



Epsom & Ewell Surface Water Management Plan

Volume 2(i) - Preliminary Assessment Report



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1 Introduction 1.1 Background to the Surface Water Management Plan Study The Epsom & Ewell Strategic Flood Risk Assessment¹ (SFRA) and the Hogsmill Integrated Urban Drainage (IUD) Pilot Study² highlighted that the main risk of flooding in the Borough is a consequence of: the inability of the sewer network to safely remove rainfall of an intensity greater than approximately 10% (1:10 year) to 5% (1:20 year) annual probability which falls directly on to the urban areas; surface runoff from the Chalk in the south of the Borough on to the Clay underlying the urbanised north of the Borough; and groundwater flooding from the Chalk following prolonged above average rainfall. Indeed, the Defra Groundwater Scoping Study³ identified a large proportion of the Borough as being at risk of groundwater flooding. This can also result in significant overland flow, which is one component of surface water flooding. Surface water flooding, as defined for this Surface Water Management Plan (SWMP), can be caused by intense rainfall before it enters a watercourse or sewer, overland flow resulting from high groundwater levels, exceedance of the capacity of the sewer network and 'out of bank flow' from small watercourses which are not designated as Environment Agency Main River. In addition to damage to properties, roads and other infrastructure, the onset of surface water flooding can be relatively sudden and can lead to both high velocity flows in steep areas and deep ponding of flood water. There is, therefore, a risk to life associated with significant surface water flooding. Based on national mapping available in August 2009, Defra identified 3900 properties in the Borough that may be susceptible to surface water flooding⁴. Based on this number of properties at risk, Epsom & Ewell ranks 80th out of more than 4000 settlements in England. The Borough has the same number of susceptible properties as Rochdale, for example, which received SWMP direct funding as part of the 77 initially funded priority settlements. Although the Borough missed out on this initial Defra funding to prepare a SWMP, a subsequent application to Defra for Surface Water Early Actions funding was successful and this SWMP has been prepared for the Borough as a high priority. The study area is being taken as all land within the Borough boundary (Figure 1.1), whilst recognising the influence of flow inputs from surrounding catchments, particularly the wider Hogsmill catchment which extends beyond the Borough boundary to the south and east. The Epsom & Ewell SWMP project commenced in October 2010 and has followed the revised SWMP Technical Guidance⁵. ¹ Jacobs (2008) Epsom & Ewell Strategic Flood Risk Assessment. May 2008 ² Jacobs (2008) River Hogsmill Integrated Urban Drainage DEFRA Pilot Study. Reference SL2303. June 2008 Jacobs (2004) Strategy for Flood and Coastal Erosion Risk Management: Groundwater Flooding Scoping Study (LDS 23). May 2004.

⁴ http://archive.defra.gov.uk/environment/flooding/manage/surfacewater/index.htm

⁵ Defra (2010) Surface Water Management Plan Technical Guidance. March 2010. Available at: <u>http://archive.defra.gov.uk/environment/flooding/manage/surfacewater/index.htm</u>







Figure 1.1 The Borough of Epsom & Ewell (taken from the SFRA, 2008)





1.2 SWMP Partnership, Communication and Engagement

The SWMP Partnership (the 'core' members) consists of representatives from the following five organisations:

- Epsom & Ewell Borough Council (lead partner);
- Surrey County Council;
- Environment Agency;
- Thames Water; and
- Jacobs Engineering UK Ltd.

Although Surrey County Council is the Lead Local Flood Authority for the Borough, Epsom & Ewell Borough Council is taking the lead role in the production of this SWMP. However, as illustrated in Figure 1.2, the Flood & Water Management Act sets out a partnership approach to flood risk management.



The Partnership has met a number of times throughout the duration of the project to steer development of the SWMP Action Plan. Furthermore, consultation with partner





organisations, stakeholders and those representing local communities has been a key element throughout the SWMP study. Partners, stakeholders and community representatives have been consulted during preparation of the SWMP Action Plan and the views taken into consideration. This wider group of stakeholders who have been consulted with is listed in the tables in Appendix A. Appendix A also provides the Communications and Engagement Plan agreed at the outset of the project.

1.3 SWMP Study Objectives

Following discussions at the inaugural SWMP partnership meeting on 29th October 2010, the vision and supporting aims of the study were agreed to be:

The Epsom & Ewell SWMP Vision

Identify viable options to manage the risk of surface water flooding, for the benefit of the Borough of Epsom & Ewell and its people, both now and in the future.

Supporting aims

- 1. Reduce the consequences of flooding on the people of Epsom & Ewell Borough
- 2. All partners will work together to improve the understanding of the specific flood issues affecting the Borough of Epsom & Ewell
- 3. Establish clarity over responsibilities and agree roles and working arrangements both now and going forward
- 4. Inform spatial and emergency planning policies and assist long term sustainable development and regeneration
- 5. Raise awareness so that people at risk are better prepared and able to respond appropriately
- 6. Identify the preferred options to manage surface water flood risk, from an economic, environmental, technical, social and project perspective
- 7. Seek options that will provide other benefits in addition to better management of flood risk
- 8. Develop a prioritised SMART⁶ action plan that is evidence-based and addresses flood risks in the short, medium and longer term, including 'quick wins'
- 9. Identify funding options available to implement the preferred deliverables

1.4 Structure of this Report

This Preliminary Assessment Report documents the work undertaken and findings of the Preparation and initial Risk Assessment stages of the project:

Section 2: Data Collection

Section 3: Past Flooding

- Section 4: Existing Plans and Recommendations for Epsom & Ewell
- Section 5: Preliminary Risk Assessment
- Section 6: Stakeholder Surgery
- Section 7: Definition of Drainage Areas
- Section 8: Summary

⁶ Specific, Measurable, Achievable, Relevant, Time-Bound



2



Data Collection

2.1 Introduction

Data were requested from each of the four core SWMP partners who agreed to share data according to the protocol presented in Figure 2.1. The received data are catalogued in this section.

2.2 Data Used within the Study

Tables 2.1 to 2.3 list the data supplied by the core SWMP partnership members, exclusively for use in this project. Spatial data were supplied or converted to GIS format where possible and are presented in the composite maps in Appendix B.

Table 2.1 Data provided by Epsom & Ewell Borough Council and Surrey **County Council**

Data received	Details
Ordnance Survey Mapping	Mastermap and 1:10 000 scale raster tiles
Topographic data	IfSAR 5m data covering the Borough
Epsom & Ewell Strategic Flood Risk	Final Report May 2008
Assessment ⁷	
Council policies and development	Local Development Framework Core Strategy
plans	(adopted July 2007) ⁸ ; Plan E (April 2010) ⁹
Infrastructure Delivery Plan	Most recent version (March 2010)
Historic flooding data	As published in the SFRA
Surrey County Council 'Wetspot' data	October 2010
Vulnerable infrastructure	Local Multi-Agency Flood Plan and details in the
	SFRA
Geological Information	1:625 000 scale solid and drift layers

Table 2.2 Data provided by the Environment Agency

Data received	Details
Hogsmill IUD Report with GIS layers and Infoworks CS2D surface water model	June 2008 final report ¹⁰ and supporting data
River Hogsmill Flood Study	Final hydraulic modelling report ¹¹
River Thames Catchment Flood Management Plan ¹²	December 2009
Historical flooding information	Historic Flood Map v1.20; Hogsmill Flood Study ¹³

⁷ Jacobs (2008) Epsom & Ewell Strategic Flood Risk Assessment. May 2008

⁸ Epsom & Ewell Borough Council (2007) Local Development Framework Core Strategy. July 2007

⁹ Epsom & Ewell Borough Council (2010) Plan E Submission Document. April 2010

¹⁰ Jacobs (2008) River Hogsmill Integrated Urban Drainage DEFRA Pilot Study. Reference SL2303. June 2008 ¹¹ Jacobs (2003) River Hogsmill Flood Study. Final Modelling Report Volume II – Hydraulic

Modelling. December 2003

¹² Environment Agency (2009) River Thames Catchment Flood Management Plan. December 2009





Data received	Details
Topographic data	Complete 1m resolution LiDAR data coverage was available from the Hogmsill IUD study, whilst updated 1m data from 2009 covered only some areas of the Borough
Fluvial Flood Zones	National Flood Zones 2 and 3 v4 ¹⁴
River centrelines	Main River centreline v8.0
Areas Susceptible to Surface Water	April 2009 update ¹⁵
Flooding maps	
Flood Map for Surface Water	November 2010 ¹⁶
National Receptor Database	Version 1.1 ¹⁷
Source Protection Zones	Latest shapefile (February 2011)
The London Catchment Abstraction Management Strategy ¹⁸	April 2006
Pre-feasibility studies for Nonsuch and Rosebery Park Flood Attenuation Areas	March 2009 final reports ^{19 20}

Table 2.3 Data provided by Thames Water

Data received	Details
Flood history	GIS data supplied 2007 and published in the
	SFRA
Sewer Model, drainage network and	GIS layers of drainage infrastructure and
system catchment areas	catchment areas

¹³ Jacobs (2003) River Hogsmill Flood Study TH06: Final Flooding History Database Report. November 2003

¹⁴ Flood Zones refer to the probability of flooding from rivers, the sea and tidal sources and ignore the presence of existing defences. Land in Flood Zone 2 (medium probability) is assessed as having between a 1 in 100 and 1 in 1000 annual probability of river flooding (1% - 0.1%) or between a 1 in 200 and 1 in 1000 annual probability of sea flooding (0.5% - 0.1%) in any year, and Zone 3 (high probability) is assessed as having a 1 in 100 or greater annual probability of river flooding (>1%) or a 1 in 200 or greater annual probability of flooding from the sea (>0.5%) in any year.

¹⁵ Environment Agency (2010) What are Areas Susceptible to Surface Water Flooding. Guidance for Local Resilience Forums, Regional Resilience Teams, Local Planning Authorities and Lead Local Flood Authorities v1 November 2010

¹⁶ Environment Agency (2010) What is the Flood Map for Surface Water. Guidance for Local Resilience Forums, Regional Resilience Teams, Local Planning Authorities and Lead Local Flood Authorities v1 November 2010

¹⁷ Environment Agency (2010) National Receptor Database. Guidance for Environment Agency staff and professional partners

 ¹⁸ Environment Agency (2006) The London Catchment Abstraction Management Strategy.
 April 2006.
 ¹⁹ Environment Agency (2000) Nonsuch Park Elood Attenuation Area Pro Esseibility Otypic

¹⁹ Environment Agency (2009) Nonsuch Park Flood Attenuation Area Pre-Feasibility Study. March 2009

²⁰ Environment Agency (2009) Rosebery Park Flood Attenuation Area Pre-Feasibility Study. March 2009





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Figure 2.1 Data sharing protocol





3 Past Flooding in the Borough

The Borough of Epsom & Ewell lies wholly within the Thames Catchment area. The Thames Catchment Flood Management Plan²¹ (CFMP) states that flooding in the Thames CFMP area can occur from: rivers (fluvial flooding), urban drainage systems (surface water and sewer flooding) and rising groundwater. In Epsom & Ewell, the risk of fluvial flooding from the River Hogsmill and its tributaries (Greens Lane Stream and Horton Stream are Main River, with the Ewell Court Stream being an ordinary watercourse - see Figure 3.1) is relatively confined. The CFMP estimates that between 500 and 1000 properties are at risk from fluvial flooding in a 1% (1:100 year) annual probability event. This can be compared with the estimated 3900 properties at risk of surface water flooding (in a 0.5% annual probability storm event). Indeed, the Strategic Flood Risk Assessment (SFRA)²² concludes that the most significant source of flooding in the Borough is from surface water runoff and that the urbanised areas, steep topography and potential rainfall runoff from the Epsom Downs introduces a relatively high susceptibility to surface water, groundwater and localised flooding in certain parts of the Borough. The Hogsmill Integrated Urban Drainage (IUD) study²³ concluded that surface water flooding is generally not affected by fluvial flooding, except within about 50m of the river.

The CFMP states that in most years surface water flooding and localised river flooding will occur somewhere in the Thames CFMP region following heavy storms. The last major flood event in the Borough of Epsom & Ewell was in July 2007. After a wet early summer, very heavy and intense rain fell on the 19 and 20 July. This caused immediate surface water flooding in the Borough, with 29 recorded incidents, including 13 occurrences of property flooding (see Figure 3.2). The River Hogsmill Flood Study²⁴ provides some accounts of surface water flooding which have taken place in or near the Borough prior to 2007. A selection of the most relevant of these have been tabulated in Table 3.1.

Prior to 2007, flooding was experienced in the Borough in the wet winters of 2000/1 and 2002/3, primarily as a result of high groundwater levels. As stated in the SFRA, many of the reports of groundwater flooding in Epsom & Ewell have arisen in the areas at the northern foot of the Downs, at the junction between the permeable chalk and the less permeable and impermeable strata in the north-west of the Borough. The Defra Groundwater Flooding Scoping Study²⁵ identified nine groundwater flooding incidents in the Borough during the wet winters of 2000/1 and 2002/3 (see Figure 3.2).

The Thames Water flood history database provided for use in the SFRA contains details of six incidents of flooding from the surface water sewer network, three incidents from the combined sewer and 29 incidents from the foul sewer (see Figure 3.2).

²¹ Environment Agency (2009) River Thames Catchment Flood Management Plan. December 2009

²² Jacobs (2008) Epsom & Ewell Strategic Flood Risk Assessment. May 2008

²³ Jacobs (2008) River Hogsmill Integrated Urban Drainage DEFRA Pilot Study. Reference SL2303. June 2008 ²⁴ Jacobs (2003) River Hogsmill Flood Study TH06: Final Flooding History Database Report.

November 2003

²⁵ Jacobs (2004) Strategy for Flood and Coastal Erosion Risk Management: Groundwater Flooding Scoping Study (LDS 23). May 2004.







Figure 3.1 Watercourses and critical drainage areas, taken from SFRA (2008)







Figure 3.2 Historic flooding, taken from SFRA (2008)





Table 3.1 Historic flood events taken	from the Hogsmill Flooding History
Database (Jacobs, 2003)	

Source with the Hogsmill Flooding History Database	Description
Special Report of the Borough Engineer (Epsom and Ewell) to the Sewerage and Sewage disposal committee on the 10th September 1952	"As mentioned in my preliminary report to you, no economically designed sewerage system could possibly be expected to be adequate with rainfall of such intensity, but doubtless the fact that the 42" diameter culvert (forming part of Tributary No. 5 of the River Hogsmill (this related to Ewell Court Stream)) was partially obstructed contributed to the flooding in the particular area. Committee will recall that upon investigation, this culvert was found to be partially blocked in the length from Clandon Close to Stoneleigh Park Road where it passes under the railway."
Surrey Comet, dated 13th August 1960	"Tolworth Broadway shopping centre became a lake and at one time water in the road was reported to be 18 inches deep. It stretched from Tolworth roundabout over the vacant site at the rear of the Odeon cinema and across the Ewell Road into Raeburn Avenue." "There was flooding at Plough Green, Worcester Park, and in Hook Road between Cecil Road and Green End, both of which were also under water for a time and there was about two feet of water across the road at Bonesgate, Chessington."
Surrey Comet, dated 11th July 1973	"It was 5pm when the storm burst over Chessington and Tolworth – an hour later hundreds of homes were awash with stinking water. By the end of the evening families were bailing out after the worst floods there in living memory." "Friday's storm was a freak of such phenomenal intensity that no drainage system could have coped with it. That is the expert view of Kingston's deputy borough engineer, Mr. J. D. Smethurst, who said yesterday that such a storm was likely to happen only once a century."
Surrey Comet October 1992 (exact date unknown)	"Staff at a New Malden store watched in horror as a foot-deep flood in their car park came within inches of spilling into the shop on Saturday. The manager of Queensway in Burlington Road now has sandbags standing by after forecasters raised fears of further heavy rain at the weekend." "He added that manhole covers were pushed up by the volume of water."
West Ewell & Ruxley Residents Association 19 June 2001	"Ruxley Lane flooded badly 3 years ago"

Finally, there are 38 'wetspots' distributed across the Borough identified by Surrey County Council Highways Department (see composite maps in Appendix B). The majority of these have been identified as being caused by blockage or otherwise inadequate maintenance of the drainage system (including blocked soakaways). Subsequent flooding is noted as affecting both highways and properties.

Some further local information on flooding which has been experienced in the Borough was obtained through the stakeholder consultation reported in Chapter 6.



4



Existing Plans and Recommendations for Epsom & Ewell

4.1 Flood Risk Management

The Thames CFMP²⁶ considers the Borough of Epsom & Ewell as being within the Hogsmill Catchment unit which is described as having some urban areas as well as significant areas of natural river and floodplain. The preferred option in the CFMP for future management of the catchment is to take action with others to store water or manage run-off in locations that provide overall flood risk reduction or environmental benefits. Some identified actions are:

- To maintain, and where possible improve, the flow of water in the rivers as they pass through built up areas. This needs to be complimented by improvements to other parts of the drainage network.
- To maintain and, if possible, improve the capacity of the floodplain to store water, making use of the open spaces available within the floodplain, and preventing the loss of open spaces.
- Work with Planning Authorities to maintain the existing open space in the floodplain, manage urban run-off, take advantage of opportunities for flood storage and increase the resistance and resilience of buildings through redevelopment.

In addition to the more generic recommendations for improved flood risk management in the Borough made by the SFRA²⁷, the following more specific recommendations were made, which have been further considered in this study:

- Planning policy needs to be informed about the risk posed by flooding.
- Redevelopment and regeneration offer a crucial opportunity to reduce flood risk.
- Planning should encourage use of pervious surfaces and other infiltrating SuDS, wherever practicable (and no contamination risk exists) to improve infiltration to the aquifer this is to be strongly encouraged.
- Infrastructure is planned and managed to accommodate more surface water flows. This needs to commence now with new developments and/or redevelopments and also the upgrading or refurbishment of roads and other physical infrastructure.
- It is recommended that all owners/maintainers of culverts, gullies and drains produce a pro-active maintenance schedule to ensure that they are clear and fully functioning prior to flood events.
- Where a potential risk of groundwater is identified, it may be appropriate to, for example, incorporate flood proofing measures and/or the raising of entry thresholds to mitigate possible damages.

The Hogsmill IUD study²⁸ and the subsequent pre-feasibility studies for flood attenuation areas in Rosebery and Nonsuch²⁹ parks made a number of

²⁶ Environment Agency (2009) River Thames Catchment Flood Management Plan. December 2009

²⁷ Jacobs (2008) Epsom & Ewell Strategic Flood Risk Assessment. May 2008

 ²⁸ Jacobs (2008) River Hogsmill Integrated Urban Drainage DEFRA Pilot Study. Reference SL2303. June 2008





recommendations for improved flood management in the Hogsmill catchment which includes the Borough of Epsom & Ewell. These are reproduced in Appendix C and the following have been further considered in this SWMP study:

- Raise awareness of risk: Use hazard and risk maps produced by the SWMP to raise awareness of surface water flooding both within the council (to include spatial and emergency planning teams) and potentially with the public. Link actions in response to any Met Office/Environment Agency Extreme Rainfall Alerts to hazard/risk mapping.
- **Groundwater flooding:** Use mapping of topographic depressions to ensure that flood hazard/risk maps produced in the SWMP identify areas which may be susceptible to groundwater flooding. This information could be used in spatial and emergency planning.
- **Emergency planning:** Understand which roads or major pedestrian routes may be blocked by surface water flooding and plan traffic and pedestrian diversions.
- **New development:** Planning policy could ensure that future development should respect natural drainage routes and land form.
- **Property level resistance/resilience:** Raise awareness of the benefits and costs of available property level measures within the council and with those potentially at risk of flooding, and identify any available incentives for their use.
- **Suitability of SuDS:** Produce a map showing the likely suitability of different SuDS techniques across the Borough to inform their future use.
- Surface water sewer capacity: Target maintenance to ensure that sewer network operates to maximum capacity. Thames Water policy could permit disconnection of surface water sewers upstream of overground attenuation areas (and reacceptance of water further downstream) to increase capacity in the system. Further increase in surface water capacity (and quality) could be achieved through reducing infiltration of surface water and groundwater into the sewer systems and keeping surface water and foul systems separate.
- Watercourse capacity: Target maintenance of existing watercourses, drainage channels, trash screens etc

Although now rescinded, Policy SE3 (Flooding and Land Drainage) of the Surrey Structure Plan³⁰ stated that Surrey County Council should adapt to the risks and opportunities presented by climate change through a number of measures, which include measures relating to flooding. The policy stated that: strategic development should be guided to locations offering greater protection from impacts such as flooding; SuDS should be incorporated into new buildings; flood storage capacity should be increased; and that the most should be made of opportunities and options for sustainable flood management. In addition, policy SE1 (Natural Resources and Pollution Control) encouraged winter water storage reservoirs and other sustainable farming practices that disperse runoff and increase flood storage capacity.

²⁹ Environment Agency (2009) Nonsuch Park Flood Attenuation Area Pre-Feasibility Study. March 2009

³⁰ Surrey County Council (2004) Surrey Structure Plan 2004. Adopted 4 December 2004.





4.2 Development Plans

4.2.1 Introduction

The EEBC Core Strategy³¹ identifies a housing target of at least 181 new dwellings per annum during the period 2007-2022. In addition to residential housing, the council has plans to redevelop large areas of Epsom Town Centre, as set out in Plan E³². The development plans for the Borough are summarised in the following sections.

4.2.2 Former Hospital Sites

The Core Strategy policy CS8 identifies that the three former hospital sites in the west of the Borough will be redeveloped to provide much of the required new housing. The three sites (Horton B, St Ebbas and West Park) are identified on the key diagram reproduced in Figure 4.1. The Council confirmed that redevelopment of Horton B is complete, redevelopment in St Ebba's is partially complete and plans for redevelopment of West Park are currently being developed.

4.2.3 Epsom Town Centre

Policy CS8 of the Core Strategy states that, in principle, higher density development will be directed to central locations, such as Epsom town centre and other local centres, which are close to existing services and facilities and are accessible by public transport, walking and cycling. The long term strategy for development of Epsom town centre is the subject of Plan E, which provides a framework for future change up to 2026. It is a long term 'spatial' strategy which will help deliver not only the Council's objectives for the town centre, but also the Local Strategic Partnership and partner organisation's goals and aspirations. It will build on the vision for the town centre set out in the Core Strategy. Plan E highlights a number of locations that will require surface water mitigation measures and indicates that this SWMP will provide the necessary details. These locations include (see Proposals Map Figure 4.2):

- Depot Road / Upper High Street (Policy E14)
- Utilities site / East Street (Policy E15)
- Former Magistrates Court and Council Site in The Parade and Ashley Road (Policy E17)
- Comrades Club in the The Parade (Policy E17)
- Town Hall Square and the car park at the rear of the Town Hall (Policy E17)

4.3 Thames Water Proposals for Upgrades to the Sewer Network

Thames Water Utilities is responsible for the management of surface water drainage network and sewerage within the Borough, whilst Sutton and East Surrey Water supply water (utilising water resources from the aquifer beneath the North Downs) and do not manage waste or drainage. The majority of the sewer network serving the Borough is separate, with only a few small isolated areas served by combined sewers.

³¹ Epsom & Ewell Borough Council (2007) Local Development Framework Core Strategy. July 2007

³² Epsom & Ewell Borough Council (2010) Plan E Submission Document. April 2010





Thames Water confirmed that it does not have any plans for upgrades to the surface water sewer network in the Borough in the next five year period (2010 - 2015). This is understood to be due to the absence of recorded sewer flooding which is severe or frequent enough to justify intervention. Every five years, the regulator Ofwat sets the level of customers' bills, which helps fund the improvements Thames Water carries out to the water and sewerage networks. Ofwat seeks to ensure bills are no higher than necessary by checking that these improvements represent good value for money. Thames Water is therefore required to demonstrate that the flood relief schemes included in its planned work have been subject to a cost benefit analysis. Thames Water has discussed with Ofwat the work proposed in the next five-year period from 2010 to 2015. The analysis is made using various pieces of information recorded on the Sewer Flooding History Database, including the severity and frequency of flooding and the number of homes that would benefit from each scheme. It has also included the results of research carried out with customers to see how much they were willing to pay in their bills for these flood protection improvements. A similar process is used by all water companies to help prioritise planned work, in a process supported by the Consumer Council for Water.

However, Thames Water has not solely restricted itself to using this method. It realises that sewer flooding is the worst service failure a customer can experience, and has therefore considered other issues when assessing these projects. These have included taking into account whether buildings at risk of flooding are vulnerable properties such as schools or hospitals, whether they have suffered frequent flooding and whether it is possible to provide alternative protection measures.







Figure 4.1 Key Diagram from Epsom & Ewell Core Strategy (2007)³³

³³ Epsom & Ewell Borough Council (2007) Local Development Framework Core Strategy. July 2007







Figure 4.2 Plan E Proposals Map³⁴

³⁴ Epsom & Ewell Borough Council (2010) Plan E Submission Document. April 2010



5



Preliminary Risk Assessment

5.1 Introduction

An initial site walkover was conducted on 25th October 2010 to enable an initial broad assessment to be made of areas that may be susceptible to surface water flooding. The locations visited were selected from a desk-based review of the previous studies (particularly the Hogsmill IUD study) and composite maps shown in Appendix B. The inspections enabled an initial broad assessment to be made of areas that may be susceptible to surface water flooding. They also provided valuable verification of the mapping and an initial idea of some of the measures that might be possible to reduce the risk of surface water flooding. Given that much ground truthing of identified surface water flowpaths and areas susceptible to surface water flooding was undertaken in the Hogsmill IUD study, the focus of the site inspections undertaken for this study was to determine what had changed since the completion of the IUD study in 2008, as well as any locations highlighted by the Environment Agency Areas Susceptible to Surface Water Flooding (ASTSWF) maps, which were unavailable in 2008³⁵.

Observations made during site visits on 25th October 2010, and subsequently, are summarised below. In total, around 30 separate locations were visited. The observations and review of available information has been used to prioritise areas for detailed risk assessment.

5.2 Observations across the Borough

5.2.1 Introduction

Locations visited were based on a desk-based review of previous studies and composite maps (Appendix B), which displayed:

- reported instances of flooding, where the cause could have included surface water, groundwater or sewer capacity exceedance (taken from the SFRA);
- GIS identification of surface water flowpaths and ponding areas (taken from Hogsmill IUD study);
- Vulnerable sites, key infrastructure and multiple benefit sites as identified in the SFRA;
- Environment Agency mapping of ASTSWF; and
- Strategic development locations (taken from Core Strategy and Plan E)

For consistency with the SFRA, the Character Areas were used at this stage to group the findings for the locations visited. The character areas are listed and a brief summary of each area visited is provided below:

- Epsom South (Woodcote ward)
- Epsom West (Ruxley, Court and Stamford wards)
- Epsom Town Centre (Town Centre ward)
- Epsom East (Nonsuch and College wards)
- Ewell (West Ewell and Ewell wards)

³⁵ The Environment Agency Flood Map for Surface Water (FMfSW) only became available after the initial site visit and risk assessment was completed. However, the composite maps in Appendix B have been updated for this report to show the FMfSW.





• Epsom North (Cuddington, Ewell Court, Auriol and Stoneleigh wards)

5.2.2 Epsom South

The character area of Epsom South (see selected photos in Figure 5.1) is largely made up of open space, with only Langley Vale by Epsom racecourse and the south-west sector of Epsom being urbanised. It is bounded by the Boroughs of Reigate & Banstead and Mole Valley on its southern perimeter. Much of Epsom South overlies the North Downs chalk aquifer.

Although this area suffers little flood risk from watercourses it has the potential to contribute significantly to flood risk in Epsom town centre through northwards flow from the North Downs escarpment. A significant surface water flowpath, which commences on the Downs and in Burgh Heath in the Borough of Reigate & Banstead, flows west then north through Langley Vale toward Epsom via Woodcote. Although there are only 2 incidents of flooding recorded in the SFRA (from the foul sewer), there is the potential for high groundwater levels and surface runoff to activate the identified surface water flow route and cause flooding of land and property, for example in Woodcote. Indeed, the Surrey County Council 'wetpots' database identifies the bottom of Langley Vale Road, where the flowpath crosses the road, as an area of inadequate drainage. The Environment Agency maps highlight this flowpath as being an area which is susceptible to surface water flooding, and the Groundwater Emergence Maps highlight this flowpath as an area susceptible to groundwater flooding.

In summary, this area functions more as a source and pathway to surface water flooding than as a receptor, although there are some isolated issues and the potential for wider property flooding in Woodcote.

5.2.3 Epsom West

The character area of Epsom West (see selected photos in Figure 5.2) comprises the western area of the Borough. It is bounded by the Bonesgate Stream in the north-west, West Ewell to the north and Epsom town centre to the east.

Flooding in the area could be influenced by the right bank of the Bonesgate Stream, the Horton Stream and the Green Lanes Stream, with the latter two flowing through the area for most of their length. However, there are only isolated incidents of flooding recorded in the SFRA, 3 from the foul sewer system and 1 report of nonproperty flooding in July 2007. Therefore, similarly to Epsom South, it appears that this area acts mostly as a source and pathway, contributing to flood risk further downstream through northwards flow from Epsom Common. One major flowpath passes through the West Park development before entering the Bonesgate Stream. During the site inspection of 25th October, it was noted that development of West Park should respect this natural drainage route. A second flowpath collects runoff from Horton Park Farm and St Ebba's development and routes it northwards through Horton Country Park before entering West Ewell. A third series of flowpaths collects flow from the Common and routes it into Epsom Pond (Stamford Green) from where it enters the Greens Lane Stream. Only isolated areas along these flowpaths are identified as being susceptible to surface water flooding and the area is mostly outside the Groundwater Emergence Zone.

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Looking north from the high ground of the Epsom Downs





Thames Water

Looking south up Langley Vale with Thames Water treatment works in foreground



The Millennium pond at Woodcote Green, adjacent Rosebery Park, with existing pond in the foreground Woodcote Green Road

Figure 5.1 Selected photos of locations in the Epsom South character area







Existing buildings in topographic depression in West Park



Properties and open ground in the Clarendon Park development





Ground sloping down to low threshold properties in the Greens Lane Stream St Ebbas development

Figure 5.2 Selected photos of locations in the Epsom West character area





However, the area contains the strategic developments of the hospital sites (of which West Park could be most influenced by this study) as well as substantial indications of flooding around the Horton Park Farm and Clarendon Park development. During the site inspections, newly constructed properties on the St Ebba's site were observed to have thresholds below road level, which could pose a risk if surface water overtopped the road. The Surrey 'wetspots' database highlights drainage maintenance issues along Christchurch Road (particularly adjacent to Epsom Pond), as well as maintenance and potentially inadequate highway drainage elsewhere in the area (e.g. Horton Lane and Upper Court Road).

In summary, although this area functions more as a source and pathway to surface water flooding, there are some flooding issues which should be further considered in this study, particularly with respect to the planned redevelopment of the West Park hospital site.

5.2.4 Epsom Town Centre

The character area of Epsom Town Centre (see selected photos in Figure 5.3) is largely urbanised. It comprises the commercial centre and a large industrial area. It is bounded by Ewell, Epsom West, Epsom South and Epsom East character areas. There are no surface watercourses within Epsom Town Centre. However, a significant natural drainage route from the North Downs flows south-north through the town centre. There is potential for surface water resulting from rainfall on the urban area, groundwater emerging from the chalk Downs to the south and that exceeding the capacity of the sewers to follow this flow path and cause flooding and disruption within Epsom Town Centre. Indeed, flooding on this flow path has been reported in 2000 and 2007. There are other flowpaths into the south-east sector of the town from Epsom Downs. In total, there are 5 recorded incidences of groundwater flooding in Epsom Town Centre (the entire area is designated as a potential Groundwater Emergence Zone), 2 reported foul water flooding incidences, as well as 1 flooded property and 1 non-property flood event from 2007. Areas of the Town Centre are identified as being susceptible to surface water flooding; the railway underpass, which forms the major traffic junction between the High Street and East Street, for example. This underpass, as well as the other railway underpass towards West Hill are identified in the Surrey 'wetspots' database as areas of ponding due to inadequate drainage, and the database highlights East Street, for example, as an area requiring maintenance of the existing system.

In addition to the sensitivity of the land use within the Town Centre, the history of flooding and the potential for future flooding with the presence of the surface water flowpath, the area is marked for substantial redevelopment through the Council's Plan E. Plan E suggests that this SWMP should make recommendations for the management of surface water flooding which should be followed in the redevelopment.

In summary, this area functions as a pathway and receptor to surface water flooding. It has a history of localised flooding and the potential for future flooding. The substantial plans for redevelopment of the Town Centre will require surface water to be effectively managed.

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Epsom High Street – a major traffic, retail and public area



Railway underpass at junction of East Street and High Street



Gas holders in the Plan E Utilities Site adjacent East Large car parks in the town centre, including the Plan E Street



Depot Road site

Figure 5.3 Selected photos of locations in the Epsom Town Centre character area





5.2.5 Epsom East

The character area of Epsom East (see selected photos in Figure 5.4) contains the Epsom Downs, farmland, Cuddington Golf Course, Nonsuch Park and the urban areas of south-east Epsom and East Ewell. It is bounded by the boroughs of Sutton and Reigate & Banstead to the east and all character areas except Epsom West. Although there are no formal watercourses within Epsom East, the area contains a number of surface water flowpaths which flow north west towards Epsom Town Centre and Ewell, and a potentially significant surface water flowpath, which commences in Nork, in the Borough of Reigate & Banstead, flows through East Ewell and Nonsuch Park to the Ewell Court Stream (Ewell Area) where it has the potential to overwhelm the culverted watercourse in an extreme event. Although there are no recorded incidents of groundwater flooding, the spring line between the Chalk and the Clay passes through this area and the majority is identified as a Groundwater Emergence Zone. The SFRA contains 3 reported foul water incidents, 5 flooded property and 6 non-property flooded incidents in 2007. The Surrey 'wetspots' database contains reports of problems on the highways mainly due to maintenance of gullies and soakaways and surface water ponding (e.g. at Drift Bridge, Nork).

Therefore, similarly to Epsom West, although this area functions more as a source and pathway to surface water flooding than as a receptor, there are some flooding issues which should be further considered in this study, particularly with respect to the cross-border flow of surface water northwards from Nork which has the potential to reach Nonsuch Park and, ultimately, feed the Ewell Court Stream.

5.2.6 Ewell

The Ewell character area (see selected photos in Figure 5.5) is almost entirely urbanised. It comprises the area on the southern (left) bank of the Hogsmill River, from its source to its confluence with the Horton Stream. The Ewell character area also extends northwards to Stoneleigh and arches around the north-east sector of Epsom town centre. On the southern boundary are Epsom Town Centre and Epsom West.

There are properties at risk from fluvial flooding in this area, particularly from the Hogsmill River and Greens Lane Stream. Indeed, the Surrey 'wetspots' database highlights sections of road adjacent to the Greens Lane and Hogsmill streams which are likely to suffer from fluvial flooding. Surface water flowpaths enter Ewell from the south east (originating close to the North East Surrey College of Technology) and from the west (originating near the St Ebba's development). There are two recorded groundwater flood incidents in the Ewell area, with a large proportion of the area being susceptible to groundwater emergence. In addition to 4 reported foul water flooding incidences, 1 flooded property and 3 non-property flooded incidences were recorded in 2007.

In summary, similar to Epsom Town Centre, this area functions as a pathway and receptor to surface water flooding. It has a history of localised flooding and the potential for future flooding. The hydrology in the area will be complicated as a result of the confluence of a number of watercourses and surface water flowpaths.







Drift Bridge railway embankment which forms the boundary between Epsom and Reigate & Banstead



Epsom College sports fields



Embankment between field and the Cheam Road



Existing pond and wetland in Nonsuch Park

Figure 5.4 Selected photos of locations in the Epsom East character area







Bourne Hall and the source of the Hogsmill River





Gibraltar Recreation Ground looking towards the railway line



railway line

Properties at the end of West Street adjacent the Properties on West Street near the junction with the High Street

Figure 5.5 Selected photos of locations in the Ewell character area





5.2.7 Epsom North

The character area of Epsom North (see selected photos in Figure 5.6) comprises the area to the north-east of the Hogsmill River, which extends to the Borough boundary and Nonsuch Park. The area is influenced by the right bank of the Hogsmill River and almost the entire length of the Ewell Court Stream, although this is mainly culverted. The SFRA indicates that the culvert could have capacity to convey at least the 5% (1 in 20 year) flow. Of the 11 records of flooding from the July 2007 event in this area, only 3 are adjacent to the course of the Ewell Court Stream, with the remainder clustered near the Hogsmill River and near Worcester Park (bordering with Sutton) in the very north of the Borough. There are a number of reports of sewer flooding across the area (surface water and foul) and 2 recorded groundwater flood incidences from the winters of 2000/1 and 2002/3. There are some isolated issues reported in the Surrey 'wetspots' database related to the blockage or under capacity of highway drainage. One of these records, for Beaufort Road near Nonsuch Park, is reported as affecting emergency services.

Although there are a few surface water flowpaths identified, most of these are have relatively small catchment areas and drain to the north and west into the Hogsmill River. The most likely significant flowpath is that which follows the line of the Ewell Court Stream from Nonsuch Park which could convey exceedance flow in the event of the capacity of the culvert being exceeded.

In summary, similarly to Ewell and Epsom Town Centre, this area functions as a pathway and receptor to surface water flooding. It has a history of localised flooding and the potential for future flooding, although not to the same degree as the Town Centre.

5.3 Conclusions from the Preliminary Risk Assessment

The following conclusions can be drawn from the desk-based review of previous studies, additional available information and the subsequent site visits:

- As previously identified, there is demonstrable history of surface water and groundwater flooding across the Borough. Although relatively few depressions were observed where water could pond to a significant depth, there are some significant natural drainage paths, some of which extend long distances across the Borough, which could become conduits for surface water flow in extreme events. The following observations were made:
 - Many of the natural drainage paths have been obstructed or diverted by development such that there is a risk of flooding when they become activated.
 - Planned major development in, for example, West Park, has opportunity to develop around these natural drainage routes.
 - A number of major flow routes cross political boundaries and enter the Borough of Epsom & Ewell from Reigate & Banstead and Sutton. Therefore, cross-border communication and co-operation will be important to manage surface water flooding.
 - There are a number of open spaces in line with surface flow routes which could be considered for attenuation of surface flow.
- A number of reported flooding issues appear to result from poorly maintained drainage systems, or systems with insufficient capacity. A prioritised maintenance schedule may provide maximum benefit from the existing system.







Railway underpass adjacent Worcester Park station



Beverley Brook adjacent Worcester Park station

Figure 5.6 Selected photos of locations in the Epsom North character area





6 Stakeholder Surgery

6.1 Introduction

In order to discuss the conclusions from the Preliminary Risk Assessment and gather further local information to help direct the study, a surgery was held on Tuesday 22 February at Bourne Hall (Ewell) in the morning and Epsom Town Hall in the afternoon. Half-hour slots were allocated to all who attended. The SWMP team was represented by EEBC and Jacobs. Over 40 counsellors, officers and representatives of the various Residents Associations were invited (as per the Communication and Engagement Plan in Appendix A), and those listed in Table 6.1 attended. The main points raised are noted below.

Table 6.1Attendees of the SWMP stakeholder surgery

Bourne Hall, Ewell			
9.30	Cllr Michael Arthur: Ewell Ward Councillor-Residents Association- and Planning		
	Policy Sub Committee Chairman.		
10.00	Cllr Nigel Pavey: Stamford Ward Councillor- Liberal Democrat		
10.30	Mr Richard Evans: Representative for Ewell Village Residents Association		
11.30	Mr Keith Lugton: Representative for Nonsuch park & District Residents Association		
13.00	Cllr Jean Steer: West Ewell Ward Councillor- Residents Association		
Town Hall, Epsom			
14.30	Cllr Christine Key: College Ward Councillor- Liberal Democrat		
15.00	Mike Hill, Building Control Manager		
15.30	John Vadgama, Procurement Manager		

6.2 Summary of Consultations

6.2.1 Cllr Michael Arthur

- The area around Longmead Road used to be a sewage treatment works before it was relocated downstream. Longmead Road may have storm tanks fitted.
- Flooding in and around the Borough has occurred in 1968 and 1993/4³⁶
- The low spots on West Street (adjacent junctions with the High Street and The Rise) may require improved road gullies. Indeed, leaves and other debris blocking drains could be a key issue.
- Foul sewer flooding has been observed at the end of West Street, adjacent to the railway line.
- Corbet Road near West Street has previously flooded.
- Gibraltar Recreation Ground, alongside the railway line and particularly near Ewell West station, appears to flood due to poor drainage under the railway. Gardens on the adjacent road The Headway have also been known to flood. The geology may change locally from Chalk to clay.
- Langton Avenue (off Epsom Road) had a flood issue but clearance of gullies and soakaways appears to have resolved the problem.
- The Hogsmill River (and associated tributaries) do not appear to present a significant flood risk.

³⁶ These events (1992 rather than 1993/4) are catalogued in the Hosgmill Flood History Database Report





6.2.2 Cllr Nigel Pavey

- Experience of flooding in The Wells is limited to a single property on The Greenway where water may have run off the ground at the rear of the property to the east.
- Standing water can often be observed at Wheelers Lane
- Standing water is an issue in the Court Recreation Ground (especially the southern portion at the Court Lane entrance) and associated car park, possibly due to the blockage of the ditch running along the northern boundary.
- Gardens of properties between Kendor Avenue and Horton Hill can flood from Green Lanes Stream, possibly due to the lack of maintenance. In addition, standing water on the roundabout on Kendor Avenue can become a hazard, especially if it freezes.
- In the Manor Park development (adjacent Devon Close), the football pitch can become waterlogged which prevents football.
- The ground to the south of Horton Crescent can become waterlogged

6.2.3 Mr Richard Evans

- On the south west side of Epsom Road (near Homebase), road drainage appears to be to soakaway which can become blocked.
- Richard has not known serious flooding in the Ewell area in the 27 years he has been a resident.
- Air pollution caused by the volume of traffic is currently more of an issue than flooding in the village

6.2.4 Mr Keith Lugton

- The roundabout on the A232 between Cheam Road and Northey Avenue regularly has standing water. The water doesn't appear to drain well down onto the adjacent land. There is an electricity substation adjacent to the roundabout. The agricultural land to the south of the roundabout is owned by SCC and farmed on their behalf.
- The Cheam Road passes under the railway adjacent to Ewell East station and water collects in the dip. It appears that the road drains are not cleared as regularly. Water could be seeping northwards from fields to the south of the station.
- Properties in Queensmead Avenue have flooded previously with water collecting in the road outside.
- The railway underpass near NESCOT traps much debris and silt. Planning permission for further development of the NESCOT site could already have been granted.
- There is no known experience of flooding on Holmwood Road, Northey Avenue or Briarwood Wood to the west of Nonsuch Park. The railway underpass adjacent to Holmwood Road is regularly cleared by residents.
- Nonsuch Park is owned by SCC and let to EEBC and Sutton Boroughs on a 125 year lease arrangement.

6.2.5 Cllr Jean Steer

- Horton Golf Course was previously described as a quagmire and experienced significant problems with drainage. These problems appear to have been rectified following works.
- The lower end of the Green Lanes Stream (properties around the junction of Green Lane and Eastcroft Road) has experienced flooding. Residents





endeavour to keep the stream clear to improve conveyance. Cllr Steer is applying for funding from the council to clear the stream. Her experience is that Greens Lane Stream rises following heavy rainfall but does not cause flooding itself – backing up from the Hogsmill may be a more significant contributing factor.

- The junction of Chessington Road and Greens Lane is an area known to have flooded. Improved drainage may be required so that water can drain freely into the Greens Lane Stream.
- The playing fields adjacent Chessington Road ('Bakers' field) contains a Children's play area which has previously flooded.
- No flooding on the roundabout junction of Horton Lane and Chessington Road has been recorded.

6.2.6 Cllr Christine Key

• Cllr Key is not aware of any previous flooding on Albert Road.

6.2.7 Mike Hill

- Standard advice to developers in the absence of an infiltration test is to plan for 1m³ of soakaway volume for every 34m² of area to be drained.
- There is currently no interaction between EEBC building control and SCC in terms of approval for SUDS. Similarly, the building control function has no current involvement in resistance/resilience measures and it does not have a SUDS suitability map or similar.

6.2.8 John Vadgama

- At Clarendon Park, the grassland to the south of McKenzie Way was used as storage site by the developer and so was heavily compacted. Following flooding on 13 December 2008 and then 25 January 2009, drainage pipes were put underneath the east-west path between McKenzie Way and Horton Park Farm, but these did not improve the situation. The situation may have been improved now by breaking up the ground using an 'earthquake' machine. Flow appears to converge at the site running from the east down the footpath and from the south from David Lloyd's leisure centre. The timing of the flood problems appears to coincide with construction of the leisure centre.
- Ewell Court House may be suffering leakage from their private lake through the dam which needs to be fully investigated.
- Gibraltar Recreation Ground floods adjacent to the railway line and particularly near Epsom West station.
- Land to the northeast of Abbots Avenue is known to have flooded although it is not clear whether water continues to flow north on to Horton Lane as indicated by the LiDAR flowpaths.

6.2.9 The Bourne Hall Museum

- A partially forgotten watercourse runs beneath Church Street, approximately following the line of the LiDAR-derived flowpath. Various flows were known to converge at a well located at the junction of High Street and Upper High Street. Groundwater has caused flooding of some basement properties in the town centre.
- Horton used to mean muddy or dirty water, with West Ewell being a marsh.
- The site of the current Stamford Pond used to be a ford, known as the Stoneleigh Ford.





- The land to the north of the Stew Pond used to be another pond which has now been filled in.
- In Ewell, water is likely to have historically flowed down the High Street, possibly following the LiDAR-derived flowpath

6.2.10 CII Eber Kington (by email to KT 30.01.2011)

- Surface water in Ewell Village on the Kingston Road (opposite Mill View). It
 occurs almost at the narrowest part of the footpath and many pedestrians get
 soaked if the cars/lorries get too close to the footpath.
- The drainage at the bus stop in Ewell Village at the Spring (Bourne Hall side) could be improved. The bus shelter gets flooded because of the cars and lorries driving through the surface water which cannot get away quickly enough into the stream running along from the Dog Gate and eventually into the horse pond.
- Residents in Mavis Close report that they have very bad garden flooding and surface water. They report that the problem has got worse recently which may be due to surrounding neighbours using excess concrete etc in their gardens
- A resident in Kingston Road reports that his back garden floods easily "we have always been led to believe that we are the lowest point around here". Also the green between Kingston Road and the A240 Kingston Road floods when the rain is heavy.





7 Definition of Drainage Areas

For the purposes of the Epsom & Ewell SWMP, the Borough has been split into discrete geographic areas termed Drainage Areas. The Drainage Areas are shown in Figure E.1 in Appendix E and have been delineated based on:

- Geology: predominantly Chalk or predominantly Clay.
- Drainage: predominantly to soakway or predominantly to surface water sewers
- Surface water sewers: draining to the same watercourse
- Catchment areas: drainage to the same watercourse

In other words, the above four characteristics should be broadly the same within each identified Drainage Area. The eleven Drainage Areas are listed in Table 7.1, along with an indication of the susceptibility to flooding from surface water, groundwater and sewers. The degree of susceptibility is given in relative terms (high, medium or low) based on the following analysis. Thresholds were selected by visually inspecting the spread of data.

- **Surface water:** The susceptibility was determined from the number of properties in the National Receptor Database which lie within the Flood Map for Surface Water 0.5% AEP shallow (>0.1m) outline, as a proportion of the number of properties in the Drainage Area. Drainage Areas with a proportion below 20% were classed as low susceptibility, between 20% and 30% medium susceptibility and greater than 30% high susceptibility.
- **Groundwater:** The susceptibility was determined by reference to the Groundwater Emergence Map and Areas Susceptible to Groundwater Flooding mapping. Low susceptibility was assigned to those Drainage Areas lying predominantly on clay where the two types of groundwater maps suggested low susceptibility for flooding from consolidated aquifers (i.e. Chalk). High susceptibility was assigned to those Areas where the groundwater maps indicated a high susceptibility. Medium probability was assigned to other Areas underlain by Chalk.
- Sewer: The susceptibility was determined from the number of incidents of sewer flooding as recorded by Thames Water and published in the SFRA. Where there were up to two recorded incidents (from the surface water, foul or combined sewers) in a Drainage Area, sewer flooding was classified as a low susceptibility. In those with between 3 and 5 incidents, sewer flooding was classified as a medium susceptibility and, where 6 or more incidents were recorded, sewer flooding was classified as a high susceptibility.

The distribution of susceptibility across the Drainage Areas is shown in Figure 7.1. The maps show that the Drainage Areas across the centre of the Borough (i.e. West Park, Epsom West, Epsom Centre and Ewell) generally have the highest susceptibility to each of the three sources of flooding. However, Epsom North also has a high sewer flooding susceptibility. This distribution of susceptibility is broadly consistent with other evidence of flooding (previous studies, anecdotal evidence and site inspections) presented in the preceding chapters in this report.

These Drainage Areas will be used to discuss and group results and options in this SWMP. They may also be viewed as management units, within which similar management options or policies may be most applicable.





Table 7.1 Indicative flood susceptibility in SWMP drainage areas

			Flood Susceptibility				
Name	Primary Geology	Drainage	Surface Water Sewer Discharge Point	Fluvial Catchment	Surface Water	Groundwater	Sewer
Worcester Park	London Clay	Surface Water Sewer	Beverley Brook	Beverley Brook	Low	Low	Low
Hogsmill North	London Clay	Surface Water Sewer	River Hogsmill	River Hogsmill	Medium	Low	High
Stoneleigh	London Clay	Surface Water Sewer	Ewell Court Stream	River Hogsmill	Medium	Low	Medium
Horton & West Ewell	London Clay	Surface Water Sewer	Horton Stream	River Hogsmill	Medium	Low	Medium
Ewell	Chalk & London Clay	Soakaway & Surface Water Sewer	River Hogsmill	River Hogsmill	Medium	High	Medium
West Park	London Clay	Surface Water Sewer	Bonesgate Stream	River Hogsmill	High	Low	Low
Epsom West	London Clay	Surface Water Sewer	Greens Lane Stream	River Hogsmill	High	Low	Medium
Epsom Centre	Chalk & London Clay	Soakaway & Surface Water Sewer	Greens Lane Stream	River Hogsmill	High	High	High
Drift Bridge	Chalk	Soakaway	N/A	River Hogsmill	Low	Medium	Low
The Wells	London Clay	Surface Water Sewer	The Rye	The Rye	Low	Low	Low
Epsom Downs	Chalk	Soakaway	N/A	River Hogsmill	Medium	Medium	Low







Figure 7.1 Drainage areas and their indicative flood susceptibility





8 Summary

Based on national mapping provided by the Environment Agency, Defra identified that a significant number of properties in the Borough of Epsom & Ewell may be susceptible to surface water flooding. Subsequently, Epsom & Ewell Borough Council (EEBC) has successfully applied for and been allocated funding by Defra to prepare a Surface Water Management Plan (SWMP) for the Borough.

Surface water flooding can be caused by intense rainfall before it enters a watercourse or sewer, overland flow resulting from high groundwater levels, exceedance of the capacity of the sewer network and 'out of bank flow' from small watercourses which are not designated as Environment Agency Main River. In addition to damage to properties, roads and other infrastructure, the onset of surface water flooding can be relatively sudden and can lead to both high velocity flows in steep areas and deep ponding of flood water. There is, therefore, a risk to life associated with significant surface water flooding.

The purpose of the SWMP study is to identify sustainable responses to manage surface water flooding and to prepare an Action Plan. The Action Plan will provide an evidence base upon which future decisions and funding applications for putting the recommendations into practice can be put forward. Preparation of the Action Plan for Epsom & Ewell is building on previous studies and following Defra guidance. The study comprises the following key stages:

- **Preparation:** A partnership approach to local flood risk management through integrated working between the Borough and County Councils, the Environment Agency, Thames Water and other stakeholders.
- **Risk Assessment:** An initial assessment to determine the highest risk areas within the Borough and the key issues upon which the main study should focus. Detailed modelling (to be reported separately) in these highest risk areas will provide greater understanding of where and why this type of flooding occurs, an economic assessment of the likely damage and the ability to test potential management options to determine their viability.
- **Options:** Identification and testing of potential options to manage surface water flooding, with a focus on those which will be sustainable and provide as many benefits as possible (e.g. environmental and social).
- Action Plan: Selection of preferred management options and preparation of an Action Plan to take them forward.

This Preliminary Assessment Report documents the work undertaken and findings of the Preparation and initial Risk Assessment stages of the project. Ultimately, this report will be combined with separate reports covering the later stages and will support the Action Plan.

The SWMP project started in October 2010, and a working partnership has been established with EEBC as the lead partner. The vision for the project was agreed by the SWMP Partnership as:

Identify viable options to manage the risk of surface water flooding, for the benefit of the Borough of Epsom & Ewell and its people, both now and in the future.





Data collation has included consultation with counsellors and technical experts in the councils, consultation with representatives of Residents' Associations, as well as desk based assessment of available information and site inspections. From this, the following key issues have been identified:

- The main risk of flooding in the Borough is not from fluvial flooding, but as a consequence of:
 - the inability of the sewer network to safely remove rainfall of an intensity greater than approximately 10% (1:10 year) to 5% (1:20 year) annual probability which falls directly on to the urban areas;
 - surface runoff from the Chalk in the south of the Borough on to the Clay underlying the urbanised north of the Borough; and
 - groundwater flooding from the Chalk following prolonged above average rainfall.
- There is demonstrable history of surface water and groundwater flooding across the Borough. Although relatively few depressions were observed where water is likely to pond to a significant depth, there are some significant natural drainage paths, some of which could extend long distances across the Borough. These could become conduits for surface water flow in extreme events.
- Many of the natural drainage paths have been obstructed or diverted by development to the point where there is a risk of flooding when they become active. This could happen during intense rainfall and/or when the surrounding chalk hills become saturated, frozen or otherwise have reduced water permeability.
- Future development has the opportunity to grow around these natural drainage routes and therefore manage surface water flood risk. There are a number of open spaces in line with surface flow routes which could be considered for attenuation of surface flow.
- A number of potential flow routes cross political boundaries, entering the Borough of Epsom & Ewell from Reigate & Banstead and Sutton. Therefore, cross-border communication and co-operation will be important to manage surface water flooding.
- A number of reported flooding issues appear to result from poorly maintained drainage systems, or systems with insufficient capacity. A prioritised maintenance schedule may assist in tackling this.

A stakeholder surgery was held on 22 February 2011 to discuss the above issues and gather further local information to help direct the study. According to analysis of feedback forms filled in by each attendee, this was a positive experience and provided evidence of enthusiastic support for the SWMP. The following points provide a general summary of all responses:

- There was general confirmation of findings made in this Preliminary Risk Assessment regarding location of problem areas.
- Although in the recent past there have been no major flooding issues, there are a number of locally important issues.
- Lack of maintenance of existing infrastructure or at least the perception is a key issue





• The importance of appropriate planning for new developments was often highlighted, and opportunities to raise awareness within EEBC of flood risk, and strengthen links with SCC, should be pursued.

A number of recommendations have been made by previous studies to improve flood risk management in the Borough. The following strong themes are evident in these recommendations:

- Use of open spaces to manage flood flows
- Manage flood risk through planning and redevelopment, including encouragement for SuDS and property level resistance and resilience
- Appropriate maintenance of infrastructure

The council is undertaking or is planning a number of significant redevelopments (e.g. West Park hospital site and Plan E Epsom town centre) where these recommendations, as well as the findings of this SWMP, could be implemented.

To summarise the susceptibility to local flooding, the Borough has been split into eleven discrete geographic areas termed Drainage Areas. The geology, type of drainage (i.e. to soakaway or piped sewer), sewer catchment area (if applicable) and topography (drainage to a watercourse) is broadly the same within each identified Drainage Area. The Drainage Areas across the centre of the Borough generally have the highest susceptibility to each of the three sources of flooding (surface water, groundwater and sewers). This distribution of susceptibility is broadly consistent with the other evidence of flooding presented in this assessment, such as previous studies, anecdotal evidence obtained through consultation and site inspections. These Drainage Areas will be used to discuss and group results and options in this SWMP. They may also be viewed as management units, within which similar management options or policies may be most applicable.





Appendix A Communication and Engagement Plan

Purpose of the Plan:

- To illustrate internally and externally the importance of communicating honestly and transparently with our delivery partners, stakeholders and communities.
- To support the project team in spending time and resources more wisely, informing and influencing the right people about the right things, at the right time.
- To act as an overarching umbrella plan which ensures co-ordination between stakeholder engagement activities, media communications, internal communications, external funding and stakeholder support communications, and other consultations.

Business Objectives:

Our main business objectives for the EEBC SWMP are to:

- 1. Develop a robust understanding of surface water flood risk in the study area.
- 2. Produce a plan to manage surface water flood risk in the study area.
- **3.** Determine funding opportunities / how best to fund flood risk management in the study area.
- 4. Determine how best to allocate funds available.

Topline Communication Objectives:

- Listen to stakeholder and community views and build long-term relationships
- Educate, explain and ensure understanding
- Manage expectations
- Encourage involvement, participation and ownership of the project outcomes
- Follow good practice guidance and consultation legislation

Key Messages:

- Communities across Epsom and Ewell are at risk of surface water flooding
- Surrey County Council and its partners need to identify ways to reduce the risk
 of surface water flooding across Epsom and Ewell and will be seeking feedback
 on these ideas
- We will be actively engaging with local people to raise awareness, inform them about this flood risk and to help reduce risks to people and property by taking action.

Communicating Risk

How 'risk' is communicated, to whom, when and how will be particularly important. Risk means different things to different audiences that communications processes will need to be mindful of. Project communications will need to avoid creating a negative image about an area or individual properties.

EDD vs. DAD:

We have adopted the Engage, Deliberate, Decide (EDD) process of decision making as advocated by engagement legislation, and the Sustainable Development Commission. This process promotes the early and ongoing deliberation of issues with all stakeholders to enable shared understanding of problems, as well as helping to generate innovative solutions and support for these. The intention is to reduce concerns and conflicts during strategy implementation. EDD positively contrasts with the Decide, Announce, Defend (DAD) approach familiar to many decision making





bodies; the latter often results in resource wastage, delays and even project abandonment in some cases.

The Approach

This Communication and Engagement Plan follows a similar approach to the six planning for engagement steps detailed in the Environment Agency's key communication guidance 'Working with others: building trust with communities': It also meets Statement of Community Involvement Requirements.

- Step 1: What do you want to do?
- Step 2: Why do you need to work with the community?
- Step 3: Who do you need to involve?
- Step 4: How will you involve them?
- Step 5: Doing it!
- Step 6: How did it go and what did you learn?

Step 1. What do we want to do?

We want to undertake an efficient and appropriate study, that produces a cost effective, achievable action plan that reflects the area's needs and those of local people.

Step 2. Why do we need to work with the community?

Ultimately, SWMP outcomes will affect their lives and they will need to both understand the implications and have a say in what will be delivered. Local people's views and knowledge will help with decision making. This approach is clearly supported by Defra guidance on the need to involve communities.

Step 3. Who do we need to involve?

Stakeholders will be identified and engaged ('stakeholder mapping') in line to the engagement table below. The importance and timing of who 'needs to know' and be engaged will change amongst stakeholders during the life of the project, and in following phases. Our approach will be forward looking, mindful that outcomes of this project need to be linked to/provide a transferable legacy for future work.

Step 4. How will we involve them?

At agreed project phases, and via a range of communication and engagement methods. Examples include invitations to meetings, briefing sessions, workshops and forums, through existing local networks, press releases, e-newsletters.

Step 5. Doing it!

This Plan is the engine driving the communications and engagement process. Responsibilities will be agreed/allocated between the partnership members and the consultant.

There will be three communication/engagement interaction stages spanning the development of the SWMP:

- Stage 1: Inform Letting agreed stakeholders know about the project; for the 'wider public' a simple press release.
- Stage 2: Deliberation / Engagement working with all stakeholders as appropriate to arrive at preferred deliverables, engaging with communities and wider public to raise awareness and gain views.
- Stage 3: Feedback telling people the outcomes and what happens next.





Step 6. How did it go, what did we learn?

Communication and engagement will be a regular agenda item at progress meetings and a subject to regular review. Findings from the engagement process, how and if they have been incorporated, will be included in options development, where appropriate in the action plan and in the final consultation report.

Stakeholder Engagement Table

Terms used:

- 'Internal' = Teams and departments within the Borough plus elected members
- 'External' = All other audiences outside of the immediate Borough
- 'Primary' = The 'must have' stakeholders with whom we need close and regular contact with/inputs from or whose responses and inputs are key to successful delivery.
- Secondary = Stakeholders who may be influential, whose objectives may be affected by the SWMP and vice versa. Their support will be needed. However, close continuous contact may not be appropriate.

Team/Department	Do they need to be directly & continuously involved?	Notes
Emergency Planning Contact Point Two members of staff job share multi agency contingency role.	Yes	Usually the focal point for flood risk management. Buy-in key to adoption of action plan. Critical Infrastructure Status/Action. G. Marchbank has seen the tender document and project briefing. Has not been directly involved due to time constraints. It will be necessary to circulate any findings from this point onwards and invite a representative to meetings where appropriate. Input needed to confirm critical/vulnerable infrastructure. Map required. Buy-in key to adoption of action plan. Building control and SUDS are other important elements.
Discusiones On sticlishead in a		Key liaison point: Kate Turner, EEBC
Planning: Spatial planning, Development planning and planning policy.	Yes	Levelopment is a key issue to be considered basis for communication. Key team members to be invited to a drop in informative surgery in February 2011. Liaison via: Kate Turner
Transportation/Highways (Surrey County Council).	Yes	Access is a key issue in flooding. Water providers do not have the responsibility for dealing with flood events for

Table A.1 Primary Internal Stakeholders





Team/Department	Do they need to be directly & continuously	Notes
Steve Howard (road modeling).		transportation infrastructure. Also likely to have historic knowledge of flooding/critical assets. Inputs to be gained from CapitaSymonds – Surrey CC Infrastructure Plan and surface water drainage information/road modeling inputs. Buy-in key to adoption of action plan. Will need to be involved in development of options. Liaison via: Owen Lee (SCC). Owen to contact Steve Howard. Invite to February surgery
Maintenance/Drainage Engineers – or equivalent responsible person. Surrey CC is the regulatory body for EEBC. Eric Turner Jan Deel John Badema	Yes	They hold knowledge of assets, incidents, buy-in needed for way forward. The Borough does not have a drainage engineer but some knowledge is held with the procurement and Countryside Managers and other contact points as indicated in column 1. Knowledge needs to be tapped in to. Need confirmation that there is no need to involve the Highways agency. Liaison via: Countryside managers' lead (Stewart Cocker) Owen Lee for the HA question/ involvement of other Surrey CC staff
Parks	No	Early input desirable and likely to contribute to wider understanding of hotspots and risk. Parks are potential sites for flood alleviation measures. Will need to comment on Action Plan. Countryside Manager already involved in the project. Invite to February drop in surgeries. Liaison via: Kate Turner
Leisure/Lands and Estates	No	Early as possible input/view seeking.
EEBC Leisure Centre a key asset.		Invite to February drop in surgeries.
East Ewell Sports Grounds		
Implications for future development		





Table A.2 Secondary Internal Stakeholders

Team/Department	Do they need to be directly & continuously involved?	Notes
Environment	Yes	Desirable in the early stages to ensure relevant environmental issues are captured and understood for action plan considerations. Represented on the partnership group via Kate/Karol. Stewart Cocker (Countryside Manager) who will be involved in site visits and other stages where appropriate. Invite to progress meetings as appropriate.
Communications Officers	No	It will be beneficial if they can have an appropriate early briefing and their input to the communication of risk will be important. Particularly important that they are briefed in order to manage public queries and contact from Residents' Associations. Views on public involvement and key messages needed. If necessary, arrange a telephone conversation to include Jacobs.
Droporty/Accet	No	Liaison/input via: Kate Turner
Brendan Smith (valuation)		Agreements. Will need to determine their role and influence in the Borough and in respect of the Action Plan in particular.
Risk/insurance	No	Will need to ensure regular contact in
management Finance Department		addition to early briefings and inputs. Especially important to have inputs to understanding and communicating risk.
Elected members	No	Liaison/input via: Kate Turner
Key members need to be involved. In particular Chairs of committees e.g. Planning Policy sub committee, Leisure Committee Flood Resilience Forum Members representing directly affected communities / locations.		need to sign off the action plan. Timing of their involvement should be agreed and understood. Need to identify elected members serving as Flood Resilience Forum or similar representatives and ensure they are briefed. Regular updates as appropriate by Borough lead officer. Particularly important that they are briefed in order to manage constituents' queries and contact from Residents'
Need to avoid 'politicizing'		Associations.
of the project.		A Briefing note to be prepared by





Team/Department	Do they need to be directly & continuously involved?	Notes
		Jacobs that can be used to generally inform people about the project and help gain their views.
		Invite to February drop in surgeries.
		Going forward, a possible approach could be the use of the 'Members
		Briefing' emails that get sent to all Members on a weekly basis. These
		could contain general progress
		on specific schemes. A more specific
		email could also be sent to Planning Policy Sub Committee members. Mainly
		due to time restrictions it may be
		member meeting. Perhaps concluding
		findings could be presented by Jacobs
		Liaison/inputs via: Kate Turner
Conservation Manager	No	Liaison/inputs via: Kate Turner

Table A.3 Primary External Stakeholders

Team/Department	Do they need to be directly & continuously	Notes
	involved?	
Neighbouring Boroughs 'downstream' and 'upstream'	No	Important for developing pro/inter active action plans, exploring the potential for shared resources going forward. Involve during risk assessment and before
Kingston, Reigate & Banstead		developing short list of measures.
Peter Russell.		Liasion/inputs via: Richard Horlor/McFarlane (boundary interface)
All Partners – the Environment Agency and Thames Water	Yes.	Involved at all phases, represented on the Partnership Group.
		Liaison/inputs also via: Richard Horlor.
Golf courses	No	Important for early involvement to
RAC Cuddington (Reigate &		(recharge aquifers) as a flood alleviation measure.
Dansieau)		Direct contact to be made and briefing provided.
		Input required to options. Liaison/inputs via: Richard Horlor
Sutton and East Surrey Water	No	Contact needed to discuss this project, identify cross boundary issues and involvement in approach to measures.





Team/Department	Do they need to be directly & continuously involved?	Notes
Peter Isherwood		comment on action plan.
		Liaison/inputs via: Kate Turner supported by Richard Horlor.
Residents Associations Chairs. Note individual residents or elected members. Involve specific wards directly affected.	No	 With a powerful 'political' role and their understanding and buy-in will be important to a successful action plan. It will be important to not cause over concern or potential 'blight'. Contact to be initiated through a letter and briefing note to Chairs inviting them to the February drop in surgeries. Need to communicate final outcomes.
		Liaison/inputs via: Kate Turner
Directly affected Communities/Individuals	No	Will have increasing importance as the project advances. Controlled release of information required in order not to cause alarm or property 'blight'. Key liaison will be through residents associations Liaison/inputs via: Kate Turner
Other preiorte including	Ne	supported by EEBC communications team.
Other projects, including Woking, Hogsmill,Byfleet, Rosebury/Nonsuch Parks, Surrey Preliminary Flood Risk Assessment and others.	NO	Need to be involved early on and at appropriate stages in the process, to be identified and agreed. Consider interactions and effects of emerging action plans on one another. May be achieved through existing
		programme of meetings. Need to identify critical paths.
		Most projects are main river focused thus governing impacts/importance but ability for surface water to drain away is an important factor.
		Liaison/inputs via: Stewart Cocker and Richard Horlor
The 'wider public'	No	It will be important to agree the messages to be communicated to the wider public, when and how. The content of press releases (for example) will need to be aligned with project key messages.
		Main representation via website and newsletters as appropriate.
		:Liaison via: Kate Turner





Table A.4 Secondary External Stakeholders

Team/Department	Do they need to be directly & continuously involved?	Notes
Emergency 'blue light' services Local Strategic Partnership	No	They will need to understand the process and have input to it. Inform and include, via Borough Emergency Planning Lead, Flood Resilience Forums, etc. Invite comments on proposed measures and action plan. Liaison via: Karol/Jill
Flood Resilience Forums Passenger Transport providers e.g. bus operators, demand responsive transport Involvement likely to be bus / site specific A Surrey County Council Role	No No	As above They will need to understand the process and have input to it. Inform and include as necessary through existing forums Invite comments on proposed measures and action plan Liaison via: Owen Lee
Other utilities companies (except gas and electricity), key infrastructure owners e.g. Network Rail Insurance providers	As above No.	As above Liaison via: Richard Horlor Whilst insurers have an ambiguous role
ABI		will be important to management, their views will be important to managers of property risk (internal and external) and affected individuals. One outcome of identifying and taking action to manage flood risk can be a rise in insurance premiums. We should be mindful of their stance.





Appendix B Composite Maps





Appendix C Management Options Identified in Previous Studies

The River Hogsmill IUD Pilot Study (Jacobs, 2008) identified a number of actions which could reduce flood risk across the Hogsmill River catchment. Those related to integrated planning are reproduced as Table C.1 and those assigned to the Hogsmill Working Group reproduced as Table C.2.

Following from the River Hogsmill IUD Pilot Study, the Nonsuch and Rosebery Park Flood Attenuation Area Pre-Feasibility Studies (Environment Agency, 2009a,b) identified a number of suggested actions based on the River Hogsmill IUD Pilot Study and the Pitt Review. These actions which were to be considered by the Hogsmill Working Group are reproduced in Table C.3. Although the Hogsmill Working Group no longer meets regularly, the same partners covering Epsom & Ewell are now partnering to produce the SWMP and many of the listed actions remain relevant.

Following review of these actions identified in Tables C.1, C.2 and C.3, the following have been further considered as generic options to manage surface water flooding in Epsom & Ewell:

- **Raise awareness of risk:** Use hazard and risk maps produced by the SWMP to raise awareness of surface water flooding both within the council (to include spatial and emergency planning teams) and potentially with the public. Link actions in response to any Met Office/Environment Agency Extreme Rainfall Alerts to hazard/risk mapping.
- **Groundwater flooding:** Use mapping of topographic depressions to ensure that flood hazard/risk maps produced in the SWMP identify areas which may be susceptible to groundwater flooding. This information could be used in spatial and emergency planning.
- **Emergency planning:** Understand which roads or major pedestrian routes may be blocked by surface water flooding and plan traffic and pedestrian diversions.
- **New development:** Planning policy could ensure that future development should respect natural drainage routes and land form.
- **Property level resistance/resilience:** Raise awareness of the benefits and costs of available property level measures within the council and with those potentially at risk of flooding, and identify any available incentives for their use.
- **Suitability of SuDS:** Produce a map showing the likely suitability of different SuDS techniques across the Borough to inform their future use.
- Surface water sewer capacity: Target maintenance to ensure that sewer network operates to maximum capacity. Thames Water policy could permit disconnection of surface water sewers upstream of overground attenuation areas (and reacceptance of water further downstream) to increase capacity in the system. Further increase in surface water capacity (and quality) could be achieved through reducing infiltration of surface water and groundwater into the sewer systems and keeping surface water and foul systems separate.
- Watercourse capacity: Target maintenance of existing watercourses, drainage channels, trash screens etc





Table C.1 Potential measures which could be used to manage flood risk (reproduced from Hogsmill IUD Study Main Report Table 4.6)

Measure		Aeasute	Potential Barriers on Hogsmill
Type:	No.	Detail	
Naw	1	Spattal planning	Lack of detailed understanding of risks and
development	2	Development control: property resilience to high and medium flood risk	benefits to be gain through development by local authorities.
	3	SUDS	Main urban pressures and flood risk is within the lower part of the catchment with a clay geology. The geology is less suitable for infitration SUDs techniques. Although attenuation techniques using storage are viable these require greater space, although other small-scale control at source methods could be used (i.e. water butts). The issue regarding responsibility of SUDs maintenance is yet to be resolved.
Existing development – non structural	4	Quantification and communication of existing risk	Approisal of risk needs to be catchment-based, not constrained by Local Authority boundaries. Flood Risk Tool needs to be applied thoroughly and consistently.
options (managing existing risk)	5	Flood warning	Currently extreme rainfall cannot be reliably predicted at the scale of sub-catchments, to provide surface water flood warnings.
	6	Emergency planning (and recovery plann)	Potential barriers to emergency response. Adjacent LA in the same catchment come under different Local Resilience Fora under the Civil Contingences Act (GLA, Surrey CC),
Existing development – structural	7	Increase resilience at individual property level (including SUDs).	Currently no incentives or enforcement programme for non-compliance.
measures	5	Infrastructure modification	The role infrastructure plays in conveyance of floods, and creating barriers to flood flows is not well recognised. Equally the opportunity to modify infrastructure to reduce flood risk over time when carrying out capital maintenance is not promoted.
	9	Physical flood alleviation works, including retrofit of SUDs	Cross-boundary insues: Surface water detention areas (SWDA) may be in a separate LA area from that where the flooding originates. Responsibility insues of accepting runoff from SWDA back into server.





Table C.2 Possible actions to reduce flood risk (reproduced from RiverHogsmill IUD Pilot Study Appendix A Table 27)

Source	Puth	Receptor	Working Group Action	Responsible Organisation
The Cital# upper catchment	Run-off exceeding Chalk infiltration	infrastructure on the overland flow paths	Provide attenuation and retention ponds upstream of development in built amas, improve dramage/ modify roads to collect and direct flow out of the built area to retention ponds and soakaways or, as a last resort, to watercourses. Emute that future development and redevelopment is designed to accommodate flow paths in open spaces. Reduce surface water infiltration to severage systems to keep surface water and ground water separate from the foul system.	LPA LPA/SCC LPA TW
The Clay lower catchment nurface water	Ram-off following overtand flow- paths	infrastructure on the overland flow paths	Provide upstream attenuation and/or improve drainage to collect and direct flow to storage. Modify road infrastructure as overtand flow-paths to direct flow where possible to open spaces for attenuation. Ensure future development and redevelopment is designed to accommodate flow paths in open spaces.	LATWISCC LAVSCC
The Chaik aquifer	Underground 'Tow-paths' in Chalk aquiter	Infrastructure In the groundwater Risk Area around the spring-line	Map depressions and low-lying areas, collate GW flood history Require developers to raise threshold levels and plan safe access and egrees.	EALA EALA
Manhoies where the drainage network capacity is excalled	Overland flow- paths	Infrastructure on the overland flow paths	To be discussed with TW – Agree strategy with LAs to attenuate upstream of network in preference to increasing capacity which would have downstream implications as general approach Ensure that the surface water and foul sewage systems are separated as much as practicable so that any exceedance does not cause foul contaminated flooding. Ensure that the network operates to design standard Provide or contribute to on-line and/or off-line attenuation in open- topaces Receive back attenuated flow where it cannot discharge directly to a watercourse.	τw
Manholiss where the foul sewer network capacity is exceeded	Overland flow- paths	infrastructure on the overtand flow paths	To be discussed with TW ~ Agree strategy with LAs to investigate misconnectons, infiltration and reduce risk of blockages	TW





Source	Path	Receptor	Working Group Action	Responsible Organiaation
Watercourse	Out of bank flow	anfræstructure on floodplæn	Ensure that the watercourse and structures are maintained to actileve the design standard of protection Use Ptanning and Development Control to 'make space for water' by preventing new development and where possible, removing existing development at critical points within the flood plain. Flood proofing and community based measures as recommended in the Strategic Flood Risk assessment. Interview of flood watering	EA

Note: LPA – Local Planning Authorities; SCC – Sussex County Council; TW – Thames Water; EA - Environment Agency

Table C.3 Suggested Actions for the Hogsmill Working Group (reproduced from Nonsuch Park Pre-Feasibility Study Table 8.1)

Action	Suggested Owner ^A	Ref in Hogsmill IUD / Pitt report
Understand which overland flow routes may be	Local	Pitt Rec. 16, 45;
blocked by flooding and plan traffic and pedestrian	Resilience	IUD Vol. 2
diversions.	Forum	Appendices A & D
"Protect" natural flood detention dams, such as, The Avenue at Nonsuch Park.	Planning	-
Review construction of traffic calming measures-	Local	-
modify those on overland flow paths to ensure they	authority	
do not retain flood water.	L A Dorko	
Posebery Parks which should encourage	LA Faiks	
landscaping works to include small bunds across	Dept	
overland flow paths (but see Note B).		
Introduce a policy for landowners to be	Incorporate	IUD Vol. 2
encouraged to create small (see Note B)	in LDF	Appendix A
bunds on overland flow paths on chalk to act as		
natural flood detention basins and silt traps.		
Develop a policy for property level SuDS and	EA/ Planning	Pitt Rec. 9,
investigate how this could be incentivised (rebates on		10, 20
rates?).		
Thames Water to agree that where surface water	Thames/ LA	Pitt Rec. 21
flooding solutions are being developed, they liaise		IUD Vol. 2
with the LPA on surface land use to identity if any		Appendix I
viable surface retention options are available, (as		
opposed to increasing conveyance).	A 11	
vvnerever a surface retention option is being	All	IUD VOI. 1
development opportunition for opvironmental		Executive
anterior and a menity/ biodiversity are to be		Summary
considered		

Notes:

A: To be considered by Working Group

B: Subject to appropriate planning permission, both in terms of visual impact (e.g. <1m high to avoid need for planning) and so as not to increase or cause flood risk to other areas





Appendix D Drainage Areas Map



Hospitals Hospitals	Acie Carlos Constructiones Constructions of the construction of th	Corrections control of the second control of	to of the Controller of Her dreproduction infringes edings. Epsom & Ewell Borough Council
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Astrian Bargh Bargh Bargh Bargh Bargh Bargh Bargh Bargh Bargh Bargh Bargh Bargh Bargh Bargh Bargh Bargh	Education Sites Groundwater Flooding Flood Map for Surface Water Electricity Sub Stations Flooding (Property) > 0.1m Telecoms Flooding (No Property) > 0.3m	2.01 - 100.00 —— Drainage Flowpaths	0 0.25 0.5 1 Kilometers	NCIL WWW	ProducedDCApr 2011CheckedPAApr 2011ApprovedDCApr 2011

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Image: Spring Line I	Drawing Title Preliminary Risk Assessment	Epsom & Ewell SWMP
 Hospitals Hospitals Groundwater Flooding Flood Map for Surface Water (1:200yr) 1.01 - 2.00 	Drawing Number Figure B.3	1180 Eskdale Road, Winnersh, Wokingham, RG41 5TU
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