Tunbridge Wells Borough Council

Level 1 Strategic Flood Risk Assessment (SFRA)

Tunbridge Wells Borough Council

Level 2 Strategic Flood Risk Assessment (SFRA)

Summary

This document provides two separate reports:

1. **Level 1 SFRA**: work commissioned by Tunbridge Wells Borough Council to prepare a Level 1 Strategic Flood Risk Assessment covering its administrative area.
2. **Level 2 SFRA**: work commissioned by Tunbridge Wells Borough Council to prepare a Level 2 Strategic Flood Risk Assessment for its administrative area.

Both reports have been presented within this one document as there are links between the two stages of SFRA and so this approach improves user interaction with the documents.

The Level 1 SFRA is presented first, followed by the Level 2 SFRA. Links to each report are provided below. The Level 1 SFRA has separate documents provided as digital appendices which should be referred to, whilst the Appendix to the Level 2 SFRA is embedded within the document.

Link to Level 1 SFRA

Link to Level 2 SFRA

Tunbridge Wells Borough Council

Level 1 Strategic Flood Risk Assessment

Final Report

July 2019

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Revision History

Revision Ref / Date Issued	Amendments	Issued to
Draft v1 / December 2016	Draft report sections 1-4 and 5-11 (certain sub-sections are omitted where data is yet to be supplied/agreed)	Sarah Lowe (Tunbridge Wells Borough Council)
Draft v2 / January 2018	Updated missing report sections now flood risk mapping outputs for fluvial present day and climate change zones have been agreed	Sharon Evans (Tunbridge Wells Borough Council)
Draft v3 / March 2019	Updated flood risk mapping for Paddock Wood, and updated to represent the latest flood risk policies	Sharon Evans (Tunbridge Wells Borough Council)
Draft v4 / April 2019	Updated following comments received from the council on 27 March 2019 and 16 April 2019	Sharon Evans (Tunbridge Wells Borough Council)
Draft v5 / June 2019	Updated following comments received from the council on 14 May 2019	Sharon Evans (Tunbridge Wells Borough Council)
Final v6 / July 2019	Updated following comments received from the council on 20 June 2019	Sharon Evans (Tunbridge Wells Borough Council)

Contract

This report describes work commissioned by Tunbridge Wells Borough Council. The Council's representative for the contract was Sharon Evans. Aaron Barber, Kristie Darling and Ben Gibson of JBA Consulting carried out this work.

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Purpose

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Executive Summary

Introduction

This Strategic Flood Risk Assessment (SFRA) 2019 document replaces the Level 1 SFRA update previously published by Tunbridge Wells Borough Council in 2007, and the Level 2 SFRA previously published by Tunbridge Wells Borough Council in 2009. The main purpose of the SFRA is to inform selection of options for Local Plan allocations and support determination of planning applications.

SFRA objectives

The key objectives of the SFRA are:

- To provide up to date information and guidance on flood risk for Tunbridge Wells Borough, considering the latest flood risk information and the current state of national planning policy
- To determine the variations in risk from all sources of flooding in Tunbridge Wells Borough
- Identify the requirements for site-specific flood risk assessments
- Determine the acceptability of flood risk in relation to emergency planning capability
- Consider opportunities to reduce flood risk to existing communities and developments

SFRA outputs

Level 1 outputs

- Assessment of all potential sources of flooding
- Mapping of location and extent of functional floodplain
- Assessment of standard of protection provided by existing flood risk management infrastructure
- Assessment of the potential impact of climate change on flood risk
- Assessment of locations where additional development may increase flood risk elsewhere
- Identification of critical drainage areas and recommendations on potential need for Surface Water Management Plans
- Recommendations of the criteria that should be used to assess future development proposals and the development of a Sequential Test and sequential approach to flood risk.
- Guidance for developers including requirements for site specific flood risk assessments and the process for flood map challenges.
- A suite of maps has been produced for the Level 1 SFRA:
    - Appendix A: Grid square references for A3 appendix maps
    - Appendix B: Watercourses in Tunbridge Wells Borough
    - Appendix C: Flood Zones (present day)
    - Appendix D: Climate change fluvial flood risk mapping (future Flood Zone 3a)
    - Appendix E: Surface water flood risk mapping
    - Appendix F: Groundwater emergence susceptibility mapping
    - Appendix G: Flood warning coverage
    - Appendix H: Historic flood records

Summary of Level 1 Assessment

Sources of flood risk

- Flood history shows that Tunbridge Wells Borough has been subject to flooding from several sources of flood risk, with the principal risk from fluvial and pluvial sources.
- The key watercourses flowing through the study area are the River Medway and its tributaries, including the River Teise, Southborough Stream, Greggs Wood Stream, and Paddock Wood Stream. Other watercourses that flow through the borough but are not tributaries of the Medway, include the River Rother and Kent Ditch. The majority of fluvial

flood risk within the borough is associated with these watercourses, however issues with the insufficient capacity of Ordinary Watercourses has also been highlighted.

- The primary fluvial flood risk within the borough is associated with the River Medway and its main tributaries e.g. the Teise and Beult. Records show that the Medway has overtopped its banks during several major recorded flood events.
- Tunbridge Wells Borough has experienced several historic surface water flood events, often associated with heavy rainfall overloading carriageways and drains. However, records also indicate that flooding within the borough has also occurred because of blocked drains and gullies, and also run-off from adjacent agricultural land.
- Understanding of groundwater flooding within the borough is limited, however the Tunbridge Wells Surface Water Management Plan (SWMP) along with records provided by Kent County Council identify areas known to have been affected by groundwater flooding in the past, including Speldhurst Road which is known as a drainage hotspot due to the location of a nearby spring.
- Numerous sewer related flood events are noted to have occurred within Tunbridge Wells Borough, mainly within Tunbridge Wells town and Paddock Wood. The overloading of foul and/or sewer systems has mainly caused these events. The DG5 register managed by Southern Water records these historical sewer flooding events.
- There are five reservoirs located within the borough and ten additional reservoirs located outside of the borough that have the potential to inundate parts of the borough following breach or failure. In the National Inundation Reservoir Mapping (NRIM) study, worst-case inundation extents as a result of reservoir breach show central and northern extents of the borough to be most affected.

Key policies

There are several relevant regional and local key policies which have been considered within the SFRA, such as, the Tunbridge Wells Surface Water Management Plan (SWMP), Paddock Wood Surface Water Management Plan (SWMP), the Preliminary Flood Risk Assessment (PFRA), Kent Local Flood Risk Management Strategy (LFRMS), and the Emergency Flood Plan for Tunbridge Wells Borough Council. Other policy considerations have also been incorporated, such as sustainable development principles, climate change and flood risk management.

Development and flood risk

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

Defences

A high-level review of existing flood defences was undertaken which found formal defences in the study area along parts of the River Rother (Environment Agency maintained), Southborough Stream (privately maintained) and Alder Stream (maintained by Tunbridge Wells Borough Council). Defences consist of embankments with the majority providing protection against a 20% AEP event. Leigh Flood Storage Area embankment (maintained and operated by the Environment Agency) also extends a short distance into the very north west of the borough.

Recommendations

Assessing Flood Risk and Developments

- The NPPF supports a risk-based and sequential approach to development and flood risk in England, so that development is located in the lowest flood risk areas where possible; it is recommended that this approach is adopted for all future developments within the borough.
- A site-specific FRA is required for all developments which are located in the Environment Agency's Flood Zones 2 and 3, or developments greater than 1 ha in size in Flood Zone 1. They are also required for developments less than 1 ha in Flood Zone 1 where there is a change in use to a more vulnerable development where they could be affected by sources of flooding other than rivers and the sea (e.g. surface water drains, reservoirs). All developments located in areas of Flood Zone 1 highlighted as having critical drainage problems must also be accompanied by an FRA. The FRA should be proportionate to the degree of flood risk, as well as the scale, nature and location of the development.

- It is recommended that the impact of climate change to a proposed site is considered in FRAs and that the percentage increases which relate to the proposed lifetime of the development and the vulnerability classification of the development are identified and taken into account. The Environment Agency and LLFA should be consulted to confirm a suitable approach to climate change in light of the latest guidance.
- Opportunities to reduce flood risk to wider communities could be sought through the regeneration of brownfield sites, through reductions in the amount of surface water runoff generated on a site.
- The Local Planning Authority (LPA), Environment Agency and LLFA should be consulted to confirm the level of assessment required and to provide information on any known local issues.
- When assessing sites not identified in the Local Plan (windfall sites), developers should use evidence provided in this SFRA to apply the Sequential Test, augmented as appropriate by site specific flood risk evidence as well as provide evidence to show that they have adequately considered other reasonably available sites.
- As noted above a Sequential risk based approach has been adopted to the preparation of the Level 1 SFRA. The relatively extensive areas of land available for potential housing development in Zones 1 and 2 has made it possible to align the selection of housing land when performing the Sequential Test so all potential new housing sites can be located on land outside of the high-risk Flood Zone. Where potential housing sites are shown to comprise some land in a high-risk Flood Zone, proposed development will only be allowed to take place on land zoned as medium or low risk, and if appropriate any supplementary housing will be located on land immediately adjacent to the housing site on land in a medium or low risk Zone.

Future developments

Development must seek opportunities to reduce overall levels of flood risk at the site, for example by:

- Reducing volume and rate of surface water runoff based on Local Plan policy and LLFA Guidance
- Locating development to areas with lower flood risk
- Creating space for flooding.
- Integrating green infrastructure into mitigation measures for surface water runoff from potential development and consider using Flood Zones 2 and 3 as public open space.

The LPA should consult the NPPF and Environment Agency's 'Flood Risk Standing Advice (FRSA) for Local Planning Authorities', published in March 2014, when reviewing planning applications for proposed developments at risk of flooding.
At the planning application stage, developers may need to undertake more detailed hydrological and hydraulic assessments of the watercourses to verify flood extent (including latest climate change allowances) inform development zoning within the site and prove, if required, whether the Sequential and Exception Tests can be passed.

Promotion of SuDS

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

- A detailed site-specific assessment of SuDS would be needed to incorporate SuDS successfully into the development proposals. New or re-development should adopt source control SuDS techniques to reduce the risk of frequent low impact flooding due to post-development runoff.
- For proposed developments, it is imperative that a site-specific infiltration test is conducted early on as part of the design of the development, to confirm whether the water table is low enough to allow for SuDS techniques that are designed to encourage infiltration.
- Where sites lie within or close to Groundwater Source Protection Zones or aquifers, there may be a requirement for a form of pre-treatment prior to infiltration. Further guidance can be found in the CIRIA SuDS manual on the level of water quality treatment required for drainage via infiltration. Further restrictions may still be applicable, and guidance should be sought from the LLFA.

- Developers need to ensure that new development does not increase the surface water runoff rate from the site and should therefore contact the LLFA and other key stakeholders at an early stage to ensure surface water management is undertaken and that SuDS are designed, promoted and, implemented to overcome site-specific constraints.
- The LPA will need to consider drainage schemes for major applications, but it is advised developers utilise the LLFA's Polices and Guidance to develop their drainage scheme for minor applications.

Additionally, Sewers for Adoption (8th Edition) for England and Wales is due to be published and adopted in 2019, which provides detailed guidance for developers, designers and constructors on how to design and build foul and surface water sewerage systems to a standard such that they will be adopted by water companies, under section 104 of the Water Industry Act.

Sewers for Adoption 8 (SfA8) recognises the roles of the various Risk Management Authorities with responsibilities for surface water management, and the expectation within the NPPF that SuDS be implemented, as a first preference, for all developments. It therefore widens the definition of what can be defined as adoptable sewers, allowing for the adoption of SuDS components including swales, rills, bioretention systems, ponds, wetlands, basins, tanks, infiltration trenches and soakaways.

Therefore, consideration should be given from the earliest stage of a Surface Water Drainage Strategy and Flood Risk Assessment as to whether site SuDS will be offered for adoption by the water company. Additionally, there will be an increased need to engage with the water company when preparing surface water drainage strategies.

Infrastructure and Access

Safe access and egress

Safe access and egress will need to be demonstrated at all development sites; the development should be above the 1 in 100 annual probability (1% AEP) flood level, plus an allowance for climate change, and emergency vehicular access should be possible during times of flood. Finished Floor Levels should be above the 1% AEP flood level, plus an allowance for climate change.

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

Green Infrastructure and WFD

Opportunities to enhance green infrastructure and reduce flood risk by making space for water should be sought. In addition, opportunities where it may be possible to improve the WFD status of watercourses, for example by opening culverts, weir removal, and river restoration, should be considered. Green infrastructure should be considered within the mitigation measures for surface water runoff from development.

Technical recommendations

It is important to recognise that the SFRA has been developed using the best available information at the time of preparation. This relates both to the current risk of flooding from rivers, and the potential impacts of future climate change.

The Environment Agency regularly reviews their flood risk mapping, and it is important that they are approached to determine whether updated (more accurate) information is available prior to commencing a site-specific FRA.

The SFRA should be **periodically updated** when new information on flood risk, flood warning or new planning guidance or legislation becomes available. New information on flood risk may be provided by Tunbridge Wells Borough Council, Kent County Council (in its role as LLFA), the Highways Authority, Southern Water, and the Environment Agency. It is recommended that the SFRA is reviewed internally on an annual basis, allowing a cycle of review, followed by checking with the above bodies for any new information to allow a periodic update.

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Using this document

Hyperlinks

Hyperlinks have been provided where there are useful reference points. These are shown as **green bold text.**

Contents, list of figures, list of tables and references to other sections, figures and tables have also been hyperlinked to enable easy navigation around the report.

Abbreviations and Glossary of Terms

Term	Definition
AEP	Annual Exceedance Probability
AStGWF	Areas Susceptible to Groundwater Flooding
Brownfield	Previously developed parcel of land
CC	Climate change - Long term variations in global temperature and weather patterns caused by natural and human actions.
CFMP	Catchment Flood Management Plan- A high-level planning strategy through which the Environment Agency works with their key decision makers within a river catchment to identify and agree policies to secure the long-term sustainable management of flood risk.
CIRIA	Construction Industry Research and Information Association
Defra	Department for Environment, Food and Rural Affairs
DG5 Register	A water-company held register of properties which have experienced sewer flooding due to hydraulic overload, or properties which are 'at risk' of sewer flooding more frequently than once in 20 years.
EA	Environment Agency
EU	European Union
FEH	Flood Estimation Handbook
Flood defence	Infrastructure used to protect an area against floods as floodwalls and embankments; they are designed to a specific standard of protection (design standard).
Flood Risk Area	An area determined as having a significant risk of flooding in accordance with guidance published by Defra and WAG (Welsh Assembly Government).
Flood Risk Regulations	Transposition of the EU Floods Directive into UK law. The EU Floods Directive is a piece of European Community (EC) legislation to specifically address flood risk by prescribing a common framework for its measurement and management.
Fluvial Flooding	Flooding resulting from water levels exceeding the bank level of a main river
FRA	Flood Risk Assessment - A site specific assessment of all forms of flood risk to the site and the impact of development of the site to flood risk in the area.
FRMP	Flood Risk Management Plan
Greenfield	Undeveloped parcel of land
Ha	Hectare
Indicative Flood Risk Area	Nationally identified flood risk areas, based on the definition of 'significant' flood risk described by Defra and WAG.
JBA	Jeremy Benn Associates
LFRMS	Local Food Risk Management Strategy
LLFA	Lead Local Flood Authority - Local Authority responsible for taking the lead on local flood risk management
LPA	Local Planning Authority
m AOD	metres Above Ordnance Datum
Main River	A watercourse shown as such on the Main River Map, and for which the Environment Agency has responsibilities and powers
NPPF	National Planning Policy Framework
Ordinary Watercourse	All watercourses that are not designated Main River. Local Authorities or, where they exist, IDBs have similar permissive powers as the Environment Agency in relation to flood defence work. However, the riparian owner has the responsibility of maintenance.
PFRA	Preliminary Flood Risk Assessment
Pluvial flooding	Flooding as a result of high intensity rainfall when water is ponding or flowing over the ground surface (surface runoff) before it enters the underground drainage network or watercourse, or cannot enter it because the network is full to capacity.
PPG	National Planning Policy Guidance

Term	Definition
Resilience Measures	Measures designed to reduce the impact of water that enters property and businesses; could include measures such as raising electrical appliances.
Resistance Measures	Measures designed to keep flood water out of properties and businesses; could include flood guards for example.
Risk	In flood risk management, risk is defined as a product of the probability or likelihood of a flood occurring, and the consequence of the flood.
Return Period	Is an estimate of the interval of time between events of a certain intensity or size, in this instance it refers to flood events. It is a statistical measurement denoting the average recurrence interval over an extended period of time.
RoFSW	Risk of Flooding from Surface Water
Sewer flooding	Flooding caused by a blockage or overflowing in a sewer or urban drainage system.
SHELAA	Strategic Housing and Employment Land Availability Assessment - The Strategic Housing Land Availability Assessment (SHELAA) is a technical piece of evidence to support local plans and Sites & Policies Development Plan Documents (DPDs). Its purpose is to demonstrate that there is a supply of housing land in the borough which is suitable and deliverable.
SFRA	Strategic Flood Risk Assessment
SIRF	Sewer Incidence Report Form. A Southern Water database containing recorded incidences of hydraulic overload of the sewer system.
Stakeholder	A person or organisation affected by the problem or solution, or interested in the problem or solution. They can be individuals or organisations, includes the public and communities.
SuDS	Sustainable Drainage Systems - Methods of management practices and control structures that are designed to drain surface water in a more sustainable manner than some conventional techniques
Surface water flooding	Flooding as a result of surface water runoff as a result of high intensity rainfall when water is ponding or flowing over the ground surface before it enters the underground drainage network or watercourse, or cannot enter it because the network is full to capacity, thus causing what is known as pluvial flooding.
SWIMS	Severe Weather Impacts Monitoring System
SWMP	Surface Water Management Plan - The SWMP plan should outline the preferred surface water management strategy and identify the actions, timescales and responsibilities of each partner. It is the principal output from the SWMP study.
TWBC	Tunbridge Wells Borough Council
WFD	Water Framework Directive

1 Introduction

1.1 Purpose of the Strategic Flood Risk Assessment

> ***"Inappropriate development in areas at risk of flooding should be avoided by directing development away from areas at highest risk (whether existing or future). Where development is necessary in such areas, the development should be made safe for its lifetime without increasing flood risk elsewhere."*** (National Planning Policy Framework, paragraph 155).
>
> ***Strategic policies should be informed by a strategic flood risk assessment, and should manage flood risk from all sources. They should consider cumulative impacts in, or affecting, local areas susceptible to flooding, and take account of advice from the Environment Agency and other relevant flood risk management authorities, such as lead local flood authorities and internal drainage boards."*** (National Planning Policy Framework, paragraph 156).

This Strategic Flood Risk Assessment (SFRA) 2019 document replaces the Level 1 SFRA originally published by Tunbridge Wells Borough Council in November 2007. The main purpose of the SFRA update is to provide the appropriate supporting evidence for the emerging Local Plan.

The 2019 SFRA update will be used to inform the location of future development and the preparation of sustainable policies for the long-term management of flood risk.

1.2 SFRA objectives

The key objectives of the 2019 SFRA update are:

1. To take into account the latest flood risk policy

There is a need to update the assessment with reference to the following key changes to policy and guidance that have occurred since the 2007 SFRA was published:

- Changes to legislation, both relating to flood risk and planning policy, including the Flood Risk Regulations (2009), Flood and Water Management Act (2010), the National Planning Policy Framework (NPPF) (2012), the Localism Act (2011) and the Climate Change Act (2008); and powers and responsibilities bestowed on Kent County Council as the Lead Local Flood Authority (LLFA) under the Flood and Water Management Act (2010) and their dependencies therefore with the Council's local development and forward planning roles.
- Recent guidance published in April 2015 regarding the role of LLFAs, Local Planning Authorities and the Environment Agency with regards to SuDS approval.
- Changes to technical guidance, for example the Consultation on SuDS Regulations and Standards (2011), Defra's non-statutory technical standards for sustainable drainage systems (March 2015), and NPPF Planning Practice Guidance, CIRIA SuDS Manual C753 (2015)
- Climate change allowances for flood risk assessments released by the Environment Agency in February 2016

2. Take into account the latest flood risk information and available data

A number of changes to available data have occurred, including:

- Fluvial flood risk modelling of Paddock Wood prepared specifically for this SFRA (referred to as Paddock Wood fluvial modelling, 2019). Refer to section 6.4.1 for a summary of the modelling prepared.
- Availability of the Environment Agency's updated flood risk modelling of the fluvial River Medway (2015)
- Kent County Council Local Flood Risk Management Strategy (2013)
- Tunbridge Wells Surface Water Management Plan (2013)
- Paddock Wood Surface Water Management Plan (2011)
- Availability of the Risk of Flooding from Surface Water (RoFSW) dataset
- Availability of the Areas Susceptible to Groundwater Flooding (AStGWF)

3. To provide individual flood risk analysis for sites identified by the Council as part of their Local Plan preparation.

The new Local Plan will set out the Council's spatial strategy to help guide and manage future development in the most sustainable way. Under this Level 1 assessment, high-level screening of potential sites against flood risk information has been summarised to enable Tunbridge Wells Borough Council to better understand flood risk at sites within the borough. These 472 sites were produced partly from the Council's 'Call for Sites' exercise which first ran from the 9 February 2016 to the 18 September 2016. A second Call for Sites was carried out at the same time as the Local Plan Issues and Options consultation in 2017. Additionally, a number of "late sites" were also submitted outside of the formal Call for Sites periods[1]. If sites are pursued which have flood risk constraints identified through the Level 1 SFRA, then a detailed assessment will be required as part of a Level 2 SFRA.

4. To provide a comprehensive set of maps including, but not limited to

- Fluvial flood risk, including functional floodplain and climate change;
- Surface water risk;
- Groundwater risk; and
- Flood warning coverage.

1.3 Levels of SFRA

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

- Level 1: 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.
- Level 2: where land outside Flood Zones 2 and 3 cannot appropriately accommodate all the necessary development creating the need to apply the NPPF's Exception Test. In these circumstances the assessment should consider the detailed nature of the flood characteristics within a Flood Zone and assessment of other sources of flooding.

This report fulfils the requirements of a Level 1 SFRA.

1.4 SFRA outputs

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

- Assessment of all potential sources of flooding
- Updated review of historical flooding incidents.
- Mapping of location and extent of functional floodplain.
- Assessment of the standard of protection provided by existing flood risk management infrastructure.
- Assessment of the potential impact of climate change on flood risk.
- Assessment of the impact of future large-scale developments both within and outside the Tunbridge Wells Borough.
- Assessment of existing flood warning and emergency planning procedures (including safe access and egress during an extreme event).
- Recommendations of the criteria that should be used to assess future development proposals and the development of a Sequential Test and sequential approach to flood risk.
- High-level screening of proposed development sites against flood risk information.

[1] The number of additional sites (56) reflects the number which the council have received at the time of finalising the final SFRA (15 April 2019). The council made use of the SFRA flood risk datasets to assess these sites in the same manner as those which came forward as part of the Call for Sites processes. Further sites may continue to be received by the council that are not presented within the SFRA.

1.5 Consultation

The following parties (external to Tunbridge Wells Borough Council) have been consulted during the preparation of this SFRA:

- Environment Agency
- Kent County Council
- Southern Water
- Upper Medway Internal Drainage Board

1.6 Use of SFRA data

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

SFRAs should be a 'living document', and as a result should be updated when new information on flood risk, new planning guidance or legislation becomes available. New information on flood risk may be provided by Tunbridge Wells Borough Council, the Highways Authority, Kent County Council, IDBs, Southern Water and the Environment Agency. Such information may be in the form of:

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

The Environment Agency regularly reviews their flood risk mapping, and it is important that they are approached to determine whether updated information is available prior to commencing a detailed Flood Risk Assessment. It is recommended that the SFRA is reviewed regularly so that the latest data is still represented in the SFRA, allowing a cycle of review and a review of any updated data by checking with the above bodies for any new information.

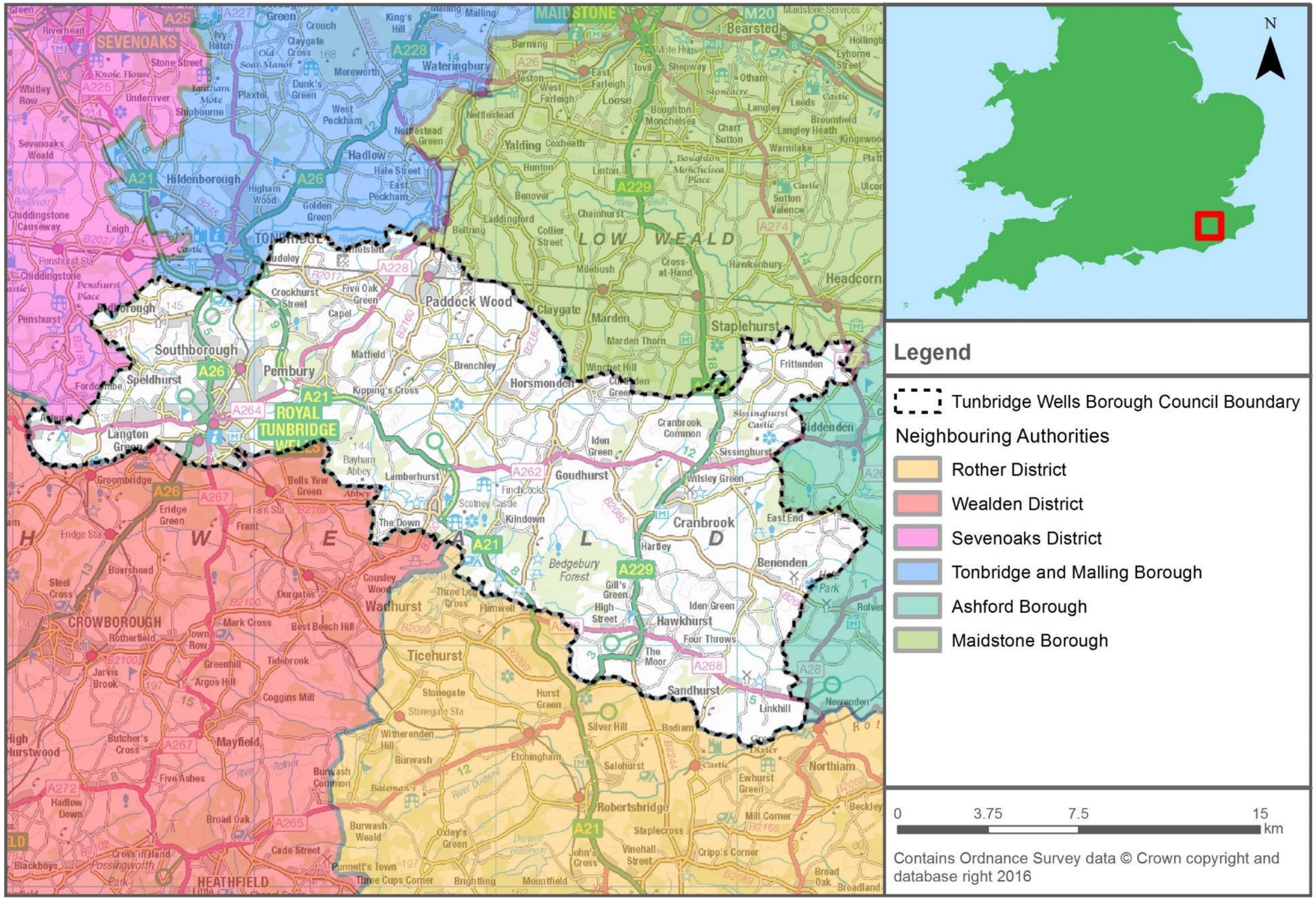
1.7 SFRA user guide

Table 1-1: SFRA report contents

Section	Contents
1. Introduction	Provides a background to the study, defines objectives, outlines the approach adopted and the consultation performed.
2. The Planning Framework and Flood Risk Policy	Includes information on the implications of recent changes to planning and flood risk policies and legislation, as well as documents relevant to the study.
Level 1 Strategic Flood Risk Assessment	
3. The sequential, risk based approach	Describes the Sequential Approach and application of Sequential and Exception Tests.
4. Sources of information used in preparing the SFRA	Outlines what information has been used in the preparation of the SFRA
5. Climate change	Outlines climate change guidance and the implications for the SFRA area.
6. Understanding flood risk in Tunbridge Wells Borough	Introduces the assessment of flood risk and provides an overview of the characteristics of flooding affecting the borough. Provides a summary of responses that can be made to flood risk, together with policy and institutional issues that should be considered.
7. Flood defences	Assessment of residual risk from flood defences, including future protection from climate change.

Section	Contents
8. FRA requirements and guidance for developers	Identifies the scope of the assessments that must be submitted in FRAs supporting applications for new development. Provides guidance for developers and outlines conditions set by the LLFA that should be followed.
9. Surface water management and SuDS	Advice on managing surface water run-off and flooding
10. Flood warning and emergency planning	Outlines the flood warning service in the Tunbridge Wells Borough and provides advice for emergency planning, evacuation plans and safe access and egress.
11. Strategic flood risk solutions	Summary of strategic flood risk solutions.
12. Development management recommendations	Sets out recommendations for considering and assessing flood risk in Tunbridge Wells Borough
13. Level 1 assessment of potential development sites	Summarise the flood risk from all sources to all sites supplied by Tunbridge Wells Borough for assessment in the SFRA. Outlines considerations for taking forward sites to the Level 2 assessment.
Summary and recommendations	
14. Summary	Reviews Level 1 SFRA and provides recommendations
Appendices	
Appendix A: Grid square references for A3 appendix maps	Index squares and codes for A3 grid mapping of the borough
Appendix B: Watercourses	Locations of Main Rivers and Ordinary Watercourses within the borough
Appendix C: Flood Zones (present day)	Present day Flood Zones within the borough
Appendix D: Climate change fluvial flood risk mapping (future Flood Zone 3a)	Flood Zone 3a predicted using the Higher Central and Upper End allowances for the 2080s across the borough.
Appendix E: Surface water flood risk mapping	Present day surface water flood risk: Risk of Flooding from Surface Water (RoFSW) dataset
Appendix F: Groundwater emergence susceptibility mapping	Areas Susceptible to Groundwater Flooding dataset.
Appendix G: Flood warning coverage	The extent of the Environment Agency's Flood Warning Areas service.
Appendix H: Historic flood records	Historic flood records across the borough up to 2016.

Figure 1-1: Tunbridge Wells Borough and neighbouring authorities



2 The Planning Framework and Flood Risk Policy

2.1 Introduction

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

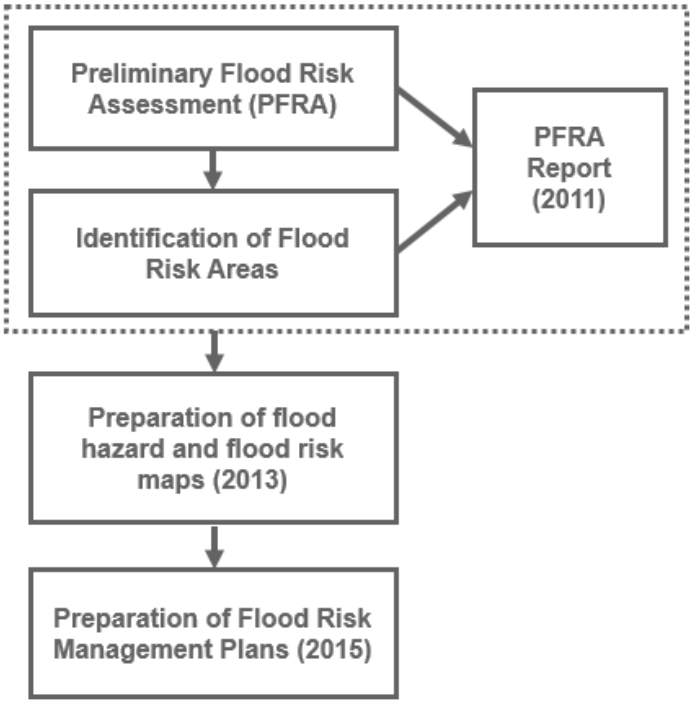
2.2 Flood Risk Regulations (2009) and Flood and Water Management Act (2010)

2.2.1 Flood Risk Regulations, 2009

The Flood Risk Regulations (2009) translate the current EU Floods Directive into UK law and place responsibility upon Lead Local Flood Authorities (LLFAs) to manage localised flood risk. Under the Regulations, the responsibility for flooding from rivers, the sea and reservoirs lies with the Environment Agency. However, responsibility for local and all other sources of flooding rests with LLFAs. Details on the responsibilities of LLFAs is provided in Sections 2.2.4 to 2.2.6.

Figure 2-1 illustrates the steps that were initially taken to implement the requirements of the EU Directive in the UK via the Flood Risk Regulations. The Regulations established a process that is repeated on a six-year cycle.

Figure 2-1: Flood Risk Regulation Requirements



2.2.2 Preliminary Flood Risk Assessments (PFRAs)

Under this action plan and in accordance with the Regulations, LLFAs initially had the task of preparing a Preliminary Flood Risk Assessment (PFRA) report. This exercise is then repeated on a six year cycle.

PFRAs report on significant past and future flooding from all sources except from Main Rivers and reservoirs, which are covered by the Environment Agency, and sub-standard performance of the adopted sewer network (covered under the remit of Southern Water). The PFRA is a high-level screening exercise and considers floods which have significant harmful consequences for human health, economic activity, the environment and cultural heritage.

The **PFRA document** that covers the borough was first published by Kent County Council in 2011.

The Regulations require the LLFA to identify significant Flood Risk Areas. The threshold for designating significant flood Risk Areas is defined by Defra and the PFRA is the process by which these locations can be identified. Of the ten national indicative Flood Risk Areas that were identified by the Defra/Environment Agency, none encroach on the administrative area of Tunbridge Wells Borough Council and the indicative designations have been accepted.

A further **review of preliminary flood risk assessments** was completed by Kent County Council in 2017 and no Flood Risk Areas were identified for the borough and indeed county as a whole.

2.2.3 Flood Risk Management Plans (FRMPs)

Under the Regulations the Environment Agency exercised an 'Exception' and did not prepare a PFRA for risk from rivers, reservoirs and the sea. Instead they had to prepare and publish hazard and risk mapping and an FRMP. The FRMP summarises flooding affecting the area and describes the measures to be taken to address the risk in accordance with the Flood Risk Regulations. The final **Thames River Basin District Flood Risk Management Plan** (FRMP) was issued in March 2016 and covers the period of 2015 to 2021[2]. The FRMP draws on previous policies and actions identified in Catchment Flood Management Plans (Section 2.5) and also incorporates information from Local Flood Risk Management Strategies (Section 2.2.5).

2.2.4 Flood and Water Management Act (2010)

The Flood and Water Management Act (2010)[3] implements some of Sir Michael Pitt's recommendations following his review of the 2007 floods and aims to create a simpler and more effective means of managing both flood risk and coastal erosion.

Duties for LLFAs established under the Act include:

- Local Flood Risk Management Strategy (LFRMS): LLFAs must develop, maintain, apply and monitor an LFRMS to outline how they will manage flood risk, identify areas vulnerable to flooding and target resources where they are needed most.
- Flood Investigations: When appropriate and necessary, LLFAs must investigate and report on flooding incidents (Section 19 investigations).
- Register of Flood Risk Features: LLFAs must establish and maintain a register of structures or features which, in their opinion, are likely to have a significant effect on flood risk in the LLFA area.
- Designation of Features: LLFAs may exercise powers to designate structures and features that affect flood risk, requiring the owner to seek consent from the authority to alter, remove or replace it.
- Consenting: When appropriate LLFAs will perform consenting of works on Ordinary Watercourses.

The Flood and Water Management Act also provides new arrangements for reservoir safety and aims to update the Reservoirs Act 1975 by including a provision to reduce the capacity of reservoir regulation from 25,000m^3 to 10,000m^3. Phase 1 of the update was implemented in July 2013 and required large raised reservoirs to be registered to allow the Environment Agency to categorise whether they are 'high risk' or 'not high risk'. Although enacted in Northern Ireland and Wales, a second phase of revising the volume of reservoirs which falls under the Act classification is yet to be enacted in England, so the 25,000m^3 volume criteria remains[4].

2.2.5 Kent Local Flood Risk Management Strategy 2017-2023

Kent County Council has developed a Local Flood Risk Management Strategy (LFRMS) under the Act, in consultation with local partners. This Strategy acts as the basis and discharge of duty for flood risk management co-ordinated by Kent County Council.

Kent County Council is responsible for developing, maintaining, applying and monitoring the **LFRMS** for Kent, which covers the Tunbridge Wells Borough. The latest version of the LFRMS, 2017-2023, was distributed for consultation during 2017 and Kent County Council published the final version in December 2017[5]. The Strategy is used as a means by which the LLFA co-ordinates

[2] Environment Agency, (March, 2016), Thames River Basin District Flood Risk Management Plan 2015 to 2021
[3] Flood and Water Management Act (2010)
[4] Environment Agency, (September, 2013), Frequently Asked Questions: Changes to reservoir safety legislation
[5] https://consultations.kent.gov.uk/consult.ti/LocalFloodRiskManagementStrategy/consultationHome

flood risk management on a day to day basis. The Strategy also sets measures to manage local flood risk i.e. flood risk from surface water, groundwater and Ordinary Watercourses.

The objectives of the study are:

1. Understanding flood risk in Kent, and sharing with partners.
2. Reducing the risk of flooding, through partnership working and delivery of cost-effective flood risk management projects.
3. To facilitate resilient planning, so that flood risks are effectively managed.
4. Empowering individuals and communities to increase resilience to flooding, by providing appropriate data and information to understand flood risk, how it is managed, and by whom.

Tunbridge Wells town has been identified as a priority area within the county to focus on. Key flood risk management issues identified include flood events in 2015, 2017 and 2018 causing flooding to the town centre and other areas of the town. In some instances, including at Tunbridge Wells, **specific flood investigation reports** have been prepared by Kent County Council. Kent County Council will work with partners to understand the causes of these floods and identify opportunities to reduce the risk,

The Strategy also sets out an action plan of how the LLFA intends to achieve these objectives. The Strategy should be updated regularly or when key triggers are activated. An example of a key trigger would be issues such as amendments to partner responsibilities, updates to legislation, alterations in the nature or understanding of flood risk or a significant flood event.

2.2.6 LLFAs, surface water and SuDS

On 18 December 2014 a Written Ministerial Statement laid by the Secretary of State for Communities and Local Government set out changes to the planning process that would apply for major development from 6 April 2015. When considering planning applications, Local Planning Authorities should consult the LLFA on the management of surface water in order to satisfy that:

- the proposed minimum standards of operation are appropriate, and
- there are clear arrangements in place for ongoing maintenance over the lifetime of the development, through the use of planning conditions or obligations

In March 2015, the LLFA was made a statutory consultee which came into effect on 15 April 2015. As a result, Kent County Council, will be required to provide technical advice on surface water drainage strategies and designs put forward for new major developments.

Major developments are defined as

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

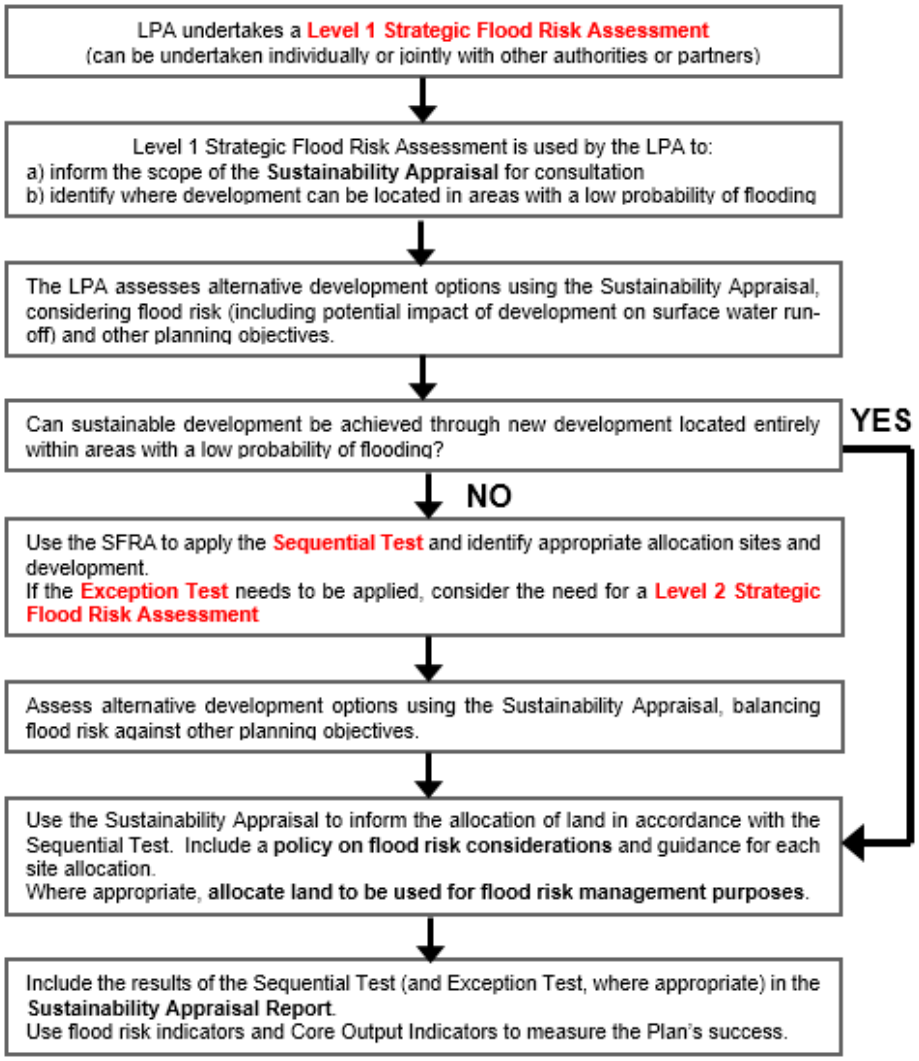
Surface water management and SuDS is described further in Section 9.

2.3 National Planning Policy Framework and Guidance

The **Revised National Planning Policy Framework** (NPPF)[6] was issued in July 2018, and updated in February 2019, as an update to the NPPF 2012, which replaced the previous documentation as part of reforms to make the planning system less complex and more accessible, and to protect the environment and promote sustainable growth. It replaces most of the Planning Policy Guidance Notes (PPGs) and Planning Policy Statements (PPSs) that were referred to in the previous version of the SFRA. The NPPF is a source of guidance for local planning authorities to help them prepare Local Plans and for applicants preparing planning submissions. The **National Planning Practice Guidance** (NPPG) was published in March 2014, updated in July 2018, and sets out how the NPPF should be implemented. The NPPG for Flood Risk and Coastal Change advises on how planning can account for the risks associated with flooding and coastal change in plan making and the application process. It sets out Flood Zones, the appropriate land uses for each zone, flood risk assessment requirements, including the Sequential and Exception Tests, and the policy aims for developers and authorities regarding each Flood Zone. Further details on Flood Zones and associated policy is provided in Table 3-1 and throughout this report. The Sequential and Exception Tests are covered in greater detail in Sections 3.3.1 and 3.3.2 respectively.

A description of how flood risk should be considered in the preparation of Local Plans is outlined in Diagram 1 contained within the Planning Practice Guidance.

Figure 2-2: Flood risk and the preparation of Local Plans†



† Diagram 1 of NPPF Planning Practice Guidance: Flood Risk and Coastal Change (paragraph 004, Reference ID: 7-004-20140306) March 2014

[6] National Planning Policy Framework (Department for Communities and Local Government, March 2012)

2.4 Surface Water Management Plans

Surface Water Management Plans (SWMPs) outline the preferred surface water management strategy in a given location. SWMPs are undertaken by LLFAs in consultation with key local partners who are responsible for surface water management and drainage in their area. They are produced to understand the flood risks that arise from local flooding.

SWMPs establish a long-term action plan to manage surface water in a particular area and are intended to influence future capital investment, drainage maintenance, public engagement and understanding, land-use planning, emergency planning and future developments.

Three SWMPs have been undertaken that cover all, or part of, the study area. The outcomes and actions from each of these SWMPs should be considered in the context of proposed developments within the area of Tunbridge Wells Borough.

2.4.1 Tunbridge Wells Borough Stage 1 SWMP (2013)

The **Tunbridge Wells Stage 1 SWMP[7] (2013)** was conducted by Kent County as part of their remit for the strategic oversight of local flood risk management in Kent. Given that Tunbridge Wells was identified as an area potentially at risk of local flooding within the PFRA, the SWMP aimed to determine whether there are any local flood risks and what further work would be needed within the study area.

The SWMP identified a range of recommended actions to reduce flood risk across the study area. A generic SWMP Action Plan was also established which collates all information included within the SWMP study and:

- Outlines the actions required, where and how they should be undertaken;
- Sets out which partner or stakeholder is responsible for implementing the actions and who will support them;
- Provides indicative costs; and
- Identifies priorities within the study area.

The SWMP also established a Location Specific Action Plan for the following locations:

- Tunbridge Wells
- Tunbridge Wells Rural West
- Tunbridge Wells Rural East
- Five Oak Green

2.4.2 Paddock Wood Stage 1 SWMP (2011) and Stage 2 SWMP (2015)

Paddock Wood is an area that has experienced a number of incidents of surface water flooding associated with small watercourses, sewerage and private drainage systems. It was recommended within the Tunbridge Wells Borough Council Level 2 SFRA (2009) that Paddock Wood be designated as an 'area of critical drainage'. However, formal adoption of Paddock Wood as a Critical Drainage Area did not occur. To better assess the local flooding issue, the **Paddock Wood Stage 1 SWMP[8] (2011)** was conducted to provide a more detailed understanding of local flood risk in the study area. This was extended to a **Stage 2 SWMP assessment (2015)[9]**.

As part of the Stage 1 SWMP, an options assessment was undertaken to identify, shortlist and assess a series of structural and non-structural measures for mitigating surface water flooding across Paddock Wood. Based on the outcomes of the assessment, a range of recommended actions were identified, and an Action Plan was established. It is noted that actions are not specific to individual development sites, but the prioritisation of actions would be affected by any future potential housing allocations.

The Stage 2 SWMP built on this analysis and prepared a Flood Alleviation study which involved hydraulic modelling of the watercourses, public surface water sewers and surface water drainage of the town of Paddock Wood in Kent. A shortlist of options to mitigate flooding in Paddock Wood was developed and tested within the hydraulic model. The model results were then used to

[7] JBA Consulting, (October 2013), Tunbridge Wells Stage 1 Surface Water Management Plan Final Report
[8] JBA Consulting, (December, 2011), Paddock Wood Surface Water Management Plan [Stage 1] Final Report
[9] JacksonHyder, (April, 2015), Paddock Wood Flood Alleviation Study

undertake an economic appraisal of the shortlisted options, leading to preferred options. Several of these were reported to have a robust cost benefit that would justify capital investment. The Stage 2 SWMP notes that susceptibility of flooding in Paddock Wood is influenced by the existing surface water network being at capacity and the SWMP recommends that any development should seek ways to allow the existing network to discharge without adding to it. It further explains that new development, regeneration (e.g. improvements to commercial road) or changes to existing impermeable areas should seek every opportunity to reduce surface water entering the existing system. SuDS such as bio-retention structure (tree pits, rain gardens) and attenuation features (ponds and swales) should be considered. The two highest contributing factors to flooding are reported to be the overland flows that affect residential properties in the north west and north east and the ability of the surface water network to discharge into the watercourses. The SWMP makes particular comment regarding certain features which influence flood risk in Paddock Wood. These are summarised below (taken from section 6 of the SWMP).

- Culverts: Flow through culverts under the railway is mainly controlled by downstream water levels.
- Surface water and local watercourses: Flow out of the surface water system is restricted when water levels in the watercourses are high, this is especially relevant to flood risk in the areas of Allington Road and Dimmock Close.
- Development: Development should avoid placing obstructions to natural flow routes, unless they are a designed attenuation feature. Development should not be allowed to increase flows to the existing water network (this includes watercourses) and should look at ways to alleviate existing flood risk by holding water back from the water courses, including taking every opportunity to promote sustainable forms of drainage.

2.5 Catchment Flood Management Plans

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

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

The six national policies are:

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

2.5.1 River Medway CFMP (2009)

The borough is covered by the **River Medway CFMP**[10]. The primary policy units for Tunbridge Wells are:

- Sub Area 1: Upper catchment
- Sub Area 6: Teise
- Sub Area 7: Beult

[10] Environment Agency, (December 2009), River Medway Catchment Flood Management Plan

These sub areas are all covered by Policy Option 3, which is for areas of low to moderate flood risk where the Environment Agency are generally managing existing flood risk effectively. A range of proposed actions have been outlined to implement the preferred approach in each sub area.

The CFMP provides a starting point for measures being considered strategically to manage flood risk within its area. To that end, an important consideration of the NPPF for Tunbridge Wells Borough relates to safeguarding land from development that is required for current and future flood management.

2.6 Water Framework Directive (WFD)

In England, the Environment Agency is responsible for the delivery of the WFD objectives and has therefore produced River Basin Management Plans describing how the WDS will be achieved. All waterbodies have to achieve a Good Ecological Status (GES) or Good Ecological Potential (GEP) by a set deadline.

Future development should ensure there is no adverse impact on the quality of watercourses within the borough council . Opportunities to improve the status of watercourses should also be considered. Example restoration options which could be considered are structure removal and/or modification and re-naturalisation.

2.6.1 Flood Risk Management Plans

The Thames River Basin District Flood Risk Management Plan (FRMP) 2015-2021 (2016) describes the risk of flooding from rivers, seas, surface water, groundwater and reservoirs to part of the borough. It sets out how risk management authorities will work with communities to manage flood and coastal risk over the next six years.

Tunbridge Wells also lies within the Medway Flood Risk Management Plan Catchment, and flood risk within the catchment is interdependent, but primary risk of flooding is caused by fluvial, surface water and to a lesser extent, groundwater. Tidal flooding impacts the lower Medway catchment, downstream of Maidstone.

FRMPs are aligned with River Basin Management Plans (RBMPs) as part of the WFD.

2.6.2 River Basin Management Plans

River Basin Management Plans (RBMPs) are prepared under the Water Framework Directive (WFD) and assess the pressure facing the water environment in River Basin Districts. Part of Tunbridge Wells borough falls within the Thames River Basin District RBMP, and part within the Medway Management Catchment.

The purpose of the Thames RBMP is to provide a framework for protecting and enhancing the benefits provided by the water environment. The priority river basin management issues to tackle in the Medway catchment are physical modifications to the river, water quality and water flows and availability.

2.7 Association of British Insurers Guidance on Insurance and Planning in Flood Risk Areas for Local Planning Authorities in England

The Association of British Insurers (ABI) and the National Flood Forum have published guidance for Local Authorities with regards to planning in flood risk areas[11]. The guidance aims to assist Local Authorities in England in producing local plans and dealing with planning applications in flood risk areas. The guidance complements the National Planning Policy Framework. The key recommendations from the guidance are:

- Ensure strong relationships with technical experts on flood risk.
- Consider flooding from all sources, taking account of climate change.
- Take potential impacts on drainage infrastructure seriously.
- Ensure that flood risk is mitigated to acceptable levels for proposed developments.
- Make sure Local Plans take account of all relevant costs and are regularly reviewed.

[11] Guidance on Insurance and Planning in Flood Risk Areas for Local Planning Authorities in England (Association of British Insurers and National Flood Forum, April 2012)

2.8 Implications for Tunbridge Wells

The responsibilities under the Flood and Water Management Act 2010 and the Flood Risk Regulations 2009 are summarised in Table 2-1.

Table 2-1: Roles and responsibilities in Tunbridge Wells Borough

Risk Management Authority (RMA)	Strategic Level	Operational Level
Environment Agency	National Statutory Strategy Reporting and supervision (overview role)	• Preliminary Flood Risk Assessment (per River Basin District)* • Managing flooding from main rivers and reservoirs and communication flood risk warnings to the public, media and partner organisations. • Identifying Significant Flood Risk Area* • Preparation of Flood Risk and Hazard Maps • Preparation of Flood Risk Management Plan • Enforcement authority for Reservoirs Act 1975 • Managing RFCCs and supporting funding decisions, working with LLFAs and communities. • Emergency planning and multi-agency flood plans, developed by local resilience forums
Lead Local Flood Authority (Kent County Council)	Input to National Strategy. Formulate and implement Local Flood Risk Management Strategy.	• Responsible for enforcing and consenting works for Ordinary Watercourses, risk assessing Ordinary Watercourses. • Managing local sources of flooding from surface water runoff and groundwater and carrying out practical works to manage flood risk from these sources where necessary. • Preparing and publishing a PFRA • Identifying Flood Risk Areas • Preparing Flood Hazard and Flood Risk Maps • Preparing Flood Risk Management Plans (where local flood risk is significant) • Investigating certain incidents of flooding in Section 19 Flood Investigations • Statutory roles in planning for surface water drainage. • Keeping asset registers of structures and features which have a significant effect on local flood risk. • Acting consistently with LFRMS in realising FRM activity and have due regard in the discharge of other functions of the strategy
Local Planning Authority (Tunbridge Wells Borough Council)	Input to National and Local Authority Plans and Strategy (e.g. Tunbridge Wells Local Plan – to develop a spatial strategy for growth within the area which accounts for flood risk)	• Preparation of a Local Plan to guide development. • The competent determining authority for planning applications and have the ultimate decision on the suitability of a site in relation to flood risk and management of surface water run-off. • Responsibilities for emergency planning as a responder to a flood event. • Own and manage public spaces which can potentially be used for flood risk management.

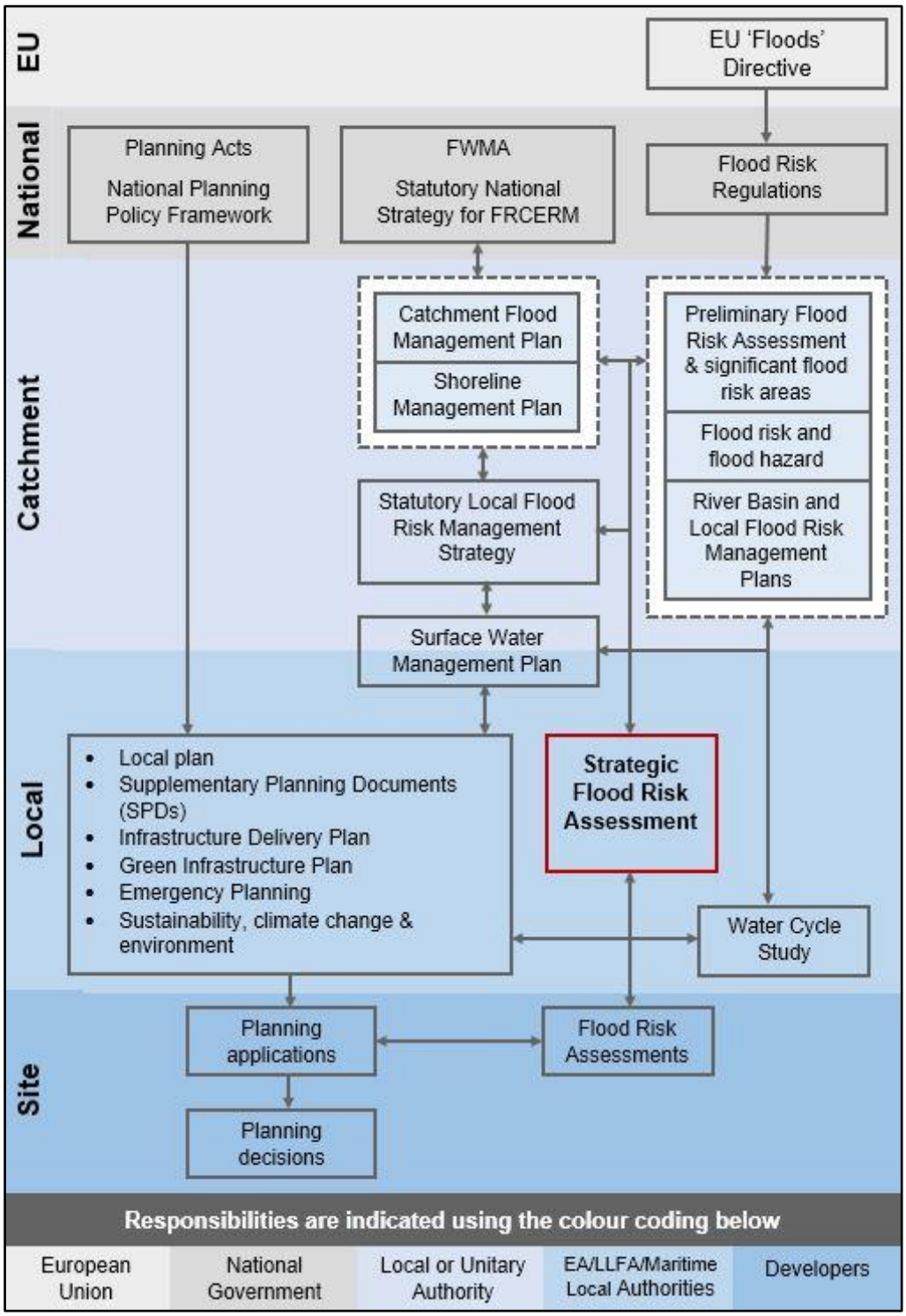
Risk Management Authority (RMA)	Strategic Level	Operational Level
Internal Drainage Board (Upper Medway Internal Drainage Board)	Input to Local Authority Plans and Strategy (e.g. Tunbridge Wells Local Plan).	• Support the delivery og the Government's policy aims and objectives for the management of flood risk and water levels. • Encourage the provision of adequate economically technically and environmentally sound and sustainable flood defence measures. • Discourage inappropriate development in areas at risk of flooding. • IDBs contribute to the planning system by taking consideration of the drainage of new and existing developments within their districts, and advising on planning applications, specifically the use of sustainable urban drainage systems (SuDS). • Under the Land Drainage Act 1991, the IDB exercises a general power of supervision over all matters relating to water level management within its district. In pursuance of this role they can prohibit the obstruction of watercourses within their district. IDBs also have a series of bylaws relating to the management of watercourses and can designate features and structures within their district which relate to managing flood risk. A designation prevents the owners from altering, removing or replacing the structure or feature without the consent of the IDB.

* Environment Agency did not prepare a PFRA; instead they exercised an exception permitted under the Regulations

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

SFRAs contain information that should be referred to in responding to the Flood Risk Regulations and the formulation of local flood risk management strategies and plans. SFRAs are also linked to the preparation of Catchment Flood Management Plans (CFMPs), Shoreline Management Plans (SMPs), Surface Water Management Plans (SWMPs) and Water Cycle Strategies (WCSs).

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



† See Table 2-1 for roles and responsibilities for preparation of information

2.9 Riparian ownership

A riparian owner is a person who owns land on, or adjacent to, a watercourse. The law presumes, in the absence of any other evidence, that the land adjoining the watercourse includes the watercourse to its mid-point; therefore, there may be more than one riparian owner of a watercourse.

Anyone with a watercourse in or adjacent to their land has rights and responsibilities as a riparian owner. The Environment Agency, LLFA and other risk management authorities have permissive powers to work on watercourses under their jurisdiction, however, they are not required to do so.

Under land drainage law, watercourses cannot be obstructed and the riparian owner must accept water flowing onto their land.

Kent County Council have prepared guidance (Owner responsibility for rivers and ditches) **http://documents.hants.gov.uk/flood-water-management/HCCFloodRiskManagement-Landowners.pdf**[12] which provides further information on the rights and responsibilities of riparian owners.

2.10 When to consult authorities

The new and emerging responsibilities under the Flood and Water Management Act 2010 and the Flood Risk Regulations 2009 are summarised in Table 2-2.

Table 2-2: When to consult authorities in Tunbridge Wells Borough

Key Authority	When to consult
Tunbridge Wells Borough Council	Pre-application consultation is recommended to identify the range of issues that may affect the site and, following on from the Sequential and, if necessary, Exception Test, determine whether the site is suitable for its intended use. Should be consulted where an awarded watercourse runs within or adjacent to proposed development consultation
Environment Agency	Should be **consulted** on development, other than minor or as defined in the Environment Agency's Flood Risk Standing Advice document within Flood Zone 2 or 3, or in Flood Zone 1 where critical drainage problems have been notified to the LPA. Consultation will also be required for any development projects within 20m of a Main River or flood defence, and other water management matters.
Kent County Council (LLFA)	Where the proposed work will either affect or use an ordinary watercourse or require consent permission, outside of an IDB's rateable area. As of the 15 April 2015 the LLFA should be consulted on surface water drainage proposal for all major developments
Kent County Council (Local Highway Authority)	Where the proposed development will either involve a new access to the local highway network or increase or change traffic movements
Highways England	When the quality and capacity of the **Highways England** (strategic) road network could be affected.
Historic England	Whilst Historic England are not a RMA, they should be consulted where proposals may affect heritage assets and their settings.
Natural England	**Natural England** has mapped 'risk zones' to help developers and LPAs determine whether consultation is required. This is likely where water bodies with special local or European designations (e.g. SSSI or Ramsar) exists
Southern Water	Where connection to surface water sewers is required, or where the flow to public sewerage system may be affected
South East Water	Where new connections to the water supply network are required or if any alterations are made to existing connections
Upper Medway Internal Drainage Board	Where the proposed work will either affect or use an ordinary watercourse or requires consent permission within the IDBs rateable area.

[12] https://www.kent.gov.uk/__data/assets/pdf_file/0004/19957/Rivers-and-ditches.pdf

3 The sequential, risk based approach

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

The Sequential Test should be applied to the whole Local Planning Authority area to increase the likelihood of allocating development in areas not at risk of flooding. The Sequential Test can be undertaken as part of a Local Plan Sustainability Appraisal. Alternatively, it can be demonstrated through a free-standing document, or as part of strategic housing land or employment land availability assessments. The NPPG for Flood Risk and Coastal Change **describes how the Sequential Test should be applied in the preparation of a Local Plan** (Figure 3-1).

It is often the case that it is not possible for all new development to be allocated on land that is not at risk from flooding. In these circumstances the Flood Zone maps (that show the extent of inundation assuming that there are no defences) provide a starting point for assessment. However, a greater understanding of the scale and nature of the flood risks will also be required.

3.1 Flood Zones

Table 1 of the NPPG Flood Risk and Coastal Change identifies the following Flood Zones. These apply to both Main River and Ordinary Watercourses. Flood risk vulnerability and flood zone compatibility is set out in **Table 3** of the NPPG. Table 3-1 summarises this information and provides information on when an FRA would be required. The zones describe the flood risk assuming that there are no defences present with the exception of Zone 3b that does take account of the presence of defences.

Table 3-1: Flood Zone descriptions

Zone	Probability	Description
Zone 1	Low	This zone comprises land assessed as having a less than 1 in 1,000 annual probability of river or sea flooding in any year (<0.1%).
		All land uses are appropriate in this zone.
		For development proposals on sites comprising one hectare or above the vulnerability to flooding from other sources as well as from river and sea flooding, and the potential to increase flood risk elsewhere through the addition of hard surfaces and the effect of the new development on surface water run-off, should be incorporated in a flood risk assessment.
		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.
Zone 2	Medium	This zone comprises land assessed as having between a 1 in 100 and 1 in 1000 annual probability of river flooding (0.1% – 1%) or between 1 in 200 and 1 in 1000 annual probability of sea flooding (0.1% – 0.5%) in any year.
		Essential infrastructure, water compatible infrastructure, less vulnerable and more vulnerable land uses (as set out by NPPF) as appropriate in this zone. Highly vulnerable land uses are allowed as long as they pass the Exception Test.
		All developments in this zone require an FRA.
		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.
Zone 3a	High	This zone comprises land assessed as having a greater than 1 in 100 annual probability of river flooding (>1.0%) or a greater than 1 in 200 annual probability of flooding from the sea (>0.5%) in any year Developers and the local authorities should seek to reduce the overall level flood risk, relocating development sequentially to areas of lower flood risk and attempting to restore the floodplain and make open space available for flood storage.
		Water compatible and less vulnerable land uses are permitted in this zone. Highly vulnerable land uses are not permitted. More vulnerable and essential infrastructure are only permitted if they pass the Exception Test.
		All developments in this zone require an FRA.

Zone	Probability	Description
		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. - relocate existing development to land in lower risk zones - create space for flooding by restoring functional floodplain and flood flow pathways and by identifying, allocating and safeguarding open spaces for flood storage.
Zone 3b	Functional Floodplain	This zone comprises land where water must flow or be stored in times of flood. SFRAs should identify this Flood Zone in discussion with the LPA and the Environment Agency. The identification of functional floodplain should take account of local circumstances.
		Only water compatible and essential infrastructure are permitted in this zone and should be designed to remain operational in times of flood, resulting in no loss of floodplain or blocking of water flow routes. Infrastructure must also not increase flood risk elsewhere.
		All developments in this zone require an FRA.
		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. - relocate existing development to land in lower risk zones

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

When preparing a Local Plan, the Local Planning Authority should demonstrate that it has considered a range of site allocations, using an SFRA to apply the Sequential and Exception Tests where necessary.

The NPPG defines both the Sequential and Exception Tests as:

The Sequential Test

"The Sequential Test ensures that a sequential approach is followed to steer new development to areas with the lowest probability of flooding. The flood zones, as refined in the Strategic Flood Risk Assessment for the area, provide the basis for applying the Test. The aim is to steer new development to Flood Zone 1 (areas with a low probability of river or sea flooding). Where there are no reasonably available sites in Flood Zone 1, local planning authorities in their decision making should take into account the flood risk vulnerability of land uses and consider reasonably available sites in Flood Zone 2 (areas with a medium probability of river or sea flooding), applying the Exception Test if required. Only where there are no reasonably available sites in Flood Zones 1 or 2 should the suitability of sites in Flood Zone 3 (areas with a high probability of river or sea flooding) be considered, taking into account the flood risk vulnerability of land uses and applying the Exception Test if required".

(National Planning Practice Guidance, Flood Risk and Coastal Change, Paragraph 019)

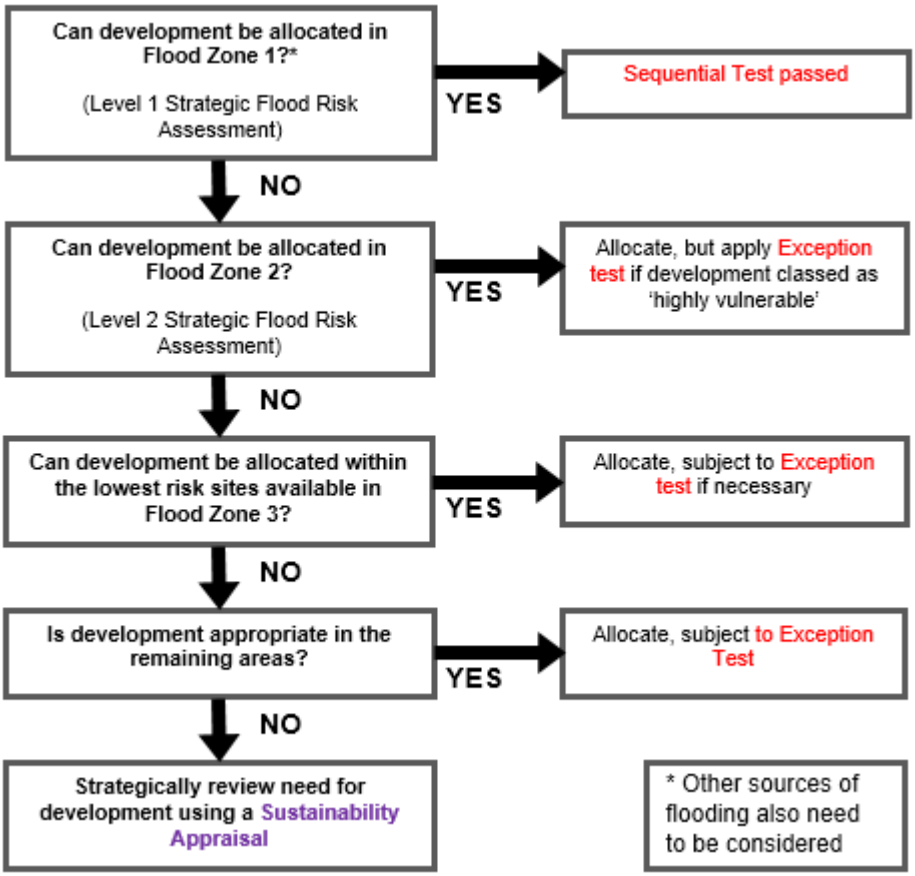
The Exception Test

"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.

Essentially, the two parts to the Test require proposed development to show that it will provide wider sustainability benefits to the community that outweigh flood risk, and that it will be safe for its lifetime, without increasing flood risk elsewhere and where possible reduce flood risk overall.".

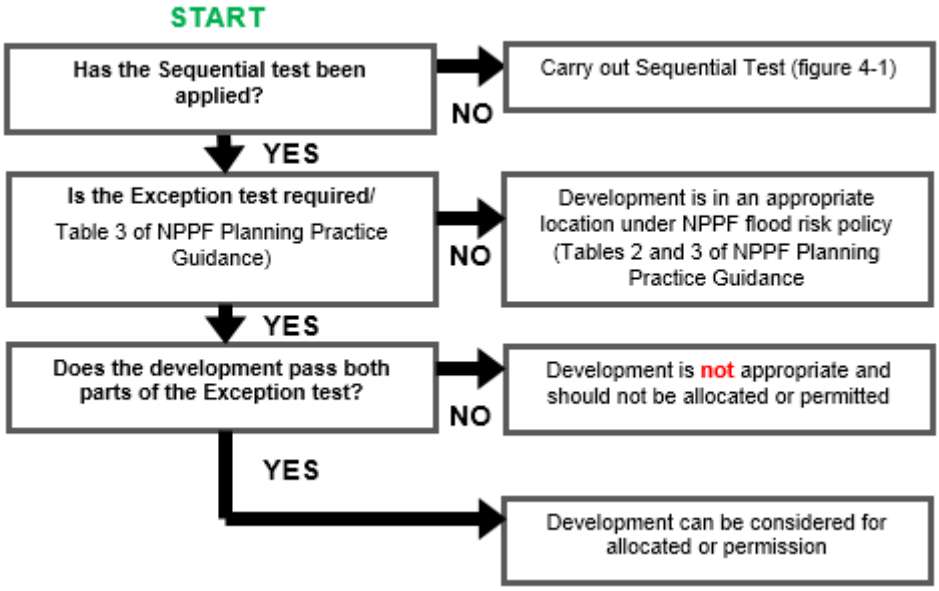
(National Planning Practice Guidance, Flood Risk and Coastal Change, Paragraph 023)

Figure 3-1: Applying the Sequential Test in the preparation of a Local Plan



The Exception Test should only be applied following the application of the Sequential Test and as set out in Table 3 of the NPPG for Flood Risk and Coastal Change. The NPG **describes how the Exception Test should be applied in the preparation of a Local Plan** (Figure 3-2).

Figure 3-2: Applying the Exception Test in the preparation of a Local Plan



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

3.3.1 Sequential Test

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

Tunbridge Wells Borough Council, with advice from the Environment Agency, are responsible for considering the extent to which Sequential Test considerations have been satisfied, and will need to be satisfied that the proposed development would be safe and not lead to increased flood risk elsewhere.

The Sequential Test does not need to be applied for individual developments under the following circumstances:

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

It is normally reasonable to presume and state that individual sites that lie in Zone 1 satisfy the requirements of the Sequential Test. However, consideration should be given to risks from all sources, areas with critical drainage problems and critical drainage areas. Consideration must be given to the resolution of the zone mapping and higher resolution local assessments prepared as appropriate to determine the extent of zones that might not be shown on national mapping.

3.3.2 Exception Test

If, following the application of the Sequential Test it is not possible for the development to be located in areas with a lower probability of flooding, the Exception Test must be applied if deemed appropriate. The aim of the Exception Test is to ensure that more vulnerable property types, such as residential development can be implemented safely and are not located in areas where the hazards and consequences of flooding are inappropriate. For the Test to be satisfied, both of the following elements must be accepted for development to be allocated or permitted:

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

   Local Planning Authorities will need to consider what criteria they will use to assess whether this part of the Exception Test has been satisfied, and give advice to enable applicants to provide evidence to demonstrate that it has been passed. If the application fails to prove this, the Local Planning Authority should consider whether the use of planning conditions and / or planning obligations could allow it to pass. If this is not possible, this part of the Exception Test has not been passed and planning permission should be refused[13] .

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.

   The site-specific Flood Risk Assessment should demonstrate that the site will be safe, and the people will not be exposed to hazardous flooding from any source. The following should be considered[14]:

   - The design of any flood defence infrastructure.
   - Access and egress.
   - Operation and maintenance.

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

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

- Design of the development to manage and reduce flood risk wherever possible
- Resident awareness.
- Flood warning and evacuation procedures.
- Any funding arrangements required for implementing measures.

3.4 Actual flood risk

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

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

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

- The level of protection afforded by existing defences might be less than the appropriate standards and hence may need to be improved if further growth is contemplated.
- The flood risk management policy for the defences will provide information on the level of future commitment to maintain existing standards of protection. If there is a conflict between the proposed level of commitment and the future needs to support growth, then it will be a priority for the Flood Risk Management Strategy to be reviewed.
- The standard of safety must be maintained for the intended lifetime of the development (assumed to be 100 years for residential development). Over time the effects of climate change will erode the present-day standard of protection afforded by defences and so commitment is needed to invest in the maintenance and upgrade of defences if the present-day levels of protection are to be maintained and where necessary land secured that is required for affordable future flood risk management measures.
- The assessment of actual risk can include consideration of the magnitude of the hazard posed by flooding. By understanding the depth, velocity, speed of onset and rate of rise of floodwater it is possible to assess the level of hazard posed by flood events from the respective sources. This assessment will be needed in circumstances where consideration is given to the mitigation of the consequences of flooding or where it is proposed to place lower vulnerability development in areas that are at risk from inundation.

For information on defences reference should be made to the Environment Agency's Asset Information Management System (AIMS) which contains details on the standard of protection of defences.

3.5 Residual risk

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

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

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

3.6 Impact of additional development on flood risk

When allocating land for development, consideration must be given to the potential cumulative impact of development on flood risk. The increase in impermeable surfaces and resulting increase in runoff increases the chances of surface water flooding if suitable mitigation measures, such as SuDS, are not put in place. Additionally, the increase in runoff may result in more flow entering watercourses, increasing the risk of fluvial flooding downstream.

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

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

The cumulative impact of development should be considered at the planning application and development design stages and the appropriate mitigation measures undertaken to ensure flood risk is not exacerbated, and in many cases the development should be used to improve the flood risk. This guidance applies to developments in all Flood Zones. It is possible that it might be more appropriate to consider strategic measures, but additional studies would be required to provide evidence that the provisions supported the principle of development and were deliverable.

3.7 Cross boundary considerations

The topography and location of the borough means that several major watercourses flow through the study area. As such, future development, both within and outside the borough can have the potential to affect flood risk to existing development and surrounding areas, depending on the effectiveness of SuDS and drainage implementation. Tunbridge Wells Borough has boundaries with various Local Authorities, displayed in Figure 1-1.

Development management should ensure that the impact on receiving watercourses from development in Tunbridge Wells Borough has been sufficiently considered during the planning stages and appropriate mitigation measures put in place to ensure there is no adverse impact on flood risk or water quality.

Recommendations for development management across Tunbridge Wells Borough are outlined in greater detail in Section 11.

4 Sources of information used in preparing the SFRA

4.1 Summary of SFRA mapping for all sources of flood risk

4.1.1 Fluvial

The data used to prepare the fluvial mapping for this study is based on the National Flood Zone modelling, the results from the following hydraulic models provided by the Environment Agency and Kent County Council, and also specific fluvial flood risk modelling of Paddock Wood prepared for this SFRA (Paddock Wood fluvial modelling, 2019):

- Environment Agency fluvial models
    - Kent & East Sussex Flood Zone Improvements (2011)
    - River Medway Mapping and Modelling (2015)
    - River Medway Climate Change Modelling (2016)
- Kent County Council combined sources flood risk model
    - Paddock Wood modelling (2019)

4.1.2 Surface water

Mapping of surface water flood risk in Tunbridge Wells Borough Council has been taken from the Risk of Flooding from Surface Water (RoFSW) dataset published by the Environment Agency. These maps are intended to provide a consistent standard of assessment for surface water flood risk across England and Wales in order to help LLFAs, the Environment Agency and any potential developers to focus their management of surface water flood risk.

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

Table 4-1: RoFSW risk categories

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

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

4.1.3 Groundwater

Mapping of groundwater flood risk has been based on the Areas Susceptible to Groundwater Flooding (AStGWF) dataset. The AStGWF dataset is a strategic-scale map showing groundwater flood areas on a 1km square grid. It shows the proportion of each 1km grid square, where geological and hydrogeological conditions indicate that groundwater might emerge. It does not show the likelihood of groundwater flooding occurring and does not take account of the chance of flooding from groundwater rebound. This dataset covers a large area of land, and only isolated

locations within the overall susceptible area are actually likely to suffer the consequences of groundwater flooding.

The AStGWF data should be used only in combination with other information, for example local data or historical data. It should not be used as sole evidence for any specific flood risk management, land use planning or other decisions at any scale. However, the data can help to identify areas for assessment at a local scale where finer resolution datasets exist.

4.1.4 Sewers

Historical incidents of flooding are detailed by Southern Water in their DG5 register. This database records incidents of flooding relating to public foul, combined or surface water sewers and displays which properties suffered flooding. The data provided by Southern Water covers all reported incidence as of its export of 3 October 2016.

4.1.5 Reservoirs

The risk of inundation as a result of breach or failure of a number of reservoirs within the area has been mapped using the outlines produced as part of the National Inundation Reservoir Mapping (NIRIM) study.

4.1.6 Suite of maps

All of the mapping can be found in the appendices to this SFRA and is presented in the following structure:

- Appendix A: Grid square references for A3 appendix maps
- Appendix B: Watercourses in Tunbridge Wells Borough
- Appendix C: Flood Zones (present day)
- Appendix D: Climate change mapping (future Flood Zone 3a)
- Appendix E: Surface water flood risk mapping
- Appendix F: Groundwater emergence susceptibility mapping
- Appendix G: Flood warning coverage
- Appendix H: Historic flood records

4.2 Other relevant flood risk information

Users of this SFRA should also refer to other relevant information on flood risk where available and appropriate. Any development or flood risk management measures should be consistent with wider catchment, and borough, wide policy. This information includes:

- **Kent County Council Preliminary Flood Risk Assessment** (2017)
- **River Medway Catchment Flood Management Plan** (2009)
- **Kent County Council Local Flood Risk Management Strategy** (2013)
- **Tunbridge Wells Stage 1 Surface Water Management Plan** (2013)
- **Paddock Wood Stage 1 Surface Water Management Plan** (2011)
- **Thames River Basin District Flood Risk Management Plan** (2015)
- **Environment Agency's Asset Information Management System (AIMS)**

  Provides information on assets in the area and can be used to identify where residual risk should be assessed. Users should note that recently completed schemes may not yet be included in this dataset.

5 Climate change

5.1 Climate change and the NPPF

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

5.2 Revised climate change guidance

The Environment Agency published **updated climate change guidance** on 19 February 2016, which supports the NPPF and must now be considered in all new developments and planning applications. The document contains guidance on how climate change should be taken into account when considering development, specifically how allowances for climate change should be included with FRAs. The Environment Agency can give a free preliminary opinion to applicants on their proposals at pre-application stage. There is a charge for more detailed pre-application planning advice. The guidance presented in this SFRA is based on UKCP09, but it should be noted that following the publication of UKCP18, updated Environment Agency guidance on climate change is expected to be issued in 2019, after the publication of this SFRA. Until this information is published, the Environment Agency advise that they are contacted for interim guidance. When updated guidance for considering climate change allowances within FRAs and SFRAs becomes available, the expectation will be that this is used to inform the evidence behind planning decisions.

5.3 Climate change allowances

By making an allowance for climate change it will help reduce the vulnerability of the development and provide resilience to flooding in the future. The 2016 climate change guidance includes climate change predictions of anticipated change for peak river flow and peak rainfall intensity. The guidance also covers sea level rise and water height. These allowances are based on climate change projections and difference scenarios of carbon dioxide emissions to the atmosphere. Due to the complexity of projecting climate change effects, there are uncertainties attributed to climate change allowances related to the confidence in the prediction. As a result, the guidance presents a range of possibilities to reflect the potential variation in climate change impacts over the three periods that reflect the differing levels of confidence in the predictions.

5.4 Peak river flows

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

The peak river flow allowances provided in the guidance show the anticipated changes to peak flow for the river basin district within which the subject watercourse is located. Once the river basin district has been identified, guidance on uplift in peak flows are provided for three allowance categories, Central, Higher Central and Upper End which are based on the 50th (Central), 70th (Higher Central) and 90th (Upper End) percentiles respectively. The 'percentile' is a measure of the confidence in the prediction of the magnitude of the allowance, i.e. lower uplift values (50th percentile – 'Central) are statistically more likely and thus attributed with greater confidence compared with higher uplift values (e.g. 90th percentile – 'Upper End') which allow for future conditions that accept a greater level of uncertainty. The allowance category to be used is based on the vulnerability classification of the proposed development and the flood zones within which it is to be located.

These allowances are provided, in the form of figures for the total potential change anticipated, for three climate change periods:

- The '2020s' (2015 to 2039)
- The '2050s' (2040 to 2069)
- The '2080s' (2070 to 2115)

The time period used in the assessment depends upon the expected lifetime of the proposed development. Residential development should be considered for a minimum of 100 years, whilst

the lifetime of a non-residential development depends upon the characteristics of that development. Further information on what is considered to be the lifetime of development is provided in the **NPPG**.

Land within Tunbridge Wells Borough is located within either the South East River Basin District or Thames River Basin District. Maps showing the extent of River Basins are **published by the Environment Agency**. The allowances for the River Basin Districts are provided in Table 5-1 and Table 5-2, respectively.

Table 5-1: Peak river flow allowances for the South East River Basin District

Allowance Category	Total potential change anticipated for the '2020s' (2015 to 2039)	Total potential change anticipated for the '2050s' (2040 to 2069)	Total potential change anticipated for the '2080s' (2070 to 2115)
Upper end	25%	50%	105%
Higher central	15%	30%	45%
Central	10%	20%	35%

Table 5-2: Peak river flow allowances for the Thames River Basin District

Allowance Category	Total potential change anticipated for the '2020s' (2015 to 2039)	Total potential change anticipated for the '2050s' (2040 to 2069)	Total potential change anticipated for the '2080s' (2070 to 2115)
Upper end	25%	35%	70%
Higher central	15%	25%	35%
Central	10%	15%	25%

5.4.1 High++ allowances

High++ allowances only apply in assessments for developments that are very sensitive to flood risk, for example large scale energy generating infrastructure, and that have lifetimes beyond the end of the century. H++ estimates represent the upper limit of plausible climate projections and would not normally be expected for schemes or plans to be designed to or incorporate resilience for the H++ estimate. Further information is provided in the Environment Agency publication, **Adapting to Climate Change: Advice for Flood and Coastal Erosion Risk Management Authorities**

5.4.2 Which peak river flow allowance to use

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

Flood Zone 2

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

Flood Zone 3a

Vulnerability classification	Central	Higher central	Upper end
Essential infrastructure			✓

Highly vulnerable	Development not permitted		
More vulnerable		✓	✓
Less vulnerable	✓	✓	
Water compatible	✓		

Flood Zone 3b

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

5.5 Peak rainfall intensity allowance

Climate change is predicted to result in wetter winters and increased summer storm intensity in the future. This increased rainfall intensity will affect land and urban drainage systems, resulting in surface water flooding, due to the increased volume of water entering the systems. Table 4-3 shows anticipated changes in extreme rainfall intensity in small and urban catchments. These allowances should be used for small catchments and urban drainage sites. For catchments, larger than 5km^2, the guidance suggests the peak river flow allowances should be used.

For Flood Risk Assessments, both the central and upper end allowances should be assessed to understand the range of impact.

Table 5-3: Peak rainfall intensity allowance in small and urban catchments

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

5.6 Using climate change allowances

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

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

5.7 Groundwater

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

5.8 The impact of climate change in Tunbridge Wells Borough

5.8.1 SFRA climate change modelling

Climate change modelling was available from the Environment Agency for Alder Stream and part of the River Teise (downstream of Goudhurst Road) for the Flood Zone 3a event in the 2080s epoch for the Higher central and Upper end estimates. This information has been used to inform the predicted climate change extents presented in the mapping. Additionally, modelling prepared as part of the SFRA for Paddock Wood also simulated these events, and this information has also been used to inform the mapping.

Where no climate change modelling and mapping is available, a precautionary approach has been adopted for the SFRA, in which the present day Flood Zone 2 extent has been used as a conservative indicator of the potential changes to Flood Zone 3a in the future. This does not directly relate to published guidance on potential changes to fluvial flood flows but used as an indication for the SFRA. Note that future modelling that does use the published values may produce outlines that differ from the mapping presented in the SFRA.

5.8.2 Adapting to climate change

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

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

6 Understanding flood risk in Tunbridge Wells Borough

6.1 Demographics

Tunbridge Wells Borough covers an area of approximately 331.3km^2 and has a population of 116,251[15] at the last estimate. The main urban area is Royal Tunbridge Wells and Southborough (population circa 75,000), with other towns and larger settlements including Paddock Wood (population circa 8,000), Cranbrook (population circa 7,000) and Hawkhurst (population circa 5,000).

6.2 Topography, geology and soils, and hydrology

6.2.1 Topography

The topography of the borough is displayed in Figure 6-1 (mapping provided at the end of Chapter 6). The topography primarily comprises higher elevations and steeper slopes in the western and eastern regions of the borough. The highest elevations reach approximately 154 metres Above Ordnance Datum Newlyn (m AOD) near Sherwood and Pembury, and approximately 148m AOD to the south-east of Hawkenbury. Elevations generally decrease in the northern, central, and south-eastern regions of the borough due to the presence of several river valleys. For example, elevations decrease to approximately 5m AOD near Linkhill and 12m AOD at Paddock Wood. The main watercourses that occupy these lower elevations include Alder Stream and Paddock Wood Stream.

6.2.2 Geology and soils

The geology of a catchment can be an important influencing factor in the way that water runs off the ground surface. This is primarily due to variations in the permeability of the surface material and bedrock stratigraphy. Tunbridge Wells Borough is primarily underlain by various geologies within the Wealden Group which formed 125-146 million years ago, in the Cretaceous Period. The most notable bedrock formations within the Wealden Group that underlie the borough is the Tunbridge Wells Sand Formation, the Ashdown Formation, the Wadhurst Clay Formation, the Weald Clay Formation and the Ardingly Sandstone Member.

The Tunbridge Wells Sand Formation underlies the majority of the borough. The Formation can be divided into three geologies informally known as the Lower and Upper Tunbridge Wells Sand Formations and the intervening Grinstead Clay Member. The Tunbridge Wells Sand Formation is also interspersed by the Ashdown and Wadhurst Clay Formations, both of which characterise localised areas in the centre of the borough. Both the Tunbridge Wells Sand and Ashdown Formations consist of sandstone and siltstone, while the Grinstead Clay Member and the Wadhurst Clay Formation consist of mudstone.

The western section of the borough surrounding Royal Tunbridge Wells is primarily underlain by the Ardingly Sandstone Member, while the northern section of the borough between Tudeley and Cranbrook Common is underlain by the Weald Clay Formation. Similar to the formations noted above, the Ardingly Sandstone Member consists of sandstone whereas the Weald Clay Formation consists of mudstone.

Given the composition and thus the greater permeability of the Tunbridge Wells Sand Formation, Ashdown Formation and the Ardingly Sandstone Member, the majority of the borough is likely to have a relatively slow response to rainfall. However, areas of mixed and / or less permeable bedrock formations will exhibit different catchment responses. For example, the localised central areas and the northern section of the borough dominated by mudstone will have a quicker catchment response. Therefore, flood volumes will be slightly more critical for areas underlain by the less permeable Wadhurst and Weald Clay Formations.

Figure 6-2 shows the arrangement of the various bedrock formations throughout the borough.

There is a variety of superficial (at the surface) deposits within Tunbridge Wells Borough. Specifically, the areas surrounding Tudeley Hale, Paddock Wood, Sinkhurst Green and Buckhurst in the north of the borough are underlain by Alluvium deposits while River Terrace deposits

[15] Office for National Statistics, (June 2013), Population Estimates for the UK, England and Wales, Scotland and Northern Ireland – mid-2015 (MYE3: components of population change for local authorities in the UK, mid-2015).

characterise the floodplains of the borough's Main Rivers. Figure 6-3 shows the arrangement of the various superficial deposit formations throughout the borough.

6.2.3 Hydrology

A summary of the Main Rivers within the borough is provided in Table 6-1 and mapping of their location is provided in Appendix B. Each of the watercourses listed (excluding the River Rother and Kent Ditch) forms a tributary watercourse to the River Medway. Tributaries to these watercourses include primarily smaller Ordinary Watercourses.

The River Teise is the longest watercourse within the borough, the catchment of which receives approximately 785mm of rainfall on average per year[16] (downstream extent: NGR: 568950, 49600). However, the catchments of the smaller Southborough, Greggs Wood and Paddock Wood Streams receive a slightly lower average of 714mm-726mm of rainfall per year[16].

Table 6-1: Principle watercourses within Tunbridge Wells Borough

Watercourse name	Description
Alder Stream	Alder Stream rises at Alder Road, near Springfield (NGR: 564325, 144077) and flows northwards, towards Five Oak Green. The river then changes course to flow in a north-westerly direction for approximately 1,700m, before changing direction again past moat Farm to follow as easterly course. Alder Stream flows out of the borough at NGR: 566553, 147090; to the north-east of Whetsted.
Greggs Wood Stream	Greggs Wood Stream rises in Sherwood (NGR: 560102, 140881). The stream flows northwards, through Gregg's Wood and Lamberts Wood, before joining Southborough Stream at Dowding Way (NGR: 560102, 142324).
Kent Ditch	Kent Ditch has its source at NGR: 578449, 126765, and flows in a south-easterly direction which follows the borders of the borough. The channel then converges with the River Rother at NGR: 580550, 125822.
Lesser Teise	The Lesser Teise enters the borough at NGR: 572497, 142765, where it converges with the River Teise.
Paddock Wood Stream	Paddock Wood stream has its source at the B2017:B2160 junction (NGR: 566841, 144092). It flows in a northerly direction through the area of Paddock Wood, with a few converging Ordinary Watercourses along its route. The rivers course changes direction at Wagon Lane, to follow the borders of the borough in an easterly direction, before exiting the borough at NGR: 567960, 146273.
River Beult	The River Beult enters the borough at NGR: 568603, 133963, and flows northwards before joining the River Teise (NGR: 569683, 136705). Several Ordinary Watercourses join the Beult along its course.
River Medway	The River Medway enters the borough near Little Clayton's Wood (NGR: 551179, 137624), where it follows the borough's boundaries westwards. The Medway leaves the borough to the north of Ashurst Wood (NGR:501257, 139780) and re-enters the borough at NGR:553735, 144066. The Medway flows northwards and exits the borough through Ashour Wood.
River Rother	The River Rother enters the borough to the south-east, at its confluence with Kent Ditch (NGR: 580550, 125822). The Rother flows north-east, following the TWBC border. The river exits the borough at NGR: 582856, 126864. Two smaller Rother channels converge with the main stem near the south-easterly extent of the borough. The first rises near Great Ethnam Farm and joins the main stem at NGR: 580766, 126015. The second enters the borough and converges with the main stem of the Rother at NGR: 580958, 125953.
River Teise	The River Teise rises to the south-east of Tunbridge Wells, entering the borough borders near Win Bridge (NGR: 564724, 135957). The Teise then exits the borough (NGR: 564788, 135951) and flows for approximately 879m before re-entering the borough (NGR: 565237, 136564) and continuing its course in a generally north-east direction. The River Beult converges with the Teise, near the Haymow Finchcocks (NGR: 569684, 136705). The main channel bifurcates at NGR: 572420, 140672, with its course changing direction to flow in a north-westerly direction. The two channels of the Teise re-join at NGR: 572436, 142826 and flows along the borough's border, before eventually exiting the borough near Bockingfold (NGR: 570515, 144852).

[16] SAAR value extracted from the FEH CD-ROM v3.0 © NERC (CEH). © Crown copyright. © AA. (2009)

Watercourse name	Description
Southborough Stream	Southborough Stream has its source in High Brooms (NGR: 559667, 141760), and flows north-east towards Pilgrim's Wood. The stream changes course to flow north-west (NGR: 560312, 14264) before regaining a north-easterly flow at Copyhold Wood, where the stream follows the boroughs border. Southborough stream flows leaves the borough in a northwards direction at NGR: 560767, 146700.

6.3 Historical flooding

Tunbridge Wells Borough has a well-documented history of flood events; the main sources of which are from fluvial (river/watercourse) and pluvial (surface water) sources.

The events of 1960, 1963, 1968, 1985, 2000 and 2009 caused widespread flooding within the north of the borough e.g. at Paddock Wood and Five Oak Green, and areas along the River Teise, due to heavy rainfall over a prolonged period of time. Since this time, significant flooding occurred within the borough during the Winter 2013/14, which included notable flooding from the River Medway, as well as August 2015.

Historical flood records provided by the Environment Agency, Kent County Council and Tunbridge Wells Borough Council identify the flood events known to have occurred between 1958 and 2016. The following locations are noted to have been affected by more than one historical flood event during this period:

Goudhurst and Lamberhurst Ward

- Cranbrook Road
- Curtisden Green Lane
- Furnace Lane
- High Street
- Hog Hole Lane
- Rosemary Lane
- The Slade

Frittenden and Sissinghurst Ward

- Biddenden Road
- Cranbrook Road
- Tenterden Road

Speldhurst and Bidborough Ward

- Lower Green Road

Hawkhurst and Sandhurst Ward

- Heartenoak Road
- High Street
- Highgate Hill
- Slip Mill Road

Benenden and Cranbrook Ward

- Cranbrook Road
- Goddards Green Road
- Goudhurst Road
- High Street
- Marden Road
- New Pond Road
- The Street

St. John's Ward

- Speldhurst Road
- Upper Grosvenor Road

Pantiles and St. Mark's Ward

- Forest Road
- Warwick Park

Brenchley and Horsmonden Ward

- Brenchley Road
- Furnace Lane
- Maidstone Road

Park Ward

- Prospect Road

Sherwood Ward

- Redleaf Close

Southborough and High Brooms Ward

- London Road
- North Farm Road
- Prospect Road
- Speldhurst Road

Culverden Ward

- John Street

Pembury Ward

- Hastings Road
- Lower Green Road

Broadwater Ward

- London Road

The maximum extent of flooding indicated by the historical records (all extents from these events combined) is shown in Figure 6-4. The locations and source (where known) of each flood event is also shown in the figure.

This information is also presented in larger scale mapping in Appendix H. Available details of the significant flood events noted to affect Tunbridge Wells are summarised as follows:

- November 1960: Frequent and heavy rainfall across England and Wales from July through to November 1960 caused widespread flooding across the country[17]. It is specifically noted that the heavy and prolonged rainfall in November 1960 caused widespread flooding across much of Kent as the Rivers Medway, Teise and Beult exceed their channel capacities. The areas surrounding Five Oak Green, Lamberhurst, Buckhurst, Ashurst and Ashour Wood are recorded to have flooded during this event.
- November 1963: The Rivers Medway, Teise and Beult exceeded their channel capacities during November 1963. However, the flood event was not as extensive as that during November 1960 as records only show the area north of Tudeley Hale and Whetsted to have flooded within Tunbridge Wells Borough.
- September 1968: Prolonged heavy rainfall associated with a slow-moving depression and thunderstorms caused severe flooding across the south east of England. Between the 14th and 15th of September, 150mm-200mm of rainfall was recorded across Kent[18]. As a result, the River Medway exceeded its channel capacity and caused flooding in the west and north of the borough near Ashurst, Ashour Wood, Tudeley Hale and areas of Paddock Wood.
- October 2000: The wet weather in the autumn of 2000 resulted in many river catchments being subjected to multiple flood events. Large areas of Kent and Sussex were left under water as several rivers burst their banks[19]. The channel capacities of the Rivers Medway, Teise and Beult caused flooding in areas north of Tudeley Hale and Paddock Wood. It is specifically noted that properties on 'The Cedars' road flooded to a depth of 0.1m due to culvert blockages at the road and the railway crossing locations[20]. Mascalls Court Farm in Paddock Wood and properties in Lamberhurst also experienced flooding during this event[2021]. (SFRA)
- December 2013: During the winter of 2013-14, a series of Atlantic depressions brought heavy rainfall and stormy conditions to much of England and Wales. Rising levels within the River Teise put properties in Horsmonden, Goudhurst and Lamberhurst at risk of flooding[22] and areas located along the floodplain of the river are recorded to have flooded during late December 2013. Elsewhere, Maidstone, Tonbridge and Yalding (located outside of the borough) were noted to be affected by flooding from the River Medway[23].
- August 2015: widespread flooding was reported in late August 2015 within Royal Tunbridge Wells due to a localised heavy summer storm event. It is noted that 40.4mm of rain fell within an hour period on the evening of 24 August 2015, which caused flash flooding in several areas across the town, including the Pantiles and River Grom Area, London Road and Castle Street, and Mount Pleasant Road and Railway Station[24].
- July 2017: widespread flooding was reported on the 19 July 2017 within Royal Tunbridge Wells due to heavy rainfall in a short, summer rainfall event[25]. It is noted that 32mm of rain fell within a 45 minute period, with 22.6mm of rain falling in a 15 minute period, which caused flash flooding in several areas across the town, with many of the areas affected in

[17] Homewood, P, (March, 2014), Floods in 1960, accessed 08/12/2016 (https://notalotofpeopleknowthat.wordpress.com/2014/03/10/floods-in-1960/)
[18] Tonbridge Weather Notes Post 1929 (1968: 14 & 15th September)
[19] The Met Office: The Wet Autumn of 2000 (November 2012)
[20] Scott Wilson, (November, 2007), Tunbridge Wells Borough Council – Strategic Flood Risk Assessment, Level 1
[21] Environment Agency, (2000), Environment Agency Kent Area: Autumn 2000 Floods Review Area Report
[22] Kent Online, (December, 2013), Kent's nightmare before Christmas as county battered by severe storm that brings down trees and power cables
[23] BBC News, Kent County Council report says new flood warning system needed, (22nd January 2014).
[24] Kent County Council, (May, 2016), Flood Investigation Report: Flooding affecting the Tunbridge Wells Area on 24th August 2015. Available: https://www.kent.gov.uk/__data/assets/pdf_file/0007/93139/Flooding-affecting-Tunbridge-Wells-investigation-24-August-2015.pdf
[25] Kent County Council, (March, 2019), Flood Investigation Report: Flooding affecting the Tunbridge Wells Area on 19 July 2017. Available: https://www.kent.gov.uk/__data/assets/pdf_file/0004/58297/Tunbridge-Wells-Section-19-report.pdf

this flood also affected during the August 2015 flooding. Areas flooded include Royal Victoria Palace, High Brooms and The Pantiles.

- July 2018: surface water and sewer flooding was reported on the 5 July 2018 within Tunbridge Wells, due to a heavy summer thunderstorm event. The Pantiles area of Tunbridge Wells, as well as Mount Pleasant Road, were impacted by surface water and sewer flooding, as noted in numerous photographs, video footage and eyewitness reports in various news reports[26].

6.3.1 Winter 2013/2014 flooding

One of the most recent significant flood events to affect Tunbridge Wells occurred in the winter of 2013-2014. The Kent Severe Weather Impacts Monitoring System (SWIMS) recorded five successive weather events across Kent and Medway:

- The St Jude's storm (28 October 2013)
- Fluvial event (1 November 2013)
- East coast tidal surge (5-6 December 2013)
- Fluvial and surface water floods (20 December 2013 – 28 March 2014)
- Groundwater floods (25 January 2014)

The SWIMS Event Summary Report for Kent & Medway states that Kent received 242% of the long-term average rainfall during the 2013-2014 winter. The highest rainfall intensity was recorded by the Met Office at Goudhurst where rainfall fell at 6.8mm per hour in late October[27]. As part of the National Severe Weather Warning Service, 43 Yellow and 7 Amber weather warnings as well as 63 flood alerts were issued.

Of particular note is the storm of the 23-24 December 2013, which bought heavy rain (50-70mm) to southern England and caused significant widespread flooding[28]. Heavy rainfall on already saturated catchments caused river, surface water and sewage flooding across Kent and affected hundreds of homes and businesses[29].

The reported impacts experienced in Tunbridge Wells are summarised as follows:

- One fatality occurred in Tunbridge Wells as a result of the severe weather and a falling tree[27].
- A total of 929 residential and commercial properties in Kent were flooded, 32 of which were located in the Tunbridge Wells Borough area. The Christmas and New Year 2013-2014 Storms and Floods Report[29] states that these figures are likely to be an underestimate as they are based on the number of properties known to have flooded by rivers, groundwater or groundwater-fed rivers. Information of the number of properties flooded by surface water and sewage is less certain.
- Transport assets including the highways in Tunbridge Wells were identified as hotspots of vulnerability as they were repeatedly flooded throughout the winter[27].
- A landslip at Wadhurst disrupted the key rail route between London and the Sussex coast, and specifically caused suspension to train services in Sevenoaks and Tonbridge[30].

6.3.2 August 2015 flooding

Another recent flood event to affect Tunbridge Wells occurred on 24 August 2015. Many areas in Royal Tunbridge Wells experienced significant flooding, with disruptions to traffic and public transportation, and inundation of several properties.

The **Kent County Council Flood Investigation Report** states the flooding was caused by a localised heavy summer storm event. This is due to the fact that a total of 66.4mm of rainfall was recorded at the Tunbridge Wells rain gauge whereas less than 30mm of rainfall was recorded at

[26] BBC News: Tunbridge Wells recovers after flash flooding
[27] SWIMS Event Summary Report for Kent & Medway Winter 2013-2014 Full Report
[28] The Met Office: Winter Storms, December 2013 to January 2014 (July, 2014)
[29] Thanet District Council: Christmas & New Year 2013-2014 Storms & Floods Final Report (Appendix 1)
[30] BBC News, South East flooding: How has the region coped? (17th February 2014).

Redgate Mill (approximately 7.5km southwest) and Lamberhurst (approximately 10km southeast) of Tunbridge Wells over the entire day.

The most significant rainfall was recorded between 17:00 and 18:00 BST by the Tunbridge Wells rain gauge; 40.4mm of rain fell during this hour period and this coincides with the first reports of flooding in the town which were received at 17:34[31].

Based on the information provided by Tunbridge Wells Borough Council, Kent Fire and Rescue Service and Kent County Council, the Report identified the following areas to have been affected by the flood event:

- Pantiles Area and River Grom (including both residential and commercial properties located on Nevill Street, The Pantiles, Market Street, Warwick Park and Sussex Mews)
- London Road and Castle Street (residential and commercial properties flooded including the highway which became impassable to pedestrians)
- Mount Pleasant Road and Tunbridge Wells Railway Station (a commercial property and the highway flooded as well as the railway track which caused closure of the Tonbridge to Hastings line until the flooding subsided).

Due to the urban nature and relatively low permeability of the ground across the town, the watercourses in the area respond rapidly to rainfall. As a result, the heavy rainfall caused high flows which overwhelmed culverted sections of watercourses and their channel capacities and led to flooding across the town. Furthermore, the intensity of the rainfall meant that surface water was unable to enter the surface network fast enough. This also led to the accumulation of surface water in topographically low areas of the town which reached sufficient depths to enter properties.

The heavy rainfall also caused surcharging, or 'backing up', of the combined sewer network across the town, which led to combined sewer water to back up into properties (e.g. two properties affected on Neville Street).

Flooding on Neville Street (August 2015)

Kent County Council also noted that the debris carried by flood waters may have caused damage to the trash screen of the culverted section of the River Grom. This impeded some of the flow and further exacerbated the flooding across the town.

Although a flood from a similar event cannot be fully prevented in the future, Kent County Council identified several options that could be implemented to reduce the risk of flooding in the town. Such options, among others, include undertaking future gulley cleaning, draining surface water from highways areas directly to the culverted section of the River Grom, assessing whether the trash screen on the River Grom can be improved, and making residents aware of their risk of flooding and what they can do to protect themselves (such as fitting Property Level Protection Measures)[32].

6.3.3 July 2017 flooding

A significant flood event occurred in parts of Tunbridge Wells on the 19 July 2017. Many of the areas affected experienced extensive highway flooding and inundation of properties.

The **Kent County Council Flood Investigation Report** for this event states that the flooding was caused by a localised heavy rainfall event. A total of 32mm of rainfall was recorded for Tunbridge Wells between 02:00 and 02:45 BST, with 22.6mm of rainfall occurring in a 15 minute period between 02:15 and 02:30 BST. In addition to rain measurements at Tunbridge Wells, as stated above, recordings at Redgate Mill (approximately 7.5km southwest) and Lamberhurst (approximately 10km southeast) noted heavy rainfall during the early hours of 19 July 2017, with

[31] Kent County Council, (May, 2016), Flood Investigation Report: Flooding affecting the Tunbridge Wells Area on 24th August 2015
[32] Kent County Council, (May, 2016), Flood Investigation Report: Flooding affecting the Tunbridge Wells Area on 24th August 2015

Redgate Mill recording 28.8mm of rainfall between 00:45 and 03:00 and Lamberhurst recorded 22.5mm of rainfall between 01:30 and 02:45.

Based on the information provided by Tunbridge Wells Borough Council, Kent Fire and Rescue Service, Southern Water Services and Kent County Council, the Report identified the following areas to have been affected by the flood event:

- Royal Victoria Place
- High Brooms
- The Pantiles
- Individual roads including Birling Road, Broadwater Down, Ferndale, Molyneux Park Road, St Johns Road and Boyne Park.

Kent Fire and Rescue Service (KFRS) received over 60 calls as a result of the flood incident, with reports of over 1 metre depth of water within some properties. Fire officers attended the incidents with three fire engines which carried out pumping of some of the properties and fire crews provided humanitarian assistance. By 04:30 BST the water had receded and KFRS scaled back its response. The majority of the areas flooded were urban development of residential and commercial properties located in the town centre. These locations have a high percentage of impermeable surfaces due to highways and car parking, hardstanding, and buildings, which drain to surface water or combined sewers where they are available. The flood mechanisms across the areas flooded were identified as intense rainfall which exceeded capacity of drainage and sewer systems, leading to surcharging of manholes, and narrow river channels capturing flows from large urban areas responding quickly to intensive rainfall, resulting in river levels rising quickly.

Following the 2017 flood event, Kent County Council have undertaken drainage cleansing in numerous roads in Tunbridge Wells affected by flooding and have undertaken CCTV surveys on the Southborough Stream culvert system and River Grom culvert, to assess for damage, defects and blockages. Kent County Council has established a flood action group of residents affected by the flooding within Tunbridge Wells, and the group regularly meets to identify the key issues and concerns that they feel need to be addressed in managing flood risk. Additionally, Kent County Council in partnership with the Countryside Management Partnerships has been delivering natural flood management (NFM) measures within Hilbert Woods and Grosvenor Park, including the construction of leaky dams.

To address the issue of sewer surcharging, Southern Water have fitted non-return valves to toilets in the basement of commercial properties in Mount Pleasant Road to prevent sewers from backing up and causing or exacerbating flooding.

Kent County Council completed works planned after the 2015 flood event to disconnect the highway drainage system from the combined sewer network, and discharge to the River Grom. This has provided some capacity within the combined public sewer served by the small pumping station at Warwick Park and will help to reduce the risk of surcharging within the properties connected to this asset. the discontinuance of flows to the combined sewer system and discharge to the River Grom should increase the rate at which water discharges from the highway, as the capacity will no longer be reliant on the relatively small magnitude of the pumped flow.

6.3.4 July 2018 flooding

On the 5 July 2018, a severe thunderstorm caused torrential rain and associated surface water and sewer flooding in Tunbridge Wells, specifically in the town centre and The Pantiles areas. News reports from the BBC News[33] and the Evening Standard[34] showed video footage and evidence of sewers surcharging, and surface water runoff causing flooding in Tunbridge Wells.

6.4 Fluvial flood risk

The flood history of Tunbridge Wells Borough highlights that in the past there have been issues with insufficient capacity in Ordinary Watercourses and within their relative culverts, having surcharged during extreme events in the past. Examples of this include the flooding events experienced in High Street Cranbrook, Roundabout Wood (Tunbridge Wells Town) and Folly

33 BBC News: Tunbridge Wells recovers after flash flooding (6 July 2018)

34 Evening Standard: Tunbridge Wells flood: Thunderstorm deluge sparks flash flood in Kent

Shaw. Historically, there have been issues with unmaintained watercourses, for example, due to blocked trash screens and culverts; particularly within Tunbridge Wells Town.

The primary source of fluvial flood risk in Tunbridge Wells Borough is associated with the River Medway and its main tributaries e.g. the River Teise and River Beult. Records show that the River Medway has overtopped its banks and defences in several of the major flood events to have been experienced by the borough, including 1960, 1968 and 2000 and 2013/2014.

Other fluvial flood risk areas identified in the borough are from the Main Rivers of the Teise, Beult and the Rother. Regular flooding has been recorded from the River Teise at Lamberhurst. Along the River Teise, residents rely on flood warning services to prepare and operate the two Environment Agency Property Level Protection (PLP) schemes within the area. Flooding resulting from overtopping defences has also been recorded for the River Rother.

In addition to these watercourses, it is important to note flooding within the borough has also been associated with Alder Stream, which flows through Five Oak Green, and Paddock Wood Stream, which flows through Paddock Wood. The Alder Stream catchment is described as particularly flashy, resulting in regular flooding from the Stream. Railway embankments act as a dam, which consequently worsens the flooding in this area of the borough with roads and property having been affected in the past. In some instances, high water levels in the Alder Stream have affected highway drains, gullies, and local sewer networks.

Flooding incidents have been reported historically in Paddock Wood. The area to the north of the railway is reported to have been affected by flooding from the rivers Teise and Medway (flood events occurred in 1960, 1968, 2000/2001, 2013/14). The Paddock Wood Stage 2 SWMP reports that Paddock Wood Town Council have stated that the corner of Church Road, The Cedars and The Ridings floods every year. Flooding south of the railway is noted to generally be associated with heavy rainfall, resulting in flooding from surface water and watercourses that flow south to north through and adjacent to Paddock Wood. In 2000, the SWMP reports that approximately 50 properties were flooded from Gravely Ways Stream and Tudeley Brook.[35]

6.4.1 Paddock Wood fluvial modelling (2019)

To better understand the fluvial flood risk to Paddock Wood, updated flood risk modelling was prepared for the Paddock Wood area. The modelling utilised the existing InfoWorks ICM hydraulic model originally developed for the Stage 2 Paddock Wood SWMP, and prepared flood risk mapping from fluvial sources to provide updated Flood Zone extents. The modelling approach, updates made to the Stage 2 SWMP model and a summary of testing conducted is documented within a standalone flood risk modelling report.

From this model, updated fluvial Flood Zones 2, 3a and 3b were prepared for the present day, as well as Flood Zone 3a under climate change: reflecting the Higher central and Upper end estimates for the 2080s epoch (+35% and +70% allowances, respectively). These flood risk outputs were incorporated into revised Flood Zone information used to inform the SFRA. Tunbridge Wells Borough Council, the Environment Agency, Kent County Council and the Upper Medway IDB were consulted on the model outputs. The outputs of this modelling will be used to inform updates to the Environment Agency's published Flood Map for Planning.

6.4.2 Five Oak Green Flood Zone update

Five Oak Green and the Alder Stream were not included in the updated modelling performed for the 2019 SFRA given that the sites for assessment for the Level 2 SFRA were outside of the Alder Stream catchment. The Environment Agency completed updated flood risk modelling and mapping for Alder Stream in 2015, with climate change modelling and mapping prepared in 2016. However, at the time of preparing the 2019 SFRA, these updates had not been incorporated into the published Flood Zone mapping. So that the SFRA was based on the most recent flood risk information, the Flood Zone mapping used in this SFRA was updated with the latest Alder Stream modelling information. The Environment Agency were consulted on the adjustments made to Flood Zones so that the information used in this SFRA will reflect the information prepared by the Environment Agency when they do their next round of Flood Zone updates.

[35] Kent County Council, (April, 2015), Paddock Wood Flood Alleviation Study

6.5 Surface water flooding

Flooding from surface water runoff (or 'pluvial' flooding) is usually caused by intense rainfall that may only last a few hours and usually occurs in lower lying areas, often where the natural (or artificial) drainage system is unable to cope with the volume of water. Surface water flooding problems are inextricably linked to issues of poor drainage, or drainage blockage by debris, and sewer flooding.

The Risk of Flooding from Surface Water (RoFSW) predominantly follows topographical flow paths of existing watercourses or dry valleys with some isolated ponding located in low lying areas. Mapping of the RoFSW throughout the borough is provided in Appendix E.

Surface water flood records (provided by Kent County Council) are shown in Figure 6-5. Although the data provided by Kent County Council covers a period from 1958 to 2016, records of surface water flooding prior to 2008 are relatively limited and several records do not have a date specified. Therefore, based on the data provided, there is a total of at least 139 records of surface water flooding across the borough, 113 of which have occurred since 2008.

The majority of these surface water flood event records are clustered around Royal Tunbridge Wells, while the remaining surface water records are dispersed more sporadically across the borough. Interestingly, no specific entries recorded in this dataset are present in Paddock Wood town (although entries are present surrounding this), yet there are known surface water flood risk and drainage issues here. This highlights the need for the data presented to be seen as indicative, but not definitive in terms of areas with historic issues of flooding.

The Tunbridge Wells Borough SWMP[36] states that, for the most part, surface water flooding could be attributed to heavy rainfall overloading carriageways, drains / gullies. However, there are other instances where the source of flooding was perceived to be from blocked drains / gullies or due to high water levels within receiving watercourses impeding free discharge from surface water drains and gullies. It is noted that roads within the borough are regularly flooded due to run off from adjacent agricultural land discharging into watercourses that do not have sufficient capacity to convey the flows. Flooding of this type is known to occur at Whites Lane, Foxhole Lane, and Rye Road[36]in Hawkhurst.

Paddock Wood is also identified as an area that has experienced a number of incidents of surface water flooding associated with small watercourses, sewerage and private drainage systems. In order to address the local flooding issue, the Paddock Wood SWMP[37] was undertaken (see section 2.4.2 for more detail). Stage 1 of the SWMP identified that reports of flooding in the area have been a result of surface water and minor watercourses, often occurring relatively rapidly from the onset of heavy rainfall[37]. Very few dates or photographs were available for the recorded flood incidents, so it was not possible to get a clear picture of the severity of frequency of surface water flooding in the area. However, Table 2-3[37] and Map 5[37] of the SWMP identifies the areas that are known to have historically flooded from surface water sources since 1960.

6.6 Groundwater flooding

Compared with other sources of flooding, current understanding of the risks posed by groundwater flooding is limited and mapping of flood risk from groundwater sources is in its infancy. Under the Flood and Water Management Act (2010), LLFAs have powers to undertake risk management functions in relation to groundwater flood risk. Groundwater level monitoring records are available for areas on Major Aquifers. However, for low lying valley areas, which can be susceptible to groundwater flooding caused by a high-water table in mudstones, clays and superficial alluvial deposits, very few records are available. Additionally, there is increased of groundwater flooding where long reaches of watercourses are culverted as a result of elevated groundwater levels not being able to naturally pass into watercourses and be conveyed to less susceptible areas.

Mapping of the whole borough has been provided showing the Areas Susceptible to Groundwater Flooding (AStGWF) dataset. This information is provided in Appendix F.

The information provided within the AStGWF dataset indicates that susceptibility to groundwater flooding is greatest in the north-eastern extent of the borough. For example, more than 75% of the area within the 1km grid squares surrounding the Whetsted and Tudeley Hale as well as the area north of Five Oak Green are susceptible to groundwater flooding. Other areas to note include

[36] JBA Consulting, (October 2013), Tunbridge Wells Stage 1 Surface Water Management Plan Final Report
[37] JBA Consulting, (December, 2011), Paddock Wood Surface Water Management Plan [Stage 1] Final Report

Ashurst, Frittenden and Knox Bridge, and Broadford, as at least 25-50% of the area in the 1km grid squares in these areas are considered to be susceptible to groundwater flooding. This pattern strongly links with the bedrock deposits displayed in Figure 6-3.

The Tunbridge Wells SWMP and historical flood records provided by Kent County Council indicates that Speldhurst Road in Southborough and Clifton Road in High Brooms have experienced groundwater flooding in the past[36]. It is specifically noted that Speldhurst Road is a drainage hotspot due to the location of the nearby spring. Although works are planned to install a French drain to divert water from the spring away from the road, there are 126 records of groundwater flooding along the road from this source[38].

However, it should be noted that it is difficult to ascertain if a source of flooding is directly from groundwater. This is because the risk of flooding may be from a combination of courses, or a culverted watercourse being mistaken for a spring of underground stream[36]. Therefore, developers planning to build within any groundwater emergence zones should still investigate whether groundwater flooding is likely to be a problem locally.

6.7 Flooding from artificial sources

6.7.1 Flooding from sewers

Sewer flooding occurs when intense rainfall overloads the sewer system capacity (surface water, foul or combined), and/or when sewers cannot discharge properly to watercourses due to high water levels. Sewer flooding can also be caused when problems such as blockages, collapses or equipment failure occur in the sewerage system. Infiltration or entry of soil or groundwater into the sewer system via faults within the fabric of the sewerage system, is another cause of sewer flooding. Infiltration is often related to shallow groundwater and may cause high flows for prolonged periods of time.

Since 1980, the Sewers for Adoption guidelines have meant that most new surface water sewers have been designed to have capacity for a rainfall event with a 1 in 30 chance of occurring in any given year, although until recently this did not apply to smaller private systems. This means that, even where sewers are built to current specification, they are likely to be overwhelmed by larger events of the magnitude often considered when looking at river or surface water flooding (e.g. a 1 in 100 chance of occurring in a given year). Existing sewers can also become overloaded as new development adds to the discharge to their catchment, or due to incremental increases in roofed and paved surfaces at the individual property scale (urban creep). Sewer flooding is therefore a problem that could occur in many locations across the study area.

The Tunbridge Wells Borough SWMP identified that there have been numerous sewer flooding events across the borough, many of which have occurred in Tunbridge Wells town[36]. Such events are noted to be predominantly caused by hydraulic overloading of surface water, foul and/or combined sewer systems, and sewer water from storm discharges is known to pollute the watercourses flowing from the Tunbridge Wells Dome[36].

Historical incidents of flooding are recorded by Southern Water in their DG5 register. This database includes incidents of flooding relating to public foul, combined or surface water sewers and displays which properties suffered flooding. For confidentiality reasons, this data has been supplied on a postcode basis from the Sewer Incident Report Form (SIRF) hydraulic overload database. Data covers all reported incidences as of its export on 3rd October 2016. The information from the SIRF database is shown in Table 6-2.

The SIRF hydraulic overload information indicates a total of 214 recorded flood incidents in Tunbridge Wells Borough. The more frequently flooded postcodes areTN12 6 (42), TN4 0 (37), and TN2 5 (34). It is important to recognise that the information does not indicate whether flooding incidences were caused by general exceedance of the design sewer system, or by operational issues such as blockages. The information also represents a snap shot in time and may become outdated following future rainfall events. Also, risk in some areas may reduce in some locations by capital investment to increase of the capacity of the network. As such, the sewer flooding flood risk is not a comprehensive ‘at risk register’ and updated information should be sought to enhance understanding of flood risk from sewers at a given location.

[38] Kent County Council, (October, 2016), Historic Flood Information Database: Tunbridge Wells Borough Council

Table 6-2: Sewer Incident Report Form database for the Tunbridge Wells Borough

Post Code	Recorded Flood Incidents	Post Code	Recorded Flood Incidents
TN1 1	8	TN18 5	8
TN1 2	9	TN2 3	19
TN11 0	1	TN2 4	16
TN12 6	42	TN2 5	34
TN12 7	2	TN3 0	12
TN12 8	1	TN3 8	3
TN17 1	1	TN3 9	3
TN17 2	4	TN4 0	37
TN17 3	2	TN4 8	1
TN17 4	6	TN4 9	2
TN18 4	3		
Total: 214			
Note: Based on information exported on 03 October 2016 provided from Southern Water. Records representative of 5-year period (2011-2016).			

6.7.2 Flooding from reservoirs

Reservoirs are artificial bodies of water, where water is collected and stored behind a man-made structure and released under control either to reduce the flow magnitudes in downstream channels or to meet a requirement when needed for purposes such as irrigation, municipal needs or hydroelectric power[39].

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

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

The risk of inundation to Tunbridge Wells Borough as a result of reservoir breach or failure of a number of reservoirs within the area was assessed as part of the National Inundation Reservoir Mapping (NIRIM) study.

There are five reservoirs located within Tunbridge Wells Borough; however, there are also ten reservoirs located outside the borough boundary that could inundate parts of the borough following a breach or failure. Details of the reservoirs are provided Table 6-3.

Outlines from the NRIM study show the worst-case inundation extents across Tunbridge Wells Borough if the reservoirs within and surrounding the boundary were to breach and fail. As shown in Figure 6-6, reservoir breaches would primarily affect the central and northern extent of the borough. This is due to the four reservoirs that are located along the River Beult and the River Teise, an unnamed tributary of the River Teise and the Alder Stream. Therefore, a breach of these reservoirs could have serious implications for the settlements located along fluvial floodplains of these watercourses. Such settlements include but are not limited to Lamberhurst, Horsmonden, Paddock Wood, Capel, Five Oak Green, Whetsted and Tudeley Hale.

Other areas at risk of flooding from reservoirs within the borough include Ashurst and areas north of Speldhurst and Bidborough. However, the risk of flooding from reservoirs in these areas is less

[39] Defra – national flood and coastal erosion risk management strategy for England (2011): https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/228898/9780108510366.pdf

extensive compared to the risk of flooding in the central and northern extent of Tunbridge Wells Borough.

Table 6-3: Reservoirs that may potentially affect Tunbridge Wells Borough in the event of a breach or failure

Reservoir	Location (grid reference)	Reservoir owner	Environment Agency area	LLFA
Within Tunbridge Wells Borough				
Furnace Pond Horsmonden	569478, 141220	Webb	Kent and South London	Kent County Council
Pembury	562769, 142696	South East Water		
Bayham Lake	564315, 136595	Bayham Lake Management Limited		
Bedgebury Park Great Lake	572382, 134818	Bell Bedgebury International School		
Dunorlan Park Lake	560191, 139563	Tunbridge Wells Borough Council		
Outside Tunbridge Wells Borough (reservoirs located outside of borough that intersect its boundaries)				
Wiremill Lake	536875, 141941	Wiremill Waterski Club	Kent and South London	Surrey County Council
Hever Castle Lake	548849, 145550	Hever Castle Ltd		Kent County Council
Bough Beech	549168, 147292	Sutton & East Surrey Water Company		
Leigh Barrier (Medway) FSR	556408, 146112	Environment Agency		
Main Lake, Eridge Park	556134, 135014	The Nevill Estate Co. Ltd		East Sussex County Council
Buckhurst Park Lake	549797, 135106	Trustees of the Buckhurst Park Fund		
Darwell	572022, 121297	Southern Water Services Ltd		
Bewl Bridge	568239, 133654	Southern Water Services Ltd		
Wadhurst Park Lake	563741, 127902	Wadhurst Park Ltd		
Weirwood	540713, 135333	Southern Water Services Ltd		

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

- Developers should seek to contact the reservoir owner to obtain information which may include
    - reservoir characteristics: type, dam height at outlet, area/volume, overflow location;
    - operation: discharge rates / maximum discharge;
    - discharge during emergency drawdown; and
    - inspection / maintenance regime.
- Developers should apply the sequential approach to locating development within the site. The following questions should be considered
    - can risk be avoided through substituting less vulnerable uses or by amending the site lay-out?
    - can it be demonstrated that less vulnerable uses for the site have been considered and reasonably discounted? and
    - can layout be varied to reduce the number of people or flood risk vulnerability or building units located in higher risk parts of the site?
- Consult with relevant authorities regarding emergency plans in case of reservoir breach

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

6.8 The impact of climate change

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

- Consideration of the vulnerability of the proposed development types or land use allocations to flooding and directing the more vulnerable away from areas at higher risk due to climate change.
- Use of 'built in' resilience measures. For example, raised floor levels.
- Capacity or space in the development to include additional resilience measures in the future, using a 'managed adaptive' approach.

The last consideration acknowledges that there may be instances where some flood risk management measures are not necessarily needed now but may be in the future. This 'managed adaptive' approach may include for example setting a development away from a river so it is easier to improve flood defences in the future.

The latest guidance on climate change allowances for flood risk assessment released by the Environment Agency[40] provides predictions of anticipated change for

- peak river flow;
- peak rainfall intensity;
- sea level rise; and
- offshore wind speed and extreme wave height.

6.8.1 Fluvial flooding

Climate change mapping has for Tunbridge Wells Borough been provided in Appendix D (refer to the comment in section 6.8 regarding the latest climate change allowance guidance).

It is important to note that climate change does not just affect the extent of flooding. Even where flood extents do not significantly change; flooding is likely to become more frequent under a climate change scenario. The impact of an event with a given probability is also likely to become more severe. For example, as water depths, velocities, and flood hazard increase, so will the risk to people and property. Although qualitative statements can be made as to whether extreme events are likely to increase or decrease over the UK in the future, there is still considerable uncertainty regarding the magnitude of localised impact of these changes. Further details regarding the uncertainties in predicting the impacts of climate change can be found in:

- **Environment Agency (2016) Flood Risk Assessments: Climate Change Allowances**
- **UK Climate Projections (UKCP09)**

The guidance used in this SFRA is based on UKCP09, but it should be noted that updated Environment Agency guidance on climate change is expected to be issued in 2019, after the publication of this SFRA, following the publication of UKCP18. Until this information is published, the Environment Agency advise that they are contacted for interim guidance.

6.8.2 Surface Water flooding

Climate change is predicted to increase rainfall intensity in the future by up to 40%[40] (for the Upper End estimate to the 2080s epoch (2070 to 2115) under the new range of allowances published by the Environment Agency. This will increase the likelihood and frequency of surface water flooding, particularly in impermeable urban areas, and areas that are already susceptible. Changes to predicted rainfall should be incorporated into flood risk assessments and drainage and surface water attenuation schemes associated with developments.

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

6.8.3 Groundwater flooding

The effect of climate change on groundwater flooding problems, and those watercourses where groundwater has a large influence on winter flood flows, is more uncertain. The updated climate change guidance released in February 2016 does not provide information on expected changes to groundwater flooding under future climate change. However, milder wetter winters may increase the frequency of groundwater flooding incidents in areas that are already susceptible, but warmer drier summers could counteract this effect by drawing down groundwater levels to a greater extent during the summer months. Where groundwater flooding is expected to influence a development site, it will be expected that consideration of groundwater flooding under a changing climate is assessed and measures taken to mitigate any change in risk.

6.8.4 Climate change assessment of flood risk at sites

To inform the SFRA, the outputs from hydraulic modelling and mapping of fluvial flood risk from the River Medway (excluding the majority of its tributaries except for the River Teise and River Beult) expected under climate change was used. This information was prepared by the Environment Agency and permitted for use in the SFRA. The modelling and mapping completed focused on predicted flood risk at the 2080s epoch (2070-2115) under increased flow rates of +30% and +70% for the undefended case 1% AEP event (Flood Zone 3a). The fluvial flow allowances represent the High Central and Upper End allowances under the latest guidance for the Thames River Basin District in which the River Medway catchment is located.

Flood Zone outlines for the latest climate change guidance are not available for non-Medway watercourses, except for the River Teise (from Goudhurst Road southeast of Horsmonden), the River Beult (prepared by the Environment Agency), and for the Paddock Wood Stream and catchments draining through Paddock Wood. Consideration of development should seek to confirm whether the site(s) would be influenced by flood risk from watercourses both in the present day and with anticipated changes in flows brought about by climate change.

With respect to the vulnerability classification of development and its intended lifetime, the Environment Agency consider that within Flood Zone 3a More Vulnerable development types should consider the Higher Central estimate as the design flood, whilst Essential Infrastructure should consider the Upper End estimate. Less Vulnerable and Water Compatible development should consider the Central estimate as the design flood.

Note that Tunbridge Wells Borough is covered by two River Basin Districts (Thames RBD and South East RBD), meaning that for a given epoch/allowance different changes in peak river flows are required to be considered. Refer to the Environment Agency guidance for information on what these allowances are.

Figure 6-1: Topography across Tunbridge Wells Borough

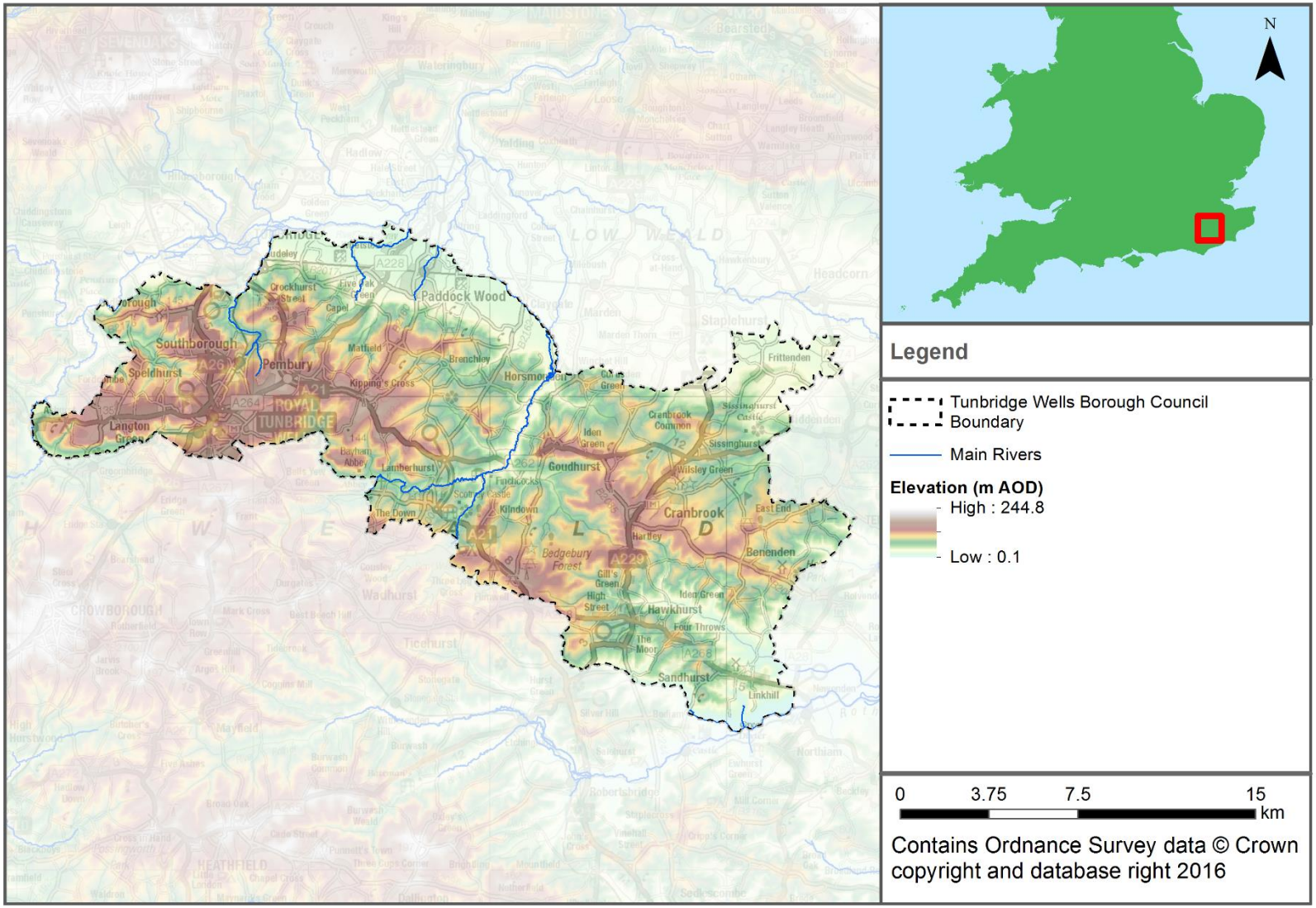


Figure 6-2: Bedrock deposits in Tunbridge Wells Borough

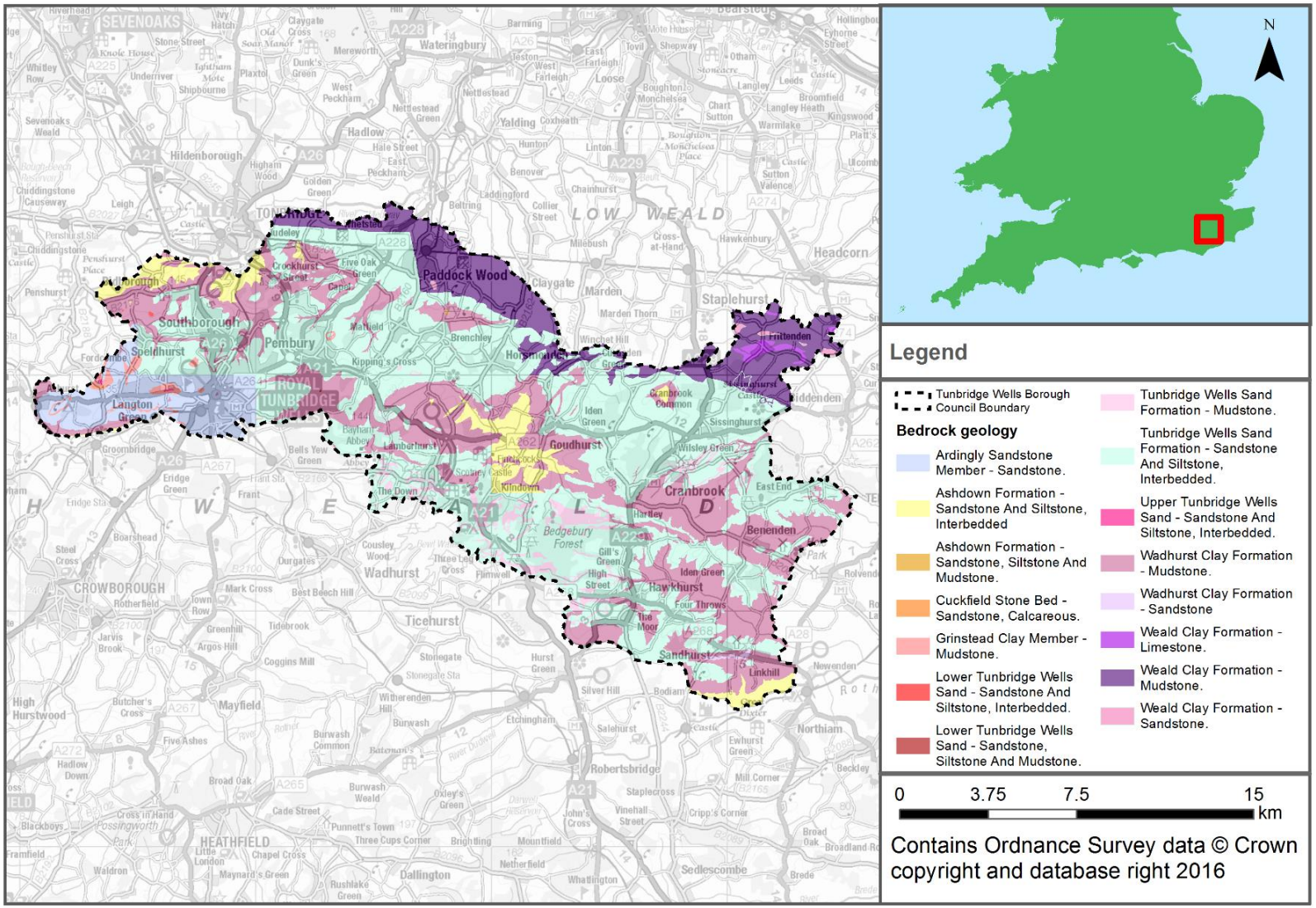


Figure 6-3: Superficial deposits in Tunbridge Wells Borough

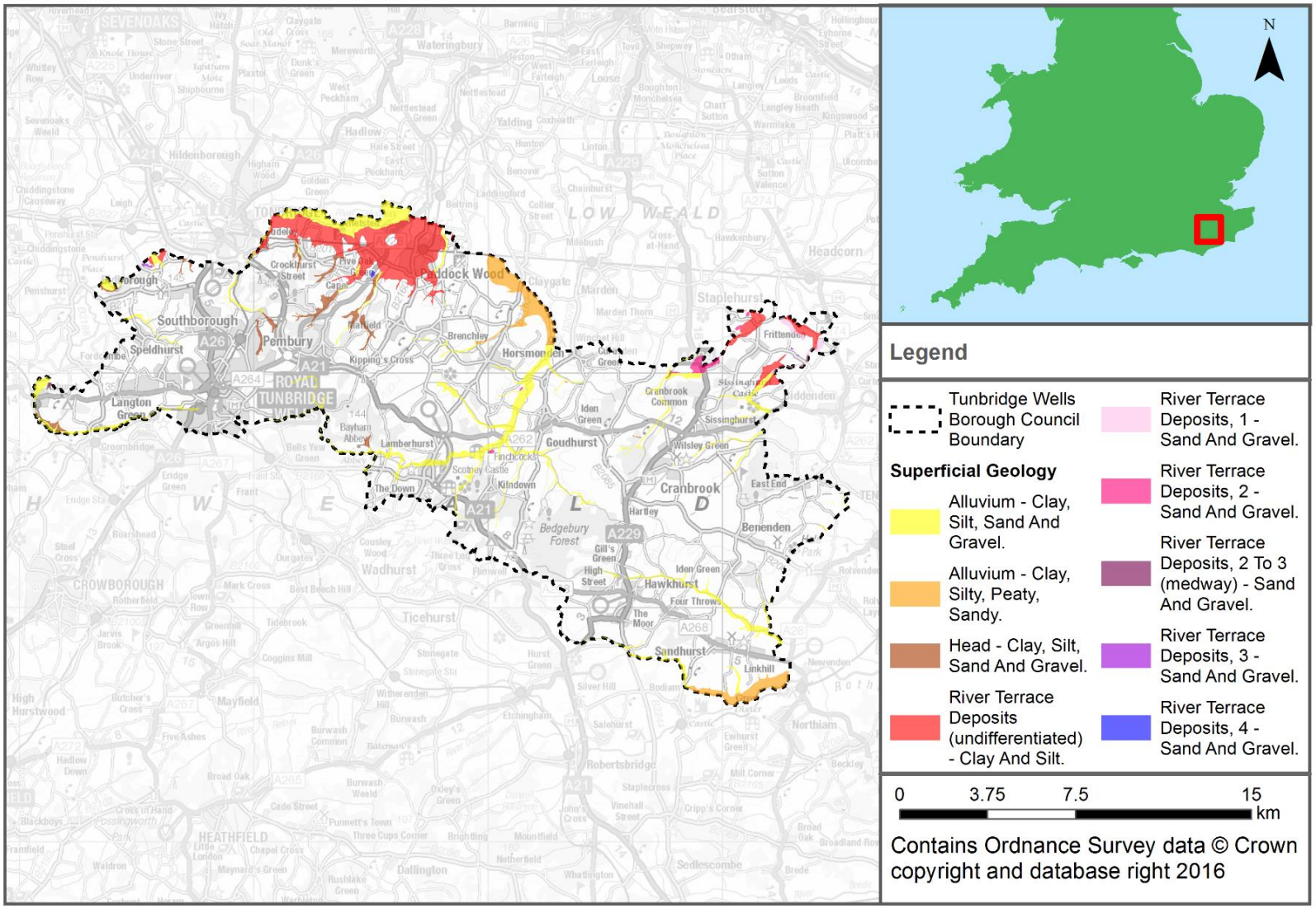


Figure 6-4: Historical flood records across Tunbridge Wells Borough

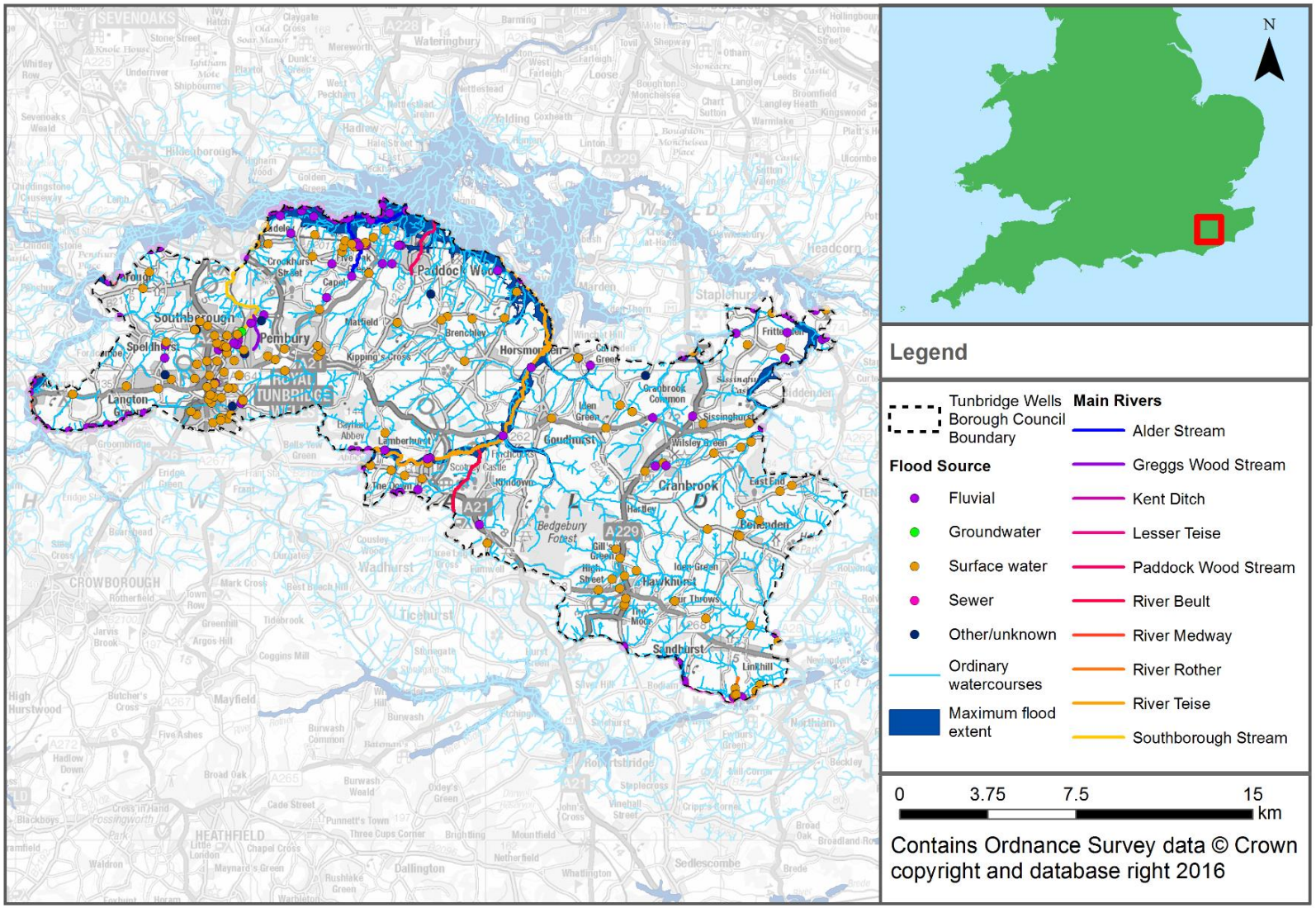


Figure 6-5: Surface water flooding records (1958-2016)

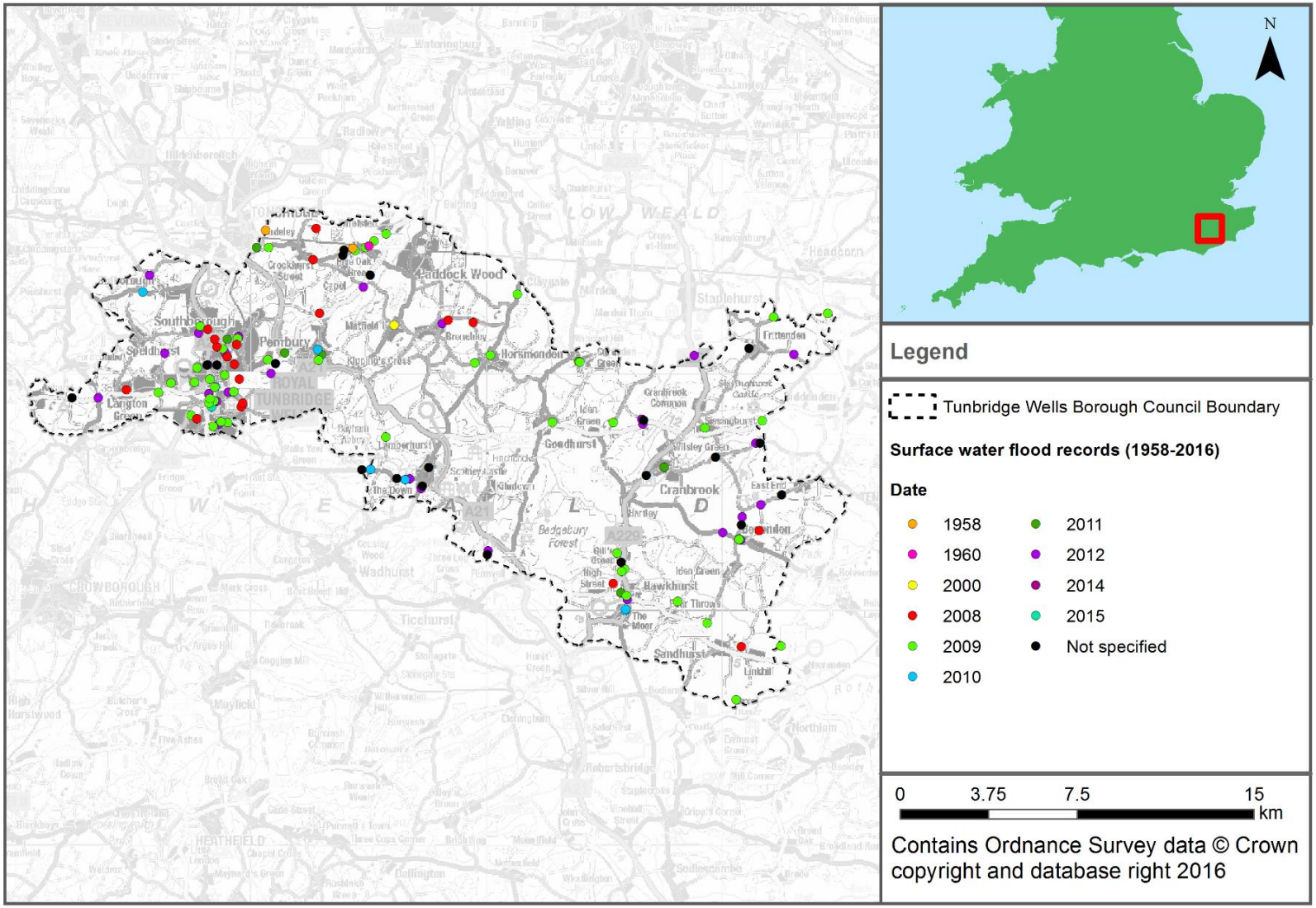
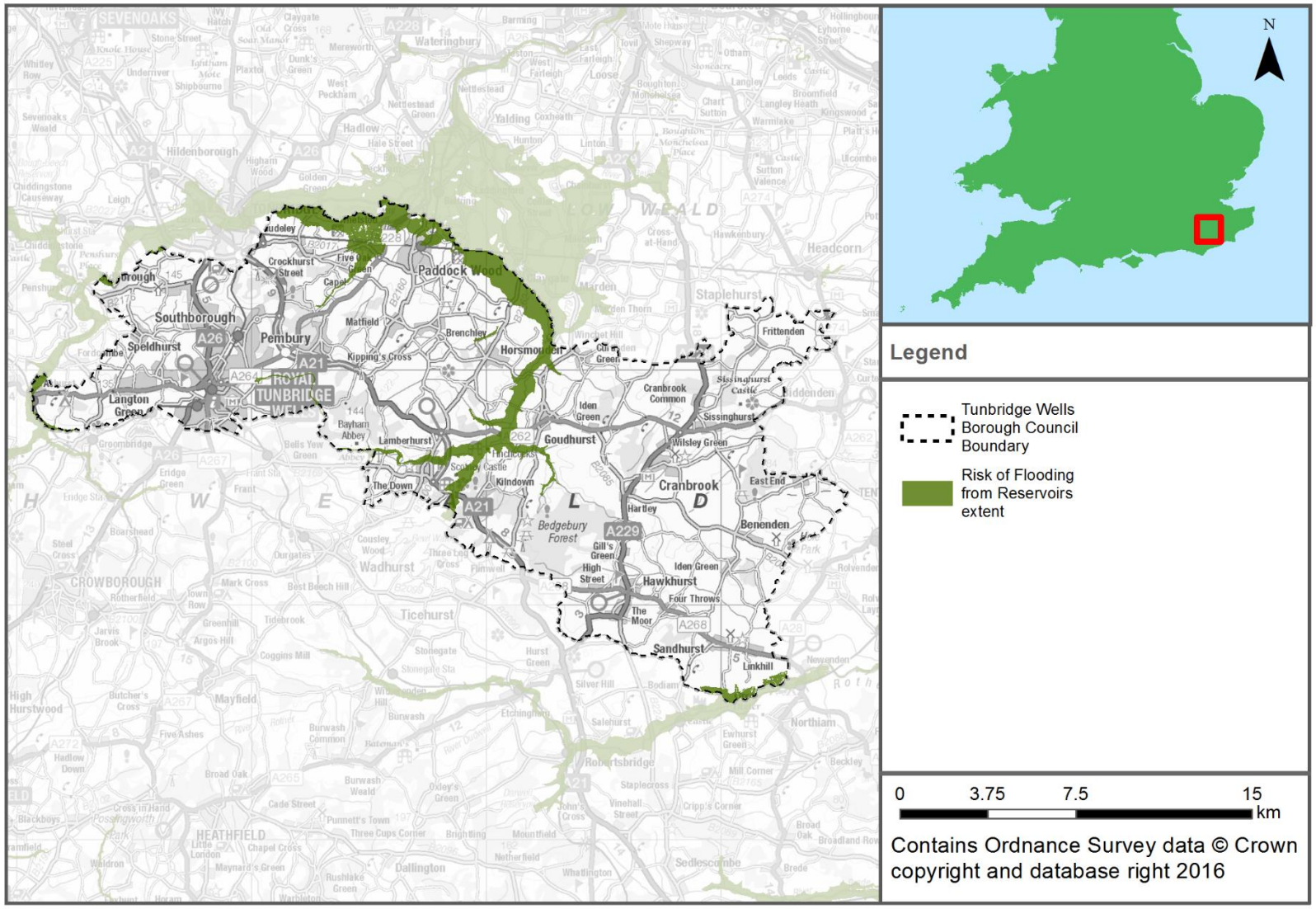


Figure 6-6: Areas of risk of reservoir flooding following a breach or failure



7 Flood defences

7.1 Formal flood defences

A high-level review of formal flood defences, their condition and standard of protection was completed. Details of defence location and condition were provided by the Environment Agency in addition to some explanation of these defences.

Defences are categorised as either raised flood defences (e.g. walls/embankments) or flood storage areas (FSAs). The assessment has considered man-made defences only and has not considered any natural defences which may arise for instance due to the presence of naturally high ground adjacent to a settlement.

7.2 Defence standard of protection and residual risk

One of the principal aims of the SFRA is to outline the present risk of fluvial flooding from watercourses across Tunbridge Wells Borough including consideration of the effect of flood risk management measures (including flood banks and defences). The modelling that informs the understanding of flood risk across the borough is typically catchment-wide and suitable for preparing evidence on possible site options for development. In cases where a specific site risk assessment is required, detailed studies should seek to refine the broad understanding of flood risk from all sources.

Consideration of the residual risk behind flood defences has been undertaken as part of this study. The residual risk of flooding in a flood event or from failure of defences should also be carefully considered.

Developers should also consider the standard of protection provided by defences and residual risk as part of a detailed Flood Risk Assessment (FRA).

Standard of Protection

Flood defences are designed to give a specific standard of protection, reducing the risk of flooding to people and property in flood prone areas. For example, a flood defence with a 1% AEP standard of protection means that the flood risk in the defended area is reduced to a 1% chance of flooding in any given year.

Although flood defences are designed to a standard or protection it should be noted that, over time, the actual standard of protection provided by the defence may decrease, for example due to deterioration in condition or increases in flood risk due to climate change

7.3 Defence condition

Formal structural defences are given a rating based on a grading system for their condition[41]. A summary of the grading system used by the Environment Agency for condition is provided in Table 7-1.

Table 7-1: Defence asset condition rating

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

Source: Condition Assessment Manual – Environment Agency 2006

[41] Condition Assessment Manual, Environment Agency (2006)

7.4 Defences in Tunbridge Wells Borough

Within Tunbridge Wells Borough, raised flood defences are present alongside sections of channel or set back from the channel to protect certain areas from fluvial flooding. A review of key defences across the borough, their condition and standard of protection is included in the following sections.

7.4.1 Defences: River Rother and Kent Ditch at Sandhurst

As shown in Figure 7-1, flood defences in the form of embankments are located along the reach of the River Rother approximately 2.5km south-east of Sandhurst. The defences are maintained by the Environment Agency. The overall condition of the defences is variable, ranging from good to fair (Figure 7-2).

The standard of protection afforded by these defences is also variable (Figure 7-3). Given that the area is primarily used for agricultural land-uses, the embankments located along the main reach of the River Rother are designed to protect the area to a 50% AEP standard of protection (1 in 2-year flood event). The embankments located along the river's small tributary are designed to afford a slightly higher standard of protection of 20% AEP (1 in 5-year flood event).

Figure 7-1: Location of defences near Sandhurst

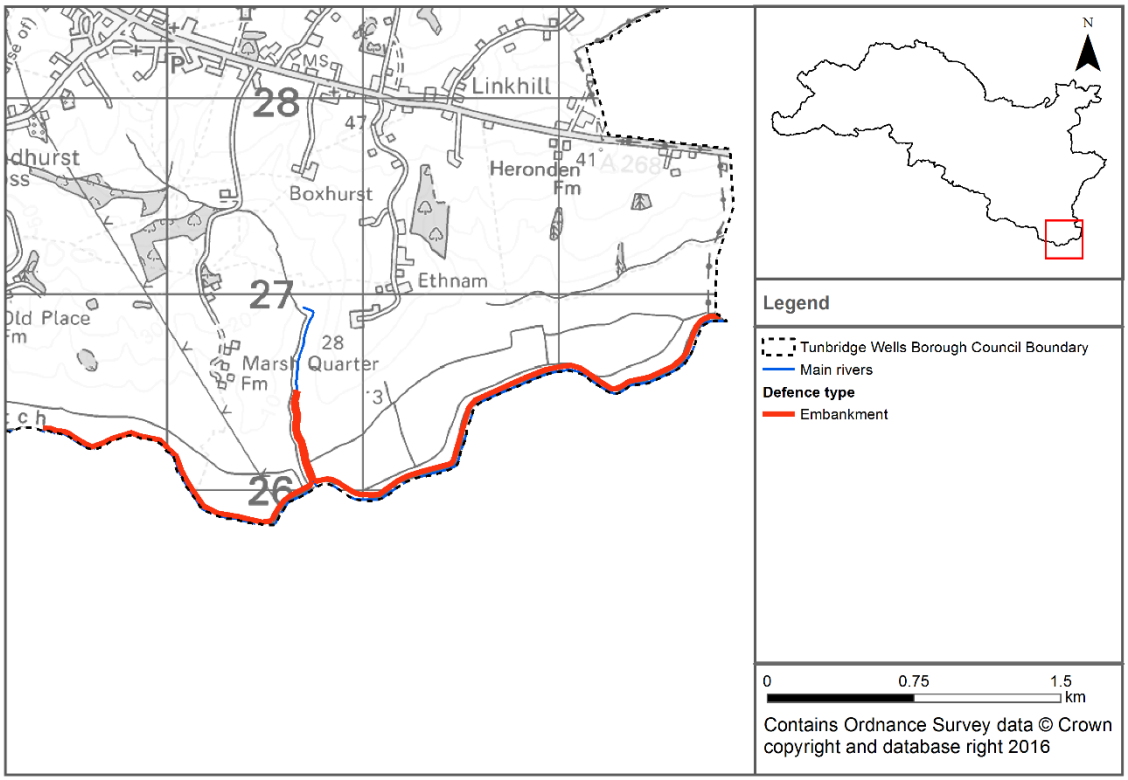


Figure 7-2: Condition grade of defences near Sandhurst

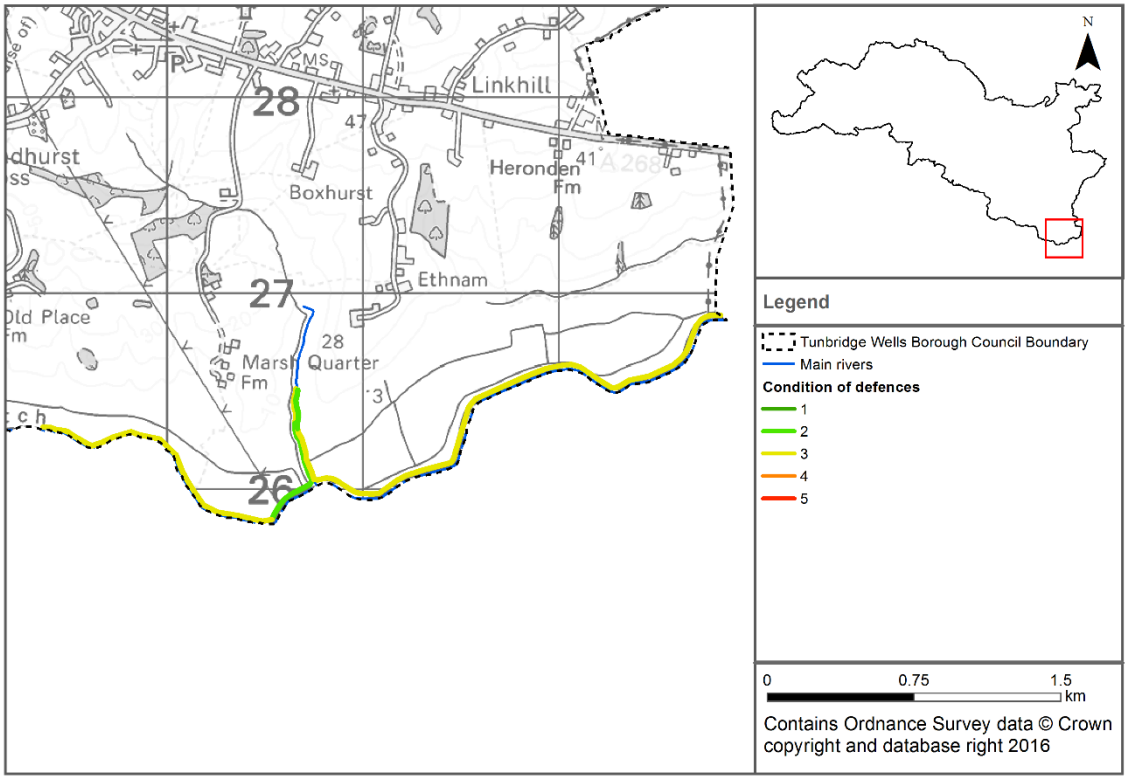
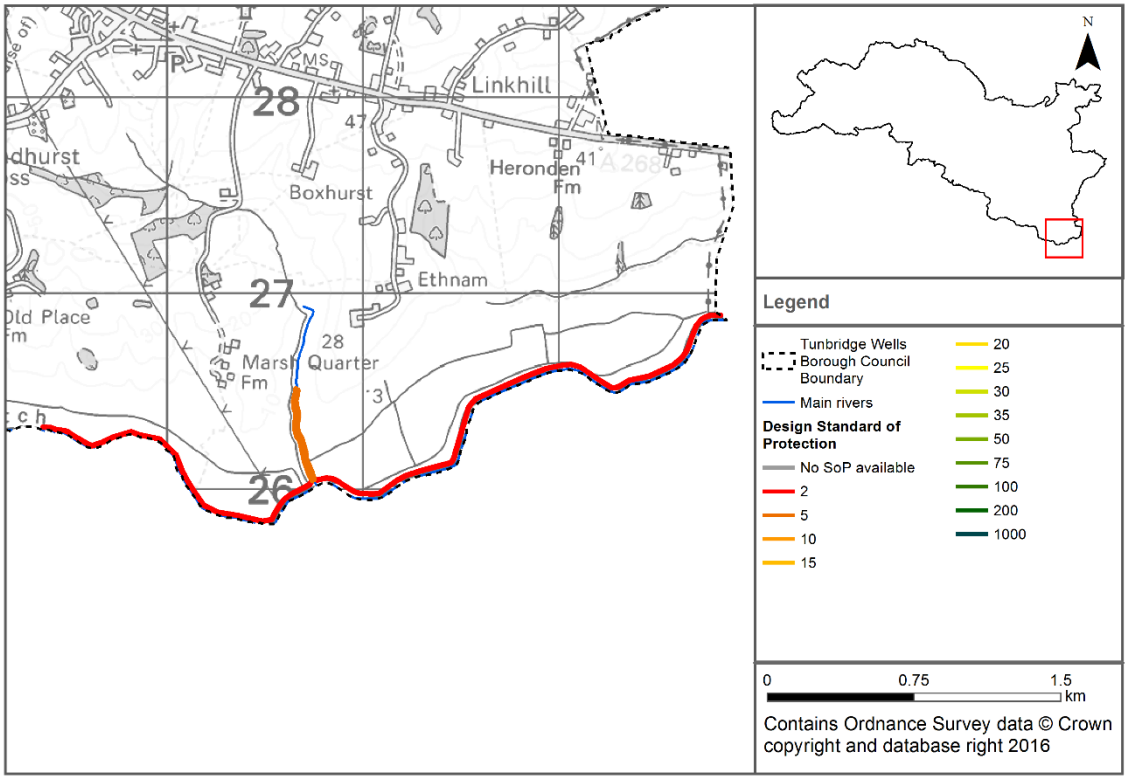


Figure 7-3: Design Standard of Protection for defences near Sandhurst



7.4.2 Defences: Woodgate Way

A defence is located along a small section of the Southborough Stream approximately 3.8km north-east of Southborough and adjacent to Woodgate Way in Tonbridge. The defence is privately maintained. The information provided by the Environment Agency noted that the defence in this area is in the form of an earth embankment and raised sandbags which line the channel of the stream (Figure 7-4).

The defence has a 'fair' condition grade, meaning that defects may be present which could reduce the overall performance of the defence (Figure 7-5). The earth embankment is designed to provide a standard or protection of 20% AEP (Figure 7-6). The defence serves to protect the industrial properties located along Woodgate Way and within the riparian area of the stream from a 1 in 5-year event.

Figure 7-4: Location of defences near Woodgate Way

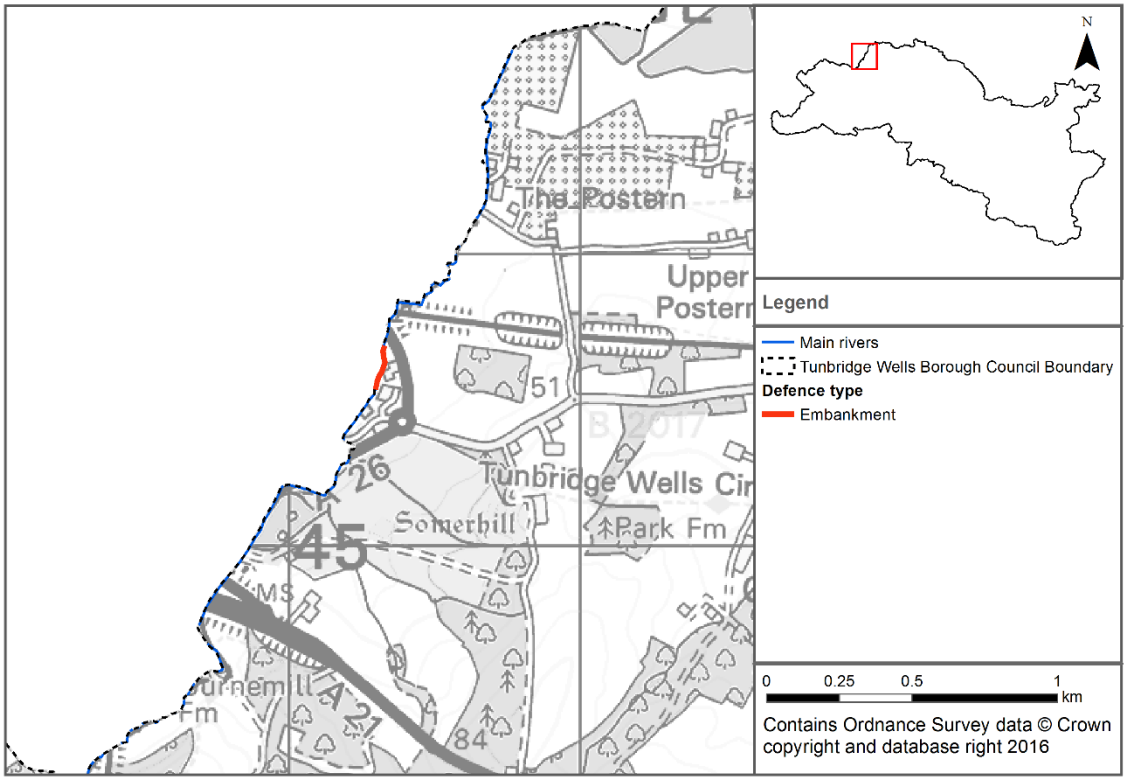


Figure 7-5: Condition grade of defences near Woodgate Way

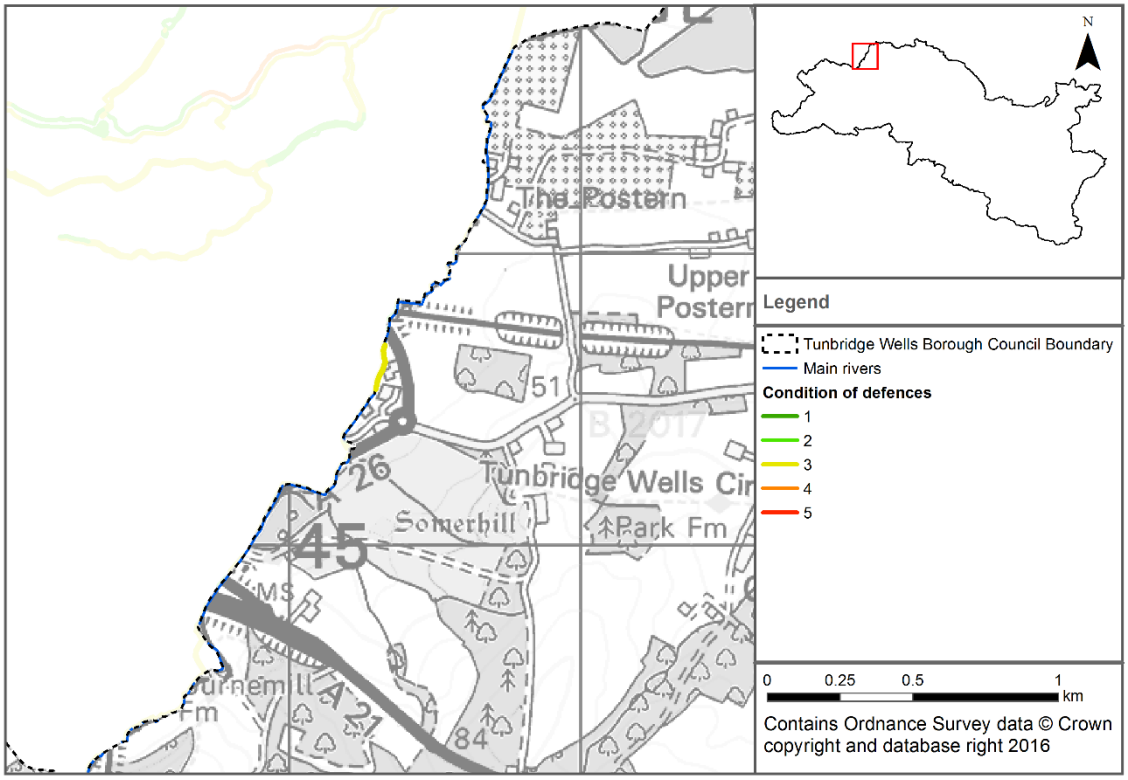
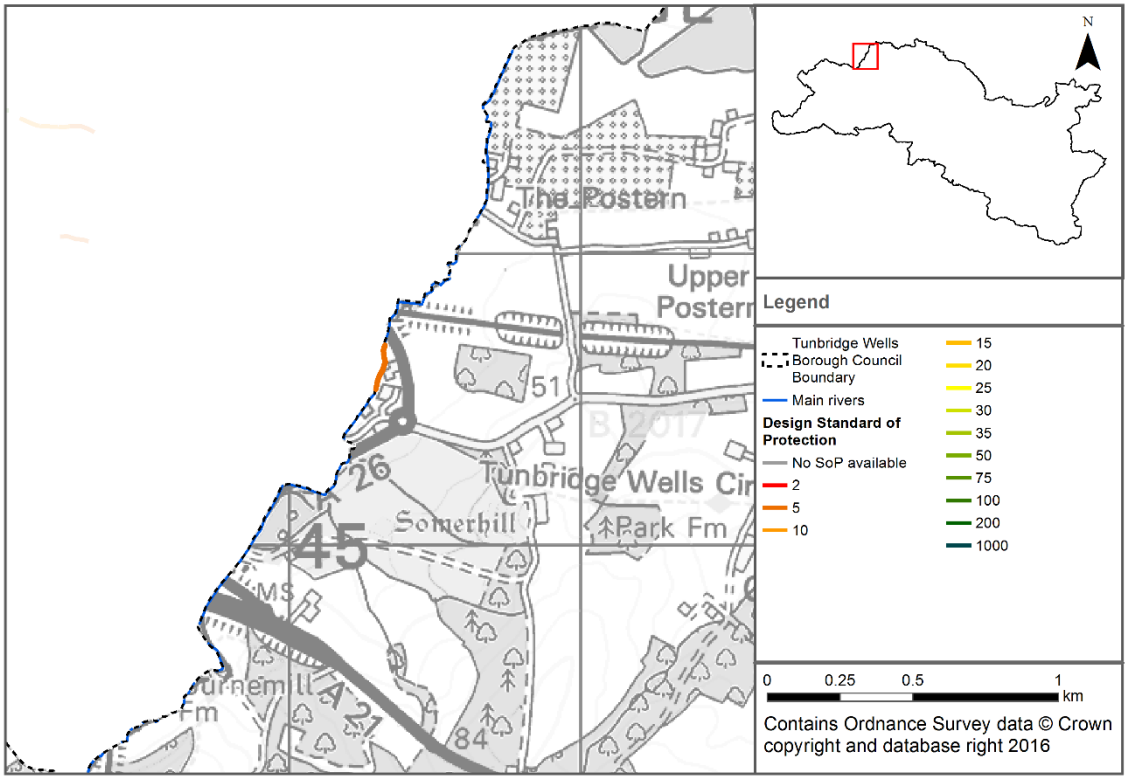


Figure 7-6: Design Standard of Protection for defences near Woodgate Way



7.4.3 Defences: Five Oak Green

A small raised defence is located along the banks of the Alder Stream approximately 0.2km south of Five Oak Green Road. The information provided by the Environment Agency noted that the defence in this area is an embankment which is accompanied by concrete bank protection works (Figure 7-7).

The condition grade of the defence is 'Fair', meaning that defects may be present that could the overall performance of the defence lining the Alder Stream (Figure 7-8). The defence has been designed to provide a standard of protection of 20% AEP and thus protect the surrounding properties from a 1 in 5-year flood event (Figure 7-9).

Unlike the defences near Sandhurst and Southborough, the defence adjacent to Alder Stream is owned and maintained by the Local Authority.

Figure 7-7: Location of defences at Five Oak Green

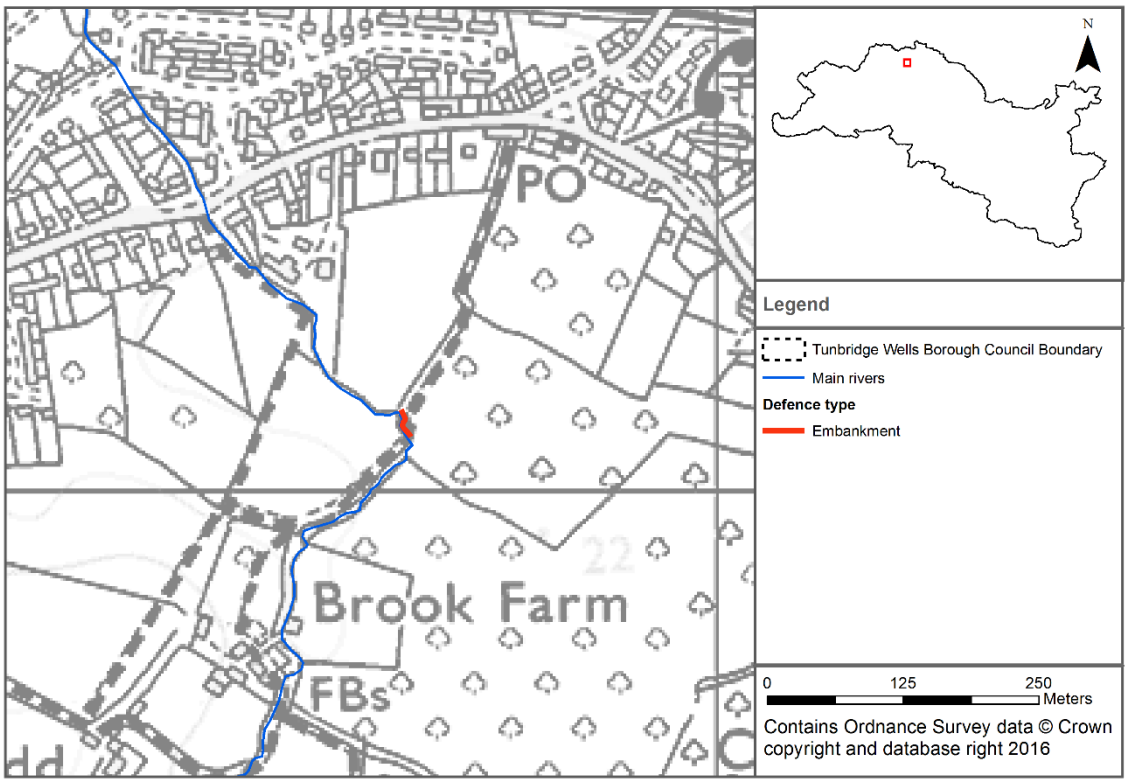


Figure 7-8: Condition grade of defences at Five Oak Green

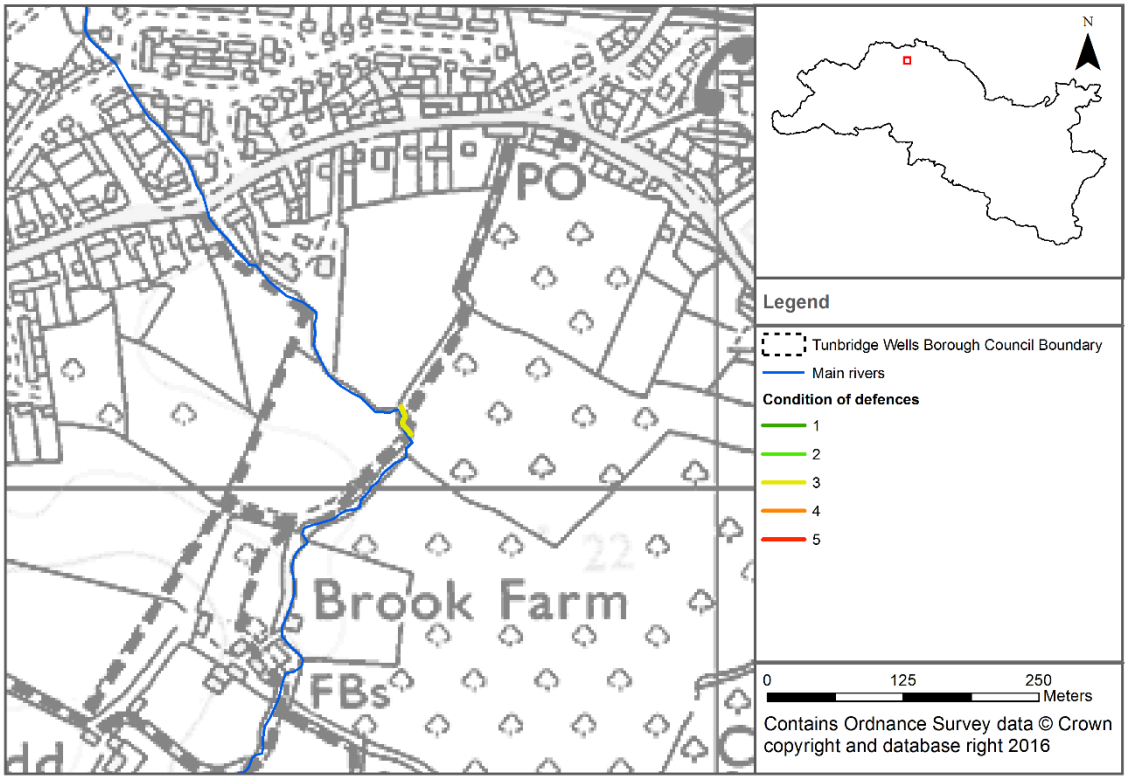
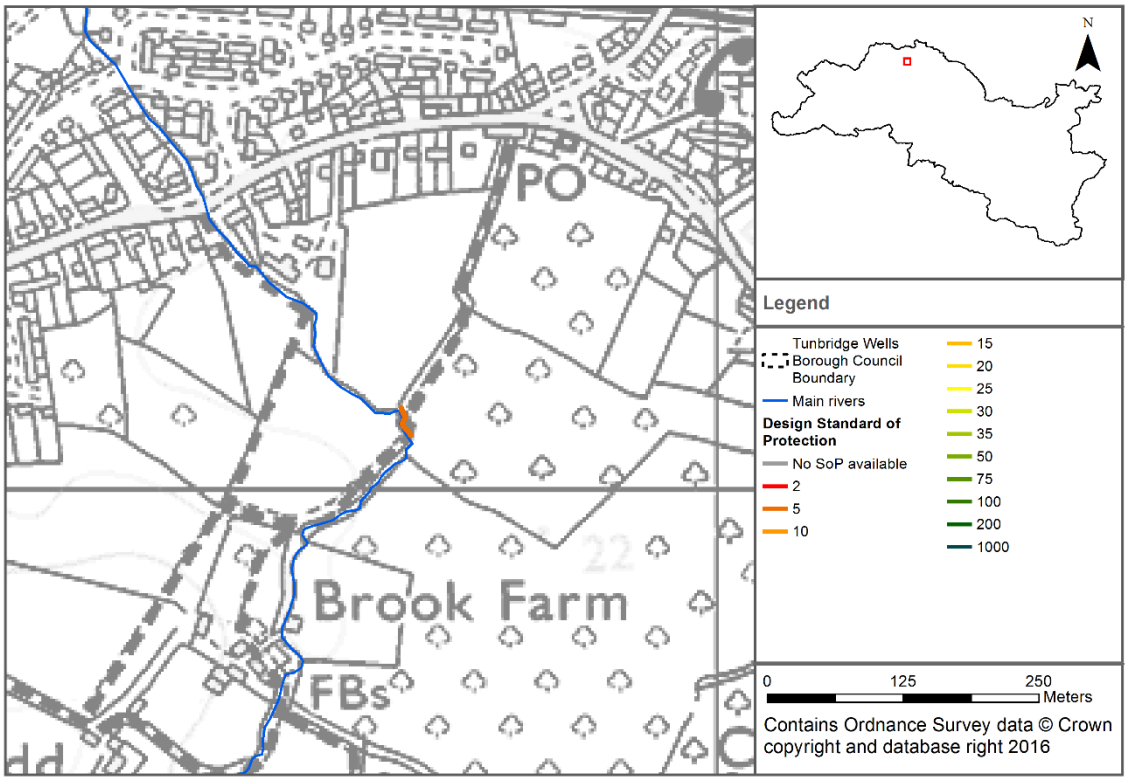


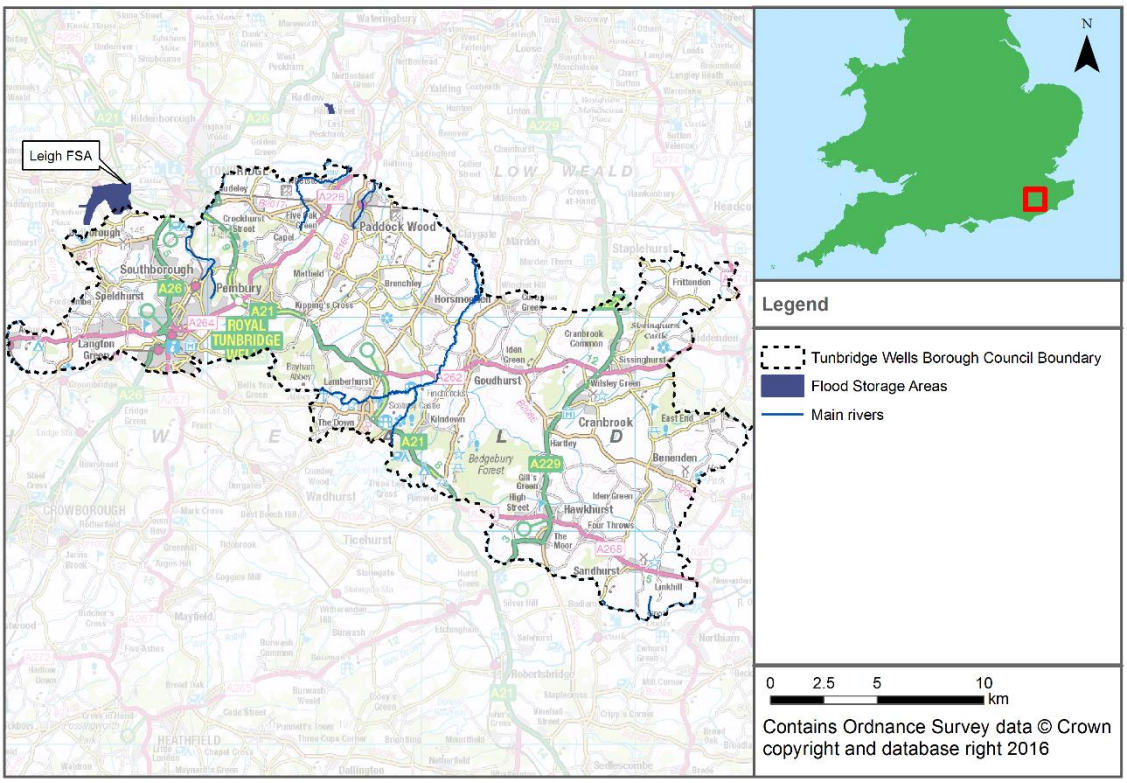
Figure 7-9: Design standard of protection of defences at Five Oak Green



7.4.4 Flood storage areas

The Leigh Flood Storage Area is the only Flood Storage Area (FSA) located within the vicinity of Tunbridge Wells Borough (Figure 7-10). Although Leigh FSA is located approximately 1km north of the borough boundary, a small section of the area forming the FSA extends into Tunbridge Wells Borough approximately 1.3km north of Bidborough.

Figure 7-10: Location of Leigh FSA



Leigh Flood Storage Area

The Leigh FSA is an online storage reservoir located on the River Medway that was constructed in 1982. Although the FSA is kept empty under normal flow conditions, it attenuates floods from the Upper Medway catchment (River Medway and River Eden) during times of raised flows and primarily aims to reduce the flow of the Medway and protect Tonbridge from flooding. However, it provides some benefit in terms of reduced peak flood flows downstream of Tonbridge in the River Medway floodplain at the north of the borough.

The FSA consists of an impounding embankment with an outflow through three radial gates. It is operated to limit forward flows but has a maximum impounding level of 28.05m AOD. If that level is likely to be exceeded, then alternative operation of the FSA is considered by the Environment Agency.

Assigning a single standard of protection for the FSA is not possible as the inflows to the FSA, volume of water stored and reduced outflows possible, leading to reductions in flooding varies on an event by event basis. The FSA has been regulated under the Reservoirs Act 1975 (now under the Flood and Water Management Act 2010) and has a condition grade of 1 (Very Good).

The **Kent County Council Flood Risk to Communities – Tonbridge and Malling** (March 2016) report has stated that prior to the floods during the winter of 2013/2014, Leigh FSA was planned to have work carried out by the Environment Agency to extend the life to 2035[42]. Since the event, a partnership has formed between the Environment Agency, Kent County Council, Sevenoaks and Tonbridge and Malling Borough Councils[43] to bring forward plans to increase the capacity of the

[42] Kent County Council Flood Risk to Communities – Tonbridge and Malling (2016)
[43] Environment Agency policy paper. The Medway Flood Partnership: objectives, members and action plan. Published 25 July 2017 (updated 18 January 2019). Available: https://www.gov.uk/government/publications/the-river-medway-partnership-objectives-members-and-action-plan

Leigh FSA. As part of this planning, Tunbridge Wells Borough Council has been consulted on the proposals.

The **latest update on plans for the Leigh Flood Storage Area expansion**, indicate that detailed design is currently underway and subject to receiving planning permission, construction is scheduled for 2020-2023. It is anticipated that preliminary works are to commence in 2018, with the aim to complete the main construction by 2022.

7.5 Other defence works

The Environment Agency's Flood and Coastal Erosion Management (FCERM) capital investment programme outlines how government investment will be managed to reduce risk and coastal erosion in England[44]. The full programme lists all FCERM projects that are planned to take place over the next six years since April 2015 across the UK.

In order to reflect the increasing certainty of development, all projects are categorised into one of three stages of FCERM programme:

- Construction programme – includes projects that are already in construction, fully funded projects that are due to start construction in the coming financial year, or projects scheduled to start construction in the coming financial year subject to securing other funding contributions;
- Development programme – includes projects in development with full funding packages agreed and expected to start construction in future year subject to approval of a full business case, or projects in development that are expected to start construction in future years subject to approval of a full business case and securing other funding contributions;
- Pipeline programme – includes projects proposals that are likely to qualify for some government funding before 2021 and have been given an indicative allocation. However, they have not yet identified sufficient contributions and/or do not have a sufficiently well-Developed case to enter the development programme at this stage.

Based on the information published by the EA, there are three FCERM projects within the development programme for Tunbridge Wells Borough, further details of which are included below.

7.5.1 Five Oak Green Flood Alleviation Scheme

Since the flooding of December 2013, several measures have been implemented to reduce the risk of flooding to the properties within the village of Five Oak Green[45]. Such measures include:

- Bi-annual public meetings have been held by the Parish Council to allow residents to make any flooding concerns clear to the relevant authorities.
- The drains in the centre of the village have been surveyed using CCTV systems and blockages have been cleared[45],
- The Environment Agency realigned the culverted section of the river in the summer of 2014 to provide a better level of protection of 166 properties located along Norton's Way and Five Oak Green[46].

In order to further reduce the risk of fluvial flooding from the Alder Stream, a Five Oak Flood Alleviation Scheme has been proposed. Initially, the scheme concept was to design and construct a flood diversion and storage area near Capel to provide a better level of protection to 265 properties at risk of fluvial flooding between Capel and Five Oak Green[44]. The Environment Agency are still investigating options for Five Oak Green. Recently an Initial Assessment into potential flood risk management options was completed for the Alder Stream catchment to improve understanding of what may be feasible to reduce fluvial flood risk. Further investigation is needed into the viability of options. The project remains on the Environment Agency's register of potential schemes, but no date for taking additional work forward is known at this time.

[44] Environment Agency, (July, 2016), Programme of flood and coastal erosion risk management schemes
[45] Liberal Democrats, (30th January, 2016), Council Patterson Calls for Money for Flood Relief
[46] Capel Parish Council, (13th October, 2014), Flood Committee Meeting: 3. Environment Agency Report

7.5.2 Greggs Wood Stream Culvert Renovation Scheme

The culverted section of Greggs Wood Stream beneath the North Farm Industrial Estate in Tunbridge Wells was found to be in poor condition and some sections were at risk of collapse[47]. The culvert was therefore registered as a failing asset.

A renovation scheme was been proposed and the Environment Agency have been coordinating with several riparian owners to repair sections of culvert running under their sites. The majority of the identified repairs have been completed, with a few small sections remaining. No future funding is allocated by the Environment Agency.

7.5.3 Paddock Wood Flood Alleviation Scheme

Paddock Wood is at risk from both fluvial and pluvial flooding when the amount of rainfall is too much for the watercourses and sewers to discharge quickly enough. As a result, a number of flood incidents have been reported across the Paddock Wood Area over recent years.

To understand approaches which may help to mitigate the risk of flooding, Kent County Council appointed Jackson Hyder to carry out a hydraulic modelling study to assess a series of options to mitigate flooding in Paddock Wood[48]. Based on the economic appraisal undertaken as part of the study, the following preferred mitigation options were identified:

- Option 2 – Reduce overland flow from Tudeley Brook to Gravelly Ways: this option comprises the construction of earth bunds and redefining drainage ditches, as well as installing a flow control structure to prevent flow from Tudeley Brook entering the Gravelly Ways Stream.
- Option 3 – Rhoden East Flood Storage: this option comprises the construction of an earth bund on the left bank of the Rhoden East that ties into the old railway culvert. The bund will store water from Rhoden East and prevent some overland flow from Rhoden East overloading the Rhoden West.
- Option 6 – Paddock Wood Flood Storage: this option comprises the construction of earth bunds and a flow control structure to control flows from upstream and the storage area into the downstream culvert. The bund will store water from the Paddock Wood Stream and prevent some overland flow from overtopping the banks and travelling down the B2160 road.
- Option 7 – Gravelly Ways Stream Wall: this option comprises the construction of a flood wall along the border between the field with gardens and railway. An additional culvert on Tudeley Brook and the addition of one way flow control flaps onto the surface water outfalls will also be required. The wall will prevent the right bank of the Gravelly Ways Stream from overtopping and thus prevent overland flow down the back of Allington Road.

To further minimise the flood risk in the future, the study also recommended that the culverts beneath the railway should be improved, and the local community should be encouraged to take responsibility for managing and reporting debris and vegetation that may affect flood flows in the watercourses and surface water network.

An entry for the scheme remains on the Environment Agency's Flood and Coastal Erosion Risk Management (FCERM) Development Programme. However, progress with a potential scheme is hold on hold, with a likely next step requiring the preparation of a business case to support any requests for funding.

[47] Kent County Council, (January 2015), Environment & Transport Cabinet Committee Meeting: Costal and river flood defence investment (Appendix 1 – Full list of Kent flood defence schemes not yet started)
[48] Jackson Hyder, (April, 2015), Kent County Council: Paddock Wood Flood Alleviation Study

8 FRA requirements and guidance for developers

8.1 Over-arching principles

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

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

8.2 Requirements for site specific flood risk assessments

8.2.1 What are site specific FRAs?

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

8.2.2 When are site specific FRAs required?

Site specific FRAs are required in the following circumstances:

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

8.2.3 Objectives of site specific FRAs

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

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

Flood Risk Assessments for sites located in Tunbridge Wells Borough should follow the approach recommended by the NPPF (and associated guidance) and guidance provided by the Environment Agency and Kent County Council. Guidance and advice for developers on the preparation of site specific FRAs include:

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

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

In circumstances where FRA's are prepared for windfall sites then they should include evidence that demonstrates the proposals are in accordance with the policies described in the Local Plan and provide evidence on flood zones as appropriate.

8.3 Flood risk management guidance - mitigation measures

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

8.3.1 Site layout and design

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

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

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

Making space for water

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

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

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

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

8.3.2 Raised floor levels

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

If it has been agreed with the Environment Agency that, in a particular instance, the raising of floor levels is acceptable, Finished Floor Levels (FFLs) should be set to the higher of a minimum of 600mm above the 1 in 100-year (1% AEP) plus climate change peak flood level, or 300millimetres (mm) above the general ground level of the site.[49] The minimum FFL should be agreed with Tunbridge Wells Borough Council.

[49] Environment Agency (2012): Flood risk assessment: standing advice. Available: https://www.gov.uk/guidance/flood-risk-assessment-standing-advice

This additional height that the floor level is raised above the predicted flood water level is referred to as the "freeboard". Additional freeboard may be required to account for risks such as blockages to the channel, culvert or bridge, uncertainty in the predictions and should be considered as part of an FRA.

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

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

Similarly, the use of basements should be avoided. Habitable uses of basements within Flood Zone 3 should not be permitted, whilst basement dwellings in Flood Zone 2 will be required to pass the Exception Test. Access should be situated 300mm above the design flood level and waterproof construction techniques used.

8.3.3 Development and raised defences

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

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

8.3.4 Modification of ground levels

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

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

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

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

Any proposal for modification of ground levels will need to be assessed as part of a site-specific FRA.

8.3.5 Developer contributions

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

DEFRA's Flood and Coastal Risk Management Grant in Aid (FCRMGiA)[50] can be obtained by operating authorities to contribute towards the cost of a range of activities including flood risk management schemes that help reduce the risk of flooding and coastal erosion. Some schemes

[50] Principles for implementing flood and coastal resilience funding partnerships (Environment Agency, 2012)

are only partly funded by FCRMGiA and therefore any shortfall in funds will need to be found from elsewhere. Such examples include local levy funding, local businesses or other parties benefitting from the scheme, or contributions from developers or other parties that benefit from the provisions.

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

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

The appropriate route for the consideration of strategic measures to address flood risk issues is the LFRMS. The LFRMS should describe the priorities with respect to local flood risk management, the measures to be taken, the timing and how they will be funded. It will be preferable to be able to demonstrate that strategic provisions are in accordance with the LFRMS[51], can be afforded and have an appropriate priority.

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

8.4 Flood risk management guidance – resistance measures

'Measures designed to keep flood water out of properties and business'

There may be instances where flood risk to a development remains despite implementation of such planning measures as those outlined above. For example, where the use is water compatible, where an existing building is being changed, where residual risk remains behind defences, or where floor levels have been raised but there is still a risk from the 1 in 1000-year (0.1% AEP) flood event. In these cases, (and for existing development in the floodplain), additional measures can be put in place to reduce damage in a flood and increase the speed of recovery. These measures should not normally be relied on for new development as an appropriate mitigation method.

Most of the measures should be regarded as reducing the rate at which flood water can enter a property during an event and considered an improvement on what could be achieved with sand bags. They are often deployed with small scale pumping equipment to control the flood water that does seep through these systems. The effectiveness of these measures is often dependant on the availability of a reliable forecasting and warning system; such measures should be deployed in advance of an event. The following measures are often deployed:

Permanent barriers

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

Temporary barriers

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

Community resilience measures

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

[51] http://www.kent.gov.uk/about-the-council/strategies-and-policies/environment-waste-and-planning-policies/flooding-and-drainage-policies/kent-flood-risk-management-plan

8.5 Flood risk management guidance – resilience

'Measures designed to reduce the impact of water that enters a property and business'

Flood-resilient buildings are designed and constructed to reduce the impact of flood water entering the building. These measures aim to ensure no permanent damage is caused, the structural integrity of the building is not compromised and the clean up after the flood is easier. Interior design measures to reduce damage caused by flooding include:

- Electrical circuitry installed at a higher level with power cables being carried down from the ceiling rather than up from the floor level
- Water-resistant materials for floors, walls and fixtures
- Non-return valves to prevent waste water from being forced up bathrooms, kitchens or lavatories

Resilience measures will be specific to the nature of flood risk, and will be informed and determined by the FRA.

8.6 Reducing flood risk from other sources

8.6.1 Groundwater

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

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

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

8.6.2 Surface water and sewer flooding

Developers should discuss public sewerage capacity with the water utility company at the earliest possible stage. The development must improve the drainage infrastructure to reduce flood risk on site and wider area. It is important that a drainage impact assessment shows that this will not increase flood risk elsewhere, and that the drainage requirements regarding runoff rates and SuDS for new development are met.

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

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

8.6.3 Sustainable Drainage Systems

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

The inclusion of SuDS within developments should be seen as an opportunity to enhance ecological and amenity value, and promote Green Infrastructure, incorporating above ground facilities into the development landscape strategy. Council specific policies relating to management of surface water should be followed so that development proposals are compliant with the intentions of the council for betterment in surface water flood risk. SuDS must be considered at the outset, during preparation of the initial site conceptual layout to ensure that enough land is given to design spaces that will be an asset to the development rather than an after-thought. Advice on best practice is available from the Environment Agency, Kent County Council and the Construction Industry Research and Information Association (CIRIA).

More detailed guidance on the use of SuDS is provided in Section 9.

9 Surface water management and SuDS

9.1 What is meant by surface water flooding?

For the purposes of this SFRA, the definition of surface water flooding is that set out in the Defra SWMP guidance[52]. Surface water flooding describes flooding from sewers, drains, and ditches that occurs during heavy rainfall in urban areas.

Surface water flooding includes

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

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

From April 2015, local planning policies and decisions on planning applications relating to major development should ensure that SuDS for management of run-off are put in place. The approval of SuDS lies with the Local Planning Authority.

In April 2015 Kent County Council was made a statutory consultee on the management of surface water and, as a result, will be required to provide technical advice on surface water drainage strategies and designs put forward for major development proposals.

Major developments are defined as

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

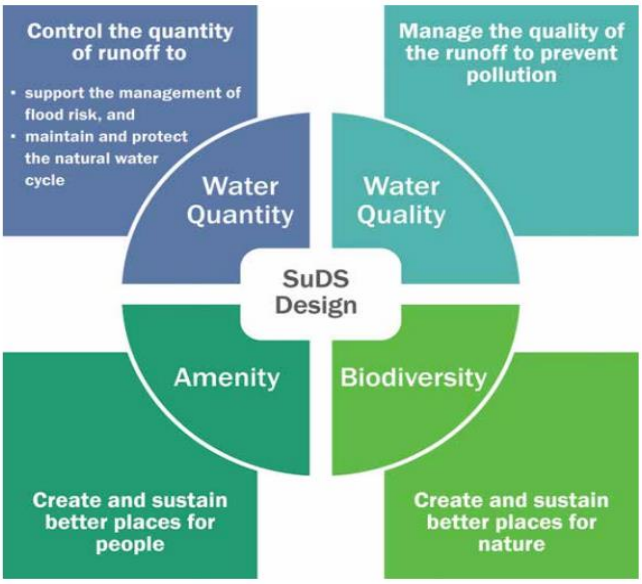
The LLFA will also provide advice on minor development on a non-statutory basis.

When considering planning applications, Tunbridge Wells Borough Council will seek advice from the relevant flood risk management bodies, principally Kent County Council on the management of surface water, will satisfy themselves that the development's proposed minimum standards of operation are appropriate and ensure, through the use of planning conditions or planning obligations, that there are clear arrangements for on-going maintenance over the development's lifetime. Judgement on what SuDS system would be reasonably practicable will be through reference to Defra's technical standards and will consider design and construction costs.

It is essential that developers consider sustainable drainage at an early stage of the development process – ideally at the master-planning stage. This will assist with the delivery of well designed, appropriate and effective SuDS. Proposals should also comply with the key SuDS principles regarding solutions that deliver multiple long-term benefits. These four principles are shown in Figure 9-1.

[52] Defra, Surface Water Management Plan Technical Guidance (March 2010). https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/69342/pb13546-swmp-guidance-100319.pdf

Figure 9-1: Four principles of SuDS design



Source: **The SuDS Manual (C753) Ciria (2015)**

Kent County Council and Tunbridge Wells Borough Council will:

- promote the use of SuDS for the management of run off;
- ensure their policies and decisions on applications support and complement the Building Regulations on sustainable rainwater drainage, giving priority to infiltration over watercourses and then sewer conveyance;
- incorporate locally distinctive favourable policies within development plans, where appropriate;
- adopt locally distinctive policies for incorporating SuDS requirements into Local Plans, where appropriate;
- encourage developers to utilise SuDS whenever practical, if necessary, through the use of appropriate planning conditions; and
- develop joint strategies with sewerage undertakers to further encourage the use of SuDS.

9.3 Sustainable Drainage Systems (SuDS)

Sustainable Drainage Systems (SuDS) are designed to maximise the opportunities and benefits that can be secured from surface water management practices.

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

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

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

It is a requirement for all new major development proposals to ensure that sustainable drainage systems for management of runoff are put in place. Likewise, minor developments should also

ensure sustainable systems for runoff management are provided. The developer is responsible for ensuring the design, construction and future/ongoing maintenance of such a scheme is carefully and clearly defined, and a clear and comprehensive understanding of the existing catchment hydrological processes and existing drainage arrangements is essential.

9.3.1 Types of SuDS Systems

There are many different SuDS techniques that can be implemented in attempts to mimic pre-development drainage (Table 9-1). The suitability of the techniques will be dictated in part by the development proposal and site conditions. Advice on best practice is available from the Environment Agency and the Construction Industry Research and Information Association (CIRIA) e.g. the **CIRIA SuDS Manual C753 (2015).**

Table 9-1: Examples of SuDS techniques and potential benefits

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

9.3.2 Treatment

A key part of the four pillars of SuDS is to provide the maximum improvement to water quality through the use of the "SuDS management train". To maximise the treatment within SuDS, CIRIA recommends[53] the following good practice is implemented in the treatment process:

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

[53] C753 CIRIA SuDS Manual (2015)

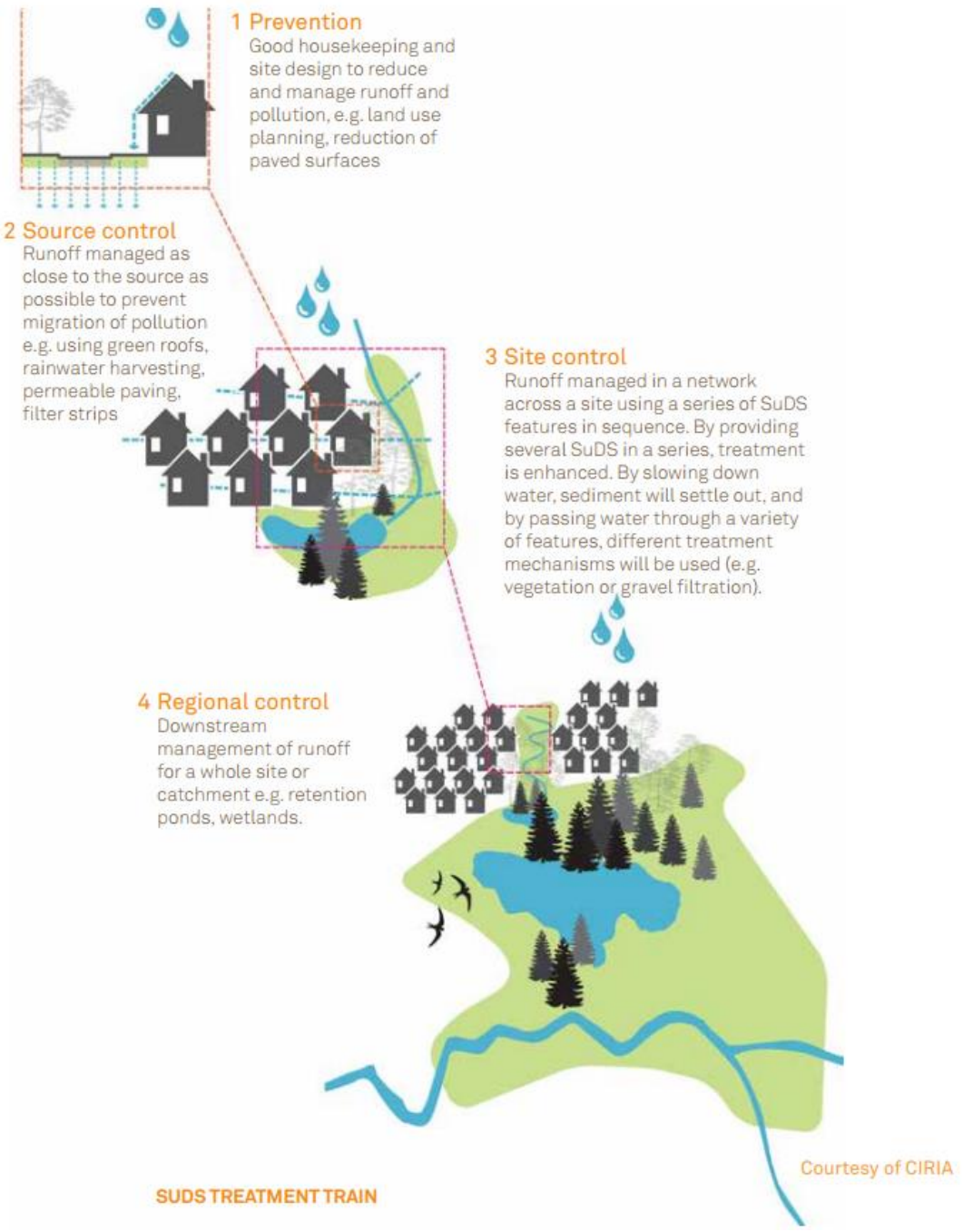
5. **Minimise the impact of spill:** Designing SuDS to be able to trap spills close to the source or provide robust treatment along several components in series.

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

9.3.3 SuDS Management

SuDS should not be used individually but as a series of features in an interconnected system designed to capture water at the source and convey it to a discharge location. SuDS components should be selected based on design criteria and how surface water management is to be integrated within the development and landscaping setting. By using a number of SuDS features in series it is possible to reduce the flow and volume of runoff as it passes through the system as well as minimising pollutants which may be generated by a development (Figure 9-2).

Figure 9-2: SuDS Management Train



Source: Water. People. Places: A guide for master planning sustainable drainage into developments (2013)

9.3.4 Overcoming SuDS constraints

The design of a SuDS system will be influenced by several physical and policy constraints. These should be considered and reflected upon during the conceptual, outline and detailed stages of SuDS design. Table 9-2 details some possible constraints and how they may be overcome and includes information from both the SuDS Manual (C753) and Kent County Council SuDS Guidance.

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

9.4 Sources of SuDS Guidance

Part of Kent County Council's responsibility as a LLFA is to be a statutory consultee to the planning process for surface water on all major developments. As part of this role the LLFA will also advise on surface water drainage applications based on **National Planning Practice Guidance**[54] and **non-statutory technical standards for sustainable drainage schemes**[55].

Guidance is also available to developers to help with completing surface water drainage strategies for a development. Developers should have regard for and consider these documents during the design and delivery of SuDS for all types of development. These documents are discussed in the following sections.

9.4.1 Water. People. Places: A guide for master planning sustainable drainage into developments

The **document** was published in 2013 by the LLFAs of the South East of England, of which Kent County Council is a part of, to outline the process for integrating SuDS into the master planning of large and small developments[56]. The South East LLFAs expect this guidance to be used as part of the initial planning and design plans for all types of residential, commercial, and industrial development. The guidance complements existing guidance on SuDS design, maintenance, and operation, which should also be used to inform detailed design and delivery of SuDS.

Although SuDS can be applied to any site, there are a variety of conditions and constraints that could restrict the suitability of different types of SuDS or trigger the need for bespoke design. Therefore, consideration of the movement of water and its interaction with site-specific conditions (e.g. soil types) at the earliest stage of design is crucial to the success of a SuDS scheme.

Section 4 of the 'Water. People. Places' document provides detailed SuDS design guidance for a range of commonly encountered site conditions. A summary of this guidance is provided in the SuDS Selection Matrix (Figure 9-3), whereby the suitability of each type of SuDS is presented for each common site condition.

It is noted in the guidance document that SuDS design should be fully integrated into a master plan as an essential part of land use and development planning, and considered in conjunction with other aspects of the design. Although there is no formal process for master planning, a typical design process for SuDS is outlined in Sections 5 and 6 of the guidance document. The process is designed to allow planners and designers to scope and embed opportunities for SuDS as land use and design ideas evolve.

[54] National Planning Practice Guidance (2015) http://planningguidance.communities.gov.uk/blog/guidance/flood-risk-and-coastal-change/
[55] Non-Statutory Guidance for Sustainable Drainage Schemes (2015) https://www.gov.uk/government/publications/sustainable-drainage-systems-non-statutory-technical-standards
[56] AECOM, (2013), Water. People. Places: A guide for master planning sustainable drainage into developments.

Table 9-2: Example SuDS constraints and possible solution

Constraint		Solution
Flood conditions	Floodplain area	Given the likely high groundwater table and vulnerability to erosion, floodplain SuDS should be selected and designed accordingly. This includes limiting grading and the creation of surface features that may be washed out in a flood. Surface discharge from SUDS should be dispersed and attenuation periods should be designed so that SuDS are empty within 48 hours of rainfall.
	Preventing runoff from neighboring sites	SuDS such as a swale could be used along the boundary to intercept and divert flows from neighboring sites. Minimising flood risk to the wider area will require collaboration among all stakeholders with the aim to manage runoff at the wider catchment or neighborhood scales.
	Addressing local surface water flooding issues	It is important to understand if the site is within or upstream of a flood risk area as you may be subject to additional restrictions, and this may influence the placement or design for SuDS. Flow and attenuation requirements should be discussed with the LLFA.
Groundwater	High groundwater level	SuDS should be selected and designed on the surface or shallow in depth as high groundwater levels may flood deep SuDS features. Infiltration should also be avoided in order to prevent contamination. As such, SuDS that normally allow infiltration may be lined with an impermeable liner.
	Groundwater Source Protection Zone	SuDS proposals for areas located within GSPZs should be discussed with the Environment Agency. SuDS should be lined and used to treat surface water before infiltration to ensure contamination is avoided.
Topography	Shallow slopes	Shallow SuDS features may be used to provide a sufficient gradient. For example, kerbs and shallow rills and swales should be used to convey water on the surface. A designer should consider all alternatives before considering pumping as a last resort.
	Steep slopes	Check dams and staged storage may be used to slow the runoff rates on steeper slopes. Bioretention and wetland features can be staggered in a terraced arrangement on slopes to slow flows. Infiltration should be avoided as it may reduce slope stability.
Soils and geology	Poor permeability	SuDS should be designed to provide the required attenuation and treatment above or near the surface. It may also be worth understanding the vertical geology of the area to identify if a more permeable layer exists and would allow infiltration to occur at greater depths.
	Contaminated land	SuDS should be lined and designed to attenuate water on or near the surface. Infiltration may not be suitable as concentrated ground flows may lead to water-borne contaminates being transferred to deeper soils or aquifers.
Land availability	Existing infrastructure	Existing infrastructure should be considered in the SuDS design to identify the most cost-effective solution. It will also be important to understand the location and capacity of existing drainage to determine what features should be reused in the SuDS Scheme. Other buried infrastructure will need to be considered. Permeable paving and bioretention should be avoided in major service strips in order to prevent disturbance and reconstruction of the SuDS system.
	Limited space	A network of SuDS that manage runoff close to its source will avoid the need for large storage areas. Space efficient SuDS include green roofs, bioretention gardens and tree pits, permeable paving, rills, rainwater harvesting, hardscape storage, and micro-wetlands.
	Primarily paved	Permeable paving may be used as part of the paved area to drain to a large area. This should be located in the least trafficked areas and outside of service strips. Hardscape depressions and rills can be used to provide aboveground storage, and bioretention gardens will double the landscaped area. Underground storage is also an option, but it will not deliver any amenity benefits.
Run-off characteristics	Ensuring runoff is not contaminated (particularly from industrial sites)	Managing runoff from such sites and ensuring the water remains uncontaminated should be achieved by defining and isolating drainage sub-catchments so that 'high risk areas' drain to separate systems while roof water and general car park runoff drains to the SuDS system.
	Preventing the reduction of water quality	A treatment train of SuDS should be introduced to maintain the quality of water in the receiving waterbody. The treatment train will ensure that water is exposed to a variety of filtration mechanisms and attenuated to allow any pollutants to settle out. It is likely that a great number of treatment stages will be required when the quality of the receiving waterbody is high.
Protected species of habitat	Existing geological areas	Site surveys be conducted to identify areas of interest, including designated areas for nature conservation, areas with protected species and locally important habitats. SuDS should be designed to protect or enhance such areas. SuDS should be well thought out in terms of long-term maintenance to ensure that habitats are not harmed.
Ownership and maintenance	Designing SUDs for adoption	Adoption discussions should be held early in the design process to ensure that SuDS are designed to the standards required by the adoption authority. The adoption authority could be the LLFA, local authority, highways authority, land owner or water company.
	Ensuring SuDS costs are viable	Although capital costs for SuDS are considerably less than traditional drainage systems, there is also a chance to limit long term maintenance costs by thinking about SuDS early in the design process. SuDS also have a number of benefits that can deliver value and people are willing to pay for.
	Managing runoff to/from Adopted Highways	Specific design requirements and guidelines will exist for each authority area. The local highways authority representative should be engaged early in the master planning process, as there may be potential for an efficient solution which benefits both private property owners and the highways authority

Source: SuDS guidance document prepared by the Lead Local Flood Authorities of the South East of England: Water. People. Places: A guide for master planning sustainable drainage into developments.

9.4.2 Kent Design Guide

Th **Kent Design Guide** document updates the 'Guide to Sustainable Development' originally published in 2000 and assists designers to achieve high standards of design and construction by promoting a common approach to the main principles that underlie the criteria for assessing planning applications[57]. The guide is offered to all LPAs across Kent for formal adoption and it is expected that it is used as a Supplementary Planning Document attached to the LPAs' Local Plans.

The guide is spilt into four sections:

- Section 1 – the value of good design
- Section 2 – Creating the design
- Section 3 – Getting the planning process right
- Section 4 – Appendices

The guide is also accompanied by a set of technical appendices that replace previous advice about the design of housing and industrial estates.

9.4.3 Kent Design Guide – Making it Happen

The **'Making it Happen – Sustainability (Drainage Systems)'** document comprises the technical appendices of the Kent Design Guide. Therefore, the information provided in the appendices should be read in conjunction with the advice provided in the Kent Design Guide.

Appendix C of the document specifically considers sustainability and provides advice guidance and information about the design and implementation of drainage systems, including SuDS for both residential and industrial developments[58]. The information aims to assists developers with the process that needs to be considers when preparing a drainage design for a development and the specific requirements that need to be met for drainage of adoptable residential and industrial / commercial roads. The advice provided deals with the design and procedures relating to both SuDS and more traditional positive drainage systems.

9.4.4 Sewers for Adoption 8th Edition – Water UK

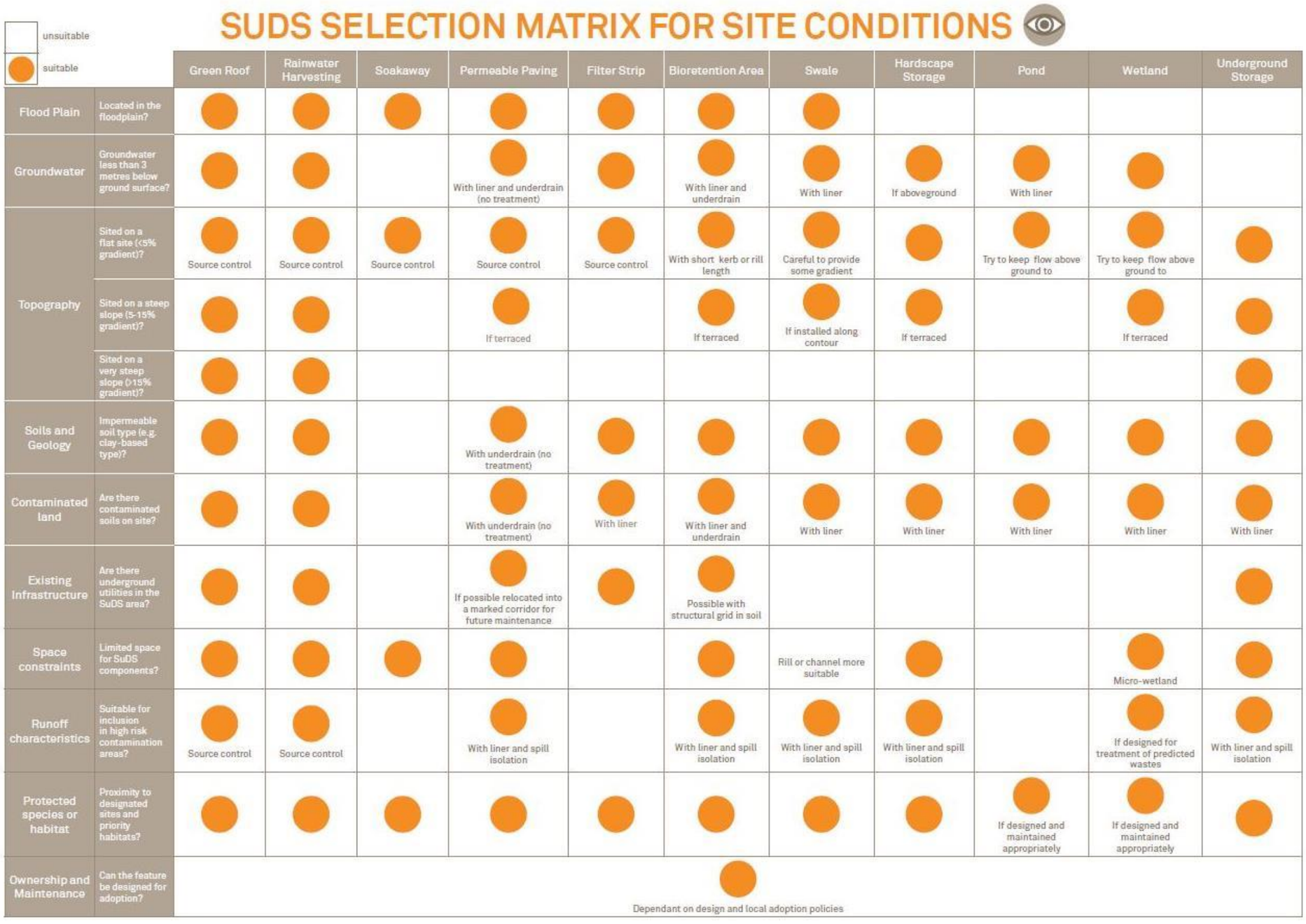
The **Sewers for Adoption (8th Edition)** for England and Wales, by Water UK, is due to be published and adopted in 2019. This document will provide detailed guidance for developers, designers and constructors on how to design and build foul and surface water sewerage systems to a standard such that they will be adopted by water companies, under section 104 of the Water Industry Act.

Sewers for Adoption 8 (SfA8) recognises the roles of the various Risk Management Authorities with responsibilities for surface water management and the expectation within the NPPF that SuDS be implemented, as a first preference, for all developments. It therefore widens the definition of what can be defined as adoptable sewers, allowing for the adoption of SuDS components including swales, rills, bioretention systems, ponds, wetlands, basins, tanks, infiltration trenches and soakaways.

Therefore, consideration should be given from the earliest stage of a Surface Water Drainage Strategy and Flood Risk Assessment as to whether site SuDS will be offered for adoption by the water company. Additionally, there will be an increased need to engage with the water company when preparing surface water drainage strategies.

[57] Kent County Council: Kent Design Guide
[58] Kent County Council: Making it Happen (Appendix C – Sustainability).

Figure 9-3: SuDS selection matrix for site conditions



Exported from the SuDS guidance document prepared by the Lead Local Flood Authorities of the South East of England: Water. People. Places: A guide for master planning sustainable drainage into developments.

9.4.5 Surface Water Management Plans

Kent County Council state that the relevant SWMPs should also be referred to during the formulation of a SuDS scheme for a site. In this case, SuDS developers should refer to the guidance provided in the Tunbridge Wells and Paddock Wood Stage 1 SWMPs. These documents provide advice regarding the feasibility of SuDS across Tunbridge Wells Borough.

It is noted that the choice of SuDS is site-specific, depending on the nature of the proposed development and local conditions. Tunbridge Wells Borough is underlain by several different geologies, meaning that areas which are underlain by low permeability deposits may not be suitable for infiltration drainage. When considering infiltration options, Groundwater Source Protection Zones must also be considered. If discharge is proposed within a source protection zone, then additional information may be required to demonstrate that there is not an unacceptable risk to groundwater and the surrounding environment. Additional information and advice can be found on:

- The **Environment Agency's Website**, and
- Within the **Groundwater protection: Principles and practice (GP3)** document.

The SWMPs also state that new development should seek to incorporate SuDS to reduce surface water runoff where feasible and appropriate to the size and scale of development. The hierarchy of surface water disposal is as follows:

- The use of SuDS techniques, appropriate to the location, size and type of the development.
- Discharge to the watercourse.
- Discharge to a surface sewer.
- Discharge to a combined sewer.

9.4.6 Tunbridge Wells Borough Green Infrastructure Plan

This **document** was published in August 2014 and outlines the means to consider the implementation of green infrastructure across the borough. One of the key functions of green infrastructure is to improve water resource and flood management through the use sustainable design and drainage systems. It is noted that flood risk can be reduced by integrating SuDS into developments across the borough and reducing the area of impermeable surfaces[59]. The document recommends that the SuDS measures outlined in the borough's SWMPs should be implemented to mitigate flood risk within the area. Such measures can be incorporated into the overall green infrastructure for the town and immediate surrounding rural area.

A new Green Infrastructure Strategy is to be produced by Tunbridge Wells Borough Council to support the new Local Plan, due in 2020.

9.4.7 C753 CIRIA SuDS Manual (2015)

The **C753 CIRIA SuDS Manual** (2015)[53] replaces and updates the previous version (C697) providing up to date guidance on planning, design, construction and maintenance of SuDS. The document is designed to help the implementation of these features into new and existing developments, whilst maximising the key benefits regarding flood risk and water quality. The manual is divided into five sections ranging from a high-level overview of SuDS, progressing to more detailed guidance with progression through the document. It is recommended that developers and the LPA utilise the information within the manual to help design SuDS which are appropriate for a development.

[59] Tunbridge Wells Borough Council, (August, 2015), Green Infrastructure Plan Supplementary Planning Document

9.5 Other surface water considerations

9.5.1 Groundwater Source Protection Zones (GSPZ)

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

- Zone 1 (Inner Protection Zone) – Most sensitive zone: defined as the 50-day travel time from any point below the water table to the source. This zone has a minimum radius of 50 metres
- Zone 2 (Outer Protection Zone) – Also sensitive to contamination: defined by a 400-day travel time from a point below the water table. This zone has a minimum radius around the source, depending on the size of the abstraction
- Zone 3 (Total Catchment) - Defined as the area around a source within which all groundwater recharge is presumed to be discharged at the source. In confined aquifers, the source catchment may be displaced some distance from the source.
- Zone 4 (Zone of special interest) – A fourth zone SPZ4 or 'Zone of Special Interest' usually represents a surface water catchment which drains into the aquifer feeding the groundwater supply (i.e. catchment draining to a disappearing stream).

9.5.1.1 GSPZs in Tunbridge Wells Borough

There are 22 GSPZs within Tunbridge Wells Borough (based on the number of Inner Protection Zones). They are situated in and around the following areas and are displayed in Figure 9-4:

- Hartlake Road, north of Tudeley Hale
- Old Church Road and Redwings Lane, Lower Green
- Forest Wood, Lower Green
- Two areas off Stone Court Lane, Pembury
- Snipe Wood, Romford
- Foxhole Lane and Bramble Reed Lane, Romford
- Knells Bottom and Summerford Farmhouse, Romford
- Area north of Furnace Lane, Lamberhurst
- Finchcocks Farm, north-west of Riseden
- Station Road, Blue Coat Lane, Peasley Lane, and Ranters Lane, Goudhurst

One area within Zone 4 (zone of special interest) has also been identified in Tunbridge Wells Borough. This GSPZ extends across much of Pembury Ward and into Brenchley and Horsmonden Ward; including the areas of Pembury, Lower Green, Henwood Green, and Romford.

9.5.2 Nitrate Vulnerable Zones

Nitrate Vulnerable Zones (NVZs) are areas designated as being at risk from agricultural nitrate pollution. Nitrate levels in waterbodies are affected by surface water runoff from surrounding agricultural land entering receiving waterbodies.

The level of nitrate contamination will potentially influence the choice of SuDS and should be assessed as part of the design process.

Within Tunbridge Wells Borough, there are three surface water NVZs. The locations of these NVZs are shown in Figure 9-5.

Figure 9-4: Groundwater Source Protection Zones

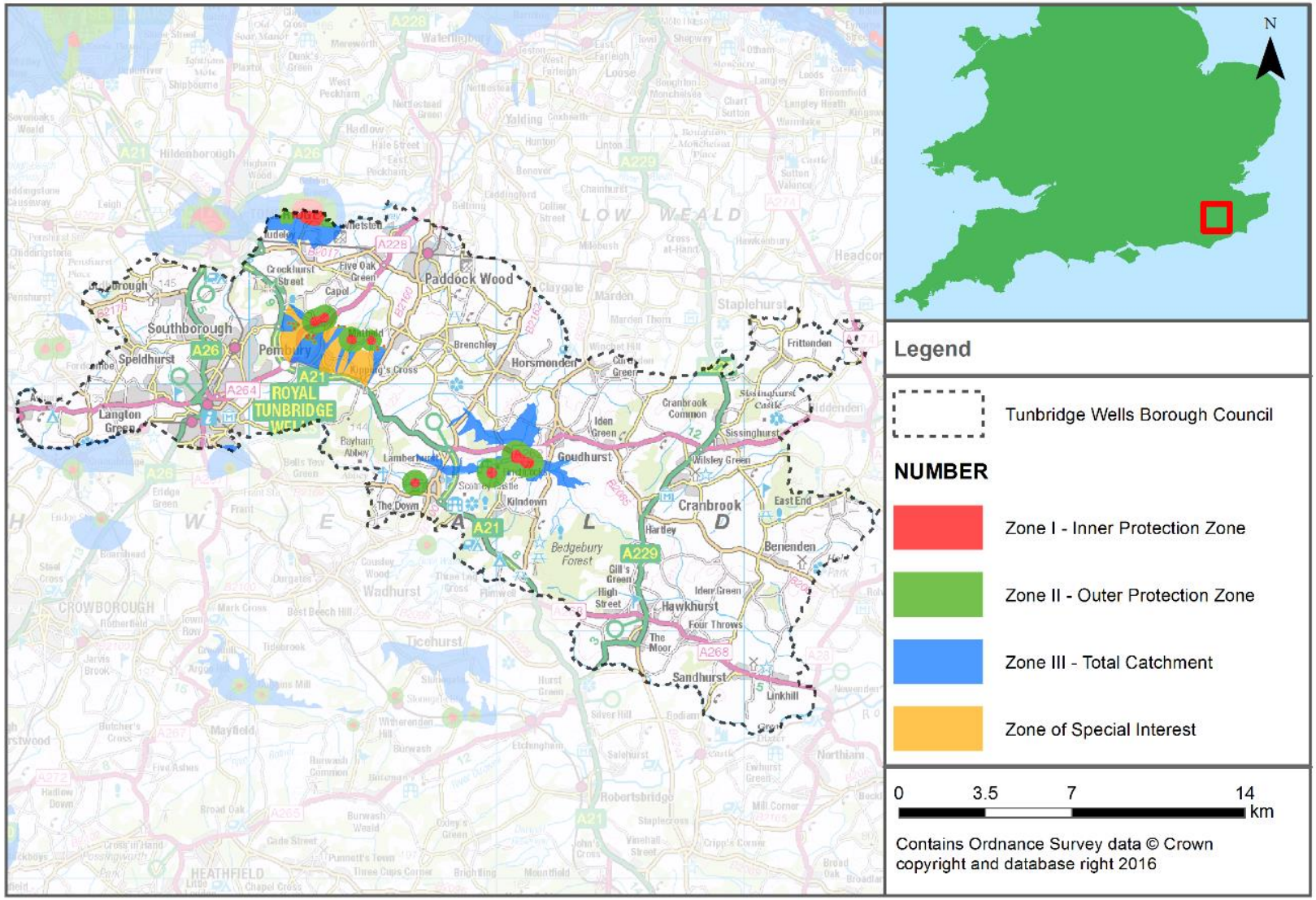
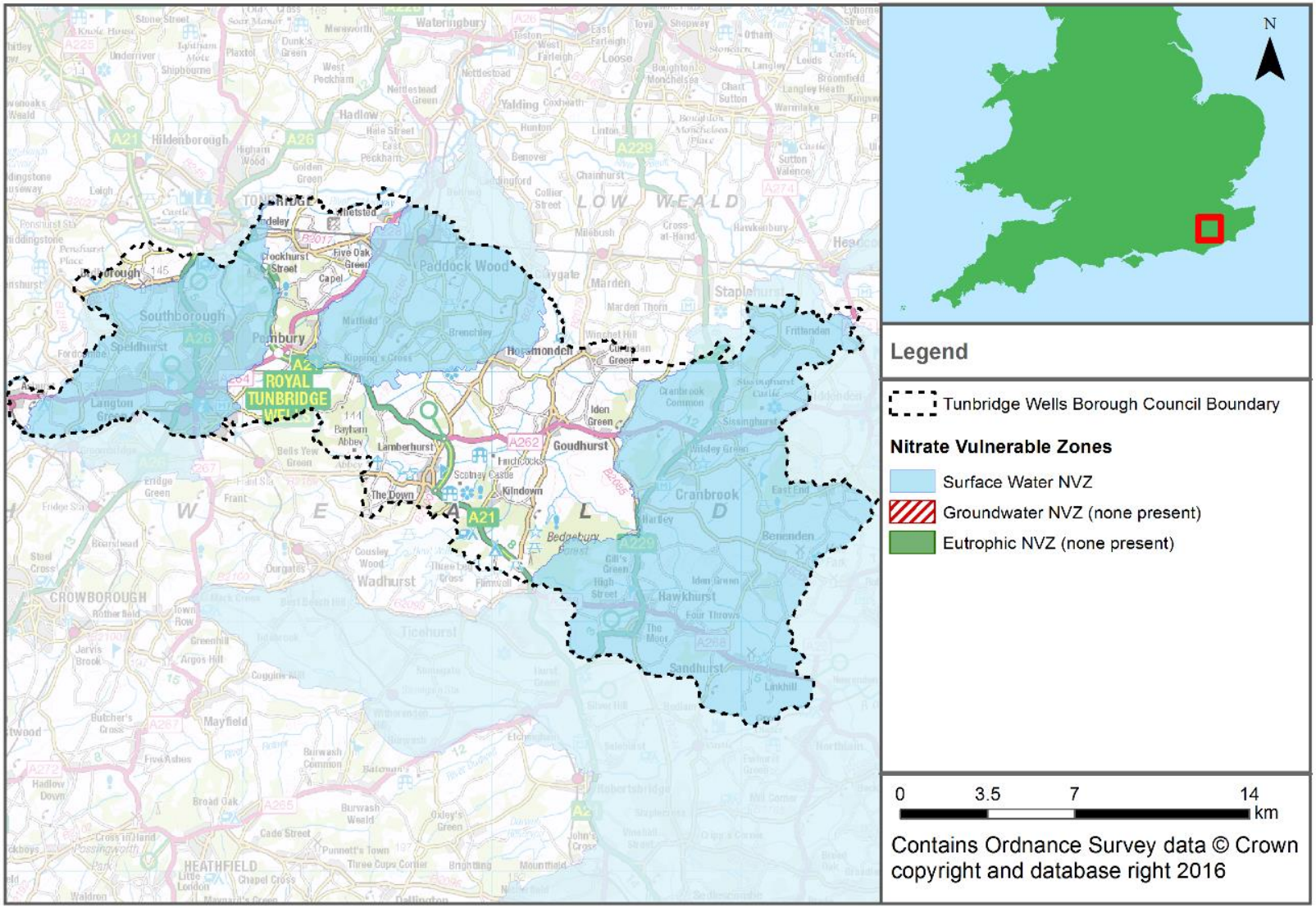


Figure 9-5: Nitrate Vulnerable Zones



10 Flood warning and emergency planning

10.1 Flood emergencies

Emergency planning is a core component of civil protection and public safety practices and seeks primarily to prevent, or secondly mitigate the risk to life, property, businesses, infrastructure and the environment. In the UK, emergency planning is performed under the direction of the 2004 Civil Contingencies Act (CCA).

From a flood risk perspective, emergency planning can be broadly split into three phases: before, during and after a flood. The measures involve developing and maintaining arrangements to reduce, control or mitigate the impact and consequences of flooding and to improve the ability of people and property to absorb, respond to and recover from flooding. In development planning, a number of these activities are already integrated in national building control and planning policies e.g. the NPPF.

Safety is a key consideration for any new development and includes the likely impacts of climate change and, where there is a residual risk of flooding, the availability of adequate flood warning systems for the development, safe access and egress routes and evacuation procedures. It is a requirement under the NPPF that a flood warning and evacuation plan is prepared for sites at risk of flooding used for holiday or short-let caravans and camping and are important at any site that has transient occupants (e.g. hostels and hotels)[60] and for essential ancillary sleeping or residential accommodation for staff. Flood warning and evacuation plans may also be referred to as an emergency flood plan or flood response plan.

Emergency planning and flood risk management links

- 2004 Civil Contingencies Act: **http://www.legislation.gov.uk/ukpga/2004/36/contents**
- DEFRA (2014) National Flood Emergency Framework for England: **https://www.gov.uk/government/publications/the-national-flood-emergency-framework-for-england**
- Government guidance for public safety and emergencies is available at: **https://www.gov.uk/topic/public-safety-emergencies/emergencies-preparation-response-recovery**

10.2 Existing flood warning systems

The Environment Agency is the lead organisation for providing warnings of fluvial flooding (for watercourses classed as Main Rivers) and coastal flooding in England. The Environment Agency supplies Flood Warnings via the Floodline Warnings Direct (FWD) service, to homes and business within Flood Zones 2 and 3. The different levels of warning are shown below in Table 10-1.

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

Flood warnings are disseminated to people registered to receive flood warnings via the FWD service by phone, text and / or e-mail. Warnings may also be reported in news and weather bulletins. The Environment Agency have a 24-hour Floodline number (0345 988 1188) that the public can call to receive more detailed information regarding the flood warning.

There are seven Flood Alert Areas and nine Flood Warning Areas (FWAs) covering Tunbridge Wells Borough. Appendix G shows the FWA coverage for Tunbridge Wells Borough.

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

Table 10-1: Environment Agency Flood Warnings Explained

Flood Warning Symbol	What it means	What to do
	**Flood Alerts** are used to warn people of the possibility of flooding and encourage them to be alert, stay vigilant and make early preparations. It is issued earlier than a flood warning, to give customers advice notice of the possibility of flooding, but before we are fully confident that flooding in Flood Warning Areas is expected.	✓ Be prepared to act on your flood plan ✓ Prepare a flood kit of essential items ✓ Monitor local water levels and the flood forecast on the Environment Agency website ✓ Stay tuned to local radio or TV ✓ Alert your neighbours ✓ Check pets and livestock ✓ Reconsider travel plans
	**Flood Warnings** warn people of expected flooding and encourage them to take action to protect themselves and their property.	✓ Move family, pets and valuables to a safe place ✓ Turn off gas, electricity and water supplies if safe to do so ✓ Seal up ventilation system if safe to do so ✓ Put flood protection equipment in place ✓ Be ready should you need to evacuate from your home ✓ 'Go In, Stay In, Tune In'
	**Severe Flood Warnings** warn people of expected severe flooding where there is a significant threat to life.	✓ Stay in a safe place with a means of escape ✓ Co-operate with the emergency services and local authorities ✓ Call 999 if you are in immediate danger
Warnings no longer in force	Informs people that river or sea conditions begin to return to normal and no further flooding is expected in the area. People should remain careful as flood water may still be around for several days.	✓ Be careful. Flood water may still be around for several days ✓ If you've been flooded, ring your insurance company as soon as possible

10.3 Managing flood emergencies in Tunbridge Wells Borough

Kent County Council's **Kent Resilience Forum** (KRF) is one of a number of Local Resilience Forums (LRFs) that have been set up across England. The overall aim of an LRF is to ensure that the various agencies and organisations plan and subsequently work together so that responses to emergencies are coordinated appropriately[61]. The KRF is made up of a number of different agencies and organisations that work together across a range of areas including planning for emergencies.

10.3.1 Kent County Council Flood Response Plan

The **Kent County Council Flood Response Plan** sets out the principles that govern the Kent County Council's response to a significant flooding event within their local authority administrative area. The Plan was produced in July 2016 to meet the requirements of the Civil Contingencies Act 2004, and is built upon the existence and maintenance by Category 1 and 2 Responders of their own plans for response to flooding[62].

[61] Kent Prepared, (November, 2016), Kent Resilience Forum
[62] Kent County Council, (July, 2016), Kent County Council Flood Response Plan: Issue 5

Category 1 Responders for Tunbridge Wells are:

- Kent County Council
- Tunbridge Wells Borough Council
- Kent Police
- Kent Fire and Rescue Service
- South East Coast Ambulance Service
- Environment Agency

The Category 2 Responders for Tunbridge Wells are utility providers, such as Southern Water.

The response plan provides information on Kent County Council's actions, roles and responsibility in response to a flood in their administrative area.

10.3.2 Tunbridge Wells Borough Council's Emergency Plan[63]

Tunbridge Wells Borough have a Major Emergency Plan that aims to provide procedures and guidance that facilitate an appropriate and proportionate response by the Council to meet the needs of any emergency.

Section 8.3 of the Plan outlines the roles and responsibilities of Tunbridge Wells Borough Council and Kent County Council during a severe weather or flooding event. The Plan, along with any recovery plans business continuity plans provide the framework for the Council's response to such events when they occur at a scale that causes major disruption to the community or the critical functions of the Council.

- The main documents associated with the response to a severe weather and flood event include the
- KRF Pan- Kent Emergency Response and Recovery Frameworks and Individual multi-agency Local Area Flood Plans
- The individual multi-agency flood plan covering Tunbridge Wells Borough Council is discussed in greater detail below.

10.3.3 Local Multi Agency Flood Plan covering Tunbridge Wells Borough Council[64]

The main objective of the Local Multi-Agency Flood Plan is to ensure a coordinated multi-agency response to a significant flood in Tunbridge Wells Borough Council's administrative area. The Plan sits underneath the Pan Kent Multi Agency Flood Plan and alongside the relevant emergency plans of all Category 1 and 2 responders and other organisations concerned with supporting the response of the community to a flood.

In a major flood emergency, Tunbridge Wells Borough Council have the following responsibilities

- To set up rest/reception centres and associated services for people who are evacuated and unable to stay with family or friends.
- To support other Category 1 and 2 responders and provide resources (where required and in the remit of the local authority).
- To try and mount a reasonable flood defence response by making sandbags available at the locations of high risk.

Sandbags

Sandbags have been traditionally used to block doorways, drains and other openings to properties. Sandbags are not waterproof and will be unable to permanently prevent the ingress of water to an area protected by them.

Although the provision of sandbags is not a statutory function of Tunbridge Wells Borough Council, the Council will issue sandbags from local stocks in Tunbridge Wells, Lamberhurst, Capel and Five

[63] Tunbridge Wells Borough Council, (August, 2014), Tunbridge Wells Borough Council Major Emergency Plan: Issue 1.2
[64] Kent Resilience Forum, (December, 2014), Local Multi Agency Flood Plan Covering Tunbridge Wells Borough Council: Issue 2

Oak Green and Paddock Wood[64]. It should be noted that sandbags will only be issued during a flooding emergency to affected homes and businesses following an assessment of the situation by a member of the Council's Streetscene team[65]. The Council will not supply sandbags to protect garages, garden sheds, outbuildings or gardens.

In the midst of a flood emergency it cannot be guaranteed that sandbags will be delivered in sufficient time or quantities to prevent/reduce damage to a property due to the limited stocks available[65].

The Environment Agency has produced a guidance document on how to use sandbags properly for flood protection, downloadable from their **website**.

Sandbags will not be collected after the event and householders are advised to keep them for future use. Advice of how to correctly store sandbags is provided by the Council on their **website**.

Evacuation

If a decision is made to evacuate then the responsibility to lead the evacuation falls upon the police, with other agencies aiding. Decisions to evacuate are not taken lightly and are based on information relating to public safety and expected ground conditions. The preference to evacuate will always be to do so when it is deemed safe, i.e. before water has reached or entered a property.

Flood Wardens

Flood Wardens have been allocated to areas where flooding can be managed effectively. The Flood Wardens are local volunteers and are trained by the Kent Resilience Team. The role of a Flood Warden involves:

- Keeping an eye on the local watercourses.
- Use their own local knowledge to recognise and report flood risks.
- Relay messages about potential flooding to others in the area they cover.
- Provide emergency services with important information in the event of a flood.

The role of a flood warden is primarily to observe and report, they should not place themselves in any danger, take responsibility for moving or protecting anyone's property, or clear ditches or culverts. To find out who your local Flood Warden is, or if you would like to volunteer to become a Flood Warden, then please contact Tunbridge Wells Borough Council.

10.3.4 Area specific flood plans

The Local Multi-Agency Flood Plan also outlines various plans in place for specific areas across the Tunbridge Wells Borough. Such plans may be used to assist in a broader emergency response and may cover the general arrangements to support the local community during a severe weather event. Area specific flood plans are currently in place for:

- Speldhurst, Royal Tunbridge Wells, and Pembury;
- Paddock Wood, Capel & Five Oak Green, and Brenchley; and
- Goudhurst, Lamberhurst, and Horsmonden.

Each plan provides information on properties, infrastructure and facilities at risk, the availability of local flood warning services within the area, what actions should be taken at different stages of a flood warning (area-specific thresholds and triggers), and evacuation and shelter information[64].

10.3.5 Community Emergency Plans

Capel and Five Oak Green is also served by the Capel Flood Committee which is managed by and forms part of the Capel Parish Council. The Committee meets bi-annually and attempts to address flooding and drainage issues across the area that have occurred or are ongoing from previous years. The Committee forms a link between the local residents and the Parish Council, Tunbridge Wells Borough Council, Kent Highways, the Environment Agency and Southern Water.

[65] Tunbridge Wells Borough Council, (2016), Emergency Planning and Business Continuity: Sandbags

Although Capel Parish Council has a Community Emergency Plan in place, it was noted in the Extra-Ordinary Flooding Committee Meeting that the Plan should be revised following the flooding during the Winter 2013/2014[66]. Consequently, seven Flood Wardens were established for the area. The Flood Wardens continue to attend training events and meetings held by the Kent Resilience Flood Forum, the first two of which were held in July and November 2015[67]. It is noted that the Flood Wardens managed to prevent flooding on at least four occasions during the Autumn 2015[67].

Similarly, the members of different Parish Councils have been working in partnership with the Kent Resilience Planning Team and the Environment Agency to establish flood wardens and Community Emergency Plans to co-ordinate the responses to the risk of flooding within their own administrative areas.

Within Tunbridge Wells Borough Council, Community Flood Plans are being revised and/or established for:

- Capel and Five Oak Green
- Horsmonden
- Brenchley

However, it should be noted that the plans are not yet fully established or fully operational.

10.4 Emergency planning and development

The NPPF seeks to avoid inappropriate development in areas at risk from all sources of flooding. It is essential that any development which will be required to remain operational during a flood event is located in the lowest flood risk zones to ensure that, in an emergency, operations are not impacted on by flood water. All flood sources should be considered. In particular, sites should be considered in relation to any areas with critical drainage problems highlighted in the Tunbridge Wells and Paddock Wood SWMPs.

The outputs of this SFRA should be compared and reviewed against any emergency plans and continuity arrangements within Kent. This includes the nominated rest and reception centres (and prospective ones), to ensure evacuees are outside of the high-risk flood zones and will be safe during a flood event.

10.4.1 Safe access and egress

The NPPG outlines how developers can ensure safe access and egress to and from development in order to demonstrate that development satisfies the second part of the Exception Test[68]. Access considerations should include the voluntary and free movement of people during a 'design flood' as well as for the potential of evacuation before a more extreme flood. The access and egress must be functional for changing circumstances over the lifetime of the development. The NPPG sets out that:

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

As part of a FRA, the developer should review the acceptability of the proposed access in consultation with the Council and the Environment Agency. Site and plot specific velocity and depth

[66] Capel Parish Council, (20th January, 2014), Extra-ordinary Flooding Committee Meeting Minutes: 7. Other Items
[67] Capel Parish Council, (20th June, 2016), Flood Committee Meeting Minutes: 5. Flood Warden Report
[68] NPPF Planning Practice Guidance: Flood Risk and Coastal Change (paragraph 039, Reference ID: 7-039-20140306) March 2014

of flows should be assessed against standard hazard criteria to ensure safe access and egress can be achieved.

10.4.2 Potential evacuations

During flood incidents, evacuation may be considered necessary. The Environment Agency and DEFRA's standing advice for undertaking FRAs for planning applications states that details of emergency escape plans are required for any parts of the building that are below the estimated flood level. The plans should show

- single storey buildings or ground floors that do not have access to higher floors can access a space above the estimated flood level, e.g. higher ground nearby;
- basement rooms have clear internal access to an upper level, e.g. a staircase; and
- occupants can leave the building if there is a flood and there is enough time for them to leave after flood warnings[69].

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

10.4.3 Flood warning and evacuation plans

Flood warning and evacuation plans are a potential mitigation measure to manage the residual risk. It is a requirement under the NPPF that a flood warning and evacuation plan is prepared for sites at risk of flooding used for holiday or short-let caravans and camping and are important at any site that has transient occupants (e.g. hostels and hotels).

The Environment Agency provides practical advice and templates on how to prepare a flood plan for individuals, communities and businesses (see text box for useful links)

It is recommended that emergency planners at Kent County Council are consulted prior to the production of any emergency flood plan.

Guidance documents for preparation of flood response plans

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

[69] EA and DEFRA (2012) Flood Risk Assessment: Standing Advice: https://www.gov.uk/flood-risk-assessment-standing-advice

11 Strategic flood risk solutions

11.1 Introduction

Strategic flood risk solutions may offer a potential opportunity to reduce flood risk in the borough. As described in Section 2.5, the sub-areas relevant to Tunbridge Wells Borough have been assigned Policy Option 3 under the River Medway CFMP, which means that the existing flood risk is, in general, being managed effectively.

In order to continue the effective management of flood risk across the area, several 'preferred' actions have been proposed for the sub-areas covering the borough. The common actions relevant to the borough, in relation to strategic flood risk mitigation, are:

- Undertake System Action Management Plans (SAMPs) to review maintenance regimes and to maintain current level of investment.
- Follow the Strategic Flood Risk Assessment to influence planned development and avoid inappropriate development in the floodplain.
- Work towards improving the flood warning service, Floodline Warnings Direct. Improve the accuracy of real-time flood warnings by assisting the development of our National Flood Forecasting System.
- Implement the outcomes of the Middle Medway Strategy (MMS) to reduce the flood risk across the borough (further details of the Middle Medway Strategy are provided in section 11.1.1).
- Investigate opportunities to work with landowners to create wetland habitats (link to Regional Habitat Creation Programme).
- Assist and provide education with flood proofing of properties where appropriate.
- Influence the development of emergency response plans.

More detailed information on the proposed strategic actions and measures for the Medway Flood Risk Area can be found in the Thames River Basin District Flood Risk Management Plan - Parts A, B, C and D[70].

The following sections outline different options which could be considered as strategic flood risk solutions for the borough.

11.1.1 Middle Medway Strategy

The Middle Medway Strategy was completed in August 2005 and investigated flood risk management options for the Middle Medway catchment through modelling, economic and strategic environment assessment[71]. The strategy was intended to guide those involved in flood defence and planning to present a business case to justify future works and investment in flood risk management[71]. The MMS was revised in 2010 to set out options to manage flood risk from the River Medway, the River Beult and the River Teise[71].

The options outlined included enlarging the capacity of the Leigh FSA from 5.5 million cubic metres to 8.8 million cubic metres to improve the standard of protection for properties along the fluvial River Medway and within Tonbridge in the neighbouring authority.

Along with increasing the FSA in the Medway Catchment, the River Medway CFMP noted that other outcomes of the MMS should be implemented, such as further investigating both structural and non-structural schemes to benefit locations within the borough near the confluence of the Medway and its tributaries[72].

Structural options include the potential construction of a 45,000m^3 FSA on the River Teise combined with 350m of local defences to reduce flood damages in Lamberhurst[65]. Although the scheme would not provide catchment-wide benefits, the Strategy notes that consideration should be given to

[70] Environment Agency, Thames River Basin District Flood Risk Management Plan 2015-2021 Part C (March 2016). Available: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/507148/LIT_10231_THAMES_FRMP_PART_C.pdf

[71] Environment Agency: Middle Medway Strategy Study for Flood Risk Management – Project Appraisal Report (2005)

[72] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/293890/Medway_Catchment_Flood_Management_Plan.pdf

further investigation and more detailed studies of the scheme with possible funding from a local levy to provide a better level of protection for properties within and downstream of Lamberhurst[71].

Given that some areas would not experience any significant improvement from such structural measures, the following non-structural measures have been recommended:

- Improved operation of the Leigh Barrier to take advantage of operating experience and developments in telemetry and flood forecasting.
- Flood warning improvements, for which a substantial programme is currently being implemented.
- Assistance with flood proofing in areas which do not benefit from one of the recommended structural options.
- Improved development management to limit the increasing number of properties in the flood plain.

Such non-structural measures form an essential part of the Strategy and are expected to reduce the flood risk in areas without any structural flood protection measures[71]. They are specifically expected to assist the management of risk to properties located in the Five Oak Green area as well as the hamlets of Hartlake and Tudeley Hale which surrounding the River Medway[71].

11.2 Flood storage schemes

Flood storage schemes aim to reduce the flows passed downriver to mitigate downstream flooding. Development increases the impermeable area within a catchment, creating additional and faster runoff into watercourses. Flood storage schemes aim to detain this additional runoff, releasing it downstream at a slower rate, to avoid any increase in flood depths and/or frequency downstream. Methods to provide these schemes include[73]:

- Enlarging the river channel;
- Raising the riverbanks; and/or
- Constructing flood banks set back from the river

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

The construction of new upstream storage schemes as part of upstream catchment-based approaches on watercourses in Tunbridge Wells Borough could provide one potential strategic solution to flood risk. Watercourses which are rural in their upper reaches but have high levels of flood risk to urban areas in the downstream reaches are potential candidates, as the open land in the upper reaches can potentially provide the space for an attenuation area, providing benefit to the urban area downstream. It should be noted that such schemes are often driven by requirements outlined by the LLFA and the Environment Agency.

Opportunities to work with natural processes to reduce flood and erosion risk, benefit the natural environment, and reduce cost of schemes should be sought. This requires integrated catchment management and involving those who use and shape the land. It also requires partnership working with neighbouring authorities, organisations and water management bodies.

Possible locations for potential flood storage schemes have been identified by the MMS[71]. The report recommends that further investigation and more detailed studies are undertaken regarding the construction of an online FSA on the River Teise to provide a better level of protection for properties within and downstream of Lamberhurst[71].

Expansion of the existing Leigh FSA could also decrease the flood risk in the borough. The Environment Agency is currently planning to expand Leigh FSA, with work commencing in 2018[74]. Refer to section 7.5 for further information on other potential flood risk management schemes in the borough.

[73] http://evidence.environment-agency.gov.uk/FCERM/en/FluvialDesignGuide/Chapter10.aspx?pagenum=2
[74] Kent County Council: Flood Risk to Communities Tonbridge and Malling (March 2016)

11.2.1 Promotion of SuDS

By considering SuDS at an early stage in the development of a site, the risk from surface water can be mitigated to a certain extent within the site as well as reduce the risk that the site poses to third party land. SuDS should be promoted on all new developments to ensure the quantity and quality of surface water is dealt with sustainably to reduce flood risk. The policies and guidance produced by Kent County Council as the LLFA (summarised in Chapter 9) should actively promote developers to use this information to produce technically proficient and sustainable drainage solutions for drainage. On more substantial development sites consideration should be given to the integration of sustainable water management with the provisions for green infrastructure within urban areas. Green infrastructure planning presents a significant potential opportunity for introducing measures to address surface water climate change effects.

11.3 Catchment and floodplain restoration

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

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

- Promoting existing and future brownfield sites that are adjacent to watercourses to naturalise banks as much as possible. Buffer areas around watercourses provide an opportunity to restore parts of the floodplain
- Removal of redundant structures to reconnect the watercourse and the floodplain. There are a number of culverted sections of watercourse located throughout the borough which if returned to a more natural state would potentially reduce flood risk to the local area
- Apply the Sequential Approach to avoid new development within currently undefended floodplain.

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

11.3.1 Upstream natural catchment management

Opportunities to work with natural processes to reduce flood and erosion risk, benefit the natural environment and reduce costs of schemes should be sought, requiring integrated catchment management and involving those who use and shape the land. It also requires partnership working with neighbouring authorities, organisations and water management bodies.

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

11.3.2 Structure removal and / or modification (e.g. weirs)

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

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

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

Further information is provided in the 'Trash and Security Screen Guide 2009'[75], published by the Environment Agency/ Defra, which should be used as evidence for any culvert assessment, improvement or structure retention.

11.3.3 Bank stabilisation

It is generally recommended that bank erosion is avoided where possible and all landowners are encouraged to avoid using machinery and vehicles close to or within the watercourse.

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

11.3.4 Bank removal, set back and / or increased easement

The removal or realignment of flood embankments and walls can allow the natural interrelationship between the river channel and the floodplain to be reinstated. This can be achieved at a small scale within urban areas providing pockets of attractive green spaces along rivers, whilst also improving floodplain storage within confined urban environments at times of flooding.

A detailed assessment would need to be undertaken to gain a greater understanding of the response to the channel modification, including flood risk analysis to investigate flood risk impacts.

An assessment of formal flood defences has been undertaken as part of this SFRA. All formal defences have a role in reducing flood risk, and therefore opportunities for bank removal, set back and / or increased easement will be limited. However, there may be informal artificial structures (embankments, walls) or defences within the borough which are now redundant.

11.3.5 Re-naturalisation

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

11.4 Flood defences

Although there are no formal flood defences or alleviation measures owned by the Environment Agency, there are several privately owned defences present within Tunbridge Wells Borough (see section 7.4 for further information). The risk to a number of sites considered within the Local Plan and / or put forward by developers may be influenced by the presence of such defences. Therefore, at such locations, it will be important to understand the benefit that defences can have on reducing flooding, and consequences if their design standard is exceeded or they fail.

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

[75] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/291172/scho1109brhf-e-e.pdf

12 Development management recommendations

12.1 Overview

This chapter sets out recommendations for considering and assessing flood risk in Tunbridge Wells Borough.

12.2 Development management policy

The following recommendations have been identified for flood risk policy for new development. The first recommendations are relevant to all development regardless of the Flood Zone they are in. The remaining recommendations are relevant to specific Flood Zones (note some policies are relevant to more than one flood zone and hence will have been repeated).

Recommendations relevant for development in all Flood Zones (1, 2, 3a, 3b)

- Where Flood Zones do not currently exist for smaller watercourses and drains (those with a catchment area less than 3km^2), the RoFSW can give a broad indication of the potential flow path and flood extent from these watercourses. At the planning application stage, developers would be expected to undertake more detailed hydrological and hydraulic assessments of the watercourses to verify flood extents, inform development zoning within the site and prove, if required, whether the Exception Test can be passed. The assessment should also identify the risk of existing flooding to adjacent land and properties to establish whether there is a requirement to secure land to implement strategic flood risk management measures to alleviate existing and future flood risk
- An FRA is required for all developments over 1ha and should be proportionate to the degree of flood risk, as well as the scale, nature and location of the development. The LPA and Environment Agency should be consulted to confirm the level of assessment required and to provide any information on any known local issues.
- The LPA should consult the Environment Agency's 'Flood Risk Standing Advice (FRSA) for Local Planning Authorities', when reviewing planning applications for proposed developments at risk of flooding
- It should be demonstrated through a Surface Water Drainage Strategy, that the proposed drainage scheme, and site layout and design, will prevent properties from flooding from surface water, allowing for climate change effects. They should also show that flood risk elsewhere will not be exacerbated by increased levels of surface runoff. Consideration must also be given to residual risk and maintenance of sustainable drainage and surface water systems
- Surface water runoff management should be undertaken, through the utilisation of appropriate SuDS techniques, prioritising the use of surface SuDS features which provide additional benefits (e.g. biodiversity, amenity space)
- Normally no buildings should be constructed within eight metres of the banks of watercourses. This is to allow access for maintenance, as well as providing an ecological corridor

Recommendations for Flood Zone 1

Fluvial flood risk is not a significant constraint to development within Flood Zone 1. However, there are a number of locations in Zone 1 where flooding from Ordinary Watercourses are not shown on Environment Agency flood maps and this should be reviewed and assessed as appropriate. There is also residual risk, in some locations, from reservoirs within the borough.

- FRA is required for all developments over 1ha.
- Reference should be made to the LFRMS and consideration given to requirements for the management of local flood risk.

Recommendations for Flood Zone 2

Most development is permitted in Flood Zone 2 with the exception of Highly Vulnerable development. Highly Vulnerable development is only permitted if it has passed the Exception Test.

- An FRA is required for all developments within this zone.
- Development design should incorporate mitigation measures to manage any flood risk to the development, including residual risk. Finished Floor Levels should be above the 1 in 100-year (1% AEP) flood level, plus an allowance for climate change (agreed with the Environment Agency and Tunbridge Wells Borough Council).
- The layout of buildings and access routes should adopt a sequential approach, steering buildings towards areas of lowest risk within the site.

Recommendations for Flood Zone 3a

Development in Flood Zone 3a is significantly constrained by flood risk. Highly Vulnerable development is not permitted within this zone and More Vulnerable development and Essential Infrastructure are only permitted if the Exception Test can be passed.

- An FRA is required for all developments within this zone.
    - It should be demonstrated that flood defences provide an acceptable standard of protection, including an allowance for climate change for the lifetime of the development.
    - Residual risks should be assessed, and the Environment Agency consulted regarding whether there is a need for a breach analysis to map a rapid inundation zone.
- The layout of buildings and access routes should adopt a sequential approach, steering buildings towards areas of lowest risk within the site. Where rapid inundation zones have been identified, development should be avoided in these areas.
- Development should not impede flow routes, reduce floodplain storage or consume flood storage in a ‘flood cell’ within a defended area. If the development does result in a loss of storage, compensatory floodplain storage should be provided on a ‘level for level’ and ‘volume for volume’ basis.
- If existing defences are to be upgraded as part of the development, an assessment should be undertaken to ensure it does not result in an increase in flood risk elsewhere.
- Development design should incorporate mitigation measures, to manage any flood risk to the development, including residual risk for the lifetime of the development. FFLs should be above the 1 in 100-year (1% AEP) flood level, plus an allowance for climate change.
- It is recommended that all types of new development behind flood defences is avoided, where possible, due to the residual risks of breach and overtopping
- Consideration should be given to the type of building that will be permitted, for example single-storey buildings and basements should be avoided.

Recommendations for Flood Zone 3b (Function Floodplain)

Development is highly constrained within Flood Zone 3b. Only Essential Infrastructure and Water Compatible uses are permitted in this zone, and only if the Exception Test has been passed.

Functional floodplain is vital for the conveyance and storage of floodwater. Development within this zone will potentially impede the flow of floodwater as well as result in a loss of flood storage, increasing flood risk both within the area and further downstream. Consideration should be given to 'rolling back' development in this zone, withdrawing development from the floodplain and allowing it to return back to a natural floodplain. This has an additional benefit of reducing flood risk to communities further downstream.

For the purpose of the SFRA, the defended case 20-year return period (5% Annual Exceedance Probability) event informs the Functional Floodplain within Tunbridge Wells Borough. However, where flood outlines of Flood Zone 3b are not available, Flood Zone 3a should be considered as Flood Zone 3b unless, following further work as part of a site-specific FRA, and in consultation with the Environment Agency, it can be proven as Flood Zone 3a.

- Essential infrastructure should only be allocated in this zone if no reasonable alternative sites are available in areas of lower flood risk.
- An FRA is required for Essential Infrastructure within this zone and should include evidence to demonstrate the Exception Test has been passed. Should the site pass the Exception Test, it 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
- Development should not impede flow routes or reduce floodplain storage. If the development does result in a loss of storage, compensatory floodplain storage should be provided on a 'level for level' and 'volume for volume' basis.
- Development design should incorporate mitigation measures, to manage any flood risk to the development, including residual risk. Floor levels should be above the 1 in 100-year (1% AEP) flood level, plus an allowance for climate change.

13 Level 1 assessment of potential development sites with site information

13.1 Introduction

A total of 472 sites within the borough were identified from the Strategic Housing and Employment Land Availability Assessment (SHELAA) Call for Sites process (which ran in two parts) and additional submission of sites after the Call for Sites process (number correct as of 15 April 2019). These sites were screened against a suite of available flood risk information and spatial data to provide a summary of risk to each site (see Table 13-1). Information considered includes the flood risk datasets listed below. Indication is provided on the proportion of a given site affected by levels and types of flood risk.

- Flood Zones (present day)
- Future Flood Zone 3a in the 2080s epoch (Higher central and Upper end estimates)
- Risk of Flooding from Surface Water
- Risk of Flooding from Reservoirs
- Areas Susceptible to Groundwater Flooding

The information provided is intended to enable a more informed consideration of the sites following the sequential approach. This should be used to determine whether more detailed assessment of sites is required as part of a Level 2 SFRA to further identify those that should be taken forward as potential development allocations.

13.2 Sequential testing

The SFRA has not performed the Sequential Test of potential development sites. However, Table 13-1 summarises the flood risk to the potential development sites which can assist with completion of the Sequential Test. The majority of sites are located within Flood Zone 1 and where part of the site is located within higher flood risk zones, a large number remain predominantly within Flood Zone 1. However, the majority of sites are shown to be at risk from surface water flooding (indicated by the RoFSW extent being present in the site).

Inclusion of SHELAA sites in the SFRA does not mean that development can be permitted without further consideration of the Sequential Test. The required evidence should be prepared as part of a Local Plan Sustainability Appraisal or alternatively, it can be demonstrated through a free-standing document, or as part of strategic housing land or employment land availability assessments. NPPF Planning Practice Guidance for Flood Risk and Coastal Change describes how the Sequential Test should be applied in the preparation of a Local Plan. The assessments undertaken for this SFRA will assist the Council when they undertake the Sequential Test.

Table 13-1: Site summary assessment – flood risk and spatial datasets

Site name	Site ref	Site area (ha)	Proportion of site within Flood Zone 3b	Proportion of site within Flood Zone 3a	Proportion of site within Flood Zone 2	Proportion of site within Flood Zone 1	Flood Zone 3b informed from Precautionary Flood Zone 3a	Proportion of site within future Flood Zone 3a (2080s Higher Central)	Proportion of site within future Flood Zone 3a (2080s Upper End)	Future Flood Zone 3a informed from current Flood Zone 2 (Yes/No)	Proportion of site within RoFSW 30-year extent	Proportion of site within RoFSW 100-year extent	Proportion of site within RoFSW 1,000-year extent	Proportion of site outside RoFSW extent	Most common AStGWF category in site	Site intersected by Risk of Flooding from Reservoirs extent (Yes/No)
Car park for former Slaughterhouse, adjacent to Brewers Street/Hopgarden Close, Lamberhurst.	1	0.83	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0%	100%	< 25%	No
Chittenden Fields, adjacent to High Street and Slip Mill Road, Hawkhurst.	2	3.03	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0%	100%	< 25%	No
Stears Field, Trenley Lane, Gill's Green, Hawkhurst.	3	0.39	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0% > 25%	75% > 100%	No Data	No
Land east of London Road and south of St Andrews Park Road, Southborough.	4	0.06	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0%	100%	No Data	No
85 London Road, Southborough.	5	0.07	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0%	100%	No Data	No
Montacute Gardens, Royal Tunbridge Wells.	7	0.86	0% > 25%	0%	0% > 25%	75% > 100%	Yes	0% > 25%	0% > 25%	Yes	0% > 25%	75% > 100%	0% > 25%	0% > 25%	No Data	No
Wheelers Field, Powder Mill Lane, Southborough.	8	1.08	0%	0%	0%	100%	No	0%	0%	No	0% > 25%	0% > 25%	0% > 25%	75% > 100%	< 25%	No
The Piggery, Powder Mill Lane, Southborough.	10	2.35	0%	0%	0%	100%	No	0%	0%	No	0% > 25%	0% > 25%	0% > 25%	75% > 100%	< 25%	No
Land at and to the rear of 50 Whetsted Road, Five Oak Green, TN12 6RT.	11	1.62	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0% > 25%	75% > 100%	No Data	Yes
Tunbridge Wells West to Grove Junction.	12	1.08	0%	0%	0%	100%	No	0%	0%	No	0% > 25%	0% > 25%	0% > 25%	75% > 100%	No Data	No
Scriventon Farm Buildings, Four Winds Farm, off Franks Hollow Road, Speldhurst.	13	0.95	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0% > 25%	75% > 100%	< 25%	No
Spindles, West Road, Goudhurst.	15	0.33	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0% > 25%	75% > 100%	< 25%	No
Land west of Pinehurst and north of Spindles, West Road, Goudhurst, TN17 1AA.	16	0.37	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0%	100%	< 25%	No
Land adjacent to High Banks Nursery, Cranbrook Road, Gill's Green, Hawkhurst.	17	0.73	0%	0%	0%	100%	No	0%	0%	No	0%	0% > 25%	0% > 25%	75% > 100%	No Data	No
Matfield House orchards and land, The Green, Matfield TN12 7JT.	18	2.2	0%	0%	0%	100%	No	0%	0%	No	0% > 25%	0% > 25%	0% > 25%	75% > 100%	< 25%	No
Matfield House orchards and land, The Green, Matfield TN12 7JT.	18	1.26	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0%	100%	< 25%	No
Land at Heartenoak Road, Hawkhurst.	19	2.42	0%	0%	0%	100%	No	0%	0%	No	0% > 25%	0% > 25%	0% > 25%	75% > 100%	< 25%	No
Land at Knells Farm, Queen Street, Paddock Wood.	20	38.64	0% > 25%	0% > 25%	0% > 25%	50% > 75%	No	25% > 50%	25% > 50%	No	0% > 25%	0% > 25%	0% > 25%	50% > 75%	< 25%	Yes
Land adjacent to Clay Hill, west of Goudhurst.	21	14.43	0%	0%	0%	100%	No	0%	0%	No	0% > 25%	0% > 25%	0% > 25%	75% > 100%	< 25%	No
Dingley Dell, Langton Road, Royal Tunbridge Wells TN4 8XG.	22	0.78	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0%	100%	No Data	No
Kippings Cross Farm Land, Hastings Road, Royal Tunbridge Wells, TN12 7HB.	23	16.56	0%	0%	0% > 25%	75% > 100%	No	0% > 25%	0% > 25%	No	0%	0% > 25%	0% > 25%	75% > 100%	No Data	No
Tunbridge Wells Garden Centre, Eridge Road, TN4 8HP.	24	7.91	0% > 25%	0%	0% > 25%	75% > 100%	Yes	0% > 25%	0% > 25%	No	0% > 25%	0% > 25%	25% > 50%	50% > 75%	< 25%	No
Land to the west of Frythe Way and east of Freight Lane, Cranbrook.	25	2.83	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0% > 25%	75% > 100%	< 25%	No
1) Land adjacent to the rear of Asher Reeds and 2) Land adjacent to to Cherry Trees, Farnham Lane, Langton Green.	27	1.11	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0% > 25%	75% > 100%	No Data	No
1) Land adjacent to the rear of Asher Reeds and 2) Land adjacent to Cherry Trees, Farnham Lane, Langton Green.	27	1.11	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0% > 25%	75% > 100%	No Data	No
Land on the eastern side of Woodside Road, Pembury, TN2 4BG.	28	0.89	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0%	100%	No Data	No
Land at Boycourt Orchards A229 Angley	29	1.59	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0%	100%	No Data	No

Site name	Site ref	Site area (ha)	Proportion of site within Flood Zone 3b	Proportion of site within Flood Zone 3a	Proportion of site within Flood Zone 2	Proportion of site within Flood Zone 1	Flood Zone 3b informed from Precautionary Flood Zone 3a	Proportion of site within future Flood Zone 3a (2080s Higher Central)	Proportion of site within future Flood Zone 3a (2080s Upper End)	Future Flood Zone 3a informed from current Flood Zone 2 (Yes/No)	Proportion of site within RoFSW 30-year extent	Proportion of site within RoFSW 100-year extent	Proportion of site within RoFSW 1,000-year extent	Proportion of site outside RoFSW extent	Most common AStGWF category in site	Site intersected by Risk of Flooding from Reservoirs extent (Yes/No)
Road Wisley pound Cranbrook Kent TN17 2HR.																
Land at Caenwood Farm and Whitegates Farm, Reynolds Lane, Royal Tunbridge Wells.	30	61.37	0% > 25%	0%	0% > 25%	75% > 100%	Yes	0% > 25%	0% > 25%	No	0% > 25%	0% > 25%	0% > 25%	75% > 100%	< 25%	No
Land adjacent to Furnace Lane and Gibbett Lane, Horsmonden.	31	1.82	0%	0%	0%	100%	No	0%	0%	No	0% > 25%	0% > 25%	0% > 25%	75% > 100%	No Data	No
Land south of Woodham Hall, Rye Road, Hawkhurst, TN18 5DA.	33	0.83	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0%	100%	No Data	No
Walters Farm, High Street, Brenchley,TN12 7NU.	34	2	0%	0%	0%	100%	No	0%	0%	No	0%	0% > 25%	0% > 25%	75% > 100%	No Data	No
Land at Walkhurst Road, Benenden.	35	0.71	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0% > 25%	75% > 100%	No Data	No
Land fronting Maidstone Road and Chestnut Lane, Matfield.	36	3.65	0%	0%	0%	100%	No	0%	0%	No	0%	0% > 25%	0% > 25%	75% > 100%	< 25%	No
The Granary Field, off Furnace Lane, Lamberhurst TN3 8ET.	37	0.5	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0%	100%	No Data	No
Land Adjoining Dunorlan Park, Pembury Road, Royal Tunbridge Wells, TN2 3QN.	39	2.5	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0%	100%	No Data	No
Land Fronting Barden Road, opposite Barden Furnace Farm, Speldhurst.	40	1.6	25% > 50%	0%	0% > 25%	50% > 75%	Yes	25% > 50%	25% > 50%	No	25% > 50%	0% > 25%	0% > 25%	25% > 50%	< 25%	No
Allotment Gardens, Tibbs Court Lane, Matfield.	41	0.16	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0%	100%	No Data	No
Land at High View, Langton Road, Langton Green, Royal Tunbridge Wells TN3 0BB.	42	0.78	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0% > 25%	75% > 100%	No Data	No
Longview, North Road, Goudhurst, TN17 1JJ.	43	0.45	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0%	100%	< 25%	No
Land to the south of Camden Avenue, High Street, Pembury TN2 4AA (Part OS 4255).	44	0.52	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0% > 25%	75% > 100%	No Data	No
Land adjoining Birchwood Avenue/Dower House Crescent, Southborough.	45	7.43	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0%	100%	< 25%	No
Land to the rear of Santers Court, Cranbrook Road, Gill's Green, Cranbrook, Kent, TN18 5EQ.	46	0.25	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0%	100%	< 25%	No
46A Land to the rear of Santers Court, Cranbrook Road, Gill's Green, Cranbrook, Kent, TN18 5EQ.	46	0.25	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0%	100%	< 25%	No
Ledgers Works, Queen Street, Paddock Wood, TN12 6NN.	47	0.86	0%	0%	0%	100%	No	0%	0%	No	0% > 25%	0% > 25%	0% > 25%	75% > 100%	< 25%	No
Bramley House, Five Oak Green Road, Five Oak Green, Capel, TN12 6TJ.	48	0.75	0% > 25%	0% > 25%	0% > 25%	75% > 100%	No	0% > 25%	0% > 25%	No	0%	0%	0% > 25%	75% > 100%	No Data	Yes
Land at Castle Hill Farm, Castle Hill Farm, Pembury Road, Tonbridge, TN11 0QG.	49	47.73	0%	0%	0%	100%	No	0%	0%	No	0% > 25%	0% > 25%	0% > 25%	75% > 100%	< 25%	No
50A Hubbles Farm and 32 Hastings Road (including adjacent land), Pembury, TN2 4JP.	50	0.74	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0%	100%	No Data	No
50A Hubbles Farm, Hastings Road, Pembury, TN2 4JP and 32 Hastings Road, TN2 4JP and Adjacent land.	50	5.42	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0% > 25%	75% > 100%	No Data	No
Land West of Maidstone Road and north of Eldon Way, Paddock Wood.	51	7.5	0% > 25%	25% > 50%	25% > 50%	0% > 25%	No	50% > 75%	50% > 75%	No	0%	0% > 25%	0% > 25%	75% > 100%	No Data	Yes
Land and property at Streatley, Horns Road, Hawkhurst, Kent TN18 4QT.	52	3.15	0%	0%	0%	100%	No	0%	0%	No	0% > 25%	0% > 25%	0% > 25%	75% > 100%	No Data	No
Plot B - Land to the east and north of Hawkenbury allotments, Hawkenbury, Royal Tunbridge Wells.	53	12.61	0%	0%	0%	100%	No	0%	0%	No	0% > 25%	0% > 25%	0% > 25%	75% > 100%	< 25%	No

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Plot A: Land to the north of Hawkenbury Recreation Ground and Plot B: Land to the east and north of Hawkenbury allotments, Hawkenbury, Royal Tunbridge Wells.	53	7.07	0%	0%	0%	100%	No	0%	0%	No	0% > 25%	0% > 25%	0% > 25%	75% > 100%	< 25%	No
Land on the east side of Mill Lane, Sissinghurst, TN17 2HX.	54	0.86	0%	0%	0%	100%	No	0%	0%	No	0% > 25%	0% > 25%	0% > 25%	75% > 100%	No Data	No
March's Field, Lime Grove, Gills Green, Hawkhurst, Kent TN18 5BD.	55	0.63	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0%	100%	No Data	No
Land between Crittenden Road and Crittenden Farm Bungalow, Crittenden Road, Matfield, TN12 7EN.	56	0.09	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0%	100%	< 25%	No
Land adjacent to Longfield Road, Royal Tunbridge Wells.	57	22.3	0%	0%	0%	100%	No	0%	0%	No	0% > 25%	0% > 25%	0% > 25%	75% > 100%	< 25%	No
The Wealden Advertiser, Cowden Close, Horns Road, Hawkhurst, Kent, TN18 4QT.	58	0.17	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0%	100%	No Data	No
Gate Farm, adjacent to Hartley Road and Glassenbury Road, Hartley, Cranbrook, TN17 2ST.	59	0.67	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0%	100%	No Data	No
The Paddocks, Home Farm, 92 Lower Green Road, Rusthall, Kent TN4 8TT.	60	1.29	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0%	100%	No Data	No
Robin Gate, Blackhurst Lane, Royal Tunbridge Wells, TN2 4QA.	61	2.07	0%	0%	0%	100%	No	0%	0%	No	0%	0% > 25%	0% > 25%	75% > 100%	< 25%	No
Land to the south of Appletree and Devils Wood (north of North Farm Lane), Royal Tunbridge Wells.	62	53.95	0% > 25%	0% > 25%	0% > 25%	75% > 100%	No	0% > 25%	0% > 25%	No	0% > 25%	0% > 25%	0% > 25%	75% > 100%	< 25%	No
Land west of Maidstone Road and north of Kirkins Close, Horsmonden.	63	0.53	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0%	100%	No Data	No
Land at Woodside House, Woodside Road, Pembury TN2 4BG.	64	1.61	0% > 25%	0% > 25%	0% > 25%	75% > 100%	No	0% > 25%	0% > 25%	No	0% > 25%	0% > 25%	0% > 25%	75% > 100%	No Data	No
Land at and adjacent to the Blueboys Oast, Hastings Road, Royal Tunbridge Wells, TN12 7HE.	65	0.12	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0%	100%	< 25%	No
Part garden of Broughton House, rear of Leybourne Dell, Benenden, TN17 4EE.	66	0.3	0%	0%	0%	100%	No	0%	0%	No	0%	0% > 25%	75% > 100%	0% > 25%	No Data	No
Land to the rear of Pembury Village Hall, Pembury.	67	1.08	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0%	100%	No Data	No
Land at junction of Common Road and Frittenden Road, Sissinghurst.	68	1.61	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0%	100%	< 25%	No
Site adjacent to Lamberhurst Road and Rock Lane, Horsmonden, TN12 8DP.	69	2.1	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0% > 25%	75% > 100%	No Data	No
Land south west of Campion Crescent at Hartley, Cranbrook.	70	0.23	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0%	100%	No Data	No
Land adjoining Cranbrook Primary School, Off Quaker Lane, Cranbrook, TN17 3JZ: Site B.	71	2.05	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0% > 25%	75% > 100%	< 25%	No
Former North Farm Landfill Site, North Farm Lane, Royal Tunbridge Wells, TN2 3EE.	72	20.19	0% > 25%	0% > 25%	0% > 25%	75% > 100%	No	0% > 25%	0% > 25%	No	0% > 25%	0% > 25%	0% > 25%	75% > 100%	< 25%	No
Land at Pembury Road (South) Royal Tunbridge Wells.	73	7.12	0%	0%	0%	100%	No	0%	0%	No	0%	0% > 25%	0% > 25%	75% > 100%	< 25%	No
Land East of Spray Hill, Pearse Place, Lamberhurst, TN3 8EJ.	74	1.37	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0% > 25%	75% > 100%	< 25%	Yes
Broad Oak, Town Hill, Lamberhurst, Kent TN3 8EP.	75	0.97	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0% > 25%	75% > 100%	< 25%	No
Corsica Nursery, Brenchley Road, Matfield, TN12 7PT.	76	0.59	0%	0%	0%	100%	No	0%	0%	No	0%	0% > 25%	0% > 25%	75% > 100%	< 25%	No

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Land North of Royal Tunbridge Wells, adjacent to Forest Farm.	77	33.63	0%	0%	0%	100%	No	0%	0%	No	0% > 25%	0% > 25%	0% > 25%	75% > 100%	< 25%	No
Land off Copthall Avenue, Hawkhurst TN18 4LR.	78	5.28	0%	0%	0%	100%	No	0%	0%	No	0% > 25%	0% > 25%	0% > 25%	75% > 100%	No Data	No
Land at Church Farm, Church Road, Paddock Wood.	79	22.43	0% > 25%	0% > 25%	25% > 50%	25% > 50%	No	25% > 50%	25% > 50%	No	0% > 25%	0% > 25%	25% > 50%	25% > 50%	< 25%	No
Parsonage Farm, Brenchley Road, Brenchley, TN12 7PA.	80	18.32	0%	0%	0%	100%	No	0%	0%	No	0%	0% > 25%	0% > 25%	75% > 100%	< 25%	No
Land adjacent to Bassetts Farm, Goudhurst Road, Horsmonden, TN12 8AS.	82	1.01	0%	0%	0%	100%	No	0%	0%	No	0%	0% > 25%	0% > 25%	75% > 100%	No Data	No
Land to the west of Balcombes Hill, Goudhurst, TN17 1AT.	83	0.44	0%	0%	0%	100%	No	0%	0%	No	0% > 25%	0% > 25%	0% > 25%	75% > 100%	< 25%	No
Field located to the south west of Furzefield Avenue and north of Penshurst Road, Speldhurst.	84	4.59	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0%	100%	No Data	No
Land at Goods Station Road, Royal Tunbridge Wells.	85	0.12	0%	0%	0%	100%	No	0%	0%	No	0%	0% > 25%	0% > 25%	75% > 100%	No Data	No
Land at Highgate Hill, Hawkhurst.	86	4.13	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0% > 25%	75% > 100%	No Data	No
Land at Speldhurst Road, Langton Green.	87	3.26	0%	0%	0%	100%	No	0%	0%	No	0% > 25%	0% > 25%	0% > 25%	75% > 100%	No Data	No
Land to the north of Leggs' Lane, Langton Green.	88	0.58	0%	0%	0%	100%	No	0%	0%	No	0% > 25%	0% > 25%	0% > 25%	75% > 100%	No Data	No
Land west of Hawkhurst Community Hospital, High Street, Hawkhurst.	89	0.24	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0%	100%	No Data	No
Mabledon London Road, Southborough TN4 0UH.	90	12.43	0%	0%	0%	100%	No	0%	0%	No	0% > 25%	0% > 25%	0% > 25%	75% > 100%	< 25%	No
RTA Joinery, Rear of 5 Birling Road, Royal Tunbridge Wells, TN2 5LX.	91	0.23	0%	0%	0%	100%	No	0%	0%	No	0% > 25%	0% > 25%	25% > 50%	25% > 50%	No Data	No
Land south of Grove Cottage, Tilsden Lane, Cranbrook, TN17 3PJ.	92	1.04	0%	0%	0%	100%	No	0%	0%	No	0% > 25%	0% > 25%	0% > 25%	75% > 100%	No Data	No
Upper Haymans Farm, Land to the east of Maidstone Road, Horsmonden.	93	1.77	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0%	100%	No Data	No
Land at Milford House, Penshurst Road, Speldhurst, TN3 0PH.	94	1.46	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0% > 25%	75% > 100%	No Data	No
Land on the north west side of Maidstone Road at Church Meadow, Horsmonden.	96	2.19	0%	0%	0%	100%	No	0%	0%	No	0%	0% > 25%	0% > 25%	75% > 100%	No Data	No
Land on the north west side of Maidstone Road and to the south east of Swigs Hole Farm, Horsmonden.	97	1.42	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0%	100%	No Data	No
Site at Windmill Street, Royal Tunbridge Wells.	98	0.06	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0%	100%	No Data	No
Land at Pembury Road, Royal Tunbridge Wells, TN2.	99	6.57	0%	0%	0%	100%	No	0%	0%	No	0%	0% > 25%	0% > 25%	75% > 100%	< 25%	No
Land to the south of Speldhurst Road, adjacent to Whitegate Close, Royal Tunbridge Wells.	100	1.19	0%	0%	0%	100%	No	0%	0%	No	0%	0% > 25%	0% > 25%	75% > 100%	No Data	No
Colebrooke House, Pembury Road, Capel, Tonbridge, Kent TN11 0QD.	101	9.4	0%	0%	0%	100%	No	0%	0%	No	0%	0% > 25%	0% > 25%	75% > 100%	< 25%	No
Hawkhurst Station Business Park, Gills Green, Cranbrook, Kent, TN18 5BD.	102	2.14	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0% > 25%	75% > 100%	No Data	No
Brenchley & Matfield Primary School, Market Heath, Brenchley, TN12 7NY.	103	1.26	0%	0%	0%	100%	No	0%	0%	No	0% > 25%	0% > 25%	0% > 25%	75% > 100%	< 25%	No
3 Lonsdale Gardens, Royal Tunbridge Wells, TN1 1NX.	104	0.09	0%	0%	0%	100%	No	0%	0%	No	0%	0% > 25%	0% > 25%	75% > 100%	No Data	No
5 Lonsdale Gardens, Royal Tunbridge Wells, TN1 1NX.	105	0.1	0%	0%	0%	100%	No	0%	0%	No	0% > 25%	0% > 25%	0% > 25%	75% > 100%	No Data	No

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Heathervale House, Vale Avenue, Royal Tunbridge Wells, TN1 1DJ.	106	0.1	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0% > 25%	75% > 100%	No Data	No
Hawkhurst Place Farm, Rye Road, Hawkhurst, TN18 5DA.	107	2.55	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0%	100%	No Data	No
Old Station Garage, Goudhurst Road, Horsmonden, Kent, TN12 8AD.	108	1.85	0%	0%	0%	100%	No	0%	0%	No	0% > 25%	0% > 25%	0% > 25%	75% > 100%	No Data	No
Weald Business Park (old Brickworks), Dig Dog Lane, Frittenden TN17 2AZ.	109	1.92	0%	0%	0%	100%	No	0%	0%	No	0%	0% > 25%	0% > 25%	75% > 100%	< 25%	No
Land to the west of the Co-Operative, High Street, Cranbrook, TN17 3DQ.	110	0.46	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0%	100%	< 25%	No
Land surrounding Elmhurst Farm, Dundale Road, Matfield, TN12 7HD.	111	13.16	0%	0%	0%	100%	No	0%	0%	No	0% > 25%	0% > 25%	0% > 25%	75% > 100%	< 25%	No
Scrap Yard, Heartenoak Road, Hawkhurst, Kent TN18 5EY.	112	0.4	25% > 50%	0%	0% > 25%	25% > 50%	Yes	50% > 75%	50% > 75%	No	25% > 50%	0% > 25%	0% > 25%	25% > 50%	< 25%	No
Land at Sandown Park, west of A21 Royal Tunbridge Wells TN2 4RT.	114	5.05	0%	0%	0%	100%	No	0%	0%	No	0%	0% > 25%	0% > 25%	75% > 100%	< 25%	No
Land at Sandown Park, west of A21 Royal Tunbridge Wells TN2 4RT.	114	5.38	0%	0%	0%	100%	No	0%	0%	No	0%	0% > 25%	0% > 25%	75% > 100%	< 25%	No
Land forming part of the Hawkhurst Golf Course to the north of High Street, Hawkhurst TN18 4JS.	115	19.45	0% > 25%	0%	0% > 25%	75% > 100%	Yes	0% > 25%	0% > 25%	No	0% > 25%	0% > 25%	0% > 25%	75% > 100%	< 25%	No
Land south of Pembury Road, Royal Tunbridge Wells.	116	7.19	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0% > 25%	75% > 100%	No Data	No
Part Ramshill Service Station, Maidstone Road, Horsmonden, TN12 8HA.	117	0.13	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0% > 25%	75% > 100%	No Data	No
Land on the edge of Foxearth Woods, Cranbrook Road, Frittenden, TN17 2AU.	118	2.63	0%	0%	0%	100%	No	0%	0%	No	0%	0% > 25%	0% > 25%	75% > 100%	< 25%	No
Land adjacent Angley Road, Cranbrook.	119	1.31	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0%	100%	< 25%	No
Land east of Camden Lodge, adjacent to Mill Lane and Sissinghurst Road, Sissinghurst.	120	2.2	0%	0%	0%	100%	No	0%	0%	No	0% > 25%	0% > 25%	0% > 25%	75% > 100%	No Data	No
Gate Farmland at Charity Farm, Swattenden Lane, Cranbrook, TN17 3PS.	122	2.61	0%	0%	0%	100%	No	0%	0%	No	0%	0% > 25%	0% > 25%	75% > 100%	No Data	No
Land east of Wallers, Speldhurst Hill, Speldhurst, Kent TN3 0NH.	123	0.4	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0% > 25%	75% > 100%	< 25%	No
Land east of Balcombes Hill and adjacent to Maypole Lane, Goudhurst, TN17 1AE.	124	1.07	0%	0%	0%	100%	No	0%	0%	No	0% > 25%	0% > 25%	0% > 25%	75% > 100%	< 25%	No
Land adjoining Wilsley Farm, adjacent to Angley Road and Whitewell Lane, Cranbrook, TN17 2LE.	125	0.99	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0% > 25%	75% > 100%	< 25%	No
Hurst Cottage, Ewehurst Lane, Speldhurst TN3 0JX.	126	0.26	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0%	100%	No Data	No
Land adjacent to Petteridge Oast, Petteridge Lane, Matfield, TN12 7LX.	127	2.78	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0%	100%	No Data	No
Scott Field, Main Campus, Cranbrook School, adjacent to Bakers Cross, Cranbrook.	128	4.46	0%	0%	0%	100%	No	0%	0%	No	0% > 25%	0% > 25%	0% > 25%	75% > 100%	< 25%	No
Big Side Playing Field adjacent to Quaker Lane and Waterloo Road, Cranbrook.	129	4.64	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0%	100%	< 25%	No
Cranbrook School Main Campus Waterloo Road, Cranbrook, TN17 3JD.	130	16.07	0%	0%	0%	100%	No	0%	0%	No	0% > 25%	0% > 25%	0% > 25%	75% > 100%	< 25%	No
Jaegers Field, Angley Road, Cranbrook.	131	2.75	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0% > 25%	75% > 100%	< 25%	No
Rammell Field, Bakers Cross, Cranbrook.	132	1.69	0%	0%	0%	100%	No	0%	0%	No	0%	0% > 25%	25% > 50%	50% > 75%	< 25%	No
Land adjoining Cranbrook Primary School, off Quaker Lane Cranbrook: Site A.	133	2.05	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0% > 25%	75% > 100%	< 25%	No

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Land adjoining Cranbrook Primary School, off Quaker Lane Cranbrook: Site A.	133	4.21	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0% > 25%	75% > 100%	< 25%	No
Land around Sandstone House, Longdrift, Court lodge and Shallowdene, Broadwater Down, Royal Tunbridge Wells, TN2 5PE.	134	1.35	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0% > 25%	75% > 100%	No Data	No
Land between Cranbrook Road and Mile Lane, Goudhurst.	135	5.68	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0%	100%	No Data	No
Land at Notcutts Garden Centre, Tonbridge Road, Pembury, TN2 4QN.	136	0.72	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0%	100%	No Data	No
Land to the west of Eridge Road at Spratsbrook Farm, Royal Tunbridge Wells, TN3.	137	15.74	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0% > 25%	75% > 100%	< 25%	No
Knights Park, Royal Tunbridge Wells, TN2 3UW.	138	0.67	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0%	100%	< 25%	No
Knights Park, Royal Tunbridge Wells, TN2 3UW.	139	1.57	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0%	100%	< 25%	No
Knights Park, Royal Tunbridge Wells, TN2 3UW.	140	5.91	0%	0%	0%	100%	No	0%	0%	No	0% > 25%	0% > 25%	0% > 25%	75% > 100%	< 25%	No
Site south of Badsell Road, Paddock Wood, TN12 6QR.	141	0.46	0% > 25%	0% > 25%	0% > 25%	75% > 100%	No	0% > 25%	0% > 25%	No	0% > 25%	0% > 25%	0% > 25%	75% > 100%	< 25%	No
Land to the north of Badsell Road, Five Oak Green, TN12 6QR.	142	45.33	0% > 25%	25% > 50%	25% > 50%	25% > 50%	No	50% > 75%	50% > 75%	No	0% > 25%	0% > 25%	0% > 25%	75% > 100%	< 25%	No
Land at Tolhurst Road, Five Oak Green.	143	0.7	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0% > 25%	75% > 100%	No Data	Yes
Land adjacent to Yew Tree Green Road, Maidstone Road and Furnace Lane, Horsmonden.	144	51.78	0% > 25%	0% > 25%	0% > 25%	75% > 100%	No	0% > 25%	0% > 25%	No	0% > 25%	0% > 25%	0% > 25%	75% > 100%	No Data	Yes
WA Turner Factory Site, Broadwater Lane, Royal Tunbridge Wells, TN2 5RD.	145	1.36	0%	0%	0%	100%	No	0%	0%	No	0% > 25%	0% > 25%	0% > 25%	75% > 100%	No Data	No
Tunbridge Wells Golf Club, Langton Road, Royal Tunbridge Wells TN4 8XH.	146	14.13	0%	0%	0%	100%	No	0%	0%	No	0% > 25%	0% > 25%	0% > 25%	75% > 100%	No Data	No
Land adjacent to Old Orchard and Stream Pit Lane, Sandhurst, TN18 5LQ.	147	0.35	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0%	100%	No Data	No
Land on the south side of Sayville, Rye Road, Sandhurst, Cranbrook Kent TN18 5JL.	149	2.13	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0% > 25%	75% > 100%	< 25%	No
Land between Forge House and Rosemary Cottage, Stockland Green Road, Speldhurst, TN3 0TS.	151	0.09	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0% > 25%	75% > 100%	< 25%	No
Land parcel at Ringle Green Farm, to the south west of Bodiam Road.	153	0.66	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0% > 25%	75% > 100%	No Data	No
Park Farm (formerly Breach Farm), Goudhurst Road, Cranbrook, TN17 2LJ.	155	1.15	0%	0%	0%	100%	No	0%	0%	No	0%	0% > 25%	0% > 25%	75% > 100%	No Data	No
Bracken Dale, Maidstone Road, Colts Hill, Capel, TN2 4AL.	156	0.64	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0%	100%	< 25%	No
The Tanyard Woodyard, The Tanyard, Cranbrook, TN17 3HU.	157	0.22	0%	0%	0%	100%	No	0%	0%	No	0% > 25%	0% > 25%	25% > 50%	50% > 75%	< 25%	No
Land to the rear of Greenacres, The Street, and adjacent to New Pond Road, Benenden.	158	5.8	0%	0%	0%	100%	No	0%	0%	No	0% > 25%	0% > 25%	0% > 25%	75% > 100%	No Data	No
Land south of The Street, Sissinghurst.	159	0.55	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0%	100%	< 25%	No
Land South of Brenchley Road to the west of Fromandez Drive, Horsmonden.	162	3.48	0%	0%	0%	100%	No	0%	0%	No	0% > 25%	0% > 25%	0% > 25%	75% > 100%	No Data	No
Pantiles Car Park, Major Yorks Road, Royal Tunbridge Wells, TN2 5TP.	165	0.77	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0% > 25%	75% > 100%	No Data	No
Land on the north west side of	167	5.04	0%	0%	0%	100%	No	0%	0%	No	0% > 25%	0% > 25%	0% > 25%	75% > 100%	< 25%	No

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Heartenoak Road, Hawkhurst.																
Land adjacent to Yew Tree Green Road and Maidstone Road, Horsmonden.	169	5.1	0%	0%	0%	100%	No	0%	0%	No	0% > 25%	0% > 25%	0% > 25%	75% > 100%	No Data	No
Land at Spray Hill, Lamberhurst	170	1.71	25% > 50%	0% > 25%	0% > 25%	50% > 75%	No	25% > 50%	25% > 50%	No	0% > 25%	0% > 25%	0% > 25%	75% > 100%	< 25%	Yes
Land adjacent to No. 6 Sydney Terrace, Cranbrook Road, Hawkhurst.	172	0.04	25% > 50%	0%	0% > 25%	50% > 75%	Yes	25% > 50%	25% > 50%	No	0% > 25%	0% > 25%	0% > 25%	75% > 100%	< 25%	No
Broadford Oast, Goudhurst Road, Horsmonden.	173	0.54	0%	0%	0% > 25%	75% > 100%	No	0%	0%	No	0%	0% > 25%	0% > 25%	75% > 100%	>= 25% <50%	Yes
Land north of Triggs Farm and west of Paynetts Farm, Cranbrook Road, Goudhurst.	174	1.74	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0%	100%	< 25%	No
Court Lodge & Land to the rear of Sandstone House, 44 Broadwater Down, Royal Tunbridge Wells, TN2 5PE.	175	0.46	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0% > 25%	75% > 100%	No Data	No
Former Plant and Tool Hire site on Eridge Road, Royal Tunbridge Wells, TN4 8HJ.	176	0.41	0% > 25%	0%	0% > 25%	75% > 100%	Yes	0% > 25%	0% > 25%	No	0% > 25%	0% > 25%	50% > 75%	25% > 50%	No Data	No
Land on the west side of Hartlake Road opposite The Poacher Public House and on the east side of Hartlake Road, Tudeley, Capel.	178	2.91	0%	75% > 100%	0% > 25%	0% > 25%	No	75% > 100%	75% > 100%	Yes	0% > 25%	0% > 25%	0% > 25%	75% > 100%	>= 25% <50%	Yes
Tanners Farm, Church Lane, Capel.	183	1.34	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0%	100%	< 25%	No
Yew Tree Farm, Pembury Road, Pembury.	187	3.04	0%	0%	0%	100%	No	0%	0%	No	0% > 25%	0% > 25%	0% > 25%	75% > 100%	< 25%	No
Land adjacent to Hartley Dyke, Cranbrook.	188	7.58	0%	0%	0%	100%	No	0%	0%	No	0%	0% > 25%	0% > 25%	75% > 100%	No Data	No
Land south of Hastings Road, Pembury.	189	4.78	0%	0%	0%	100%	No	0%	0%	No	0% > 25%	0% > 25%	0% > 25%	75% > 100%	No Data	No
Land south east of Sandhurst Avenue, Pembury.	190	3.52	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0% > 25%	75% > 100%	No Data	No
Land north of Henwoods Mount, Pembury.	191	3.19	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0%	100%	No Data	No
Tunbridge Wells Telephone Engineering Centre, Broadwater Lane, Royal Tunbridge Wells, TN2 5RE.	198	1.08	0%	0%	0%	100%	No	0%	0%	No	0%	0% > 25%	0% > 25%	75% > 100%	No Data	No
Land and buildings at Smockham Farm, Reynolds Lane, Royal Tunbridge Wells, TN4 9XL.	199	23.06	0%	0%	0%	100%	No	0%	0%	No	0% > 25%	0% > 25%	0% > 25%	75% > 100%	No Data	No
Former Morrisons and Torrington Car Park site, Vale Road, Royal Tunbridge Wells, TN1 1BT.	200	0.43	0%	0%	0%	100%	No	0%	0%	No	0% > 25%	50% > 75%	25% > 50%	0% > 25%	No Data	No
Land at Sessele House and Marlborough House School, High Street, Hawkhurst, Cranbrook, Kent, TN18 4PY.	201	1.43	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0%	100%	No Data	No
Land to the South of St Mark's Road, Broadwater Down, Royal Tunbridge Wells.	202	0.36	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0%	100%	No Data	No
The Bunker Site, Off Broadwater Down, Royal Tunbridge Wells.	203	0.99	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0%	100%	No Data	No
Land off Bayham Road, Royal Tunbridge Wells.	204	5.05	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0%	100%	No Data	No
Little Knoll, Reynolds Lane, Royal Tunbridge Wells, TN4 9XL.	205	1.93	0%	0%	0%	100%	No	0%	0%	No	25% > 50%	0% > 25%	0% > 25%	25% > 50%	No Data	No
54a Culverden Down, Royal Tunbridge Wells, TN4 9SG.	206	1.14	0%	0%	0%	100%	No	0%	0%	No	0% > 25%	0% > 25%	0% > 25%	75% > 100%	No Data	No
Land to the rear of Kirkins Close and Willard Place, Horsmonden.	207	1.14	0%	0%	0%	100%	No	0%	0%	No	0%	0% > 25%	0% > 25%	75% > 100%	No Data	No
Romford House Farm, Kings Toll Road, Pembury, TN2 4BE.	208	5.68	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0% > 25%	75% > 100%	No Data	No

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Land to the north of Chantlers Hill, Paddock Wood.	212	2.65	0%	0%	0%	100%	No	0%	0%	No	0% > 25%	0% > 25%	0% > 25%	75% > 100%	< 25%	No
Land at Kippings Cross (rear of Blue Boys and north of Cryals Road), Brenchley.	214	7.6	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0% > 25%	75% > 100%	< 25%	No
Land at Horsmonden Road, adjacent to Church Close, Brenchley.	215	2.35	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0% > 25%	75% > 100%	No Data	No
Land at Moat Farm, Whetstead Road, Five Oak Green.	216	1.06	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0% > 25%	75% > 100%	No Data	Yes
Land at Little Rhoden Farm, Lucks Lane, Paddock Wood, TN12 6PA.	218	15.8	0% > 25%	0% > 25%	25% > 50%	0% > 25%	No	50% > 75%	50% > 75%	No	0% > 25%	0% > 25%	0% > 25%	75% > 100%	< 25%	Yes
Bedgebury Manor, Lady Oak Lane, Bedgebury Road, Goudhurst, TN17 2SJ.	219	36.55	0% > 25%	0%	0%	75% > 100%	Yes	0% > 25%	0% > 25%	Yes	0% > 25%	0% > 25%	0% > 25%	50% > 75%	No Data	Yes
Thorn Barn, Maidstone Road, Standings Cross, Matfield, TN12 7JH.	220	0.39	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0% > 25%	75% > 100%	< 25%	No
St Andrews Medical Centre, St Andrews Court, Pinewood Gardens, Southborough, TN4 0LZ.	221	0.13	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0% > 25%	75% > 100%	No Data	No
Land on the west side of Iden Green Road, Benenden, TN17 4ES.	222	5.05	0%	0%	0%	100%	No	0%	0%	No	0%	0% > 25%	25% > 50%	50% > 75%	No Data	No
Land at Risden Lane, Hawkhurst, Cranbrook.	223	0.48	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0%	100%	No Data	No
The Old Rectory, The Street/Mill Lane,Frittenden, TN17 2DG.	224	0.33	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0% > 25%	75% > 100%	>= 25% <50%	No
The Lodge and Gardeners Cottage (incl walled garden), Blackhurst Lane, Royal Tunbridge Wells, TN2 5LS.	225	1.26	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0% > 25%	75% > 100%	< 25%	No
St Mark's Recreation Ground, Frant Road, Royal Tunbridge Wells, TN2 5LS.	226	1.07	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0%	100%	No Data	No
Land on the south side of Sayville, Rye Road and west of Marsh Quarter Lane, Sandhurst, TN18 5JL.	227	2.13	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0% > 25%	75% > 100%	< 25%	No
Land adjacent and field to the south of Wayside Cottage, Pearson's Green Road, Brenchley.	228	8.26	0%	0%	0%	100%	No	0%	0%	No	0% > 25%	0% > 25%	0% > 25%	75% > 100%	No Data	No
Risden Oast, Risden Lane, Hawkhurst, TN18 5DU.	230	0.04	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0%	100%	No Data	No
Land to the west of Speldhurst Road and south of Ferbies, Speldhurst, TN3 0NS.	231	0.79	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0% > 25%	75% > 100%	< 25%	No
Land between Bright Ridge and Speldhurst Road, Former Speldhurst Road Allotments, Southborough.	232	0.56	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0%	100%	No Data	No
Land rear Hornbeam Avenue / Walnut Way, Southborough.	233	1.49	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0% > 25%	75% > 100%	< 25%	No
Southborough Hub, London Road, Southborough,TN4 0ND.	234	1.79	0%	0%	0%	100%	No	0%	0%	No	0% > 25%	0% > 25%	0% > 25%	75% > 100%	No Data	No
Land at Culverden Stadium, Culverden Down, Royal Tunbridge Wells, TN4 9SG.	235	3.6	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0% > 25%	75% > 100%	No Data	No
Land at Bayham Sports Field West, Bayham Road, Royal Tunbridge Wells	236	1.94	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0% > 25%	75% > 100%	No Data	No
Land at Cadagan Sports Field, St John's Road, Royal Tunbridge Wells.	237	1.67	0%	0%	0%	100%	No	0%	0%	No	0% > 25%	0% > 25%	0% > 25%	50% > 75%	No Data	No
Land at Colebrook Sports Field, Liptraps Lane, Royal Tunbridge Wells.	238	4.22	0% > 25%	0% > 25%	0% > 25%	75% > 100%	No	0% > 25%	0% > 25%	No	0% > 25%	0% > 25%	0% > 25%	50% > 75%	< 25%	No
Land adjacent to Rusthall recreation ground, Southwood Road.	239	2.75	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0% > 25%	75% > 100%	< 25%	No
Land at High Woods Lane, Hawkenbury.	240	8.16	0%	0%	0%	100%	No	0%	0%	No	0% > 25%	0% > 25%	0% > 25%	75% > 100%	< 25%	No

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Land south east of Sandhurst Avenue, Pembury.	241	3.58	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0%	100%	No Data	No
Cinderhill sports field, adjacent to Cinderhill Woods, Five Wents, Matfield.	242	1.28	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0%	100%	No Data	No
Car Park, Warwick Road, Royal Tunbridge Wells.	243	0.05	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0%	100%	No Data	No
Car Park, Little Mount Sion, Royal Tunbridge Wells.	244	0.04	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0%	100%	No Data	No
Camden Road Car Park, Camden Road, Royal Tunbridge Wells, TN1 2QZ.	245	0.18	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0% > 25%	75% > 100%	No Data	No
Surface Car Park, Beech Street, Royal Tunbridge Wells, TN1 2RX.	246	0.1	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0%	100%	No Data	No
Meadow Road Car Park and adjacent site, Meadow Road, Royal Tunbridge Wells TN1 2EN.	247	0.52	0%	0%	0%	100%	No	0%	0%	No	0%	0% > 25%	0% > 25%	75% > 100%	No Data	No
Land at Rifle Range, Warwick Road, Royal Tunbridge Wells, TN2 5FD.	248	1	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0% > 25%	75% > 100%	No Data	No
Cemetery Depot, Benhall Mill Road, Royal Tunbridge Wells, TN2 5JH.	249	0.52	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0% > 25%	75% > 100%	No Data	No
Land at Royal Victoria Place, Royal Tunbridge Wells.	250	3.69	0%	0%	0%	100%	No	0%	0%	No	0% > 25%	0% > 25%	0% > 25%	75% > 100%	No Data	No
8 Grosvenor Road, Royal Tunbridge Wells.	251	0.04	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0% > 25%	75% > 100%	No Data	No
Land at Red Oak, Hawkhurst TN18 4QN.	252	0.18	0%	0%	0%	100%	No	0%	0%	No	0%	0% > 25%	25% > 50%	25% > 50%	No Data	No
Northgrove Car Park, Northgrove Road, Hawkhurst.	253	0.08	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0%	100%	No Data	No
Land at Sychem Lane, Five Oak Green, Capel.	254	0.56	0%	0%	0%	100%	No	0%	0%	No	0%	0% > 25%	0% > 25%	75% > 100%	< 25%	No
Land at Hawkenbury , off Hawkenbury Road/Maryland Road, Royal Tunbridge Wells.	255	13.93	0%	0%	0%	100%	No	0%	0%	No	0% > 25%	0% > 25%	0% > 25%	75% > 100%	< 25%	No
9-19 Colebrook Industrial Estate, Longfield Road, Royal Tunbridge Wells.	256	0.3	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0%	100%	< 25%	No
Land at Hilbert Road, George V Hill, Royal Tunbridge Wells.	257	0.66	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0% > 25%	75% > 100%	< 25%	No
TN2 and adjacent land, Greggs Wood Road, Sherwood, Royal Tunbridge Wells.	258	0.2	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0% > 25%	75% > 100%	< 25%	No
Land at Linden Park Road, West Station Coach Park, Royal Tunbridge Wells.	259	0.23	0%	0%	0%	100%	No	0%	0%	No	25% > 50%	0% > 25%	0% > 25%	25% > 50%	No Data	No
Auction House and public car park, Linden Park Road, Royal Tunbridge Wells, TN2 5QL.	260	0.13	0%	0%	0%	100%	No	0%	0%	No	0% > 25%	0% > 25%	0% > 25%	75% > 100%	No Data	No
Land at North Farm Lane, North Farm Industrial Estate, Royal Tunbridge Wells, TN2 3EE.	261	1.11	0% > 25%	0% > 25%	0% > 25%	50% > 75%	No	25% > 50%	25% > 50%	No	0% > 25%	0% > 25%	25% > 50%	50% > 75%	< 25%	No
Mount Pleasant car park and surgery, Mount Pleasant Avenue, Royal Tunbridge Wells, TN1 1QY.	262	0.29	0%	0%	0%	100%	No	0%	0%	No	0%	0% > 25%	0% > 25%	75% > 100%	No Data	No
Great Hall car park and part Calverley Grounds, Mount Pleasant Road, Royal Tunbridge Wells.	263	0.73	0%	0%	0%	100%	No	0%	0%	No	0% > 25%	0% > 25%	0% > 25%	50% > 75%	No Data	No
Town Hall/Town Centre site, Royal Tunbridge Wells.	264	4.17	0%	0%	0%	100%	No	0%	0%	No	0%	0% > 25%	0% > 25%	75% > 100%	No Data	No
Union House, Eridge Road, Royal Tunbridge Wells, TN4 8HF.	265	0.35	0%	0%	0%	100%	No	0%	0%	No	0% > 25%	25% > 50%	0% > 25%	25% > 50%	No Data	No
Surface car park at Montacute Gardens, Royal Tunbridge Wells, TN4 8HG.	266	0.24	0% > 25%	0%	0% > 25%	75% > 100%	Yes	0% > 25%	0% > 25%	No	0%	50% > 75%	0% > 25%	0% > 25%	No Data	No

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Rowan Tree Road, Showfields, Royal Tunbridge Wells, TN2 5PR.	267	0.69	0%	0%	0%	100%	No	0%	0%	No	0% > 25%	0% > 25%	0% > 25%	75% > 100%	No Data	No
Vale Avenue and Torrington Car Park, Royal Tunbridge Wells.	268	1.02	0%	0%	0%	100%	No	0%	0%	No	0% > 25%	0% > 25%	0% > 25%	25% > 50%	No Data	No
Museum and land, Carriers Road, Cranbrook.	269	0.16	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0% > 25%	75% > 100%	< 25%	No
Land at Crane Lane including WC block and Wilkes Field, Cranbrook.	271	0.4	0%	0%	0%	100%	No	0%	0%	No	0% > 25%	0% > 25%	0% > 25%	50% > 75%	< 25%	No
Wesley Centre and Land at Commercial Road / Old Kent Road, Paddock Wood TN12 6DS.	272	0.1	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0% > 25%	75% > 100%	< 25%	No
Commercial Road East Car Park, Paddock Wood.	273	0.18	0%	0%	0%	100%	No	0%	0%	No	0%	0% > 25%	0% > 25%	50% > 75%	< 25%	No
Land at Goldings / Badsell Road, Paddock Wood.	274	0.26	0%	0% > 25%	0% > 25%	75% > 100%	No	0% > 25%	0% > 25%	No	0% > 25%	0% > 25%	0% > 25%	75% > 100%	< 25%	No
Commercial Road West Car Park, Paddock Wood.	275	0.26	0%	50% > 75%	0% > 25%	0% > 25%	No	50% > 75%	75% > 100%	No	0% > 25%	0% > 25%	25% > 50%	50% > 75%	< 25%	No
Land at Dowding House, Commercial Road, Paddock Wood.	276	0.05	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0%	100%	< 25%	No
Feoffee Cottages and Land Walkhurst Road Benenden Cranbrook, Kent	277	1.46	0%	0%	0%	100%	No	0%	0%	No	0%	0% > 25%	0% > 25%	75% > 100%	No Data	No
Land Between Brewer Street and Parsonage Lane, Lamberhurst, Kent	278	1.06	0%	0%	0% > 25%	75% > 100%	No	0% > 25%	0% > 25%	Yes	0% > 25%	0% > 25%	0% > 25%	50% > 75%	< 25%	Yes
The ex-vineyard land, Lamberhurst, Kent	279	6.04	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0% > 25%	75% > 100%	No Data	No
Land at The Midway, Nevill Court, Tunbridge Wells, Kent	280	4.56	0%	0%	0%	100%	No	0%	0%	No	0%	0% > 25%	0% > 25%	75% > 100%	< 25%	No
St Cuthbert's Lodge, Stream Lane, Hawkhurst, Kent	281	0.32	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0%	100%	No Data	No
Romford House Kings Toll Road Pembury, Kent	282	5.46	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0% > 25%	75% > 100%	No Data	No
Land South of Orchard Lea Langton Green, Kent	283	0.39	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0% > 25%	75% > 100%	< 25%	No
Dee House Rye Road Hawkhurst Kent	284	1.24	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0%	100%	No Data	No
Misty Meadow Furnace Lane Lamberhurst, Kent	285	10.38	0%	0%	0%	100%	No	0%	0%	No	0% > 25%	0% > 25%	0% > 25%	75% > 100%	No Data	No
Land at Rope Walk, Goudhurst, Cranbrook, Kent	286	0.24	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0%	100%	< 25%	No
Land Opposite Tucks Villas and Land Fronting Horsmonden Cricket Club, Maidstone Road, Horsmonden, Tonbridge, Kent	287	0.12	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0% > 25%	75% > 100%	No Data	No
Land Opposite Tucks Villas and Land Fronting Horsmonden Cricket Club, Maidstone Road, Horsmonden, Tonbridge, Kent	287	0.15	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0%	100%	No Data	No
Land lying on the West side of Maidstone Road, Matfield, Tonbridge, Kent	288	2.07	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0% > 25%	75% > 100%	< 25%	No
Land on the west side of Maidstone Road, Matfield, Tonbridge, Kent	288	2.07	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0% > 25%	75% > 100%	< 25%	No
Babbs Lane Benenden Tunbridge Wells Kent	289	5.85	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0% > 25%	75% > 100%	< 25%	No
Abbots, Woodside Close Pembury Kent	290	0.91	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0%	100%	No Data	No
Field at Cranbrook Road Hawkhurst Kent	291	1.16	0%	0%	0%	100%	No	0%	0%	No	0%	0% > 25%	0% > 25%	75% > 100%	No Data	No
Land at South of High Street, Cranbrook, Kent	292	4.96	0%	0%	0%	100%	No	0%	0%	No	0% > 25%	0% > 25%	0% > 25%	75% > 100%	< 25%	No

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Highlands, Chantlers Hill, Paddock Wood, Kent	293	0.07	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0%	100%	< 25%	No
Old Apple Farm, Church Lane, Kilndown, Kent	294	0.49	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0%	100%	No Data	No
Wandle Mill Studios Mill Street Iden Green, Kent	295	0.19	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0% > 25%	75% > 100%	< 25%	No
Oak Tree Farm, The Common, Wilsey Pound, Cranbrook, Kent	296	0.67	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0%	100%	No Data	No
Bassetts Farm, Goudhurst Road, Horsmonden, Kent	297	13.79	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0% > 25%	75% > 100%	< 25%	No
Oaklands Farm, Bodiam Road, Sandhurst, Kent	299	9.31	0%	0%	0%	100%	No	0%	0%	No	0%	0% > 25%	0% > 25%	75% > 100%	No Data	No
Marlborough Wood, Pembury, Tunbridge Wells, Kent	300	8.25	0%	0%	0%	100%	No	0%	0%	No	0% > 25%	0% > 25%	0% > 25%	75% > 100%	< 25%	No
The Moss Field, Sissinghurst Road, Sissinghurst, Cranbrook, Kent	301	2.73	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0% > 25%	75% > 100%	< 25%	No
Stables and Paddock at Heathertye Mount Pleasant Lane Lamberhurst Kent	302	0.26	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0%	100%	< 25%	No
Land south of Heathertye, Mount Pleasant Lane, Lamberhurst, Kent	303	4.21	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0%	100%	< 25%	Yes
Land to the north east of Tonbridge Road, Pembury, Tunbridge Wells, Kent	304	1.57	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0% > 25%	75% > 100%	< 25%	No
Land at Colts Hill, Paddock Wood, Kent	306	5.03	0%	0%	0% > 25%	75% > 100%	No	0% > 25%	0% > 25%	No	0%	0% > 25%	0% > 25%	75% > 100%	< 25%	No
Land to the north of Badsell Road, Five Oak Green, Kent	307	3.79	0%	0% > 25%	25% > 50%	50% > 75%	No	25% > 50%	25% > 50%	No	0% > 25%	0% > 25%	0% > 25%	75% > 100%	No Data	Yes
Land to the west of Maidstone Road, Five Oak Green, Kent	308	5.8	0%	0%	25% > 50%	50% > 75%	No	25% > 50%	25% > 50%	No	0%	0% > 25%	0% > 25%	75% > 100%	< 25%	Yes
Land to the east of Maidstone Road, Five Oak Green, Kent	309	9.18	0% > 25%	25% > 50%	25% > 50%	0% > 25%	No	50% > 75%	50% > 75%	No	0% > 25%	0% > 25%	0% > 25%	75% > 100%	No Data	No
Land at Whetsted Farm, Maidstone Road, Five Oak Green, Kent	310	10.39	0% > 25%	0% > 25%	0% > 25%	75% > 100%	No	0% > 25%	0% > 25%	No	0% > 25%	0% > 25%	0% > 25%	75% > 100%	No Data	Yes
Land at Sebastopol, Whetsted Road, Five Oak Green, Kent	311	11.42	0% > 25%	0% > 25%	25% > 50%	50% > 75%	No	0% > 25%	25% > 50%	No	0% > 25%	0% > 25%	0% > 25%	75% > 100%	>= 25% <50%	Yes
Land at Whetsted Wood, Maidstone Road, Five Oak Green, Kent	312	7.85	0% > 25%	0% > 25%	0% > 25%	50% > 75%	No	0% > 25%	0% > 25%	No	0% > 25%	0% > 25%	0% > 25%	75% > 100%	No Data	No
Land at Eastlands, Paddock Wood, Kent	313	14.22	0% > 25%	0% > 25%	25% > 50%	50% > 75%	No	0% > 25%	25% > 50%	No	0% > 25%	0% > 25%	0% > 25%	75% > 100%	No Data	Yes
Land south of Whetsted Road, Paddock Wood, Kent	314	15.23	0% > 25%	0% > 25%	50% > 75%	25% > 50%	No	0% > 25%	50% > 75%	No	0% > 25%	0% > 25%	0% > 25%	75% > 100%	>= 25% <50%	Yes
Land at Eastland Cottages, Maidstone Road, Paddock Wood, Kent	315	3.16	0% > 25%	0% > 25%	25% > 50%	0% > 25%	No	25% > 50%	25% > 50%	No	0%	0% > 25%	0% > 25%	75% > 100%	No Data	No
Land to the south of Tudeley Brook Farm, Paddock Wood, Kent	316	23.7	0% > 25%	0% > 25%	50% > 75%	0%	No	50% > 75%	50% > 75%	No	0%	0% > 25%	0% > 25%	75% > 100%	>= 25% <50%	Yes
Tudeley Brook Farm, Whetsted Road, Paddock Wood, Kent	317	5.3	0% > 25%	50% > 75%	25% > 50%	0%	No	75% > 100%	75% > 100%	No	0%	0%	0% > 25%	75% > 100%	>= 25% <50%	Yes
Land to the north of Durrant's Farm, Maidstone Road, Paddock Wood, Kent	318	9.68	50% > 75%	25% > 50%	0% > 25%	0%	No	75% > 100%	100%	No	0% > 25%	0%	0% > 25%	75% > 100%	< 25%	Yes
Land adjacent to Leys Cottages, Maidstone Road, Paddock Wood, Kent	319	4.72	50% > 75%	25% > 50%	0% > 25%	0% > 25%	No	75% > 100%	75% > 100%	Yes	0%	0% > 25%	0% > 25%	75% > 100%	< 25%	Yes
Land at Old Well House, Rye Road, Sandhurst, Kent	320	1.04	0%	0%	0%	100%	No	0%	0%	No	0% > 25%	0%	0% > 25%	75% > 100%	No Data	No
Cottage Paddock, The Cottage, Brenchley Road, Horsmonden, Kent	321	0.71	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0% > 25%	75% > 100%	No Data	No
Milestone Paddock, Milestone Cottages, Brenchley Road, Horsmonden, Kent	322	0.47	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0%	100%	No Data	No
Land adjacent to Hartley Gate Farmhouse	323	0.17	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0%	100%	No Data	No

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Cranbrook Kent																
Land at Bramley Cottage, Back Lane, Horsmonden, Kent	324	0.88	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0% > 25%	75% > 100%	No Data	No
Land at Bramley Cottage, Back Lane, Horsmonden, Kent	324	0.94	0%	0%	0%	100%	No	0%	0%	No	0% > 25%	0% > 25%	0% > 25%	75% > 100%	No Data	No
Land adjacent to Colliers Green Primary School, Colliers Green, Kent	325	48.05	0%	0%	0%	100%	No	0%	0%	No	0% > 25%	0% > 25%	0% > 25%	75% > 100%	< 25%	No
Land at Dundale Road, Pembury, Kent	326	10.16	0%	0%	0%	100%	No	0%	0%	No	0% > 25%	0% > 25%	0% > 25%	75% > 100%	< 25%	No
Land at Blackthorn Avenue, Royal Tunbridge Wells, Kent	327	0.65	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0% > 25%	75% > 100%	< 25%	No
Land at Eridge Road & Eastlands Close, Royal Tunbridge Wells, Kent	328	0.73	0%	0%	0%	100%	No	0%	0%	No	0%	0% > 25%	0% > 25%	75% > 100%	No Data	No
School field, Finches Farm, Five Oak Green, Tonbridge, Kent	329	7.33	0% > 25%	0% > 25%	0% > 25%	75% > 100%	No	0% > 25%	0% > 25%	No	0% > 25%	0% > 25%	0% > 25%	75% > 100%	No Data	Yes
Finches Farm, Five Oak Green, Tonbridge, Kent	330	1.38	75% > 100%	0% > 25%	0% > 25%	0% > 25%	No	75% > 100%	75% > 100%	No	0%	0% > 25%	50% > 75%	25% > 50%	No Data	Yes
Forstal Field Finches Farm Five Oak Green Tonbridge Kent	331	3.39	0% > 25%	0% > 25%	25% > 50%	25% > 50%	No	25% > 50%	50% > 75%	No	0% > 25%	0% > 25%	25% > 50%	50% > 75%	No Data	Yes
Priory Farm Romford Road Pembury Kent	332	4.91	0% > 25%	0% > 25%	0% > 25%	75% > 100%	No	0% > 25%	0% > 25%	No	0% > 25%	0% > 25%	0% > 25%	75% > 100%	< 25%	No
Kippings Cross Distribution Centre, Hastings Road, Kippings Cross	333	1.48	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0%	100%	< 25%	No
South West Side of Hearten Oak Lane Hawkhurst Kent	334	1.91	0% > 25%	0%	0% > 25%	75% > 100%	Yes	0% > 25%	0% > 25%	No	0% > 25%	0% > 25%	50% > 75%	25% > 50%	< 25%	No
Land To The north of Speldhurst Road & To The west of Adjacent To Bright Ridge, Southborough, Kent	335	3.67	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0%	100%	No Data	No
Bentinck Farm, Romford Road, Pembury, Kent	336	3.38	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0%	100%	< 25%	No
Allotment land North East of the end of Southwood Road, Rusthall and adjacent to Peacock Farm	337	1.54	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0%	100%	No Data	No
Land between Ferbies and Ewehurst lane, Langton road, Speldhurst, Kent	338	12.14	0%	0%	0%	100%	No	0%	0%	No	0% > 25%	0% > 25%	0% > 25%	75% > 100%	< 25%	No
Kerylands Sale Field Lucks Lane Paddock Wood, Kent	340	6.23	0% > 25%	25% > 50%	50% > 75%	0%	No	75% > 100%	75% > 100%	No	0%	0%	0% > 25%	75% > 100%	< 25%	Yes
Church Orchard Maidstone Road Matfield Kent	341	6.25	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0%	100%	No Data	No
Land north of Chantlers Hill Paddock Wood, Kent	342	2.95	0%	0%	0%	100%	No	0%	0%	No	0% > 25%	0% > 25%	0% > 25%	75% > 100%	< 25%	No
Land to the East of Mascalls Court Road, Paddock Wood Kent	344	3.09	0%	0%	0%	100%	No	0%	0%	No	0% > 25%	0% > 25%	0% > 25%	75% > 100%	< 25%	No
Land adjacent Glassenbury Road Glassenbury Road Cranbrook Kent	345	1.37	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0%	100%	No Data	No
Land Fronting Penshurst Road, Bidborough, Kent	346	7.97	0%	0%	0%	100%	No	0%	0%	No	0% > 25%	0% > 25%	0% > 25%	75% > 100%	< 25%	No
Swatlands Farm Luck Lane Paddock Wood Tonbridge Kent	347	8.56	0% > 25%	0% > 25%	50% > 75%	0% > 25%	No	75% > 100%	75% > 100%	No	0%	0% > 25%	0% > 25%	75% > 100%	< 25%	Yes
The Nurseries Pralls Lane Matfield, Kent	348	1.22	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0%	100%	< 25%	No
Pound Hill Field Biddenden Road Frittenden Kent	349	1.52	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0% > 25%	75% > 100%	< 25%	No
High Banks Garden Centre Cranbrook Road Hawkhurst Kent	350	3.5	0%	0%	0%	100%	No	0%	0%	No	0%	0% > 25%	0% > 25%	75% > 100%	No Data	No
High Banks Slip Mill Road Hawkhurst Kent	351	1.01	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0% > 25%	75% > 100%	< 25%	No
Court Lodge Church Road, Lamberhurst,	352	0.17	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0%	100%	< 25%	No

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Kent																
Ashes Plantation Maidstone Road Matfield Kent	353	2.95	0%	0%	0%	100%	No	0%	0%	No	0%	0% > 25%	0% > 25%	75% > 100%	< 25%	No
Stone Court Farm	354	1.95	0%	0%	0% > 25%	75% > 100%	No	0%	0% > 25%	No	0% > 25%	0% > 25%	0% > 25%	75% > 100%	< 25%	No
Land adjacent to Goudhurst Road Horsmonden Kent	355	1.08	0%	0%	0%	100%	No	0%	0%	No	0% > 25%	0% > 25%	0% > 25%	50% > 75%	No Data	No
Bethany School, Curtisden Green, Goudhurst, Kent	356	1.84	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0% > 25%	75% > 100%	No Data	No
Bethany School, Curtisden Green, Goudhurst, Kent	357	2.35	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0% > 25%	75% > 100%	< 25%	No
Bethany School, Curtisden Green, Goudhurst, Kent	358	0.76	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0% > 25%	75% > 100%	< 25%	No
Land to the east of Halliwell Nursing Home Kingswood Road Tunbridge Wells, Kent	359	0.4	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0%	100%	No Data	No
Land Between Cranbrook Road And Vale Road Hawkhurst Cranbrook Kent	360	0.36	0%	0%	0%	100%	No	0%	0%	No	0% > 25%	0% > 25%	0% > 25%	50% > 75%	< 25%	No
Land at The White House, Highgate Hill, Hawkhurst, Kent	361	0.61	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0% > 25%	75% > 100%	No Data	No
Land at Chick's Lane Kilndown Goudhurst Kent	362	1.06	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0%	100%	No Data	No
Land at 36 Brewer Street Lamberhurst Kent	363	0.39	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0% > 25%	75% > 100%	< 25%	Yes
Land at existing Sandstone Quarry Priors Heath Goudhurst Kent	364	2.37	0%	0%	0%	100%	No	0%	0%	No	0% > 25%	0% > 25%	0% > 25%	75% > 100%	No Data	No
Old Railway Line Bishops Lane Hartley Cranbrook Kent	365	0.7	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0% > 25%	75% > 100%	< 25%	No
The Saw Mill, Forge Farm Bedgebury Business Park Goudhurst Kent	366	0.89	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0% > 25%	75% > 100%	< 25%	No
Land to the southwest of Woodside House, Woodside Road, Pembury, Kent	367	2.23	0% > 25%	0% > 25%	0% > 25%	75% > 100%	No	0% > 25%	0% > 25%	No	0% > 25%	0% > 25%	0% > 25%	75% > 100%	No Data	No
51 High Street Pembury, Kent	368	0.08	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0%	100%	No Data	No
Land to the north of the A21 (Pembury Bypass), to the east of Comford Land, west of Chalket Lane, and south of the High Street, Pembury, Kent	369	3.72	0%	0%	0%	100%	No	0%	0%	No	0% > 25%	0% > 25%	0% > 25%	75% > 100%	No Data	No
Land Adjacent to Beechurst and Jarvis Lane, Goudhurst, Kent	370	1.41	0%	0%	0%	100%	No	0%	0%	No	0%	0% > 25%	0% > 25%	75% > 100%	< 25%	No
Land to the north of Mascalls Court Road Paddock Wood Kent	371	10.06	0% > 25%	0% > 25%	0% > 25%	75% > 100%	No	0% > 25%	0% > 25%	No	0% > 25%	0% > 25%	25% > 50%	50% > 75%	< 25%	No
Rhoden Yard, Lucks Lane, Paddock Wood Kent	372	0.26	0% > 25%	0% > 25%	0% > 25%	75% > 100%	No	0% > 25%	0% > 25%	No	0% > 25%	0% > 25%	0% > 25%	75% > 100%	< 25%	Yes
Land at Downingbury Farm, Pembury, Kent	373	3.74	0%	0%	0%	100%	No	0%	0%	No	0% > 25%	0% > 25%	0% > 25%	75% > 100%	< 25%	No
Land to the north of Church Road and adjacent to Queen Street, Paddock Wood.	374	7.45	0%	0% > 25%	0% > 25%	75% > 100%	No	0% > 25%	0% > 25%	No	0% > 25%	0% > 25%	0% > 25%	50% > 75%	< 25%	No
Land east of Rowley Hill, Pembury being part of Downingbury Farm, Pembury, Kent	375	4.53	0%	0%	0%	100%	No	0%	0%	No	0% > 25%	0% > 25%	0% > 25%	75% > 100%	< 25%	No
Land to the South of Mascalls Court Lane Paddock Wood Kent	376	7.92	0% > 25%	0% > 25%	0% > 25%	75% > 100%	No	0% > 25%	0% > 25%	No	0% > 25%	0% > 25%	0% > 25%	75% > 100%	< 25%	No
Land to the north of Brenchley Road, Horsmonden, Kent	377	5.88	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0% > 25%	75% > 100%	No Data	No
Land to the East of Furnace Lane and Gibbet Lane Horsmonden Kent	378	9.94	0%	0%	0%	100%	No	0%	0%	No	0% > 25%	0% > 25%	0% > 25%	75% > 100%	No Data	No

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Land at Henwood Green Road, Pembury, Kent	379	3.61	0% > 25%	0% > 25%	0% > 25%	75% > 100%	No	0% > 25%	0% > 25%	No	0% > 25%	0% > 25%	0% > 25%	75% > 100%	No Data	No
Glassenbury Timber Yard, Iden Green, Goudhurst, Kent	380	2.18	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0%	100%	No Data	No
Dodges Oast Curtisden Green Goudhurst Cranbrook Kent	381	0.82	0%	0%	0%	100%	No	0%	0%	No	0% > 25%	0% > 25%	0% > 25%	75% > 100%	No Data	No
Land to the South of the A21 and East of Dundale Road Kippings Cross Tunbridge Wells, Kent	383	32.86	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0% > 25%	75% > 100%	< 25%	No
Land at Great Bayhall, Tunbridge Wells, Kent	384	227.54	0% > 25%	0% > 25%	0% > 25%	75% > 100%	No	0% > 25%	0% > 25%	No	0% > 25%	0% > 25%	0% > 25%	75% > 100%	< 25%	Yes
The Providence Chapel Stone Street Cranbrook Kent	385	0.03	0%	0%	0%	100%	No	0%	0%	No	0% > 25%	50% > 75%	25% > 50%	0%	< 25%	No
Ashwood Lodge Farm Penshurst Rd Speldhurst Tunbridge Wells	386	1.13	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0%	100%	No Data	No
Capel Grange Lodge Badsell Road Five Oak Green Kent	387	0.37	0%	50% > 75%	25% > 50%	0%	No	100%	100%	Yes	0%	0% > 25%	0% > 25%	75% > 100%	No Data	Yes
Glen Cove Cranbrook Common Cranbrook Kent	388	0.81	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0%	100%	No Data	No
Harpers Farm Summerhill Goudhurst Cranbrook Kent	389	1.23	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0%	100%	>= 25% <50%	No
30 & 30A Hastings Road, Pembury, Kent	390	0.12	0%	0%	0%	100%	No	0%	0%	No	0%	0% > 25%	0% > 25%	75% > 100%	No Data	No
Rear of Limes Grove Oast, Slip Mill Road, Hawkhurst, Cranbrook, Kent	391	0.5	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0%	100%	No Data	No
Trewint Farm and Jacks Paddock Slip Mill Lane Hawkhurst Kent	392	1.64	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0% > 25%	75% > 100%	< 25%	No
Town Farm, Palmers Green Lane, Brenchley, Tonbridge, Kent	393	2.62	0%	0%	0%	100%	No	0%	0%	No	0% > 25%	0% > 25%	0% > 25%	75% > 100%	No Data	No
Land West of Slip Mill Lane at Trewint Farm Slip Mill Lane Hawkhurst Kent	394	1.92	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0% > 25%	75% > 100%	< 25%	No
Woodsgate Corner Pembury Tunbridge Wells Kent	395	4.78	0%	0%	0%	100%	No	0%	0%	No	0%	0% > 25%	0% > 25%	75% > 100%	No Data	No
Land West of Freight Lane, Cranbrook, Kent	396	6.71	0%	0%	0%	100%	No	0%	0%	No	0% > 25%	0% > 25%	0% > 25%	75% > 100%	< 25%	No
Pheasant Lodge Standen Street Iden Green Benenden	397	1.62	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0%	100%	< 25%	No
Land at Marden Road, Cranbrook, Kent	398	4.41	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0% > 25%	75% > 100%	< 25%	No
Tibbs Court Farm, Tibbs Court Lane, Brenchley, Kent	399	1.44	0%	0%	0%	100%	No	0%	0%	No	0% > 25%	0%	0% > 25%	75% > 100%	No Data	No
Land to the east of Halliwell Nursing Home Kingswood Road Tunbridge Wells, Kent	400	2.97	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0% > 25%	75% > 100%	No Data	No
Land at Maidstone Road, Matfield, Kent,	401	1.65	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0%	100%	< 25%	No
Land west of Maidstone Road and north of Eldon Way, Paddock Wood, Kent	402	1.32	0% > 25%	25% > 50%	50% > 75%	0% > 25%	No	75% > 100%	75% > 100%	No	0%	0% > 25%	0% > 25%	75% > 100%	No Data	No
Land at Oakfield Road, Matfield, Kent	403	0.85	0%	0%	0%	100%	No	0%	0%	No	0%	0% > 25%	0% > 25%	75% > 100%	< 25%	No
Land at Limes Grove Farm, Slip Mill Lane, Potters Lane and Hawkhurst Road, Hawkhurst, Kent	404	12.65	0%	0%	0%	100%	No	0%	0%	No	0%	0% > 25%	0% > 25%	75% > 100%	< 25%	No
Land at Yew Tree Green Farm, Yew Tree Green Road, Horsmonden, Kent	405	2.41	0% > 25%	0% > 25%	0% > 25%	75% > 100%	No	0% > 25%	0% > 25%	No	0% > 25%	0% > 25%	0% > 25%	75% > 100%	No Data	No
Land at Glebe House, Brenchley Road, Brenchley, Kent	406	0.93	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0% > 25%	75% > 100%	< 25%	No
Land at Brooksden, High Street, Cranbrook, Kent	407	0.41	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0%	100%	< 25%	No

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The High Weald Academy, Angley Road, Cranbrook, Kent	409	1.7	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0%	100%	< 25%	No
Land at Brenchley Road, Matfield, Kent	410	15.69	0%	0%	0%	100%	No	0%	0%	No	0% > 25%	0% > 25%	0% > 25%	75% > 100%	< 25%	No
Land at Sandown Park between Pembury Grange and A21, Royal Tunbridge Wells, Kent	411	6.71	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0% > 25%	75% > 100%	< 25%	Yes
Land at Fowlers Park, Hawkhurst, Kent	413	7.45	0%	0%	0%	100%	No	0%	0%	No	0%	0% > 25%	0% > 25%	75% > 100%	No Data	No
Land north-east of Maidstone Road, Matfield, Kent	414	1.37	0%	0%	0%	100%	No	0%	0%	No	0% > 25%	0% > 25%	0% > 25%	75% > 100%	< 25%	No
Land off Ladham Lane Goudhurst, Kent	415	0.58	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0%	100%	< 25%	No
Land North of Langton House, Langton Green, Kent	416	5.4	0%	0%	0%	100%	No	0%	0%	No	0% > 25%	0% > 25%	0% > 25%	75% > 100%	No Data	No
Land to the East of Horsmonden Road, Brenchley, Kent	417	0.85	0%	0%	0%	100%	No	0%	0%	No	0% > 25%	0%	0% > 25%	75% > 100%	No Data	No
Capel Grange Farm, Badsell Road, Five Oak Green, Kent	418	1.45	0%	0%	0% > 25%	75% > 100%	No	0% > 25%	0% > 25%	Yes	0% > 25%	0% > 25%	0% > 25%	75% > 100%	< 25%	Yes
Land at Westfield/east of Highgate Hill, Hawkhurst, Kent	419	1.3	0%	0%	0%	100%	No	0%	0%	No	0%	0% > 25%	0% > 25%	75% > 100%	No Data	No
Land at Downingbury Farm, Maidstone Road, Pembury, Kent	420	4.76	0%	0%	0%	100%	No	0%	0%	No	0% > 25%	0% > 25%	0% > 25%	75% > 100%	< 25%	No
Land Adjoining the Oak & Ivy, Rye Road, Hawkhurst, Kent	421	1.43	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0%	100%	No Data	No
Santers Yard, Gills Green Farm, Gills Green, Hawkhurst, Kent	422	2.44	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0% > 25%	75% > 100%	< 25%	No
Lamberhurst Winery, Lamberhurst Down, Lamberhurst, Kent	423	6.35	0%	0%	0%	100%	No	0%	0%	No	0% > 25%	0%	0% > 25%	75% > 100%	No Data	No
Land comprising South East Quadrant, Benenden Hospital, Corner of Goddard's Green Road and Green Lane, Benenden, Kent	424	4.2	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0% > 25%	75% > 100%	No Data	No
Land to the east of Mockbeggar Lane, Benenden, Cranbrook, Kent	425	1.02	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0%	100%	No Data	No
Land at Capel Grange Farm, Badsell Road, Five Oak Green, Kent	426	36.3	0% > 25%	0% > 25%	0% > 25%	50% > 75%	No	25% > 50%	25% > 50%	No	0% > 25%	0% > 25%	0% > 25%	75% > 100%	< 25%	Yes
Knowle Hill Farm, Knowle Road, Brenchley, Kent	427	0.83	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0%	100%	< 25%	No
Part Old Park Wood, Four Wents, Iden Green, Kent	429	2.55	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0%	100%	No Data	No
Turnden Farm Hartley Road Cranbrook Kent	430	27.64	0%	0%	0%	100%	No	0%	0%	No	0% > 25%	0% > 25%	0% > 25%	75% > 100%	< 25%	No
The Parish Office, Horsmonden Village Hall Back Lane, Horsmonden Kent	431	0.04	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0%	100%	No Data	No
Land to the east of Heartenoak Road, Hawkhurst, Kent	432	4.34	0%	0%	0%	100%	No	0%	0%	No	0%	0% > 25%	0% > 25%	75% > 100%	< 25%	No
OS Plot 7007, Cranbrook Road, Hawkhurst, Cranbrook, Kent	433	0.45	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0% > 25%	75% > 100%	No Data	No
Tutty's Farm, Hawkenbury, Royal Tunbridge Wells, Kent	434	7.67	0%	0%	0%	100%	No	0%	0%	No	0% > 25%	0% > 25%	0% > 25%	75% > 100%	< 25%	No
Walkhurst Farm, Benenden, Kent	436	61.66	0%	0%	0%	100%	No	0%	0%	No	0% > 25%	0% > 25%	0% > 25%	75% > 100%	< 25%	No
Land adjacent to Iden Green, Iden Green, Kent	437	24.87	0%	0%	0%	100%	No	0%	0%	No	0% > 25%	0% > 25%	0% > 25%	75% > 100%	< 25%	No
Land at Challenden, Challenden, Kent	438	267.13	0% > 25%	0%	0% > 25%	75% > 100%	Yes	0% > 25%	0% > 25%	No	0% > 25%	0% > 25%	0% > 25%	75% > 100%	< 25%	No
Land to the rear of The Castle Inn, Crook Road, Brenchley, Kent	439	0.43	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0%	100%	No Data	No

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The Old Vicarage, Five Oak Green Road, Tudeley, Tonbridge, Kent	440	1.42	0%	0%	0%	100%	No	0%	0%	No	0% > 25%	0% > 25%	0% > 25%	75% > 100%	< 25%	No
Southfields Park, St John's Road, Southborough, Kent	441	9.29	0%	0%	0%	100%	No	0%	0%	No	0% > 25%	0% > 25%	0% > 25%	75% > 100%	No Data	No
Land Adjacent Orchard Cottage, Frittenden Road, Sissinghurst, Kent	442	0.42	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0%	100%	No Data	No
Land east of A228, Pembury, Tunbridge Wells, Kent	443	3.59	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0% > 25%	75% > 100%	< 25%	No
Land to the north of Tunbridge Wells Hospital, Tonbridge Road, Pembury, Tunbridge Wells, Kent	444	22.47	0%	0%	0%	100%	No	0%	0%	No	0% > 25%	0% > 25%	0% > 25%	75% > 100%	< 25%	No
Mabledon and Nightingale east of A26 and south of the A21, Southborough, Kent	445	171.88	0% > 25%	0% > 25%	0% > 25%	75% > 100%	No	0% > 25%	0% > 25%	No	0% > 25%	0% > 25%	0% > 25%	75% > 100%	< 25%	No
Land at Tudeley, Tudeley, Tonbridge, Kent	446	299.32	0% > 25%	0% > 25%	0% > 25%	75% > 100%	No	0% > 25%	0% > 25%	No	0% > 25%	0% > 25%	0% > 25%	75% > 100%	< 25%	Yes
Land at the east of A26, Alders Wood, Tudeley, Tonbridge, Kent	447	20.47	0% > 25%	0% > 25%	0% > 25%	75% > 100%	No	0% > 25%	0% > 25%	Yes	0% > 25%	0% > 25%	0% > 25%	75% > 100%	< 25%	No
Land at Tudeley, Tudeley, Tonbridge, Kent	448	157.47	0%	0% > 25%	0% > 25%	75% > 100%	No	0% > 25%	0% > 25%	No	0% > 25%	0% > 25%	0% > 25%	75% > 100%	< 25%	Yes
Land at Potters Wood, Pembury Road, Tonbridge, Kent	449	0.82	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0%	100%	No Data	No
Parcel 1 Land west of Five Oak Green and south of Five Oak Green Road, Capel, Tonbridge, Kent	450	6.67	0%	0%	0%	100%	No	0%	0%	No	0% > 25%	0% > 25%	0% > 25%	75% > 100%	< 25%	Yes
Parcel 2 Land west of Five Oak Green and south of Five Oak Green Road, Capel, Tonbridge, Kent	451	5.09	0%	0%	0%	100%	No	0%	0%	No	0%	0% > 25%	0% > 25%	75% > 100%	< 25%	No
Land South of Tudeley Road, Tudeley, Tonbridge, Kent	452	1.28	0%	0%	0%	100%	No	0%	0%	No	0% > 25%	0% > 25%	25% > 50%	25% > 50%	< 25%	No
Land off Hartlake Road, Tudeley, Tonbridge, Kent	453	0.7	0%	0%	0%	100%	No	0%	0%	No	0% > 25%	0% > 25%	0% > 25%	75% > 100%	< 25%	No
Land at the east of A26, Postern, Tudeley, Tonbridge, Kent	454	11.85	25% > 50%	0% > 25%	0% > 25%	50% > 75%	No	25% > 50%	25% > 50%	No	0% > 25%	0% > 25%	0% > 25%	75% > 100%	< 25%	No
Whitewood Farm, White Lane, Hawkhurst, Cranbrook, Kent	455	4.6	0%	0%	0%	100%	No	0%	0%	No	0% > 25%	0% > 25%	0% > 25%	75% > 100%	< 25%	No
Bishops Down Park Road, Rusthall, Royal Tunbridge wells, Kent	456	0.15	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0% > 25%	75% > 100%	No Data	No
Tutty's Farm, Hawkenbury Road, Royal Tunbridge Wells	457	2	0%	0%	0%	100%	No	0%	0%	No	0% > 25%	0% > 25%	0% > 25%	75% > 100%	< 25%	No
Pear Tree House, Rye Road, Hawkhurst	458	0.16	0%	0%	0%	0%	No	0%	0%	No	0%	0%	0%	100%	No Data	No
Land at Heartenoak Road, Hawkhurst	459	1.42	0% > 25%	0% > 25%	0% > 25%	75% > 100%	Yes	0% > 25%	0% > 25%	Yes	25% > 50%	0% > 25%	0% > 25%	25% > 50%	< 25%	No
Site at Gill's Green (Cahill)	460	1.87	0%	0%	0%	0%	No	0%	0%	No	0%	0%	0% > 25%	75% > 100%	No Data	No
Site at Gill's Green (Ford)	461	1.80	0%	0%	0%	0%	No	0%	0%	No	0% > 25%	0% > 25%	0% > 25%	75% > 100%	< 25%	No
Dayspring Cottage, 55 High Street, Pembury	462	1.18	0%	0%	0%	0%	No	0%	0%	No	0%	0%	0%	100%	No Data	No
Part OS Plot 2429 Common Road Sissinghurst	463	0.47	0%	0%	0%	0%	No	0%	0%	No	0%	0%	0%	100%	No Data	No
Land at Little Puxted, High Street, Brenchley	464	1.86	0%	0%	0%	0%	No	0%	0%	No	0%	0%	0% > 25%	75% > 100%	No Data	No
Land at Iden Green (Boxall)	465	0.86	0%	0%	0%	0%	No	0%	0%	No	0%	0%	0% > 25%	75% > 100%	No Data	No
Paddock - K786083	466	7.86	0% > 25%	0% > 25%	0% > 25%	75% > 100%	Yes	0% > 25%	0% > 25%	No	0% > 25%	0% > 25%	0% > 25%	75% > 100%	No Data	No
Orchard Brook, Five Oak Green Road, Five Oak Green	467	0.77	0% > 25%	0% > 25%	25% > 50%	50% > 75%	No	25% > 50%	25% > 50%	No	0% > 25%	0% > 25%	0% > 25%	75% > 100%	No Data	Yes
Kerrys Yard Bodiam Road Sandhurst	468	1.04	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0% > 25%	75% > 100%	No Data	No

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Land on the south side of Five Oak Green Road	469	2.10	0% > 25%	0% > 25%	50% > 75%	25% > 50%	No	50% > 75%	50% > 75%	No	0% > 25%	0% > 25%	0% > 25%	75% > 100%	No Data	Yes
Owlsnest Wood, Pembury	470	4.64	0%	0%	0%	100%	No	0%	0%	No	0% > 25%	0% > 25%	0% > 25%	75% > 100%	No Data	No
Additional Land at Gate Farm, Hartley	471	1.48	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0%	100%	No Data	No
Herons Oast Farm, Speldhurst Road, Langton Green	472	5.04	0%	0%	0%	100%	No	0%	0%	No	0% > 25%	0% > 25%	0% > 25%	75% > 100%	No Data	No
Uphill, New Pond Road, Benenden TN17 4EJ.	473	0.78	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0% > 25%	75% > 100%	No Data	No
Land between Tenterden Road and Golford Road	474	11.88	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0% > 25%	75% > 100%	< 25%	No
Woodside 1 (TQ816	475	0.93	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0% > 25%	75% > 100%	No Data	No
Woodside 2 (TQ809326)	476	1.03	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0% > 25%	75% > 100%	No Data	No
Woodside 3 (TQ811325)	477	3.64	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0% > 25%	75% > 100%	No Data	No
Little Weavers, Iden Green, Kent, TN17 4HJ	478	1.44	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0%	100%	No Data	No
Cranbrook Landholding - Garden Village Opportunity	479	177.53	0% > 25%	0% > 25%	0% > 25%	75% > 100%	No	0% > 25%	0% > 25%	No	0% > 25%	0% > 25%	0% > 25%	75% > 100%	< 25%	No
Langton Green West Urban Extension	480	26.90	0%	0%	0%	100%	No	0%	0%	No	0% > 25%	0% > 25%	0% > 25%	75% > 100%	No Data	No
Little Cowden Farm, Fairmans Lane, Brenchley, Kent	481	1.89	0% > 25%	0% > 25%	0% > 25%	75% > 100%	Yes	0% > 25%	0% > 25%	Yes	0%	0%	0%	100%	No Data	No
Land at Speldhurst Road, Speldhurst	482	1.75	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0%	100%	No Data	No
Park Farm Queen Street, Paddock Wood	483	17.17	0% > 25%	0% > 25%	0% > 25%	75% > 100%	No	0% > 25%	0% > 25%	No	0% > 25%	0% > 25%	0% > 25%	75% > 100%	< 25%	Yes
Land between Brenchley Road…, Matfield	484	2.84	0%	0%	0%	100%	No	0%	0%	No	0% > 25%	0% > 25%	0% > 25%	75% > 100%	< 25%	No
Land at Cranbrook Road, Frittenden	485	1.53	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0%	100%	< 25%	No
Land at Sychem Lane, Five Oak Green	486	6.23	0% > 25%	0% > 25%	0% > 25%	75% > 100%	No	0% > 25%	0% > 25%	No	0% > 25%	0% > 25%	0% > 25%	75% > 100%	< 25%	Yes
Pinecroft, Frittenden Road, Sissinghurst	487	0.67	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0%	100%	No Data	No
Land associated with 1 Zion Cottages	488	0.80	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0% > 25%	75% > 100%	No Data	No
Land off of Waterloo Road, Cranbrook,	489	8.38	0% > 25%	0% > 25%	0% > 25%	75% > 100%	Yes	0% > 25%	0% > 25%	No	0% > 25%	0% > 25%	0% > 25%	75% > 100%	< 25%	No
Land off of Brenchley Road, Brenchley	490	0.85	0%	0%	0%	100%	No	0%	0%	No	0% > 25%	0% > 25%	25% > 50%	25% > 50%	No Data	No
Land at Market Heath, Brenchley	491	0.14	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0%	100%	No Data	No
Land to the south of the Memorial Hall, Brenchley	492	0.73	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0%	100%	No Data	No
Land at Whisketts Farm, Lamberhurst, TN3 8JG	493	5.09	0%	0%	0%	100%	No	0%	0%	No	0% > 25%	0%	0% > 25%	75% > 100%	No Data	No
Glenn House, Hartley Road, Cranbrook. TN17 3QP	494	1.72	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0%	100%	< 25%	No
Land at Camden House, Sissinghurst Rd	495	0.21	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0% > 25%	75% > 100%	No Data	No
Dragonfly Farm, Langton Road, Speldhurst	496	0.88	0%	0%	0%	100%	No	0%	0%	No	0%	0% > 25%	0% > 25%	50% > 75%	< 25%	No
Land to the south east of Goddard's Green Road	497	4.91	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0% > 25%	75% > 100%	No Data	No
Land to the north east of Goddard's Green Road	498	3.71	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0%	100%	No Data	No
Land adjacent to Apple Tree Cottage, Horsmonden	499	0.42	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0% > 25%	75% > 100%	No Data	No
Land NE of North Farm Industrial Estate, Capel	500	21.48	0%	0%	0%	100%	No	0%	0%	No	0% > 25%	0% > 25%	0% > 25%	50% > 75%	No Data	No
Parcel A Tibbs Court Lane, Petteridge	501	0.77	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0%	100%	No Data	No
Parcel B Tibbs Court Lane, Petteridge	502	0.55	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0%	100%	No Data	No
Land off Maidstone Road, Matfield	503	0.69	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0% > 25%	75% > 100%	< 25%	No
Land at Friars, Matfield	504	0.71	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0% > 25%	75% > 100%	< 25%	No

Site name	Site ref	Site area (ha)	Proportion of site within Flood Zone 3b	Proportion of site within Flood Zone 3a	Proportion of site within Flood Zone 2	Proportion of site within Flood Zone 1	Flood Zone 3b informed from Precautionary Flood Zone 3a	Proportion of site within future Flood Zone 3a (2080s Higher Central)	Proportion of site within future Flood Zone 3a (2080s Upper End)	Future Flood Zone 3a informed from current Flood Zone 2 (Yes/No)	Proportion of site within RoFSW 30-year extent	Proportion of site within RoFSW 100-year extent	Proportion of site within RoFSW 1,000-year extent	Proportion of site outside RoFSW extent	Most common AStGWF category in site	Site intersected by Risk of Flooding from Reservoirs extent (Yes/No)
Elm Tree, Mile Oak Road, Paddock Wood	505	0.21	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0% > 25%	75% > 100%	< 25%	No
Land adjacent to Oaklands, Cranbrook Road	506	1.07	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0%	100%	< 25%	No
Land to the rear of Sandhurst Farm Shop	507	2.29	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0%	100%	No Data	No
St Georges Hall Sissinghurst	508	0.05	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0%	100%	< 25%	No
Mascalls Farm Phase 2	509	4.01	0% > 25%	0% > 25%	0% > 25%	75% > 100%	No	0% > 25%	0% > 25%	No	0% > 25%	0% > 25%	0% > 25%	75% > 100%	< 25%	No
Land at Bull Farm	510	2.89	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0%	100%	No Data	No
Courtlands Turnden Road	511	0.42	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0%	100%	< 25%	No
Field to the south Bodiam Road	512	0.71	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0%	100%	No Data	No
Heathertye, Mount Pleasant Lane	513	0.52	0%	0%	0%	100%	No	0%	0%	No	0%	0%	0%	100%	< 25%	No

14 Summary

The Level 1 assessment can be summarised as follows:

14.1 Sources of flood risk

- Tunbridge Wells Borough has a history of documented flood events from several sources of flood risk. Flood records indicate that the main source of risk is from fluvial and surface water sources.
- The principle watercourses flowing through Tunbridge Wells Borough are the River Medway and its tributaries, which include the Alder Stream, Paddock Wood Stream, River Beult and the River Teise, the longest watercourse within the borough. The main source of fluvial flood risk is associated with the Rivers Medway, Teise and Beult, caused by runoff and catchment inflows across the borough.
- The most significant flood events reported to have affected Tunbridge Wells Borough occurred in 1960, 1968, 2000, 2013/14 and 2015, all with the exception of 2015 included notable flooding from the Rivers Medway, Teise and Beult.
- Historic records also indicate that Tunbridge Wells Borough has experienced several surface water / drainage related flood events, which have been attributed to a range of sources. Kent County Council flood records show the majority of surface water flood events clustered around Royal Tunbridge Wells, with the rest spread sporadically across the borough, although within Paddock Wood there are no specific historic recorded within the data received. The Tunbridge Wells SWMP states that, for the most part, surface water flooding could be attributed to heavy rainfall overloading carriageways, drains and gullies with blockages and high water levels impeding discharge also occurring. It is noted that roads within the borough are regularly flooded due to run off from adjacent agricultural land discharging into watercourses that do not have sufficient capacity to convey the flows. The Risk of Flooding from Surface Water (RoFSW) dataset shows a number of surface water flow paths which predominantly follow topographical flow paths along existing watercourses or dry valleys with some isolated ponding located in low lying areas.
- Very few areas in the borough have recorded groundwater flood events. Speldhurst Road in Southborough is located near to a spring, and consequently experiences drainage issues, with 126 records of groundwater flooding along the road attributed to this source. The Areas Susceptible to Groundwater Flooding (AStGWF) mapping suggests that susceptibility to groundwater flooding is greatest in the north-east of the borough, specifically in the areas of Whetsted, Tudeley Hale and Five Oak Green. Other areas to note include Ashurst, Frittenden and Knox Bridge, and Broadford. This groundwater flood potential is consistent with the location of more permeable strata and superficial to the north of the borough.
- The Sewer Incident Report Form data supplied by Southern Water indicates a total of 214 recorded flood incidents within Tunbridge Wells Borough between 2011-2016. The more frequently flooded postcodes are TN12 6, TN4 0 and TN2 5. However, it is important to recognise that the information does not present whether flooding incidences were caused by general exceedance of the design sewer system, or by operational issues such as blockages.
- In relation to artificial sources of flooding, there are no records of flooding from reservoirs impacting properties inside the borough. The Environment Agency's Risk of Flooding from Reservoir's flood extent mapping indicates that reservoirs in or outside of the borough could affect properties in the event of a breach. This includes the Leigh Flood Storage Area, north of the borough, and a breach of which could have notable implications for Whetsted, Five Oak Green and Paddock Wood in the north of the borough.

14.2 Key Policies

There are several relevant regional and local key policies and guidance documents which have been considered within the SFRA, such as, the Tunbridge Wells Surface Water Management Plan (SWMP), Paddock Wood Surface Water Management Plan (SWMP), the Preliminary Flood Risk Assessment (PFRA), Kent Local Flood Risk Management Strategy (LFRMS), and the Emergency Flood Plan for Tunbridge Wells Borough Council. Key local policies include the following:

- Thames River Basin District Flood Risk Management Plan (FRMP): within Part C identified priorities are to implement outcomes of the Middle Medway Strategy and improve flood warning.
- Kent County Council Preliminary Flood Risk Assessment (PFRA): The PFRA reports significant past and future flooding from all sources except Main Rivers, the Sea and Reservoirs, which are covered by the Environment Agency, and sub-standard performance of the adopted sewer network (covered under the remit of Southern Water). The Flood Risk Regulations (2009) require the Lead Local Flood Authority (LLFA) to identify significant Flood Risk Areas. No Flood Risk Areas have been identified in Tunbridge Wells Borough based on critical infrastructure/access routes, sewer/surface water problems and areas prone to significant ponding.
- Kent Local Flood Risk Management Strategy (2013): The Strategy is used as a means by which the LLFA co-ordinates Flood Risk Management on a day to day basis and sets out measures to manage local flood risk (i.e. flood risk from surface water, groundwater and Ordinary Watercourses). The Strategy also sets out an action plan of how the LLFA intends to achieve the high-level objectives proposed for managing flood risk.
- Surface Water Management Plans (SWMPs): SWMPs are produced to understand the flood risks that arise from local flooding, which is defined by the Flood and Water Management Act 2010 as flooding from surface runoff, groundwater, and Ordinary Watercourses. Options to alleviate the risks are identified and presented as a long-term action plan to manage local flooding in a particular area. The SWMPs relevant to Tunbridge Wells Borough that have been considered in this SFRA are the:
    - Tunbridge Wells Stage 1 SWMP (2013)
    - Paddock Wood Stage 1 SWMP (2011)
    - Paddock Wood Stage 2 SWMP (2015)

14.3 Development and flood risk

This SFRA provides details of the Flood Risk Assessment (FRA) requirements and guidance for developers. These recommendations include those of the NPPF, Environment Agency standing advice, as well as reference to regional and local policy. Site-specific FRAs should include assessment of mitigation measures required to safely manage flood risk along with the promotion of Sustainable Drainage Systems (SuDS) to create a conceptual drainage strategy and safe access/egress at the development in the event of a flood.

Surface water flooding and the role of the LLFA and the Local Planning Authority (LPA) in surface water management has also been defined with guidance provided for the design and implementation of SuDS as part of the initial planning stage of all types of residential, commercial and industrial developments. The SFRA provides details of the types of SuDS available and when they should be used, and outlines the recommendations included in the relevant national, regional and local guidance documents.

The merits of strategic flood risk solutions should be identified and understood when considering development within the borough as these can involve measures that deliver wider strategic benefits and can be more easily and efficiently maintained than a myriad of individual smaller scale measures. Developers should work with stakeholders to identify issues and provide appropriate solutions.

14.4 Defences and residual risk

A high-level review of formal flood defences was carried out using existing information to provide an indication of their condition and standard of protection. Details of the flood defence locations and condition were provided by the Environment Agency for the purpose of preparing this assessment, in addition to explanations of some of these defences.

Formal defences are present along parts of the River Rother, Southborough Stream and Alder Stream. Additionally, Leigh Flood Storage Area embankment (maintained and operated by the Environment Agency) also extends a short distance into the borough at its north west extent.

14.5 Flood warning and emergency planning

Emergency planning considerations have been included and the flood warning service coverage assessed; currently there are seven Flood Alert Areas and nine Flood Warning Areas covering Tunbridge Wells Borough. Requirements outlined by the NPPF for safe access and egress have also been set out.

14.6 Recommendations

14.6.1 Assessing Flood Risk and Developments

- The NPPF supports a risk-based and sequential approach to development and flood risk in England, so that development is located in the lowest flood risk areas where possible; it is recommended that this approach is adopted for all future developments within the borough.
- A site-specific FRA is required for all developments which are located in the Environment Agency's Flood Zones 2 and 3, or developments greater than 1ha in size in Flood Zone 1. They are also required for developments less than 1ha in Flood Zone 1 where there is a change in use to a more vulnerable development where they could be affected by sources of flooding other than rivers and the sea (e.g. surface water drains, reservoirs). All developments located in areas of Flood Zone 1 highlighted as having critical drainage problems must also be accompanied by an FRA. The FRA should be proportionate to the degree of flood risk, as well as the scale, nature and location of the development.
- It is recommended that the impact of climate change to a proposed site is considered in FRAs and that the percentage increases which relate to the proposed lifetime of the development and the vulnerability classification of the development is identified and taken into account. The Environment Agency and LLFA should be consulted to confirm a suitable approach to climate change in light of the latest guidance.
- Opportunities to reduce flood risk to wider communities could be sought through the regeneration of brownfield sites, through reductions in the amount of surface water runoff generated on a site.
- The LPA, Environment Agency and LLFA should be consulted to confirm the level of assessment required and to provide any information on any known local issues.
- When assessing sites not identified in the Local Plan (windfall sites), developers should use evidence provided in this SFRA to apply the Sequential Test as well as provide evidence to show that they have adequately considered other reasonably available sites.

14.6.2 Future Developments

Development must seek opportunities to reduce overall levels of flood risk at the site, for example by:

- Reducing volume and rate of surface water runoff based on Local Plan policy and LLFA Guidance
- Locating development to areas with lower flood risk
- Creating space for flooding.
- Integrating green infrastructure into mitigation measures for surface water runoff from potential development and consider using Flood Zones 2 and 3 as public open space.

The LPA should consult the NPPF and Environment Agency's 'Flood Risk Standing Advice (FRSA) for Local Planning Authorities', published in March 2014, when reviewing planning applications for proposed developments at risk of flooding.

At the planning application stage, developers may need to undertake more detailed hydrological and hydraulic assessments of the watercourses to verify flood extent (including latest climate change allowances) inform development zoning within the site and prove, if required, whether the Exception Test can be passed.

14.6.3 Promotion of SuDS

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

- A detailed site-specific assessment of SuDS would be needed to incorporate SuDS successfully into the development proposals. New or re-development should adopt source control SuDS techniques to reduce the risk of frequent low impact flooding due to post-development runoff.
- For proposed developments, it is imperative that a site-specific infiltration test is conducted early on as part of the design of the development, to confirm whether the water table is low enough to allow for SuDS techniques that are designed to encourage infiltration.
- Where sites lie within or close to Groundwater Source Protection Zones or aquifers, there may be a requirement for a form of pre-treatment prior to infiltration. Further guidance can be found in the CIRIA SuDS manual on the level of water quality treatment required for drainage via infiltration. Further restrictions may still be applicable, and guidance should be sought from the LLFA.
- Developers need to ensure that new development does not increase the surface water runoff rate from the site and should therefore contact the LLFA and other key stakeholders at an early stage to ensure surface water management is undertaken and that SuDS are promoted and implemented, designed to overcome site-specific constraints.
- The LPA will need to consider drainage schemes for major applications, but it is advised developers utilise the LLFA's Polices and Guidance to develop their drainage scheme for minor applications.

14.6.4 Infrastructure and Access

Safe access and egress will need to be demonstrated at development sites. Consideration of alternative access and egress routes should be made in the event that primary routes are inundated with flood water. Resilience measures will be required if buildings are situated in the flood risk area, and opportunities to enhance green infrastructure and reduce flood risk by making space for water should be sought.

14.6.5 Green Infrastructure and WFD

Opportunities to enhance green infrastructure and reduce flood risk by making space for water should be sought. In addition, opportunities where it may be possible to improve the WFD status of watercourses, for example by opening up culverts, weir removal, and river restoration, should be considered. Green infrastructure should be considered within the mitigation measures for surface water runoff from development.

14.7 Use of SFRA data and future updates

It is important to recognise that the SFRA has been developed using the best available information at the time of preparation.

The SFRA should be periodically updated when new information on flood risk, flood warning or new planning guidance or legislation becomes available. New information on flood risk may be provided by authorities including Tunbridge Wells Borough Council, Kent County Council (in its role as LLFA), the Highways Authority, Southern Water and the Environment Agency. It is recommended that the SFRA is reviewed internally on an annual basis, allowing a cycle of review, followed by checking with the above bodies for any new information to allow a periodic update.

A Level 2 SFRA accompanies this Level 1 SFRA. The Level 2 SFRA considers a refined set of parcels (grouping of sites from the Call for Sites process, including any additional sites received after this time) supplied by the council subsequent to the finalisation of the draft Level 1 SFRA. The Level 2 assessment considers whether the principle of development can be supported at the proposed development parcels and the nature and conceptual approach outlining the flood risk management measures that can be implemented so the proposed development is safe and does not have an adverse effect on other people or property, now or in the future.

Appendices

A Grid square references for A3 Appendix mapping

B Watercourses in Tunbridge Wells Borough

C Flood Zone mapping (present day)

D Climate change mapping (future Flood Zone 3a)

E Surface water flood risk mapping

F Groundwater emergence susceptibility mapping

G Flood warning coverage

H Historic flood records

Tunbridge Wells Borough Council
Level 2 Strategic Flood Risk Assessment

Final Report

July 2019

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Revision History

Revision Ref / Date Issued	Amendments	Issued to
Draft v1 / March 2019	-	Sharon Evans (Tunbridge Wells Borough Council)
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Draft v3 / June 2019	Updated following comments received from the council on 14 May 2019	Sharon Evans (Tunbridge Wells Borough Council)
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Contract

This report describes work commissioned by Tunbridge Wells Borough Council. The Council's representative for the contract was Sharon Evans. Aaron Barber, Ben Gibson and James Axton of JBA Consulting carried out this work.

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Purpose

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Executive Summary

Introduction

This Strategic Flood Risk Assessment (SFRA) 2019 document replaces the Level 1 SFRA update previously published by Tunbridge Wells Borough Council in 2007, and the Level 2 SFRA previously published by Tunbridge Wells Borough Council in 2009. The main purpose of the SFRA is to inform selection of options for Local Plan allocations and support determination of planning applications.

SFRA objectives

The key objectives of the Level 2 SFRA are:

- To provide up to date information and guidance on flood risk for Tunbridge Wells Borough, considering the latest flood risk information and the current state of national planning policy
- To assess whether the principle of development can be supported at proposed development locations (including consideration of cumulative impacts) that are located within Flood Zones 2 and 3 and therefore the need to apply the Exception Test.
- To consider the flood risk management adaptation, infrastructure or other measures needed to support delivery of the proposed development.

Level 2 outputs

- An assessment of a refined set of land parcels for potential development
- Updated fluvial flood risk modelling; the preparation of flood predictions for a revised 'SFRA Baseline', 'with proposed development' scenarios, and further scenarios in which flood risk management measures are considered in conjunction with the proposed development
- An assessment of possible strategic flood risk management measures and associated flood risk metrics for these

Summary of Level 2 Assessment

Assessing Flood Risk and Developments

Detailed summary tables have been produced for each of the ten potential development parcels located in and around the Paddock Wood area (Capel and Paddock Wood parishes). Parcels are labelled 1-12, but excluding numbers 8 and 10, which were not associated with built development. The summary tables include maps of extents, depth and velocity of flooding as well as hazard mapping. Additionally, the summary tables include discussion regarding the hydraulic modelling assessment of development across the proposed development parcels and the impact this has on flood risk.

Hydraulic modelling conducted specifically for the Level 2 assessment of the parcels focused on the actual risk of flooding for 1% Annual Exceedance Probability/100-year Return Period event both for the present day and accounting for climate change (Upper End fluvial flood scenario).

It is important to recognise that for the Level 2 SFRA a number of different sets of data have been used to clarify the actual risk. Mapping shown in the detailed parcel summary tables in Appendix I may differ slightly to the Environment Agency Flood Zones and 'Flood Map for Planning'. The reason for differences is due to the results obtained from additional modelling that was undertaken during the assessment of the 10 development parcels. Given that not all mapping presented as part of the Level 2 assessment has been processed following the same criteria as the Flood Map for Planning it is possible that the mapped outlines will be slightly different.

Water Framework Directive

Future development should be implemented so there is no adverse impact on the quality of watercourses within the borough. Opportunities to improve the status of watercourses should also be considered. Example restoration options which could be considered may include structure removal and/or modification and re-naturalisation.

Strategic flood risk solutions

The proposed development parcels are not directly protected by formal flood defences, but Leigh Flood Storage Area, located on the River Medway upstream of Tonbridge, acts to reduce the depth of flood water originating from the River Medway. For watercourses flowing in a northerly direction towards Paddock Wood, actual risk is aligned with the magnitude of events that describe the Flood Zones (i.e. the extent of the risk is the same whether or not defences are taken into account). For the River Medway the Leigh Flood Storage Area reduces actual flood extents and levels on the floodplain at the north of Paddock Wood and so actual flood risk (the probability of a flood occurring that produces a particular flood extent) is less than the risk described by the Flood Zones.

Consideration needs to be given to where flood risk management measures may be required in the future to manage flooding in the borough (e.g. due to influence of climate change on fluvial flood flows). Strategic provisions for future flood risk management may provide an opportunity to make a proposed development safe, but confirmation of potential offsite effects (and mitigation of these), residual risk and maintenance arrangements for the lifetime of the development (e.g. funding the measures) is required. The testing completed as part of this SFRA provides a strategic understanding of the potential effect of development and the potential for mitigation by implementing flood risk management measures. Some of the proposed development configurations are shown to have notable influence on flooding, both within development parcels but also existing areas of development in Paddock Wood. Equally, some flood risk management measures have a large positive effect on flooding (e.g. depths and extents) in Paddock Wood. Future and more detailed assessment should refine understanding of how measures may reduce flood risk, and their viability.

Principle of development at the proposed development parcels

At each of the ten proposed development parcels, the assessment generally shows that the principle of development can be supported. The proposed development tested was positioned preferentially in lower fluvial flood risk zones, where possible in accordance with the sequential approach. This helps to reduce the change in risk (e.g. extents and depths of flooding). An exception to this general conclusion is the eastern development area considered at parcel 1, which is discussed in greater detail below.

When the effects of development areas were evaluated using flood risk modelling (by simply raising developed areas completely above the flood level) changes in flood risk were predicted from all parcels, with each displaying detriment to some locations in the catchment downstream. In most cases the changes in risk were relatively minor (e.g. parcels 4, 7, 9, 11 and 12) and resulted from the deflection of flood water, due to the raised development areas blocking routes that rainfall and/or overland flow would follow. The results from the modelling performed for the SFRA assessment indicate that adjusting the site layout (where buildings are positioned), implementing more formal flood risk management measures (e.g. new or improved drainage channels, flood storage) or raising the developed area of buildings above ground level can all contribute to the management of the flood risk. On the basis of the results from the strategic assessment, the outputs show that the principle of development can be supported.

For sites where the results from the assessment indicate that the proposed development results in more pronounced flood risk effects (e.g. 1, 2, 3, 5 and 6), the assessment shows that the principle of development can still be supported, but in these circumstances more substantive interventions are needed to manage the change in flood risk. Of all of the parcels tested, positioning a development area at the east of parcel 1 has greatest potential effect on flooding, as this proposal results in the obstruction of a well-defined flow route. The obstruction of this flow route reduces the eastward flow of flood water, reducing flood extents and depths at existing developed areas of Paddock Wood. However, this obstruction also diverts greater volumes of flood water northwards towards the railway line and parcels 2, 3 and 4.

Of the flood risk management measures considered for the purpose of the strategic assessment, only strategic storage of flood water was the approach with the potential to mitigate the increased risk to areas of land resulting from the development at the east of parcel 1 (although other flood risk management measures considered could contribute). Therefore, it is important to investigate the potential for this measure to be realised.

When parcels 2-12 are considered in isolation, their influence on flood risk is less notable, given the development areas are positioned in the lowest risk areas. For these areas, while storage of flood water is one means of addressing changes in flood risk, other flood risk management approaches

may provide the mitigation needed (e.g. increasing conveyance with new channels or improving existing channels).

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1 Level 2 Assessment of strategic development parcels

1.1 Introduction

The SFRA forms an integral part of Tunbridge Wells Borough Council's evidence base for the production of a new Local Plan, in terms of identifying locations for development and preparation of flood risk policies in the Local Plan, with one of the objectives of an SFRA being to help inform site allocations so they are in accordance with the NPPF. Potential development locations have been provided by the council to be assessed in the SFRA. The Level 2 SFRA considered a refined set of parcels (grouping of sites from the Call for Sites process, including some received after this process had ended) supplied by the council subsequent to the finalisation of the Level 1 SFRA. The parcels taken forward and description of the refinements are recorded in Table 1-1. Note that parcels numbered 8 (named East of Queen Street Parcel) and 10 (named Playing Pitches) are excluded from the assessment as they are not allocated for built development, but rather intended for either biodiversity, landscaping or recreation land uses.

Table 1-1: List of sites taken forward for Level 2 SFRA

Parcel name and number	Area (ha)	Proposed development type	Change from Level 1 SFRA individual site assessment submitted through the Call for Sites
South West Parcel (Parcel 1)	54.66	Residential and mixed use	Merger of sites 142 and 309. Sites names: 'Land to the north of Badsell Road' 'Land to the east of Maidstone Road'
North West Parcel (Parcel 2)	59.80	Residential and mixed use	Merger of five sites: 310, 311, 312, 313 and 314. Site names: 'Land at Whetsted Farm' 'Land at Sebastopol' 'Land at Whetsted Wood' 'Land at Eastlands' 'Land south of Whetsted Road'
North Central Parcel (Parcel 3)	43.67	Residential and mixed use	Merger of four sites: 316, 317, 318 and 319. Site names: 'Land to the south of Tudeley Brook Farm' 'Tudeley Brook Farm' 'Land to the north of Durrant's Farm' 'Land adjacent to Leys Cottages'
North West Central Parcel (Parcel 4)	7.50	Residential and mixed use	Merger of three sites: 51, 315 and 402. Site names: 'Land west of Maidstone Road and north of Eldon Way' 'Land at Eastland Cottages, Maidstone Road' 'Land west of Maidstone Road and north of Eldon Way'
North Parcel (Parcel 5)	15.01	Non-residential (employment)	Merger of sites 340 and 347. Site names: 'Kerylands Sale Field, Lucks Lane' 'Swatlands Farm Luck Lane'
North East Parcel (Parcel 6)	10.26	Non-residential (employment)	Sites 218. Note: reduction in area of parcel, with land north of Lucks Lane removed from the total site.
East Parcel (Parcel 7)	47.00	Residential and mixed use	Merger of four sites: 20, 47, 79 and 374. Site names: 'Land at Knells Farm, Queen Street' 'Ledgers Works, Queen Street' 'Land at Church Farm, Church Road' 'Land to the north Church Road and adjacent to Queen Street'

Parcel name and number	Area (ha)	Proposed development type	Change from Level 1 SFRA individual site assessment submitted through the Call for Sites
South East Parcel (Parcel 9)	17.40	Residential and mixed use	Site 371. Note: increase in area in the western area of the site, from 10.06ha.
Outer South Parcel (Parcel 11)	11.18	Residential and mixed use	Sites 344 and 376. Site names: 'Land to the east of Mascalls Court Road' 'Land to the south of Mascalls Court Lane'.
Mascalls School Parcel (Parcel 12)	5.56	Non-residential (education)	Sites 212 and 342. Site names: 'Land to the north of Chantler's Hill' 'Land north of Chantlers Hill'.

This assessment, as part of a Level 2 SFRA provides more detailed information on:

- The resolution and detail of the analysis used to assess the flood risk (more detailed data and higher resolution flood modelling has been prepared so appropriate evidence is available to consider the implications of performing the Exception test);
- The severity and extent of actual flood risk across proposed parcels;
- The site-specific flood risk assessment requirements; and
- The preparation of local policies to provide for sustainable developments as well as reducing flood risk to existing communities in the area.

1.2 Level 2 aims and objectives

The Level 2 SFRA aims to assess strategic parcels that have been identified to be at a risk of flooding on the basis of the data available for the Level 1 assessment and determine the implications with respect to implementing development that is safe for its intended life. Through detailed assessment, any parcels wholly unsuitable can be identified, and parcels with potential for development with careful management and mitigation can be determined.

1.3 Methodology and modelling approach

For detailed Level 2 assessment updated fluvial flood risk modelling was undertaken. Separate reporting is available which documents the updated flood risk modelling.

1.3.1 Summary of data collection and survey

Updated Environment Agency LIDAR was used in the preparation of updated modelling, with fluvial modelling utilising existing and recently commissioned topographic channel surveys.

1.3.2 Summary of modelling approach

An existing Flood Modeller–TUFLOW linked 1D-2D models was updated for the Tunbridge Wells Level 1 SFRA. Updated flood risk modelling has been carried out for the Level 2 SFRA in order to capture the requisite level of detail in the model so the level of flood hazards can be predicted and to provide a model that can be used to understand the potential impact of development on the allocation parcel. The updates included running the 2016 Environment Agency Climate Change Allowances (Higher Central and Upper End allowances), updated hydrology, and a new 1D-2D InfoWorks ICM mode for Paddock Wood. The updated modelling was informed by new channel and structure survey data collected for the SFRA.

Surface water flood risk modelling was available for all 10 parcels for the 1 in 100 event (an event with a 1 in 100 chance of occurring in each and every year).

1.4 Modelling and mapping results

1.4.1 Level 2 detailed parcel summary tables

As part of the Level 2 SFRA, detailed parcel summary tables have been prepared for the 10 parcels assessed. These parcels are shown to contain land within Flood Zones 2, 3a or 3b and therefore

at fluvial flood risk. The detailed parcel summary tables have been prepared for these parcels to provide further information on flood risk to assist with the strategic application of the Exception Test.

For assessment of actual fluvial flood risk consideration has been given to events with a chance of occurrence of 1 in 20, 1 in 100 and 1 in 1000 (5%, 1% and 0.1% Annual Exceedance Probabilities [AEP] respectively) as these equate to the severity of flooding used to define the probability of floods described by Zones 3b, 3a, 2 and 1 respectively. Where relevant, the modelling has been performed using versions of the models that include for the presence of flood defences, so the actual risk is described (whereas the version of the models used to prepare Flood Zone results do not include for the effect of defences).

Additionally, the impact of development across multiple SFRA parcels of land has been considered in each parcel summary sheet, with modelling undertaken to understand potential impacts of development upon neighbouring parcels, as well as the impact of development across multiple parcels across Paddock Wood so potential cumulative effects can be understood.

As individual developments, or groups of developments as part of a masterplanned and comprehensive development approach, are brought forward more detailed Flood Risk Assessments should be performed to satisfy the requirements of the Exception Test as the information in the SFRA does not include the appropriate level of detail. The summary tables are provided in Appendix I . Each table sets out the following information:

- Parcel area and type of development;
- Parcel overview (including topography, watercourses and summary of present day flood risk);
- A summary of the proposed development configuration tested as part of the SFRA
- A summary of existing drainage features;
- A summary of flood hazards and historic flood incidents;
- Proportion of the site in each Flood Zone and surface water flood extents (including an assessment of the impacts of climate change);
- Overview of risk of flooding to site from groundwater and reservoir flooding;
- Existing flood risk management infrastructure;
- Emergency Planning including access and egress and whether the site is covered by a flood warning or alert service;
- Outline scope of potential measures to address flood risk management and drainage issues;
- Parcel designations;
- The impact of the proposed development on flood risk (including the change in flood risk when the proposed development is considered only at the individual parcel and the change when the proposed development is considered at all SFRA parcels);
- The flood risk management measures investigated for the parcel;
- The change in flood risk when the flood risk management mitigation measures are implemented;
- A broad scale assessment of suitable SuDS techniques and considerations;
- The implications for the plan allocations (including statements on whether the principle of development at the parcel can be supported and whether the flood risk management measures have the potential to reduce the existing level of flood risk);
- A high level summary of the matters that should be investigated further in parcel / parcel-specific Flood Risk Assessments;
- Mapping including present day fluvial flood extents, depths and hazards, climate change fluvial flood extents and depths, and surface water extent maps.

1.4.2 Important note on Flood Zones within summary tables

For the SFRA a number of different sets of data have been used to describe the extent of the Flood Zones. The Environment Agency are in the process of updating their Flood Map for Planning using more detailed mapping prepared as part of the SFRA. This should be completed by mid-2019, although the exact date that the changes will be made are not known. After this time the flood mapping shown in the detailed parcel summary tables should align with the Environment Agency's mapping.

2 Strategic flood risk management options

2.1 Introduction

Strategic flood risk solutions potentially offer the opportunity to reduce flood risk in the borough. The study area lies within the **River Medway CFMP**. Policy options throughout the study area vary and should be referred to when formulating any strategic flood risk solutions. Specific 'actions' for flood risk management are described for each sub-area within the relevant CFMP.

Information on proposed strategic measures and approaches are available in the **Thames River Basin District FRMP.**

When considering strategic flood risk solutions, it is important not only to consider whether a solution provides the most effective way of removing parcels of land from a given magnitude event or Flood Zone, but must also consider many other factors, including:

- Whether the flood risk solution will make the development safe e.g. whether safe access and egress can be achieved
- How the flood risk solution will be managed and maintained for the lifetime of development
- The cost of implementing the solution (and maintaining it)
- Environmental implications of the flood risk solution (both during and after implementation)
- The WFD requirements and the impact proposals may have on water quality and quantity
- Alignment with the **Thames River Basin District FRMP** objectives and actions
- Whether an Environmental Permit is required from the Environment Agency or consent from the LLFA is needed.
- Whether the provision of the solution should be co-ordinated with other strategic measures required to manage risk for existing development
- Whether there is an opportunity to include measures that reduce known risk to existing communities, particularly in circumstances where land within a parcel should be set aside for such measures.

The following sections provide a high-level outline different options which could be considered for strategic flood risk solutions.

However, importantly for the SFRA, specific consideration has been given to flood risk management measures that may provide benefit to flood risk at the parcels, which helps decision-making on whether the principal of development can be supported.

2.1.1 Influence of proposed developments on flood risk and potential flood risk management measure

A separate project report has been prepared, which, using the flood risk mapping models for Paddock Wood Streams and the River Medway, describes the impact that proposed development within parcels has on flood risk. This report should be read alongside this SFRA. Potential development configurations within each parcel were implemented into the modelling, and the change in flood risk (principally flood depths) was assessed. Consideration was then given to flood risk management measures which may help mitigate changes in flood risk due to development, and agreement reached with the Tunbridge Wells Borough Council on which to assess. These measures were schematised within the modelling and tested to understand the change in flood risk. Various mapping outputs were prepared to support understanding of the influence of development and the flood risk management measures.

The Level 2 parcel summary sheets presented in Appendix I include discussion on the change in flood risk at parcels when flood risk management measures are tested.

2.2 Characteristics of actual flood risk at each parcel

The Level 2 parcel summary sheets in Appendix I provide context to the flood risk conditions at each parcel. Typically, across the parcels, groundwater emergence risk is identified and risk of infiltration of groundwater into sewers is also identified. Unlike fluvial, surface water or tidal/coastal flood risk, groundwater flooding is difficult to control via strategic flood risk management solutions and therefore has not formed part of this reporting. It is considered that measures to deal with potential for groundwater flooding would be evaluated during the development of site-specific development proposals.

The effect of surface water flood risk varies for the parcels assessed, with some at a minor risk and others at substantial risk. Management of surface water is discussed in the Level 1 SFRA document, and so is not repeated here in the strategic flood risk solutions chapter.

Fluvial food risk is predicted from main rivers and ordinary watercourses at all of the parcels included in the Level 2 SFRA (refer to the summary sheets provided in Appendix I). The risk is most extensive around parcels located to the west of Paddock Wood along Tudeley Brook and to the north of Paddock Wood.

The following further outline of strategic solutions presented in the Level 2 SFRA focus on managing these forms of flood risk.

2.3 Flood defences

The parcels identified within the Level 2 SFRA are typically located alongside smaller watercourses and main rivers, and therefore generally are undefended. A watercourse running through a parcel included in the assessment to the north of Paddock Wood is embanked, but the raised bank levels only provide a 1 in 5 year standard of protection. Leigh Flood Storage Area, located on the River Medway upstream of Tonbridge, acts to reduce the depth of flood water originating from the River Medway. For watercourses flowing north through Paddock Wood, actual risk is aligned with the magnitude of events that inform the Flood Zones. For the River Medway the Leigh Flood Storage Area reduces flood extents and levels on the floodplain to the north of Paddock Wood and so actual flood risk is less than the risk presented in Flood Zones.

At locations with flood defences, it is important to understand the benefit that defences can have on reducing flooding, and consequences if their design standard is exceeded or if they fail. Residual risk of these defences should be understood and managed and maintenance arrangements (including funding mechanisms) for the defences will need to be evidenced for the lifetime of the development.

Defences may provide an opportunity to make a proposed development safe. However, flood mitigation measures should only be considered if, after application of the Sequential Approach, development sites cannot be located away from higher risk areas. If defences are constructed to protect a development site, it will need to be demonstrated that the defences will not have a resulting negative impact on flood risk elsewhere, that there is no net loss in floodplain storage that could cause flood water levels on adjacent land to be elevated. A further influential consideration is the long-term management and maintenance arrangements that are required for such structures and if this option is preferred then the commitment required for their management and maintenance should be secured.

2.4 Land raising

Increasing the elevation of land for whole or parts of the parcels could be implemented to prevent flood flows affecting the land up to the design level. The elevation selected could be determined to coincide with the re-designation of the parcel (or part of the parcel) from one Flood Zone to another (e.g. from Flood Zone 3a to Flood Zone 2). Raising of land which floods would potentially reduce the volume of storage on the floodplain in a flood event. Such ground level adjustments would therefore normally require level for level floodplain volume compensation (so no loss of floodplain storage occurs) and also analysis to evidence that the increase in ground levels does not result in adverse changes in flood risk (or other environmental issue) elsewhere, e.g. through deflection of flood water or loss of conveyance. The Level 2 SFRA parcel summary sheets (Appendix) include a strategic modelling assessment of the impact of development across all parcels, utilising a basic outline of proposed development areas. Consideration can be given to providing strategic compensatory storage areas remote from allocation sites, but such proposals would require

additional land provisions and more detailed modelling to determine that development could be brought forward safely and that the change to flood flow paths does not adversely affect third parties.

In low-lying areas of land with little topographic gradient it is likely that conveyance of fluvial flood water may be less critical than the loss of floodplain volume, whereas in areas with greater topographic gradient, conveyance may become more critical.

2.5 Flood storage and flood conveyance schemes

Flood storage schemes aim to reduce the flows passed downriver to mitigate downstream flooding. Development increases the impermeable area within a catchment, creating additional and faster runoff into watercourses. Some flood storage schemes aim to detain this additional runoff brought about by development, releasing it downstream at a slower rate, to avoid any increase in flood depths and/or frequency downstream. Methods to provide these schemes include[76]:

- Enlarging the river channel;
- Raising the riverbanks;
- Constructing flood banks set back from the river; and
- Implementation of SuDS storage schemes.

Flood storage schemes have the advantage that they potentially benefit wider areas downstream, not just the parcel. The construction of new upstream storage schemes as part of upstream catchment-based approaches on watercourses in the Tunbridge Wells Borough could provide one potential strategic solution to flood risk. Watercourses which are rural in their upper reaches but have high levels of flood risk to urban areas in the downstream reaches are potential candidates, as the open land in the upper reaches can potentially provide the space for an attenuation area, providing benefit to the urban area downstream.

It is also possible to consider schemes that improve the local flood conveyance capacity of watercourses to reduce flood risk in conjunction with storage schemes that compensate for the loss of flood storage volume resulting from the improved channel capacity.

Opportunities to work with natural processes to reduce flood and erosion risk, benefit the natural environment, and reduce cost of schemes should be sought. This requires integrated catchment management and involving those who use and shape the land. It also requires partnership working with neighbouring authorities, organisations and water management bodies.

Conventional flood storage and conveyance schemes as described will likely still be preferred, but consideration of 're-wilding' rivers upstream (or Natural Flood Management) could provide cost efficiencies as well as considering multiple sources of flood risk; for example, through wider land management practices (e.g. woodland management, creation of upland wetlands and managed farming practices) or building earth banks to capture runoff, could be cheaper and smaller-scale measures than implementing flood walls for example. Again, this may require partnership working with neighbouring authorities and landowners. With flood prevention schemes, consideration needs to be given to the impact that flood prevention has on the WFD status of watercourses. It is important that any potential schemes do not have a negative impact on the ecological and chemical status of waterbodies.

2.5.1 Promotion of SuDS

Surface water flood risk is present across certain areas of Paddock Wood. By considering SuDS at an early stage in the development of a parcel, the risk from surface water can potentially be mitigated within the parcel as well as reduce the risk that the parcel poses to third party land. Regionally, SuDS should be promoted on all new developments to ensure the quantity and quality of surface water is dealt with sustainably to reduce flood risk. The detailed policies and guidance produced by Tunbridge Wells Borough Council within their Local Plan will set out how the council will actively promote developers to use this information to produce technically proficient and sustainable drainage solutions.

2.5.2 **Groundwater and drainage design**

Parcels located within a Southern Water designated area of high risk of groundwater inundation into foul sewers will potentially require special measures. All development equivalent to one dwelling or

[76] Environment Agency: Fluvial Design Guide – Chapter 10 (2010)

greater will require consultation with Southern Water, in order to agree flood risk mitigation measures.

2.6 Floodplain restoration and augmentation

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

Although the restoration or augmentation of floodplains is difficult in previously developed areas where development cannot be rolled back, the following measures could be considered:

- Promoting existing and future brownfield sites that are adjacent to watercourses to naturalise banks as much as possible. Buffer areas around watercourses provide an opportunity to restore parts of the floodplain.
- Removal of redundant structures to reconnect the river and the floodplain. culverted sections of watercourses located throughout the district should be returned to a more natural state to help reduce flood risk to the local area.
- Apply the Sequential Approach to avoid new development within currently undefended floodplain.

In more rural environment such as Paddock Wood and the surrounding area, it can be possible to make provision for increasing the storage of flood water during an event by introducing floodplain interventions. This can have the effect of reducing risk downstream and can be delivered in areas of sites where the severity of flood risk makes development inappropriate.

2.7 Engaging with key stakeholders

Flood risk to an area or development can often be attributed to a number of sources such as fluvial, surface water and/or groundwater. In rural areas the definition between each type of flood risk is more distinguished. However, within urban areas flooding from multiple sources can become intertwined. Where complex flood risk issues are highlighted it is important that all stakeholders are actively encouraged to work together to identify issues and provide suitable solutions.

Engagement with riparian owners is also important to ensure they understand their rights and responsibilities including:

- maintaining river bed and banks;
- allowing the flow of water to pass without obstruction; and
- controlling invasive alien species e.g. Japanese knotweed.

More information about riparian owner responsibilities can be found in information published by the Environment Agency (**Owning a watercourse**).

2.8 Proposed measures in the Thames River Basin District FRMP

The Flood Risk Management Plan (FRMP) sets out a series of measures to manage flood risk across the Thames River Basin District. Paddock Wood and the surrounding area lies within the Medway catchment area. The FRMP summarises the flooding affecting the area and describes the measures to be taken to address the risk in accordance with the Flood Risk Regulations.

Some of the measures specific to the Medway District that are relevant to Paddock Wood are identified below. Part A of the FRMP should be viewed to understand measures applicable to the whole FRMP, whilst Part C of the FRMP provides the full suite of measures.

Preventing risk:

- *There are 17 prevention measures in the Medway. Within the wider catchment we are managing risk through sustainable drainage with new development and working closely with local councils on their surface water plans. This includes flood management investigations on internal drainage board's watercourses and other non-main rivers. Actions are also relating to the profile of blockages in key flood hotspots, and developing better drainage infrastructure in urban areas.*

Preparing for risk:

- *We are improving preparedness in the catchment through 27 measures, including working with communities to improve flood resilience (emergency flood plans) and improving flood warning systems and procedures. In addition to this, adapting to the risks associated with climate change and sea level rise will drive the Medway Estuary and Swale Strategies. These will also look at options for creating more sustainable coastal flood defence lines, through managed realignment.*

Protecting from risk:

- *There are 26 measures to protect the catchment through developing new flood defence schemes or improving existing ones such as the Leigh FSA. We will continue to progress new schemes and improve maintenance of the channel as funding allows. We are also working closely with local councils and the internal drainage boards to develop schemes and practices to reduce risk from surface water and ordinary watercourse flooding.*

3 Green Infrastructure and the Water Framework

3.1 Green Infrastructure

There are multiple definitions of Green Infrastructure; which can be defined as a strategically planned and managed urban network of green spaces and environmental components, which connect and surround the urban built environment and rural settings and can consist of:

- Open spaces – lakes, nature reserves, woodland, wetlands and formal gardens;
- Connections / linkages – greenways, canals and river corridors, pathways and cycle routes; and/or
- "urban green" networks – green roofs, private gardens, street trees and verges.

The NPPF defines Green Infrastructure as: *"a network of multi-functional green space, urban and rural, which is capable of delivering a wide range of environmental and quality of life benefits for local communities".*

Green Infrastructure is a multi-functional resource; it is capable of proving numerous services and benefits across many different sectors including climate change and sustainable development. It is central to climate change action and is referred to frequently in the planning policy. Identifying and planning for Green Infrastructure is intrinsic to sustainable growth and therefore, merits investment and consideration as much as other socio-economic priorities.

It has been recognised that Green Infrastructure can provide a means of flood mitigation and sustainable drainage, as well as improving water quality. For example, green spaces can be used as flood storage areas, managing storm flows and storing excess flows, to reduce the risk of damage to the built environment. Green Infrastructure can also support urban and rural regeneration and can provide an opportunity for a multi-functional network encompassing major landscape features, biodiversity and extensive habitats.

3.1.1 Tunbridge Wells Council Green Infrastructure Study

The South East Green Infrastructure Framework was published in 2009 to provide a regional-level approach to implementing the South East's Green Infrastructure Policy. However, following reforms to the planning system and the implementation of the Localism Act, the policy context for Green Infrastructure has significantly changed. Therefore, the Tunbridge Wells Green Infrastructure Supplementary planning document published in 2014 provides an updated borough-wide framework for Green Infrastructure in Tunbridge Wells. The main aim of the study is to set out:

"[…] a clear vision and framework for existing and future green infrastructure: setting out the current provision of green infrastructure assets; identifying areas where there are gaps in provision or linkages; and identifying potential opportunities for enhancing and filling these gaps".

Paddock Wood has been highlighted as one of a number of specific sites that will form the focus of the Council's efforts in terms of creating green infrastructure opportunities and linkages across the borough. This has been prompted by the outcomes of the Paddock Wood Surface Water Management Plan which aim to improve surface water management within Paddock Wood and reduce surface water risk. The Green Infrastructure Plan identifies that one of the specific objectives identified in order to reduce surface water flood risk is to develop and implement a policy to manage and reduce the impact of urban creep. The Green Infrastructure Study identifies that this could be achieved through:

" […] incorporating elements of green infrastructure into the sustainable design of new developments, or the retrofitting of existing development, in order to intersect rainfall before entering and overflowing the drainage system."

Appendix 2 of the Tunbridge Wells Borough Council Green Infrastructure Plan Supplementary Planning Document contains mapping showing the green infrastructure assets within Paddock Wood. Tunbridge Wells Borough Council are updating the Green Infrastructure Plan, which should be referred to when published.

3.1.2 Kent County Council Local Flood Risk Management Strategy (2013)

The LFRMS states that flood risk management authorities should support communities by managing risk in wats that take account of all potential current and future impacts and deliver significant economic, environmental and social benefits. Therefore, it is recommended that risk management solutions are 'forward looking' and implement the latest thinking regarding Water Sensitive Urban Design and Green Infrastructure.

Building adjacent to riverbanks can cause problems to the structural integrity of the riverbanks and the building itself, making future maintenance of the river much more difficult.

It also enables the avoidance of disturbing riverbanks, adversely impacting on ecology and the need to construct engineered riverbank protection.

3.2 Using this SFRA to support Green Infrastructure plans and strategies

The evidence base provided in this SFRA should be used to help inform Green Infrastructure Plans or Strategies in Tunbridge Wells. River corridors identified as functional floodplain can provide flood storage during a flood event. The council Green Infrastructure strategies should also incorporate any areas identified within the urban environment or upstream of a critical surface water flooding area. Creating flood storage areas or flow paths areas and improving accessibility to this land can help protect current and future property.

Potential development parcels, as identified by the Council, which have watercourses flowing through them, provide an opportunity to use the land as green infrastructure by adopting the Sequential design to locate development away from watercourses and Flood Zones, and by the use of SuDS. This can provide multiple benefits across a number of disciplines including flood risk and biodiversity / ecology and may provide opportunities to use the land for an amenity and recreational purposes. Run-off from green space can cause flooding in developed areas and this should be considered when deriving Green Infrastructure plans.

3.3 The Water Framework Directive

The EU Water Framework Directive (WFD) seeks to integrate and enhance the way in which water bodies are managed throughout Europe by the preservation, restoration and improvement of the water environment. On 23 October 2000 the European Commission established the Water Framework Directive (WFD) requiring each Member State of the European Union to satisfy the environmental objectives set by the Directive and implement the legislation. This was transposed into law in England and Wales by the Water Environment (Water Framework Directive) (England and Wales) Regulations 2003. In England, the Environment Agency (EA) is responsible for the delivery of the WFD objectives.

The Directive requires that Environmental Objectives be set for all surface and ground waters in England and Wales to enable them to achieve Good Ecological Status (or Good Ecological Potential for Heavily Modified and Artificial Water Bodies) by a defined date. The Thames River Basin Management Plan Update published in 2015 includes the following environmental objectives listed below:

- to prevent deterioration of the status of surface waters and groundwater;
- to achieve objectives and standards for protected areas;
- to aim to achieve good status for all water bodies or, for heavily modified water bodies and artificial water bodies, good ecological potential and good surface water chemical status;
- to reverse any significant and sustained upward trends in pollutant concentrations in groundwater;
- the cessation of discharges, emissions and losses of priority hazardous substances into surface waters; and
- progressively reduce the pollution of groundwater and prevent or limit the entry of pollutants.

The Environment Agency's River Basin Management Plans set statutory objectives for water bodies and describe how the measures will achieve them. The RBMP for the Thames RBD Management Plan sets out the chemical and the ecological objectives for each water body and a deadline by which the objectives need to be met. The target is for all waterbodies have to achieve Good Ecological Status (GES) or Good Ecological Potential (GEP) by 2021. Good Ecological Potential is

the best ecological improvements that can be achieved for a water body while still enabling Flood and Coastal Erosion Risk Management (FCERM) works to be undertaken to protect people and property from flooding. The RBMP for the Thames RBD Management Plan states that the GES and GEP status cannot be achieved for a number of water bodies by that deadline and outlines two further management cycles (2015-2021 and 2021-2027) which seeks to achieve this target by 2027. The 2027 deadline is an extended case where it is considered to be more appropriate, have less impact on existing activities or where the environment will need more time to respond to the planned measures.

The WFD defines the flow, shape and physical characteristics of a watercourse as its 'hydromorphology'. Any in-channel works can impact upon the shape of a watercourse and the natural processes that occur within it, including:

- Flow patterns;
- Width and depth of a channel;
- Features such as pools, riffles, bars and bank slopes;
- Sediment availability/transport;
- Interaction between a channel and its floodplain; and
- Ecology and biology (i.e. habitats which support plants and animals)

Any adverse impacts can cause a waterbody's ecology to deteriorate and prevent environmental improvements from being undertaken. Nevertheless, in-channel works can also be beneficial if they can be designed to help achieve environmental improvements (for instance two-stage channels as part of SuDS measures as indicated within the Paddock Wood Strategic Surface Water Management Strategy) included in the RBMP, thus enhancing the water environment for plants and animals.

3.4 Preventing deterioration in status

Any activity which has the potential to have an impact on the ecology of a waterbody will need consideration in terms of whether it could cause deterioration in its Ecological Status or Potential.

For each waterbody, three different status objectives are identified. These are the overall status objective, the ecological status or potential objective and the chemical status objective. A default objective for all water bodies is to prevent the deterioration in the Ecological Status (or Ecological Potential for Heavily Modified and Artificial Water Bodies) of the waterbody.

The Ecological Status of a waterbody is determined through analysis of its constituent biological Quality Elements (listed below). These elements are in turn supported by a series of physio-chemical and hydromorphological Quality Elements. These Quality Elements are taken from Annex V of the Directive and are listed below. The overall Ecological Status is determined by the lowest element status.

Biological Quality Elements:

- Fish
- Invertebrates
- Macrophytes
- Phytobenthos

Any activity that has the potential to have an impact upon any of the Quality Elements will need consideration in terms of whether it could cause a deterioration in the status of a waterbody. The activity will also need to be considered in terms of whether it will compromise the ability of the waterbody to reach Good Ecological Status or Good Ecological Potential by the date specified in the RBMP.

Whilst good ecological status is defined as a slight variation from undisturbed natural conditions in natural water bodies, artificial and heavily modified water bodies are unable to achieve natural conditions. Instead, artificial and heavily modified water bodies have a target to achieve Good Ecological Potential, which recognises their important uses, whilst making sure ecology is protected as far as possible. Ecological potential is also measured on the scale high, good, moderate, poor

and bad. The chemical status of these water bodies is measured in the same way as for natural water bodies.

Specific mitigation measures have been identified for each Artificial and Heavily Modified Waterbody and are listed in the RBMP. These mitigation measures are necessary to reduce the existing hydromorphological impacts on the waterbody and all measures need to be in place in order for the waterbody to achieve Good Ecological Status or Potential.

A ruling of the Court of Justice of the EU on the EU on the Weser dredging case (C-461/13) defining deterioration under the WFD was published on 1 July 2015. Whilst many of the Court's findings reflect the approach already adopted in the UK, some of the points of detail clarified by the ruling nonetheless have potentially important implications for anyone proposing an activity or development that could affect the ecological or chemical status of a waterbody.

The main conclusions of the Court are that:

- Member States are required – unless a derogation is granted – to refuse authorisation for an individual project where it may cause a deterioration of the status of a body of surface water or where it jeopardises the attainment of good surface water status or of good ecological potential and good surface water chemical status by the date laid down by the directive; and
- the concept of 'deterioration of the status' must be interpreted as meaning that there is deterioration as soon as the status of at least one of the quality elements, within the meaning of Annex V to the directive, falls by one class, even if that fall does not result in a fall in classification of the body of surface water as a whole. However, if the quality element concerned is already in the lowest class, any deterioration of that element constitutes 'a deterioration of the status' of a body of surface water.

3.5 Artificial or Heavily Modified Water Bodies

Whilst good ecological status is defined as a slight variation from undisturbed natural conditions in natural water bodies, artificial and heavily modified water bodies are unable to achieve natural conditions. Instead, artificial and heavily modified water bodies have a target to reach Good Ecological Potential, which recognises their important uses, whilst making sure ecology is protected as far as possible. Ecological potential is also measured on the scale high, good, moderate, poor and bad. The chemical status of these water bodies is measured in the same way for natural water bodies.

Specific mitigation measures have been identified for each Artificial and Heavily Modified Waterbody and are listed in the RBMP. These mitigation measures are necessary to reduce the existing hydromorphological impacts on the waterbody and all measures need to be in place in order for the waterbody to achieve Good Ecological Status or Potential.

3.6 WFD assessments

A detailed assessment should be undertaken to determine the effects that any proposed works within or adjacent to a watercourse could have upon Quality Elements. Any impacts identified should then be considered in relation to the Ecological, Hydromorphological and Chemical Status of the waterbody and the status objectives.

The following assessment objectives should then be used to determine whether the proposed works comply with the overarching objectives of the WFD. These objectives were therefore derived from the Environmental Objectives of the Directive:

- Objective 1: The proposed scheme does not cause deterioration in the Status of the Biological Elements of the waterbody
- Objective 2: The proposed scheme does not compromise the ability of the waterbody to achieve its WFD status objectives
- Objective 3: The proposed scheme does not cause a permanent exclusion or compromised achievement of the WFD objectives in other bodies of water within the same RBD
- Objective 4: The proposed scheme contributes to the delivery of the WFD objectives

In order to establish whether the strategy complies with the WFD it is necessary to ascertain whether the preferred options have the potential to result in:

- failure of a water body to achieve good ecological status or potential; or
- failure to prevent a deterioration in the ecological status or potential of a water body.

If the answer to these questions is 'no' the strategy can be considered WFD compliant. If either of these failures is identified, further assessment may be required to identify if the strategy meets all of the conditions set out by the WFD Legislation.

Future development should ensure there is no adverse impact on the quality of watercourses within the borough. Opportunities to improve the status of watercourses should also be considered.

3.7 Example restoration options and assessments

3.7.1 Structure removal and/or modification (e.g. weirs)

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

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

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

A detailed assessment would need to be undertaken to gain a greater understanding of the restoration response, including erosion and flood risk analysis to ensure that the post removal and / or modification scenario does not increase flood risk at the site and up and downstream of the site.

3.7.2 Re-naturalisation

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

4 Current understanding of flood risk in Paddock Wood

4.1 Historic flooding

Tunbridge Wells Borough and Paddock Wood more specifically has a well-documented history of flood events; the main sources of which are from fluvial (river/watercourses) and pluvial (surface water) sources.

The events of 1960, 1963, 1968, 1985, 2000 and 2009 caused widespread flooding within the north of the borough e.g. at Paddock Wood and Five Oak Green, and areas along the River Teise, due to heavy rainfall over a prolonged period of time. Further information relating to these events is given in the Level 1 SFRA for Tunbridge Wells Borough.

4.2 Topography, geology, soils and hydrology

4.2.1 Topography

The topography around Paddock Wood slopes very gently from approximately 28.0m AOD in the most southerly parcel to approximately 13.0m AOD at the most northerly. Elevations are typically lower to the north of Paddock Wood compared to the rest of the Tunbridge Wells borough due to the presence of several river valleys which main watercourses flow through including the Alder Stream and Paddock Wood Stream. Elevations to the south of Paddock Wood are much greater, rising to 107m AOD.

4.2.2 Geology and soils

The geology of a catchment can be an important influencing factor in the way that water runs off the ground surface. This is primarily due to variations in the permeability of the surface material and bedrock stratigraphy. Potential development parcels are located in the west of the study area are underlain by the Tunbridge Wells Sand Formation consisting of interbedded sandstone and siltstone whilst sites in the east are underlain by the Weald Clay Formation consisting of mudstone. The area is therefore likely to have a varied response to rainfall events, with eastern areas of the study area underlain by typically less permeable mudstones being characterised by a quicker catchment response. Flood volumes will be more critical for areas underlain by the less permeable Weald Clay Formation with areas underlain by the Tunbridge Wells Sand Formation having a slower response to rainfall.

There is a variety of superficial (at the surface) deposits in the study area including River Terrace Deposits, head Deposits and Alluvium.

4.2.3 Hydrology

A number of ordinary watercourses flow through the study area including the Alder Stream, Paddock Wood Stream and Tudeley Brook. In the east of the study area a number of unnamed, smaller ordinary watercourses which flow off the hills to the south of Paddock Wood and through a number of allocated sites before flowing into Paddock Wood Stream. Paddock Wood Stream flows through the centre of the study area in a northerly direction towards the River Medway. Tudeley Brook flows in a northerly direction through the west of the area before joining Alder Stream which flows in a north easterly direction adjacent to the study area.

4.3 Fluvial flood risk

The flood history of Tunbridge Wells Borough highlights that in the past there have been issues with insufficient capacity in Ordinary Watercourses and within the culverts, which have been observed to have surcharged during extreme events in the past.

The primary source of fluvial flood risk in Tunbridge Wells Borough is associated with the River Medway and its main tributaries e.g. the River Teise and River Beult. Records show that the River Medway has overtopped its banks and defences in several of the major flood events to have been experienced by the borough, including 1960, 1968 and 2000 and 2013/2014.

Flooding within the borough has also been associated with the Alder Stream, which flows through Five Oak Green, and Paddock Wood Stream, which flows through Paddock Wood. The Alder Stream catchment is described as particularly flashy, resulting in regular flooding from the Stream. Railway embankments act as a dam, which consequently exacerbates the flooding in this area of

the borough with roads and property having been affected in the past. In some instances, high water levels in the Alder Stream have affected highway drains, gullies, and local sewer networks.

Flooding incidents have been reported historically in Paddock Wood. The area to the north of the railway is reported to have been affected by flooding from the rivers Teise and Medway (flood events occurred in 1960, 1968, 2000/2001, 2013/14). The Paddock Wood Stage 2 SWMP reports that Paddock Wood Town Council have stated that the corner of Church Road, The Cedars and The Ridings floods every year. Flooding south of the railway is noted to generally be associated with heavy rainfall, resulting in flooding from surface water and watercourses that flow south to north through and adjacent to Paddock Wood. In 2000, the SWMP reports that approximately 50 properties were flooded from Gravely Ways Stream and Tudeley Brook.

4.4 Surface water flooding

Flooding from surface water runoff (or 'pluvial' flooding) is usually caused by intense rainfall that may only last a few hours and usually occurs in lower lying areas, often where the natural (or artificial) drainage system is unable to cope with the volume of water. Surface water flooding problems are inextricably linked to issues of poor drainage, or drainage blockage by debris, and sewer flooding. Data provided by Kent County Council shows that a total of 139 instances of surface water flooding have been recorded across the borough.

Paddock Wood has been identified as an area which has experienced a number of surface water flood events associated with small watercourses, sewerage and private drainage systems. The Paddock Wood Stage 1 Surface Water Management Plan (SWMP), undertaken in 2011 identified that reported instances of flooding have occurred due to surface water and minor watercourses, often occurring relatively rapidly from the onset of heavy rainfall. Very few dates or photographs were available for the recorded flood incidents, so it was not possible to get a clear picture of the severity or frequency of surface water flooding in the area. Table 2-3 and Map 5 of the SWMP identifies areas known to have historically flooded from surface water sources since 1960.

4.5 Groundwater flooding

Compared with other sources of flooding, current understanding of the risks posed by groundwater flooding is limited and mapping of flood risk from groundwater sources is in its infancy. Under the Flood and Water Management Act (2010), LLFAs have powers to undertake risk management functions in relation to groundwater flood risk. Groundwater level monitoring records are available for areas on Major Aquifers. However, for low lying valley areas, which can be susceptible to groundwater flooding caused by a high-water table in mudstones, clays and superficial alluvial deposits, very few records are available. Additionally, there is increased of groundwater flooding where long reaches of watercourses are culverted as a result of elevated groundwater levels not being able to naturally pass into watercourses and be conveyed to less susceptible areas.

BGS mapping indicates that the superficial river terrace deposits underlying much of Paddock Wood are designated as a secondary (undifferentiated) aquifer. Areas in and adjacent to the west of Paddock Wood are underlain by the bedrock aquifer of the Lower Tunbridge Wells Sandstone, whilst the eastern side of the town is underlain by Wealden Clay of low permeability.

Mapping of Paddock Wood and the surrounding area has been provided showing the Areas Susceptible to Groundwater Flooding (AStGWF) dataset defined in 1km grid squares. The information provided by the AStGWF dataset indicates that less than 25% of the area of the grid squares in the east and south of the study area are susceptible to groundwater flooding. A number of parcels in the north and north west of the study area are located in 1km grid squares where 25% - 50% of the area is susceptible to groundwater flooding.

More than 75% of the area within the 1km grid square directly north of Five Oak Green is also susceptible to groundwater flooding. A small area of one of the parcels is located within this grid square. It is noted that the groundwater susceptibility is unclassified in large areas to the west of Paddock Wood.

It should be noted that it is difficult to ascertain if a source of flooding is directly from groundwater. This is because the risk of flooding may be from a combination sources or in some cases, a culverted watercourse being mistaken for a spring or underground stream. Developers planning to build within any groundwater emergence zones should undertake site investigations to determine whether groundwater flooding is likely to be a problem locally.

4.6 Flood from artificial sources

4.6.1 Flooding from sewers

Sewer flooding occurs when intense rainfall overloads the sewer system capacity (surface water, foul or combined), and/or when sewers cannot discharge properly to watercourses due to high water levels. Sewer flooding can also be caused when problems such as blockages, collapses or equipment failure occur in the sewerage system. Infiltration or entry of soil or groundwater into the sewer system via faults within the fabric of the sewerage system, is another cause of sewer flooding. Infiltration is often related to shallow groundwater and may cause high flows for prolonged periods of time.

Since 1980, the Sewers for Adoption guidelines have meant that most new surface water sewers have been designed to have capacity for a rainfall event with a 1 in 30 chance of occurring in any given year, although until recently this did not apply to smaller private systems. This means that, even where sewers are built to current specification, they are likely to be overwhelmed by larger events of the magnitude often considered when looking at river or surface water flooding (e.g. a 1 in 100 chance of occurring in a given year). Existing sewers can also become overloaded as new development adds to the discharge to their catchment, or due to incremental increases in roofed and paved surfaces at the individual property scale (urban creep). Sewer flooding is therefore a problem that could occur in many locations across the Tunbridge Wells Borough and more specifically in Paddock Wood.

TG5 records provided by Southern Water indicate that there have been several reported flood instances in the Paddock Wood area as a result of overloading public sewer. The number of sewer flooding instances occurring in each postcode area is shown in Map 5 of the Paddock Wood SWMP. The areas which appear to be susceptible to sewer flooding are generally located from the allocated parcels which are predominantly in rural locations. One notable exception is the parcel to the west of Maidstone Road which is located adjacent to an area which has experienced at least six instances of sewer flooding.

4.6.2 Flooding from reservoirs

Reservoirs are artificial bodies of water, where water is collected and stored behind a man-made structure and released under control either to reduce the flow magnitudes in downstream channels or to meet a requirement when needed for purposes such as irrigation, municipal needs or hydroelectric power.

Reservoirs with an impounded volume greater than 25,000 cubic metres in England are governed by the Reservoir Act 1975, as amended by the Flood and Water Management Act, 2010 and are listed on a register held by the Environment Agency. The level and standard of inspection and maintenance required under the Act means that the risk of flooding from reservoirs is relatively low. Recent changes to legislation under the Flood and Water Management Act require the Environment Agency to designate the risk of flooding from these reservoirs.

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

Flooding as a result of a breach in a reservoir structure would only impact parcels in the north of the study area however this may be up to 2m in some cases. It is recommended that development in these areas should consider reservoir flooding during the planning stage. It recommended that developers seek to contact the reservoir owners to obtain more information on the relevant reservoir structure including characteristics and maintenance regime. Further information on the risk of reservoir flooding is given in the Level 1 SFRA.

5 Summary of Level 2 SFRA

5.1.1 Assessment methods

As part of the Level 2 SFRA, detailed parcel summary tables have been produced for each of the 10 potential development parcels.

The summary tables set out the flood risk to each parcel, including maps of extent, depth and velocity of flooding as well as hazard mapping. Additionally, the summary tables include hydraulic modelling assessments of development upon flood risk across the proposed development parcels. Each table also sets out the NPPF requirements for the parcel as well as guidance for site-specific Flood Risk Assessments.

Hydraulic modelling conducted specifically for the Level 2 assessment of the parcels focused on the actual risk of flooding for 1% Annual Exceedance Probability/100-year Return Period event both for the present day and accounting for climate change (Upper End fluvial flood scenario).

It is important to recognise that for the Level 2 SFRA a number of different sets of data have been used to clarify the actual risk. Mapping shown in the detailed parcel summary tables in Appendix I may differ slightly to the Environment Agency Flood Zones and 'Flood Map for Planning' due to the results obtained from additional modelling that was undertaken during the assessment of the 10 development parcels and given that various maps presented for the SFRA did not require the same level of post-processing as required by the Flood Map for Planning datasets.

5.1.2 Water Framework Directive

In England, the Environment Agency is responsible for the delivery of the WFD objectives and has therefore produced River Basin Management Plans describing how the WFD will be achieved. All waterbodies have to achieve Good Ecological Status (GES) or Good Ecological Potential (GEP) by a set deadline.

Future development should ensure there is no adverse impact on the quality of watercourses within the borough. Opportunities to improve the status of watercourses should also be considered. Example restoration options which could be considered are structure removal and/or modification and re-naturalisation

5.1.3 Strategic flood risk solutions

- The parcels studied are not currently protected by formal flood defences, but Leigh Flood Storage Area, located on the River Medway upstream of Tonbridge, acts to reduce the depth of flood water originating from the River Medway. For watercourses flowing in a northerly direction towards Paddock Wood, actual risk is aligned with the magnitude of events that describe the Flood Zones (i.e. the extent of the risk is the same whether or not defences are taken into account). For the River Medway the Leigh Flood Storage Area reduces actual flood extents and levels on the floodplain at the north of Paddock Wood and so actual flood risk is less than the risk described bythe Flood Zones.
- Consideration needs to be given to where flood risk management measures may be required in the future to manage flood risk in the borough (e.g. due to influence of climate change on fluvial flood flows,). Strategic provisions for future flood risk management may provide an opportunity to make a proposed development safe, but confirmation of potential offsite effects (and mitigation of these), residual risk, and maintenance arrangements for the lifetime of the development (e.g. funding the measure) is required. The testing completed as part of this SFRA provides a strategic understanding of the potential effect of development and the potential for mitigation by implementing flood risk management measures. Some of the proposed development configurations are shown to have notable influence on flood risk, both within development parcels but also existing areas of development in Paddock Wood. Equally, some flood risk management measures have a large potential effect on flooding (e.g. depths and extents) in Paddock Wood. Future and more detailed assessment should refine understanding of how measures may reduce flood risk, and their viability.
- Floodplain restoration or augmentation represents the most sustainable form of strategic flood risk solution by allowing watercourses to return to a more naturalised state. This may involve measures such as:

- return existing and future brownfield sites that are adjacent to watercourses back to floodplain, rather than allowing new development;
- providing greater connectivity of the channel and floodplain (e.g. by removing raised banks);
- removal of redundant structures to reconnect the river and the floodplain; and
- apply the Sequential Approach to avoid new development within currently undefended floodplain.
- In more rural environments can be possible to make provision for areas where the volume of storage during a flood is increased by introducing flood plain interventions.

- Many of the possible site options identified by the Council are located on the rural fringe of existing settlements, therefore the opportunity to restore floodplain in previously developed areas is limited. However, by using the Sequential approach and by locating development away from watercourses it will help to ensure that the watercourse retains connectivity to its floodplain.
- Where complex flood risk issues are highlighted it is important that all stakeholders are actively encouraged to work together to identify issues and provide suitable solutions. Engagement with riparian owners is also important to ensure they understand their rights and responsibilities including:
  - maintaining river beds and banks;
  - allowing the flow of water to pass without obstruction; and
  - controlling invasive alien species e.g. Japanese knotweed.

5.1.4 Principle of development at the proposed development parcels

At each of the ten proposed development parcels, the assessment generally shows that the principle of development can be supported. The proposed development tested was positioned preferentially in lower fluvial flood risk zones, where possible in accordance with the sequential approach. This helps to reduce the change in risk (e.g. extents and depths of flooding). An exception to this general conclusion is the eastern development area considered at parcel 1, which is discussed in greater detail below.

When the effects of development areas were evaluated using the flood risk modelling (by simply raising developed areas completely above the flood level) changes in flood risk were predicted from all parcels, with each displaying detriment to some locations in the catchment downstream. In most cases the changes in risk were relatively minor (e.g. parcels 4, 7, 9, 11 and 12) and resulted from the deflection of flood water, due to the raised development areas blocking routes that rainfall and/or overland flow would follow. The representation of development in the model has been simplistic and thus it is possible that these issues may not occur or cause much less effect when actual site layouts and drainage arrangements are defined. The results from the modelling performed for the SFRA assessment indicate that adjusting the site layout (where buildings are positioned), implementing more formal flood risk management measures (e.g. new or improved drainage channels, flood storage) or raising the developed area of buildings above ground level can all contribute to the management of the flood risk. On the basis of the results from the strategic assessment, the outputs show that the principle of development can be supported.

For sites where the results from the assessment indicate that the proposed development results in more pronounced flood risk effects (e.g. 1, 2, 3, 5 and 6), the assessment shows that the principle of development can still be supported, but in these circumstances more substantive interventions are needed to manage the change in flood risk. Of all of the parcels tested, positioning a development area at the east of parcel 1 has greatest potential effect on flooding, as this proposal results in the obstruction of a well-defined flow route. The obstruction of this flow route reduces the eastward flow of flood water, reducing flood extents and depths at existing developed areas of Paddock Wood. However, this obstruction also diverts greater volumes of flood water northwards towards the railway line and parcels 2, 3 and 4.

Of the flood risk management measures considered for the purpose of the strategic assessment, strategic storage of flood water was the approach with the potential to mitigate the increased risk to areas of land resulting from the development at the east of parcel 1 (although other flood risk management measures considered could contribute). Therefore, it is important to investigate the

potential for this measure to be realised. When parcels 2-12 are considered in isolation, their influence on flood risk is less notable, given the development areas are positioned in the lowest risk areas. For these areas, while storage of flood water is one means of addressing changes in flood risk, other flood risk management approaches may provide the mitigation needed (e.g. increasing conveyance with new channels or improving existing channels).

Appendices

I Level 2 parcel summary sheets

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