# Warrington Borough Council

# Warrington Strategic Flood Risk Assessment

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**FINAL**


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## CONTRACT

This final report describes work commissioned by Warrington Borough Council of 19/01/2007. The client's representative for the contract was Kate Bentley. Jonathan Cooper, Howard Keeble, Katharine Miles and Christopher Isherwood of JBA Consulting carried out the work.

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## PURPOSE

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# ABBREVIATIONS

| | |
|---|---|
| AONB | Area of Outstanding Natural Beauty |
| CFMP | Catchment Flood Management Plan |
| DC | District Council |
| COW | Critical Ordinary Watercourse |
| DPD | Development Planning Document |
| EA | Environment Agency |
| EI | Essential Infrastructure |
| EU | European Union |
| FEH | Flood Estimation Handbook |
| FRA | Flood Risk Assessment |
| FZ | Flood Zone |
| HV | Highly Vulnerable |
| IDB | Internal Drainage Board |
| IDD | Internal Drainage District |
| LDF | Local Development Framework |
| LDS | Local Development Scheme |
| LiDAR | Light Detection and Ranging |
| LPA | Local Planning Authority |
| LV | Less Vulnerable |
| MoD | Ministry of Defence |
| MV | More Vulnerable |
| NFCDD | National Fluvial and Coastal Defence Database |
| ODPM | Office of the Deputy Prime Minister |
| OS | Ordnance Survey |
| PPG | Planning Policy Guidance |
| PPS | Planning Policy Statement |
| RFRA | Regional Flood Risk Assessment |
| RPB | Regional Planning Body |
| RPG | Regional Planning Guidance |
| RSS | Regional Spatial Strategy |
| SA | Sustainability Appraisal |
| SEA | Strategic Environmental Assessment |
| SFRA | Strategic Flood Risk Assessment |
| SFRT | Sequential Flood Risk Test |
| SMP | Shoreline Management Plan |
| SPZ | Source Protection Zone |
| SuDs | Sustainable Drainage Systems |
| SUDS | Sustainable Urban Drainage Systems |
| UDP | Unitary Development Plan |
| W | Water-compatible |

# GLOSSARY

| | | |
|---|---|---|
| Actual Risk | | The risk posed to development situated within a defended area (i.e. behind defences), expressed in terms of the probability that the defence will be overtopped, and/or the probability that the defence will suffer a structural failure, and the consequence should a failure occur |
| Catchment Flood Management Plan | CFMP | A strategic planning tool through which the Environment Agency (EA) will seek to work with other key decision-makers within a river catchment to identify and agree policies for sustainable flood risk management |
| Compensatory Storage | | A floodplain (flood storage) area introduced to compensate for the loss of storage as a result of filling for development purposes |
| Critical Ordinary Watercourse | COW | A watercourse that is known to have caused flooding or is perceived to pose a flood risk. DEFRA defines a COW as a watercourse that is not classified as "main river" but which the EA and other operating authorities agree is critical because it has the potential to put at risk flooding large numbers of people and property. Note: |
| Combined Sewer Overflow | CSO | A structure that permits the controlled release of water from the combined underground foul and surface water drainage system when the pipe capacity is exceeded |
| Controlled (Regulated) Washland | | A flood storage area that is filled and drained in a controlled manner during a flood event |
| Defended Area | | An area offered a degree of protection against flooding through the presence of a flood defence |
| DG5 register | DG5 | Register held by water companies on the location of properties at risk of sewage related flooding problems |
| Extreme Flood Outline | EFO | Flood 'zone' maps released by the EA in June 2004 depict anticipated 0.1% (1 in 1000 year) flood extents in a consistent manner throughout the UK |
| Flood Risk Management | | The introduction of mitigation measures (or options) to reduce the risk posed to property and life as a result of flooding. It is not just the application of physical flood defence measures |
| Formal Defence | | A flood defence asset that is maintained by the EA |
| Flood Estimation Handbook | FEH | Provides current methodologies for estimation of flood flows for the UK |
| Floodplain | | Any area of land over which water flows or is stored during a flood event or would flow but for the presence of defences |
| Flood Risk Assessment | FRA | A detailed site-based investigation that is undertaken by the developer at planning application stage |
| Flood Risk Vulnerability Classification | | Refer to Appendix B for definitions |
| Fluvial Flooding | | Flooding caused by the overtopping of river or stream banks |

| | | |
|---|---|---|
| Freeboard | | A 'safety margin' to account for residual uncertainties in water level prediction and/or structural performance, expressed in mm |
| Indicative Floodplain Map | IFM | A depiction of the estimated 1% (1 in 100 year) flood extent, derived as a compilation of historical flooding, empirical estimates (IH130) and/or detailed flood modelling assuming "no flood defences" |
| Informal Defence | | A structure that provides a flood defence function, however is not owned nor maintained by the EA |
| IH130 | | The methodology adopted in the initial empirical estimation of the 1% (1 in 100 year) flood extent, informing the earliest version Indicative Floodplain Map |
| Main River | | A watercourse designated by DEFRA, that is managed and maintained by the EA using their permissive powers |
| Measure | | A deliverable solution that will assist in the effective management (reduction) of risk to property and life as a result of flooding, e.g. flood storage, raised defence, effective development control and preparedness, and flood warning |
| Mitigation | | The management (reduction) of flood risk |
| Option | | Refer 'measure' |
| PAG2 | | Project Appraisal Guidance (PAG) 2 (Strategic Planning) outlines the DEFRA requirements against which the EA must demonstrate that they are managing flood risk in a strategic (catchment wide) manner |
| Probability | 1% | A measure of the chance that an event will occur. The probability of an event is typically defined as the relative frequency of occurrence of that event, out of all possible events. Probability can be expressed as a fraction, % or a decimal. For example, the probability of obtaining a six with a shake of a fair dice is 1/6, 16% or 0.166. Probability is often expressed with reference to a time period, for example, annual exceedance probability |
| Rapid Inundation Zone | | An area immediately behind defences which, should they fail, will generate a combination of high velocities and flood depths that would cause a risk to life. |
| Residual Risk | | The risk that inherently remains after implementation of a mitigation measure (option) |
| Return Period | | The expected (mean) time (usually in years) between the exceedance of a particular extreme threshold. Return period is traditionally used to express the frequency of occurrence of an event, although it is often misunderstood as being a probability of occurrence. |
| Risk | | The threat to property and life as a result of flooding, expressed as a function of probability (that an event will occur) and consequence (as a result of the event occurring) |
| Section 105 Maps | S105 | The programme through which the EA have (to date) reviewed the 1% (1 in 100 year) flooding extents through detailed flood modelling throughout the UK as part of their duties under Section105 of the Water Resources Act 1991 |

| | | |
|---|---|---|
| Scheme | | An engineering solution that will assist in the management (reduction) of risk to property and life as a result of flooding |
| Sequential Flood Risk Test | SFRT | The assessment and 'categorisation' of flood risk on a catchment-wide basis in accordance with PPG25 Table 1 and Paragraph 30 |
| Shoreline Management Plan | SMP | Non Statutory plan to provide sustainable coastal defence policies. They are prepared by Coastal Defence Groups |
| Standard of Protection | SoP | The return period to which properties are protected against flooding |
| Strategic Flood Risk Assessment | SFRA | The assessment of flood risk on a catchment-wide basis for proposed development in a District |
| Strategic Flood Risk Management | SFRM | Considers the management of flood risk on a catchment-wide basis, the primary objective being to ensure that the recommended flood risk management 'measures' are sustainable and cost effective |
| Sustainable Urban Drainage System | SuDS | Current 'best practice' for new urban development that seeks to minimise the impact upon the localised drainage regime, e.g. through the use of pervious areas within a development to reduce the quantity of runoff from the site |
| Tidal Flooding | | Flooding caused as a result of tidal activity |
| Uncertainty | | A reflection of the (lack of) accuracy or confidence that is considered attributable to a predicted water level or flood extent |
| Uncontrolled Washland | | A flood storage area that fills and drains 'naturally' (i.e. without manual interference) during a flooding event |
| Washland | | A flood storage area that is bounded by raised embankments to contain floodwaters |

# 1 INTRODUCTION

## 1.1 Overview

In January 2007 JBA Consulting was commissioned by Warrington Borough Council to undertake the Warrington Strategic Flood Risk Assessment (SFRA).

This SFRA is prepared in accordance with Planning Policy Statement 25 *Development and Flood Risk* (PPS25)[1].

The SFRA is a planning tool that enables the council to assess and implement sustainable development away from vulnerable flood risk areas. This assessment focuses on potential areas for development within the borough. It also sets out the procedures to be followed when assessing the suitability of sites for development in the future and for determining the acceptability of potential sites for development in terms of flood risk. The SFRA will assist the council to make the spatial planning decisions required to inform their Local Development Framework (LDF) and will inform Development Control decisions.

## 1.2 Study Objectives

Current policy requires local authorities to demonstrate that due regard has been given to the issue of flood risk as part of the planning process. It also requires that flood risk is managed in an effective and sustainable manner. To this end, the key objectives of the Warrington SFRA are:

- To investigate and identify the extent and severity of flood risk to the area. This assessment will enable the council to steer development away from those areas that are at highest risk, ensuring that areas proposed for development can be developed in a safe, cost effective and sustainable manner.
- To supplement current policy guidelines and to provide a straightforward risk based approach to development control in the local area. This is aimed at both councils and developers.
- To contribute to the council's Strategic Environmental Assessment (SEA) and LDF. The SEA will be used to inform the council's Sustainability Appraisal (SA), which will aid the selection of suitable future land allocations for development.
- The SFRA is a reference document to which all parties involved in planning and flood risk can reliably turn to for initial advice.

The recommendations of the report will inform the development and appraisal of options for a review of planning policies, which will be the basis of consultation, assessment and examination before being adopted in the Council's Local Development Framework.

The conclusions and recommendations will also be used to inform Development Control advice and decisions and will be available to developers and their agents for use in site specific Flood Risk Assessment and to the public for information.

The Executive Member for Environment Services has endorsed the publication of the report as a background document to be used as part of the evidence base for the production of the LDF and in the assessment of planning applications.

## 1.3 Study Area

Warrington Borough Council does not currently have any development plan allocations. The sites included in this study have been identified by the council as areas of potential development only.

[1] Communities and Local Government. 2006 *Planning Policy Statement 25: Development and Flood Risk.* December 2006. http://www.communities.gov.uk/pub/955/PlanningPolicyStatement25DevelopmentandFloodRisk_id1504955.pdf

The general suitability of these sites for development, in terms of flood risk, has been assessed at a strategic level for this SFRA. As these sites are not currently required for development by the council Sequential Testing required prioritising sites, and Exceptions Testing, has not been undertaken.

If sites are brought forward for development the onus will fall on the individual developer to justify the need for development in their planning application and demonstrate that their proposal is safe in terms of flood risk.

# 2 STRATEGIC FLOOD RISK ASSESSMENTS – AN INTRODUCTION

## 2.1 Summary: A step by step approach

The SFRA is a planning tool that can be used to inform the spatial planning and development management process. This Section of the SFRA summarises how the suitability of potential development sites can be determined, in terms of flood risk, by Sequential and Exceptions Testing.

### 2.1.1 Windfall Sites

Warrington Council has no allocated sites for development in its Unitary Development Plan. Proposed development will not, therefore, be derived from allocation in a Local Development Document (LDD) that has been sequentially tested. However, the SFRA does provide information and framework for a sequential approach to flood risk and development planning,

Windfall sites are subject to Sequential Testing and, when necessary, Exception Testing at the planning application stage. Reasoned justification, by developers, will be required by the council to demonstrate how development proposals are compliant with the requirements of the Sequential and Exception Tests. Developers may use the information provided in this SFRA, as well as further assessment or available information, as part of the justification process.

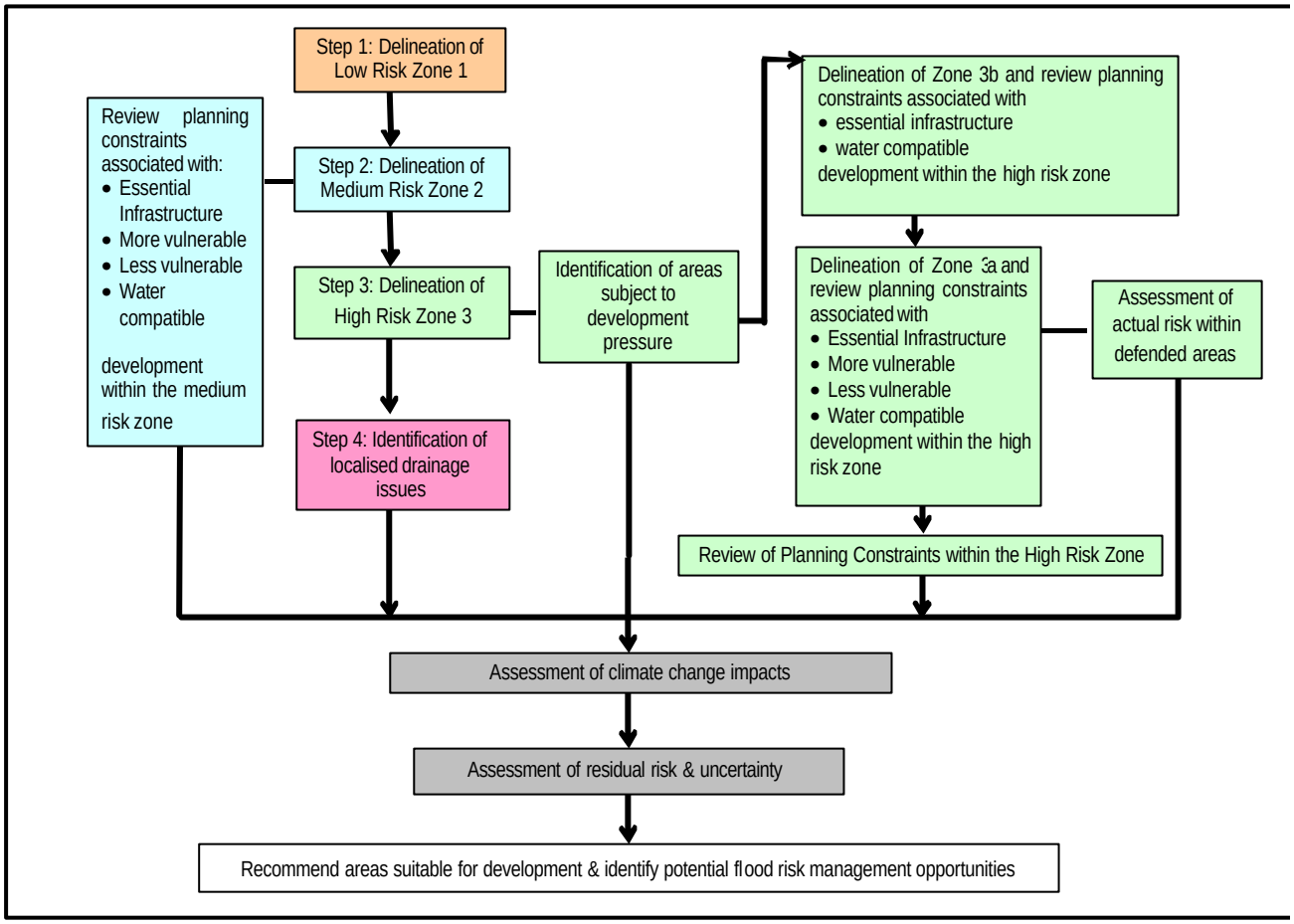
### 2.1.2 The Sequential Flood Risk Assessment

When allocating, proposing or approving land for development in flood risk areas, councils and developers are expected to demonstrate that there are no suitable alternative development sites located in lower flood risk areas. A Sequential Flood Risk Test is used to prioritise sites in order of probability to flooding and their acceptability in terms of development.

If allocations are required at a future date the council will be required to prioritise land for development in ascending order from Flood Risk Zones 1 to 3. Where development is located within medium flood risk zone (Zone 2) or high flood risk zone (Zone 3) the Environment Agency (EA) will require the council to demonstrate that there are no reasonable alternatives for development in lower flood risk zones. Those proposing development on windfall sites will need to provide the council with justification for Sequential Testing.

The information provided in the SFRA allows the Local Planning Authority (LPA) and Developers to carryout a Sequential Test.

## Sequential Flood Risk Assessment



### 2.1.3 The Exception Test

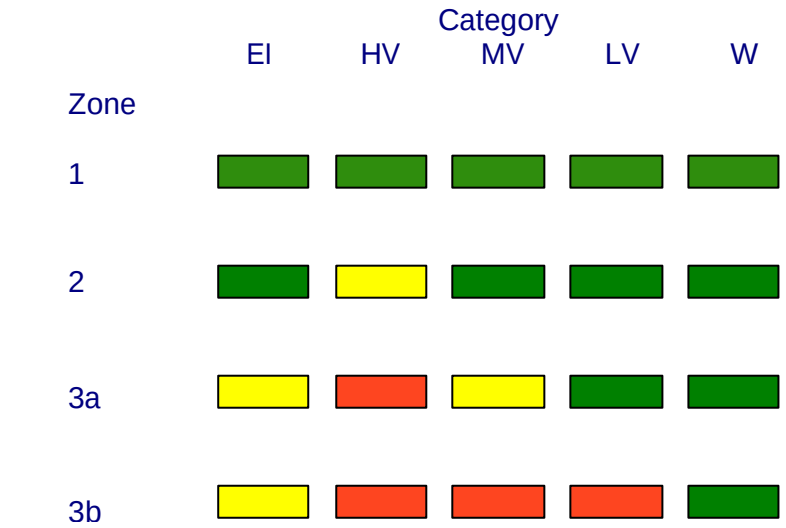
Where departures from the Sequential Flood Risk Test are justified by the need to locate development in medium or higher risk zones, or in order to meet the wider aims of sustainable development, it is necessary to apply the Exception Test.

Only on completion of the Sequential Test should the Exception Test be used to justify either allocations or planning submissions for developments in high risk areas. Whilst the SFRA has been undertaken in conjunction with the EA, it is likely they will object to some of the identified sites, and may maintain objections to them on site specific flood risk grounds unless sufficient information can be provided to show the risks can be safely mitigated in the design. This is a matter of detail that cannot be addressed in a strategic assessment.

PPS25 explains where and for what type of development the Exception Test needs to be applied. In some situations, for certain types of development, it is not appropriate to use the Exception Test to justify development. For example, highly vulnerable development cannot be justified within the high risk zone through the use of the Exception Test. The situations where it is necessary and appropriate to apply the Exception Test are outlined below.

**Application of the Exception Test**

## Where the Exception Test applies




**EI= Essential Infrastructure, HV= High Vulnerability, MV= More Vulnerability, LV= Low Vulnerability, W= Water Related**

Denotes where Exception test applies
Note: Including FRA

Denotes that development would not be permitted in this zone

Denotes that development would be permitted, and FRA would be required in Zones 2 & 3 and may be required in Zone 1 sites.

Where new development is exceptionally necessary within areas at risk of flooding, policy aims to make it safe without increasing flood risk elsewhere and where possible reducing overall flood risk. This is in accordance with paragraph 19 of PPS25, which states:

"*The Exception Test is only appropriate for use when there are large areas in Flood Zones 2 and 3, where the Sequential Test alone cannot deliver acceptable sites, but where some continuing development is necessary for wider sustainable development reasons, taking into account the need to avoid social or economical blight and the need for essential civil infrastructure to remain operational during floods…*"[2]

Where the Exception Test is required it should be applied, as appropriate, to proposed LDD allocations for development at the earliest stage of preparation and to planning applications. All three elements of the Exception Test have to be passed before development is allowed. The three elements of the Exception Test are:

a) It must be demonstrated that the development provides wider sustainability benefits to the community which outweigh flood risk,

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) An FRA must demonstrate that the development will be safe, without increasing flood risk elsewhere, and, where possible, will reduce flood risk overall.

### 2.1.4 Sites within Zone 1

From a flood risk perspective all land uses are acceptable within Flood Zone 1. Flood risk is not considered to be a significant constraint to development and all land uses listed below are appropriate in this zone

- Essential infrastructure
- Highly vulnerable
- More vulnerable
- Less vulnerable
- Water compatible development

A Flood Risk Assessment will not usually be required for development in this zone unless there are, for example, historical records of localised flooding or site specific considerations that necessitate further investigation.

However, due to their potential impact on the local flood risk, a Flood Risk Assessment will be required for all developments greater than **1ha** in size. This will include further consideration of surface water drainage and onsite mitigation measures that may be required, particularly where the capacity of the surface water sewer or receiving watercourse is limited. A Flood Risk Assessment will be undertaken by the potential developer of the site. The Environment Agency will be able to advise potential developers as to their specific requirements on a site by site basis.

[2] Communities and Local Government. 2006 *Planning Policy Statement 25: Development and Flood Risk.* December 2006. pg7. http://www.communities.gov.uk/pub/955/PlanningPolicyStatement25DevelopmentandFloodRisk_id1504955.pdf

### 2.1.5 Sites within Zone 2

Subject to the application of the Sequential Flood Risk Test, PPS25 specifies suitable types of development in this zone as:

- Essential infrastructure
- More vulnerable
- Less vulnerable
- Water compatible development.

It is not for the SFRA to assess whether the site will pass parts a. and b. of the Exception Test. However, the council or a developer must be able to demonstrate the need for development through the spatial planning process. Highly vulnerable uses should only be permitted in this zone if the Exception Test is passed.

A Flood Risk Assessment will be required for all development in this zone. The Flood Risk Assessment will need to assess the current level of flood risk as well as the level of flood risk following development. Development plans for the site will need to demonstrate that flood risk can be effectively and safely managed without increasing flood risk elsewhere.

Proposals will also need to demonstrate that access and egress to the development can be maintained during an extreme flood event and that development is set at an appropriate level. A further level of analysis may be required where development is planned behind or adjacent to existing defences in order to test the sustainability and robustness of the mitigation measures. In keeping with Flood Zone 1 other flood risk constraints, such as incidents of localised flooding and other site specific considerations will need to be addressed. Again, Flood Risk Assessments will be undertaken by the developer of the site and the Environment Agency will be able to advise potential developers as to their specific requirements on a site by site basis. The Flood Risk Assessment will need to address parts c. of the Exceptions Test.

### 2.1.6 Sites within Zone 3

A Sequential Flood Risk Test is used to prioritise sites in order of vulnerability to flood risk and their acceptability for development. Developers should primarily focus on lower Flood Zones in preference to Flood Zone 3.

Any proposals for development within Flood Zone 3 will require developers to undertake a detailed Flood Risk Assessment. It should be noted that constraints to development are likely to be significant and developers should seek advice from Warrington Borough Council and the Environment Agency as to the specific requirements for assessment.

Flood Zone 3 is subdivided into Zones 3a and 3b. Owing to the frequency of inundation, Zone 3b areas are considered to be Functional Floodplain. Zone 3a areas are considered to be at high risk of flooding. For the purpose of this SFRA, Greenfield sites within Flood Zone 3 are considered to be Zone 3b until proven otherwise.

Zone 3a is potentially suitable for water compatible and less vulnerable land uses. The more vulnerable and essential infrastructure uses should only be permitted in this zone if the Exception Test is passed. Highly vulnerable development should not be permitted in this zone. Only water-compatible uses and the essential infrastructure should be permitted in Zone 3b.

Where sites are partially located within Flood Zone 3, it is recommended that the council should avoid development by specifying water compatible uses or Public Open Space for these areas.

### 2.1.7 Warrington Flood Mapping

To support the planning process and the implementation of PPS25, the Environment Agency is producing a range of flood mapping products. These include Flood Zone Maps and the Historical Flood Map. Functional floodplain does not have a simple a definition, and performance of the river floodplain in a local context will guide where floodplain has a functionality that should be protected and enhanced.

The Flood Zone Maps are the first of these to be delivered. These maps predict the high (1% fluvial and 0.5% tidal) and medium (0.1% fluvial and tidal) flood risk zones across all of England and Wales. Version 3.4 of the Flood Zone Maps has been used in this SFRA.

In Warrington, the limitations of the maps must be recognised. The Flood Zone Maps do not take account of flood defences and, therefore, represent a theoretical extent of flooding. The actual extent of flooding is mitigated, to some extent, by flood defences. In this sense the Flood Zone Maps provide a conservative assessment of the extent of flooding and are consistent with PPS25, which categorises flood risk ignoring the effects of defences.

Potential development sites situated wholly or partially within the Flood Zones must be critically reviewed to assess the degree of flood risk posed directly to or by the proposed development.

The centre of Warrington is located on the banks of the River Mersey and is susceptible to combined flooding from fluvial and tidal events. The Environment Agency have undertaken a number of studies to determine the extent of flood risk in Warrington. The combined effects of fluvial and tidal flooding, as well as the interaction with the Manchester Ship Canal, have proved difficult to predict in past investigations.

In order to evaluate the extent of fluvial flooding, consideration needs to be given to controlling effect of the Manchester Ship Canal. The Manchester Ship Canal has significant capacity and works in union with the River Mersey to convey flows. Understanding how flood water is distributed between the River Mersey and Manchester Ship Canal is, therefore, essential for defining a realistic flood risk outline through Warrington.

The EA acknowledge that the current Flood Zones for Warrington tend to overestimate the likely extent of fluvial flooding. The two main reasons for this are:

- that no detailed hydraulic model of the Mersey is currently available and;
- that, as a manmade structure, consideration of the Manchester Ship Canal (and its flood alleviating function) is not taken into account.

Further assessment of the extent of flooding through Warrington was undertaken for the EA by JBA in 2006. These revised flood zones take the Manchester Ship Canal into account and indicate a reduction in the extent of flooding. The EA have acknowledged that these revised flood zones provide a more realistic extent of flooding through Warrington. For the purpose of this SFRA both the National Flood Zone Maps, as shown on the EA's website, and the revised flood zone maps have been included to enable the council and developers to make informed decisions.

When assessing the suitability of sites for development an initial review of a potential site should first be made against the EA defined Flood Zone Map. Where the site is located in Flood Zones 2 or 3 then further comparison should be made against the updated flood zone map. If the site remains in either revised zones 2 or 3 then the site will require Sequential Testing. Where the revised flood zones indicate that a site is now located in revised zone 1 then further consultation with the EA is required.

### 2.1.8 How to assess the likelihood of passing the Exception Test

The fact that mitigation measures are discussed in this SFRA should not be taken as a presumption that the Sequential Flood Risk Test has been short circuited. It is included to give improved understanding of the consequences associated with allocation of a site for development, or assessing development proposals on a site in high risk areas. It is also used to provide additional indicative evidence for assessment of the Exception Test.

Mitigation measures must be designed to provide an appropriate level of flood mitigation to a site for the lifetime of the development. At most sites it is technically feasible to mitigate or manage flood risk (if potential off-site impacts are ignored). However, where the depth of flooding is substantial, these mitigation measures may result in practical constraints to development with significant financial implications. The Exception Test needs to explicitly understand offsite impacts of development as well as the limiting factors that influence flood risk.

Often the determining factor in deciding whether a particular development can proceed is the financial feasibility of flood risk mitigation rather than technical limitations. It is important that recommendations for development should not be made when there is little or no chance of feasible and cost effective mitigation measures being realised. Demonstrating that a site can be developed is, however, difficult without a detailed Flood Risk Assessment.

At the SFRA stage broad assumptions need to be made about the feasibility of flood risk mitigation so that sites with realistic development potential are put forward. In this context the assumptions shown in the following table have been made. It is assumed that floor level raising will continue to be the traditional mitigation measure, however, it should be noted that the Environment Agency consider land raising to be a final option rather than a desired approach to flood risk management.

This table refers to indicative depths of flooding before mitigation measures are put in place and should not be mistaken for acceptable levels of flooding after mitigation.

**Suggested Screening Criteria for Mitigation Measures**

| Depth of Inundation | Comments |
|---|---|
| 0 to 1.0 m | Sustainable mitigation and flood risk management may be feasible for both housing and employment purposes. There is a greater likelihood that the Exception Test can be passed. |
| 1.0 to 1.5 m | Mitigation is likely to be costly and may not be economically justifiable for low value land uses. Housing allocations are considered appropriate, provided flood risk can be managed or mitigated (e.g. by using lower levels for car parks or public areas). Floor level raising for employment purposes is unlikely to be economically viable and employment developments should be reconsidered in favour of alternative lower risk sites. The likelihood of passing the Exception Test is lower. |
| Above 1.5 m | Flood risk mitigation measures are unlikely to be economically justifiable and both housing and employment developments should be reconsidered in favour of alternative lower risk sites. Development is unlikely to be sustainable and the likelihood of passing the Exception Test is low. |

It is recognised that in some locations urban regeneration and redevelopment will be essential to maintain the long term viability and vitality of communities and the balance of planning considerations may support redevelopment. These social and economic considerations may justify a relaxation of the screening criteria set out above and the retention of housing and employment sites in certain areas. In these instances the commercial viability of the development and risks to public safety will need to be given careful considerations during the planning of the development. A range of flood management and flood proofing measures are available that can reduce the financial impacts of flooding.

Whilst flooding mitigation measures can be implemented in most sites, it is worth noting that in some instances the findings of individual Flood Risk Assessments may determine that the risk of flooding to a proposed development is too great and mitigation measures are not feasible. In these instances, the development will be subject to an objection by the Environment Agency.

### 2.1.9 General points for consideration by Development Planners

To assist Development Planners in evaluating the suitability of planning submissions in terms of flood risk, and in accordance with Section 1.48 of the *Practice Guide Companion to PPS25,* a copy of the Environment Agency's framework for transparent application of the Sequential Test for planning submissions is included as Appendix D.

In accordance with Section 1.14 of the *Practice Guide Companion to PPS25,* guidance for developers from pre-purchase to submission of a completed planning application and accompanying FRA, is also included as Appendix D. This guidance provides a mechanism for developers and LPAs as to the requirements and procedures to be followed when determining the suitability of a site for development.

In order to evaluate potential sites for development the council may also consider the following:

- Sites put forward for development should be assessed against the SFRA flood maps. Sites should be selected at lower risk of flooding in preference to higher risk areas. Developers will need to provide sufficient information to enable the council to assess a Sequential Test which will demonstrate that there are no reasonably available, alternative sites that are situated in a lower flood risk zone. Where phased development is planned, Sequential Testing for the development should be used to identify those areas where development should be discouraged or avoided.

- Departures from the Sequential Flood Risk Test involving the need for development in higher risk zones, need to be justified. A developer will need to provide reasoned justification to the LPA wherever the Exception Test needs to be applied.

- The SFRA is a strategic review of flood risk, based on existing available information and does not provide the site specific consideration of flood risk and mitigation measures required of a Flood Risks Assessment. The developer will need to undertake a detailed Flood Risk Assessment to address relevant parts of the Exceptions Test.

- The developable area may further be reduced by the need for a maintenance easement where there is a watercourse within or adjacent to a site. Typically an 8m access strip, void of development, is required along the bank top for maintenance purposes. This is likely to reduce the available developable area.

- Where possible the granting of planning permission for residential development in Flood Zone 3 should be avoided. Passing the Exception Test is likely to be harder and applications are likely to be opposed by the Environment Agency. Any development planned within Flood Zone 3 will require a Flood Risk Assessment to demonstrate that development is sustainable and flood risk can be effectively managed.

- Where development sites encroach into Flood Zone 3, the Council should consider specifying that Flood Zone 3 areas should only be developed as water compatible uses or Public Open Space.

- Where employment or residential developments are proposed within higher risk zones, the developer's site specific flood risk assessment should consider the likely depth of flooding as this will indicate the likely extent of mitigation measures required. The depth of flooding can be used as an indication of whether or not the Exception Test is likely to be passed. This will be less likely where the depth of flooding is likely to require substantial mitigation.

- A site specific Flood Risk Assessment should consider the source of flooding. In general, if flood risk is tidal then land raising (one form of mitigation) is unlikely to increase tidal flood levels and compensatory flood storage is unlikely to be required. If flood risk is fluvial then mitigation measures will be required to compensate for loss of floodplain storage. Depending on the extent of flooding, mitigation measure in these instances may significantly reduce the developable area. Consideration should also be given to the likely impact of development elsewhere. For example, surface water drainage from greenfield development is likely to

increase flood risk to neighbouring developments unless surface water drainage is effectively managed.

The determination of acceptability remains with the LPA, and will draw upon the advice of the EA and the Emergency Planning officer.

Before the submission of a planning application, if a site is considered to be critical to regeneration, the council can opt to undertake a Flood Risk Assessment (including sequential and, where necessary, exceptions tests) in order to first justify the sustainability of individual development sites.

### 2.1.10 The ongoing process

The SFRA procedure is seen as an ongoing process and doesn't end with the final report. The above step-by-step approach can be undertaken with the support of GIS data provided, to identify future suitable areas for development. The Sequential Flood Risk Test can then be used to prioritise these sites in order of probability to flood risk and their acceptability in terms of allocation for development.

Along with the final report, GIS data can be constantly updated, providing an evolving tool in identifying suitable development sites, located in lower flood risk areas.

Improvements to the Flood Zone Mapping in Warrington are expected and the council will need to periodically update the mapping to include the EA's best available data.

### 2.1.11 Roles and Responsibilities

The roles and responsibilities of the Developer and the LPA are described in Sections 1.4 to 1.53 of the *Practice Guide Companion to PPS25.* This guidance has been reproduced as Appendix D of this SFRA.

## 2.2 Example site classification with explanatory comments

The location of each site or area, identified for consideration by the council, is included on the plans that accompany this report. Available information for each site is also summarised in the appropriate Site Classification table in Section 3. Comparison of the various site classification tables demonstrates which locations are more suitable for development in terms of vulnerability to flooding. An example Site Classification table, including explanatory comments, is included below.

| **Site Classification** | | | | **Explanatory comments** |
|---|---|---|---|---|
| **Site:** | OP24: Walton Locks | | | Site reference and description |
| **Size (ha):** | 220 | | | Site Area |
| **Reference:** | Urban Potential Study (Site 220) | | | Source of information (council reference) |
| **Catchment:** | Mersey | | | Identifies the primary source of flood risk |
| **National Flood Zones:** | FZ1–32% | FZ2–25% | FZ3–43% | Each site is initially categorised according to the current National Flood Zones. In this instance 43% of this site is located within the high risk Flood Zone 3, 25% is located in the medium risk Flood Zone 2 and the remained, 32%, is located in the low risk Flood Zone 1. |
| **Revised flood zones:** | fz1–67% | fz2–33% | fz3–0% | The EA acknowledge that the current Flood Zones for Warrington tend to overestimate the likely extent of flooding.<br><br>Further assessment of the extent of flooding through Warrington was undertaken for the EA by JBA in 2006. These revised flood zones indicated a reduction in the extent of flooding.<br><br>Site Classifications include the extent of these revised flood zones so that a more informed understanding of flood risk at each site can be made. Environment Agency are due to revise the National Flood Zone Maps for the Warrington following detailed modelling of the tidal Mersey and Sankey systems.<br><br>Under the revised flood zone, 33% is located in the medium risk Flood Zone 2 and 67% is located in the low risk flood zone 1. |
| Indicative depth of Inundation (m) | Max < 1m | Average < 1m | | The indicative depth of flooding. The average depth is taken across those areas of the site in flood zones 2 and 3 only i.e. any areas in fz1 where depth = 0m is not included in the average.<br><br>Where flooding is fluvial a depth prediction for the 1 in 100yr event (including 20% increase in flows for climate change) is given.<br><br>Where flooding is tidal a depth prediction for the 1 in 200 yr event including 260mm for sea level raise is given.<br><br>For this site, the indicative depth of flooding is less than 1m. This suggests that sustainable mitigation and flood risk management may be implemented without causing problems elsewhere or that flood risk can be compensated for.<br><br>There is a greater likelihood that the Exception Test can be passed. |
| Defended: | No | | | Where there is a defence or other registered asset in the vicinity of the site an assessment of any associated residual risks maybe required. |
| Historical flooding / Drainage on site: | No information available | | | No historical flooding records have been provided |
| Soil Type | Un-surveyed. Mainly urbanised | | | A general description of the site soil type, taken from Soil Map of England and Wales, Lawes Agricultural Trust, Soil survey of England and Wales 1983. |

| **Site Classification** | | **Explanatory comments** |
|---|---|---|
| **Site:** | OP24: Walton Locks | Site reference and description |
| | | |
| Indicative Suitability for SuDs | Unknown | All sites will require a more detailed assessment of suitability for SuDs as part of the site specific FRAs, but an indication is given based on the information provided by the soil map. |
| Brown / Greenfield: | Brownfield | Consideration of land use is required by the council to justify allocation or granting planning permission under part b. of the Exception Test.<br><br>Whether a site is Green or Brownfield has been decided by looking at maps and satellite photographs only. It is likely that the council will have more detailed information and should refer to this when making decisions. |
| Additional information: | Non provided | Specific comments relevant to this site provided by the LPA or the EA. |
| Exception Test applicable: | Yes – if Flood Zone 2 areas are used for highly vulnerable development or if Flood Zone 3 areas are used for essential infrastructure or more vulnerable development | Details the instances in which the Exception test would be applicable. A small number of sites have a specific land use identified and hence, it is possible to make an assessment based on the vulnerability classification of that land use.<br><br>However, as none of the sites are actually allocated, a general assessment is included anyway to account for the possibility that other land uses may be considered in the future. |
| Likelihood of passing Test: | MEDIUM/HIGH – According to the National Flood Zone 43% of the site is in FZ3. This reduced to 0% when compared to the revised flood zones.<br><br>Residual risk (mitigation measures), sustainable development objectives, for Flood Zone 2 will need to be considered. | This is a subjective assessment. A site specific Flood Risk Assessment is required to determine actual flood risk and how residual risk would be managed. However, in this instance the site is located partially within a high risk zone according to the National Flood Zones. The indicative depth of flooding suggests that mitigation may be possible. Flood risk is predominantly tidal and the site is brownfield. The indicative likelihood of passing the Exception Test is, therefore, considered Medium/High. (For comparison, if this development located in Flood Zone 2 then the likelihood of passing the Exception Test would be considered to be higher.) |
| Recommendations: | According to the revised flood zone 67% of the site is in zone 1 and is, therefore, available for development. At worst, 32% of the site is still in Flood Zone 1 and available for development.<br><br>**If the Council has to consider this site's suitability for development, they should ensure that they have sufficient information to assess the need for development and to address element a. of the Exceptions Test.**<br><br>**A Flood Risk Assessment will be required to assess other sources of flooding and any mitigation measures required for potential development.** | Those areas that are in Flood Zone 1 would not be subject to the Exceptions Test.<br><br>As this site appears to be Brownfield, part b. of the Exceptions Test is automatically passed.<br><br>A Flood Risk Assessment will be required to assess the actual level of risk for this site. The assessment will usually be undertaken by the potential developer of the site. However, if the site is considered to be critical to regeneration, for example, then the Council can opt to undertake an outline Flood Risk Assessment in order to first justify the sustainability of the allocation. |

# 3 WARRINGTON BOROUGH COUNCIL SEQUENTIAL AND EXCEPTION TESTS

## 3.1 Introduction

The potential development sites to be considered in Warrington have been divided into the following areas.

- Inner Warrington (see Figure 2007s2261-DW05)
- Sankey and Penketh (see Figure 2007s2261-DW06)
- Burtonwood, Winwick, Westbrook, Gemini and Bewsey (see Figure 2007s2261-DW07)
- Padgate, Orford, Fearnhead and Woolston (see Figure 2007s2261-DW08)
- Risley, Birchwood and Glazebrook (see Figure 2007s2261-DW09)
- Thelwall, Westy and Lymm (see Figure 2007s2261-DW10)
- Stockton Heath, Appleton, and Walton (see Figure 2007s2261-DW11)

An overview plan of potential development areas in Warrington is included as Figure 2007s2261-DW04.

## 3.2 Warrington Borough Council area

The most significant sources of flood risk is the Tidal Mersey and River Sankey System. Flood risk from the Mersey is predominantly tidal as fluvial flooding is controlled by the Manchester Ship Canal. There has been no record of fluvial flooding in Warrington from the River Mersey since the construction of the Manchester Ship Canal.

### 3.2.1 Principles for development of Warrington sites

Warrington Borough Council has no need to allocate sites for development within the borough at the present time. However, when assessing the suitability of planning applications the following principles for development planning will be adopted.

Flood Zone 1

Development of Flood Zone 1 areas will be encouraged in preference to higher flood risk areas.

Flood Zone 2

Development sites within Flood Zone 2 will be considered in preference to Flood Zone 3 areas. Any development planned within Flood Zone 2 will require a Flood Risk Assessment to demonstrate that development is sustainable and flood risk can be effectively managed.

Flood Zone 3

Where allocations include areas in Flood Zone 3, and where departures from the Sequential Flood Risk Test are justified, the Council will give consideration to the following:

- The council's preferred use of Flood Zone 3 areas will be for the development of green corridors and for areas of Public Open Space. These land uses, as part of any subsequent redevelopment proposals, are considered to be water compatible developments.
- The developable area in Flood Zone 3 will further be reduced by the need for a maintenance easement. Typically an 8m access strip, void of development, is required along the bank top for maintenance purposes. This is likely to reduce the available developable area.
- Finally, any development planned within Flood Zone 3 will require a Flood Risk Assessment to demonstrate that development is sustainable and flood risk can be effectively managed.

## 3.3 Inner Warrington

Inner Warrington has been defined according to the EMP5 outline, including Wilderspool and Latchford, and parts of Orford, Winwick and Bewsey.

The River Mersey meanders through the centre of Inner Warrington and poses a significant flood risk as indicated by the width of the flood outlines in this area. Flood risk from the Mersey is predominantly tidal and the wide Flood Zones indicate the level of flood risk to the area. The Manchester Ship Canal (MSC) runs along the south side of the city centre. The MSC provides significant fluvial flood relief to the Mersey

Additional fluvial flood risk is posed by Sankey Brook which flows to the west of Inner Warrington before joining the Mersey.

The main reason for the differences between the current Flood Zone outlines and the revised flood zone is that the former makes no allowance for the flood limiting effect of the MSC.

The Environment Agency's Historic Flood Map indicates that there have been recorded flood incidents originating from both watercourses. Victoria Park and surrounding areas were affected by tidal flooding from the Mersey. In February 1990 and October 2000 areas in Bewsey were flooded from Sankey Brook. Further information from the EA indicates that Eastford Road and areas in Latchford south of Knutsford Road were also affected in the 1990 Mersey floods. Anecdotal evidence also suggests that areas around Bank Quay and Liverpool Road are affected by flooding on an annual basis.

This area also includes the Arpley and Bridgefoot area for which the council is currently developing an Area Action Plan (AAP). The area covered by the Action Plan is considered in more detail later in this report.

### 3.3.1 Inner Warrington: Flood Zone 1

The following sites are located in Flood Zone 1 and are not, therefore, considered to be at significant risk to fluvial or tidal flooding. Other sources of flood risk, such as overland flow routes or groundwater, will still need to be considered by potential developers.

| Site | Site Ref | Policy | Area (ha) | Catchment |
|---|---|---|---|---|
| | | | | |
| **Sites for Potential Urban Regeneration:** | | | | |
| UR5: Wireworks | | EMP8 | 2.6 | Mersey |
| UR10: Hawleys Lane | | EMP8 | 0.7 | Mersey |
| | | | | |
| **Other Potential Development Sites** | | | | |
| OP4: Hall Motors, Folly Lane | 310 | n/a | 0.9 | Dallam Brook |
| OP6: Warrington Baths, Leigh Street | 146 | n/a | 0.6 | Mersey |
| OP9: Cairo Street Chapel | 159 | n/a | 0.2 | Mersey |
| OP16: 31-37 Winwick Street | 221 | n/a | 0.1 | Mersey |
| OP39: Peninsula Barracks, Marsh House | 161 | n/a | 0.3 | Padgate Brook |
| | | | | |

## 3.4 Inner Warrington: Flood Zones 2 & 3

| **Site:** | **UR1: Arpley Meadows 3** | | |
|---|---|---|---|
| Size (ha): | 8.24 | | |
| Reference: | UDP: EMP8 | | |
| Catchment: | Mersey | | |
| National Flood Zones: | FZ1 - 0% | FZ2 – 0% | FZ3 – 100% |
| Revised flood zones (Mersey ): | fz1 – 25% | fz2 – 5% | fz3 – 70% |
| Indicative depth of Inundation (m): | Max < 1.5m | Average < 1m | |
| Defended: | No | | |
| Historical flooding / Drainage on site: | No site specific record of flooding | | |
| Soil Type | No soils information is available. | | |
| Indicative Suitability for SuDs | Unknown | | |
| Brown / Greenfield: | Brownfield– Previous dredging ground | | |
| Additional information: | -- | | |
| Exception Test applicable: | Yes – if Flood Zone 3 areas are used for essential infrastructure or more vulnerable development or if revised flood zones are adopted and flood zone 2 areas are used for highly vulnerable development | | |
| Likelihood of passing Test if Applied: | **LOW** – 100% in FZ3 decreasing to 70% in fz3 by revised zone outlines but Brownfield; need to consider residual risk (mitigation measures), sustainable development objectives, etc. | | |
| **Recommendations:** | **According to the National Flood Zone Map all of this site is located within FZ3. When compared to the revised flood zone, 25% of the site moves to being in fz1 and 70% is in fz 3. The average depth of flooding is less than 1m**<br><br>**If the Council has to consider this sites suitability for development, they should ensure that they have sufficient information to assess the need for development and to address elements a. and b. of the Exceptions Test.**<br><br>**Consider water compatible land use only for Flood Zone 3 areas.**<br><br>**A Flood Risk Assessment will be required to assess other sources of flooding and any mitigation measures required for potential development.** | | |

| **Site:** | **UR2: Arpley Meadows 2** | | |
|---|---|---|---|
| Size (ha): | 22.0 | | |
| Reference: | UDP: EMP8 | | |
| Catchment: | Mersey | | |
| National Flood Zones: | FZ1 - 70% | FZ2 – 10% | FZ3 – 20% |
| Revised flood zones (Mersey ): | fz1 – >88% | fz2 – <1% | fz3 – 11% |
| Indicative depth of Inundation (m): | Max > 1.5m | Average > 1.5m | |
| Defended: | No | | |
| Historical flooding / Drainage on site: | No site specific record of flooding | | |
| Soil Type | No soils information is available. | | |
| Indicative Suitability for SuDs | Unknown | | |
| Brown / Greenfield: | Brownfield– Previous dredging ground | | |
| Additional information: | -- | | |
| Exception Test applicable: | Yes – if Flood Zone 2 areas are used for highly vulnerable development or if Flood Zone 3 areas are used for essential infrastructure or more vulnerable development | | |
| Likelihood of passing Test if Applied: | **MEDIUM** – 20% in FZ3 decreasing to 11% in fz3 by revised zone outlines and Brownfield; need to consider residual risk (mitigation measures), sustainable development objectives, etc. | | |
| **Recommendations:** | **According to the National Flood Zone Map 70% of this site is located within FZ1 and therefore this area may be suitable for development in flood risk terms. When compared to the revised flood zone, this increases to more than 88% of the site being in fz1, 11% is in flood zone 3 and the average depth of flooding is more than 1.5m**<br><br>**If the Council has to consider this sites suitability for development, they should ensure that they have sufficient information to assess the need for development and to address elements a. and b. of the Exceptions Test.**<br><br>**Consider water compatible land use only for Flood Zone 3 areas.**<br><br>**A Flood Risk Assessment will be required to assess other sources of flooding and any mitigation measures required for potential development.** | | |

| **Site:** | **UR3: Arpley Meadows 1** | | |
|---|---|---|---|
| Size (ha): | 31.5 | | |
| Reference: | UDP: EMP8 | | |
| Catchment: | Mersey | | |
| National Flood Zones: | FZ1 - 64% | FZ2 – 6% | FZ3 – 30% |
| Revised flood zones (Mersey ): | fz1 – 75% | fz2 – 3% | fz3 – 22% |
| Indicative depth of Inundation (m): | Max < 1m | Average < 1m | |
| Defended: | No | | |
| Historical flooding / Drainage on site: | No site specific record of flooding | | |
| Soil Type | No soils information is available. | | |
| Indicative Suitability for SuDs | Unknown | | |
| Brown / Greenfield: | Brownfield– Previous dredging ground | | |
| Additional information: | -- | | |
| Exception Test applicable: | Yes – if Flood Zone 2 areas are used for highly vulnerable development or if Flood Zone 3 areas are used for essential infrastructure or more vulnerable development | | |
| Likelihood of passing Test if Applied: | **MEDIUM** – 30% in FZ3 decreasing to 22% in fz3 by revised zone outlines and Brownfield; need to consider residual risk (mitigation measures), sustainable development objectives, etc. | | |
| **Recommendations:** | **According to the National Flood Zone Map 64% of this site is located within FZ1 and therefore this area may be suitable for development in flood risk terms. When compared to the revised flood zone, this increases to 75% of the site being in fz1, 22% is in flood zone 3 and the average depth of flooding is less than 1m**<br><br>**If the Council has to consider this sites suitability for development, they should ensure that they have sufficient information to assess the need for development and to address elements a. and b. of the Exceptions Test.**<br><br>**Consider water compatible land use only for Flood Zone 3 areas.**<br><br>**A Flood Risk Assessment will be required to assess other sources of flooding and any mitigation measures required for potential development.** | | |

| Site: | UR4: Monks Hall | | |
|---|---|---|---|
| Size (ha): | 3.9 | | |
| Reference: | UDP: EMP8 | | |
| Catchment: | Mersey | | |
| National Flood Zones: | FZ1 – 0% | FZ2 – 0% | FZ3 – 100% |
| Revised flood zones (Mersey ): | fz1 – 55% | fz2 – 20% | fz3 – 25% |
| Indicative depth of Inundation (m): | Max < 1.5m | Average < 1m | |
| Defended: | No | | |
| Historical flooding / Drainage on site: | No site specific record of flooding | | |
| Soil Type | Mainly urbanised. No soils information is available | | |
| Indicative Suitability for SuDs | Unknown | | |
| Brown / Greenfield: | Brownfield | | |
| Additional information: | -- | | |
| Exception Test applicable: | Yes – if Flood Zone 3 areas are used for essential infrastructure or more vulnerable development or if revised flood zones are adopted and flood zone 2 areas are used for highly vulnerable development or | | |
| Likelihood of passing Test if Applied: | **MEDIUM/HIGH** – 100% in FZ3 decreasing to 25% in fz3 by revised zone outlines and Brownfield; need to consider residual risk (mitigation measures), sustainable development objectives, etc. | | |
| **Recommendations:** | **According to the National Flood Zone Map all of this site is located within FZ3. When compared to the revised flood zone, 60% is in flood zone 1 and therefore this area may be suitable for development in flood risk terms. Only 25% of the site remains in flood zone 3 and the average depth of flooding is less the 1m.**<br><br>**If the Council has to consider this sites suitability for development, they should ensure that they have sufficient information to assess the need for development and to address element a. of the Exceptions Test.**<br><br>**Consider water compatible land use only for Flood Zone 3 areas.**<br><br>**A Flood Risk Assessment will be required to assess other sources of flooding and any mitigation measures required for potential development.** | | |

| Site: | UR7: Remaining Land at Dalton Bank | | |
|---|---|---|---|
| Size (ha): | 1.9 | | |
| Reference: | UDP: EMP8 | | |
| Catchment: | Mersey | | |
| National Flood Zone Map: | FZ1 – 95% | FZ2 – 5% | FZ3 – 0% |
| Revised flood zones (Mersey ): | fz1 – 100% | fz2 – 0% | fz3 – 0% |
| Indicative depth of Inundation (m): | No flooding predicted in recent modelling | | |
| Defended: | No | | |
| Historical flooding / Drainage on site: | No site specific record of flooding | | |
| Soil Type | Mainly urbanised. No soils information is available | | |
| Indicative Suitability for SuDs | Unknown | | |
| Brown / Greenfield: | Brownfield | | |
| Additional information: | -- | | |
| Exception Test applicable: | Yes – until flood zones are revised and if Flood Zone 2 areas are used for highly vulnerable development. | | |
| Likelihood of passing Test if Applied: | **HIGH** – at least 95% of the site is located in FZ 1 and Brownfield. | | |
| **Recommendations:** | **According to the National Flood Zone Map 95% of this site is located within FZ1 and therefore this area may be suitable for development in flood risk terms. When compared to the revised flood zone, this increases to 100% of the site.**<br><br>**A Flood Risk Assessment will be required to assess other sources of flooding and any mitigation measures required for potential development.** | | |

| Site: | UR8: Wilderspool/Bridgefoot | | |
|---|---|---|---|
| Size (ha): | 11.5 | | |
| Reference: | UDP: EMP8 | | |
| Catchment: | Mersey | | |
| National Flood Zones: | FZ1 – 0% | FZ2 – 0% | FZ3 – 100% |
| Revised flood zones (Mersey): | fz1 – 0% | fz2 – 0% | fz3 – 100% |
| Indicative depth of Inundation (m): | Max > 1.5m | Average < 1.5m | |
| Defended: | No | | |
| Historical flooding / Drainage on site: | No site specific record of flooding | | |
| Soil Type | Urbanised. No soils information is available | | |
| Indicative Suitability for SuDs | Unknown. | | |
| Brown / Greenfield: | Brownfield | | |
| Additional information: | -- | | |
| Exception Test applicable: | Yes – if the site is used for essential infrastructure or more vulnerable development | | |
| Likelihood of passing Test if Applied: | **LOW**– 100% in FZ3 but Brownfield; need to consider residual risk (mitigation measures), sustainable development objectives, etc. | | |
| **Recommendations:** | **According to the National Flood Zone Map and the revised flood zones all of this site is located within FZ3. The average depth of flood is less than 1.5m but more than 1m.**<br><br>**Lower risk sites should be considered in preference to this one.**<br><br>**If the Council has to consider this sites suitability for development, they should ensure that they have sufficient information to assess the need for development and to address element a. of the Exceptions Test.**<br><br>**Consider water compatible land use for site.**<br><br>**A Flood Risk Assessment will be required to assess other sources of flooding and any mitigation measures required for potential development.** | | |

| Site: | UR9: Wilson Patten Street South | | |
|---|---|---|---|
| Size (ha): | 6.72 | | |
| Reference: | UDP: EMP8 | | |
| Catchment: | Mersey | | |
| National Flood Zones: | FZ1 – 0% | FZ2 – 0% | FZ3 – 100% |
| Revised flood zones (Mersey): | fz1 – 0% | fz2 – 0% | fz3 – 100% |
| Indicative depth of Inundation (m): | Max > 1.5m | Average > 1.5m | |
| Defended: | No | | |
| Historical flooding / Drainage on site: | No site specific record of flooding | | |
| Soil Type | Mainly urbanised. No soils information is available | | |
| Indicative Suitability for SuDs | Unknown | | |
| Brown / Greenfield: | Brownfield | | |
| Additional information: | -- | | |
| Exception Test applicable: | Yes – if the site is used for essential infrastructure or more vulnerable development | | |
| Likelihood of passing Test if Applied: | **LOW**– 100% in FZ3 but Brownfield; need to consider residual risk (mitigation measures), sustainable development objectives, etc. | | |
| **Recommendations:** | **According to the National Flood Zone Map and the revised flood zone all of this site is located within FZ3. The average depth of flood is more than 1.5m.**<br><br>**Lower risk sites should be considered in preference to this one.**<br><br>**If the Council has to consider this sites suitability for development, they should ensure that they have sufficient information to assess the need for development and to address element a. of the Exceptions Test.**<br><br>**Consider water compatible land use for site.**<br><br>**A Flood Risk Assessment will be required to assess other sources of flooding and any mitigation measures required for potential development.** | | |

| **Site:** | **E5: Sankey Sewage Works** | | |
|---|---|---|---|
| Size (ha): | 6.23 | | |
| Reference: | UDP & Employment Land Report 2006 (Site APAS5/20) | | |
| Catchment: | Mersey | | |
| National Flood Zones: | FZ1 – 0% | FZ2 – 0% | FZ3 – 100% |
| Revised flood zones (Mersey): | fz1 – 11% | fz2 – 6% | fz3 – 83% |
| Indicative depth of Inundation (m): | Max > 1.5m | Average < 1.5m | |
| Defended: | No | | |
| Historical flooding / Drainage on site: | No site specific record of flooding | | |
| Soil Type | No soils information is available. | | |
| Indicative Suitability for SuDs | Unknown | | |
| Brown / Greenfield: | Brownfield | | |
| Additional information: | -- | | |
| Exception Test applicable: | No – if site is used for less vulnerable development as indicated, i.e. employment.<br>Yes – if Flood Zone 3 areas are used for essential infrastructure or more vulnerable development or if revised flood zones are adopted and flood zone 2 areas are used for highly vulnerable development or | | |
| Likelihood of passing Test if Applied: | **LOW** – 100% in FZ3 decreasing to 83% in fz3 by revised zone outlines but Brownfield; need to consider residual risk (mitigation measures), sustainable development objectives, etc. | | |
| **Recommendations:** | **According to the National Flood Zone Map all of this site is located within FZ3. When compared to the revised flood zones, 11% of the site is in flood zone 1 and therefore this area may be suitable for development in flood risk terms, Using revised flood risk zones 83% of the area is in fz3 and the average depth of flood is less than 1.5m but more than 1m.**<br><br>**If the Council has to consider this sites suitability for development, they should ensure that they have sufficient information to assess the need for development and to address element a. of the Exceptions Test.**<br><br>**Consider water compatible land use for Flood Zone 3 areas.**<br><br>**A Flood Risk Assessment will be required to assess other sources of flooding and any mitigation measures required for potential development.** | | |

| Site: | OP7: Patten Arms Hotel, Parker Street | | |
|---|---|---|---|
| Size (ha): | 0.2 | | |
| Reference: | Urban Potential Study 2006 (Site 162) | | |
| Catchment: | Mersey | | |
| National Flood Zones: | FZ1 –0% | FZ2 –0% | FZ3 – 100% |
| Revised flood zones (Mersey): | fz1 – 31% | fz2 – 69% | fz3 – 0% |
| Indicative depth of Inundation (m): | Max < 1m | Average < 1m | |
| Defended: | No | | |
| Historical flooding / Drainage on site: | No site specific record of flooding | | |
| Soil Type | Urbanised. No soils information is available | | |
| Indicative Suitability for SuDs | Unknown | | |
| Brown / Greenfield: | Brownfield | | |
| Additional information: | -- | | |
| Exception Test applicable: | Yes – if Flood Zone 3 areas are used for essential infrastructure or more vulnerable development or if revised flood zones are adopted and flood zone 2 areas are used for highly vulnerable development or | | |
| Likelihood of passing Test if Applied: | **MEDIUM** – 100% in FZ3 and 69% in fz2 by revised flood outlines and Brownfield; need to consider residual risk (mitigation measures), sustainable development objectives, etc. | | |
| **Recommendations:** | **According to the National Flood Zone Map all of this site is located within FZ3. When compared to the revised flood zones, 31% of the site is in flood zone 1 and therefore this area may be suitable for development in flood risk terms. None of the site remains in flood zone 3. The average depth of flood in the flood zone 2 area is less than 1m.**<br><br>**If the Council has to consider this sites suitability for development, they should ensure that they have sufficient information to assess the need for development and to address element a. of the Exceptions Test.**<br><br>**Consider water compatible land use for Flood Zone 3 areas.**<br><br>**A Flood Risk Assessment will be required to assess other sources of flooding and any mitigation measures required for potential development.** | | |

| Site: | OP8: Adj Magistrates Court, Winmarleigh Street | | |
|---|---|---|---|
| Size (ha): | 0.05 | | |
| Reference: | Urban Potential Study 2006 (Site 217) | | |
| Catchment: | Mersey | | |
| National Flood Zones: | FZ1 –0% | FZ2 –100% | FZ3 – 0% |
| Revised flood zones (Mersey): | fz1 – 100% | fz2 – 0% | fz3 – 0% |
| Indicative depth of Inundation (m): | No flooding predicted by recent modelling | | |
| Defended: | No | | |
| Historical flooding / Drainage on site: | No site specific record of flooding | | |
| Soil Type | Urbanised. No soils information is available | | |
| Indicative Suitability for SuDs | Unknown | | |
| Brown / Greenfield: | Brownfield | | |
| Additional information: | -- | | |
| Exception Test applicable: | Yes – until flood zones are revised and if Flood Zone 2 areas are used for highly vulnerable development. | | |
| Likelihood of passing Test if Applied: | **HIGH** – 100% in FZ2 but 100% in fz1 by revised flood outlines and Brownfield; need to consider residual risk (mitigation measures), sustainable development objectives, etc.<br>**N/A** if revised flood outlines adopted | | |
| **Recommendations:** | **According to the National Flood Zone Map all of the site of this site is located within FZ2. When compared to the revised flood zones, all of the site is in flood zone 1 and therefore may be suitable for development in flood risk terms.**<br><br>**A Flood Risk Assessment is recommended to assess other sources of flooding. However, because the site footprint is less than 1 ha, if the revised flood zones are adopted, a Flood Risk Assessment would not be required.** | | |

| Site: | OP10: Land at Times Square | | |
|---|---|---|---|
| Size (ha): | 1.3 | | |
| Reference: | Urban Potential Study 2006 (Site 219) | | |
| Catchment: | Mersey | | |
| National Flood Zones: | FZ1 –52% | FZ2 –28% | FZ3 – 20% |
| Revised flood zones (Mersey): | fz1 – 100% | fz2 – 0% | fz3 – 0% |
| Indicative depth of Inundation (m): | No flooding predicted by recent modelling | | |
| Defended: | No | | |
| Historical flooding / Drainage on site: | No site specific record of flooding | | |
| Soil Type | Mainly Urbanised. No soils information is available. | | |
| Indicative Suitability for SuDs | Unknown | | |
| Brown / Greenfield: | Brownfield | | |
| Additional information: | -- | | |
| Exception Test applicable: | Yes – until flood zones are revised and if Flood Zone 2 areas are used for highly vulnerable development or if Flood Zone 3 areas are used for essential infrastructure or more vulnerable development | | |
| Likelihood of passing Test if Applied: | **HIGH** – 20% in FZ3 but 100% in fz1 by revised flood outlines and Brownfield; need to consider residual risk (mitigation measures), sustainable development objectives, etc.<br>**N/A** if revised flood outlines adopted. | | |
| **Recommendations:** | **According to the National Flood Zone Map 52% of the site of this site is located within FZ1 and therefore this area may be suitable for development in flood risk terms. When compared to the revised flood zones, this increases to 100%.**<br><br>**A Flood Risk Assessment will be required to assess other sources of flooding and any mitigation measures required for potential development.** | | |

| Site: | OP11: APW Thomas Locker (Front) | | |
|---|---|---|---|
| Size (ha): | 0.5 | | |
| Reference: | Urban Potential Study 2006 (Site 311) | | |
| Catchment: | Mersey | | |
| National Flood Zones: | FZ1 –0% | FZ2 –0% | FZ3 – 100% |
| Revised flood zones (Mersey): | fz1 – 100% | fz2 – 0% | fz3 – 0% |
| Indicative depth of Inundation (m): | No flooding predicted by recent modelling | | |
| Defended: | No | | |
| Historical flooding / Drainage on site: | No site specific record of flooding | | |
| Soil Type | Urbanised. No soils information is available | | |
| Indicative Suitability for SuDs | Unknown | | |
| Brown / Greenfield: | Brownfield | | |
| Additional information: | -- | | |
| Exception Test applicable: | Yes – until flood zones are revised and if site is used for essential infrastructure or more vulnerable development | | |
| Likelihood of passing Test if Applied: | **HIGH** – 100% in FZ3 but 100% in revised flood outlines and Brownfield; need to consider residual risk (mitigation measures), sustainable development objectives, etc.<br>**N/A** if revised flood outlines adopted | | |
| **Recommendations:** | **According to the National Flood Zone Map all of the site of this site is located within FZ3. When compared to the revised flood zones, all of the site is in flood zone 1 and therefore may be suitable for development in flood risk terms.**<br><br>**A Flood Risk Assessment is recommended to assess other sources of flooding. However, because the site footprint is less than 1 ha if the revised flood zones are adopted, a Flood Risk Assessment would not be required.** | | |

| Site: | OP12: APW Thomas Locker (Rear) | | |
|---|---|---|---|
| Size (ha): | 0.9 | | |
| Reference: | Urban Potential Study 2006 (Site 312) | | |
| Catchment: | Mersey | | |
| National Flood Zones: | FZ1 –0% | FZ2 –0% | FZ3 – 100% |
| Revised flood zones (Mersey): | fz1 – 41% | fz2 – 1% | fz3 – 58% |
| Indicative depth of Inundation (m): | No depth results available | | |
| Defended: | No | | |
| Historical flooding / Drainage on site: | No site specific record of flooding | | |
| Soil Type | Urbanised. No soils information is available | | |
| Indicative Suitability for SuDs | Unknown | | |
| Brown / Greenfield: | Brownfield | | |
| Additional information: | -- | | |
| Exception Test applicable: | Yes – if Flood Zone 3 areas are used for essential infrastructure or more vulnerable development or if Flood Zone 2 areas are used for highly vulnerable development | | |
| Likelihood of passing Test if Applied: | **MEDIUM** – 100% in FZ3 but decreasing to 58% in fz3 by revised zone outlines and Brownfield; need to consider residual risk (mitigation measures), sustainable development objectives, etc. | | |
| **Recommendations:** | **According to the National Flood Zone Map all of the site of this site is located within FZ3. When compared to the revised flood zones, 41% of the site is in flood zone 1 and therefore this area may be suitable for development in flood risk terms, 58% of the site remains in flood zone 3. No modelling results are currently available to provide an indicative flood depth.**<br><br>**If the Council has to consider this sites suitability for development, they should ensure that they have sufficient information to assess the need for development and to address element a. of the Exceptions Test.**<br><br>**Consider water compatible land use for Flood Zone 3 areas.**<br><br>**A Flood Risk Assessment will be required to assess other sources of flooding and any mitigation measures required for potential development.** | | |

| Site: | OP14: Land between Helsby Street and Salisbury Street | | |
|---|---|---|---|
| Size (ha): | 1 | | |
| Reference: | Urban Potential Study 2006 (Site 222) | | |
| Catchment: | Mersey | | |
| National Flood Zones: | FZ1 –4% | FZ2 – 66% | FZ3 – 30% |
| Revised flood zones (Mersey): | fz1 – 100% | fz2 – 0% | fz3 – 0% |
| Indicative depth of Inundation (m): | No flooding predicted by recent modelling | | |
| Defended: | No | | |
| Historical flooding / Drainage on site: | No site specific record of flooding | | |
| Soil Type | Urbanised. No soils information is available. | | |
| Indicative Suitability for SuDs | Unknown | | |
| Brown / Greenfield: | Brownfield | | |
| Additional information: | -- | | |
| Exception Test applicable: | Yes – until flood zones are revised and if Flood Zone 2 areas are used for highly vulnerable development or if Flood Zone 3 areas are used for essential infrastructure or more vulnerable development | | |
| Likelihood of passing Test if Applied: | **HIGH** – 30% in FZ3 but 100% in fz1 by revised flood outlines and Brownfield; need to consider residual risk (mitigation measures), sustainable development objectives, etc.<br>**N/A** if revised flood outlines adopted | | |
| **Recommendations:** | **According to the National Flood Zone Map only 4% of the site is in Flood Zone 1. When compared to the revised flood zones, this increases to all of the site being in fz1 and therefore all of the site may be suitable for development in flood risk terms.**<br><br>**A Flood Risk Assessment will be required to assess other sources of flooding and any mitigation measures required for potential development.** | | |

| Site: | OP20: South of Centre Park, Arpley Meadows | | |
|---|---|---|---|
| Size (ha): | 8.2 | | |
| Reference: | Urban Potential Study 2006 (Site 129) | | |
| Catchment: | Mersey | | |
| National Flood Zones: | FZ1 –0% | FZ2 –0% | FZ3 – 100% |
| Revised flood zones (Mersey): | fz1 – 0% | fz2 – <1% | fz3 – >99% |
| Indicative depth of Inundation (m): | Max > 1.5m | Average > 1.5m | |
| Defended: | No | | |
| Historical flooding / Drainage on site: | No site specific record of flooding | | |
| Soil Type | Urbanised. No soils information is available | | |
| Indicative Suitability for SuDs | Unknown | | |
| Brown / Greenfield: | Brownfield | | |
| Additional information: | -- | | |
| Exception Test applicable: | Yes – if site is used for essential infrastructure or more vulnerable development | | |
| Likelihood of passing Test if Applied: | **LOW** – 100% in FZ3 and more than 99% in fz3 by revised zone outlines but Brownfield; need to consider residual risk (mitigation measures), sustainable development objectives, etc. | | |
| **Recommendations:** | **According to the National Flood Zone Map all of this site is located within FZ3. When compared to the revised flood zones, more than 99% of the site is in fz3 and the average depth of flood is more than 1.5m.**<br><br>**Lower risk sites should be considered in preference to this one.**<br><br>**If the Council has to consider this sites suitability for development, they should ensure that they have sufficient information to assess the need for development and to address element a. of the Exceptions Test.**<br><br>**Consider water compatible land use for site.**<br><br>**A Flood Risk Assessment will be required to assess other sources of flooding and any mitigation measures required for potential development.** | | |

| Site: | OP21: Land at junction of Gainsborough Road/Chester Road | | |
|---|---|---|---|
| Size (ha): | 0.4 | | |
| Reference: | Urban Potential Study (Site 229) | | |
| Catchment: | Mersey | | |
| National Flood Zones: | FZ1 –99% | FZ2 –1% | FZ3 – 0% |
| Revised flood zones (Mersey): | fz1 – 100% | fz2 – 0% | fz3 – 0% |
| Indicative depth of Inundation (m): | No flooding predicted by recent modelling | | |
| Defended: | No | | |
| Historical flooding / Drainage on site: | No site specific record of flooding | | |
| Soil Type | No soils information is available | | |
| Indicative Suitability for SuDs | Unknown | | |
| Brown / Greenfield: | Greenfield | | |
| Additional information: | -- | | |
| Exception Test applicable: | Yes – until flood zones are revised and if Flood Zone 2 areas (current zones) are used for highly vulnerable development. | | |
| Likelihood of passing Test if Applied: | **HIGH** – at least 99% in FZ1; need to consider residual risk (mitigation measures), sustainable development objectives, etc.<br>**N/A** if revised flood outlines adopted. | | |
| **Recommendations:** | **According to the National Flood Zone Map 99% of the site is in Flood Zone 1 and therefore may be suitable for development in flood risk terms. When compared to the revised flood zones, this increases to all of the site being in fz1.**<br><br>**A Flood Risk Assessment is recommended to assess other sources of flooding. However, because the site footprint is less than 1 ha if the revised flood zones are adopted, a Flood Risk Assessment would not be required.** | | |

| Site: | OP22: Furnish with Flair Site, Wilderspool | | |
|---|---|---|---|
| Size (ha): | 0.2 | | |
| Reference: | Urban Potential Study (Site 171) | | |
| Catchment: | Mersey | | |
| National Flood Zones: | FZ1 –0% | FZ2 –0% | FZ3 – 100% |
| Revised flood zones (Mersey): | fz1 – 0% | fz2 – 0% | fz3 – 100% |
| Indicative depth of Inundation (m): | No depth results available | | |
| Defended: | No | | |
| Historical flooding / Drainage on site: | No site specific record of flooding | | |
| Soil Type | Urbanised. No soils information is available | | |
| Indicative Suitability for SuDs | Unknown | | |
| Brown / Greenfield: | Brownfield | | |
| Additional information: | -- | | |
| Exception Test applicable: | Yes – if site is used for essential infrastructure or more vulnerable development | | |
| Likelihood of passing Test if Applied: | **LOW**– 100% in FZ3 but Brownfield; need to consider residual risk (mitigation measures), sustainable development objectives, etc. | | |
| **Recommendations:** | **According to the National Flood Zone Map and the revised flood zones all of this site is located within FZ3. No modelling results are currently available to provide an indicative flood depth.**<br><br>**Lower risk sites should be considered in preference to this one.**<br><br>**If the Council has to consider this sites suitability for development, they should ensure that they have sufficient information to assess the need for development and to address element a. of the Exceptions Test.**<br><br>**Consider water compatible land use for site.**<br><br>**A Flood Risk Assessment will be required to assess other sources of flooding and any mitigation measures required for potential development.** | | |

| Site: | OP23: Greenall's Car Park (North Side) | | |
|---|---|---|---|
| Size (ha): | 0.2 | | |
| Reference: | Urban Potential Study (Site 171) | | |
| Catchment: | Mersey | | |
| National Flood Zones: | FZ1 –0% | FZ2 –0% | FZ3 – 100% |
| Revised flood zones (Mersey): | fz1 – 0% | fz2 – 0% | fz3 – 100% |
| Indicative depth of Inundation (m): | No depth results available | | |
| Defended: | No | | |
| Historical flooding / Drainage on site: | No site specific record of flooding | | |
| Soil Type | Urbanised. No soils information is available | | |
| Indicative Suitability for SuDs | Unknown | | |
| Brown / Greenfield: | Brownfield | | |
| Additional information: | -- | | |
| Exception Test applicable: | Yes – if site is used for essential infrastructure or more vulnerable development | | |
| Likelihood of passing Test if Applied: | **LOW**– 100% in FZ3 but Brownfield; need to consider residual risk (mitigation measures), sustainable development objectives, etc. | | |
| **Recommendations:** | **According to the National Flood Zone Map and the revised flood zones all of this site is located within FZ3. No modelling results are currently available to provide an indicative flood depth.**<br><br>**Lower risk sites should be considered in preference to this one.**<br><br>**If the Council has to consider this sites suitability for development, they should ensure that they have sufficient information to assess the need for development and to address element a. of the Exceptions Test.**<br><br>**Consider water compatible land use for site.**<br><br>**A Flood Risk Assessment will be required to assess other sources of flooding and any mitigation measures required for potential development.** | | |

| **Site:** | **OP29: J&G Greenall's Distillery, Lousher's Lane** | | |
|---|---|---|---|
| Size (ha): | 4.2 | | |
| Reference: | Urban Potential Study (Site 131) | | |
| Catchment: | Mersey | | |
| National Flood Zones: | FZ1 –0% | FZ2 –0% | FZ3 – 100% |
| Revised flood zones (Mersey): | fz1 – 20% | fz2 – 1% | fz3 – 79% |
| Indicative depth of Inundation (m): | No depth results available | | |
| Defended: | No | | |
| Historical flooding / Drainage on site: | No site specific record of flooding | | |
| Soil Type | Urbanised. No soils information is available | | |
| Indicative Suitability for SuDs | Unknown | | |
| Brown / Greenfield: | Brownfield | | |
| Additional information: | -- | | |
| Exception Test applicable: | Yes – if Flood Zone 3 areas are used for essential infrastructure or more vulnerable development or if Flood Zone 2 areas are used for highly vulnerable development | | |
| Likelihood of passing Test if Applied: | **MEDIUM/LOW** – 100% in FZ3 decreasing to 79% in fz3 by revised zone outlines and Brownfield; need to consider residual risk (mitigation measures), sustainable development objectives, etc. | | |
| **Recommendations:** | **According to the National Flood Zone Map all of this site is located within FZ3. When compared to the revised flood zones, 20% of the site is in fz1 and therefore this area may be suitable for development in flood risk terms. 79% of the site remains in fz3. No modelling results are currently available to provide an indicative flood depth.**<br><br>**If the Council has to consider this sites suitability for development, they should ensure that they have sufficient information to assess the need for development and to address element a. of the Exceptions Test.**<br><br>**Lower risk sites should be considered in preference to this one. Consider water compatible land use for site.**<br><br>**A Flood Risk Assessment will be required to assess other sources of flooding and any mitigation measures required for potential development.** | | |

| Site: | OP30: Greenall's Depot, Off Lousher's Lane | | |
|---|---|---|---|
| Size (ha): | 2.4 | | |
| Reference: | Urban Potential Study (Site 134) | | |
| Catchment: | Mersey | | |
| National Flood Zones: | FZ1 –0% | FZ2 –0% | FZ3 – 100% |
| Revised flood zones (Mersey): | fz1 – 0% | fz2 – 0% | fz3 – 100% |
| Indicative depth of Inundation (m): | No depth results available | | |
| Defended: | No | | |
| Historical flooding / Drainage on site: | No site specific record of flooding | | |
| Soil Type | Urbanised. No soils information is available | | |
| Indicative Suitability for SuDs | Unknown | | |
| Brown / Greenfield: | Brownfield | | |
| Additional information: | -- | | |
| Exception Test applicable: | Yes – if site is used for essential infrastructure or more vulnerable development | | |
| Likelihood of passing Test if Applied: | **LOW**– 100% in FZ3 but Brownfield; need to consider residual risk (mitigation measures), sustainable development objectives, etc. | | |
| **Recommendations:** | **According to the National Flood Zone Map and the revised flood zones all of this site is located within FZ3. No modelling results are currently available to provide an indicative flood depth.**<br><br>**Lower risk sites should be considered in preference to this one.**<br><br>**If the Council has to consider this sites suitability for development, they should ensure that they have sufficient information to assess the need for development and to address element a. of the Exceptions Test.**<br><br>**Consider water compatible land use for site.**<br><br>**A Flood Risk Assessment will be required to assess other sources of flooding and any mitigation measures required for potential development.** | | |

| Site: | OP32: Former Dairy Works, Knutsford Road | | |
|---|---|---|---|
| Size (ha): | 0.2 | | |
| Reference: | Urban Potential Study (Site 224) | | |
| Catchment: | Mersey | | |
| National Flood Zones: | FZ1 –0% | FZ2 –0% | FZ3 – 100% |
| Revised flood zones (Mersey): | fz1 – 0% | fz2 – 0% | fz3 – 100% |
| Indicative depth of Inundation (m): | Max < 1.5m | Average < 1.5m | |
| Defended: | No | | |
| Historical flooding / Drainage on site: | No site specific record of flooding | | |
| Soil Type | Urbanised. No soils information is available | | |
| Indicative Suitability for SuDs | Unknown | | |
| Brown / Greenfield: | Brownfield | | |
| Additional information: | -- | | |
| Exception Test applicable: | Yes – if site is used for essential infrastructure or more vulnerable development | | |
| Likelihood of passing Test if Applied: | **LOW**– 100% in FZ3 but Brownfield; need to consider residual risk (mitigation measures), sustainable development objectives, etc. | | |
| **Recommendations:** | **According to the National Flood Zone Map and the revised flood zones all of this site is located within FZ3. The average depth of flooding is less than 1.5m but more than 1m.**<br><br>**Lower risk sites should be considered in preference to this one.**<br><br>**If the Council has to consider this sites suitability for development, they should ensure that they have sufficient information to assess the need for development and to address element a. of the Exceptions Test.**<br><br>**Consider water compatible land use for site.**<br><br>**A Flood Risk Assessment will be required to assess other sources of flooding and any mitigation measures required for potential development.** | | |

| **Site:** | **OP33: Colas UK, Lousher's Lane** | | |
|---|---|---|---|
| Size (ha): | 1.5 | | |
| Reference: | Urban Potential Study (Site 314) | | |
| Catchment: | Mersey | | |
| National Flood Zones: | FZ1 –0% | FZ2 –0% | FZ3 – 100% |
| Revised flood zones (Mersey): | fz1 – 0% | fz2 – 0% | fz3 – 100% |
| Indicative depth of Inundation (m): | No depth results available | | |
| Defended: | No | | |
| Historical flooding / Drainage on site: | No site specific record of flooding | | |
| Soil Type | Urbanised. No soils information is available | | |
| Indicative Suitability for SuDs | Unknown | | |
| Brown / Greenfield: | Brownfield | | |
| Additional information: | -- | | |
| Exception Test applicable: | Yes – if site is used for essential infrastructure or more vulnerable development | | |
| Likelihood of passing Test if Applied: | **LOW**– 100% in FZ3 but Brownfield; need to consider residual risk (mitigation measures), sustainable development objectives, etc. | | |
| **Recommendations:** | **According to the National Flood Zone Map and the revised flood zones all of this site is located within FZ3. No modelling results are currently available to provide an indicative flood depth.**<br><br>**Lower risk sites should be considered in preference to this one.**<br><br>**If the Council has to consider this sites suitability for development, they should ensure that they have sufficient information to assess the need for development and to address element a. of the Exceptions Test.**<br><br>**Consider water compatible land use for site.**<br><br>**A Flood Risk Assessment will be required to assess other sources of flooding and any mitigation measures required for potential development.** | | |

| Site: | OP47: Orford Park | | |
|---|---|---|---|
| Size (ha): | 28.6 | | |
| Reference: | WBC | | |
| Catchment: | Longbrook | | |
| National Flood Zones: | FZ1 –11% | FZ2 –6% | FZ3 – 83% |
| Revised flood zones (Sankey Brook): | fz1 – 2% | fz2 – 57% | fz3 – 41% |
| Indicative depth of Inundation (m): | Max > 1.5m | Average < 1.5m | |
| Defended: | No | | |
| Historical flooding / Drainage on site: | No site specific record of flooding | | |
| Soil Type | No soils information is available. | | |
| Indicative Suitability for SuDs | Unknown | | |
| Brown / Greenfield: | Greenfield | | |
| Additional information: | Other assets info - Culvert, condition: 2. Regraded channel, condition: 3 | | |
| Exception Test applicable: | Yes – if Flood Zone 2 areas are used for highly vulnerable development or if Flood Zone 3 areas are used for essential infrastructure or more vulnerable development | | |
| Likelihood of passing Test if Applied: | **MEDIUM/LOW** – 83% in FZ3 decreasing to 41% in fz3 by revised zone outlines but only 2% in fz1 and Greenfield; need to consider residual risk (mitigation measures), sustainable development objectives, etc. | | |
| **Recommendations:** | **According to the National Flood Zone Map, 11% of the site is in Flood Zone 1 and this area may therefore be suitable for development in flood risk terms. When compared to the revised flood zone this decreases to only 2% being in fz1, implying that a lower risk site should be considered in preference to this one. However the proportion of the site in FZ3, also decreases from 83% to 41%. The average depth of flood is less than 1.5m but more than 1m.**<br><br>**If the Council has to consider this sites suitability for development, they should ensure that they have sufficient information to assess the need for development and to address elements a. and b. of the Exceptions Test.**<br><br>**Consider water compatible land use for Flood Zone 3 areas of the site.**<br><br>**A Flood Risk Assessment will be required to assess other sources of flooding and any mitigation measures required for potential development.**<br><br>**Warrington Borough Council's Executive Board decision of the 9th October 2006 confirms that little significant weight can be attached to the safeguarded route for the Long Lane Diversion (see potential development site: T5: Long Lane Diversion) when considering the emerging development proposals for Orford Park.** | | |

| **Site:** | **T4: Bridgfoot Bypass** | | |
|---|---|---|---|
| Length (km): | 0.6 | | |
| Reference: | UDP: LUT19 | | |
| Catchment: | Mersey | | |
| National Flood Zones: | FZ1 – 0% | FZ2 – 0% | FZ3 – 100% |
| Revised flood zones (Mersey): | fz1 – 8% | fz2 – 0% | Rev fz3 – 92% |
| Indicative depth of Inundation (m): | Max > 1.5m | Average < 1.5m | |
| Defended: | No | | |
| Historical flooding / Drainage on site: | No site specific record of flooding | | |
| Soil Type | No soils information is available. Mainly urbanised. | | |
| Indicative Suitability for SuDs | Unknown | | |
| Brown / Greenfield: | Mostly Brownfield | | |
| Additional information: | Work undertaken on the original scheme revealed higher than expected costs which meant that the identified benefits could not be delivered within the original Transport bid. The scheme is therefore currently under review and the need for consideration of a fully strategic solution has become apparent. The land for the original scheme is, however, still safeguarded by UDP Policy LUT19. | | |
| Exception Test applicable: | Yes – if the bypass is considered essential infrastructure. | | |
| Likelihood of passing Test if Applied: | **LOW** – 100% in FZ3 and 92% in fz3 by revised zone outlines; need to consider residual risk (mitigation measures), sustainable development objectives, etc. | | |
| **Recommendations:** | **According to the National Flood Zone Maps all of the site is in FZ3. When compared to the revised flood zone outlines, this decreases to 92% being in flz3. 8% of the site becomes fz1 and this area may therefore be suitable for development in flood risk terms. The average deep of flood is less than 1.5m but more than 1m.**<br><br>**It is acknowledged that this site shows an indicative road alignment for a bypass so its location cannot be changed in favour of lower risk sites.**<br><br>**The indicative road alignment is already shown in the adopted Development Plan, but If the Council decides to proceed with this development, they should assess the need for development through the spatial planning process and address element a. of the Exceptions Test.**<br><br>**A Flood Risk Assessment will be required to assess other sources of flooding and any mitigation measures required for potential development.** | | |

| Site: | T5: Long Lane Diversion | | |
|---|---|---|---|
| Length (km)): | 1.5 | | |
| Reference: | UDP: LUT19 | | |
| Catchment: | Mersey | | |
| National Flood Zones: | FZ1 – 5% | FZ2 – 7% | FZ3 – 88% |
| Revised flood zones (Sankey Brook): | fz1 – 14% | fz2 – 65% | fz3 – 21% |
| Indicative depth of Inundation (m): | Max < 1.5m | Average < 1m | |
| Defended: | No | | |
| Historical flooding / Drainage on site: | No site specific record of flooding | | |
| Soil Type | No soils information is available. Mainly urbanised. | | |
| Indicative Suitability for SuDs | Unknown | | |
| Brown / Greenfield: | Mixed green and brown field areas | | |
| Additional information: | | | |
| Exception Test applicable: | Yes – if the bypass is considered essential infrastructure. | | |
| Likelihood of passing Test if Applied: | **MEDIUM** – 88% in FZ3 and 23% in fz3 by revised zone outlines; need to consider residual risk (mitigation measures), sustainable development objectives, etc. | | |
| **Recommendations:** | **According to the National Flood Zone Map, 5% of the site is in FZ1 and therefore may be suitable for development in flood risk terms. When compared to the revised flood zone this increases to 14% being in fz1. However the proportion of the site in FZ3, also decreases from 88% to 21%. The average depth of flood is less than 1m.**<br><br>**It is acknowledged that this development is an indicative road alignment so its location cannot be changed in favour of lower risk sites.**<br><br>**The indicative road alignment is already shown in the adopted Development Plan, but if the Council decides to proceed with this development, they should assess the need for development through the spatial planning process and address elements a. and b. of the Exceptions Test.**<br><br>**A Flood Risk Assessment will be required to assess other sources of flooding and any mitigation measures required for potential development.**<br><br>**Warrington Borough Council's Executive Board decision of the 9th October 2006 confirms that little significant weight can be attached to the safeguarded route for the Long Lane Diversion when considering the emerging development proposals for Orford Park (see potential development site OP47: Orford Park).** | | |

## 3.5 Inner Warrington: Sites with Planning Permission within the Flood Zone

The following sites are located partially or wholly in the flood risk zones and currently undeveloped but have been awarded planning permission. Normally sites of this nature would not be included in an SFRA as once a site has been awarded planning permission as it is not possible to retrospectively apply the Sequential Test. However it was felt appropriate to do so here, primarily to highlight the flood risks posed and inform the remaining development stages but also to provide the information required should planning permission lapse on any site and it becomes possible to apply the Sequential Test.

| Site | Site Ref | Area (ha) | Catchment | FZ1 (%) | FZ2 (%) | FZ3 (%) | Rev FZ1 | Rev FZ2 | Rev FZ3 |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | |
| **Housing Sites** | | | | | | | | | |
| | | | | | | | | | |
| Howley Quay | 1101/ APAS25 | 0.58 | Mersey | 0% | 0% | 100% | 0% | 0% | 100% |
| Edwards Cheshire, Navigation S | 1108/ APAS27 | 0.43 | Mersey | 0% | 0% | 100% | 0% | 0% | 100% |
| Workshop between 56&58 Oxfor | 913 | 0.02 | Mersey | 0% | 0% | 100% | 0% | 0% | 100% |
| Adj 414 Knutsford Road | 1019 | 0.08 | Mersey | 0% | 0% | 100% | 0% | 0% | 100% |
| The 2nd Hand Shop, 15 Wash Ln | 1125 | 0.01 | Mersey | 0% | 0% | 100% | 0% | 55% | 45% |
| Springbank Service Station | 1104 | 0.08 | Mersey | 0% | 0% | 100% | 38% | 56% | 6% |
| 152 Wilderspool Causeway | 1117 | 0.01 | Mersey | 0% | 0% | 100% | 0% | 0% | 100% |
| 102/102A Wilderspool Causeway | 1138 | 0.02 | Mersey | 0% | 0% | 100% | 0% | 0% | 100% |
| 30 Arpley Street | 1159 | 0.01 | Mersey | 0% | 100% | 0% | 100% | 0% | 0% |
| 35 Dixon Street | 1206 | 0.01 | Mersey | 0% | 60% | 40% | 100% | 0% | 0% |
| Former Christadelphian Hall | 1211 | 0.06 | Mersey | 0% | 100% | 0% | 100% | 0% | 0% |
| 5 Hanover Street | 1218 | 0.01 | Mersey | 17% | 83% | 0% | 100% | 0% | 0% |
| Land at Western end of Greenall's Avenue | 1262 | 0.83 | Lumb Brook | 98% | 1% | 1% | 98% | 2% | 0% |
| Hallfields Service Station | 598 | 0.14 | Longford Brook | 10% | 90% | 0% | 100% | 0% | 0% |
| Land of Orford War Memorial | 1030 | 0.22 | Longford Brook | 32% | 68% | 0% | 100% | 0% | 0% |
| Land to r/o 2-12 Nora Street | 1107 | 0.05 | Mersey | 0% | 0% | 100% | 0% | 0% | 100% |
| 26 Salisbury Street | 1110 | 0.05 | Mersey | 0% | 0% | 100% | 100% | 0% | 0% |
| Land to r/o 25-29 Church Street | 1133 | 0.18 | Mersey | 0% | 0% | 100% | 0% | 70% | 30% |
| Land adj to 144-148 Longshaw S | 1226 | 0.09 | Dallam Brook | 0% | 100% | 0% | 100% | 0% | 0% |
| Marsden Vanplan Ltd | 1235 | 1.77 | Dallam Brook | 31% | 62% | 7% | 100% | 0% | 0% |
| The Caravan Park, Gorsey Lane | 1242 | 0.07 | Mersey | 0% | 100% | 0% | 100% | 0% | 0% |
| 8 Thelwall Lane | 1209 | 0.01 | Mersey | 0% | 100% | 0% | 100% | 0% | 0% |
| | | | | | | | | | |
| **Employment Sites:** | | | | | | | | | |
| | | | | | | | | | |
| Gateway 49, Kerfoot Street | 204B | 2.4 | Mersey | 78% | 22% | 0% | 100% | 0% | 0% |
| Mr Smiths Car Park | 219 | 0.14 | Mersey | 0% | 0% | 100% | 0% | 0% | 100% |
| JMD Midlands Ltd | 221 | 0.46 | Longford Brook | 85% | 15% | 0% | 100% | 0% | 0% |
| Sterile Technologies (Treatment Centre) | 238 | 1.12 | Longford Brook | 96% | 4% | 0% | 100% | 0% | 0% |
| Edward Cheshire Ltd | 241 | 0.09 | Mersey | 0% | 0% | 100% | 0% | 0% | 100% |
| 55 Wilson Patten Street | 256 | 0.16 | Mersey | 0% | 0% | 100% | 0% | 12% | 88% |

| Site | Site Ref | Area (ha) | Catchment | FZ1 (%) | FZ2 (%) | FZ3 (%) | Rev FZ1 | Rev FZ2 | Rev FZ3 |
|---|---|---|---|---|---|---|---|---|---|
| Warrington Fabrications Co Ltd | 269 | 0.69 | Mersey | 0% | 0% | 100% | 6% | 74% | 20% |
| | | | | | | | | | |
| **Urban Regeneration Sites:** | | | | | | | | | |
| | | | | | | | | | |
| Edward Cheshire Ltd, Navigation Street | 241 | 0.09 | Mersey | 0% | 0% | 100% | 0% | 0% | 100% |
| Farrell Street | 1092 | 11.3 | Mersey | 0% | 0% | 100% | 0% | 0% | 100% |

## 3.6 Sankey and Penketh

This covers the area to the west of Inner Warrington. The River Mersey meanders across the southern side of the area and poses a substantial risk from tidal flooding to the surrounding area. The area is crossed by three of the Mersey's main tributaries; Sankey Brook, Whittle and Penketh Brooks. Barrow's Green Brook and Barrow Brook, which are tributaries of Penketh Brook and Whittle Brook, also flow through this area.

Recent EA studies for the Sankey area, Sankey Strategy (JBA 2006), have provided an updated flood outline. These revised outlines, along with the Flood Zones are shown on the maps and used in the classification of Potential Development Sites in the vicinity of Sankey Brook.

Many of the watercourses in this area are heavily culverted and parts of Whittle Brook are formally defended. Any development proposal in the area should consider the condition of these assets and the associated residual risk.

The Environment Agency's Historical Flood Map indicates that a large area to the south side of the Mersey, in between Arpley Landfill site and Moss Side Farm, was subject to tidal flooding in February 1990.

### 3.6.1 Sankey and Penketh: Flood Zone 1

The following sites are located in Flood Zone 1 and are not, therefore, considered to be at significant risk to fluvial or tidal flooding. Other sources of flood risk, such as overland flow routes or groundwater, will still need to be considered by potential developers. A Flood Risk Assessment, appropriate to the scale nature and location of the development, will be required for all developments greater than **1 ha** in size.

| Site | Site Ref | Policy | Area (ha) | Catchment |
|---|---|---|---|---|
| | | | | |
| **Other Potential Development Sites:** | | | | |
| OP1: Dawson House, Liverpool Road | 187 | n/a | 5.8 | Whittle Brook |
| OP2: Littledale Road, Whittle Hall | 192 | n/a | 0.8 | Whittle Brook |
| OP3: Land rear of Sportsmans Pub | 167 | n/a | 0.3 | Penketh Brook |
| | | | | |

## 3.7 Sankey and Penketh: Flood Zones 2 & 3

None of the potential development sites in this area are located in Flood Zones 2 or 3.

## 3.8 Sankey and Penketh: Sites with Planning Permission within the Flood Zone

The following sites are located partially or wholly in the flood risk zones and currently undeveloped but have been awarded planning permission. Normally sites of this nature would not be included in an SFRA as once a site has been awarded planning permission as it is not possible to retrospectively apply the Sequential Test. However it was felt appropriate to do so here, primarily to highlight the flood risks posed and inform the remaining development stages but also to provide the information required should planning permission lapse on any site and it becomes possible to apply the Sequential Test .

| Site | Site Ref | Area (ha) | Catchment | FZ1 (%) | FZ2 (%) | FZ3b (%) | Rev FZ1 | Rev FZ2 | Rev FZ3 |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | |
| **Housing Sites** | | | | | | | | | |
| 32 Mill Avenue | 948 | 0.06 | Whittle Brook | 0% | 100% | 0% | 100% | 0% | 0% |
| Eagle Sports Club | 1114 | 0.4 | Whittle Brook | 55% | 45% | 0% | 100% | 0% | 0% |
| Land at 'Oakmount' | 954 | 0.12 | Penketh Brook | 96% | 4% | 0% | 100% | 0% | 0% |
| Land between 32&34 Neville Crescent | 1053 | 0.04 | Whittle Brook | 0% | 7% | 93% | 100% | 0% | 0% |
| | | | | | | | | | |

## 3.9 Burtonwood, Winwick, Westbrook, Gemini and Bewsey

This area is located on the north west side of the borough. The most significant source of flood risk, as indicated by the Flood Zone, is Sankey Brook which flows through the urban areas of Gemini and Dallam, to join the Mersey. The area also includes numerous tributaries to Sankey Brook, including Phipps Brook, Causey Brook, Dallam Brook, Mill Brook and North Park Brook.

Many of the watercourses in the area are culverted and there are some formal, raised defences on Sankey Brook. Any development proposal in the vicinity of any watercourse will have to consider the condition of these assets and the associated residual risk.

The Environment Agency's Historical Flood Map indicates that areas of Dallam located in between Sankey and Dallam Brooks were affected by flooding in October 2000.

There is one 'major developed site in the greenbelt' in this area which falls under policy GRN8 in the Warrington UDP. Policy GRN8 is intended to give some leeway to sites that pre-date the greenbelt designation to undertake limited redevelopment or infilling. The site in this area is located in Newton-le-Willows and is located in Flood Zone 1 according to both sets of Flood Zone outlines.

### 3.9.1 Burtonwood, Winwick, Westbrook, Gemini and Bewsey: Flood Zone 1

The following sites are located in Flood Zone 1 and are not, therefore, considered to be at significant risk to fluvial or tidal flooding. Other sources of flood risk, such as overland flow routes or groundwater, will still need to be considered by potential developers. A Flood Risk Assessment, appropriate to the scale nature and location of the development, will be required for all developments greater than **1 ha** in size.

| Site | Site Ref | Policy | Area (ha) | Catchment |
|---|---|---|---|---|
| | | | | |
| **Sites for Potential Housing Development:** | | | | |
| H2: KW8 N Tourney Green North | 261/PAS2 | DCS1 | 2.8 | North Park Brook |
| | | | | |
| **Sites for Potential Employment Development:** | | | | |
| E19: Phipps Lane Industrial Estate | 64 | n/a | 0.2 | Phipps Brook |
| E3: Omega South (Phases 3,4&5) | Phase 3,4&5/APA | EMP2 | 129 | Barrow Brook |
| E4: South of Westbrook Police stat | 215/APAS4 | DCS1 | 6.39 | North Park Brook |
| E15: Lingley Mere | 15A/APAS4 &6 | EMP3 | 25 | Barrow Brook |
| T2: Chapelford Railway Station | APAS2 | LUT8 | n/a | Whittle Brook |
| | | | | |

## 3.10 Burtonwood, Winwick, Westbrook, Gemini and Bewsey: Flood Zones 2 & 3

| **Site:** | **E18: Europa Boulevard** | | |
|---|---|---|---|
| Size (ha): | 0.46 | | |
| Reference: | Employment Land Study (Site 30d) | | |
| Catchment: | Sankey Brook | | |
| National Flood Zones: | FZ1 – 0% | FZ2 –0% | FZ3 –100% |
| Revised flood zones (Sankey Brook): | fz1 – 22% | fz2 – 15% | fz3 –63% |
| Indicative depth of Inundation (m): | Max < 1.5m | Average < 1m | |
| Defended: | No | | |
| Historical flooding / Drainage on site: | No site specific record of flooding | | |
| Soil Type | Mostly stoneless clayey, fine silty and fine loamy soils affected by ground water. | | |
| Indicative Suitability for SuDs | Low | | |
| Brown / Greenfield: | Brownfield | | |
| Additional information: | -- | | |
| Exception Test applicable: | No – if site is used for less vulnerable development as indicated. i.e. employment<br>Yes – if Flood Zone 3 areas are used for essential infrastructure or more vulnerable development or if revised flood zones are adopted and flood zone 2 areas are used for highly vulnerable development or | | |
| Likelihood of passing Test if Applied: | **MEDIUM** – 100% in FZ3 but decreasing to 63% in fz3 by revised zone outlines and Brownfield; need to consider residual risk (mitigation measures), sustainable development objectives, etc. | | |
| **Recommendations:** | **According to the National Flood Zone Maps all of the site is in FZ3. When compared to the revised flood zone outlines, this decreases to 63% being in fz3. 22% of the site moves to being in fz1 and this area may therefore be suitable for development in flood risk terms. The average depth of flood is less than 1m.**<br><br>**If the Council has to consider this sites suitability for development, they should ensure that they have sufficient information to assess the need for development and to address element a. of the Exceptions Test.**<br><br>**Consider water compatible land use for Flood Zone 3 areas.**<br><br>**A Flood Risk Assessment will be required to assess other sources of flooding and any mitigation measures required for potential development.** | | |

| **Site:** | **OP5: Bewsey Old Hall** | | |
|---|---|---|---|
| Size (ha): | 1.3 | | |
| Reference: | Urban Potential Study (Site 141) | | |
| Catchment: | North Park Brook | | |
| National Flood Zones: | FZ1 – 90% | FZ2 –10% | FZ3 – 0% |
| Revised flood zones (Sankey Brook): | fz1 – 100% | fz2 – 0% | fz3 – 0% |
| Indicative depth of Inundation (m): | No flooding predicted by recent modelling | | |
| Defended: | Partially – Man-made raised defence at Bewsey Railway Bridge, condition: 2 | | |
| Historical flooding / Drainage on site: | No site specific record of flooding | | |
| Soil Type | No soils information is available | | |
| Indicative Suitability for SuDs | Unknown | | |
| Brown / Greenfield: | Mostly Brownfield | | |
| Additional information: | -- | | |
| Exception Test applicable: | Yes – until flood zones are revised and if Flood Zone 2 areas are used for highly vulnerable development. | | |
| Likelihood of passing Test if Applied: | **HIGH** – at least 90% of site in FZ1 and mostly Brownfield; need to consider residual risk (mitigation measures), sustainable development objectives, etc. | | |
| **Recommendations:** | **According to the National Flood Zone Maps 90% of the site is in FZ1 and therefore this area may be suitable for development in flood risk terms. When compared to the revised flood zone outlines this increases to all of the site.**<br><br>**A Flood Risk Assessment will be required to assess other sources of flooding.** | | |

| Site: | OP45: Gemini Washlands | | |
|---|---|---|---|
| Size (ha): | 17 | | |
| Reference: | WBC | | |
| Catchment: | Sankey Brook | | |
| National Flood Zones: | FZ1 – 0% | FZ2 –0% | FZ3 – 100% |
| Revised flood zones (Sankey Brook): | fz1 – 6% | fz2 – <1% | fz3 – >93% |
| Indicative depth of Inundation (m): | Max > 1.5m | Average < 1.5m | |
| Defended: | Partially Culverted Channel | | |
| Historical flooding / Drainage on site: | No site specific record of flooding | | |
| Soil Type | Partly un surveyed<br>Partly stoneless clayey, fine silty and fine loamy soils affected by ground water.<br>Partly coarse loamy, very acid upland soils over rock with wet peaty surface. | | |
| Indicative Suitability for SuDs | Low | | |
| Brown / Greenfield: | Greenfield | | |
| Additional information: | -- | | |
| Exception Test applicable: | Yes – if Flood Zone 2 areas are used for highly vulnerable development or if Flood Zone 3 areas are used for essential infrastructure | | |
| Likelihood of passing Test if Applied: | **LOW**– 100% in FZ3 and more than 93% in FZ3 by revised zone outlines and is Greenfield; need to consider residual risk (mitigation measures), sustainable development objectives, etc. | | |
| **Recommendations:** | **According to the National Flood Zone Maps all of the site is in FZ3. When compared to the revised flood zone outlines, this decreases to just over 93% being in fz3. 6% of the site moves to being in fz1 and therefore this area may be suitable for development in flood risk terms. The average depth of flood is less than 1m.**<br><br>**The site is Greenfield and floods in the 10% event so should be considered Functional Floodplain, as indicated by its name.**<br><br>**Lower risk sites should be considered in preference to this one.**<br><br>**If the Council has to consider this sites suitability for development, they should ensure that they have sufficient information to assess the need for development and to address elements a. and b. of the Exceptions Test.**<br><br>**Consider water compatible land use for the site.**<br><br>**A Flood Risk Assessment will be required to assess other sources of flooding and any mitigation measures required for potential development.** | | |

## 3.11 Burtonwood, Winwick, Westbrook, Gemini & Bewsey: Sites with Planning Permission

The following sites are located partially or wholly in the flood risk zones and currently undeveloped but have been awarded planning permission. Normally sites of this nature would not be included in an SFRA as once a site has been awarded planning permission as it is not possible to retrospectively apply the Sequential Test. However it was felt appropriate to do so here, primarily to highlight the flood risks posed and inform the remaining development stages but also to provide the information required should planning permission lapse on any site and it becomes possible to apply the Sequential Test.

| Site | Site Ref | Area (ha) | Catchment | FZ1 (%) | FZ2 (%) | FZ3b (%) | Rev FZ1 | Rev FZ2 | Rev FZ3 |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | |
| **Employment Sites:** | | | | | | | | | |
| Capitol Park | 19 | 6.02 | Dallam/Mill Brook | 75% | 25% | 0% | 100% | 0% | 0% |
| (Behind Asics /HT Electrical), Europa Boulevard | 29 | 0.4 | Sankey Brook | 0% | 0% | 100% | 100% | 0% | 0% |

## 3.12 Padgate, Orford, Fearnhead and Woolston

This area is located to the north east of Inner Warrington. The National Flood Zone maps indicate that the south west corner of this area is subject to fluvial flood risk originating from Sankey Brook and its tributaries. Two other tributaries to the Mersey cross the area, that of Padgate Brook and Spittal Brook, which is fed by Cockshot and Cross Brooks. Winwick Reservoir is also located in this area.

As is the case with all areas within the borough, many of the watercourses are culverted and any development proposal in the vicinity of any water course will have to consider the condition of local assets and the associated residual risk.

The Environment Agency Historical map shows no recorded incidents in the area.

### 3.12.1 Padgate, Orford, Fearnhead and Woolston: Flood Zone 1

None of the potential development sites in this area are located entirely in Flood Zone 1.

## 3.13 Padgate, Orford, Fearnhead and Woolston: Flood Zones 2 & 3

| **Site:** | **OP37: Andover Close/Birchwood Way** | | |
|---|---|---|---|
| Size (ha): | 0.37 | | |
| Reference: | Urban Potential Study 2006 (Site 149) | | |
| Catchment: | Padgate Brook | | |
| National Flood Zones: | FZ1 – 85% | FZ2 – 10% | FZ3 – 5% |
| Indicative depth of Inundation (m): | No modelling available | | |
| Defended: | No | | |
| Historical flooding / Drainage on site: | No site specific record of flooding | | |
| Soil Type | No soils information is available | | |
| Indicative Suitability for SuDs | Unknown | | |
| Brown / Greenfield: | Greenfield | | |
| Additional information: | As there is no revised outline specifically for Padgate Brook it is uncertain whether flood risk at the site would actually be reduced, as suggested by the revised flood outline for Sankey Brook. Hence the site is categorised according to the current National Flood Zone Map only.<br><br>Other asset info – culvert, condition: 2 | | |
| Exception Test applicable: | Yes – if Flood Zone 2 areas are used for highly vulnerable development or if Flood Zone 3 areas are used for essential infrastructure or more vulnerable development | | |
| Likelihood of passing Test if Applied: | **HIGH** – 85% in FZ1; need to consider residual risk (mitigation measures), sustainable development objectives, etc. | | |
| **Recommendations:** | **According to the National Flood Zone Maps 85% of the site is in FZ1 and this area may therefore be suitable for development in flood risk terms.**<br><br>**If the Council has to consider this sites suitability for development, they should ensure that they have sufficient information to assess the need for development and to address elements a. and b. of the Exceptions Test.**<br><br>**Consider water compatible land use for flood zone 3 areas.**<br><br>**A Flood Risk Assessment will be required to assess other sources of flooding and any mitigation measures required for potential development.** | | |

| Site: | OP38: Former Police Training Centre | | |
|---|---|---|---|
| Size (ha): | 8.7 | | |
| Reference: | Urban Potential Study (Site 225) | | |
| Catchment: | Padgate Brook | | |
| National Flood Zones: | FZ1 – 6% | FZ2 – 36% | FZ3 – 58% |
| Indicative depth of Inundation (m): | No modelling available | | |
| Defended: | No | | |
| Historical flooding / Drainage on site: | No site specific record of flooding | | |
| Soil Type | No soils information is available | | |
| Indicative Suitability for SuDs | Unknown | | |
| Brown / Greenfield: | Brownfield | | |
| Additional information: | As there is no revised outline specifically for Padgate Brook it is uncertain whether flood risk at the site would actually be reduced, as suggested by the revised flood outline for Sankey Brook. Hence the site is categorised according to the current National Flood Zone Map only.<br><br>Other asset info – Culverted channel, condition: 1-2 | | |
| Exception Test applicable: | Yes – if Flood Zone 2 areas are used for highly vulnerable development or if Flood Zone 3 areas are used for essential infrastructure or more vulnerable development | | |
| Likelihood of passing Test if Applied: | **MEDIUM/HIGH** – 58% in FZ3 but Brownfield; need to consider residual risk (mitigation measures), sustainable development objectives, etc. | | |
| **Recommendations:** | **According to the National Flood Zone Maps only 6% of the site is in FZ1 and this area may therefore be suitable for development in flood risk terms.**<br><br>**If the Council has to consider this sites suitability for development, they should ensure that they have sufficient information to assess the need for development and to address element a. of the Exceptions Test.**<br><br>**Consider water compatible land use for flood zone 3 areas.**<br><br>**A Flood Risk Assessment will be required to assess other sources of flooding and any mitigation measures required for potential development.** | | |

| Site: | T6: Dualling on Birchwood way | | |
|---|---|---|---|
| Length (km): | 2.3 | | |
| Reference: | APAS4&5 | | |
| Catchment: | Padgate Brook | | |
| National Flood Zones: | FZ1 – 74% | FZ2 – 13% | FZ3 – 13% |
| Revised flood zones (Sankey Brook): | fz1 – 93% | fz2 – 7% | fz3 – 0% |
| Indicative depth of Inundation (m): | Max < 1m | Average < 1m | |
| Defended: | No | | |
| Historical flooding / Drainage on site: | No site specific record of flooding | | |
| Soil Type | No soils information is available | | |
| Indicative Suitability for SuDs | Unknown | | |
| Brown / Greenfield: | Mixed green and brown field | | |
| Additional information: | -- | | |
| Exception Test applicable: | Yes – until flood zones are revised and if the development is considered essential infrastructure. | | |
| Likelihood of passing Test if Applied: | **HIGH** – at least 74% in FZ1; need to consider residual risk (mitigation measures), sustainable development objectives, etc.<br>**N/A** to revised flood zone, none of the site is fz3 and development is not highly vulnerable. | | |
| **Recommendations:** | **According to the National Flood Zone Maps, 74% of the site is in FZ1 and this area may therefore be suitable for development in flood risk terms. When compared to the revised flood zone outlines, this increases to 93% of the site and none of the site is in fz3.**<br><br>**A Flood Risk Assessment will be required to assess other sources of flooding and any mitigation measures required for potential development.** | | |

## 3.14 Padgate, Orford, Fearnhead & Woolston: Sites with Planning Permission

The following sites are located partially or wholly in the flood risk zones and currently undeveloped but have been awarded planning permission. Normally sites of this nature would not be included in an SFRA as once a site has been awarded planning permission as it is not possible to retrospectively apply the Sequential Test. However it was felt appropriate to do so here, primarily to highlight the flood risks posed and inform the remaining development stages but also to provide the information required should planning permission lapse on any site and it becomes possible to apply the Sequential Test .

| Site | Site Ref | Area (ha) | Catchment | FZ1 (%) | FZ2 (%) | FZ3b (%) | Rev FZ1 | Rev FZ2 | Rev FZ3 |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | |
| **Housing Sites** | | | | | | | | | |
| | | | | | | | | | |
| Rear of Orford Green serv Stn | 932 | 0.12 | Padgate Brook | 0% | 23% | 77% | 100% | 0% | 0% |
| Land adj to 1 Clifton Close | 1014 | | Mersey | 0% | 100% | 0% | 100% | 0% | 0% |
| Greymist House, 97 Manchester Road | 1037 | | Mersey | 0% | 100% | 0% | 100% | 0% | 0% |
| | | | | | | | | | |
| **Employment Sites:** | | | | | | | | | |
| | | | | | | | | | |
| Eddie Stobbart (previous TNT/Shell National Distribution centre) | 12 | 0.96 | Spittal Brook | 0% | 0% | 100% | 100% | 0% | 0% |
| Imco Recycling (UK) Ltd - Aluminium Recycling Cent | 245 | 1.38 | Thelwall Heys Brook | 0% | 0% | 100% | 100% | 0% | 0% |
| Land adj to Fleet Parts, New Cut Lane, Woolston | 257 | 0.12 | Spittal Brook | 0% | 0% | 100% | 0% | <1% | >99% |
| Land at New Cut Lane, Woolston | 260 | 0.45 | Spittal Brook | 0% | 0% | 100% | 33% | 53% | 14% |
| Site of former Kingsway, Latchford | 223 | 0.29 | Padgate Brook | 0% | 93% | 7% | 100% | 0% | 0% |
| Juniper Lane | 248 | 0.95 | Fishington Brook | 0% | 35% | 65% | 100% | 0% | 0% |
| Land east of Latchford Locks | 263 | 1.11 | Thelwall Heys Brook | 0% | 0% | 100% | 100% | 0% | 0% |
| Unit 14, Rowan House, Padgate Business Park, Green Lane | 264 | 0.44 | Spittal Brook | 0% | 68% | 32% | 100% | 0% | 0% |
| New World Ltd, New World House, Thelwall Lane, Warrington | 276 | 1.7 | Thelwall Heys Brook | 0% | 0% | 100% | 100% | 0% | 0% |
| | | | | | | | | | |
| **Urban Regeneration Sites** | | | | | | | | | |
| | | | | | | | | | |
| New World Ltd, New World House, Thelwall Lane, Warrington | 276 | 1.7 | Thelwall Heys Brook | 0% | 0% | 100% | 100% | 0% | 0% |
| | | | | | | | | | |

## 3.15 Risley, Birchwood and Rixton with Glazebrook

This area is located to the far north east of the borough. In comparison to the rest of the borough, this area is relatively free from flood risk. This is partly due to the limited number of large watercourses and elevated ground. The largest river in the area is Glaze Brook which flows along the eastern boarder, but the narrow Flood Zone indicates that the flood risk posed is restricted by the surrounding ground levels.

Tributaries to Glaze Brook cross the east side of the area, including Carr Brook, Jibcroft Brook, Holcroft Brook and Hollins Green Brook. Cockshot Brook and Cross Brook, including its sub tributaries of Springfield and Croft Heath Brooks, cross the western tip of the area, on their way to join Padgate Brook.

As is the case with all areas within the borough, many of the watercourses are culverted and any development proposal in the vicinity of any watercourse will have to consider the condition of local assets and the associated residual risk.

The Environment Agency's Historical map shows no recorded incidents in the area.

There are three 'major developed sites in the greenbelt' in this area which falls under policy GRN8 in the Warrington UDP. Policy GRN8 is intended to give some leeway to sites that pre-date the greenbelt designation to under take limited redevelopment or infilling. The sites in this area are located in Risley, Culcheth and Rixton. All sites located in Flood Zone 1 according to both sets of Flood Zone outlines.

### 3.15.1 Risley, Birchwood and Rixton with Glazebrook: Flood Zone 1

The following sites are located in Flood Zone 1 and are not, therefore, considered to be at significant risk to fluvial or tidal flooding. Other sources of flood risk, such as overland flow routes or groundwater, will still need to be considered by potential developers. A Flood Risk Assessment, appropriate to the scale nature and location of the development, will be required for all developments greater than **1 ha** in size.

| Site | Site Ref | Policy | Area (ha) | Catchment |
|---|---|---|---|---|
| | | | | |
| **Sites for Potential Employment Development:** | | | | |
| E16:Trident Industrial Estate, Daten Avenue | 166e | n/a | 2.18 | Mersey |
| E17: Birchwood Park (Site 1) Building 109 | 250 (1e) | n/a | 1.05 | Cross Brook |
| | | | | |

## 3.16 Risley, Birchwood and Rixton with Glazebrook: Flood Zones 2 & 3

None of the potential development sites in this area are located in Flood Zones 2 or 3.

## 3.17 Risley, Birchwood and Rixton with Glazebrook: Sites with Planning Permission

The following sites are located partially or wholly in the flood risk zones and currently undeveloped but have been awarded planning permission. Normally sites of this nature would not be included in an SFRA as once a site has been awarded planning permission as it is not possible to retrospectively apply the Sequential Test. However it was felt appropriate to do so here, primarily to highlight the flood risks posed and inform the remaining development stages but also to provide the information required should planning permission lapse on any site and it becomes possible to apply the Sequential Test .

| Site | Site Ref | Area (ha) | Catchment | FZ1 (%) | FZ2 (%) | FZ3b (%) | Rev FZ1 | Rev FZ2 | Rev FZ3 |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | |
| **Housing Sites** | | | | | | | | | |
| | | | | | | | | | |
| 2 Glazebrook Lane | 1234 | 0.23 | Glaze | 0% | 100% | 0% | 100% | 0% | 0% |
| | | | | | | | | | |
| **Employment Sites:** | | | | | | | | | |
| | | | | | | | | | |
| WRDC Site 26, behind Spencer House, Birchwood Centre | | 0.78 | Spittal Brook | 91% | 9% | 0% | 100% | 0% | 0% |
| | | | | | | | | | |

## 3.18 Thelwall, Westy and Lymm

This area is located to the far south east of the borough. The Mersey crosses the northern edge of the area and the MSC passes to the south of the Mersey. A number of smaller rivers flow from the south of the region and outfall in to the MSC, the largest of these is the Bollin. Thelwall Brook has some associated flood risk at the point where it is siphoned under the MSC before discharging into the Mersey, although almost no flooding is shown along the rest of its length. Other watercourses include Statham pools Brook, Thelwall Heys Brook and Morris Brook. The National Flood Zone maps indicate that little flood risk is posed by them.

Lymm Reservoir is located at the centre of this area. It is fed by Bradley Brook and Sow Brook flows from the reservoir to the Mersey. The Lymm Dam is a significant asset in this area and the Bridgewater Canal also flows through this area.

Many of the watercourses in the area are culverted and any development proposal in the vicinity of any watercourse will have to consider the condition of local assets and the associated residual risk.

The Environment Agency's Historical Flood Map indicates that areas to the north of Westy were affected by flooding from the Mersey in February 1990. During the same event the Woolston New cut between Miles Bite and the Woolston Weir also filled with flood water from the Mersey.

There is one 'major developed site in the greenbelt' in this area which falls under policy GRN8 in the Warrington UDP. Policy GRN8 is intended to give some leeway to sites that pre-date the greenbelt designation to under take limited redevelopment or infilling. The site in this area is located in Lymm and is located in Flood Zone 1 according to both sets of Flood Zone outlines.

### 3.18.1 Thelwall, Westy and Lymm: Flood Zone 1

The following sites are located in Flood Zone 1 and are not, therefore, considered to be at significant risk to fluvial or tidal flooding. Other sources of flood risk, such as overland flow routes or groundwater, will still need to be considered by potential developers. A Flood Risk Assessment, appropriate to the scale nature and location of the development, will be required for all developments greater than **1 ha** in size.

| Site | Site Ref | Policy | Area (ha) | Catchment |
|---|---|---|---|---|
| | | | | |
| **Sites for Potential Employment Development:** | | | | |
| E12: Whitbarrow Road | 195 | n/a | 1.19 | Sow Brook |
| | | | | |
| **Other Potential Development Sites:** | | | | |
| OP35: Rushgreen Service Station | 228 | n/a | 0.4 | Rushgreen |
| OP36: Star Lane, Lymm | 226 | n/a | 0.4 | Sow Brook |
| | | | | |

## 3.19 Thelwall, Westy and Lymm: Flood Zones 2 & 3

| **Site:** | **E13: British Alcan Aluminium Recycling Plan – New Furnace** | | |
|---|---|---|---|
| Size (ha): | 0.1 | | |
| Reference: | Employment Land Report (Site 224) | | |
| Catchment: | Morris Brook | | |
| National Flood Zones: | FZ1 – 0% | FZ2 – 0% | FZ3 – 100% |
| Revised flood zones (Mersey): | fz1 – 100% | fz2 – 0% | fz3 – 0% |
| Indicative depth of Inundation (m): | No flooding predicted by recent modelling | | |
| Defended: | No | | |
| Historical flooding / Drainage on site: | No site specific record of flooding | | |
| Soil Type | No soils information is available | | |
| Indicative Suitability for SuDs | Unknown | | |
| Brown / Greenfield: | Brownfield | | |
| Additional information: | | | |
| Exception Test applicable: | No – if site is used for less vulnerable development as indicated, i.e. employment.<br>Yes – until flood zones are revised and if the site is used for essential infrastructure or more vulnerable development. | | |
| Likelihood of passing Test if Applied: | **HIGH** – 100% in FZ3 but 100% in fz1 by revised flood outlines and Brownfield; need to consider residual risk (mitigation measures), sustainable development objectives, etc.<br>**N/A** if revised flood adopted | | |
| **Recommendations:** | **According to National Flood Zone Maps all of the site is in FZ3. When compared with the revised flood zone outlines all of the site is in fz1 and therefore may be suitable for development in flood risk terms.**<br><br>**A Flood Risk Assessment is recommended to assess other sources of flooding. However, because the site footprint is less than 1 ha if the revised flood zones are adopted, a Flood Risk Assessment would not be required.** | | |

| Site: | OP44: Former Pierpoint & Bryant Lagoon | | |
|---|---|---|---|
| Size (ha): | 3.4 | | |
| Reference: | Urban Potential Study (Site103) | | |
| Catchment: | Mersey | | |
| National Flood Zones: | FZ1 – 0% | FZ2 – 0% | FZ3 – 100% |
| Revised flood zones (Mersey): | fz1 – >97% | fz2 – <1% | fz3 – 2% |
| Indicative depth of Inundation (m): | No depth results available | | |
| Defended: | No | | |
| Historical flooding / Drainage on site: | No site specific record of flooding | | |
| Soil Type | Partly un-surveyed. Partly deep stoneless fine silty and clayey soils variably affected by groundwater. | | |
| Indicative Suitability for SuDs | Low | | |
| Brown / Greenfield: | Brownfield | | |
| Additional information: | | | |
| Exception Test applicable: | Yes – if Flood Zone 2 areas are used for highly vulnerable development or if Flood Zone 3 areas are used for essential infrastructure or more vulnerable development | | |
| Likelihood of passing Test if Applied: | **HIGH** – 100% in FZ3 but more than 97% in fz1 by revised zone outlines and Brownfield; need to consider residual risk (mitigation measures), sustainable development objectives, etc. | | |
| **Recommendations:** | **According to the National Flood Zone Maps all of the site is in FZ3. When compared to the revised flood zone outlines, this decreases to only 2% and more than 97% becomes fz1 and therefore may be suitable for development in flood risk terms. No modelling results are currently available to provide an indicative flood depth.**<br><br>**If the Council has to consider this sites suitability for development, they should ensure that they have sufficient information to assess the need for development and to address element a. of the Exceptions Test.**<br><br>**Consider water compatible land use for Flood Zone 3 areas.**<br><br>**A Flood Risk Assessment will be required to assess other sources of flooding and any mitigation measures required for potential development.** | | |

## 3.20 Thelwall, Westy and Lymm: Sites with Planning Permission within the Flood Zone

The following sites are located partially or wholly in the flood risk zones and currently undeveloped but have been awarded planning permission. Normally sites of this nature would not be included in an SFRA as once a site has been awarded planning permission as it is not possible to retrospectively apply the Sequential Test. However it was felt appropriate to do so here, primarily to highlight the flood risks posed and inform the remaining development stages but also to provide the information required should planning permission lapse on any site and it becomes possible to apply the Sequential Test .

| Site | Site Ref | Area (ha) | Catchment | FZ1 (%) | FZ2 (%) | FZ3b (%) | Rev FZ1 | Rev FZ2 | Rev FZ3 |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | |
| **Housing Sites** | | | | | | | | | |
| Thelwall Lane, Latchford | 1091/ APAS22 | 2.55 | Mersey | 87% | 1% | 12% | 100% | 0% | 0% |
| Cardinal Newman High School | 1178/ APAS29/36 | 15.6 | Mersey | 1% | 5% | 94% | 5% | 5% | 90% |
| New World Ltd, New World House | 1201 | 12.3 | Mersey | 0% | 1% | 99% | 2% | 5% | 93% |
| 8 Danebank Road | 915 | 0.12 | Sow Brook | 62% | 10% | 28% | 100% | 0% | 0% |
| Sewage Works, off Reddish Lane | 1058 | 2.43 | Sow Brook | 77% | 20% | 3% | 100% | 0% | 0% |
| | | | | | | | | | |

## 3.21 Stockton Heath, Appleton and Walton

This area is located between the MSC and the southern boarder of the borough. Almost no flood risk is indicated in this area by the Flood Zones Maps due to the steeply rising ground to the south side of the MSC.

Lumb Brook and Morris Brook cross the northern part of the area and outfall into the MSC but the flood zone outlines do not indicate any significant flood risk associated with either watercourse. The National Flood Zone maps do, however, depict some flood risk associated with two parallel drains located either side of Walton Gardens, which outfall into the MSC.

Lumb Brook is heavily culverted and any development proposal in the vicinity of the watercourse will have to consider the condition of local assets and the associated residual risk.

Appleton Reservoir is located in this area and the Bridgewater Canal runs east to west through the area. Any development proposal brought forward in the locality of the either of these features will have to consider the associated residual risks.

The Environment Agency Historical map shows no recorded incidents in the area.

There is one 'major developed site in the greenbelt' in this area which falls under policy GRN8 in the Warrington UDP. Policy GRN8 is intended to give some leeway to sites that pre-date the greenbelt designation to under take limited redevelopment or infilling. The site in this area is located in Moore and is located in Flood Zone 1 according to both sets of Flood Zone outlines.

### 3.21.1 Stockton Heath, Appleton and Walton: Flood Zone 1

The following sites are located in Flood Zone 1 and are not, therefore, considered to be at significant risk to fluvial or tidal flooding. Other sources of flood risk, such as overland flow routes or groundwater, will still need to be considered by potential developers. A Flood Risk Assessment, appropriate to the scale nature and location of the development, will be required for all developments greater than **1 ha** in size.

| Site | Site Ref | Policy | Area (ha) | Catchment |
|---|---|---|---|---|
| | | | | |
| **Sites for Potential Housing Development:** | | | | |
| H1: GH Grappenhall Heys (Remainder) | 218/APAS1 | DCS1 | 20.6 | Lumb Brook |
| H3: AC Appleton Cross | 308/APAS3 | DCS1 | 2.8 | Lumb Brook |
| H4: Land at Pewterspear Green Road | 304-6/APAS4/5 | DCS1 | 7.3 | Gale Brook |
| | | | | |
| **Sites for Potential Employment Development:** | | | | |
| E6: Remainder of Big Apple (Phase 2), Stretton Distribution Units | 95C/APAS 7 | DSC1 | 4.13 | Bradley Brook |
| E10: Lyncastle Way | 22e | n/a | 0.37 | Bradley Brook |
| E11: Former FB Atkins Site, Stretton Distribution centre | 99A | n/a | 1.52 | Bradley Brook |
| | | | | |
| **Other Potential Development Sites** | | | | |
| OP27: Land off Montclaire Crescent | 142 | n/a | 1.5 | Lumb Brook |
| | | | | |
| **Land Safeguarded for Potential Transport Schemes:** | | | | |
| T3: Ackers Road Crossing | APAS3 | LUT19 | | Lumb Brook |
| | | | | |

## 3.22 Stockton Heath, Appleton and Walton: Flood Zones 2 & 3

| **Site:** | **OP24: Walton Locks** | | |
|---|---|---|---|
| Size (ha): | 9.83 | | |
| Reference: | Urban Potential Study (Site 220) | | |
| Catchment: | Mersey | | |
| National Flood Zones: | FZ1 –32% | FZ2 –25% | FZ3 – 43% |
| Revised flood zones (Mersey): | fz1 – 67% | fz2 – 33% | fz3 – 0% |
| Indicative depth of Inundation (m): | Max < 1m | Average < 1m | |
| Defended: | No | | |
| Historical flooding / Drainage on site: | No site specific record of flooding | | |
| Soil Type | No soils information is available | | |
| Indicative Suitability for SuDs | Unknown | | |
| Brown / Greenfield: | Brownfield | | |
| Additional information: | | | |
| Exception Test applicable: | Yes – if Flood Zone 2 areas are used for highly vulnerable development or if Flood Zone 3 areas are used for essential infrastructure or more vulnerable development | | |
| Likelihood of passing Test if Applied: | **MEDIUM/HIGH** – 43% in FZ3 but 0% in fz3 by revised zone outlines and Brownfield; need to consider residual risk (mitigation measures), sustainable development objectives, etc. | | |
| **Recommendations:** | **According to National Flood Zone Maps 32% of the site is in FZ1 and this area may therefore be suitable for development in flood risk terms. When compared to the revised flood zone outlines, this increases to 67% being in fz1 with none of the site being in fz3. The average depth of flood in the fz2 areas is less than 1m.**<br><br>**If the Council has to consider this sites suitability for development, they should ensure that they have sufficient information to assess the need for development and to address element a. of the Exceptions Test.**<br><br>**A Flood Risk Assessment will be required to assess other sources of flooding and any mitigation measures required for potential development.** | | |

| **Site:** | **OP25: Former Greenall's Nursery** | | |
|---|---|---|---|
| Size (ha): | 1.5 | | |
| Reference: | Urban Potential Study (Site 147) | | |
| Catchment: | Lumb Brook | | |
| National Flood Zones: | FZ1 – 75% | FZ2 –3% | FZ3 – 22% |
| Indicative depth of Inundation (m): | Not Available | | |
| Defended: | No | | |
| Historical flooding / Drainage on site: | No site specific record of flooding | | |
| Soil Type | Partly un-surveyed.<br>Partly deep permeable sandy and coarse loamy soils. Groundwater controlled by ditches. | | |
| Indicative Suitability for SuDs | High | | |
| Brown / Greenfield: | Brownfield | | |
| Additional information: | According to the National Flood Zone Maps, flood risk to the site originates from a drain south of the MSC so it is uncertain whether flood risk at the site would actually be reduced, as suggested by the revised flood outline for the Mersey. Hence the site is categorised according to the current National Flood Zone Map only. | | |
| Exception Test applicable: | Yes – if Flood Zone 2 areas are used for highly vulnerable development or if Flood Zone 3 areas are used for essential infrastructure or more vulnerable development | | |
| Likelihood of passing Test if Applied: | **MEDIUM/HIGH** – 22% in FZ3 and Brownfield; need to consider residual risk (mitigation measures), sustainable development objectives, etc. | | |
| **Recommendations:** | **According to the National Flood Zone Maps 75% of the site is in FZ1 and therefore may be suitable for development in flood risk terms.**<br><br>**If the Council has to consider this sites suitability for development, they should ensure that they have sufficient information to assess the need for development and to address element a. of the Exceptions Test.**<br><br>**Consider water compatible land use for Flood Zone 3 areas.**<br><br>**A Flood Risk Assessment will be required to assess other sources of flooding and any mitigation measures required for potential development.** | | |

| Site: | OP46: Solvay Interox Chemical Plant | | |
|---|---|---|---|
| Size (ha): | 3.7 | | |
| Reference: | WBC | | |
| Catchment: | Mersey | | |
| National Flood Zones: | FZ1 –0% | FZ2 –65% | FZ3 – 35% |
| Revised flood zones (Mersey): | fz1 – 84% | fz2 – 16% | fz3 – 0% |
| Indicative depth of Inundation (m): | No depth results available | | |
| Defended: | No | | |
| Historical flooding / Drainage on site: | No site specific record of flooding | | |
| Soil Type | Deep permeable sandy and coarse loamy soils. Groundwater controlled by ditches. | | |
| Indicative Suitability for SuDs | High | | |
| Brown / Greenfield: | Brownfield | | |
| Additional information: | | | |
| Exception Test applicable: | Yes –if Flood Zone 2 areas are used for highly vulnerable development or if Flood Zone 3 areas are used for essential infrastructure or more vulnerable development | | |
| Likelihood of passing Test if Applied: | **MEDIUM/HIGH** – 35% in FZ3 but 84% in FZ1 by revised zone outlines and Brownfield; need to consider residual risk (mitigation measures), sustainable development objectives, etc. | | |
| **Recommendations:** | **According to the National Flood Zone Maps 35% of the site is in FZ3. When compared to the revised flood zone outlines, none of the site is fz3 whilst 84% of the site becomes fz1 and therefore may be suitable for development in flood risk terms.**<br><br>**If the Council has to consider this sites suitability for development, they should ensure that they have sufficient information to assess the need for development and to address element a. of the Exceptions Test.**<br><br>**A Flood Risk Assessment will be required to assess other sources of flooding and any mitigation measures required for potential development.** | | |

## 3.23 Stockton Heath, Appleton and Walton: Sites with Planning Permission within the Flood Zone

The following sites are located partially or wholly in the flood risk zones and currently undeveloped but have been awarded planning permission. Normally sites of this nature would not be included in an SFRA as once a site has been awarded planning permission as it is not possible to retrospectively apply the Sequential Test. However it was felt appropriate to do so here, primarily to highlight the flood risks posed and inform the remaining development stages but also to provide the information required should planning permission lapse on any site and it becomes possible to apply the Sequential Test .

| Site | Site Ref | Area (ha) | Catchment | FZ1 (%) | FZ2 (%) | FZ3b (%) | Rev FZ1 | Rev FZ2 | Rev FZ3 |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | |
| **Housing Sites** | | | | | | | | | |
| Ford Farm, Eastford Road | 1261 | 0.42 | Mersey | 0% | 0% | 100% | 26% | 24% | 50% |
| | | | | | | | | | |

# 4 DETAILED ASSESSMENT OF ARPLEY AND BRIDGEFOOT AREA

## 4.1 Arpley & Bridgefoot Area Action Plan

The Local Development Scheme submitted to Government Office for the North West in March 2007, sets out Warrington Borough Council's commitments to producing DPDs and LDDs over the next 3 years. These will form the Local Development Framework and will gradually replace the Unitary Development Plan. One of the first of the DPDs programmed to be undertaken is the Arpley & Bridgefoot Area Action Plan (AAP). Adoption of the AAP is expected in June 2010.

The plan will cover the area incorporating Arpley Meadows, Wilderspool, Bridgefoot and Wilson Patten Street. The area is located within the EMP5 Inner Warrington boundary and is to the south of the centre and includes a number of areas designated as Potential Urban Regeneration Areas under UDP Policy EMP8. The areas of potential development are located within the meanders of the Mersey. The Action Plan Area is included as Figure 2007s2261 – DW11.

A number of new transport schemes are being considered by the Council for this area. Most of these are in early conceptual stages so have not been included in the classification tables in this report. As the details of the schemes develop, the information and principles outlined in this report should be used to inform the decision making process.

## 4.2 Flood Risk

Flood Risk in the area originates from the Mersey and is predominantly tidal. As shown of Figure 2007s2261 – DW11, the flood zone outlines do cover significant parts of the area. According to both the National Flood Zone and revised flood zone EMP8 sites UR8 and UR9 are located entirely in Flood Zone 3.

Large areas of the Arpley Meadows sites, comprising UR1, UR2 and UR3, are located on higher ground. Although these sites encroach into Flood Zones 2 and 3, they are predominantly located in low risk Flood Zone 1 and hence, are considered suitable for development in flood risk terms.

However, it should be noted that low risk areas are typically surrounded by higher risk areas vulnerable to flooding. This may make access to the site more difficult during flooding events. Emergency Planning must, therefore, be a high priority for any development proposed in these areas.

A number of new transport schemes are being considered and this could provide an opportunity to meet the safe access and egress requirements for the area. It is essential that the design and construction of any new railway or road in the area considers flood risk.

The Environment Agency Historical Flood Map indicates that the Bridgefoot Area was affected by flooding from the Mersey in 1996 and 1997. Both incidents are attributed to tidal waters exceeding the channel capacity.

Mitigation measures for land outside of the flood zones 2 and 3 should focus on attenuation of surface water, and other sources of flooding, so that flood risk is not increased elsewhere as a result of potential development. This may be achieved through sustainable urban drainage system or conventional piped storage.

Mitigation, such as land raising is not required for areas of the Arpley Meadows Site as much of the area is already higher than the design flood level. In accordance with the requirements of PPS25 lower areas, susceptible to flooding, should ideally be designated as open space or water compatible uses.

Access to the site is a particular issue and detailed assessment on inundation periods and depth will be required as part of the detailed site specific Flood Risk Assessment.

## 4.3 Surface Water Modelling

The effects of climate change may serve to increase the intensity of summer rain storms and hence increases the extent of areas vulnerable to overland flooding. In order to investigate this scenario and identify vulnerable areas in the Arpley and Bridgefoot Area, a simple modelling process has been used to understand surface water issues in the area. This assessment is based on topographical data and estimated rainfall for severe storms coinciding with a 1% AEP event. Using the 2D modelling package JFlow, a representation of a storm scenario was created and any area where surface water is likely to collect, or pond, to significant depths has been identified. Figure 2007s2261 – DW13 provides a plot of the maximum recorded depths above 30cm. It can be seen that water collects along water courses and roads, as might be expected, but it also shows some other areas on land where water has ponded.

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# APPENDICES

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# Appendix A: - SFRA Policy Text

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# 5 THE PLANNING FRAMEWORK

## 5.1 Introduction

The planning process is driven by legislation and guidance developed at national, regional and local level. Flood risk is one of many planning considerations that need to be balanced when making land use decisions.

## 5.2 National Planning Policy

### 5.2.1 Planning and Compulsory Purchasing Act

The SFRA has been undertaken during a period in which planning authorities have been implementing the provisions of the Planning and Compulsory Purchase Act 2004 and accompanying planning guidance, including Planning Policy Statement 1 *Delivering Sustainable Development*[3] (PPS1) and Planning Policy Statement 12 *Local Development Frameworks*[4] (PPS12). The Act has affected all tiers of the planning system and has necessitated major changes at regional and local level.

At a district council level, Local Plans are to be phased out and replaced by Local Development Frameworks (LDF), which are a suite of planning documents that will guide decisions on the development and use of land. Where Local Plans have been adopted recently, or preparation is at an advanced stage, the process will continue with adoption providing 'saved policies' for development control purposes. As the new Development Plan Documents are adopted, they will replace parts of the Local Plan. However, where it is proposed to cease work on the review of Local Plans and to commence work on LDFs, only those local plan policies which form part of the development plan can be saved.

Local Authorities (LAs) were required to produce a Local Development Scheme (LDS) by March 2005, setting out their programme for the production of the new development plan and summarising the documents that will, collectively, make up the Local Development Framework. Hence the transition provides an ideal opportunity for each of the local authorities to review and update their policies on flood risk.

### 5.2.2 Development and Flood Risk

The introduction of PPG25 in July 2001 reinforced the responsibility that Local Planning Authorities (LPAs) have to ensure that flood risk is understood and managed effectively using a risk based approach as an integral part of the planning process. PPG25 represented a marked shift from the reactive resolution of flooding problems as a result of development (i.e. flood defence) to the effective management of flood risk within the planning system.

Notwithstanding this, it is widely recognised that flood risk is one of many policy constraints placed upon the local planning system. Development must facilitate the socio-economic needs of a community, and spatially must sit within an existing framework of landscape and infrastructure. For this reason, a balance must be sought between development need and the flood risk posed to existing and future development in an area.

[3] Communities and Local Government. 2005. *Planning Policy Statement 1: Delivering Sustainable Development*. February 2005
http://www.communities.gov.uk/pub/806/PlanningPolicyStatement1DeliveringSustainableDevelopment_id1143806.pdf

[4] Communities and Local Government. 2004 *Planning Policy Statement 12: Local Development Frameworks*. September 2004
http://www.communities.gov.uk/embedded_object.asp?id=1143848

The role of the Environment Agency is to provide advice to LPAs to ensure the management of flood risk in an effective manner as part of the planning process. The Government has set an objective for the Environment Agency to reduce the risks to people and to the developed and natural environment from flooding. In response to this the Environment Agency has set a target to seek to influence planning activities to prevent 100% of inappropriate development inside floodplains.

### 5.2.3 Planning Policy Statement 25: Development and Flood Risk

Whilst it is generally agreed that PPG25 has worked well, and highlighted the importance of flood risk in the development process, it has been recognised that there is a need to focus on core policies that are clearer and easier to understand.

In December 2006 Planning Policy Statement 25 (PPS25) was published, superseding PPG25. The new PPS25 is accompanied by a draft Practice Guide.

The Government, through PPS25, provides clarity on what is required at a regional and local level to ensure that appropriate and timely decisions are made to deliver sustainable planning for development. The key planning objectives are as follows:

*"Regional planning bodies (RPBs) and local planning authorities (LPAs) should prepare and implement planning strategies that help to deliver sustainable development by:*

- *Identifying land at risk and the degree of risk of flooding from river, sea and other sources in their areas*
- *Preparing Regional or Strategic Flood Risk Assessments (RFRAs / SFRAs) as appropriate, as a freestanding assessment that contributes to the Sustainability Appraisal of their plans.*
- *Framing policies for the location of development which avoid flood risk to people and property where possible, and manage any residual risk, taking account of the impacts of climate change*
- *Only permitting development in areas of flood risk when there are no suitable alternative sites in areas of lower flood risk and the benefits of the development outweigh the risks from flooding*
- *Safeguarding land from development that is required for current and future flood management e.g. conveyance and storage of flood water, and flood defences*
- *Reducing flood risk to and from new development through location, layout and design, incorporating sustainable drainage systems (SUDS)*
- *Using opportunities offered by new development to reduce the cause and impacts of flooding e.g. surface water management plans; making the most of the benefits of green infrastructure for flood storage, conveyance and SUDS; re-creating functional floodplain; and setting back defences*
- Working effectively with the Environment Agency, other operating authorities and other stakeholders to ensure that best use is made of their expertise and information so that plans are effective and decisions on planning applications can be delivered expeditiously
- Ensuring spatial planning supports flood risk management policies and plans, River Basin Management Plans and emergency planning".

The Sequential Test remains a key part of PPS25, which steers new development to areas at the lowest risk of flooding. This Test is intended to provide a rigorous understanding of flood risk within their area, delineating the extent and nature of flooding in accordance with the flood risk zones set out within PPG25. This must consider the planning context and provide the framework for robust and sustainable flood risk management solutions within those areas where a balance is required between susceptibility to flooding and wider spatial planning pressures.

In addition, PPS25 introduces the Exception Test which allows some scope for departures from the sequential approach where it is necessary to meet the wider aims of sustainable development. When the use of the Exception Test is required, decision makers should apply it at the earliest stage in the preparation of all Local Development Documents (LDDs). All three elements of the Exception Test need to be passed before development is permitted.

PPS25 clarifies that the potential impacts of climate change should be addressed in Flood Risk Assessments, and includes advice on current sources of information on climate change including PPS Planning and Climate Change[5], to ensure that plans and planning decisions are fully informed about climate change.

PPS25 introduces the proposal for a Town and Country Planning (Flooding) (England) Direction 2006 which would make the Environment Agency a Statutory Consultee on all applications for development in flood risk areas (except minor development), including those in areas with critical drainage problems and for any development on land exceeding 1 hectare outside flood risk areas. The Direction would also introduce the requirement for LPAs to notify the Secretary of State where they are minded to approve a planning application contrary to a sustained objection by the Environment Agency. PPS25 also includes provision to extend the criteria used to determine when the Environment Agency should be consulted on a planning application.

Catchment boundaries often encompass many more than one planning district, therefore, it is imperative that the planning process ensures that policies adopted within the current planning timeframe are consistent with the longer term vision for the wider catchment, and take adequate account of the impacts that the decisions made may have upon adjoining districts.

### 5.2.4 Other Planning Policy Statements

PPS1[6] published in February 2005, sets out the overarching planning policies for the delivery of sustainable development across the planning system and sets the tone for other planning policy statements. PPS1 explicitly states that development plan policies should take account of flooding, including flood risk. It proposes that new development in areas at risk from flooding should be avoided. Planning authorities are also advised to ensure that developments are "sustainable, durable and adaptable" including taking into account natural hazards such as flooding.

PPS1 also places an emphasis on 'spatial planning' in contrast to the more rigid 'land use planning' approach which it supersedes. Planning authorities will still produce site specific allocations and a proposals map as local development documents, but their core strategy will be more strategic and visionary in content and will take into account the desirability of achieving integrated and mixed use development and will consider a broader range of community needs than in the past. With regard to flood risk, it will be important for the core strategies and accompanying supplementary planning documents to recognise the contribution that non-structural measures can make to flood management.

Whilst not directly relevant to the development of an SFRA, it is important to recognise that the exercise takes place within the context of other planning policy guidance and statements, some of which also require sequential testing of site allocations and development proposals. PPS3 (Housing)[7], PPG4 (Industrial and Commercial Development and Small Firms)[8] and PPS6 (Planning for Town Centres)[9] are intrinsic within the planning process and, therefore, an understanding of the constraints faced as a result of this additional policy guidance is required.

For example, whilst the PPS3 Sequential Test recognises flood risk as a material consideration, its main emphasis is to seek the re-use of previously developed sites and empty or under-used buildings for housing. PPS25 attempts to reconcile the emphasis which Government places on

[5] Communities and Local Government. 2006. *Planning Policy Statement 25: Development and Flood Risk*. December 2006. http://www.communities.gov.uk/pub/955/PlanningPolicyStatement25DevelopmentandFloodRisk_id1504955.pdf

[6] Communities and Local Government. 2005. *Planning Policy Statement 1: Delivering Sustainable Development*. February 2005
http://www.communities.gov.uk/pub/806/PlanningPolicyStatement1DeliveringSustainableDevelopment_id1143806.pdf

[7] Communities and Local Government. 2006. *Planning Policy Statement 3: Housing*. November 2006. http://www.communities.gov.uk/pub/931/PlanningPolicyStatement3Housing_id1504931.pdf

[8] Communities and Local Government. 1992. *Planning Policy Guidance 4: Industrial, commercial development and small firms*. November 1992.
http://www.communities.gov.uk/index.asp?id=1143959

[9] Communities and Local Government. 2005. *Planning Policy Statement 6: Planning for Town Centres*. March 2005.
http://www.communities.gov.uk/pub/821/PlanningPolicyStatement6PlanningforTownCentres_id1143821.pdf

development of previously developed (brownfield) land for housing with the reality that a significant proportion of this land is located alongside rivers and vulnerable to flooding. Paragraph D14 of PPS25 states:

*"Criterion b) of para. D( (The Exceptions Test) reflects the Government's commitment to make to most efficient and effective use of land in line with the principles of sustainable development. Reflecting this, Planning Policy Statement 3 (PPS3): Housing[10] sets out the Government's objectives for a flexible, responsive supply of land for housing which gives priority to the use of previously-developed land for development. However, flood risk should be taken into account in determining the suitability of the land for development."*

It also recommends that local authorities should consider combining the Sequential Test for flood risk assessment with reviews of housing land allocations under PPS3. There is some cause for concern as to whether challenging housing targets can be met when both these potentially conflicting Sequential Tests have been satisfied. One possible solution has been put forward by the Association of British Insurers:

*"…when developing on higher-elevation greenfield sites… leaving an equivalent area of low lying brownfield land for flood storage could be the most effective way to minimise flood risk".*

This solution will require developers and urban designers to seek innovative design solutions to accommodate the necessary levels of development, whilst ensuring practical and manageable solutions are designed to address the issue of flood risk. Notwithstanding the above, the recently published PPS3 (November 2006) removes the requirement for sequential testing of housing sites and instead places emphasis on providing housing within sustainable locations. PPS3 identifies that in preparing development plan documents relating to housing, local planning authorities should assess their potential and suitability for development against:

- The physical and environmental constraints on development of land, including, for example, the level of contamination, **stability of flood risk, taking into account that such risks may increase as a result of climate change.**

In determining which sites to include as housing allocations, regard should also be made to the sustainability appraisal of the site allocation. It is considered likely that all Local Authorities will include within their sustainability appraisal framework an element regarding potential impacts on flood risk. This along with an SFRA document should help to inform the identification of appropriate sites which are either not at risk of flooding or are considered sustainable and can incorporate adequate mitigation measures.

### 5.2.5 Making Space for Water

During 2004, the Department for Environment, Food and Rural Affairs (DEFRA) undertook a consultation exercise, the object of which was to engage a wide range of stakeholders in a debate about the future direction of flooding strategy. The consultation document "Making Space for Water" [11] sets out the following vision:

*"…we want to make space for water so that we can manage the adverse human and economic consequences of flooding and coastal erosion while achieving environmental and social benefits in line with wider government objectives."*

In other words, the aim of the strategy was to balance the three pillars of sustainability, managing flood risk and ensuring that the social and economic benefits which accrue from growth and development are attained. This balanced approach, integrating sustainable development with responsible risk management, has underpinned the current study.

[10] Communities and Local Government. 2006. *Planning Policy Statement 3: Housing*. November 2006. http://www.communities.gov.uk/pub/931/PlanningPolicyStatement3Housing_id1504931.pdf

[11] DEFRA. 2004. *Making Space for Water – Developing a new Government strategy for flood and coastal erosion risk management in England.*

Section Seven of the consultation document deals with measures to reduce flood risk through land-use planning. This section emphasises the Government's commitment to ensuring that the planning system aims to reduce flood risk wherever possible and, in any event, should not add to it. However, it is acknowledged that 10 percent of England is already within mapped areas of flood risk and that contained within these areas are the brownfield sites which other areas of Government policy has identified as a priority for future housing provision. The document asserts that over the past five years, 11 percent of new houses were in flood-risk areas. The document identifies three sets of measures which may be undertaken to manage flood risk when development is sited in such areas:

- Protection measures to provide, at minimum, the standards of protection specified in PPG25 (now PPS25)
- Provision of features such as sacrificial areas and compartmentalisation to reduce the consequences of a flood event should one occur
- Use of construction techniques that increase the flood resistance and resilience of buildings.

The document proposes that Regional Spatial Strategies and Local Development Frameworks should take full account of flood risk and incorporate the sequential approach introduced by PPG25. Moreover, the document encourages integration with other planning systems, in particular Catchment Flood Management Plans[12]. Use of European Union (EU) funding streams, such as Intgerreg IIIB is recommended to enable local authorities to undertake trans-national projects aimed at advancing knowledge and good practice in flood risk management.

At the development control level, the document encourages local authorities to give full weight to the advice issued by the Environment Agency in response to consultations on planning applications, implying that only in exceptional cases should permission should be granted against the Environment Agency's advice. In addition, the use of site specific (local) flood risk assessments as supporting documents to planning applications in areas of flood risk is encouraged. The document proposes that if mitigating measures are shown to be required, they should be fully funded as part of the development.

## 5.3 Regional Planning Policy

### 5.3.1 The Regional Special Strategy for the North West

The emerging Regional Spatial Strategy formerly known as RPG13 is being prepared by the North West Regional Assembly, as part of the Planning and Compulsory Purchase Act 2004, which intends to bring *"together economic, social and environmental issues linked to planning in a coherent framework[13]."*

A draft document, entitled 'The North West Plan', was submitted to the Secretary of State in January 2006. The publication of the revised RSS is due in late 2007. The document is intended to provide guidance on the Government's planning and transport policy for the North West region for a 15-20 year period.

A review of the emerging North West Plan, when compared to the current North West RSS, shows two very different approaches to flood risk policy. The current North West RSS provided a policy dedicated to 'Development and Flood Risk' under Policy ER8 for all types of flooding, while the emerging North West Plan has incorporated flood risk within Policy EM5 'Integrated Water Management' and EM6 'Managing the North West's Coastline'.

The emerging North West Plan Policy EM5 regarding flooding states that:

[12] Catchment Flood Management Plans are voluntary plans through which the Environment Agency works with other key decision makers in river catchments to identify and agree policies for sustainable flood risk management.

[13] Government Office for the North West: Regional Planning.
http://www.gos.gov.uk/gonw/Planning/RegionalPlanning/?a=42496

*"Plans and strategies should have regard to River Basin Management Plans and assist in achieving integrated water management and delivery of the EU Water Framework Directive (WFD). They should protect the quality of surface, ground and coastal waters and manage flood risk by:*

- *Phasing development to reflect existing water supply and waste water treatment capacity, unless new infrastructure can be provided ahead of the development without environmental harm;*
- *Implementing the 'Meeting the Sequential Flood Risk Test – Guidelines for the North West Region[14]';*
- *Requiring that any development which, exceptionally must take place in current or future flood risk areas is resilient to flooding; protected to appropriate standards and does not increase the risk of flooding elsewhere;*
- *Requiring new, and where possible, existing development (including transport infrastructure) to incorporate sustainable drainage systems and water conservation and efficiency measures;*
- *Raise people's awareness of flood risks and the impact of their behaviour and lifestyles on water consumption.[15]"*

While North West Plan Policy EM6 includes the management of costal erosion it also demonstrates an understanding of flood management. This should be achieved by:

*"Taking account of natural and coastal change and the likely impacts of climate change, to ensure that development is sited or re-sited carefully to avoid:*

- *The risk of future loss from coastal erosion, land instability and flooding;*
- *Unsustainable coastal defence costs;*
- *Damaging existing defences and the capacity of the coast to form natural defences or to adjust to future changes without endangering life or property. [16]"*

## 5.4 Local Plans Context

As a result of the Planning and Compulsory Purchase Act 2004, the way in which development plans are prepared has changed. The purpose of introducing the new legislation was to assist with speeding up and simplifying plan preparation and improving community involvement. The Local Plan documents will be replaced by Local Development Framework (LDF). The LDF is made up of several Local Development Documents (LDDs). LDDs can either deal with different issues or different geographical areas, but when taken together they will set out the Councils' policies for how the Councils will assess development proposals and direct future growth. Until the new system is implemented, the adopted local plans produced by each of the local authorities are the statutory documents which will be considered for the purpose of this report.

### 5.4.1 Warrington Borough Council

#### Warrington Unitary Development Plan

The Warrington Unitary Development Plan (UDP) was adopted in January 2006. It was initially prepared under the Town and Country Planning Act 1990. The final stages of the preparation were

[14] North West Regional Assembly/Environment Agency (2004) Meeting the Sequential Flood Risk Test – Guidance for the North West Region

[15] North West Regional Assembly (2006) The North West Plan: Submitted Draft Regional Spatial Strategy for the North West of England. http://www.gos.gov.uk/497468/docs/248821/396778

[16] North West Regional Assembly (2006) The North West Plan: Submitted Draft Regional Spatial Strategy for the North West of England. http://www.gos.gov.uk/497468/docs/248821/396778

completed under the transitional arrangements of the Planning and Compulsory Purchase Act 2004. The UDP replaced all other operative plans. The adopted Plan is 'saved' as part of the Council's Local Development Framework under the 2004 Act.

With regard to borough wide flood risk management, policy REP4 entitled "*Protection of the Flood Plain*" is of most relevance. It states that, "*In areas at risk from flooding, and in circumstances where the risk of flooding elsewhere would increase as a consequence, new development or land raising will not be permitted unless appropriate flood protection and mitigation measures are to take place as part of the development…*".

It also states that, "*…developers will be required to carry out a detailed Flood Risk Assessment (FRA)…*". The policy explanation goes on to say that it is, "…*essential that local authorities, in consultation with other appropriate bodies including the Environment Agency, ensure that the integrity and continuity of flood defences is maintained.*"

Other flooding issues are addressed in the next policy, REP5 entitled "*Surface Water Run-off and Sustainable Drainage Systems*". It states that, "*...Developers will be expected to cover the costs of assessing surface water drainage impacts and of any necessary mitigation works, including long term management.*" The policy goes on to say that, "*…Decisions will be made in consultation with neighbouring authorities and other relevant agencies, including the Environment Agency*".

### Emerging Arpley & Bridgefoot Area Action Plan

The Local Development Scheme submitted to Government Office for the North West in March 2005, sets out Warrington Borough Council's commitments to producing DPDs and LDDs over the next 3 years, which will form the Local Development Framework and replace the Unitary Development Plan. The first of the DPDs to be undertaken include the Statement of Community Involvement, the Core Strategy and the Area Action Plan, AAP, for the area incorporating Arpley Meadows, Wilderspool, Bridgefoot and Wilson Patten Street. Adoption of the AAP is expected in March 2008.

The council are aware that parts of the area are located in the Environment Agency National Flood Zone Maps.

### Other Studies

Other information regarding the location and detail of potential development sites has been obtained from:

- Urban Potential Study
- Employment Land Report 2006
- Housing Land Report 2006

# 6 STRATEGIC FLOOD RISK ASSESSMENT - OVERVIEW

## 6.1 Background to Strategic Flood Risk Management Objectives

Historically, the management of flood risk was undertaken in a somewhat reactive manner, addressing problems on an as-needed basis in response to flooding events. It was recognised by Government that this approach was generally not cost effective and often failed to consider individual problem areas within the wider river system.

To address this, the Environment Agency is committed to a rolling programme of flood risk mapping and strategic flood risk management investigations. These include Catchment Flood Management Plans (CFMP) and Flood Risk Management (PAG2) Strategies within fluvial systems and Shoreline Management Plans (SMP) within coastal areas.

These studies take a catchment wide approach to flood risk. They identify where flooding is known or perceived to be an existing problem and consider how flooding regimes are likely to alter as a result of climate and land use changes. The studies aim to understand the mechanism of flooding in an area and include assessments of how flooding can be cost effective and sustainably managed over the next 50 to 100 years. These investigations also pay particular attention to the environmental implications of flood risk management and seek to provide opportunities for environmental enhancement wherever possible.

The importance of influencing both the strategic planning process and development control, by preventing development within flood risk areas, is recognised as a key Environment Agency objective. For this reason it is vital that the recommendations of the SFRA are consistent with the long-term strategy for flood risk management in the study areas.

## 6.2 Overview of the SFRA Process

The SFRA is a planning tool that can be used to inform the spatial planning process.

In accordance with PPS 25, allocations should be made outside of the flood risk areas (i.e. in Zone 1) wherever possible. If there are no reasonably appropriate Flood Zone 1 sites available for development then, subject to flood risk vulnerability land use, consideration maybe given to sites with Zone 2. Only where there are no reasonably available sites in Flood Zone 1 or 2 should Zone 3 allocations be considered. In order to demonstrate that there are no lower risk sites available the Sequential Test needs to be carried out.

The information provided in the SFRA should allow the LPAs to carryout the Sequential Test.

Only on completion of the Sequential Test should the Exception Test be used to justify allocations or planning applications for development in high risk areas. Whilst the SFRA has been undertaken in conjunction with the EA, it is likely they will object to some of the potential allocation sites, and may maintain objections to these on site specific flood risk grounds unless sufficient information can be provided to show the risks can be safely mitigated in the design. This is a matter of detail that cannot be addressed in a strategic assessment.

An SFRA is a project with defined start and end points. The deliverable is a tool to allow the Sequential Testing to take place within the LDF. The SFRA itself cannot determine where additional replacement sites in low risk areas can be found, nor can the LPA stop the SFRA at the sequential test phase, revisit their allocations, and then return to continue testing via the Exception Test.

The LPAs have the information and options to sequentially test, provide more detailed evidence to support the exception test within this SFRA. The SFRA will remove allocations or planning applications at the extreme of flood risk policy, i.e. sites in functional floodplain. In an upland rural

catchment with defined settlements the SFRA will not have the data to resolve how safe the flood risk will be at proposed development sites.

The SFRA provides some indication of deliverability, and hence whether the site should be considered in more detail.

At its highest level the SFRA assesses the spatial flood probability across the study areas allowing the Sequential Test to be undertaken. Within defended floodplains where individual allocations have the potential to alter the risks significantly, leading to significant residual risks, the Sequential Test requires a more detailed assessment of probability and consequences.

Floodplains provide storage and attenuation for the river system. Any major changes to the floodplain must, therefore, also consider the impact to the river system as a whole.

The assessment of flood risk within the study areas should be targeted where development is proposed within current planning horizons. Furthermore, the confidence placed in the SFRA, with respect to the delineation of flood risk, should be sufficient so that it may be used to inform the future allocation of sites within the Local Development Framework.

Risk is defined as a function of both probability of an event occurring and the consequence should that event take place. When considering the actual risk associated with the failure of a flood defence, consideration must be given to both overtopping and the structural integrity of the defence. In terms of both economic viability and practically, the consequence of defence failure is largely a function of the intended land use. For example, the vulnerability of residential areas to flooding is considered greater than flooding to industrial or commercial developments. Similarly, the risk to a residential home is considered greater than the risk to a renovated mill where the ground floor level is not likely to be used for residential accommodation. PPS25 (Annex G) identifies the importance of safely managing residual flood risks. Residual risks have been identified in paragraph G1 as *"the risk remaining after applying the sequential approach and taking mitigating actions"* including the residual risks involved with development behind existing defences and other infrastructure acting as a flood defence.

Paragraph G2 of PPS25 states *"…development should not normally be permitted where flood defences, properly maintained and in combination with agreed warning and evacuation arrangements, would not provide an acceptable standard of safety taking into account climate change."*

Taking this into account, an assessment must be made to determine whether an existing defence is high enough to provide the 1% standard of protection. A structural assessment will also be required. If the condition or suitability of a defence is in doubt the proposed development should be given less weight than other available sites within appropriately defended areas.

To assess actual risk, it may be necessary to model the consequence of overtopping in a 1% chance event. Generally, the worst case scenario will coincide with a failure of the defences at the peak of the flood event. To this end, a two dimensional inundation model (which has the ability to predict depth and velocity) of the defended area may be required to examine the impact of either a breach failure or overtopping during the design event. The extent of inundation behind the defence should be identified, and the depth and velocity of flow (within the inundated area) monitored over time throughout the duration of the event. Other infrastructure such as road, rail embankments and other existing transport infrastructure should also be considered in the same context, as they can affect water flows during floods.

## 6.3 The PPS25 Sequential Flood Risk Test (SFRT)

PPS25 provides the basis for the sequential approach. PPS25 recommends that LPAs and other decision-makers use a risk based approach to development planning and specifies the need for undertaking an SFRA to informing the preparation of its LDDs.

When allocating or approving land for development in flood risk areas, those responsible for making development decisions are expected to demonstrate that there are no suitable alternative development sites located in lower flood risk areas.

The methodology sets out a robust approach to a Sequential Flood Risk Test (SFRT) that is core to the SFRA process. The SFRT is the key driver for the SFRA. The Environment Agency Flood Zone Map will provide the basis of the test, which will be undertaken a number of times, considering a greater resolution and understanding of flood risk at each stage taking into account flooding from other sources. At each step, sites of lower flood risk are identified and prioritised in order of vulnerability to flood risk and their safety in terms of allocation for development.

A further level of analysis may be required after applying the sequential approach in order to test the sustainability and robustness of the mitigation measures, known as the residual risks. These include areas where development is planned behind or adjacent to existing defences.

This SFRA provides each council with flood zone classifications for all present locations identified for development as well as the information required to classify future allocations. The information provided by the SFRA will assist individual councils to develop their LDFs and prioritise allocations.

The council will be required to prioritise the allocation of land for development in ascending order from Flood Risk Zone 1 to 3, including the subdivisions of Flood Risk Zone 3. The Environment Agency has statutory responsibility and must be consulted on all development applications allocated with medium and high risk zones, including those in areas with critical drainage problems and for any development on land exceeding **1 hectare** outside flood risk areas. In these circumstances, the Environment Agency will require the council to demonstrate that there are no reasonable alternatives, in lower flood risk categories, available for development.

## 6.4 The Exception Test

Where departures from the Sequential Test are justified by the need to locate development in higher risk zones than is appropriate, in order to meet the wider aims of sustainable development, it is necessary to apply the Exceptions Test. PPS25 acknowledges that flood risk is one of many issues (including transport, housing, economic growth, natural resources, regeneration and the management of other hazards) which need to be considered in spatial planning.

The Exception Test is "*only appropriate for use when there are large areas in Flood Zone 2 and 3, where the Sequential Test alone cannot deliver acceptable sites, but where some continued development is necessary for wider sustainable development reasons, taking into account the need to avoid social or economical blight and the need for essential civil infrastructure to remain operational during floods. It may also be appropriate to use it where restrictive national designations such as landscape, heritage and nature conservation designations…prevent the availability of unconstrained sites in lower risk areas*"[17].

Although there is no definition of "small" and "large" within PPS25, it does state that the exceptions test is not required for minor development. Minor development being defined as:

- Minor non-residential extensions with a footprint less than 250m²
- Development that does not increase the size of buildings
- Householder developments

PPS25 explains where and for what type of development the Exception Test needs to be applied. In some situations, for certain types of development, it is not appropriate to use the Exception Test to justify development, e.g. development which is highly vulnerable to flood risk cannot be justified within the high risk zone through the use of the Exception Test. The situations where it is necessary and appropriate to apply the Exception Test are outlined below.

Where the Exception Test is required, it should be should applied as soon as possible to all Local Development Document (LDD) allocations for development and all planning applications. All three

[17] Communities and Local Government. 2006. *Planning Policy Statement 25: Development and Flood Risk*. December 2006. pg 7. http://www.communities.gov.uk/pub/955/PlanningPolicyStatement25DevelopmentandFloodRisk_id1504955.pdf

elements of the Exception Test have to be passed before development is allocated or permitted. For the Exception Test to be passed:

a) It must demonstrate that the development provides wider sustainability benefits to the community that outweigh flood risk, informed by a SFRA where on has been prepared. If the DPD has reach the 'submission' stage 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 developable land, that there are no reasonable alternatives 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.

PPS25 (paragraphs D11 and D12) states that the Exception Test "should be applied to LDD site allocations for development and used to draft criteria-based policies against which to consider planning applications…Where the Exception Test has been applied in LDD allocations or in criteria-based policies, the local planning authority should include policies in its LDDs to ensure that the developer's FRA satisfies criterion C) in para. D9. The Environment Agency and other appropriate operating authorities such as Internal Drainage Boards should be consulted on the drafting of any policy intended to apply the Exception Test at a local level".

Compliance "with each part of the Exception Test should be demonstrated in an open and transparent way".

# 7 METHODOLOGY AND DATA SOURCES

## 7.1 Methodology of Strategic Flood Risk Assessment

The methodology for the assessments comprises the following:

- A sequential assessment of the flood risk posed to potential development sites in the towns and villages in the area. This includes categorisation of each site with respect to the degree of flood risk posed by development
- An assessment of each site located in Flood Zones 2 and 3 site as to how likely it is that those sites will pass the Exception Test.

## 7.2 Catchment Processes

With reference to catchment processes, it is important to consider how the different areas in the SFRA interact with each other. As the following section will demonstrate, flood processes and flood risk issues across the Warrington area are inextricably linked by the main rivers and their tributaries. However, it is also vital to consider the interactions with other districts beyond the borough boundaries. The importance of examining river systems at a catchment level has long been recognised, and is an approach advocated by the Environment Agency. The policies within this SFRA also recognise and support flood risk management with the catchment.

Currently, two Catchment Flood Management Plans (CFMPs) are being prepared for the Warrington area. The Draft Upper Mersey CFMP is not due to be issued until August 2007. The Draft Mersey Estuary CFMP is available from the EA's website. The consultation phase of the CFMP was due to end June 2007.

### 7.2.1 The Mersey Estuary

The Mersey Estuary CFMP covers an area of approximately 600km$^2$. The catchment has been heavily modified by industrial purposes, the most significant of which being the Manchester Ship Canal (MSC). The MSC was built in 1894 for navigation into Manchester, and has a significant influence on the River Mersey.

The main rivers that make up the Mersey Estuary catchment are:

- The River Mersey
- Glaze Brook
- Sankey Brook
- Ditton Brook
- Rivacre Brook
- Dibbinsdale Brook and;
- The Birket.

### 7.2.2 The River Mersey

The River Mersey starts in Stockport at the confluence of the River Goyt and the River Tame. It flows in a generally easterly direction and meets the Irish Sea at Liverpool Bay

The River Mersey through Warrington is subject to both tidal and fluvial flows. Under normally conditions, the tidal limit is Howley Weir, but in high Spring tides and surge events the weir can be drowned out and the tide can reach as far as Wollston Siphon Weir. Fluvial flows begin to dominant at Westy. A portion of the fluvial flows are discharged through the Manchester Ship Canal. There has been no incidence of fluvial flooding from the Mersey in Warrington since the MSC was constructed in 1894.

## 7.3 Detail Approach

The approach to the SFRA is as follows:

### 7.3.1 Data Collection

A critical phase in the project delivery is the collection and review of existing information. These data comprise known or perceived flood risk issues within the district, development pressures and constraints, and current policy governing development within flood risk affected areas. The majority of this data has been recorded and included in the GIS data layers used to undertake this assessment. A summary of data sources used in this assessment is provided below:

- Warrington Unitary Development Plan
- Pre-production summary of Arpley & Bridgefoot Area Action Plan
- Details of any other areas of potential development e.g. Urban Potential Study and Land Reports
- Historical records of flooding including cause and extent. Specifically Flood Incident Records from the Cheshire Fire Brigade.
- Main River designations and investigations
- Known and perceived flood risk issue areas, including localised drainage. Specifically DG5 data from United Utilities
- Catchment topography (LiDAR (Light Detection and Ranging) data and Ordnance Survey (OS) Mapping)
- Existing Section 105 investigations for watercourses in the borough
- Current EA flood risk management strategies including details of flood defence assets
- EA Flood Mapping Studies
- Strategic Review of Flood Risk in Warrington including Strategic Environmental Assessment supplied by the Environment Agency
- Proposed land use changes.

### 7.3.2 Assessment of Flood Risk

The primary objective is to assess and categorise, in accordance with Table D.1 of PPS25 (Flood Risk Zones – see also Table B-1 Appendix B.1), flood risk within the developing areas. In general, the following considerations have been addressed as part of the flood risk assessment process:

- Definition of areas subject to development and regeneration pressures
- Identification of known or perceived flood risk areas, including the nature of the flooding problem (e.g. river flooding, local under-capacity drainage, culvert blockage) providing the initial 'filter' for key flood risk issue areas within the SFRA area
- Review of the current Environment Agency Flood Zone Maps, to provide the broad (first pass) definition of high risk Flood Zone 3
- Review of more detailed flood risk information, from model results where available, to refine the delineation of actual risk in Flood Zones
- Identification of washland and critical floodplain areas as high risk Flood Zone 3b
- Identification of formal and informal flood defences that reduce flooding to developing and regeneration areas
- Identification of developing areas contributing to watercourses and/or known flooding issue areas to ensure impact upon upstream and downstream properties is adequately considered (irrespective of flood risk posed to proposed development).

### 7.3.3 Categorisation of Sites in Accordance with PPS25

This involves identifying those areas in the borough that fall within Flood Risk Zones 1, 2 and 3. The local authorities have identified a large number of sites within the Local Plans and Urban Capacity Studies as well as a number of potential key development areas and preliminary sites put

forward to be considered in the LDF. The individual sites are overlain onto the defined flood risk zones and each site has subsequently been categorised in accordance with the PPS25 Sequential Test.

A review of all potential development sites has been undertaken to categorise sites with respect to the degree of flood risk posed to them. The filtering process used to categorise these sites is summarised below. It should be noted that undeveloped areas within Zone 3a have been identified early on during the screening process, as they are seen as potential 3b areas that should be tested against functionality criteria, and therefore safeguarded against significant development.

*Preferred location for development* ***(least risk and greater range of compatible land use)***

1. **Sites within Flood Zone 1**: Sites located outside the medium and high Flood Risk Zones 2 and 3, respectively. PPS25 considers areas within low Flood Risk Zone 1 to be at little or no risk of fluvial flooding. Flood risk zones are defined by the Environment Agency's Flood Zone Maps.

2. **Sites within Flood Zone 2**: Sites located outside the high flood risk zone 3 but wholly or partially located within the medium Flood Risk Zone 2.

*Development not acceptable* ***(highest risk and least range of compatible land use)***

3. **Sites within Flood Zone 3a**: Previously developed or undeveloped areas wholly or partially located within high Flood Risk Zone 3a.

4. **Sites within Flood Zone 3b**: Sites located wholly or partially within the functional floodplain. These are areas where water has to flow or be stored in times of flood.

For the purpose of this SFRA, there is a presumption that urban areas within Warrington have been classified as Flood Zone 3a. There is also a presumption that new greenfield sites or rural areas are classed as Flood Zone 3b. It should be noted that in either case, a site specific FRA will be required to determine the actual level of risk and to confirm a sites actual classification.

### 7.3.4 Definition of Zone 3b - Functional Floodplain

PPS25 defines this as land, *'where water has to flow or be stored in times of flood' and, 'which would flood with an annual probability of 1 in 20 (5%) or greater in any year'* [18]

The following criteria have been developed and applied in this study, based on the guidance provided in PPS25:

1. A functional floodplain needs to comprise an unobstructed area of land where flood water is not prevented by flood defences or by permanent buildings from inundation during times of flood.
2. A functional floodplain must be active, meaning land which provides flood conveyance or flood storage, either through natural processes, or by design or designation.
3. A functional floodplain designation is also dependent of the regularity of flooding and must be an area of land where water regularly flows in times of flood. It is understood that the regularity of flooding for a zone 3b area arises from a flood with a 5% chance of occurrence in any one year or greater.

In practical terms, this means that no urban, or 'Brownfield', area can be designated functional floodplain as it cannot satisfy points 1 and 2.

Previous modelling work carried out be JBA, as part of the *'Tidal Mersey at Warrington'* (2005) and *'Sankey Feasibility Assessment'* (2006) projects, was used to determine those areas that would flood with the equivalent frequency stated in point 3. Figures C1-7 and C1-8 provide flood

[18] Communities and Local Government. 2006. *Planning Policy Statement 25: Development and Flood Risk*. December 2006. pg 7. http://www.communities.gov.uk/pub/955/PlanningPolicyStatement25DevelopmentandFloodRisk_id1504955.pdf

depth contour plots for the 1 in 25 (4%) flood event for North and South Sankey respectively. The outlines derived from this study have been used to define the Functional Floodplain associated with the Sankey Brook.

Areas of the River Mersey are included in the EA's tidal flood forecasting system. Overtopping assessments for the River Mersey focused on the eight flood cells identified in the Tidal Flood Forecasting System, or Tidal Triggers, report (Royal Haskoning, June 2004). These cells are defined by elevated features, such as roads and railway lines, which tend to contain flood water and prevent it flowing between adjacent areas. The results to this analysis enable more detailed understanding of the sequence of flooding as well as flow routes and velocities of flood water during inundation of the lowest areas of ground. Further information is given in Appendix C of this report.

### 7.3.5 Review Climate Change and Land Use Impacts

Consideration has been given to the implications of wider land management practices on flood risk in the area. The delineation of Flood Zones 2 and 3, coinciding with the 0.1% and 1% events respectively, has been used as a general indication of how flood risk may alter laterally as a result of climate change.

A review of the Flood Zone maps indicates that in general, there are few areas where the difference between Zone 2 and 3 is significant enough to alter the delineation of high risk zones for application of the Sequential Test.

Where existing river models were available, such as the Sankey, further interrogation of modelling results has been used to determine more accurately the potential impact of climate change and land use change on design levels. Threshold of flooding and flood depths mapping for the Sankey areas are included in this SFRA.

There is a significant body of scientific evidence that the global climate is changing, and that the rate of change will accelerate. This will lead to increasing storm intensities and rising sea levels which will in turn have an impact on flood risk. PPS25 states that each new development, "…*should remain safe throughout the lifetime of the plan or proposed development and land use*". Hence to ensure that this requirement is met, and the that the principle of sustainable development is upheld, the possible effects of climate change on flood risk for each potential development site should be considered.

The site specific FRA should include a detailed assessment of the potential effects of climate change and how the increased flood risk will be managed safely. However, as an indication, the 'Indicative Depths of Inundation' provided for each site considered in this study are based on modelled estimates with allowance for climate change over the next 50 years. This is to give the council an additional level of resolution of flood information and therefore further inform decision making within the context of the Sequential Test. **The information is not intended to inform any detailed building design** e.g. with regard to floor levels etc. This is within the remit of the FRA.

Depth predictions are available for those areas affected by tidal flooding in the Mersey Valley from the 'Tidal Mersey in Warrington' study, JBA 2005. The indicative depths of inundation are taken from the 1 in 200 year event with an additional 260mm to represent the possible rise in sea level. The representative sea level rise was calculated according to the, 'FCDPAG3 Economic Appraisal: Supplementary Note to Operating Authorities – Climate Change Impacts', Defra 2006. The calculation considered the possible sea level rise between 2005, the date of the original study, and 2055, 50 years from the original study. The details of the calculation are shown below:

| DEFRA Time Category | Net Sea-Level Rise (mm/yr) | No of years Considered | Sea-Level Rise (mm) |
|---|---|---|---|
| 1990-2025 | 2.5 | 20 (2005-2025) | 50 |
| 2025-2055 | 7 | 30 (2025-2055) | 210 |
| | | **Total Rise (mm)** | 260 |

Depth predictions are available for those areas affected by fluvial flooding from Sankey Brook from the, 'Review of Sankey Strategy', JBA 2005. The indicative depths of inundation are taken from the

1 in 100 year event plus 20% increase on flows to represent the possible increase in storm intensity.

Figure 2007s2261-DW01 provides a plan of the flood depth grid used to obtain the indicative depths.

For the purpose of this SFRA there is a presumption by the council that proposals for new development will be accompanied by a Surface Water Management Plan that will demonstrate how flood risk associated with new development will be managed without increasing flood risk elsewhere. The general principle adopted by the council is that all surface water should be attenuated on site for the duration of the flood event before being release in a control manner back into the drainage system or receiving watercourse.

The council will encourage development that enhances opportunities to restore the natural floodplain. However, it is also recognised that few areas within the borough can be classified as functional floodplain, due to the infrequent rate of inundation.

### 7.3.6 Planning Review Sites within Flood Risk Zones 1 and 2

Recommendations for the future management of development and redevelopment sites in low to medium Flood Risk Zones are provided to meet the requirements of national planning guidance and regional and local flood risk policy.

### 7.3.7 Planning Review of Sites within High Risk Zone 3

Consideration has been given to the actual risk posed to individual sites in high Flood Risk Zone 3 and recommendations for development allocations have been made. Development constraints within these areas are dependent on the strategic importance and requirement for development (within a planning context).

Recommendations for the future management of development within the high Flood Risk Zone have been provided on a site-by-site basis to meet the requirements of PPS25, as well as regional and local flood risk policy.

### 7.3.8 Establishment of Guidance for LPA and Developers at Planning Application Stage

Concise and pragmatic guidance has been developed to assist the council and developers to ensure that the outcomes and recommendations of the SFRA are followed through to the planning application and implementation stage.

It is imperative to ensure that the requirements placed upon developers at planning application are robust and fit for purpose. Similarly, the ownership, roles and responsibilities of the LPA and Environment Agency as appraisal bodies must also be clearly understood to ensure that the intent of the SFRA and planning process are not lost.

### 7.3.9 Detail Assessment Requirements and Exception Test

In order to assist the councils in determining whether housing and employment requirements can be met, without affecting existing areas of medium to high flood risk, detailed assessment has been carried out at a number of sites. At these sites the potential impact and feasibility of generic mitigation measures has been considered.

All the sites which are located in Flood Zones 2 and 3 are assessed as to the likelihood of them passing the Exception Test and general recommendations given (there can be more than one possibility for each site). Those sites located in Flood Zones 2 and 3 are then subsequently examined in more detail.

## 7.4 Flood Zone Maps

To support the planning process and the implementation of PPS25, the Environment Agency is producing a range of flood mapping products. These include Flood Zone Maps and the Historical Flood Map. Functional floodplain does not have a simple a definition, and performance of the river floodplain in a local context will guide where floodplain has a functionality that should be protected and enhanced.

The Flood Zone Maps are the first of these to be delivered. These maps predict the high (1% fluvial and 0.5% tidal) and medium (0.1% fluvial and tidal) flood risk zones across all of England and Wales. They have been prepared using a consistent methodology based on the national digital terrain model (NextMap), derived river flows (Flood Estimation Handbook (FEH)) and two dimensional flood routing. The theoretically derived flood zone extents have been adjusted in some locations where the results are inconsistent with historical flooding extents, more detailed flood mapping studies or where there are known errors in the digital terrain model.

The Flood Zone Maps were first released to LPAs and others in June 2004. The maps have been revised since that time and are updated every quarter to include new, improved data from EA surveying and modelling programmes. Version 3.4 of the Flood Zone Maps has been used in this SFRA.

Whilst the Flood Zone Maps are an improvement on past broad scale modelling approaches (such as the IH130 methodology), the limitations of the maps must be recognised. The methodology does not allow for the impact of features such as washlands or historical river diversions, and consequently there can be inconsistencies between the theoretical flood extents and historical flood extents. However, the boundary between Zones 3a and b are unlikely to be affected. Whilst the topographic data used in the modelling is fit for purpose, there are uncertainties associated with the data which affect the accuracy of the flood extents.

The Flood Zone Maps do not take account of flood defences and, therefore, represent a theoretical extent of flooding. The actual extent of flooding is mitigated, to some extent, by flood defences. In this sense the Flood Zone Maps provide a conservative assessment of the extent of flooding and are consistent with PPS25, which categorises flood risk ignoring the effects of defences.

Allocations and other developing areas that are situated wholly or partially within the Flood Zone Maps must be critically reviewed to assess the degree of flood risk posed directly to or by the proposed development.

The centre of Warrington is located on the banks of the River Mersey and is susceptible to combined flooding from fluvial and tidal events. The Environment Agency have undertaken a number of studies to determine the extent of flood risk in Warrington. The combined effects of fluvial and tidal flooding, as well as the interaction with the Manchester Ship Canal, have proved difficult to predict in past investigations.

In order to evaluate the extent of fluvial flooding, consideration needs to be given to controlling effect of the Manchester Ship Canal. The Manchester Ship Canal has significant capacity and works in union with the River Mersey to convey flows. Understanding how flood water is distributed between the River Mersey and Manchester Ship Canal is, therefore, essential for defining a realistic flood risk outline through Warrington.

The EA acknowledge that the current Flood Zones for Warrington tend to overestimate the likely extent of fluvial flooding. The two main reasons for this are:

- that no detailed hydraulic model of the Mersey is currently available and;
- that, as a manmade structure, consideration of the Manchester Ship Canal (and its flood alleviating function) is not taken into account.

Further assessment of the extent of flooding through Warrington was undertaken for the EA by JBA in 2006. These revised flood zones take the Manchester Ship Canal into account and indicate a reduction in the extent of flooding through Warrington. The EA have acknowledged that these revised flood zones provide a more realistic extent of flooding through Warrington. For the purpose of this SFRA both the National Flood Zone Maps, as shown on the EA's website, and the revised flood zone maps have been included to enable the council and developers to make informed decisions.

The EA are currently modelling the tidal Mersey through Warrington and Sankey system. This work will culminate in publication of updated Flood Zone Maps for Warrington later this year.

Areas of Warrington along the banks of the Mersey can generally be broken down into discrete flood risk cells. These cells are defined by elevated features, such as roads and railway lines, which tend to contain flood water by preventing it from flowing between adjacent areas.

In order to improve the level of confidence placed in the accuracy and limitations of the exiting flood mapping data, eight of the vulnerable cells were assessed using LiDAR and two dimensional inundation (JFlow) simulations to determine the extent, depth and rate of inundation. The analysis has produced a series of plans that demonstrate the mechanism by which each cell floods. Flow routes through each cell have been identified as a series of snap shots which indicate the extent of flooding within each cell, throughout the tidal cycle. Contoured plans indicating the depth of flooding within each cell have also been produced and are included in Appendix C of this report. The cells selected for use in the assessment are:

- Westy
- Miles's Bite
- Howley
- Knutsford Road
- Arpley Meadows
- Eastford Road
- Bank Quay Right Bank
- Sankey Bridge

The mapping and depths of flooding used in this SFRA are based on the EA flood studies *Flood Risk Mapping Review-Tidal Mersey at Warrington* (JBA 2005), *Flood Risk Mapping Review-Review of Flood Zone Maps* (JBA 2006), the *Sankey Feasibility Assessment* (JBA 2005).

## 7.5 Flood Defences

PPS25 considers that defended areas (i.e. those areas that are protected to some degree against flooding by the presence of a formalised flood defence) are still at risk of flooding, and therefore sites within these areas must be assessed with respect to the adequacy of the defences.

The location and condition of all flood defences is provided by the Environment Agency via the National Fluvial and Coastal Defence Database (NFCDD). A copy of registered assets in the area has also been obtained for this study, they are represented in each of the detailed plans for each of the study areas within Warrington.

The condition of the existing defences is provided in the form of a 'rating' (1 to 5), and is a reflection of any signs of 'obvious' structural problems. The condition rating is determined on the basis of visual inspection, focussing on obvious signs of structural defect (e.g. slippage, cracking, poor maintenance), designed to inform the maintenance programme. A summary of the NFCDD condition rating allocations is provided in the table below.

**Table 7-1: NFCDD Condition Ratings**

| Condition Rating | Condition | Condition Description |
|---|---|---|
| 1 | Very Good | Fully serviceable. |
| 2 | Good | Minor defects. |
| 3 | Fair | Some cause for concern. Requires careful monitoring. |
| 4 | Poor | Structurally unsound now or in the future. |
| 5 | Very Poor | Completely failed and derelict. |

As part of the SFRA these visual condition grades have been taken as an indication of the risk of defence failure as this is an accepted EA process undertaken in the National Flood Risk Assessment (NaFRA) flood risk maps. In detailed Flood Risk Assessments (FRAs) the condition of the defences will need to be explored more thoroughly, especially where the defences are informal

and contain a wide variation of condition grades. In this SFRA the term poor condition has been used. This reflects defences of condition grade below 2, or where specific concern has been raised by the Environment Agency.

## 7.6 Topography

Remotely sensed ground level data (LiDAR) have been made available for use in the SFRA by the Environment Agency. This information is in the form of a land surface level grid with a 2m grid resolution. The nominal vertical accuracy of LiDAR data is typically ± 0.25 m. LiDAR data are available for most of the main rivers within the study area and have been utilised.

## 7.7 Hydraulic Modelling

No large scale hydraulic model of the Mersey through Warrington (including the Manchester Ship Canal) was available for use in this SFRA. Hydraulic modelling was available for the Sankey system.

It is understood that the Environment Agency are currently undertaking modelling of the Tidal Mersey system.

## 7.8 Historical Flooding

Historical flooding records have been provided by:

- Details of historical flooding records in Warrington have been provided by council and Environment Agency officers. Refer to Fig 2007s2261-DW02 for details
- Flood Incident Records have been provided by the Cheshire Fire Brigade Refer to Fig 2007s2261-DW03 for details
- DG5 Data has been provided by United Utilities

The British Hydrological Society Chronology list significant flood events in the Mersey Estuary in 1881, 1911, 1928, and 1933.

There have been no incidents of fluvial flooding in Warrington since the Manchester Ship Canal was constructed in 1894.

The largest of recent tidal flooding events occurred in February 1990 and February 1997.

## 7.9 Limitations of Background Information

Data and models are key to the understanding of the scale of the flood risk. However the data used in the SFRA is limited in many aspects and it is important that these limitations are considered.

The limitations of Flood Zone Maps have been discussed in Sections 7.4.

Where there is no reference to localised flooding issues at a site, this does not necessarily mean that there are none.

The LiDAR data used has been filtered, i.e. objects such as trees and buildings have theoretically been removed. However, in some cases some of these features may have been left in, which will clearly have implications for those sites where water levels have been estimated during floods. There are also gaps in the LiDAR data, where the land height appears as “null”.

Where water levels have been taken from the models for the fluvially affected areas around Sankey Brook, cross-sections have been taken along the watercourse, usually through the model node locations. Using the LiDAR data, the ground level along the cross-section has been recorded. The flood depths were calculated by taking the ground level from the water level predicted at the model node. Assuming that the water level would remain constant as the flood wave progresses in land is a simplified approach and the real flood mechanism is likely to be more complex.

Cross-sections can only give an indication of what water levels are like in times of flood, and cannot be applied to the whole site, as land levels can fluctuate considerably from one point to another.

The models for tidal affected areas around the Mersey are generated using the 2D modelling package JFlow. These depths have been generated assuming a breach scenario which is potentially more unlikely than the design event suggests.

Detailed site specific Flood Risk Assessments (for sites carried forward to development) will need to be undertaken to investigate the flood regime in detail.

## 7.10 Flooding From Other Sources

In addition to tidal and fluvial flood risk other sources of flooding need to be assessed. alternative sources of flooding including groundwater, overland flow and drainage systems also need to be considered when planning for development.

Although explicit consideration of these sources of flooding is not a requirement for flood zone allocation, local drainage issues have the potential to cause substantial damage and distress. When considering development proposals, known drainage and surface water problems need to be taken into account.

Information provided by the Cheshire Fire Service and United Utilities has been used to and identify areas where drainage might be an issue.

However, some general information regarding surface water flood risk and its management has been collected as part of this study:

### Evidence of Flood Incidents from Surface Water

In order to make a strategic assessment of surface water flooding issues in the borough the following information was obtained:

- Flood Incident Records for the past 5 years from the Cheshire Fire Service
- DG5 Register from the United Utilities

The Flood Incident Record provides the address of any property attended by the Cheshire Fire Service in order to assist with a flood incident. However, the record do not provide much detail about the causes of flooding. For example, records from the Fire Service do not necessarily differentiate between surface water flooding, which could be of consequence to spatial planning, and a damaged water main pipe.

The DG5 Register is split into Internal and External Flooding. Only the External data has been used in this study. The DG5 data splits the borough into sub catchments and gives a rating depending on how many properties in that catchment have been affected by flooding. Some allowance can be made for that fact that ratings may be higher in urbanised areas as there will be a higher concentration of properties. The DG5 data does not provide any detailed information of the location of flooding.

A cluster of recorded flooding incidents would tend to indicate a surface water flooding problem that could influence where additional development could increase existing problems. However, in this instance no significant surface water problems have been identified.

### *Sustainable Urban Drainage Systems (SuDs)*

For each site identified by the council for consideration, a general description of the soil type has been obtained from the, 'Soil Map of England and Wales', Lawes Agricultural Trust, Soil survey of England and Wales 1983. From this information, an initial indication of the sites likely suitability for a Sustainable Urban Drainage System (SUDs) has been made. However, this information is highly generalised and a more detailed assessment as part of a site specific FRA.

Where a localised drainage issue has been identified, further development upstream of this location has a potential to exacerbate the existing problem by increasing discharge and altering the flow regime of the watercourse.

For the purpose of this SFRA, all proposed developments need to consider mitigation measures to ensure flood risk is not increased either upstream or downstream of the proposed development. In this instance mitigation may take the form of sustainable drainage techniques or surface water

attenuation. The consideration of soil type will provide a positive contribution in the consideration of drainage arrangements strategically and will give an indication of their suitability for soakaway solutions (SuDS). It should be stressed that whilst the permeability of the soil is an important consideration for infiltration techniques, some SuDS techniques can be used on impermeable soils and could help aid attenuation by reducing conveyance time. Soil classifications should, therefore, be considered when carrying out a more site specific investigation.

### Ground Water

No significant ground water issues have been identified by the EA with the borough

### Reservoirs and Canals

Other sources of flood risk in Warrington include raised canals and reservoirs. Failure of a canal or reservoir embankment could cause rapid inundation to the surrounding area. Where new development is planned in the vicinity of these structures then residual risks associated with either a breach or overtopping of the structure will need to be assessed in detail by undertaking a site specific and detailed FRA.

The following canal and reservoirs have been identified:

- The Bridgewater Canal
- St Helens Sankey Canal
- Winwick Reservoir
- Appleton Reservoir
- Lymm Reservoir

The Council has not identified any sites for potential development either adjacent to or in vicinity of these structures. Overtopping and breach assessments of reservoirs and the canal have not therefore been undertaken as part of this SFRA.

# 8 STRATEGIC FLOOD RISK ASSESSMENT – PRACTICAL APPLICATION

## 8.1 Delineation of the Flood Risk Zones

The first pass of the Sequential Test uses the Environment Agency's published Flood Zone Maps to identify areas at low, medium and high flood risk. These areas correspond to Flood Risk Zones 1, 2 and 3, respectively. The Environment Agency's Flood Zone Maps provide an overview of areas considered susceptible to flood risk in the study area as a result of fluvial and tidal flooding. The Flood Zone Maps have been prepared in a consistent manner across the whole of the UK and provide an estimation of the extent of flooding for both the 1% and 0.1% events.

PPS25 divides the country into three basic flood zones, Flood Zones 1, 2 and 3, corresponding to areas of low, medium and high flood risk, respectively. The flood zones are based on the Environment Agency's Flood Zone Maps (see Table B - 1in Appendix B.1 for full descriptions of all the flood zones under PPS25). Therefore they refer to the probability of flooding from rivers, the sea and tidal sources (where appropriate) and ignore the presence of existing defences, because these can be breached, overtopped and may not be in existence for the lifetime of the development.

### 8.1.1 Delineation of Low Risk Zone 1

PPS25 considers areas within Flood Zone 1 to be at low risk to flooding. The annual probability of flooding within this zone is less than 0.1% or can be easily defined as areas within the borough council area located outside either Flood Zone 2 or 3.

Generally there is no constraint to development, in terms of flood risk, within Flood Zone 1 although, to stay in line with Environment Agency Standing Advice, any development over **1 ha** should be submitted accompanied by a site-specific Flood Risk Assessment. Localised drainage arrangements should be discussed and consideration of drainage needs to ensure that development will be safe and there will be no increase in flood risk elsewhere.

### 8.1.2 Delineation of Medium Risk Zone 2

PPS25 considers areas within Flood Zone 2 to be at medium risk of flooding. The annual probability of fluvial flooding within this zone is between 0.1% and 1% (or between 0.5% and 0.1% for tidal flooding). In general, Flood Zone 2 is considered suitable for most development except highly vulnerable land uses where the Exception Test is required, such as police stations, fire stations and ambulance stations.

However a risk-based assessment of allocations within Zone 2 must be undertaken. Although more vulnerable land uses such as hospitals, residential institutions and residential development are permitted in Flood Zone 2, it will be extremely important that detailed Flood Risk Assessments are carried out. These will need to clearly quantify actual flood risk, show that there is safe access and egress and show that any residual risk can be safely managed, especially when development is in the form of hospitals. Consideration of local drainage issues will also be required.

### 8.1.3 Delineation of High Risk Zone 3

PPS25 considers areas within Flood Zone 3 to be at high risk of flooding. PPS25 defines High Risk Flood Zone 3 as two sub-zones 3a and 3b, which corresponded to high probability flooding and the functional floodplain.

- **Flood Zone 3a: High Probability**

  In accordance with Table D.1 of PPS25 "*This zone comprises land assessed as having between a 1% and 0.1% annual probability of flooding or between a 0.5% and 0.1% annual probability of sea flooding in any year.*"
- **Flood Zone 3b: The Functional Floodplain**

In accordance with Table D.1 of PPS25 "*This zone comprises land where water **has** to flow or be stored in times of flood*"

### 8.1.4 Delineation of the Functional Floodplain

Although PPS25 considers the Functional Floodplain as areas compromising land within Flood Zone 3 where water has to flow or be stored in times of flooding, SFRAs have received the responsibility of identifying Flood Zone 3b.

PPS25 has suggested the 5% annual probability flood event for the baseline of a Functional Floodplain, however a larger probability could be used where appropriate depending on catchment characteristics and on agreement between the LPA and the Environment Agency.

SFRAs also have the ability to identify where it might be appropriate to extend the 5% (or higher) flood outline to areas within Flood Zone 2 and 3 to restore or expand the Functional Floodplain. The ability to identify and safeguard large enough areas against redevelopment and development in both urban and rural areas means that open space can be used for flood storage, effectively reducing flood risk downstream. This process targets Zone 3 policy aims, identified in table D.1 in PPS25, which include:

1. "*Reduce the overall level of flood risk in the area through the layout and form or the development and the appropriate application of sustainable drainage systems,"*
2. "*Create space for flooding to occur by restoring functional floodplain and flood flow pathways and by identifying, allocation and safeguarding open space for flood storage."*

The SFRA should be fully integrated with Catchment Flood Management Plans (CFMPs) and other Strategies that show, at catchment scale, the need to protect the floodplain and preclude development in high flood risk areas.

The extension of Functional Floodplain as part of PPS25 should be considered as better flood management by reducing the overall level of flood risk in those areas that should not be used as potential areas for compensation, to justify developing in inappropriate high flood risk areas.

### 8.1.5 Implications for the SFRA

The Flood Zones for this SFRA have been defined in accordance with PPS25 and the potential development areas have been classified accordingly.

Functional Floodplains in this SFRA are acknowledged to be 5% annual probability flood event as a baseline of the floodplain extent. The Functional Floodplain has been extended in both rural and urban areas on undeveloped land. Low lying undeveloped land upstream of major communities has been given priority as extended Functional Floodplains, allowing for a reduction of flood risk to that community during large fluvial events, while developed land subject to flooding has been left as Flood Zone 3a.

### 8.1.6 Implications of the Exception Test for the SFRA

The introduction of the Exception Test in PPS25 does not negate the need to apply the Sequential Test. The Sequential Test must be applied prior to application of the Exception Test to demonstrate that there are no available sites in areas of lower probability of flooding that would be appropriate for the purported development. Application of the Sequential Test should reduce the number of sites where it will be necessary to apply the Exception Test, thus reducing council costs.

The policies formulated as part of the SFRA will need to consider the Exception Test and will inform, if not form, the draft criteria-based policies against which planning applications will be considered. This increases the importance of consultation with the Environment Agency as statuary consultees and obtaining their approval of the policies through the SFRA.

The focus of an SFRA is the Sequential Test but this study will aim to provide information to inform part c of the Exception Test. The SFRA will provide high level information on the probability of mitigation measures being feasible and which measures should be employed. This should provide a

broad identification of those areas which are most likely to pass clause c of the Exception Test and those that will probably not.

The SFRA also includes preliminary consideration of whether sites provided for assessment are on developable previously-developed land or on developable un-developed land.

In previous SFRAs the sites identified for consideration have been assessed in terms of sustainability and flood risk. Because of the recently published PPS25 this has been extended to include consideration of whether application of the Exception Test is required/appropriate and whether it is likely this will be passed in terms of flood risk i.e. is likely to pass part c. It is not for the SFRA to assess whether the site will pass parts a. and b. of the Exception Test. This will need to be done separately as part of the spatial planning process.

Once the Council has identified areas within the high risk zone, which after application of the Sequential Test need to be retained, they will need to commission a detailed Flood Risk Assessment to pass parts c. of the Exception Test. The SFRA cannot provide this level of site specific information.

## 8.2 Flood Risk Vulnerability Classification

In PPS25 different types of development are divided into five flood risk vulnerability classifications (see Table B - 2 in Appendix B.2 for complete list):

- Essential infrastructure
- Highly vulnerable
- More vulnerable
- Less vulnerable
- Water compatible development.

Subject to the application of the Sequential Test, PPS25 specifies which of these types of development are suitable within each zone:

- Zone 1: All the uses of land listed above are appropriate in this zone.
- Zone 2 The water-compatible, less vulnerable and more vulnerable uses of land and essential infrastructure are appropriate in this Zone. The highly vulnerable uses are only appropriate in this zone if the Exception Test is passed.
- Zone 3a: The water-compatible and less vulnerable uses of land are appropriate in this zone. The highly vulnerable should not be permitted in this zone. The more vulnerable and essential infrastructure uses should only be permitted in this zone if the Exception Test is passed.
- Zone 3b: Only the water-compatible uses and the essential infrastructure that has to be there should be permitted in this zone. Essential infrastructure in this zone should pass the Exception Test and be designed and constructed to meet a number of flood risk related targets. The less vulnerable, more vulnerable and highly vulnerable uses should not be permitted in this zone.

### 8.2.1 Implications of the Flood Vulnerability Classification for the SFRA

Following the application of the Sequential Test, it may become apparent that further testing is appropriate via the Exception Test. PPS25 implies that it is not necessary to apply the Exception Test to employment allocations within Zone 3a, therefore consideration of whether the site is developed or undeveloped is not necessary under PPS25. It is important to check Table D2 of Annex D for the full flood risk vulnerability classification.

The guidance derived by JBA for other SFRAs has already, to some extent, reflected the variation in flood risk vulnerability of different types of development. This guidance has been developed further to ensure that it fully reflects the new requirements of PPS25 and the councils.

## 8.3 Conclusion

PPS25 has significant implications for the guidance produced and scope of the SFRA. However it does not affect the level of information provided, and most other changes are in terminology and test structure.

The SFRA provides sufficient information to complete the Sequential Test in terms of flood risk. However it can only provide information on where it will be necessary to complete the Exception Test and areas where part c of the Exception Test is most likely to be met. It will not provide sufficient information to complete the Exception Test. To pass part c, more detailed assessment of risk will still be required.

# 9 STRATEGIC FLOOD RISK GUIDANCE

## 9.1 Introduction

The guidance detailed below has been developed to provide a clear, concise and consistent means of assessing the feasibility and sustainability of sites and to determine appropriate flood risk mitigation measures where required. The framework will aid LPAs and others to assess flood risk associated with allocations and potential development sites. It will also allow policies on flood risk to be included in the LDD's, which draw upon national guidance for consistency, but provide the local detail and interpretation of these national policies.

PPS25 aims to direct development to lower flood risk sites wherever possible. It states in paragraph 5, "The aims of planning policy on development and flood risk are to ensure that flood risk is taken into account at all stages in the planning process to avoid **inappropriate** development in areas at risk of flooding, and to direct development away from areas at higher risk". Only when the Sequential Test has been employed and new development is, **exceptionally**, necessary and no other lower risk sites have been shown to be available should the Exceptions Test be applied.

In paragraph G.2 of PPS25, it states that "development should not normally be permitted where flood defences, properly maintained and in combination with agreed warning and evacuation arrangements, would not provide an acceptable standard of safety for the lifetime of the development taking into account climate change". The Practice Guide, which accompanies the final PPS25, gives further information on the residual risks behind defences and on how to apply PPS25 policy to development in these defended areas. However, it should be noted that defences don't eliminate the risk, only reduce the frequency of flooding.

The guidance focuses on the technicalities of flood risk management rather than the other planning issues an LPA must consider in selecting allocations. It should, therefore, be assumed that:

- These other planning issues have been considered separately
- For land to be allocated within the high risk zone, the full range of planning issues has been evaluated.

It should also have been determined through the SEA (Strategic Environmental Assessment) and SA (Strategic Assessment) that the land is the most suitable for development.

**It must be made clear that this SFRA does not preclude the need for site specific flood risk assessments.**

This chapter will present the guidance for Flood Zone 3b; Flood Zone 3a (including defended and undefended areas, public safety and rapid inundation, and the feasibility of flood risk mitigation); Flood Zone 2; and Flood Zone 1. It will then discuss issues relating to other known flood risk areas and Internal Drainage Districts.

## 9.2 Flood Zone 3b – The Functional Floodplain

In PPS25 only the water compatible uses are allowed in this Flood Zone. Essential Infrastructure can be permitted after the Exceptions Test is passed. According to PPS25, developers and local authorities should:

- Reduce overall level of flood risk in the area through the layout and form of the development and the appropriate application of sustainable drainage techniques; and

- Relocate existing development to land with a lower probability of flooding[19]

In addition, according to PPS25, essential infrastructure should:

- Remain operational and safe for users in times of flood;
- Result in no net loss of floodplain storage;
- Not impede water flows; and
- Not increase flood risk elsewhere[20].

## 9.3 Flood Zone 3a – High Probability

PPS25 states that the water-compatible uses and less vulnerable development are allowed in this Flood Zone, following testing within the sequential process. According to PPS25 highly vulnerable development is not permitted. Essential infrastructure and more vulnerable development need to pass the Exception Test, while essential infrastructure should be designed and constructed to remain operational and safe for users in times of flood.

According to PPS25, developers and local authorities should implement the following policy aims:

- Reduce the overall level of flood risk in the are through the layout and form of the development and the appropriate application of sustainable drainage techniques;
- Relocate existing development to land in zones with a lower probability of flooding; and
- Create space for flooding to occur by restoring functional floodplain and flood flow pathways and by identifying, allocating and safeguarding open space for flood storage[21]

The delineation of the subset zones of High Risk Zone 3 may be sufficient to allow the spatial planning process to continue, with development steered away from these high risk zones. However, regeneration of land or change in land use behind existing defended areas in the High Risk Zone will continue to require a more detailed assessment of the flood risk (i.e. whether the scale of risk is worth taking, and how sustainable and effective the mitigation measures would be (i.e. whether the risk could be managed). Where, due to wider sustainable development reasons, there are no other suitable sites available in lower risk zones then an assessment of the actual risk within Flood Zone 3 is required. Annex G in PPS25 deals with managing residual flood risk.

Paragraph G2 of PPS25 states that following application of the Sequential Test and Exception Test for Zone 3a development:

> *"Should **not** normally be permitted where flood defences, properly maintained and in combination with agreed warming and evacuation arrangements, would not provide an acceptable standard of **safety** taking into account climate change."*

It would be up to the developer to demonstrate how in planning terms this safety can be achieved and how the residual risks will be managed. A clear distinction between commercial flood standards of protection and management of loss of life should be explored in the FRA. A greater reliance on flood warning may be required, which is not always a tangible alternative to accepting a lower standard of protection.

In the context of this discussion an **undefended area** (Figure 9.2) of floodplain is considered to be an area where the water level for the 1% event will be similar to that in the relevant watercourse. These areas may be entirely undefended or if defences are present they are discontinuous or

[19] Communities and Local Government. 2006. *Planning Policy Statement 25: Development and Flood Risk*. December 2006. pg 24 http://www.communities.gov.uk/pub/955/PlanningPolicyStatement25DevelopmentandFloodRisk_id1504955.pdf

[20] Communities and Local Government. 2006. *Planning Policy Statement 25: Development and Flood Risk*. December 2006. pg 25 http://www.communities.gov.uk/pub/955/PlanningPolicyStatement25DevelopmentandFloodRisk_id1504955.pdf

[21] Communities and Local Government. 2006. *Planning Policy Statement 25: Development and Flood Risk*. December 2006. pg 25 http://www.communities.gov.uk/pub/955/PlanningPolicyStatement25DevelopmentandFloodRisk_id1504955.pdf

constructed to a low standard. In these areas guidance provided in Section 9.3.1 (undefended areas) will be most relevant in assessing sustainability and determining mitigation requirements.

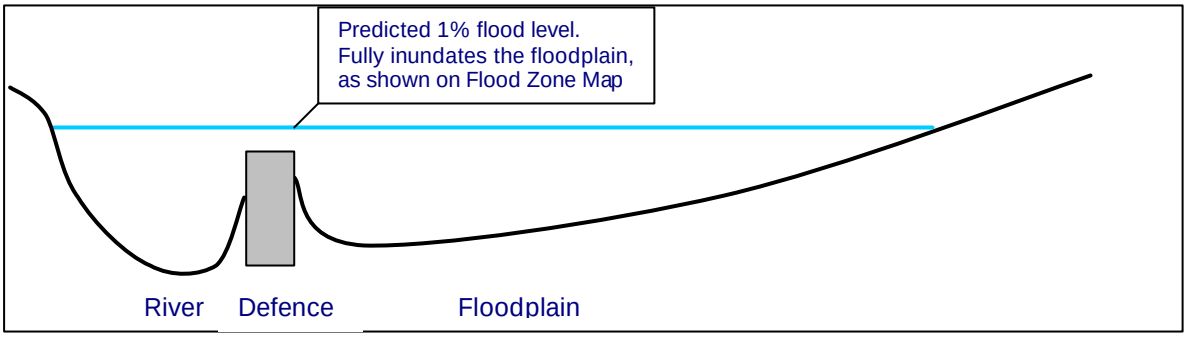



**Figure 9-1: Illustration of the undefended area case, where the standard of protection is low and floodplain is small and fills to the same level as the river**

A **defended area** (Figure 9.3)) is considered to be an area of floodplain where the defences will result in a water level for the 1% event that is considerably lower than in the source watercourse. This means the defences substantially (but not necessarily completely) mitigate the flood risk associated with the 1% event. These areas will be defended to a minimum standard promoted by Defra, but not always necessarily to the 1% standard. In these areas guidance provided in Section 9.3.2 (defended areas) will be most relevant in assessing sustainability and determining mitigation requirements.

Areas Benefiting from Defences is the next generation of information to be provided by the Environment Agency on their Flood Map. For the purposes of future application of this guidance the standard of protection provided by the Environment Agency or from an assessment from an existing or new model would suffice. Areas which are defended will be protected by recent flood management schemes and are therefore well known to Environment Agency staff.

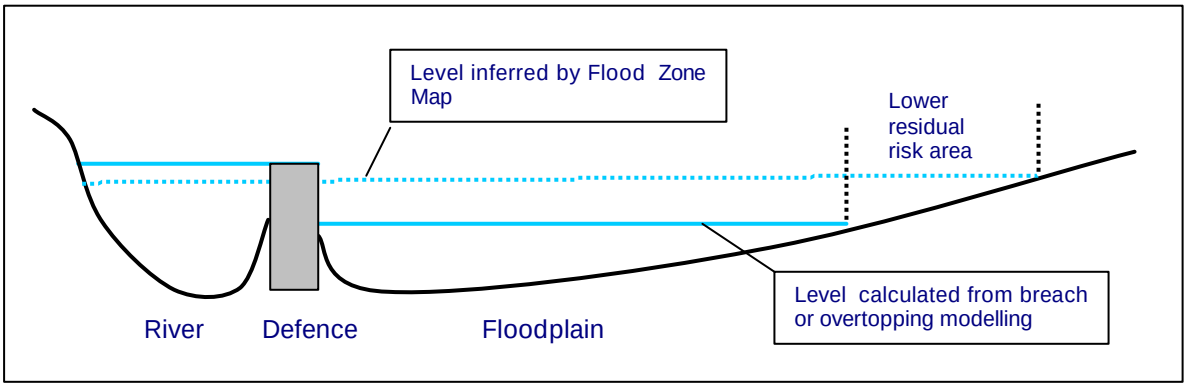



**Figure 9-2: Illustration of the defended area, where the overtopping or breach volume is small compared to the floodplain receptor and allows a refined assessment of residual risk**

### 9.3.1 Undefended Areas – Flood Risk Mitigation

Within undefended or poorly defended Zone 3a areas, floor levels for housing developments should, as a minimum, be situated above the acceptable standard of safety with sufficient freeboard to account for uncertainties in flood level prediction and climate change.

In accordance with PPS25 development within Zone 3a will require flood risk management measures, constructed with the operating authority's satisfaction with a dedicated sum to fully fund whole life maintenance and future climate change adaptability costs. The following paragraphs

define an appropriate standard of flood risk mitigation in undefended areas in the context of this SFRA.

The Sequential Test should be applied within the development site area, and it is considered appropriate to direct more vulnerable land uses to parts of the site at less probability and residual risk of flooding. The lower floors of buildings in areas at both medium and high probability of flooding should seek to develop water-compatible and less vulnerable land uses, including car parks or other public areas consistent with Table B-2.

Housing developments (more vulnerable development) should provide a minimum habitable space floor level above the estimated 1% year water level with the addition of allowances for modelling uncertainty and climate change (i.e. freeboard). This may be achieved by providing car parking or other public areas at ground floor level.

Employment development (less vulnerable development) should provide a similar standard of flood defence as housing developments. Within undefended or poorly defended Zone 3a areas, employment development should remain dry during the 1% event (or breach scenario where defences are in poor condition), with sufficient freeboard to account for uncertainties in flood level prediction and climate change. Developers will need to carefully consider the commercial viability of developing in these areas. In exceptional circumstances, where there is significant planning justification for development and the provision of this standard of defence is not feasible, a greater acceptance of flood risk may be permitted for less vulnerable development in areas of high probability of flooding with the focus on providing safety to occupants, flood proofing and designing buildings to minimise flood damage.

Flood proofing may be considered in circumstances where there is a low probability of limited shallow depth water entry and buildings are not subjected to severe inundation depths. This type of construction is designed to reduce the consequences of flooding and facilitate recovery from the effect sooner than conventional buildings.

This may be achieved "through the use of water-resistant materials for floors, walls and fixtures and the sitting of electrical controls, cables and appliances at a higher than normal level."[22] and flood resistant construction to either reduce the amount of water or prevent entry of water into a building where resistant techniques are used. A means of safe access and egress in times of flooding must be provided, especially when considering those with restricted mobility.

Whilst the basic level of protection afforded to residential and commercial development is the same, it is clear that approaches to how residual risk is managed may differ between these two types of developments. For residential development residual risk is a societal issue, for which a presumption of avoidance and removal is appropriate. Hence a significant freeboard should be incorporated into housing development floor levels, whereas for a commercial property the end user and insurer can assess and transfer this residual risk as appropriate. Therefore commercial and employment uses have a suitably different approach to the management of the residual risk, above that provided by the basic mitigation works. The onus would be on the local authorities to determine whether these risks are acceptable, in conjunction with advice from the EA. PPS25 advocates a risk based approach linked to vulnerability, and does not provide a prescriptive set of flood protection standards. Wherever possible as high a standard should be provided, but in exceptional circumstances, where alternative or complementary flood risk management measures can be taken and are sustainable, a lower standard may be acceptable. Care must be taken that such an approach would not result in future public expenditure on retrospective flood alleviation measures. Therefore this approach is exceptional and only applicable in limited locations where the flood risks are fully understood.

Isolated small greenfield developments may be sustainable in terms of their impact on floodplain storage and conveyance, however the cumulative effects of many small developments can be large and greenfield sites must be viewed within a wider perspective.

[22] Communities and Local Government. 2006. *Planning Policy Statement 25: Development and Flood Risk*. December 2006. pg 38 http://www.communities.gov.uk/pub/955/PlanningPolicyStatement25DevelopmentandFloodRisk_id1504955.pdf

The feasibility of mitigation measures may be assessed in accordance with the guidance established in Section 9.3.4.

### 9.3.2 Defended Areas

Within defended areas flood risk is primarily associated with overtopping and breach of defences (and localised flooding associated with drainage systems in some locations). These risks are related to the likelihood (standard of protection and structural integrity of defences) and consequences of flooding (depth, speed and duration of flooding, velocity of flood waters, and land use within defended area).

The likelihood of overtopping can be estimated by comparison of modelled water levels (where available) and defence crest levels. An indication of the likelihood of defence breach can be gained by reviewing the flood defence condition data held within the National Flood and Coastal Defence Database (NFCDD) and more detailed surveys and investigations undertaken by the Environment Agency and/or others. The consequences of defence overtopping or breach failure can be estimated using flood inundation modelling and mapping.

For developments to proceed it must also be shown that the development will not increase flood risk elsewhere through a loss of breach storage or conveyance. Flood risk must be reduced or kept at current levels as contained in the Regional Spatial Strategy (RSS) policy statement.

The feasibility of mitigation measures may be assessed in accordance with the guidance established in 9.3.4.

#### Overtopping

Areas where the standard of protection is less than 1% are defined as undefended by this SFRA and the guidance provided in Section 9.3.1 should be applied. Where assessments show an area to be at risk of defence overtopping in the 1% event (with climate change), measures should be employed to mitigate the risk. Where floor level raising is the preferred mitigation technique, minimum floor levels for housing developments should be set above the estimated water level that would result behind the defences (with an allowance for uncertainty and climate change). In exceptional circumstances, where there is significant planning justification for development and the provision of this standard of risk mitigation is not feasible, a lower degree of flood risk mitigation may be permitted in employment developments with the focus on providing safety to occupants, flood proofing and designing buildings to minimise flood damage.

A maximum inundation depth of 0.6 m is considered appropriate for the 1% event with the addition of allowances for modelling uncertainty and climate change. Minimum floor levels may be lower than the main river level if the floodplain is large.

Where the defences consist of earth embankments, overtopping of the defences is likely to lead to erosion and weakening of the defence structure. In these circumstances failure of the defences is considered highly probable and an assessment of the consequences of defence breach is also required.

#### Breach

Where the defences are shown to be at risk of overtopping (as above) and/or NFCDD data or additional information indicate that the flood defences are in poor or very poor condition, for the purposes of the SFRA it is assumed that there is a reasonable likelihood of defence breach in a major flood event during the lifetime of any new development A high degree of flood risk mitigation needs therefore to be provided or it may be that due to the high risk, the location is deemed to be unsuitable for development. If mitigation measures are acceptable, then minimum floor levels in housing developments should be set above the estimated maximum breach water level for the 1% event with allowance for climate change and other uncertainties.

In locations where the defence is of a high standard, both in terms of stability and height, then the probability of a breach occurring is reduced and hence the risk reduces as well. The overall probability of the consequences associated with a breach occurring extend to the extreme end of the risk continuum. This does allow a more considered approach to residual risk, and some flooding of non-sensitive or vulnerable developments may be considered acceptable.

Where the defences are shown to provide a standard of protection greater than the 1% event (with climate change), NFCDD data indicate that the defences are in **fair, good or very good** condition, and there is an absence of detailed survey data to suggest otherwise, for the purposes of the SFRA it is assumed that the likelihood of defence failure in a major flood event is low. With the defences mitigating risk substantially, a lesser degree of site-based flood risk mitigation may be adopted, with the focus on providing safety to the development and its occupants from residual risks. For housing developments it is recommended that minimum floor levels be set to the maximum breach level for a 1% event less 300 mm, or 600 mm above natural surface level, whichever is greater.

A maximum inundation depth of 0.6m is considered appropriate when combined with the 1% (1 in 100 yr) event and a breach in these well defended areas in **employment developments**[23] under these circumstances after consideration of uncertainty and climate change has been added to the minimum floor levels. Identification of the rapid inundation zone is essential in these circumstances, before deploying a relaxation of the residual risk accepted within the design. In comparison to residential areas, where societal risks are generally designed out, it is considered appropriate to possibly transfer these residual risks via insurance or resilience in the design of the commercial use, if the users of the site can be safely managed.

The effects of land raising within defended areas on potential breach risk also warrants careful consideration in the flood risk assessment. In confined floodplains where breach levels approach those in the main river, land raising is unlikely to have any impact on breach water levels and extents. However, where the floodplain is not confined by natural high ground or secondary defences, or where the passage of breach floodwater is restricted by partial barriers such as road or rail embankments, and consequently breach levels do not approach the main river level, then there is potential for land raising to lead to an increase in flood risk (extent and depth of breach) elsewhere. The potential for increasing breach related flood risk elsewhere is directly related to the loss of breach storage volume and conveyance, and single, small-scale developments are unlikely to have a significant impact. However, the cumulative effect of individual development proposals needs to be considered. Quantitative assessment of these effects may require detailed breach modelling to be undertaken in individual flood risk assessments. This guidance is not restricted to Zone 3a and applies to any site that is located with a defended area that is at risk flooding from defence failure 9.3.1.

### 9.3.3 Public Safety and Rapid Inundation

For all Zone 3a allocations, and particularly in defended areas where a development site is close to a defence (i.e. within 500m), consideration must be given to residual risks and the risk to public safety associated with access and egress from properties. Residual risks are those associated with very low likelihood events, such as events of frequency less than 1% annual exceedance probability and failure of defences where defences provide a high standard of protection.

Development should not be sited where these risks unduly threaten public safety and/or the structural integrity of buildings and infrastructure. Consideration of the depth of flooding, flow velocity, rate of inundation and safe access / egress is required to assess these risks. This assessment is applicable to areas at risk from both breach and overtopping.

There is a range of research and guidance available on flood hazards and public safety. DEFRA / Environment Agency Flood and Coastal Flood Defence Research and Development Programme, Project FD2317, Flood Risks to People consolidates flood hazard research from many sources.

The most recent flood hazard formula proposed by Phase 2 of the Risks to People Project is:

Flood hazard = d.(v+0.5) +DF

Where:

d is depth m

v is velocity $ms^{-1}$

DF is the debris factor with a value of 0-1

[23] Employment allocations are assessed as being “less vulnerable” in the Flood Risk Vulnerability Classification in PPS25.

A number of flood hazard thresholds have been identified describing a flood hazard as "*Dangerous for some*", "*Dangerous for most*" and "*Dangerous for all*". At present the lower threshold for "*dangerous for some*" of 0.75 is appropriate with a conservative upper threshold of 1.5. The threshold of 2.5 for *"Dangerous to all"* has been set with a less conservative view (see Table 8-1). It should be noted that hazard is not purely a function of flood depth.

**Table 9-1: Flood Hazard Thresholds**

| Flood Hazard d.(v+0.5)+DF | Description | Alternative Name / Hazard Class |
|---|---|---|
| 0 | Safe (dry) | None |
| 0 to 0.75 | Caution | Low |
| 0.75 to 1.5 | Dangerous for some | Moderate |
| 1.5 to 2.5 | Dangerous for most | Significant |
| Over 2.5 | Dangerous for all | Extreme |

For the purpose of the SFRA it is considered appropriate to provide a low hazard environment in access and egress routes associated with new housing developments. Environment Agency guidance suggests that all development should have a dry access and egress in the 1% event. This should be the aim, but in exceptional circumstances a low hazard condition may be acceptable if the flood warning is robust. Greater depth and velocity may be permitted where elevated access / egress to safe ground is provided.

### 9.3.4 Feasibility of Flood Risk Mitigation

Where allocations remain in high risk flood zone areas for other material considerations, it needs to be demonstrated that technically feasible flood mitigation options are available. A fuller appreciation of the sustainability of the site and its mitigation measures will be addressed via the Sustainability Appraisal. These measures must be designed to provide an appropriate level of flood mitigation to a site for the lifetime of the development. At most sites it is technically feasible to mitigate or manage flood risk (if potential off-site impacts are ignored), however the measures required may result in some practical constraints on development and/or require significant financial cost where flood risk is high.

The fact that mitigation measures are discussed in this SFRA should not be taken as a presumption that the Sequential Test has been short-circuited. It is included to give a fuller picture of the implications of allocating a site, and for use in the subsequent SA.

Often the determining factor in deciding whether a particular development can or cannot proceed is the financial feasibility of flood risk mitigation rather than technical limitations. Detailed technical assessments are required in the detailed site-based FRA to assess this feasibility, together with a commercial review by the developer of the cost of the mitigation works. However it is important at the SFRA stage that allocations or areas where there is little or no chance of feasible flood risk mitigation are not recommended, because doing so could have an adverse impact on the achievement of development targets in the UDP or LDF.

At the SFRA stage broad assumptions are therefore required regarding the feasibility of flood risk mitigation to ensure that only sites with realistic development potential are put forward. In this context the assumptions shown in Table 9.2 have been made. It is assumed that floor level raising will continue to be the traditional mitigation measure. It should be noted that the Environment Agency see actual land raising as a last option. This table refers to depths of flooding before mitigation measures are put in place and should not be mistaken as acceptable levels of flooding after mitigation. Thought will also be required to ensure dry access and egress is available during the 1 in 100 year event.

**Table 9-2: Screening Criteria for Mitigation Measures**

| Depth of Inundation* | Comments |
|---|---|
| 0 to 1.0 m | Mitigation and management may be feasible for both housing and employment purposes. Allocations may be retained. |
| 1.0 to 1.5 m | Mitigation is likely to be costly and may not be economically justifiable for low value land uses. Housing allocations are considered appropriate, provided flood risk can be managed or mitigated (e.g. by using lower levels for car parks or public areas). Floor level raising for employment purposes is unlikely to be economically viable and Employment allocations should be reconsidered in favour of alternative lower risk sites. |
| Above 1.5 m | Flood risk mitigation measures are unlikely to be economically justifiable and both housing and Employment allocations should be reconsidered in favour of alternative lower risk sites. |
| Table-Notes* Based on predicted depth of inundation for the 1% event with climate change, or from a breach event in the prime defence without land filling or floor level raising.<br>Mitigation measures including first floor accommodation, and the attendant access and egress measures, and where appropriate, land platform raising. | |

It is recognised that in some locations urban regeneration and redevelopment will be essential to maintain the long term viability and vitality of communities and the balance of the raft of planning considerations may support redevelopment. These social considerations may justify a relaxation of the screening criteria set out above and the retention of housing and Employment allocations in certain areas. In these instances the commercial viability of the development and risks to public safety will need to be given careful considerations during the planning of the development. A range of flood management and flood proofing measures are available that can reduce the financial impacts of flooding.

Whilst flooding mitigation measures can be implemented in most sites, it is worth noting that in some instances the findings of individual FRAs may determine that the risk of flooding to a proposed development is too great and mitigation measures are not feasible. In these instances, the development will be subject to an objection by the Environment Agency.

## 9.4 Other Known Flood Risk Areas Including Internal Drainage Board Districts

Sites that are situated upstream of an area that is known to be susceptible to localised flooding (e.g. as a result of problematic surface water drainage) must be managed effectively to ensure that the impact upon downstream properties is fully mitigated. Wherever possible, this should be achieved through the implementation of a sustainable drainage or flow retention system, constructed within the boundaries of the development site.

The capacity of internal drainage infrastructure is often limited and at or near capacity under existing conditions. Development that leads to increased peak runoff within the drainage catchments may lead to infrastructure capacity being exceeded, with the potential for increased flood risk. In adopting the precautionary approach it is therefore considered prudent to manage all development within Internal Drainage Districts (IDDs), to ensure peak discharges do not increase and potential impacts on downstream properties are fully mitigated. Wherever possible, this should be achieved through the implementation of a sustainable drainage or flow retention system, constructed within the boundaries of the development site.

A flood risk assessment will be required in each instance to design appropriate mitigation measures and demonstrate that the development will not adversely affect existing flooding conditions. The FRA should define and address the constraints that will govern the design of the drainage system.

The effectiveness of a flow management scheme within a single site is heavily limited by site constraints including (but not limited to) topography, geology (soil permeability), and available area. The design, construction and ongoing maintenance regime of such a scheme must be carefully

defined, and a clear and comprehensive understanding of the catchment hydrological processes (i.e. nature and capacity of the existing drainage system) is essential.

In these areas a flood risk assessment will be required that demonstrates that the proposed development will not adversely affect existing flooding conditions.

At the planning application stage, discussions should be held with the Environment Agency, Local Planning Authority and United Utilities to ascertain the specific nature and most appropriate means of managing the flood risk.

The integration of drainage management is highlighted within the Defra strategy for flood and coastal erosion risk management in England, detailed within the consultation document 'Making space for Water' [24]. The strategy aims to achieve better overall management of surface water drainage through better co-ordination between the different bodies.

### 9.4.1 Internal Drainage Districts

The relevant Internal Drainage Board (IDB) should be consulted in each instance to ensure the development is compatible with drainage systems. There may be instances where additional drainage system capacity is available and increased peak runoff is acceptable, but these areas are exceptional, can only be identified by the relevant IDB and development proposals will still require a detailed flood risk assessment.

[24] Defra. 2004. *Making Space for Water; Developing a new Government strategy for flood and coastal erosion risk management in England, A consultation exercise.*

# 10 GUIDANCE FOR DETAILED FLOOD RISK ASSESSMENTS

## 10.1 General

In accordance with current planning policy guidance, the planning process encourages only sustainable development in areas vulnerable to flooding. This includes adopting a precautionary approach to decisions based on estimates of the present and future impact of flood risks. The Warrington SFRA focuses on delivering a strategic assessment of flood risk within the area. Prior to development, site specific assessments will need to be undertaken to ensure that all forms of flood risk, at a site, are fully addressed. In addition, following the Sequential Test, some sites may be put forward for the Exception Test. This will require an outline Flood Risk Assessment.

## 10.2 Standard Flood Risk Management Guidance for Developers

The aim of a Flood Risk Assessment (FRA) is to demonstrate that proposed development will not be at risk to flooding during the design event. This includes assessment of mitigation measures required to safely manage flood risk. The FRA also needs to demonstrate that the proposed development will not increase flood risk either upstream or downstream of the site. All sources of flood risk, including fluvial, surface water runoff and drainage need to be considered.

Flood Risk Assessments for proposed development in the borough should follow the approach recommended by:

- The Environment Agency (see its *National Standing Advice to Local Planning Authorities for Planning Applications – Development and Flood Risk in England* (June 2004). See www.pepernetworking.com for all guidance on the scoping of FRAs.
- CIRIA Report C624 *Development and Flood Risk – Guidance for the Construction Industry* (2004)
- PPS25 and its Practice Guide.

These documents describe when a FRA is required and are commensurate with the advice given in this SFRA. All proposed development sites require at least an initial assessment of flood risks. A detailed FRA will be required for all developments that fall in the medium and high flood risk zones and other sites where significant flood risk is identified. A brief FRA will be required for sites in Flood Zone 1 which are greater than 1 ha (unless there are significant flooding issues, when a more detailed FRA will be necessary).

## 10.3 Assessment of Fluvial Risk

The majority of potential sites are located in Flood Zone 1. They are, therefore, considered to be at little or no risk to flooding from watercourses.

When considering future development needs in the region, a detailed and site specific FRA is required. The design criterion for development within floodplain areas is generally to the design event coinciding with a 1% annual probability of occurrence, including the impact of climate change. Detailed consideration will need to be given to the impact these mitigation measures may have and it is a requirement to ensure that flood risk is not increased elsewhere as a result of development. Compensation measures may take the form of compensatory flood storage as mitigation for loss of floodplain, enhanced flood defences and flood compatible master planning. Compensation measures will be needed in both defended and undefended floodplains. This concept is included in PPS25 and ensures that residual risk is fairly managed in new and existing development.

Before embarking on detailed modelling, and in light of this SFRA, proposals for development should be discussed in detail with the Environment Agency at an early stage.

The floodplain assessments could be conducted using hydraulic models. However, before any modelling is undertaken a review of available information should be conducted to assess if modelling is necessary. A survey of the floodplain may indicate whether the Flood Zone Maps have any obvious inaccuracies and whether or not modelling of the river system, under the 1% event, would yield a more realistic flood outline.

For fluvial floodplains an assessment of the hydrological regime is required. This should be undertaken using available gauged records and Flood Estimation Handbook (FEH) techniques.

Hydraulic modelling will need to include structures, such as bridges and weirs that influence flood levels. This modelling should include floodplains to accurately determine the depth and extent of flooding.

Whenever possible models should be verified using historical records of flooding. Its sensitivity to modelling assumptions and climate change should also be investigated. Mapping the extent of flooding will enable the risk of flooding to a development to be assessed.

## 10.4 Surface Water Drainage Assessments

Opportunities for developing an Integrated Water or Drainage Management Strategy across development site boundaries should be explored, and a catchment led approach should be adopted. This approach has been recognised in the recent consultation paper by Defra, *Making Space For Water*. An integrated approach to controlling surface water drainage can lead to a more efficient and reliable surface water management system as it enables a wider variety of potential flood mitigation options to be used. In addition to controlling flood risk, integrated management of surface water has potential benefits, including improved water quality and a reduction of water demand through grey water recycling.

Integrated drainage systems may be considered suitable for catchments where other development is being planned or constructed, and where on-site measures are set in isolation of the systems and processes downstream.

Surface water drainage assessments are required where proposed development may be susceptible to flooding from surface water drainage systems. The potential impact upon areas downstream of the development, including the impact on a receiving watercourse, also needs careful consideration.

The requirements for surface water drainage systems will need to be discussed with the Environment Agency and United Utilities. Consideration should be given to whether a "Greenfield runoff approach" to the assessment of source control is appropriate. This method is generally satisfactory in the cases where the development is relatively small, isolated from other planned sites and the runoff processes are fully understood.

The FRA should then conclude with an assessment of the scale of the impact, and the recommended approach to controlling surface water discharge from a proposed development.

## 10.5 Future Planning Applications

The first document that local planners should refer to when considering future planning applications is the Environment Agency's *National Standing Advice to Local Planning Authorities for Planning Applications – Development and Flood Risk*, England (June 2004).

This SFRA is not intended to be a prescriptive document, but a planning tool to guide future sustainable development away from vulnerable flood risk areas. It is not intended that minor planning applications (for small extensions or garden sheds) on existing properties in areas that are designated not suitable for new development be prohibited.

## 10.6 Environment Agency Objection to Planning Authority

The SFRA should be used to do a 'first pass' to test the validity of the Environment Agency's objection to any future development.

If the development meets with the recommendations of the SFRA strategically, then the specifics of an objection should be addressed in an FRA.

A precautionary approach to development and flood risk is required. At each site, applicants for all development proposals need to carry out an assessment of flood risk from all sources and they also need to consider the potential impact the development could have on others through the completion of a flood risk and runoff assessment. Guidance on the detail required in this assessment for different types of development is provided by the Environment Agency through their standing advice on development and flood risk (www.pipernetworking.com). If the Environment Agency's requirements for sustainable development can be met through completion of an FRA then their objection, on the basis of flood risk, is more likely to be lifted.

# Appendix B: - Flood Risk Zones / Flood Risk Vulnerability Classification

## B.1 FLOOD RISK ZONES

**Table B - 1: Flood Risk Zones**[25]

### Zone 1: Low Probability

**Definition**

This zone comprises land assessed as having a less than 1 in 1000 annual probability of river and sea flooding in any year (<0.1%).

**Appropriate uses**

All uses of land are appropriate in this zone

**FRA requirements**

For development proposals on sites comprising one hectare or above the vulnerability to flooding from other sources as well as from river and sea flooding, and the potential to increase flood risk elsewhere through the addition of hard surfaces and the effect of the new development on surface water run-off, should be incorporated in an FRA [Flood Risk Assessment]. This need only be brief unless the factors above or other local considerations require particular attention. See Annex E (of PPS25) for minimum requirements

**Policy aims**

In this zone, developers and local authorities should seek opportunities to reduce the overall level of flood risk in the area and beyond through the layout and form of the development and the appropriate application of sustainable drainage techniques.

### Zone 2: Medium Probability

**Definition**

This zone comprises land assessed as having between a 1 in 100 and 1 in 1000 annual probability of river flooding (1% – 0.1%) and between a 1 in 200 and 1 in 1000 annual probability of sea flooding (0.5% – 0.1%) in any year.

**Appropriate uses**

The water-compatible, less vulnerable and more vulnerable uses of land and essential infrastructure listed in…[the Flood Risk Vulnerability Classification, see Table A-2] are appropriate in this zone.

Subject to the Sequential Test being applied, the highly vulnerable uses in Table D.2 (of PPS25 and Table A-2 of this report) are only appropriate in this zone if the Exception Test is passed

**FRA requirements.**

All development proposals in this zone should be accompanied by a FRA,. See Annex E (of PPS25) for minimum requirements

**Policy Aims**

In this zone, developers and local authorities should seek opportunities to reduce the overall level of flood risk in the area through the layout and form of the development and the appropriate application of sustainable drainage techniques.

[25] Communities and Local Government. 2006. *Planning Policy Statement 25: Development and Flood Risk*. December 2006. http://www.communities.gov.uk/pub/955/PlanningPolicyStatement25DevelopmentandFloodRisk_id1504955.pdf

## Zone 3a: High Probability

**Definition**

This zone comprises land assessed as having a 1 in 100 or greater annual probability of river flooding (>1%) and a 1 in 200 or greater annual probability of flooding from the sea (>0.5%) in any year.

**Appropriate uses**

The water-compatible and less vulnerable uses of land listed in Table D.2 (of PPS25 and Table A-2 of this report) are appropriate in this zone.

The highly vulnerable uses listed in Table D.2 (of PPS25 and Table A-2 of this report) should not be permitted in this zone.

The more vulnerable and essential infrastructure listed in the Table D.2 (of PPS25 and Table A-2 of this report) should only be permitted in this zone if the Exception Test is passed. Essential Infrastructure permitted in this zone should be designed and constructed to remain operational and safe for user in times of flood.

**FRA requirements**

All development proposals in this zone should be accompanied by a FRA, See Annex E (of PPS25) for minimum requirements.

**Policy Aims**

In this zone, developers and local authorities should seek opportunities to:

i. reduce the overall level of flood risk in the area through the layout and form of the development and the appropriate application of sustainable drainage techniques;

ii. relocate existing development to land in lower flood zones; and

iii. Create space for flooding to occur by restoring functional floodplain and flood flow pathways and by identifying, allocation and safeguarding open space for flood storage.

## Zone 3b: The Functional Floodplain

**Definition**

This zone comprises land where water has to flow or be stored in times of flood. SFRAs should identify this Flood Zone (land which would flood with an annual probability of 1 in 25 (5%) or greater in any year or is designed to flood in an extreme (0.1%) flood, or at another probability to be agreed between the LPA and the Environment Agency, including water conveyance routes).

**Appropriate uses**

Only the water-compatible uses and the essential infrastructure listed in Table D.2 (of PPS25 and Table A-2 of this report) that has to be there should be permitted in this zone. It should be designed and constructed to

– remain operational in times of flood;

– result in no net loss of floodplain storage;

– not impede water flows; and

– not increase flood risk elsewhere.

Essential infrastructure in this zone should pass the Exception Test.

**FRA requirements**

All development proposals in this zone should be accompanied by a FRA,. See Annex E for minimum requirements.

**Policy aims**

In this zone, developers and local authorities should seek opportunities to:

i. reduce the overall level of flood risk in the area through the layout and form of the development and the appropriate application of sustainable drainage techniques; and

ii. relocate existing development to land with a lower probability of flooding.

Note 1: These Flood Zones refer to the probability of river and sea flooding ignoring the presence of defences

## B.2 FLOOD RISK VULNERABILITY CLASSIFICATION

**Table B - 2: Flood Risk Vulnerability Classification**[26]

| Classification | Description |
|---|---|
| Essential Infrastructure | • Essential transport infrastructure (including mass evacuation routes) which has to cross the area at risk and strategic utility infrastructure, including electricity generating power stations and grid and primary substations. |
| Highly Vulnerable | • Police stations, Ambulance stations and Fire stations and Command Centres and telecommunications installations required to be operational during flooding.<br>• Emergency dispersal points.<br>• Basement dwellings.<br>• Caravans, mobile homes and park homes intended for permanent residential use.<br>• Installations requiring hazardous substances consent (1) |
| More Vulnerable | • Hospitals.<br>• Residential institutions such as residential care homes, children's homes, social services homes, prisons and hostels.<br>• Buildings used for: dwelling houses; student halls of residence; drinking establishments; nightclubs; and hotels.<br>• Non–residential uses for health services, nurseries and educational establishments.<br>• Landfill and sites used for waste management facilities for hazardous waste. (2)<br>• Sites used for holiday or short-let caravans and camping, subject to a specific warming and evacuation plan |
| Less Vulnerable | • Buildings used for: shops; financial, professional and other services; restaurants and cafes; hot food takeaways; offices; general industry; storage and distribution; non–residential institutions not included in 'more vulnerable'; and assembly and leisure.<br>• Land and buildings used for agriculture and forestry.<br>• Waste treatment (except landfill and hazardous waste facilities).<br>• Minerals working and processing (except for sand and gravel working).<br>• Water treatment plants.<br>• Sewage treatment plants (if adequate pollution control measures are in place). |
| Water-compatible Development | – Flood control infrastructure.<br>– Water transmission infrastructure and pumping stations.<br>– Sewage transmission infrastructure and pumping stations.<br>– Sand and gravel workings.<br>– Docks, marinas and wharves.<br>– Navigation facilities.<br>– MOD defence installations.<br>– Ship building, repairing and dismantling, dockside fish processing and refrigeration and compatible activities requiring a waterside location.<br>– Water-based recreation (excluding sleeping accommodation).<br>– Lifeguard and coastguard stations. |

[26] Communities and Local Government. 2006. *Planning Policy Statement 25: Development and Flood Risk*. December 2006. http://www.communities.gov.uk/pub/955/PlanningPolicyStatement25DevelopmentandFloodRisk_id1504955.pdf

### Table B - 2: Flood Risk Vulnerability Classification[26]

| Classification | Description |
|---|---|
| | – Amenity open space, nature conservation and biodiversity, outdoor sports and recreation and essential facilities such as changing rooms.<br>– Essential ancillary sleeping or residential accommodation for staff required by uses in this category, subject to a specific warning and evacuation plan.<br>– |

Note 1: This classification is based on advice from the Environment Agency on the flood risks to people and the need of some uses to keep functioning during flooding.

Note 2: Buildings that combine a mixture of uses should be placed into the higher of the relevant classes of flood risk sensitivity. Developments that allow uses to be distributed over the site may fall within several classes of flood sensitivity.

(1) DETA Circular 04/00 – para. 18: *Planning controls for hazardous substances*. www.communities.gov.uk/index.asp?id=1144377

(2) See Planning for Sustainable Waste Management: Companion *Guide to Planning Policy Statement 10* for definition. www.communities.gov.uk/index.asp?id=1500757

## B.3 DEVELOPMENT IN THE FLOOD ZONES

**Table B - 3: Development allowed and not permitted in Flood Zones 1, 2 and 3**

| Flood Zones | Appropriate development | Development not permitted | Development allowed *only* if Exception Test is passed | Site specific Flood Risk Assessment |
|---|---|---|---|---|
| Flood Zone 1: Low Probability | All development:<br>Essential infrastructure<br>Highly vulnerable<br>More vulnerable<br>Less vulnerable<br>Water-compatible development | N/A | N/A | FRA required for development proposals on sites of 1 ha or more[1] |
| Flood Zone 2: Medium Probability | Water-compatible<br>Less vulnerable<br>More vulnerable<br>Essential infrastructure | N/A | Highly vulnerable | FRA required for all development |
| Flood Zone 3a: High Probability | Water-compatible<br>Less vulnerable | Highly vulnerable | More vulnerable<br>Essential infrastructure | FRA required for all development |
| Flood Zone 3b: – The Functional Floodplain | Water-compatible | Less vulnerable<br>More vulnerable<br>Highly vulnerable | Essential infrastructure | FRA required for all development |

Table-Notes 1
Note 1: This need only be brief unless there are concerns about: a) the site's vulnerability to flooding from other sources as well as from river and sea flooding and b) the development's potential to increase flood risk elsewhere through the addition of hard surfaces and the effect of the new development on surface water runoff – or any other local considerations which require particular attention.
Note 2: In this case, essential infrastructure should be designed and constructed to: a) remain operational in times of flood b) result in n net loss of floodplain storage c) not impede water flows and d) not increase flood risk elsewhere.

# Appendix C: - Information from Previous JBA Studies

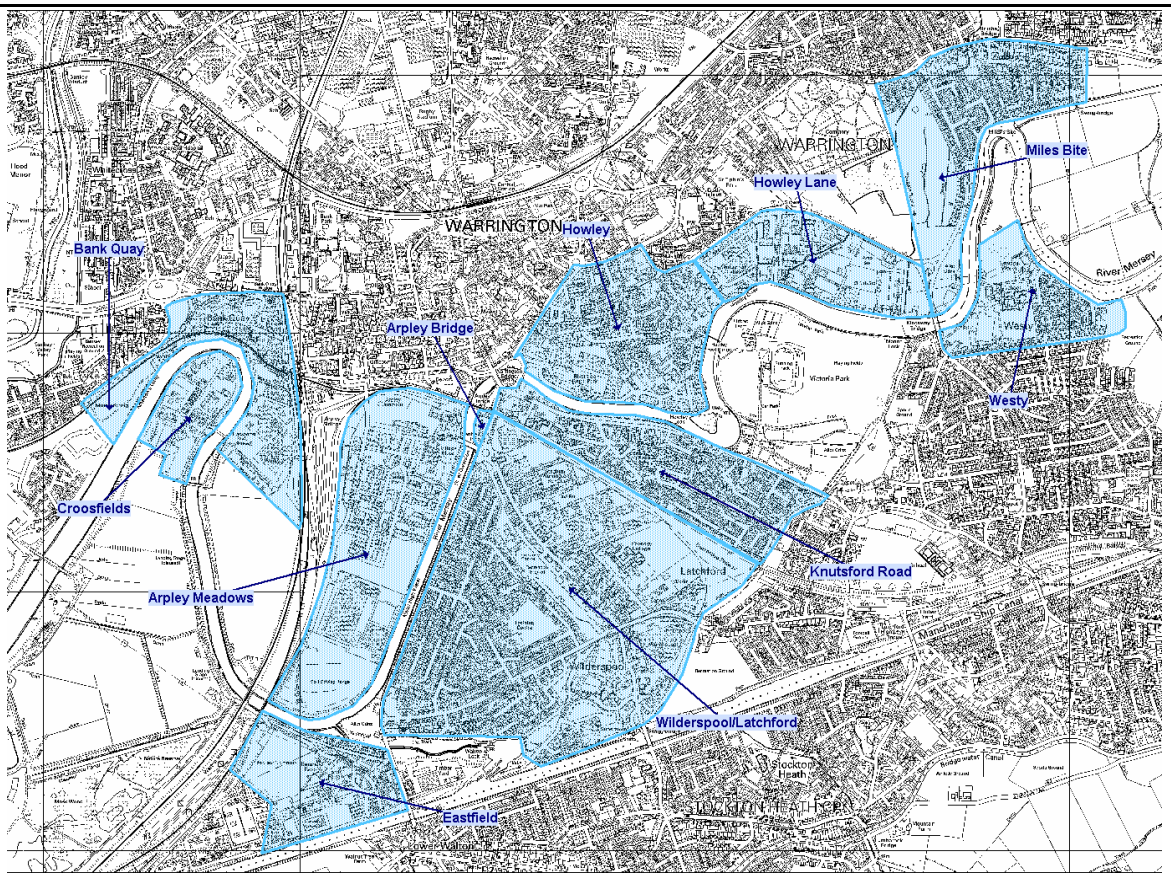
# C.1 TIDAL MERSEY

## C.1.1 Flood Risk Mapping Review – Tidal Mersey at Warrington

This project was completed for the Environment Agency in June 2005. As part of the project, a set of hydraulic models were developed in order to assess the effect of tidal flooding due to overtopping along the banks of the Mersey in Warrington. The results of the modelling provided the Environment Agency with information to improve the level of confidence placed in their existing flood maps.

The models were developed in the 2-D floodplain program JFlow. The overtopping assessments focused on the eight flood cells identified in the Tidal Flood Forecasting System, or Tidal Triggers, report (Royal Haskoning, June 2004). These cells are defined by elevated features, such as roads and railway lines, which tend to contain flood water and prevent it flowing between adjacent areas. The figure below shows the location of the eight flood cells.

**Figure C.1 – Mersey Flood Cells**




The results of the JFlow modelling have been used in part to inform the indicative inundation depths for the potential development sites in the primary section of this report. However, viewing the model results as a series of snapshots provides crucial information on the flooding regime, showing both the change in depth and extent over time. The following set of snapshots shows the sequence of flooding for each of the eight flood cells given the assumption that buildings would be

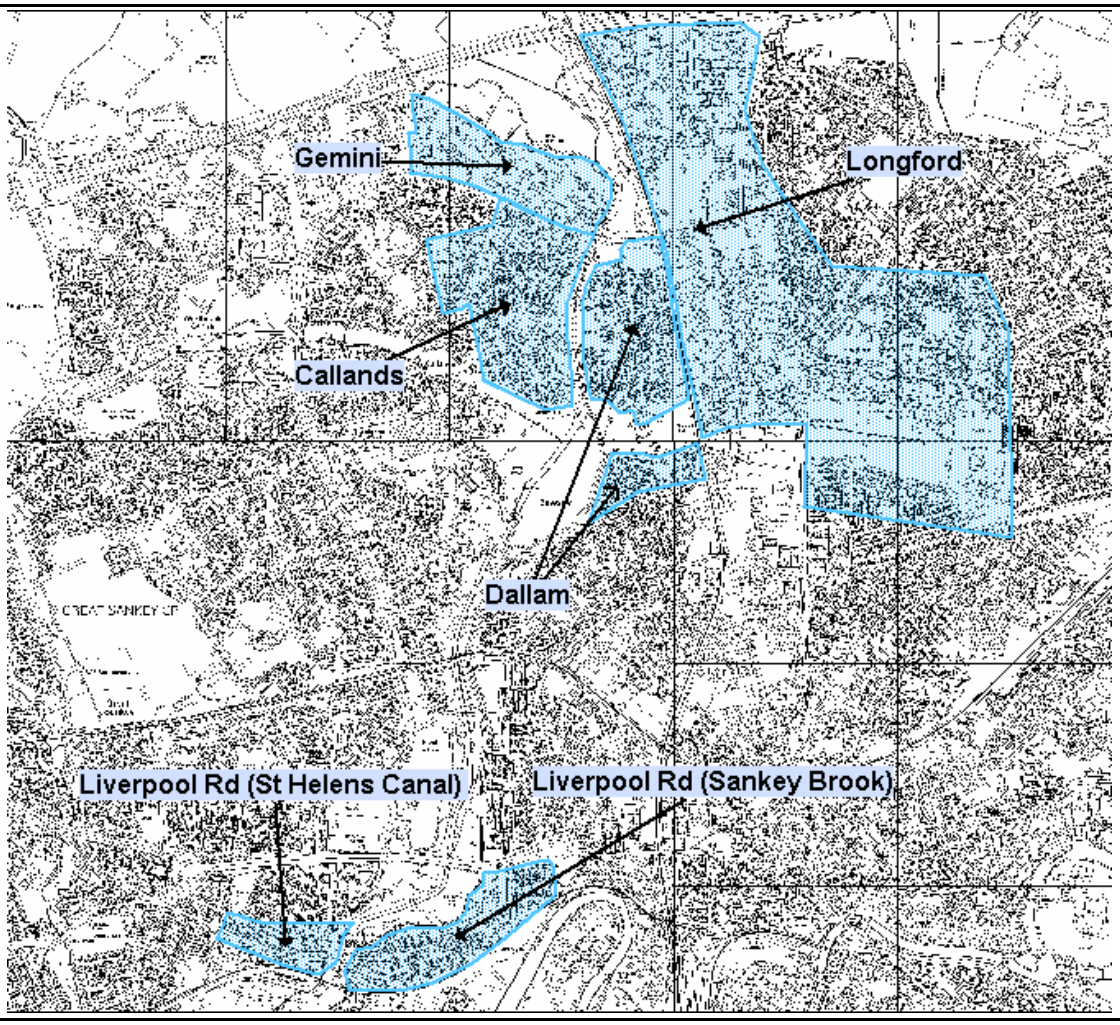
permitted to flood, i.e. for the models based on filtered LiDAR data. A full set of results is provided in the final project report.

# C.2 SANKEY BROOK

## C.2.1 Sankey Feasibility Assessment and Strategy

This project was completed for the Environment Agency in March 2006. In order to process the Sankey Strategy, to pre-feasibility stage, the Environment Agency required a review of the existing modelling work for the Sankey Brook catchment. Five general flood risk areas have been identified by the Environment Agency as sites requiring defences. In order to understand the mechanism by which these areas flood, and determine the extent and depth of flooding, further hydraulic modelling was carried out using the 1-D application, MIKE11 and the 2-D application JFlow. The figure below shows the location of the sites

**Figure C.2 – Sankey Brook Flood Risk Areas**




The results of the study have been used in part to inform the indicative inundation depths for the potential development sites in the primary section of this report. However, the following is Appendix C taken from the 'Modelling Update and Options Review' final report, and provides further flood depth information on the area.

# Appendix D: - Roles and responsibilities of the Developer and LPA - Extract from the Practice Guide Companion to PPS25

# D.1 ROLES AND RESPONSIBILITIES OF THE DEVELOPER AND LPA

## D.1.1 Extract from the Companion to the Practice Guide PPS25

**INDIVIDUAL PLANNING APPLICATIONS**

**The role of the developer**

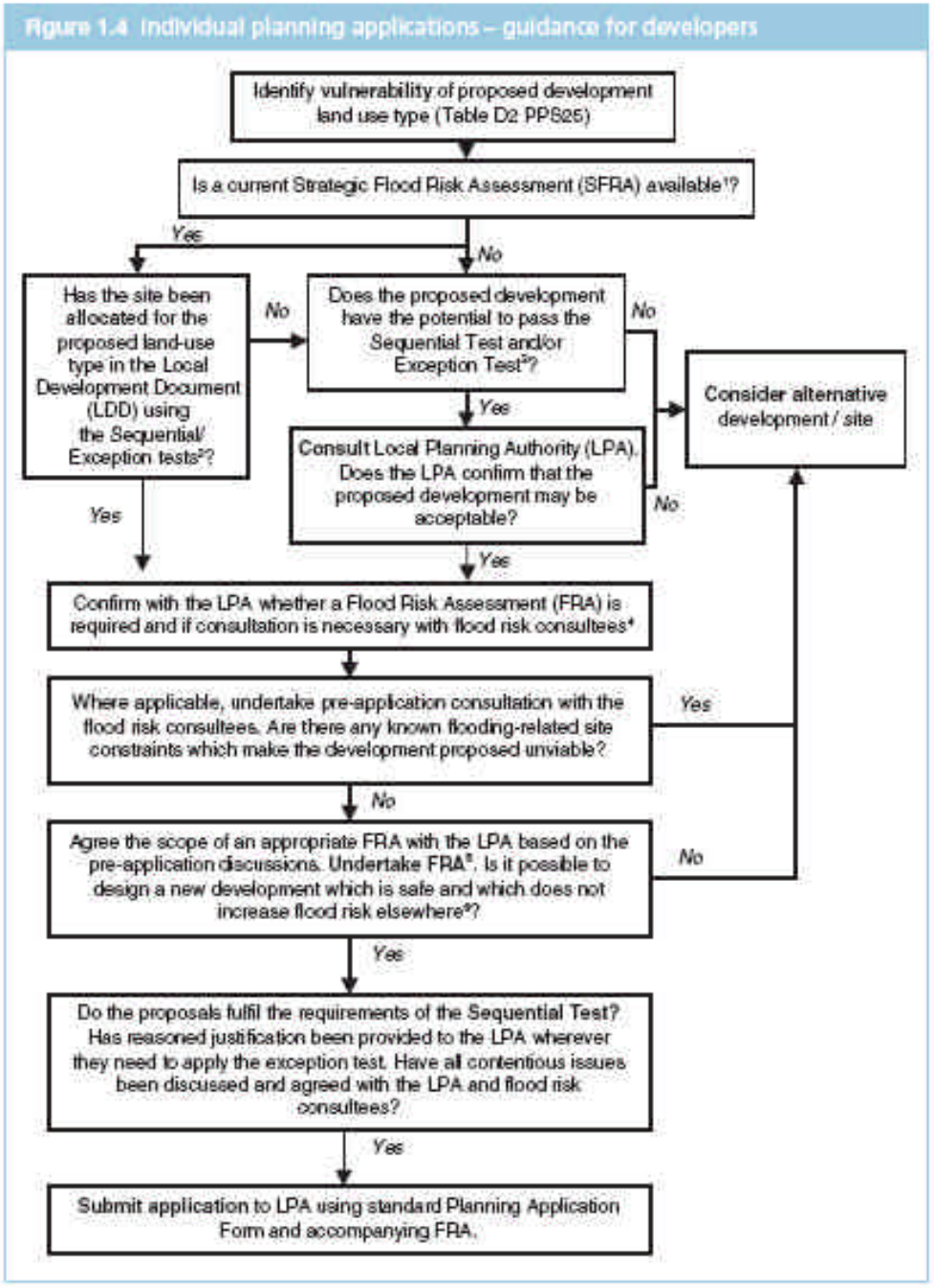
1.40 Paragraphs 22-23 of PPS25 clarify the responsibility of developers to carefully consider the flood risk issues at a site as early as possible. Flood risk is one of many constraints that should be considered prior to taking forward a development and it has significant implications for the value of, and potential for, a development site. Whilst the Environment Agency Flood Map and Standing Advice provide a useful indication of the likely flood risk issues at a site, and the SFRA may provide further more detailed information, developers are advised to make independent checks prior to purchasing sites. Guidance on assessing flood risk at development sites is provided in Chapter 2 of this Guide.

1.41 A developer is not required to apply the Sequential Test if a proposed development is located on a site which has been allocated for that type of development in a LDD that has been sequentially tested and supported by a SFRA. However, the developer should still apply the sequential approach to any flood risk within the site itself when determining the location of appropriate land uses. Guidance on use of the sequential approach within a development site is provided in Chapter 3.

1.42 In any areas where flood risk has been identified as an issue, developers should liaise with the LPA to agree on who should be consulted. The scope of any site specific Flood Risk Assessment (FRA) should be agreed with the LPA, if necessary in consultation with the Environment Agency. It is strongly recommended that key issues are resolved prior to the submission of any planning application.

1.43 Once a planning application, together with an appropriate FRA, is submitted by the developer, it will be assessed to ensure that the applicant has considered flood risk from all sources and demonstrated how flood risk will be managed taking climate change into account.

1.44 The process from pre-purchase to submission of a completed planning application form with accompanying FRA is illustrated in Figure 1.4.




**Notes**

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

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

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

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

5 Guidance on undertaking a FRA can be found in Chapter 2.

6 Including surface water management.

1.45 Where either:
(a) the proposed site is not consistent in scale, development type and location with a site allocation that has already been sequentially tested as part of a LDD,
or
(b) the Sequential and Exception Tests have not been applied to the LDD and the site is within an area at risk of flooding, reasoned justification should be provided by the developer for the proposed development that is compliant with the requirements of the Sequential and Exception Tests. It is recommended that any contentious issues are discussed with the LPA and the Environment Agency prior to the application being submitted, to minimise the risk of the Environment Agency raising an objection.

**The role of the local planning authority (LPA)**

1.46 The LPA is the principal decision-maker regarding applications for new development. LPAs should seek to engage in pre-application discussions with any developer expressing an interest in submitting a planning application for a site that is in an area at risk of flooding or which has potential to increase flood risk elsewhere. Specifically the LPA should:

- refer the developer to the Strategic Flood Risk Assessment (SFRA) and any policies within the LDD of relevance to flood risk at the site, including policies or guidance on the application of sustainable drainage measures
- inform the developer as to whether the Sequential Test and/or Exception Test has already been applied as part of the site allocation process for the LDD
- where the site has not been allocated in accordance with the requirements of the Sequential and Exception Tests, clarify the specific supporting information required to allow the LPA to apply the Sequential or Exception Test as part of the individual planning application process
- advise the developer on the need for a site-specific Flood Risk Assessment (FRA) and consultation with Environment Agency and/or other flood risk consultees
- set out and agree the scope for the FRA using the Environment Agency Standing Advice, or in direct consultation with the Environment Agency and any relevant flood risk consultees, as appropriate
- encourage pre-application discussions with the identified flood risk consultees to ensure flood risk issues are resolved prior to submission of the planning application.

1.47 On receipt of the application, the LPA will consult the Environment Agency in accordance with Article 10 of the Town and Country Planning (General Development Procedure) Order 1995 ('the GDPO'). The GDPO was amended on 1 October 2006 to make the Environment Agency a statutory consultee for specified categories of development where flood risk is an issue as follows:

- development within 20m of the bank top of a Main River
- any culverting operation or development which controls the flow of any river or stream
- development other than minor development in Flood Zones 2 & 3
- development in Flood Zone 1 where there are critical drainage problems
- any development exceeding one hectare in extent.

The Environment Agency is required to respond to consultations on preplanning enquiries within 21 days, unless otherwise formally agreed in writing.

1.48 The checklist used by the Environment Agency to provide a framework for transparent demonstration of the application of the Sequential Test to planning applications is provided in Table 1.3.

**Table 1.3 Environment Agency checklist to provide a framework for transparent demonstration of the application of the Sequential Test to planning applications**

| Question | Answer Yes/No | Sequential Test – passed or failed? |
|---|---|---|
| 1. Is this application consistent in scale, development type and location, with a site allocation that has already been sequentially tested and included in the Local Development Document (LDD)? | If yes, state which allocation and the location in the development plan.<br>**If the answer is 'No' go to Question 2.** | If the answer is Yes the Sequential Test has been passed – FINISH HERE |
| 2. Does the application site fall within an area identified for 'windfall' development that has been agreed as part of the LDD in association with a Strategic Flood Risk Assessment (SFRA)? | If yes, state the location in the LDD.<br>**If the answer is 'No' or there are no such areas identified in the LDD, go to Question 3.** | If the answer is Yes the Sequential Test has been passed – FINISH HERE |
| 3. Does the LDD or background documents contain reasonably available, alternative site allocations that are situated in a lower flood risk zone? | If yes, state which allocation(s) and the location in the development plan.<br>**If the answer is 'No' go to Question 4** | If the answer is Yes the Sequential Test has been failed – FINISH HERE |
| 4. Does the development plan or background documents contain reasonably available, alternative site allocations that are within the same Flood Zone and subject to a lower probability of flooding *from all sources* as detailed by the SFRA? | If yes, state which allocation(s) and the location in the development plan. | **If the answer is No to Questions 3 *and* 4 the Sequential Test has been passed.**<br>**If the answer is Yes to Question 4, the Sequential Test has been failed – FINISH HERE** |

**Note:**
Refer to Environment Agency standing advice at environment-agency.gov.uk/planning for the full version of this table

1.49 The Environment Agency Advice and the evidence supplied by the developer should be used as the basis for taking flood risk issues into account in the LPA's planning decision. In coming to its decision, the LPA should demonstrate how the requirements of the Sequential Test and, where necessary, the Exception Test have been met.

1.50 The Town and Country Planning (Flooding) (England) Direction, 2007 requires an LPA to notify the Secretary of State of any application for major development in a flood risk area (as defined in the Direction), where it is minded to grant permission against advice from the Environment Agency (on flood risk grounds). The Government considers that in such cases, all parties (the LPA, Environment Agency and applicant) should, as soon as practicable, discuss and agree the course of action required to enable the Environment Agency to withdraw its objection. The discussions should be commenced as soon as possible after the objection is made known by the Environment Agency. There should be effective and ongoing liaison between the parties so that each is aware, at all stages in the process, of the position of the others regarding the application.

1.51 The discussions are likely to be helped if the Environment Agency sets out its reason(s) for objecting to the application, and the LPA/applicant set out their reason(s) for supporting it. If, following such discussions, the Environment
Agency concludes that it is unable to withdraw its objection, it should advise the LPA of this as soon as possible.

1.52 Where a LPA remains minded to grant permission in such a situation, the
Direction requires them to notify the Secretary of State of the application. This provides the Secretary of State with an opportunity to check the application's general compliance with the policies in PPS25 and to consider whether to call it in for determination. The Secretary of State will wish to be assured that all reasonable steps have been taken by the LPA, the Environment Agency and the applicant to examine ways

in which the application might be amended or further information provided to support it, which would have allowed the Environment Agency to withdraw its objection. In line with current policy, the Secretary of State will continue to be selective about calling in planning applications.

1.53 For the purposes of the Direction, development is defined as major if:

- for residential development, the number of dwellings to be provided is 10 or more, or the site area is 0.5 hectares or more or
- for non–residential development, the new floorspace to be provided is 1,000 square metres or more, or the site area is 1 hectare or more.

A flood risk area is defined as:

- land in an area within Flood Zones 2 or 3; or
- land in an area within Flood Zone 1 which has critical drainage problems and which has been notified to the local planning authority by the Environment Agency.

# MAPS