

BLOE WAVE TEWKESBURY JULY 2008





SEVERN & AVON VALLEY COMBINED FLOOD GROUP BUILDING ON THE FLOODPLAIN IS MISGUIDED (A DEFINITIVE PROOF OF EVIDENCE) REVISED EDITION SEPTEMBER 2008





AUTHORS: D.A. WITTS – VERNON SMITH

Preface:

It is almost a year on since we published our report "Building on the Floodplain is Misguided (A Proof of Evidence)", in our view central government has not made any adequate preparation for the next big deluge.

The Severn and Avon Valley Combined Flood Group are pleased that our report has opened and has developed the debate on issues relating to the unique flooding problem of this area. We are somewhat concerned that there appear to be some individuals who remain intransigent in their attitudes.

Our original report was based on the evidence we had to hand at the time. Since then much more new evidence and ideas have come to the fore. Professionals such as Professor Ian Cluckie of Bristol University and Simon Fox MSc BSc MBCS MIBC, a respected geologist, have supported our conclusions made in the original report.

Much of the evidence from original report remains the same. However, we have added further evidence and some modification of our judgements.

The debate has been opened up and this will continue until such times building on and near the floodplain is suspended. We believe it is essential that a major inquiry is held to consider the problems caused by the poor planning policy of the past and ensure this doesn't carry on in the future.

Quote: 1

Whilst acknowledging and sympathising strongly with the devastation suffered by Tewkesbury and other areas in the summer, it would not be sensible to react by banning all development in areas at any risk. Rt. Hon Hilary Benn MP Secretary of State DEFRA

Quote: 2

"The flooding problems experienced in Tewkesbury, largely stem from historic planning decisions and built developments that were constructed before modern regulation".

Stuart Gamble Planning and Corporate Services Manager, Environment Agency May 2008

Mayoral Endorsements:

This report is the result of a great deal of research and hard work carried out by Dave Witts and Vernon Smith.

The contents are as a result of the immense impact of the floods of July 2007 upon a huge number of residents in Tewkesbury Borough including the authors.

The motivation for the report was consequently to identify and provide evidence which reflects in the strongest possible terms the folly of permitting development on the flood plain.

It is timely in as much as the Regional Spatial Strategy is open for consultation and the contents of the document should be an essential part of providing strong arguments against a government policy whose recommendations in an area such as Tewkesbury Borough Council quite frankly beggars belief.

Undoubtedly the recommendations will trigger further arguments and debate but in commending this to your perusal the authors must be applauded for the manner in which they have set about their important task.

Councillor Brian Calway MA Mayor Tewkesbury Borough Council



An excellent report, the authors should be pleased with the results of all the hard work and many hours of fact finding. Well done to all concerned.

Councillor Barbara Cromwell Tewkesbury Town Mayor



Summary of Report:

This report is a development of our previous report of October 2007. It refers specifically to the lessons we believe must be learned as a result of July 2007 flooding events within the North Gloucestershire area. It will especially focus on the issue of the inadvisability of allowing further development on or near the floodplain.

We start by looking at the limitations of the present PPS 25 Government guidelines. This is particularly focused on the fact that PLUVIAL and historical flooding is not included in judging appropriate development sites.

The group examined the particular situation of the Tewkesbury floodplain and questioned the level of flooding that Local Authorities and the Environment Agency believe occurred last July. We believed this level to be almost two metres higher than the 12.92 m flood that the TBC and Environment Agency is using as a basis for future planning.

We look at the evidence for infill of land to make it more attractive for development and focus especially on the Wheatpieces site, which we can show has been raised more than six metres since 1991. Not only do we question the moral and ethical principles behind such a policy, but also point out the effect such a policy has on the whole community in the Water Displacement this produces.

The report challenges the TBC assertion that building has not taken place on the floodplain. We show evidence both cartographic and photographic that proves this assertion to be misplaced. Indeed, until it is recognised that mistakes have taken place in the past, it is difficult to persuade authorities, not to make similar mistakes in the future.

We show evidence that proves that insufficient maintenance has been undertaken on watercourses. We believe that the present structural arrangements, where there is no controlling authority with effective powers to enforce such maintenance, will mean the situation is likely to remain unchanged.

The group refer to what, we believe, is the imbalance of power between local authorities and the community, as opposed to that of the developers. We believe that the S106 agreement actually enhances developer power – thus acting as a system of legitimate bribery.

Finally we question the credibility and legitimacy of the Government RSS. We question whether the 3 million housing target is in any way realistic and ask on what evidential base it is made. We also question whether that the South West Regional Assembly, as an unelected quango, has either the moral or legitimate right to impose targets against the wishes of communities like Tewkesbury and those of their elected representatives.

Contents:

Preface	Page 1
Mayoral endorsements	Page 2
Summary of report	Page 3
Forward	Page 5
Introduction	Page 5
Our Aim	Page 6
Key summary conclusion	Page 6
FLOODPLAIN	Page 7
Case Study No 1: Limitations of PPS25	Page 8
Policy Documents and Statements	Page 9
Communities and Local Government	Page 12
Flood Maps	Page 13
Case study No. 2: Indicative Flood Map	Page 14
Uncertainty Levels	Page 16
Hydrologist flood map	Page 17
1924 flood map	Page 19
Floodplain runoff and bottlenecks	Page 21
Water displacement	Page 26
Case study No. 3: Wheatpieces 1	Page 27
Sustainable Urban Drainage System (SUDS)	Page 30
Case study No 4: Suds in Wheatpieces	Page 31
Climate Change	Page 34
Future Building	Page 35
Case study No. 5: Potential development land	Page 38
Water does not respect county borders	Page 39
Case study No6: River Isbourne	Page 39
Infrastructure	Page 41
Surface water drainage	Page 41
Case study No7: Walton Cardiff Lane	Page 42
Case study No.8: Oak Drive Northway	Page 43
Foul sewer systems	Page 44
Modernisation	Page 45
Report conclusions	Page 46
Recommendations	Page 48
Bibliography and sources	Page 50
Quote references	Page 51
Appendix 1: National housing policy (authors opinion)	Page 52
Appendix 2 Tewkesbury Town Council report	Page 54

FORWARD

The National Flood Forum strongly encourages local communities who are at risk of flooding to proactively get involved with how floods are managed in their own area.

Local communities are often the 'real experts' when it comes to flood history and they also understand the mechanics of how a community floods. Local communities are actively committed to lessening their risk of flooding and preventing further flooding. This can often be exacerbated by new developments; especially if they are built on the flood plain. Local communities must be listened to when it comes to understanding where is at risk of flooding as they are the ones on the ground watching a flood event as it happens. They are also passionate about preventing new developments that they know to be at risk of flooding.

I commend this study to you, many hours of hard work and research has been put into this report and I sincerely hope that the community of Tewkesbury are listened to and the evidence presented with in this report is treated with the seriousness it deserves.

Mary Dhonau Chief executive The National Flood Forum 01299 403055 www.floodforum.org.uk



Introduction:

This report focus is upon the inadequate response by Government and its agencies to the catastrophic flood events of July 2007. We believe we have shown that the much vaunted PPS25 is fatally flawed in not considering the issue of PLUVIAL flooding. Moreover, PPS25 does not significantly alter the unbalanced relationship between Planning Authorities and Developers, which we show has been, skewed very much in favour of the later.

We also refer to the institutional lack of focus in effectively resolving issues such as maintenance of the water courses, flood defences and defence of the functional floodplain. The present situation remains chaotic, without any sufficiently powerful responsible body being held accountable for these issues.

We further believe this report has a strong evidential basis which is largely unanswerable. We expect this document to inform and expand further debate on these issues.

l.H

D A Witts

Vernon Smith

© Copyright D A Witts and Vernon Smith

Our Aim:

The Severn and Avon Valley Group believe the government should declare Tewkesbury and district a Special Flood Risk Area and stop all large developments in and near the floodplain. This is because two major rivers the Severn and the Avon converge at Tewkesbury. The Severn being tidal also affects the Avon. The large volumes of water that is handled by the Tewkesbury floodplain cannot be managed by the Governments PPS25, which is a Risk Based Strategy. PPS25 is only effective where the volumes of water are minimal.

Tewkesbury is the focal point for what happens in the rest of Gloucestershire as far as flooding is concerned. Once all large development has been stopped, an extensive inquiry is needed to establish what investment is required to reduce the dangers of flooding. We know that this area remains particularly prone to flooding. However, Tewkesbury needs major investment and innovative engineering thinking to reduce the flooding risk; especially to the existing housing stock.

Key Summary Conclusion:

Without question building has been permitted on the floodplain. The question is what to do **now!**

- 1. No more building developments on the floodplain.
- 2. New developments should be assessed using updated hydrology maps.
- 3. Infrastructure improved to cope with the exacerbated water displacement.
- 4. Main water courses cleaned and maintained and major rivers dredged.
- 5. Create one, sole agency, such as an enhanced Envioronment Agency, with a mandate to enforce the maintenance required and protect people and property from flooding.
- 6. PPS 25 guidelines should be tightened and made compulsoryfor Tewkesbury taking into account its unique situation.
- 7. TBC, because of the uniqueness of Tewkesbury's situation, must resource adequate and skilled advisers/enablers with a particular understanding of flood management.
- 8. The Government should change the remit of the Environment Agency and instruct them to include PLUVIAL (rainfall), uncertainty levels and historical sources of flooding as mandatory.
- 9. Tewkesbury Borough Council's local plan should be adapted to include those issues raised by this report.

FLOODPLAIN



TBC permitted Wheatpieces and the Eastern Relief Rd to be built here. (Photo circa 1992)

The floodplain covering the three counties of Gloucestershire, Worcestershire and Herefordshire is the largest in the UK. Tewkesbury is unique in the fact that it is situated at the junction of the Rivers Severn and Avon. The Severn is tidal which affects the Avon making Tewkesbury the focal point for what happens in large parts of North Gloucestershire. This means that water volumes are so high during flooding, water management (SUDS), as advocated by PPS 25, is ineffectual. PPS25 water management criteria deals in minimums which does not allow not allow for Tewkesbury's unique situation.

PLUVIAL vs. FLUVIAL

Since the floods new words have come into our everyday language and two of these are PLUVIAL and FLUVIAL

The word **FLUVIAL** comes from the Latin *fluvius* meaning "river" and is used in geography and earth science to refer to all topics related to flowing water. Fluvial usually refers to rivers, streams etc. Thus when the amount of water being carried by a river is so great that the water breaks its banks this is called fluvial flooding. The word **PLUVIAL** comes from the Latin *pluvia*, which means "rain." Thus when the amount of rain is so great that the surrounding landscape cannot absorb the water quickly enough and the excess water creates a sort of lake; this is called **PLUVIAL** flooding.

These words will feature throughout this report and we felt it was necessary to explain their meaning at the beginning.

Case Study No. 1: Limitations of PPS25

A major development in Tewkesbury that has caused a lot of controversy, is the site known as the Bredon Road development.

Background

The first phase of this site was approved by the local planning authority before PPS 25 came into effect; Objections were raised by local residents that this site flooded. The Local Planning Authority and the Environment Agency both concluded that the site did not flood and was not in the floodplain., Local resident's evidence was completely ignored. This site is less than 100 metres from the banks of the river Avon.

The following photograph was taken on February 6th 2002 just after there was a total of 41.5 mm of rain between January 31st and February 5th 2002 41.5 mm = 1.6 inches. This was modest compared to what we had in July 2007. Yet according to Tewkesbury Borough Council the Bredon Rd site does not flood!



Quote: 3

This site is not in the floodplain nor did it flood in July 2007.

Chris Shaw Director of Strategic Operations TBC March 2008

The rainfall and flooding in July 2007 was much more substantial and the following two pictures show the Bredon road site under construction flooded



You will notice the water marks on the building are much higher, proving that the photographs were taken below the peak levels. Tewkesbury Town Council issued a report completed by Georgina Smith (2002) which confirms our observations; namely that the site flooded regularly. Witness statements are in the back of the report. Sadly all of this was completely ignored by TBC and Members were not even shown the report.

Quote: 4 Witness statements taken from residents for the 2002 report had been ignored by the authorities.

Cllr Brian Calway September 13th 2007

POLICY DOCUMENTS AND STATEMENTS

Aspects of planning policy and guidance are covered in the following documents.

PPG25

Prior to 2006 planning guidance, such as it was, was provided by the Government directive PPG25 (Planning Policy Guidance 25). PPS25 was intended to strengthen what was perceived as insufficiently robust guidelines.

PPS25

PPS 25 is the Government's flagship document for controlling building in the floodplain, the full name of the document is Planning Policy Statement 25. The Severn and an Avon Valley Combined Flood Group accepts that this document has much to be recommended. Nevertheless, this document uses words such as "guidance", "consult", "may" and "where possible" instead of "must", "will", and "it is compulsory". Thus PPS25 is essentially a code of practice and lacks the mandatory teeth that are essential insuring that the floodplain is adequately protected. This is especially so because the LPA's are self policing without the essential supervisory muscle to enforce a robust policy.

Quote: 5

Authorities are independent of Central Government and are responsible for their actions and decisions to their local electorate, their Auditor and ultimately the Courts. Ministers have no statutory duty of powers to supervise the general preparatory of individual authorities.

Trudi Collins Government Office for the South West January 2008.

Another limitation of PPS 25 is it does not include PLUVIAL flooding and only addresses the narrower issue of surface water runoff from new developments. This, combined with the fact that the Environment Agency does not include PLUVIAL flooding in their mapping is, we believe, a fundamental error. Based on their calculations the Government states that 10% of England by land area, population and housing stock is within areas of flood risk. It is easy to see why the Government insists that PLUVIAL flooding is excluded, because the 10% would drastically increase if all types of flooding were taken into account. PPS25 does mention Surface Water Runoff but this is not PLUVIAL, it is merely water displaced from a proposed existing or new development.

Quote: 6

Homes can be built in high risk areas if there is nowhere else to build them and the need for them outweighs the flood risk. David Stritch, Communities and local Government April 2008.

Planning Policy Statement 25: *Development and Flood Risk* is based on three flood risk levels.

RFRA: Regional Flood Risk Appraisal.

This identifies land at risk and the degree of risk of flooding from river, sea and other sources in their areas.

RFRA

The Regional Flood Risk Appraisal (RFRA) was done by the South West Regional Assembly (SWRA) and completed in February 2007. PPS 25 states that the RFRA should be done in conjunction with the Strategic Flood risk Assessment (SFRA). The SFRA has not yet been completed.

The existing RFRA refers to Tewkesbury and its floodplain with a one line statement, but our belief is that Tewkesbury is the focal point for what happens in large parts of Gloucestershire as far as flooding is concerned. The flood group contacted the SWRA with this view and asked them to consider revising the RFRA and bring it up to date to include the effects of the July 2007 floods, the evidence of our report and the SFRA when it is available especially as the Regional Spatial Strategy is based on this document.

The SWRA's response was "Tewkesbury has not been assessed in detail in the RFRA as it is not considered a regionally strategic location and has not been designated as a Strategically Significant City and Town (SSCT) in the draft Regional Spatial Strategy".

This is a damning statement to the residents of North Gloucestershire and has allowed the Regional Spatial Strategy Panel to earmark thousands of new houses for this area with little regard to flooding issues and the safety of existing homes and businesses.

SFRA: Strategic Flood Risk Assessment.

A SFRA should be carried out by the local planning authority having regard to catchment-wide flooding issues which affect the area.

PPS 25 was issued in December 2006 and the SFRA level 1 has only just been initiated, the effect of this delay has caused problems up and down the system. The FRA's produced by developers for specific site applications are invalid because they do not consider the effects of flooding in other areas on a strategic basis.

We believe the local planning authorities do not give due consideration to the possible upstream and downstream impacts of new developments. However, if PPS 25, with some modification, was rigorously applied it would have an effect on future development. This would mean the RFRA would have to be modified once the SFRA is finalized.

Quote: 9

The Government policy is a <u>risk based strategy</u> who takes the risk? We do. Dave Witts Severn and Avon Valley Combined Flood Group March 2008

The Risk Based Approach is a methodology by which the floodplain is assessed and judgements about frequency of flooding. We believe this methodology to be fundamentally flawed for the following reasons:

In Tewkesbury, we think that the Risk Based Approach is gambling with people's lives and property especially as the Borough Council has admitted that it has not carried out a **Strategic Flood Risk Assessment level 1 or 2** in accordance with

their Local Plan; however, the level one draft assessment has been issued, but is not open for public debate as yet. Therefore it remains to be seen whether PLUVIAL flooding and historic data will be incorporated into the assessment.

In the Government Inspector's report, "Public Local Inquiry into Objections of the Tewkesbury Borough Local Plan to 2011", the inspector states as follows:

"It would be inappropriate to preclude development from the floodplain altogether. PPG25 states that flooding is a material consideration in determining planning applications and preparing development plans. The **risk based approach** advocated in PPG25 and incorporated in the new policy would allow the Council to attach appropriate weight to the issue of flooding, depending on the location and the level of risk attached to the site of the proposal. In this way each application could be determined on its own merits".

She goes on to say.

"The recommended new policy is accompanied by substantive new text that would provide the background to and reasoned justification for the policy. Reference to historic trends and likely severity of flooding has been removed in favour of a **risk based approach**".

In a letter to our flood group, David Stritch of the Communities and Local Government planning policy department states:

"The primary test of a planning application will be against the policies of a local planning authority's development plan. If the development plan is up to date its policies will accordance with government policy, including that of PPS 25. If the plan was adopted some time ago however, there is a risk that its policies may not fully accord with Government policy. In such cases, the material considerations will come into play and may override the policies of the development plan. PPS 25 and all other Government planning policy are material considerations".¹

FRA: Site Specific Flood Risk Assessment.

At the planning application stage, an appropriate FRA will be required to demonstrate how flood risk from all sources of flooding to the development itself and flood risk to others will be managed now and taking climate change into account. Policies in LDDs should require FRAs to be submitted with planning applications in areas of flood risk identified in the plan.

The FRA is a site specific flood risk appraisal done by the developer in conjunction with the local planning authority and the SFRA. When no SFRA is available the local planning authority should specify to the developer special requirements for its FRA to cover items that the SFRA would normally cover. Developers are issued with the EA basic start map (FLUVIAL only) as a definitive document by the LPA which the developer uses.

¹ A letter from Mr David Stritch Department for Communities and Local Government May 2008

Communities and Local Government:

RSS

The Regional Spatial Strategy (RSS) determines the development need of the region until 2026

The RSS influences the future planning of the region in a number of ways:

- a) Part of the development plan system it provides guidance on the location and scale of development within the Local Development Frameworks (LDFs).
- b) All aspects of planning for the South West Region including the number of houses allocated for the Tewkesbury region.

The RSS Panel is the Government quango that dictates to local authorities the number of houses they should include in their local plan to be built up to 2020.

When assessing house building in flood risk areas the panel uses the RFRA. This is disturbing, because the RFRA assesses Tewkesbury's flood risk in one sentence, "Of the 100 or so 'Market Towns' in the South West, the following are not within the sub regional boundaries and have been identified as being within flood zone 3 (functional floodplain)". The document then lists Tewkesbury/Ashchurch.

Quote: 7

Although the RFRA does not deal specifically with the regions market towns, it Should be noted that the majority of the 100 or so market towns in the South West have a degree of fluvial flood risk. South West Regional RFRA February 2007

We need to remember that the RFRA only deals with FLUVIAL flooding and not PLUVIAL because PPS 25 does not demand PLUVIAL to be included.

Question:

How can the Regional Spatial Strategy Panel allocate houses to an area where the RFRA excludes 50% of flooding information?

Since the July 2007 floods the flood water levels in the RFRA have become redundant. The Environment Agency, have reported the flood levels at the Mythe station gauge on the River Severn reaching 12.92 metres during the July 2007 floods. It was stated at the Gloucester County Council scrutiny inquiry² that this figure was a FLUVIAL reading only and if you included PLUVIAL flood levels it was much higher.

The Regional Spatial Strategy Panel has based all its decisions for housing on outdated and redundant information in the RFRA. The Severn and Avon Valley Combined Flood Group contacted the South West Regional Assembly and asked

² Gloucestershire County Council scrutiny hearing May 2008.

them to update the RFRA. They declined to do this because RSS report was close to being considered by the Secretary of State and they were not prepared to alter this at this late stage. It does seem that flooding in Tewkesbury is not important to their overall strategy.

Recommendation: 25

The South West Regional Assembly should update their February 2007 RFRA to include PLUVIAL and historic data and take into account the July 2007 floods.

Quote: 8

Tewkesbury has not been assessed in detail in the RFRA as it is not considered a regionally strategic location and has not been designated as a Strategically Significant City and Town.

Anne Mette Jacobsen Planning Policy Officer South West Regional Assembly April 2008

Recommendation: 18

The Tewkesbury Borough Council's Local Plan to 2011 should be suspended and reviewed to fully accord with Government policy.

Recommendation: 9

PPS 25 should make mandatory the use of local knowledge and historical records on flooding,

Flood Maps:

The EA Indicative Floodplain Map (IFM):

The indicative floodplain map is an Environment Agency map issued to local authorities and developers and is supposed to show the extent of the existing floodplain. When the Environment Agency was initially setup, as a separate body, the Government told the agency to exclude PLUVIAL flooding³.

It has only been in recent months that the Environment Agency has shifted its stance. They are now saying that their flood map is a starting point only and that Planning Authorities such as Tewkesbury Borough Council should include PLUVIAL flooding and historic data in their own flood map for issue to developers.⁴

The Overview and Scrutiny Committee of TCB has recently asked their Director of Strategic Operations to write to the Environment Agency requesting it to take into account pluvial and fluvial flooding as well as climate change when commenting on

³ This was advised to our group by the Bristol University Hydrology Dept.

⁴ Stated by Anthony Perry EA to the GCC Scrutiny Inquiry May 2008

developments, and that the floodplain map be reconsidered in the light of its investigations and research into those factors⁵.

We can see quite clearly there remains considerable confusion over who is responsible for what. One is bound to ask whether this situation encourages 'organisational amnesia' thus avoiding responsibility by simply passing the buck.



Case study continued.

The Tewkesbury Eastern bypass (No.2), is a road constructed on a built up strip of land through the middle of the floodplain. News reporters who flew over Tewkesbury during the July floods reported that the water was 2 metres higher on the eastern (Newtown) side of the bypass than the western side. Clearly, this road is acting as a dam, this is especially so because the height of the road averages 15.5 metres whereas the land was only 10-11 metres at the time of the 1974 OS map. This further undermines the validity of the existing IDF map.

A recent development (No.3), on the Bredon Rd is shown on the IDF as just bordering the floodplain. Originally, this area consisted of allotments. Local knowledge clearly shows that this land flooded regularly. Some local witnesses worked their own allotments there for a number of years. Furthermore, allotment heights on the 1974 O.S. map showed the land to be no higher anywhere than 12 metres and in places as low as 10.4 metres above sea level (NRA map 1991). Thus this land, now being developed, is significantly below the height of the 2007 flood.



Quote: 10a

No residential development has been allowed by TBC in floodplain since 1974.

Chris Shaw Director of Strategic Operations TBC March 2008

These sites are opposite the Bredon Road Development





The town centre does not flood according to the Environment Agency's I.D.F. map dated 2007.

The Indicative Floodplain Map shows that the Newtown area (No.4) is not in the floodplain. Yet in July 2007 Newtown flooded. Lower Newtown is only 13 metres above sea level (datum point Spa House) – again lower than the highest point of the 2007 flood!

Newtown is further affected by additional flooding risk from the river Swilgate and the Tirle Brook. Industrial development east of Tewkesbury (Northway Lane Industrial Estate), additional housing developments in Bishops Cleeve (450 houses since 2002) and the M5 motorway all add significantly to water flow and displacement. This situation is not adequately reflected in the 2007 IDF map. If we further mention water treatment plant, which is also placed in this map outside the floodplain, we can see this makes the future serious flooding inevitable with possibly even more tragic circumstances

Quote: 12 Every time it rains I fear that we will be flooded out again. Surely someone can do something about this! Julie Irwin Local Newtown Resident 2007

UNCERTAINTY LEVELS:



Recommendation: 23

PLUVIAL and other sources of flooding together with uncertainty levels should be included into local authority flood maps before issuing them to developers.

Flood Maps influence on Local Plan:

The Tewkesbury Borough Council's Local Plan promulgated in 1988 was constructed prior to the introduction of planning guidance (PPG25 and PPS25). It therefore no longer conforms to contemporary Government planning guidelines. Moreover, because the Government's **Risk Based Strategy** is centrally coordinated, we believe it undervalues local knowledge and expertise. The TBC Local Plan has only a passing reference to issues of hydrology and historical record. This therefore undermines the reliability and the legitimacy of the Local Plan; at least in the eyes of many local residents.

Recommendation: 19

A local plan should be drawn up by a wider cross section of concerned stakeholders. Ideally this should consist from the County Council, Environment Agency, local councillors, Risk Assessors of the Association of British Insurers, local businesses and interested developers. The Local Planning Authority should have an advisory role only.

Hydrologist Floodplain Map:



Figure 4: Hydrologist Floodplain Map © Environment Agency

Figure 4 shows the hydrologist map of the floodplain that was **commissioned by** the Environment Agency in 1999 and updated in 2003⁶. The reason the map was updated in 2003 was to include the tidal affect of the River Severn that was overlooked in 1999. In flood conditions, the Avon is also affected by the tidal influence of the Severn; this is not taken into account by the 2003 map and this map needs to be updated'.

The hydrologist map is based on a worst case scenario, the worst six months rainfall on record and on the worst rainfall in 24 hours on record, together with the highest spring tide height of the River Severn⁸. The effect of building structures is ignored. A hydrologist uses ordnance survey map contours to determine height. The hydrology map assumes the highest flood levels at 15 metres above sea level. This compares to the maximum 13.4 metres above sea level that TBC assumes when looking at planning applications. Thus there is nearly a 2 metre difference between the two methodologies. As we believe the hydrology map is more reliable, the results could be catastrophic if TBC continues to ignore this evidence.

⁶ You only have to glance at the maps shown in figures 1 and 4 to see that the hydrologist floodplain bears no resemblance to the indicative floodplain.

This was admitted to the Town Council by Anthony Perry and Rex Thomas of the Environment Agency Town council October 1st 2007. ⁸ The floodplain on this map compares closely (within 10%) of the 1924 floodplain map (see *Figure: 5* under 1924

Floodplain section) and the National Rivers Authority floodplain map 1991.

We believe that if the July flooding had occurred in line with the hydrologist map worst case scenario, the consequences for Tewkesbury would have been total devastation and many more fatalities. Thus, it is clear that Government bodies, such as the Environment Agency, as well as the TBC are literally gambling with people's lives when they pursue their current policies, rather than using more fully the expertise of hydrologists. It is also clear that local people fully understand the limitations of present central and local government policy and expect the Government and the TBC to respond appropriately.

As we have seen only that the Environment Agency has started to move their stance since May 2008 by saying that their floodplain maps are a 'starting point only'⁹. They now expect the Local Planning Authority to add in PLUVIAL and all other forms of flooding as well as historical data to complete the flood map before issuing it to developers. This seems to be another example of the EA avoiding responsibility!

The Hydrology map shows:

- Parts of the Wheatpieces Estate should flood, but instead now displaces 528 million gallons of water into other areas. (July 2007.)
- The Eastern Bypass should flood, but effectively acts as a dam.
- Newtown could flood, as part of it did.
- Mythe Treatment Plant could flood and did.
- The Abbey could flood. Records show it has flooded six times in 600 years. – With the intervals rapidly shortening between floods.
- Wynyards Close and Morrisons Superstore could flood and did.
- Church Street could flood and did.
- Half of the Mitton Estate could flood but was saved by the Carrant Brook bursting its banks at the Northway M5 culvert, saving lower Mitton to the detriment of Northway Kestrel Way etc.
- Bredon Road Development could flood and part of it did.
- The Town Centre could flood but was saved because the tidal effect of the Severn was not at its peak in July 2007.

Figure 4a (page 19) Shows the profile of July 2007 flood, which follows very closely to the Hydrologist's map¹⁰.

⁹ This term used by the Environment agency seems to mean that the floodplain maps should only be seen as a base point to which other factors should be added.

¹⁰ The data for the map was taken from recorded levels, witness testimony and photographic evidence.



Figure 4a Flood profile July 2007. © Crown Copyright Licence No. 100047974

1924 Floodplain Map:

Figure 5 shows a representation of the 1924 floodplain, this map was constructed by the author and is based on the Royal ordnance survey map of that year and the 1974 O.S. map.¹¹ These data were also enhanced after interviewing many senior citizens of Tewkesbury who have lived in the area all their lives and have a lot of anecdotal knowledge concerning flooding in the area¹².

Recommendation: 9

PPS 25 should make mandatory the use of local knowledge and historical records on flooding.

Based on the knowledge of local people and historical records, the 1924 map shows that 15 metres was the expected average for flood height. They recognised it was unwise to build in the floodplain; this is evident in the location of the remaining older buildings. We believe that this 'common sense approach' has been overlooked by TBC since it was formed in 1974. This has resulted, in our opinion, in a series of unfortunate and ill-informed planning decisions.

¹¹ Both maps show areas marked "Liable to Flood".

¹² It is estimated that there is only a 10% difference between this floodplain map and the 2003 hydrologist map. The reason for this is because in 1924 the Ordnance Survey maps used a datum on the mean sea level at Liverpool. It was not until 1933 that they changed to the Newlyn Datum line. The difference is that the Liverpool line is 3ft higher than the Newlyn one.



Figure: 5 1924 Floodplain. . © Crown Copyright Licence No. 100047974

The author also produced an overlay of the major building developments that have taken place since 1924 (see Figure 5a) and it seems to confirm that the Environment Agency's hydrologist's floodplain map is correct on its prediction of property that would flood. This map is available for further examination.



Figure 5a: Major developments since1924. ©Crown Copyright Licence No. 100047974

We can see by referring to website *http://flood.firetree.net/* that, using NASA data, the effect of sea level rises from 7 metres up to 14 metres mimics a FLUVIAL and PLUVIAL flood of 14 metres AOD which is roughly the flood level of July 2007!

TBC dispute the evidence of the hydrology map as not being robust enough. This is despite the fact that this map was commissioned by the Environment Agency for their use.

Quote: 13 The local Authority Officers act as technical advisors, enablers and coordinators and formulate advice and recommendations to Councillors to make decisions.

Chris Shaw Director of Strategic Operations TBC March 2008

Floodplain Runoff & Bottlenecks:

In their written statement to the Gloucestershire County Council scrutiny inquiry the Environment Agency stated "We need a public debate about what level of flood protection we want and choose to afford in this country"¹³. Anthony Perry and Rex Thomas officers of the Environment Agency stated to the Tewkesbury Town Council that Tewkesbury was not top of their priority list, their priority list bears no resemblance to flood danger, it is based on population¹⁴. We can therefore assume towns and districts with heavier populations, but no danger of flooding, are given higher priority within the Environment Agency's spending.

Gloucestershire County Council is in the process of cleaning the Highway drainage systems. This work will be in vain if the Tirlebrook, Swilgate, Little Fid and Carrant Brook are not properly maintained. There has been no systematic programme of maintenance for many years¹⁵

Figure 6 shows the state of the culverts for the Tirle Brook under the road near the Morrisons Supermarket.



Quote: 14 These areas are a biological minefield.

Prof. Cluckie Bristol University July 2008

¹³ GCC Scrutiny meeting May 2008

¹⁴ Tewkesbury Town Council meeting October 2007.

¹⁵ Local residents believe that there has been no proper maintenance of these tributaries for 20-25 years.



Figure 6: Tirlebrook culvert and exit channels near Morrisons Supermarket. These also make excellent breeding grounds for mosquitoes.

Many of these brooks are in this state; this hampers runoff of water into the rivers Avon and Severn. It does not seem to register with the authorities that the quicker local water can get away, the less damage is caused by incoming water surges from other areas.

Carrant Brook:

Much of the surface water from roads and the recent industrial estates to the east of Tewkesbury runs into the Carrant Brook which flows into the Avon. Its exit is only 5 metres wide at this point and needs urgent canalization. Since July the EA has pollarded some trees, but no clearance or dredging has been done¹⁶.

The Little Fid

Wheatpieces is a housing estate to the south east of Tewkesbury (see case study No 1). A major part of the surface water from this large housing estate drains into the Swilgate, but part of it, and the proposed Wheatpieces 2 estate, will drain via the Little Fid. The Little Fid junction with the Swilgate is only 1 metre wide. This water course needs urgent upgrading by the Environment Agency. To compound the problem even more houses are being approved to be built in this location!

Tewkesbury Borough Council has approved another 107 houses (Rudgeway) to be built next to the Wheatpieces estate. Figure 7 is a picture of this site taken on July 23rd three days after the deluge; this confirms that this development is in the functional floodplain. Burn marks on the hedge rows surrounding this site shows the water was 2.4 metres (8 feet high) at one point. The Little Fid is located at the back of this picture and the un-flooded land in the centre consists of spoil dumped by the builder from other parts of the Wheatpieces site. Residents in the building that the photograph was taken from stated that the water was lapping their doorsteps and

¹⁶ Confirmed in a meeting with EA May 2008; they also confirmed at this meeting, that the EA only have 15 workmen to cover from the Sharpness canal to the Eden Dam.

they had to use sandbags on July 21st. Recent authenticated surveying shows the present height in this area is only 12 metres above sea level¹⁷.



Quote: 15

I recognise that people believe the land to be in the floodplain but it is not. Nor did it flood in July.

Chris Shaw Director of Strategic Operations TBC October 25th 2007

Figure 7: site of 107 houses just approved by Tewkesbury Borough.

There is clearly a significant gap between the accurate evidence we have aquired and the evidential basis of the advice being given to the members of TBC!



Figure 8: the state of the Little Fid

Quote: 16

If you think the run-off from a housing estate, where there were once fields, did not exacerbate the problems for the surrounding area then your idea of hydraulics is more King Canute than Archimedes.

Dr. Graham Sheppard (retired) letter to Chris Shaw August 2008.

Tirle Brook

The Tirle Brook is another major tributary that drains the Cotswold escarpment into the Severn River via the Swilgate. A considerable amount of the land on either side of it is in private ownership. Therefore, under current rules the riparian owner is responsible for the condition of the brook. This might save the authorities money but the land owners do not have the same obligations as statutory bodies and to date

¹⁷ Authenticated by the use of contemporary Ordnance Survey maps.

there is no enforcement of a maintenance regime. Figure 9 shows the state of the Tirlebrook at this moment in time¹⁸.

Recommendation 11

The responsibility of clearing ditches brooks and streams should be taken away from the riparian owners and placed with the Environment Agency.



Figure 9: The Tirlebrook

Quote: 17

The sale of this land near the Tirle Brook, by Bovis, is I believe the first real victory for the Seven and Avon Combined Flood Group. Cllr Vernon Smith TTC August 2008.

The Swilgate

The Swilgate is the largest tributary that connects the Little Fid, Tirle Brook and Deans Brook (Bishops Cleeve) to the Mill Avon and thence the Severn. All the surface water from the new domestic and industrial developments, in the area, drain into them. The increased concentration of water that these tributaries contribute to the Swilgate causes this river to overflow on a regular basis. The increased runoff has also created two major bottlenecks¹⁹, in the flow of water. There is an urgent need for the GCC to invest in modifying these bottlenecks; most especially the A38 culvert which was built in 1837!

Recommendation 13

As a matter of urgency the exits of the Swilgate River and Carrant brook need to be upgraded to increase the flow of water. It is estimated each would cost around £500,000.

¹⁸ Owned by Bovis and currently up for sale. The Severn and Avon Group believe that Bovis, the current owners, as developers intended to use this for further building development. ¹⁹ The culvert at the entrance to the Vinyards also the A38 culvert by the Glos. Rd, car park.



Figure 10 shows bottlenecks in the Swilgate and you can see that the openings restrict the flow. The first picture was taken after a short heavy rainfall.

Recommendation 13a:

Diversion of Water: (A recommendation by Tewkesbury Town Council) and endorsed by this report

In order to relieve the amount of water approaching Tewkesbury during heavy rainfall the river Swilgate could be diverted before it reaches Tewkesbury. This could be done in the form of a Roman *vallum* (see Figure 14) starting at the junction of Deans Brook and the Swilgate across farm land to join the existing Coombe Hill Canal (see figure 15). The distance is approximately 2.5 kilometres; a large culvert would be needed to be built under the A38 connecting the two canals. The *vallum* could be kept as grass pastoral land 18ft wide and 6ft to 8 ft deep. The estimate for this at today's prices is £250,000 and would divert at least two thirds of the water away from Tewkesbury and would also benefit the village of Deerhurst, which was devastated in July. The gradient levels on the survey map indicate that the water would flow.



Figure 14: An example of a Roman vallum.

Recommendation 13a continued:



Figure 15: Proposed "Roman" vallum. © Crown Copyright Licence No. 100047974

Water Displacement:

Water displacement was discovered by the Greek thinker Archimedes in the 3rd century BC. He discovered that if you put an object in water, the amount of water displaced (thrown out) is equal to the volume of that object. In effect by measuring the volume of the object, you can work out the volume of water displaced.

There are four major areas on the eastern side of Tewkesbury where land, in the floodplain, has been filled in and consequently displaced water to other areas. These are the Morrisons Supermarket site, part of Wynyards Close, a field known as Massey Tombs field, Wheatpieces 1 and 2 and the Tewkesbury S. E. bypass²⁰.

Clearly, when TBC insists that they have not permitted building in the floodplain, they are being somewhat disingenuous by not referring to the fact that areas now designated as not on the floodplain have been raised artificially by the dumping of soil and rubble. We would expect a candid admission by TBC that this has happened and recognition that water that has been displaced as a consequence of this.

Attenuation programmes which TBC claim, have mitigated flooding from these developments, are in our opinion, insufficiently grounded in the basic science of

²⁰ Reference here historical evidence and local knowledge. Refer especially the Royal Ordnance Survey map of 1924 and 1974.

hydrology. This is especially so, because of the lack of use of basic hydrological tools such as hydrographs, which show the effect before and after proposed attenuation²¹.







Figure 11 Wheatpieces Ground levels 1974/2008 in Metres



²¹ Comment by Professor Cluckie at a meeting 28/07/2008

Continued:

TBC has recently approved the building of another 107 houses (Wheatpieces 2). At present this land is 12 metres above sea level; this is below the 12.4 metres 1947 flood level and considerably below the July 2007 levels. We are entitled to ask whether landfill will take place here as it did in Wheatpieces 1. At any rate we have another clear example of the TBC allowing building on the floodplain!



The TBC claim they have compensated for any water displacement by scalloping the land. Such a process would require a vast lake, vallum or balancing pond (2000 metres long, 1500 metres wide and 4 metres deep to cope with this water displacement!)



Wheatpieces Sept. 2008 shows that build up has taken place. The flood water in the picture is no where near the level of July 2007, but it indicates the problem. This area used to be known as the Goose Flats because it was marsh land and locals used to shoot ducks and wild geese here.

Morrisons Supermarket, Wynyards Close and Massey Tombs Field:

Morrisons Supermarket, Wynyards Close and Massey Tombs Field are the three other sites that have been subjected to landfill. Because these sites are closer to the Newtown area of Tewkesbury, which flooded for the first time in July 2007, they represent an even greater threat in future. The following graph *Figure 12* shows the land levels for the sites in 1974. The lighter green area shows the difference the level in 1974 and 2007. Whilst it is true that only part of Wynyards Close was unfilled the difference in levels is significant.



Figure 12 Land Levels in metres

Now that we have established that landfill has taken place, we can show the water displacement for each site. The following chart (*Figure 13*) shows the water displacement in gallons at various flood levels. The obvious question should now be asked "Where was the water pushed to?"

Quote: 21

There are only a few places where material has been placed in the flood plain. The water displacement theory is not supported by facts. Chris Shaw Director of Strategic Operations TBC 4th March 2008

Flood Level	Gallons Displacement by Site (millions)				
Metres	Wheatpieces	Bypass	Morrisons	Tombs Field	Totals
0.5	66.04	4	1.05	.990	72.08
1.5	198	11.9	3.2	3.04	216.14
2.0	264.2	15.9	4.2	4	288.3
2.5	330.2	19.8	5.3	5	360.3
3.0	396.3	23.8	6.3	5.9	432.3
3.5	462.3	27.7	7.4	7	504.4
4.0	528.3	31.7	8.5	7.9	576.4
5.0	660.4	39.6	10.6	9.9	720.5
6.0	792.6	47.6	12.7	11.9	864.8

Figure 13 Gallons displacement by site. Red = 2007 flood.

From this, we estimated that in the July 2007 floods **495 million** gallons of this displaced water flooded the Newtown area. Newtown was not unique. However, what makes it so special was that it has never flooded before! Other areas of the town also experienced elevated water levels. It is agreed that the July 2007 floods were extraordinary. The basic effects of water displacement have been evident over a number of years. When the eastern bypass was built two balancing ponds were constructed at the north end of the road. These ponds are nearly always half full, which is contrary to the whole theory of SUDS. Moreover, the total capacity of both is a mere 60000 gallons. Displacement of the bypass at 0.5 metres flood level is 4 million gallons alone. This half-hearted attempt at flood alleviation was obviously totally inadequate!

<u>Quote: 22</u>

The Eastern By-Pass, for example, which crosses part of the floodplain has been subject to strict flood alleviation measures to compensate for loss of floodplain, thus meeting the requirements of the EA and relevant legislation. Chris Shaw Director of Strategic Operations TBC 07/08/2008

<u>Quote. 23</u>

The balancing ponds along the Eastern Relief Road are woefully inadequate for the purpose and are badly in need of maintenance.

Anthony Perry Flood Manager EA 01/10/2007

SUDS (Sustainable Urban Drainage Systems)

One of the main criteria's in PPS 25 is SUDS (Sustainable Drainage Systems).

What is SUDS? According to PPS 25:

"SUDS aim to mimic natural drainage processes and remove pollutants from Urban run-off at source. SUDS comprise a wide range of techniques, including green roofs, permeable paving, rainwater harvesting, swales, detention basins, ponds and wetlands. To realise the greatest improvement in water quality and flood risk management these components should be used in combination, often referred to as the SUDS Management Train2.²²

Case Study No 4: SUDS within the Wheatpieces Estate



These two photographs are different views of the same field. The first photograph shows the balancing pond in dry weather. The second shows another part of the field during the January 2008 flood . It is clear that this balancing pond is within the functional floodplain. The question needs to be asked how effective can SUDS be, when they are frequently overwhelmed by flood water.

Quote: 24

Your claim that new development exacerbated flooding is entirely without substance as Wheatpieces held its own water in the balancing pond and did not add to the problems caused by the exceptional rainfall in a very short period of time. Chris Shaw Director of Strategic Operations TBC 22nd July 2008



²² Taken from PPS25 page 34

Whilst SUDS Management Train²³ is a very effective method of flood control in some circumstances, it is of limited value for developments built within the functional floodplain where the soils and topography impede its efficiency.

Tewkesbury is unique in the fact that it has the largest floodplain in the country. Volumes of water, both from FLUVIAL and PLUVIAL are so great; balancing or retention ponds could not be made large enough and would be too expensive to retain the water for slow release. Thus we can see that SUDS are not catch all system that some would have us believe and are of very limited value within the Tewkesbury area.

Simon Fox MSc BSc MBCS MIBC states that the soils and topography of the floodplain in Tewksbury has a significant influence on the risk of FLUVIAL and PLUVIAL flooding in the area. In his evidence to our report, he has submitted the following;

"The following diagram is one that I have produced specifically for this review and is based on soil maps of the area. It shows the six major soils groups in the area surrounding Tewkesbury and the influence of the local topography on the flow of fluvial and pluvial waters.





Of particular interest is the low-lying South Eastern area of Tewkesbury enclosed on the map within the dotted, blue rectangle. The soils within this rectangle are heavy textured, clayey soils typical of floodplain terrain. They have naturally high groundwater levels and heavily impeded drainage with Hydraulic Conductivity rates in the very low range of 0.10 - 0.01 mm/day when saturated²⁴. This means that water in these soils moves very slowly indeed and that natural drainage when saturated is measured in weeks not minutes and hours.

²³ See CIREA manual.

²⁴ Ref 1: Hydraulic conductivity profiles of two clay soils, E. G. YOUNG & M. J. GOSS, AFRC Rothamsted Experimental Station

The comparatively lighter soils (loams and clay loams) of the higher ground and upstream of Tewkesbury drain relatively freely (about 0.5 cm/sec) and would contribute significantly to flows within the watershed above Tewkesbury given high levels of rainfall and pluvial flows. Additionally, the underlying subsoils of many of these soils have impeded drainage causing water moving through these soils on slopes to spring to the surface. This gives rise to surface runoff and soil erosion as clays and silts in particular are carried off downstream.

Naturally, as the map shows, the flood waters drain towards, and are concentrated upon, the central meeting points of Tewkesbury. At these points, and when the inherent ability of the downstream drainage capacity has been overwhelmed, rivers go out of bank and the flood waters spread across the floodplain to the South and East of Tewkesbury. This was exacerbated in 2007 by the coincidental (but not uncommon) impact of the tidal limit of the River Severn.

As has been stated, by the time of such inundation these soils would be effectively impervious, offering no useful drainage. Nevertheless, under normal circumstances the waters would spread across this floodplain to an even, shallow depth where they would remain for a number of weeks while the natural effects of slow drainage and evaporation take effect²⁵.

Quote: 25

The margins for error are tight and the success of the proposed development depends upon the SUDS and more importantly on the SUDS long-term maintenance; the risk to human life and property is acceptable.

Ms Ruth V Mackenzie BA (Hons) MRTPI Inspector Longford Glos. Inquiry final report July 2008.

Simon Fox also addresses the subject of water displacement as follows:

"As pointed out in your report, the intervention of both recent development work and the construction of bypasses raised (for good reason) above the level of the floodplain and their consequential landfill have reduced the effective floodplain area and impeded the flow of waters across it.

In my opinion, given the virtually impervious nature of the soils at the point of severe inundation by floodwaters, the manmade restrictions in available floodplain area and the obstructions to flow would result in the displacement of this water both in terms of elevation and in seeking alternative avenues of escape.

Evidently in the summer floods of 2007 such displacement took place across large areas of Tewkesbury where flooding is either highly unusual or has never previously been recorded. This, along with the recorded data, strongly suggests and supports both your views and those of Professor Cluckie that the current risk of flooding to 13 or 14 metres Above Ordnance Datum (AOD) cannot be discounted.

Furthermore, it raises the risk that more housing developments will restrict the available floodplain still further, which may have the consequence of greater amplification of the displacement effect and raising the recorded flood heights to levels as yet unrecorded.

²⁵ Letter from Simon Fox to Cllr Vernon Smith 08/06/2008

Tewkesbury Borough Council needs to gain a very clear understanding of the multiple risks and factors influencing this issue, particularly following the stark outcomes of the summer floods of 2007. It is not sufficient to follow the limited and rather narrowly defined guidance from the Environment Agency"²⁶.

SUDS is based on two working elements, infiltration/absorption and water storage. Infiltration is effective if you have a water table 30 feet underground with appropriate loamy soil on the surface so that the water can infiltrate down into the water table. As Simon Fox has stated; "the soils in Gloucestershire are mostly clay which make infiltration/absorption ineffective"²⁷.

Because water storage (SUDS) is a very expensive option, developers are reluctant to spend more than the basic minimum required. Moreover, most balancing ponds are put in place with no maintenance agreements. Without proper maintenance, these SUDS are less affective. We do not believe, that SUDS put in place for the Wheatpieces estate have been properly maintained. Furthermore, because balancing ponds are usually shallow, which encourages the formation of blue algae as well a toxic ammonias and phosphates they become a prime breeding ground for mosquitoes, which means that there are significant public health risks²⁸.

Ironically, the few balancing ponds that are made deeper, to keep any water stored fresher, then become hazards to children's safety, because they are located close to, or within the developments.

Climate Change:

PPS 25 defines three types of flooding in the UK FLUVIAL, PLUVIAL and Coastal Flooding, Tewkesbury and its floodplain is affected by all three.

FLUVIAL flooding is becoming more prevalent with intense rainstorms in the northern areas of the Severn and Avon, which then the flows down into the Tewkesbury floodplain.

PLUVIAL flooding is again affected by intense storms over the Cotswold escarpment and here again water flows down the Swilgate, Tirlebrook and Carrant Brook into the main Rivers that merge at Tewkesbury.

Global warming will mean rising sea levels. Thus the tidal effect of the Severn will be of increasing importance to contributing to flooding events within the Tewkesbury

²⁶ Simon Fox to Cllr Vernon Smith op cit

²⁷ Simon Fox ibid

²⁸Hospitals have been warned that outbreaks of malaria and tick-born viruses could become a problem. A spokesman for the Health Protection Agency said: "Our work is based on what is likely to happen if we do nothing to prevent it - and it could well be that we see an increase in diseases such as malaria. Malaria has been seen in these islands in the past, and it is not impossible that it will return regularly if the UK experiences more tropical temperatures and rain on the scale experienced last summer. Daily Telegraph February 2nd 2008

area. Climate change could have an effect on health issues, mosquitoes are moving north by 10 miles per year²⁹.

Quote: 25a

The health risk issue has been overlooked and as yet the true extent of the situation is still to be realised.

Dave Witts August 2008

It is commonly assumed that climate change will have the consequence of creating more flooding events. However, it may be that recurring long-term weather patterns rather than climate change may be the cause. This is the message from Professor Stuart Lane, an expert at Durham University's new Institute of Hazard and Risk. Professor Lane says that after about 30 to 40 less eventful years, we seem to be entering a 'flood-rich' period. More flooding is likely over a number of decades;

"The British summer is a product of the UK's weather conveyor belt and the progress of the Circumpolar Vortex or 'jet stream'. This determines whether there are high or low pressure systems over the UK. Usually the jet stream weakens and moves northwards during spring and into summer. This move signals the change from winter-spring cyclonic weather to more stable weather during the summer. High pressure systems extend from the south, allowing warm air to give the British summer. In 2007, the jet stream stayed well south of its normal position for June and July, causing low pressure systems to track over the UK, becoming slow moving as they did so. What we don't know is whether climate change will make this happen more in the future"³⁰.

Whether or not we accept Professor Lane's particular views, it is clear that the overwhelming evidences that climate change will have significant effects on British weather patterns. This point is reinforced by Professor Cluckie Head of Hydrology from Bristol University when he stated, at the Longford inquiry; "We are likely to have wetter winters, drier summers but the flood producing storms would become more intense than July 2007".³¹

Using NASA data at *http://flood.firetree.net/* shows the increasingly catastrophic effects of rising sea level. They model rises from 7 metres to 14 metres. If sea level rises of this magnitude occur, this taken together with FLUVIAL and PLUVIAL flooding, this would mean the total devastation of the North Gloucestershire area. This modelling also gives us a reasonable idea what happened in July 2007 with a flood level of 14 metres, which contradicts the EA's reported flood level of 12.92 metres.

²⁹ Professor Cluckie 28/08/2008

³⁰ Labnews.co.uk 4/09/2008

³¹ Professor Cluckie evidence Longford inquiry April 2008

Future Building:

We recognise that pressure for future building development is being driven by Central Government. As it stands 14600 houses have been designated to be built within the TBC area. Much of the Borough is situated on or near the floodplain. As a Planning Authority TBC is under intense pressure to conform to this Government directive. It is worth noting that in the last six months both inquiries at both Longford and Bishops Cleeve have ruled in favour of the developers.³² In our view the imposition of this additional development is unreasonable, given the particular situation of Tewkesbury and North Gloucestershire. Furthermore, the fact that this is being imposed by the South West Regional Assembly, an unelected quango, flies in the face of the democratic rights of the people.

Large building developments put extreme pressure on existing drainage and sewer systems. Moreover, they will exacerbate flooding in an area that is known to have a fragile floodplain. The additional houses designated for the Tewkesbury area simply add even further pressure. In 1988 Tewkesbury Borough Council mapped out its Strategic Housing Options for the area (see Figures 16 & 17). If these houses are to be built where indicated, Tewkesbury risks being under water every year. Figure 16 shows clearly that the eastern relief road is built in the centre of the floodplain³³.



Figure 16: Strategic Housing Options Plan 1

³² In both cases the TBC withdrew their objections

³³ This is despite TBC assurances to the contrary.

Figures 16 and 17 (produced by TBC) clearly conflicts with the Royal Ordnance Survey map 1924, OS1974 and the NRA 1991 maps. In addition the EA hydrology map 2003 shows that many of these proposed developments are within or near the functional floodplain. This is especially so, if one accepts our contention that the flood level in July 2007 was near 14+ metres in many places. We are especially concerned that No. 5 (Bredon Rd) and No. 4 (Wheatpieces developments), both of which have secured planning consent, are clearly in the floodplain



Figure 17: Strategic Housing Options Plan 2

In anticipation developers have purchased, or secured options on a number of parcels of land. The value of this land for potential development is entirely dependant on whether planning permission is forthcoming or not. If there was a definitive flood map that enforced the limits of development at 15 metres plus, for safe building, and

14.2 metres as the flood height³⁴, much of this speculation would be valueless. This is simply because this land would revert to an agricultural value and developers would lose a great deal of money. Thus, this therefore acts as a major driving force to encourage developers to spend a great deal to challenge any planning refusal. Moreover, the local authority has an incentive to support inappropriate development because it is a direct beneficiary of this development through the S106 planning gain payments.



Picture 1

Picture 2

Picture 1 shows the level of flooding in July 2007, indicated by the red line, this is a culvert that goes under the M5 motorway. Picture 2 is the same scene from the opposite angle with the red line showing the height of the July 2007 flood. This land has been purchased by a developer for potential building. The culvert cannot cope with the existing amount of water. This was the direct cause of considerable flooding of the Northway area and the M5. Surely, it is inconceivable that planning permission would be given for development on this land. However, the developer has invested a great deal of money on the assumption that planning permission will be granted!

Quote: 26

Officers work hard to advise Members carefully, professionally and with considerable local knowledge and experience of the Borough.

Chris Shaw Director of Strategic Operations TBC 22nd July 2008

Quote: 27

It is crazy to plan to build so many houses in this area when there has been such bad flooding and which will obviously remain prone to flooding.

Quote: 28

Peter Ainsworth MP Shadow Environment Secretary June 2008

all development until the Ageney has finis

They need to call a halt to all development until the Agency has finished redrawing the floodplain. They owe it to the people whose homes have been ruined, the people who can't get flood insurance, the people living in caravans and the people facing Christmas in a hotel. Editor Gloucestershire Echo October 25th 2007.

³⁴ supported by Bristol University and Simon Fox

WATER DOES NOT RESPECT COUNTY BORDERS:

Case Study No. 6 River Isbourne

Water does not respect county boundaries. The river Isbourne rises in the Cotswold escarpment and then flows through Winchcombe and into Worcestershire and join the river Avon at Evesham. The residents of Sedgeberrow report that in July 2007 their village was hit by a 24ft wall of water that came down the Isbourne, it was so powerful that the first house the wave hit in the village was completely flattened to the foundations and has had to be rebuilt. From witness statements, and as a result of guidance from the University of Bristol, it now seems that the wall of water reported by residents was cause by a number of **Debris Dams**, where waters builds up behind them, then all of a sudden the blockages break and release the water as a wave.

The river has not been maintained for many years. There is a sluice gate near the old mill that is filled with debris and not working properly. Further problems arise from the fact that responsibility for maintenance illustrates the fragmentation of the system. The river flows through three district councils and two County Councils. Riparian owners, including the EA, are not fulfilling their responsibilities. The situation is further complicated by the fact that the Isbourne is re-designated from river to stream at Wormington Bridge. The authors of this report walked along the river a number of miles and found debris and obstructions everywhere.









The above pictures were taken of the lsbourne 27/08/2008. Picture 1-3 show the sluice gate full of debris the channel shown by the yellow arrow is where the water should normally travel down but is blocked completely. Picture 4 is self explanatory.

Continued:





This picture and diagram represents a bend in the River Isbourne in the village of Sedgeberrow. In July 2007 the water came down the river, rushed over the bank and flooded the houses on the left with 6ft of water. The rest of the village suffered as well.

The residents asked a hydrologist to examine the problem. He suggested that the river channel should be straightened to speed the flow of water. This would help protect the houses on both sides of the river. The land required was to be donated by the resident who owned it.

The Environment Agency refused even to consider the scheme until the village paid $\pounds 10,000$ for a computer model to be completed.

The residents also asked the EA to pollard the trees in this section. The EA first rejected this because birds were nesting in the trees. The residents therefore waited until the winter, but the excuse then was the EA employees could be in danger if the river flooded. In desperation residents did the work themselves.

THE INFRASTRUCTURE



The Infrastructure:

Many people believe that over the last 30 to 40 years the infrastructure of the country has deteriorated due to a lack of maintenance and little or no investment in modernising the systems. Widely publicized cutbacks by successive Governments have led to many parts of the system failing. This is especially true in the Tewkesbury area, which the following examples will seek to show.

Surface Water Drainage:

The surface water drainage systems (in Tewkesbury and its environs.) have not been adequately maintained over the last 10 to 20 years. This caused large parts of the system to fail during heavy rain on July 20th and 21st 2007. Many houses started to flood due to the accumulation of rainwater, because drains were blocked with silt and debris. This contributed to the very high level flooding when the rivers and tributaries broke their banks.

During the heavy rains in early January 2008 many roads and houses were again flooded due to blocked drains. A representative of Gloucestershire County Council stated on a BBC radio Gloucestershire interview that even if they had maintained the drains to allow water runoff, many of the pipes in the system were too small to cope.

This is an extraordinary statement which suggests that Central and Local Governments need to make much heavier investment in the drainage systems in order to protect property and ultimately lives. Regular cleaning and maintenance of Highway drains is an essential duty of Gloucester County Council and should be treated as such!

In Tewkesbury and Bishops Cleeve the majority of surface water from roads and buildings drains into the tributaries of the rivers Severn and Avon. This means that a vast amount of water, drain very quickly into the Tewkesbury floodplain. This situation is further exacerbated, because the tributaries are not maintained in anything like pristine condition.



The water drainage from the western end of Knights Way drains through pipes going under Walton Cardiff Lane into the ditches adjacent to the road. These ditches have not been maintained for at least of 20 to 25 years. Consequently, any water flow has become minimal. The above photographs show the lamentable state of these ditches. There is a minimal flow at the northern end of Walton Cardiff lane, but then this flow peters out to nothing on its way down to the Tirlebrook.

The four photographs are a sequence showing the state of the ditches from near Pyke house progressing down to the Tirlebrook. These ditches require a complete recut and the drainage pipes where they enter the ditches need refurbishing.

It is of some concern that the residents of Walton Cardiff village have been complaining to local authorities about flooding issues for the past 10 to 15 years and to date nothing has been done.

Recommendation: 20

Because of the uniqueness of the North Gloucestershire flood plain the TBC and GCC should ensure professional advisors and planning officers are more fully conversant with the particular issues relating to flooding.

Case study No 8: Northway Oak Drive



First photograph shows Oak Drive Northway flooded, the second photograph shows the back of Oak Drive.

Oak Drive, Northway is not on the floodplain; therefore the flooding in July 2007 was entirely due to PLUVIAL water. Flood defences such as they were, are both poorly maintained and of inadequate design. This can be shown in the second photograph, where a red arrow points to a 25 metre embankment on which industrial units have been built. This embankment acts as a dam and has been the cause of flooding ever since it has been erected. Moreover, the ditch at the base of the embankment has not been maintained. It is thus wholly ineffective and together with the embankment meant that the residents of Oak Drive unnecessarily flooded last July.

The local authority are now trying to alleviate any backup of water runoff and the photograph below shows a ditch that has been dug to take the water from Oak Drive. Unfortunately this ditch runs into a 9 inch pipe which takes it under the M5 motorway. Thus this acts as a pinch point and risks the future flooding of the motorway. It does seem extraordinary the LA should not see that these two problems are inter-related and should be dealt with together. This is unfortunately a typical example of the problems of inter-agency co-operation, in that the ditch is the responsibility of the Gloucestershire Highways section of GCC, whereas the drain under the M5 is the responsibility of the Highways Agency. A single statutory body with responsibility for all aspects of drainage and flooding issues would easily resolve this issue.



Kestrel Way Northway:

Kestrel Way was severely flooded in the July 2007 floods. The flooding of the sewage pumping station added significantly to the unpleasant nature of the experience. Water displacement was also a factor, because Sallis Close had been built up during the development of the site. However the culvert on the Carrant Brook near the M5 had not been maintained and upgraded to cope with the increasing volume of water caused by additional development, such as Bishops Cleeve and the M5, as well as climate change.

Recommendation: 24

A plan should be produced to overcome the dam effect of the embankment at the Oak Drive Northway site by increasing the size of the culvert under the M5.

The Gloucestershire County Council, to their credit, have undertaken much work clearing the drainage systems of the county. In our opinion, much of this will be in vain unless other responsible bodies and individuals such as the Environment Agency and Riparian owners undertake their duties to clean and maintain water courses. Thus we return to a vital issue, which is the fragmentation of responsibility for the maintenance of the infrastructure. Until this is resolved the situation is likely to remain unchanged. It is essential that one authority co-ordinates all this work. We cannot understand why the Government doesn't immediately implement this change?

Recommendation 11

The responsibility of clearing ditches brooks and streams should be taken away from the riparian owners and placed with the Environment Agency.

Foul Sewer System: (Tewkesbury Town)

The main sewerage systems in Tewkesbury town were made up of a mixture of different designs, some of which date back to Victorian Times. This mixture combines pressurised and gravity fed systems. The Bredon Road development proposes to add a modern pressurised system to the existing gravity fed system, which runs through the Mitton Estate, after which it attaches to another pressurised system. Our concern is that an essentially Victorian sewage system, designed for a town of 5000 people, is in danger of being seriously overloaded and may well not cope with these additional attachments. This concern is "echoed" in the Gloucestershire Echo report of November 27th 2007



Figure 18 Gloucestershire Echo Report

Modernisation:

Mitton:

The existing sewage system in Tewkesbury was, as we have said, designed for a much smaller population. Extensive developments over the last 20-30 years have meant that the present system is no longer fit for purpose. It is essential, in our view, that the entire system should be modernised. It may be that Severn Trent will require Government funding to complete this. We believe that as a fundamental duty of care, both Severn Trent and Central Government have an obligation to ensure that this completed in as short a time span as possible, ideally within 5 years.

Cotteswold Road (Tewkesbury)

Cotteswold Road has a particularly deficient sewage system. The pipes are only 225mm. It is for this reason that Severn Trent have refused to adopt this system. At the same time Cotteswold Road is especially prone to extensive PLUVIAL flooding. It is our contention that because PLUVIAL flooding is not recognised in existing EA maps, this problem is entirely ignored by the TBC.

We hope that when Tewkesbury's sewer system is upgraded, it becomes a modern pressurised system. However, in designing the upgrade, there must be close liaison between TBC and Severn Trent Water, who have sophisticated software which will permit accurate mapping of PLUVIAL flooding.

Report Conclusions:

1: PPS 25 is a guide with no legislative force and is, in our opinion, weighed towards the developer Therefore it encourages the LPA to take a conciliatory stance which often acts against the interests of the local community.³⁵

2: If the stricter criteria required under PPS25 had been in place earlier we believe that this would have invalidated most major planning approval awarded since 1980.

3: PPS25 cannot effectively be used, without adequate external appraisal, to justify LPA policy.

4: PPS 25 advocates a **Risk Based Approach** to flooding where the residents of existing houses take the risk. This flies in the face of natural justice where those affected by flooding are doubly victimised.

5: Because of the unique situation of Tewkesbury (reference; number of rivers, quantity of flood water etc.) a **Risk Based Approach** is not appropriate.

6: Since 2006 PPS25 has required LPA's to produce a **Strategic Flood Risk Assessment.** We note as of August 2008 Tewkesbury Borough Council has yet to complete this assessment.

7: The situation is made worse by the fact that even the stricter guidelines in place since 2006 do not include PLUVIAL events. This in our view weakens the whole process.

8: The Environment Agency's indicative floodplain map is of limited value. This is in the main due to the Government remit to include FLUVIAL flooding only. This point is further reinforced by the fact that "Uncertainty Levels" a standard hydrological tool, is one of a number of basic practices excluded from the Indicative Floodplain Map thus making it a less valuable as an indicator of future flooding.

9: Despite the fact that the EA floodplain maps do not include PLUVIAL (rainfall) and other sources of flooding the LPA is expected to consider these matters when deciding on future developments.³⁶

10: There is undeniable evidence in recent local developments, such as Wheatpieces, where ground levels have been raised above the floodplain. This can misrepresent the extent of the actual floodplain and skew planning policy inappropriately.

11: Landfill and increased water run off from new developments has exacerbated flooding in the area. ³⁷

³⁵ Reference Professor Ian Cluckie: "*PPS25's biggest limitation is that it is a guide only and is open to local authority interpretation. The responsibility still rests ultimately with the LA*" meeting Bristol University 28/07/2008

³⁶ The Pitt Report question 5.22 seems to endorse this policy. In our opinion this leaves the situation extremely vague and makes it very difficult for LPA to resist powerful developers.

³⁷ PPS 25 does not require any detailed study on displacement and its effects.

12: Our calculations suggest that water displaced by recent landfill is approaching **One Billion Gallons.**

13: There is no general statutory duty on the Government to protect land or property against flooding. $^{\mbox{\tiny 38}}$

14: There is no statutory body in place with the authority to police any development infringement and oversee large scale developments in and near the floodplain.

15: The tributaries of the Severn and Avon have not been maintained or enlarged to cope with increased water levels and the culverts cause bottlenecks.

16: Landowners have the primary responsibility for safeguarding their land and other property against natural events such as flooding. This is so, when they have no control over Government actions that put their properties in danger.

17: Too much confidence has been placed in the efficacy of water management schemes (SUDS). We believe that these have minimal value in areas which experience high volumes of floodwater such as Tewkesbury.

³⁸ PPS 25 whilst superficially appearing to require Government authorities to protect land and property actually makes it clear that there is no legal requirement to do so.

Recommendations:

Many of these recommendations have been put forward by the Tewkesbury Town Councils Infrastructure Committee (see appendix 2) we have included some of the major ones here and we endorse TTC report.

1: To clean and maintain major water courses.

2: The Environment Agency should have a statutory duty to reduce flood risk to people and property over time and to put this priority above other environmental objectives.

3: The developers of new build developments should contribute towards the wider cost of upgrading drainage and foul water sewerage systems.

4: Building regulations should be upgraded to a higher standard and the Code for Sustainable Homes should be made mandatory.

5: The water companies should be statutory consultants on sewerage systems for new developments.

6: A clear investment commitment is needed by Central Government to update the local infrastructure.

7: Central Government should have a statutory duty to protect people and property from the dangers of flooding.

8: PPS25 should cease to be guidance and become a statutory obligation on Local Authorities.

9: PPS 25 should make mandatory the use of local knowledge and historical records on flooding.

10: Landfill should be made illegal within the floodplain, to stop water displacement into other areas, and landowners' should be compelled to clear illegal landfill.

11: The responsibility of clearing ditches brooks and streams should be taken away from the riparian owners and placed with the Environment Agency.

12: The old railway line acted as a dam during the floods of July 2007 and without this bund effect, areas of North Oldbury up to Hollams Road, Old Hospital Road and Rope Walk up to Chance Street would have flooded. We urge this damning affect of the old railway line to be enhanced by putting temporary flood defences in the gaps at Cotteswold Road, Newtown Lane and Northway Lane. This would have the effect of protecting these localised areas. We believe that these temporary flood defences which could be re-used in times of expected flood would cost in the region of £12 to £15000.

13: As a matter of urgency the exits of the Swilgate River and Carrant brook need to be upgraded to increase the flow of water. It is believed each would cost around £500,000.

13a: We recommend that a Roman vallum type causeway, as discussed on page 18 of this report, is built to divert the river Swilgate away from Tewkesbury at the time the flooding. The estimated cost of this is around £250,000 with £2 million culvert under the A38 linking to the existing canal.

14: The M5 motorway junction 10 should be opened to both carriageways in both directions. This would facilitate easier access for traffic on and off the M5 and allow higher volumes of traffic for relief aid the times of flooding. The estimated cost for the Highways Agency is between $\pounds 1m - \pounds 2m$.

15: The Eastern Bypass acted as a dam during the recent floods and we recommend Armco piping culverts to alleviate this affect. Several should be constructed underneath a road at various distances with an average cost of £60,000 each culvert.

16: With the Rivers Severn and Avon converging at Tewkesbury we recommend that the whole area incorporating the floodplain be made a special case and all building and landfill should suspended and an inquiry is undertaken into the flood resilience of the area. This would fully recognise the unique situation of Tewkesbury and the clear limitations of the PPS25 regime.

17: The Tewkesbury Borough Council's Local Plan to 2011 should be suspended and reviewed to fully accord with Government policy.

18: A local plan should be drawn up by a wider cross section of concerned stakeholders. Ideally this should consist from the County Council, Environment Agency, local councillors, Risk Assessors of the Association of British Insurers, local businesses and interested developers. The Local Planning Authority should have an advisory role only.

19: Because of the uniqueness of the North Gloucestershire flood plain the TBC and GCC should ensure professional advisors and planning officers are more fully conversant with the particular issues relating to flooding.

20: A professional hydrologist should also be employed jointly between the County Council and Borough Council.

21: Because of the scarcity of resources consideration should be given to the use of Army equipment and personnel at Ashchurch army camp to undertake urgent infrastructure and maintenance work. They might well enhance the army engineer training programme.

22: PLUVIAL and other sources of flooding together with uncertainty levels should be included into local authority flood maps before issuing them to developers.

23: A plan should be produced to overcome the dam effect of the embankment at Oak Drive Northway site.

24: The South West Regional Assembly should update their February 2007 RFRA to include PLUVIAL and historic data and take into account the July 2007 floods.

Bibliography and Sources:

Authors:

Dave Witts had a 40 year career with a large Engineering Company in the Tewksbury area. He spent 10 years as an Industrial Market Analyst and is skilled in analysing data and statistics. David also spent a number of years in sales and ended his career as a manager in Warehouse and Transport logistics.

Vernon Smith trained in civil engineering at Kidderminster Technical College. Vernon worked in the highways department for Worcester County Council from 1978 – 1999 He was a self employed civil engineer from 1999 – 2003. He started his own civil engineering company which he operates to this day.

We have written this report with an open mind and presented facts that have taken many months of foot slogging, research and authentication. We are satisfied that our conclusions, however controversial, are grounded in fact and fully supported by the evidence.

We strongly hope Planning Authority will read and digest this updated report.



Vernon Smith

Date published: September 2008

Licences: Ordnance Survey Paper Map copying licence 100047974.

Sources:

PPS 25 Planning Portal www.planningportal.gov.uk Environment Agency Tewkesbury Town Council Infrastructure Committee Tewkesbury Borough Council Gloucestershire County Council http://flood.firetree.net National Flood Forum Local Knowledge Ordnance Survey Professor Cluckie FREng, FRSA Bristol University Simon Fox MSc BSc MBCS MIBC Gloucestershire Echo Communities and Local Government With thanks to Cllr. Chuck Pavey for the original vallum idea.

The authors would like to thank John Badham for all the work he has undertaken proof reading this report.

Quote References:

Quote No: 1 Letter Hilary Benn MP to TTC 06/04/2008.

Quote No: 2 Letter to Severn and Avon Valley Combined Flood Group (SAVCFG) 07/05/2008.

Quote No: 3, 13, 20, and 21 Officers comment to SAVCFG 04/03/2008.

Quote No: 4 Article Glos Echo 13/09/2007.

Quote No: 5 Letter to SAVCFG 01/2008.

Quote No: 6 Letter to SAVCFG 04/2008.

Quote No: 7 South West Regional Assembly's RFRA 02/2007.

Quote No: 8 Email to SAVCFG 04/2008.

Quote No: 9 Authors quote.

Quote No: 10, 11 Anthony Perry to GCC scrutiny inquiry may 2008.

Quote No: 12 Local Resident to SAVCFG committee meeting 2007.

Quote No: 14, 18 SAVCFG meting at Bristol University Prof. Ian Cluckie 28/07/2008.

Quote No: 15, 27 and 28 Article Glos. Echo 25/10/2007.

Quote No: 16 Dr. Shepherd letter to Chris Shaw 08/2008.

Quote No: 17 Cllr Vernon Smith SAVCFG committee meeting 08/2008.

Quote No: 10a, 19, 24, and 26 Letter to SAVCFG 22/07/2008.

Quote No: 22 Letter to SAVCFG 07/08/2008.

Quote 25 conclusion of inspectors report Longford inquiry July 2008.

Quote 23 Said by Anthony Perry EA at a meeting with the Town Council 1/10/2007 confirmed in a letter by the Town Clerk 2/10/2007 to Chris Shaw TBC.

Appendix 1

National Housing Policy (authors personal opinion)

With the recent announcement by the Regional Spatial Strategy panel that an additional 4100 houses are to be built in the Tewksbury area the Severn and Avon Valley Combined Flood Group feel it necessary to comment on the Government's National Housing Policy.

1: We question the Governments assumption that the country will require **3 million houses** over the next 20 years. We believe that this figure has little validity and is a result of much flawed thinking;

- a) Recent industrial decline and outsourcing of manufacture abroad reduces the capability of the Government to keep large numbers of people employed.
- b) The birth rate over the last few decades that the population is liable to decrease rather than increase.
- c) The construction industry is being used as a job creation at the price of the destruction of much of rural England.
- d) Climate change is likely to increase our need to produce more of our own food. Unnecessary housing development is reducing our capability to do so.

2: The RSS has been imposed by the South West Regional Assembly which is an unelected Government quango with little or no accountability.

3: Decisions taken by the RSS appear in some cases to be bizarre. It seems extraordinary that the Cotswold area, which is less prone to flooding and larger in size than Tewkesbury should only be required to provide one third of the number of new houses.

4: In addition, climate change is having a real affect of the world's capability to produce food and the more land we take out of food production the more food we have to import. This opens us up to all kinds of dangers such as uncontrolled price rises and it is not beyond our imagination to see a country who is exporting food stuffs to the UK using food as a blackmail weapon to fulfil demands they might have on us. Recent events in the former Soviet Union have demonstrated the likelihood of this.

Lost Food Production Exercise:

We felt it would be interesting to do an exercise on lost food production based on available statistics.

The table for crop yields was taken from the Department of Agricultural and Rural Development website and shows the yield for three crops over three years and the average of those years.

We contacted the British Federation of Builders and they told us that the average plot size for houses was 100 square metres using this figure times the three million houses and an allowance for roads we came up with a land usage of 350 sq kilometres. It is felt that this figure is very conservative because no allowance was made for balancing ponds, swales or amenities.

The figure of 350 sq kilometres converts into 34964 hectares; we then decided to divide the hectares equally between the three main crops. This way we were unable to work out food loss on a cumulative basis over 1, 5, 10, 20 and 25 year basis.

Continued

Table 1: Estimates of Crop Yields Tonnes per Hectare							
	2005	2006	2007	3 year average			
Oats	5.03	5.87	5.29	5.40			
Wheat	7.37	7.58	7.41	7.45			
Potatoes Marketable yield	35.02	37.14	34.64	35.60			

Table one Source DARD





Table 2 Food Loss on a cumulative basis over time.

Table 3 Food loss at August 2008 prices (source Farmers Weekly)

Total loss to the economy over 25 years **£2,061,000,000** at todays prices if you allow for inflation and time this figure woul be upto **£1 trillion**.

Appendix 2

Floods July 2007: Infrastructure Working Group

Report of Deliberations to Full Council, 10 September 2007.

<u>A.</u> Preface

- a. The Working Group has met upon 3 occasions: 14, 21 and 28 August. It also met on 5 September to listen to **Clir. Cal way's** interpretation of the **2002 Local Public Enquiry** to consider its report to Council.
- b. It was Chaired by Cllr. Vernon Smith and comprised Cllrs. J Dixon, G Dawson (CC), C. Pavey, P Aldridge, M. Sztymiak (TBC)
- c. It was assisted by invitation by Cllr. Cromwell (GCC), Peter Finnegan, Alan Cromwell and Dr. Graham Shephard.
- d. This report has been written in the style required for The Government Enquiry (*EFRA PN60/070726*) which requires submissions by 13 September 2007. It requires an Executive summary + 3,000 word max submission.
- B. Council Executive Recommendations

For geographical reasons, Tewkesbury has always been and will always be susceptible to flooding. Since 1990 witnesses have experienced an increasing frequency and severity of flooding and the reasons for this must be understood and mitigated. The people of Tewkesbury are very vulnerable to decisions made elsewhere with scant regard for the consequences "down stream"

1 <u>Imperative: that one local agency should have complete control/scrutiny over all</u> agencies be they governmental (e.g. *E.A.*) or private (*Severn Trent Water*)

- a. flood prevention measures: to enforce spending where required
- b. **defining the flood plain**: it is clear that the current E.A. definition is too limited.
- c. **over-ruling plans to build** on the defined flood plain and to ensure that developers provide and maintain adequate drainage systems from the development to the outfall, however, distant that may seem.
- 2. <u>Demand a Local Public Enquiry into the causes of the 2007 Floods</u> and ascertain why the submission by Tewkesbury Town Council *Tewkesbury, Development within the Flood Plain,* written and research by Georgina Smith in October 2002 was not implemented. Re-visited since July 2007, it is arguable that had the evidence been heeded then the disaster of July 2007 might have been diminished.
- Halt all developments and plans which are currently taking place on or near the <u>flood plain</u> until it is decided that a flood disaster will not be the consequence.
 Living with flooding

It is argued that there are **three different types of flood**, which affect Tewkesbury

1. Flash floods

A. the hard flood - run off from concrete

B. the soft flood - run off from agricultural land

However as the hard flood travelled such distances from the Cotswold scarp villages like the now huge Bishops Cleeve, the hard and soft floods were coinciding in Tewkesbury. Flash floods in Tewkesbury then exacerbate the problem. 2. Avon Flood - 2-3 days later

<u>3.</u> <u>Severn Flood</u> - 2 to 3 days after the Avon flood, depending on where in the catchment area the rain had fallen. This is then exacerbated, especially on 22 July 2007 by a high tide on the Severn

Once all 3 floods coincide then tributaries like the *Swilgate*, *Tirle and Carrant Brook* back up causing even more flooding and damage.

The aim of many of our proposals would be

to enhance the passing of the flash floods before the impact of the River flood

C. Phased Recommendations re Infrastructure:

The Group analysed the problems and recommended solutions under three perspectives: **Short Term** (issues of maintenance which have been neglected), **Medium** (issues which require extraordinary funding but are urgent) and **Long Term** (issues which require extra-ordinary funding but which will be of long term benefit to the Town)

a. <u>Short Term (issues of maintenance which have been neglected.)</u>

- i. Drains Roads, gullies: clearing existing systems. Estimated Cost £99,000
 - a. Estimated that *Gulley sucker* required 30 daysx10 hoursx£80 ph *Jet Flush* 50 daysx10hrsx£150ph
 - b. Knights Way a priority, already in hand: GCC report now awaited;
 - c. Ashchurch Road: should 1 ft (0.3m) diameter pipes be replaced by 1 metre

culvert?

d. Wynyards Close

e. GCC have conceded that **there are no maps of drainage** systems so these must be drawn up by Parishes, with the assistance of Residents Groups.

f. It is claimed that Morrison's is protected by 2 culverts and a ditch from the *Tirle* which links up with the *Carrant Brook*, however the former Safeway had been built upon Wash lands called the *Water Meadows* which always used to flood without harm.

g. <u>Alleys</u>: where does responsibility lie for poor quality paving; lack of drainage from newer properties and blocked drains?

- ii. <u>Ditches</u>:
 - a. systematic plan for clearing debris and banks; There has been no increase in the capacity of the *Tirlebrook* or the *Fidd* and that the planning led to the joining of large culverts to smaller ones; the theory being that the flash floods would pass quickly; he also provided photographs of the bed of the Swilgate passing through *Rudgeway Farm* in 2006 which showed how silted up is that river in that location.
 - b. responsibility of residents of *Tirlebank* to clear half of *Tirlebrook* on each property to be clarified and enforced;
 - c. TTC has responsibility for ditch behind <u>Derek Graham play area</u>

<u>d.</u> <u>Balancing ponds</u> - are they adequate? Are they working? Who owns them? Who maintains them? It was felt that they were now silted up and, in any case, rendered less valuable because at level of water table.

iii. <u>Flood Plains</u>:

a. recommended that Town Council Advice contained in 2002 Flood Enquiry submissions be implemented

- b. The culvert under the A38 which gives the Swilgate access to the Lower Avon was - and still is - inadequate for the amount of water that it must pass in times of flood; since 2002 more houses have been occupied in Wheatpieces along with 400 homes in Bishops Cleeve. It must be stressed that the Swilgate hosts water from the rivers Tirle and Fidd as well as smaller brooks and drains the scarp of the Cotswolds from Dixton Hill to Cleeve Hill
- c. <u>The filling in of the Flood Plains</u>:
 - 1. Severn Trent should re-impose clearance order concerning materials dumped on the field behind *Pike House*, so-called *Massey's Field*
 - 2. Chapel Fields in Walton Cardiff had been in-filled by a local farmer

d. <u>The possible damming effect of new Roads</u>: are the culverts sufficiently large and are they cleared?

- 1. The Eastern Bypass:
- 2. The M5
- <u>iv.</u> Cycleway on former railway track which provides a dry route during floods. Cllr.
 Dawson (GCC) reported that it is in the funding priority for 2008-9 but that, because of its importance, he hopes that its priority will increase.

v. Closing the Cotteswold Road Gap in the Railway embankment which caused such misery

- b. Medium Term (issues which require extra-ordinary funding but are urgent)
- i. Coventry Close, Priors Park needs urgent building of a defence e.g. a bund

ii. *Mill Avon* requires

- a. Abbey Mill pond to be dredge from 3ft to nearer former 32'
- b. Owners of *Abbey Mill* be required to clear water wheel bays to allow passage of water
- c. King John Bridge archways need dredging and keeping clear of debris
- d. Finger moorings to be replaced by *floating mooring* with a *winding point* being kept clear to encourage tourist narrow boats to turn right and moor in Tewkesbury;
- e. Re-establish *LANT* control of <u>Town Slipway</u> by restoring chain on slipway with key issued only to *LANT* licence holders;
- f. Action taken to reduce speed which is wearing away the banks

iii. Prior's Park Emergency Dry Route:

a. the area already was a serious shortage of parking spaces for residents

verges where possible to be replaced by grass creep parking bays which could be cleared in emergency for use by police etc.

iv. <u>New estate development</u>; planning requirements need to be amended so that

- a. developers must ensure that they pay for improvements to existing communal drainage so that new homes can be drained effectively without overloading the system; perhaps this is the only moral use for Section 106 payments?
 - b. all new homes to be built with grey water provision
- v. raised decked causeways with Armco piping to be built at crucial blockage points
 - a. **Bredon Road** between c Handyman centre and corner of Oldbury Road (*Carrant Brook*) What about the need to rebuild the Carrant Brook bridge on Bredon Rd

using railings instead of a solid parapet to prevent damming of flood water which increases flooding of buildings? (GD)

- b. Ashchurch Rd: Wilding Close to Oldfield Road (Tirlebrook)
- c. <u>Church Street</u> but problem of Abbey Terrace might mean only recourse is to widen stream through Gloucester Road bridge on the *Swilgate*
- vi. <u>link road between Morrison's Ghost Road and Station Road</u> with bollards to restrict traffic except in emergency as only dry route into town. . (Some councillors would like this |road extended along Station Road to give access only to the Town Centre Car Park in Spring Gardens. Cllr. Dawson advised that "it had already been looked at by GCC and rejected on safety grounds on at least 2 occasions in the past."

vii. Canal bypass

Cllr. Pavey provided a rationale for a flood canal to link the **Swilgate** just west of its confluence with Deans Brook and the **Coomb Hill Canal**. The distance was estimated at 2.5 km and way leave would be purchased to construct a *vallum* for flood water which would be grassed for pastoral use in normal times. This would necessitate a really appropriately large culvert under the A38

The benefit would be that much of the water which funnels into the Swilgate via Tewkesbury suburbs would enter the Severn giving some relief to Deerhurst.

The disadvantage would be the threat to the wild life reserve on the *Coomb Hill Canal* which suffered to badly in these floods of 2007.

However, all members of the committee thought the idea merited earnest consideration.

<u>viii.</u> Dredging/clearing of debris from Rivers Severn and Avon: in commercial days 12 ft was the depth and in pleasure days 6ft. Is this maintained?

<u>c.</u> <u>Long Term</u> (issues which require extra-ordinary funding but which will be of long term benefit to the Town)

i. <u>M5 Junction 10 to be opened up to both carriageways and directions.</u>

ii. Relief Roads

a. Northern *Relief Road*

i. The Chair explained from professional and personal experience that the embankment which carried the former railway acted as a dam which probably protected a lot of the Northern Oldbury from being flooded

ii. the flooding in Station Lane and Cotteswold Road was probably caused by flood water **penetrating the gap** which used to be bridged by the railway: the gap needs flood defences

iii. therefore, if present ideas were carried through and the embankment was gradually lowered to meet a roundabout in the Bredon Road, then even more properties in the Oldbury would have been flooded

iv. <u>Conclusion</u>: from a perspective of flood prevention then the proposed GCC **Northern Bypass** along with former railway would exacerbate flooding in the northern Oldbury area.

b. <u>Alternative Bypass Plans submitted by Peter Finnigan via the Chair (plan attached)</u>

i. <u>Phase 1</u>: This would coincide with raising the level of the Bredon Roads over Carrant Brook by decking; Bredon Road would be raised on a solid embankment from the decked section to the White Bear

<u>ii.</u> Phase 2: The former railway embankment would be preserved as a noise and flood barrier (with a bund filling in the crucial gap at the end of Cotteswold Road. The Relief

Road would then be built on a new embankment to the north of the existing one in the Carrant Flood Plain which would gradually be lowered to meet the raised Bredon Road.

<u>iii.</u> Phase 3: would then be the purchase of land from the Tewkesbury Marina to bridge the Avon and follow the enlarged railway embankment to a roundabout at the junction of the A38 and the Ledbury Road.

iv. The committee concluded that this imaginative plan might be so expensive and exacerbate the flooding y using the Carrant Brook floodplain.

c. Alternative relief roads for the traffic (which would also be dry in times of

flooding):

i. <u>a road linking Shannon Way and the Bredon Road</u>, north of the new allotments. This would give an alternative e way of accessing the M5 without travelling through the town centre.