Stemming the flow – Managing flood risk in existing developments

LANDF♦RM/CIEF event: E9510

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EXECUTIVE SUMMARY

Speakers	Andrew Savage	Warwickshire County Council
	David Schofield	Arup
	Mary Dhonau	National Flood Forum
	Melanie Dinnis	Birmingham City Council
Chairman	Nigel Ridgway	Arup

THE ISSUES

The 2007 floods demonstrated the impact of flooding on people, businesses and communities. One in six buildings in England and Wales are at risk of flooding from the seas, rivers or surface water. Research has suggested that unless this is addressed, the cost and impact of flooding will only get worse.

Subsequent reviews of the 2007 flooding, guidance and proposed changes in regulations suggest that flood risk in existing developments needs to be tackled. This involves addressing difficulties in communities already vulnerable to flooding and/or looking at the opportunities regeneration provides to improve the way that flooding is managed in existing developments.

This event highlighted a number of the challenges that are faced when managing flood risks in existing developments, and also outlined a number of approaches to deal with the issues of flood risk.

LEARNING POINTS

1. Gain an appreciation of the different approaches local authorities take to managing flood risk in existing developments.
2. Appreciate the importance and understand the recent developments in IT systems used to predict and manage flooding events.
3. Understand how sustainable drainage can be retrofitted into developments, in particular using Portland in the USA as a case study.
4. Be provided with an overview of how individuals and communities can prepare for flooding, including flood protection techniques for individual properties.
5. Be provided with an overview of how homes can be made more resilient to flooding events, making recovery from flooding a simpler, less stressful experience.
6. Gain an insight into how local authorities plan for emergencies and how risk is managed appropriately.

7. Understand the importance of community/public engagement, before, during and after flooding events.

CHAIR'S INTRODUCTION
Nigel Ridgway, Arup

- *Nigel is an Associate Director at Arup, working within their Water Engineering department. Nigel has many years of experience working both in the UK and internationally.*

Nigel very kindly introduced himself and then set the scene for the afternoon, highlighting the issues faced by individuals and organisations in the face of increased flooding. He reminded the attendees of the impacts of the 2007 floods and how important it is to learn from the issues that arose at that time.

OVERVIEW OF FLOODING IN WARWICKSHIRE
Andrew Savage, Warwickshire County Council

- *Andrew Savage is a Chartered Engineer with 25 years experience within Consulting, Contracting and Local Authorities across a broad range of structural design, regeneration and highway maintenance activities. As a senior bridge engineer in 1998, first hand experience was had in directing resources to repair some 60 bridges damaged in Warwickshire by the Easter 1998 Floods.*

  In 2007 some 2000 properties were flooded in Warwickshire. Andrew was involved in the Emergency Response activities in his role of County Highways Operations Manager. Whilst the damage to highway infrastructure was less than 1998, the impact on some 75 communities in 2007 across Warwickshire where clusters of 5 to over 100 properties were flooded was significant. Andrew established a strategic flood forum in Warwickshire to progress multi-agency solutions to the varied and complex causes and responsibilities of flooding. The presentation gives examples of the progress and challenges in Warwickshire to help mitigate future flooding and how emergency services respond to such events. Flooding of 40 properties in Bedworth in December 2008 clearly demonstrates the randomness of floods and that local flood events can happen almost anytime and are not the "norm" of 1 in 50, 100 or 200 year events.

Andrew introduced himself and gave a brief background of flood events over the past 100 years in Warwickshire. In particular, he highlighted that of the 9 major flooding events that have occurred in the past 100 years or so, 5 have been in the last 11 years. When dealing with this flooding, Andrew outlined some of the difficulties faced by local authorities and the complexity of flood response mechanisms.

A brief pictorial guide to the 2007 flooding highlighted the damage done in Warwickshire, where almost 2000 properties were flooded in 75 different communities. The total insurance bill in Warwickshire was £90 million, with particular problems affecting the highways.

In response to the 2007 flooding, the Warwickshire Strategic Flood Forum (WSFF) was established in October 2007. This was developed to ensure that individuals and key stakeholders work closely as a team. If this does not happen, then coordinating a response to flooding is made impossible. The WSFF engaged with the Environment Agency (EA), Severn Trent Water, the 5 local districts and numerous other stakeholders to ensure effective flood risk management. Terms of reference were set to ensure effective collaboration.

In response to the 2007 flooding, weather conditions are monitored much closer these days whilst proactive surveys during flood events helps to identify major risks. This is particularly

the case for the road network. It is therefore essential to clear roads as quickly as possible – working closely with partners such as the EA is essential to make this run smoothly. However, it is also essential that PR is managed effectively to ensure that the public are kept fully informed at all times. Ideally you need someone on the ground within the hour. Road repairs must be blitzed and completed within 48 hours if possible.

In order to help manage flooding events, an IT system has been developed. This is deemed essential as it helps to manage and share information amongst key stakeholders. The IT systems can also be used to manage assets and infrastructure, such as gullies and culverts that need cleaning. Using this system helps to explain to the public what is happening and to manage their expectations.

The use of GIS systems is a big leap forward for Warwickshire county council. GIS systems can be used to plot the extent of flooding and the location of flooded properties, helping to target responses during flood events. Lots of future GIS layers can be created, adding to the usability of the system.

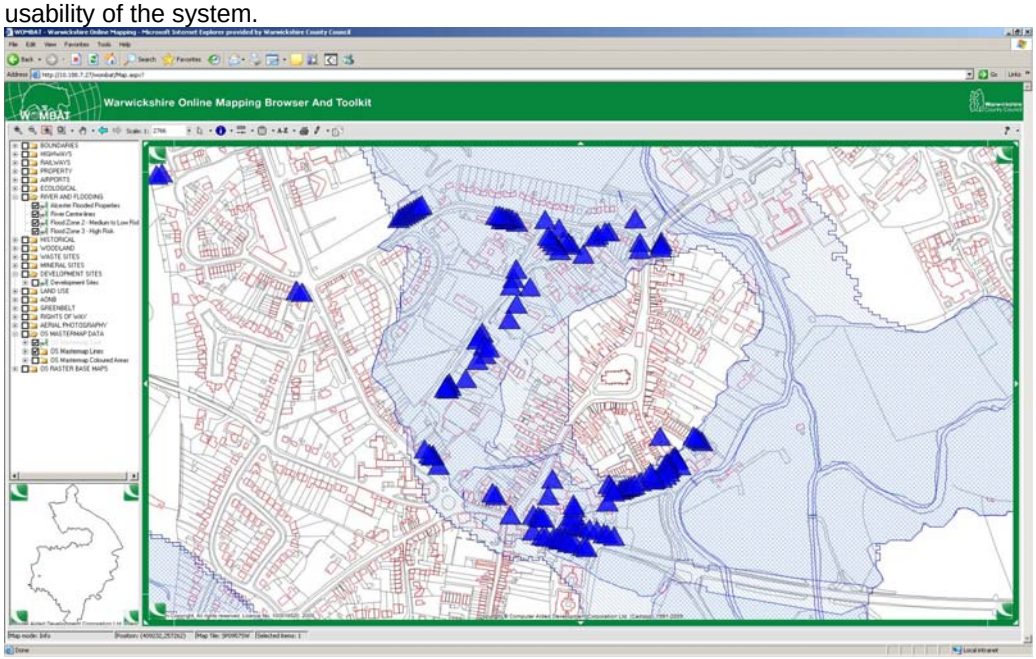

Figure 1: Example of IT system used by Warwickshire County Council to help predict and deal with flooding events.

However, all these systems require money. £0.5 to £2 million is needed to sort out the initial problems faced, and £10 to £30 million projects will be required in the next 10 years or so. However, simple, localised solutions offer protection at a much lower cost to all involved. For example, a £30,000 scheme to reduce flooding may result in a £2 million saving.

Finally, future schemes such as the EA's 3D flood mapping programme really help to develop knowledge and responses to flooding events. Such information is also vital to help explain what is happening to the public. However, a team effort such as this is essential to ensure the effectiveness of responses.

In conclusion, Andrew highlighted the importance of information sharing and particularly the use of IT systems such as GIS and 3D flood mapping software. He also mentioned that working in partnerships is essential, not only before a flood occurs, but also during and afterwards.

MANAGING SURFACE WATER WITH RETROFIT SUSTAINABLE DRAINAGE
David Schofield, Arup

- *David is an Arup sustainable drainage and flood risk management design champion, with over 24 years of experience in infrastructure and water engineering. He is a leading member of British Water's Sustainable Drainage Focus Group and was a member of the Department of Trade and Industry's 2006 Technical Watch Mission to understand sustainable drainage in the United States. He regularly presents on the subject of sustainable drainage.*

David introduced his presentation and highlighted the advantages to learn from overseas examples of best practice. David discussed his first hand knowledge of overseas examples of sustainable drainage systems, focusing on a DTI supported Technical Mission to the United States, as part of a group led by Professor Richard Ashley. Particularly relevant and interesting is the Portland Oregon case study. From this Technical Mission, a guidance document was produced that drew many of the same conclusions as the Pitt Report and the draft Flood and Water Management Bill (FWMB). This guidance document can still be found on DEFRA's website with regards to surface water management.

Using Portland as the key case study, David explained that many of the changes made were led by Local Government and a landscape architect called Tom Liptan. The Willamette River that flows through Portland had been considered an open sewer, with extremely high levels of combined sewer overflow discharges occurring yearly. Led by Tom Liptan and driven by the American Clean Water Act, Portland's Local Government introduced a raft of sustainable drainage implementation, some simple and some much more complex, that have led to the dramatic cleaning of the city's waterways. This is the best case study currently available for the benefits of implementing sustainable drainage. Further information on this case study can be downloaded from:

www.portlandonline.com

It is important to understand that the implementation of sustainable drainage will not prevent flooding. There is already a huge impermeable footprint stamped across the UK and drainage systems are overloaded. Different from traditional drainage practices, sustainable drainage systems have the capability help to manage flood risk, not prevent them from occurring.

Joined up thinking is essential to allow this to happen. David discussed the virtual triangle of developer/consultant, planner and the EA in the three corners. If this triangle is turned into a circle and all parties work as a team, then the successful and widespread implementation of flood risk management and sustainable drainage will be closer to being realised. This forward thinking has been shown to work, and is essential for the future development of flood risk management.

The FWMB suggests that Local Authorities are empowered to deal with flooding and sustainable drainage; this is a positive step and the best way to realise potential success. However, David highlighted that a recent backward step was the loss of the sewerage drainage agencies from within Local Authority in the 1990's. To combat this loss, a contemporary team approach is required that involves all the key stakeholders. In this way, a new centre of excellence can be developed that in time may replace the loss of local knowledge from the old drainage agencies.

Engaging and empowering the public is also essential. Education ensures that the message about sustainable drainage gets across and also allows individuals to take ownership of their own drainage issues. Again, Portland provides a fantastic example of this success, where the public were actively engaged from an early stage of the project. It should also ensure that the general public better understand drainage issues; such as a reduction of adding to the impermeable cover already present in cities, by concreting/paving front gardens for parking. Instead, home owners and developers should use sustainable drainage techniques to limit the impact of excessive surface water runoff.

However, part of the problem is that the current drainage systems used in the UK do not adhere to the principles of sustainable development and there needs to be a move towards

sustainable drainage. Sustainable drainage should include not only soft solutions such as ponds, swales and reed beds, but should also include proprietary solutions such as buried detention tanks and systems with flow control, as long as the design and operation of these systems is achieved in a sustainable manner. Use fully the toolbox of techniques; choose the correct solution for each sustainable drainage implementation. Trees and plants are also extremely important in managing and attenuating surface water. Catchment restoration, as advocated by Chris Baines, can certainly help improve downstream surface water management.

Using Portland as an example, David ran through a number of examples of sustainable drainage. This included downpipe disconnection, which was carried out completely or partially on 48,000 Portland properties. With a very similar climate to the UK, why couldn't this work in the UK? Also linked to a reduction water rates from reducing runoff into the public system, so a visible incentive there. Curb extensions are also a great example of innovative but simple sustainable drainage. Instead of infilling traffic calming measures with concrete or macadam, natural vegetation and storage volumes is provided to help manage surface water quantity and quality, while providing local amenity from sustainable drainage. Some of these schemes were so popular in Portland that the local neighbourhood adopted maintenance of them, carrying out light work when appropriate, and they now make up part of Portland's Green Streets. Space is often considered to be a problem, but there is space available if we look; for example, the middle of roundabouts. Other examples from Portland included rain water gardens, surface water planting boxes and swales. An important thing to remember is that these schemes work as either new build or retrofit.

Figure 2: Surface water planter box in Portland, Oregon.

Maintenance is also often considered to be a barrier to implementation of these sustainable drainage techniques. However, studies in Portland have found that the increased maintenance costs are negligible over pure landscape areas, while the potential benefits are huge. Natural areas are often needed in city centre locations, and combining these with sustainable drainage is an obvious solution.

Other examples of possible systems include Fillterra (by Hydro International), which is a bioretention system that is simple, effective and easy to install. This shows that proprietary solutions can be combined with natural sustainable drainage. Other ideas include brown roofs and green roofs, both of which can be retrofitted, but are more likely new build.

Finally, the EU Water Framework Directive (WFD) is also important. It is here to stay and will have a big say in future water management techniques. Many of the systems and techniques outlined above can also help to meet the needs of the WFD. Another key message is the operation and maintenance of these schemes. Water companies must be engaged in order to

successfully manage these systems. If we are to achieve authentically sustainable drainage, then the whole life-cycle issues of drainage schemes must be considered and addressed, to meet the criteria for sustainable development.

Q&A – Andrew Savage and David Schofield

Is there a possibility that flood information will be made free under the freedom of information act?

It would be fantastic if it could be made available, and certainly in the past it was free to access. However, the information that is provided needs to be accurate, and getting this accuracy is expensive. Who will pay for this? Likely to be the taxpayer.

What is Warwickshire County Council doing to prevent continued development on water/river fronts?

Policy is being reviewed and developments are now being scrutinised in more detail before being allowed to proceed through planning. Many local authorities are now using their Core Strategy's for development planning, and this includes flood planning issues. There is also an added case for using technology and IT systems. The tipping points between a flood occurring and not occurring are extremely marginal, and the technology that is available is essential to assess this sensitivity.

Will this type of work be rolled out nationally?

Very difficult to roll this out nationally as there are so many people to deal with. You can't network with everybody, but talking to neighbours is essential. It is a logical process, but Warwickshire are still at the early stages of this.

How do you engage with the public?

In Portland, this was driven by the vision of one man, Tom Lipton. However, the information still had to be provided to the public. This is achieved though flyers, lots of information on their website, and the tools to DIY disconnect. There are also cycling and walking tours to see sustainable drainage schemes in the city.

How do you prevent public fatigue towards sustainability?

Got to start at the local government level. In Portland, 10 years ago the situation was terrible. However, the local government kept banging away until everybody took ownership. Education of the public here was key.

PREPARING AND RECOVERING FROM FLOODING
Mary Dhonau, National Flood Forum

- *Mary Dhonau is the chief executive of the National Flood Forum which is a registered charity run by people who have experienced the trauma of flooding. The National Flood Forum provides support to communities and individuals that have been flooded, or are at risk of flooding. It aims to influence central and local government and all agencies that manage flood risk.*

Mary explained that she has been flooded numerous (12) times in the past, and having recently moved houses, she was horrified to see how much urban creep there is in suburban areas. Her aim is to make homes greener and more flood resilient.

For this to take place, being prepared is essential. When she was asked to do this presentation, she was asked to discuss the public's perception of risk. Those that live with flooding are very aware of the risk that flooding poses, for example, those that live on the

water front in Worcester. These people don't generally sign up to EA flood warnings as they know what is likely to happen and unfold.

However, at the other end of the spectrum, trying to explain flood risk to those who are rarely flooded is extremely difficult. What does a 1 in 75 flood actually mean? If there has just been a 1 in 50 flood, then surely there is not going to be another large flood for 50 years, right? Mary uses dice to try and explain the risk involved with flooding, and how random the occurrence of flooding can be. It is essential that individuals, families and businesses are prepared.

Mary then provided those in attendance with an excellent pictorial guide to individual property based flood protection, many of which are available using Defra grants. Making a house more flood resilient is essential as all flood barriers are likely to be topped at some point. A family flood plan is also a useful way of making a home more flood resilient. This plan will provide information for getting everything out of harms way. Mary has done this on her own home, and the last time she was flooded, she returned home within 3 weeks.

Mary's pictorial guide highlighted to following flood protection techniques:

- Sand bags – these are generally not a good option for the simple reason that they don't work very well. They also require huge amounts of man power to move, fill and dispose of. New technology has developed bags that soak up huge amounts of water, much more efficient than old style sand bags.
- Flood stop – a temporary plastic structure that can be useful at keeping back flood waters.
- Rapidam – well known for their use during the 2007 flood events. These can be stored in strategically placed depots and can be rolled out when needed. These are especially effective on a short term basis where it is not cost effective to develop large scale flood defenses. Without such schemes in Morpeth, for example, a huge evacuation would have had to take place.
- Geodesign barriers – these have been used in Sweden where they are placed around small infrastructure.
- Fencing flood kit – this is an easily erected garden fence that also looks fairly attractive. Some of the fence goes underground to prevent property level flooding.
- Door boards – these work, especially for flash floods events.
- Air brick covers – there are a number of styles of air brick covers, all of which are effective at preventing homes from flooding. Many houses flood through their air bricks, so there is lots of evidence that these schemes work.
- Anti back flow valves – these are extremely useful, but need to be fitted professionally.
- Huge polythene bags – these are used to protect household items that can not be moved upstairs.
- Retractable membrane – this has been shown to be useful in a Wales restaurant. The housekeeper pulled up the membrane by herself, so it's very easy to do.
- Flood alarms – extremely useful for those houses that do not receive a flood warning or are often flooded by small streams or brooks.

The majority of the solutions outlined above are now available in B&Q. Many are certified and have kite marks, but there needs a change in mindset for people to start buying and using these products. Even DIY solutions work, and they are cheap to install.

Information on all of these products can be found in the National Flood Forum Blue Pages which are currently being upgraded in conjunction with the EA.

Houses can also be made more resilient. Techniques for this can include using:

- Plastic skirting boards
- Raised sockets
- Raised white goods

- Concrete steps to staircases
- Drains fitted inside the home
- Barge board removal
- Installing sumps, pumps and drains
- Easily removed radiators
- Rendered walls
- Plastic carcass to rooms, where wood fittings can be removed.

A lot of these are simple and common sense solutions which can help to remove the stress from being flooded. The stress of being moved out of home is huge, and in some cases people have had to live somewhere else for 2 years (often in a caravan).

To help flood victims, there needs to be a one stop shop that provides consistent advice that is readily available at a time of need. There also needs to be trained staff to be able to deal with traumatised victims of flooding.

In conclusion, individuals, households and businesses at risk of flooding must be prepared. The essential flood guide provides very useful advice and can help the community to work together, not against each other. Finally, the development of community and family flood plans is essential.

FLOODING AND EMERGENCIES
Melanie Dinnis, Birmingham City Council

- *Melanie Dinnis is a member of the Emergency Planning Society and has worked at Birmingham City Council since 2006 where she has helped to develop the council's emergency planning training and exercising strategy. She also advises on the development of community flood plans. She has organised a wide variety of flood exercises involving key stakeholders.*

Melanie works for a multi-agency team comprising of council, fire, police and health officers. This helps considerably with teamwork and communication. There are always 2 council emergency planning duty officers on duty at any one time to ensure that there is always a single point of contact for emergency services requiring council resources during emergencies.

The Civil Contingencies Act 2004 (CCA04) has helped to shape this team and its responsibilities. Assessing risk is a major part of this process, as is emergency planning, warning, informing and advising the public, and sharing information with local responders. The team is also involved with business continuity management within their own organisations and promotion to Birmingham businesses and voluntary organisations.

Under CCA04, the team is responsible for developing risk assessments. Risk is expressed as a measure of the significance of a potential event in terms of likelihood and impact, where:
- Likelihood is the probability of an event occurring in the next 5 years; and
- Impact is a measure of the impacts that the event will have.

The West Midlands Conurbation Resilience Forum (which includes seven unitary authorities and emergency response organisations) is responsible for creating and maintaining a Community Risk Register which contains 52 different risks. With regards to flooding, there are 3 specific risks that have been identified within the register and entered into the matrix below which all have an overall risk rating of high. These are:

- Major local fluvial flooding due to a sustained period of heavy rainfall and steadily rising river levels resulting in flooding of more than 1,000 and less than 10,000 properties
- Major local fluvial flooding due to a sustained period of heavy rainfall and steadily rising river levels resulting in flooding of more than 100 and less than 1,000 properties

- Localised fluvial flash flooding due to heavy localised rainfall in steep valley catchments resulting in flooding of up to 200 properties

Birmingham has a population of around 1 million, living in a heavily urbanised area (an average of 3,649 people per km^2). Birmingham is also situated in a narrow floodplain which heightens the risks of flooding. Many of the watercourses respond quickly which leaves approximately 14,000 homes at risk of fluvial flooding, and 22,000 homes at risk of surface water flooding. Watercourses are either categorised as 'Main River' or 'Ordinary Watercourse' and this provides a distinction for responsibility. The Environment Agency is the enforcement authority for Main Rivers and the Council for Ordinary Watercourses.

Flooding in the local area has occurred recently, particularly in 2007 and 2008. Over 200 properties were affected in Witton in June 2007, 100 properties in Sparkhill in July 2007 and over 100 properties were affected in South Birmingham in September 2008. One of the most challenging aspects of dealing with flood events is gathering information. Often the number of individuals and households affected by flooding are underestimated as many are unreported, and this creates real difficulties when trying to gather a clear picture of the impact of the event and provide support to local communities.

The Pitt Review (Independent Report into the Summer 2007 Floods) prompted many changes in flood management including the development of new national flood planning guidance and associated checklists. In response to this, the Birmingham Resilience Group developed the Multi-agency Flood Plan for Birmingham. This plan details the individual responsibilities of agencies and their co-ordinated response, whilst the appendix of this document includes a flood tool kit which links to templates and useful documents to be used by those responding to flooding. This plan has clear triggers for monitoring and activation and also acknowledges some of the limitations of the agencies response to flooding.

A neighbourhood flood plan template has also been developed to assist newly formed local flood action groups in their arrangements. These groups are being encouraged and supported by the Birmingham Resilience Team.

The following actions may be undertaken by responding agencies during a flood event:

- Clearing blocked gulleys
- Clearing blocked grills/trash screens
- Deploying sandbags (despite their limitations)
- Road closures
- Property protection measures (agencies protecting own assets or assisting vulnerable residents as detailed in local neighbourhood plans)
- Evacuation
- Transport of the public to shelters, including specialist transport
- Temporary shelter and welfare arrangements
- Crisis support teams
- Translation services
- Provision of information to public and media management
- Provision of machinery and equipment e.g. lighting
- Provision of high volume pumps

Birmingham Resilience Group has developed a Multi-agency Recovery Plan which includes provision for engaging with the communities affected by flooding. Door knocking is undertaken to provide advice and support to communities and newsletters distributed which detail special services e.g. additional waste collection. The Council may also activate its emergency information line.

The Birmingham Resilience Team promote community resilience through a combination of simple measures including advice and guidance leaflets, community forums and events, a resilience DVD and website. Engagement with communities has identified a number of innovative approaches and allows these measures to be tailored to their needs.

Figure 3: The Birmingham Resilience Team engaging with the community

Finally, one of the key messages that came from Melanie's presentation was the need to ensure integration of all relevant partners. In this way work will not be duplicated and different groups will communicate effectively, ensuring that public interest is maintained – hopefully leading to an increase in flood resilience.

Q&A – Mary Dhonau and Melanie Dinnis

Do flood plans include depths?

Some limited information is available in local neighbourhood plans. This is generally anecdotal from previous experience of events. As more information becomes available e.g. through modelling work, this is likely to be included.

Multi-agency plans – has there been a problem with giving out information?

This has not been a problem so far. If communication is dealt with effectively, then this should not prove to be a problem.

To date, organisations have been focused on achieving quick wins. After this runs its course, is there a possibility that infrastructure will be changed?

This is certainly a possibility. If we start at the outfalls and work upstream, then this may happen. However it needs the input of the government to be successful. Legislation needs to change for this to happen. In November the draft Flood and Water Management Bill will be re-branded the Flood and Water Emergencies Bill.

Do neighbourhood flood plans target specific areas of flooding?

So far, the neighbourhood flood plans have focused on areas that are worst hit during times of flooding. However, this is just a starting point, we hope to encourage more communities at risk of flooding to develop plans in the future.

DISCUSSION – All panel members

You discussed earlier that in Portland incentives were provided for people to join sustainable drainage schemes. How did this work?

Incentives came in a number of forms. There was the opportunity to reduce water rates if you disconnected down pipes. However, the best incentive came through the provision of education to the population. Arial photography was used to show areas with the best schemes, and the benefits of using these schemes.

Generally, the approach in Portland was belligerent – the city provided information and kept doing so until the local communities accepted it. The incentives therefore came from the driver of improving the city and environment you live in.

This question then led on to an animated debate regarding the paving of front gardens…

A number of attendees discussed the legislation relevant to hard paving, and in particular to front gardens. At the moment, the majority of the public don't see the problem with paving over front gardens, and this is generally due to the lack of information that is readily available. This information needs to be promoted for there to be a significant change in peoples attitudes.

It was also then stated that permitted development rights that allow householders to pave their front gardens changed last year. This legislation, however, only covers front gardens, leaving back gardens to be treated in any way.

The point was also made that planners are not always to blame for this type of work. The planners work within the regulations, and often in the most cost effective method.

Finally, it was generally agreed that for changes to occur, then community engagement and education is extremely important. Without this public buy-in, then any changes made to drainage systems will be very difficult.

Mealnie Dinnis has kindly provided the following information with regards to the above debate:

Section from the CLG Guidance on the permeable surfacing of front gardens (available from: http://www.communities.gov.uk/documents/planningandbuilding/pdf/pavingfrontgardens.pdf):

From 1 October 2008 the permitted development rights that allow householders to pave their front garden with hardstanding without planning permission have changed in order to reduce the impact of this type of development on flooding and on pollution of watercourses.

You will not need planning permission if a new or replacement driveway of any size uses permeable (or porous) surfacing, such as gravel, permeable concrete block paving or porous asphalt, or if the rainwater is directed to a lawn or border to drain naturally.

If the surface to be covered is more than five square metres planning permission will be needed for laying traditional, impermeable driveways that do not provide for the water to run to a permeable area.

From Pg 91 of the Draft Flood and Water Management Bill:

Prevent actions that increase surface run-off risk

492. Article 4 of the Town and Country Planning Act (General Permitted Development) Order 1995 allows local authorities to impose local restrictions on works that would reduce the water

retention of back gardens and private roads. It specifies which types of development do not require specific planning permission and are deemed 'permitted'. Since changes made on 1 October 2008, these rights do not include the hard surfacing of front gardens with impermeable materials where the area in question exceeds five square metres. They continue to include the impermeable paving of back gardens and privately owned roads. However, Article 4 directions allow local authorities to introduce local restrictions on these activities.