In partnership with:

Medway Council

Strategic Flood Risk Assessment
Medway Council

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Strategic Flood Risk Assessment
Medway Council

Contents Amendment Record

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Executive Summary

The National Planning Policy Framework (NPPF) and accompanying National Planning Practice Guidance (NPPG) both emphasise the responsibility of Local Planning Authorities (LPA's) to ensure that flood risk is understood, managed effectively and sustainably throughout all stages of the planning process. This Strategic Flood Risk Assessment (SFRA) identifies that Medway is at risk from a number of sources of flooding, with over 40km of coastline, low-lying marshland and the River Medway flowing through the area. It is therefore evident that flooding must be a key consideration for any future development within Medway.

The focus of this SFRA update is address the changes since the previous SFRA addendum was prepared in 2011, to bring the planning context and flood risk information up to date, and to reflect changes in policy and legislation. The SFRA is also intended to aid development policies to support the emerging Local Plan. The main objectives are as follows:

- To identifying the risk from each source of flooding at key locations within Medway.
- Outline the requirements of the Sequential Test and Exception Test.
- To state the requirements of a Flood Risk Assessment (FRA) and to provide guidance for developers on how to prepare a compliant FRA.
- To state the requirements in relation to surface water drainage and provide guidance for developers on how to complete the Sustainable Drainage (SuDS) proforma.
- Recommend Local Plan policies in relation to the management of flood risk.

This report is supplemented by a series of mapping, which provides information required to appraise the risk of flooding and includes the location of the key watercourses and defences, as well as historic records of flooding.

The Medway Towns are earmarked for future development, and the low-lying marshes to the north provide internationally important habitats. Both are at increasing risk of flooding due to climate change and future protection will therefore be dependent on flood and coastal risk management. Priority should be given to improving the standard of protection provided by defences over the lifetime of any development.

It should be recognised that at the time of publication, Medway Council is developing the emerging Local Plan. As such, the information contained within this report will help to support this process and the guidance in relation to the points stated above should be considered when developing any local planning policies relating to flood risk management.

Looking forward, the information contained within this report will assist the LPA to draft policies for use within the emerging Local Plan and provide developers with the guidance required to accurately appraise the risk of flooding as part of a planning application. Notwithstanding this, it should also be acknowledged that the SFRA is a living document and as such, should be regularly updated to ensure that the most contemporary information in relation to flood risk is considered.

Contents Page

1. Scope of Appraisal **1**

1.1. Drivers for the SFRA *1*

1.2. Key Updates Since 2011 *2*

1.3. Objectives of the 2020 SFRA *3*

2. Background **4**

2.1. Study Area *4*

2.1.1. Topography 5

2.1.2. Geology 5

2.2. Sources of Flooding *6*

2.2.1. Flooding from Rivers and Watercourses 6

2.2.2. Flooding from the Sea 7

2.2.3. Flooding from Surface Water 7

2.2.4. Flooding from Groundwater 8

2.2.5. Flooding from Sewerage Infrastructure 8

2.2.6. Flooding from Reservoirs 9

2.3. Historic Flooding *9*

2.4. Design Flood Event *9*

2.5. Climate Change *10*

2.5.1. Extreme Sea Level 10

2.5.2. Offshore Wind Speed and Extreme Wave Height 11

2.5.3. Peak River Flow 12

2.5.4. Peak Rainfall Intensity 13

2.5.5. Impacts of Climate Change on Medway 14

2.6. Flood Defences *15*

2.7. Actual Risk and Residual Risk *15*

3. Policy Requirements **18**

3.1. Applicable Policies and Studies *18*

3.2. Definition of Development Types *21*

3.2.1. Householder Development 21

3.2.2. Minor Development 21

3.2.3. Major Development 22

3.2.4. Permitted Development 22

3.2.5. 'Small Development' 22

3.2.6. 'Minor Development' in Relation to Flood Risk 23

3.3. Requirements for a Flood Risk Assessment *23*

4. Flood Risk Management **25**

4.1. What should an FRA include? *25*
4.2. Sequential Test *26*
4.3. Exception Test *27*
4.4. Designing for Flood Risk *29*
4.4.1. Flood Risk Standing Advice 30
4.4.2. Sequential Approach 31
4.4.3. Flood Defences 31
4.4.4. Land Raising and Raising Finished Floor Levels 31
4.4.5. Resistance and Resilience 32
4.4.6. Compensatory Flood Storage 33
4.4.7. Impedance of Flood Flows 35
4.4.8. Proximity to Watercourses 35
4.4.9. Maintenance and Biodiversity Easements 35
4.4.10. Permitting and Consent 36
4.4.11. Safe Access Routes 36

5. Management of Surface Water Runoff **38**

5.1. Requirements for a Surface Water Management Strategy *38*
5.2. Proposed Method of Discharge *40*
5.2.1. Discharging via Infiltration 40
5.2.2. Discharging to a Tidal Waterbody 41
5.2.3. Discharging to a Watercourse or Surface Waterbody 42
5.2.4. Discharging to a Sewer 43
5.3. Development Runoff Rates and Volumes *43*
5.3.1. Methods for Calculating Surface Water Runoff Rates 44
5.3.2. Limiting Surface Water Discharge Rates 44
5.3.3. Limiting Surface Water Discharge Volumes 44
5.4. Water Quality *44*
5.5. Urban Creep *45*
5.6. Maintenance *45*
5.7. Surface Water Management in Construction *45*
5.8. Sensitivity Testing *46*
5.8.1. Exceedance Event 46
5.8.2. Blockage Event 46
5.8.3. Evaluating the Impacts of a Sensitivity Scenario 46

6. Local Plan Policy Recommendations **48**

7. Conclusions **49**

A. Appendices

1. Scope of Appraisal

1.1. Drivers for the SFRA

The National Planning Policy Framework (NPPF) requires the Local Planning Authority (LPA) to apply a risk-based approach to the preparation of development plans with respect to potential flooding. This district-wide appraisal of flood risk is to be delivered through the Strategic Flood Risk Assessment (SFRA). Herrington Consulting has been commissioned by Medway Unitary Council to update the SFRA (addendum) which was prepared in 2011, which pre-dated the introduction of the NPPF in 2012 (updated in 2018, and 2019). This latest version of the SFRA report has therefore been prepared in accordance with the requirements of the NPPF, as outlined within Paragraphs 9 and 10 of the *Planning Practice Guidance: Flood Risk and Coastal Change*.

This study provides an up to date analysis of the main sources of flood risk across the administrative area, together with a detailed means of appraising development allocation sites and existing planning policies, against the risks posed by flooding over this coming century.

The predominant risk of flooding is from tidal sources (the River Medway and the coast). The defence infrastructure currently provides a varying level of protection to the areas of ecological importance across the low-lying land in the north of Medway, and the strategically important towns situated along the tidal River Medway. The centre of the district is in parts low lying, and the varied topography throughout the district can present a risk of surface water flooding to both rural and urban communities alike. Consequently, the focus of the SFRA is to provide a strategic overview of the risk of flooding from each of the main sources of flooding to enable informed spatial planning decisions to be made.

The completion of the SFRA addendum in 2011 quantified the risk of flooding for a set number of strategic sites, however, since the publication of the first SFRA many of these strategic sites have either been developed, or alternatively are no longer relevant/available. As such, the 2020 SFRA has been prepared to provide a revised view in relation to flood risk, collating information relating to the physical characteristics of the district and defining the relevant planning policies relating to all forms of flooding. In addition, the revised SFRA is aimed at providing developers with clear guidance on how to submit information relating to flood risk in support of planning applications.

It is acknowledged that the way in which the risk of flooding is managed is constantly changing, with improved predictions relating to climate change and new planning policy reflecting the changes in relation to requirements for development. As such, it is imperative that the SFRA is adopted as a ‘living’ document and is reviewed regularly in light of emerging policy directives and an improving understanding of flood risk within Medway.

1.2. Key Updates Since 2011

Since the latest SFRA addendum report in 2011 there has been a number of key developments in national policy. An overview of the policies which are currently applicable is provided in Section 3.1 of this report. Since the previous SFRA report was prepared, the most notable change has been the introduction of the NPPF in 2012, which was updated in 2018, and again in 2019. The 2011 SFRA addendum referenced the now superseded Planning Policy Statement 25 (PPS25) and the accompanying technical guidance, both of which are now obsolete. The latest technical guidance which compliments the NPPF was released in 2014 and is called the National Planning Policy Guidance Suite (NPPG). The information contained within the NPPG can be found at; https://www.gov.uk/government/collections/planning-practice-guidance.

The Flood and Water Management Act was introduced in 2010 and defines responsibilities for managing flood risk in England and Wales. Under the FWMA, County or Unitary Authorities, such as Medway, were designated as 'Lead Local Flood Authorities' (LLFA). The LLFA is responsible for managing flood risk at a local scale, which includes supporting the use of Sustainable Drainage Systems (SuDS).

Following consultation on Schedule 3 of the FWMA, the Non-Statutory Technical Standards for Sustainable Drainage Systems (NSTSDS) were released in March 2015. Further to this, Paragraph 163 of the latest National Planning Policy Framework (NPPF) promotes the use of SuDS in areas at risk of flooding. In light of this, local guidance is also included within this SFRA to encourage all new development to manage surface water runoff sustainably.

The enactment of the EU Floods Directive (2007) and subsequent Flood Risk Regulations (2009) included the production of Preliminary Flood Risk Assessments by 2011, and risk maps, which were released in December 2013. These maps identify areas which are at risk of flooding from rivers or the sea, surface water and reservoirs, and are publicly available. These maps are updated on a regular basis, and the latest version of these maps at the time of publication has been used within this report to appraise the risk of flooding across the district.

Finally, datasets managed by the EA are now freely available, including data from flood modelling studies and aerial height data (LiDAR). Updates in flood data in this area include a numerical flood model of the River Medway and North Kent Coast, which consider the impact of climate change on fluvial and tidal flood risk. The results from these modelling studies have been considered within this report.

1.3. Objectives of the 2020 SFRA

The key objectives of this SFRA are;

- to update the SFRA report to reflect changes in planning policy, guidance and data availability since the previous SFRA was prepared in 2011;
- provide an overarching appraisal of the risk of flooding across the district from all sources;
- inform the sustainability appraisal so that flood risk is taken into account when considering strategic land use policies;
- provide sufficient data and information to enable the Council to apply the Sequential Test to land use allocations and to identify whether the application of the Exception Test is likely to be necessary;
- to support the Council's policies for the management of flood risk within the Local Plan and to assist with the testing of site proposals;
- provide prescriptive guidance to developers on the requirements for managing the risk of flooding to a development, ensuring that development is sustainable into the future (i.e. in response to a changing climate) and, addressing the potential increased risk of flooding elsewhere as a result of development;
- consider the acceptability of flood risk in relation to emergency planning capability, and;
- consider opportunities to reduce flood risk to existing communities and developments through better management of surface water, provision for conveyance and of storage for flood water.

2. Background

2.1. Study Area

Located in the county of Kent, Medway comprises a Unitary Authority covering an area of approximately 268 square kilometres with a population of greater than 275,000. A map of Medway is provided in Figure 2.1 below, delineating the 5 main towns of Rainham, Gillingham, Chatham, Rochester and Strood. The more rural areas on the Hoo Peninsula and Isle of Grain are located in the north of Medway.

Figure 2.1 – Location map of Medway (Contains Ordnance Survey data © Crown copyright and database right 2020)

There are a number of areas which are of international importance, due to the habitats they provide for a variety of species of flora and fauna. To the southwest lies the North Downs Woodland Special Area of Conservation (SAC). There are also a number of other areas which are designated as Sites of Special Scientific Interest (SSSI). The Estuary and Marshes of the River Thames and Medway are designated as Special Protection Areas (SPA), Ramsar sites, and as a SSSI. The marshes comprise a unique tidal system which supports saltmarshes and grazing marshes and supports various coastal habitats, particularly for wild birds. Further information on land designations can be found at;

https://magic.defra.gov.uk/MagicMap.aspx

2.1.1. *Topography*

Land levels across Medway range from 0m Above Ordnance Datum Newlyn (AODN) across the low-lying areas to the north, to approximately 200m AODN in the chalk uplands located to the south. The north of the area is relatively flat and comprises drainage marshland, with the exception of a small series of hills across the Hoo Peninsula. The River Medway cuts a valley through the chalk downs, with low-lying land levels adjacent to the River and its associated tributaries.

2.1.2. *Geology*

Figure 2.2 shows the bedrock geology, which can be seen to follow the general topography of the area. Chalk dominates the southern half of Medway, whilst clay-like geology is typically found in the low-lying marsh area to the north.

Superficial soil deposits can be found across many of the hills and valleys throughout Medway, including the Chalk Downs, Luton Valley and elevated areas of the Hoo Peninsula. The lower lying areas of Medway, including areas adjacent to the River Medway mostly comprise superficial deposits of Alluvium or tidal flat deposits.

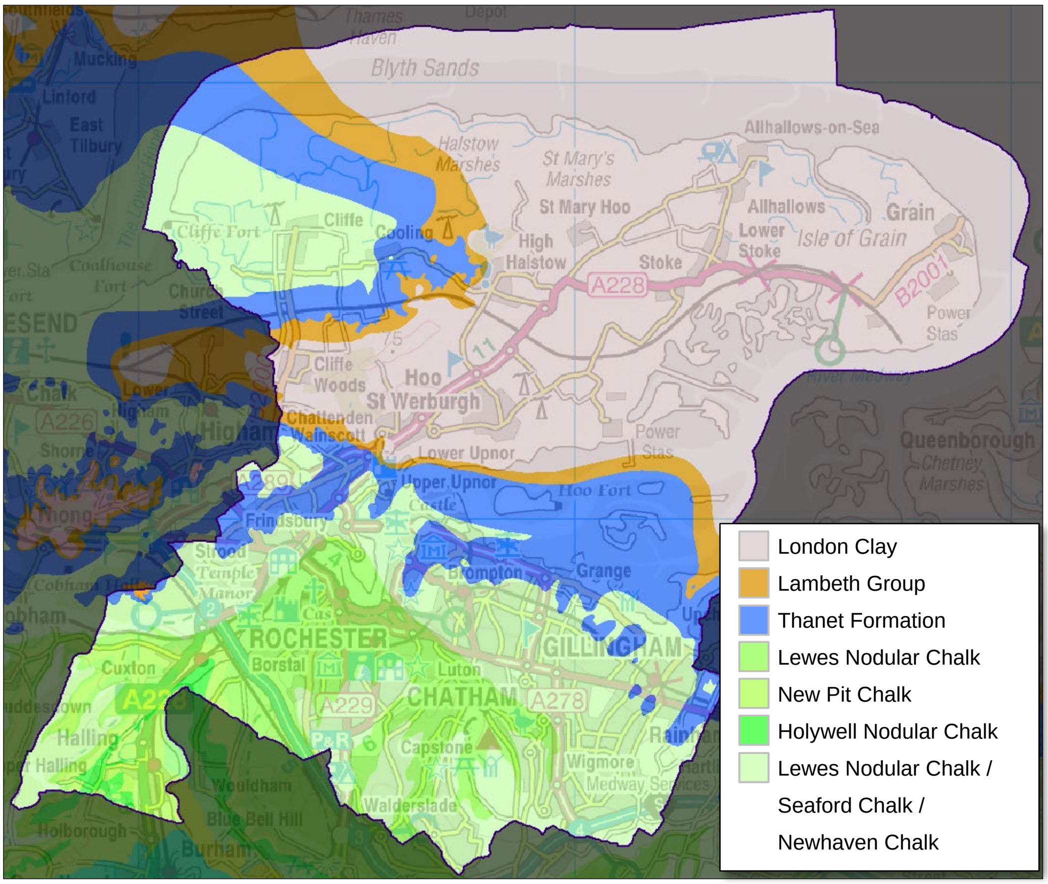

Figure 2.2 – Bedrock geology map of Medway (© British Geological Survey 1999/013A, Ref IPR/1809-209DX), Mapping contains Ordnance Survey Data © Crown copyright and database right 2020)

2.2. Sources of Flooding

2.2.1. Flooding from Rivers and Watercourses

There are a number of rivers and watercourses throughout Medway and the location of these are shown on the map in Appendix A.2.

The River Medway is classified as a 'main river' and passes from Halling in the south, through the towns of Rochester, Strood and Upnor in the north whereby it forms the Medway Estuary. The tidal limit is located at Allington Lock (approximately 8km south of Medway). Through the urban centre of the Medway Towns, the River Medway is relatively confined within the river valley and from St Mary's Island onwards, the river widens into an estuary which encompasses the Hoo Salt Marsh, Nor Marshes and Stoke Saltings.

The northern side of the Hoo Peninsula is bordered by the River Thames, which is also tidally influenced. The tidal limit of the River Thames is located at Teddington Lock over 70km further upstream of the river mouth. The tidal influence of the River Medway and River Thames means that water levels will be governed by extreme sea levels within the estuary.

The north of Medway is dominated by marshland, which is drained by a network of man-made ditches, the primary function of which is to maintain lower water levels across the marshlands. The drainage ditches across the Cliffe Marshes, Cooling and Halstow Marshes, Allhallows Grain and Stoke Marshes all drain into the River Thames. Tide locking at the outlet of these watercourse may result in increased water levels within the network of ditches, which in turn could result in localised flooding of the lower-lying areas. The North Kent Marshes Internal Drainage Board (NKMIDB) are responsible for the management of these ditches.

2.2.2. *Flooding from the Sea*

There are two main ways that the sea can cause flooding; An extreme increase in the sea level, or through wave overtopping; These two mechanisms are discussed below.

- An extreme increase in water levels, known as a surge event, can occur when an already high tide coincides with a low-pressure weather event, resulting in the surface of the sea becoming elevated. Unlike the day-to-day tide, the height of a surge event is difficult to predict. Elevated sea levels due to a surge could result in flooding in coastal locations.

- A wave overtopping event usually occurs when large powerful waves collide with the shoreline, or sea defences, forcing seawater landwards. In this event the effects can be exacerbated by strong onshore winds, which contribute to increased runup and spray from the waves, allowing water to pass over the crest of the sea defences.

Development located directly behind the defences could be susceptible to flooding from wave overtopping or breach. This type of flooding is likely to occur when waves repeatedly strike the defence during a storm event resulting in overtopping or failure, and/or if the drainage system cannot cope with the sudden deluge of water. The results provided by the EA as part of their numerical flood modelling reveals that the Isle of Grain and parts of the Cliffe Marshes and Hoo Peninsula could be subject to flooding when waves overtop the defences. However, this is likely to be confined to the marshes and is unlikely to affect any larger settlements.

2.2.3. *Flooding from Surface Water*

The risk of flooding from surface water within the area is almost entirely governed by natural land levels. A series of small valleys has been identified within the town centres which direct surface water flows towards low points, where flood water has the potential to accumulate. This combined with large areas of impermeable surfacing, can contribute to increases in runoff rates and localised flooding as a result of this mechanism is known to have occurred in the past.

On the Hoo Peninsula, the majority of surface water is collected by the network of drainage ditches which dominate the landscape. Whilst the drainage ditches across the Peninsula act to drain the surrounding land, there are instances of historic flooding in this location, during which the capacity of these drainage ditches has been exceeded following an extreme rainfall event. Furthermore, the majority of the drainage network discharges into the River Thames and the River Medway, and therefore flooding has the potential to occur when high water levels in these rivers prevent the water discharging freely from the drainage network.

2.2.4. *Flooding from Groundwater*

Groundwater flooding typically occurs in areas with permeable underlying geology. The emergence of groundwater can occur in topographic low points, or where a groundwater spring has formed.

The Chalk Downs form a large principle aquifer and hold a large volume of groundwater. The migration of water through the chalk primarily occurs through fissures and fractures within the rock. Water held within the chalk is extracted via a number of mechanisms; human activity, wells and pumping stations, or is naturally drained to surface waters by springs. There is potential for groundwater flooding across the chalk downs, especially at the base of dry valleys, where large seasonal fluctuations in groundwater levels can reactivate springs or watercourses that are normally dry. The sometimes seasonal, or more often infrequent activation of springs, can in some cases make it particularly difficult to predict where groundwater emergence is likely to occur.

The influence of human activity (i.e. abstracting groundwater) may also need to be considered, especially as in recent years the reduction in groundwater extraction for industry has contributed to groundwater rebound. This is where water levels within aquifers return to a level which is higher than the natural levels.

Groundwater flooding is also possible in other areas of Medway, including the low lying flat land adjacent to the watercourses, such as the River Medway, or the Estuary. Groundwater emergence can also occur where barriers are introduced to natural groundwater flow or where subterranean structurers such as basements or tunnels are constructed below the water table. In these cases, care should be taken with respect to the design of underground structurers, to ensure the influence on groundwater does not result in an increased risk of flooding at the site or within the surrounding area. An assessment of groundwater flood risk is included within the Medway Local Flood Risk Management Strategy.

2.2.5. *Flooding from Sewerage Infrastructure*

Flooding from sewers can occur when the sewer is overwhelmed by heavy rainfall, becomes blocked, or is of inadequate capacity. Sewer networks are typically designed to accommodate the water generated under a storm with a 1 in 30 year return period and as such, higher return period rainfall events can cause sewers to surcharge. As a result, water may back up through pipework, flooding properties, or exit the sewer system via gullies and manholes.

Although typically confined to urban areas, sewer flooding is still possible within more rural locations where the sewer network is not so extensive and therefore, may have less capacity available. Common locations where sewer flooding can occur are where the gradient of sewer pipes become shallow. For example; upon reaching the base of valleys, near junctions between several sewers, and where large volumes of surface water runoff can easily enter the combined or foul sewer network. When a significant volume of water enters a combined or foul sewer, there is a risk that floodwater could become contaminated by foul effluent. The hazards attributed to untreated foul effluent can increase the risk associated with sewer flooding, although generally the effects are relatively localised.

Although sewers may be designated for draining surface water, foul water, or combined waste, it is recognised that misconnections can occur. This can result in a reduction in available capacity, increasing the likelihood of sewer flooding. The removal of unauthorised misconnections should therefore be a priority for minimising the risk of sewer flooding.

2.2.6. Flooding from Reservoirs

There are no potable water reservoirs within Medway, nor are there any artificial waterways such as canals. However, The EA's 'Risk of Flooding from Reservoirs' website does identify three reservoirs; the Bough Beech reservoir, Weird Wood reservoir and Bewl Water reservoir, all of which have the potential to flow into the River Medway during flood conditions. Although the risk of these privately owned and well maintained structures failing is low, these is still a minor risk of flooding from this source.

2.3. Historic Flooding

A review of the historic flood records for Medway has identified that there has been a number of minor flood events since the original SFRA addendum was published in 2011. These mainly comprise localised surface water and sewer flooding incidents within the more urban parts of Medway (i.e. the Medway Towns). More recent flooding from extreme rainfall occurred across urban areas in Medway in 2016 and 2018.

With regard to historic flooding from rivers or the sea, the last major flood event from the coast was recorded in 1953, during the storm surge which affected most of the North Kent coast. Since this date, tidal surges which resulted in minor flooding have been recorded in December 2005 and in 2013.

The historic records have been updated and are presented on the map in Appendix A.1. A list of the stakeholders which have contributed historical records of flooding as part of this SFRA are presented in Appendix A.8.

2.4. Design Flood Event

The magnitude of a flood event is expressed as its probability of occurrence. This can be defined as the average number of years expected before another event of the same magnitude will occur (termed the 'recurrence interval'). This is more commonly referred to as the return period and is expressed as the '1 in X year return period' event. Alternatively, events are defined as the probability that an event with a greater magnitude will occur in any one year, this is referred to as the Annual Exceedance Probability and is expressed as a percentage (i.e. X% AEP).

The NPPF requires that the risk of flooding is appraised for the 'design flood' event. For most sources of flooding this is defined as the 1 in 100 year return period or 1% AEP event. The exception is tidal flooding, where the design flood is based on the 1 in 200 year return period or 0.5% AEP event. In all circumstances, an allowance for climate change over the expected lifetime of the proposed development is also required to be considered.

The design event is used to appraise the suitability of a development and should inform the design of any mitigation measures.

2.5. Climate Change

The global climate is constantly changing, but it is widely recognised that we are now entering a period of accelerating change. Over the last few decades there have been numerous studies into the impact of potential changes in the future and there is now an increasing body of scientific evidence which supports the fact that the global climate is changing as a result of human activity. Past, present and future emissions of greenhouse gases are expected to cause significant global climate change during this century.

The nature of climate change at a regional level will vary: for the UK, projections of future climate change indicate that more frequent short-duration, high-intensity rainfall and more frequent periods of long-duration rainfall of the type responsible for the recent UK flooding could be expected.

These effects will tend to increase the size of flood zones associated with rivers, and the amount of flooding experienced from other inland sources. The rise in sea level will change the frequency of occurrence of high water levels relative to today's sea levels. It will also increase the extent of the area at risk should sea defences fail, although this increase will be comparatively small in the area due to the valley topography of the coastal floodplains. Changes in wave heights due to increased water depths, as well as possible changes in the frequency, duration and severity of storm events are also predicted.

To ensure that any recommended mitigation measures are sustainable and effective throughout the lifetime of the development, it is necessary to base the appraisal on the extreme flood level that is commensurate with the planning horizon for the proposed development. The NPPG states that residential development should be considered for a minimum of 100 years, but that the lifetime of a non-residential development depends on the characteristics of the development. For commercial development, a 60 year design life is typically assumed, although the LPA and Environment Agency should be consulted to determine the most appropriate design life for each development.

2.5.1. Extreme Sea Level

Global sea levels will continue to rise, depending on greenhouse gas emissions and the sensitivity of the climate system. The relative sea level rise in England also depends on the local vertical movement of the land, which is generally falling in the south-east and rising in the north and west.

Since the previous SFRA, the Environment Agency has published new guidance on sea level rise allowances for climate change. Reference to guidance published by the EA specifies allowances for different regions across England. The predicted rates of relative sea level rise for the 'South East' region, relevant to Medway, are shown in Table 2.1. These values correspond with the Higher Central and Upper End percentiles (the 70th and 90th percentile respectively). The latest guidance provided by the Environment Agency recommends that the impact of both categories is appraised as part of a Flood Risk Assessment (Section 4.1).

Administrative Region	Allowance Category	Net Sea Level Rise (mm/yr) (Relative to 2000)			
		2000 to 2035	2036 to 2065	2066 to 2095	2096 to 2125
South east	Higher Central	5.7	8.7	11.6	13.1
	Upper end	6.9	11.3	15.8	18.2

Table 2.1 – Recommended contingency allowances for net sea level rise. Adapted from the EA guidance 'Flood risk assessments: climate change allowances'

When these values are applied to the current day predicted extreme sea levels, it can be seen that the increase in sea level is significant and is not linear. The extreme water levels under a 1 in 200 year event have therefore been calculated for time steps between the current day and the year 2125 for both the 'Higher Central' and 'Upper End' scenarios. These values are summarised in Table 2.2 below for node point 4316, which is located north of Grain and provides an indicative profile of the predicted extreme sea level in this area.

Year	'Higher Central' scenario	'Upper End' scenario
Current day (year 2017)	4.65	4.65
2035	4.85	4.89
2065	5.11	5.23
2080	5.28	5.47
2095	5.46	5.70
2115	5.72	6.07
2125	5.85	6.25

Table 2.2 – Climate change impacts on extreme flood levels

2.5.2. *Offshore Wind Speed and Extreme Wave Height*

As a result of increased water depths resulting from changes in the climate, wave heights may change. The following allowances in Table 2.3 for offshore wind speed and wave height are applicable around the entire English coast and are relative to a 1990 baseline. These figures also include a sensitivity allowance, to show that the potential impact of climate change.

Parameter	2000 to 2055	2065 to 2125
Offshore wind speed allowance	+5%	+10%
Offshore wind speed sensitivity test	+10%	+10%
Extreme wave height allowance	+5%	+10%
Extreme wave height sensitivity test	+10%	+10%

Table 2.3 – Recommended climate change allowance and sensitivity ranges for offshore wind speed and extreme wave height (relative to 1990 baseline). Adapted from the EA guidance 'Flood risk assessments: climate change allowances'

2.5.3. Peak River Flow

Since the previous SFRA, the Environment Agency has published new guidance on the peak river flow allowances for climate change. The new figures show the anticipated changes to peak river flow by river basin district. Medway is covered by the Thames River Basin Districts, as defined by the Environment Agency River Basin maps. A copy of these maps can be found at;

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

For each district a range of climate change allowances are provided for different time epochs over the next century, which correlate with the planning horizons for the varying classifications of development.

For each epoch there are three climate change allowances defined. These represent different levels of statistical confidence in the possible emissions scenarios on which they are calculated. The three levels of allowance are as follows:

- Central: based on the 50th percentile
- Higher Central: based on the 70th percentile
- Upper End: based on the 90th percentile

With reference to this methodology, it is recognised that although the higher percentile allowances are possible, these events are less likely to occur.

As well as encouraging sustainable development to meet the demands of a growing population, the NPPF also promotes a precautionary approach. For more vulnerable development in areas of higher risk of flooding, a higher percentile allowance is recommended in order to manage the risk of flooding over the lifetime of the proposed development. The Environment Agency has therefore provided guidance regarding the application of the climate change allowances and how they should be applied in the planning process, which can be seen in Table 2.4 below.

Flood Risk Vulnerability Classification	Flood Zone 2	Flood Zone 3a	Flood Zone 3b
Essential infrastructure	↑	↑	↑
Highly vulnerable	↗ ↑	X	X
More vulnerable	↗ ↑	↗ ↑	X
Less vulnerable	→ ↗	→ ↗	X
Water compatible development	→	→	→

Key:

↑	Upper End	→	Central
↗	Higher Central	X	Development should not be permitted

Table 2.4 – Recommended Climate Change allowance percentile based on flood risk vulnerability and flood zone compatibility. Adapted from the EA guidance 'Flood risk assessments: climate change allowances'

The allowances for Medway cover the Thames River Basin District and are shown in Table 2.5 below.

River Basin District	Allowance Category	2015 to 2039	2040 to 2069	2070 to 2115
Thames	Upper End	25%	35%	70%
	Higher Central	15%	25%	35%
	Central	10%	15%	25%

Table 2.5 – Recommended peak river flow allowances for each epoch for the Thames river basin district (1961 to 1990 baseline). Adapted from the EA guidance 'Flood risk assessments: climate change allowances'

2.5.4. Peak Rainfall Intensity

The recommended allowances for increase in peak rainfall intensity have also been updated since the completion of the previous SFRA. Although the allowance is applicable nationally, there is a range of values provided which correspond with the central and upper end percentiles (the 50^{th} and 90^{th} percentile respectively) over three-time epochs. The recommended allowances are shown in Table 2.6 below.

Allowance Category (applicable nationwide)	Total potential change anticipated for epoch		
	2015 to 2039	2040 to 2069	2070 to 2115
Upper End	10%	20%	40%
Central	5%	10%	20%

Table 2.6 – Recommended peak rainfall intensity allowance for small and urban catchments (1961 to 1990 baseline). Adapted from the EA guidance 'Flood risk assessments: climate change allowances'

For large (>5km^2) rural catchments, the allowances for peak river flow (Table 2.5) should be used. The EA guidance goes on to state that '*Where on-site flooding for the upper end allowance presents a significant flood hazard (for example, depths and velocities of surface water runoff cause a significant danger to people), you will need to take further mitigation measures to protect people and property (for example, raising finished floor levels). As a minimum, there should be no significant flood hazard to people from on-site flooding for the central allowance'.*

When designing Surface Water Drainage Systems, the EA advises that there should be no increase in the rate of runoff discharged from the site for the 'Upper End Allowance'.

All of the above recommended allowances for climate change should be used as a guideline and can be superseded if local evidence supports the use of other data or allowances. Additionally, in the instance where flood mitigation measures are not considered necessary at present but will be required in the future (as a result of changes in climate), a "managed adaptive approach" may be adopted where development is designed to allow the incorporation of appropriate mitigation measures in the future.

2.5.5. *Impacts of Climate Change on Medway*

Climate change will inevitably result in an increased risk of flooding from all sources. Consequently, the potential impacts of climatic change will require careful consideration before sites for development are allocated.

The Environment Agency Flood Zone maps are based on current day sea levels and climate conditions. However, these maps do not take into consideration the impact of flood defences or climate change. Whilst large parts of Medway have been shown to benefit from formal flood defence infrastructure, the standard of protection is considered to reduce with time as extreme sea levels, and peak flows into the River Medway, increase into the future. To address the impact of climate change, it will be necessary to increase the crest level of the defences in line with these increases in water level in the future.

The consequences of such structures failing (i.e. a breach), or becoming overtopped, will therefore also increase in the future. When the dynamics of a breach are considered, the increase in sea level over the next 100 year period will result in a significant increase in the volume of water which is able to flow through the breach during the peak of an extreme event. Higher water levels can promote larger wave heights along the coastline, as waves are sustained closer inshore through a combination of increased water levels and increases in offshore wind speed.

In addition to the risk of tidal flooding, consideration should also be paid to the impact of climate change associated with pluvial flooding. Due to the topography and urbanised character, the town centres are prone to flashy responses during intense rainfall which has historically caused problems. Consequently, an increase in peak rainfall intensity is also likely to significantly increase the risk of flooding from rivers.

By managing surface water in a sustainable manner, through the use of SuDS for example, it is possible to ensure that new development does not exacerbate flood risk on site, or elsewhere within the catchment. Taking climate change into account at the planning stage will ensure that its impacts are mitigated, thus the risk of flooding can be managed throughout the lifetime of the development.

2.6. Flood Defences

The location and extent of the existing defence infrastructure network within the area is shown in Appendix A.2. The mapping shows that that entire coastline benefits from defences, with the exception of Allhallows-on-Sea. The defences continue inland along the tidal watercourses, including the River Medway.

The Standard of Protection (SoP) varies significantly across Medway from a 1 in 20 year SoP to 1 in 1000 year SoP. The Medway Flood Defence Strategy undertaken in 2011 reveals that the majority of the existing defence infrastructure in the urban areas of Medway is below “the required standard based on present day flood levels”. Defence condition also varies considerably throughout the area. When the impact of climate change is taken into account, the standard of protection will further reduce, and many areas which are currently protected have the potential to flood. This flooding is shown in the 2115 results of the EA numerical flood model for the North Kent Coast. As such, investment in flood defence infrastructure will become more important in the future.

Works have been undertaken to improve the standard of protection at a number of strategic sites within Medway, including Strood and Rochester; which include localised flood walls and significant land raising. Within Medway, the ownership or maintenance responsibilities for the flood defences vary; the majority of the defences are privately owned and maintained, with the remainder maintained by either Medway or the EA. Furthermore, the Medway Estuary and Swale Flood and Coastal Risk Management Strategy is currently being prepared, which will outline suitable schemes which are designed to protect people, property, agricultural land and designated habitat over the next 100 years.

2.7. Actual Risk and Residual Risk

The NPPF requires the **‘actual risk’** of flooding to a development to be appraised. The actual risk considers the likelihood of flooding under extreme conditions (e.g. the design flood event), whilst considering the influence of any defence infrastructure, or drainage systems, which may provide a level of protection to the site.

The presence of such defences, or drainage system, does not necessarily imply a low risk of flooding, as locations where the design standard is low can still result in flooding under the design flood event.

Examples of actual risk are as follows;

- A combination of a storm surge and extreme waves resulting in waves overtopping the sea wall;
- The in-channel river level exceeding the crest height of the flood embankment which has a low standard of protection (e.g. 1 in 20 years);
- Surface water ponding in a topographic depression following a heavy rainfall event;
- Flooding from the emergence of groundwater due to a rising water table following prolonged rainfall;
- The capacity of the public sewer being exceeded, due to its low design standard (typically 1 in 30 years);
- Flooding within the highway due the highway gullies becoming overwhelmed, as these gullies are typically designed to manage the 1 in 2 year return period event.

The NPPF requires development to be appraised against the actual risk of flooding under design flood event conditions. However, from the above examples it is evident that many sites within Medway are reliant on the protection of flood defences, or are dependent on the influence of on-site drainage systems to ensure that the actual risk of flooding under the design event is reduced.

However, properties could be at risk of inundation by floodwater under the following conditions:

- If the defences were to fail (e.g. due to a breach).
- If the drainage system was to become overwhelmed, or blocked.
- The occurrence of an event greater than the design flood event (termed an exceedance event), causing water to overtop the defences.

The above risk is termed the **'residual risk'** of flooding.

Residual risk is a particular issue within the low-lying areas situated landward of the defences, along the River Medway and River Thames. When impacts of climate change are taken into consideration, the potential impact of residual risk is further exacerbated. Much of the marsh area located to the north of Medway is situated below the predicted extreme sea level in the future and unless the defences are upgraded in line with increasing water levels, the likelihood of the defences failing and the water level exceeding the crest height of the wall will increase into the future.

Given the rapid rate of inundation and extensive flooding which is likely to result from a residual risk flood event, the use of hydrodynamic numerical flood modelling is required to appraise the depth, extent and velocity of flooding under such scenarios. Such modelling has been undertaken by the EA for the Isle of Grain as part of the North Kent Coast Modelling Study.

The EA has also completed similar modelling for the reservoirs across England, to provide information on the expected depth and velocity of flooding in the event or a reservoir failure. The 'Flood Risk from Reservoirs' mapping identifies that there are no major reservoirs located within Medway, although floodwater from a failure of the Bough Beech Reservoir, Weird Wood Reservoir and Bewl Water Reservoir (located outside of Medway) would flow into the River Medway. The EA's 'Flood Risk for Reservoirs' mapping can be accessed at; https://flood-warning-information.service.gov.uk/long-term-flood-risk/map

It is also necessary to consider the residual risk of flooding if the drainage system was to become surcharged. Flooding typically occurs during a pluvial event which exceeds the design criteria of sewer, or alternative as the result of a failure of the drainage system (i.e. due to a blockage). Consequently, these two scenarios should be considered when designing any new drainage systems. To minimise the risk of flooding to properties, it is recognised that the potential overland flow routes should also be considered to establish the area where floodwater is likely to pond following an exceedance event. This analysis will need to demonstrate that the proposed drainage system does not increase the risk of above ground flooding to the development, or to the surrounding area.

3. Policy Requirements

3.1. Applicable Policies and Studies

The purpose of this section is to highlight the important and applicable policies which inform the FRM process. This includes reference to both Local (e.g. Local Plan) and National planning policy (e.g. NPPF) relating to flood risk.

Flood and Water Management Act (FWMA) (2010)

In response to the Pitt Review which followed the summer 2007 floods, and the requirements of the EU Flood Directive, the Flood and Water Management Act was implemented in England and Wales in April 2010. The act outlines the responsibilities for managing flood risk and drought, with an increased focus on the risk of flooding from local sources. An important outcome of the act is that County or Unitary Authorities are now classified as *'Lead Local Flood Authorities'* and have the responsibility for managing flood risk at a local scale. Additionally, it aims to encourage the use of SuDS, and promotes resolution of sewer misconnections.

National Planning Policy Framework (NPPF)

The National Planning Policy Framework (NPPF) was published on the 27th March 2012 and updated on 24th July 2018 and 19th February 2019. This Framework is a key part of the Government's reforms to make the planning system less complex and more accessible, to protect the environment and to promote sustainable growth. The NPPF sets out the Government's planning policies for England and is used in the preparation of local plans, as well as in decision making with respect to planning. The framework is executed by means of the accompanying Planning Policy Guidance Suite (March 2014) which supersedes PPS25: Development and Flood Risk Practice Guide (2009).

Paragraphs 7 to 211 contain policy that represents the Government's view of sustainable development. In order to achieve sustainable development within different districts, local circumstances need to be taken into account. Each Local Planning Authority is required to complete a SFRA to assess the risk of flooding from all sources, following criteria set out in the NPPF. The overarching use of SFRAs is to implement the Sequential Test, and where necessary the Exception Test, when determining land use allocation.

Non-Statutory Technical Standards for Sustainable Drainage Systems (NTSS)

As part of the Government's continuing commitment to protect people and property from flood risk, the Department for Environment, Food and Rural Affairs (Defra) consulted on a proposal to make better use of the planning system to secure sustainable drainage systems (2014).

National Standards for design, construction, maintenance and operation of SuDS came into effect from the 6th April 2015 and relate to Schedule 3, Paragraph 5 of the Flood and Water Management Act 2010.

These Non-Statutory Technical Standards for SuDS provide additional detail and requirements not initially covered by the NPPF through specifying criteria to ensure sustainable drainage is included within applications classified as major development.

Medway Council Local Flood Risk Management Strategy

Medway Council is the Lead Local Flood Authority (LLFA) and has the duty to manage local flooding, which covers the risk of flooding from surface water, groundwater and ordinary watercourses. In line with the Flood and Water Management Act, Medway Council produced a Local Flood Risk Management Strategy (LFRMS), which was published in 2014. The strategy sets out to outline the approach to managing local flood risk within the area and how these could be implemented.

Medway Surface Water Management Plans (SWMP's):

Surface Water Management Plans have been undertaken in 2016 and 2020. The reports provide an assessment of the risk of surface water flooding in Medway by utilising hydraulic modelling, which has been undertaken as part of the reports. The results of the modelling have been used to recommend suitable surface water management strategies which could reduce the risk of flooding. The SWMPs include the urban areas within Medway in addition to the areas considered as part of the Local Plan consultation.

Medway Council Preliminary Flood Risk Assessment (PFRA)

In accordance with the Flood Risk Regulations 2009, Medway Council produced a PFRA in 2011 which was updated by the EA in 2017 The report identifies the risk of flooding across Medway from local sources (i.e. surface water, groundwater and ordinary watercourses), both historically and into the future. The study includes modelling of the risk of flooding from surface water.

Medway Flood Defence Strategy – High level appraisal of potential solutions to manage flood risk in urban Medway

A report produced in 2011 to determine the SoP and condition of existing flood defence structures, including an economic analysis to estimate the likely damage costs attributed to flood events on a flood cell basis.

North Kent Rivers Catchment Flood Management Plan (CFMP)

The North Kent Rivers CFMP, relevant to Medway, was completed and published by the Environment Agency in December 2009. A CFMP is a high-level strategic planning tool through which the EA seeks to work with other decision-makers within a river catchment to identify and agree policies for sustainable flood risk management. The primary objectives of the CFMP are to:

- Develop complementary policies for long-term (50-100 years) management of flood risk within the catchment that take into account the likely impacts of changes in climate, land use and land management.
- To undertake a strategic assessment of current and future flood risk from all sources within the catchment and quantify the risk in economic, social and environmental terms.

- Identify opportunities and constraints within the catchment for reducing flood risk through strategic changes and identify how these benefits could be delivered.

- Identify opportunities to maintain, restore or enhance the total stock of natural and historic assets from flooding.

- Identify the relative priorities for the catchment and assign responsibility to the Environment Agency and other operating authorities, local authorities, water companies and other key stakeholders for further investigations or actions to be taken to manage and reduce flood risk within the catchment.

Shoreline Management Plans

The Shoreline Management Plan is a large-scale assessment of the risk associated with coastal erosion and flooding, which seeks to set out high-level management options over three time epochs; 0 to 20 years, 20 to 50 years, and 50 to 100 years. The SMP is a non-statutory document used to inform the coastal planning and each management policy was derived taking into account social, environmental, technical and economic drivers over the next 100 years.

Whilst the SMP is not formally embedded within the planning system, it is used to inform the coastal change management area process outlined within Paragraph 166 to 169 of the NPPF.

Medway is covered by two SMPs which were adopted in 2008. The section of coastline from All Hallows on Sea to Grain falls within 'SMP10 Isle of Grain to South Foreland'. Inside the Medway Estuary, from the Isle of Grain, the coastline, and riverside, are covered by the 'SMP9 Medway Estuary and Swale'. These policies are still current and adopted. However, all SMPs within the UK are due to be subject to a light touch review referred to as the 'SMP Refresh Process'.

Information on Shoreline Management Plans and a copy of the Plans relevant to Medway can be accessed at; http://www.se-coastalgroup.org.uk/category/shoreline-management-plans/

Thames Estuary 2100 (TE2100)

The Thames Estuary 2100 Strategy sets out how to manage tidal flood risk up to 2100, and outlines short, medium and long-term actions required to address the increasing risk of flooding to communities along the Thames Estuary, as a result of climate change. Excluding the Medway Estuary, the Medway coastline is covered by the TE2100 Plan, and includes the embankments, revetments and seawalls designed to defend the Hoo Peninsula.

Medway Estuary and Swale Flood and Coastal Risk Management Strategy

The Medway Estuary and Swale Flood and Coastal Erosion Strategy (MEASS) is currently being undertaken. Once published the strategy will determine the best approach to manage flood and coastal erosion risk, with the key focus on; economic, environmental and technical factors. The strategy will look to identify suitable schemes to deliver the policies set out within the Medway Estuary and Swale, and the Isle of Grain to South Foreland SMPs, with the ultimate objective of protecting people, property, agricultural land and designated habitat over the next 100 years. Updates on the Strategy can be found at;

https://www.gov.uk/government/publications/medway-estuary-and-swale-flood-and-coastal-risk-management-strategy/medway-estuary-and-swale-flood-and-coastal-risk-management-strategy

Local Plan

The current Local Plan was adopted in 2003 and is currently in the process of being updated. The updated plan is due to be adopted in 2020 and will cover the period up until 2035. The Local Plan sets out policies for Medway in line with the Council's objectives for development. The SFRA forms part of the evidence base for the updated Plan, which will be used to update Local Planning Polices in relation to flood risk and surface water management, as well as informing the development allocation process.

The current Local Plan (2003) has two policies relevant to flood risk Policy BNE45 relates to development along the undeveloped section of the coastline with respect to the existing standard of protection provided by the defences. Policy CF13 outlines requirements for development in tidal flood risk areas.

3.2. Definition of Development Types

There are a number of development classifications which are referenced throughout this SFRA. Applications submitted to Medway Council will be classified as either householder, minor or major development depending on the scale of development. However, such development may also fall under a second definition relevant to the management of flood risk and surface water. The definitions of these development types are provided below for reference;

Classifications for New Applications (Town and Country Planning Act)		
Householder	Minor	Major
Other Classifications relevant to Flood Risk and Surface Water Management:		
Small development	Minor development (in relation to flood risk)	

Table 3.1 – Classifications of development relevant to the SFRA.

3.2.1. Householder Development

Householder development is applicable for planning applications for internal changes and extensions to existing dwellings.

3.2.2. Minor Development

Minor development is applicable for planning applications which are not classified as householder development, but are not large enough to be considered as major development.

3.2.3. Major Development

Major development is defined within the Town and Country Planning (Development Management Procedure) (England) Order 2010 as development involving one or more of the following;

> a) *the winning and working of minerals or the use of land for mineral-working deposits;*
>
> b) *waste development;*
>
> c) *the provision of dwelling houses where:*
>
> (i) *the number of dwelling houses to be provided is 10 or more; or*
>
> (ii) *the development is to be carried out on a site having an area of 0.5 hectares or*
>
> (iii) *more and it is not known whether the development falls within sub-paragraph (c)(i);*
>
> d) *the provision of a building or buildings where the floor space to be created by the development is 1,000 square metres or more; or*
>
> e) *development carried out on a site having an area of 1 hectare or more.*

3.2.4. Permitted Development

The Town and Country Planning (General Permitted Development) Order 1995 was amended in May 2013 to allow householders to undertake a wide scope of enlargements, improvements, and other alterations to their properties. This allowed for greater flexibility under permitted development for the change of use of commercial premises, without the need for a full planning permission. In April 2016, the Order was revised to incorporate the change of use of other use classifications to residential use; including (but not limited to) laundrettes and light industrial use buildings. Further amendments to the categories of use change which are permitted have been made on an annual basis. An up-to-date summary of the class use changes which are allowed under *permitted development rights* can be found at:

https://www.planningportal.co.uk/info/200130/common_projects/9/change_of_use/2

3.2.5. 'Small Development'

This SFRA outlines the requirements for managing surface water runoff from new development which applies to all development with the exception of 'small development'. This classification is not directly related to the type of planning application submitted, but instead determines whether the Surface Water Management Proforma is required to be submitted alongside the planning application. Small development comprises the following:

- Extensions to existing buildings and ancillary outbuildings (e.g. sheds, garages, games rooms etc.) with a footprint less than 25m².

- Alterations to an existing development which does not increase the size of buildings (e.g. change of use). This includes any development that would create a separate dwelling within the curtilage of the existing dwelling e.g. subdivision of houses into flats.

3.2.6. *'Minor Development' in Relation to Flood Risk*

The NPPG outlines a definition of minor development in relation to flood risk. This definition is used by the EA to define development which is subject to different guidance on the management of flood risk (Refer to Flood Risk Standing Advice), and is used within the NPPF to identify developments which are not subject to the Sequential and Exception Test. The NPPG definition of minor development in relation to flood risk is not to be confused with the Council's definition of minor development (see above). Minor development in relation to **flood risk** is defined as;

- *minor non-residential extensions: industrial/commercial/leisure etc extensions with a footprint less than 250 square metres.*
- *alterations: development that does not increase the size of buildings e.g. alterations to external appearance.*
- *householder development: For example; sheds, garages, games rooms etc within the curtilage of the existing dwelling, in addition to physical extensions to the existing dwelling itself. This definition excludes any proposed development that would create a separate dwelling within the curtilage of the existing dwelling e.g. subdivision of houses into flats.*

3.3. Requirements for a Flood Risk Assessment

The NPPF (2019) requires a site-specific FRA to be submitted for **all development located within Flood Zones 2 and 3**. In addition, development situated within **Flood Zone 1** will also require an FRA if the application meets one or more of the following criteria;

- The development site (red line boundary) is **greater than 1 hectare.**
- The development site is located within an area known to have **critical drainage problems***.
- The development site is located within an area identified by the SFRA as being at increased flood risk in the future.
- The development site introduces more vulnerable uses in an area shown to be at risk of flooding from other sources.

(*) It is recognised that there are no areas designated by the EA as Critical Drainage Areas within Medway. Nevertheless, the LLFA may request that an FRA is submitted in support of an application, for example, for sites where localised issues relating to flooding are identified (for example sites within Sensitive Drainage Areas, identified in Section 5.3.2).

For some minor development and change of use, the NPPF states that the above criteria for preparing a site-specific flood risk assessment still apply. However, such applications are not subject to the Sequential Test or Exception Test.

A site-specific FRA is also required to be submitted in support of applications for **a change of use** where the proposals are subject to **permitted development rights.** Such applications are subject to a notification procedure with the LPA, referred to as a prior approval application (PAA). The applicant is required to submit details of the proposals, site details and any other information deemed necessary for the LPA to assess the potential impact with regard to: transport and highway; contamination; flood risk; and noise impact. The FRA should demonstrate how the risk of flooding will be managed to ensure that the development remains safe through its lifetime.

To determine which Flood Zone the development site is located, the EA's 'Flood Maps for Planning' should be referenced:

https://flood-map-for-planning.service.gov.uk/

4. Flood Risk Management

4.1. What should an FRA include?

This section provides guidance on managing flood risk for developments which are required to submit a Flood Risk Assessment (see *"Requirements for a Flood Risk Assessment")*

A site-specific FRA should be prepared in accordance with the requirements set out in Paragraphs 30 - 32 and 68 of the *Planning Practice Guidance: Flood Risk and Coastal Change*. A checklist of the points to be included within a site-specific FRA can be found at the following web address:

https://www.gov.uk/guidance/flood-risk-and-coastal-change#Site-Specific-Flood-Risk-Assessment-checklist-section

The FRA must be appropriate to the scale, nature and location of the development and consider all possible sources of flood risk including the effects of flood risk management infrastructure and the vulnerability of those that could occupy and use the proposed development.

The following sections of this report provide guidance on the various sections required within an FRA: application of the Sequential and Exception Test, designing to manage flood risk, and the management of surface water runoff from a development. To assist in navigation through the report, the relevant sections which are applicable for each classification of development are presented in Table 4.1 below.

	Permitted Development (Change of use)	**Householder**	**Minor**	**Major**
Sequential Test required?	*Not Required*		*Yes for sites in Flood Zone 2 and/or 3 only.*	
Exception Test	*Not Required*		*Yes , dependant on vulnerability and Flood Zone classification.*	
Analysis and management of Flood Risk	*Yes - for all sites which require an FRA to be submitted*			
Management of Surface Water Runoff	*Refer to Section 5.1 'Requirements for Surface Water Runoff'*			

Table 4.1 – Quick reference for the appropriate section for each classification of development.

4.2. Sequential Test

LPAs are encouraged to take a risk-based approach to proposals for development in areas at risk of flooding through the application of the Sequential Test. The objectives of this test are to steer new development away from high risk areas, towards those at lower risk of flooding. The Sequential Test therefore requires the applicant to demonstrate that the development cannot be located in an area at lower risk of flooding by searching for alternative opportunities. In some areas, where developable land is in short supply, it may be demonstrated that there are no alternative sites at lower risk of flooding, and that there is overriding need to build in areas that are at risk of flooding.

The following developments are **exempt** from the Sequential Test;

- Development classified as 'minor development' in relation to flood risk.
- A change of use application where by the lawful planning use is changed. For example, Part 3, Class M: changing a Class A1 (shops) to Class C3 (dwelling houses). The exception is for applications for a change of use to a caravan, camping or chalet site, or to a mobile home or park site.

Based on the above criteria, development sites which are determined to be subject to the Sequential Test will be required to submit supporting information to the LPA to accompany the planning application.

The NPPF specifies that '*the Sequential approach should be used in areas know to be at risk now or in the future from any form of flooding*'. Although NPPG states that the Sequential Test is applicable for sites located within Flood Zones 2 and 3,paragraph 019 of the NPPG states that '*within each flood zone, surface water and other sources of flooding also need to be taken into consideration when applying the sequential approach to the location of development'.* In consideration of this, Flood Zones have been used in conjunction with the EA's 'Flood Risk from Surface Water' and 'Flood Risk from Reservoirs' mapping to produce a combined 'Potential Risk of Flooding' map provided in Appendix A.4.

The potential risk of flooding map does not indicate areas which are at risk of flooding from other sources such as sewers, groundwater or ordinary watercourses, although the Local Flood Risk Management Strategy does provide some indicative groundwater flood risk mapping, and Surface Water Management Plans appraise the risk of surface water flooding including detailed surface water sewer flooding. However, the Potential Risk of Flooding map can be used in the first instance to identify sites which are potentially at risk of all sources of flooding and therefore, are required to apply the Sequential Test.

Guidance on the application of the Sequential Test will be produced by Medway Council and will be available on the Council's website. This guidance has been applied as part of the site allocation process in support of the emerging Local Plan.

4.3. Exception Test

If following the application of the Sequential Test it is not possible, or consistent with wider sustainability objectives, for the development to be located in an area at lower risk of flooding, the Exception Test can be applied.

As part of this process it is necessary to consider the type and nature of the development. Table 2 of the *Planning Practice Guidance: Flood Risk and Coastal Change* (Paragraph 66) defines the type and nature of different development classifications in the context of their flood risk vulnerability. This has been summarised in Table 4.2 below, which highlights the combinations of vulnerability and flood zone compatibility that require the Exception Test to be applied.

Flood Risk Vulnerability Classification	Zone 1	Zone 2	Zone 3a	Zone 3b
Essential infrastructure – Essential transport infrastructure, strategic utility infrastructure, including electricity generating power stations	P	P	e	e
High vulnerability – Emergency services, basement dwellings, caravans and mobile homes intended for permanent residential use	P	e	r	r
More vulnerable – Hospitals, residential care homes, buildings used for dwelling houses, halls of residence, pubs, hotels, non-residential uses for health services, nurseries and education	P	P	e	r
Less vulnerable – Shops, offices, restaurants, general industry, agriculture, sewerage treatment plants	P	P	P	r
Water compatible development – Flood control infrastructure, sewerage infrastructure, docks, marinas, ship building, water-based recreation etc.	P	P	P	P

Key:

P Development is appropriate
r Development should not be permitted
e Exception Test required

Table 4.2 - Flood risk vulnerability and flood zone compatibility

As with the Sequential Test, applications for 'change of use' or 'minor development' (in relation to flood risk) are exempt from the Exception Test.

Flood Zone 3 as shown by the EA's Flood Maps for Planning is further sub-divided into Zone 3a and 3b (referred to as the *functional floodplain*). Clarification between Flood Zone 3a and 3b is an important distinction that needs to be made when determining when the Exception Test is applicable. Table 4.2 identifies that no development, other than essential transport and utilities infrastructure, will be permitted within the functional floodplain.

To determine whether a development is located within the functional floodplain, it will be necessary to consult the EA to obtain additional information on the likelihood of flooding at the application site. Based on this information (where available) the following Test should be applied;

- *Do predicted flood levels show that the site will be affected by an event with a return period of 1 in 20 years or less?*
- *Is the site defended by flood defence infrastructure that prevents flooding under events with a return period of 1 in 20 years or greater?*
- *Does the site provide a flood storage or floodwater conveyance function?*
- *Does the site contain areas that are 'intended' to provide transmission and storage of water from other sources?*

The NPPG states that '*the identification of functional floodplain should take account of local circumstances and not be defined solely on rigid probability parameters'*. The functional floodplain has been defined using the area of land which naturally flood during a 1 in 20 year return period event or greater in any year (5% AEP) taken from the EA's North Kent Coast modelling study. Mapping showing the Functional Floodplain can be found in Appendix A.5.

Sites which are identified within Table 4.2 to be subject to the Exception Test cannot be permitted or allocated until the Exception Test is passed. There are two criteria which make up the Exception Test, both of which must be satisfied;

Part A: It should be demonstrated that the development provides wider sustainability benefits to the community that outweigh flood risk

The sustainability benefits of the development can be appraised against the objectives outlined within the Medway Council's sustainability appraisal, which will be undertaken as part of the evidence base for the emerging Local Plan.

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

The following section outlines guidance on the preparation of a flood risk assessment, including how to consider appropriate mitigation measures which will help to meet the second criterion of the Exception Test.

Development sites which have been allocated as part of the emerging Local Plan will still be required to meet the objectives of the Exception Test before permission can be granted.

4.4. Designing for Flood Risk

In accordance with the requirement of the NPPF outlined above, all development located in an area identified to be at risk of flooding is required to consider options for mitigating the risk of flooding. This is to ensure that occupants/users of the development will be safe throughout its anticipated lifetime. Mitigation measures should be designed up to an including the design flood event and should remain effective even when an allowance for climate change is considered. For development that is subject to the Exception Test, the use of appropriate mitigation measures will be necessary to ensure that the second criterion is met.

In accordance with CIRIA Report 624 - *Development and flood risk - guidance for the construction industry*, certain flood mitigation methods should be considered before others, this is known as the Flood Risk Management hierarchy, which is outlined below;

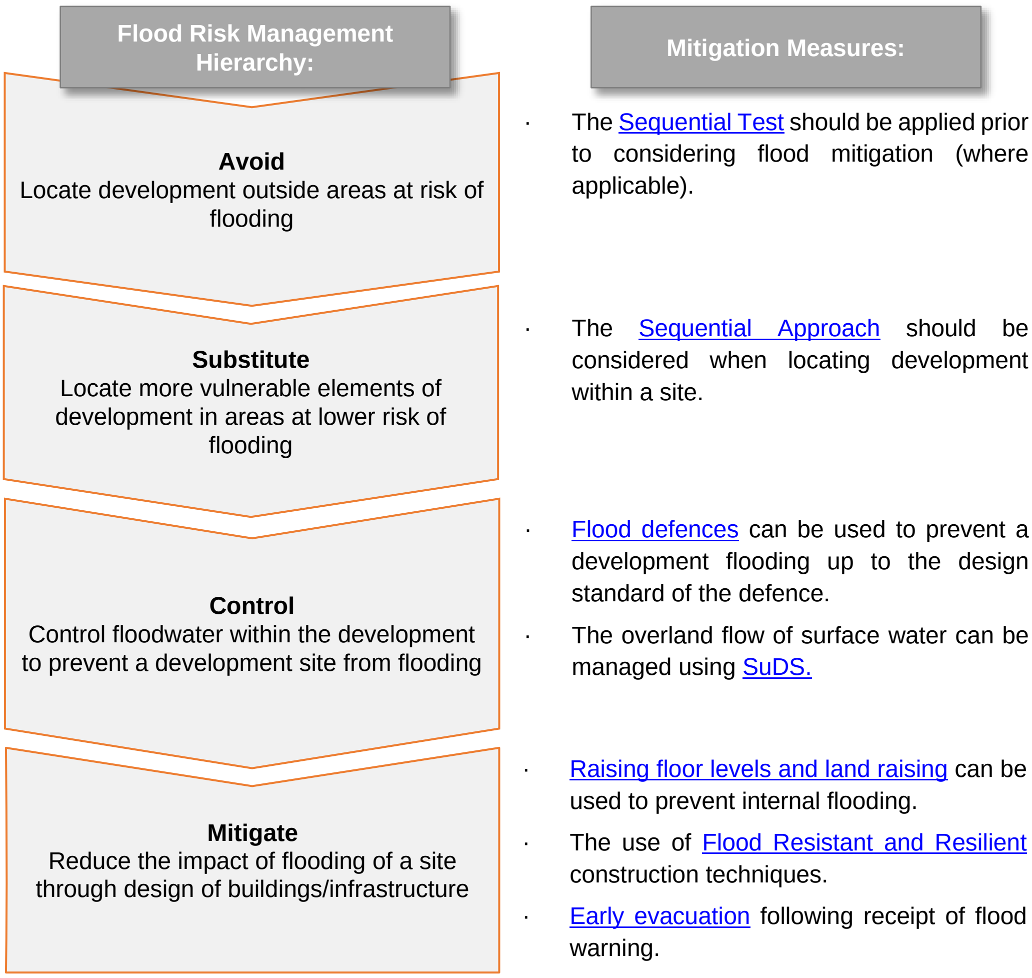

Figure 4.1 – Flood Risk Management hierarchy with associated methods of flood mitigation

Following the hierarchy outlined in Figure 4.1, the following sections provides an overview of each mitigation measures and identifies any key points for consideration when designing a scheme.

4.4.1. Flood Risk Standing Advice

The EA's Flood Risk Standing Advice applies to the following development types;

- *a minor extension (household extensions or non-domestic extensions less than 250 square metres) located within flood zone 2 or 3.*
- *'more vulnerable' development located within flood zone 2 (except for landfill or waste facility sites, caravan or camping sites).*
- *'less vulnerable' development locate within flood zone 2 (except for agriculture and forestry, waste treatment, and water and sewage treatment).*
- *'water compatible' development located within flood zone 2.*

Details of the requirements outlined under the EA's Flood Risk Standing Advice can be found at; https://www.gov.uk/guidance/flood-risk-assessment-standing-advice

For all other types of development, the mitigation measures described in the following sections should be followed.

4.4.2. *Sequential Approach*

Following application of the Sequential Test, the ***sequential approach*** should be applied to locating and designing development on a site-based scale. For example, more vulnerable elements of the scheme should be located where the risk of flooding is lowest (e.g. on the higher parts of the site). The higher risk areas of the site (e.g. lower-lying parts of the site) should only be allocated for less vulnerable elements (e.g. parking, recreational land or even commercial buildings).

The Sequential Approach should also be applied within the design of the internal layout of the building. This would mean that more vulnerable elements such as sleeping accommodation should preferably be located above the less vulnerable elements (e.g. parking, offices, living accommodation on lower floors).

4.4.3. *Flood Defences*

Flood defences can be used to prevent floodwater from reaching a development site. Defences can be constructed on a strategic scale, as part of a flood defence scheme facilitated by the EA. Alternatively, defences can be used at a site-scale, such as the construction of an earth bund designed to manage overland flows through a development. Temporary defences may also be used to provide protection to a development in anticipation of an extreme flood event.

However, it should be recognised that flood defences will only provide protection up to the design standard of the protection, and as such, the development could still be subject to the *residual risk* of flooding (e.g. if the defences were to fail). The ongoing maintenance of any formal structures which are constructed will also need to be considered as part of the design of a flood defence, to ensure that the structure continues to function as designed.

Furthermore, the loss of flood storage from the area which is being protected may need to be offset to ensure that the risk is not increased elsewhere by directing floodwater into the surrounding flood compartment.

4.4.4. *Land Raising and Raising Finished Floor Levels*

If it is not possible to avoid floodwater reaching the development site, the finished floor levels should be raised to reduce the risk to the occupants/users of the site.

For sites at risk of tidal or river flooding, the EA typically requires the finished floor levels for all new development to be raised 300mm above the design flood level for living accommodation and 600mm above the design flood level for sleeping accommodation. In order to achieve the required levels, it may be possible to use a combination of the following techniques;

- Raising the internal ground floor level to the required level. Where floor levels are raised substantially above the existing ground level, consideration should be made for access to/from the building, particularly where disabled access is required.

- The use of townhouse-style development, comprising parking or other non-habitable uses on the ground floor. When proposing a sacrificial ground floor, the requirements for access/egress to/from the development should be considered. Furthermore, the addition of a sacrificial floor can have an impact on other planning requirements (i.e. ridge height limitations).

- Raising land levels to create a development platform above the design flood level. When land raising, consideration needs to be given to the potential for the displacement of floodwater.

It is recognised that there may be circumstances where the requirements outlined above are not achievable within the constraints of the development. For example, where ridge height limitations, or the existing fabric of the building limit the height to which the internal floor level can be raised. In such circumstances, clarification with regard to the requirements for finished floor levels should be sought on a site-by-site basis. It is recommended that the EA/LLFA are consulted through their pre-application advice service at the earliest opportunity.

4.4.5. *Resistance and Resilience*

For development located within a flood risk area, buildings should be designed appropriately to limit the potential impact of a flood event, and to minimise the cost and time of recovery following a flood event. The document '*Improving the Flood Performance of new buildings'* provides guidance on common building material and construction methods which could be considered to reduce the impact of flooding to a building. This document can be found at;

https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/7730/flood_performance.pdf

For flood depths up to 0.3m, the preferred approach is to minimise floodwater ingress whilst maintaining structural integrity. This is achieved through the use of flood resistance measures. Typical examples include the use of low permeability building materials (e.g. engineering bricks, solid-concrete floors), or temporary measures such as covers for doors and airbricks. The use of permanent (termed *passive)* flood resistance measures is preferable over temporary (termed *active)* measures, as they do not require action by owners/users of the site during times of flooding.

Most flood resistance products are only effective to a flood depth up to 0.6m. Therefore, for flood depths equal to, or less than 0.6m, flood resistance measures should be used in an effort to limit the potential for the ingress of floodwater into the building. Notwithstanding this, in circumstances where the ingress of floodwater into a building is possible, the building should be designed to limit the impact that a flood event could have. This is focussed on the time and cost of recovering from such an event. Flood resilience measures can include, but are not limited to: raising appliances;

boilers and other electrical fittings above the flood level; using materials such as tiles and waterproof plasterboard.

As flood depths exceed 0.6m, the design standard of most resistance measures is likely to be exceeded, resulting in internal flooding of the building. In such circumstance, flood resistance is still recommended in order to delay the ingress of water (i.e. as water levels rise outside the building). However, the emphasis is placed on using flood **resilient** design.

For minor development (in relation to flood risk) and change of use applications, it may not be possible to avoid internal flooding using the flood mitigation measures outlined above (e.g. the sequential approach, raising finished floor levels etc.). The EA's Flood Risk Standing Advice states where it is not possible to raise floor level at least 300mm above existing flood level, the LPA should be consulted if resistance and resilience measures are required.

Where internal changes to an existing building are proposed (i.e. change of use), it is unlikely that flood resistant and resilient construction techniques can be implemented successfully. However, there are an increasing number of products available which can be retrofitted into existing buildings. These are referred to as Property Level Protection (PLP) measures.

To install PLP measures requires a survey of the flood performance of the existing building to identify potential locations where floodwater could ingress. Information on PLP measures, and details of appropriately qualified PLP surveyors can be found at the Blue Pages, hosted on the National Flood Forum website:

http://bluepages.org.uk/

4.4.6. Compensatory Flood Storage

In circumstances where a building displaces floodwater, the volume of water displaced may need to be compensated for by providing a compensatory flood storage scheme. This is to ensure that the risk of flooding is not increased elsewhere.

Compensatory flood storage is typically *not* required for *tidal* flooding. When the extent of flooding from a tidal source is considered, it can be seen that the floodplain is not confined and does in fact extend for some considerable distance. It is therefore concluded that development proposed in the tidal floodplain is unlikely to have an adverse impact on maximum surrounding flood levels and therefore, compensatory flood storage is not required.

When considering the extent of flooding from a *fluvial* source it is evident that the floodplain is more confined and consequently, the impact of displacing floodwater is likely to a greater impact on the flood levels in the surrounding floodplain. Therefore, under these circumstances it will be necessary to provide compensatory floodplain storage.

The EA requires the 'Upper End' allowance for peak river flow (refer to 'climate change') to be used to calculate compensatory flood storage in the following circumstances;

- When the catchment is particularly sensitive to small changes in volume, causing significant increases in flood depth or hazard.
- The affected area contains essential infrastructure or vulnerable uses such as primary schools, caravans, bungalows or basement dwellings.

The 'Central' allowance for peak river flow may be used to calculate compensatory flood storage if evidence is submitted to the EA to demonstrate that the affected area contains only low vulnerability uses such as water compatible development, taking into consideration future land uses based on allocated sites in the local plan and submitted planning applications.

The measures below have been listed in order of preference and should be followed when displacement from a fluvial source is evident:

- All the buildings should be located outside the predicted flood extent on site, in accordance with the Sequential Approach.
- If the buildings cannot be located outside the flood extent, compensatory floodplain storage should be provided onsite and on a level-for-level, volume-for-volume basis. An equal volume of water displaced by the development is to be provided and should be located outside of the flood extent. Floodplain storage can be provided as either a 'block' which matches the development, (i.e. covering a similar area), or alternatively floodplain storage may be distributed across the site at convenient locations (within the same flood compartment). However, an equal volume must apply at all levels between the lowest point on site and the design flood level to ensure that there is no adverse impact offsite.

It is recognised that there are circumstances where it may not be possible to provide compensatory flood storage. Whilst inappropriate development within flood risk areas is discouraged, sites which have demonstrated that there are no other reasonable locations for the development to be located (i.e. through the application of the Sequential Test), and it has been demonstrated that it is not possible to provide compensatory storage using the methods outlined above, then the EA/LLFA should be consulted to discuss the use of undercroft void space (otherwise referred to as 'stilts'). Through the use of undercroft voids, the ground floor level can be raised above the predicted flood level to allow the storage of floodwater beneath the building.

If voids are specified, they will typically be required to be 1m in width and there should be a minimum of one void for each 5m length of wall. The underside of the floor (top of the void) should be situated a minimum of 300mm above the design flood level. The voids should be designed to allow water to flow unimpeded beneath the building and the use of anti-vandalism, or anti-vermin mesh can be considered, providing there is a maintenance schedule in place to ensure that any mesh is cleared of obstructions on a regular basis.

It may be possible to incorporate a sacrificial ground floor within the scheme design (i.e. the use of undercroft parking) which is designed to enable floodwater to be stored beneath the building during an extreme flood event.

4.4.7. *Impedance of Flood Flows*

All development should be designed to ensure any identified flow paths are not obstructed as part of the development proposals. The preferred mitigation would be to locate all development outside of the overland flow path. Green-blue infrastructure corridors should be incorporated into the scheme design to accommodate any overland flow routes through the development site and be incorporated into the open space provision where feasible. For large sites, it may be necessary to quantify the extent, depth and velocity of flood flows including an allowance for climate change into the future to enable suitable design of any green features (e.g. swales etc.). The CIRIA SuDS Manual provides advice on designing to accommodate overland flows.

4.4.8. *Proximity to Watercourses*

There are several bodies responsible for rivers and ordinary watercourses according to the Water Resources Act 1991 and Land Drainage Act 1991.

- The LLFA are responsible for the regulation of ordinary watercourses.
- The Internal Drainage Board (IDB) is responsible for the regulation of watercourses located within defined ‘internal drainage districts’. Within Medway there are two IDBs; the Lower Medway IDB, and the North Kent Marshes IDB. A map showing the areas covered by each IDB is included in Appendix A.3.
- The EA is responsible for watercourses which are designated as ‘main rivers’. To determine whether the development site is in proximity to a main river, refer to the following website;

  https://environment.maps.arcgis.com/apps/webappviewer/index.html?id=17cd53dfc524433980cc333726a56386

4.4.9. *Maintenance and Biodiversity Easements*

For main rivers, the EA require that an 8m buffer zone is retained between the river bank and any permanent construction such as buildings, or car parking etc. This buffer zone increases to 16m for tidal waterbodies and sea defence infrastructure. This buffer is required to allow access for maintenance and to promote biodiversity along the river corridor.

For development sites located in proximity to an ordinary or IDB maintained watercourse, it is recommended that the responsible body is contacted to confirm the access and maintenance requirements.

4.4.10. Permitting and Consent

In addition to the above, it may be necessary to obtain a Flood Risk Activity Permit from the EA for works undertaken;

- on or near a main river
- on or near a flood defence structure
- in a floodplain
- on or near a sea defence

Information on which activities are subject to a Flood Risk Activity Permit can be found at; https://www.gov.uk/guidance/flood-risk-activities-environmental-permits.

For works on ordinary, or IDB maintained watercourses, a Flood Risk Activity Permit is not required. However, the Land Drainage Act requires that formal written consent is sought from the relevant body for **any works adjacent to, or within a watercourse, that could affect in-channel flows** and is located within the buffer zone as defined by each responsible body. This includes any proposals for culverting a watercourse.

4.4.11. Safe Access Routes

The NPPG requires that new development is designed to ensure safe access/egress to/from the development is available under design event conditions. This should include provision for the emergency services vehicles to safely reach the development.

To determine whether access/egress to/from a development is considered to be *safe*, the flood hazard should be quantified. The methodology for calculating flood hazard is outlined in the report 'Flood Risks to People' (R&D output FD2320/TR2) and is based on the expected depth and velocity of flooding along the anticipated access route. The flood hazard is classified into categories which show the degree of hazard;

Hazard Rating (HR)	Degree of flood hazard	Description
< 0.75	Low	Caution – shallow flowing water or deep standing water
0.75 to 1.25	Moderate	Dangerous for some, i.e. children – deep or fast flowing water
1.25 to 2.5	Significant	Dangerous for most people – deep fast flowing water
> 2.5	Extreme	Dangerous for all – extreme danger with deep and fast flowing water

Table 4.3 - Classification of Hazard Rating Thresholds.

For sites located within an area at risk of flooding, a Flood Warning and Evacuation Plan (FEP) may be requested by the EA. The NPPG also requires that a Flood Warning and Evacuation Plan (FEP) is prepared for *'sites used for holiday or short-let caravans and camping'*.

A FEP should provide information to owners/residents of a development on procedures to be followed on receipt of a flood alert, flood warning, or severe flood warning. This should include emergency contact numbers and a flood action plan explaining measures that residents/users of the development can take to lessen the impact of such an event (e.g. moving belongings upstairs, installing PLP measures). Other site-specific information, such as emergency access routes through the site to an area that is located above the predicted flood level (which can be used as a safe haven until floodwater recede), should be detailed within the FEP.

To inform early warning and evacuation, the EA operates a flood warning service in areas at risk of flooding from rivers or the sea. This service is based on different measurements of rainfall, river levels and tide levels and utilises in-house predictive models, rainfall radar data and information from the Met Office. This service operates 24 hours a day, 365 days a year.

Occupants/owners of developments which are located in an area identified to be at risk of flooding should sign up to the EA's Flood Warning Service;

https://www.gov.uk/sign-up-for-flood-warnings

Further advice can be sought from the Council's document 'Guidance for Emergency Planning' which can be accessed at;

https://www.medway.gov.uk/floodrisk

5. Management of Surface Water Runoff

The following section of this report outlines the level of assessment required to be submitted as part of a planning application and provides guidance on how the risk from surface water should be appraised and managed.

New development has the potential to increase the rate of runoff from the site due to an increase in the impermeable area of the site. This acts to increase both the rate and volume of runoff from a site. In turn, this can increase the risk of flooding to the surrounding area, reduces the replenishment of groundwaters via infiltration, and encourages erosion and pollution of watercourses through increased flow rates and sediment entrainment. It is therefore necessary to manage the runoff from development in a sustainable manner though the use of SuDS.

SuDS can contribute towards many planning objectives and improve places and spaces within local communities. The use of SuDS provides a natural approach to the management of surface water taking into consideration water quantity (flooding), water quality (pollution), biodiversity (wildlife and plants) and amenity. Recognising the requirements of NPPF, the use of SuDS within developments should provide multi-functional benefits by working holistically within the context of landscape, urban design, and open space requirement via a SuDS Management Train as appropriate.

5.1. Requirements for a Surface Water Management Strategy

The requirement for either a Surface Water Management Strategy and/or SuDS Proforma, and the level of detail which is required to be submitted is dependent on the scale of the development, as outlined at Table 5.1.

A Surface Water Management Strategy can be a standalone document, or form part of a Flood Risk Assessment where one is required. A Surface Water Management Strategy sets out how local flood risk (flooding from sewers, drains, groundwater, ordinary watercourses, heavy rainfall) can be managed for the lifetime of the development, using the guidance included within this SFRA at Sections 4 and 5.

Within the Medway area, it is recognised that there are areas which are not perceived to be at direct risk of flooding from surface water, but may be hydraulically linked to areas which are at high risk of flooding from surface water. Consequently, to limit the increased risk of flooding posed by new development within these high risk areas, parts of the district may be subject to additional restrictions.

Using data from the Medway Preliminary Flood Risk Assessment (PFRA), Surface Water Management Plan (SWMP) catchment areas, historic flood incident mapping for Medway, as well as geological and topographical maps, a number of 'Sensitive Drainage Areas' have been identified. A map of the 'Sensitive Drainage Areas' (SDAs) is included within Appendix A.7.

If a development site is shown to be located within a SDA, this should be recorded on the SuDS proforma in the relevant section (where applicable).

The Sustainable Drainage (SuDS) Proforma can be found within Appendix A.6 of this report, and guidance on how to complete the proforma is provided in the following sections.

Application Type	Requirement
Permitted development Householder application within definition of 'small development'	The NPPF encourages the use of SuDS for all development, however, there are no local policy requirements to provide additional supporting documentation in relation to SuDS at this time. Notwithstanding this, all development will be subject to The Building Regulations requirements for drainage and waste disposal (Part H).
Householder (except 'small development') Minor	In accordance with national planning policy, all development should use SuDS where possible to ensure that the risk of flooding off-site is not increased as a result of surface water runoff. For development identified to be located within a 'Sensitive Drainage Area', Medway Council ***may recommend*** that a SWMS or Sustainable Drainage (SuDS) Proforma is submitted. Please contact suds@medway.gov.uk for more information.
Major	Major development is required to demonstrate compliance with the Non-Statutory Technical Standards for SuDS, as well as all local planning policies related to drainage. Medway Council therefore ***require*** all developers to submit a detailed Surface Water Management Strategy (SWMS). In addition, the SuDS Proforma should be completed alongside the planning application. The Proforma should make reference to the relevant sections of the SWMS. Evidence should be included to show how SuDS are to be incorporated within the proposed development.
Minor development positioned within **5m** of an existing watercourse	Medway Council require the Sustainable Drainage System (SuDS) Proforma to be submitted in support of the application.

Table 5.1 – Requirements for submission in respect to managing surface water runoff from new development.

5.2. Proposed Method of Discharge

Part 4 of Surface Water Drainage Proforma

The method of discharge for all developments must follow the drainage hierarchy as identified within the **Non-statutory Technical Standards for Sustainable Drainage Systems (NTSS)** and Part H3 of the Building Regulations**.** The drainage hierarchy options are summarised below; followed by prescriptive guidance for each of the methods of discharge;

***Infiltration (into the ground)* –** The preferred method for discharging surface water runoff from development sites is via infiltration, directly into the ground. This method of discharge manages the water at source and allows replenishment of the groundwater.

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***Surface Waterbody/Watercourse* –** Where infiltration cannot be achieved, the next favoured option is to discharge to a watercourse, or a surface waterbody. This option follows the natural hydrological cycle and can help to promote biodiversity. The waterbody, or watercourse which the development site is proposed to be connected to should be hydraulically linked to a river, or to the sea, to ensure that the risk of flooding offsite is not increased. Appropriate pollution control measures will be required if connecting to a receiving waterbody or watercourse.

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***Sewer* –** If neither alternative option for discharging surface water runoff is available (i.e. discharge via infiltration, or to a watercourse), the discharge of runoff to a public sewer may be permitted. Ideally surface water should be discharged to a dedicated surface water sewer (where available), or as a secondary option, to a combined sewer (i.e. foul and surface water). Discharge of surface water to a dedicated foul sewer is strongly discouraged and will only be considered in exceptional circumstances.

5.2.1. Discharging via Infiltration

For all development where it is proposed to use SuDS which rely on infiltration as the *only* option for discharging surface water runoff (i.e. soakaway, infiltration drainage basin, permeable surfacing etc.), infiltration testing is expected to be undertaken following the procedures outlined in BRE Digest 365 (BRE365), appropriate to the nature and size of the site. The results of this testing should be submitted with the planning application and referenced in the SuDS proforma.

If the proposed development cannot be discharged via infiltration, it will be necessary to provide evidence to justify why. This information should take into consideration any specific site constraints, or restrictions which could include, but are not limited to the following:

- Poor ground conditions / limited infiltration rate;
- High groundwater levels (within 1m of the base of the infiltration system);

- Contaminated ground (a contamination report should ideally be provided to support any assumptions made);
- Environment Agency's Source Protection Zones (specify which SPZ the site is located in).

Ground Conditions and Groundwater Levels - Infiltration SuDS will be prohibited if the ground water is shown to be located within 1m from the base of the infiltration system. In some cases where groundwater is expected to prevent the SuDS system from working effectively, the LPA may request further test results are provided to confirm the level of the groundwater at the location of the proposed SuDS, to ensure that the proposed system is suitable.

The scale of ground investigations should be proportionate to the size of the development and as such, for small developments with low groundwater, a single set of testing in accordance with BRE365 would normally be sufficient. For larger sites, it may be necessary to provide evidence to demonstrate that appropriate testing has been undertaken at a number of locations across the site. If the applicant is unsure, the LPA should be contacted to confirm whether this information is required to be provided.

Some sites may be associated with geotechnical hazards whereby solution features within chalk can cause chalk to dissolve. The risks caused by solution features may need to be addressed in any site Investigation report where a risk is identified by British Geological Survey mapping.

Contaminated Ground - Where there is a risk of ground contamination on the existing site, or on sites which are known to have vulnerable ground conditions, additional soil analysis and geotechnical assessments may be required. The requirement to submit this additional information will need to be determined on a site-by-site basis. If the applicant is unsure, the LPA should be contacted to confirm whether this information is required to be provided.

Source Protection Zones - The EA's Groundwater Source Protection Zone maps are required to be referenced if infiltration is proposed, as in some cases this type of discharge may not be considered suitable or indeed acceptable. In such circumstance, approval may be required from the EA before planning permission is granted. The Groundwater Source Protection Zone maps can be accessed at: http://magic.defra.gov.uk/

5.2.2. Discharging to a Tidal Waterbody

When discharging to an existing **tidal waterbody**, unattenuated discharge may be considered acceptable where the proposed outlet is located higher than the maximum water level. It is recognised that the likelihood of the design pluvial event coinciding with an extreme tidal event is extremely low, and as such, joint probability analysis can be undertaken to determine the most appropriate maximum water level. Using this method, it is possible to calculate the approximate time that the tidal outfall will remain blocked, which will influence the volume of storage required to be provided on site.

The storage calculations should ensure that the design rainfall event can be accommodated on site when the outfall is 100% blocked (i.e. due to tide locking). An alternative approach to undertaking joint probability analysis is to assume that the outfall will be 100% blocked for a minimum of six hours. However, it is acknowledged that the volume of storage required may increase if this methodology is adopted.

In all cases, the first 5mm of rainfall discharged from the site (termed the 'first flush') should be considered and ideally stored on site, to minimise the risk of pollutants being passed on to the waterbody.

Where an outfall passes through a flood defence structure, a flap valve should be provided. The number of outfall pipes passing through a flood defence structure should be kept to a minimum to ensure the integrity of the defence. Where possible, drainage works should be rationalised to reduce the number of small individual outfalls. It will be necessary for the integrity of the flood defence to be protected during construction and to ensure that the works do not work weaken the flood defence.

The visual impact of the finished structure is an important consideration and construction materials should have regard for the local environment. Outfall and headwall design should be agreed with the Environment Agency, as their consent may be required for the construction and for the quantity and quality of discharge. In all cases, the body responsible for both the waterbody and the defence infrastructure should be consulted before any construction works commence.

5.2.3. Discharging to a Watercourse or Surface Waterbody

When it is proposed to discharge to a main river, consent must be obtained from the EA prior to construction commencing on site. Unattenuated discharge to a watercourse, which is the responsibility of either the EA or the Internal Drainage Board (IDB), would require further consultation with the approving body. Typically, unattenuated discharge to a watercourse/waterbody is only permitted if the watercourse/waterbody is shown to be tidally influenced at the point of discharge and if provision has been provided to manage the first 5mm of rainfall – the 'first flush' principle described in Section 5.2.2.

When discharging to an ordinary watercourse, the appropriate authority (e.g. IDB, LLFA) should be consulted prior to the submission of the planning application and any relevant consents must be obtained prior to construction commencing on site.

In all cases, if a connection to a watercourse requires crossing 3rd party land, evidence of a connection agreement from the 3rd party land owner must be provided by the applicant.

The LPA may request evidence to demonstrate that the proposed drainage system can discharge unimpeded (e.g. to show that high water levels will not prevent the site from draining). Non-return valves may also be required to specified in order to prevent the drainage system from back-filling. Evidence can be requested from the LLFA to demonstrate that sufficient storage onsite has been provided in the event that the water levels in the watercourse/waterbody prevent the outfall from discharging at the specified rate.

5.2.4. Discharging to a Sewer

The discharge of surface water runoff from a development to a public sewer will only be permitted if the options listed above (i.e. infiltration and watercourse/waterbody) are shown not to be a viable alternative. Evidence will be required to be submitted to clearly demonstrate that all of the alternative options have been exhausted first and that discharging to a public sewer is the only viable solution.

In the first instance, discharge to a dedicated surface water sewer will need to be considered. If this is deemed not to be feasible (e.g. no surface water sewer in close proximity to the site), the next favoured option would be to discharge runoff from the development into a combined sewer (i.e. a sewer which receives both surface water and foul water). Discharge to a dedicated foul sewer is strongly discouraged.

Consent from the sewage undertaker must be obtained prior to construction commencing on site for all applications which propose to create a new connection to the public sewer system, and/or propose to increase the rate of discharge to the public sewer.

In locations which are known to have historic sewer flooding or sewer capacity concerns, the LPA may request additional information is presented as part of the planning application to demonstrate that discharging runoff from a development is suitable (e.g. sewer capacity checks). This may result in upgrade requirements being imposed *before* the development can progress to the construction phase.

5.3. Development Runoff Rates and Volumes

Part 5 of the Surface Water Drainage Proforma

In order to make an assessment of the peak discharge rates and volumes, it is necessary to calculate the potential runoff rates and volumes, taking into consideration the local geology and rainfall estimates. Typically, runoff rates and volumes are calculated for a range of return period events, including the following;

Design Event: Typically, the SuDS system is designed for the 'design event', including an increase in peak rainfall intensity to account for the impacts of climate change.

Greenfield Runoff Rates: The estimated peak runoff rate from a development site in its greenfield condition is referred to as the 'greenfield runoff rate', and the return period of the rainfall event will dictate the greenfield runoff rate for that specific return period (E.g. 1 in 100 year greenfield runoff rate).

5.3.1. *Methods for Calculating Surface Water Runoff Rates*

The most contemporary method for calculating the rate and volume of surface water runoff from the site catchment should be applied. In the first instance, industry standard methods (e.g. Flood Estimation Handbook methodology) should be used for calculating runoff rates and volumes. Where this data is not available, or is not considered to be appropriate (e.g. relative to the size of the development), then the chosen method for calculating the runoff criteria should be clearly stated and supporting evidence provided. It is recognised that methodology for estimating the runoff will be dictated by the local characteristics of individual sites and therefore, where considered necessary, developers should justify the chosen methodology recognising the limitations as described within the section 24 of the CIRIA SuDS Manual.

Surface water runoff rates from brownfield sites can be calculated using the total impermeable area and the most appropriate runoff estimation methodology stated within section 24 of the CIRIA SuDS Manual. The method used to calculate these rates should also be stated within the SuDS proforma.

5.3.2. *Limiting Surface Water Discharge Rates*

For all developments, it will be necessary to limit the rate at which surface water runoff is discharged from the development in accordance with Standards S2 and S3 of the NTSS. The proposed discharge rates from the developed site should replicate greenfield runoff rates, if practicable.

Where the greenfield runoff rates are less than 2l/s, a maximum discharge rate of 2l/s may be considered acceptable; *but only when all of the other options have been exhausted*. In such circumstances, evidence must be provided to demonstrate to the LPA why greenfield runoff rates cannot be achieved (e.g. risk of blockage).

Development sites located within an SDA can have additional restrictions imposed by the LLFA. These restrictions could include the requirement for additional mitigation measures, designed to reduce the risk of flooding to both the proposed development and to the surrounding area (e.g. flow restrictions). If the applicant is unsure, the LLFA should be consulted to confirm whether this information is required to be provided.

5.3.3. *Limiting Surface Water Discharge Volumes*

For all developments, it will be necessary to limit the volume of surface water runoff discharged from the site in accordance with Standards S4 to S6 of the NTSS. These Standards outline the preferred methods for volume control. The proposed runoff volume should never exceed the greenfield volume for the 1 in 100 year return period rainfall event with a 6 hour duration.

5.4. Water Quality

Part 6 and 8 of the Surface Water Drainage Proforma

As a guide, SuDS measures should follow the water quality management train set out within the CIRA SuDS Manual C753.

All development must consider incorporating safeguarding measures to protect water quality, such as the ability for the proposed drainage system to remove pollutants before discharging via one of the mechanisms discussed in Section 5.2. The design of any drainage system must ensure that the water quality does not adversely impact the receiving waterbody/aquifer, during both the construction phase and once operational.

Where possible 'at source' SuDS should be prioritised, and development sites should allow for interception storage for the 5mm event – termed 'the first flush event'. Generally, this 'first flush' will contain the majority of pollutants and thus should be held back and treated on-site.

Sites situated within, or adjacent to the following; Natura 2000 sites, Sites of Special Scientific Interest (SSSI), or Wetlands of International Importance under Ramsar Convention (Ramsar site) must provide supporting evidence to demonstrate that the current WFD Environmental Quality Standards (EQS) are met for the specific watercourse the site is being drained into. Where deemed appropriate, further consultation with Natural England may be required before the planning application is submitted.

5.5. Urban Creep

Part 5 of the Surface Water Drainage Proforma. Applicable to major development:

All major developments should consider how the drainage design will function in the future and as such, should include an allowance for potential increases in impermeable surfacing over the lifetime of the development (e.g. resulting from new patios, driveways, extensions etc.). An additional 10% should be applied to all impermeable areas to account for 'urban creep' within the proposed SuDS design. It must be clearly demonstrated that the impact of urban creep has been considered within the calculations submitted.

5.6. Maintenance

It should be made clear to the LLFA/LPA *who* will be responsible for the maintenance of the proposed drainage systems on completion of the development. Typically, this can be the property owner, or alternatively a service maintenance company. Measures should be in place to ensure that the owner/occupier is aware of their maintenance responsibilities and a maintenance regime is required for any critical features that form part of the system.

Medway will consider the adoption of SuDS elements under a S38 Highways Adoption Agreement where the element accepts greater than 50% runoff from the highway.

5.7. Surface Water Management in Construction

It is recognised that during the construction phase of a project there is an increased risk of surface water flooding from the development. The LLFA/LPA may require additional surface water management details to be supplied for the construction phase of the development to ensure the risk of flooding to the proposed development and to the surrounding area is not increased. If the applicant is unsure, the LLFA/LPA should be contacted to confirm whether this information is required to be provided.

5.8. Sensitivity Testing

Part 7 of the Surface Water Drainage Proforma

5.8.1. Exceedance Event

As highlighted above, typically the SuDS system is designed using a 'design event', which is typically classified as a rainfall event with a 1 in 100 year return period, including an increase in peak rainfall intensity to account for the impacts of climate change. However, in accordance with the precautionary principle promoted by the NPPF, it is also necessary to consider the impact of an event which exceeds the design event; termed an *'exceedance event'.*

Evaluating the response of the proposed drainage system under an event greater than the 1 in 100 year event (which includes an allowance for climate change) will help to assess the sensitivity of the system to changes in peak rainfall intensity, and represents any uncertainty in calculating the rainfall hydrograph, or climate change allowance.

It is therefore a requirement for the developer to consider both the impact on-site and off-site, as a result of an exceedance event. Guidance on assessing and designing to accommodate an exceedance scenario can be found in the CIRIA document 'Designing for exceedance in urban drainage – good practice' (C635). Where applicable, a flow route diagram should be provided to show areas where flood water could pond during an exceedance event.

5.8.2. Blockage Event

It is also necessary to consider the implications of a failure of the proposed drainage system. Consequently, the LPA require that the impact is quantified for a scenario where the drainage system becomes 100% blocked. This is of particular importance for development sites where the proposed method of discharge is to a watercourse which could exhibit high water levels. High water levels could prevent the site from discharging surface water, as the outfall could become submerged.

5.8.3. Evaluating the Impacts of a Sensitivity Scenario

Sensitivity testing does not require the developer to design the drainage system to accommodate a 100% blockage scenario, instead the Part 7 of the SuDS proforma is simply designed to *appraise* the sensitivity of the proposed drainage system to such events. This ensures that there is no undue risk to life resulting from a 'residual risk' scenario.

The following points are a guide to enable the developer to consider the impacts on the drainage system, based on the sensitivity tests described above:

On-site impacts: If the proposed drainage system is shown to surcharge under either a 100% blockage, or an exceedance event the following should be considered: *What is the expected depth* *and velocity of flooding across the site? Can you describe the overland flow route of water leaving the drainage system, based on the topography of the site? What is the risk of internal flooding?*

Off-site impacts: If water is expected to flow off-site during either a 100% blockage, or an exceedance event the following should be considered: *Can you describe the overland flow route of water leaving the site, based on the topography of the site? What is the risk of flooding off-site? e.g. to nearby properties, pedestrian/vehicular access routes etc.*

6. Local Plan Policy Recommendations

The current Local Plan 2003 includes two policies concerning flood risk. Owing to legislative and policy changes, availability of updated flood risk information, and a more holistic approach to flood risk management via the planning system, a number of high level policies have been proposed by Medway Council, which can be supported by specific Development Management Policies at a later date in the Local Plan process.

Policy - Flood and Water Management

Flood Risk Management

- *Ensuring that development has a positive or nil impact on flood risk management interests.*
- *Development that would harm the effectiveness of existing flood defences or prejudice their maintenance or management will not be permitted.*
- *Where development benefits from existing or proposed flood infrastructure, the development should contribute towards the capital costs and/or maintenance of the defences over the lifetime of the development.*

Sustainable Drainage:

- *Development proposals subject to LLFA statutory consultation shall be accompanied with a Surface Water Management Strategy/SuDS Proforma that is appropriate to the scale and nature of the development at risk.*
- *Development should enable or replicate natural ground and surface water flows and volumes via the use of Sustainable Drainage systems (SuDS). Where SuDS are provided, arrangements must be put in place for their management and maintenance over the full lifetime of the development.*

It is further recommended that any high level flood and water management policy includes a cross reference to other related policies concerning landscaping, water quality, water supply, climate change adaptation and open space to facilitate a holistic approach to flood and water management.

7. Conclusions

The National Planning Policy Framework (NPPF 2019) published by the Department for Communities and Local Government, requires Local Planning Authorities (LPA) to apply a risk-based approach to the preparation of their development plans in respect of potential flooding. In simple terms, the NPPF requires LPAs to review the variation in flood risk across their district, and to steer vulnerable development (e.g. housing) towards areas of lowest risk.

Where development is to be permitted in areas that may be subject to some degree of flood risk, the NPPF requires the LPA to demonstrate that there are sustainable options for mitigation available, which will ensure that the risk to property and life is minimised should flooding occur.

In accordance with the NPPF's requirements, this SFRA report provides an evidence base and builds upon the original SFRA which was prepared in 2006. This latest iteration addresses changes to planning policy and introduces new mapping, which is designed to assist with the appraisal of flood risk and to support better spatial planning.

The main purpose of the new 'Potential Risk of Flooding maps', is to move away from a reliance on the EA's Flood Maps for Planning when applying the Sequential Test, which only consider the risk of fluvial and tidal sources of flooding. With an increased awareness of surface water flooding over recent years, it is recommended that planning policy encourages good design for sites which are identified to be at risk of flooding from surface water too. Therefore, using these new maps to apply the Sequential Test will allow the risk of flooding to appraised across a wider range of sources, whilst also providing the opportunity to use these maps to apply the Exception Test. This process will help to ensure that development will remain safe from localised flooding into the future.

It is also recognised that the EA Flood Zone Maps for Planning do not take into consideration future responses to climate change, or the impact of residual risk of flooding in defended areas. It is therefore recommended that the approach to the Sequential Test is refined in the future to account for these inaccuracies, once this information becomes readily available. As such, the SFRA should be reviewed regularly and any changes to planning policy should be taken into consideration.

The update to this SFRA also includes additional information to assist developers to submit planning applications for sustainable developments, taking into consideration flood risk and drainage. This SFRA report clearly identifies that the requirements of a Flood Risk Assessment (FRA) and provides guidance for developers on how to prepare a compliant FRA. In addition, the requirements in relation to surface water drainage are also outlined and further guidance is provided to enable developers to complete the Sustainable Drainage (SuDS) proforma.

In summary this updated SFRA update provides a clear evidence base which will enable Local Plan policies to be developed in the future, relating to the management of flood risk and drainage.

A. Appendices

Appendix A.1 – Historic Flooding

Appendix A.2 – Watercourses and Defence Infrastructure

Appendix A.3 – Administrative Boundaries

Appendix A.4 – Potential Risk of Flooding Map

Appendix A.5 – Functional Floodplain

Appendix A.6 – Sustainable Drainage (SuDS) Proforma

Appendix A.7 – Sensitive Drainage Areas (SDAs)

Appendix A.8 – Data Sources

Appendix A.1 – Historic Flooding

Appendix A.2 – Watercourses and Defence Infrastructure

Appendix A.3 – Administrative Boundaries

Appendix A.4 – Potential Risk of Flooding Map

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Appendix A.8 – Data Sources

Data Layer	Source
OS VectorMap	Ordnance Survey
OS 1:250 000 mapping	Ordnance Survey
Historic flood extents	Environment Agency
Historic flood records	Medway Council Lower Medway IDB Fire and Rescue Southern Water
Flood Zones 2	Environment Agency
Flood Zone 3	Environment Agency
Flood Risk from Reservoirs	Environment Agency
Flood Risk from Surface Water	Environment Agency
1 in 20 year flood extents	Environment Agency
Detailed River Network	Environment Agency
Drainage Network	Southern Water
Internal Drainage Board Areas	Medway Council
Geology	British Geology Survey
Spatial Flood Defences	Environment Agency
District boundary	Medway Council