

FLOODY HELL

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Abstract

Is flooding becoming more prevalent – would history show different? What is the level of impact of media coverage over the years and how has it evolved and grown? What are the flooding impact and effects on local communities (people impacts) and the response to these impacts by a Local Council including the political role? Is existing flooding legislation (1961) and Planning Policy (2004) sufficient regarding the approach to flood prevention – direct defences approach, or does new legislation have a different emphasis of dealing with flooding. Is climate change happening?

Key Words: Past impacts from floods on communities, current approach to address impacts, future approach to address impacts (Scottish perspective) including the role of the Municipal Engineer.

Introduction

So why are we interested in floods and their effects? What is currently undertaken and what is currently being proposed to manage the threat and risk from flooding.....in Scotland?

Firstly what causes floods?

Quite simply floods are caused, generally, by the following:

- Heavy rainfall, act of God – not the Local Council's fault;
- Inadequate capacity of watercourses and culverts;
- Developments in urban areas;
- Global warming and climate change.....are weather patterns changing???
- Land wetness;
- Snow melt;
- Cumulative effects;

Has there been an increase in floods?

Well recent news reports would tend to confirm that.

Recent flooding in the summer of 2007 was linked to the deaths of 13 people, damage occurred to approximately 48,000 homes and

7,000 businesses across the UK. The Moray communities of Elgin, Rothes and Lhanbryde were severely hit by flash flooding in 1997 and 2002 causing an estimated £100m worth of damage to property.

Global warming, climate change (?) does appear to be happening - a report prepared by the Babbie Group (now Jacobs) for the Scottish Government has suggested that by the year 2080 in some parts of Scotland, flood return periods will have halved. That means if a flood has a current return period of 1 in 100 years, it will probably be 1 in 50 years by the year 2080.

The risk of flooding has also been increased by the growth of towns. Rain, instead of falling onto absorbent fields or woods, now falls onto roofs and roads, draining swiftly into watercourses, increasing storm flows and creating new flooding problems where none existed before.

Even the great City of Melbourne has suffered from flooding in the past. The most significant flood in Melbourne's recorded history, now referred locally as the "great flood of 1891", occurred after two days and two nights of rainfall, and caused the Yarra to swell to 305 metres wide, with around 3000 people having to vacate their houses. Did the local populace ask the question at that time; was this flood caused by climate change? More recently flash flooding took place in Melbourne as recently as 1972. Did the local

populace ask the question at that time; was this flood caused by climate change? But has there been an increase in floods? I will come back to this question.

Has there been an increase in damage?

The economic impact of floods is now greater than it was in the past.....Why is that?

Well, the consequences of water entering homes and business in terms of financial loss are now much greater than they were, say, a hundred years ago. Houses with solid stone walls, seasoned timber floors, no electricity and relatively few possessions do not result in the same economic losses as a modern timber framed house with chipboard floors, filled with all manner of high value consumer items. Similarly, flooding of a heavy engineering works does not produce the same losses as flooding of an electronics factory.....nor the submergence of a bicycle the same loss as the submergence of a car.

Another aspect is the development of land that is subject to periodic flooding. There was little need to use such land hundreds of years ago, except for possible crop growth. Today, such areas are covered in houses, factories, transport systems, supermarkets and all the other aspects of modern living.

Flood events nowadays are very costly for insurers. A research project undertaken at the University of Dundee in 1996 established that only half a metre of water in a modern semi detached house will cost an average of £15,000 for buildings damage and £9,000 for damage to contents.

That was in 1996; we have moved on 13 years, so these costs will have risen.....now for 100mm of flood water in a house we are looking at £75,000 of damage (18 July 2007, flooded house in Kilmarnock, due to a blocked culvert).

Has there been an increase in interest?

There is now a huge increase in interest from the media. So what has happened in recent

years, especially before year 2000, to make us more aware of the effects and threats of floods?

In the past, floods tended to be of local interest, reported locally, now major flood events are reported nationally and internationally, almost as they occur.

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| 1989 | East Highlands, the Spey and Ness flooded areas in Inverness and Carrbridge; |
| 1990 | Tay, parts of Perth and Bridge of Allan was flooded; |
| 1993 | Tay again, there was widespread flooding of Perth, and during this time, the highest ever river level was recorded; that's not to say that this had been its highest, but the highest recorded; |
| 1994 | December, Central Scotland, the Clyde, Kelvin, River Irvine, Paisley area all affected by widespread floods; |
| 1995 | Kilmarnock Water and River Irvine again caused problems. |

Even recently, last summer in 2008 will undoubtedly be one of the most unforgettable for some of those living in central and North West England. June and July were extraordinarily wet months contributing to some of the worst flooding that the UK has ever experienced, or so it was reported. These floods cost an estimated £2 billion pounds and 11 lives were lost.

Notwithstanding these devastating floods, look at the coverage the country wide flooding of Mozambique at the beginning of year 2000 received, with pictures via satellite transmitted straight into your television direct into your front room.....that flood event left hundreds dead and almost 1m people displaced. But, how many people knew that in 1950, Mozambique suffered in similar floods.

And what about the widespread media coverage of the floods in Boscastle in the UK in August 2004. The national media coverage in days gone by was certainly not what it is

today, this is due to advanced technology capabilities in communication.

But has there been an increase in floods especially in East Ayrshire, Scotland?.....Would history show different? What has happened in the real world? Here are some recorded news reports (headlines) on floods in Kilmarnock and surrounding district:

- 1852 - "Great Flood of Kilmarnock" (*Melbourne had theirs in 1891*)
- 1932 - "Kilmarnock Suffers Flood Chaos"
- 1951 - "Kilmarnock hit by Floods"
- 1958 - "When Kilmarnock had its worst Flooding" (*note, history shows different*)
- 1963 - "The Floods left Trail of Damage and Distress"
- 1966 - "Kilmarnock is again hit by Floods"
- 1992 - "Save us from this Flooding"
- 1994 - "Flood Chaos"

What was interesting from these reports was the distinct lack of reference to climate change. When Noah built his Ark did he do so because of the possible impact of Climate Change? (No prizes for the obvious wrong answer)

Now, all these flood events tends to concentrate the mind, especially the minds of politicians. The Government were under pressure to do something to alleviate the situation, because they were the ones taking all of the flak....and Government officials do not like taking flak. So what was the reaction by the politicians to address the issues of flooding?

Point to note: The Government and Local Authorities tend to be looked upon as a nanny state. 100 years ago, people helped themselves, now there has been a noticeable shift from individual responsibility.....now, Government, Councils and even insurance companies are now expected to do something about everything.

Existing Flood Legislation

1961 saw the introduction of the 'Flood Prevention (Scotland) Act'. This Act gave local council's the power to carry out measures for the prevention or mitigation of flooding of non-agricultural land including:

- Cleansing any watercourse or embankment;
- Repairing any watercourse or embankment;
- Maintenance of any watercourse or embankment
- Improvement, alteration or reinstatement of a watercourse;
- Construction of a new watercourse.

These powers were permissive and discretionary only, i.e. the council could exercise the powers but did not have to. Additionally, no work other than maintenance could be carried out under the Act without the promotion of a flood prevention scheme by the local council.

But since 1961, flooding cycles continued and with the advent of significantly improved media coverage capability, flood issues gained even more prominence, and it was felt, in government circles that the 1961 Act did not go far enough in addressing flood issues.

There seemed therefore to be a need to place responsibility for more rigorous watercourse maintenance on some statutory body, and the political choice was the new Local Authorities created in Scotland in April 1996. In other words, there was a clear desire to shift the responsibility of flood prevention very firmly on to Local Councils. This led to the 1961 Flood Prevention (Scotland) Act being amended by "The Flood Prevention and Land Drainage (Scotland) Act 1997" by placing statutory duties on local authorities including:

- Requiring the local authority to assess all watercourses from time to time to ascertain whether or not they are likely to cause flooding of non-agricultural land;

- Requiring the local authority to carry out works to reduce the likelihood of flooding of non-agricultural land caused by the condition of the watercourse;
- Requiring local authorities to liaise with adjacent authorities in order to warn them of flood risk from watercourses;
- Requiring local authorities to prepare biennial flood reports.

Existing Planning Policy

To further lessen the impact flooding has on developments, the Scottish Government in February 2004 introduced 'Scottish Planning Policy 7, Planning and Flooding', (SPP7). The central purpose of this Policy is to prevent further development which would have a significant probability of being affected by or which would increase the probability of flooding elsewhere.

The general principles of this Policy are based on the following:

New development should not:-

- Materially increase the probability of flooding elsewhere;
- Add to the area of land which requires protection by flood prevention measures;
- Affect the ability of the functional flood plain to attenuate the effects of flooding by storing flood water (functional flood plains are those within the 1 in 200 year flood event);
- Interfere detrimentally with the flow of water in the flood plain;
- Compromise major options for future shoreline or river management

Built development should not therefore take place on functional flood plains. Piecemeal reduction of the flood plain must be avoided because of the cumulative effects on storage capacity. (SPP7 is currently being reviewed by the Scottish Government).

East Ayrshire Council

In 1996, at the time East Ayrshire Council (EAC) was created as a result of local government re-organisation, EAC decided to commit itself to try and protect vulnerable residential and business communities through their stated commitments.

- **Quality.** To eliminate poverty, deprivation and unemployment. (Unemployment in East Ayrshire around 1996–97 was in the top 4 of 32 Councils in Scotland, around 8%).
- **Equality.** To protect the weak and vulnerable in every community (residential and business alike)
- **Access.** To secure a quality environment for living and working (free from flooding and effects of flooding).
- **Partnership.** To strive for a society based on equality and equal opportunities (to compete on equal footing, insurance etc)

Now given the devastation that flooding causes, as a responsible local council, EAC had to put in place Flood Prevention Schemes to mitigate the effects of flooding for social and economic reasons, to retain good housing stock and to retain businesses. Flood prevention schemes can also have the added bonus of releasing land, in particular brownfield sites, for development opportunities.

With this in mind, in 1996 East Ayrshire Council took it upon themselves, the Council made a commitment, did not have to (permissive power), to put in place a programme of flood prevention measures to protect business communities, thereby preserving employment and, of course to protect the residential communities. This commitment was based, at that time, on the history of flooding experienced within East Ayrshire and not due to the "forecast" effects of climate change, although prudent measures were taken in the design to allow

for an element of possible climate change effects.

Flood Prevention Scheme Design

Major schemes were designed and constructed that now protects areas of Kilmarnock, Crookedholm and Galston from the effects of flooding, representing some £25m of investment. The design event was to a 1 in 100 year River Irvine flood event and a freeboard allowance of 0.5m for walls and 0.6m for embankments was generally adopted. As intimated previously, at the time of design, this included an allowance for climate change. The provision of offline storage upstream of the direct defences constructed is arguably the most significant element of the flood scheme's development and fits well with the fundamental principle of sustainable flood management. The attenuation of flood flows during extreme flood events upstream of the direct defences at Crookedholm and Kilmarnock enabled the reduction of the level of walls required in these areas while avoiding increasing flood risk downstream.

Where defensive walls were required sheet pile construction was adopted wherever possible to avoid the excavation and disposal of potentially contaminated material which may have been necessary if bored piled reinforced concrete walls were adopted. However, ground conditions were such that a combination of both was unavoidable in certain locations. Softer engineering solutions such as embankments were used wherever space permitted.

Environmental issues in the Kilmarnock and Crookedholm areas included limitations on working periods in the river to mitigate impacts on migratory fish together with landscape planting and relocation of an otter holt. Efforts were also made to sympathetically finish the defensive walls to match their surrounding environment. Consultation with planners, residents and businesses played a key role in agreeing the final design details.

Two bridges in Kilmarnock required their parapets to be raised and as the bridges were listed (architectural heritage legislative

protection), it was necessary to consult with Historic Scotland during the design process with the design developed on the basis that the existing sandstone would be removed and cut to face up the new reinforced concrete parapet cores. However it was necessary to supplement the existing sandstone with new. This required having to artificially age the new sandstone with a mix of soot and milk in order to match the old existing sandstone (original bridge construction in Old Street was 1786). One of the original gas lamp columns was refurbished and reinstalled on Old Street Bridge.

As a result of the constructed flood defences East Ayrshire has already witnessed new investment in business and construction of residential property.

New Flood Legislation

So is the 1961 Flood Prevention (Scotland) as amended in 1997 still fit for purpose. The answer has to be no, as this Act was introduced to tackle fluvial flooding at the place of happening.

New legislation, "The Flood Risk Management (Scotland) Act 2009" seeks to establish a way of co-ordinating catchment flood management to ensure a national approach, where local authorities, being accountable to their communities, will continue to be responsible for the implementation of flood prevention measures but will work in partnership with other stakeholders such as the 'Scottish Government', 'Scottish Environment Protection Agency (SEPA)' and 'Scottish Water'. The new Act now addresses the entire 'water' environment including sewers, overland flows and demands integrated working between the responsible bodies, by requiring such integration to be formally addressed within an agreed Plan.

This new 2009 Act makes provision in relation to five main areas:

- i) coordination and cooperation within the domain of flood risk management;

- ii) assessment of flood risk and preparation of flood risk maps and flood risk management plans;
- iii) amendments to local authority and SEPA functions for flood risk management;
- iv) a revised statutory process for flood protection schemes;
- v) amendments to the enforcement regime for the safe operation of reservoirs.

The new Act transposes the European Directive on Flooding into Scottish Legislation. Under this Act the role of SEPA is to support the coordination of flood risk management efforts; facilitate good decision making through co-ordination and acquisition of information; and to provide the necessary level of strategic national planning, guidance and prioritisation including the production of flood risk hazard mapping.

Municipal Engineers will be responsible for preparing Local Flood Risk Management Plans to supplement District Plans to ensure that objectives and measures set out in District Plans are based on locally targeted and coordinated actions to manage flood risk. Management of flood risk is inextricably linked to development control to ensure that future generations are not blighted by the effects of flooding.

The new Act also streamlines the planning process for flood mitigation works whereby once a flood 'protection' scheme is confirmed (whether by the local authority of the Scottish Ministers), the Scottish Ministers are to direct that any necessary planning permission is deemed to be granted, subject to any planning conditions which Ministers may specify.

Conclusion

Municipal Engineers try to and do help people, but there is, and has to be a limit, to what Municipal Engineers can do.

Therefore, what is it that we as a Local Council and as Municipal Engineers should be looking to avoid.....

During the Easter weekend of 1998 in England, 5 people lost their lives directly or indirectly as a result of flooding. The UK Environment Agency produced a report covering all aspects of its response to the emergency including details of insurance loss.

But also included in this report was the impact the floods had on people.

Here are two examples of what was officially recorded.....this is what we want to avoid.

'A young mother recounted her anxiety as the fast rising water flooded the first real home of her married life and forced her to entrust her young daughter to a complete stranger during the rescue.

She and her husband had just fifteen minutes to move their most valuable possessions upstairs and, in the understandable panic, all their wedding photographs and earliest pictures of their daughter were lost.

The experiences of the floods and the daily struggles with insurers, banks, builders and employers that followed, and are continuing, have placed exceptional strains on the family.

The mother's principal concern, however, was how she would tell her daughter as she grew up, that she had no photographs of her babyhood.'

The other example from the report read:

'An elderly widow in poor health, who had not been affected by the worst of the 1947 floods in Northampton, told how she was moved by the Police from her bungalow to her daughter-in-law's home as the floods approached the town.

Not suspecting that this time the floods would reach her bungalow, she left everything where it was.

When she returned two days later her home was in ruins. The shattering effect on the physical and mental health of that frail old lady, who had lost every memento of her life and marriage prior to the flood as well as her

home, may not easily be accounted for in any subsequent cost-benefit calculations.

Such domestic tragedies, which may be dismissed as unfortunate and unavoidable by some observers, were repeated in hundreds of homes across Northampton and surrounding areas.'

This is what we as Municipal Engineers want to avoid in the future.

One final comment to conclude, as Municipal Engineers, we are meant to have an enquiring mind, we are meant to question things (Why? Where? Which? When? Who? How?) Climate change, is it happening? Are we getting a balanced view being expressed in the media by those who do not subscribe to the climate change agenda? Are we able to make an independent judgement call on the question of climate change or do we just accept what is being stated as "*scientific fact*" (For interest why not Google 'Morner Maldives'). Without prejudice, I leave these thoughts with you.

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For the past 40 years I have worked in private, contracting and consulting engineering and currently work within East Ayrshire Council as Acting Chief Engineer. I have presented papers covering a variety of topics such as flood prevention and road management issues. I have responded to numerous consultation documents from the Scottish Executive/Government and in 2005 received the SCOTS Achievement Award (Engineer of the Year). As a Fellow, I have been active within the Institution of Civil Engineers for over 20 years, serving on the Local Association, Membership Committee, UK Regional Affairs Committee, Professional Reviews Panel, Standards Panel, Municipal Engineers Board and currently Chair the Audit Panel and Chair the Municipal Group Scotland. I am also a Reviewer for the ICE.