Guidance Document: Fareham Borough Council

Flood Risk Overview

Sources of Flood Risk

Fareham occupies a central position in the PUSH sub-region, situated to the north west of Portsmouth. It covers a total area of approximately 74 km². The Borough has 8.5 km of open coastal frontage, 14.5 km of frontage on the tidal River Hamble and 11.5 km of frontage onto Portsmouth Harbour. The Rivers Wallington and Meon flow through the Borough, with a total main river length of 35 km. At present, approximately 9% of the Borough's land area is designated as within Flood Zones 2 and 3a/3b (see SFRA Map Set 1A).

The SFRA has shown that the primary source of flood risk to Fareham Borough is from the sea. The key parts of the Borough which are currently at risk of flooding from the sea are the Fareham frontage to Portsmouth Harbour, Portchester, Lower Swanick and Warsash.

The secondary source of flood risk to the Borough is from rivers. The River Meon in Fareham Borough has a large floodplain in its downstream reach which is designated as a National Nature Reserve downstream of the village of Titchfield. The River Meon is defended from tidal inundation by the harbour frontage at Hill Head. If this defence were to fail, the River Meon would be inundated regularly by tidal flows. As such, 'undefended' Flood Zones show the Meon valley as predominantly at risk of tidal flooding. The River Wallington flows through the village of Wallington before discharging into Portsmouth Harbour. A number of properties in Wallington lie within the predicted flood outline of the Wallington River and its functional floodplain (Flood Zone 3b) and flooding recently occurred in the village in 2000. Upstream of Wallington, large areas of Greenfield land are covered by the river's predicted flood outlines.

There have been some previous incidents of groundwater flooding adjacent to the upper part of the River Meon in Fareham Borough, while Fareham has also been susceptible to flooding from other sources including surface water and flooding caused by infrastructure failure.

Key physical characteristics that may constrain development

Approximately 47% of Fareham Borough is currently covered by existing development. A number of environmentally designated areas represent a significant constraint on development in the Borough, covering approximately 13% of its area. As such there may be only limited Greenfield land upon which development can be permitted following consideration of other planning constraints.

The topography of the Borough ranges from sea level to approximately 50 metres above ordnance datum (mAOD) for the majority of the Borough with the exception of the area to the north of Portchester which rises to approximately 110 mAOD on Portsdown Hill, the Borough's steepest slope. The areas of lowest elevation are exclusively along the coastline or within the Wallington or Meon valleys. A lot of existing development, including Fareham town, Locksheath and the northern part of Portchester is situated on higher ground away from tidal and fluvial floodplains, suggesting that future development outside areas of flood risk should be possible in the Borough.

Geologically, the Borough is underlain by low and moderately permeable bedrock formations for all areas to the south and west of and including the town of Fareham. To the north east of Fareham, the Borough is underlain by the chalk outcrop of Portsdown Hill. Moderately permeable superficial deposits overlie much of the bedrock in Fareham Borough. Low permeability superficial deposits are present in the Wallington valley and at the foot of Portsdown Hill, reducing the permeability of those areas not covered by artificial surfaces in terms of surface water runoff generation. This can potentially make the installation of Sustainable Drainage Systems (SUDS) difficult in attempting to reduce the flood risk to 'downstream' sites when promoting new development.

Vulnerability to Climate Change

The SFRA has generated predicted tidal outlines for a number of years up to 2115 (see SFRA Map Set 1E). These outlines account for the most up-to-date predicted rises in sea-level over the coming century due to

climate change and they therefore allow the identification of locations that will be most vulnerable to this change due to their topography. In Fareham Borough, the areas most vulnerable to rising sea levels are Portchester (both north and west of Portchester Castle), the village of Wallington and the frontage between Town Quay and Hoeford Lake. In addition to this effect of rising sea levels, it is anticipated that climate change will result in an increase in fluvial flood flows. This may put additional pressure on settlements which are adjacent to rivers such as Wallington and Titchfield.

Vulnerability of existing communities

In general, the wards of Fareham Borough have a mix of average and high social vulnerability to flooding (see SFRA Map Set 2). However, within Flood Zones 2 and 3 (i.e. those areas potentially likely to experience flooding) the wards generally have a high social vulnerability to flooding, with little variation across the Borough. This may provide an additional incentive to increase flood protection measures to many communities who are already at risk of flooding in Fareham.

Existing defence assets and likely future investment

The coastal frontages of Fareham Borough are either: low-lying and subject to some form of coastal defence; or are composed of higher ground which protects the land behind from coastal flooding.

Of the low-lying areas, only some are protected from a present day 1 in 200 year tidal flood. Areas below the minimum standard of protection required for new development are on the Hamble estuary (particularly around Warsash), the Fareham frontage between Town Quay and Hoeford Lake and the Portchester frontage on Portsmouth Harbour. In these areas, while many defences do not offer protection to a 1 in 20 year tidal flood, it is not thought that flood protection is the primary purpose of the majority of these defences. The coastal defences in Fareham are, however, likely to be susceptible to climate change, as 100 years of predicted sea level rise would mean that almost all man-made defences fail to offer protection from a 1 in 20 year tidal flood. On some frontages where defences can prevent inundation of large areas by tidal flooding, significant investment will be required in improving and maintaining existing flood defences. In order to consider the sustainability of investing in improved defences, the 'danger to people from breaching' index (SFRA Map Set 1D) will provide indications as to where the residual risk due to breaching may remain unfavourably high following improvements to defences to protect from extreme tidal floods.

Sequential and Exception Test

Planning Policy Statement 25 (PPS25) sets out the Government's objectives for achieving sustainable development through the avoidance and management of flood risk. The aim of PPS25 is to ensure that flood risk is taken into account at all stages of the planning process to avoid inappropriate development in areas of flood risk. To achieve this aim, PPS25 provides a decision making tool to ensure that sites with a low probability of flooding are developed in preference to areas at higher risk. The Sequential Test is the decision process which Local Authorities must demonstrate when developing their Local Development Frameworks and Local Development Documents. This SFRA has developed a suite of mapping outputs to assist Local Authorities in applying the Sequential Test.

When applying the Sequential Test, Output Package 1 of the SFRA will provide all the necessary information required upon which to base decisions regarding the location of future development in relation to flood risk. Within Output Package 1, the key map required for applying the Sequential Test is the Flood Zones map, shown as Map Set 1A. This map shows the spatial extent of 3 of the 4 Flood Zones identified in PPS25, these include:

Map Set 1A

- **Flood Zone 2** – Medium Probability of Flooding

Fluvial (river) and Tidal Flooding

- **Flood Zone 3a** – High Probability of Flooding, sub-divided into:

Fluvial Flooding
Tidal Flooding
Tidal / Fluvial (combined flooding processes where known)

- **Flood Zone 3b** – Functional Floodplain

Fluvial Flooding only

The area outside of these zones is considered to be the fourth zone, 'Flood Zone 1' which has a low probability of flooding.

Output Package 1 also contains 5 other Map sets which provide useful information to support Local Authorities when applying the Sequential Test, these include:

- Map Set 1B – Undefended Flood Hazard Maps (Zones 2 & 3)
- Map Set 1C – Indicative Areas Benefiting From Defences
- Map Set 1D – Danger to People from Breaching Maps
- Map Set 1E – Climate Change Outlines for 2025, 2055, 2085 and 2115
- Map Set 1F – Other sources of Flooding including:
    - Wave Energy
    - Groundwater Flooding
    - Impact of Land Use Change on Surface Water Runoff
    - Overland Flow
    - Historic Incidents of Surface Water Sewer Overload

When allocating a site in line with the Sequential Test, Figure 1 illustrates the decision process, the key questions that need to be answered and details of how the outputs of the SFRA can help inform the process.

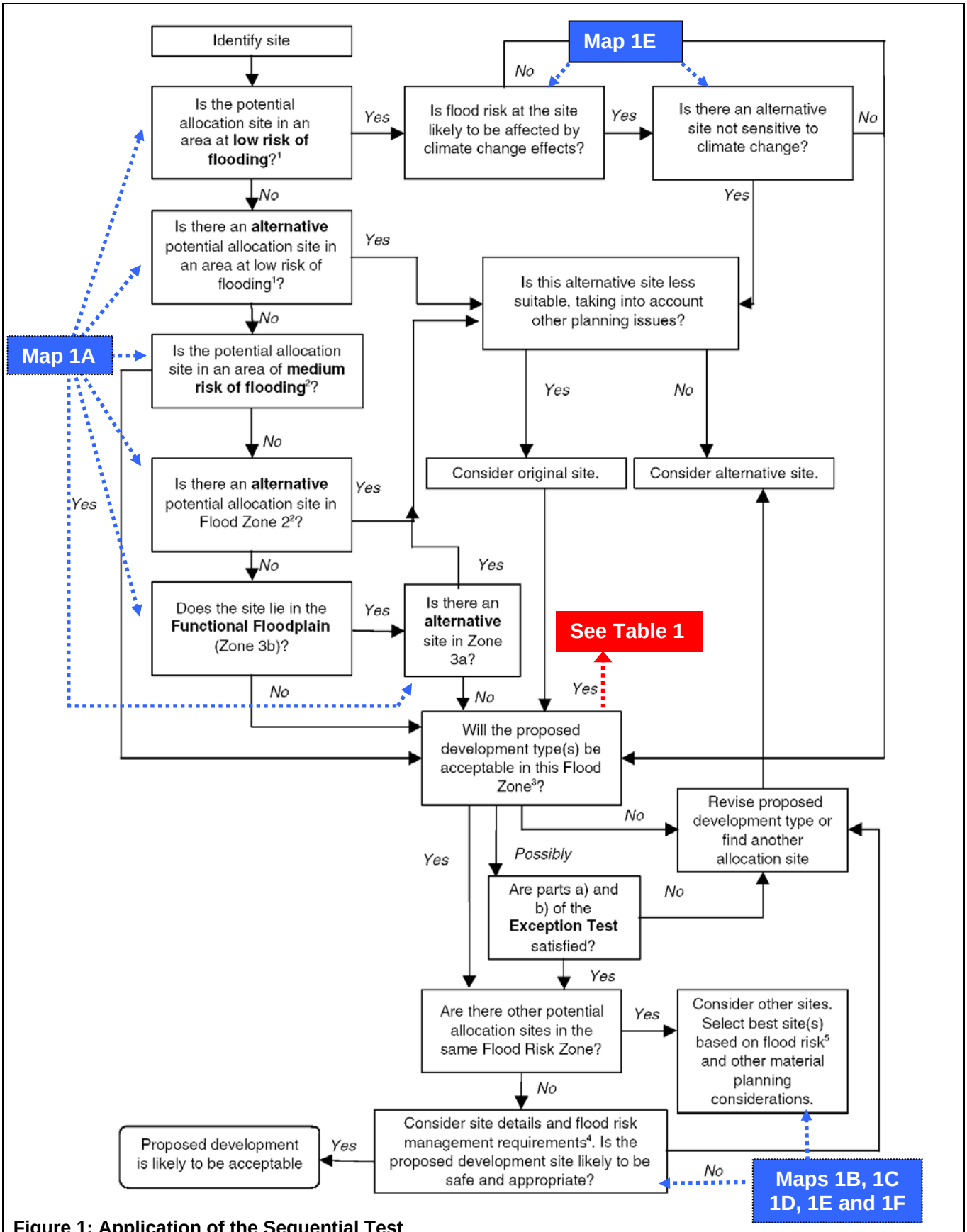

Figure 1: Application of the Sequential Test
Ref: Development and Flood Risk: A Practice Guide Companion to PPS25 'Living Draft'

Notes on Figure 1 Flow Chart

1 Flood Zone 1 for fluvial and tidal flooding and with a low risk of flooding from other sources.
2 Flood Zone 2 for fluvial and tidal flooding and with a medium risk of flooding from other sources.
3 As defined by the Sequential Test.
4 Development to be safe and to not increase flood risk elsewhere. Required to pass part c) of the Exception Test, where applicable.
5 Including susceptibility to future climate change and residual flood risk.

Flood Risk Vulnerability Classification

Where there are no reasonably available sites in Flood Zone 1, Local Authorities should take account of the flood risk vulnerability of land uses when considering the suitability of sites in Flood Zone 2 and then if necessary Flood Zone 3, applying the Exception Test if required. With reference to PPS25, Table 1 provides a summary of the appropriateness of land uses in relation to the Flood Zones.

	Essential Infrastructure	Water Compatible	Highly Vulnerable	More Vulnerable	Less Vulnerable
Zone 1	✓	✓	✓	✓	✓
Zone 2	✓	✓	Exception Test required	✓	✓
Zone 3a	Exception Test required	✓	×	Exception Test required	✓
Zone 3b	Exception Test required	✓	×	×	×

Table 1: Flood Risk Vulnerability and Flood Zone Compatibility (Ref: PPS25)

Key: ✓ Development is appropriate, subject to demonstrating the Sequential Test

× Development should not be permitted.

(*This table does not show: the application of the Sequential Test which guides development to FZ1 first, then FZ2, and then FZ3; FRA requirements; or the policy aims for each Flood Zone.)

If the application of the Sequential Test demonstrates a need to consider allocating sites within Flood Zones 2 or 3, a 'Sequential Approach' should also be applied within each of these Zones to steer new development to areas with the lowest probability and consequences of flooding. To facilitate this approach to site allocations within the Flood Zones, the SFRA Outputs (in particular Map Sets 1B, 1C, 1D and 3A / 3B) will provide useful information on the variation of flood hazard and the level of benefit provided by existing defences.

The findings of the Statistical Analysis undertaken in Stage 1 of this SFRA suggest that Fareham Borough Council can achieve their draft South East Plan housing allocation in line with the Sequential Test. However, the need for potential commercial regeneration of developed areas and possible 'windfall' sites may mean that Fareham Borough Council will need to consider development within Flood Zones 2 and 3. Where the Sequential Test alone cannot identify acceptable sites for urban regeneration or where windfall sites, having satisfied the Sequential Test, are located in Flood Zones 2 or 3, the Exception Test may need to be applied.

Exception Test

The Exception Test should only be applied following application of the Sequential Test. There are 3 elements of the Exception Test, all of which need to be demonstrated before the test can be passed. The 3 elements are:

a) It must be demonstrated that the development provides wider sustainability benefits to the community that outweigh flood risk, informed by a SFRA where one has been prepared. If the DPD has reached the 'submission' stage – see Figure 4 of PPS12: Local Development Frameworks – the benefits of the development should contribute to the Core Strategy's Sustainability Appraisal;

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

c) A FRA must demonstrate that the development will be safe, without increasing flood risk

elsewhere, and, where possible, will reduce flood risk overall.

When developing LDDs, Local Authorities are advised by PPS25 to prepare criteria-based polices in line with their Core Strategy's Sustainability Appraisal, against which item a) of the Exception Test can be tested. This will minimise the need to consider this element of the Exception Test for each individual planning application.

By assisting Local Authorities, at the site allocation level, in steering new development to areas with the lowest probability and hazard of flooding, the use of the SFRA outputs (in particular Map Sets 1B, 1C, 1D and 3A / 3B) will mean that site specific flood risk assessments in these areas will be more likely to satisfy criteria c) of the Exception Test.

SFRA Mapping Outputs

Table 2 summaries the most relevant mapping outputs and their purpose, for each of the key users of the PUSH SFRA.

Key Users	Relevant SFRA Mapping Outputs	Purpose
Forward Planners	**Output Package 1:** PPS25 Sequential Test and Relevant Supporting Information	Output Package 1 provides all the necessary information to help planners apply the Sequential Test and Exception Test when allocating new sites for development. Output Package 1 also allows planners to identify sites with the lowest probability of flooding and lowest flood hazard / danger and how the extent of flooding is likely to change in the future due to climate change.
Flood Risk Managers	**Output Package 1:** PPS25 Sequential Test and Relevant Supporting Information	Output Package 1 helps Flood Risk Managers to identify variations in flood hazards / dangers to existing development. The data also provides mapping to show how the extent of flooding is likely to increase over time due to climate change.
	Output Package 2: Social Vulnerability of and Flood Hazard / Danger to Existing Development	Output Package 2 can help Flood Risk Managers to: o Identify critical areas where social vulnerability and flood hazard / danger are high. o Help inform assessments of the sustainability of existing development. o Help identify and prioritise asset management and improvements.
	Output Package 3: Appropriate Defence Standards and Levels of Investment	Output Package 3 can help Flood Risk Managers to: o Identify shortfalls in existing defences in providing appropriate standards of defence, now and in the future. o Identify indicative levels of investment required to provide the appropriate standards, now and in the future.
Development Control	**Output Package 1:** PPS25 Sequential Test and Relevant Supporting Information	Output Package 1 can help Development Control personnel to: o Prepare specifications for site specific FRAs. o Review site specific FRAs for new development sites and check for compliance with PPS25.
Emergency Planners	**Output Package 1:** PPS25 Sequential Test and Relevant Supporting Information	Output Package 1 can provide emergency planners with information on the variation of flood probability and hazard across the sub region. Such information can aid in the development of emergency plans and evacuation routes during flood events.
	Output Package 2: Social Vulnerability of and Flood Hazard / Danger to Existing Development	Output Package 2 can inform emergency planners of the locations where social vulnerability and flood hazard are highest. Such information can help emergency planners prioritise evacuation plans.

Table 2: The Mapping Output Packages appropriate for key users of the SFRA

Recommendations for Site Specific Flood Risk Assessments

Whilst the information presented in this SFRA will inform Local Authorities and facilitate their strategic allocation of sites for future development, it should not preclude the need for developers to undertake site specific flood risk assessments (FRAs). A SFRA, by its very nature, is a high level assessment of flood risk at the local authority level. It does not provide sufficiently detailed information to satisfy all of the requirements of a site specific FRA as outlined in PPS25.

On the 1st October 2006, the Town and Country Planning (General Development Procedure) (Amendment) (No 2) (England) Order 2006 (GDPO), made the Environment Agency a statutory consultee for planning applications involving flood risk in specified circumstances. To improve the efficiency of disseminating general guidance, the Environment Agency has produced a suite of standing advice. The advice is available to Local Authorities and the Public, via a web page http://www.pipernetworking.com/floodrisk/ . The standing advice also includes guidance on the requirements for site specific FRAs for both low and high risk developments. The web page provides Guidance Notes for 3 types of FRAs and advice on operational development less than 1 hectare in Flood Zone 1 as summarised below:

- Operational Development less than 1 hectare in Flood Zone 1.
- FRA Guidance Note 1: Development Greater than 1 hectare in Flood Zone 1.
- FRA Guidance Note 2: Minor Extensions.
- FRA Guidance Note 3: Development in Flood Zones 2 and 3.

The following sections provide additional specific guidance for assessing flood risk at the site specific level within Fareham Borough and indicate how the outputs from the SFRA can inform such assessments.

Tidal Flooding

As previously discussed, flooding from tidal sources is the primary source of flood risk within Fareham Borough and the areas at risk are predicted to increase significantly by 2115. Map Set 1A shows the existing areas at risk of tidal flooding and Map Set 1B shows the associated undefended flood hazard. The index of flood hazard represents a gradation of hazard within the Flood Zones based on a combination of the depth of flood water and the velocity of the water (indicative ranges for which have been assumed based on distance from the coastline).

The frontages where existing defences provide the minimum standards required for new development (i.e. 1 in 200 years for tidal flooding), are identified in Map Set 1C by a purple line. Indicative Areas Benefiting from Defences (ABDs) are also shown in Map Set 1C. The Indicative ABDs have been defined as areas where the crest levels of the existing defences are consistently equal to or higher than the present day 1 in 200 year extreme sea level.

If small lengths of defences have crest levels which fall below the 1 in 200 year extreme sea level (even for a short length), the area behind the defence has not been classed as an Indicative ABD. The frontage of Portchester is an example of where this study has not been able to define an Indicative ABD due to small lengths of defence where the crest levels fall below the 1 in 200 year extreme sea level. The gaps in the defence level can also be viewed in more detail using Map Set 3A. Further details of methodology and reasoning used to define the Indicative ABDs are described in Section 4.2.1.3 of the main report. It should be noted that other areas may potentially be classified as ABDs if more detailed modelling assessments of the defences, which is beyond the scope of this SFRA, are carried out.

Map Set 1D shows the flood hazard (in terms of danger to people) associated with a hypothetical breach in the defences for the whole of the tidal frontage. The Indicative ABDs shown in Map Set 1C define which of the hazard maps (1B or 1D) is most appropriate for consideration. Map Set 1D is only appropriate for considering present day flood hazards within an ABD. To aid the interpretation of Map Set 1D the areas where this index is not appropriate for present day analysis are hatched out. The benefit of showing hazard information in the hatched out areas is to allow planners and developers to understand the likely residual risks that would remain if they were to invest in defending an area to a 1 in 200 year standard. Map Set 1B (Undefended Flood Hazard) should be used to assess the variation of flood hazard within the Flood Zones for all areas outside the Indicative ABDs.

The benefit of both the undefended flood hazard maps (Map Set 1B) and the danger from breaching maps (Map Set 1D), is that the gradation of flood hazard within the Flood Zones can facilitate both planners and developers to ensure that development is steered away from the areas of highest hazard. The hazard mapping presented in Map Sets 1B and 1D, however, should only be applied when appropriate consideration has been taken of alternative sites at a lower probability of flood risk (i.e. within Flood Zone 1).

The flood hazard information, for both the undefended and breach scenario, developed as part of this SFRA, has been undertaken at a strategic level and is therefore at an appropriate level of detail to allow Local Authorities to strategically allocate sites for development. The hazard data has been classified into 4 categories to illustrate the gradation of flood hazard within Flood Zones 2 and 3 in line with best practice guidance as set out in Defra FD2320. The hazard data has not been calculated using modelling or other detailed numerical methods and is therefore not appropriate for identifying design parameters as part of site specific FRAs. It is therefore recommended that FRAs for sites located within the flood hazard zones should still include a quantitative assessment of flood hazard based on more detailed assessments of defence standards, defence failure scenarios and overland conveyance of flood flow.

The impact of climate change on increasing sea levels has a significant effect on the extents of Flood Zones 2 and 3 by 2115, especially in parts of Portchester. Although present day planning decisions are based on the Flood Zones for 2007, at the site specific level consideration should be given to increases in risk as a result of climate change. The climate change flood extents presented in Map Set 1E should be used when undertaking a site specific FRA to inform the assessment of the long term sustainability of developments currently within Flood Zone 1 and the likely increases in flood risk in Flood Zones 2 and 3.

The defence information provided in Map Set 3 can provide developers undertaking site specific FRAs with an indication of the equivalent tidal return period of the crest level of the existing defences in 2007 and an indicative level of investment that may be required to raise defence standards to the minimum required for new development. Such investment could be secured through the development process by Section 106 agreements.

Wave Overtopping

Map Set 1F-1, Wave Energy, shows how exposure to wave energy varies along the frontage of the study area. Such information can be used to assess, at a high level, the risk of flooding caused by extreme wave overtopping. Fareham's harbour frontages experience low wave energies but its open coast frontage experiences moderate wave energies. Based on information from other similarly exposed frontages in the PUSH sub-region, it is recommended that all applications for development within the vicinity of the open coast frontage of Fareham Borough include an assessment of extreme wave overtopping, regardless of which Flood Zone the site is in. This will ensure that this risk is always considered for new development in the relevant locations. The assessment of extreme wave overtopping should be appropriate to the scale of risk and may, in some cases, be ruled out as a significant risk quite easily, but should nevertheless be addressed.

Fluvial Flooding

Parts of Fareham Borough are at risk of fluvial flooding from the Rivers Wallington and Meon. Map Set 1A shows the fluvial Flood Zones, which show the Wallington Village and Titchfield to be the key areas at risk of fluvial flooding in the Borough.

In Fareham Borough there is more fluvial flood risk data available than in other parts of the PUSH sub-region. The two principal rivers in the Borough, the Meon and Wallington are two of the most significant in the sub-region, with a number of flood risk areas and historic records of flooding. Hydraulic modelling of the River Wallington has been finalised as part of the Environment Agency's ongoing Strategic Flood Risk Mapping programme. Therefore, it has been possible in this SFRA to designate Flood Zone 3b (defined by PPS25 as the 'functional floodplain') for the River Wallington by using a modelled 1 in 25 year flood outline. This is in accordance with the PPS25 Draft Practice Guide. The River Meon does not have a modelled flood outline to define Flood Zone 3b, but the Environment Agency have provided a detailed historic flood outline which they have recommended is used to define Flood Zone 3b for this SFRA. Where this information is not available (in Fareham Borough this represents only a small part of the River Hamble) fluvial Flood Zone 3 has been assumed to be functional floodplain, in line with the Draft Practice Guide's precautionary approach and should be tested

by site specific FRAs, where required.

Unlike the tidal Flood Zones, flood levels associated with the fluvial Flood Zones have not been identified as part of this SFRA. The variations in previous modelling approaches (some of which are awaiting EA approval) for the rivers within the PUSH sub-region, coupled with the spatial variation on flood levels along the river valleys, meant that it was not possible to provide a consistent approach to identifying fluvial flood levels without re-modelling a number of rivers. Such detailed assessments were outside the scope of this SFRA. Developers undertaking a FRA for a site within the fluvial Flood Zones should obtain the most up to date flood risk data from the Environment Agency. If no further information is available then a site specific FRA may need to include a numerical assessment to refine the understanding of fluvial flood risk, and agree the form of this assessment with the Environment Agency.

The impacts of climate change on fluvial flooding are likely to result in a 10% increase in flows up to 2025 and 20% from 2025 to 2115. Again due to current gaps in available data that are being addressed by the Environment Agency's ongoing flood mapping programme, there are no consistent estimates for Fareham Borough of the extreme fluvial flood extent taking climate change into account. Based on Environment Agency guidance, this SFRA has assumed that the present day Flood Zone 2 (medium probability) becomes Flood Zone 3 (high probability) by 2025. This is a conservative assumption which should be tested by site specific FRAs, where required. This also means that there is no data available to estimate Flood Zone 2 after the present day. Therefore, the fluvial climate change outline shown in Map Set 1E only shows a Flood Zone 3.

Undefended flood hazard information, shown in Map Set 1B, has also been developed for the fluvial Flood Zones 2 and 3. This information can provide developers with an indication of the varying degree of flood hazard within the Flood Zones which can facilitate the design and layout of development sites to avoid areas of high hazard. As with the tidal flood hazard data, it is recommended that FRAs for sites located within the flood hazard zones undertake a more detailed quantitative assessment of flood hazard based on an improved understanding of defences and flow routes.

Surface Water/Overland Flow Flooding

Map Set 1F-4 shows the variation in the potential source of overland flow across the PUSH sub-region. The areas shown in red and orange relate to areas of very high and high potential for generating overland flow. Notably, the urban areas are indicated as red or orange due to the high runoff potential from urban land uses. Within Fareham Borough there are a number of areas which have a high to very high potential for generating overland flow. FRAs for sites that are found to be within or in the vicinity of these areas, especially if the local topography places the site at a lower elevation than the surrounding land and hence downstream of the source, should consider the impacts and management of flooding due to overland flow.

In addition to the information provided in relation to the source of overland flow flooding, Map Set 1F-3 provides information to inform Local Authorities of the potential impacts of land use changes on the local surface water runoff regime. The areas showing diagonal hatching represent the urban areas, where a change in land use is unlikely to significantly affect the existing surface water runoff rates and volumes. This representation is a high level assessment across the PUSH sub-region and would therefore need to be confirmed when undertaking a site specific FRA. The areas outside of the hatching represent the effect that changes in land use are likely to have on the surface runoff rates and volumes from Greenfield sites. The data shows that new development located on the majority of the Greenfield Land in Fareham Borough is likely to have a low or moderate impact on the surface water runoff regime. There is, however, a large area to the north of Fareham where permeable geology indicates that development would have a high impact on surface water runoff regimes. Site specific FRAs should therefore carefully consider the impact of development on the local surface water runoff regime and should investigate SUDS options to manage surface water where achievable.

Groundwater Flooding

Within the PUSH region the key areas at risk of groundwater flooding are north of Fareham Borough in East Hampshire, Winchester, Eastleigh and Test Valley where highly permeable geology meets lower permeability geology as shown by Map Set 1F-2, which has been verified by inspection of the historical incident records. The River Meon due to its highly permeable upstream geology is very sensitive to groundwater conditions and there has been previous groundwater flooding observed around Titchfield. The Wallington also includes significant

permeable catchment area upstream of Fareham. Site specific FRAs within Fareham Borough should seek to ascertain whether a site has been previously affected by groundwater flooding if it lies adjacent to the River Meon or Wallington.

Flooding from Infrastructure

Historically, a number of parts of Fareham Borough have recorded incidents of flooding caused by problems relating to drainage infrastructure as shown by Map Set 1F-5. When undertaking a site specific FRA for a large development site, consultation with Southern Water should always be undertaken to investigate whether the proposed development will have an adverse impact on the local drainage system.

Furthermore, a parallel study being undertaken on behalf of PUSH, 'Hampshire Integrated Water Management Study', is investigating the issues relating to the future management of surface water within the region with respect to the anticipated increases in housing as indicated in the draft South East Plan. It is recommended that those undertaking a site specific FRA within the urban areas of Fareham Borough make reference to the findings of this study.

Sustainable Urban Drainage Systems (SUDS)

Conventional surface water drainage systems have traditionally used underground pipe networks to efficiently convey water away from sites. In the past this has led to problems of downstream flooding, reductions in groundwater recharge and waste pollution incidents associated with surface water overwhelming combined sewers. Both '*Making Space for Water*' and the '*Water Framework Directive*' have highlighted the need for an improved understanding and better management of how our urban environments are drained. The SUDS management train approach, as shown in Figure 2, is the principle that a range of SUDS which feed into each other can often offer benefits to the delivery of a successful surface water system/strategy.

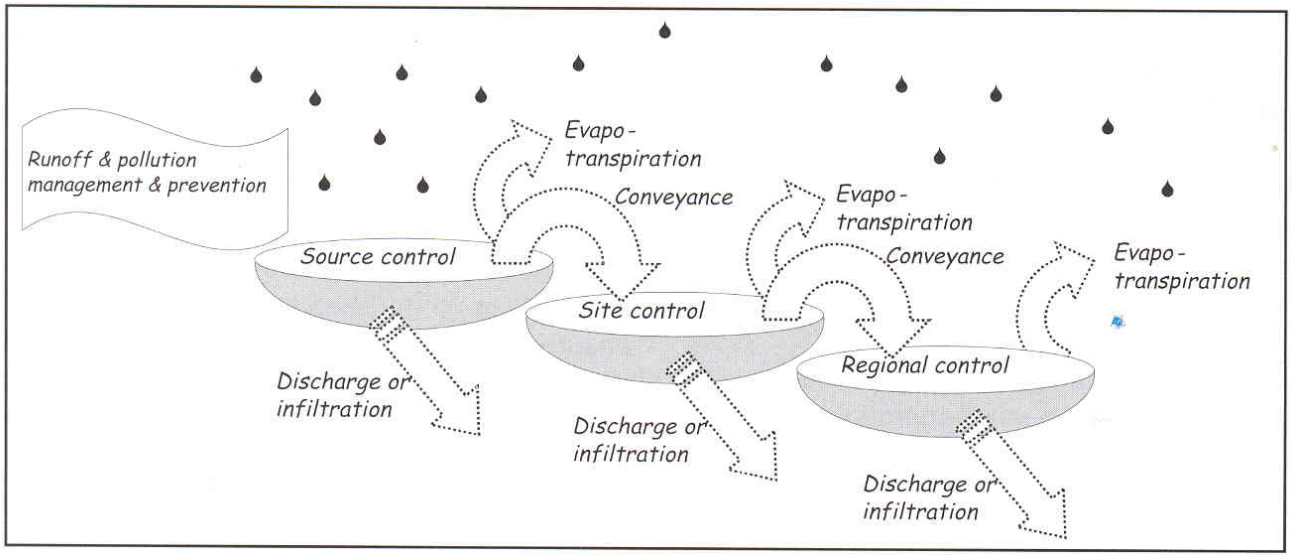

Figure 2: SUDS Management Train Approach

PPS25 states that Local Authorities should prepare and implement planning strategies that help to deliver sustainable development, by using opportunities offered by new development to reduce the causes and impacts of surface water flooding. By implementing polices to encourage developers to incorporate SUDS wherever possible, Local Authorities can help to mitigate the impacts that development has on surface water runoff rates and volumes. Appendix F of PPS25 states:

'the surface water drainage arrangements for any development site should be such that the volumes and peak flow rates of surface water leaving a developed site are no greater than the rates/volumes prior to the proposed development, unless specific off-site arrangements are made and result in the same net affect.'

Map set 1F-2 provides information relating to the spatial variation of permeability across Fareham Borough. This information can be used as a first estimate of the suitability of different types of SUDS within the Borough as shown in Table 3.

Permeability	Indicative Suitability of SUDS Techniques
High Permeability	Infiltration and Combined Systems
Moderate Permeability	Infiltration and Combined Systems
Low Permeability	Attenuation Systems

Table 3: Suitability of SUDS

It is important to note that the above assessment of the spatial suitability of SUDS is an indicative estimate and should be confirmed at the site specific level, using ground investigation data.

Infiltration Systems

Infiltration systems allow surface water to discharge directly into the ground. These systems are only appropriate 1) where ground conditions permit a suitable water acceptance potential and 2) in locations where groundwater recharge will not adversely affect drinking water aquifers as identified by the Environment Agency's source protection zones, available on their website http://www.environment-agency.gov.uk. Such systems may include:

- Permeable surfaces
  - Gravel
  - Permeable Paving
  - Block Paving with voids
  - Grassed areas
- Sub Surface Infiltration
  - Filter Drains
  - Geocellular Systems
  - Soakaways

Infiltration systems may not be appropriate in areas of potentially contaminated land. In such circumstances, other systems, such as contained attenuation systems, that avoid mobilisation of contaminants may be more appropriate.

Attenuation Systems

If ground conditions cannot support infiltration systems, surface water may need to be attenuated using measures to store surface water. Attenuation systems, if designed above ground, have the potential to take up large areas of development sites. Early consideration of such constraints is therefore essential. Attenuation systems may include:

- Landscaped
  - Detention Basins
  - Balancing Ponds
  - Retention Ponds
  - Wetlands
  - Lagoons
- Engineered
  - Underground Tanks
  - Ornate Water Features
  - Rainwater Harvesting
  - Green Roofs
  - Oversized Pipes

Combined Systems

SUDS designs for most sites can include a combination of infiltration and attenuation systems and they have been categorised above according to the dominant process. Other forms of SUDS which can provide more balanced benefits of infiltration and attenuation include:

- Swales
- Filter Strips

Fareham Strategic Development Area

Located to the north of the borough, the Fareham Strategic Development Area (SDA) spans a total area of 7km². The Wallington River flows in a southerly direction through the eastern part of the SDA area and the associated floodplain for this reach of river has been designated as functional floodplain by this SFRA. The floodplain covers a small area of the SDA and the land either side of the river rises steeply away from the floodplain. The Masterplan for the SDA will therefore need to ensure that development does not encroach into the floodplain.

The underlying geology of the SDA area is highly permeable, with a natural attenuation of surface water runoff. Development of this area could, if unmanaged have a significant impact on runoff rates from the site and subsequently increase flows into the River Wallington. Such impacts are not acceptable under PPS25 and so the Masterplan for this area will need to include options to mitigate increases in surface water runoff. Since the underlying geology of the SDA area is highly permeable, options for source control of surface water are likely to feasible and should be considered in the design of the drainage strategy.

Emergency Planning

As well as informing the development control process, the outputs of the SFRA can also be used by the Local Authority to inform their Emergency Planning Polices. Map Sets 1A, 1B, 1C, 1D and 1E are particularly useful when considering the feasibility and sustainability of key access routes within their administrative boundaries. The benefit of producing such outputs on a sub-regional scale mean that the Local Authority can also consider access to the Borough beyond their administrative boundary where key access routes (e.g. M27) cross a number of Local Authorities.

Additional Guidance

In addition to the guidance provided by the Environment Agency http://www.pipernetworking.com/floodrisk/, there are a number of other documents that provide detailed advice and guidance for undertaking site specific FRAs:

- Planning Policy Statement 25: Development and Flood Risk, (2006), Communities and Local Government.
- Development and Flood Risk: A Practice Guide Companion to PPS25 - 'Living Draft', (2007), Communities and Local Government
- Development and Flood Risk: Guidance for the Construction Industry, (2004), CIRIA (Based on PPG25)
- Flood Risk Assessment Guidance for New Development: FD2320/TR2, (2005), Defra (Based on PPG25)
- Sustainable Urban Drainage Systems: Best Practice Manual, (2001), CIRIA

Annex 1 – Data Sources for Fareham Borough Council

Further to the general technical details provided in the main SFRA Stage 2 report, this annex includes data issues specific to Fareham Borough Council

Defence Data

A small amount of defence asset information was available for Fareham Borough Council. Portchester Castle to Emsworth Coastal Defence Strategy Study (2006) provided information for the eastern boundary of Fareham and was supplemented by asset data held in the Environment Agency National Flood Coastal Defence

Database (last updated in 2004) for the left bank of the River Hamble.

Information for the standard of protection of the remainder of the Fareham authority was provided using local land levels and identifying spot level heights using the PUSH topographic grid. This methodology was used previously in the Portchester Castle to Hoeford Lake Shoreline Defence Strategy (2005).

Topographic Data

92% of the topographic grid in Fareham Borough is composed of LiDAR data. Areas where LiDAR was not available are a thin strip from the northern slope of Portsdown Hill stretching across to Fareham, an area to the north west of HMS Collingwood and a strip along the border with Gosport Borough. Photogrammetry data was used to fill the thin strip around Fareham, while NextMap data was used in the other two areas.

Fluvial Flood Zone 3b

In Fareham Borough, fluvial Flood Zone 3b was represented using a modelled 1 in 25 year flood outline on the River Wallington and observed historic flood extent on the River Meon. It should be noted that the observed historic outline on the River Meon extends downstream into the area that is represented as at tidal flood risk by the undefended Flood Zones, but is actually protected from tidal inundation by a defence.

Along a tiny part of the River Hamble in Fareham (where the Environment Agency Flood Zones denote flooding to be fluvial) Flood Zone 3 was used to represent Flood Zone 3b in the absence of data to prove otherwise. This approach in Fareham Borough is in accordance with PPS25 practice guide section 3.17 and was recommended by the Environment Agency.

Fluvial Climate Change Outlines

In Fareham Borough, the fluvial outlines after the present day were represented by assuming that Flood Zone 3 will expand to fill the current area of Flood Zone 2. This means there is no estimate of fluvial Flood Zone 2 after the present day for the Borough. This approach was recommended by the Environment Agency.