Crawley Borough Council

Level 1 Strategic Flood Risk Assessment (SFRA)

August 2014

- Areas of 'low' probability of flooding are assessed as having a less than 0.1% (1 in 1000) chance of flooding in any year, and are referred to as Zone 1 Low Probability.

Within flood affected areas, to recommend appropriate land uses (in accordance with the NPPF *Sequential Test*) that will not unduly place people or property at risk of flooding

Where development is found to be necessary in areas of flood risk, having had regard to the sequential test, the SFRA recommends flood mitigation solutions that

the development provides wider sustainability benefits to the community that outweigh flood risk, informed by a Strategic Flood Risk Assessment where one has been prepared; and

a site-specific flood risk assessment must demonstrate that the development will be safe for its lifetime taking account of the vulnerability of its users, without increasing flood risk elsewhere, and, where possible, will reduce flood risk overall.

Both elements of the test will have to be passed for development to be allocated or permitted.

Outcomes of the Crawley Borough SFRA

xii. Crawley has been delineated into zones of low, medium and high probability of flooding from fluvial (watercourse) sources, based upon information in the Environment Agency Flood Map for Planning, which can be viewed at: http://maps.environment-agency.gov.uk/wiyby/wiybyController?x=357683.0&y=355134.0&scale=1&layerGroups=default&ep=map&textonly=off&lang=_e&topic=floodmap. The spatial variation in flood risk across the Borough has been delineated in the following manner:

Zone 3b Functional Floodplain

xiii. Flood Zone 3 represents areas that are identified as being at greatest risk of flooding. *Planning Practice Guidance: Flood Risk and Coastal Change* sub-divides this area into Zone 3a (High Probability) and 3b (Functional Floodplain). Strategic Flood Risk Assessment are required to identify areas covered by Zone 3b (an annual probability of 1 in 20, or 5%), within which only water compatible uses and essential infrastructure will be permitted.

xiv. As agreed with the Environment Agency, this SFRA takes a precautionary approach to identifying the Functional Floodplain. Therefore, within Flood Zone 3, all undeveloped areas and areas of open space will be treated as representing areas of Flood Zone 3b (Functional Floodplain).

Zone 3a High Probability

xv. Developed or brownfield areas falling within Flood Zone 3 will be treated as Flood Zone 3a (High Probability) for the purposes of this SFRA. Land within Zone 3a has a 1% (1in 100) or greater chance of flooding in any year. As such, residential and other vulnerable development should be avoided in these areas wherever possible. It is however recognised that there may be strong planning arguments as to why housing or other vulnerable development may be required in these areas.

xvi. To meet the requirements of the Exception Test therefore, it will be necessary for the developer, or as appropriate the Council, to demonstrate that the development provides

Zone 2 Medium Probability

xviii. Areas that have a between 1% and 0.1% (1 in

and the Environment Agency;
Detailed flood risk mapping;
Environment Agency Flood Map for Land Use Planning;
Topography (LiDAR).

14. This forms the core dataset that has informed the SFRA process. The application of this data in the delineation of zones of 'high', 'medium' and 'low' probability of flooding and the formulation of planning and development control recommendations is explained in Section 5. An overview of the core datasets, including their source and their applicability to the SFRA process, is outlined below.

2.2 Environment Agency Flood Map for Planning

15. The Environment Agency Flood Map for Planning shows the natural floodplain (undefended position), and therefore areas potentially at risk of flooding from rivers or the sea. It identifies land that is susceptible to a 1% annual exceedance probability (AEP) (1 in 100 chance) of flooding from rivers in any one year. It also indicates the area that has a 0.1% AEP (1 in 1000 chance) of flooding from rivers and/or the sea in any given year; this is also known as the Extreme Flood Outline.

16. The Flood Map for Planning outlines have been produced from a combination of a national generalised computer model, more detailed local modelling (where available) and records of historic flood event outlines, to provide a consistent picture of flood risk for England and Wales. The Environment Agency's knowledge of the floodplain is

localised fluvial flooding regime in line with Section 105 (2) of the Water Resources Act.

21. The detailed hydraulic models developed on behalf of the Environment Agency assume 'typical' conditions within the respective river systems that are being analysed. The predicted water levels may change if the operating regimes of the rivers involved are altered (e.g. engineering works which may be implemented in the future), culverts are permitted to block, or the condition of the river channel is allowed to deteriorate.

22. The Flood Map for Planning incorporating the available modelling represents the best available data, and therefore forms the basis for identifying flood risk through the SFRA. Where flood risk is identified, the Environment Agency advise that developers look at site specific modelling in Flood Risk Assessments to inform development proposals and any potential works.

2.5 Flood Defences

23. Flood defences are typically raised structures that alter natural flow patterns and prevent floodwater from entering property in times of flooding. They are generally categorised as either 'formal' or 'informal' defences. A 'formal' flood defence is a structure built specifically for the purpose of flood defence, and is maintained by its respective owner, which could be the Environment Agency, Local Authority, or an individual. An 'informal' flood defence is a structure that has not been specifically built to retain floodwater, and is not maintained for this specific purpose, but may afford some protection against flooding. These can include boundary walls, industrial buildings, railway embankments and road embankments situated immediately adjacent to rivers.

24. The Environment Agency has identified a small number of defence structures within the Borough of Crawley. These are situated at Titmus Lake (Tilgate Park), Water Lea (Furnace Green), Grattons Park (Three Bridges) and the River Mole diversion (Gatwick Airport). Most represent constructed embankments that encircle localised flood storage facilities, and none are considered to pose a potential risk to life.

25. The Environment Agency Risk of Flooding from Rivers and Sea map takes account of the impact of defences on flood risk. These establish a more realistic picture of flood risk, and do not set out the worst-case flooding scenario. However, the Environment Agency is clear that it is the Flood Map for Planning (i.e. the undefended position) that should be used alongside the SFRA to make land use planning decisions.

Zone 3b Functional Floodplain

3.3 Assessment of Risk to People (Flood Hazard)

40. The assessment of flood risk has thus far considered the maximum extent to which flooding will occur during a particular flood event. This provides the basis for assessing broadly the areas potentially impacted by flooding. Of equal importance however is the speed with which flooding occurs as river levels rise. The inundation of floodwaters into low lying areas can pose a considerable risk to people.

41. Substantial research has been carried out internationally into the risk posed to pedestrians during flash flooding. This has concluded that the likelihood of a person being knocked over by floodwaters is related directly to the depth of flow, and the speed with which the water is flowing. This is referred to as 'Flood Hazard'.

42. For example, if a flood flow is relatively deep but is low energy (i.e. slow moving), then an average adult will be able to remain standing. Similarly, if the flow of water is moving rapidly but is very shallow, then once again an ave

4.3 Environment Agency Role and Responsibilities

4.3.1 Overview

70. The Environment Agency takes a strategic approach to flood risk management, with the assessment and management of flood risk carried out on a 'whole of catchment' basis. This enables the Environment Agency to review the impact that proposed defence works at a particular location may have upon flooding at other locations throughout the catchment. A number of flood risk management strategies are underway within the region, encompassing the large river system that includes the Upper Mole catchment and flood risk within Crawley Borough. A brief overview of these investigations is provided below.

4.3.2 Catchment Flood Management Plan (CFMP)

71. Catchment Flood Management Plans provide an overview of flood risk within a specific river catchment area, and set out the Environment Agency's preferred plan for sustainable flood risk management in the catchment over the next 50 to 100 years.

72. To help understand the nature of flood risks across the area, the River Thames CFMP divides the region into broad river catchment areas, and applies 1 of 6 policy approaches to each. The Thames CFMP identifies the Upper Mole area (referred to as Sub-Area 5 in the CFMP) as an area "of low to moderate flood risk where we [*the Environment Agency*] will take action with others to store water or manage run-off in locations that provide overall flood risk reduction or environmental benefits."

73. Subsequently, the Thames CFMP identifies a recommended strategy to address flood risk within the sub-area. Key actions include the safeguarding of open space, the identification of opportunities for flood storage, maintenance and improvement of river flows in urban areas, improvement of existing drainage systems, increasing resistance and resilience of buildings through redevelopment, and the development of emergency response planning.

74. Four over arching key messages have been highlighted by the CFMP:

> Flood defences cannot be built to protect everything;
> Climate change will be the major cause of increased flood risk in the future;
> The floodplain is our biggest asset in managing flood risk;
> The ongoing cycle of development and urban regeneration is a crucial opportunity to manage flood risk.

75. The CFMP includes a specific section for each of the sub-areas. Sub-area 5 (which includes the Upper Mole) is characterised as "urbanised places with some flood defences" where "the river corridors have not been over-developed and there is not an over-dependence upon flood defence structures that are difficult and expensive to maintain". The CFMP proposes the following actions to implement the policy:

> Maintain the existing flow of rivers in urban areas that reduce the risk of flooding from the smaller, more frequent floods and identify viable opportunities to make the existing drainage systems more effective (for example, where there are significant restrictions to flow from undersized pipes, culverts or bridges).
>
> Make sure the recommendations in Strategic Flood Risk Assessments and Local Development Framework policies create the potential to reduce flood risk through adaptation of places at risk, managing run-off and retaining open spaces in the floodplain.
>
> Identify locations where the attenuation of water could have local social and

economic benefits (by reducing flood risk) and environmental benefits (by increasing the frequency of flooding) and encourage compatible land uses. (Crawley in the Upper Mole is cited as a specific example.).

Develop emergency response planning to deal with extreme events, including raising public awareness and working with key partners to identify critical infrastructure at risk.

76. These objectives succinctly reinforce the over-arching requirements of the NPPF, i.e. it is important that Local Authorities seek to restrict development within flood affected areas, protecting and enhancing the natural floodplain wherever possible.

4.3.3 Upper Mole Flood Alleviation Scheme

77. In response to recent flood events, the Environment Agency has been working to bring forward the Upper Mole Flood Alleviation Scheme, comprising a number of flood detention reservoirs to temporarily store (detain) flood water upstream. The objective of the scheme is to reduce the risk of flooding to properties situated within the Upper Mole catchment, in particular reducing the risk of flooding to homes and businesses within Maidenbower, Three Bridges and Horley. The alleviation scheme will also result in a reduction in the risk of flooding to Gatwick Airport. When complete, the Upper Mole Flood Alleviation Scheme will reduce flood risk to over 1,000 homes in Crawley and Horley.

78. The scheme itself comprises work at a number of areas within and adjacent to Crawley, including the addition of flood detention reservoirs at Ifield and Worth Farm, alongside a wider programme of works at Tilgate Lake, Clays Lake, and Grattons Park. Work at Tilgate Lake is now complete, raising the height of the dam at Tilgate Park by approximately 2.5 metres to increase storage capacity during times of flood. Works to construct a temporary flood storage reservoir at Worth Farm are now also complete, with works at Grattons Park Stream nearing completion. Completion of these schemes will allow communities downstream to benefit from the reduction in flood risk offered. Construction of the scheme at Clays Lake is planned to commence in September 2014, with a completion date of September 2016.

79. The Environment Agency is continuing to investigate the feasibility of a flood attenuation scheme within the Ifield area, and is working with local stakeholders and undertaking further works to understand the full benefits a scheme in this area could offer. In addition, the Environment Agency is continuing to explore opportunities to secure external funding for flood alleviation works for the Ifield area.

4.4 Managing Flood Risk through the Planning System

4.4.1 Sequential and Exception Tests

80. Both the NPPF and PPG: *Flood Risk and Coastal Change* require that a sequential, risk based approach is applied to managing flood risk. This approach is designed to ensure that areas which are at the lowest risk of flooding are developed in preference to those areas of higher risk. To ensure that development is, so far as possible, steered away

emerging local plan and future windfall sites.

90. Specific planning and development management re

4.4.5 Future Development within Zone 1 Low Probability

97. Planning Recommendations – Allocation of Land for Future Development

There are generally no flood risk related constraints placed upon future development within Zone 1 Low Probability (in accordance with the NPPF), however it is important to recognise that future development within this zone may adversely impact upon the existing flooding regime if not carefully managed. Flooding related issues of a localised nature may also occur within Zone 1 Low Probability. For this reason, all development should be carried out in accordance with the development management recommendation

Table 1. SHLAA Sites: Overview of Flood Risk from Fluvial, Surface Water and Groundwater Sources (Adapted from West Sussex County Council Data, 2014)

Red = large parts/all of site at risk
Orange = parts of site at risk
Yellow = minor areas of risk on site

FLOOD RISK LEVEL

focus on surface water runoff.

110. As Douster Brook splits the site, the Main River comments and Byelaw Margin would apply, and the Environment Agency would wish to see development kept as far back from the watercourse as possible. Should proposals to develop the site include crossing of the Brook for access, this presents concern about potential culverting and bridge soffit levels that would need to be addressed at the planning stage. The Environment Agency would wish to comment on any such proposals, which could require Flood Defence Consent (FDC) for any structure.

Land Adjacent to Desmond Anderson School, Tilgate

111. The Desmond Anderson School site, which is provisionally identified for residential development, is partly situated within flood zones 2 and 3. The Environment Agency has

emergency services. It is essential that a robust plan is in place that clearly sets out (as a minimum):

- roles and responsibilities;
- paths of communication;
- evacuation routes;
- community centres to house evacuated residents;
- contingency plans in case of loss of power and/or communication.

149. 'Dry' access (i.e. above flood level) should be sought wherever possible to ensure that all residents can be safely evacuated in times of flood. As part of their long term strategy for road maintenance and improvement, the Council progressively should seek to raise critical evacuation routes above the greater of the 1% AEP + 20% flow (i.e. climate change) flood level. As an absolute minimum, 'safe' access must be assured during the 1% AEP fluvial flood level, defined with due consideration to the Defra/Environment Agency research project FD2320. It is highlighted that road raising must not have a detrimental impact upon flow routes and/or the effectiveness of floodplain storage.

150. Coordination with the emergency services and the Environment Agency is imperative to ensure the safety of residents in time of flood. Areas within the Borough that are at risk of river flooding are typically susceptible to relatively long duration rainfall events and considerable forewarning will generally be provided to encourage preparation in an effort to minimise property damage and risk to life

151. In contrast, areas suffering from localised flooding issues will tend to be at greater risk. These areas are susceptible to 'flash' flooding, associated with storm cells that pass over the district resulting in high intensity, often relatively localised, rainfall. It is anticipated that events of this nature will occur more often as a result of possible climate change over the coming decades. Events of this nature are difficult to predict accurately, and the rapid runoff that follows will often result in flooding that cannot be sensibly forewarned.

152. All areas are potentially at some degree risk of localised flooding due to heavy rainfall. The blockage of gullies and culverts as a result of litter and/or leaves is commonplace and this will inevitably lead to localised problems that can only realistically be addressed by reactive maintenance.

153. It is recommended that the Council's Emergency Response Plan is reviewed in light of the findings and recommendations of the SFRA to ensure that safe access can be provided during a major flooding event.