# ADDENDUM

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| JBA Project Code | 2020s0632 |
| Contract | West Berkshire Level 2 Strategic Flood Risk Assessment and Water Cycle Study |
| Client | West Berkshire Council |
| Day, Date and Time | December 2020 |
| Author | Fiona Hartland MSci |
| Reviewer / Sign-off | Jenny Grist BSc MSc MCIWEM C.WEM |
| Subject | West Berkshire Level 1 SFRA Addendum - Cumulative impacts Assessment |

# 1 Catchment-level Assessment of Cumulative Impacts of Development on Flood Risk

## 1.1 Introduction

Cumulative impacts are defined as the effects of past, current and future activities on the environment.

Under the 2019 NPPF[1], strategic policies and their supporting Strategic Flood Risk Assessments (SFRAs), are required to '*consider cumulative impacts in, or affecting, local areas susceptible to flooding*' (para. 156). These cumulative impacts may be negative, i.e. development leading to an increase in the existing level of flood risk within the catchment, or positive i.e. surface water management within a development helping to alleviate existing flooding issues within a catchment.

To understand the impact of future development on flood risk in West Berkshire, historic flood risk data has been compared with potential change in developed area within each river catchment defined within the Water Framework Directive (WFD). This identifies the catchments where development may have the greatest impact on flood risk, and further assessment would be required within a site-specific Flood Risk Assessment (FRA).

Where catchments have been identified as sensitive to the cumulative impact of development, the assessment concludes with potential strategic planning policy suggestions to manage the risk.

## 1.2 Method

### 1.2.1 Cumulative impact of development: Assessing existing and future development scenarios

To ensure that the strategic policies of the Local Plan Review (LPR) consider the impact of any future development on areas susceptible to flooding, the potential development pressures during the LPR period need to be considered.

This has been assessed by establishing the 'baseline' scenario, of development already committed prior to the LPR, as well as the potential future development pressures.

It should be noted that the inclusion of potential future development pressures makes the scoring method sensitive to future change, should any larger sites be removed, or additional sites come forward. However, it provides the best possible indication of development pressure across West Berkshire at the time of assessment.

Several of the WFD catchments assessed within the cumulative impact assessment cross administrative boundaries into neighbouring districts. To account for this in the study, the neighbouring councils were contacted to provide information of future development. The councils are:

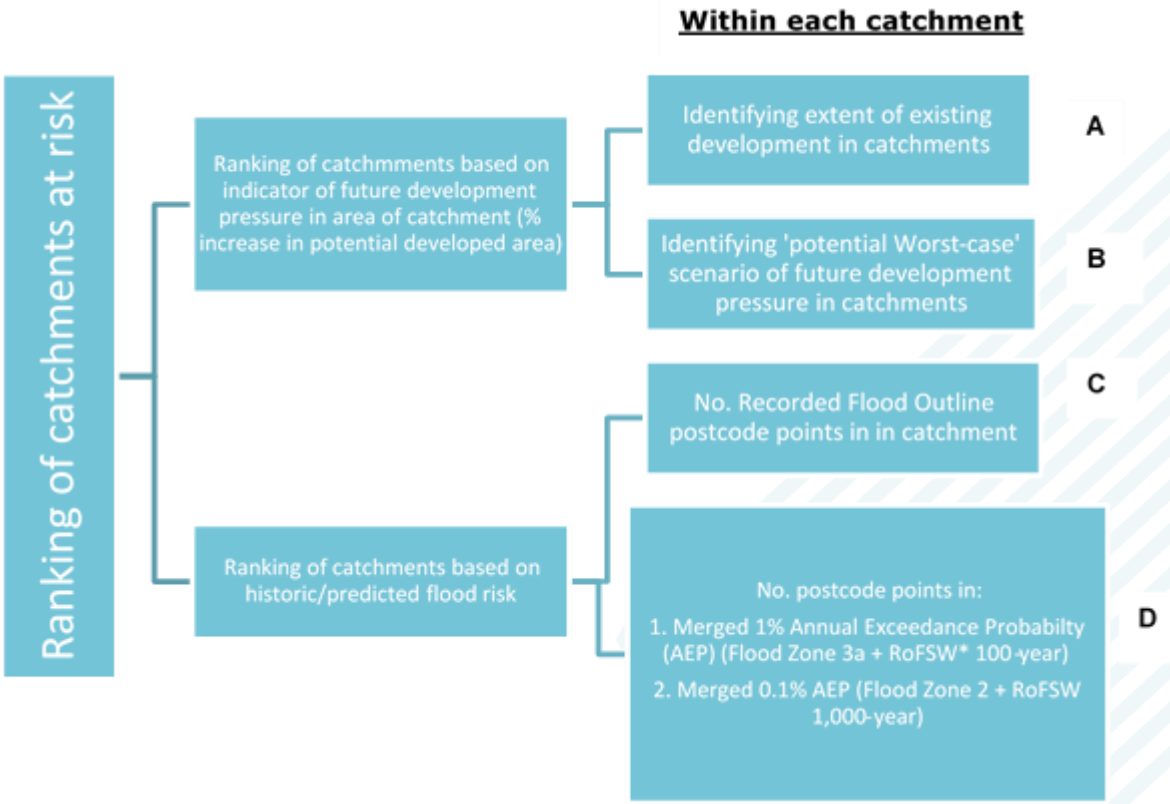
1 Ministry of Housing, Communities and Local Government (2019) National Planning Policy Framework. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/810197/NPPF_Feb_2019_revised.pdf

- Basingstoke and Deane Borough Council
- Reading Borough Council
- South Oxfordshire District Council
- Vale of White Horse District Council
- Wiltshire County Council
- Wokingham Borough Council
- Test Valley Council

The site data received from these councils was combined with that of West Berkshire to understand risk to each WFD catchment based upon proposed future growth.

The approach to understanding the catchments most influenced by the cumulative impact of development is conceptualised in Figure 1-1.

**Figure 1-1: Overview of the method used within the Cumulative Impacts Assessment.**




**Risk of Flooding from Surface Water (RoFSW)*

## A. Existing development scenario

To understand the level of existing development within the study area, the 2019 - 2020 residential and non-residential committed development sites were used. The data describes areas of ongoing or committed development in West Berkshire and each of the neighbouring authorities, which represented the existing development area within each catchment.

It was not possible to calculate the level of committed development within Reading Borough, as site areas were not provided with the committed development data.

### 1.2.2 Indicator of Development Pressure

To understand which catchments within West Berkshire are likely to experience the greatest pressure for future growth, all Housing and Economic Land Availability Assessment (HELAA) sites with potential for allocation within the LPR were analysed.

This analysis has been used as an **indicator** of areas likely to be subject to the greatest development pressure in future. This is the only indicator available at this time because definitive development areas have not yet been allocated within the Local Plan. It is important to recognise that this approach inevitably suggests a very high development impact, because it effectively assumes that all sites could be developed. In reality, many of the HELAA sites with potential would not be allocated for development in the West Berkshire LPR.

The data allowed calculation of the overall area of submitted / suggested sites within each catchment, illustrating the relative pressures on the catchments. This data was used, with the existing development extent, to identify catchments likely to be under the greatest pressure for development.

**Table 1-1: Summary of datasets used within West Berkshire Cumulative Development Scenario.**

| Dataset | Coverage | Source of data | Use of data |
|---|---|---|---|
| **Data used to define river catchments** | | | |
| Catchment Boundaries | West Berkshire Study Area | Water Framework Directive (WFD) Catchments | Existing development / Flood risk |
| **Data used to estimate future development pressure** | | | |
| West Berkshire Committed Developments 2019 | West Berkshire Study Area | West Berkshire Council | Existing development |
| HELAA sites identified as having potential for allocation within the Local Plan process | West Berkshire Study Area | West Berkshire Council | Indicator of relative development pressure |
| Neighbouring authority Local Plan allocations and committed | West Berkshire Study Area | Basingstoke and Deane District Council<br>Reading Borough Council | Indicator of relative development pressure |

| | | | |
|---|---|---|---|
| developments | | South Oxfordshire District Council<br>Test Valley District Council<br>Vale of White Horse District Council<br>Wokingham Borough Council | |
| **Data used to rank catchments by flood risk** | | | |
| Merged 1 in 100-year flood extent (Flood Zone 3a and 1 in 100-year RoFSW extent) | West Berkshire Study Area | Environment Agency (EA) | Potential fluvial flood risk |
| Merged 1 in 1000-year flood extent (Flood Zone 2 and 1 in 1000-year RoFSW extent) | West Berkshire Study Area | Environment Agency (EA) | Potential future fluvial flood risk |
| Recorded Flood Outline (fluvial flood risk) | West Berkshire Study Area | Environment Agency (EA) | Historic flooding |
| OS Code Point Open postcode points - the plotted at the average co-ordinates representative of all individual addresses within a particular postcode. | West Berkshire Study Area | Ordnance Survey (Open source) | Proxy for number of properties at risk |

### 1.2.3 Cumulative impact of flood risk: Assessment of flood risk

A composite flood risk score was derived for each catchment, by taking an average ranking of both recorded (historic incidents) and modelled (predicted) flood risk.

To understand the relative flood risk within the catchments, a ranking system of 1 - 23 was adopted, with the worst-case flood risk numbered '1'.

The ranked categories were:

### C. Historic Flood Risk

- EA Recorded Flood Outline (number of property postcode points affected) - flood extents mapped following flood events (largely relates to fluvial flooding). This was intersected with postcode points, to approximate the number of properties affected.

### D. Sensitivity to increases in flood flows

Data used in assessment:

- Merged fluvial and surface water 1 in 100-year (1% AEP) flood extent - Flood Zone 3a and RoFSW 100-year (number of postcode points at risk within catchment).
- Merged fluvial and surface water 1 in 1,000-year (0.1% AEP) flood extent - Flood Zone 2 and RoFSW 1000-year (number of postcode points at risk within catchment).
- Postcode point data was used to identify properties within the West Berkshire study area.
- The postcode data was intersected with the 1,000-year and 100-year merged fluvial and surface water flood extents separately to approximate the increase in the number of properties at risk of flooding, with increased runoff upstream. The flood extents were merged to prevent double counting of properties at risk where fluvial and surface water flood risks overlap.
- The difference between the two was then calculated and given as a percentage of the total number of OS Code Point Open points in the catchment, to give an indication of which areas are most sensitive to increases in surface water runoff from upstream e.g. if there were 100 postcode points in a catchment, 15 within the 1,000-year merged flood extent and 5 within the 100-year merged flood extent, 10% of properties in that catchment have been considered.
- The assessment is an indicator of where local topography makes an area more sensitive to increases in flood risk that may be due to any number of reasons, including climate change, new development etc. It is not an absolute figure or prediction of the impact that new development will have on flood risk.

## 1.2.4 Assessment assumptions and limitations

The study has been undertaken using the best available data. The assumptions made in assessing and ranking the impacts of cumulative development on catchments within West Berkshire are summarised in Table 1-2.

**Table 1-2: Assumptions and limitations of the assessment**

| Assessment aspect | Assumption made | Details of limitation in method | Justification of method used |
|---|---|---|---|
| Development pressure | *Inclusion of HELAA sites with potential for allocation, received by the Council during the LPR process* | The study assessed the potential impact of the HELAA sites with potential for allocation, received during the Local Plan process.<br>This includes sites which will not ultimately be suitable for allocation. As a result, it presents a 'worst case' assessment of growth, which may overestimate the risk within each catchment. | Although this method has significant limitations; at this stage it is the best available indicator of development pressures. It identified relative levels of development pressure across all settlements and catchments. |
| | *Assumption of housing density and impermeable areas* | As potential development densities were not known for all of the sites, it was assumed that all of the site area would contribute surface water runoff to the wider catchment. In reality, landscaping and requirements for SuDS within sites lessen the impacts of new development. | The assessment considered the 'worst case' development scenario if surface water runoff was not controlled from new developments. With housing densities and proportions of undeveloped areas not known, the approach overestimates the potential impact, but is the best available indicator. |
| | *Current site use* | The current use of the sites (e.g. greenfield/brownfield) was undefined. Brownfield sites are unlikely to have a significant impact on | |

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|---|---|---|---|
| | | flood risk as they have previously been developed, therefore in absence of this information, a 'worst case' assessment is produced which may overestimate the risk within each catchment. | |
| | | | |
| Flood risk | *Overlap between fluvial and surface water flood extents* | The Risk of Flooding from Surface Water mapping identifies the lowest points in the landscape, and therefore low-lying river floodplains are also classified as being at surface water risk. This can lead to 'double counting' of flood risk. | To prevent double counting, the Flood Zone and Risk of Flooding from Surface Water dataset were merged, to create a composite flood risk layer, with any overlapping areas dissolved. |
| | *Use of OS Code Point Open postcode point data to represent properties affected by historic /predicted flood risk* | As postcode points represent the average location of all properties within a postcode area, there may have been properties at the edges of a catchment or the study area which were counted within the neighbouring area, or not picked up at all. | The postcode points were an available open source dataset. Postcode area sizes are also relative to the density of properties in a location, providing better data coverage in areas where a greater number of properties were likely to be affected. |

### 1.2.5 Ranking the results

The results were ranked for each of the above assessments and these rankings were combined to give an overall ranking. A RAG rating was then applied to the catchments, with red being high risk, amber being medium risk and green being low risk (as shown in Table 1-3).

**Table 1-3: Final combined rankings**

| Predicted flood risk ranking | Potential growth ranking | | | |
|---|---|---|---|---|
| | | **High** | **Medium** | **Low** |
| | **High** | High | High | Medium |
| | **Medium** | High | Medium | Low |
| | **Low** | Medium | Low | Low |

Specific policies are provided for each resulting risk category.

The catchments rated as at high sensitivity to the cumulative impacts of development are:

- Kennet and Holy Brook - *includes Burghfield Common, Aldermaston Wharf*
- Thames Wallingford to Caversham - *including Purley-on-Thames and Streatley*
- Kennet (Lambourn confluence to Enborne confluence) - *including Thatcham, Newbury and Woolhampton*
- Holy Brook - *includes Theale, Calcot*
- Foudry Brook (West End Brook to M4) - *including Mortimer*
- Kennet and Avon Canal and Dun above Hungerford

The catchments rated as medium sensitivity to the cumulative impacts of development are:

- Sulham Brook - *including Sulham*
- Burghfield Brook - *including Burghfield and Grazeley*
- Lambourn (Source to Newbury) - *including Lambourn and North Newbury*
- Bourne Rivulet
- Middle Kennet (Hungerford to Newbury) - *including Hungerford, West Newbury and Kintbury*
- Shalbourne (source to Kennet at Hungerford)
- Pang - *including Pangbourne*
- Loddon (Sherfield on Loddon to Swallowfield)

A map of the RAG rating for each catchment is shown in Figure 1-2 and a summary of the results is shown in Table 1-4.

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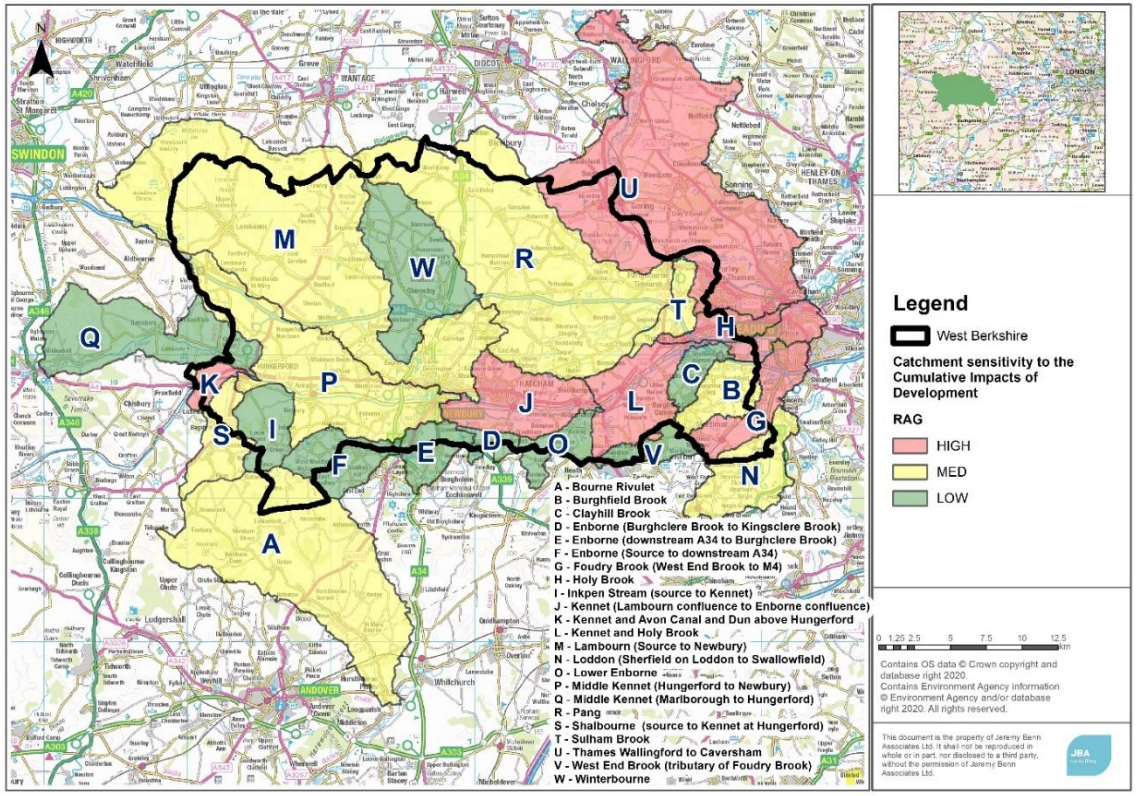
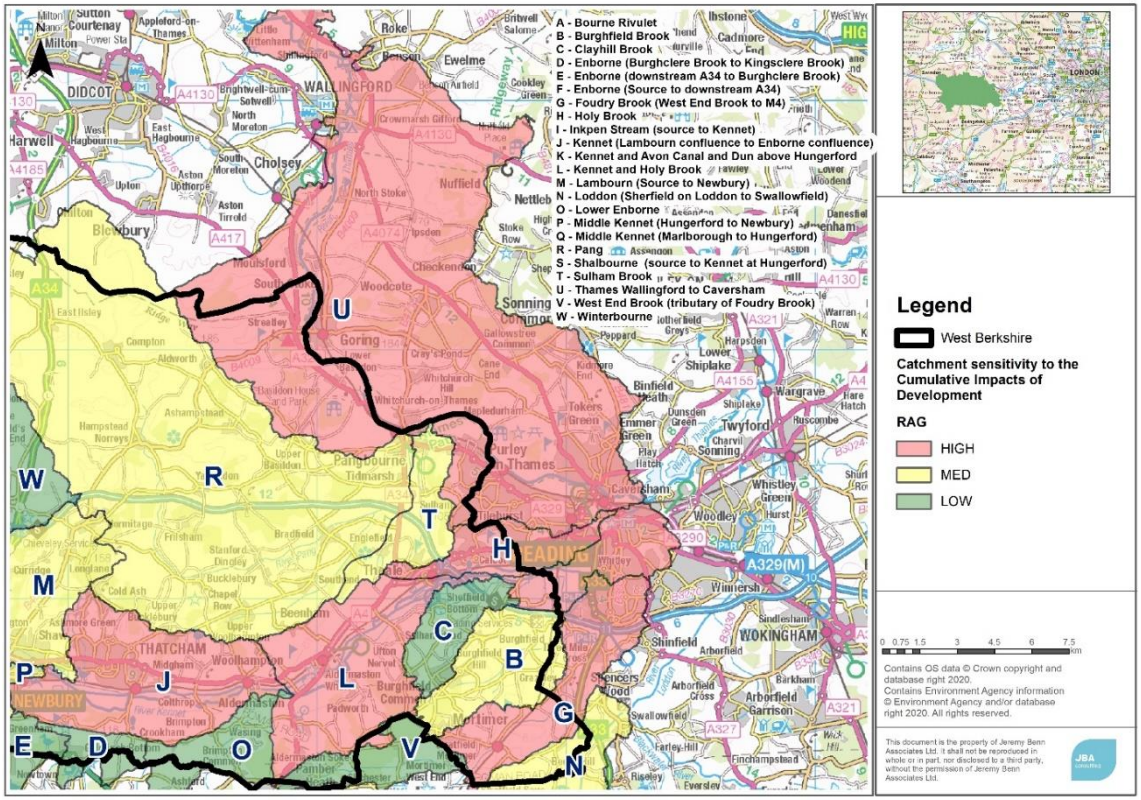
**Figure 1-2: Sensitivity to cumulative impacts scoring of catchments within West Berkshire**



### Figure 1-3: Highly sensitive catchments



### Table 1-4: Results of cumulative impacts assessment

| Map ref | Catchment name | % area of committed development | % area of proposed development | Postcode points in historic flood outlines | % increase in properties at risk: 1 in 100 to 1 in 1,000-year flood extent | Combined sensitivity (flood risk/growth) H = High, M = Medium, L = Low | RAG score |
|---|---|---|---|---|---|---|---|
| J | Holy Brook | 0.7% | 11.2% | 128 | 6% | HH | HIGH |
| L | Kennet and Holy Brook | 0.3% | 2.8% | 186 | 7% | HM | HIGH |
| U | Thames Wallingford to Caversham | 0.3% | 1.2% | 555 | 11% | HM | HIGH |
| K | Kennet and Avon Canal and Dun above Hungerford | 1.7% | 0.7% | 13 | 10% | HM | HIGH |
| G | Foudry Brook (West End Brook to M4) | 2.1% | 23.5% | 41 | 4% | MH | HIGH |
| H | Kennet (Lambourn confluence to Enborne confluence) | 4.3% | 2.5% | 82 | 7% | MH | HIGH |
| M | Lambourn (Source to Newbury) | 0.3% | 0.6% | 112 | 5% | MM | MED |
| P | Middle Kennet (Hungerford to Newbury) | 0.3% | 16.3% | 72 | 5% | MM | MED |
| N | Loddon (Sherfield on Loddon to Swallowfield) | 0.9% | 0.0% | 20 | 3% | MM | MED |
| T | Sulham Brook | 0.1% | 1.6% | 64 | 0% | MM | MED |

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| Map ref | Catchment name | % area of committed development | % area of proposed development | Postcode points in historic flood outlines | % increase in properties at risk: 1 in 100 to 1 in 1,000-year flood extent | Combined sensitivity (flood risk/growth) H = High, M = Medium, L = Low | RAG score |
|---|---|---|---|---|---|---|---|
| A | Bourne Rivulet | 0.1% | 3.9% | 144 | 4% | HL | MED |
| B | Burghfield Brook | 0.2% | 21.8% | 2 | 2% | LM | MED |
| S | Shalbourne (source to Kennet at Hungerford) | 0.1% | 0.0% | 0 | 8% | ML | MED |
| R | Pang | 0.2% | 0.1% | 98 | 4% | ML | MED |
| W | Winterbourne | 0.3% | 0.2% | 0 | 0% | LM | LOW |
| F | Enborne (Source to downstream A34) | 0.2% | 0.0% | 7 | 1% | ML | LOW |
| C | Clayhill Brook | 0.8% | 0.0% | 16 | 0% | LH | LOW |
| E | Enborne (downstream A34 to Burghclere Brook) | 0.5% | 0.7% | 4 | 0% | LH | LOW |
| V | West End Brook (tributary of Foudry Brook) | 0.1% | 0.0% | 0 | 0% | LL | LOW |
| D | Enborne (Burghclere Brook to Kingsclere Brook) | 0.2% | 0.0% | 2 | 0% | LL | LOW |
| O | Lower Enborne | 0.2% | 0.0% | 0 | 0% | LL | LOW |

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| Map ref | Catchment name | % area of committed development | % area of proposed development | Postcode points in historic flood outlines | % increase in properties at risk: 1 in 100 to 1 in 1,000-year flood extent | Combined sensitivity (flood risk/growth) H = High, M = Medium, L = Low | RAG score |
|---|---|---|---|---|---|---|---|
| I | Inkpen Stream (source to Kennet) | 0.0% | 0.4% | 1 | 0% | LL | LOW |
| Q | Middle Kennet (Marlborough to Hungerford) | 0.0% | 0.0% | 37 | 0% | LL | LOW |

## 1.3 Planning policy considerations

Catchment-specific planning policy considerations have been identified for the catchments where cumulative development is likely to have the greatest impact on flood risk to communities.

The overall analysis provides a context for further appropriate consideration of catchment-scale flood risk issues once the LPR reach Pre-Submission (draft site allocation) stage.

In addition to assessment at a SFRA level, it is recommended that site-specific FRAs are required to include consideration of the cumulative effects of the proposed development. It should be demonstrated that flood risk downstream will not be made worse by the combination of effects from more than one development allocation.

### 1.3.1 Considerations for all developments in West Berkshire

- Developments should seek betterment of existing flood risks both within the site and in surrounding areas. As a minimum, developments must meet national and local standards for Flood Risk Assessments and surface water drainage strategies. By looking at flood risks beyond the site boundary, developers should be encouraged to implement sustainable solutions which manage flood risk.
- In upland and rural areas of the catchments, Natural Flood Management (NFM) techniques, such as woodland planting and earth bunds, can be used to slow down and store flood waters upstream of settlements. In urban and suburban locations, Sustainable Drainage Systems (SuDS) should be integrated into the site design, to manage the existing surface water flow paths on the site and to help mitigate the flood risks to downstream communities.
- Successive minor developments have the potential to significantly impact on existing surface water and flood risk issues, particularly as the LLFA is not consulted on these applications. Therefore, planning policy for minor developments should support existing West Berkshire Council policy on the reduction of existing runoff rates, through the use of SuDS.
- As the majority of watercourses in West Berkshire are groundwater-fed, the catchments may also be sensitive to increases in impermeable area, as the ability of rainfall to drain into the ground and maintain groundwater levels may be restricted. Maintaining Green Infrastructure within the catchment, and incorporating infiltration SuDS features will encourage recharge of the groundwater, while also managing surface water runoff. However, this does not preclude the use of above-ground, vegetated SuDS, which contribute to Green Infrastructure and biodiversity benefits.
- Any development within the floodplain (i.e. Flood Zones 3b, 3a and 2) should provide suitable flood compensation storage, in consultation with the Environment Agency, to avoid a net loss in floodplain.

### 1.3.2 Planning considerations for medium sensitivity catchments

All new development (other than minor extensions) in these catchment should:

- Incorporate SuDS and provide details of adoption, ongoing maintenance and management, in line with the West Berkshire SuDS SPD. Preference will be given to above ground, vegetated SuDS, which contribute to the conservation and enhancement of biodiversity and green infrastructure in West Berkshire.
- Developments in these areas should be incentivised to provide wider betterment by demonstrating in site specific Flood Risk Assessments and Surface Water Drainage Strategies what measures can be put in place to contribute to a reduction in flood risk downstream. This may either be through provision of additional storage on site e.g. through oversized SuDS, natural flood management techniques, green infrastructure and green-blue corridors and/or by providing a Partnership Funding contribution towards a wider community scheme.

### 1.3.3 Planning Considerations for higher sensitivity catchments

All new development (other than minor extensions) in this catchment should:

- National and local flood risk planning policy must be stringently applied within these areas, with flood risk from all sources given the appropriate priority, particularly when applying the Sequential and Exception Tests.
- A Surface Water Drainage Strategy should be required for all developments in these catchments, regardless of development size.
- For larger sites and strategic developments:
  - The LLFA, Environment Agency and LPA should be consulted at pre-application stage.
  - The FRA should examine the cumulative impacts of potential peak rates and volumes of water from across the site on peak flows, duration of flooding and timing of flood peaks in receiving watercourses. This should include the impact of other developments within the WFD catchment as advised by the LPA/LLFA if appropriate.
  - A Surface Water Drainage Masterplan should develop and implement appropriate drainage sub-catchments and specific runoff rate and volume requirements for each sub-catchment, based on the SuDS management train.
- Particular attention should be given to limiting runoff volumes to greenfield volume, with long-term storage to be provided where required. The timing of runoff released from the development site will need to be assessed against peak flow timings on the receiving watercourse, to ensure that discharges do not have a detrimental impact on downstream flood risk.
  - The timing of flows released from the development site will need to be assessed in the context of peak flows on the receiving watercourse.
  - Every opportunity should be taken to infiltrate and/or store water at a plot level.
  - Longer-term measures to managing flood risk should be considered, including river restoration (supporting ongoing work in the River Pang and River Kennet) and contributions to pipeline flood alleviation schemes.

- Where development sites receive runoff, or drain towards, neighbouring authorities:
  - Work closely with neighbouring Local Authorities and the LLFA to develop complementary Local Planning Policies on cumulative flood risk and sustainable drainage.

### 1.3.4 Additional rapid response catchment considerations for Newbury and Thatcham

- Newbury and Thatcham have been designated as a nationally significant 'Flood Risk Areas' for surface water flood risk within the 2018 Environment Agency Preliminary Flood Risk Assessment.
- A Surface Water Drainage Strategy should be required for all developments in Newbury and Thatcham, regardless of development size.
- Developers should seek to reduce existing flood risk in Newbury and Thatcham, which may include making a developer contribution towards wider flood alleviation works, as appropriate.
- Ensure that all developments in Thatcham and Newbury have taken into account the rapid response nature of the catchments when designing safe access and escape routes. The availability of flood alerts and flood warnings, as well as the time people would have to respond should also be considered as part of an agreed emergency flood plan, to ensure no additional burden is placed on emergency services.