9. STRATEGY OPTIONS FOR DRAINAGE & FLOOD MANAGEMENT

In line with various Government sourced reports and likely policy guidance, LPAs will need to take an increasingly proactive role in identifying and managing flood risk [1]. This requires a coordinated long-term overview of the likely infrastructure that will be needed, and coordinated and integrated policies that deliver effective sustainable flood management. This is a challenging task for any LPA, but this must be addressed soon.

This section brings together various previous evidence bases, and identifies the key strategic infrastructure and associated policy issues that will have to be promoted in the near to medium future. Some of these issues may be considered in other strategic plans; especially the Environment Agency based **Catchment Flood Management Plan** and the **Severn Trent River Basin Management Plan**.

9.1 Policy Responsibilities

Flood risk management is delivered by a number of organisations with varying powers and responsibilities. Whichever Agency is responsible for flood policy, the common aim is to reduce flood risk by:

- discouraging inappropriate development in areas at risk from flooding
- encouraging adequate and cost effective flood warning systems and flood emergency arrangements
- encouraging adequate technically, environmentally and economically sound and sustainable flood risk management measures

Arrangements for managing surface water drainage are split between the Environment Agency, local authorities, water companies, and other agencies, with no one organisation having overarching responsibility. As a result, decisions about new drainage or development investments are usually taken without a complete understanding of surface water risks and the most effective solutions.

It may be inferred that to date LPAs principal role (not always successful) was in the first of these objectives. However, there is increasing momentum at Government level for increased coordination of drainage and flood management strategies [1], and it is clear that LPAs will have an increasingly responsible role in coordinating effective drainage strategies through the planning process.

As part of the new strategy for flood risk management Making Space for Water [2] the UK Government is exploring how the different organisations in urban drainage can work in partnership to promote a more strategic and integrated approach to surface water management. The pilot studies are already highlighting that the key to achieving a more integrated approach is a shared view of risks by the main decision-makers. PPS 25 has clarified the role of Strategic Flood Risk Assessments in developing such a shared view, but to date surface water issues have not featured strongly.

In critical drainage areas, where the risk from surface water drainage is significant, the local authority should prepare a **Surface Water Management Plan**. This would be an action plan, agreed by all local stakeholders with drainage responsibilities, to clarify responsibilities and manage these risks. Given the potential risks posed by surface water flooding around the country, the Government is now consulting separately on how to give Surface Water Management Plans a stronger role in coordinating development and investment planning.

It sees local authorities in a central leadership role, with the Environment Agency advising on and potentially quality-assuring the plans. In particular LPAs and water companies should work together in preparing such plans and using them to guide investment decisions on solving local drainage, including options for above-ground storage and routing.

This Chapter of the SFRA begins to address these likely policy options associated with Surface Water Management Plans, which nevertheless will have to be continued post-SFRA via stakeholder discussions between the LPA, Welsh Water and the Environment Agency.

9.2 Policy Options under the CFMP

Environment Agency CFMP policies are supposedly driven by the extent, nature and scale of current and future flood risk across the whole catchment, with the overall aim of reducing flood risk by meeting specific CFMP objectives. Within many catchments it is not possible to reduce flood risk everywhere so an understanding of where the greatest risks are (both current and future) is needed before deciding which policies to implement.

Table 9-1 illustrates that the EA policy options and the associated risk management approaches are much generalised. The problem with this approach is that at the scale of individual developments (some of which are likely to be very large), the engineering practicalities and the impact of flood risk and drainage changes are not considered.

The wider policy objectives do indeed have to be set at a broad scale (the river basin), focused on the risks apparent to that catchment, but they have to be demonstrably practicable right down to the scale of the sub-catchment and the individual site. For high level policy objectives to be effective, they must build from the bottom up, NOT the top down. This means that what is practicably achievable within specific catchments by means of strategic attenuation, SUDS, infiltration, site attenuation, channel improvements etc. must be the first consideration BEFORE high level policies are established.

For example, if there is a preponderance of impermeable soils within a particular catchment, it is unlikely that SUDS such as soakaways and swales will be practicable. Hence, it may be more appropriate that sites in this particular catchment contribute to offsite works to provide improved channel capacities downstream, so that sites are able to discharge as rapidly as possible to the arterial river. Such a policy can be highly effective in lessening downstream flood risk, provided it is done in the correct catchment [3, 4]

Table 9-1 – Standardised Policy Options for CFMPs

Table 1.1: Definition of policy options	
CFMP Policy Option	Risk management approach
1. No active intervention (including flood warning and maintenance). Continue to monitor and advise.	Accept existing and future risks and allow natural processes to evolve
2. Reduce existing flood risk management actions (accepting that flood risk will increase over time).	Accept existing and future increases in risk
3. Continue with existing or alternative actions to manage flood risk at the current level (accepting that flood risk is likely to increase over time from this baseline due to climate change).	Accept existing risk. Increasing risk in the future will be acceptable
4. Take further action to sustain current scale of flood risk into the future (responding to the potential increases in flood risk from urban development, land use change and climate change).	Reduce risks in the longer term as they increase from current level. Eliminate new risk
5. Take further action to reduce flood risk (now and/or in the future).	Reduce the risk now and in the longer term. Eliminate new risk.
6. Take action to increase the frequency of flooding to deliver benefits locally or elsewhere (which may constitute an overall flood risk reduction, e.g. for habitat inundation).	Transfer the risk.

Source: EA Wye and Usk Catchment Flood Management Plan

9.3 Policy Options under LPA Surface Water Management Plans

New developments, whether single large sites, or an accumulation of smaller sites, can have profound impacts on local drainage and flood risk. Drainage and flood risk are material considerations in the determination of a planning application and a satisfactory means of foul water and surface water disposal must be demonstrated in order to show that:

- the site can be adequately developed
- any land-take required for proposed drainage facilities has been allowed for
- due consideration has been given to the impact of the proposed development on the drainage catchment area.

Historically these issues have been dealt with on a site by site basis, with differing requirements being set for individual developments. Hence there is a significant risk that at planning application stage, the detailed engineering requirements for site drainage and/or flood mitigation will inevitably override the higher level, and possibly inappropriate CFMP policy objectives.

There is a significant risk of this happening within the Local Development Framework, particularly in and around Hereford and Leominster, where flooding is prevalent, drainage issues are complex, and development pressure is significant.

The resultant piece-meal approach to site drainage and flood mitigation (each site for itself) is not sustainable in the long term. Truly integrated strategies require that at the micro-scale (the site) each site contributes in a consistent way to the wider policy objectives, BUT the policy objectives must coincide with what is practicably feasible at the site scale AND is appropriate at the local catchment scale.

The significant risk of the CFMP approach is that it is insufficiently detailed so as to take account of these practicalities, and this is where Surface Water Management Plans have a critical role to bridge the gap between high level policy objectives and detailed site drainage proposals.

9.4 Catchment Dynamics as the Foundation of Effective Flood Risk Management

9.4.1 Sub-catchments as Policy Units

It is the contention of this SFRA that in preparing for effective drainage and flood management, policies arising from current flood risk and future development impact should be catchment and sub-catchment based.

All drainage and flood risk impacts are gravity driven, bounded by the respective watershed, but subsequently interacting with other catchments downstream in increasingly complex ways.

These impacts are fundamentally different in their scale and timing within different catchments. Effective long-term flood risk management MUST therefore be based on catchments, not arbitrary policy units. Furthermore, the catchment hydrodynamics (volume of runoff, speed of runoff, drainage capacity, and timing of peak) must be very well understood before blindly embarking on drainage and flood mitigation policies that may prove to be counter-productive in the long-term [3]

This SFRA is founded on catchments, and has presented a wealth of evidence and data to support emerging appropriate drainage policies for integrated flood management. The process is ongoing, but a provisional list of appropriate drainage strategies (based on catchment hydrodynamic principles and what is at risk) is drafted in Table 9-2. A cascading type check-list has been formulated to assist in identifying the most likely appropriate policy.

9.4.2 Site Attenuation is not a Panacea for all Development

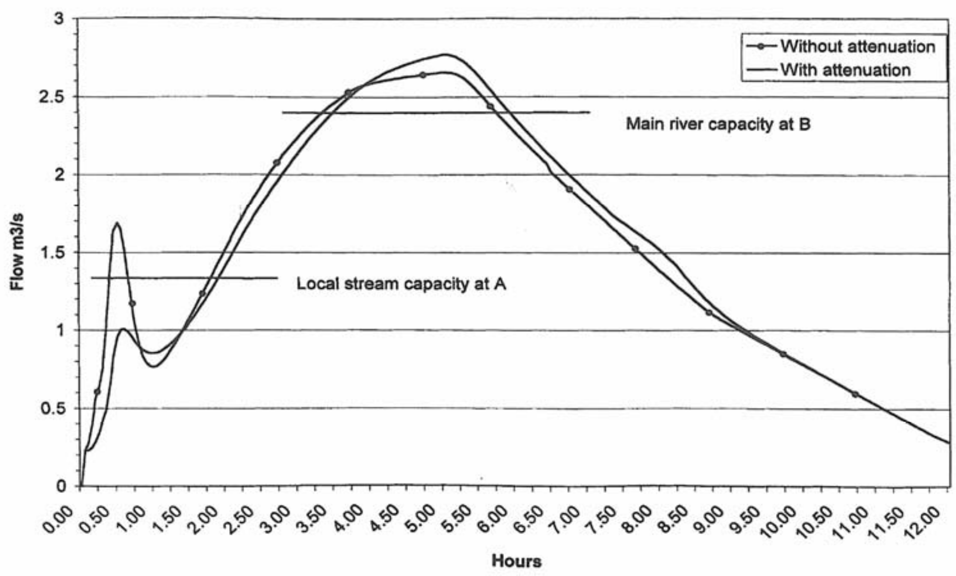
There is a widespread lack of understanding throughout the drainage industry, including the regulatory authorities with regard to the effectiveness and appropriateness of attenuation as the preferred measure to alleviate downstream flood risk [5]. This has arisen precisely because of the past emphasis on piece-meal, site focused solutions to increased runoff with Environment Agency stipulations such as 'maintain green-field' runoff rates etc.

Maintaining green-field runoff rates creates the illusion that the site drainage is 'safe' and the local flood risk status quo is being maintained. In fact, the more widespread attenuation is, and the larger the total attenuated area becomes, there is a significant real risk that in downstream catchments, flood risk is actually increased not decreased.

Whilst regulating outflow at green-field rates maintains flows to 'safe' limits in the immediately receiving watercourse (and this may frequently be desirable), the interaction with the next 'sequential' watercourse downstream may in fact have the opposite effect. This is because the volume of the runoff of the developed site is inevitably greater than the green-field state; hence for the same or lesser peak runoff at the point of disposal, the duration of outflow must continue for a longer period. The peak timing of the receiving watercourse also tends to be delayed. When the prolonged outflow and the delayed timing of the receiving watercourse coincide with a later and larger peak in the arterial river, the net effect is actually an increase in the peak flow on the arterial river.

Attenuation from a single small site (< 2ha) is unlikely to create noticeable impact on an arterial river, but an accumulation of such small sites, or individual large (>10 ha) sites over a long period of time will have a measurable (and detrimental) effect.

Figure 9-1 – Example of how Attenuation Increases Flood Risk



Runoff with and without attenuation

Figure 9-1 shows downstream impacts from a typical 15 ha development site on the receiving watercourse and the sequential arterial watercourse further downstream. Site attenuation does indeed reduce local runoff to a safe (less than bankfull) amount, but the knock-on effect is that the delayed outflow continues for a longer period than when it is unattenuated, and this tends to add increase flows on the main river peak downstream. Hence flood-risk is actually increased in the downstream location.

These subtle but crucial alterations to local drainage patterns have not been well understood previously, and consequently ignored by regulatory authorities. If there is a committed move to more strategic, integrated drainage management as required by UK Government, then these subtleties must be appreciated and incorporated into drainage policies and Surface Water Management Plans generally.

9.4.3 Minimising Natural Fluvial Flood Risk

The proper management of fluvial flood risk is highly dependent on catchment hydrodynamics (volume of runoff, speed of runoff, drainage capacity and timing of peak) AND the way in which these interact in the downstream direction.

The perception of fluvial flooding is that it arises from an excessive flood peak from a single hydrograph. It is crucial to understand however that the observed peak at say, Leominster or Bromyard is not the result of a single independent hydrograph, but rather the accumulation and convolution of many separate smaller hydrographs emanating from different sources i.e. sub-catchments, modified in their downstream passage by the effects of attenuation on the floodplain.

The key to successful regional flood alleviation strategies is to reinforce the natural hydrodynamics of the catchments themselves [3, 4, 5], and to achieve as far as possible disruption or disaggregation of the combining natural hydrographs. In the simplest terms, this means delaying even further the timing of runoff from catchments that have long times to peak or that have a headwater location, and advancing the timing of catchments that have short times to peak or have a downstream location.

Reduction in the peak rate of outflow below current rates (whether from a development site or a catchment in its entirety) will only be beneficial if that catchment peaks later than the sequential watercourse into which it discharges.

Some examples:

- It is counter productive to attenuate either development sites or tributary (local) watercourses that peak many hours before the peak of the arterial river downstream. This may actually increase the peak flow. The preferred solution is to improve the capacity of the local watercourse and/or discharge at the maximum safe rate i.e. one that does not exceed the channel capacity.

- Upland catchments or development sites in headwater catchments should by preference attenuate as much as possible. This helps to disaggregate the original hydrograph.

9.5 Strategy Definitions & Implications

A limited number of catchment based drainage strategies can be evolved that provide an integrated approach that lessens overall flood risk at the regional scale whilst also protecting local property and/or critical infrastructure.

Some strategies should actively promote rapid runoff to maximise effective use of channel capacities and rapid timings of watercourses, others will maintain the status quo in terms of matching green-field runoff rates, and at the other end of the scale, significant attenuation may be desirable (by storage of flood water either on-site or in strategically placed reservoirs).

The appropriate strategy clearly depends on the combination of:

- What are the physical characteristics of the site and wider catchment that can be used to offset these constraints?
- What is at risk downstream and how vulnerable is it?
- What are the downstream restrictions, and can these be modified?

Table 9-2 proposes 9 distinct drainage strategies that in combination are most likely to achieve an integrated regional flood mitigation plan. Account is taken first of the natural characteristics of the catchment, and then various risk tests can be applied to select the appropriate form of drainage control.

9.5.1 Strategy FR1 - Maximum Attenuation on Site (SUDS)

There is increasing recognition in Government guidance [1] that surface water below-ground systems are unnecessarily overloaded. There is a strong likelihood that in future increased site runoff will be regarded virtually as a pollutant, with increasing requirements for site owners to pay proportionately for their discharge. The automatic right to connect to surface water systems may become less readily available.

"Good surface water management will involve increased use of SUDS and surface water flow routes, through the design and planning of the whole urban fabric, as the capacity of the landscape to store and convey water is much greater than the below-ground system.

The nature of SUDS means that their implementation and management does not readily sit within established water industry structures . The major obstacles to their wider uptake and implementation have to do with ownership, maintenance and funding arrangements. We are now consulting separately on options for resolving these barriers to take up, including options for ownership and adoption of SUDS across the main agencies involved in urban and land drainage." [1]

The most desirable policy of all therefore (subject to groundwater protection issues) is to retain as much as possible if not all surface water on the development site. To be fully effective, this requires highly permeable sites and catchments. Where such soil types exist, this should be the preferred policy, and the sewerage undertaker and or LPA must implement ownership systems and legal agreements to accept and adopt these.

Significant reduction of site runoff to well below green-field rates will alleviate downstream flood risk in vulnerable areas, and the detrimental interactions with subsequent watercourses are also likely to be highly marginal, so this policy will work successfully even where there is vulnerable property or infrastructure on the next sequential watercourse.

9.5.2 Strategy FR2 – Neutral Attenuation on Site (SUDS)

Where there is still a high level of on-site permeability but no particular existing flood risk downstream or prevalence of restrictive structures i.e. the watercourse is free from artificial influences, there is little need to 'over-attenuate' runoff from development sites.

The preference should be in fact to maintain the status quo as the safest option i.e. attenuation results in a neutral downstream effect. This means that the site should discharge at the green-field equivalent rate. It is crucially important to understand that this does NOT mean that all runoff from the site should discharge at a fixed '1 in 2 year rate' or similar. This is a flawed policy often promoted in the absence of an understanding that this over-zealous attenuation can be thoroughly counter-productive in the wrong location.

Green-field status quo means that for a 1 in 5 year event the developed site discharges at the equivalent 1 in 5 green-field rate, for a 1 in 50 year event it discharges at the equivalent 1 in 50 green-field rate etc. It is the runoff growth curve that is maintained, not a fixed discharge (which is practically very difficult to achieve in any case).

The only exception to the 'neutral attenuation policy without downstream risk' is one where climate change effects within the catchment are expected to be significant. Hence, over-attenuation may be built in as part of the DEFRA recommended 'Managed Adaptive Approach', **5.10.2**, to accommodate future changes.

9.5.3 Strategy FR3 – Local Attenuation Upstream

Where catchments (and sites) do not have the maximum capability for infiltration or surface water retention, the next test should be if these sites are located in headwater areas of the principal arterial watercourses, namely the Monnow, Teme, Lugg, Arrow, Frome and Leadon rivers.

By default under Table 9-1 these catchments should also tend to have relatively higher impermeability. Attenuation of these sites is of course achievable for each site independently in a piece-meal approach, and for very large sites, it may be appropriate and preferable for the site to host its own attenuation reservoir.

However, these upstream catchments have a vital strategic role. It is these catchments that are the most beneficial for larger 'strategic' reservoirs for upstream storage of flood water. Attenuation is a powerful mitigation option because the reduction effect is carried continuously downstream, sometimes for many kilometres. The higher up the location of the reservoir, the more extensive is its impact.

There is increasing recognition [1] that upland storage has a crucial role to play in alleviating downstream flood peaks in existing high fluvial risk areas. If such storage facilities are to be constructed to alleviate existing flood risk, it makes economic sense to enlarge these further to accommodate also the impacts of new development, thereby avoiding a proliferation of smaller, less manageable and less effective reservoirs.

In the optimum case, it could be that a contributions policy from all of the new developments combined would fully fund a localised strategic attenuation facility, offsetting their own risks and providing significant betterment to existing properties.

This policy is most effective within catchments where there is significant flood risk downstream in the same receiving watercourse, and the presumption under FR3 is that the attenuation facility is sited upstream in the same catchment as that of the developments contributing to it. Such facilities do not have to be large or expensive to be effective [4], say between 10 – 25,000 m³.

9.5.4 Strategy FR4 – Strategic Attenuation

Where there is no particular flood risk downstream on the receiving watercourse, but there IS flood risk further downstream on a sequential or arterial watercourse, by definition the flood peaks will be larger and the flood damage costs proportionately greater than those for a smaller upstream watercourse.

Developments across several upstream catchments may be contributing adversely to this flood risk in a collective and accumulative way. A multiplicity of independent storage reservoirs becomes expensive to monitor and maintain, and will have complex hydrological effects. This argues for even larger, more strategic attenuation reservoirs (> 25,000 m³) that have catchment scale impact as opposed to local impact. These could be sited in any appropriate upstream catchment, and not necessarily the one with the most development. Adjacent catchments might be more effective. The design rule is to select the catchment that achieves the most attenuation for the least storage [4].

Strategy FR4 will require significant feasibility study to identify appropriate sites well in advance of when they may be needed. Land acquirement issues may be complex and time consuming, but with appropriate site election, many such strategic reservoirs, engineered flood meadows or washlands can retain a dual use function either for grazing, public open space or nature reserves as well as occasional flood control.

9.5.5 Strategy FR5 – Neutral Attenuation on Site (Lagoons)

Where there are no significant downstream risks or restrictions OR they are not anticipated in future, there is little to be gained in promoting centralised reservoirs. It may be more practicable to enforce on-site attenuation individual to each site. Generally these attenuation facilities will tend to be lagoons and ponds, as the capacity for infiltration source control may be limited. SUDS should be implemented wherever possible however.

Generally, because there are no immediate downstream or sequential risks, the runoff rate should match the green-field runoff curve, which minimises the storage residence time of flood-water runoff.

This is an essential design requirement of most if not all attenuation facilities, namely that they should empty as rapidly as possible (subject to safe downstream capacities) after the downstream risk has passed, so as to provide capability to absorb secondary storm events. Reservoirs or flood meadows that have unnecessarily prolonged storage times have a serious risk of failure in the typical long-duration frontal events that are prevalent in UK winters.

9.5.6 Strategy FR6 – Offsite Improvements + On-site Attenuation

Where the receiving watercourse peaks many hours before the advent of the larger and later peak of the sequential or arterial river, a widespread policy of attenuation in the receiving catchment may protect local watercourses from increased flood risk. However, the long-term effect will generally be to increase the peak discharge on the arterial river downstream.

Where development sites lie within say 1 km of an arterial watercourse (i.e. the Wye, Teme, Monnow, Lugg or Frome), it is also strategically counter-productive to significantly attenuate such sites. The larger the development sites, and the greater the degree of attenuation, the more this risk is increased.

This phenomenon is most common in smaller catchments with short or steep watercourses that drain directly to a much larger arterial river, such as the Wye and the Lugg. Reference to Table 4-1 shows the relative times to peak of the 47 principal sub-catchments within the study.

It shows for example that whilst the hydrograph in the Middle Lugg at Leominster takes some 10 hours to peak, several nearby catchments discharging immediately upstream of Leominster do so earlier in the same storm event, for example Ridgemoor Brook (7.8 hours), Cheaton Brook (8.1 hours) and Pinsley Brook (9.1 hours). Strategically, it is more appropriate to maintain as rapid a drainage rate as possible from these catchments (and development sites within them) so as to avoid conflicts with the later peaking Lugg, subject obviously to safe downstream limits. In this way flood risks to downstream Leominster are actually lessened, because the local components of the flood hydrograph are discharged first.

Strategy FR6 therefore is most applicable in smaller catchments and subsidiary watercourses where it can be shown that the peak will discharge earlier.

Significant attenuation on these catchments will actually delay the peak of the subsidiary watercourse, and create increased risks downstream on the arterial watercourse.

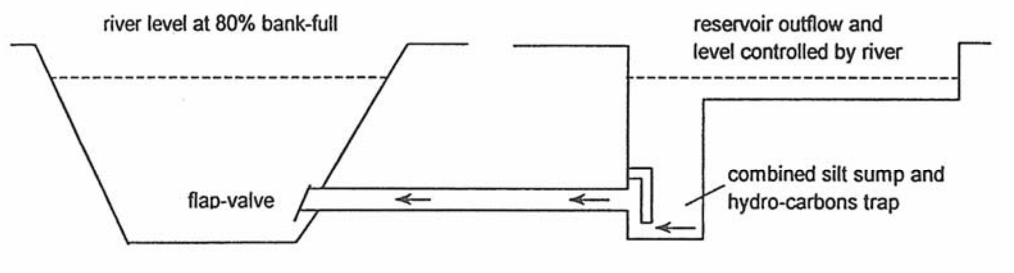
Under this policy is assumed that there are significant downstream risks on the receiving watercourse. Hence a hydrological balance must be struck between discharging development sites as quickly as possible without increasing flood risks. Detailed hydrological and hydraulic modelling of these catchments will be required as part of a wide Surface Water Management Plan to correctly quantify design criteria.

Since the permitted outflow rates will still be less than the maximum, there will still be a requirement for sites to provide on-site attenuation to take up any residual storage.

In this case the most appropriate form of outflow control is one which is directly related to the water level of the receiving watercourse. When the receiving water level drops (i.e. there is increased capacity), the development should be able to discharge proportionately more. When the river level rises, storage outflow is curtailed and possibly stopped altogether, see Figure 9-2. This ‘differential head’ form of control is extremely effective in maximising development runoff without compromising downstream flood risk, and is ‘fail-safe’ in its operation.

In its optimum form, the storage area could even be designed to accommodate reverse flow from the river, thereby providing a safety valve on existing downstream flood risk.

Figure 9-2 – Simplified Arrangement of Optimum Attenuation Control



Simplified arrangement of automatically regulated attenuation.

Source: B Faulkner, Urban Water, Vol.1(3) 1999

The most notable watercourses where Strategy FR6 (and possibly FR7 see below) are likely to be applicable include Ridgemoor Brook, Wellington Brook and Little Lugg on the Lugg, Letton Lake, Cage Brook, Withy, Red and Newton Brooks on the Middle Wye, Kempley, Glynch and Ell Brook on the Leadon, Wriggle Brook, Sollers Brook, Bailey Brook and Rudhall Brook on the Lower Wye and the Honddu on the Monnow. If and where these areas provide high infiltration capacity and potential for SUDS, Strategy FR1 is to be preferred.

9.5.7 Strategy FR7 – Offsite Improvement Works

Strategy FR7 is a variation of FR6 for watercourses where rapid discharge of runoff is desirable. In this case it is identified that there are also significant channel improvements works that could be implemented to improve watercourse capacity. This policy should therefore not only facilitate the new development, but also provide significant betterment to existing flood risk properties.

The appropriate policy response is to promote off-site improvement works along the full length of the subsidiary watercourse. Frequently this may simply require some localised improved defences, replacement of intermittent culverts and reinforcement of bridges with relief culverts etc.

These improvement-works being completed, the contributing developments should be allowed to discharge as much as is safely possible into the receiving watercourse. The proviso is that this must never be at a rate that is likely to compromise the capacity of the improved watercourse.

Consequently, it may still be necessary for the site to provide some residual flood storage on-site, but the advantage to the developer is that this will be significantly smaller in volume and extent than the full attenuation requirement. The larger the development area, the greater the scope to fund significant channel improvement works to the benefit of the downstream community via a contribution scheme.

What is the threshold difference in time to peak that should be tested to determine whether improvement works are desirable? Obviously times to peak of sub-catchments vary slightly primarily depending on antecedent wetness condition, but as a general rule not by more than 20% from the standard observed value.

Consequently, a simple test can be that if a subsidiary watercourse peaks more than 20% earlier than the arterial watercourse to which it discharges, the subsidiary watercourse is a prime candidate for maintaining rapid discharge, with minimised attenuation and/or channel improvement works. This also safeguards against the occasional conflicting impact of storm movement.

Conversely, if a subsidiary watercourse peaks within 20% of the time of the main sequential watercourse downstream, a ‘maintain status quo’ attenuation policy such as FR5 – Neutral Attenuation may be preferable

Off-site works have frequently been a major hindrance to effective integrated drainage strategies. Developers have been allowed the ‘soft’ option of providing on-site attenuation even where this may not have been the appropriate response. There are legal difficulties with entering into Section 106 agreements where of-site works and third parties are involved.

However, if the Local Development Framework is to adequately meet Government guidance on best practice, Surface Water Management Plans should explicitly facilitate the implementation of such schemes. The Environment Agency should also be more supportive of such schemes.

9.5.8 Strategy FR8 – Increased Attenuation on Site

For a significant number of catchments in the SFRA study area, there will be limited potential to institute extensive SUDSs. At the same time these catchments will also have little strategic value in that they peak at the same time or later than the arterial watercourse. Hence these catchments have little impact on the arterial flood risk on the main rivers, which will be affected by the simultaneous (or earlier) much larger flood peak on the main river.

However, these developments still have the potential to increase localised flood-risk on the receiving watercourse because of the increased runoff volume and advancing peak.

If there is significant downstream property or critical infrastructure already at risk, the appropriate policy response is to use the development sites to not only offset their own downstream impacts, but to provide betterment to these areas. This requires that the developments ‘over-attenuate’ to rates that are significantly less than the green-field equivalents. This will help to reduce the peak load on the receiving watercourse. As for Policy FR6, attenuation storage could be designed to facilitate reverse flow from the river into the lagoon to enhance downstream protection even further. The larger the sites and the attenuation, the more effective will be the policy in providing betterment.

In situations where there is no downstream flood risk but there are downstream capacity restrictions, Strategy FR7 or FR8 might be equally appropriate.

9.5.9 Strategy FR9 – New Flood Channel Infrastructure

Strategy FR9 is a special case where there is an engineering option to divert or relieve a watercourse to an entirely different outfall or provide some form of bypass or flood relief arrangement. The Marsh Cut relief channel around north Leominster is an example.

Such schemes may be used in combination with offsite improvements and or residual attenuation to reduce total risk. Because of topography and urban pressures, such schemes tend to be underground and inevitably highly expensive.

However, in certain cases this is a viable option above ground, and a current scheme under active consideration in Hereford is to provide a high level offtake and relief channel to the Yazor Brook (which has significant existing flood pressures) running southwards by gravity direct to the Wye. The offtake will be located in the vicinity of Credenhill Community Centre. A combination of open and culverted channel will transfer flood flows south through largely agricultural land discharging to the River Wye in the vicinity of Weir Cliff. The proposed route of the diversion is shown in **Evidence Map 9-1 – Flood Control Strategies**

9.6 Future Flood Infrastructure

It is a requirement of an SFRA that some preliminary assessment should be made of likely future flood management infrastructure. This requirement will overlap substantially with the Environment Agency's views expressed via the CFMP, and to some extent will depend on the locations of new development IF these exert increased pressure on downstream flood risk areas.

It is likely however that some new or reinforced flood infrastructure will be needed to adapt to climate change and to protect concentrations of property and/or critical infrastructure already at risk of flooding.

9.6.1 Catchment Drainage Policies

Catchment drainage policies will be one of the largest contributors to improved flood management infrastructure. Utilising the natural dynamics of the catchments to disaggregate flood hydrographs is probably the single most effective long-term approach, BUT it requires a sustained and consistent approach by the LPA and EA to implement these policies at the catchment scale and to all developments within that catchment.

This will require a commitment to 'strategic drainage' not yet experienced by the LPA or for that matter the EA.

Practical experience of where such strategic drainage policies and associated infrastructure have been implemented show clearly that it is a) achievable b) successful e.g. the regional attenuation strategy for Emersons Green and Folly Brook, Bristol (15,000 houses +, 1990 – 2000).

A set of detailed and effective drainage strategies to support LDF and LDD policies has been developed as part of this Strategic Flood Risk Assessment.

9.6.2 Strategic Attenuation Reservoirs

Larger, centralised attenuation reservoirs or controlled washlands are especially effective in upland or headwater catchments. This is because the attenuation effect can be seen for a significant distance downstream, with all property and infrastructure benefiting from this reduction in peak flow. The magnitude of the reduction obviously reduces in the downstream direction, but if sufficiently large, such reservoirs have significant impact.

Conversely, local flood defence schemes such as at Hereford and Hampton Bishop serve only relatively small areas, and maintain a high level of residual risk that they will be breached or overtopped.

Reservoirs capable of strategic scale attenuation will inevitably be large (> 25,000 m^3), and may require significant embankment, control structure and earth-works. However, this one facility may substitute 10 on-site schemes, and correctly located, is likely to be technically more effective.

They will require significant issues of land acquisition or rental, but frequently the dual use of the land behind the attenuation embankment can be retained for grazing, public open space or amenity value. The Ross-on-Wye Flood Alleviation Scheme is a successful example.

This SFRA has identified that several high flood risk areas in Herefordshire should receive policy attention and further technical consideration with respect to providing strategic attenuation reservoirs.

Foremost amongst these is the town of Kington, which is considered to be at enhanced risk for a number of reasons: it lies at the confluence of two rivers with similar times to peak (always a recipe for disproportionate flooding), with relatively little time available for flood warning.

Depending on hydrograph dynamics, strategic attenuation upstream of Kington on either the Back Brook or upper Arrow (or both) might also benefit the village of Eardisland, another high risk area. A reservoir or controlled washland nearer on the Curl Brook might however be more suitable.

With sufficient upstream attenuation with perhaps four or five installations, it is conceivable that flood risk at Leominster itself could be reduced.

As a fourth priority, the village of Bosbury encounters persistent flooding, which will most effectively be alleviated by upstream attenuation.

The villages of Orleton and Brimfield are at risk of severe flash flooding from the Brimfield Brook, and this can only be resolved by attenuation upstream.

Hereford remains a high risk area, because of the large concentration of high value assets. Flooding from and along the Yazor Brook might be reduced by a facility near Bishopstone if this was cost-beneficial.

Although it would require an embankment across the Wye floodplain at Bredwardine, a low level embankment here might utilise vast storage upstream in the Letton Lake area without a significant increase in flood level.

The flood affected villages of Peterchurch, Ewyas Harold and Pontrilas would also benefit from upstream attenuation installations.

Although Bromyard is not considered to be a high risk area, the downstream catchment of the middle Frome is relatively high on the Catchment Flood Hazard Index and the Fluvial Flood Risk Index. There are a significant number of observed flood reports downstream. The upper Frome is therefore a prime candidate catchment for strategic attenuation to mitigate downstream risk.

It should be an active an ongoing task of the LPA in association with the EA to identify appropriate headwater sites where such facilities may be constructed. Evidence Map 9-1 shows only the indicative locations where such installations may be appropriate, purely on the basis of location, floodplain extent and adjacent topography. Considerable further investigation would be required before precise sites could be identified, and Benefit-Cost studies undertaken to confirm value added.

9.6.3 Channel Improvement Works

Currently identified channel improvement works that require particular mention in LDDs are:

As part of the Edgar Street Grid (ESG) development in central Hereford, it is proposed to divert floodwaters from the Yazor Brook at Credenhill southwards to the River Wye. This scheme should be fully supported, as it is strategically robust. The scheme should bring considerable relief from flooding to those areas of Hereford along the Yazor and Widemarsh Brook corridors, as well as enabling the ESG proposals to go ahead, supported by additional on-site measures to meet planning requirements.

Significant new development may proceed in the Bullingham area of south Hereford. It is likely that there will be significant pressure on the Red and Withy Brooks. The downstream areas are heavily at risk from flooding from the Wye. Increased peak flows and or prolonged attenuation from new development upstream will exacerbate this flooding. It is strongly recommended that active consideration be given to major capacity improvements along these watercourses to permit more rapid but safe discharge of development run-off upstream.

There may be some development pressure in the Cheaton Brook catchment. Improvements to the receiving watercourse (Cheaton Brook) are desirable in preference to attenuation as part of an optimised drainage strategy.

There may be significant development pressure in south Leominster. Improvements to the receiving watercourse (River Arrow) are desirable in preference to attenuation as part of an optimised drainage strategy.

There may be significant development pressure in the Cradley Brook catchment. Improvements to the receiving watercourse (Cradley Brook) are desirable in preference to attenuation as part of an optimised drainage strategy.

There may be significant development pressure in the Wellington Brook catchment. Improvements to the receiving watercourse (Wellington Brook) are highly desirable in preference to attenuation as part of an optimised drainage strategy.

There may be some development pressure in the Preston Brook. Improvements to the receiving watercourse (Preston Brook) are desirable in preference to attenuation as part of an optimised drainage strategy.

9.6.4 Agricultural Land Practice

There is increasing recognition that widespread positive drainage of farm-land or poor agricultural techniques has a significant impact on downstream runoff. Inappropriate or untimely cultivation can cause soil compaction and capping.

In conjunction with the Environment Agency and Welsh Assembly Government where appropriate, Herefordshire should actively consider options for runoff minimisation in the headwater catchments of the upper Arrow, upper Lugg, Hindwell Brook, Back Brook, upper Frome, upper Leadon, Dore and upper Monnow via improved land management practices.

These may include reduced drainage or afforestation programmes or alternative cropping methods. Significant implementation of such practices might obviate the need for more formal engineered reservoirs, although they are less predictable in their operation.

9.7 Provisional Drainage Strategy Map

To assist the LPA in preparation of its Local Development Documents concerning drainage issues, the various cascade rules of Table 9-2 have been applied to the 47 catchments of the SFRA to identify provisional optimum drainage and flood risk mitigation strategies. The most appropriate solutions according to the rules of Table 9-2 are built in as a field within the GIS database and layer **HSFRA All Catchments**.

These provisional policies are shown in **Evidence Map 9-1 Flood Control Strategies**. This map also highlights the most pressing areas where the LPA should address specifically matters of improved flood control infrastructure in consultation with the Environment Agency.

9.7.1 Basic Principles of Good Drainage Strategy

The provisional drainage strategy is powerful but flexible in its concept, and it is based on a few fundamental basic principles that should apply in most if not all circumstances. These rules apply not only at the catchment scale, but also at the local (site) scale.

1) The overriding drainage strategy preference should be to promote high levels of surface water retention on site via SUDS systems, where site conditions permit, even if the wider catchment is not generally suitable for widespread source control. This will largely depend on the soil types and sub-soil conditions prevailing at the site.

2) In general terms, the most effective strategic solution to large scale flood risks (at the catchment scale) is to attenuate significantly runoff from upstream catchments, maintain a neutral stance in middle catchments, and promote improved runoff and capacity in downstream catchments. The same principles apply to development sites within catchments in the absence of an overriding general policy for the catchment as a whole.

3) The most appropriate drainage and flood mitigation policy for a site should be derived from i) what is at risk downstream ii) the physical attributes of the site ii) the physical attributes of the catchment.

4) Where there is likely to be a proliferation of small attenuation facilities within a single catchment, it will be more appropriate to construct a single or fewer larger, centralised strategic facilities. This is especially the case in upland headwater catchments where strategic attenuation is likely to be most

effective.

5) Significant widespread attenuation within a catchment that peaks substantially before the arterial watercourse to which it drains is likely to increase the flood risks on the arterial watercourse. While the proportional increase in flood risk hazard (i.e. flow) may be small, the consequence may be larger; hence flood risk may be increased depending on the magnitude of the arterial peak flow and the property at risk.

6) Consequently, where site drainage is likely to reach an arterial watercourse substantially before the peak of that watercourse, the optimum policy is to promote direct and rapid discharge to the arterial watercourse subject to the receiving minor watercourse flow remaining within safe limits.

7) Where on-site or catchment attenuation is the preferred policy, unless it is a specific requirement that attenuation should be at a maximum for strategic reasons (i.e. significantly below green-field rates), the attenuation facility should be designed to empty as rapidly as possible subject to the green-field runoff rate OR downstream capacity restrictions, whichever is the lesser.

Table 9-2 – Proposed Drainage and Flood Mitigation Strategies

Stage	Site or Catchment Test	Risk Test	Drainage and/or Flood Control Method	STRATEGY
1	Is the site and/or catchment highly or moderately suitable for source control, infiltration and SUDS? If **YES** step right, else go to **2**	Is there significant property or critical infrastructure at risk downstream on the receiving watercourse? If **YES** step right, else step down	Reduce runoff significantly below green-field rates via on-site high capacity SUDS and other appropriate attenuation measures.	**STRATEGY FR1 –** **MAXIMUM ATTENUATION ON SITE (SUDS)**
		Are there significant structural restrictions to flow capacity downstream on the receiving watercourse? If **YES** step right, else step down	Reduce runoff significantly below green-field rates via on-site high capacity SUDS or other appropriate attenuation measures.	**STRATEGY FR1 –** **MAXIMUM ATTENUATION ON SITE (SUDS)**
		Is there significant property or critical infrastructure at risk downstream on the next sequential watercourse within 5 km? If **YES** step right, else step down	Reduce runoff significantly below green-field rates via on-site high capacity SUDS or other appropriate attenuation measures.	**STRATEGY FR1 –** **MAXIMUM ATTENUATION ON SITE (SUDS)**
		There are no current downstream risks or restrictions Step right.	Maintain runoff status quo at existing green-field rates via onsite SUDS or other appropriate attenuation measures	**STRATEGY FR2 –** **NEUTRAL ATTENUATION ON SITE (SUDS)**
2	Is the site located in an upper catchment of the Teme, Monnow, Arrow, Lugg, Frome or Leadon systems? If **YES** step right, else go to **3**	Is there significant property or critical infrastructure at risk downstream on the receiving watercourse? If **YES** step right, else step down	Provide or contribute to a local upstream strategic attenuation facility on receiving watercourse. Site discharges at residual maximum safe runoff rate, storing balance as necessary	**STRATEGY FR3 –** **LOCAL ATTENUATION UPSTREAM**
		Are there significant structural restrictions to flow capacity downstream on the receiving watercourse? If **YES** step right, else step down	Provide or contribute to a local upstream strategic attenuation facility on receiving watercourse. Site discharges at residual maximum safe runoff rate, storing balance on-site as necessary	**STRATEGY FR3 –** **LOCAL ATTENUATION UPSTREAM**
		Is there significant property or critical infrastructure at risk downstream on the next sequential watercourse within 5 km? If **YES** step right, else step down	Provide or contribute to a centralised strategic attenuation facility on receiving or adjacent watercourse. Site discharges at residual maximum safe runoff rate, storing balance on-site as necessary	**STRATEGY FR4 –** **STRATEGIC ATTENUATION ADJACENT**
		There are no current downstream risks or restrictions Step right.	Maintain runoff status quo at existing green-field rates via onsite attenuation measures such as tank sewers and lagoons.	**STRATEGY FR5 –** **NEUTRAL ATTENUATION ON SITE (LAGOON)**
3	Will the site discharge to a watercourse that will peak substantially earlier (+25%) than the arterial watercourse? If **YES** step right, else go to **4**	Is there significant property or critical infrastructure at risk downstream on the receiving watercourse? If **YES** step right, else step down	Site discharges at maximum safe runoff rate, storing balance on-site as necessary. Contribution to offsite works may be appropriate to increase runoff rates	**STRATEGY FR6 –** **POSITIVE DISCHARGE + ON-SITE ATTENUATION (LAGOON)**
		Are there significant structural restrictions to flow capacity downstream on the receiving watercourse? If **YES** step right, else step down	Contribute to improved downstream capacity scheme. Site discharges at maximum safe rate from development on completion of off-site works, storing balance as necessary.	**STRATEGY FR7 –** **OFFSITE WORKS TO IMPROVE CAPACITY**
		Is there significant property or critical infrastructure at risk downstream on the next sequential watercourse within 5 km? If **YES** step right, else step down	Site discharges at maximum safe runoff rate, storing balance on-site as necessary.	**STRATEGY FR6 –** **POSITIVE DISCHARGE + ON-SITE ATTENUATION (LAGOON)**
		There are no current downstream risks or restrictions	Maintain runoff status quo at existing green-field rates via onsite attenuation measures such as tank sewers and lagoons.	**STRATEGY FR5 –** **NEUTRAL ATTENUATION ON SITE (LAGOON)**
4	The site is in a downstream catchment that is inappropriate for source control, infiltration or SUDS, and will peak at a similar time or later to that of the arterial watercourse	Is there significant property or critical infrastructure at risk downstream on the receiving watercourse? If **YES** step right, else step down	Reduce runoff rates significantly below green-field rates via onsite attenuation measures such as tank sewers and lagoons.	**STRATEGY FR8 –** **INCREASED ATTENUATION ON SITE (LAGOON)**
		Are there significant structural restrictions to flow capacity downstream on the receiving watercourse? If **YES** step right, else step down	Reduce runoff rates significantly below green-field rates via onsite attenuation measures such as tank sewers and lagoons.	**STRATEGY FR8 –** **INCREASED ATTENUATION ON SITE (LAGOON)**
		Is there significant property or critical infrastructure at risk downstream on the next sequential watercourse within 5 km? If **YES** step right, else step down	Maintain runoff status quo at existing green-field rates via onsite attenuation measures such as tank sewers and lagoons.	**STRATEGYFR5 –** **NEUTRAL ATTENUATION ON SITE (LAGOON)**
		There are no current downstream risks or restrictions	Maintain runoff status quo at existing green-field rates via onsite attenuation measures such as tank sewers and lagoons.	**STRATEGY FR5 –** **NEUTRAL ATTENUATION ON SITE (LAGOON)**
5	The site is in a catchment that has the capability to divert flows to an alternative larger watercourse via new diversionary or flood relief channels	Is the flood risk avoided (hazard x consequence) on the receiving watercourse greater than the flood risk imposed on the alternative If **YES** step right, else step down	Contribute to offsite works for new diversionary or flood alleviation channels as part of a wider strategic scheme. Site discharges at maximum safe runoff rate, storing balance as necessary	**STRATEGY FR9 –** **NEW FLOOD CHANNEL INFRASTRUCTURE**
		Risks should remain within the original catchment	Contribute to a local upstream strategic attenuation facility. Site discharges at maximum safe runoff rate, storing balance as necessary	**STRATEGY FR3 –** **LOCAL ATTENUATION UPSTREAM**

9.8 Collation of Future Flood Data

Herefordshire Council must greatly increase its awareness and field-intelligence of the sources and mechanisms of flooding in its administrative area. This is essential to effective planning, investment and emergency response in flood management. There should be a systematic method of efficiently collating flood and accessing information, whether from fluvial flooding or from surface water.

This was a clear recommendation of the West Midlands Regional Flood Risk Appraisal [5].

A detailed pro-forma has been specifically developed as part of this SFRA, see Technical Appendix Chapter 11. In line with RFRA recommendations this form is comprehensive in identifying the incident, source, cause, extent and impact of the flooding. This pro-forma is designed to support the GIS database HSFRA Flood Reports.

It is strongly recommended that this form be posted to the Herefordshire Council website where it can be downloaded by the general public AND other Agencies who may encounter flooding incidents. The draft was sent to Herefordshire Council in December 2007, no comments yet received.

The Environment Agency does not provide a standardised flood reporting form for general use and it is recommended that Herefordshire Council provides its own standardised method of reporting.

Significant effort has been directed towards compiling a Flood Reports database (**HSFRA Flood Reports**). This database should be regarded as live and ongoing. It should be a high priority task of the LPA to adopt and maintain this database at all times. The information contained therein is of significant value in strategic flood risk planning.

9.9 Interactions with the EA CFMP

The Environment Agency does not provide a standardised flood reporting form for general use and it is recommended that Herefordshire Council provides its own standardised method of reporting.

Catchment drainage policies will be one of the largest contributors to improved flood management infrastructure. Utilising the natural dynamics of the catchments to disaggregate flood hydrographs is probably the single most effective long-term approach, BUT it requires a sustained and consistent approach by the LPA and EA to implement these policies at the catchment scale and to all developments within that catchment.

It should be an active an ongoing task of the LPA in association with the EA to identify appropriate headwater sites where strategic attenuation facilities may be constructed. Evidence Map 9-1 shows only the indicative locations where such installations may be appropriate, purely on the basis of location, floodplain extent and adjacent topography.

This SFRA has identified that several high flood risk areas in Herefordshire should receive policy attention and further technical consideration from the EA with respect to providing strategic attenuation reservoirs.

The key to successful regional flood alleviation strategies is to reinforce the natural hydrodynamics of the catchments themselves, and to achieve as far as possible disruption or disaggregation of the combining natural hydrographs. In the simplest terms, this means delaying even further the timing of runoff from catchments that have long times to peak or that have a headwater location, and advancing the timing of catchments that have short times to peak or have a downstream location.

All drainage and flood risk impacts are gravity driven, bounded by the respective watershed, but subsequently interacting with other catchments downstream in increasingly complex ways.

These impacts are fundamentally different in their scale and timing within different catchments. Effective long-term flood risk management MUST therefore be based on catchments, not arbitrary policy units. Furthermore, the catchment hydrodynamics (volume of runoff, speed of runoff, drainage capacity, and timing of peak) must be very well understood before blindly embarking on drainage and flood mitigation policies that may prove to be counter-productive in the long-term.

9.10 Evidence Based Statements

1) Arrangements for managing surface water drainage are split between the Environment Agency, local authorities, water companies, and other agencies, with no one organisation having overarching responsibility. As a result, decisions about new drainage or development investments are usually taken without a complete understanding of surface water risks and the most effective solutions.

2) There is increasing momentum at Government level for increased coordination of drainage and flood management strategies, and it is clear that LPAs will have an increasingly responsible role in coordinating effective drainage strategies through the planning process.

3) In critical drainage areas, where the risk from surface water drainage is significant, the local authority should prepare a **Surface Water Management Plan**. This would be an action plan, agreed by all local stakeholders with drainage responsibilities, to clarify responsibilities and manage these risks.

4) For high level policy objectives to be effective, they must build from the bottom up, NOT the top down. This means that what is <u>practicably achievable</u> within specific catchments by means of strategic attenuation, SUDS, infiltration, site attenuation, channel improvements etc. must be the first consideration before high level policies are established.

5) New developments, whether single large sites, or an accumulation of smaller sites, can have profound impacts on local drainage and flood risk.

Drainage and flood risk are material considerations in the determination of a planning application and a satisfactory means of foul water and surface water disposal must be demonstrated.

6) The significant risk of the CFMP approach is that it is insufficiently detailed so as to take account of these practicalities, and this is where Surface Water Management Plans have a critical role to bridge the gap between high level policy objectives and detailed site drainage proposals.

7) Effective long-term flood risk management MUST therefore be based on catchments, not arbitrary policy units. Furthermore, the catchment hydrodynamics (volume of runoff, speed of runoff, drainage capacity, and timing of peak) must be very well understood before blindly embarking on drainage and flood mitigation policies that may prove to be counter-productive in the long-term.

8) The key to successful regional flood alleviation strategies is to reinforce the natural hydrodynamics of the catchments themselves, and to achieve as far as possible disruption or disaggregation of the combining natural hydrographs. In the simplest terms, this means delaying even further the timing of runoff from catchments that have long times to peak or that have a headwater location, and advancing the timing of catchments that have short times to peak or have a downstream location.

9) Some strategies should actively promote rapid runoff to maximise effective use of channel capacities and rapid timings of watercourses, others will maintain the status quo in terms of matching green-field runoff rates, and at the other end of the scale, significant attenuation may be desirable (by storage of flood water either on-site or in strategically placed reservoirs).

10) Table 9-2 proposes 9 distinct drainage strategies that in combination are most likely to achieve an integrated regional flood mitigation plan. Account is taken first of the natural characteristics of the catchment, and then various risk tests can be applied to select the appropriate form of drainage control.

11) Catchment drainage policies will be one of the largest contributors to improved flood management infrastructure. Utilising the natural dynamics of the catchments to disaggregate flood hydrographs is probably the single most effective long-term approach, BUT it requires a sustained and consistent approach by the LPA and EA to implement these policies at the catchment scale and to all developments within that catchment.

9.11 Evidence Based Recommendations

1) This SFRA has prepared detailed strategic assessments of hydrological impacts and flood hazards and flood risks, leading to a set of detailed proposed strategies founded on robust technical appraisal. It will be necessary for these micro-scale policies to be reconciled with the much more general and broader policies in the forthcoming CFMP. It is essential that the CFMP recognises the areas of greatest flood risk as identified in the SFRA, and promotes policies that are in line with the practicalities of

appropriate catchment drainage strategies.

2) Herefordshire Council must greatly increase its awareness and field-intelligence of the sources and mechanisms of flooding in its administrative area. This is essential to effective planning, investment and emergency response in flood management. There should be a systematic method of collating flood information, whether from fluvial flooding or from surface water. A Flooding Report pro-forma has been prepared for this purpose.

3) The HSFRA Flood Reports database should be adopted forthwith by the LPA and maintained and updated on a continuous basis. The Flooding Report pro-forma should be used to support this process.

4) Proposed drainage strategies in the SFRA should be considered by the LPA and as far as possible incorporated into Local Development Documents.

5) The proposed diversion channel associated with the Edgar Street Grid development running from the Yazor Brook at Credenhill to the Wye at Sugwas Pool is in accordance with Strategy FR9, and should be fully supported. In conjunction with a strategic attenuation facility higher in the Yazor Brook catchment, downstream flooding of the Widemarsh area might be eliminated.

6) Significant new development may proceed in the Bullingham area of south Hereford. It is likely that there will be significant pressure on the Red and Withy Brooks. The downstream areas are heavily at risk from flooding from the Wye. Increased peak flows and or prolonged attenuation from new development upstream will exacerbate this flooding. It is strongly recommended that active consideration be given to major capacity improvements along these watercourses to permit more rapid but safe discharge of development run-off upstream. A Surface Water Management Plan for the Withy Brook and Red Brook catchments is strongly recommended.

7) There may be some development pressure in the Cheaton Brook catchment. Improvements to the receiving watercourse (Cheaton Brook) are desirable in preference to attenuation as part of an optimised drainage strategy.

8) There may be significant development pressure in south Leominster. Improvements to the receiving watercourse (River Arrow) are desirable in preference to attenuation as part of an optimised drainage strategy.

9) There may be significant development pressure in the Cradley Brook catchment. Improvements to the receiving watercourse (Cradley Brook) are desirable in preference to attenuation as part of an optimised drainage strategy.

10) There may be significant development pressure in the Wellington Brook catchment. Improvements to the receiving watercourse (Wellington Brook) are highly desirable in preference to attenuation as part of an optimised drainage strategy.

11) There may be some development pressure in the Preston Brook. Improvements to the receiving watercourse (Preston Brook) are desirable in preference to attenuation as part of an optimised drainage strategy.

9.12 References and Additional Resources

The following published or web-based documentation has been referred to in the following sections, and may provide useful further reference material for the Local Development Framework.

1) **Future Water – The Government's Water Strategy for England**, (HMSO, 2008)
http://www.defra.gov.uk/environment/water/strategy

2) **Making Space for Water – Government Programme for Flood & Coastal Flood Risk Management**
http://www.defra.gov.uk/environ/fcd/policy/strategy.htm

3) **Faulkner, B.L.,** '**The Analysis of Flooding and Land Drainage on a Catchment-Wide Basis'**. National Symposium on Catchment Planning and Management, Wallingford, June 1993

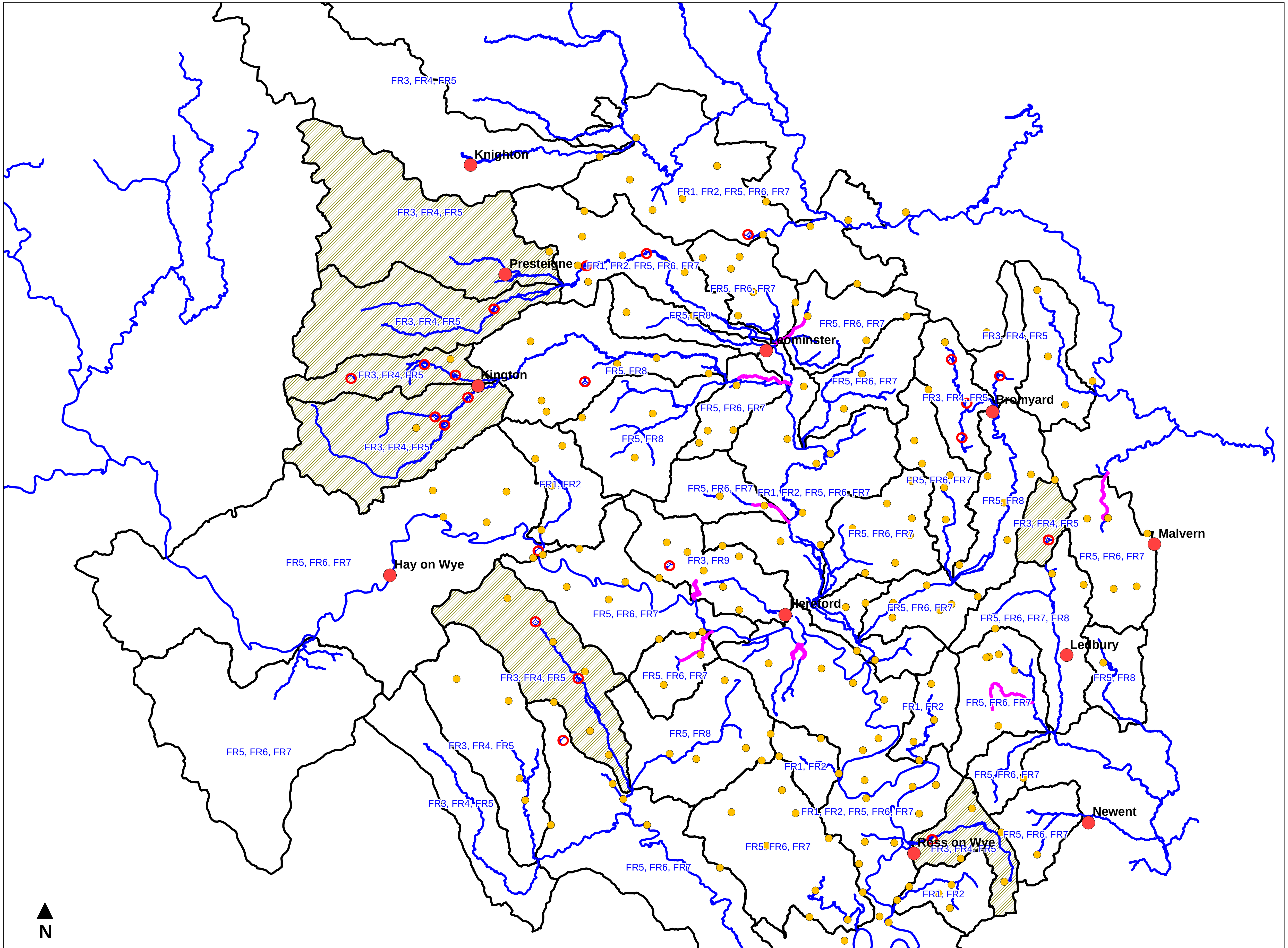
4) **Faulkner, B.L., 'Innovative and Cost-effective Design of Flood Attenuation Reservoirs in Urban Areas Based on the Exploitation of Catchment Runoff Dynamics'.** Novatech 2001 - 4th International Conference on Innovative Technologies in Urban Storm Drainage, Lyon, France, May 2001

5) **Faulkner, B.L. 'The Control of Surface Runoff from New Development - UK National Policy in Need of Review?'**. In Urban Water - An International Journal, Volume 1, no.2, Elsevier, June 2000

6) **Foresight Programme Future Flooding – Flood and Coastal Defence**
http://www.foresight.gov.uk/previous_projects/flood_and_coastal_defence/

7) **Strategic Flood Mitigation Options – Appraisal Report**. ESG Herefordshire Ltd, Dec. Capita Symonds, 2007

Evidence Map 9-1 – Flood Control Strategies



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Key

- Wye Catchment
- Herefordshire
- Principal Rivers
- Main Town
- Village
- FR3 Recomended catchment drainage strategy
- Strategic attenuation desirable
- Channel improvement desirable
- Land management desirable
- EA Flood Zone 2

Client
Herefordshire Council

Scheme
Strategic Flood Risk Assessment

Drawing

Title	Flood Control Strategies
Subset	By sub-catchment
No.	1110/EB/9-1/a
Date	24-1-2008
Check:	BF

Revisions

Scale : 1:NTS

Evidence Map 9-1

10. FUTURE FLOOD MANAGEMENT ISSUES

It is likely that in the coming decade Herefordshire Council will play an increasingly proactive role in the strategic and contingency aspects of ever increasing flood risk within its own region.

The following sections summarises latest industry and Government guidance and evolving issues that are likely to directly affect Herefordshire Council and which may provide further material for the evidence base.

10.1 UK Climate Impacts Programme – UKCIP

The Climate of the United Kingdom and Recent Trends [1] is the first in a series of reports under the umbrella of the UK 21st Century Climate Change Scenarios (known as UKCIP08). UKCIP08 will provide probabilistic climate projections, based on an approach developed by the Met Office Hadley Centre.

The Scenarios Gateway of the UK Climate Change Impacts Programme (www.ukcip.org.uk) provides access to maps, datasets and guidance relevant to UKCIP climate change scenarios. The UKCIP climate change scenarios are funded by the Department for Environment, Food and Rural Affairs (DEFRA) and modelled by the Hadley Centre for Climate Prediction and Research (part of the Met Office), and are a key component of UK national and regional climate impacts assessment.

The guidance pages are a good starting point for general information about climate change scenarios and their use in impacts assessment. They describe how climate change scenarios can be used in decision-making and provide details of the uncertainties involved in climate modelling. They also contain frequently asked questions, definitions of commonly-used terms and links to other relevant data and resources.

10.2 Foresight Future Flooding Report

How will climate change affect us in 30 to 100 years time? How much will flooding increase in that time? How should changes be managed?

These and many other questions are tackled in the **Foresight Future Flooding** [2] report that was released in April 2004 by the Department of Trade and Industry (DTI). The report is the most wide-ranging analysis of flood risk in the UK. It predicts that climate change will be an important factor in increasing flood risk, and that both the number of people in danger from flooding and the costs of damage from floods will significantly rise.

Using a series of scenarios that take into account potential social and economic changes, as well as information on climate change, the main findings of the Foresight Future Flooding report are as follows:

- Climate change is an important factor in increasing flood risk, particularly through the impacts of rising sea levels and more stormy weather.
- Other important factors include the way we use land, increased urban development and the effects of increased wealth and higher standards of living.
- Figures for annual damage from flooding could rise from the present level of £1 billion to about £25 billion in the worst case scenario.
- The number of people at a high risk from flooding could rise from 1.5 million to 3.5 million.
- More effective land management will help reduce the risks in most scenarios. However, in the worst case scenario these are of little benefit and greater use of flood defences and coastal re-alignment will be required.

Table 10-1– Future Foresight Project Assessment of Options

Catchment-scale responses	
Theme	**Examples**
Managing the Rural Landscape	Catchment-Wide Storage
Managing the Urban Fabric	Urban Storage
Managing Flood Events	Forecasting and Warning Individual Damage Avoidance Actions
Managing Flood Losses	Land-Use Management Floodproofing
River and Coastal Engineering	Increasing River Conveyance River Defences Coastal Defences Coastal Defence Realignment and Abandonment

Source: Foresight Future Flooding,

A key objective of the programme was to identify management responses which are effective in reducing risk, and which are also sustainable. Responses were assessed against economic, social and environmental sustainability criteria. It was found that none scored highly in effectiveness and sustainability across all four scenarios. However, several performed well across three of the four, and are therefore reasonably robust to socioeconomic and climatic change.

The most robust were:

- Catchment-Wide Storage
- Land-Use Planning
- Realigning Coastal Defences

All of these can produce environmental benefits, reduce flood risk and be made sustainable with careful implementation. The key message is that it is how the responses are implemented, that is the critical factor.

The key strategic choices facing regulatory agencies and LPAs include:

- What standards of protection should we aim for in the future, and what standards will the public expect
- Who should pay for that protection
- How should we use land, balancing the wider economic and social needs against creating a legacy of flood risk?

While these issues are not new, the project has provided scientific-based estimates of the risks and costs of responses. These will help to inform the development of long-term policies. They will also allow decision-makers to gauge the importance of flood management relative to the many other issues faced.

10.3 DEFRA - Making Space for Water

The DEFRA strategy '**Making Space for Water**' [3] has identified the need for a holistic, joined-up, and integrated approach to manage flood risk. An improved response is especially needed in urban areas where there is a complex interaction of drainage systems and fractured institutional arrangements.

One of the Making Space for Water research themes is therefore addressing integrated urban drainage management (IUDM, HA2); how technical and institutional approaches to managing urban drainage systems can be improved to most effectively deliver reduced flood risk in urban areas and at the same time contribute to delivering water quality protection and improvements required by the Water Framework Directive.

Inefficiencies in the current institutional arrangements are still being examined using the pilot studies as a primary source of evidence. However four categories of inefficiency have quickly emerged:

1. **Information**. When customers are flooded from stormwater, they do not know who to contact for help or where to report the incident. Anecdotal evidence suggests that customers can be passed between organisations with no one willing to take responsibility for the water or the incident. There is no single repository or formal reporting of historic flood incidents from stormwater, except perhaps insurance companies, who rarely share this information because it is commercially sensitive.

2. **Risk assessment.** No single organisation has an incentive to carry out a comprehensive assessment of the risks of stormwater flooding or has been given responsibility to do so. Individual organisations typically conduct their own independent work on mapping and modelling flood risk in relation to their own assets, with no one taking a strategic or

holistic overview. Some local authorities have begun to develop Surface Water Management Plans which integrate drainage provision across local development sites

3. **Development planning**. Decisions for new development (properties and infrastructure) are often taken without a full understanding of the risks of stormwater flooding – in part because no one organisation takes responsibility for assessing the effect of the cumulative runoff from new developments. Consideration of new developments on a case-by-case basis can ignore cumulative stormwater effect

4. **Investment decisions**. As organisations own different parts of the urban drainage infrastructure, they make investment decisions based on a limited cost-benefit analysis that rarely considers the wider drainage issues. The sum total of these individual and piecemeal investment strategies is unlikely to produce the most effective solution.

10.4 Future Water – Government Water Strategy for England

Published in March 2008, the **Future Water** [4] strategy document is a far-reaching set of objectives and visions across the entire water cycle. Amongst other objectives, the Government signals its intention to use Surface Water Management Plans as a tool to improve the coordination of drainage stakeholders. It also wants to promote sustainable drainage by clarifying responsibilities and improving incentives for property owners and developers.

Consultations are ongoing on these issues, including options for ownership and maintenance of sustainable drainage systems, and alternatives to the ability to automatically connect surface water drainage to the public sewerage system.

10.5 The Pitt Review 2008

The final report is expected in late 2008, and is likely to emphasise an increased role for LPAs in emergency planning and coordination, critical infrastructure protection, and strategic drainage planning.

10.6 Insurance Industry Drivers

A concluding assessment of future drivers in integrated flood risk management would not be complete without reference to the critical influence of the insurance industry. Developments at risk of flooding may increasingly face difficulties with the cost or availability of insurance. This, in turn, could cause problems for property buyers in obtaining mortgages.

PPS 25 suggests that the insurance industry may wish to seek to reduce the risk exposure by making appropriate representations about proposals for the location of new development during the preparation of local development plans [6]. The LPA should be cognisant of this.

The insurance industry increasingly perceives that there are opportunities for it to:

- use its risk management skills to help planners, architects, utilities and other sectors of society to manage flood risk
- go to court to recover claims payments from the authorities, thus providing an incentive for the authorities to manage flood risks better
- help local planners to avoid building in flood hazard areas

Quoting from Insurance Research and Practice [7]

"the ABI Statement of Insurance Principles was intended to reduce social problems by helping existing insurance customers maintain their cover, provided the flood hazard is less than a 1.3% probability (1 in 75 yeas.) But it is discriminatory ….

Low-income families may be more likely to shop around for insurance or to have breaks in cover when finances are tight. Many low income families do not have bank accounts or access to insurance with rent schemes so continuity of cover can be difficult. This can mean they have no protection from the ABI statement. The ABI estimates that over a million people could lose their insurance following revisions to the statement.

The plight of small businesses flood hazard areas also needs to be considered. They receive little help from the authorities yet they provide local employment and are a source of innovative new ideas and enterprise.

The local hairdresser, pub or corner shop is an important element in making the local, community more cohesive and cultivating good citizenship, but these businesses are becoming increasingly vulnerable to bankruptcy after a flood event.

Even without climate change, all these factors add up to, a recipe for social exclusion on a large scale. Insurers should be aware that this could lead to a breakdown not only in essential services but in law and order. There could even be pressure from the government with threats to apply increased regulation of insurance to contain increases in premium."

The insurance industry is currently considering a two pronged approach for the future:

- Increasing use of litigation against LPAs if flood damages are thought to be the result of poor maintenance, neglect or negligence in the operation of flood defence infrastructure
- Insurers are a key stakeholder, and could offer increased expert advice and partnership with LPAs via flood liaison advice groups (FLAGS).

10.7 References and Further Resources

The following published or web-based documentation has been referred to in the following sections, and may provide useful further reference material for the Local Development Framework.

1) **The Climate of the UK and Recent Trends – UKCIP08**
http://www.ukcip.org.uk/index.php?option=com_content&task=view&id=469&Itemid=477

2) **Future Foresight Programme – Flood and Coastal Defence**
http://www.foresight.gov.uk/Previous_Projects/Flood_and_Coastal_Defence/index.html

3) **Making Space for Water – Government Programme for Flood & Coastal Flood Risk Management**
http://www.defra.gov.uk/environ/fcd/policy/strategy.htm

4) **Future Water – The Government's Water Strategy for England**, (HMSO, 2008)
http://www.defra.gov.uk/environment/water/strategy

5) **West Midlands Regional Flood Risk Appraisal** , Faber Maunsell, October 2007

6) **Association of British Insurers (undated). Flooding and Insurance**.
http://www.abi.org.uk/flooding

7) **Insurance Research and Practice,** D. Crichton, No 1, December 2007
http://www.cii.co.uk

11. DRAWINGS & TECHNICAL APPENDICES

11.1 List of A2 Evidence Maps

11.2 List of Databases and GIS Layers Prepared

Theme	Description	Version
Base Mapping		
HSFRA Herefordshire	County boundary	
HSFRA Villages	Principal named village locations	
HSFRA Wye Catchment	Wye river basin boundary	
HSFRA Study Area	Colour theme of 47 sub-catchments	
HSFRA Height_contour_5m	5m contour interval map, Herefordshire	
Fluvial Systems		
HSFRA Wye Rivers	Expanded set of minor watercourses	
HSFRA Reservoirs	Outlines of principal reservoirs	
Nat_floodzones3_v3_4	EA supplied Zone 3 flood mapping	3.4
Nat_floodzones2_v3_4	EA supplied Zone 2 flood mapping	3.4
Nat_floodzones3_v3_8	April 2008 update of flood zones	3.8
Nat_floodzones2_v3_8	April 2008 update of flood zones	3.8
Nat_defences_v2_2	EA supplied fluvial defences	2.2
Nat_areasbenefit_v1_9	EA supplied areas defended areas	1.9
HSFRA Flood Defences	SFRA updated layer of all defences	
HSFRA Flood Models	Cross-sections of all hydraulic models	072811a
Soils		
HSFRA Ross Soils	1:20 000 Soil Survey Map, south	
HSFRA Hereford Soils	1:20 000 Soil Survey Map, west	
HSFRA Malvern Soils	1:20 000 Soil Survey Map, east	
Flood Risk Assessment		
HSFRA All Catchments	47 study catchments with all attributes	
HSFRA Flood Levels	Observations of record flood levels	072811a
HSFRA Flood Runoff	Standard Percentage Runoff – x 47	
HSFRA Flood Response	Catchment Time to Peak – x 47	
HSFRA Flood Reports	800+ historical flood reports	071128a
HSFRA Adpoint Zone 3	All Address data located in Flood zone 3	
HSFRA Main Flood Spots	Summarised version of flood reports	
HSFRA Flood Hazard	Flood Hazard Index – 5 worst catchments	
HSFRA Flood Risks	Flood Risk Index – 5 worst catchments	
HSFRA Development Sites	Collation of all feasible development sites	080411
Flood Warning		
HSFRA Flood Warning Areas	EA designated flood warning zones	
HSFRA EA Gauging Stations	All EA flow and level gauging stations	080311b
HSFRA Telemetry Raingauges	Early warning telemetry sites	
Infrastructure		
HSFRA_A_Roads_FZ2	A Roads located in Flood Zone 2	080215
HSFRA_A_Roads_FZ3	A Roads located in Flood Zone 3	080215
HSFRA_B_Roads_FZ3	B Roads located in Flood Zone 3	080215
HSFRA_B_Roads_FZ2	B Roads located in Flood Zone 2	080215
HSFRA CI Command&Control	Police, Fire Brigade & Council sites	
HSFRA CI Evacuation&Assembly	Schools, Community Centres, Leisure C	
HSFRA CI Medical Facilities	Ambulance Stations, Hospitals, Surgeries	
HSFRA CI Utilities	Sub-stations, telecoms, water infra.	

Flood Management Strategy		
HSFRA Zone 3 Climate Change	JFLOW outline of Zone 3 @ flows + 20%	
HSFRA Zone 3 Climate Change	Update to above file, now including Leadon	081013
HSFRA Flood Control Strategies	Proposed drainage strategies x 47	
HSFRA Functional Floodplain	JFLOW output of Q20 floodplain, all areas	081013
Post Publication Updated Layers		
HSFRA Development Sites	Update to earlier file	080630

11.3 Flood Estimation Catchment Data

This section contains summary Tables for Catchment Descriptor data derived from the Flood Estimation Handbook.

All parameters quoted relate to the total upstream area inclusive of the cited sub-catchment, and are NOT specific to the individual named catchments.

The critical duration storm (D Storm $_C$) is derived conventionally from the FEH recommended formula:

D Storm $_C$ = Tp(t) x (1 + SAAR / 1000)

Conventionally the critical storm duration must be to the nearest odd integer, to provide a symmetrical storm distribution.

The critical storm duration is that which will produce the largest peak flow for a specified event probability. Hence, for the Lugg and Arrow catchments above Leominster, the critical storm duration which will produce the largest peak for any specified probability is a 19 hour duration event.

The fact that the Lugg and Arrow catchments have the same critical duration greatly increases the likelihood of coincident events, and explains why there are disproportionately high significant floodplains in this area.

11.4 Catchment Flood Hazard Index

In essence, this Index attempts to objectively classify sub-catchments into a flood hazard potential class, derived from a comparative ranking of each sub-catchment with regard to a specific flood creating attribute. These attributes are subjective, and could be the subject of further refinement in the future if the method is found useful.

The principal use of the method is to provide a planning tool when considering alternative sites for development under the Sequential Test. If there is little to choose between sites on capacity, infrastructure, highways and environmental features, then the Flood Hazard Potential Index could be sued to assign the development to an area with the lowest potential flood hazard.

The primary flood hazard attributes considered are discussed listed below.

11.4.1 Catchment Area

It is intuitively obvious that larger catchments will create larger floods. However, river capacities expand in proportion to the catchment area upstream, so area per se is not necessarily indicative of increased flood risk. To be meaningful, catchment measures of flood potential should necessarily be standardised i.e. related to unit area.

Obviously a catchment with a high level of impermeability might flood anywhere within the area, not just at a downstream river location. Hence we have discounted using catchment area directly within the computation of the CFRP index. However, area IS used in the computation of a standardised assessment of the Flooding Reports database (described in 3.5.7 below).

11.4.2 Standard Annual Average Rainfall (SAAR)

Annual average rainfall varies across Herefordshire, decreasing markedly west to east. Higher SAAR values tend to be associated with higher elevations, which in turn is associated with steeper catchments. However, the majority of the surface water flooding reports in Herefordshire lie in the eastern catchments where rainfall is lowest. SAAR is insufficiently sensitive therefore as a measure of isolated flood risk, and it is heavily cross-correlated with other more useful indicators such as soil moisture deficit.

11.4.3 Soil Moisture Deficit (SMD)

As evaporation rates accelerate through the spring and soils dry out a 'soil moisture deficit' becomes established - this represents the amount of rainfall necessary to return the soil to what is called 'field capacity' (when the soil can hold no further water) - this is typical of most soils through the winter.

Soil moisture conditions are very important in agriculture - they are used directly to assess irrigation needs for a variety of crops - but they also exert an important control on river flows. High soil moisture deficits which extend across much of England in a typical summer allow the soils to absorb much of the summer rainfall reducing the risk of flooding. Equally, long-term average low soil moisture deficits indicate ‘wet’ catchments which obviously have higher propensity to flood.

The Met Office provides monthly and weekly soil moisture data for 40 km by 40 km squares in Britain, based on 120 meteorological stations, the so called MORECS system.

The long-term average SMD parameter can be readily established from FEH data, and it is a useful general indicator of increased flood risk.

11.4.4 Standard Percentage Runoff (SPR)

Catchments with low SPR values will as a general rule generate low response to rainfall. This is because they are more permeable, and a significant proportion of precipitation tends to infiltrate to deeper ground, until these zones reach field saturation point.

Conversely, high SPR values imply less permeable soils, which will tend to become saturated quickly, and increase runoff rates and possibly even lead to flash flooding.

11.4.5 Time to Peak Tp

Time to Peak (Tp) of a Unit Hydrograph is defined as the time interval between the centroid of the rainfall event and the time of the resultant flood peak. Under FEH procedures, Tp can be calculated for any sub-catchment from the following catchment descriptors:

$$Tp(0) = 4.27\ DPSBAR^{-0.35}\ PROPWET^{-0.80}\ DPLBAR^{0.54}\ (1+URBEXT)^{-5.77} \quad [1]$$

Where DPSBAR = Mean Drainage Path Slope of the catchment (m/km)
PROPWET = Proportion of time that Soil Moisture Deficit was less than 6mm (1961-1990)
DPLBAR = Mean Drainage Path Length of the catchment (km)
URBEXT = Extent of urban and suburban land cover within catchment, 1:50 000 scale

Hence the response time of the catchment will be shorter with steeper or wetter catchments, or those with higher levels of urbanisation. The latter two parameters are of course highly relevant within the context of the SFRA, because PROPWET (soil moisture) can be directly affected by future climate change, and URBEXT (urbanisation) will be directly affected by development pressure.

11.5 Flood Incident Reporting Pro-Forma

HEREFORDSHIRE COUNCIL

Flood Incident Report

Please use this standard Form to report or record a flooding incident. On completion, please post or deliver the Form to:

Head of Environmental Services
Herefordshire Council
PO Box 4, Plough Lane Offices
Hereford HR4 0XH

Respondent Name
Designation
Contact Phone
Contact Email

Where did the flooding occur?

Please be as precise and as detailed as possible

Property Address ______ Postcode ______

OS Grid Reference ______ East ______ North

Nearest Highway ______ Number ______ Location

General Locality ______

What was affected?

Residential Property ☐ Industrial Property ☐ Highway ☐

Civic or Amenity Building ☐ School or College ☐ Emergency Service ☐

Other Use ______

How many properties or premises were affected? ______ Was the area evacuated? ______

Describe the general type of flood damage ______

What was the source of the flooding?

Main river flooding ☐ Local brook or ditch ☐ Runoff from fields ☐

Runoff from highway ☐ Overloaded sewers ☐ Blocked culvert or drains ☐

Breach of defences ☐ Groundwater flooding ☐ Other ______

What time did the flooding occur?

Please be as precise and as detailed as possible

Start Date ______ End Date ______ Start Time ______

What was the time of the highest flood peak? ______ End Time ______

What was the maximum depth of flooding at the peak? ______

Did you take any photographs or record any levels at the flood location? ______

Flood Warning

Are you registered with Floodline Warnings Direct? ______ Yes/No More Information? ______

How quickly did the flood rise? ______ Did you receive a Flood Warning? ______

Data Protection Act (1998). Information provided on this Form will not be disclosed to third parties (outside Herefordshire Council). Information will be used solely to improve Herefordshire Council's knowledege of and operational response to flood emergencies. This Form is to assist Herefordshire Council to investigate the incident, and cannot be construed as an admission of liability for any injury or property damage incurred. 0801b

11.6 Potential Development Sites within Flood Zone 3

Table 11-1 – Potential Development Sites Falling Significantly Within Flood Zone 3

Policy	Site_Ref_No	Main_Settlement	Site_Name	Area_ha	FZ3aF	FZ3aP	FZ2F	FZ2P	Flood Level	FFR_Index	CFH_Index	FTE_Index
H2	R/372	Ross-on-Wye	Former Alton Court Brewery	0.300	3aF					8	14	6
H2	H/553	Hereford	Friar Street	1.573		3aP		2P		1	44	47
H2	LEO/436/LP	Leominster	East of Ridgemoor Road	2.577		3aP		2P		13	47	37
H5	42/45	Canon Pyon	Bus and Coach Depot	0.572		3aP		2P		16	23	19
	HLAA/012/001	Wellington	Bridge Lane	0.457		3aP		2P		16	23	19
	HLAA/017/001	Kington	Land at Portway	1.919	3aF					7	28	35
	HLAA/027/003	Leominster	Field 8892, adjacent River Lugg	6.282	3aF					13	47	37
	HLAA/027/001	Leominster	Field 9752, Mill Street	0.285		3aP		2P		13	47	37
	HLAA/027/004	Leominster	Field 0662, adajacent A44	1.464		3aP	2F			15	43	26
	HLAA/027/002 12	Leominster	Broad Farm	2.038	3aF					15	43	26
	HLAA/055/001	Hampton Bishop	Church Lane	0.539	3aF					1	44	47
	HLAA/068/002	Canon Pyon	adjacent Crown House	2.035		3aP		2P		16	23	19
	HLAA/073/001	Eardisland	The Elms	0.159	3aF					7	28	35
	HLAA/096/001	Hereford	Land between Yazor Road & Derwent Drive	0.531		3aP		2P		2	11	24
	HLAA/112/001	Hereford	The Straight Mile	0.663	3aF					1	44	47
	HLAA/123/001	Leominster	Corner Meadow, North Road	2.606	3aF					13	47	37
	HLAA/126/001	Coughton	between Norland Place & Fowbridge Gar	1.934		3aP		2P		18	36	8
	HLAA/142/001	Bodenham	North of Bodenham	10.852		3aP		2P		4	30	46
	HLAA/169/001	Eardisley	South of Cannon Ford Avenue	11.273		3aP	2F			24	42	44
	HLAA/149/005	Bodenham	West of Siward James Close	16.602		3aP		2P		4	30	46
	HLAA/215/002	Hereford	North of The White House, Lower Bullinghar	0.127		3aP		2P		1	44	47
	HLAA/215/003	Hereford	Adj to Poplar Cottage, Lwr Bullingham	0.053	3aF					1	44	47
	HLAA/215/004	Hereford	South of the White House, Lower Bullinghan	0.090		3aP		2P		1	44	47
	HLAA/215/005	Hereford	Land adj Rotherwas Chapel	2.306	3aF					1	44	47
	HLAA/215/006	Hereford	Manor Farm	0.354	3aF					1	44	47
	HLAA/215/007	Hereford	Watery Lane Farm	0.413	3aF					1	44	47
	HLAA/215/008	Hereford	d between Holme Lacy Road and Watery L	0.513	3aF					1	44	47
	HLAA/219/001	Hereford	Behind St Martin's Street	0.177	3aF					1	44	47
	HLAA/225/003	Pontrilas	Behind Doyre Terrace	0.204				2P		9	45	43
	HLAA/215/001	Hereford	Adj to railway line and Holme Lacy Rd	3.484		3aP		2P		1	44	47
	HLAA/260/001	Ross-On_Wye	11-15 Kyle Street	0.159				2P		8	14	6
	HLAA/261/001	Kington	Land Adjoining Kington by-pass	0.703	3aF					12	2	10
	HLAA/197/003	Hereford	Site to the East of Hereford City Centre	43.454		3aP		2P		1	44	47
	HLAA/001/002	Shobdon	Land at the rear of Roseville Terrace	1.959		3aP		2P		3	38	32
	HLAA/264/001	Leominster	Portley Turkey Farm	0.527	3aF					13	47	37

	HLAA/274/001	Fownhope	Falcon Booster Pumps, How Chapel	0.123		3aP		2P		33	27	14
	HLAA/225/006	Kentchurch	Land adjacent to Old Post Office	0.174		3aP		2P		9	45	43
	HLAA/225/007	Kentchurch	Land adjacent to Whitegates	0.179		3aP		2P		9	45	43
	HLAA/123/002	Leominster	North Road	9.158	3aF					13	47	37
	HLAA/319/001	Lea	Lana adjoining Millbrook Gardens	1.406		3aP		2P		8	14	6
	HLAA/321/001	Bromyard	3 Mills House, Station Road	1.004		3aP		2P		40	40	22
	O/Bod/001			0.557		3aP		2P		4	30	46
	O/Bod/003			5.482		3aP		2P		4	30	46
	O/Mol/006			6.997		3aP		2P		4	30	46
	O/HuDin/001			0.274	3aF					4	30	46
	O/Well/004			0.349		3aP		2P		16	23	19
	O/Well/008			1.810		3aP		2P		16	23	19
	O/Well/010			4.092		3aP		2P		16	23	19
	O/Mord/001			2.511		3aP	2F			4	30	46
	O/Mord/004			0.384		3aP	2F			4	30	46
	O/Ross/004			7.841		3aP	2F			8	14	6
	O/Ross/010			9.588	3aF					1	44	47
	O/Ross/011			9.253	3aF					1	44	47
	O/Ross/015			0.278	3aF					8	14	6
	4ZPP			2.328	3aF					8	14	6
	O/Cou/005			2.646		3aP		2P		18	36	8
	O/Cou/006			0.882		3aP	2F			18	36	8
	O/Yar/001			3.521		3aP		2P		15	43	26
	O/Leo/001			2.292	3aF					13	47	37
	O/Leo/002			2.204	3aF					13	47	37
	O/Leo/003			0.052	3aF					3	38	32
	O/Leo/004			0.097	3aF					3	38	32
	O/Leo/005			0.241	3aF					3	38	32
	O/Leo/006			0.081		3aP	2F			3	38	32
	O/Leo/008			0.063	3aF					13	47	37
	O/Leo/018			0.407		3aP		2P		4	30	46
	O/Leo/044			0.025	3aF					4	30	46
	O/Leo/045			0.127	3aF					4	30	46
	O/Fown/002			1.309		3aP		2P		1	44	47
	O/Cred/001			3.617		3aP		2P		2	11	24
	O/Eardd/001			2.239	3aF					7	28	35

	O/Ling/005			2.287		3aP		2P		13	47	37
	O/K/007			0.474		3aP		2P		12	2	10
	O/K/020			0.129	3aF					20	5	2
	O/K/026			0.629		3aP		2P		12	2	10
	O/K/031			4.785		3aP		2P		12	2	10
	O/Her/035			2.587		3aP		2P		2	11	24
	O/Her/036			0.647		3aP		2P		2	11	24
	O/Her/037			0.180	3aF					1	44	47
	O/Her/038			1.763		3aP		2P		1	44	47
	O/Her/026			14.000	3aF					1	44	47
	O/Her/030			3.765		3aP		2P		4	30	46
	O/Her/029			8.067		3aP		2P		4	30	46
	O/Her/027			10.950		3aP		2P		1	44	47
	O/Her/025			40.380	3aF					1	44	47
	Bish/5	Bishops Frome	Frome Valley Haulage Depot	1.140		3aP		2P		14	6	41
	Bod/14	Bodenham	Buildings at Gravel Farm	0.500		3aP		2P		4	30	46
	CP/1	Canon Pyon	Coach depot adj. Village Hall	0.560		3aP		2P		16	23	19
	CP/3	Canon Pyon	Nags Head car park	0.130						16	23	19
	CP/4	Canon Pyon	Adj. Carlton	0.060						16	23	19
	CP/6	Canon Pyon	Adj. Newend House	0.080						16	23	19
	Cred/3	Credenhill	South of Brookfield	0.120		3aP		2P		2	11	24
	Eardd/10	Eardisland	Individual infill plot	0.080	3aF					7	28	35
	Eardd/11	Eardisland	Individual infill plot	0.070	3aF					7	28	35
	Eardd/2	Eardisland	Adj. Bridge House	0.060	3aF					7	28	35
	Eardd/3	Eardisland	Chapel	0.010		3aP	2F			7	28	35
	Eardd/4	Eardisland	Farm in south of village	0.150		3aP	2F			7	28	35
	Eardd/6	Eardisland	Individual infill plot	0.050		3aP		2P		7	28	35
	Eardd/7	Eardisland	Individual infill plot	0.080	3aF					7	28	35
	Eardd/8	Eardisland	Individual infill plot	0.040	3aF					7	28	35
	Eardd/9	Eardisland	Individual infill plot	0.570		3aP	2F			7	28	35
	Eardy/7	Eardisley	Barn rear of East View	0.030	3aF					24	42	44
	Ew/3	Ewyas Harold	Old Matt House	0.080		3aP	2F			9	45	43
	Ew/5	Ewyas Harold	Birches	0.380		3aP	2F			9	45	43
	H/A1/1	Hereford South	Rear of Greyhound	3.770	3aF					1	44	47
	H/A1/2	Hereford South	Car park/ garage adj. Hunderton Road	0.110	3aF					1	44	47
	H/A1/4	Hereford South	Villa Street	0.920		3aP		2P		1	44	47

	H/A2/3	Hereford South	Barr Court	0.370		3aP		2P		1	44	47
	H/B1/2	Hereford South	St Martins Street	0.190	3aF					1	44	47
	H/B4/1	Hereford South	Holme Lacy Industrial Estate	0.540	3aF					1	44	47
	H/B4/2	Hereford South	Wokshop, Bullingham Lane	0.010	3aF					1	44	47
	H/B4/3	Hereford South	Watery Lane Farm	0.430	3aF					1	44	47
	H/B4/4	Hereford South	m, Lower Bullingham Lane, Holme Lacy R	0.520	3aF					1	44	47
	H/B4/5	Hereford South	Rear of The Willows	0.080	3aF					1	44	47
	H/B4/6	Hereford South	Tool hire building	0.250	3aF					1	44	47
	H/C/10	Hereford Central	BT Relay Station	0.220		3aP		2P		1	44	47
	H/C/11	Hereford Central	Former restaurant	0.250	3aF					1	44	47
	H/C/12	Hereford Central	Adj. New Bridge	0.150	3aF					1	44	47
	H/C/13	Hereford Central	Rear of Bridge Street	0.290		3aP		2P		1	44	47
	H/C/14	Hereford Central	Warehouse, Gwynne Street	0.010	3aF					1	44	47
	H/C/16	Hereford Central	Green Dragon car park	0.170		3aP		2P		1	44	47
	H/C/18	Hereford Central	Portland Street	0.240		3aP		2P		2	11	24
	H/C/19	Hereford Central	Widemarsh Street Yard	0.170		3aP	2F			2	11	24
	H/C/20	Hereford Central	Widemarsh Street north	0.250		3aP		2P		1	44	47
	H/C/22	Hereford Central	Police playing field, Widemarsh Street	1.830	3aF					1	44	47
	H/C/3	Hereford Central	Health Authority Offices	0.340	3aF					2	11	24
	H/C/30	Hereford Central	East of Canal Road	0.070	3aF					1	44	47
	H/C/31	Hereford Central	West of Canal Road	0.600		3aP		2P		1	44	47
	H/C/5	Hereford Central	Barton Yard Council Depot	1.840		3aP		2P		1	44	47
	H/C/6	Hereford Central	Land at Sainbury's	0.410		3aP		2P		1	44	47
	H/C/7	Hereford Central	Antelope PH	0.270		3aP		2P		1	44	47
	H/C/8	Hereford Central	Plenders Mill	0.850		3aP		2P		1	44	47
	H/C/9	Hereford Central	Midland Red Bus Depot	0.530		3aP		2P		1	44	47
	H/D/1	Hereford West	Western end of Moor Street	0.060		3aP		2P		2	11	24
	H/D/13	Hereford West	Large garden fronting Moor Farm Lane	0.050		3aP		2P		2	11	24
	H/D/4	Hereford West	Commercial buildings, Millbrook Street	0.150	3aF					2	11	24
	H/D/5	Hereford West	Commercial buildings, Millbrook Street	0.220	3aF					2	11	24
	H/D/6	Hereford West	Rear gardens & parking area, Millbrook St	0.140		3aP		2P		2	11	24
	H/D/7	Hereford West	Underused gardens, adj. parking area	0.080	3aF					2	11	24
	H/D/8	Hereford West	Business use, Mostyn Street	0.050	3aF					2	11	24
	H/E1/10	Hereford East	Hampton Park Road	0.050		3aP		2P		1	44	47
	H/E4/1	Hereford East	Ledbury Road Nursery	0.510		3aP		2P		1	44	47
	K/13	Kington	Tan House Meadows	0.980	3aF					12	2	10

	Leo/12	Leominster	East of Ridgemoor Road	2.960		3aP		2P		13	47	37
	Leo/13	Leominster	Dales former offices	1.160	3aF					13	47	37
	Leo/23	Leominster	Caradoc Drive	0.060	3aF					4	30	46
	Mor/5	Moreton-on-Lugg	East of The Willows & Lower House	0.350		3aP		2P		4	30	46
	Well/1	Wellington	Brook House	0.030	3aF					16	23	19
	Well/5	Wellington	Adj. The Cottage	0.010	3aF					16	23	19
	Well/7	Wellington	Adj. Chapel	0.730		3aP	2F			16	23	19
	Well/8	Wellington	Adj. Bridge Farm	0.320		3aP		2P		16	23	19
H5	P842	Canon Pyon	Land opposite Canon Court	1.060		3aP		2P		16	23	19
H5	P842	Canon Pyon	Land south of Brookside	1.060		3aP		2P		16	23	19
H5	P1177	Bodenham The Moor	Land west of Englands Gate	0.950		3aP		2P		4	30	46
H5	P383	Eardisland	Shop Cottage	0.120	3aF					7	28	35
M1	P372	Eardisland / Monklanc	Arrow Green, nr Eardisland	27.890		3aP		2P		7	28	35
HBA6	P535	Kington	Conservation area - east			3aP		2P		12	2	10
HBA6	P535	Kington	Conservation area - north east			3aP		2P		20	5	2
HBA6	P535	Kington	Conservation area - north west			3aP		2P		20	5	2
RST4	P535	Kington	Land adjacent A44	7.270		3aP		2P		12	2	10
RST5	P1011	Wellington	Land adjacent to the Chapel	0.350	3aF					16	23	19
TCR9	P433	Leominster	Land at F.H. Dales Ltd	1.160	3aF					13	47	37
H2	P692	Hereford	land off Sherrington Drive	1.410		3aP		2P		2	11	24
H5	P844	Wellington	Wellington Chapel	0.990		3aP		2P		16	23	19
M5	P1081	Lower Bullingham	Land at Lower Bullingham	82.230		3aP		2P		1	44	47
RST5	P135	Hereford	Unity Garden, Hereford	1.100		3aP		2P		1	44	47
RST5	P136	Hereford	Unity Garden, Hereford	1.100		3aP		2P		1	44	47
M1	P1036	Wellington	Moreton on Lugg Depot Central	16.100	3aF					16	23	19
M1	P1036	Wellington	Moreton on Lugg Depot North	8.050	3aF					4	30	46
LA2	P944	Newton	Cadburys Marlbrook	8.550	3aF					4	30	46
HBA9	W189	Kington	d between Tanyard Lane and the River Arr	0.670	3aF					12	2	10
RST5	P75	Hereford	Unity Garden, Hereford	1.100		3aP		2P		1	44	47
RST5	P76	Hereford	Unity Garden, Hereford	1.100		3aP		2P		1	44	47
RST5	P77	Hereford	Unity Garden, Hereford	1.100		3aP		2P		1	44	47
RST5	P78	Hereford	Unity Garden, Hereford	1.100		3aP		2P		1	44	47
RST5	P79	Hereford	Unity Garden, Hereford	1.100		3aP		2P		1	44	47
RST5	P80	Hereford	Unity Garden, Hereford	1.100		3aP		2P		1	44	47
RST5	P81	Hereford	Unity Garden, Hereford	1.100		3aP		2P		1	44	47
RST5	P82	Hereford	Unity Garden, Hereford	1.100		3aP		2P		1	44	47

RST5	P83	Hereford	Unity Garden, Hereford	1.100		3aP		2P		1	44	47
RST5	P84	Hereford	Unity Garden, Hereford	1.100		3aP		2P		1	44	47
RST5	P85	Hereford	Unity Garden, Hereford	1.100		3aP		2P		1	44	47
RST5	P86	Hereford	Unity Garden, Hereford	1.100		3aP		2P		1	44	47
RST5	P87	Hereford	Unity Garden, Hereford	1.100		3aP		2P		1	44	47
RST5	P88	Hereford	Unity Garden, Hereford	1.100		3aP		2P		1	44	47
RST5	P89	Hereford	Unity Garden, Hereford	1.100		3aP		2P		1	44	47
RST5	P90	Hereford	Unity Garden, Hereford	1.100		3aP		2P		1	44	47
RST5	P91	Hereford	Unity Garden, Hereford	1.100		3aP		2P		1	44	47
RST5	P92	Hereford	Unity Garden, Hereford	1.100		3aP		2P		1	44	47
RST5	P93	Hereford	Unity Garden, Hereford	1.100		3aP		2P		1	44	47
RST5	P94	Hereford	Unity Garden, Hereford	1.100		3aP		2P		1	44	47
RST5	P95	Hereford	Unity Garden, Hereford	1.100		3aP		2P		1	44	47
RST5	P96	Hereford	Unity Garden, Hereford	1.100		3aP		2P		1	44	47
RST5	P137	Hereford	Unity Garden, Hereford	1.100		3aP		2P		1	44	47
RST5	P138	Hereford	Unity Garden, Hereford	1.100		3aP		2P		1	44	47
RST5	P139	Hereford	Unity Garden, Hereford	1.100		3aP		2P		1	44	47
RST5	P140	Hereford	Unity Garden, Hereford	1.100		3aP		2P		1	44	47
RST5	P141	Hereford	Unity Garden, Hereford	1.100		3aP		2P		1	44	47
RST5	P142	Hereford	Unity Garden, Hereford	1.100		3aP		2P		1	44	47
RST5	P143	Hereford	Unity Garden, Hereford	1.100		3aP		2P		1	44	47
RST5	P145	Hereford	Unity Garden, Hereford	1.100		3aP		2P		1	44	47
RST5	P156	Hereford	Unity Garden, Hereford	1.100		3aP		2P		1	44	47
RST5	P157	Hereford	Unity Garden, Hereford	1.100		3aP		2P		1	44	47
RST5	P159	Hereford	Unity Garden, Hereford	1.100		3aP		2P		1	44	47
RST5	P213	Hereford	Unity Garden, Hereford	1.100		3aP		2P		1	44	47
RST5	P161	Hereford	Unity Garden, Hereford	1.100		3aP		2P		1	44	47
RST5	P162	Hereford	Unity Garden, Hereford	1.100		3aP		2P		1	44	47
RST5	P163	Hereford	Unity Garden, Hereford	1.100		3aP		2P		1	44	47
RST5	P164	Hereford	Unity Garden, Hereford	1.100		3aP		2P		1	44	47
RST5	P218	Hereford	Unity Garden, Hereford	1.100		3aP		2P		1	44	47
RST5	P219	Hereford	Unity Garden, Hereford	1.100		3aP		2P		1	44	47
RST5	P229	Hereford	Unity Garden, Hereford	1.100		3aP		2P		1	44	47
RST5	P230	Hereford	Unity Garden, Hereford	1.100		3aP		2P		1	44	47
RST5	P231	Hereford	Unity Garden, Hereford	1.100		3aP		2P		1	44	47
RST5	P232	Hereford	Unity Garden, Hereford	1.100		3aP		2P		1	44	47

RST5	P233	Hereford	Unity Garden, Hereford	1.100		3aP		2P		1	44	47
RST5	P238	Hereford	Unity Garden, Hereford	1.100		3aP		2P		1	44	47
RST5	P240	Hereford	Unity Garden, Hereford	1.100		3aP		2P		1	44	47
RST5	P241	Hereford	Unity Garden, Hereford	1.100		3aP		2P		1	44	47
RST5	P267	Hereford	Unity Garden, Hereford	1.100		3aP		2P		1	44	47
RST5	P272	Hereford	Unity Garden, Hereford	1.100		3aP		2P		1	44	47
RST5	P273	Hereford	Unity Garden, Hereford	1.100		3aP		2P		1	44	47
RST5	P275	Hereford	Unity Garden, Hereford	1.100		3aP		2P		1	44	47
RST5	P276	Hereford	Unity Garden, Hereford	1.100		3aP		2P		1	44	47
RST5	P277	Hereford	Unity Garden, Hereford	1.100		3aP		2P		1	44	47
RST5	P281	Hereford	Unity Garden, Hereford	1.100		3aP		2P		1	44	47
RST5	P280	Hereford	Unity Garden, Hereford	1.100		3aP		2P		1	44	47
RST5	P282	Hereford	Unity Garden, Hereford	1.100		3aP		2P		1	44	47
RST5	P283	Hereford	Unity Garden, Hereford	1.100		3aP		2P		1	44	47
RST5	P285	Hereford	Unity Garden, Hereford	1.100		3aP		2P		1	44	47
RST5	P286	Hereford	Unity Garden, Hereford	1.100		3aP		2P		1	44	47
RST5	P288	Hereford	Unity Garden, Hereford	1.100		3aP		2P		1	44	47
RST5	P291	Hereford	Unity Garden, Hereford	1.100		3aP		2P		1	44	47
RST5	P592	Hereford	Unity Garden, Hereford	1.100		3aP		2P		1	44	47
RST5	P591	Hereford	Unity Garden, Hereford	1.100		3aP		2P		1	44	47
RST5	P497	Hereford	Unity Garden, Hereford	1.100		3aP		2P		1	44	47
RST5	P496	Hereford	Unity Garden, Hereford	1.100		3aP		2P		1	44	47
RST5	P469	Hereford	Unity Garden, Hereford	1.100		3aP		2P		1	44	47
RST5	P467	Hereford	Unity Garden, Hereford	1.100		3aP		2P		1	44	47
RST5	P464	Hereford	Unity Garden, Hereford	1.100		3aP		2P		1	44	47
RST5	P463	Hereford	Unity Garden, Hereford	1.100		3aP		2P		1	44	47
RST5	P447	Hereford	Unity Garden, Hereford	1.100		3aP		2P		1	44	47
RST5	P446	Hereford	Unity Garden, Hereford	1.100		3aP		2P		1	44	47
RST5	P445	Hereford	Unity Garden, Hereford	1.100		3aP		2P		1	44	47
RST5	P678	Hereford	Unity Garden, Hereford	1.100		3aP		2P		1	44	47
RST5	P680	Hereford	Unity Garden, Hereford	1.100		3aP		2P		1	44	47
RST5	P683	Hereford	Unity Garden, Hereford	1.100		3aP		2P		1	44	47
RST5	P697	Hereford	Unity Garden, Hereford	1.100		3aP		2P		1	44	47
RST5	P698	Hereford	Unity Garden, Hereford	1.100		3aP		2P		1	44	47
RST5	P699	Hereford	Unity Garden, Hereford	1.100		3aP		2P		1	44	47
RST5	P700	Hereford	Unity Garden, Hereford	1.100		3aP		2P		1	44	47

RST5	P701	Hereford	Unity Garden, Hereford	1.100		3aP		2P		1	44	47
RST5	P702	Hereford	Unity Garden, Hereford	1.100		3aP		2P		1	44	47
RST5	P703	Hereford	Unity Garden, Hereford	1.100		3aP		2P		1	44	47
RST5	P878	Hereford	Unity Garden, Hereford	1.100		3aP		2P		1	44	47
RST5	P1021	Hereford	Unity Garden, Hereford	1.100		3aP		2P		1	44	47
RST5	P1033	Hereford	Unity Garden, Hereford	1.100		3aP		2P		1	44	47
RST5	P1077	Hereford	Unity Garden, Hereford	1.100		3aP		2P		1	44	47
RST5	P1145	Hereford	Unity Garden, Hereford	1.100		3aP		2P		1	44	47
RST5	P1146	Hereford	Unity Garden, Hereford	1.100		3aP		2P		1	44	47
RST5	P1147	Hereford	Unity Garden, Hereford	1.100		3aP		2P		1	44	47
RST5	P1148	Hereford	Unity Garden, Hereford	1.100		3aP		2P		1	44	47
RST5	P208	Hereford	Unity Garden, Hereford	1.100		3aP		2P		1	44	47
RST5	P209	Hereford	Unity Garden, Hereford	1.100		3aP		2P		1	44	47
RST5	P210	Hereford	Unity Garden, Hereford	1.100		3aP		2P		1	44	47
RST5	P664	Hereford	Unity Garden, Hereford	1.100		3aP		2P		1	44	47
RST5	P663	Hereford	Unity Garden, Hereford	1.100		3aP		2P		1	44	47
RST5	P665	Hereford	Unity Garden, Hereford	1.100		3aP		2P		1	44	47
RST5	P666	Hereford	Unity Garden, Hereford	1.100		3aP		2P		1	44	47
RST5	P667	Hereford	Unity Garden, Hereford	1.100		3aP		2P		1	44	47
RST5	P672	Hereford	Unity Garden, Hereford	1.100		3aP		2P		1	44	47
RST5	P674	Hereford	Unity Garden, Hereford	1.100		3aP		2P		1	44	47
RST5	P676	Hereford	Unity Garden, Hereford	1.100		3aP		2P		1	44	47
RST5	P661	Hereford	Unity Garden, Hereford	1.100		3aP		2P		1	44	47
RST5	P662	Hereford	Unity Garden, Hereford	1.100		3aP		2P		1	44	47
RST5	P641	Hereford	Unity Garden, Hereford	1.100		3aP		2P		1	44	47
RST5	P644	Hereford	Unity Garden, Hereford	1.100		3aP		2P		1	44	47
RST5	P651	Hereford	Unity Garden, Hereford	1.100		3aP		2P		1	44	47
RST5	P657	Hereford	Unity Garden, Hereford	1.100		3aP		2P		1	44	47
RST5	P660	Hereford	Unity Garden, Hereford	1.100		3aP		2P		1	44	47
RST5	P293	Hereford	Unity Garden, Hereford	1.100		3aP		2P		1	44	47
RST5	P294	Hereford	Unity Garden, Hereford	1.100		3aP		2P		1	44	47
RST5	P295	Hereford	Unity Garden, Hereford	1.100		3aP		2P		1	44	47
RST5	P296	Hereford	Unity Garden, Hereford	1.100		3aP		2P		1	44	47
RST5	P432	Hereford	Unity Garden, Hereford	1.100		3aP		2P		1	44	47
RST5	P637	Hereford	Unity Garden, Hereford	1.100		3aP		2P		1	44	47
NC4	P971	Monkland	Monkland		3aF					7	28	35

RST5	P211	Hereford	Unity Garden, Hereford	1.100		3aP		2P		1	44	47
LA2	P773	Hereford	Land off Broomy Hill	0.080		3aP	2F			1	44	47
RST5	P368	Hereford	Yazor Road	0.530		3aP		2P		2	11	24
RST5	P1093	Hereford	Unity Garden, Hereford	1.100		3aP		2P		1	44	47
RST5	P647	Hereford	Unity Garden, Hereford	1.100		3aP		2P		1	44	47
RST5	P214	Hereford	Unity Garden, Hereford	1.100		3aP		2P		1	44	47
RST5	P68	Hereford	Unity Garden, Hereford	1.100		3aP		2P		1	44	47
RST5	P144	Hereford	Unity Garden, Hereford	1.100		3aP		2P		1	44	47
RST5	P204	Hereford	Unity Garden, Hereford	1.100		3aP		2P		1	44	47
RST5	P206	Hereford	Unity Garden, Hereford	1.100		3aP		2P		1	44	47
RST5	P212	Hereford	Unity Garden, Hereford	1.100		3aP		2P		1	44	47
RST5	P704	Hereford	Unity Garden, Hereford	1.100		3aP		2P		1	44	47
RST5	P705	Hereford	Unity Garden, Hereford	1.100		3aP		2P		1	44	47
RST5	P706	Hereford	Unity Garden, Hereford	1.100		3aP		2P		1	44	47
RST5	P707	Hereford	Unity Garden, Hereford	1.100		3aP		2P		1	44	47
RST5	P708	Hereford	Unity Garden, Hereford	1.100		3aP		2P		1	44	47
RST5	P709	Hereford	Unity Garden, Hereford	1.100		3aP		2P		1	44	47
RST5	P711	Hereford	Unity Garden, Hereford	1.100		3aP		2P		1	44	47
H4	P198	Whitchurch	Land adjacent Delburne Farm			3aP		2P		1	44	47
TCR1	P331	Ross on Wye	Land at Brookend Street / Kyrle Street	1.310		3aP		2P		8	14	6
H5	P1102	Hereford	Field Farm	0.310	3aF					1	44	47
NC4	P1102	Hereford	adjacent Sherrington Drive	1.410	3aF					2	11	24
H2	P1102	Hereford	Plough Lane	0.980	3aF					2	11	24
H4	P1092	Fownhope	Settlement Boundary			3aP		2P		1	44	47
H4	P807	Fownhope	South East of Ferry Lane			3aP		2P		1	44	47
HBA9	P785	Fownhope	Venture Play Area	0.140		3aP		2P		1	44	47
H1	P187	Holmer	Holmer House Farm			3aP		2P		2	11	24
H5	P936	Hampton Bishop	Rear of Church Farm	0.180	3aF					1	44	47
H5	P1024	Hampton Bishop	Garden of Crabtree Hall	0.120	3aF					1	44	47
H4	P987	Kingstone	Settlement Boundary			3aP		2P		20	15	23
H2	P1137	Hereford	Greyfriars Restaurant	0.440	3aF					1	44	47
T10	P171	wardine / Hampton E	Area south of Ledbury Road		3aF					4	30	46
T10	P171	wardine / Hampton E	Area north of Ledbury Road		3aF					4	30	46
H5	P1195	Moreton on Lugg	east of village	0.210		3aP	2F			4	30	46
H2	P810	Kington	Land south of River Arrow	1.060		3aP		2P		12	2	10
TCR1	P758	Hereford	Hereford United Football Ground	1.660		3aP	2F			2	11	24

E1	H/571e	Hereford	Land north of Netherwood Road Site A	0.260	3aF					1	44	47
E1	H/568e	Hereford	Land west of Fir Tree Lane	0.600	3aF					1	44	47
E1	H/569e	Hereford	Land north of Holme Lacy Road	4.130	3aF					1	44	47
E1	H/572e	Hereford	Land north of Netherwood Road Site b	0.400	3aF					1	44	47
E1	H/573e	Hereford	Land south of Netherwood Road Site C	0.300	3aF					1	44	47
E1	H/574e	Hereford	Land at Ramsden Road	0.700	3aF					1	44	47
E1	H/576e	Hereford	Land east of Coldnose Rd	1.810		3aP		2P		1	44	47
E1	H/577e	Hereford	Twyford Road South	0.690		3aP		2P		1	44	47
E1	H/407e	Hereford	Twyford Road North	3.420		3aP		2P		1	44	47
E1	H/567e/LP	Hereford	Land off Campwood Road	1.000	3aF					1	44	47