Brighton & Hove City Council

Strategic Flood Risk Assessment

Project Ref: 19627/001

March, 2008

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Glossary

AOD (Above Ordnance Datum)

Land levels are measured relative to the average sea level at Newlyn Cornwall. This average level is referred to 'Ordnance Datum'. Contours on Ordnance Survey maps of the UK show heights above Ordnance Datum.

Aquifer

A source of groundwater comprising water-bearing rock, sand or gravel capable of yielding significant quantities of water.

Catchment

The area contributing flow or runoff to a particular point on the ground.

Catchment Flood Management Plan (CFMP)

A high level planning strategy to identify and agree policies for the sustainable management of flood risk, within a river catchment.

Climate Change

Long term variations in global temperature and weather patterns both natural and as a result of human activity, primarily greenhouse gas emissions.

Coastal Defence

A term used to encompass both coastal protection against erosion and sea defence against flooding.

Coastal Erosion

The gradual wearing away of the coastline through a combination of wave attack and slope processes.

Defence Crest Level

The height of the top of the flood defence above Ordnance datum.

Defra

Defra (The Department for Environment, Food and Rural Affairs) has overall policy responsibility for flood and coastal erosion risk in England. It funds most of the Environment Agency's activities in this area and provides grant aid to the other flood and coastal defence operating authorities.

Environment Agency

The Environment Agency are the principal flood defence operating authority in England, having permissive powers for the management of flood risk arising from designated main rivers and the sea. The Environment Agency is also responsible for flood forecasting and warning dissemination, and for exercising a general supervision over matters relating to flood defence.

Exception Test

If following application of the Sequential Test, it is not possible, consistent with wider sustainability objectives, for the development to be located in zones of lower probability of flooding the Exception Test can be applied. This provides a method of managing flood risk while still allowing necessary development to occur.

Floodplain

Area of land that borders a watercourse, an estuary or the sea, over which water flows in time of flood, or would flow but for the presence of flood defences where they exist.

Flood Risk Assessment

A study to assess the risk of a site or area flooding, and to assess the impact that any changes or development in the site or area will have on flood risk.

Flood Zone

A geographic area within which the flood risk is in a particular range as defined within PPS25.

Fluvial Flooding

Flooding from a river or other watercourse.

Freeboard

The difference between the design flood level and the lowest point on a flood defence.

Functional Floodplain

Land where water has to flow or be stored in times of flood, typically identified as land which would flood with an annual probability of 1 in 20 (5%) or greater in any year or at another probability to be agreed between the Local Planning Authority and the Environment Agency.

GIS

Geographical Information System: a method of displaying layers of information, which are commonly georeferenced.

Groundwater Flooding

Flooding caused by groundwater escaping from the ground when the water table rises to or above ground level.

Hazard

A situation with the potential to cause harm. A hazard does not necessarily lead to harm.

LiDAR

Light Detection and Ranging: an airborne mapping technique which uses a laser to determine the distance between the aircraft and the ground. This technique allows a digital terrain model to be created for the assessment of flood risk.

Local Development Framework (LDF)

A non-statutory term often used to describe a folder of documents which includes all of the local planning authority's Local Development Documents (LDDs). The local development framework will also comprise the Statement of Community Involvement, the local development scheme and the annual monitoring report.

Local Development Documents (LDDs)

All development plan documents which will form part of the statutory development plan, as well as supplementary planning documents which do not form part of the statutory development plan.

Local Planning Authority (LPA)

Body responsible for planning and controlling development, through the planning system.

Mitigation Measure

A generic term referring to an element of development design which may be used to manage flood risk to the development, or to avoid an increase in flood risk elsewhere.

NFCDD

National Flood and Coastal Defence Database

Overtopping

Water passing over a flood defence structure due to wave action.

Overflow

Water level exceeding the defence level of a flood defence structure.

PPG25

PPG25 (Planning Policy Guidance Note 25) was published in 2001 and preceded PPS25 in setting out national planning policy relating to flood risk. This was replaced in 2006 by PPS25.

Planning Policy Statement (PPS)

A statement of policy issued by central Government to replace Planning Policy Guidance notes. Advice on practical implementation is not included in Planning Policy Statements.

Planning Policy Statement 25 (PPS25)

PPS25 (Development and Flood Risk) sets out the Government's national policy on land use planning relating to development and flood risk.

Residual Risk

The risk that remains after risk management and mitigation. It may include, for example, risks due to very severe events (above design standard), or risks from unforeseen hazards.

Return Period

A term used to express the frequency of extreme events. It refers to the estimated average time interval between events of a given magnitude.

Risk

Risk is a combination of the chance of a particular event, with the impact that the event would cause if it occurred. Risk therefore consists of two components: probability and consequence.

Runoff

The flow of water from an area on the catchment surface, caused by rainfall.

Sequential Test

A risk based approach to assessing flood risk, which gives priority to sites in ascending order of flood risk, i.e. lowest risk first.

Sewer Flooding

Flooding caused by the blockage or overflowing of sewers or urban drainage systems.

Strategic Flood Risk Assessment (SFRA)

An assessment of flood risk carried out for forward planning purposes

Shoreline Management Plan (SMP)

A document that sets out a strategy for coastal defence for a specified length of coastline, up to and including a whole sediment cell.

Sustainable Drainage Systems (SUDS)

A sequence of management practices and control structures, designed to drain surface water in a more sustainable manner than some conventional techniques. Typically, these techniques are used to attenuate rates of runoff from development sites.

Tidal Flooding

Flooding from the sea.

Vulnerability

Refers to the resilience of a particular group, people, property and the environment, and their ability to respond to a hazardous condition.

1 Executive Summary

Brighton and Hove City Council commissioned Peter Brett Associates (PBA) to prepare a Strategic Flood Risk Assessment of the Brighton and Hove area in line with Planning Policy Statement 25 (PPS25): Development and Flood Risk.

Data was collected from a number of sources including Brighton and Hove City Council, the Environment Agency, East Sussex Fire and Rescue Service and Southern Water, to understand historic incidents of flooding, current flood management and risks and the impact of climate change on flood risk. Using this information, a series of accompanying maps have been prepared highlighting historic flood incidents from sewer, groundwater, surface water and tidal flooding, and Flood Zones identifying the flood risk under future climate change scenarios.

One proposed development site, Brighton Marina, is identified as lying outside of Flood Zone 1 and is at risk from flooding. The Flood Zone for the area is classified as Flood Zone 3a, at risk from flooding from the 1 in 200 year annual probability event, including the climate change allowance to 2115. Specific requirements to ensure future development is defended and residual risk is minimised at the Marina are included within this SFRA.

A Level 2 SFRA is carried out for the Brighton Marina site, to assist in any required Exception Test and recommendations are included for expected detail required for inclusion in any planning application that may be submitted for the site. A Level 2 SFRA is also provided for Shoreham Harbour.

Further guidance is provided for the submission of Flood Risk Assessments for any site within the Brighton and Hove planning authority area.

This SFRA will be regularly reviewed to ensure it contains the latest data, planning policy and legislation is incorporated. This document will be reviewed when there is an update of flood risk legislation or planning policy, changes to flood risk management infrastructure or a major flood event.

2 Introduction

2.1 Overview

Peter Brett Associates (PBA) has been commissioned by Brighton and Hove City Council to prepare a Strategic Flood Risk Assessment (SFRA) for their area as required under PPS25 (Planning Policy Statement 25: Development and Flood Risk). This document has been prepared under the guidance of PPS25, the PPS25 Practice Guide Companion (Development and Flood Risk: A Practice Guide Companion to PPS25 'Living Draft') and joint Defra (Department of Environment, Food and Rural Affairs) and Environment Agency Research and Development project FD2320 'Flood Risk Assessment Guidance for New Development'.

As stated in PPS25, the role of a SFRA is to provide the evidence *'to ensure that flood risk is taken into account at all stages of the planning process to avoid inappropriate development in areas at risk of flooding, and to direct development away from areas at highest risk*.'

The first part of this document has been prepared as a Level 1 SFRA, to cover all items as listed in the PPS25 Practice Guide. That is:

- Plans showing the Brighton and Hove Local Planning Area, location of main rivers, ordinary watercourses and Flood Zones together with allocated development sites
- An assessment of the implication of climate change for flood risk at identified Development Areas
- Areas at risk of flooding from other sources
- Location of any flood risk management measures, including flood warning systems
- Guidance on the preparation of Flood Risk Assessments (FRAs) for allocated development sites and the applicability of the use of sustainable drainage systems (SUDS).

This report first presents results of the screening assessment of flood risk in the Brighton and Hove area. The results of this assessment allow the application of a Sequential Test which together with more detailed investigation of flood hazard of

those sites at risk constitutes the Level 2 SFRA, which forms the second part of this report.

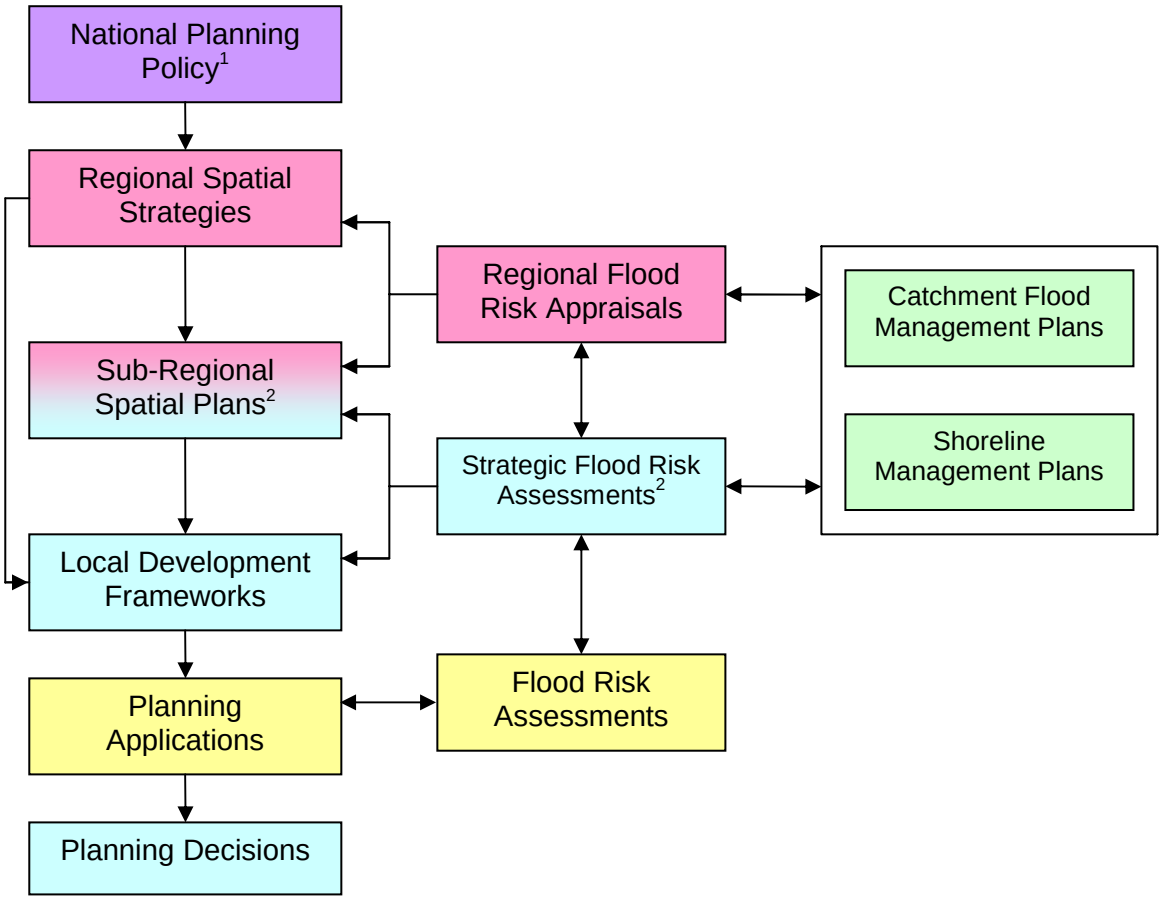
The principal purpose of the Level 2 SFRA is to facilitate application of the Exception Test. This considers the flood hazard in more detail, taking into account the presence of flood risk management measures such as flood defences. This allows a sequential approach to site allocation to be applied *within* a Flood Zone. Information on the location, standard and condition of existing flood defences (where known) is included in the Level 2 SFRA, as is a review of future policy for these flood defence systems and assets.

2.2 Planning Policy and Flood Zones

Flooding from both the rivers and sea can result in substantial damages to properties and be a threat to life. Climate change predictions suggest that flooding will become more frequent and severe within the lifetime of new developments. The Government in publishing PPS25 (and the earlier PPG25, Planning Policy Guidance 25) has stated that they wish to guide development away from areas of flood risk to reduce the financial and social cost of flooding.

All forms of flooding and their impact on the natural and built environment are material planning considerations. The aim of PPS25 is to ensure that flood risk is taken into account at each stage of the planning process. Figure 2.1 illustrates responsibilities for the production of key documents required to effectively manage flood risk through each stage of the spatial planning process.

Figure 2.1 Development Planning Process for Flood Risk



Legend: Responsibilities are indicated using colour-coding, as follows

Notes
This diagram is based on Figure 1.1 within PPS25: A Practice Guide.
1) Including Planning Policy Statement 25 'Development and Flood Risk' and the other flooding-related national planning policy listed in Appendix B of this Practice Guide.
2) SFRAs may cover more than one local planning authority region, and the adoption of a catchment-based approach by a number of LPAs working in partnership could be highly beneficial.

To identify areas at risk from flooding, the Environment Agency has developed a set of Flood Risk maps for the whole of England and Wales. These provide an initial indication of the probability of fluvial and tidal flooding only, assuming no defences are present, and split the risk of flooding into Flood Zones. These as defined as:

- Flood Zone 1: Low Probability. Comprises land assessed as having a less than 1 in 1,000 annual probability of fluvial or tidal flooding in any year (<0.1%)
- Flood Zone 2: Medium Probability. Comprises land assessed as having between a 1 in 100 and 1 in 1,000 annual probability of fluvial flooding (1% - 0.1%) or between a 1 in 200 and 1 in 1,000 annual probability of tidal flooding (0.5% - 0.1%) in any year.
- Flood Zone 3a: High Probability. Comprises land assessed as having a 1 in 100 or greater annual probability of river flooding (>1%) or a 1 in 200 or greater annual probability of tidal flooding (>0.5%) in any year.
- Flood Zone 3b: Functional Floodplain. Comprises of land where water has to flow or be stored in times of flood. SFRAs define the functional floodplain for their area which would flood with an annual probability of 1 in 20 (5%) or greater in any year, or another probability as agreed between the Environment Agency and Local Planning Authority.

The Environment Agency flood maps only show Flood Zones 1, 2 and 3 and do not make a distinction between Flood Zone 3a and Flood Zone 3b. It is assumed, in line with PPS25 Practice Guide Companion that all areas within Flood Zone 3 are functional floodplain (Flood Zone 3b) unless additional analysis has been undertaken to the satisfaction of the Environment Agency to demonstrate otherwise.

The suitability of development within a particular Flood Zone is dependant on its 'Flood Risk Vulnerability Classification', as defined in PPS25 Table D.2. For example, residential institutions (which, by their nature include sleeping accommodation) are classified as 'more vulnerable', whereas commercial development is classified as 'less vulnerable'.

The PPS25 Practice Guide Companion confirms that the principal driver for the classification of flood risk vulnerability is the risk to human life from flooding, as well as implications to life and well-being.

PPS25 Table D.3 confirms the suitability or otherwise of each flood risk vulnerability classification within a particular Flood Zone (and indicates where the Exception Test is required) (recreated as Table 2.1).

Table 2.1 Flood Risk Vulnerability and Flood Zone 'Compatibility'

Flood Risk Vulnerability Classification		Essential Infrastructure	Water Compatible	Highly Vulnerable	More Vulnerable	Less Vulnerable
Flood Zone	Zone 1	**OK**	**OK**	**OK**	**OK**	**OK**
	Zone 2	**OK**	**OK**	Exception Test Required	**OK**	**OK**
	Zone 3a	Exception Test required	**OK**	**X**	Exception Test Required	**OK**
	Zone 3b 'Functional Floodplain'	Exception Test required	**OK**	**X**	**X**	**X**

The above table does not show the requirement for the application of the Sequential Test. A Sequential Test is still required to be carried out regardless of whether an Exception Test is required.

2.3 Sequential Test

Annex D of PPS25, and chapter 3 of the PPS25 Practice Guide Companion, provide clear guidance on the application of the sequential test in relation to flood risk. Annex D confirms that '*The risk-based Sequential Test should be applied at all stages of planning. Its aim is to steer new development to areas at the lowest probability of flooding…. Within each Flood Zone, new development should be directed first to sites at the lowest probability of flooding and the flood vulnerability of the intended use matched to the flood risk of the site, e.g. higher vulnerability uses located on parts of the site at lowest probability of flooding.'*

This approach is a simple decision-making tool designed to ensure that, where appropriate, sites at little or no risk of flooding are developed in preference to areas at higher risk. It can be applied at all levels and scales of the planning process; as well as differentiating between Flood Zones it can be applied to assess the area of lowest risk within each zone.

PPS25 Annex D states that '*The SFRA will provide the basis for applying the Sequential Test, on the basis of the Zones in Table D.1.'* Where PPS25 Table D.1 defines the Flood Zones, and the appropriate land uses for each zone as discussed above and in Table 2.1.

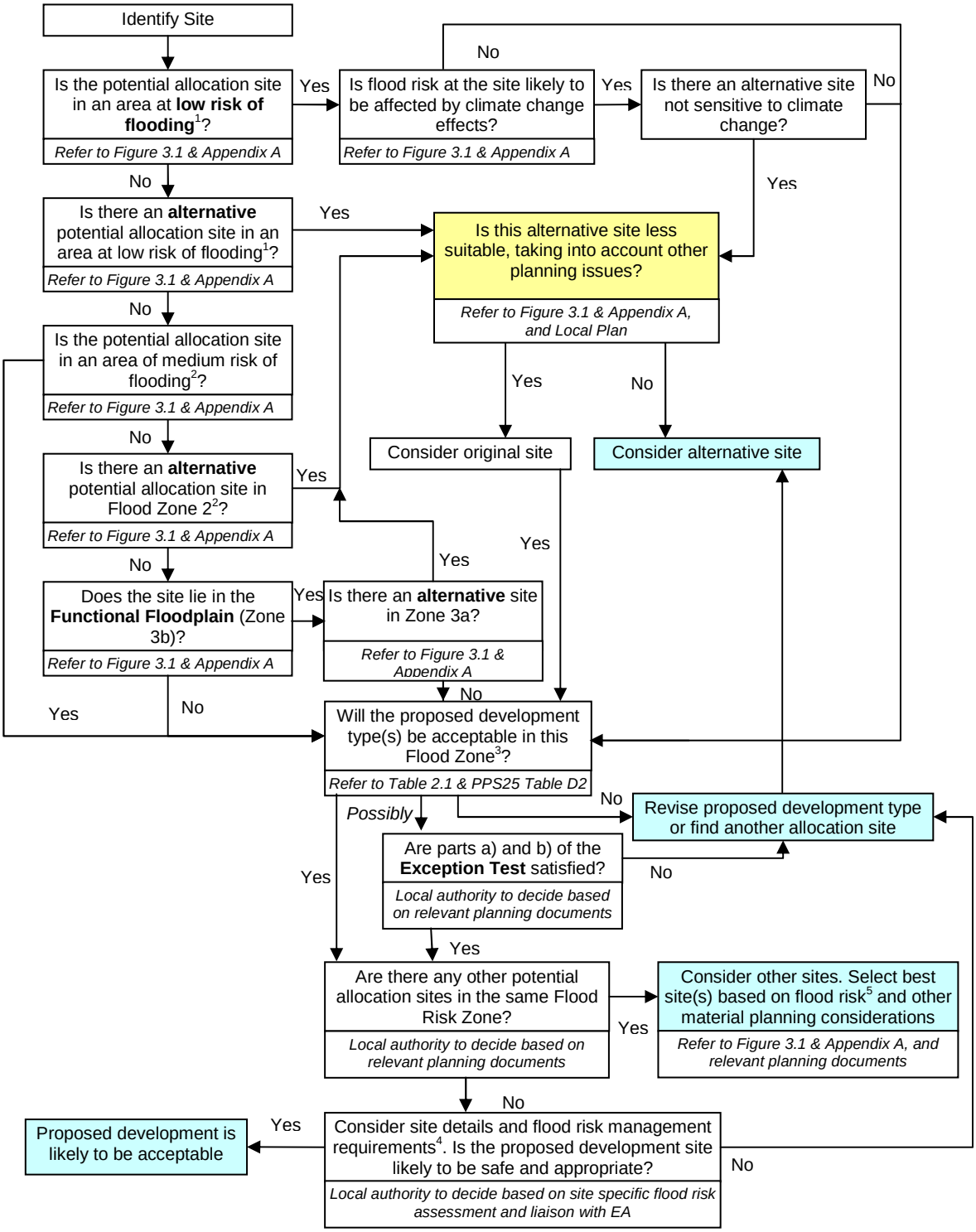
The PPS25 Practice Guide Companion confirms that '*All opportunities to locate new water-incompatible developments in reasonably available areas of little or no flood risk should be explored, prior to any decision to locate them in areas of higher risk.*

The Sequential Test refers to the application of this approach by Local Planning Authorities (LPAs) in determining land uses that are compatible with the level of flood risk at each allocated development site within a Local Authority area. Development should be directed to Flood Zone 1 wherever possible, and then sequentially to Flood Zones 2 and 3, and to the areas of least flood risk within Flood Zones 2 and 3, as identified by the Strategic Flood Risk Assessment.'

During the site allocation process, the LPA must demonstrate that it has applied the Sequential Test (and, where appropriate, the Exception Test) in conjunction with the flood risk information provided within a SFRA.

The typical application of the Sequential Test is detailed in Figure 3.1 from the PPS25 Practice Guide Companion, provided overleaf with annotations as Figure 2.2.

Figure 2.2 Application of the Sequential Test



Notes
This diagram is based on Figure 3.1 within PPS25: A Practice Guide.
1) Flood Zone 1 for fluvial and tidal flooding and with a low risk of flooding from other sources.
2) Flood Zone 2 for fluvial and tidal flooding and with a medium risk of flooding from other sources.
3) As defined by the Sequential Test.
4) Development to be safe and not to increase flood risk elsewhere. Required to pass part c) of the Exception Test, where applicable.
5) Including susceptibility to future climate change and residual flood risk.

2.4 Exception Test

Application of the Sequential Test should ensure that 'more vulnerable' property types, such as residential housing (see Table D.2 of PPS25), will not be allocated to areas at high risk of flooding. However, in exceptional circumstances, there may be valid reasons for a development type which is not entirely compatible with the level of flood risk at a particular site to nevertheless be considered. In these circumstances, it will be necessary for the LPA or developer to demonstrate that the site qualifies for development in the manner proposed by passing all elements of the Exception Test.

The Exception Test should only be applied following application of the Sequential Test. The Test consists of three stringent conditions, all of which must be fulfilled before it can be passed by a proposed development.

PPS25 Paragraph D9 states that *'For the Exception Test to be passed:*

a) it must be demonstrated that the development provides wider sustainability benefits to the community that outweigh flood risk, informed by a SFRA where one has been prepared. If the Local Development Document (LDD has reached the 'submission' stage (see Figure 4.1 of PPS12: Local Development Frameworks) the benefits of the development should contribute to the Core Strategy's Sustainability Appraisal (SA);

b) the development must be on developable previously-developed land or, if it is not on previously-developed land, that there are no reasonable alternative sites on developable previously-developed land; and

c) a site-specific Flood Risk Assessment must demonstrate that the development will be safe, without increasing flood risk elsewhere, and, where possible, will reduce flood risk overall.'

2.5 Site Specific FRA

Planning applications for development proposals of 1 hectare or greater in Flood Zone 1, and all proposals for new development in Flood Zones 2 and 3 should be accompanied by a site specific FRA. Detailed guidance for developers on producing a FRA is provided in Section 8.1 of this document.

3 Data Sources

3.1 Introduction

A key element of the SFRA process is the collation and review of existing data. The SFRA uses best available data at the time of production, collected from Brighton and Hove City Council, Environment Agency, Southern Water and East Sussex Fire and Rescue Service. The SFRA should be considered a 'live' document, and should be kept up to date with the latest information; for example Environment Agency Flood Zones, which are continuously being improved by a variety of studies, detailed models, data, and actual flooding information.

Table 3.1 Summary of Data Used to Compile SFRA

Data	Description	Source	Comments
National planning policy statements and guidance	PPS25, PPS 25 Practice Guide, FD2320	DCLG, Defra	
Local Plan/LDF		Brighton and Hove City Council	
Ordnance Survey mapping	1:10,000 and 1:50,000 mapping for Brighton and Hove	Brighton and Hove City Council	
Existing assessments of flood risk (e.g. CFMP/SMP)	Adur CFMP and Selsey Bill to Beachy Head SMP	Environment Agency	
Existing models		Environment Agency	No modelled watercourses within Brighton and Hove
Geological data	Groundwater vulnerability, groundwater protection, bedrock geology	Environment Agency	
LiDAR	Environment Agency LiDAR data flown in May 2005 and Feb 2007	Environment Agency	LiDAR flown for narrow strip of coastal frontage
Flood Zones	Environment Agency Flood Zones (June 2007)	Environment Agency	
Flood warning and coastal defence	GIS layers of flood warning areas and defence line from NFCDD	Environment Agency	Note no defence levels are present in tables extracted from NFCDD

Data	Description	Source	Comments
Existing Flood/Coastal Defences	Technical reports detailing condition and level of existing defences	Halcrow Report (2003)	
Historic sewer flooding records	Georeferenced Excel spreadsheets imported into GIS	Southern Water	
Records of fire service callouts	Georeferenced Excel spreadsheets imported into GIS	East Sussex Fire and Rescue Service	
Walkover survey	Site investigation to assess layout and continuity of defences	Site Survey	
Tide Data	Observed 5 minute tidal records from 1 July 2006 – 30 June 2007	Brighton Marina	

3.2 Brighton & Hove City Council

Ordnance Survey maps at 1:10,000 and 1:50,000 scale have been provided by Brighton and Hove City Council. GIS data layers for adopted Local Plan allocated sites and potential Local Development Framework allocated development sites including the designated category of use were provided. These are the development sites presented for Brighton and Hove on all figures in this SFRA and an overview is provided in Figure 3.1.

The Council also provided information on historic flooding (see maps in Appendix A) and details are provided in Appendix E.

3.3 Environment Agency

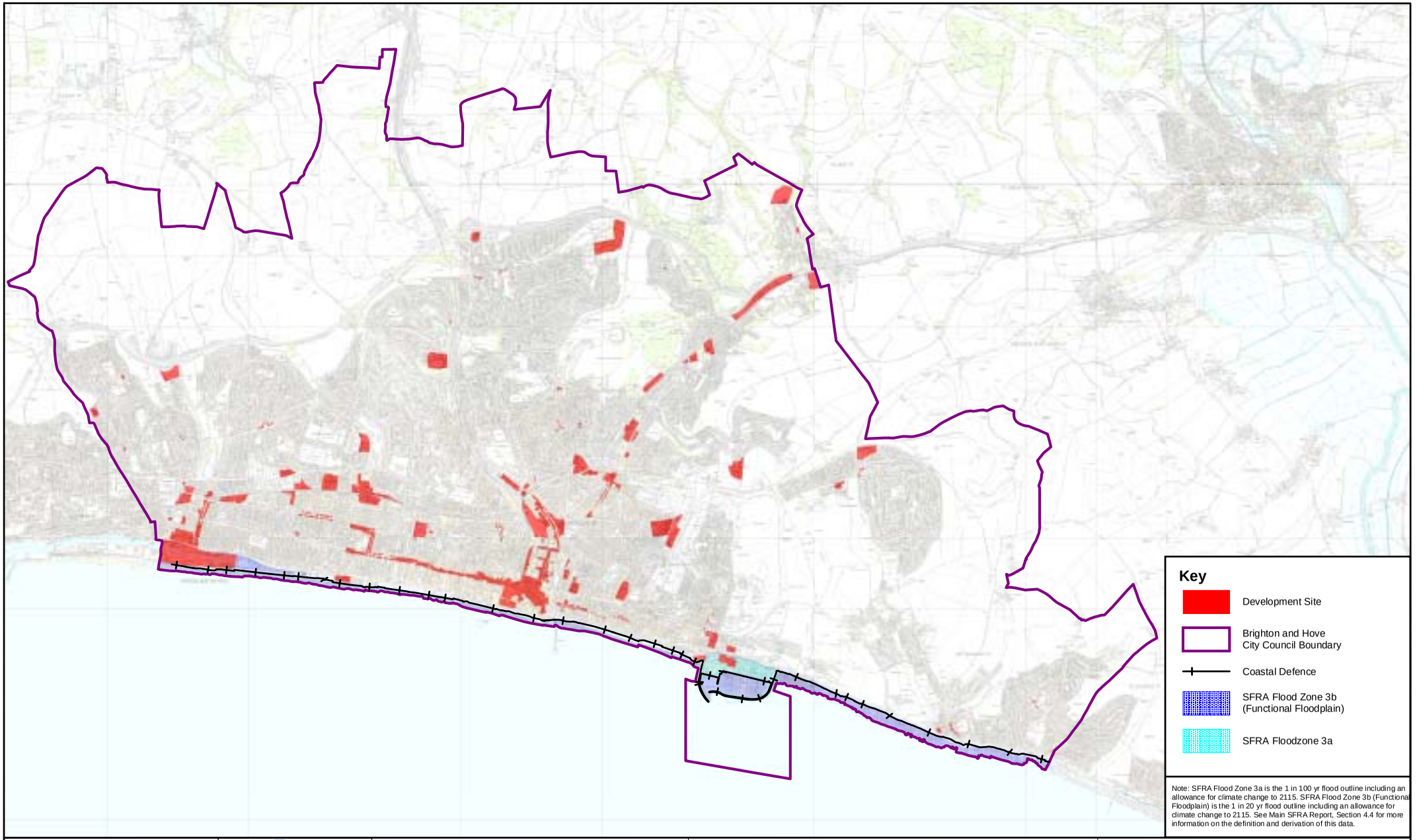
Environment Agency Flood Zones and main river centrelines, correct as of June 2007, have been provided for use in this study. Flood warning areas and flood defence GIS layers have been made available. In addition, the Environment Agency has provided maps of groundwater vulnerability, groundwater protection areas and bedrock geology for use in mapping groundwater flood risk. Remapping of the tidal flood extent under the 2115 climate change scenario, and flood hazard mapping as part of the Level 2 SFRA, has been carried out using Environment Agency LiDAR data, available for the coastal frontage of the administrative area of Brighton and Hove City Council.

3.4 Southern Water

Records of flooding incidents kept by Southern Water were obtained for Brighton and Hove in order to assess the frequency and location of sewerage flooding. This data includes the date of the most recent incident, address and grid reference, sewer type, and distinguishes between the flooding of properties internally, the flooding of land surrounding a property and highway flooding. These incidents are typically relatively low level, affecting a small number of properties at each location. The data should therefore be used to highlight areas where further investigation may be necessary for a detailed assessment of flood risk, rather than as a view of strategic flood risk *per se*. The data have been imported into GIS format, and are presented in Appendix C.

3.5 Fire and Rescue Service

Records were made available for all callouts for flood related incidents attended by East Sussex Fire and Rescue Service, which covers the Brighton and Hove area, since 1996. This information includes the date, address and grid reference of the incident, and comments on the nature of the callout and prevailing weather conditions at the time. A large number of incidents in the database were attributable to leaks and mechanical failure, or contained missing data fields. The database was therefore refined manually, removing spurious records, using weather conditions where necessary to assess whether flooding was likely to have occurred for a given callout. The data have been imported into GIS format, and are presented in Appendix D.



CLIENT: Brighton & Hove

peter brett associates CONSULTING ENGINEERS

SCALE:	1:50,000
REV:	
DATE:	January 2008
FILE:	J:\19627 Brighton SFRA\MapInfo\Wor\BH_Overview_v5.WOR

PROJECT NO: **19627/001**

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FIGURE 3-1: BRIGHTON & HOVE SFRA OVERVIEW OF DEVELOPMENT SITES AND FLOOZONES

4 Sources of Flood Risk

4.1 Overview

The administrative area of Brighton and Hove is a compact city of 8,267 hectares built on rolling hills and valleys, constrained between the South Downs and the sea. Approximately 252,000 people reside in the developed area which comprises around half of the city's extent (2004). The South East Plan has identified a need for 11,000 new homes within the administrative area of Brighton and Hove, for the period 2006 – 2026.

There are no designated main rivers, or ordinary watercourses, within Brighton and Hove, although the City area shares approximately 14km of its boundary with the sea. Underlying geology is dominated by the extensive Chalk downland, which serves to provide the city's water supply (as an aquifer). The highly permeable nature of this bedrock contributes a significant risk of flooding through emergent groundwater.

4.2 Definition of Flood Risk

Risk is a product of 'probability' and 'consequence'. For example, parts of the developed shoreline on the south coast are protected by defences to a relatively high standard of protection. Therefore the probability of flooding from the sea is relatively low, but the consequences, if flooding were to occur, are high.

In assessing flood risk for a SFRA all sources of flooding are required to be considered, including fluvial, tidal, groundwater, surface water, sewer flooding and any other potential flood risks in the area. An assessment of the increased risk of flooding as a result of climate change is a necessary part of the SFRA at Level 1. This has been assessed using the climate change allowances as given in Appendix B of PPS25.

A range of maps are provided as part of this SFRA illustrating flood risk from a variety of sources. Figure 3.1 shows an overview of tidal flood risk and allocated development sites for Brighton and Hove. Figure 4.1 gives an indication of susceptibility to groundwater flooding using Environment Agency groundwater vulnerability data and estimated historic extents of groundwater flooding. Figure 4.2 presents geological data for Brighton and Hove, giving a further indication of potential

groundwater flooding. More detailed maps showing tidal flood risk, as well as flooding from sewers and other sources are presented in Appendix A (Sheets 1 – 6).

4.3 Fluvial Flooding

There are no main rivers or ordinary watercourses within Brighton and Hove, so there is limited risk from fluvial flooding.

There are reports of a so-called 'lost river', the River Wellesbourne which is reported to run below Preston Park, London Road and The Level, discharging to the sea in the vicinity of Palace Pier. It is reported to have risen significantly in 2000 and caused considerable damage. Further investigation found no evidence for this 'lost river' and that it is a drain to the natural Chalk catchment, which has no unique outfall to the sea. Southern Water view groundwater infiltration to the sewers as a problem in this area. The flooding in 2000 is more likely to have been the result of high groundwater levels and emergence of springs rather than a culverted underground river.

4.4 Tidal Flooding

The Brighton and Hove seafront is protected from tidal flooding by formal defences. Coastal defences for the area are included in the Environment Agency's National Fluvial and Coastal Defence Database (NFCDD) although this dataset is unfortunately not populated with the defence crest level. Defence crest levels have been extracted from technical reports describing the condition and standard of protection of existing flood and coastal defences (Halcrow, 2003).

Environment Agency Flood Zones have been provided for use with this SFRA. These show the current 1 in 200 (0.5%) and 1 in 1,000 (0.1%) annual probability risk of flooding from the sea. However Environment Agency Flood Zones do not include an allowance for climate change, which is required for Strategic Flood Risk Assessment. The existing Environment Agency Flood Zones 2 and 3 have therefore been updated for this SFRA, to include the effects of climate change to 2115, as follows.

The 1 in 20 (5.0%) and 1 in 200 (0.5%) annual probability tidal flood levels for Shoreham were taken from the JBA Extreme Sea Levels report, for the year 2000 (4.1m and 4.3m AOD respectively). The sea levels estimated for Shoreham are assumed be representative for the whole of the Brighton and Hove sea front.

In order to assess the implications of climate change, the annual increase in tidal levels, as provided in Appendix B of PPS25, for Southern Region was added to these levels to obtain 1 in 20 (5.0%) and 1 in 200 (0.5%) annual probability tidal heights for 2115 (see Appendix B for more detail). These levels have been remapped using LiDAR data supplied by the Environment Agency. The new levels are for peak tides and do not include an allowance for wave heights.

A small band along the coast is a risk of flooding from the sea, as can be seen in Figure 3.1 and Appendix A Sheets 1, 3, 5 and 6. There is little difference in Flood Zones 2, 3a and 3b for Brighton and Hove due to the steep rise of the land along the coastline.

4.5 Groundwater Flooding

Brighton and Hove lies on the south of the Chalk South Downs and has suffered flooding from groundwater in the past. The most notable and largest events in recent years occurred in 2000/01. This resulted in extensive flooding of the A23 which was closed for several days.

Estimating groundwater flooding is difficult as this is caused by very variable periods of preceding rainfall. Groundwater levels in the Chalk are also partly modified by abstraction for public water supply.

The Environment Agency Flood Zone maps do not include groundwater flooding. The impact of climate change on groundwater flooding is uncertain and there is no guidance to estimate future changes. Areas of historic groundwater flooding are included on the accompanying map (Figure 4.1) and the geology of the Brighton and Hove area included in Figure 4.2. The geology within the administrative area of Brighton and Hove is very much dominated by the South Downs Chalk, with isolated pockets of clay, silt and sand lying in the south west of this area.

An assessment for the future potential for groundwater flooding in the Brighton and Hove Chalk has been included in Figure 4.1. This shows Environment Agency information on groundwater vulnerability to illustrate aquifer permeability and vulnerability. Permeability is a measure of a material's ability, in this case rock, to transmit water. Areas identified as having high aquifer permeability are likely to respond to rainfall quicker and are at greater risk from groundwater flooding. Aquifer vulnerability also provides an indication of the potential for surface derived pollutants

to infiltrate into the Chalk aquifer. Figure 4.1 shows that there is a level of risk from groundwater flooding to areas of Brighton and Hove.

The associated groundwater maps also identify major and minor aquifers. Where a major aquifer is defined as '*geological strata that exhibit high permeability and usually provide a high level of water storage. They are capable of supporting water supply on a strategic scale and are often of major importance to river baseflow*.' A minor aquifer is defined as '*permeable formations capable of supporting small to moderate water supplies and baseflows to some rivers, and those with general low permeability but with some localised resource potential*.' If a proposed development site is identified as lying above an aquifer it is recommended that the developer should refer to the Environment Agency's Groundwater Source Protection Zone maps (www.environment-agency.gov.uk), to identify which zone the development lies and if this will influence the design criteria.

Information on bedrock geology is presented in Figure 4.2, and gives a further indication of the risk of groundwater flooding in Brighton and Hove. The information in this figure naturally echoes that presented in the groundwater vulnerability mapping. In terms of bedrock, areas of Chalk are more likely to be affected by high groundwater levels due to the permeability of the underlying strata. The majority of Brighton and Hove is underlain by Chalk, with isolated pockets of clay lying towards the southwest of the area. Clay formations are typically non-water bearing and therefore unlikely to cause flooding related to groundwater. The impermeable surface will instead generate rapid runoff leading to a higher risk of flashy surface water flooding.

As mentioned previously areas at risk from groundwater flooding are difficult to predict if there are no historic recorded events. The majority of Brighton and Hove has some risk of groundwater flooding. Any area that has experienced groundwater flooding in the past has the possibility of experiencing it again in the future. Figures 4.1 and 4.2 provide an indication where the potential for groundwater flooding needs to be considered in any new development.

The risk of groundwater flooding needs to be considered when preparing a planning application within Brighton and Hove. If it is a potential issue, the planning applications should be accompanied by a site specific flood risk assessment, with appropriate mitigation measures considered, such as avoiding basements in residential dwellings or water resilient construction materials.

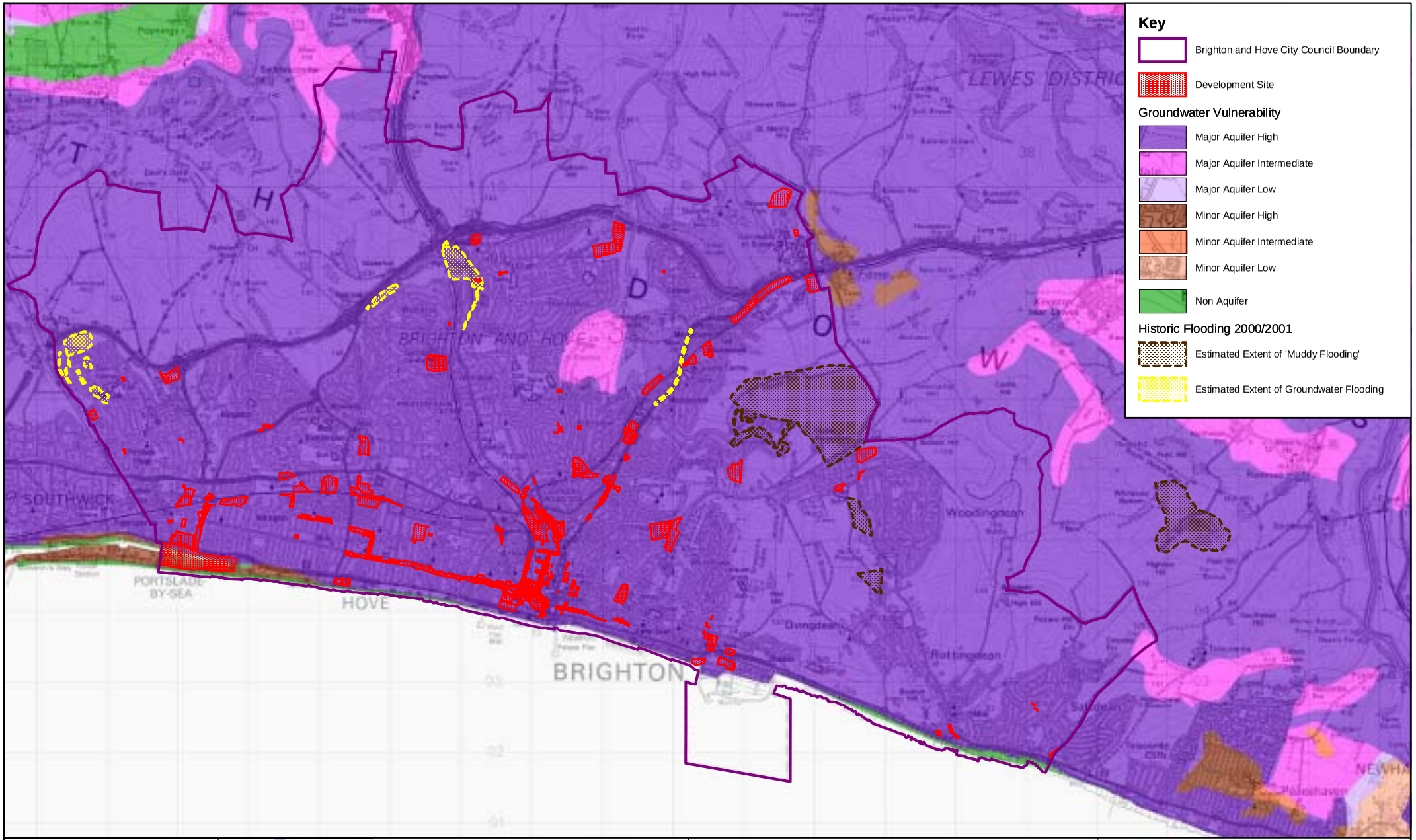

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FIGURE 4-1: BRIGHTON & HOVE SFRA INDICATION OF RISK POSED TO DEVELOPMENT SITES BY GROUNDWATER FLOODING

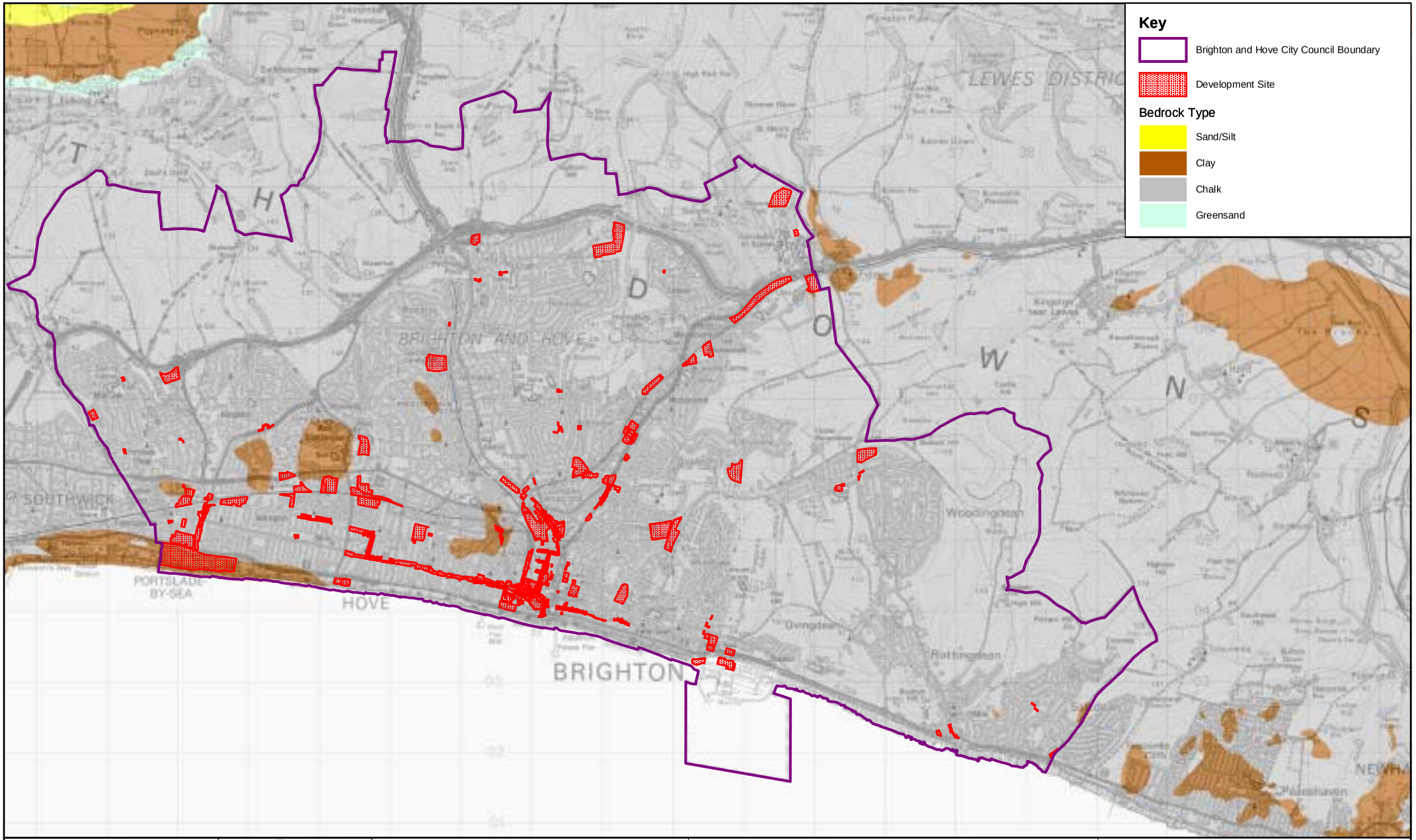

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FIGURE 4-2: BRIGHTON & HOVE SFRA BEDROCK GEOLOGY

4.6 Surface water flooding

Surface water flooding occurs in Brighton and Hove, and is a particular concern in urbanised areas, where floods occur quickly in response to heavy rainfall events. In general, surface water flooding is the most frequent cause of flooding, although floodwaters are typically shallower and persist for shorter durations than other types of flooding.

Brighton has suffered from surface water flooding on a number of occasions, recorded back to the 1960s, which are sometimes referred to as 'muddy floods'. Between September and December 2000 runoff from agricultural land resulted in the muddy flooding of suburbs of Brighton including Bevendean, Woodingdean and Ovingdean. Rottingdean has also suffered from historic 'muddy flooding'.

Surface water runs off the ploughed fields on the South Downs carrying with it some soil, and hence they are known as 'muddy floods'. It is thought that the increase in muddy floods in this area may be as a result of changes in the farming methods used. An indication of those areas which has suffered from this type of flooding is included in the accompanying maps (Figure 4.1 and Appendix A Sheets 1 - 6).

Any development proposal needs to identify if the site may be affected by surface water flooding. If identified the planning application should be accompanied by a site specific flood risk assessment identifying how the flood risk will be reduced or mitigated.

4.7 Sewer Flooding

Sewer flooding may occur where sewage is unable to drain away in sewerage pipes, but emerges at the surface usually due to the system being overloaded with floodwaters. In Brighton and Hove, storm water is generally drained by the sewer infrastructure. The permeable infrastructure can become inundated with groundwater when groundwater levels rise and the system can become overloaded in storm conditions.

There have been recorded incidences of sewer flooding in Brighton and Hove. Records of incidents since 1995 have been provided by Southern Water. Southern Water state that '*Whilst not wishing to underestimate the seriousness of sewer flooding for each of the householders these are relatively low level incidents, affecting*

only a few properties at each location. Many of these locations either have been, or will be the subject of flood alleviation schemes, depending on availability of funding, as determined by Ofwat.'

Instances of sewer flooding are plotted on the maps provided in Appendix A (Sheet 1 - 6). However, these should be viewed bearing in mind the cautionary note above, and where sewer flooding is present, indicate a requirement for more detailed investigation.

4.8 Flood Warning Areas

In areas where it is possible to forecast flooding from rivers, the Environment Agency aims to give advance warning of flooding to the public using a system of flood warning codes. Flood warnings are broadcast on TV and radio weather and travel bulletins and, in designated flood warning areas, direct to the local community by siren, loudhailer or flood wardens, and in high risk areas by phone or fax.

The flood warning information on the Environment Agency website is updated every 15 minutes. All warnings are also available through the Environment Agency's 24 hour Floodline service 0845 988 1188. Furthermore, people may sign up to Flood Warnings Direct (FWD) to receive a pre-recorded flood warning message sent to their home, work or mobile phone number.

The entire coastal frontage of Brighton and Hove City Council is covered by one flood warning area entitled 'Coastal areas from Western Arm, Shoreham Harbour to Western Arm, Newhaven Harbour'. The extent of this flood warning area corresponds to Flood Zone 2 within Brighton and Hove.

4.9 Catchment Flood Management Plan

The Adur Catchment Flood Management Plan (CFMP) which is a strategic document which identifies how the Environment Agency will work with their partners to manage non-tidal flood risk over the future, looking up to 50 – 100 years in the future, covers the area of Brighton and Hove. It has identified that there is a high flood risk from groundwater and surface water flooding, and this remains high in the future, with anecdotal reports of basement flats filling with over 1m deep of water within 4 hours. Consequently a policy of 'take further action to reduce flood risk' has been proposed as the vision for the area, to apply to both groundwater and surface water flooding.

5 Proposed Development

5.1 Identified Development Sites

The following listed areas have been identified in the Local Development Framework – Core Strategy as strategic level Development Areas within Brighton and Hove.

- Brighton Marina
- New England Quarter and London Road
- Central seafront area (Kings Road)
- Eastern Road / Edward Street corridor
- Hove Station area
- Lewes Road corridor

The potential for significant regeneration of Shoreham Harbour through mixed use development is also recognised by the City Council. The South East England Development Agency is investigating proposals for major mixed use development at the Harbour. However the City Council believes that there is currently insufficient information available on these proposals to be able to include the Harbour as an identified Development Area in the Core Strategy. An assessment of the flood risk at the Harbour is made in this SFRA for future information only.

Table 5.1 Summary of Probability of Flooding, and Development Requirement across LPA Area

No.	Question	Area (km^2)	% of Area
1	Size of planning area	85.12	n/a
2	**Area in Functional Floodplain**	1.46	1.72
3	**Area in SFRA Flood Zone 3a & 3b**	1.74	2.04
4	**Existing development in Functional Floodplain**	0.23	0.27
5	**Existing development in SFRA Flood Zone 3a & 3b**	0.47	0.55
6	**Area of SFRA Flood Zone 3 that is defended**	0.24	0.28
7	Total developed area	37.18	43.68
8	Require new development	2.02	2.37
9a	**Likely new development in Functional Floodplain**	0.00	0.00
9b	**Likely new development in SFRA Flood Zone 3**	0.03	0.04

5.2 Flood Risk to Development Sites

All the identified development sites have been screened against flood risk in Brighton and Hove. The sites differ from those listed in Section 5.1 (which identifies large scale strategic development areas). Sites listed below are those which appear as individual development areas on the SFRA maps, and have been established as being at risk of flooding.

Table 5.2 Development Sites at Risk of Flooding

Site Name	E	N	Flood Zone/ Risk	Sheet
Brighton Marina	533800	103200	3a	5
Shoreham Harbour	526300	104700	2, 3a & 3b	1
South Portslade Ind. Estate	526000	105000	Sewer	1
Withdean Stadium	529600	107500	Sewer	2
North St.	531100	104200	Sewer	3
Western Road, Brighton	530300	104400	Sewer	3
North St./East St. Junction	531200	104100	Sewer	3
Western Road, Hove	529700	104500	Sewer	3
St. Georges Road	532400	103800	Sewer	5
Old London Road, Patcham	530200	108700	Groundwater (Historic)	2
Moulsecombe & Fairways Ind. Estate	533200	107500	Groundwater (Historic)	4

The Brighton Marina and proposed Shoreham Harbour development areas lie outside of Flood Zone 1. As they lie in higher flood risk zones a Level 2 SFRA is required and can be found in Section 7.

The remaining sites in Table 5.2 above lie in areas that have experienced one or more sources of flooding historically. A site specific FRA for these sites should therefore include a more detailed investigation of this source of flooding in particular, and include suitable elements to mitigate against this form of flood risk in the future.

For the flood risks identified it is recommended that the following be included in the site specific flood risk assessment.

Table 5.3 Expected investigation for site specific Flood Risk Assessment

Flood Risk	**Policy**
Sewer	Investigation in to historic flood events, understanding of the mechanisms of flooding, has the flooding issue been resolved, methods of resolution or mitigation approach.
Groundwater	Investigation of historic events, understanding of the process of groundwater flooding in the area, mitigation against impacts of any future flooding, appropriate flood resilience measures.
Muddy/ Surface Water	Investigation in to historic flood events, understanding of the mechanisms of flooding, has the flooding issue been resolved, (in the case of muddy flooding have land management methods changed), methods of resolution or mitigation approach.

5.3 Definition of Brighton Marina as Flood Zone 3a

Brighton Marina contains a number of existing commercial, residential and leisure developments and planning permission has recently been granted for 853 residential units with new retail, commercial and community uses, car parking and associated harbour facilities. The site lies below the 1 in 20 year tidal flood level when an allowance is made for climate change. The tidal defences are also overtopped at this level. However, after discussion with the Environment Agency the area is defined within this SFRA as Flood Zone 3a for the following reasons.

- The only source of flooding is tidal flooding from the English Channel. In this context the area performs no “function” in terms of flood risk as issues of storage and conveyance are irrelevant.
- This SFRA guides developers to raise floor levels to a minimum of 300 mm above the 1 in 200 year plus climate change flood level, or to raise the existing flood defences to provide protection from the 1 in 200 year plus climate change flood event, and that the developers demonstrate that the residual flood risk behind the defence can be safely managed.

- The masterplan for the area proposes a commitment for the developers/owners of the site to maintain and enhance the standard of flood defence for the area as a whole to meet the challenges of rising sea levels as a result of climate change.

Any future development would still be required to pass the Sequential Test and also produce a robust site specific FRA to demonstrate that the Exception Test has also been passed.

6 Flood Defence Infrastructure and Future Policy

6.1 Overview

The coastal zone covered by this SFRA extends from a section of Shoreham Harbour at Portslade by Sea to the west, to Saltdean in the east. This frontage is typically highly developed, comprising the major settlements of Hove and Brighton, along with a number of smaller settlements, which have generally largely merged with one another forming a conurbation. The coastline to the east of Brighton Marina is less developed, and is protected from coastal flooding by the Chalk cliffs.

Development of broad policy for river and coastal management in the SFRA area was laid down in the South Downs Shoreline Management Plan (SMP) (Gifford Associates Consultants, 1997). This high level plan covers the coastline between Selsey Bill and Beachy Head and presents an analysis of coastal processes, resources, and policies for defence.

The preferred defence policy in the SMP for the management units in this study is to 'hold the existing defence line', in order to protect infrastructure and existing developments close to the shoreline. The presence of these assets makes 'do nothing' or 'retreat the line' policy options inappropriate due to the economic losses which would inevitably be involved, and the suite of defences that are already in place. The SMP does not recommend an 'advance the line' policy for any of the management units, and it is concluded that an 'advance the line' policy would be unlikely to have any particular benefit in coastal defence terms.

An inspection of the existing defences along the Brighton and Hove frontage was carried out by Halcrow, in July 2000 for the open coast and Brighton Marina, and January 2002 for the 'locked' section of Shoreham Port.

6.2 Condition and Standard of Current Flood Defence Infrastructure

Figure 6.1 illustrates the approximate standard of defence provided along the Brighton and Hove seafront. This information utilises crest levels as reported by Halcrow (2003), and updates the standard of protection by considering the impact of climate change as set out in PPS25. The standard of protection is therefore the length of time before the structure would be expected to be overtopped by the 200 year extreme sea level inclusive of the effects of climate change.

6.2.1 Brighton Marina

Assets within the Brighton Marina complex are all below tidal water levels, therefore flooding is a major risk. The outer breakwaters prevent open-water waves propagating into the Marina, so no overtopping is experienced within the Marina. At the same time, defence heights are currently sufficient to prevent overflow, so no flooding is experienced within the Marina. However, predicted sea level rise means that in 25 years time the 1 in 200 (0.5%) annual probability water level will exceed the height of defences for part of the inner Marina wall, resulting in overflow. By Year 50 the 1 in 100 (1.0%) annual probability event will also result in overflow.

6.2.2 Open Coast

On the open coast there are no defences that would be expected to experience overflow, either now or following 50 years of sea level rise. Any flooding on this frontage is a result of overtopping. Some defence lengths currently experience overtopping during storms, including:

- Brighton: around the Palace Pier
- Brighton: Kings Road, where the arches at the back of the promenade are flooded during storms
- Hove: King's Esplanade
- Hove: King Alfred
- Hove: Kingsway
- Hove: Western Esplanade
- Hove: Lagoon
- Aldrington, where houses are located on the beach crest
- Portslade by Sea

- Basin Road

The extent of damage caused by this overtopping varies. In some areas shingle is thrown onto the promenade but the seawater drains back onto the beach. However, flooding as a result of overtopping has caused damage to the businesses housed in the arches in the Kings Road. At two areas along the open coast the existing standard of defence is very low: at Aldrington, where damage to the houses on the beach crest is anticipated for a 1 in 1 year storm, and Basin Road South, where significant volumes of water overtop the defences.

Two defence lengths along the open coast were identified in the Coastal Protection Survey of England (1997) as showing signs of erosion:

- Defence length 574/3814 – Aldrington Basin: The defence structure on the open coast is a beach ridge consisting of concrete rubble armour and shingle. Although this structure still provides a high level of defence due to its width, it is showing signs of being eroded.
- Defence length 574/3702 – Basin Road: This defence length is on the open coast and is a shingle ridge backed by a rubble ridge. The shingle beach is fairly low and the rubble ridge behind is showing signs of erosion. Again, this structure still provides a high standard of defence due to its width.

6.2.3 Shoreham Harbour

Due to their configuration, the port lock gates are unable to remain shut when the water level outside the gates is higher than the water level inside. The water level inside the gates is maintained above high tide level, achieved by pumping seawater into the dock. Therefore, there is a risk of flooding within the port area during extreme water level events. The quay walls and other dockside structures therefore act as tidal flood defences during extreme events.

The existing defences consist mainly of steel sheet pile walling, upon which sit the port quays. The enclosed nature of the port means that there is no significant wave activity, so erosion is not considered to be a problem and overflow is the only mechanism for flooding. Minor overflow problems are already occasionally experienced within the port, which supports the assessments undertaken as part of the Brighton Marina to River Adur Strategy Plan (Halcrow, 2003) which reveals that some of the defences within the port would be overflowed during the 1 in 2-year event.

6.3 Future Flood Defence Policy

Preferred options for future coastal defence strategy are assessed in Technical Report No. 7: Economic Appraisal (Halcrow, 2003). The process whereby the preferred options have been identified is fully in accordance with the recommendations of DEFRA FCDPAG3. The study assessed only those options deemed to be both technically and environmentally acceptable for the individual strategy frontages. Summaries of considered and preferred options are presented below for the areas covered by this SFRA.

6.3.1 Brighton Marina

The overall defence policy for Brighton Marina must be to hold the current line, as any advancement would result in a loss of Marina space and retreat would result in significant loss of assets. This confirms the policy stated in the SMP.

The defences at Brighton Marina currently provide a 1 in 200-year standard of defence, which is well within the DEFRA indicative standard for intensively developed urban areas; thus negating the need to consider an 'improve the line' strategic option. Under an option whereby the current level of protection is maintained, the Marina will experience increased rates of overtopping due to sea level rise.

The preferred option for Brighton Marina involves the continuation of current annual monitoring and repair of the Marina breakwaters, along with maintenance of the inner Marina wall and the addition of concrete capping to raise the crest height to a level sufficient to prevent overflow over the next 50-years. This option prevents the breaching of the Marina breakwaters and, therefore, the loss of all Marina assets. It also prevents any flooding of Marina assets over the 50 year future coastal defences strategy life.

6.3.2 Open Coast and 'Locked' Section of Shoreham Port

This section of the frontage is predominantly at risk from coastal erosion rather than flooding, although water does overtop the existing seawall in some areas during severe storm events, causing flooding. The beaches along the whole open coast frontage are subject to coastal erosion and, if this is not controlled, the coastal defences will suffer and fail leading to significant increases in flood damages.

In assessing the coastal defence policy options, consideration has been given to the suitability of the coastal defence line for advance or retreat, in addition to holding the existing line of defence. Shoreham Port Authority is currently considering options to advance the shoreline at the western end of the open coast frontage, although this is purely to relocate their operations to free up land for other development and is not based on the need for coastal defence. Advancing the line elsewhere on the frontage has been discounted. Holding the present defence line is the viable and logical option in terms of coastal defence, as the existing defences are well-established structures and there are commercial and residential developments up to this line. For these reasons there is little or no opportunity for retreat of the line without significant loss of assets. Therefore, the SMP policy of 'hold the line' is supported.

The provision of improved seawalls or revetments are unlikely to prove economic due to their large construction cost and beach recycling or control structures would still be required in order that the new structures are protected against undermining through erosion of the foreshore. In addition, higher seawalls and revetment structures would seriously affect the recreational/amenity value of the frontage and would therefore be unacceptable. An 'open beach' policy has been considered; however, this would require significant continual beach recharge due to the high rate of sediment movement, and could leave the western end of the frontage dangerously exposed after a storm event.

The benefit cost assessment indicates that provision of a 200-year standard on the open coast between Shoreham Harbour entrance and Brighton Marina is justified. The preferred option involves the increase in quantity to 16,000m^3 of annual shingle bypassing from Shoreham Beach onto the open coast frontage, combined with an additional recharge of 15,000m^3 in the first year, sourced from Kemp Town beach. This option also involves maintenance and, in due course, replacement of existing defence structures, such as groynes and revetments. Two new groynes will be constructed, along with the extension of 17 other groynes.

This option prevents the erosion of many assets at Shoreham Port, including Shoreham Power Station and Shoreham Sewage Treatment Works, and reduces overtopping flooding at various locations along the seafront. There is no justification for recommending improved flood defences for the enclosed, or 'locked,' section of Shoreham Port. However, Shoreham Port Authority has indicated that it will continue to maintain its maritime structures from the point of view of operational use.

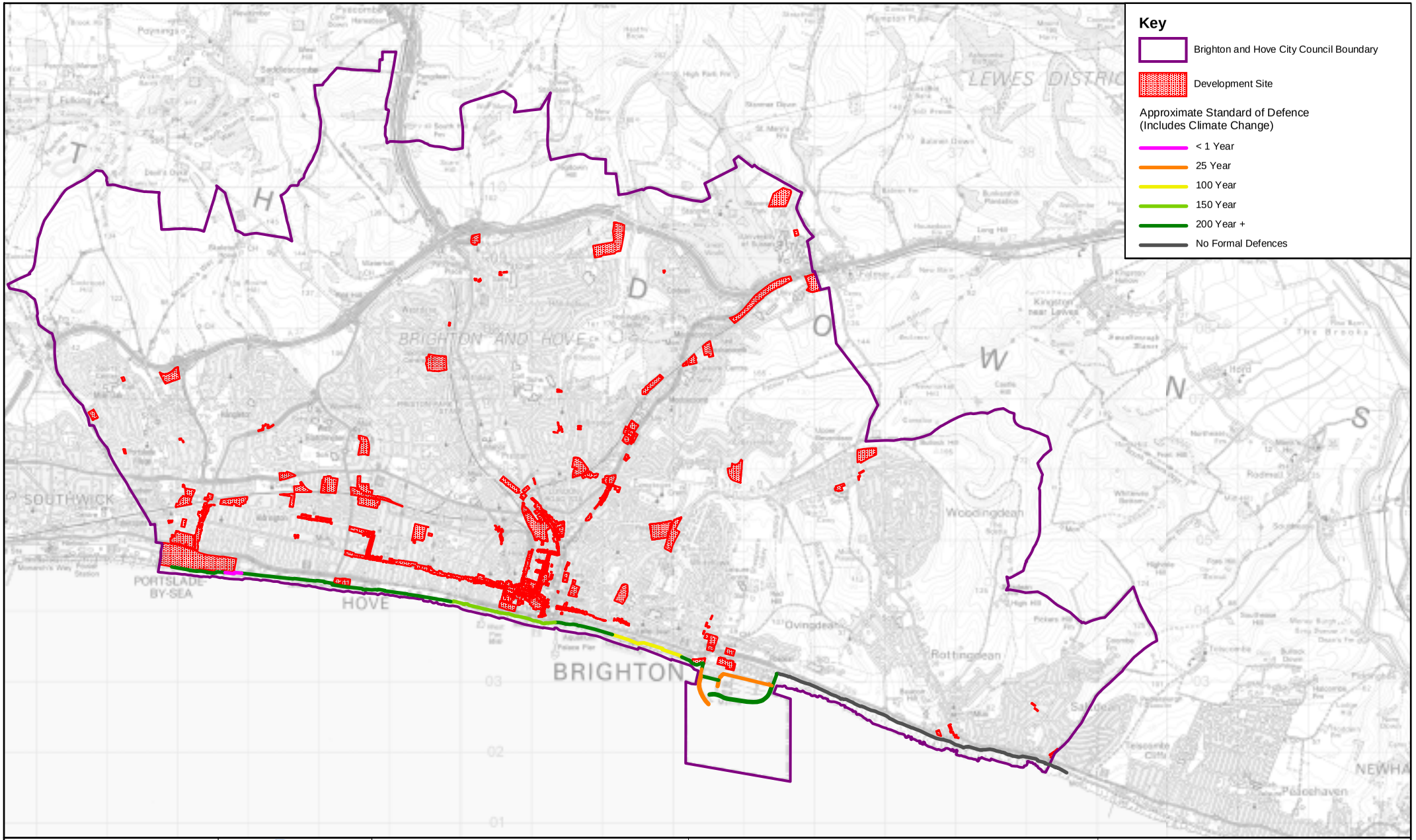

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FIGURE 6-1: BRIGHTON & HOVE SFRA STANDARD OF DEFENCES

7 Level 2 SFRA

7.1 Requirements of a Level 2 SFRA

The earlier sections of this document have formed what PPS25 refers to as the Level 1 SFRA. This is primarily a desktop study by which flood risk is assessed for the area based on existing available information. The Level 1 SFRA provides the necessary details to inform a risk-based sequential approach to flood risk guiding development to areas of least flood risk: the Sequential Test.

This approach ensures that new development is located in areas of the lowest possible risk to flooding. Where it is seen to be beneficial to allocate development in areas of higher flood risk, for example for local regeneration purposes, it is necessary to assess the flood risk in greater detail, and this forms part of the Level 2 SFRA, which will assist in the preparation of an Exception Test (PPS25 Annex D).

The main purpose of the Level 2 SFRA is to provide clear guidance for new development within Flood Zones 2 and 3. The Level 1 assessment does not take into account the impact of flood defences, their maintenance and any other flood risk management. This is considered with the Level 2 SFRA and provides a more detailed assessment of risk in these areas lying within the higher risk Flood Zones.

In accordance with PPS25, flood hazard is assessed for the site which includes an assessment of:

- Flood probability
- Flood depth
- Flood velocity
- Rate of onset of flooding

This section undertakes a Level 2 SFRA providing a detailed assessment of flood risk at two potential development sites, Brighton Marina and Shoreham Harbour.

7.2 Brighton Marina

Brighton Marina lies on the sea front just over 2km to the east of Brighton City Centre. The site was originally built to provide yacht moorings in the 1970's, but has seen significant retail, leisure and residential development from the 1980's to the present

day. There is one access road to the site, from the A259 Marine Parade, which drops down from the cliff top to the sea.

The whole of the Brighton Marina site is currently developed. Any new planning applications for the area would be for the redevelopment of existing areas and would satisfy the second part of the Exception Test.

The SFRA, after consultation with the Environment Agency, has defined Brighton Marina as Flood Zone 3a, and as such less vulnerable and water compatible developments can be built, more vulnerable development and essential infrastructure may be constructed after demonstrating acceptable Sequential and Exception Tests.

7.2.1 Flood probability

Brighton Marina is at risk of flooding from the sea. Currently the site is defended to greater than a 1 in 200 (0.5%) annual probability level. The flood defence levels are a minimum of 4.5mAOD. The current 1 in 200 (0.5%) annual probability tide is estimated at 4.3mAOD, which gives approximately 200mm of freeboard, to allow for wave and storm effects, within the marina. The breakwaters (east and west) surrounding the boat moorings are designed to protect the inner marina from open water conditions.

Table 7.1 Flood Risk at Brighton

Event Return Period (years)	Tidal flood Level (mAOD)		
	2000	**2050**	**2115**
1	3.9	4.21	5.07
5	4.0	4.31	5.17
10	4.1	4.41	5.27
20	4.1	4.41	5.27
50	4.2	4.51	5.37
100	4.3	4.61	5.47
200	4.3	4.61	5.47

Notes: 1 JBA December 2005

Brighton Marina defences overtopped

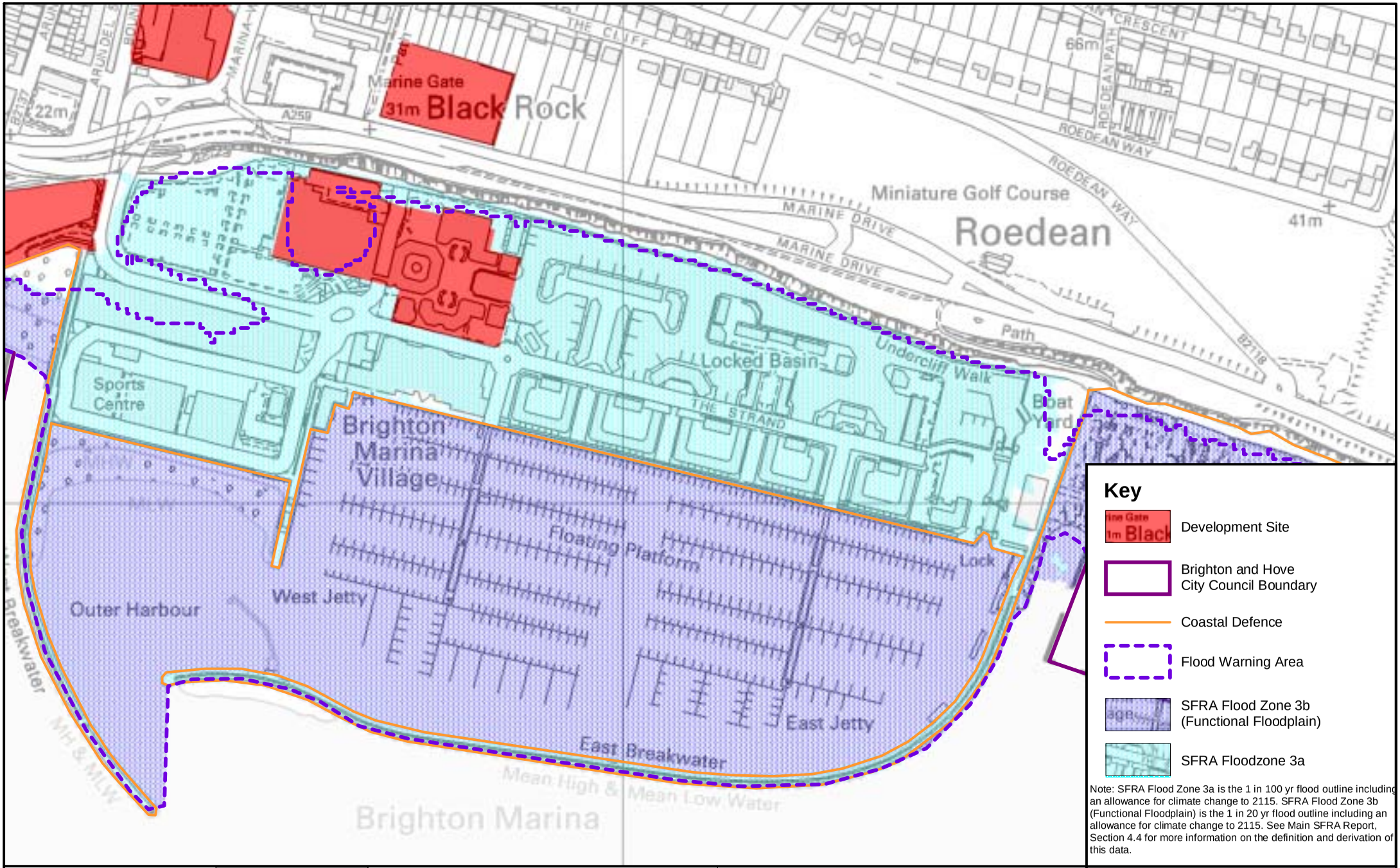

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FIGURE 7-1: BRIGHTON & HOVE SFRA BRIGHTON MARINA

From the above table it is seen that under tidal climate change assumptions from PPS25 Brighton Marina will not be at risk 50 years in the future for up to the 50 year return period event, but will be at risk from flooding for all return periods 100 years hence.

All the analysis in the following sections is based on estimated tidal peak values and does not include an allowance for wave action or wind influences.

7.2.2 Safe access

It is a requirement to provide safe access to any proposed development. Dry access is available to the north-west section of the development site via Marina Way. This access route climbs relatively steeply to Marina Drive (A259) above the cliffs behind the marina. This evacuation route would provide safe and dry access way to an area outside the flood risk area well within Flood Zone 1, which would not be inundated as the land level is significantly higher than the Brighton Marina site. This existing road will be the nearest evacuation route and the design of any development should incorporate access from all areas to it.

Developers should also consider producing evacuation plans for the properties, ensuring these are available to all occupiers. Developers should also consider consulting Brighton and Hove Emergency Planning Team when developing such plans to ensure the evacuation routes and plans are suitable.

7.2.3 Overtopping and breaching

Flooding from the sea at Brighton Marina can arise from two mechanisms. Either if there is a breach to the flood defences and the area is no longer defended, or sea level rises above the upper level of the defences and Brighton Marina is flooded from overtopping sea water. An assessment of the danger to people from such flood risk has been carried out using the simple approach to assessing the risk to people behind defences, as defined in the Defra Project Report FD2320, 'Flood Risk Assessment Guidance for New Development'.

7.2.3.1 Overtopping

In the simple approach the risk from overtopping of defences is based on the distance from the defence level and the height of water above the crest level, as shown in Table 7.2. For details regarding the danger classifications used, reference should be

made to HR Wallingford (2005) 'Flood Risks to People Phase 2, The Flood Risk to People Methodology, Environment Agency/Defra R&D Technical Report FD2321/TR1'. The following is a simplified guide to the groups of people that should be considered as falling into these danger classifications:

- Danger for some – includes children, the elderly and the infirm
- Danger for most – includes the general public
- Danger for all – includes emergency services

The analysis was carried out for the 1 in 200 year annual probability plus climate change flood level, which, at an estimated 5.47mAOD, is almost 1m higher than the current defence levels. This means that under the future climate change scenario, the sea level would be 1m higher than the sea wall and there would be significant flooding as water overflows the sea wall defences and into the marina behind. The results on the analysis can be found in Figure 7.2. The majority of the site lies within 250m of the defences, this area is identified to have 'Danger for all' if the current defences were to be overtopped, for this scenario.

Any site specific flood risk assessment would be expected to investigate the risk from over topping of the defences in greater detail than presented here.

Table 7.2 Danger to people from overtopping relative to distance from defence (Table 12.1 FD2320)

Distance from defence (m)	Head above crest level (m)			
	0.5	1	2	3
100				
250				
500				
1000				
1500				
2000				
2500				
3000				
3500				
4000				
4500				
5000				

Key:
Danger for Some
Danger for Most
Danger for All

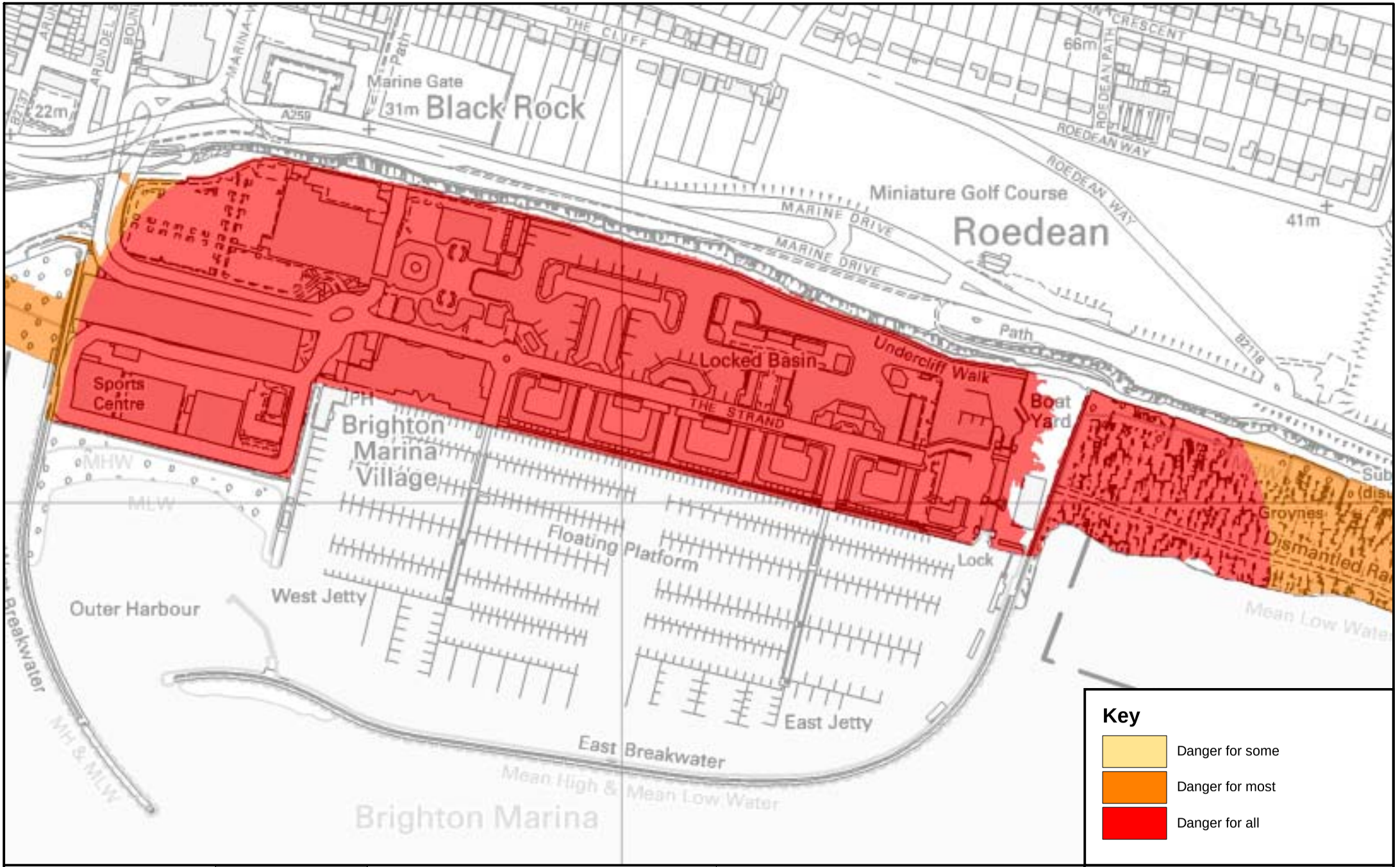

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FIGURE 7-2: BRIGHTON & HOVE SFRA
BRIGHTON MARINA
DANGER TO PEOPLE FROM OVERTOPPING

7.2.3.2 Breaching

A similar method as described and used above is recommended in the simple approach for assessing the risk from breaching of defences. A breach is a failure of the flood defences, for example a hole in the flood wall, so that the area is a risk of flooding from a lower sea level. The analysis used here is based on the distance from the defence level and the height of water above the floodplain, as shown in Table 7.3. The results of the analysis are shown in Figure 7.3.

The analysis was carried out for the 1 in 200 year annual probability plus climate change flood level (5.47 mAOD) and the natural ground levels in the Brighton Marina area. The results do not take into account the level of any raised platform. The average land level within the Brighton Marina is 2.5 mAOD, consequently a breach is assessed as being a 'Danger for all' to all but the extreme east and west of the site.

Any site specific flood risk assessment for Brighton Marina would have to demonstrate that the risk from flood defences being breached had been investigated in greater detail than presented here.

Table 7.3 Danger to people from breaching relative to distance from defence (Table 12.2 FD2320)

Distance from breach (m)	Head above floodplain (m)						
	0.5	1	2	3	4	5	6
100							
250							
500							
1000							
1500							
2000							
2500							
3000							
3500							
4000							
4500							
5000							

Key:
- Danger for Some
- Danger for Most
- Danger for All

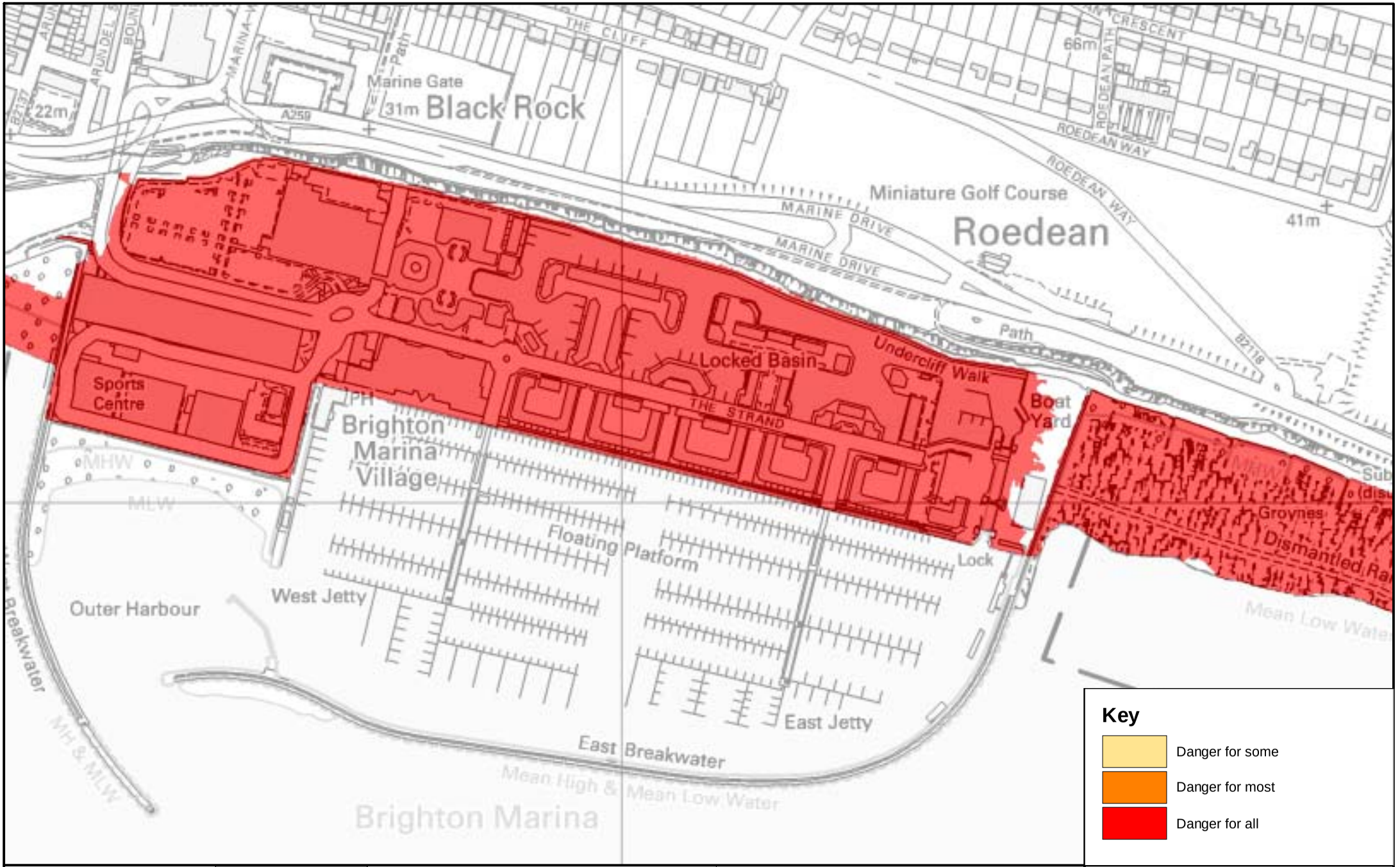

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FIGURE 7-3: BRIGHTON & HOVE SFRA
BRIGHTON MARINA
DANGER TO PEOPLE FROM BREACHING

7.2.4 Flood depth

If the Brighton Marina site was to become inundated as a result of either of the two methods described above, then as shown in the maps, the majority of the area would be covered by water. Flood depths for two future scenarios have been mapped. Figure 7.4 shows the effects of the 1 in 20 year flood level in 2115 using PPS25 climate change assumptions and Figure 7.5 which shows the 1 in 200 year flood level in 2115. Both figures assume a consistent peak tide level across the whole area. As this is tidal flooding peak flood depths are likely to occur for only a short period of time, because of the tidal cycle. The assessment does not take into account any influence of waves or wind.

For both scenarios shown which are the forecast 1 in 20 year and 1 in 200 year annual probability events in 2115, the natural land level will be flooded to a depth of 0 – 3m for the 1 in 20 year annual probability event and 0 – 3.3m for the 1 in 200 year annual probability event.

Danger to people is assessed using flood hazard, which is expressed as a combination of flood depth and velocity. The hazard rating equation, which includes conservative estimates of a debris factor, has been applied to various combinations of flood depth and velocity to produce a matrix of hazard ratings. Applying thresholds to these ratings defines the danger to people at various depths and velocities as shown in Table 7.4.

Table 7.4 Flood Hazard from FD2320

Velocity (m/s)	Depth of Flooding (m)											
	0.05	0.10	0.20	0.30	0.40	0.50	0.60	0.80	1.00	1.50	2.00	2.50
0.00												
0.10												
0.25												
0.50												
1.00												
1.50												
2.00												
2.50												
3.00												
3.50												
4.00												
4.50												
5.00												

Key:
- Danger for Some
- Danger for Most
- Danger for All

The presence, level, state and maintenance of any defences is also considered in assessing the flood hazard, as well as providing recommendations for design of the development to manage and mitigate any flood risk.

Flooding of a depth of greater than 2m is classified in Table 7.4 from the Defra Report FD2320 is considered to be a flood hazard as 'Danger for All'.

Any development in Brighton Marina area would need to ensure floor levels would be set at a minimum of the 200 year plus climate change level plus a minimum freeboard of 300mm, or that the existing flood defences are raised to provide protection from the 1 in 200 year plus climate change flood event, whilst demonstrating that the residual risk behind the defence can be safely managed.

7.2.5 Rate of onset of flooding

From analysis of the tidal cycle at Newhaven, 12 kilometres along the coast from Brighton, it is estimated that under the 200 year return period event in 2115, the defences will be overtopped for approximately 2 hours, after which sea level returns to below the defence level. These assumptions are based on a typical tidal cycle.

Brighton Marina lies within the Environment Agency's 'Coastal areas from Western Arm, Shoreham Harbour to Western Arm, Newhaven Harbour' flood warning area. After the devastating tidal floods on 1953, there has been significant investment in tidal flood and storm surge warnings. The Met Office operate the Storm Tide Forecasting Service, which provides warnings when surges effect forecast water levels to be higher or lower than the predicted astronomical tides.

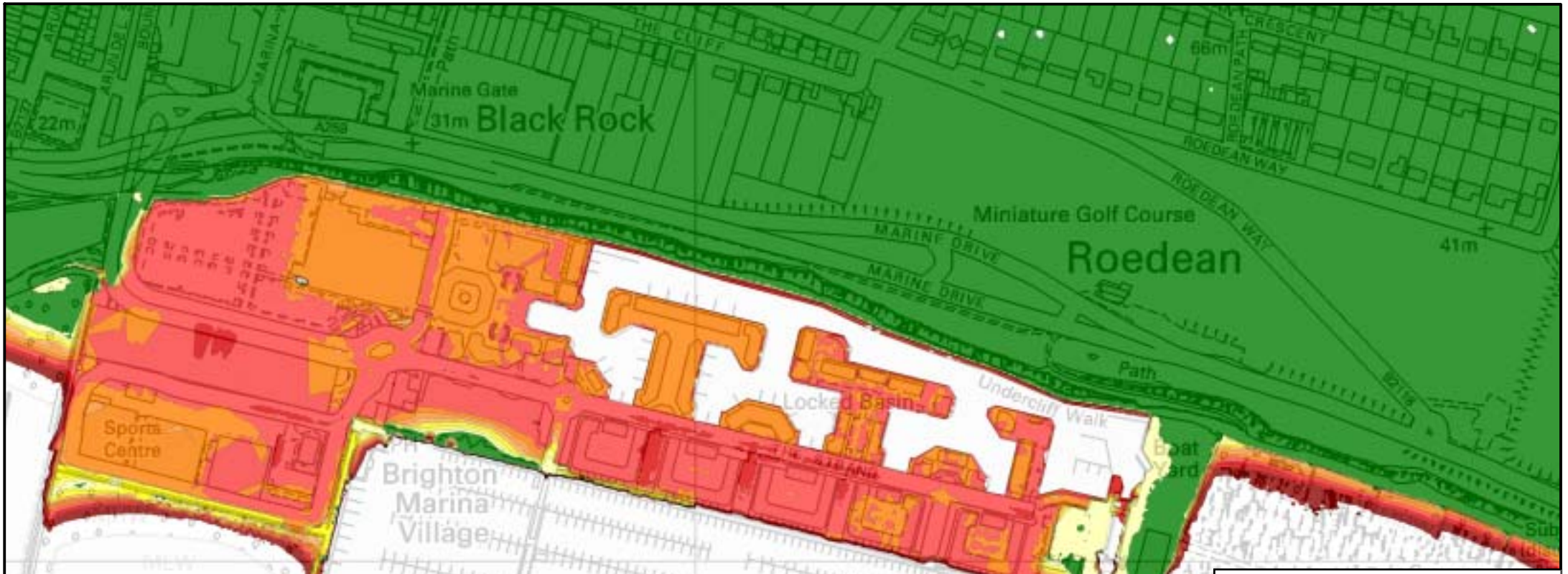

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FIGURE 7-4: BRIGHTON & HOVE SFRA
BRIGHTON MARINA
FLOOD DEPTH MAPPING 2115
(20 YEAR EVENT)

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FIGURE 7-5: BRIGHTON & HOVE SFRA
BRIGHTON MARINA
FLOOD DEPTH MAPPING 2115
(200 YEAR EVENT)

7.2.6 Flood velocity

The velocity of rising water during a flood event from rising sea level is estimated to be low. The greater risk will arise from any associated storms, waves and wind influence which will prove to be a greater hazard to life than the rising flood waters alone. Higher velocities will be found close to a breach or where defences have been overtopped. It would be expected that any site specific flood risk assessment would investigate in greater detail these velocities and the hazard they might pose.

Any proposed development will also need to ensure all buildings are resilient to storms, and the influence and impact of waves and wind are considered as well as rising sea water during a storm event.

7.2.7 Sustainable drainage systems

Currently the majority of storm water from the site drains directly into the sea. There are limited opportunities for the use of SUDS to reduce surface runoff, especially infiltration methods. Rainwater harvesting methods should be considered to assist in reducing demand on Brighton's water resources. As for all new developments, it will be necessary to show that the use of SUDS has been assessed in any application, and demonstrate that any new development will not increase runoff and flood risk elsewhere.

7.2.8 Mitigation

Under climate change scenarios for sea level rise, Brighton Marina site risk from flooding will increase steadily in the future, and the effectiveness of the current sea defences to protect developed areas will reduce. Any new development will need to provide floor levels to a minimum of 300mm above the 1 in 200 year plus climate change flood level, or to raise the existing defence to provide protection from the 1 in 200 year plus climate change flood event, whilst demonstrating that the residual flood risk behind the defence can be safely managed.

Future developments will need to demonstrate a commitment to maintain and improve the existing defences so that the development is considered to be adequately defended for its lifetime. The lifetime of a development is assumed to be 100 years for residential properties and 50 years for commercial properties.

As this site is affected by tidal flooding only, the duration of flooding will be relatively short, occurring only during the high tide period. There will be good flood warning for any event as the calculation of peak tides is established and can be estimated many years in advance. There is also a network of tide gauges around the UK which are used for the forecasting of storm surges which can result in tides higher than the astronomically predicted tides. This should provide sufficient warning for evacuation.

Other considerations should include designing the development to withstand the natural elements, including the impact of waves, in what is an exposed location to the sea.

It will be essential to demonstrate that any new development will not increase the flood risk to any other site in the area.

7.2.9 Site Specific Flood Risk Assessment

The Flood Risk Assessment accompanying any proposed development should consider all items discussed within this SFRA, especially this section (Section 7) and should include the following information and/or specifications as a minimum:

- raise ground or residential floor levels above the 1 in 200 year plus climate change (2115) levels plus a minimum freeboard of 300mm, or to raise the existing flood defences to provide protection from the 1 in 200 year plus climate change flood event, whilst demonstrating residual flood risk behind the defence can be safely managed;
- demonstrate a commitment to maintain and improve the existing defences so that the development is considered to be adequately defended for its lifetime (100 years for residential and 50 years for commercial developments);
- ensure development is located within the lowest hazard area by investigating the impacts of overtopping and breaching, including predicted water velocities, in greater detail than presented here. This equates to adopting the sequential approach to development allocation *within* the Brighton Marina site;
- design measures to withstand the natural elements including the impact of wind and waves in what is an exposed location to the sea;
- safe and dry access, the design of development should incorporate access from all areas of the site to the access road in the north-west section of the Marina as an evacuation route;

- site evacuation plans, developers should consider consulting with Brighton and Hove City Council Emergency Planners;
- use of SUDS were possible;
- demonstrate that the development will not increase flood risk to any other location.

7.3 Shoreham Harbour

Shoreham Harbour falls between the administration of Adur District and Brighton and Hove City Councils. The area covered by this SFRA is shown in Figure 7.6 and is focused around the Portslade-on-Sea area. The South East England Development Agency is investigating proposals for major mixed use development at the Harbour, however the City Council believes that there is currently insufficient information available on these proposals to be able to include the Harbour as an identified Development Area in the Core Strategy. The Level 2 SFRA information provided here is for future information.

7.3.1 Flood probability

Shoreham Harbour is at risk of flooding from the sea. The lock gates at Shoreham Harbour are unable to remain shut when the water level outside the gates is higher than the water level inside. The water level inside the gates is maintained above high tide level, achieved by pumping seawater into the dock. Therefore, there is a risk of flooding within the port area during extreme water level events. The quay walls and other dockside structures therefore act as tidal flood defences during extreme events. It is estimated that parts of Shoreham Harbour are defended to a 1 in 50 year standard of defence.

Table 7.5 Flood Risk at Shoreham Harbour

Event Return Period (years)	Tidal flood Level (mAOD)		
	2000	**2050**	**2115**
1	3.9	4.21	5.07
5	4.0	4.31	5.17
10	4.1	4.41	5.27
20	4.1	4.41	5.27
50	4.2	4.51	5.37
100	4.3	4.61	5.47
200	4.3	4.61	5.47

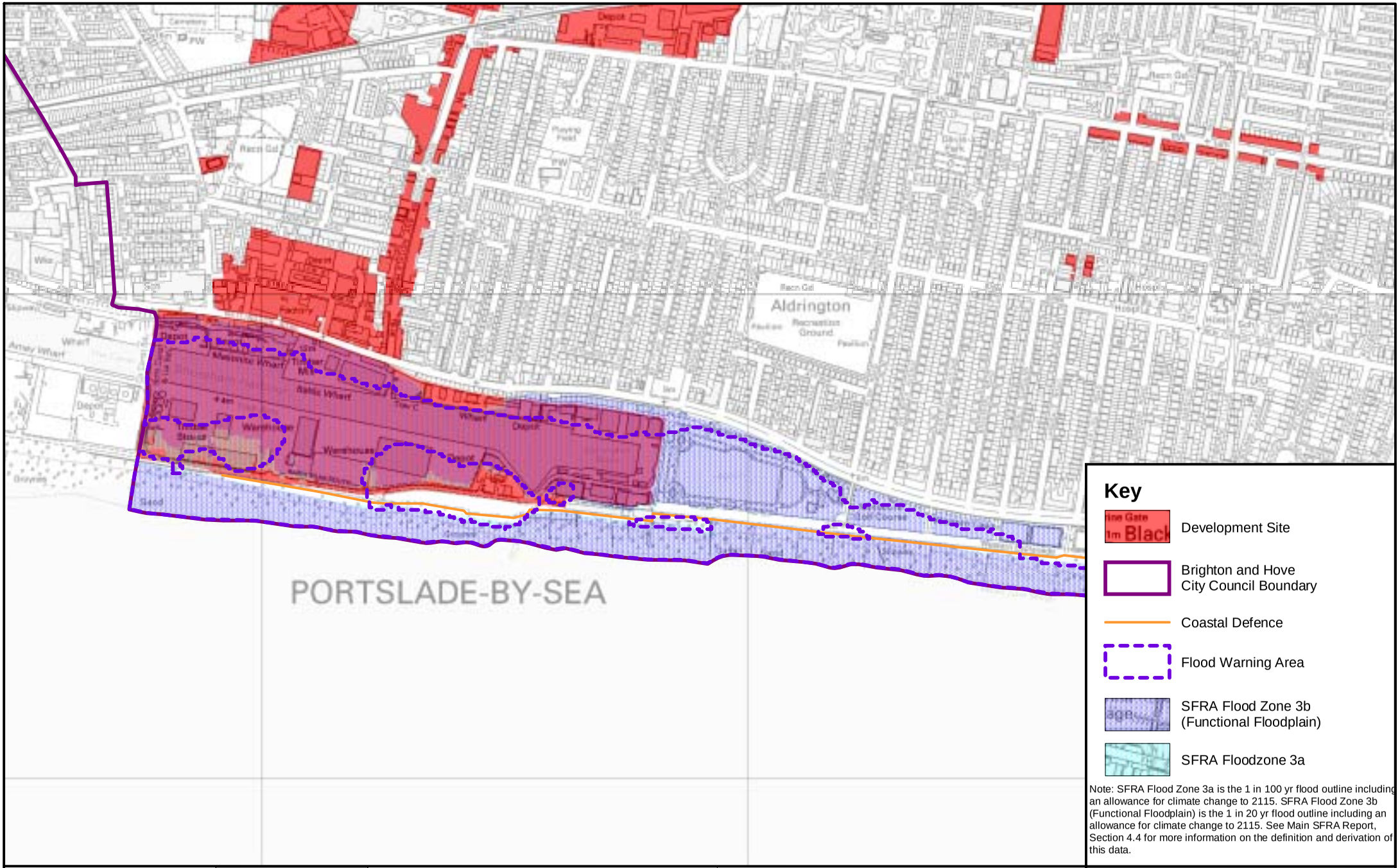

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FIGURE 7-6: BRIGHTON & HOVE SFRA SHOREHAM HARBOUR

The current 1 in 200 year return period tidal level is 4.30mAOD. Under the climate change scenario in PPS25 this is forecast to rise to 5.47mAOD by 2115. During extreme high tides, the defended peninsula is not overtopped, but flooding can occur via Shoreham lock gates being forced open as the sea level rises, and the water level rising in the port area.

7.3.2 Safe access

It is a requirement to provide safe access to any proposed development. Dry access is currently available to the north of the port area as the land rises away from the sea. There would currently be no dry access to the peninsula during the 1 in 200 year plus climate change event, the access road and footpath would both be underwater. If development of the peninsula is proposed it is likely that the existing access road would have to be reviewed and any upgrade may include the possibility of providing safe access.

7.3.3 Overtopping and Breaching

The assessment of risk from overtopping and breaching has been made based on the height of the quay walls along the wharfs of Shoreham Harbour.

7.3.3.1 Overtopping

As for the Brighton Marina assessment, the simple approach of risk assessment as detailed in Table 7.2 was used. The analysis was carried out for the 1 in 200 year annual probability plus climate change flood level, at an estimated 5.47mAOD. Under this scenario the quay walls around Shoreham Harbour would overtop resulting in flooding of the area. The results on the analysis can be found in Figure 7.7. The land lying immediately around the Harbour has been identified to be ‘Danger for most’ if overtopped, whereas moving away from the harbour, the risk reduces to ‘Danger for some’.

Key

- Danger for some
- Danger for most
- Danger for all

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FIGURE 7-7: BRIGHTON & HOVE SFRA
SHOREHAM HARBOUR
DANGER TO PEOPLE FROM OVERTOPPING

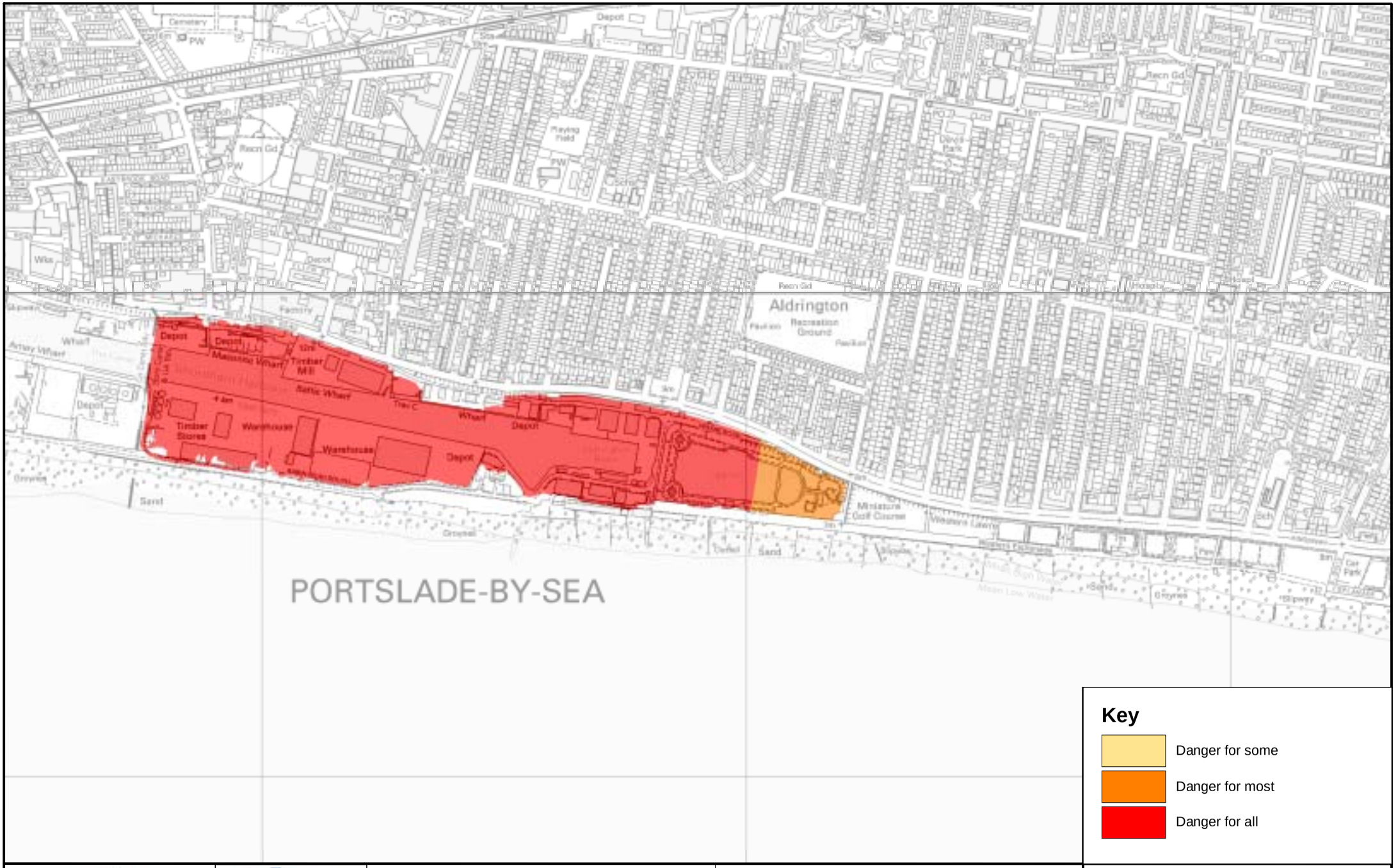

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FIGURE 7-8: BRIGHTON & HOVE SFRA
SHOREHAM HARBOUR
DANGER TO PEOPLE FROM BREACHING

7.3.3.2 Breaching

A similar method as described and used above is recommended in the simple approach for assessing the risk from breaching of defences. A breach is a failure of the flood defences, for example a hole in the flood wall, so that the area is a risk of flooding from a lower sea level. The analysis used here is based on the distance from the defence level and the height of water above the floodplain, as shown in Table 7.3. The results of the analysis are shown in Figure 7.8.

The analysis was carried out for the 1 in 200 year annual probability plus climate change flood level (5.47 mAOD). The risk from breaching is assessed as being a 'Danger for all' for the land lying along the Harbour and the risk reduces to 'Danger for most' to the east of the site.

7.3.4 Flood depth

If Shoreham Harbour was to become inundated as a result of either of mechanisms described above, then as shown in the maps, the majority of the area would be covered by water. Flood depths for two future scenarios have been mapped. Figure 7.9 shows the effects of the 1 in 20 year flood level in 2115 using PPS25 climate change assumptions and Figure 7.10 which shows the 1 in 200 year flood level in 2115. Both figures assume a consistent peak tide level across the whole area. As this is tidal flooding peak flood depths are likely to occur for only a short period of time, because of the tidal cycle. The assessment does not take into account any influence of waves or wind.

For both scenarios shown which are the forecast 1 in 20 year and 1 in 200 year annual probability events in 2115, the land level will be flooded to a depth of up to 3m within the Harbour area for the 1 in 20 year annual probability event and up to 3.5m for the 1 in 200 year annual probability event.

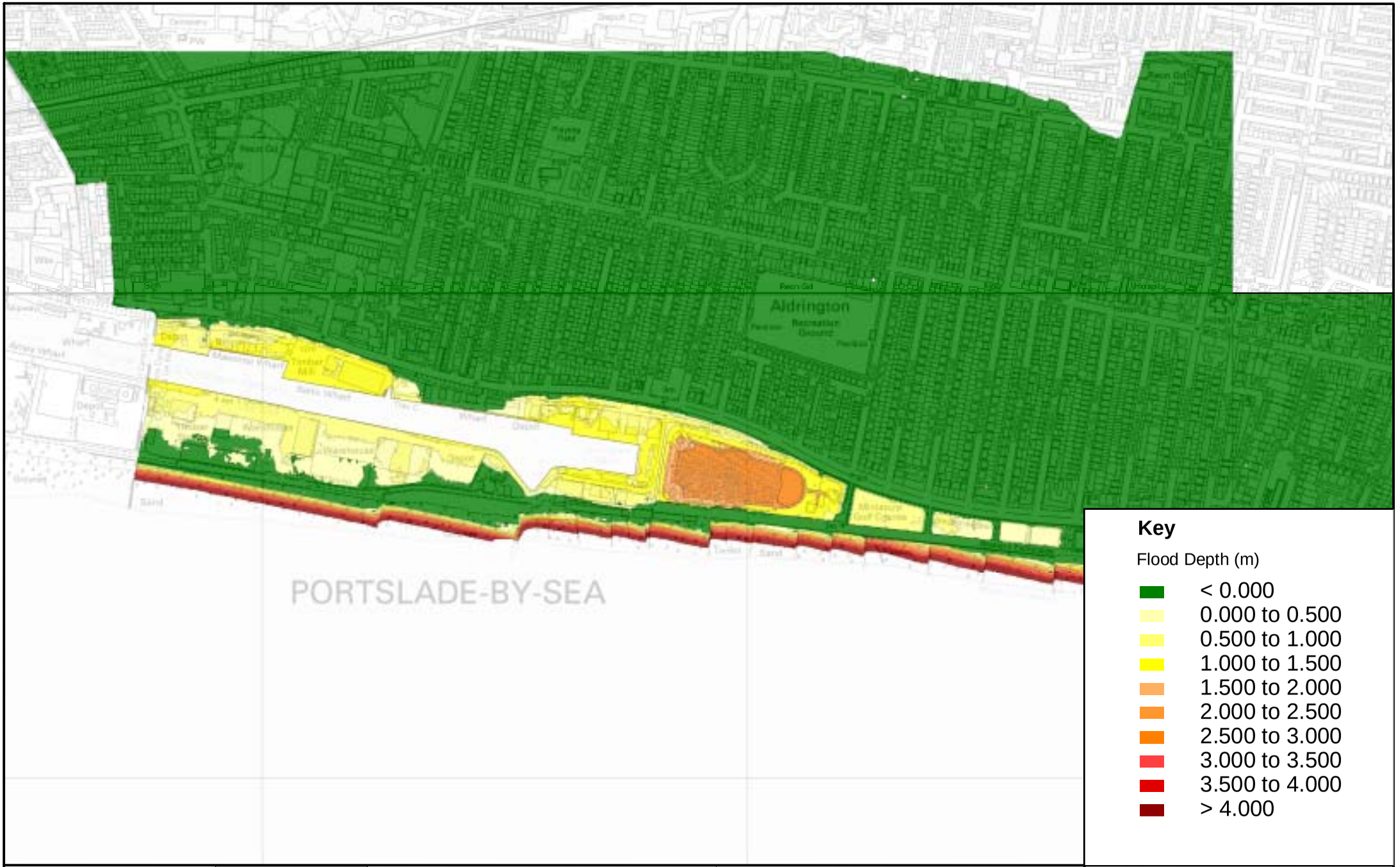

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FIGURE 7-9: BRIGHTON & HOVE SFRA SHOREHAM HARBOUR FLOOD DEPTH MAPPING 2115 (20 YEAR EVENT)

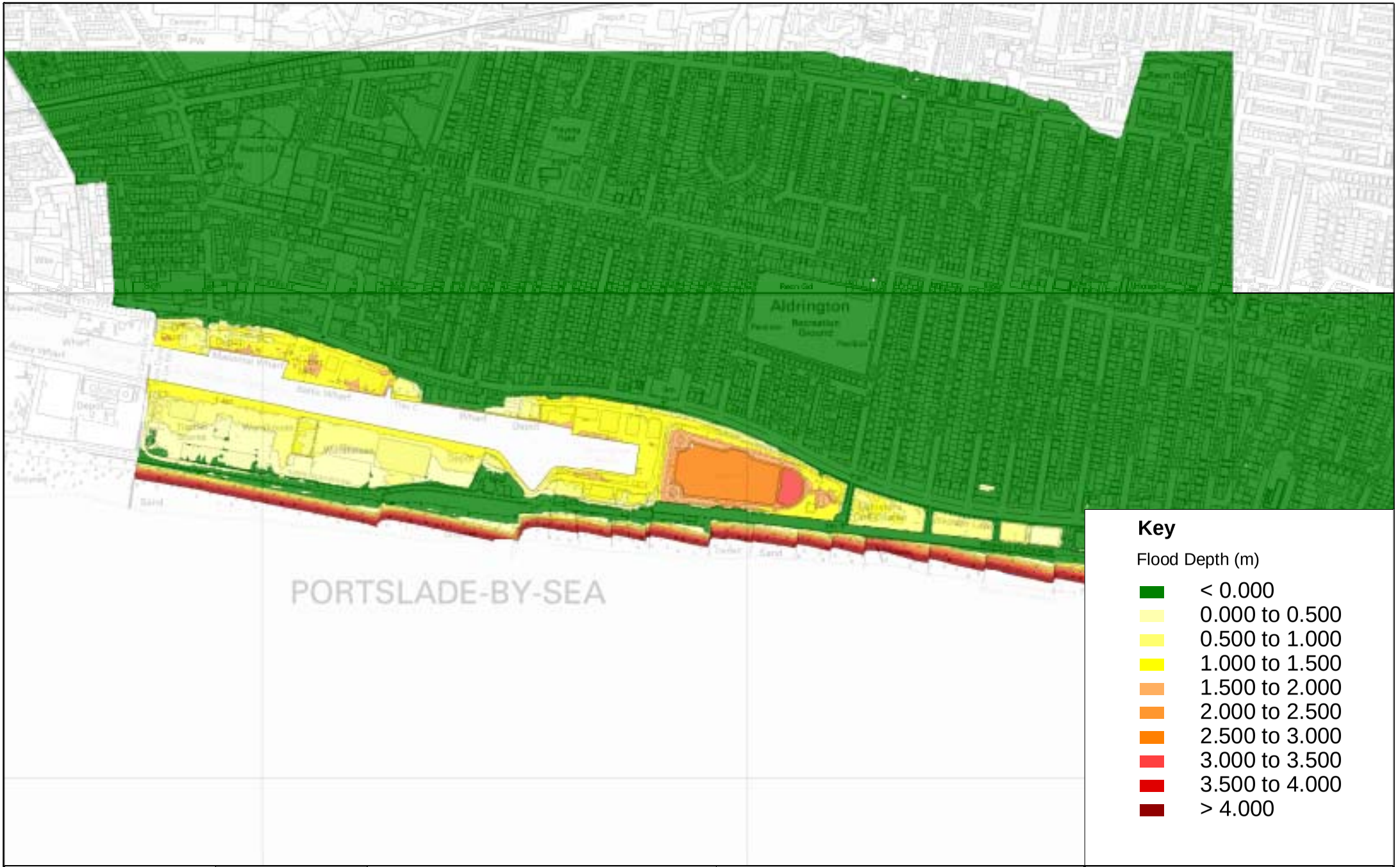

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FIGURE 7-10: BRIGHTON & HOVE SFRA SHOREHAM HARBOUR FLOOD DEPTH MAPPING 2115 (200 YEAR EVENT)

7.3.5 Rate of onset of flooding

From analysis of the tidal cycle at Newhaven, 24 kilometres along the coast from Shoreham Harbour, it is estimated that under the 200 year return period event in 2115, the area will be inundated for approximately 2-3 hours, when sea level returns below the managed harbour level.

Shoreham Harbour lies with the Environment Agency's 'Coastal areas from Western Arm, Shoreham Harbour to Western Arm, Newhaven Harbour' flood warning area.

7.3.6 Flood velocity

The velocity of rising water during a flood event from rising from sea level is estimated to be low. The greater risk will arise from any associated storms, waves and wind influence which will prove to be a greater hazard to life than the rising flood waters alone. Higher velocities will be found close to a breach or where defences have been overtopped. It would be expected that any site specific flood risk assessment would investigate in greater detail these velocities and the hazard they might pose.

8 Flood Risk Assessment Guidance

8.1 Guidance for Site-Specific FRAs

PPS25 states that *'Flood risk assessment should be carried out to the appropriate degree at all levels of the planning process, to assess risks of all forms of flooding to and from development taking climate change into account and to inform the application of the sequential approach…. Policies in LDDs should set out requirements for site-specific Flood Risk Assessments (FRAs) to be carried out by developers and submitted with planning applications in areas of flood risk identified in the plan, under circumstances set out in this PPS.'*

PPS25, paragraph 26, confirms that *'Following the coming into force, on 1st October 2006, of the amendment to Article 10 of The Town and Country Planning (General Development Procedure) Order 1995 (the 'GDPO'), LPAs are required to consult the Environment Agency on all applications for development in flood risk areas except minor development), including those in areas with critical drainage problems and for any development on land exceeding 1 hectare outside flood risk areas.'*

Paragraph E8 of PPS25 identifies that an FRA is required for the following:

- Planning applications for all proposals for new development located in Flood Zones 2 and 3.
- Planning applications for development proposals of 1 hectare or greater in Flood Zone 1.

An FRA is required for proposals of 1 hectare or greater in Flood Zone 1 to confirm that the development does not exacerbate flood risk due to an increase of surface water run-off from the site (discussed further in Section 8.2).

In general terms, a site-specific FRA must apply the following key principles:

- Identification of flood risks.
- Protection of users/occupiers of the new development.
- Ensuring there is no increased flood risk to third parties as a result of the development.

It should be noted that, prior to consultation on a FRA, the Environment Agency will require confirmation from the LPA that a proposed development site is in compliance

with the sequential test (and, if appropriate, has passed the Exception Test), if this has not already been done as part of the site allocation process. If this has not been carried out, the Environment Agency can object to the proposed development.

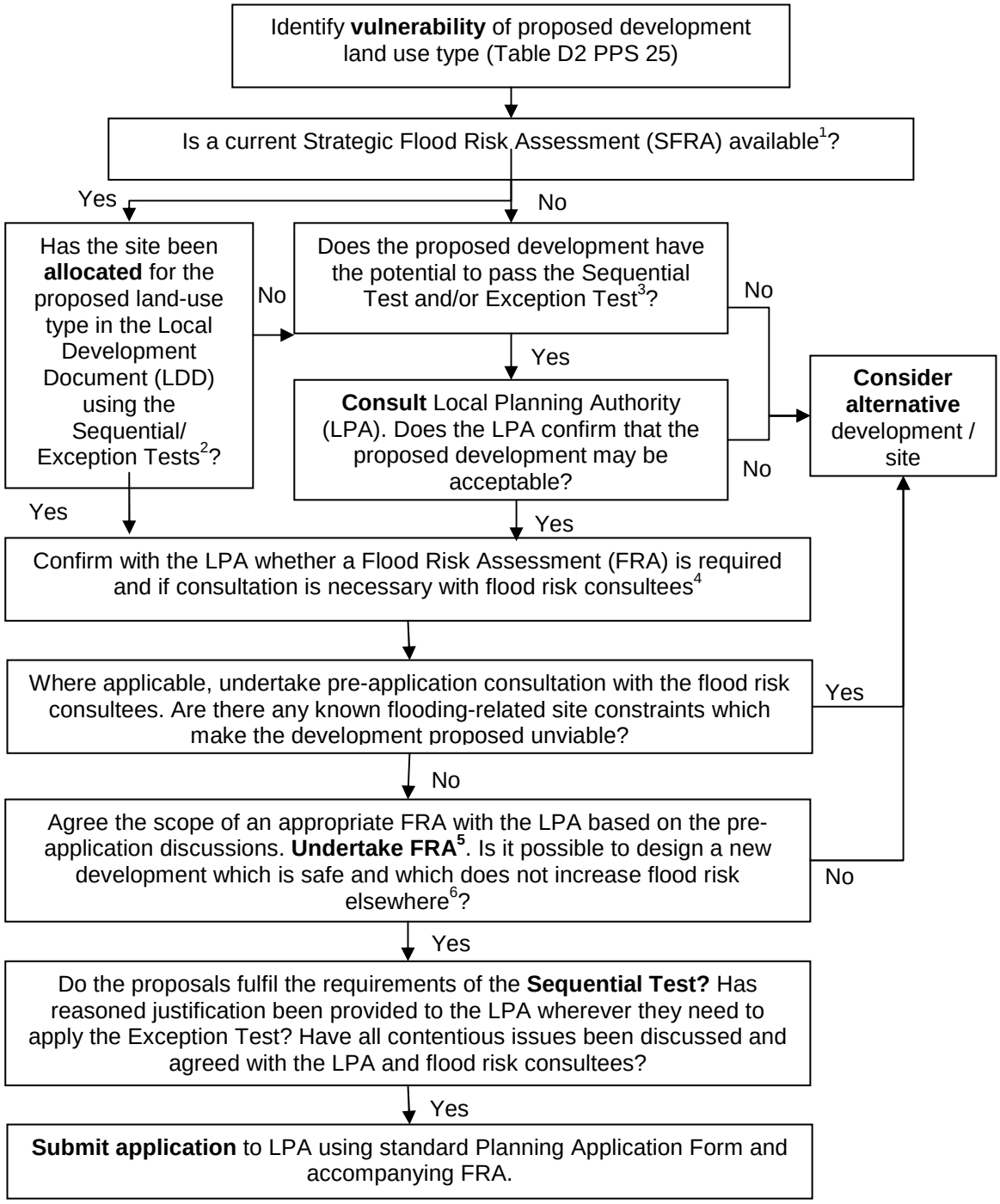
Where a Sequential Test has not already been applied by the LPA (for a windfall site, for example), this is required by national policy in accordance with PPS25. This situation is supported by the Environment Agency Standing Advice, which confirms that '*The information may also be presented by applicants to Local Planning Authorities in support of the Sequential Test for the application site*.' The Standing Advice provides a simple table listing the evidence required for applying the Sequential Test to planning applications. Reference should also be made to the PPS25 Practice Guide Companion Figure 3.1 'Application of the Sequential Test', detailed in Section 2.3.

As stated in PPS25 Paragraph D.8 *'When seeking planning permission for individual developments on sites allocated in development plans through the application of the Sequential Test, informed by a SFRA, developers need not apply the Sequential Test, but should apply the sequential approach to locate development within the site. The plan should specify requirements for Flood Risk Assessment.'*

In Brighton and Hove, there are no areas at risk of flooding from main rivers and ordinary watercourses. However there is a need to consider tidal flooding, as areas of the coastal frontage of Brighton and Hove lie within Flood Zones 2 and 3. The 200 year tidal flood level has been determined for 2115 and mapped as part of this study. While this does not extend the current Flood Zone 3 significantly, PPS25 dictates that flood risk assessments should include an assessment of future flood risk taking climate change into account.

This SFRA identifies risks from other sources of flooding, namely surface water flooding including 'muddy floods', groundwater flooding, and sewer flooding; in addition to fluvial and tidal which together make up the Environment Agency's Flood Zone maps. The purpose of the SFRA in this regard is to highlight locations where there may be a need to conduct a more detailed level of investigation into a particular flood mechanism. Table 5.3 gives some suggestions as to what issues should be considered and what level of investigation may be required.

Figure 8.1 Guidance for Developers for Individual Planning Applications



Notes

This diagram is based on Figure 1.4 within PPS25: A Practice Guide.

1) A SFRA can be defined as current if it has been prepared in accordance with PPS25.

2) If the site has been allocated in this way then subsequent steps in the process are likely to be significantly more straightforward.

3) If a site has not been allocated in the LDD because it was considered that the flood risk is unacceptable, it is unlikely that a proposed development at the site will be accepted by the LPA.

4) See PPS25 Practice Guide pages 30-31 for key consultees to the planning process with regard to flood risk.

5) Guidance on undertaking a FRA can be found in PPS25 Practice Guide Chapter 2.

6) Including surface water management.

8.2 Managing Surface Water and SUDS

PPS25 Annex F paragraph F5 states that *'The effective disposal of surface water from development is a material planning consideration in determining proposals for the development and use of land.'*

PPS25 Annex F paragraph F6 states that *'Surface water arising from a developed area should, as far as practicable, be managed in a sustainable manner to mimic the surface water flows arising from the site prior to the proposed development, while reducing the flood risk to the site itself and elsewhere, taking climate change into account. This should be demonstrated as part of the flood risk assessment.'*

PPS25 recognises that flood risk and other environmental damage can be managed by minimising changes in the volume and rate of surface runoff from development sites through the use of sustainable drainage systems (SUDS), this being complementary to the control of development within the floodplain.

One of the fundamental principles of a site-specific FRA is to ensure that the development does not cause an increased flood risk to its users or third parties, and ideally reduces flood risk. With respect to surface water runoff, a proposed development which will cause an increase to the extent of impermeable surfacing would potentially increase flood risk elsewhere. As such, appropriate measures would need to be incorporated to ensure the surface water is effectively managed to mitigate against this effect.

8.2.1 Forms of Sustainable Drainage System

The latest guidance on the use of SUDS is provided in 'The SUDS Manual' by CIRIA (ref: C697 dated March 2007). This defines SUDS as '*Surface water drainage systems developed in line with the ideals of sustainable development*….*the philosophy of SUDS is to replicate, as closely as possible, the natural drainage from a site before development."* As such, SUDS drainage can be in a variety of forms, including infiltration trenches, swales, permeable surfaces and green roofs. These are summarised in Table 8-1 below.

Table 8.1 Summary of SUDS Components

SUDS Group	Characteristics	Examples
Retention	An Area where runoff is detained for a sufficient time to allow settlement and possibility biological treatment of some pollutants	Retention Pond
		Subsurface Storage
Wetland	Wet ponds are basins that have a permanent pool of water for water quality treatment. They provide temporary storage for additional storm runoff above the permanent water level. Wet ponds may balance amenity and wildlife benefits	Shallow Wetland
		Extended Detention Wetland
		Pond/Wetland
		Pocket Wetland
		Submerged Gravel Wetland
		Wetland Channel
Infiltration	Sub-surface structures to promote the infiltration of surface water to ground. They can be trenches, basins for soakaways.	Infiltration Trench
		Infiltration Basin
		Soakaway
Filtration	Engineered sand filters designed to remove pollutants from runoff. Bioretention areas are vegetated areas designed to collect and treat water before discharge via a piped system or infiltration to the ground	Surface Sand Filter
		Sub-surface Sand Filter
		Perimeter Sand Filter
		Bioretention/Filter Strip
		Filter Trench
Detention	Detention basins are normally dry, although may have small permanent ponds at the inlet and outlet. They are designed to detain a certain volume of runoff as well as providing water quality treatment	Detention Basin
Open Channels	Shallow vegetated channels that conduct and retain water, and may also permit infiltration; the vegetation filters particulate matter	Conveyance Swale
		Enhanced Dry Swale
		Enhanced Wet Swale
Source Control	Green roofs reduce the volume and rate of runoff and remove pollution. Rainwater harvesting collects rainwater where it falls rather than allowing it to drain away. Pervious surfaces allow inflow of rainwater into the underlying construction or soil.	Green Roof
		Rainwater Harvesting
		Pervious Pavements

The Benefits of SUDS include:

- reducing peak flows to watercourses or sewers and potentially reducing the risk of flooding downstream
- reducing volumes and the frequency of water flowing directly to watercourses or sewers from developed sites
- improving water quality over conventional surface water sewers by removing pollutants from diffuse pollutant sources
- reducing potable water demand through rainwater harvesting
- improving amenity through the provision of public open space and wildlife habitat
- replicating natural drainage patterns, including the recharge of groundwater so that base flows are maintained

It is important to determine which SUDS techniques are best suited to the proposed land use of the area draining to the system, and whether there are any site characteristics that may restrict or preclude the use of a particular SUDS technique. A summary of the applicability of different SUDS techniques to different land uses, and to varying site characteristics, are presented in Table 8-2 and Table 8-3 below.

Table 8.2 SUDS Land Use Selection Matrix

SUDS Group	Technique	Low Density	Residential	Local Roads	Commercial	Hotspots	Construction Site	Brownfield	Contaminated Land
Retention	Retention Pond	Y	Y	Y[1]	Y[2]	Y[2]	Y[3]	Y	Y[2]
	Subsurface Storage	Y	Y	Y	Y	Y	Y[3]	Y	Y
Wetland	Shallow Wetland	Y	Y	Y[1]	Y[2]	Y[2]	N	Y	Y[2]
	Extended Detention Wetland	Y	Y	Y[1]	Y[2]	Y[2]	N	Y	Y[2]
	Pond/Wetland	Y	Y	Y[1]	Y[2]	Y[2]	N	Y	Y[2]
	Pocket Wetland	Y	Y	Y[1]	Y[2]	Y[2]	N	Y	Y[2]
	Submerged Gravel Wetland	Y	Y	Y[1]	Y[2]	Y[2]	N	Y	Y[2]
	Wetland Channel	Y	Y	Y[1]	Y[2]	Y[2]	N	Y	Y[2]
Infiltration	Infiltration Trench	Y	Y	Y[1]	Y[2]	N	N	Y	Y[4]
	Infiltration Basin	Y	Y	Y[1]	Y[2]	N	N	Y	Y[4]
	Soakaway	Y	Y	Y[1]	Y[2]	N	N	Y	Y[4]
Filtration	Surface Sand Filter	N	Y	Y[1]	Y[2]	Y[2]	N	Y	Y[2]
	Sub-surface Sand Filter	N	Y	Y[1]	Y[2]	Y[2]	N	Y	Y[2]
	Perimeter Sand Filter	N	N	Y[1]	Y[2]	Y[2]	N	Y	Y[2]
	Bioretention/Filter Strip	Y	Y	Y[1]	Y[2]	Y[2]	N	Y	Y[2]
	Filter Trench	Y	Y	Y[1]	Y[2]	Y[2]	N	Y	Y[2]
Detention	Detention Basin	Y	Y	Y[1]	Y[2]	Y[1,2]	Y[3]	Y	Y[2]
Open Channels	Conveyance Swale	Y	Y	Y[1]	Y[2]	Y[2]	Y[3]	Y	Y[2]
	Enhanced Dry Swale	Y	Y	Y[1]	Y[2]	Y[1]	Y[3]	Y	Y[2]
	Enhanced Wet Swale	Y	Y	Y[1]	Y[2]	Y[1]	Y[3]	Y	Y[2]
Source Control	Green Roof	Y	Y	N	Y[2]	Y	N	Y	Y
	Rainwater Harvesting	Y	Y	N	Y[2]	N	N	Y	Y
	Pervious Pavements	Y	Y	N	Y[2]	Y[1]	N	Y	Y[2]

Notes

Y: Yes N: No

[1] may require two treatment train stages, depending on type and intensity of road use and receiving water sensitivity

[2] may require three treatment train stages, depending on receiving watercourse sensitivity

[3] will require draw-down and rehabilitation following construction activities, prior to use as a permanent drainage system

[4] providing designs prevent mobilisation of contamination

This diagram is based on Table 5.2 within The SUDS Manual.

Table 8.3 SUDS Site Characteristics Selection Matrix

SUDS Group	Technique	Soils		Area Draining to a Single SUDS Component		Minimum Depth to Water Table		Site Slope		Available Head		Available Space	
		Impermeable	Permeable	0 - 2 ha	> 2 ha	0 - 1 m	> 1 m	0 - 5 %	> 5 %	0 - 1 m	1 - 2 m	Low	High
Retention	Retention Pond	Y	Y[1]	Y	Y[5]	Y	Y	Y	Y	Y	Y	N	Y
	Subsurface Storage	Y	Y	Y	Y[5]	Y	Y	Y	Y	Y	Y	Y	Y
Wetland	Shallow Wetland	Y[2]	Y[4]	Y[4]	Y[6]	Y[2]	Y[2]	Y	N	Y	Y	N	Y
	Extended Detention Wetland	Y[2]	Y[4]	Y[4]	Y[6]	Y[2]	Y[2]	Y	N	Y	Y	N	Y
	Pond/Wetland	Y[2]	Y[4]	Y[4]	Y[6]	Y[2]	Y[2]	Y	N	Y	Y	N	Y
	Pocket Wetland	Y[2]	Y[4]	Y[4]	N	Y[2]	Y[2]	Y	N	Y	Y	Y	Y
	Submerged Gravel Wetland	Y[2]	Y[4]	Y[4]	Y[6]	Y[2]	Y[2]	Y	N	Y	Y	N	Y
	Wetland Channel	Y[2]	Y[4]	Y[4]	Y[6]	Y[2]	Y[2]	Y	N	Y	Y	N	Y
Infiltration	Infiltration Trench	N	Y	Y	N	N	Y	Y	Y	Y	N	Y	Y
	Infiltration Basin	N	Y	Y	Y[5]	N	Y	Y	Y	Y	N	N	Y
	Soakaway	N	Y	Y	N	N	Y	Y	Y	Y	N	Y	Y
Filtration	Surface Sand Filter	Y	Y	Y	Y[5]	N	Y	Y	N	N	Y	N	Y
	Sub-surface Sand Filter	Y	Y	Y	N	N	Y	Y	N	N	Y	Y	Y
	Perimeter Sand Filter	Y	Y	Y	N	N	Y	Y	N	Y	Y	Y	Y
	Bioretention/Filter Strip	Y	Y	Y	N	N	Y	Y	N	Y	Y	N	Y
	Filter Trench	Y	Y[1]	Y	N	N	Y	Y	N	Y	Y	Y	Y
Detention	Detention Basin	Y	Y[1]	Y	Y[5]	N	Y	Y	Y	N	Y	N	Y
Open Channels	Conveyance Swale	Y	Y	Y	N	N	Y	Y	N[3]	Y	N	N	Y
	Enhanced Dry Swale	Y	Y	Y	N	N	Y	Y	N[3]	Y	N	N	Y
	Enhanced Wet Swale	Y[2]	Y[4]	Y	N	Y	Y	Y	N[3]	Y	N	N	Y
Source Control	Green Roof	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	Y
	Rainwater Harvesting	Y	Y	Y	N	Y	Y	Y	Y	Y			
	Pervious Pavements	Y	Y	Y	Y	N	Y	Y	N	Y	Y	Y	Y

Notes

Y: Yes N: No
[1] with liner
[2] with surface baseflow
[3] unless follows contours
[4] with liner and constant surface baseflow, or high ground water table
[5] possible, but not recommended (implies appropriate management train not in place)
[6] where high flows are diverted around SUDS component

This diagram is based on Table 5.4 within The SUDS Manual.

8.2.2 Building Regulations Surface Water Drainage Hierarchy

It is recommended that surface water drainage proposals from new development is considered in accordance with the Building Regulations. Requirement H3 stipulates

that rainwater from roofs and paved areas is carried away from the surface to discharge to one of the following, listed in order of priority:

a) an adequate soakaway or some other adequate infiltration system,

b) a watercourse, or where that is not practicable,

c) a sewer.

As such, any new development should initially consider a SUDS infiltration drainage system, which would mimic the natural drainage from the site before development. The appropriateness of a particular site for such drainage is highly dependant on the ground conditions and therefore site investigations would be required to determine the suitability of the receiving sub-soil (in terms of permeability, groundwater level, contamination etc).

Where on-site infiltration is not appropriate, discharge to a watercourse or a sewer should be limited to ensure the peak flow from the site does not exceed the existing level. This may require the surface water drainage design to incorporate on-site attenuation measures to temporarily store surface water before discharging it at an agreed rate (this rate will require discussion and agreement with the LPA, Environment Agency and/ or water company as appropriate).

9 References

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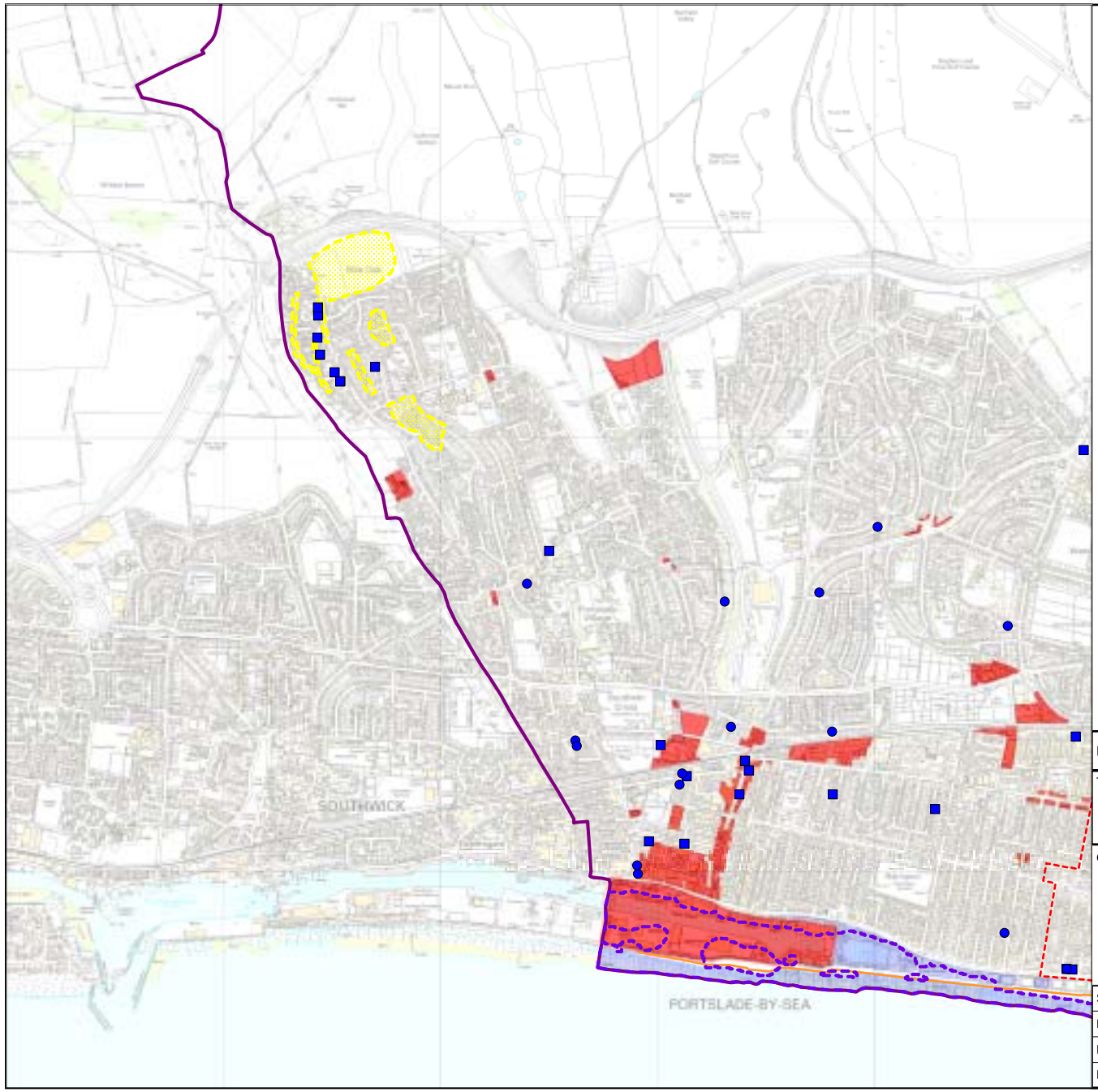
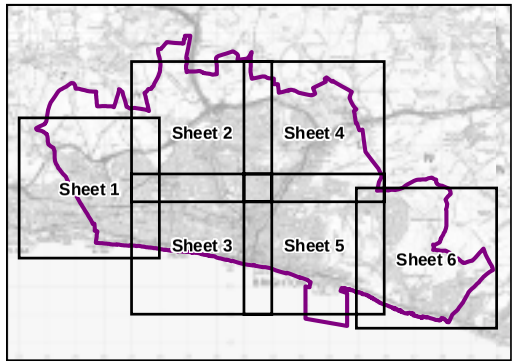
Appendix A

Detailed Flood Risk Maps for Brighton and Hove

APPENDIX





Key

- Development Site
- Hotel Core Area
- Brighton and Hove City Council Boundary
- Sewer Flooding
- Flooding from Other Sources
- Coastal Defence
- Groundwater Flooding (Coarse Estimate)
- 'Muddy' Flooding (Coarse Estimate)
- Flood Warning Area
- SFRA Flood Zone 3b (Functional Floodplain)
- SFRA Floodzone 3a

Note: SFRA Flood Zone 3a is the 1 in 100 yr flood outline including an allowance for climate change to 2115. SFRA Flood Zone 3b (Functional Floodplain) is the 1 in 20 yr flood outline including an allowance for climate change to 2115. See Main SFRA Report, Section 4.4 for more information on the definition and derivation of this data.
Areas subjected to historic groundwater flooding or 'muddy' flooding are indicative and based solely on anecdotal evidence.

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PROJECT NO: 19627/001

TITLE:

APPENDIX A: BRIGHTON & HOVE SFRA DETAILED SITE SCREENING, SHEET 1

CLIENT: Brighton & Hove

peter brett associates CONSULTING ENGINEERS

SCALE: 1:20,000

REV:

DATE: January 2008

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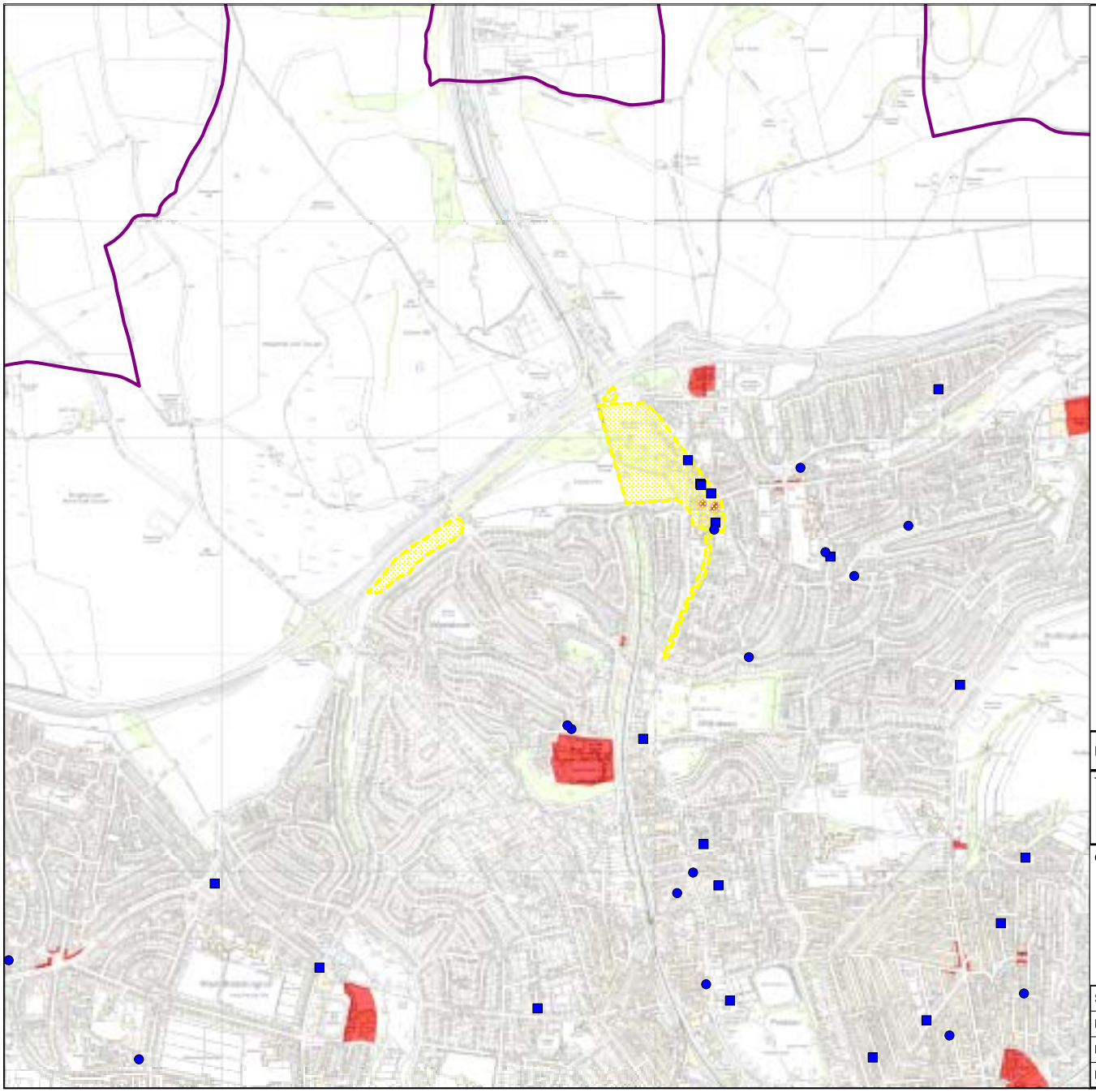

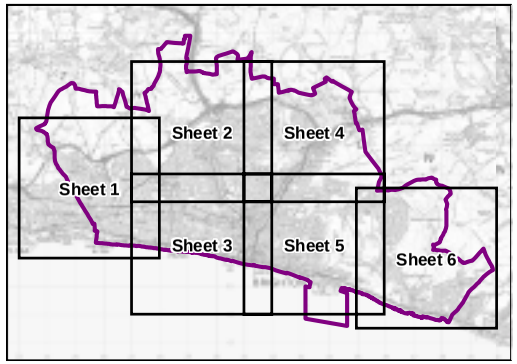

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DATE: January 2008

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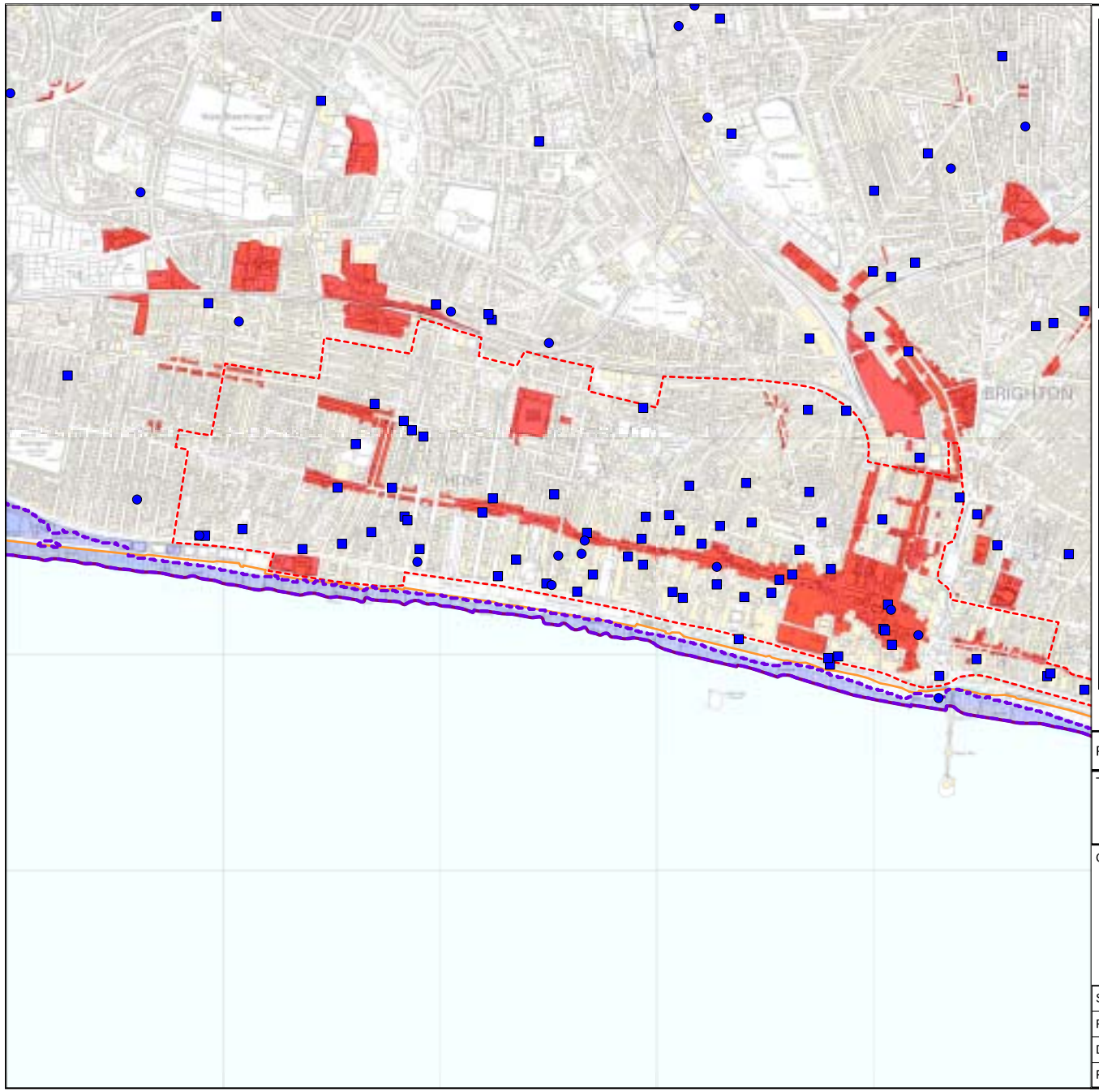

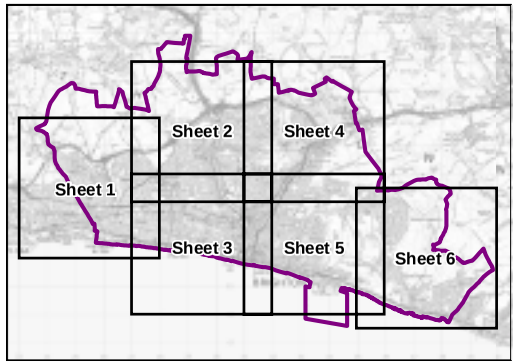

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SCALE: 1:20,000

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DATE: January 2008

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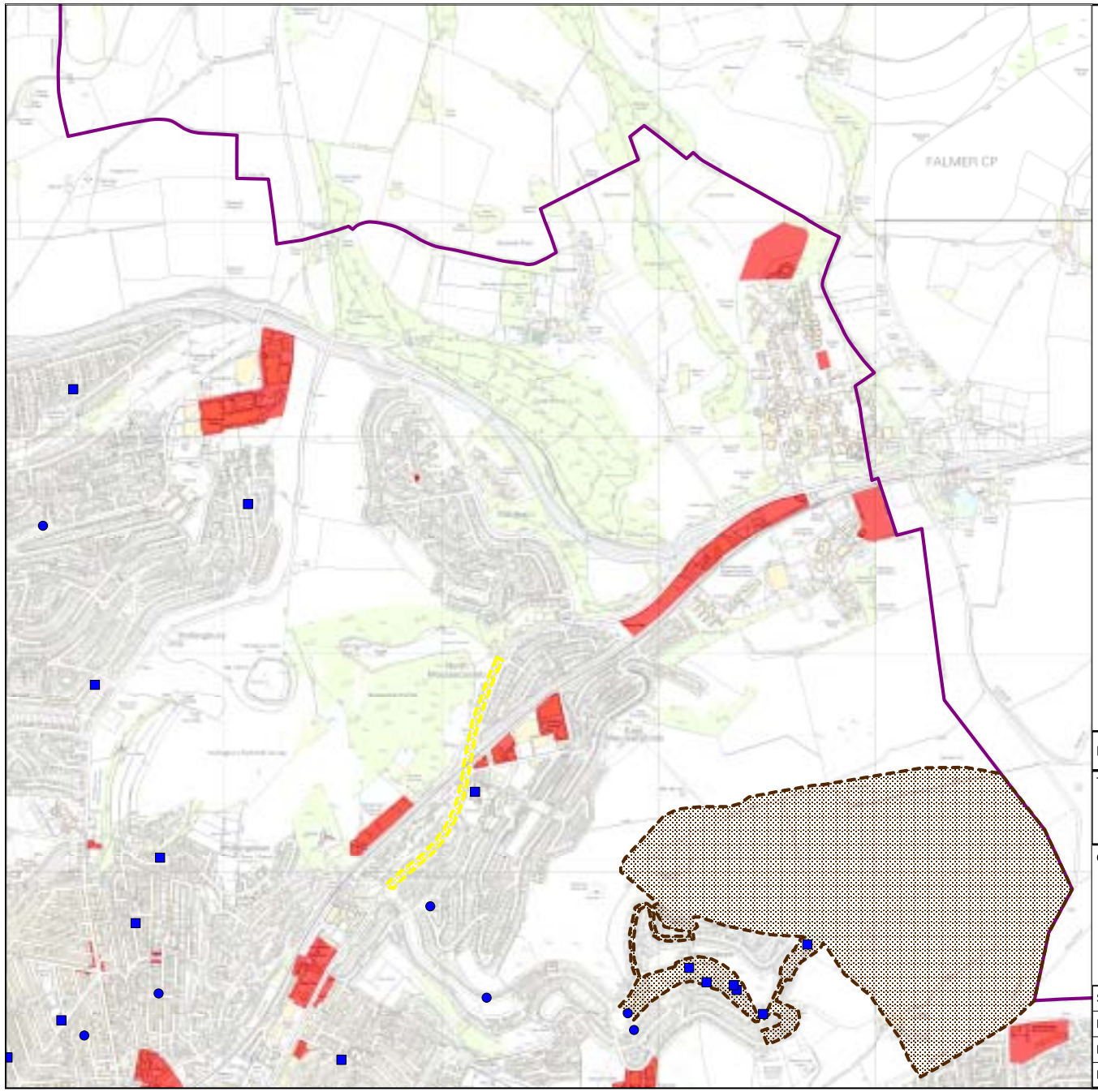

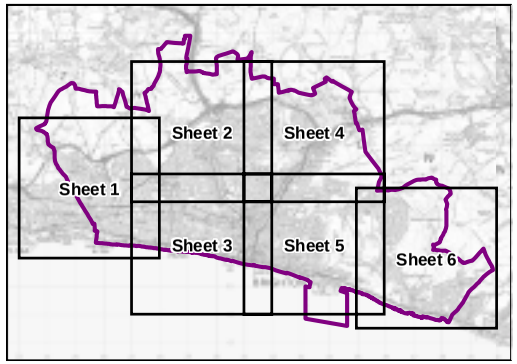

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DATE: January 2008

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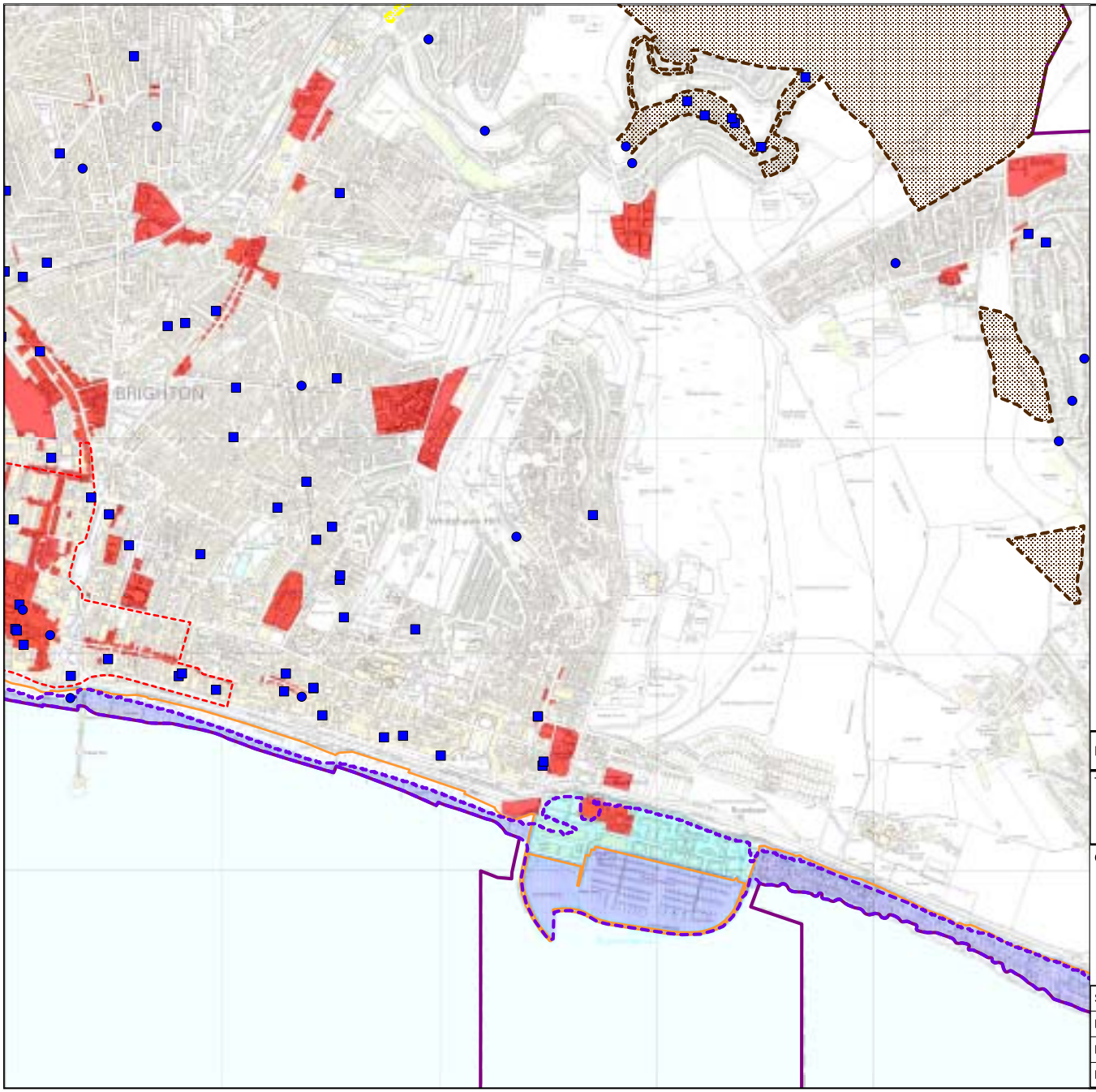

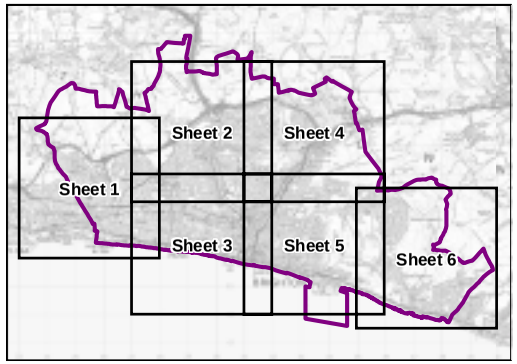

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CLIENT: Brighton & Hove

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SCALE: 1:20,000

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DATE: January 2008

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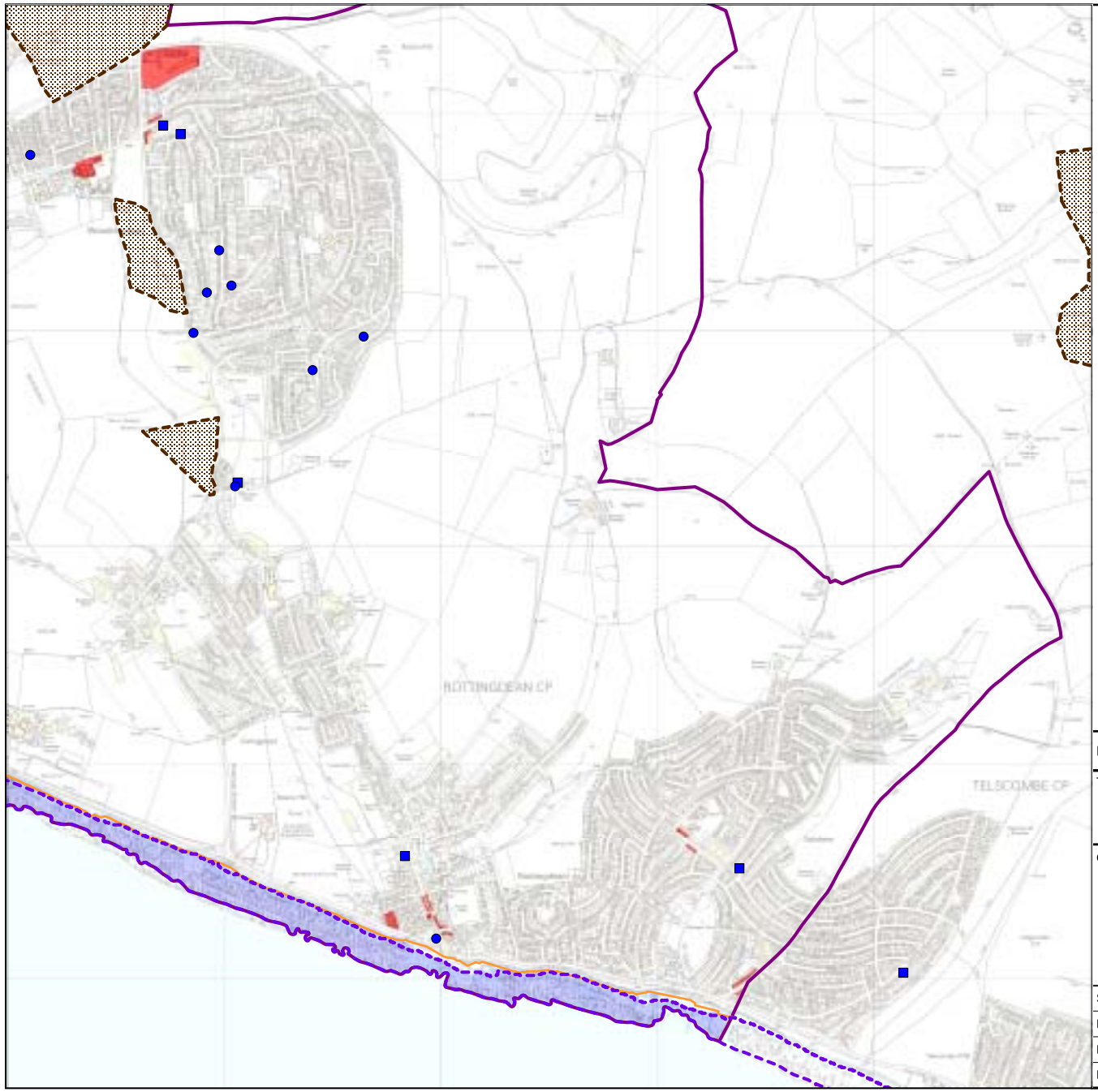

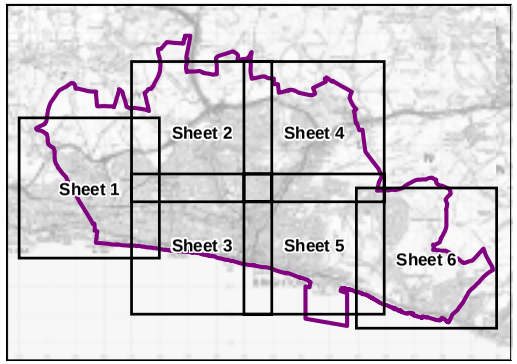

Key

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Appendix B

Remapping of Tidal Flood Extent for 2115

APPENDIX

Appendix B.1 Extreme Sea Levels (mAOD) for Sussex Sites, Year 2000: from Extreme Sea Levels, Kent Sussex, Hampshire & Isle of Wight (JBA, 2004).

	Tidal Return Period (Years)													
Location	**1**	**2**	**5**	**10**	**20**	**25**	**50**	**75**	**100**	**150**	**200**	**250**	**500**	**1000**
Shoreham	3.9	3.9	4.0	4.1	4.1	4.2	4.2	4.2	4.3	4.3	**4.3**	4.3	4.4	4.4
Brighton	*3.9*	*3.9*	*4.0*	*4.4*	*4.1*	*4.2*	*4.2*	*4.2*	*4.3*	*4.3*	***4.3***	*4.3*	*4.4*	*4.4*
Newhaven	3.9	3.9	4.0	4.4	4.1	4.2	4.2	4.2	4.3	4.3	**4.3**	4.3	4.4	4.4
Eastbourne	*4.2*	*4.3*	*4.4*	*4.5*	*4.5*	*4.6*	*4.6*	*4.7*	*4.7*	*4.7*	***4.8***	*4.8*	*4.9*	*4.9*
Pevensey	4.3	4.4	4.5	4.6	4.7	4.7	4.8	4.8	4.9	4.9	**5.1**	5.0	5.0	5.1
Hastings	*4.4*	*4.5*	*4.6*	*4.7*	*4.8*	*4.8*	*4.9*	*4.9*	*5.0*	*5.0*	***5.1***	*5.1*	*5.1*	*5.2*
Rye	4.5	4.6	4.7	4.8	4.9	4.9	5.0	5.1	5.1	5.1	**5.2**	5.2	5.3	5.4

Italics indicate interpolated ports, for which levels are estimated based on interpretation from the non-italicised ports

Appendix B.2 Recommended Contingency Allowances for Net Sea Level Rise (from PPS25)

Administrative Region	**Net Sea Level Rise (mm/yr) Relative to 1990**			
	1990 to 2025	**2025 to 2055**	**2055 to 2085**	**2085 to 2115**
East of England, East Midlands, London, SE England (south of Flamborough Head)	4.0	8.5	12.0	15.0
South West	3.5	8.0	11.5	14.5
NW England, NE England (north of Flamborough Head)	2.5	7.0	10.0	13.0

The recommended allowances in Appendix B-2 above consider all elements of estimated sea level rise, including thermal expansion, melting of polar ice caps and glaciers, and vertical adjustment of the land surface to isostatic loading.

For the south of England, projecting forward to 2115:

4.0mm/yr to 2025 = 100mm

8.5mm/yr from 2025 to 2055 = 255mm

12.0mm/yr from 2055 to 2085 = 360mm

15.0mm/yr from 2085 to 2115 = 375mm

Total = 100 + 255 + 360 + 375 = 1165mm

This sea level rise has then been added to the 200 year extreme sea level quoted in Appendix B-1 for Brighton, which results in a 2115, 200 year extreme sea level of 5.465mAOD. This is elsewhere rounded up to a value of 5.47mAOD.

The remapping of the Brighton seafront uses Environment Agency LiDAR data flown in May 2005 and February 2007. The mapping assumes a constant water surface of 5.465mAOD, which has then had the bare ground surface subtracted in order to produce a depth grid and extent of inundation. In most areas, as expected, the 2115 outline falls outside of the current Flood Zone 3. For a small number of locations, the 2115 outline lies within Flood Zone 3: this is a function of the greater resolution of the digital elevation model used to map the 2115 tidal outline.

Appendix C

Records of Sewer Flooding Provided by Southern Water

APPENDIX

Appendix C

Note: 1 = Internal Flooding
2 = Curtilage (area surrounding properties) Flooding
3 = Highway or Open Space Flooding

DATE	STREET	POSTCODE	SEWER TYPE	1	2	3	EASTING	NORTHING
05/07/2006	BAMPFIELD STREET	BN411SE	FOUL/COMBINED		Y		525622	105604
07/07/2000	BAYWOOD GARDENS	BN2 6BN	FOUL/COMBINED		Y		535108	105806
17/09/1999	BENFIELD WAY	BN412DN	SURFACE WATER	Y			526311	106245
02/10/2006	CARDEN AVENUE	BN1 8LE	FOUL/COMBINED	Y	Y	Y	531167	108595
10/08/2002	CHURCH ROAD	BN411LB	FOUL/COMBINED	Y	Y	Y	525911	104989
30/11/2000	CLIVEDEN CLOSE	BN1 6UE	FOUL/COMBINED		Y		530174	106995
17/09/2000	COWLEY DRIVE	BN2 6WD	FOUL/COMBINED			Y	536410	104813
04/07/2000	DENMARK ROAD	BN411GJ	FOUL/COMBINED		Y		526103	105400
29/09/2005	EAST STREET	BN1 1HN	FOUL/COMBINED	Y			531207	104090
03/06/1999	EDBURTON AVENUE	BN1 6EL	FOUL/COMBINED		Y		531357	106243
22/09/1999	ELM GROVE	BN2 3ES	FOUL/COMBINED	Y	Y		532367	105241
05/07/2006	ELM ROAD	BN411SA	FOUL/COMBINED	Y	Y	Y	525629	105579
04/11/2005	FALMER ROAD	BN2 6LG	FOUL/COMBINED		Y	Y	535861	104985
07/08/2001	GRAHAM AVENUE	BN1 8HA	FOUL/COMBINED		Y	Y	530431	107989
02/10/2001	HEATH HILL AVENUE	BN2 4FH	FOUL/COMBINED			Y	533864	106345
17/08/1999	HIGH STREET	BN2 7HR	FOUL/COMBINED	Y			536980	102190
10/08/2002	HILLSIDE	BN2 4TA	FOUL/COMBINED		Y	Y	532953	106839
04/07/2000	KINGS ROAD ARCHES	BN2 1TD	FOUL/COMBINED	Y			531300	103800
20/09/1999	KIPLING AVENUE	BN2 6UF	FOUL/COMBINED		Y		536036	105203
08/08/1999	LINKS ROAD	BN411XG	FOUL/COMBINED		Y	Y	526340	105667
04/10/2001	LONDON ROAD	BN1 6UF	FOUL/COMBINED		Y	Y	530100	106900
05/07/2000	MACKIE AVENUE	BN1 8RA	RISING MAIN		Y		530669	108862
12/10/2005	MEETING HOUSE LANE	BN1 1HB	FOUL/COMBINED	Y			531081	104207
14/09/2006	MILLYARD CRESCENT	BN2 6LJ	FOUL/COMBINED		Y	Y	535923	105171
02/10/2001	NORTH STREET	BN411DH	FOUL/COMBINED	Y		Y	525907	105028
16/12/2000	OLD LONDON ROAD	BN1 8XQ	FOUL/COMBINED		Y	Y	530271	108577
04/10/2001	OVINGDEAN ROAD	BN2 7AA	FOUL/COMBINED	Y	Y		536053	104277
12/10/2005	PRESTON ROAD	BN1 6SA	FOUL/COMBINED	Y	Y	Y	530234	106479
02/06/1999	ROEDALE ROAD	BN1 7GD	FOUL/COMBINED		Y		531700	106437
02/11/2005	SOUTH STREET	BN412LE	FOUL/COMBINED	Y	Y	Y	525399	106327
04/07/2000	ST. GEORGES ROAD	BN2 1EE	FOUL/COMBINED		Y		532368	103806
20/07/1999	STANSTEAD CRESCENT	BN2 6TR	FOUL/COMBINED			Y	536646	104968
21/05/2004	TAUNTON ROAD	BN2 4JN	FOUL/COMBINED		Y	Y	533893	106268
04/06/1999	THE AVENUE	BN2 4GG	FOUL/COMBINED			Y	533213	106417
03/06/1999	THE RIDGWAY	BN2 6PB	FOUL/COMBINED		Y		535979	105366
20/10/2006	TONGDEAN LANE	BN1 5JD	FOUL/COMBINED	Y	Y	Y	529613	107657
01/10/2006	VALE ROAD	BN411GD	FOUL/COMBINED	Y	Y	Y	526115	105452
08/08/1999	VALLEY DRIVE	BN1 5FA	FOUL/COMBINED			Y	529594	107674
14/09/2006	WARMDENE ROAD	BN1 8NL	FOUL/COMBINED	Y	Y		530784	108473
01/01/2001	WESTERN ROAD	BN1 2NW	FOUL/COMBINED	Y			530276	104405
14/09/2006	WHITEHAWK ROAD	BN2 5FJ	FOUL/COMBINED		Y		533359	104544
02/09/2000	WILMINGTON PARADE	BN1 8JJ	FOUL/COMBINED	Y			530917	108363
19/08/2005	BRUNSWICK TERRACE	BN3 1HA	FOUL/COMBINED	Y			529514	104321
24/08/2004	DALE VIEW	BN3 8LB	FOUL/COMBINED		Y	Y	527016	106590

DATE	STREET	POSTCODE	SEWER TYPE	1	2	3	EASTING	NORTHING
04/07/2000	GODWIN ROAD	BN3 7FS	FOUL/COMBINED	Y			526747	106287
23/06/1997	HALLYBURTON ROAD	BN3 7GW	FOUL/COMBINED		Y		526806	105645
10/08/1999	HOLLAND ROAD	BN3 1JE	FOUL/COMBINED	Y	Y		529545	104457
23/06/1997	KINGS GARDENS	BN3 2PF	FOUL/COMBINED		Y		528895	104428
17/08/1999	KINGSWAY	BN3 4GL	FOUL/COMBINED	Y	Y		527888	104550
05/07/2000	LANGDALE ROAD	BN3 4HN	FOUL/COMBINED			Y	527601	104716
04/07/2000	LANSDOWNE PLACE	BN3 1HH	FOUL/COMBINED	Y			529652	104465
10/08/2002	RUTLAND ROAD	BN3 5FE	FOUL/COMBINED	Y			528071	105537
08/08/2001	WAYFIELD AVENUE	BN3 7LW	FOUL/COMBINED			Y	527617	106133
19/08/2005	WESTERN ROAD	BN3 1JD	FOUL/COMBINED	Y			529667	104526
19/08/2005	WILBURY AVENUE	BN3 6HS	FOUL/COMBINED	Y	Y		529050	105583
23/08/1999	WILBURY CRESCENT	BN3 6FL	FOUL/COMBINED		Y	Y	529502	105438

Appendix D

Records of Callouts Provided by East Sussex Fire and Rescue

APPENDIX

Appendix D

INCIDENT REF.	DATE	ADDRESS	STATION	INCIDENT DESCRIPTION	EASTING	NORTHING	SPECIAL SERVICE DETAILS	weather
24000797	28/01/1996	King George 6th Mansions, Court Farm Road, Hove	Hove	Flooding	527967	106944	EFFECTED ENTRY TO FLAT ISOLATED WATER AND SALVAGE CARRIED OUT	Dark and Icy
24013588	23/08/1996	1, Belfast Street, Hove	Hove	Flooding	528610	104972	ATTEMPT TO PUMP OUT AND REQUEST ATTENDANCE OF COUNTY COUNCIL TO CLEAR BLOCKED CA	heavy rain
24013598	23/08/1996	98, Tamworth Road, Hove	Hove	Flooding	527930	105622	MAKE CEILING SAFE BY REMOVING PLASTER	heavy rain
24018054	04/11/1996	6, Albany Mews, Hove	Hove	Flooding	528835	104637	FLOODING TO BASEMENT PUMPED OUT USING SUBMERSIBLE PUMP	heavy rain
24018926	17/11/1996	Seafield Childrens Home, Seafield Road, Hove	Hove	Flooding effecting electrics	528547	104511	POWER SUPPLY ISOLATED	raining
25017208	06/10/1997	24, Clarendon Villas, Hove	Hove	Flooding affecting electrics	528697	105157	ELECTRICS ISOLATED	wet & windy
26003573	03/03/1998	26, Adelaide Crescent, Hove	Hove	Flooding effecting electrics	529350	104439		strong winds, heavy rain.
27008239	02/06/1999	6, Brunswick Road, Hove	Hove	Flooding severe Flooding	529929	104535	EXTERNAL DRAINS CLEARED OF STORM DEBRIS	torrential rain
27013182	08/08/1999	Barford Court Nursing Home, 157, Kingsway, Hove	Hove	Flooding electrics	528088	104580	ELECTRICAL SUPPLY ISOLATED	heavy rain
27013186	08/08/1999	Wilbury Avenue, Hove	Hove	Flooding	529238	105545	CLEARED BLOCKED DRAIN IN GUTTER	torrential rain causing flash floods
27013189	08/08/1999	185, Kingsway, Hove	Hove	Flooding in back yard	527888	104549	WATER REMOVED FROM BEDROOM/ BATHROOM	heavy rain
27013198	08/08/1999	6, Wilbury Avenue, Hove	Hove	Flooding	528981	105616	CLEARED DRAIN IN GUTTER	torrential rain causing flash floods
27013222	08/08/1999	35, Albion Street, Portslade	Hove	Flooding elderly persons involved	525961	105139	CLEARED BLOCKED GUTTER	torrential rain causing flash floods
27013228	08/08/1999	Mercedes Showroom, Victoria Road, Portslade	Hove	Flooding ceiling collapsed	526016	105583	REMOVED WATER FROM SHOWROOM AND DANDEROUS CEILING TILES	heavy rain

INCIDENT REF.	DATE	ADDRESS	STATION	INCIDENT DESCRIPTION	EASTING	NORTHING	SPECIAL SERVICE DETAILS	weather
27016145	20/09/1999	8A, Medina Villas, Hove	Hove	Flooding	528682	104565	REMOVAL OF WATER FROM EXTERIOR OF BASEMENT AREA	stormy
27016502	26/09/1999	Flat 2,1, Adelaide Crescent, Hove	Hove	Flooding	529490	104328	INSPECT ONLY NO DANGER TO PERSONS OR PROPERTY	heavy rain
27021148	11/12/1999	23, Brunswick Road, Hove	Hove	Flooding affecting electrics	529949	104636	REMOVED WATER FROM ROOF AREA AND INSTALLED SALVAGE SHEET TO AID WATER DRAIN FROM	rain, wind
27022183	26/12/1999	22, Fourth Avenue, Hove	Hove	Flooding affecting electrics	528849	104620	LIQUID SOAKED UP	heavy rain strong winds
28011896	04/07/2000	56B, Lansdowne Place , Hove, Near Lansdowne Road	Hove	Flooding affecting electrics	529678	104562	AREA MADE SAFE	heavy rain
28011902	04/07/2000	Peter Gladwin School, Drove Road, Mile Oak , Portslade	Hove	Flooding	525501	106479	REMOVE WATER FROM PLAYGROUND .CLEAR DRAINS.	Heavy rain
28018684	12/10/2000	Flat 3, 47, Waterloo Street, Hove, near Western Road	Hove	Flooding affecting electrics	529936	104415	GULLEY UNBLOCKED	heavy rain
28018699	12/10/2000	1, White Lodge, Wilbury Avenue, Hove	Hove	Flooding	529223	105571	ROAD GULLEY UNBLOCKED	stormy
28018700	12/10/2000	4, Adelaide Mansions, Kingsway, Hove	Hove	Flooding affecting electrics	529266	104362	ROOF GULLEY CLEARED	rain
28018742	12/10/2000	6, Champions Row, Wilbury Avenue, Hove, near Wilbury Villas	Hove	Flooding	528981	105616	ROAD GULLEY UNBLOCKED	heavy rain
28018752	12/10/2000	411, Mile Oak Road, Portslade, near Melrose Avenue	Hove	Flooding	524436	107566	WATER REMOVED VIA LPP AND GULLEYS CLEARED	heavy rain
28018827	12/10/2000	Care Home, 51, Norton Road, Hove, near Eaton Road	Hove	Flooding	528923	105006	GULLY CLEARED AND SLAVAGE WORK CARRIED OUT	wet
28020686	05/11/2000	Nursery Close, Mile Oak, Portslade, near Mile Oak Road	Hove	Flooding	524435	107602	FLOW DIVERTED	heavy rain
28020707	06/11/2000	Nevill Road, Hove, near Old Shoreham Road	Hove	Flooding	528450	106556	PERSON RESCUED / RELEASED + WATER REMOVED (OTHER)	raining/flash flood
28020779	06/11/2000	Mile Oak Inn PH, Mile Oak Road, Portslade	Hove	Flooding effecting electrics	524537	107261	LIQUID SOAKED UP	severe

INCIDENT REF.	DATE	ADDRESS	STATION	INCIDENT DESCRIPTION	EASTING	NORTHING	SPECIAL SERVICE DETAILS	weather
28020800	07/11/2000	Mile Oak Inn PH, Mile Oak Road, Portslade	Hove	Flooding cellar 4ft deep	524537	107261	LIQUID SOAKED UP	severe
28020870	07/11/2000	16, Oakdene Gardens, Mile Oak, Portslade, near Oakdene Crescent	Hove	Flooding	524444	107384	WATER REMOVED VIA PUMP	wet
28020879	08/11/2000	1, Compass Court, 1, Oakdene Crescent, Mile Oak, Portslade	Hove	Flooding	524512	107303	WATER REMOVED VIA PUMP	wet
28020886	08/11/2000	16, Oakdene Gardens, Mile Oak, Portslade, near Oakdene Crescent	Hove	Flooding	524444	107384	WATER REMOVED (OTHER) + WATER REMOVED VIA LPP + WATER REMOVED VIA PUMP	wet
28020895	08/11/2000	2, Oakdene Avenue, Mile Oak, Portslade, near Mile Oak Road	Hove	Flooding LPP or SP required	524432	107463	WATER REMOVED VIA PUMP	wet
28020984	09/11/2000	Mile Oak Inn PH, Mile Oak Rd, Portslade, near Mile Oak Road	Hove	Flooding cellar	524537	107261	WATER REMOVED VIA LPP	heavy rain
29003773	06/03/2001	Flat 6, 60, York Road, Hove, near Lansdowne Road	Hove	Flooding	530056	104644	FLOW DIVERTED + SHEETING UP + WATER REMOVED (OTHER)	rain
29004628	20/03/2001	Kings Cliff, 4, Third Avenue, Hove, near Church Road	Hove	Flooding	528905	104487	FLOW DIVERTED	torrential rain / strong winds
30013691	10/08/2002	Carla Lane Shop, 3, Station Road, Portslade, near Victoria Road	Hove	Flooding affecting electric	526405	105510	AREA MADE SAFE	heavy rain
30014765	25/08/2002	43, Waterloo Street, Hove, near Western Road	Hove	Flooding effecting electrics	529867	104453	FLOW DIVERTED	heavy rain
30018790	22/10/2002	65, Vale Road, Portslade, near Station Road	Hove	Flooding	526136	105440	MADE SCENE SAFE.	wet
30019641	02/11/2002	1, Denmark Villas, Hove, near Blatchington Road	Hove	Flooding affecting electrics ALP required	528832	105078	FLOW DIVERTED	wet
30019908	06/11/2002	1, Saint Aubyns Gardens, Hove	Hove	Flooding affecting electrics	528365	104487	FLOW DIVERTED	wet
31010306	08/06/2003	Budgens, 84-86, Boundary Road, Hove, near PORTLand Road	Hove	Flooding ceiling collapsed	526379	105355	FLOW DIVERTED	wet
31011295	22/06/2003	47, Saint Andrews Road, Portslade,near Station Road	Hove	Flooding affecting electrics	526126	105128	ISOLATION OF ELECTRIC AND GAS, INVESTIGATIONS	wet

INCIDENT REF.	DATE	ADDRESS	STATION	INCIDENT DESCRIPTION	EASTING	NORTHING	SPECIAL SERVICE DETAILS	weather
31022166	03/11/2003	2,Mallory Road, Hove, near Woodruff Avenue	Hove	Flooding	529456	106368	WATER REMOVED (OTHER)	Dark, sudden heavy rainfall
31025256	27/12/2003	62, Davigdor Road, Hove	Hove	Flooding affecting electrics	529937	105138	FLOW DIVERTED + SALVAGE OF PROPERTY + POWER ISOLATED	heavy rain
31025263	28/12/2003	28, Brunswick Terrace, Hove	Hove	Flooding ALP required	529632	104290	FLOW DIVERTED + SALVAGE OF PROPERTY	heavy rain
32013411	17/08/2004	Hova Villas,Hove,	Hove	Flooding	528869	105035	FLOW DIVERTED	heavy rain
32016710	13/10/2004	Stonelands School, 170A, Church Road, Hove	Hove	Flooding	528527	104771	FLOW DIVERTED	heavy rain
32016742	14/10/2004	Tiba Food Centre, 82, Boundary Road, Hove	Hove	Flooding affecting electrics	526422	105466	FLOW DIVERTED	wet
33013081	19/08/2005	177, Kingsway, Hove	Hove	Flooding effecting electrics	527915	104548	SALVAGE OF PROPERTY	heavy rain
33013087	19/08/2005	10, Rochester Gardens, Hove	Hove	Flooding	529526	104740	WATER REMOVED (OTHER)/ CLEARED DRAIN BLOCKAGE	severe rain fall over short period
33013088	19/08/2005	2, Wilbury Road, Hove	Hove	Flooding	529243	104721	FLOOD WATER PUMPED OUT OF BASEMENT	heavy rain/flash flood
33015486	29/09/2005	46, Brunswick Square, Hove	Hove	Flooding affecting electrics make 2 for salvage	529705	104370	SALVAGE OF PROPERTY + SHEETING UP	heavy prolonged wind and rain
33016223	12/10/2005	16, Stanley Avenue, Mile Oak, Portslade	Hove	Flooding elderly distressed lade	524698	107328	LIQUID SOAKED UP	very heavy rain
33016229	12/10/2005	36, Portland Villas, Hove	Hove	Flooding	526810	105355	SHEETING UP	very heavy rain
34007126	20/05/2006	39, Woodhouse Road ,Hove	Hove	Flooding from roof	527281	105288	POWER ISOLATED + SHEETING UP	raining & windy
34007130	20/05/2006	Flat 4, 20, Church Road, Hove	Hove	Flooding affecting electrics	529194	104657	AREA MADE SAFE	very heavy rain
35007549	10/05/2007	Hove News, 135, Church Road, Hove	Hove	Flooding effecting electrics	528778	104769	MADE SAFE ELECTRICS ISOLATED	heavy rain
24011799	29/07/1996	66, Elm Grove, Brighton	Preston Circus	Flooding from ceiling	532065	105232	BLOCKAGE IN DRAINPIPE REMOVED	downpour

INCIDENT REF.	DATE	ADDRESS	STATION	INCIDENT DESCRIPTION	EASTING	NORTHING	SPECIAL SERVICE DETAILS	weather
24012776	12/08/1996	71, London Road, Central Brighton	Preston Circus	Flooding	531161	105399	BASEMENT PUMPED OUT FOLLOWING HEAVY RAINFALL	overcast
24018048	04/11/1996	44, Park Crescent Road, Lewes Road, Brighton	Preston Circus	Flooding	531830	105530	FLOODED PROPERTY PUMPED OUT BY BRIGADE	wet
25009547	01/06/1997	11, Victoria Street, Monpelier, Brighton	Preston Circus	Flooding effecting electrics	530437	104610	LADDER PITCHED AND GULLY CLEARED OF DEBRIS	heavy rain
25010959	25/06/1997	54, Coombe Road, Lewes Road, Brighton	Preston Circus	Flooding	532543	106130	FLOODING STOPPED.	wet and overcast
25011109	27/06/1997	108, Brentwood Road, Hollingdean, Brighton,	Preston Circus	Flooding electrics	531707	107063	INSPECTION ONLY BY BRIGADE.	Raining and overcast
25017284	08/10/1997	61, Buckingham Place, Seven Dials, Brighton,	Preston Circus	Flooding	530874	105125	BASEMENT DRAIN UNBLOCKED	heavy downpour
26000733	13/01/1998	Moulsecoomb School, The Highway, Moulsecoomb, Brighton	Preston Circus	Flooding	533160	107367	PUMP OUT BOILER ROOM	wet
27012933	04/08/1999	Flat 4, 12, Grand Parade, Brighton, near Richmond Parade	Preston Circus	Flooding	531479	104647	WATER DIVERTED FROM BUILDING	severe rain
27013103	07/08/1999	12, Grand Parade, Brighton,near Richmond Parade	Preston Circus	Flooding	531479	104647	RAIN WATER DIVERTED FROM CEILING TO OUTSIDE OF BUILDING	severe rain
27013244	08/08/1999	Royal Mail, North Road, Central, Brighton, near Queens Road	Preston Circus	Flooding effecting electrics	531040	104624	REMOVAL OF WATER	heavy rain
27016287	22/09/1999	134, Heath Hill Avenue, Bevendean, Brighton	Preston Circus	Flooding	534353	106475	WATER REMOVED FROM PROPERTY MANUALLY	very wet
27018148	24/10/1999	Club Baracuda, 139, Kings Road Arches, Brighton	Preston Circus	Flooding	530378	104072	WATER REMOVED	wet windy
27018152	24/10/1999	158,Kings Road Arches, Brighton,	Preston Circus	Flooding	530799	103954	MANHOLE COVER LIFTED TO DRAIN SEAWATER	awful
27021876	24/12/1999	79, Larkfield Way, Hollingbury, Brighton, near Woodbourne Avenue	Preston Circus	Flooding through roof	531406	107861	ROOFING FELT RENAILED AND SALVAGE OPERATIONS IN BEDROOM	Gales and raining
27022417	30/12/1999	3, Kings Mansions, 54, Kings Road, Brighton, near Grand Junction Road	Preston Circus	Flooding effecting electrics	530837	103992	INSPECTION ADVICE GIVEN	rainy

INCIDENT REF.	DATE	ADDRESS	STATION	INCIDENT DESCRIPTION	EASTING	NORTHING	SPECIAL SERVICE DETAILS	weather
28001544	29/01/2000	82, Theobold House, Blackman Street, Brighton,	Preston Circus	Flooding	531212	104908	SUPPLY ISOLATED	Dark, ,wet & windy
28011891	04/07/2000	Basement Flat,4, Alexandra Villas, Brighton, near Leopold Road	Preston Circus	Flooding	530703	104751	FLOW DIVERTED	heavy rain
28011897	04/07/2000	42, Stanmer Villas, Hollingdean, Brighton, near Hollingbury Crescent	Preston Circus	Flooding basement	531594	106761	SALVAGE OF PROPERTY + WATER REMOVED VIA PUMP	flash floods and thunderstorm
28011947	04/07/2000	106, Upper North Street, Brighton, near Dyke Road	Preston Circus	Flooding	530657	104484	WATER REMOVED (OTHER)	rain really really heavy
28011961	05/07/2000	Royal Albion Hotel, Old Steine, Brighton	Preston Circus	Flooding over 12 inches basement	531303	103902	AREA MADE SAFE	very heavy rain
28011971	05/07/2000	15, Saint Nicholas Road, Brighton, near Upper Gloucester Road	Preston Circus	Flooding elderly gentleman	530759	104610	SALVAGE OF PROPERTY	very heavy rain
28013879	03/08/2000	44A, Montpelier Road, Brighton, near Western Road	Preston Circus	Flooding	530206	104512	BLOCKAGE RELEASED WATER REMOVED	day raining
28016939	15/09/2000	17B, Warmdene Road, Patcham, Brighton, near Carden Avenue	Preston Circus	Flooding	530807	108453	WATER REMOVED VIA PUMP	wet
28016950	15/09/2000	13A, Springfield Road, Brighton, near Preston Road	Preston Circus	Flooding basement Flat	530997	105768	SALVAGE WORK	Absolutely chucking it down/lightning
28016954	15/09/2000	138, Heath Hill Avenue, Bevendean, Brighton, near Upper Bevendean Avenue	Preston Circus	Flooding 2ft in house	534366	106453	SALVAGE OF PROPERTY	torrential rain
28018696	12/10/2000	134, Heath Hill Avenue, Bevendean, Brighton, near Upper Bevendean Avenue	Preston Circus	Flooding panicky lady	534353	106475	WATER REMOVED VIA PUMP	heavy rain
28018697	12/10/2000	3, Bodiam Close, Bevendean, Brighton, near Bodiam Avenue	Preston Circus	Flooding make pumps 2	534692	106663	WATER REMOVED VIA PUMP	heavy rain
28018741	12/10/2000	Leybourne Road, Bevendean, Brighton, near Taunton Road	Preston Circus	Flooding	534227	106488	WATER REMOVED VIA PUMP AND SALVAGE OF PROPERTIES INVOLVED	heavy rain
28018791	12/10/2000	White Admiral PH, 1, Tunton Rd, Brighton, near Taunton Road	Preston Circus	Flooding effecting electrics make pumps 2	534147	106554	WATER PUMPED INTO MAIN DRAINAGE SYSTEM	wet
28018871	12/10/2000	7, Bodiam Avenue, Bevendean, Brighton, near Heath Hill Avenue	Preston Circus	Flooding elderly person trapped	534488	106342	WATER REMOVED VIA LPP AND SLAVAGE WORK CARRIED OUT	

INCIDENT REF.	DATE	ADDRESS	STATION	INCIDENT DESCRIPTION	EASTING	NORTHING	SPECIAL SERVICE DETAILS	weather
28020040	30/10/2000	69, Springfield Road, Brighton, near Preston Road	Preston Circus	Flooding	531192	105809	WATER REMOVED VIA PUMP	heavy rain
28020327	02/11/2000	Your Move, 108, Old London Road, Patcham, Brighton, near London Road	Preston Circus	Flooding to cellar 3 ft deep	530207	108789	WATER REMOVED VIA PUMP + POWER ISOLATED	heavy rain
28020360	02/11/2000	1, Wootton House, 94, Old London Road, Patcham, Brighton, near London Road	Preston Circus	Flooding	530257	108744	WATER REMOVED VIA PUMP	heavy rain
28020607	05/11/2000	13, Park Court, Old London Road, Patcham, Brighton	Preston Circus	Flooding outside	530277	108609	FLOW DIVERTED	heavy rain
28020771	06/11/2000	108, Old London Road, Patcham, Brighton, near London Road	Preston Circus	Flooding in basement effecting elec	530207	108789	WATER REMOVED VIA PUMP	severe weather
28020776	06/11/2000	Tudor Rose Cottage, 5, Church Hill, Patcham, Brighton, near Old London Road	Preston Circus	Flooding	530150	108897	LIQUID SOAKED UP	extreme weather conditions
28020792	06/11/2000	Indian Restaurant, 136, Old London Road, Patcham, Brighton, near London Road	Preston Circus	Flooding electrics affected	530210	108783	LIQUID SOAKED UP	extreme conditions
28020801	07/11/2000	Bakery, 108, Old London Road, Patcham, Brighton, near London Road	Preston Circus	Flooding request to liase with A22	530210	108783	LIQUID SOAKED UP	severe
28020847	07/11/2000	Wlithdean Court, Varndean Road, Withdean, Brighton, near London Road	Preston Circus	Flooding electrics LPP required	530222	107126	BASEMENT PUMPED OUT	wet
29004401	17/03/2001	31, Tongdean Court, London Road, Brighton, near Clermont Road	Preston Circus	Flooding effecting electrics	529944	107612	INSPECTION ONLY	continuous heavy rain
29012445	07/07/2001	Top Flat ,5, Queens Square, Brighton, near North Street	Preston Circus	Flooding	530803	104395	SALVAGE OF PROPERTY/INSPECTED ROOF	monsoon rain showers
29013139	17/07/2001	Little Gem, 31A, Meeting House Lane, The Lanes, Brighton, near Prince Albert Street	Preston Circus	Flooding effecting electrics	531046	104119	ELECTRICAL SUPPLY ISOLATED	heavy precipitation
29015778	19/08/2001	Malvern Hotel, Regency Square, Brighton,	Preston Circus	Flooding affecting electrics	530403	104266	CLEARED BLOCKED GUTTERING ON ROOF	raining
29018816	02/10/2001	13A, Springfield Road, Brighton, near Preston Road	Preston Circus	Flooding	530997	105768	SALVAGE OF PROPERTY	heavy rain
29024145	22/12/2001	Bumpstart, 4, Brighton Square, The Lanes, Brighton, near Brighton Place	Preston Circus	Flooding effecting electrics	531053	104111	LIFTED DRAIN COVER/ ASSISTED MAINTENANCE TEAM	raining

INCIDENT REF.	DATE	ADDRESS	STATION	INCIDENT DESCRIPTION	EASTING	NORTHING	SPECIAL SERVICE DETAILS	weather
30001341	26/01/2002	41 A, Buckingham Place, Brighton, near Buckingham Road	Preston Circus	Flooding	530697	105130	LIFTED MANHOLE COVER AND CLEARED DRAIN	windy, heavy shower
30001349	26/01/2002	Flat 3, 1, Saint Georges Place, Brighton, near Gloucester Street	Preston Circus	Flooding affecting electrics	531397	104725	TURNED OFF ELECTRICS TO LIGHTING CIRCUIT, INSPECTED ROOF FROM DISTANCE	windy & shower
30001373	26/01/2002	15A, Milton Road, Brighton, near Lewes Road	Preston Circus	Flooding affecting electrics	530704	105458	ENTERED FLAT ABOVE AND PLACED BUCKETS UNDER ROOF LEAK	windy & shower
30008590	20/05/2002	Deep Pan Pizza, North Street, Brighton, near Castle Square	Preston Circus	Flooding submersible pump required	531066	104231	LIQUID SOAKED UP	wet night
30010312	19/06/2002	36, Norfolk Road, Brighton, near Montpelier Place	Preston Circus	Flooding	530106	104574	WATER REMOVED (OTHER)	day wet
30013384	05/08/2002	12, Clarence Square, Brighton, near Cannon Place	Preston Circus	Flooding	530529	104286	ROOF MADE SAFE AND LEAK PROOF	day, wet and windy
30013557	08/08/2002	4, Norfolk Terrace, Brighton, near Montpelier Place	Preston Circus	Flooding ceiling collapsing	530149	104779	FLOOD WATER CONTAINED	night
30013665	10/08/2002	225, Elm Grove, Brighton, near Lewes Road	Preston Circus	Flooding 2 inches in kitchen	532530	105275	WATER REMOVED (OTHER)	dark, heavy rain.
30013689	10/08/2002	Bargain Books, 47, Western Road, Brighton, near North Street	Preston Circus	Flooding affecting electrics	530565	104346	WATER REMOVED (OTHER)	cloudburst
30015579	06/09/2002	32, Kingswood Flats, Carlton Hill, Brighton, near Kingswood Street	Preston Circus	Flooding from flat above	531571	104504	FLOW DIVERTED	wet, raining
30022133	22/12/2002	4, Kenmure Avenue, Patcham, Brighton, near Mackie Avenue	Preston Circus	Flooding affecting electrics	531306	109225	LIQUID SOAKED UP + POWER ISOLATED	day wet
30022434	29/12/2002	The Feng Shui, Preston Street, Brighton, near Kings Road	Preston Circus	Flooding	530276	104324	POWER ISOLATED	wet & windy
31000131	04/01/2003	4, Eagle Court, Lewes Road, Brighton, near Saint Peters Place	Preston Circus	Flooding effecting electrics	531973	105585	ISOLATED SUPPLY, GAINED ACCESS TO FLAT 8	Cold, damp
31023493	23/11/2003	30, Saint Michaels Place, Brighton	Preston Circus	Flooding	530412	104792	WATER REMOVED (OTHER)	raining
31025270	28/12/2003	Belgrave Hotel, Kings Road, Brighton	Preston Circus	Flooding effecting electrics	530790	103984	ROOF DRAINHOLE CLEARED	heavy rain

INCIDENT REF.	DATE	ADDRESS	STATION	INCIDENT DESCRIPTION	EASTING	NORTHING	SPECIAL SERVICE DETAILS	weather
32010846	07/07/2004	Kingsmere, London Road, Withdean, Brighton	Preston Circus	Flooding affecting lift	530291	106935	FLOW DIVERTED	raining
32013707	23/08/2004	51, Argyle Road, Brighton	Preston Circus	Flooding electrics	530982	105467	FLOW DIVERTED + WATER REMOVED VIA PUMP	heavy rain
32013795	24/08/2004	Flat 6, 4, Montpelier Terrace, Brighton	Preston Circus	Flooding from roof affecting electrics	530292	104594	WATER REMOVED (OTHER)	raining very heaviliy
33013090	19/08/2005	New Look, Western Road, Brighton	Preston Circus	Flooding	530624	104370	SALVAGE OF PROPERTY	heavy rain
33015492	29/09/2005	102, Islingword Road, Brighton	Preston Circus	Flooding	532053	105004	WATER REMOVED (OTHER)	torrential rain
33016224	12/10/2005	77A, Stanford Avenue, Brighton	Preston Circus	Flooding	531251	106313	LIQUID SOAKED UP	heavy rain
34000023	01/01/2006	37A, Havelock Road, Brighton	Preston Circus	Flooding	531003	106141	AREA MADE SAFE + WATER REMOVED (OTHER)	raining
34011366	22/07/2006	The Café Rouge, 24, Price Albert Street, The Lanes, Brighton	Preston Circus	Flooding effecting electrics	531085	104045	WATER REMOVED (OTHER) + AREA MADE SAFE	thundery shower
34013735	23/08/2006	17, Bedford Square, Brighton	Preston Circus	Flooding effecting electrics request H04	530073	104289	FLOW DIVERTED	rain
34013751	23/08/2006	Top Floor Flat, 28, Bedford Square, Brighton	Preston Circus	Flooding effecting electrics	530120	104262	FLOW DIVERTED	wet
34013761	24/08/2006	155, Cuckmere Way, Hollingbury, Brighton	Preston Circus	Flooding	532112	108695	FLOW DIVERTED	heavy rain
34013764	24/08/2006	133B, Upper Lewes Road, Brighton	Preston Circus	Flooding	531749	105516	WATER REMOVED (OTHER)	torrential rain
35002532	14/02/2007	68, Beaconsfield Road, Brighton	Preston Circus	Flooding	531081	105743	FLOW DIVERTED	Raining heavily
24002952	15/01/1996	22, Southwater Close, Craven Vale, Brighton	Roedean	Flooding	532509	104590	MOPPED UP	Cloudy and raining
24018039	04/11/1996	24, Hendon Street, Kemp Town, Brighton	Roedean	Flooding	532543	104346	PUMPING OUT AND SALVAGE OF 2 BASEMENTS	torrential rain
24018045	04/11/1996	10, Barry Walk, Queens Park, Brighton	Roedean	Flooding	532256	104679	FLOODED PROPERTY PUMPED OUT BY BRIGADE	wet

INCIDENT REF.	DATE	ADDRESS	STATION	INCIDENT DESCRIPTION	EASTING	NORTHING	SPECIAL SERVICE DETAILS	weather
24018051	04/11/1996	27, Saint Lukes Terrace, Queens Park, Brighton	Roedean	Flooding	532389	104798	SALVAGE CARRIED OUT	wet
25002039	02/02/1997	Ravensbourne Court, Warren Way, Woodingdean, Brighton	Roedean	Flooding	535721	105941	WATER CLEARED FROM FLOOR OF LOUNGE, KITCHEN, BEDROOM, BATHROOM, HALLWAY	Mistyraining
25017291	08/10/1997	19, Hendon Street, Kemp Town, Brighton	Roedean	Flooding distressed female	532546	104365	REMOVAL OF LEAVES FROM STREET DRAIN	heavy rainfall
26000459	08/01/1998	4, Meadow Vale, Ovingdean, Brighton, near Ovingdean Road	Roedean	Flooding	536065	104293	PUMPED AWAY FLOOD WATER FROM INSIDE AND OUTSIDE PREMISE	heavy rainfall
26009486	13/06/1998	5, Eaton Place, Kemp Town, Brighton	Roedean	Flooding	532748	103619	INPSECTION ONLY	wet and windy
26020972	25/12/1998	2-5, Meadow Vale, Ovingdean, Brighton, near Ovingdean Road	Roedean	Flooding	536065	104294	WATER DISPERSED AND ALL DRAINS CHECKED AND CLEARED	torrnetial rain
26020985	25/12/1998	12, Crescent Place, Kemp Town, Brighton	Roedean	Flooding elderly person	532287	103830	DRAIN CLEARED, KITCHEN FLOOR MOPPED OUT.	overcast-torrential rain earlier
27008276	02/06/1999	6A, Arundel Street, Kemp Town, Brighton	Roedean	Flooding	533479	103488	REMOVAL OF WATER	raining
27010049	29/06/1999	5, Desmond Way, Whitehawk, Brighton	Roedean	Flooding affecting electrics	533712	104644	SALVAGE SHEET PUT ON ROOF	heavy rain and wind
27013185	08/08/1999	39, Queens Park Road, Queens Park, Brighton	Roedean	Flooding elderly disabled person	531901	104464	ASSISTANCE GIVEN	heavy rain
27013218	08/08/1999	Martins, The Newsagent Co Ltd, Whitehawk Road, Whitehawk, Brighton	Roedean	Flooding affecting electrics	533458	103715	ROADWAY PUMPED OUT TO PREVENT FURTHER FLOODING OF PROPERTIES	heavy rain
27016281	22/09/1999	Martins, The Newsagent Co Ltd, Whitehawk Road, Whitehawk, Brighton	Roedean	Flooding request 1 pump	533458	103715	WATER REMOVED FROM SHOP FLOOR	heavy rain
28009343	28/05/2000	Flat 1, 10, Walpole Terrace,Kemp Town, Brighton, near Walpole Road	Roedean	Flooding	532563	104172	WATER REDUCED, ATTEMTS TO CLEAR DRAIN	torrential rain
28011886	04/07/2000	Martins, The Newsagent Co Ltd, Whitehawk Rd, Whitehawk, Brighton, near Whitehawk Road	Roedean	Flooding	533458	103715	SALVAGE OF PROPERTY + WATER REMOVED VIA PUMP	flash floods and thunderstorm
28020033	30/10/2000	3, Bower Court, Dawson Terrace, Queens Park, Brighton	Roedean	Flooding effecting electrics	532435	104530	ROOF SHEETED UP	high winds

INCIDENT REF.	DATE	ADDRESS	STATION	INCIDENT DESCRIPTION	EASTING	NORTHING	SPECIAL SERVICE DETAILS	weather
28020056	30/10/2000	28, Rock Grove, Kemp Town, Brighton, near Marine Parade	Roedean	Flooding inside rising	533010	103534	WATER REMOVED VIA LPP	heavy rain
28020166	30/10/2000	14, Greenbank Avenue, Saltdean, Brighton, near Chichester Drive East	Roedean	Flooding affecting electrics	538379	102514	POWER ISOLATED	high winds
28020242	01/11/2000	90, The Brow, Woodingdean, Brighton, near Briarcroft Road	Roedean	Flooding affecting electrics	535802	105902	SALVAGE OF PROPERTY	high winds and rain
29016620	30/08/2001	Prospect Cottage, The Green, Rottingdean, Brighton	Roedean	Flooding	536836	102571	WATER REMOVED (OTHER)	Damp but getting dryer as day progresses
30019141	27/10/2002	Flat 4, 22, Lower Rock Gardens, Kemp Town, Brighton	Roedean	Flooding affecting electrics	531801	103901	ELECTRICS MADE SAFE	rain
31021978	30/10/2003	10, 28, College Road, Kemp Town, Brighton	Roedean	Flooding effecting electrics	532295	103912	FLOW DIVERTED	heavy rain
31025260	28/12/2003	4, Charlotte Street, Kemp Town, Brighton	Roedean	Flooding affecting electrics	531973	103838	BASEMENT CLEARED OF WATER	very wet
31025262	28/12/2003	5, Chesham Place, Kemp Town, Brighton	Roedean	Flooding	532835	103626	SALVAGE OF PROPERTY + FLOW DIVERTED	wet & windy
31025269	28/12/2003	6, Broad Street, Kemp Town, Brighton	Roedean	Flooding affecting electrics	531475	103979	GULLEY CLEARED	heavy rain
32010844	07/07/2004	9, Bloomsbury Street, Kemp Town, Brighton	Roedean	Flooding affecting house	532422	103845	FLOW DIVERTED	raining
32013418	18/08/2004	9, Bloomsbury Street, Kemp Town, Brighton	Roedean	Flooding affecting electrics	532422	103847	ELECTRICS ISOLATED, LONUGE SHEETED UP	dark & very wet
33017274	01/11/2005	47, Clare Walk, Slinfold Close, Bristol Estate, Brighton, near Whitehawk Hill Road	Roedean	Flooding	532892	104117	LIQUID SOAKED UP	wet
34013752	23/08/2006	Flats 3 4 5, 3, Portland Place, Kemp Town, Brighton	Roedean	Flooding effecting electrics	532464	103720	FLOW DIVERTED	Cats and dogs
34014988	13/09/2006	9A, Arundel Street, Kemp Town, Brighton	Roedean	Flooding in house	533484	103507	FLOW DIVERTED	heavy rain
35007546	10/05/2007	Flat 6, 19, Lower Rock Gardens, Kemp Town, Brighton	Roedean	Flooding from ceiling	531816	103913	FLOW DIVERTED + WATER REMOVED (OTHER)	raining

Appendix E

List of sites affected by flooding provided by Brighton and Hove Council

APPENDIX

Location		Date	Properties affected	Source of flood water
Patcham area	Old London Rd.	2000	15 residential also A23 and London - Brighton railway line closed.	Runoff and groundwater
	Old London Rd.	1995	5 residential (estimate)	Groundwater
	Old London Rd.	1994	Nil – surface flooding	Runoff
	Preston Rd	1988	BT offices	Groundwater
	Old London Rd.	1974	Nil – surface flooding	Runoff
	Old London Rd.	1960	Ground floor of block of flats	Groundwater
	London Rd/Mill Rd	1958	Highway only	Runoff
Bevendean	Bodiam Close, Heath Hill Ave. area	2000/2001	25, some on 4 separate occasions	Runoff
	Residential property on downland fringe	1991 and 1993	Not known	Runoff
	Walmer Crescent	1988	2 residential (estimate)	Runoff
	Bodiam Close	1987	Highway only	Runoff
	Walmer Crescent	1983	2 residential (estimate)	Runoff
Lewes Rd (A270)	by the Wild Park, Moulsecoombe railway bridge and at the Avenue	2000	Road flooded for approx 2 weeks restricting traffic flows.	Groundwater
	At foot of Elm Grove	1987	2 residential (basements filled completely in a few hours)	Runoff
	At Coldean Lane	Regular Winter event	Pedestrian subway completely filled	Groundwater
Woodingdean	Residential property on downland fringe	1987	Not known	Runoff
	Falmer Rd.	Regular Winter event	Highway only	Runoff
Ovingdean	Ovingdean Close	2000	1 residential on 2 occasions	Runoff
	Ovingdean Rd	Regular Winter event	Highway only	Groundwater
	Millcroft	2000/2001	2 gardens	Runoff
	Mile Oak Rd	2000	2 residential and 1 commercial	Runoff and groundwater
Westdene	Highway network	2000	9 roads in particular severely affected	Runoff and groundwater
Mile Oak	Properties bordering downland	1987	Properties inundated, number not known	Runoff and groundwater
	Properties bordering downland	1976	Properties inundated, number not known	Runoff and groundwater
	Mile Oak Rd	1994	1 commercial	Groundwater
	Oakdene Close	1960	Gardens	Groundwater
	Longhill School		School	Runoff
	Centre of village	1987	Most of centre of village	Runoff
Rottingdean	Longhill School		School	Runoff
	Centre of village	1987	Most of centre of village	Runoff