runoff is in Egham and Englefield Green, where there are historic incidences of surface flooding around the Egham Hill, Blays Lane and Prune Hill, and the runoff potential is considered medium.

Low Runoff Potential

8.49 In catchments where the soil type has a low runoff potential, there is a lower risk of surface water flooding in undeveloped areas. Therefore the introduction of development and construction of impermeable surfaces such as roads and roofs can cause a notable increase in runoff compared with those areas where the soil type is already relatively permeable. Low runoff potential is associated with soils and underlying geology of high permeability which enables high levels of rainfall infiltration. Areas associated with freely draining soils and hence low runoff potential are located around: Egham, Virginia Water, Thorpe, and Englefield Green in the north of the Borough; and in New Haw and Woodham in the south.

SUSTAINABLE DRAINAGE

8.50 At the heart of the NPPF is a presumption in favour of sustainable development, which should be seen as a golden thread running through both plan making and decision taking (paragraph 14). The NPPF also states that planning should promote mixed use developments, and encourage multiple benefits from the use of land in urban and rural areas, recognising that

some open land can perform many functions (such as for wildlife, recreation, flood risk mitigation, carbon storage, or food production).

8.51 Whilst the NPPF requires that new development does not increase flood risk elsewhere and takes account of the effects of climate change, it also requires that new development should take account of the local environment, conserve and enhance biodiversity and prevent water pollution. The policy aim of the NPPF, reinforced by a ministerial statement, is that the overall flood risk in an area is reduced through the layout and form of the development and the application of sustainable drainage systems (SuDS)[43]. Paragraph 051 of the Planning Practice Guidance states that the provision of SuDS is important as they are designed to control runoff close to where the rain falls and they provide opportunities to reduce the causes and impacts of flooding; remove pollutants from urban run-off at source; and combine water management with green space with benefits for amenity, recreation and wildlife. In consideration of the environmental and ecological benefits of SuDS, due regard should be given to the requirements of the Water Framework Directive and opportunities presented by development should be exploited to improve the status of the local water bodies where necessary.

8.52 Furthermore, the vision as contained in the DEFRA/HM Government Future Water report is that by 2030;

-There will be more adaptable drainage systems delivering reduced flood risk, improved water quality, and decreasing burdens on the sewer system;

-There will be better management of surface water drainage, allowing for the increased capture and reuse of water; slow absorption through the ground; and more above-ground storage and routing of surface water separate from the foul sewer system; and,

-There will be better public appreciation of the causes and consequences of surface water run-off and the actions we can all take to minimise the risks.

8.53 One of the policies put forward in this document to encourage more effective and sustainable management of surface water relates to above-ground storage and removal of surface water. Specifically this document states that, 'good surface water management will involve increased use of SUDS and surface water flow routes, through the design and planning of the whole urban fabric, as the capacity of the landscape to store and convey water is much greater than the below-ground system'.

8.54 SUDS are increasingly advocated and required in planning due to the multiple benefits they can provide, including reducing flood risk, improving water quality and creating ecology and amenity benefits. Initially however, local authorities and water companies were slow to adopt SUDS schemes.

8.55 Prior to local government reorganisation in 1974 Runnymede was split into the two administrative areas of Chertsey Urban District Council (CUDC) and Egham Urban District Council (EUDC). At that time SuDS was not a philosophy that existed. However, as a general

[43] NPPF: Sustainable drainage systems cover the whole range of sustainable approaches to surface drainage management. They are designed to control surface water run off close to where it falls and mimic natural drainage as closely as possible.

rule, EUDC did not provide surface water sewers and required surface water drainage to go to soakaways or local watercourses, whereas CUDC provided more conventional piped gravity surface water drainage systems. This means that there are comparatively few surface water sewers within the north of the Borough whereas in the south there is a surface water sewer network. Irrespective of this fact, connections to the public sewer system will only be accepted if it can be shown that it is not reasonably practical to drain a development by infiltration or to a watercourse, lake or pond and it can also be shown that there is adequate spare capacity in the sewer to receive the discharge.

8.56 There are a wide variety of SUDS techniques, which are suitable in different settings and for different scales of development. Individual components can also be combined to provide a multiple-stage treatment process at increasing scale. The suitability of SUDS on any potential development site should be based on an assessment of the following key factors identified by CIRIA (2015)[44]:

· **Land use** - Different uses may result in different SUDS techniques. For example, industrial sites where pollution is an issue are best managed with attenuation SUDS over infiltration SUDS, with multiple treatment stages;

· **Site characteristics** - soils, topography, depth to groundwater, and land availability will all influence the choice of SUDS;

· **Catchment characteristics** – drainage in particular locations may already be controlled because of their sensitivity to flooding or pollution. The use of particular SUDS techniques rather than others may therefore be critical in either alleviating or aggravating the problem that is being regulated;

· **Quantity and quality performance** – should guide the choice of a particular SUDS technique and this will be dependent upon the design requirements; and,

· **Amenity and environmental requirements** – while flood risk mitigation is the primary aim of SUDS, options such as swales and ponds that add ecological value should also be considered.

Table 14: Typical SuDS Components

Component Description	Example
Filter Strips	These are wide, gently sloping areas of grass or other dense vegetation that treat runoff from adjacent impermeable areas.
Swales	Swales are broad, shallow channels covered by grass or other suitable vegetation. They are designed to convey and/or store runoff, and can infiltrate the water into the ground (if ground conditions allow).
Infiltration Basins	Infiltration basins are depressions in the surface that are designed to store runoff and infiltrate the water to the ground. They may also be landscaped to provide aesthetic and amenity value.
Wetland Ponds	Ponds and wetlands are features with a permanent pool of water that

[44] The Construction Industry Research and Information Association (CIRIA) *The SUDS Manual - CIRIA Report C753* (2015) CIRIA London, UK

	provide both attenuation and treatment of surface water runoff. They can support emergent and submerged aquatic vegetation along their shoreline and in shallow, marshy (wetland) zones, which helps enhance treatment processes and has amenity and biodiversity benefits. Dense stands of vegetation facilitate the adhesion of contaminants to vegetation, aerobic decomposition of pollutants and can also help stabilise settled sediment and prevent resuspension.
Extended Detention Basins	Extended detention basins are normally dry, though they may have small permanent pools at the inlet and outlet. They are designed to detain a certain volume of runoff as well as providing water quality treatment.
Constructed Wetlands	Constructed wetlands are ponds with shallow areas and wetland vegetation to improve pollutant removal and enhance wildlife habitat.
Filter Drains and Perforated Pipes	Filter drains are trenches that are filled with permeable material. Surface water from the edge of paved areas flows into the trenches, is filtered and conveyed to other parts of the site. A slotted or perforated pipe may be built into the base of the trench to collect and convey the water.
Infiltration Devices	Infiltration devices temporarily store runoff from a development and allow it to percolate into the ground.
Pervious Surfaces	Pervious surfaces allow rainwater to infiltrate through the surface into an underlying storage layer, where water is stored before infiltration to the ground, reuse, or release to surface water.
Green Roofs	Green roofs are systems which cover a building's roof with vegetation. They are laid over a drainage layer, with other layers providing protection, waterproofing and insulation. It is noted that the use of brown/green roofs should be for betterment purposes and not to be counted towards the provision of on-site storage for surface water. This is because the hydraulic performance during extreme events is similar to a standard roof (CIRIA C753).
Rainwater Harvesting	Storage and use of rainwater for non-potable uses within a building, e.g. toilet flushing. It is noted that storage in these types of systems is not usually considered to count towards the provision of on-site storage for surface water balancing because, given the sporadic nature of the use of harvested water, it cannot be guaranteed that the tanks are available to provide sufficient attenuation for the storm event.

8.57 Land use and the quantum of development are likely to be the dominant factors as they influence: the volume of water required to be attenuated; the likelihood of pollution and contaminants; and the potential for infiltration to occur. The appropriate SUDS techniques at SFRA level can only be broadly indicated using sub regional information relating to hydrology and geology. An indication of the most suitable techniques for individual sites cannot be made as part of this strategic level assessment. Therefore, a site specific Flood Risk Assessment including a surface water drainage statement will need to be submitted as part of a planning application in zone 2 or 3 (with the exception of minor development) and will need to identify the most appropriate SUDS technique to support a development proposal. Further, for all major development, irrespective of the flood zone, it is necessary to submit a surface water drainage statement (see paragraph 8.87) and this will be considered by Surrey County Council as the LLFA. There is no requirement for those developments in Flood Zone 1 other than those which are classified as major developments to submit a surface water drainage

statement. However, all planning approvals for development (other than minor development) may be subject to surface water drainage conditions.

8.58 SUDS are often described in a "management train", a hierarchy of progressively larger scale practices to manage runoff and control water quality. The management train is:

· **Prevention,** Application on individual sites, e.g. avoiding unnecessary hard standing areas, use of rainwater harvesting, management to prevent additional runoff or accumulation of pollutants;

· **Source Control,** Control of runoff at or very near to its source e.g. through permeable pavements, green roofs etc;

· **Site Control,** Management of water in a local area or site e.g. by routing water from building roofs and car parks to large soakaways or infiltration/detention basins;

· **Regional Control,** Management of runoff from a site or number of sites, typically in a balancing pond or wetland.

8.59 As well as taking into account the additional runoff that will result from the on-going increase in the extent of impermeable areas (as a result of continuing development), the NPPF requires that the impact of climate change over the lifetime of the development should be taken into account. Thus, the assessment surface water drainage should include an allowance to increase runoff and thus take account of the likely impact of climate change over the lifetime of a development. More information on the lifetimes of developments can be found in chapter 7. In February 2016 the Environment Agency published revised guidance on the allowances for the effects of climate change on rainfall and river flows[45]. More information is contained in chapter 4. A probabilistic approach has been adopted for these allowances and for the variation of the effects of climate change across the country has been taken into account for increased river flows. Over the period to 2115 they show that rainfall intensity should be increase by up to 40% and flows on the River Thames should be increased by up to 70% to account for climate change. As a result, developers may have to allow for additional runoff volumes even where the impermeable area is not increased.

Infiltration SUDS

8.60 SUDS can include a variety of systems which either allow infiltration back into the ground or attenuate runoff and release it at a controlled rate to the receiving sewer or watercourse. This first option is considered preferable because it reduces the total volume of runoff discharged to rivers downstream. It is therefore given priority over drainage to watercourses and sewers in the Building Regulations 2010. However, the ability to infiltrate runoff depends on the soils, geology and hydrology of the area. Figure 23 provides a high-level overview of the areas where infiltration techniques are likely to be most appropriate in Runnymede Borough.

Infiltration Potential

8.61 Impermeable ground is not normally suitable for infiltration techniques. Some techniques are unsuitable for soils with a shallow water table. This suggests that infiltration may be limited

[45] Flood risk assessments: climate change allowances. https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances

over areas of the Borough. The BGS classify the bedrock permeability over most of the Borough as being free draining. The bedrock permeability in Egham, Thorpe and Ottershaw is shown to be highly variable. Within the Thames floodplain, which takes in Egham, Thorpe Chertsey and Addlestone there are alluvial deposits, some of which are classified as being free draining whilst other areas are classified as having highly variable permeability. However, as the assessment of infiltration potential in this SFRA is very high level, it should be noted that the potential for infiltration will be site specific due to local variations in soils and geology horizons. New development proposed in Runnymede should include a detailed site level assessment of local soils and geology in accordance with CIRIA Report 156 or BRE Digest 365 to determine the feasibility of infiltration SUDS.

Contamination Potential

8.62 The Environment Agency publishes on their website a Groundwater Vulnerability Classifications dataset that broadly show the extents of aquifers in the Borough. These maps identify where groundwater is particularly vulnerable to contamination. There may be restrictions on the types of infiltration SUDs that can be used or the drainage that can discharge to ground in such areas based on the pollution potential of the discharge. Additional pollution prevention may be required in high risk areas especially in Source Protection Zones (SPZs). There in more information on SPZs in chapter 5 of this document. This groundwater vulnerability dataset has been reproduced at figure 22.

Groundwater Protection

8.63 The Water Framework Directive provides for a range of measures to protect groundwater quality and has led to the setting up of various protected areas for groundwater such as drinking water protected areas, source protection zones and safeguard zones. With respect to drinking water safeguard zones, the whole of the Borough is designated as a Surface Water Safeguard Zone. However there are no groundwater safeguard zones or water protection zones. There is a groundwater source protection zone centred on Laleham Burway, with its total catchment covering much of the eastern side of the Borough (Figure 18).

8.64 The Environment Agency's document: Groundwater protection: principle and practice (GP3)[46] deals with groundwater and its management and protection. Section 6 of this document deals with position statements and legislation affecting groundwater. In particular, its sub-section G deals with discharges of liquid effluents into the ground.

8.65 This document also defines and references Source Protection Zones (SPZs), which are located around major public water supply abstractions. Each abstraction has three zones associated with it and these have different requirements in terms of the quality of the water that can be discharged to them and consequently the types of development from which runoff may infiltrate. Table 15 below summarises those parts of sub-section G that relate to discharge of surface water into the ground.

[46]https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/297347/LIT_7660_9a3742.pdf

Table 15: Summary of section 6 sub-section G – SuDS discharges to the ground

Sub-Section	Position Statement
G1 - Direct inputs into groundwater	Direct input of non-hazardous pollutants into groundwater will only be agreed to if all of the following apply: • it will not result in pollution of groundwater; • there are clear and overriding reasons why the discharge cannot reasonably be made indirect; • there is adequate evidence to show that the increased pollution risk from direct inputs will be mitigated. Note: Direct input is defined as follows: • They bypass the unsaturated zone; • The pollution source is in the saturated zone (or discharges directly into the saturated zone); • Fluctuations in the water table (for example, seasonal changes or those influenced by changes in abstraction rates, tidal influence or recharge over time) mean that the pollution source will be in direct contact with groundwater, for a significant period of time.
G4 - Trade effluent and other discharges inside SPZ1	Inside SPZ1 we will object to any new trade effluent, storm overflow from sewer system or other significantly contaminated discharges to ground where the risk is high and cannot be adequately mitigated. If necessary, we will use a prohibition notice to stop any such existing discharge.
G9 - Use of deep infiltration systems for surface water and effluent disposal	The use of deep pit based systems (including boreholes or other structures that bypass the soil layers) for surface water or effluent disposal will only be agreed if the developer can show that all of the following apply: • there are no other feasible disposal options such as shallow infiltration systems (for surface water) or drainage fields/mounds (for effluents) that can be operated in accordance with current British Standards; • the system is no deeper than is required to obtain sufficient soakage; • pollution control measures are in place; • risk assessment demonstrates that no unacceptable discharge to groundwater will take place, in particular that inputs of hazardous substances to groundwater will be prevented; and • there are sufficient mitigating factors or measures to compensate for the increased risk arising from the use of deep structures.
G10 - Developments posing an unacceptable risk of pollution	Objection will be made to new developments that pose an unacceptable risk of pollution to groundwater from sewage effluent, trade effluent or contaminated surface water. This applies if the source of pollution is an

	individual discharge or the combined effects of several discharges, or where the discharge will cause pollution by mobilising contaminants already in the ground. In all cases we will object to any proposal to discharge untreated sewage to groundwater and will use our notice powers to ensure treatment of any existing discharges.
G11 - Discharges from areas subject to contamination	Discharges of surface water run-off to ground at sites affected by land contamination, or the storage of potential pollutants are likely to require an environmental permit. This applies especially to sites where storage, handling or use of hazardous substances occurs (such as for example, garage forecourts, coach and lorry parks/turning areas and metal recycling/vehicle dismantling facilities). The site will need to be subject to risk assessment with acceptable effluent treatment provided.
G12 - Discharge of clean roof water to ground	The discharge of clean roof water to ground is acceptable both within and outside SPZ1 provided that all roof water down-pipes are sealed against pollutants entering the system from surface run-off, effluent disposal or other forms of discharge. The method of discharge must not create new pathways for pollutants to groundwater or mobilise contaminants already in the ground.
G13 - Sustainable drainage systems	The Environment Agency support the use of sustainable drainage systems (SuDS) for new discharges. Where infiltration SuDS are to be used for surface run-off from roads, car parking and public or amenity areas, they should have a suitable series of treatment steps to prevent the pollution of groundwater. Where infiltration SuDS are proposed for anything other than clean roof drainage (see G12 - discharge of clean roof water to ground) in a SPZ1 the Environment Agency will require a risk assessment to demonstrate that pollution of groundwater would not occur. For the immediate drainage catchment areas used for handling and storage of chemicals and fuel, handling and storage of waste and lorry, bus and coach parking or turning areas, infiltration SuDS are not permitted without an environmental permit.

8.66 As can be seen in G12 of Table 15, roof water can be discharged into the ground, as long as the pipes are sealed against pollutants entering the system from surface run-off, effluent disposal or other forms of discharge, even in SPZ1. The method of discharge must not create new pathways for pollutants to groundwater or mobilise contaminants already in the ground. In normal circumstances, the Environment Agency will only accept the discharge of clean roof water into SPZ1 and they will discourage infiltration SuDS for any other runoff.

8.67 In accordance with G13, any infiltration SuDS proposals within SPZ1, other than for roof water, will require a risk assessment to be submitted to the Environment Agency to demonstrate that

pollution of groundwater would not occur. As shown by Figure 18, the SPZ1 covers the northern side of Chertsey and Laleham Burway.

8.68 In all other areas, outside of SPZ1, where infiltration SuDS are to be used for surface run-off from roads, car parking and public or amenity areas they should have a suitable series of treatment steps to prevent the pollution of groundwater.

8.69 It should be noted that a reference to the SuDS Approval Body in G13 of section 6 sub-section G exists but it is no longer relevant and hence has not been included in the summary table above. Further, the non-statutory technical standards do not cover water quality. In accordance with the new processes for the approval of SuDS, which came into effect on 6 April 2015, Runnymede Borough Council as the LPA will require for it to be demonstrated that the groundwater is adequately protected from contamination and pollution before consent for surface water drainage is granted. This is in line with Water Framework Directive (WFD) requirements/ considerations relating to water quality which all councils including Local Planning Authorities are required to comply with. Details of the standards of design and maintenance should also be submitted as part of any planning application for approval. For major developments, Surrey County Council will be consulted on the adequacy of the standards of design and maintenance.

8.70 Subsection G1 states that direct input into groundwater will only be allowed by the Environment Agency subject to conditions. To ensure that direct input into groundwater does not occur, the base of a soakaway or other infiltration device should be at least 1 metre above the surface of the groundwater table. Where the level of the groundwater fluctuates seasonally the highest groundwater level should be used in determining the maximum depth of the base of a soakaway or other infiltration device. The typically shallow water table in Chertsey and parts of Egham increases the potential for aquifer contamination and all but the shallowest infiltration devices may be precluded from use.

8.71 In certain instances the use of deep infiltration systems such as deep bore soakaways is proposed. The use of deep bore infiltration does not mimic natural drainage systems and retain water on or near the site and thus is not considered to be a true SuDS. Deep infiltration systems will only be accepted in a planning application where it is clearly demonstrated, with supporting information, as to why other SuDS discharge options are not appropriate. i.e. the SuDS hierarchy of shallow infiltration, outfall to a surface watercourse or surface water sewer has been considered and there are valid reasons to discount them.

Discharge to watercourses, lakes ponds and sewers

8.72 Where it is not possible to discharge surface water drainage at source by means of infiltration then the same hierarchy as given in the Document H (Drainage and waste disposal) of the Building Regulations for disposal of the water should be used. That is to say, firstly to watercourses (rivers, streams, ditches etc.) lakes and ponds; then surface water sewer and finally combined sewers. Discharge of surface water into the public foul sewer network will not be permitted.

8.73 To try and replicate the natural runoff from sites, the runoff into the receiving waters from a previously undeveloped, greenfield site should be limited to the estimated greenfield values. Where brownfield sites are redeveloped then the runoff into receiving water from the site should, as near as is practically possible, be limited to greenfield values. These greenfield runoff restrictions should be applied at the 1 in 1 year, 1 in 30 years and 1 in 100 years levels. No allowance is made to the greenfield runoff values for climate change. Greenfield runoff may be assessed by using a number of methods. Some are more appropriate for large sites whist others are more appropriate for smaller sites (see list of references below).

8.74 To ensure that runoff into the receiving waters is limited to greenfield runoff, attenuation storage may be required. This storage should be sized to safely store the balance of the runoff for all storms up to the 1 in 100 year event. The storage system should also be designed so that in cases where a storm event exceeds 1 in 100 years the addition runoff is safely controlled and is drained away from buildings by the creation of flood flow paths.

8.75 The design of attenuation SuDS should take into account the requirements of Section 11 of the NPPF - Conserving and enhancing the natural environment, in particular Paragraph 109. Where practical, attenuation storage should consist of the following elements. Interception storage; attenuation storage; long term storage and treatment storage (see 'Preliminary rainfall management for developments' R&D Technical Report W5-074/A/TR/1). The design should contribute to and enhance the natural and local environment, providing net gains in biodiversity where possible, and establishing coherent ecological networks that are more resilient to current and future pressures.

8.76 Where it is not practical to use infiltration SuDS or to discharge into a watercourse then discharge into a public surface water or combined sewer will only be approved where the sewerage undertaker, Thames Water, has confirmed that their sewer has the capacity to receive the discharge.

8.77 New sewers should be designed so that flooding does not occur for rainfall events up to the 3.33% AEP (1 in 30 year) event. For rainfall events with probabilities between the 3.33% and 1% AEP (1 in 30 year and 1 in 100 year) events, any flooding that occurs should be confined along appropriate flood paths within the site and measures should be put in place to ensure that buildings are not flooded. In all cases, climate change should be allowed for.

Urban Creep

8.78 In any storage calculations for major developments an allowance should be included' for urban creep' in line with Document 'BS 8582:2013 Code of practice for surface water management for development sites' which states:

"To allow for future urban expansion within the development (urban creep), an increase in paved surface area of 10% should be used, unless this would produce a percentage

impermeability greater than 100%, or unless specified differently by the drainage approval body or planning authority" (page 32).

Green Roofs and Walls, Rainwater Harvesting and Grey Water Recycling

8.79 Although green roofs and walls, rainwater harvesting and grey water recycling contribute little, if at all, to the management of surface water runoff from a site they are an important element in the overall sustainability of new development of new development and the water cycle.

8.80 Green roofs and walls provide a degree of attenuation of surface water runoff. In addition they provide insulation to buildings, preventing heat loss during the winter and cooling buildings during the summer as the result of evaporation. Additionally to the control of the buildings climate they have a benefit to the area surrounding the building, contributing to biodiversity and having a beneficial effect on the local micro climate.

8.81 In general, any storage provided for rainwater harvesting cannot be considered to contribute to surface water runoff attenuation as the storage tanks provided are likely to be full or partially full at the time when they are required to contribute to storing further rainfall runoff. However, where there is a consistently constant demand for the harvested rainwater throughout the year, it may be possible to demonstrate that the storage provided for the rainwater is also able to contribute to the storage required for the attenuation of surface water discharge. Calculations to support the use of rainwater harvesting as part of the overall SuDS of a site should be carried out in accordance with BS 8515:2009+A1:2013 - Rainwater harvesting systems, or other appropriate code.

8.82 Grey water recycling does not contribute to the SuDS of a site. However, it does reduce the amount of foul sewage that has to be transported in the sewer network for treatment by the sewerage undertaker.

Water Quality, Amenity and Biodiversity

8.83 Section 11 of the NPPF requires that the planning system should contribute to and enhance the natural environment. The paragraphs above have principally dealt with controlling the quantity of water that is discharged from a new development site. Well-designed SuDS will also contribute to the quality of the surface water runoff generated by a new development site as well as enhancing both the amenity and biodiversity of the site.

8.84 Surface run-off from roads, car parking and public or amenity areas will become contaminated by hydro-carbons, heavy metals, nitrates and phosphates, silts, particulates and other diverse pollutants. Surface water drainage should be designed to ensure that there are adequate treatment stages included within them to remove these pollutants. The SuDS Manual – CIRIA C753 (2015) and other relevant design guidance should be used to produce the water quality design.

8.85 Well-designed SuDS, whether for greenfield development of urban regeneration, should give ample scope to enhance both the amenity and the biodiversity of the site. Wildlife friendly design specifications should be provided for newly created attenuation ponds, including variable bank profiles, water depths and islands/inlets to encourage a diversity of plants and other wildlife. Guidance can be found in, amongst other guidance documents, CIRIA C753 and Water.People.Places[47]

Maintenance and Construction Plans

8.86 Applications for major developments should demonstrate that there are clear arrangements in place for ongoing maintenance over the lifetime of the development. The sustainable drainage system should be designed to ensure that the maintenance and operation requirements are economically proportionate. A Surface Water Maintenance Plan should be submitted as part of the application for surface water drainage systems serving both major and minor developments.

8.87 The effectiveness of SuDS can be compromised by the use of inappropriate construction methods. Areas that are to be used for infiltration can have their capacity to absorb water reduced by construction plant compacting the soil. Silt and sand washing into infiltration devices can reduce block up the interstices of the infiltration media and the surrounding soils. A construction plan should therefore be submitted outlining the methods of construction to demonstrate that effective precautions will be taken to ensure that the SuDS will perform as designed for both major and minor developments.

RECOMMENDATIONS FOR SITE-SPECIFIC FRAS

8.88 Although figure 14 provide a high level indication of the areas potentially susceptible to surface water flooding across Runnymede Borough, local considerations and the development type must be taken into account in producing site-specific Flood Risk Assessments. It is recommended that drainage strategies follow the approach within the document 'Preliminary rainfall management for developments' R&D Technical Report W5-074/A/TR/1 Revision E, published by the Environment Agency (HR Wallingford reference SR744). The CIRIA report C635 – 'Designing for Exceedance' provides detailed guidance for engineers and planners on the design of urban surface water management systems to mitigate the impacts of these systems being overwhelmed during extreme rainfall events.

[47] Water .People.Places prepared by the Lead Local Flood Authorities of the South East of England - http://www.susdrain.org/files/resources/other-guidance/water_people_places_guidance_for_master_planning_sustainable_drainage_into_developments.pdf

8.89 A proforma for a model surface water drainage statement has been produced by Surrey County Council and can be obtained either from their website[48] or this Council's[49]. The proforma is also reproduced at Appendix 6.

8.90 Improvements in drainage capacity should be made where possible, provided that this does not add to flood risk elsewhere. Exceedance design should be included for extreme storm events

8.91 When considering safety, specific local circumstances need to be taken into account, including:

- the characteristics of a possible flood event, e.g. the type and source of flooding and frequency, depth, velocity and speed of onset;
- the safety of people within a building if it floods and also the safety of people around a building and in adjacent areas, including people who are less mobile or who have a physical impairment. This includes the ability of residents and users to safely access and exit a building during a design flood and to evacuate before an extreme flood;
- the structural safety of buildings, and;
- the impact of a flood on the essential services provided to a development.

8.92 While safety considerations are always very important, local planning authorities should seek to ensure that communities are sustainable, including ensuring that certain sections of society, such as the elderly and those with less mobility, are not unnecessarily excluded from areas where there is a risk of flooding.

RIVER THAMES SCHEME

Background

8.93 The River Thames Scheme is a proposed programme of projects and investment to reduce flood risk in communities near Heathrow, including: Datchet, Wraysbury, Egham, Staines upon Thames, Chertsey, Shepperton, Weybridge, Sunbury, Molesey, Thames Ditton, Kingston and Teddington.

8.94 The River Thames between Datchet and Teddington has the largest area of developed floodplain in England without flood defences. Over 15,000 homes and businesses within the area are at risk from flooding.

8.95 The scheme consists of:

- large scale engineering work to construct a new flood channel between 30 to 60 metres wide and 17 kilometres long, built in 3 sections:

[48] http://www.surreycc.gov.uk/people-and-community/emergency-planning-and-community-safety/flooding-advice/more-about-flooding/suds-planning-advice
[49] https://www.runnymede.gov.uk/CHttpHandler.ashx?id=12600&p=0

    - 1: Datchet to Hythe End flood channel
    - 2: Egham Hythe to Chertsey flood channel
    - 3: Laleham to Shepperton flood channel
- improvements to 3 of the existing weirs on the River Thames;
- providing community resilience measures to homes and communities to make them more resistant to flooding;
- improved flood incident response plans
- creation of over 40 hectares of biodiversity action plan habitat; and
- working with communities to raise flood awareness and support them in flood preparedness, response and recovery.

8.96 The route of the River Thames Scheme flood alleviation channel through the Borough of Runnymede can be seen plotted in figure 25.

8.97 The River Thames Scheme will meet the recommendations set out in the Lower Thames Flood Risk Management Strategy finalised in 2009 after consultation with other public bodies, businesses and residents, and published in November 2010.

8.98 In total approximately 15,000 homes and businesses, significant local infrastructure (roads, sewerage network, power supplies) will be better protected from flooding. The scheme will also provide economic, social and environmental benefits.

8.99 All communities between Datchet and Teddington will benefit from the River Thames Scheme. This includes the communities downstream of the flood channel, as the weir modifications will reduce water levels between Walton Bridge and Teddington too. The amount of benefit will vary along this 40 kilometre length of the river, and these benefits will be optimised during the design of the scheme.

What the scheme involves

8.100 Subject to funding, the scheme will be carried out in 2 phases. Phase 1 includes:

- developing a funding strategy for the scheme
- a hydrology and modelling study
- ecological surveys of the River Thames and specific sites
- delivering community resilience measures in some communities
- major incident planning to improve preparedness and response to flooding
- increasing the flow capacity of Sunbury, Molesey and Teddington weirs
- obtaining planning consents for the enabling works on the weirs
- securing government assurance and approvals

8.101 Phase 2 includes:

- detailed design of the scheme
- securing full, detailed planning permission and other consents for the work

- building all 3 sections of the flood channel and associated structures, and increasing the capacity of Desborough Cut

Funding

8.102 The scheme, once in place, will save local communities, businesses and critical infrastructure £2.3 billion in damages – a return on investment of £5 for every £1 invested in the scheme. This figure is likely to increase as further work is done to assess the positive benefits for transport and key infrastructure.

8.103 Costs of the scheme were previously based on the 2009 Lower Thames Flood Risk Management Strategy. The Environment Agency and its partners have taken the 2009 costs and updated them using construction inflation and to reflect changes in landfill tax.

8.104 The scheme is now estimated to cost £476 million for the design and construction phase. The costs will be updated as the scheme progresses. The project team will continually monitor costs closely to ensure the best value for public money.

8.105 The scheme is eligible for funding from central Government of £212 million, including Grant in Aid funding of £152 million and an additional investment of £60 million. Partnership funding of over £36 million has also been secured. The River Thames Scheme partners are exploring all opportunities to secure the additional funding required. The leader of Surrey County Council has set up a funding group, which will target beneficiaries and seek contributions.

Timelines

8.106 The timeline for the project is shown in table 16 below.

Table 16: Timetable for the delivery of the River Thames Scheme

Phase	Year
Approval of outline business case by HM Treasury	2018
Submission of planning application	2018
Approval of full business case by HM Treasury	2019/20
Contract award (commence construction)	2020/21
Readiness for service	2024/25
Contract completion (complete landscaping works)	2028/29

EMERGENCY PLANNING

8.107 The Civil Contingencies Act 2004 sets out a legal framework by which the emergency services, local authorities and other agencies work together to ensure Surrey is as prepared as it can be for risks and hazards identified in the UK's National Risk Register.

8.108 Working within Surrey's Local Resilience Forum (LRF), Runnymede Borough Council has developed and maintains a Multi Agency Flood Plan (MAFP) for the Runnymede area. This

plan, along with other relevant Runnymede Borough Council and Surrey LRF Plans describe the proposed procedures for managing large scale floods in Runnymede. This includes notification arrangements, linked to the Environment Agency Flood Warning processes, command and control arrangements and tactical information to support any emergency response. It should also be recognised that Thames area fluvial flooding is likely to have a widespread cumulative impact on the Lower Thames area, including neighbouring local authorities, and thereby be highly demanding on the resources of emergency response agencies. Whilst this limit to capacity is already recognised by Runnymede Borough Council, it is important that planning assumptions continue to recognise the capacity constraints of partner agencies, the understanding of which should be obtained from engagement and consultation with partners through the Local Resilience Forum. Community engagement work is also being carried out by Runnymede Borough Council and partner agencies, with the view to making residents more resilient during a flooding event, freeing up resources for vulnerable residents who require agency resources.

8.109 The Environment Agency monitors river levels within the River Thames catchment. Based upon weather predictions provided by The Met Office, the Agency makes an assessment of the anticipated maximum water level that is likely to be reached within the proceeding hours (and/or days). Where these predicted water levels are expected to result in the inundation of populated areas, the Environment Agency will issue a series of flood warnings within defined flood warning areas, encouraging residents to take action to avoid damage to property in the first instance. The Environment Agency's 'Floodline Warnings Direct' service is a free service that provides flood warnings by phone, text or email. Nationally the sign up rate for this service for fluvial flood warnings is high, which is in part due to the 'opt out service' that the Environment Agency has provided in recent years. Runnymede Borough Council, in conjunction with partner responding agencies, has also been working to increase uptake rate in the Borough through community resilience engagement work. The Environment Agency also maintain a stock of temporary demountable flood defences that may be deployed at sites in the Runnymede area during periods of flooding. The deployment of these defences is dependant on the nature of the flooding, forecast and modelling, the strategic objectives of the emergency response, and (as it is a national asset and may be deployed nationwide) the availability of the stock.

8.110 As water levels rise and begin to pose a risk to life and/or livelihood, it is the responsibility of the emergency services to coordinate the evacuation of residents, working in cooperation with the Local Authority to ensure safe shelter can be provided. It is essential that a robust plan is in place that clearly sets out (as a minimum):

- roles and responsibilities;
- paths of communication;
- evacuation routes;
- community centres to house evacuated residents;
- contingency plans in case of loss of power and/or communication.

8.111 Coordination with the emergency services and the Environment Agency and Surrey County Council is imperative to ensure the safety of residents in time of flood. Areas within the Borough that are adjoining the River Thames, and are at risk of river flooding, are often susceptible to widespread weather phenomena, and it is therefore important that as much warning of an impending flood event is provided as possible to vulnerable households to encourage preparation in an effort to minimise property damage and risk to life. In contrast, areas suffering from localised flooding issues will tend to be susceptible to 'flash' flooding, associated with storm cells that pass over the Borough. Storms of this nature result in high intensity, often relatively localised, rainfall. It is anticipated that events of this nature will occur more often as a result of possible climate change over the coming decades. Events of this nature are difficult to predict accurately, and the rapid runoff that follows will often result in flooding that cannot be sensibly predicted.

8.112 It is very important to recognise that the river flooding depicted within the flood risk maps in this SFRA is unlikely to occur in isolation. Flooding of this nature will typically occur during heavy, prolonged rainfall across the Borough, and is likely to coincide with other emergency incidents, for example localised flooding due to sewer failure. Whilst it is essential that a safe route of escape (above the maximum river flood level) is provided as part of the design process, it should be emphasised that the safety of escape routes may be hindered at the time of evacuation. For this reason, it is imperative that full control is provided to the emergency services during a flooding situation to determine the timing and route of any evacuation.

8.113 Finally, all urbanised areas are potentially at some degree risk of localised flooding due to heavy rainfall. The blockage of gullies and culverts as a result of litter and/or leaves is commonplace, and this will inevitably lead to localised problems. Where such problems are found to occur, a survey of each watercourse should be carried out to assess all structures (e.g. bridges, culverts, etc.) that might be exacerbating flooding. Removing these structures or adapting them (e.g. by widening culverts or increasing the height of bridges) could reduce flood risk whilst having additional benefits under Water Framework Directive and for biodiversity/fisheries in general. Culverts and gullies can also be blocked by sediment – in such cases, tackling the source of sediment by addressing land use management upstream can help to alleviate this problem.

8.114 It is also important to recognise that future planning decisions may alter the risk of flooding to people and property within the Borough, introducing (and/or removing) properties from areas that are potentially at risk of flooding. These decisions may therefore impact upon the emergency response required during periods of flooding in future years.

8.115 It is recommended that the Council advises the Local Resilience Forum of the risks and issues raised in the Runnymede SFRA, to ensure that planning for future emergency response can be reviewed accordingly. The Local Resilience Forum are provided with an up to date version of the Runnymede Multi-Agency Flood Plan, the content of which is partly informed by the Runnymede SFRA.

Recommendations for the Emergency Planning Team

8.116 The SFRA provides a summary of the possible sources of flooding within the borough and may be used to inform the assessment of flood risk in response to the requirements of the Civil Contingencies Act. The data within the SFRA allows emergency planning processes to be tailored to the needs of the area and be specific to the risks faced.

8.117 The Emergency Planning Team should use the SFRA findings when reviewing and/or updating the Runnymede Multi-Agency Flood Plan to determine the suitability of refuge centres and evacuation routes. The SFRA could also have the following uses from an Emergency Planning perspective:

- helping in the preparation of any specific evacuation plans for existing vulnerable institutions in the floodplain and other areas at high flood risk where required;
- helping ensure that safe evacuation routes and access routes for emergency services are possible from any existing area of flood risk to rest centres;
- as a tool to help educate local people to improve flood awareness, in cooperation with the Environment Agency. This could include dissemination of the measures that people can take to make their homes more resilient or resistant to flooding from all sources, and encourage all those at fluvial and tidal flood risk to sign up to the Environment Agency's Floodline Warnings Direct service.

Recommendations for the LPA with respect to Emergency Planning

- The LPA should formally consult the Council's Emergency Planning team on the submitted Flood Warning and Evacuation Plans for major developments in Flood Zone 2 or 3 and in dry islands.

CHAPTER 9: GUIDANCE FOR SITE SPECIFIC FRAS

9.1 A site-specific flood risk assessment is carried out by (or on behalf of) a developer to assess the flood risk which impacts on a development site. Where necessary, the assessment should accompany a planning application submitted to the local planning authority. The assessment should demonstrate to the decision-maker how flood risk will be managed now and over the development's lifetime, taking climate change into account, and with regard to the vulnerability of its users.

9.2 The Government's website confirms that a site specific FRA is required in the following circumstances:

- For proposals on sites with an area greater than 1 hectare in Flood Zone 1;
- For proposals in Flood Zone 1 where there are critical drainage problems (as notified to the local planning authority by the Environment Agency) although it should be noted that no such areas exist in Runnymede Borough; and,
- For proposals on sites of less than 1 ha in flood zone 1, including a change of use in development type to a more vulnerable class (e.g. from commercial to residential), where they could be affected by sources of flooding other than rivers and the sea (e.g. surface water drains, reservoirs)
- For all proposals for new development (including minor development and change of use) in Flood Zones 2 and 3,

9.3 The PPG confirms that the objectives of a site-specific flood risk assessment are to establish:

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

9.4 The information provided in the FRA should be credible and fit for purpose. Site-specific FRAs should always be proportionate to the degree of flood risk and make optimum use of information already available, including information contained in this SFRA.

9.5 A FRA should also be appropriate to the scale, nature and location of the development. For example, where the development proposed is an extension to an existing house (for which planning permission is required) which would not increase the number of people/households present in an area at risk of flooding, the Council will generally need a less detailed assessment to be able to reach an informed decision on the planning application. For a new development comprising a greater number of houses in a similar location, or one where the flood risk is greater, the Council will need a more detailed assessment.

9.6 The potential impact that climate change may have upon the likelihood of flooding over the life time of a development should also be taken into account and this should be addressed in site specific FRAs.

Flood Risk Assessment checklist

9.7 The PPG contains a checklist for applicants when preparing a site specific FRA which is reproduced in table 17 below (with amendments where necessary to reflect local circumstances):

Table 17: site specific flood risk assessment checklist

1 Development description and location
a. What type of development is proposed (e.g., new development (with or without a basement), siting of a caravan, an extension to existing development, a change of use etc.) and where will it be located?
b. What is its flood zone vulnerability classification? If the site is located in flood zone 1, is it located in a dry island (see chapters 4 and 6 and figure 13 for more information on this point)?
c. Is the proposed development in accordance with the Borough Local Plan? (Seek advice from the local planning authority if you are unsure about this).
d. What evidence can be provided that the Sequential Test and where necessary the Exception Test has/have been applied in the selection of this site for this development type?
e. Will your proposal increase overall the number of occupants and/or users of the building/land, or the nature or times of occupation or use, such that it may affect the degree of flood risk to these people? (Particularly relevant to minor developments (alterations & extensions) & changes of use).
2. Definition of the flood hazard
a. What sources of flooding could affect the site?
b. For each identified source in box 2a above, can you describe how flooding would occur, with reference to any historic records where these are available?
c. What are the existing surface water drainage arrangements for the site?
3. Probability
a. Which flood zone is the site within? (As a first step, check the Flood Map for Planning (Rivers and Sea) on the Environment Agency's website)
b. Does the Council's SFRA show the same or a different flood zone compared with the Environment Agency's flood map? (If different you should seek advice from the local planning authority and, if necessary, the Environment Agency).
c. What is the probability of the site flooding, taking account of the maps of flood risk from

rivers and the sea and from surface water, on the Environment Agency's website and the Strategic Flood Risk Assessment, and of any further flood risk information for the site?
d. If known, what (approximately) are the existing rates and volumes of surface water run-off generated by the site?
4. Climate change
How is flood risk at the site likely to be affected by climate change? (see contents of this SFRA and the Environment Agency's website for further information).
5. Detailed development proposals
Where appropriate, are you able to demonstrate how land uses most sensitive to flood damage have been placed in areas within the site that are at least risk of flooding (including providing details of the development layout)?
6. Flood risk management measures
How will the site/building be protected from flooding, including the potential impacts of climate change, over the development's lifetime?
7. Off site impacts
a. How will you ensure that your proposed development and the measures to protect your site from flooding will not increase flood risk elsewhere?
b. How will you prevent run-off from the completed development causing an impact elsewhere?
c. Are there any opportunities offered by the development to reduce flood risk elsewhere?
8. Residual risks
a. What flood-related risks will remain after you have implemented the measures to protect the site from flooding?
b. How, and by whom, will these risks be managed over the lifetime of the development? (E.g., flood warning and evacuation procedures).

9.8 It is recommended that applicants use this checklist as a starting point when producing their Flood Risk Assessments.

9.9 The Environment Agency is able to provide an applicant with a range of products which can inform a Flood Risk Assessment (please note that some products have a charge), including:

- product 1: Flood Map, including flood zones, defences and storage areas and areas benefiting from flood defences;
- product 3: Basic Flood Risk Assessment Map, including flood zones, defences and storage areas, areas benefiting from defences, statutory main river designations and some key modelled flood levels;
- product 4: Detailed Flood Risk Assessment Map, including flood zones, defences and storage areas, areas benefiting from defences, statutory main river designations, historic flood event

outlines and more detailed information from our computer river models (including model extent, information on one or more specific points, flood levels, flood flows);

- product 5: reports, including flood modelling and hydrology reports and modelling guidelines;
- product 6: Model Output Data, including product 5;
- product 7: Calibrated and Verified Model Input Data (CaVMID), including product 5;
- product 8: Flood Defence Breach Hazard Map including, maximum flood depth, maximum flood velocity, maximum flood hazard;

9.10 More information on flood risk assessment for planning applications can be found at: https://www.gov.uk/guidance/flood-risk-assessment-for-planning-applications. This page provides details on how to order the above products from the Environment Agency.

9.11 Surrey County Council in its role as LLFA can also provide information for site specific FRAs including information on the level of surface water and groundwater risk and any recorded historic flood events and locally known wetspots.

CHAPTER 10: FLOOD RISK POLICY AND DEVELOPMENT MANAGEMENT APPROACH

10.1 The SFRA builds on the findings in previous sections of this SFRA and recommends the approach that Runnymede Borough Council should take in relation to its planning policies which relate to flood risk in its emerging Local Plan and when making development management decisions on a day-to-day basis.

10.2 Table 18 below seeks to set out the overarching policy approach for planning decisions within each of the NPPF defined Flood Zones and with respect to a number of specific types of planning application.

Table 18: Policy approach to be taken within different flood zones

ZONE 1 - LOW PROBABILITY

Definition
This zone comprises land assessed as having a less than 1 in 1,000 annual probability of river or sea flooding (<0.1%).

Appropriate uses
All uses of land are appropriate in this zone.

Flood risk assessment requirements
For development proposals on sites comprising one hectare or above in flood zone 1 the risk of flooding from rivers or the sea is considered to be low. A flood risk assessment (FRA) is still required but it should be focussed on the management of surface water run-off, taking into account the impacts of climate change. This is because development that increases the amount of impermeable surfaces can result in an increase in surface water run-off, which in turn can result in increased flood risk both on site and elsewhere within the catchment over the lifetime of the development. This is particularly important for larger scale sites, which have the potential to generate large volumes of surface water run-off. In addition such a site may also be at risk from other sources of flooding (e.g. groundwater and overland runoff), which are not considered in the mapping of flood zones. The risk of alternative sources of flooding must also be considered.

A site specific FRA is also required to be submitted for sites which are less than 1 ha in size in flood zone 1 where a change of use in development type to a more vulnerable class (e.g. from commercial to residential) is proposed and/or where the development could be affected by sources of flooding other than from rivers and the sea (eg, surface water drains, reservoirs).

Applicants should refer to the relevant information in chapter 6 in this SFRA and the accompanying figures to determine if a development site is at risk from flooding (from various sources).

Generally speaking however by applying the sequential approach to development and utilising sustainable urban drainage systems, developments in this flood zone should address flooding from other sources as far as practicable.

Policy aims
In this zone, developers and local authorities should seek opportunities to:

- reduce the overall level of flood risk in the area and beyond through the layout and form of

the development, and the appropriate application of sustainable drainage systems[50], taking the impacts of climate change into account.

- Work with natural processes where multiple benefits such as carbon storage, recreation and/or provision of habitat can be achieved, for example through planting of trees/hedgerows to help reduce run off and increase infiltration.

If a site is located in a dry island, the Council will continue to require that those proposing future development within such areas to demonstrate that safe access and egress can be achieved in a flood event. Access and egress routes should be designed to factor in the lifetime of development and the impacts of climate change.

ZONE 2 - MEDIUM PROBABILITY

Definition

This zone comprises land assessed as having between a 1 in 100 and 1 in 1,000 annual probability of river flooding (1% – 0.1%), or between a 1 in 200 and 1 in 1,000 annual probability of sea flooding (0.5% – 0.1%).

Appropriate uses

Essential infrastructure and the water-compatible, less vulnerable and more vulnerable uses, as set out in the PPG, are appropriate in this zone. Highly vulnerable uses are only appropriate in this zone if the Exception Test is first passed.

Flood risk assessment requirements

All development proposals in this zone should be accompanied by an FRA including minor developments (see definition in para 7.16 of this SFRA) and changes of use. The Environment Agency's standing advice[51] will need to be followed when a FRA is being prepared for the following proposals in flood zone 2:

- a minor extension (household extensions or non-domestic extensions less than 250 square metres);
- 'more vulnerable' developments (except for landfill or waste facility sites, caravan or camping sites);
- 'less vulnerable' developments which are not any of the following: land or building used for agriculture or forestry; a waste treatment site; a mineral processing site; a water treatment plant; or a sewage treatment plant; and,
- 'water compatible' developments including essential accommodation within a water compatible development.

This includes developments involving a change of use into one of these vulnerability categories or into the water compatible category.

A FRA is required for all development types in this flood zone as whilst the flood risk from rivers and the sea is classified as medium, this classification is simply based on the probability of flood events occurring from rivers or the sea. It does not address the possible consequences of flooding from non-river or sea sources. The scale, nature and location of a proposed development will inform the scope and level of detail required in an FRA.

Policy aims

In this zone, developers and local authorities should seek opportunities to:

[50] Sustainable drainage systems cover the whole range of sustainable approaches to surface drainage management. They are designed to control surface water run off close to where it falls and mimic natural drainage as closely as possible.

[51] https://www.gov.uk/guidance/flood-risk-assessment-standing-advice .

- Reduce the overall level of flood risk in the area through the layout and form of the development, and the appropriate application of sustainable drainage systems.
- Relocate development to land in zones with a lower probability of flooding.
- Avoid deterioration of the ecological and chemical quality of watercourses and improve it where possible.
- Work with natural processes where multiple benefits such as carbon storage, flood risk mitigation, water purification, recreation, food/energy production, provision of habitat can be achieved, for example through the planting of trees/hedgerows to help reduce run off and increase infiltration.

FRAs should ensure that the impacts of climate change over the lifetime of the development have been taken into account.

ZONE 3A - HIGH PROBABILITY

Definition

This zone comprises land assessed as having a 1 in 100 or greater annual probability of river flooding (>1%), or a 1 in 200 or greater annual probability of flooding from the sea (>0.5%).

Appropriate uses

Water-compatible and less vulnerable uses of land (see the PPG for more detail) are appropriate in this zone. Highly vulnerable uses should not be permitted in this zone. More vulnerable uses and essential infrastructure should only be permitted in this zone if the Exception Test is first passed. Essential infrastructure permitted in this zone should be designed and constructed to remain operational and safe for users in times of flood.

Flood risk assessment requirements

All development proposals in this zone should be accompanied by a FRA including minor developments (see definition in para 7.16 of this SFRA) and changes of use. The Environment Agency's standing advice[52] will need to be followed when a FRA is being prepared for a minor extension (household extensions or non-domestic extensions less than 250 square metres).

A FRA is required as the flood risk from rivers and the sea is classified as high. This classification is however simply based on the probability of flood events occurring from rivers or the sea. It does not address the possible consequences of flooding from non-river or sea sources. The scale, nature and location of the proposed development will inform the scope and level of detail required in the FRA required.

Policy aims

In this zone, developers and local authorities should seek opportunities to:

- reduce the overall level of flood risk in the area through the layout and form of the development and the appropriate application of sustainable drainage systems;
- relocate existing development to land in zones with a lower probability of flooding;
- create space for flooding to occur by restoring natural floodplain and flood flow pathways and by identifying, allocating and safeguarding open space for flood storage;
- avoid deterioration of the ecological and chemical quality of watercourses and improve it where possible;
- Work with natural processes where multiple benefits such as carbon storage, flood risk mitigation, water purification, recreation, food/energy production, provision of habitat can be achieved, for example through:

[52] https://www.gov.uk/guidance/flood-risk-assessment-standing-advice .

-undeveloped buffer zones adjacent to watercourses to reduce erosion and sediment loss
-reconnecting the rivers with their floodplains to allow undeveloped areas to flood thus reducing flood risk downstream
-wetland habitat creation
-river restoration
-removal/reduction of weirs/impoundments
-planting of trees/hedgerows to help reduce run off and increase infiltration
-removal or adaptation of culverts/bridges that increase flood risk and prevent movement of aquatic species

Where essential infrastructure and more vulnerable development are proposed in this flood zone, it must be demonstrated that the development would remain safe for users in time of flood.

FRAs should ensure that the impacts of climate change over the lifetime of the development have been taken into account.

ZONE 3B - THE FUNCTIONAL FLOODPLAIN

Definition

This zone comprises land where water has to flow or be stored in times of flood. The Functional Floodplain as defined in this SFRA by Runnymede BC comprises land with an annual probability of flooding of 5% (1 in 20 year) in the Borough. Where detailed modelling is not available, flood zone 3 as defined by the Environment Agency in their Flood Map for Planning (rivers and sea) will be relied upon to show other parts of the Borough which potentially also fall within the functional floodplain, and where further detailed modelling by an applicant will be required.

It should be noted that the functional floodplain comprises undeveloped land within the 5% annual probability (1 in 20 year) flood outline. These areas should be safeguarded from development. Within the 5% annual probability (1 in 20 year) flood outline there are also areas of existing developments that are prevented from flooding by the presence of existing infrastructure or solid buildings. In these developed areas, existing building footprints, where it can be demonstrated that they exclude floodwater, will not be defined as functional floodplain and the planning requirements associated with Flood Zone 3B will not apply.

The full definition of the functional floodplain in Runnymede can be viewed in chapter 4 of this SFRA.

Appropriate uses

Only essential infrastructure that has to be there and has passed the Exception Test should be permitted in this zone and water compatible uses which have been designed and constructed to:

- remain operational and safe for users in times of flood;
- result in no net loss of floodplain storage;
- not impede water flows; and
- not increase flood risk elsewhere.

Flood risk assessment requirements

All development proposals in this zone should be accompanied by a FRA including minor developments (see definition in para 7.16 of this SFRA) and changes of use. The Environment Agency's standing advice[53] will need to be followed when a FRA is being prepared for a minor extension (household extensions or non-domestic extensions less than 250 square metres).

[53] https://www.gov.uk/guidance/flood-risk-assessment-standing-advice .

An FRA is required as the flood risk from rivers and the sea is classified as high. This classification is however simply based on the probability of flood events occurring from rivers or the sea. It does not address the possible consequences of flooding from non-river or sea sources. The scale, nature and location of the proposed development will inform the scope and level of detail required in an FRA.

Policy aims

In this zone, developers and local authorities should seek opportunities to:

- reduce the overall level of flood risk in the area through the layout and form of the development and the appropriate application of sustainable drainage systems;
- relocate existing development to land with a lower probability of flooding.
- Where redevelopment of a site is proposed opportunities should be sought to achieve a net reduction in flood risk. This can be achieved through a range of measures including:
  -Reducing the land use vulnerability;
  -Seeking opportunities to ensure no increase in the number of people at risk (e.g. avoiding conversions and rebuilds of properties that result in an increase in the number of residential units);
  -Raising finished floor levels;
  -Reducing surface water runoff rates and volumes from the site;
  -Increasing floodplain storage capacity and creating space for flooding to occur by restoring functional floodplain;
  -Reducing impedance to floodwater flow and restoring flood flow paths;
  -Incorporating flood resilient and/or resistance measures;
  -Ensuring development remains safe for users in time of flood (this may refer to the timely evacuation of properties prior to the onset of flooding in accordance with an individual Flood Warning and Evacuation Plan for the site).
- avoid deterioration of the ecological and chemical quality of watercourses and improve it where possible.
- Work with natural processes where multiple benefits such as carbon storage, flood risk mitigation, water purification, recreation, food/energy production, provision of habitat can be achieved, for example through:
  -undeveloped buffer zones adjacent to watercourses to reduce erosion and sediment loss
  -reconnecting the rivers with their floodplains to allow undeveloped areas to flood thus reducing flood risk downstream
  -wetland habitat creation
  -river restoration
  -removal/reduction of weirs/impoundments
  -planting of trees/hedgerows to help reduce run off and increase infiltration
  -removal or adaptation of culverts/bridges that increase flood risk and prevent movement of aquatic species

FRAs should ensure that the impacts of climate change over the lifetime of the development have been taken into account.

Cumulative Impact of Minor and Permitted Development

10.3 The PPG advises that minor developments (as defined in paragraph 7.16) are unlikely to result in significant flood risk issues unless:

- they would have an adverse effect on a watercourse, floodplain or its flood defences;
- they would impede access to flood defence and management facilities; or

- the cumulative impact of such developments would have a significant impact on local flood storage capacity or flood flows.

10.4 In parts of Runnymede there is potential for both minor development as well as schemes constructed under permitted development to be considered to be having a cumulative impact on flood risk in the local area as a result of impacts on local flood storage capacity and flood flows. However given the small scale of the development in the context of the wider fluvial catchments it is not possible to undertake modelling to confirm the impact of such development.

10.5 It is possible that the Council could consider making an Article 4 direction to remove national permitted development rights for land within Flood Zone 3 where cumulative impact is considered to be a problem. The removal of permitted development rights would ensure that a planning application and site-specific FRA will be required for any development in these areas.

10.6 FRAs for all minor development within Flood Zone 3 should demonstrate that the proposal is safe and will not increase flood risk elsewhere by impeding the flow of flood water, reducing storage capacity of the floodplain or increasing the number of properties at risk of flooding. Details of flood mitigation measures proposed to reduce the impact of flooding on the proposed development itself and adjoining properties should be provided. This may be achieved by ensuring (for example) that the existing building footprint is not increased, that overland flow routes are not truncated by buildings and/or infrastructure, hydraulically linked compensatory flood storage is provided within the site (or upstream), and/or through the incorporation of floodable voids. It is acknowledged that full compensation may not be possible for all minor developments, however, an applicant must be able to demonstrate that every effort has been made to achieve this.

Changes of Use

10.7 Where a development undergoes a change of use and the vulnerability classification of the development changes, there may be an increase in flood risk. For example, changing from industrial use to residential use will increase the vulnerability classification from Less to More Vulnerable (see table 2: Flood Risk Vulnerability Classification in the Flood Risk and Coastal Change section of the PPG for more information on the different vulnerabilities of different uses).

10.8 For change of use applications in Flood Zone 2 and 3, applicants must submit a FRA with their application. This should demonstrate how the flood risks to the development will be managed so that it remains safe through its lifetime including provision of safe access and egress and preparation of Flood Warning and Evacuation Plans where necessary.

10.9 When considering whether a change of use is acceptable, regard should be had to the findings of this SFRA. Whether a change of use is acceptable is likely to depend, at least in part, on whether developments can be designed to be safe and whether there is safe access and egress.

Basement developments

10.10 Basements developments may involve either the extension of an existing habitable basement under a house, or the construction of a completely new basement. Over the past few years it has become increasingly popular to construct basements which extend beyond the footprint of the host property and under the surrounding amenity area in Runnymede. This is most commonly seen in the Virginia Water area.

10.11 In accordance with the PPG, basement extensions to existing dwellings and basement dwellings in Flood Zone 3 should not be permitted due to the vulnerability of users. In flood zone 2, the exception test would need to be passed before such development could be permitted. Basements in other types of development in areas at risk from flooding may be granted provided there is a safe means to escape via internal access to higher floors above the 1% annual probability (1 in 100 year) flood level including an allowance for climate change.

10.12 Applications for basements or basement extensions in flood zones 2, 3a and 3b should be supported by a FRA (and on sites of 1ha or more in flood zone 1). The FRA must provide details of an appropriate sustainable urban drainage system for the site and investigation to determine whether a perimeter drainage system or other suitable measure is necessary to ensure any existing sub-surface water flow regimes are not interrupted. Thames Water has also advised that basement developments by their subterranean nature can be vulnerable to internal sewer flooding. In order to protect new basement developments from the risk of sewer flooding they recommend that wastewater from such developments is pumped into the sewerage network. As such Thames Water recommends that new basement developments incorporate positive pumped devices.

10.13 Furthermore, basement development may affect groundwater flows, and even though the displaced water will find a new course around the area of obstruction this may have other consequences for nearby receptors e.g. buildings, trees. The Council may therefore require a groundwater survey to be submitted where there is a high water table and an assessment of the cumulative impact on ground water conditions should be included. This should be discussed with the Council prior to the submission of a planning application.

CHAPTER 11: SUMMARY AND REVIEW PROCESS FOR SFRA

11.1 A large part of Runnymede is at risk of flooding. The risk of flooding posed to properties within the Borough arises from a number of sources including river flooding, localised runoff, sewer and groundwater flooding.

11.2 This SFRA collates evidence on the risk/probability of flooding occurring from different sources in line with the requirements of the NPPF and its accompanying PPG, in consultation with various consultees, in particular with the Environment Agency and Surrey County Council in its role as Lead Local Flood Authority. In this document the Borough has been broken down into wards and flood risk from different sources has been assessed on a ward by ward basis, providing the basis for the application of the Sequential Test.

11.3 Investment in flood defences in the Borough is being sought through the River Thames Scheme which, once delivered will deliver reductions in flood risk in the Borough in Egham, Staines upon Thames and Chertsey in particular.

11.4 Through the Development Management and Plan Making processes, a planning solution to flood risk management should continue be sought wherever possible across the Borough, steering vulnerable development away from areas affected by flooding in accordance with the Sequential Test as advocated in the NPPF. Specific planning recommendations have been provided for each flood zone within the Borough. These recommendations also emphasise the need to ensure that there is not further deterioration to the ecological and chemical quality of Borough's watercourses and to seek improvements where possible. Other recommendations relate to working with natural processes during the development process to provide multiple benefits such as carbon storage, flood risk mitigation, water purification, recreation, food/energy production and provision of habitat.

11.5 Where the sequential test is demonstrated to have been passed in the planning process, specific recommendations have been provided in this SFRA to assist the Council and applicants apply the Exception Test. These recommendations can be viewed in Chapter 7 of this SFRA.

11.6 Effective Council policy through the Runnymede 2030 Local Plan is essential to ensure that the development management recommendations can be imposed consistently at the planning application stage. This is essential to achieve future sustainability within the Borough with respect to flood risk management. Current saved policies SV1 and SV2 are considered to be largely consistent with the NPPF although would benefit from a refresh as part of the Runnymede 2030 Local Plan to take into account the recommendations in this document.

11.7 Emergency planning is imperative to minimise the risk to life posed by flooding within the Borough. It is recommended that the Officers in the Policy and Strategy team advise the

Borough's Emergency Planner and Drainage team of the risks and issues highlighted in the Runnymede SFRA.

Production of a level 2 SFRA

11.8 Where a Level 1 Assessment shows that land outside flood risk areas cannot appropriately accommodate all the necessary development as part of the Runnymede 2030 Local Plan, it may be necessary to increase the scope of the Assessment to a Level 2 Assessment to provide the information necessary for application of the Exception Test to potential land use allocations where appropriate. A Level 2 Strategic Flood Risk Assessment would build on the information contained in the level 1 assessment and consider the detailed nature of the flood characteristics within each flood zone including:

- flood probability;
- flood depth;
- flood velocity;
- rate of onset of flooding; and
- duration of flood

11.9 The level 2 assessment would also need to:

- Assess existing flood defence infrastructure. Such an assessment should state where the infrastructure is and what condition it is in.
- Assess the risk of flood defence infrastructure failing during the lifetime of a development. The assessment should include an allowance for climate change and consider what the consequences of failed flood defences would be for the Borough.

11.10 A Level 2 Strategic Flood Risk Assessment should also reduce burdens on developers, in particular, at windfall sites, in the preparation of site-specific flood risk assessments.

11.11 Currently the necessary evidence is being prepared to underpin the Runnymede 2030 Local Plan. As the evidence collated to date indicates that the Council may require development to be allocated inside flood zones 2 or 3, a level 2 assessment will be carried out.

Review mechanism for this SFRA

11.12 This SFRA has been developed building on existing knowledge with respect to flood risk within the Borough and upon detailed flood risk modelling and other relevant data which has been carried out in the Borough out by the Environment Agency and other bodies. However over the coming months and years it is likely that modelling will be improved or updated and Government policy and guidance may change. As such a periodic review of the Runnymede SFRA is considered to be imperative.

11.13 The following key questions should be addressed as part of the SFRA review process:

<u>Question 1</u>

Has any flooding been observed within the Borough since the previous review? If so, the following information (where known) should be captured as an addendum to the SFRA:

- What was the mapped extent of the flooding?
- Over what dates did the flooding occur?
- What was the perceived cause of the flooding?
- What was the indicative statistical probability of the observed flooding event? (i.e. how often, on average, would an event of that magnitude be observed within the Borough?)
- If the flooding was caused by overtopping of the riverbanks, were the observed flood extents situated outside of the current Zone 3a? If it is estimated that the frequency of flooding does not exceed, on average, once in every 100 years then the flooded areas (from the river) should be incorporated into Zone 3a to inform future planning decision making.

Question 2

Have any amendments to the NPPF or the PPG been released since the previous review? If so, the following key questions should be asked:

- Does the revision to the policy/guidance alter the definition of the Flood Zones presented within the SFRA?
- Does the revision to the policy/guidance alter the decision making process required to satisfy the Sequential Test?
- Does the revision to the policy guidance alter the application of the Exception Test?
- Does the revision to the policy/guidance alter the categorisation of land use vulnerability, presented within Table 2 of the Flood Zone and Flood Risk tables in the PPG? If the answer to any of these core questions is 'yes' then a review of the SFRA recommendations in light of the identified policy change should be carried out.

Question 3

Has the Environment Agency issued any amendments to their flood risk mapping and/or guidance since the previous policy review? If so:

- Has any further detailed flood risk mapping been completed within the Borough, resulting in a change to the 1 in 20, 1 in 100 year or 1 in 1000 year flood outlines? If yes then the relevant flood outlines should be updated accordingly.
- Has the assessment of the impacts that climate change may have upon rainfall and/or river flows over time altered? If yes, then a review of the impacts that climate change may have upon the Borough is required.
- Do the development management recommendations provided in Chapter 10 of this SFRA in any way contradict emerging EA advice with respect to (for example) the provision of emergency access, the setting of floor levels and the integration of sustainable drainage techniques? If yes, then a discussion with the EA is required to ensure that the development management recommendations remain appropriate.
- Have any new/updated surface water or other sources of flooding maps been produced and published?

The Environment Agency reviews the Flood Zone Map on a quarterly basis and sends the updated shapefiles to the Council's GIS team. If this results in a change in the flood zone boundaries in the Borough, the updated Flood Zones will be automatically updated on the Council's interactive mapping system which is known as rMaps. Any material amendments to the flood zone boundaries will be discussed in any review of the SFRA including the implications for the Council's spatial strategy.

Question 4

Has the implementation of the SFRA within the spatial planning and/or development management functions of the Council raised any particular issues or concerns that need to be reviewed as part of the SFRA process?

Appendix 1

Appendix 1: Modelling studies considered in the production of the 2018 SFRA

Chapter	Data relied upon
Chapter 1: Introduction and overview of approach	
n/a	n/a
Chapter 2:Policy approach	
n/a	n/a
Chapter 3: Local context	
Main rivers map referred to in 'Location section' and shown in figure 2	Environment Agency 'Detailed River Network' dataset from the EA Geostore
Ward breakdown , adjoining local authorities and extent of the Green Belt referred to in location section and shown in figure 2	Runnymede GIS data
'Topography' section and supporting figure 3	Ordnance Survey 'Land-Form Panorama' dataset
'Geology' section and supporting figures 4 and 5	BGS 'DiGMapGB-10' geology dataset
'Aquifers' section and supporting figures 6 and 7	Aquifer Designation Map (Bedrock Geology) / Aquifer Designation Map (Superficial Deposits) datasets from the EA Geostore
'Main rivers' section and supporting figure 8	Environment Agency 'Detailed River Network' dataset from the EA Geostore
Chapter 4: Overview of fluvial flood risks in Runnymede	
Figure 9- Flood risk management assets in Runnymede as shown on AIMS	Data from the Environment Agency's Asset Information Management System secured from the Environment Agency.
Figure 10-maps showing the extent of historic flooding in Runnymede	Environment Agency 'Historic Flood Map' dataset from the EA Geostore
Figure 11-extent of flood zones 1, 2 and 3 in Runnymede	Environment Agency 'Flood Map' dataset from the EA Geostore
'Definition of fluvial flood zones section'	The Environment Agency has provided the Council will the following modelling to assist in the preparation of this SFRA:

River model (if applicable)	Data source	Name	Data type	Model date
Addlestone Bourne	Environment Agency	Addlestone Bourne 1 in 100 (plus 20% on river flows) Flood Extent	Flood extent	2006
Addlestone Bourne	Environment Agency	Addlestone Bourne 1 in 100 Flood Extent	Flood extent	2006
Addlestone Bourne	Environment Agency	Addlestone Bourne 1 in 20 Flood Extent	Flood extent	2006
Addlestone Bourne	Environment Agency	Addlestone Bourne 1 in 5 Flood Extent	Flood extent	2006
Chertsey Bourne	Environment Agency	Chertsey Bourne 1 in 100 (plus 20% on river flows) Flood Extent	Flood extent	2005
Chertsey Bourne	Environment Agency	Chertsey Bourne 1 in 100 Flood Extent	Flood extent	2005
Chertsey Bourne	Environment Agency	Chertsey Bourne 1 in 20 Flood Extent	Flood extent	2005

Chertsey Bourne	Environment Agency	Chertsey Bourne 1 in 5 Flood Extent	Flood extent	2005
Lower Wey	Environment Agency	Lower Wey (up to 1 in 100) Defended Flood Extent	Flood extent	2010 update
Lower Wey	Environment Agency	Lower Wey 1 in 100 Defended Flood Extent	Flood extent	2010 update
Lower Wey	Environment Agency	Lower Wey 1 in 100 (plus 20% on river flows) Flood Extent	Flood extent	2010 update
Lower Wey	Environment Agency	Lower Wey 1 in 50 Flood Extent	Flood extent	2010 update
Lower Wey	Environment Agency	Lower Wey 1 in 5 Flood Extent	Flood extent	2010 update
Lower Wey	Environment Agency	Lower Wey 1 in 20 Flood Extent	Flood extent	2010 update
Lower Wey	Environment Agency	Lower Wey 1 in 100 (plus 20% on river flows) Hazard Mapping	Flood hazard map	2010 update
Lower Thames	Environment Agency	Lower Thames 1 in 100 Flood Extent	Flood Extent	2009
Lower Thames	Environment Agency	Lower Thames 1 in 100 (plus 20% on river flows) Flood Extent	Flood Extent	2009
Lower Thames	Environment Agency	Lower Thames 1 in 100 Undefended Flood Extent	Flood Extent	2009
Lower Thames	Environment Agency	Lower Thames 1 in 50 Flood Extent	Flood Extent	2009
Lower Thames	Environment Agency	Lower Thames 1 in 20 Flood Extent	Flood Extent	2009
Lower Thames	Environment Agency	Lower Thames 1 in 20 Hazard Mapping	Flood Hazard Map	2009
Lower Thames	Environment Agency	Lower Thames 1 in 100 Hazard Mapping	Flood Hazard Map	2009
Lower Thames	Environment Agency	Lower Thames 1 in 100 (plus 20% on river flows) Hazard Mapping	Flood Hazard Map	2012

Figure 12-map of dry islands in Runnymede	1 in 100 (plus 20% on river flows) flood extents provided by the Environment Agency relied upon to map dry islands.
'Climate change' section	1 in 100 and 1 in 100 (plus 20% on river flows) flood extents provided by the Environment Agency referred to.
Figure 13-extent of functional floodplain in Runnymede	1 in 20 flood extents provided by the Environment Agency for Addlestone Bourne, Chertsey Bourne Lower Wey and Lower Thames relied upon as well as data provided by the Environment Agency showing the extent of their

	detailed modelling.
Chapter 5: Other sources of flooding	
'Current flood mapping for surface water' section and figure 14	Environment Agency 'Updated Flood Map for Surface Water' dataset from the EA Geostore
'Historic records of sewer flooding in Runnymede' section and figures 15 and 16	Data from Thames Water's DG5 register (April 2017)
'Potential for groundwater flooding in Runnymede' section and figure 17	BGS 'Susceptibility to Groundwater Flooding' dataset
'Groundwater source protection zones' section and figure 18	Environment Agency 'Source Protection Zones' dataset from the EA Geostore
'Flooding from reservoirs' section and figures 19 and 20	Information obtained from the Environment Agency 'Risk of flooding from Reservoirs' map
'Flooding from canals and other artificial sources' section (and figure 19)	Location of the Basingstoke Canal and Wey Navigation provided by Runnymede GIS team.
'Surrey County Council wetspot data' section and figure 21	Wetspot data provided by Surrey County Council (December 2015)
Chapter 6: Level 1 assessment sheets	
'Groundwater vulnerability classifications' sections in individual ward write ups and supporting figure 22 (apart from figures 22 and 23 all other figures referred to in this chapter already have their data sources confirmed elsewhere in this table).	Environment Agency 'Groundwater Vulnerability' dataset from the EA Geostore
'SuDS suitability' sections in individual ward write ups and figure 23 (apart from figures 22 and 23 all other figures referred to in this chapter already have their data sources confirmed elsewhere in this table).	BGS Drainage Summary
Chapter 7: Avoiding flood risk	
n/a	n/a
Chapter 8: Flood Risk management and mitigation	
'Groundwater vulnerability classifications' section and supporting figure 22	Environment Agency 'Groundwater Vulnerability' dataset from the EA Geostore
Proposed route of the River Thames Scheme flood alleviation channel	Data obtained from the Environment Agency
Chapter 9: guidance for site specific FRAs	
n/a	n/a
Chapter 10: flood risk policy and development management approach	
n/a	n/a
Chapter 11: Summary and review process	
n/a	n/a

Appendix 2

Appendix 2: description, vision and preferred policies for sub areas within the Thames Catchment Management Plan that are located within Runnymede

Sub area number and name	Geographical area in sub area that is within Runnymede	Characteristics/issues in sub area	Preferred policy option	Preferred actions to implement preferred policy
Sub area 1-Towns and villages in open floodplain (north and west)	-Addlestone Bourne, Emm Brook and The Cut *(although it should be noted that the Emm Brook and the Cut are outside of Runnymede)*	The geographical areas within this category have the following characteristics: -cover large expanses of open undeveloped floodplain with villages and market towns, - Winter flooding of the undeveloped floodplain is a regular occurrence, - in 2009 the Addlestone Bourne, Emm Brook and The Cut sub area contained 1170 properties with a 1% risk of flooding form rivers.	**Policy option 6:** Areas of low to moderate flood risk where the EA will take action with others to store water or manage run-off in locations that provide overall flood risk reduction or environmental benefits.	• The EA want to maintain the existing capacity of the river systems in developed areas that reduces the risk of flooding from more frequent events. • The EA will identify locations where the storage of water could benefit communities by reducing flood risk and providing environmental benefits (by increasing the frequency of flooding) and encourage flood compatible land uses and management. • The EA will work with LPAs to retain the remaining floodplain for uses that are compatible with flood risk management and put in place polices that lead to long-term adaptation of urban environments in flood risk areas. • The EA will continue to increase public awareness, including encouraging people to sign-up for the free Floodline Warnings Direct service. • The EA will help communities and local authorities manage local flood risk. This could include flood resilience (for example in Witney and Bampton), community flood plans that identify vulnerable people and infrastructure and community based projects (for example in East Hanney).
Sub area 8-heavily populated	-Lower Thames -Byfleet and Weybridge	The geographical areas within this category have the following characteristics:	**Policy option 5:** Areas of moderate to high flood risk where the	• The EA will deliver the actions recommended in Flood Risk Management Strategies for Oxford, the Lower Lee, the Wey and Lower Thames once they

floodplain		- The geographical areas which sub area 8 include some of the most populated floodplain in Thames region. - The geographical areas in sub area 8 together contain 10% (170km²) of the total area of floodplain within the Thames CFMP but have 40% (56,000 properties with a 1% risk of flooding from rivers) of the properties at risk. This figure is estimated to increase by between 5% and 25% in the future due to the impacts of climate change as most of these areas are in wide flat floodplains of major rivers. - The Lower Thames area, with 18, 000 properties with a 1% risk of flooding, is recognised as the largest concentration of properties not protected by flood defences in the country. -In 2009, 18170 properties in the Lower Thames area had a 1% risk of flooding from rivers. In 2100, this figure is expected to rise to 21800 properties. -In 2009, 1240 properties in the Byfleet and Weybridge area had a 1% risk of flooding from rivers. In 2100, this figure is expected to rise to 1540 properties. - The flood risk is concentrated in known locations and problems with flooding from rivers are well documented. Large scale interventions will be expensive and difficult to build and maintain.	EA can generally take further action to reduce flood risk. The EA recognises the challenge of this policy and that it will not be possible to reduce the risks everywhere. - In the Lower Thames area the EA are assessing the costs and benefits of a large scale intervention to reduce the probability of flooding. There are however major technical obstacles which mean any solutions will be expensive, provide different levels of protection and not benefit everyone in the affected communities. The EA is confident however, of being able to bring forward proposals that will reduce the risk to many people.	are approved. • In the short-term, the EA will encourage partners to develop policies, strategies and initiatives to increase the resistance and resilience of all new development at risk of flooding. The EA will also look at protecting land that may be needed to manage flood risk in the future, and work with partners to identify opportunities for this and to recreate river corridors in urban areas. • In the longer-term, the EA need land and property owners to adapt the urban environment to be more flood resilient. This includes the refurbishment of existing buildings to increase resilience and resistance to flooding. • The EA need to promote the management of flood consequences. By working with our partners the EA will improve public awareness and local emergency planning, for example identifying critical infrastructure at risk and producing community flood plans.

Appendix 3

Appendix 3: Flood risk management assets on Main Rivers in Runnymede borough (source Environment Agency Asset Information Management System (AIMS))

Asset ID	Asset Sub Type	Comments	Description	NGR	Structure Height (m)	Structure Width (m)	Comments Inspection)	Condition (Inspection)
13166	simple_culvert	3 Identical concrete square culverts. 13m in width and 15m in height. Public walkway to the L/B to allow access underneath the Motorways. Note: The Owner and Maintainer of this asset is the HIGHWAY AGENCY	3 square junction Culverts.	TQ0166968093			Culvert in good condition Minor debris in channel bed Some siltation & vegetation build up to berm Forces. No change.	2
13260	simple_culvert	Concrete box culvert (3.0M wide) with concrete headwalls and bagwork wingwalls at the U/S extent. Steel handrailing above headwall at both extents. Please note the both the owner and maintainer of the asset is Highways Agency, not private as seen in tab 3.	Motorway culvert	TQ0163868331			Good clear view through culvert No obvious defects all in good order Minor siltation to channel Bagwork in fair condition. Forces: Moss on bagwork, all in decent condition.	2
13481	simple_culvert	Single span M3 bridge. 8.8m wide. 36m in length. Concrete construction wide considerable build-up of sediment on r/b. LUB=CD PHOTO:VIEW U/S	Bridge (treat as culvert)	TQ0107267594			'CAUTION: This inspection was migrated from NFCDD and the element conditions and weightings data	3

		Please note owner and maintainer is Highways agency					shown may be invalid or incomplete..' Unable to inspect the interior.due to fenced off fields although there is clear flow through culvert. 1-ENI-3	
13481	simple_culvert	Single span M3 bridge. 8.8m wide. 36m in length. Concrete construction wide considerable build-up of sediment on r/b. LUB=CD PHOTO:VIEW U/S Please note owner and maintainer is Highways agency	Bridge (treat as culvert)	TQ0107267594			Viewed from d/s end Culvert is in good condition fit for purpose Forces. No change.	2
13510	embankment	raised embankment over grown with vegetation	embankment	TQ0507063618	1.00		'CAUTION: This inspection was migrated from NFCDD and the element conditions and weightings data shown may be invalid or incomplete..' raised embankment over grown with vegetation	2

13589	simple_culvert	CONCRETE PIPE CULVERT GOING UNDER M25. NO FLOW INDICATES POTENTIAL BLOCKAGE UNDERNEATH. CONCRETE WINGWALLS AND HEADWALL AT U/S ENTRANCE. SEPERTE DRAIN CHANNEL MEETS MAIN CHANNEL AT CULVERT ENTRANCE Owner and Maintainer are the Highways Agency	Culvert	TQ0161870466			CAUTION: This inspection was migrated from NFCDD and the element conditions and weightings data shown may be invalid or incomplete..' Culvert silted up as pipe D/S is completely submerged. Concrete in good condition. Forces: No change.	2
43189	simple_culvert	2500mm (h) x 6000mm (w) rectangular concrete box construction. Owner and Maintainer for asset are highway agency	Culvert	TQ0358367720			Viewed from u/s end of culvert All look to be in good condition with no obvious structual defects Some overhanging woody vegetation d/s end	3
44806	simple_culvert	Box shape concrete culvert with sateel crash barriers at either end. Culvert runs underneath the M3. Concrete deck set on concrete abutments. 8.8m in width and approx. 3m in height. The asset is maintained and owned by the Highway	Box shape culvert, M3.	TQ0288067899			All in good condition No defects fit for purpose Forces. No change.	2

		agency						
44832	simple_culvert	Corrugated iron culvert. Surrounded by cement bags at 2.5metres wide.	Culvert	TQ0172468356			Please note I have coppied the previouir inspection as I am not sure if this was the CCTV inspection Clear flow through the culvert. Minor surface rust to the metal but no signs of corrosion. Forces: No change.	3
72176	simple_culvert	1200mm x 3600mm rectangular concrete box construction. Concrete headwalls. Brickwork wingwalls D/S. Concrete wingwalls U/S	Culvert	TQ0570864622			Unable to fully inspect culvert interior, see the latest Halcrow Confined Space Team entry inspection dated 18/04/2013 for details, good flow through the culvert with no obstructions. The concrete is in good condition. Forces: No change.	2

75151	simple_culvert	Precast concrete pipe dia 0.6m with poured concrete and blockwork headwalls. Steel handrailing above. Channel does not flow into the Research Lab lake as sub-reach line suggests - heads northeast, turns 90 degrees.	Culvert	TQ0059269992			Inspected from u/s & d/s ends only. Box section culvert d/s end was flowing to capacity. Both headwall in good condition. Forces: No change.	3
75177	simple_culvert	Precast concrete pipe dia 0.6m with brickwork headwalls and wingwalls at D/S extent. Trash screen and bagwork wingwalls at U/S extent of culvert. Owner and Maintainer local authority, Surrey CC-Highways	Culvert	TQ0030570576			Inspected from u/s & d/s ends only Could not inspect internal elements u/s headwall is in good condition d/s headwall is aged but in fair condition. Some siltation to u/s & d/s bed may indicate siltation within culvert . Forces: No change, still in a poor condition.	3
77173	simple_culvert	Precast concrete pipe 0.5m dia at D/S extent, with brickwork headwall. At U/S extent there is a brickwork structure comprising two arches and a weir with provision for timber stop logs. Owner and Maintainer	Culvert	TQ0132470136			Inspected from d/s end only Could not gain access to u/s end internal element not inspected. Forces: No change, the U/S end inspected from afar.	3

		updated to Local Authority which is Surrey CC-Highways						
97470	simple_culvert	Inlet to MH1 740mm x 740mm rectangular concrete box construction. MH1 to Outlet 1200mm circular concrete construction. Brickwork headwall and Armco lining. Service pipe attached to D/S headwall. At U/S entrance there are two 1.5m precast concrete box culverts.	Culvert	TQ0393666648			'CAUTION: This inspection was migrated from NFCDD and the element conditions and weightings data shown may be invalid or incomplete..' Unable to inspect interior of culvert. Headwalls and parapets are in good condition. Build up of earth and vegetation at the U/S and D/S extents restricting flow into and out of culvert. 1-3--ENI-3	3
98802	simple_culvert	Precast concrete pipe dia 0.8m with brickwork headwalls and minor brickwork wingwalls at U/S extent. Owner and Maintainer updated-Network Rail	Culvert	TQ0047470284			Unable to inspect culvert interior. U/S brickwork is aged with some minor cracking. Vegetation growth on D/S headwall. ENI not due to start	3

							until 04/12/15	
125940	simple_culvert	Culvert under Byfleet Road	Culvert	TQ0579862255			Unable to inspect culvert interior, see the latest CCTV inspection report dated 08/03/2010 for details of defects, CCTV Survey ref:- Dene-Tech CCTV, Haskoning Report 9V3329/R0048, Valid until 26/11/2014. Vegetation around D/S headwall, concrete headwall sound. Some minor vegetation overhanging the U/S headwall, Japanese knotweed growth on the R/B channel side at the inlet. Forces: No change.	3
125941	simple_culvert	Left bank 1500mm (h) x 1650mm (w) rectangular concrete box construction Right bank 975mm circular concrete construction	Culvert	TQ0558562090			Unable to fully inspect the culvert interior, see the latest Halcrow CCTV Inspection Report dated 23/04/2013 for details. Clear flow	2

							through the culvert although there is some tree debris at the U/S headwall. The concrete is in good condition with no defects. Forces: Level of water made it difficult to inspect, seems not to have changed condition, no major debris.	
125942	simple_culvert	1200mm circular concrete construction	Culvert	TQ0549762058			Clear flow through the culvert with no obstructions. The concrete is in a good condition. Forces: U/S headwall not in great condition.	2
125943	simple_culvert	1100mm circular concrete construction	Culvert	TQ0547162004			Clear flow through the culvert with no obstructions. The concrete is in a good condition with no defects. Forces: There is vitually no flow due to build up of debris, structure still sound.	2

125944	simple_culvert	1320mm (h) x 1800mm (w) rectangular concrete box construction. CAST CONC WITH ROAD OVER,METAL RAILINGS EACH END,WING WALLS BLENDED INTO CHANNEL SIDES	Culvert	TQ0462161569			Clear flow through the culvert with no obstructions. The concrete is generally in a good condition with only a section of minor spalling to the side wall and a minor longitudinal crack to the side wall	2
127259	simple_culvert	IO5OMM PIPE SET IN EARTH BANK WITH CONCRETE TRACK OVER,WOOD FENCE U/S END AND CRASH BARRIERS ALONG ROAD	Culvert	TQ0598262406			Unable to fully inspect culvert interior, see the latest CCTV report dated 06/04/2010 for deatails, CCTV survey ref:- Dene-Tech CCTV, Haskoning Report 9V3329/R0047 Valid until 11/03/2015. Some spalling, cracking to the U/S headwall corner, vegetation growth around the D/S headwall, appears to be a clear flow through culvert. Forces: No change.	2

137961	simple_culvert	Poured concrete box culvert at D/S extent, 1.5m wide. At U/S extent there are two 0.4m dia concrete pipes set in a brickwork headwall with a steel trash screen attached, plus further 375 mm inflow upstream of main inlet.	Culvert	TQ0333566836			Inspected from u/s end only visible elements are in good condition 1-3-ENI-1. Forces: No changes. D/S headwall is in decent condition.	3
144514	simple_culvert	600mm circular concrete construction	Culvert	TQ0112068462			Silt and debris remains on the channel bed and throughout the culvert. There is a large section of spalling to the concrete side wall 36m from the inlet but no signs of movement or cracking.	3
172075	simple_culvert	Brickwork arched culvert under railway embankment. Culvert is 3.5m wide and has a 2m soffit. Brickwork headwalls, and minor bagwork wingwalls at U/S extent. Owner/Maintainer updated. Network rail	Culvert	TQ0016267725			Several large cracks in both headwalls, loss of brickwork to interior with larger area missing to d/s lining. No obstructions to flow through culvert. Forces: Both headwalls look close to failing.	4

172076	simple_culvert	Culvert under railway embankment. At D/S end there are two brickwork arches, each 2m wide, set in brickwork headwall. At U/S there are two precast concrete box culverts, each 1.5m wide, set in poured concrete headwall. Owner/Maintainer updated tab 3 Private, however is Network Rail	Culvert	TQ0004467785			Inspected from u/s end only good clear view through culvert with no obvious defects Some siltation of r/b culvert & channel obstructions u/s of culvert. Forces: No obstructions present, all in fair condition.	3
196969	weir	Double weir located between Weybridge Road and the bridge. Concrete F/B U/S. U/S there is a weir with collapsing bagwork cannot ID the structure due to high and fast flow at the time of HG Inspection. LUB=AB PHOTO:VIEW D/S	Weir - minor	TQ0602764988	0.00		Good flow over both weir sections, generaly appears to be in good condition. Some minor debris on upper section, also the short sections of bagwork to the channel side on both sides of the upper weir are falling away with evidence of undercutting to the natural channel sides although not affecting flow. Forces: Still evidence of undercutting, debris on weir edge.	3

198022	control_gate	Sluice gate with concrete wingwalls. Concrete gantry set in RSJs. Tubular steel handrails around the top. Concrete wall U/S and D/S R/B. Bagwork bank protection L/B.	sluice	TQ0669964780	1.50		Steel gate and framework appears to be in good condition and operational, moss growth on steelwork. Concrete generaly in good condition. Some debris at the gate. Access to sluice gate is by climbing over the road side barrier rails, suggest installing a lockable access gate. Forces: No change.	2
200672	weir	Five step overfall weir. Fish pass on U/S (towards left bank) side with sluice gate. Overfall reconstructed 1959. Fish pass 1994. Steel and concrete walkway above. 6 guard piles added as element	Bell Overfall Weir	TQ0166572106	4.00	50.00	Some ageing to the concrete but generally in good condition. Some vegetation growth on concrete at the U/S end. Vegetation growth on timber guard pile booms and some ropes in the water. Forces: there has been a build up of sighnificant debris at the ropes before the weir. See photos.	2

20246 5	weir	Triangular blocks (2). possibly steel. bolted to bed at culvert entrance.	Weir	TQ0571164622	0.50	3.00	Clear even flow over weir. No defects to asset. Some minor moss growth on the channel side concrete wall and minor overhanging ivy growth on the R/B channel side concrete wall. Forces: No change, overhanging Ivy has been trimmed back.	2
20376 7	weir	weir with 37 radial steel gates to control flow. Manually operated with chains of wire and radial mechanism. 2 step fixed concrete weir at base. Fish pass on the left bank side. Steel and concrete walkway over. 20 guard piles added as element	Chertsey Weir	TQ0538367009	2.00		Minor surface rusting to some of the steel gates with moss/plant growth to gate frames, some minor timber and tree debris on the gate frames, Lock Keeper reports that all gates are operational. There is a crack in the R/B concrete channel side wall (this wall is noted in the elements as below as the L/B). D/S side of walkway handrail is bent. Some capping stones missing to	2

							fish pass walls. Forces: No change.	
270857	screen	New galvanised steel trash screen set into concrete channel with a working platform over.	Trash Screen	TQ0547162004		1.50	Steelwork to grille in good condition. There was a build up of debris at the grille at the time of asset inspection - reported to Op's for clearance. Forces: significant debris at the screen, structure, no change.	2
279052	passive_monitoring_instrument	Reference number 30/027	Gauge Board	TQ0172061905			'CAUTION: This inspection was migrated from NFCDD and the element conditions and weightings data shown may be invalid or incomplete..' Bottom section of gauge board loose and needs re renewing, NIRS issued.	4

279559	screen	Overflow outfall from channel. Two precast concrete pipes 0.5m diameter set in poured concrete headwall, with steel trash screen across face. Owner/Maintainer updated, LA, Runnymead BC	Trash Screen	TQ0331766826	0.50	0.50	As prev insp (concrete and steel are in a good condition.	2
281787	passive_monitoring_instrument	Reference number 29/004. Gauge board on the U/S end of bridge. Ownwer/Maintainer updated to EA	Gauge Board.	TQ0648365786			'CAUTION: This inspection was migrated from NFCDD and the element conditions and weightings data shown may be invalid or incomplete..' Board is clean, vegetation growth around base of board.	2
281788	passive_monitoring_instrument	Reference number 29/003. Gauge board is on the D/S end of bridge Owner/Maintainer update to the EA.	Gauge Board	TQ0650165794			'CAUTION: This inspection was migrated from NFCDD and the element conditions and weightings data shown may be invalid or incomplete..' Board is generaly in good codition	2

281789	passive_monitoring_instrument	Reference number 29/005 Gauging board (steel) attached to concrete wingwall of culvert. Owner/Maintainer updated to EA	Gauge Board	TQ0332869077			'CAUTION: This inspection was migrated from NFCDD and the element conditions and weightings data shown may be invalid or incomplete..' as prev insp. Sound fixing to concrete wingwall, vertical. No signs of rusting. Some vegetation growth at the top of the board. fit for purpose	2
282154	passive_monitoring_instrument	Reference number 30/038	Gauge Board	TQ0602564991			'CAUTION: This inspection was migrated from NFCDD and the element conditions and weightings data shown may be invalid or incomplete..' As before, gauge board is clean and clear of debris.	2
282570	passive_monitoring_instrument	Reference number 29/006 Owner/Maintainer updated to EA	Gauge Board	TQ0206570548			'CAUTION: This inspection was migrated from NFCDD and the element conditions	2

							and weightings data shown may be invalid or incomplete..' As before, inspection, board in good condition, with all numbers visible. fit for purpose	
282573	passive_monitoring_instrument	Reference number 30/003	Gauge Board	TQ0686164739			'CAUTION: This inspection was migrated from NFCDD and the element conditions and weightings data shown may be invalid or incomplete..' Board in good condition, vegetation overhanging the top of the board.	2
291563	outfall	Concrete pipe with steel flap valve. Concrete headwall and wingwalls. Tubular steel handrailing on headwall and wingwalls	Flap valve	TQ0582264764	0.30	0.30	Flap in good working order. Concrete in good condition with some overhanging vegetation on the wingwalls. Forces: No change.	2
296978	screen	Steel trash screen attached to u/s headwall of culvert. Owner and Maintainer updated. LA-Runnymeade	Trash Screen	TQ0333566836	0.40	1.20	Screen remainsl in very good condition. some siltation around the base of	2

		BC					screen	
296979	screen	Steel trash screen on the U/S extent of the culvert Owner/Maintainer updated: Runnymeade BC	Trash Screen	TQ0030570576			Headwall & screen in good condition Some siltation & debris build up against screen. Forces: No debris at the screen.	3
322038	weir	Fixed crest concrete weir. Six steps.	Shepperton Weir B1	TQ0714865823	3.00	20.00	As before, no visible defects to concrete. Forces: No change.	1
327665	simple_culvert	Concrete box culvert. 2 openings 1.5m*0.6m. 4m span. overgrown with vegetation.	Culvert	TQ0353167539			'CAUTION: This inspection was migrated from NFCDD and the element conditions and weightings data shown may be invalid or incomplete..' Concrete box culvert. 2 openings 1.5m*0.6m. 4m span. overgrown with vegetation.	3
327986	simple_culvert	Concrete box culvert 2* openings. 1.5m*0.6m. 4m span. over grown with vegetation.	culvert	TQ0340067490			'CAUTION: This inspection was migrated from NFCDD and the element conditions and weightings data	3

							shown may be invalid or incomplete..' Concrete box culvert 2* openings. 1.5m*0.6m. 4m span. over grown with vegetation.	
414635	control_structure_site		weir complex	TQ0171172091				

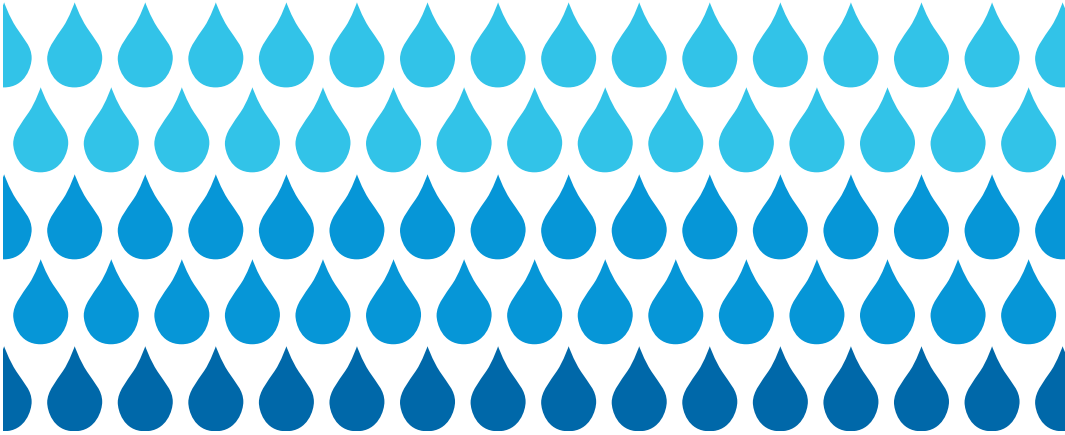
Appendix 4

Environment Agency

Flood warnings

What they are and what they do

A guide to the Environment Agency's flood warning codes



We are the Environment Agency. It's our job to look after your environment and make it **a better place** – for you, and for future generations.

Your environment is the air you breathe, the water you drink and the ground you walk on. Working with business, Government and society as a whole, we are making your environment cleaner and healthier.

The Environment Agency. Out there, making your environment a better place.

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*Approximate call costs: 8p plus 6p per minute (standard landline). Please note charges will vary across telephone providers.

What counts in a flood is good information you can act on...

Whether we like it or not, floods happen. Over the years, forecasting techniques have improved, giving us more time to prepare for flooding.

The Environment Agency is here to help. We are responsible for issuing flood warnings throughout England and Wales.

We help by:

- Building and maintaining flood defences.
- Issuing flood warnings.
- Working with partners on multi-agency flood response.
- Sharing accurate flood risk information and advice.

Flood Warnings

Everyone needs to understand our flood warnings and know what to do when they receive them. Our service includes three types of warning – Flood Alert, Flood Warning and Severe Flood Warning. Each warning type is triggered by particular weather, river or sea conditions which cause flooding.

The examples in this document are a guide to how the different warnings are used, to provide the public with advance notice of flooding and advice on what to do.

Three-day flood risk forecast	 FLOOD ALERT	 FLOOD WARNING	 SEVERE FLOOD WARNING	Warning no longer in force
What it means Be aware. Think ahead. Keep an eye on the weather situation.	**What it means** Flooding is possible. Be prepared.	**What it means** Flooding is expected. Immediate action required.	**What it means** Severe flooding. Danger to life.	**What it means** No further flooding is currently expected for your area.
When it's used Daily forecasts of flood risk on our website www.environment-agency.gov.uk. These are updated more frequently for higher flood risk situations.	**When it's used** Two hours to two days in advance of flooding.	**When it's used** Half an hour to one day in advance of flooding.	**When it's used** When flooding poses a significant risk to life or significant disruption to communities.	**When it's used** When a flood warning or severe flood warning is no longer in force.
Triggers • Information updated daily on the Environment Agency website. • The information includes the current and forecast situation and how this is likely to affect each county in England and Wales over the next three days.	**Triggers** • Forecasts that indicate that flooding from rivers may be possible. • Forecast intense rainfall for rivers that respond very rapidly. • Forecasts of high tides, surges or strong winds.	**Triggers** • High tides, surges coupled with strong winds. • Heavy rainfall forecast to cause flash flooding of rivers. • Forecast flooding from rivers.	**Triggers** • Actual flooding where the conditions pose a significant risk to life and/or widespread disruption to communities. • On-site observations from flooded locations. • A breach in defences or failure of a barrier that is likely to cause significant risk to life. • Discussions with partners.	**Triggers** • Risk of flooding has passed. • River or sea levels have dropped back below severe flood warning or flood warning levels. • No further flooding is expected. • Professional judgment and discussions with partners agree that a severe flood warning status is no longer needed.
Impact on the ground Maps will show one of four levels of risk for each county: • Green = no risk of flooding • Yellow = low risk of flooding • Amber = medium risk of flooding • Red = high risk of flooding	**Impact on the ground** • Flooding of fields, recreation land and car parks. • Flooding of minor roads. • Flooding of farmland. • Spray or wave overtopping on the coast.	**Impact on the ground** • Flooding of homes and businesses. • Flooding of rail infrastructure. • Flooding of roads with major impacts. • Significant waves and spray on the coast. • Extensive flood plain inundation (including caravan parks or campsites). • Flooding of major tourist/recreational attractions.	**Impact on the ground** • Deep and fast flowing water. • Debris in the water causing danger. • Potential or observed collapse of buildings and structures. • Communities isolated by flood waters. • Critical infrastructure for communities disabled. • Large number of evacuees. • Military support.	**Impact on the ground** • No new impacts expected from flooding, however there still may be: • standing water following flooding; • flooded properties; • flooding or damaged infrastructure.
Advice to the public/media • Check the forecast on our website. • Remain aware of the impending weather conditions for your area.	**Advice to the public/media** • Be prepared to act on your flood plan. • Prepare a flood kit of essential items. • Avoid walking, cycling or driving through flood water. • Farmers should consider moving livestock and equipment away from areas likely to flood. • Call **Floodline** on **0845 988 1188** for up-to-date flooding information. • Monitor local water levels on the Environment Agency website **www.environment-agency.gov.uk**.	**Advice to the public/media** • Protect yourself, your family and help others. • Move family, pets and valuables to a safe place. • Turn off gas, electricity and water supplies if safe to do so. • Put flood protection equipment in place. • If you are caught in a flash flood, get to higher ground. • Call **Floodline** on **0845 988 1188** for up-to-date information.	**Advice to the public/media** • Stay in a safe place with a means of escape. • Be ready should you need to evacuate from your home. • Co-operate with the emergency services. • Call *999* if you are in immediate danger. • Call **Floodline** on **0845 988 1188** for up-to-date flooding information.	**Advice to the public/media** • Be careful. Flood water may still be around for several days and could be contaminated. • If you've been flooded, ring your insurance company as soon as possible.
Advice to operational organisations • The three-day forecast is the public facing version of the Flood Guidance Statement that category 1 and 2 responders receive. • Advice for organisations varies depending on the level of flood risk and is provided on the Flood Guidance Statement issued by the Flood Forecasting Centre.	**Advice to operational organisations** • Check your flood response plans to see how your organisation needs to respond. • Speak to your local Environment Agency Flood Warning Duty Officer for the latest forecast information. • Dial into Flood Advisory Service teleconferences. • Advise the public to call **Floodline** on **0845 988 1188** for up-to-date flooding information. • Please report any flooding in your area to your local Environment Agency office.	**Advice to operational organisations** • Check flood response plans for actions required at this stage. • Speak to your local Environment Agency Flood Warning Duty Officer for the latest forecast information. • Advise the public to call **Floodline** on **0845 988 1188** for up-to-date flooding information. • Please report any flooding in your area to your local Environment Agency office.	**Advice to operational organisations** • Check flood response plans for actions required at this stage. • Advise the public to put their safety first and to be ready to evacuate should the authorities decide it's needed. • Develop clear messages for local communities and the public.	**Advice to operational organisations** • Recovery phase will have started. • Advise the public to call **Floodline** on **0845 988 1188** for advice on what to do if they have been affected by flooding.

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Appendix 5

SUPPLEMENTARY NOTE ON FLOOD HAZARD RATINGS AND THRESHOLDS FOR DEVELOPMENT PLANNING AND CONTROL PURPOSE – Clarification of the Table 13.1 of FD2320/TR2 and Figure 3.2 of FD2321/TR1.

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May 2008

Introduction

This document is a supplementary note to reconcile information provided in the 'Flood Risks to People Methodology' (FD2321/TR1[1]) and the 'Framework and Guidance for Assessing and Managing Flood Risk for New Development' (FD2320/TR2[2]) reports about the Flood Hazard Rating. It has been produced because both PPS25 in England and TAN15 in Wales require that people should be appropriately safe around new development. The document emphasises that for FRAs and FCAs at all levels to inform development allocations and proposals the simplified approach of FD2320 with regard to flood hazard rating should be used rather than the approach in FD2321. Although the final version of FD2321/TR1 post-dates FD2320/TR2, the work presented actually pre-dates the guidance in FD2320/TR2. This supplementary guidance is issued for those involved in development planning and control and to clarify the detail or difference of the Table 13.1 of FD2320/TR2 and Figure 3.2 of FD2321/TR1.

FD2321/TR1 was a research project based on the detailed literature review and analysis of empirical evidence related to flood hazard, derived mainly from theoretical assumptions and some basic laboratory experiments. Factors that affected flood hazard and vulnerability were combined in a form of multi-criteria analysis that was be used to identify the hot-spots and broadly estimate the probability of people seriously harmed and fatalities during the event of a flood. The multi-criteria method was calibrated to actual events, validated using data from seven flood events and shown to work well. The FD2321 (Risk to people) methodology illustrates the fundamental concepts and demonstrate how the approach could be used for different applications - it did not set a policy for flood hazard thresholds.

(Nevertheless there are a number of assumptions used in the FD2321 methodology, particularly with respect to the impact of debris and people's behaviour during flood events. There is a requirement for further research to collate more evidence on flood hazard, particularly the impacts of debris, and vulnerability in order to refine assumptions made in the flood hazard calculations, flood hazard thresholds and risks to people guidance. The study recommend more laboratory and field based tests on the impact of physical water quality aspect such as debris, mudflow; chemical and biological water quality that cause seriously harm or fatalities to people.)

[1] Defra and Agency (2006) *The Flood Risks to People Methodology*, Flood Risks to People Phase 2, FD2321 Technical Report 1, HR Wallingford et al. did the report for Defra/EA Flood and Coastal Defence R&D Programme, March 2006.
(http://sciencesearch.defra.gov.uk/Document.aspx?Document=FD2321_3436_TRP.pdf)
[2] Defra and Agency (2005) *Framework and Guidance for Assessing and Managing Flood Risk for New Development*, Flood Risk Assessment Guidance for New Development, FD2320 Technical Report 2, HR Wallingford et al. did the report for Defra/EA Flood and Coastal Defence R&D Programme, October 2005.
(http://sciencesearch.defra.gov.uk/Document.aspx?Document=FD2320_3364_TRP.pdf)

FD2320/TR2 (FRA guidance for new development) provides guidance that is a specific interpretation of the methodology developed under FD2321, within the context of development planning and control. Based on FD2320 consultation workshops, the project board (key users and experts) advised the project team to provide a simple methodology. Due uncertainties and limitations related to estimating risks to people, FD2320 adopted a precautionary approach, particularly with respect to the selection of debris factors and flood hazard thresholds

Risk to People (Ninj)

Ninj = **Nz** x **Flood Hazard Rating** x **Area Vulnerability** x **People Vulnerability**

where,

Ninj (Risk to People)	= number of injuries within a particular hazard 'zone';
Nz	= number of people within the hazard zone (at ground/basement level);
Flood Hazard Rating	= HR = function of flood depth/velocity (within the hazard zone being considered) and debris factor;
Area Vulnerability	= function of effectiveness of flood warning, speed of onset of flooding and nature of area (including types of buildings); and
People Vulnerability	= function of presence of people who are very old and/or infirm/disabled/long-term sick

Flood Hazard Rating (HR) and thresholds

The revised 'hazard rating' expression based primarily, on consideration to the direct risks of people exposed to floodwaters.

HR = **d** x (**v** + **n**) + **DF**

where, HR = (flood) hazard rating;
d = depth of flooding (m);
v = velocity of floodwaters (m/sec); and
DF = debris factor (0, 0.5, 1 depending on probability that debris will lead to a hazard)
n = a constant of 0.5

This final revised Flood Hazard Rating formula from the Flood Risks to People project is presented on page 10 (section 3.5) of FD2321/TR1. The formula is identical in both FD2320 and FD2321 reports.

Based on Table 3.2 of FD2321, the Figure 3.2 of FD2321 illustrates the "Hazard to People Classifications" as a function of depth, velocity and debris factor. Such categorisation and the look-up table with flood hazard threshold could be useful for a range of application as an initial indication of Risks to People.

In this case (Figure 3.2 of FD2321) the calculation takes a debris factor as zero (**HR** = **d** x (**v** + **0.5**) + **0**).

However FD2321 strongly recommends the use of the debris factor and the formulas described in the Guidance Document for further calculation. The Table 3.1 of FD2321/TR1 (Table 1 of this note) suggests appropriate debris factors for different depths, velocities and the dominant land use.

Table 1: Guidance on debris factors for different flood depths, velocities and dominant land uses. (Source FD2321 Table 3.1):

Depths (d)	**Pasture/Arable**	**Woodland**	**Urban**
0 to 0.25 m	0	0	0
0.25 to 0.75 m	0	0.5	1
d>0.75 m and\or v>2	0.5	1	1

The way that Flood Hazard Rating and thresholds have been presented in Table 13.1 in FD2320/TR2 compared to Figure 3.2 of FD2321/TR1

A concern was raised in the FD2320 consultation workshops and by the FD2320 Project Board during discussions on FD2321, that the methodology was complex and the results presented in the Figure 3.2 of FD2321 were not reflecting the potential risk to people (as this table was of hazard rating for different depths and velocity without debris). There was a need for further work to include debris, area vulnerability and people vulnerability aspects. They requested a simpler single table to represent the risk to people.

For example Figure 3.2 of FD2321 did not reflect the fact that there is a risk from drowning even at low depths and velocities. In reality FD2321/TR1 recognises this but only in the subsequent "people vulnerability" calculation (risk to children, old, sick and disable). For still water up to 1.25m depth, the Figure 3.2 of FD2321/TR1 assumes that there is low hazard, if there are no debris or vulnerable group. However to avoid further calculation, but include the vulnerability aspect the Table 13.1 of FD2320 for still water with the depths between 0.25–1.25m were reclassified as "danger to some", which was felt to be more appropriate for development planning and control, where users may make use of flood hazard without completing he more complex full calculations including people and area vulnerability.

Similarly Figure 3.2 of FD2321/TR1 shows that at the depth of 0.25m, if there is no debris then up to the flow velocity of 2.0 m/sec there would be low hazard. However FD2321/TR1 suggests the usage of an appropriate debris factor dependent on depth, velocity and the dominant land use. To make the process simpler (whatever the land use), FD2320/TR2 includes a default debris factor. In the Table 13.1 of FD2320/TR2 a debris factor of 0.5 has been applied for depths less than and equal to 0.25m and a debris factor of 1.0 has been used for depths greater than 0.25m. Therefore, in the Table 13.1 of FD2320/TR2 at the depth of 0.25m, up to the flow velocity of 0.30 m/sec is treated as low hazard.

Table 3.2 of FD2321/TR1 (Table 2 of this note) provides thresholds for classifying the hazard to people. In the FD2321/TR1 report the threshold between "danger for most" and "danger for all" is 2.5 and it was used as an initial indication of Risk to People (further calculation is recommended using the formulas). However as there is no further analysis in FD2320 but the Project Board decided that the threshold between "danger for most" and "danger for all" should be more precautionary and a Flood Hazard Rating of 2.0 is selected as a key threshold. i.e. In FD2321 the threshold for "danger for all" is 2.5 and it lowered to 2.0 in FD2320. Therefore, the Flood Hazard Rating between 2.0 to 2.5 in FD2320 is not classified as it is in FD2321.

Table 2: Hazard to People (Source Table 3.2 in FD2321/TR1)

Thresholds for Flood Hazard Rating H = d x (v + 0.5) + DF		**Degree of Flood Hazard**	**Description**
FD2321	**FD2320**		
<0.75	<0.75	Low	**Caution -** "Flood zone with shallow flowing water or deep standing water"
0.75 - 1.25	0.75 - 1.25	Moderate	**Dangerous for some (i.e. children) -** "Danger: Flood zone with deep or fast flowing water"
1.25 - 2.5	1.25 - 2.0	Significant	**Dangerous for most people -** "Danger: flood zone with deep fast flowing water"
>2.5	>2.0	Extreme	**Dangerous for all -** "Extreme danger: flood zone with deep fast flowing water"

The final difference between Table 13.1 in FD2320/TR2 and Figure 3.2 of FD2321/TR1 is the use of smaller increments of depth, so that lower depths are presented more fully in FD2320/TR2. This was felt to be more helpful for identifying what might be judged as acceptable depending on site specific circumstances.

Conclusions

Table 13.1 of FD2320 and Figure 3.2 of FD2321 look very similar but there are significant differences (see Table 3 of this paper). Either Table/Figure can be used as the basis for assessing the risks to people associated with different flood depths velocities and debris factors.

Table 3: comparison of Table 13.1 of FD2320/TR2 and Figure 3.2 of FD2321/TR1

	In Table 13.1 of FD2320/TR2	**In Figure 3.2 of FD2321/TR1**
The depths above 0.25m	Danger for some, most or all	For still water, up to 1.25m the hazard is low (In addition to hazard rating further calculation to include vulnerability aspect is recommended)
Debris factor	Debris factor of 0.5 has been applied for depths $\leq$0.25m and a debris factor of 1.0 has been used for depths $\geq$ 0.25m.	In this case a Debris factor of zero applied (in addition to this further calculation is recommended using debris factor and the formulas)
HR Thresholds for "Dangerous for all" hazard classification	>2.0 (precautionary due to uncertainties and to avoid further calculation as FD2321)	>2.5
Increments of depth	Small increments at lower depths	Every 0.25 m

Table 13.1 of FD2320/TR2 is a simple method applies the precautionary principle and uses suitable assumptions (so that there is no need for further calculations) for application in the development planning and control context (see Table 4 of this paper - an extended version of table 13.1).

This table is recommended for development planning and control use.

Table 4 – Hazard to People Classification using Hazard Rating *(HR= d x (v + 0.5) + DF)* for (Source Table 13.1 of FD2320/TR2 - Extended version)

HR	Depth of flooding - d (m)												
	DF = 0.5				DF = 1								
Velocity - v (m/s)	0.05	0.10	0.20	0.25	0.30	0.40	0.50	0.60	0.80	1.00	1.50	2.00	2.50
0.0	0.03 + 0.5 = 0.53	0.05 + 0.5 = 0.55	0.10 + 0.5 = 0.60	0.13 + 0.5 = 0.63	0.15 + 1.0 = 1.15	0.20 + 1.0 = 1.20	0.25 + 1.0 = 1.25	0.30 + 1.0 = 1.30	0.40 + 1.0 = 1.40	0.50 + 1.0 = 1.50	0.75 + 1.0 = 1.75	1.00 + 1.0 = 2.00	1.25 + 1.0 = 2.25
0.1	0.03 + 0.5 = 0.53	0.06 + 0.5 = 0.56	0.12 + 0.5 = 0.62	0.15 + 0.5 = 0.65	0.18 + 1.0 = 1.18	0.24 + 1.0 = 1.24	0.30 + 1.0 = 1.30	0.36 + 1.0 = 1.36	0.48 + 1.0 = 1.48	0.60 + 1.0 = 1.60	0.90 + 1.0 = 1.90	1.20 + 1.0 = 2.20	1.50 + 1.0 = 2.55
0.3	0.04 + 0.5 = 0.54	0.08 + 0.5 = 0.58	0.15 + 0.5 = 0.65	0.19 + 0.5 = 0.69	0.23 + 1.0 = 1.23	0.30 + 1.0 = 1.30	0.38 + 1.0 = 1.38	0.45 + 1.0 = 1.45	0.60 + 1.0 = 1.60	0.75 + 1.0 = 1.75	1.13 + 1.0 = 2.13	1.50 + 1.0 = 2.50	1.88 + 1.0 = 2.88
0.5	0.05 + 0.5 = 0.55	0.10 + 0.5 = 0.60	0.20 + 0.5 = 0.70	0.25 + 0.5 = 0.75	0.30 + 1.0 = 1.30	0.40 + 1.0 = 1.40	0.50 + 1.0 = 1.50	0.60 + 1.0 = 1.60	0.80 + 1.0 = 1.80	1.00 + 1.0 = 2.00	1.50 + 1.0 = 2.50	2.00 + 1.0 = 3.00	2.50 + 1.0 = 3.50
1.0	0.08 + 0.5 = 0.58	0.15 + 0.5 = 0.65	0.30 + 0.5 = 0.80	0.38 + 0.5 = 0.88	0.45 + 1.0 = 1.45	0.60 + 1.0 = 1.60	0.75 + 1.0 = 1.75	0.90 + 1.0 = 1.90	1.20 + 1.0 = 2.20	1.50 + 1.0 = 2.50	2.25 + 1.0 = 3.25	3.00 + 1.0 = 4.00	3.75 + 1.0 = 4.75
1.5	0.10 + 0.5 = 0.60	0.20 + 0.5 = 0.70	0.40 + 0.5 = 0.90	0.50 + 0.5 = 1.00	0.60 + 1.0 = 1.60	0.80 + 1.0 = 1.80	1.00 + 1.0 = 2.00	1.20 + 1.0 = 2.20	1.60 + 1.0 = 2.60	2.00 + 1.0 = 3.00	3.00 + 1.0 = 4.00	4.00 + 1.0 = 5.00	5.00 + 1.0 = 6.00
2.0	0.13 + 0.5 = 0.63	0.25 + 0.5 = 0.75	0.50 + 0.5 = 1.00	0.63 + 0.5 = 1.13	0.75 + 1.0 = 1.75	1.00 + 1.0 = 2.00	1.25 + 1.0 = 2.25	1.50 + 1.0 = 2.50	2.00 + 1.0 = 3.00	3.50	4.75	6.00	7.25
2.5	0.15 + 0.5 = 0.65	0.30 + 0.5 = 0.80	0.60 + 0.5 = 1.10	0.75 + 0.5 = 1.25	0.90 + 1.0 = 1.90	1.20 + 1.0 = 2.20	1.50 + 1.0 = 2.50	1.80 + 1.0 = 2.80	3.40	4.00	5.50	7.00	8.50
3.0	0.18 + 0.5 = 0.68	0.35 + 0.5 = 0.85	0.70 + 0.5 = 1.20	0.88 + 0.5 = 1.38	1.05 + 1.0 = 2.05	1.40 + 1.0 = 2.40	1.75 + 1.0 = 2.75	3.10	3.80	4.50	6.25	8.00	9.75
3.5	0.20 + 0.5 = 0.70	0.40 + 0.5 = 0.90	0.80 + 0.5 = 1.30	1.00 + 0.5 = 1.50	1.20 + 1.0 = 2.20	1.60 + 1.0 = 2.60	3.00	3.40	4.20	5.00	7.00	9.00	11.00
4.0	0.23 + 0.5 = 0.73	0.45 + 0.5 = 0.95	0.90 + 0.5 = 1.40	1.13 + 0.5 = 1.63	1.35 + 1.0 = 2.35	1.80 + 1.0 = 2.80	3.25	3.70	4.60	5.50	7.75	10.00	12.25
4.5	0.25 + 0.5 = 0.75	0.50 + 0.5 = 1.00	1.00 + 0.5 = 1.50	1.25 + 0.5 = 1.75	1.50 + 1.0 = 2.50	2.00 + 1.0 = 3.00	3.50	4.00	5.00	6.00	8.50	11.00	13.50
5.0	0.28 + 0.5 = 0.78	0.60 + 0.5 = 1.10	1.10 + 0.5 = 1.60	1.38 + 0.5 = 1.88	1.65 + 1.0 = 2.65	3.20	3.75	4.30	5.40	6.50	9.25	12.00	14.75

Flood Hazard Rating (HR)	Colour Code	Hazard to People Classification
Less than 0.75		Very low hazard - Caution
0.75 to 1.25		Danger for some – includes children, the elderly and the infirm
1.25 to 2.0		Danger for most – includes the general public
More than 2.0		Danger for all – includes the emergency services

Appendix 6

Model Surface Water Drainage Statement

In order to provide the required information on surface water drainage from the proposed development this pro-forma must be completed in full and be submitted with any planning application which seeks permission for 'major' development. This information contained in this form will be used by Surrey Council in its role as Lead Local Flood Authority and 'statutory consultee' on SuDs for all 'major' planning applications. The pro-forma is supported by the Defra/EA Guidance on Rainfall Runoff Management and can be completed using freely available tools including SuDS Tools. The pro-forma should be considered alongside other supporting SuDS Guidance, but focuses on ensuring flood risk is not made worse elsewhere. The SuDS solution must operate effectively for as long as the development exists. This pro-forma is based upon current industry standard practice.

1. Site Details

Site	
Address & post code or LPA reference	
Grid reference	
Is the existing site developed or Greenfield?	
Total Site Area served by drainage system (excluding open space) (Ha)*	
Topographical survey plan showing existing site layout, site levels and drainage system	

***** The Greenfield runoff off rate from the development which is to be used for assessing the requirements for limiting discharge flow rates and attenuation storage from a site should be calculated for the area that forms the drainage network for the site whatever size of site and type of drainage technique. Please refer to the Rainfall Runoff Management document or CIRIA manual for detail on this.

2. Impermeable Area

	Existing	Proposed	Difference (Proposed-Existing)	Notes for developers & Local Authorities
Impermeable area (ha) **(areas to be shown on a plan)**				If the proposed amount of impermeable surface is greater, then runoff rates and volumes will increase. Section 6 must be filled in. If proposed impermeability is equal or less than existing, then section 6 can be skipped & section 7 filled in.
Drainage Method (infiltration/sewer/watercourse)			N/A	If different from the existing, please fill in section 3. If existing drainage is by infiltration and the proposed is not, discharge volumes may increase. Fill in section 6.

PPG Paragraph 080

3. Proposing to Discharge Surface Water via

	Yes	No	Evidence that this is possible	Notes for developers & Local Authorities
Existing and proposed micro-drainage calculations				**Please provide micro-drainage calculations of existing and proposed run-off rates and volumes in accordance with a recognised methodology or the results of a full infiltration test (see line below) if infiltration is proposed.**
Infiltration				e.g. soakage tests. Section 6 (infiltration) must be filled in if infiltration is proposed.
To watercourse				e.g. Is there a watercourse nearby? Please provide details of any watercourse to which the site drains including cross-sections of any adjacent water courses for appropriate distance upstream and downstream of the discharge point (as agreed with the LLFA and/or EA)
To surface water sewer				Confirmation from sewer provider that sufficient capacity exists for this connection.
Combination of above				e.g. part infiltration part discharge to sewer or watercourse. Provide evidence above.
Has the drainage proposal had regard to the SuDS hierarchy?				Evidence must be provided to demonstrate that the proposed Sustainable Drainage proposal has had regard to the SuDS hierarchy.
Layout plan showing where the sustainable drainage infrastructure will be located on site.				Please provide plan reference numbers showing the details of the site layout showing where the sustainable drainage infrastructure will be located on the site. If the development is to be constructed in phases this should be shown on a separate plan and confirmation should be provided that the sustainable drainage proposal for each phase can be constructed and can operate independently and is not reliant on any later phase of development.

Technical Standards S2 and S3

4. Peak Discharge Rates – This is the maximum flow rate at which surface water runoff leaves the site during a particular storm event.

	Existing Rates (l/s)	Proposed Rates (l/s)	Difference (l/s) (Proposed-Existing)	Notes for developers & Local Authorities
Greenfield QBAR		N/A	N/A	Mean annual Greenfield peak flow - QBAR is approx. 1 in 2 storm events. Use that figure in Section 7a.
1 in 1				Proposed discharge rates (with mitigation) should be no greater than existing rates for all corresponding storm events. e.g. discharging all flow from site at the existing 1 in 100 event increases flood risk during smaller events.
1 in 30				
1in 100				
1 in 100 plus climate change	N/A			To mitigate for climate change the proposed 1 in 100 +CC must be no greater than the existing 1 in 100 runoff rate. If not, flood risk increases under climate change. 30% should be added to the peak rainfall intensity.

Technical Standards S4 to S9

5. Calculate discharge volumes –The total volume of water leaving the development site for a particular rainfall event. Introducing new impermeable surfaces increases surface water runoff and may increase flood risk outside the development.

	Existing Volume (m^3)	Proposed Volume (m^3)	Difference (m^3) (Proposed-Existing)	Notes for developers & Local Authorities
1 in 1				Proposed discharge volumes (without mitigation) should be no greater than existing volumes for all corresponding storm events. Any increase in volume increases flood risk elsewhere. Where volumes are increased section 6 must be filled in.
1 in 30				
1in 100				
1 in 100 plus climate change				To mitigate for climate change the volume discharge from site must be no greater than the existing 1 in 100 storm event. If not, flood risk increases under climate change.

6. Calculate attenuation storage – In order to minimise the negative impact on flood risk resulting from increased volumes runoff from the proposed development, storage must be provided.

		Notes for developers & Local Authorities
Storage volume required to retain discharge rates as existing (m^3)		Volume of water to attenuate on site if discharging at existing rates. Can't be used where discharge volumes are increasing
Where will the storage be provided on site?		

7. How is Storm Water stored on site?

Storage is required for the additional volume from site but also for holding back water to slow down the rate from the site. This is known as attenuation storage and long term storage. The intention is to not discharge that volume into the watercourses so as not to increase flood risk elsewhere.

			Notes for developers & Local Authorities
Infiltration	**State the Site's Geology/drift material overlaying)**		Avoid infiltrating in made ground.
	Does the site have a high ground water table? Yes/No?		If yes, please provide details of the site's hydrology.
	Is the site within a known Source Protection Zones (SPZ)? Yes/No?		Infiltration rates are highly variable and refer to Environment Agency website to identify and source protection zones (SPZ)
	Are infiltration rates suitable?		Infiltration rates should be no lower than $1x10^{-6}$ m/s.
	Is the site contaminated? If yes, consider advice from others on whether infiltration can happen.		Water should not be infiltrated through land that is contaminated. The Environment Agency may provide bespoke advice in planning consultations for contaminated sites that should be considered.
	State the distance between a proposed infiltration device base and the ground water (GW) level		Need 1m (min) between the base of the infiltration device & the water table to protect Groundwater quality & ensure GW doesn't enter infiltration devices. Avoid infiltration where this isn't possible.
	Were infiltration rates obtained by desk study or infiltration test?		Infiltration rates can be estimated from desk studies at most stages of the planning system if a back-up attenuation scheme is provided.
Is infiltration feasible?	**Yes/No?**		If infiltration is not feasible how will the additional volume be stored?. The applicant should then consider the following options in the next section.

7a. Storage requirements

Where infiltration is not possible, then the developer must confirm that either of the two options below will ne implemented for dealing with the amount of water that needs to be stored on site.

Option 1 Simple – Store both the additional volume and attenuation volume in order to make a final discharge from site at **QBAR**. This is preferred if no infiltration can be made on site. This very simply satisfies the runoff rates and volume criteria.

Option 2 Complex – If some of the additional volume of water can be infiltrated back into the ground, the remainder can be discharged at a very low rate of 2 l/sec/hectare. A combined storage calculation using the partial permissible rate of 2 l/sec/hectare and the attenuation rate used to slow the runoff from site.

		Notes for developers & Local Authorities
Please confirm what option has been chosen and how much storage is required on site.		The developer at this stage should understand the site characteristics and be able to explain what the storage requirements are on site and how it will be achieved.

8. Additional Consideration to comply with the Technical Standards and PPG

		Notes for developers & Local Authorities
Which Drainage Systems measures have been used?		SUDS can be adapted for most situations even where infiltration isn't feasible e.g. impermeable liners beneath some SUDS devices allows treatment but not infiltration. See CIRIA SUDS Manual C697 or subsequent version (C753).
How will exceedance events be catered on site without increasing flood risks (both on site and outside the development)?		**Safely:** not causing property flooding or posing a hazard to site users i.e. no deeper than 300mm on roads/footpaths
How are rates being restricted?		Hydrobrakes to be used where rates are between 2l/s to 5l/s. Orifices not be used below 5l/s as the pipes may block. Pipes with flows < 2l/s are prone to blockage.
Drainage during construction period		Provide details of how drainage will be managed during the construction period including any necessary connections, impacts, diversions and erosion control.
Key Drainage components / Features		Which component if blocked (even partial) will lead to flooding?

Technical Standards S10 to S12

9. Management and Maintenance of SuDs

Details are required to be provided of the management and maintenance plan for the SUD, including for the individual plots in perpetuity.

How is the entire drainage system to be maintained in perpetuity?		Clear details of the maintenance proposals of all elements of the proposed drainage system must be provided to show that all parts of SuDs are effective and robust. Provide a management plan to describe the SUDS scheme and set out the management objectives for the site. It should consider how the SuDs will perform and develop over time anticipating any additional maintenance tasks to ensure the system continues to perform as designed. — Specification notes that describe how work is to be undertaken and the materials to be used. — A maintenance schedule describes what work is to be done and when it is to be done using frequency and performance requirements as appropriate. — A site plan showing maintenance areas, control points and outfalls. Responsibility for the management and maintenance of each element of the SUDS scheme will also need to be detailed within the Management Plan . Where open water is involved please provide a health and safety plan within the management plan.
Please confirm the owners/adopters of the entire drainage systems throughout the development. Please list all the owners.		If these are multiple owners then a drawing illustrating exactly what features will be within each owner's remit must be submitted with this Proforma. Please give details of each feature and how it will be managed in accordance with the details in the management plan.
Please provide details demonstrating that any third party agreements required using land outside the application site have been secured.		

The above form should be completed using evidence from information which should be appended to this form. The information being submitted should be proportionate to the site conditions, flood risks and magnitude of development. It should serve as a summary of the drainage proposals and should clearly show that the proposed discharge rate and volume as a result of development will not be increasing. Where there is an increase in discharge rate or volume, then the relevant section of this form must be completed with clear evidence demonstrating how the requirements will be met.

This form is completed using factual information and can be used as a summary of the surface water drainage strategy on this site.

Form Completed By…….....

Qualification of person responsible for signing off this pro-forma .....

Company……,.....

On behalf of (Client's details) .....

Date:…….....

Appendix 7

Organisation commenting:	Page number and/or Section/Paragraph number:	Comments:	Officer response:
001-Elmbridge Borough Council (EBC)	n/a	-No specific comments to make on the document. -EBC is committed to discharging its responsibilities under the Duty to Cooperate and seeks to engage with Runnymede Borough Council (RBC) on an on-going basis particularly in relation to strategic and cross boundary issues.	-Noted. -Noted
002-Spelthorne Borough Council (SBC)		There needs to be a consistent approach to addressing flood risk across the wider area and local authorities need to address flood risk issues in a holistic manner.	Agreed, it is considered that engagement between the Boroughs and Districts with the Environment Agency and Surrey County Council in their role as Lead Local Flood Authority in particular, will ensure that there is a degree of consistency being achieved in the updated SFRAs produced across the Lower Thames Area.
002-Spelthorne Borough Council (SBC)	Page 6 of executive summary and page 30 of main report Page 5 of the main report	At this stage Environment Agency's (EA) mapping of revised climate change allowances have not been made available. Given that these allowances are substantially greater than the 20% used in the report, there is the prospect at least of a much enlarges flood risk area for Lower Thames Authorities generally. As the SFRA is to inform the Sustainability Appraisal (SA), there is currently a serious gap in information for the SA to be properly informed and realistic plan options to be identified. EA has commissioned new modelling of the Thames from Hurley to Teddington, which is intended to be released in summer 2016. This	Point noted. The Council has sought advice on this point from the Environment Agency who has confirmed that they are happy with the text that the Council has included on climate change in the SFRA, particularly in chapter 4 (paras 4.23-4.35) and in the individual ward write ups in chapter 6 (see summary of response from EA in entry 006 below). The Council remains committed to updating its SFRA in the future if necessary once new climate change modelling is released by the EA. In this regard, it is understood that the new Lower Thames modelling that will support the River Thames Scheme (RTS) will have a model output containing the new climate change allowances. This modelling is anticipated to be released to Local Authorities in the Lower Thames area in Summer/Autumn 2017. The SFRA has been updated to reflect the anticipated release

		may have some impact on the precise flood risk areas shown in current mapping and would have to be reflected upon before any site options were considered.	date of the RTS modelling.
002-Spelthorne Borough Council (SBC)	Page 5: Exec summary	Definition of the functional floodplain. The NPPF (paragraph 100) and the PPG (7-002) refer to defining 'areas of flood risk'. The approach of excluding building footprints is very much a site-based approach which seems to be at odds with the national advice on 'areas'. Since 2006 SBC has always defined the functional flood plain as the 1:20 flood risk area and this was agreed with the EA. SBC do not exclude buildings from this, how individual buildings are subsequently dealt with is a matter for policy. The definition of the functional floodplain needs to be reconsidered to ensure consistency. The references in the former PPG 25 and its Practice Guide to support the RBC position are no longer relevant as the documents have been rescinded.	Comments noted. The definition of the functional floodplain has been produced in line with advice in the PPG which requires LPAs to produce their definitions in discussion with the Environment Agency and the lead local flood authority. Runnymede has followed this approach in the production of the definition in Runnymede. Furthermore Runnymede has sought to employ a similar approach to the definition of the functional floodplain as Elmbridge to ensure consistency in approach. The EA has also agreed the definition of the functional floodplain as set out in the Elmbridge SFRA which was published in June 2015; also post the adoption of the NPPF. Whilst the approach set out in the Spelthorne SFRA is noted, it is not considered to not be appropriate to bring Runnymede's definition in line with Spelthorne's given that the Spelthorne SFRA dates back to 2006 and is therefore potentially not compliant with the NPPF. The text referring to PPS25 has been deleted as suggested. Some new text has been added into the definition of the functional floodplain to confirm that the test of whether a site is developed or undeveloped will be carried out on a site by site basis.
002-Spelthorne Borough Council (SBC)	Page 10 Exec Summary- Chapter 8	Runnymede confirming acceptance of wet routes of escape is contrary to the Spelthorne approach. It is impossible in many situations to actually know how deep flood water is and what hidden hazards exist – particularly at night. Use of such routes is highly dangerous. The text makes reference to 'very low hazard' – it is our	This approach has been discussed and agreed with the Environment Agency during the preparation of its SFRA. The PPG confirms that limited depths of flooding along escape routes may be acceptable in some instances. Runnymede has, for a number of years, accepted a low risk of hazard for access and egress routes in some circumstances.

		understanding that the EA in their use of 'low hazard' and associated Flood Risk Hazard Mapping still recognise these are being unsuitable for children, elderly and infirmed.	
002-Spelthorne Borough Council (SBC)	Para 5.21-main report	Paragraph is misleadingly simplistic. The relationships between groundwater levels and river levels is very loose and groundwater levels adjust very slowly due to the rate at which water can percolate across areas with very limited hydrologic gradient. High levels of rainfall and consequent ground saturation can lead to flooding in areas outside of those at immediate risk of flooding.	The text in this paragraph has been amended to address this comment.
002-Spelthorne Borough Council (SBC)	Page 11, exec summary	SBC do not take account of existing and proposed underfloor floods in assessing the flood water capacity of a site and compensation. This is subject to their future management and certainty that they will function throughout the life of the building.	Approach of Spelthorne BC noted.
002-Spelthorne Borough Council (SBC)	Page 6 Main Report- Reference to work with Emergency Planners	The PPG-ID-7-009 requires authorities to determine the acceptability of flood risk in relation to emergency planning. It will be important for RBC not only to consider its capability to deal with flood emergencies but the cumulative impact of major floods across the Lower Thames. Also under consideration will be the impact of the scale of flooding and people impacted on the realistic capacity of emergency services. There is no explanation whether and how these wider impacts have been considered. This also has a bearing on assumptions of people walking through flood water and the emergency response this may often require.	Additional text has been added in to the Emergency Planning section in chapter 8 to address these points, following consultation with the Council's emergency planners.

002-Spelthorne Borough Council (SBC)		-SBC are happy to talk through comments further and would be pleased to join any future meetings with the EA due to the shared nature of problems experienced by Runnymede and Spelthorne. -SBC looks forward to further discussions under the Duty to Cooperate in the near future.	-Noted. Runnymede is happy to invite Spelthorne to any relevant meetings with the EA as it progresses its Local Plan evidence. -Agreed. Runnymede also looks forward to ongoing duty to cooperate discussions with Spelthorne on a range of issues.
003-Surrey County Council (SCC)		LLFA very much likes the approach of discussing flood risk by ward and particularly the suitability for SuDS.	Support for approach welcomed.
003-Surrey County Council (SCC)	-Page 4 of executive summary -Page 6 of executive summary -Page 8, bottom of page. Executive summary -Page 12 of executive summary	-'5-15 OAD should be 5-15m AOD' -Remove word surface from 1st sentence for clarity -Text reads 'it should be noted that the localised and site specific nature of these recorded flooding incidents does not lend to each incident being assessed in detail at the strategic level'. This needs clarification. -Insert text regarding Lead Local Flood Authority (LLFA). The LLFA can also provide information for site specific FRAs including information on the level of SW and GW risk and any recorded historic flood events and locally known wetspots.	-Amended -Amended. Amendment also made in para 5.21 in main body of report. -Text amended to provide clarification. Text also amended at para 5.44 of the main report. -Text added in executive summary and main body of report at para 9.11.
003-Surrey County Council (SCC)	Paragraph 1.7	Text reads 'it should be noted that Runnymede is one of the top 10 Local Authorities in England for flood risk 1' – this needs to be explained. How does flood risk 1 related to fz1-3? This needs clarification.	The 1 actually refers to the footnote at the bottom of the page not flood zone 1. The footnote symbol has been corrected to provide clarification.

003-Surrey County Council (SCC)	P13, para 2.11 P13, para 2.12	-Statement also applies to non-major: 'The current requirement in national policy that all new developments in areas at risk of flooding should give priority to the use of sustainable drainage systems will continue to apply' -Insert major before planning applications in sentence one	-Amendment to text made at para 2.13 in line with this suggestion. -Text amended as suggested
003-Surrey County Council (SCC)	Page 22, para 3.17	-Suggested amendments to text as follows: Subsidiary to the main rivers there is a network of ordinary watercourses that drain into them. Figure 8 shows the detailed river network in Runnymede which includes the locations of the ordinary watercourses which have been mapped. There is also a network of roadside ditches, which either connect into the watercourse system or soak into the ground water. The responsibility for these ditches generally belongs to the adjacent landowner but come under the supervision of Surrey County Council in its capacity as the local highway authority or as LLFA.	Text amended as suggested
003-Surrey County Council (SCC)	Page 144, G13-Sustainable drainage systems	Mentions SAB: perhaps suggest striking through as this is explained in s 8.67 maybe a footnote?	Text amended in G13 as suggested, and also in para referred to (now para 8.69)
003-Surrey County Council (SCC)	Para 8.67	Water quality aspects are contained within Water Framework Directive (WFD) requirements/ considerations which are a duty placed on all councils including Local Planning Authorities.	Text amended in line with suggestion.
003-Surrey County Council (SCC)	Page 194	Not all the appendices have a title. Add in the full title for each appendix.	Titles have been added to each of the appendices.
003-Surrey County Council	Map comments	-OS copyright date on the figures varies from 2013 to 2016. Can this be changed to 2016?	Amended as suggested

(SCC)		-The OS copyright statements have changed. Please refer to the OS website for more information. -EA data – please refer to the copyright notices supplied with the data. Many of these are now open government license.	For the OS copyright, the below link indicates that the wording used by the Council is fit for purpose (under 'What if there is not enough room?'). https://www.ordnancesurvey.co.uk/business-and-government/help-and-support/public-sector/guidance/acknowledgments.html#ack-paper Therefore, no changes are proposed The Council is of the opinion that the copyright text being used is fit for purpose to encompass all EA related data
003-Surrey County Council (SCC)	Figure 3 Figures 4 and 5 Figure 8 Figure 17 Figure 20	-The data source should be stated on each map. What is the height data, LiDAR? And associated copyright? -Figures 5 and 6 display the BGS bedrock and superficial deposits by rock type (lithology) not be the usual convention of formation (age). Is there a reason for this? Please refer to http://www.bgs.ac.uk/ipr/ for copyright information. -The detailed river network lines are all the same colour. Should the EA symbology be used – Main River and ordinary watercourses? -No copyright text for Susceptibility to Groundwater. Requires info from BGS, e.g. EBC has a copyright statement from the BGS. -Risk of flooding from Reservoirs. Can you check with the EA on the licence.	This data is from the OS Land-Form PANORAMA product which is supplied by OS, therefore relates to the OS copyright which is on the map. This is how the data is displayed on the BGS's online web map viewer (by rock type) and as such has been used on the maps. The copyright has been taken from the BGS which appears to be correct. (It is figures 4 and 5, not 5 and 6). Figure 8 has been amended accordingly. This is data from the EA and not the BGS (it has the relevant EA copyright). RBC has checked with the EA who has confirmed that the licence information on the reservoir map is correct and acknowledges use of EA data.

	Figure 23 Figure 26	-SuDS data requires the BGS copyright -Can the River Thames Scheme be referenced in the figure	Map updated to include copyright information Amended as requested
004-Thames Water (TW)	Page 13 and 164	- Basement developments by their subterranean nature can be vulnerable to internal sewer flooding. In order to protect new basement developments from the risk of sewer flooding it is recommended that wastewater from such developments is pumped into the sewerage network. As such TW requests that there is a requirement for new basement developments to incorporate positive pumped devices. - It is considered that reference should be made to the need for positive pumped devices within the SFRA and that the requirement should be incorporate into any new planning policy relating to basement development as part of the new Local Plan.	Additional text has been added into the SFRA to address this point. The suggestion regarding the wording of the Council's flooding policy will be considered during the course of the policy development work which will occur in of 2017. Draft wording for the flooding policy/policies will be circulated to Thames Water and other relevant partners during Summer 2017 for informal comment prior to the Council's regulation 19 consultation which is scheduled to occur in Autumn 2017.
005-Natural England (NE)	N/a	- NE does not consider that this draft Runnymede SFRA (level 1 report) poses any likely risk or opportunity in relation to our statutory purpose, and so does not wish to comment on this consultation.	-Comments noted
006-Environment Agency (EA)	Missing information	Previously mentioned some of the partnership projects that the EA are involved in (Wey Diffuse Pollution project, Wey Forward project and Catchment Partnership Action Fund habitat	Text added to address this point

		improvement projects). All of these projects are aimed at addressing WFD failures and although it's not necessarily relevant to mention these projects specifically in this document, there is definitely potential to align flood alleviation and WFD objectives by working in partnership. Suggests expansion of paragraph 2.36 to explain how proposals can be aligned.	
006-Environment Agency (EA)	Executive summary-overview of fluvial flood risk, page 3 and 23 risks in Runnymede (Chapter 4) & 4.3	"The ditches in the Egham Hythe to Chertsey area therefore not only present a risk of flooding due to local rainstorms but also from flood water backup from the main rivers." The Mead Lake ditch is a main river in this area and is affected by the Thames when it is high. Suggest changing main rivers at the end of the sentence to the Thames/Chertsey Bourne to reduce confusion.	Change made as suggested
006-Environment Agency (EA)	EXECUTIVE SUMMARY - Overview of fluvial flood risks in Runnymede (Chapter 4) & Table 7, P4 & P32	"Land with an annual probability of flooding of 5% (1 in 20 year) <u>associated with the main rivers</u> in the Borough" Underlined text not needed What is we have flood outlines for ordinary watercourses, would you still want this to be classed as functional floodplain? This should be for all watercourse not just main rivers	Text deleted as suggested.
006-Environment Agency (EA)	EXECUTIVE SUMMARY - Overview of fluvial flood risks in Runnymede (Chapter 4), p6 and p28 para 4.20	States "1% AP + climate change flood models provided by the Environment Agency". This should be 1 in 100 (plus 20% on river flows) to not confuse the new climate change guidance.	Text amended as suggested
006-Environment Agency (EA)	EXECUTIVE SUMMARY - Other sources of	**Flood Map for Surface Water (uFMfSW)** is displayed online as Risk of Flooding from Surface Water. We will soon be change the name of the	Change made throughout document as suggested.

	Flooding (chapter 5), p7, p39 para 5.8, P54 onwards-all ward write ups	map internally and on geostore to match this. I would suggest changing the name in the document as well. It will still be the same data just a different name	
006-Environment Agency (EA)	Para 1.5, page 5	Due to delays in the project the Thames modelling from Hurley to Teddington is now expected in early 2017	At the date of the publication of the SFRA, this date has now been moved back to Summer/Autumn 2017 and as such the text in the SFRA has been amended accordingly.
006-Environment Agency (EA)	Para 2.11, p13	Typo – sentence starts with “In On”...	Typo corrected
006-Environment Agency (EA)	Pare 2.16, p13	Thank you for adding a section on WFD. Please could you add a phrase so that this sentence reads “In October 2000 'Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy', in short the Water Framework Directive (WFD), was adopted and came into force in December 2000.”	Text amended as suggested
006-Environment Agency (EA)	Pare 2.16, p13	At the end of this paragraph add “Where this has not been possible and subject to the criteria set out in the Directive, the aim is to now achieve good status by 2021 or 2027.” IEP probably have more to add on the WFD section as not sure it reads quite right? WFD also aims to prevent deterioration in the status of surface waters and groundwater. For heavily modified and artificial water bodies, the aim is to achieve good ecological potential and good surface water chemical status.	Text added as suggested
006-Environment Agency (EA)	Para 2.32, p17	Following the consultation, flood risk management plans have been finalised and were published in March 2016. They highlight the hazards and risks of flooding from rivers, the sea,	Text amended to reflect updated position

		surface water, groundwater and reservoirs, and set out how Risk Management Authorities (RMAs) work together with communities to manage flood risk.	
006-Environment Agency (EA)	Para 4.10 and 4.11, p25	Do not think that this accurately reflects the EAs flood forecasting predictions. At Staines the highest level was achieved on the afternoon of the 11th Feb which was maintained into much of the 12th. So the predictions of the 12-13 were pretty accurate, the severe flood warning was issued on the 9th of Feb in advance of the highest levels, not in response to it.	Text amended to address comments
006-Environment Agency (EA)	P28-30 Climate change	I think this is a good summary/links to the new climate change guidance.	Support for approach welcomed.
006-Environment Agency (EA)	P30, table 6	Is this table needed as it is not referred to in the text?	Table now referenced in text so table retained.
006-Environment Agency (EA)	P37, para 4.44	In April we changed from flood defence consents to Environmental permitting. Therefore the sentences below are no longer correct: "Furthermore, under the terms of the Water Resources Act 1991, and the Land Drainage Byelaws 1981, the prior written consent of the Environment Agency is required for any proposed works or structures, in, under, over or within 8 metres of the top of the bank of a main river. In normal circumstances the presumption will be against building work taking place within this buffer zone." Please use the following paragraph: Furthermore, under the terms of the Environmental Permitting (England and Wales) (Amendment) (No. 2)	Text amended as suggested.

		Regulations 2016, the prior written consent of the Environment Agency is required for any proposed works or structures, in, under, over or within 8 metres of the top of the bank of a main river. Some activities are also now excluded or exempt. An environmental permit is in addition to and a separate process from obtaining planning permission. Further details and guidance are available on the GOV.UK website: https://www.gov.uk/guidance/flood-riskactivities- environmental-permits	
006-Environment Agency (EA)	P37, para 4.45	Change "flood defence consent" to "environmental permit for flood risk activities"	Text amended as suggested
006-Environment Agency (EA)	P45, table 11	Still reference to South East region and North East Thames.	References deleted
006-Environment Agency (EA)	From P53, All ward sections – Climate change	I am happy with what you have outlined in the climate change section with reference to the new guidance.	Support for wording welcomed.
006-Environment Agency (EA)	P69, flood warning areas	The Flood Warning Area 'Chertsey Bourne at Thorpe Green' is not in this ward so should be removed.	Text amended as suggested.
006-Environment Agency (EA)	P80, Egham Town	Main Rivers - Ripley Springs watercourse is a main river within the ward	Text amended as suggested.
006-Environment Agency (EA)	P87, flood warning areas	Looks like this ward just touches the 'River Thames at Staines and Egham' Flood Warning Area so this should be added.	Text amended as suggested.
006-Environment Agency (EA)	P111, flood warning areas	States 'Chertsey Bourne'. This is not the name of a flood warning area and needs to be removed.	Text amended as suggested.

006-Environment Agency (EA)	P132, paras 8.23 and 8.24	Has the route of safe access and egress for the Chertsey dry island been assessed again? This has not been assessed according the new climate change guidance. I would suggest this is reviewed to see if this is still suitable. When we have the new Lower Thames modelling we will have the model output with the new climate change allowances, however this won't be available to the public until early 2017 but we should be able to supply it to RBC in Autumn 2016. I understand you can't wait for this information before finalising the SFRA but whether you would be able to make an amendment when the data is available. The Lower Thames model will cover the Thames and Chertsey Bourne.	The Council is committed to reassessing this route once the Environment Agency has issued its anticipated Lower Thames modelling which is understood to include layers for the current climate change allowances. It is understood that this modelling is to be issued in Summer/Autumn 2017. The safe route of access and egress will be plotted at figure 25 and included in the SFRA once this modelling has been received and analysed by the Council.
006-Environment Agency (EA)	P139, table 14	Row on wetland ponds needs re-wording as doesn't make sense.	Text amended to address comment
006-Environment Agency (EA)	P148, para 8.83	Wildlife friendly design specifications should be provided for newly created attenuation ponds, including variable bank profiles, water depths and islands/inlets to encourage a diversity of plants and other wildlife.	Text added as suggested
006-Environment Agency (EA)	P152, para 8.108	Thank you for incorporating our comments on culverts. It's probably worth expanding on who would be responsible for these activities, e.g. survey of watercourse structures that may provide a pinch point and exacerbate flooding. Where activities such as removing/adapting structures and addressing land use management provide benefits for both flood alleviation and WFD, opportunities should be sought to align efforts/objectives – reference Wey Landscape	Comments noted, however the Council considers that the existing text is sufficient.

		Partnership.	
006-Environment Agency (EA)	P161 and 162	Spelling mistake: “culvers” should read “culverts”	Typos corrected
006-Environment Agency (EA)	Figure 8-Detailed River Network	Penton Hook weir is missed off the map	Confirmed with the Environment Agency that the relevant figure is figure 9. Penton Hook Marina is shown on this figure. As such no change has been made.
006-Environment Agency (EA)	Figure 24	Could not be found	This figure can be found on page 122 of the SFRA main document and is entitled ‘Application of the Sequential Test for Local Plan preparation (Paragraph: 021 Reference ID: 7-021-20140306 from the PPG)’
006-Environment Agency (EA)	Appendix 1	Chapter 4 outlines models and flood extents you have used to produce the SFRA. You have outlines that there are “1 in 100 (plus CC) Flood Extent”. Please change this to “1 in 100 (plus 20% on river flows) Flood Extent”. This will reduce confusion with the new climate change guidance. Description of Figure 12 and climate change section also outlines 1 in 100 + climate change however this is 1 in 100 (plus 20% on river flows).	Text amended as suggested.
007-Surrey Wildlife Trust (SWT) (submitted on behalf of the Surrey Nature Partnership (SNP))	Page 17-18 Paragraphs 2.33-2.36	Reference to the Thames River Basin District Management Plan. Mention might also be made here of the individual Management Catchments implicated in the plan (ie. two; Wey & tributaries, and Maidenhead & Sunbury). Reference could also be made to Defra’s Catchment-based Approach (CaBA) towards implementation of RBMPs; hence the formation of ‘CaBA Partnerships’; and then to the existence of the Wey Landscape Partnership (WLP), being the major catchment relevant to Runnymede and hosted/led by the Surrey Wildlife Trust. Runnymede BC is a partner of the WLP, as are	Additional text added at these paragraphs to address the points raised.

		several functions of Surrey County Council including as Lead Local Flood Authority. WLP is presently developing its interaction with local flood forums, and is championing natural approaches to flood risk alleviation through floodplain habitat restoration and also via SuDS with its local authority partners.	
007-Surrey Wildlife Trust (SWT) (submitted on behalf of the Surrey Nature Partnership (SNP))	Chapter 4, paragraphs 4.36-4.41, Runnymede Flood Zone 3b (functional floodplain	We welcome and support the statement in para. 4.40; "There may also be opportunities to reinstate areas which can operate as functional floodplain through redevelopment to provide space for flood water and to reduce risk to new and existing development.", and later in Table 7. "Increasing floodplain storage capacity and creating space for flooding to occur by restoring functional floodplain". The Surrey Nature Partnership has recently produced a guidance document to Biodiversity Opportunity Areas (BOA) in Surrey, which collectively represent the spatial planning of a landscape-scale biodiversity conservation strategy for the county. Runnymede borough contains eight BOA in whole or in part, including R04 River Wey (& tributaries), and R06 River Thames (tow-path & islands), the boundaries of which effectively align with their respective Flood Zones 3. All BOA have a set of objectives and targets to 2020, including for restoration and creation of 'priority' (ie. NERC Act S.41) habitats. Floodplain reinstatement is an obvious major opportunity for achievement of such targets in respect of the functional floodplains of the Rivers Wey and Thames.	Additional text added at para 4.39 to address the points made about BOA.

007-Surrey Wildlife Trust (SWT) (submitted on behalf of the Surrey Nature Partnership (SNP))		The Surrey Wildlife Trust has been asked to represent the environmental NGO sector on the wider consultative panel set-up to inform the Environment Agency's proposed River Thames Scheme. We have attended various meetings and events on this to date. From these we are aware that there exist various concerns around potential impacts on protected biodiversity sites (for example Thorpe Hay Meadow SSSI); alongside significant opportunities for the restoration/ creation of priority habitats, as well as the recovery of priority species.	Comments noted.

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