

**FLOODING ISSUES ADVISORY COMMITTEE
FINAL REPORT FROM THE AWARENESS AND ASSISTANCE SUB-
COMMITTEE**

Purpose

1. The purpose of this paper is to provide the Flooding Issues Advisory Committee (FIAC) with a final report from the Awareness and Assistance Sub-Committee.

Background

2. The Sub-Committee has met five times, on 15 June 2005, 17 November 2005, 4 May 2006, 14 September 2006 and 18 January 2007. The current membership is detailed in Annex A.

3. This Sub-Committee was set up to discuss how we can improve awareness of the risks of flooding through the provision of better flood risk information and additional flood warning systems. It also considered how we could give better support to those affected by flooding. It discussed these issues within the context of promoting sustainable flood management and considered what the resource implications might be for stakeholders, including the Executive.

Workplan

4. The Sub-Committee was set up so that FIAC might offer advice to the Scottish Executive on taking forward the *Awareness* and *Assistance* elements of the National Flooding Framework Action Plan. The main aims of the Sub-Committee are therefore to help 'improve awareness of the risks of flooding' and 'improve our ability to raise awareness of flood issues' and 'to ensure that those at risk are aware of and able to make effective use of the assistance available to them'. These aims were addressed under 4 headings as detailed below.

Effective awareness raising***Position statement and responsibilities***

5. The Executive agreed SEPA's proposals for a three-year Flood Awareness Campaign strategy, with £190,000 being made available for 2006/07 and 2007/08. Compared to the annual awareness fortnight held in previous years, a three year campaign strategy enables SEPA to sustain a planned forward programme of awareness raising activity. Ms Rhona Brankin launched the SEPA Flood Awareness campaign on 10 October 2006 at Colinton Primary School, Edinburgh. She visited the SEPA exhibition trailer and spoke to SEPA staff. She also watched an educational play, which has been shown in schools in flood risk areas across Scotland.

6. This Campaign focuses around existing flood warning schemes areas where SEPA offers the full Floodline service. The Campaign includes a road show with Floodline trailer containing an interactive exhibition and is visiting areas at risk of flooding throughout Scotland. At the trailer people are able to speak to SEPA hydrologists, view the flooding pages of the SEPA web site and obtain flooding information literature.

Outputs

7. The Sub-Committee highlighted the importance of local authorities working closely with SEPA to raise awareness of flooding in communities. SEPA has taken this on board during the current campaign. Some local authorities helped out at the road show in their area by providing materials, information and personnel as well as more practical matters such as permissions and locations.
8. Members discussed how campaigns might raise awareness of flood resilience products without endorsing any particular company or products.

Flood Maps as a tool for raising awareness

Position statement and responsibilities

9. The SEPA Indicative River and Coastal Flood Map 2006 supports Scottish Planning Policy 7: Planning and Flooding. Local authorities were invited to apply for a licence to use the map in September 2006 and it was published on the web on 1st November. Over the first three days of being placed on the web 350,000 pages on the site were accessed. Thereafter, during November and December the website received an average 5,000 hits a day with higher values (up to 40,000 – 60,000 a day) during the peak recent events on 4th and 13th December.

10. The map indicates flood risk for areas, not individual properties, at a base scale of 1:50,000 (Ordnance Survey Land Ranger maps). At this scale it is not always possible to tell whether a property is within the risk area. The accuracy is also affected by variations in the vertical landform data, and the uncertainty inherent in the methodology means that the map is not definitive for individual sites. Furthermore, the methodology used to prepare the map could not take existing flood defences into account although the areas protected by them are shown separately on the map where known. These limitations mean the map is not definitive for specific sites and a site-specific flood risk assessment may be required. Explanatory material and disclaimers to cover these points as well as detailed questions and answers to help ensure that users understand the flood risk shown accompany the map.

11. The Scottish Flood Defence Asset Database (SFDAD) compliments the map and provides an inventory for all of the 72 Flood Prevention Schemes constructed to date in Scotland, built with the powers contained in the 1961 Act. It is intended that the SFDAD will be made available to local authorities, SEPA and others professionally engaged in flood prevention through a website portal. In addition to basic technical information on flood defence structures and a broad assessment of their condition (including photographs), an outline assessment has been made of the current standard of protection provided by these schemes. As these schemes have been constructed over the last 30 years or so current standards or levels of protection may be less than currently required because of changes in the minimum standard of protection set by the Scottish Office, and subsequently the Scottish Executive, and climate change.

12. The Asset Database will be a ‘live’ tool which will be continually updated with new information and indeed new schemes. As such, it will be an important tool in strategic flood risk management at catchment level. Further information is available on the Scottish Executive Flooding website at:

www.scotland.gov.uk/Topics/Environment/Water/Flooding/16919/research003 and also the

RISE website at www.sniffer.org.uk/rise.

Outputs

13. The Sub-Committee recognised the need for the ongoing support of the flood map. In particular the importance of ensuring a strong link between the flood map and the national floods database recommended by SNIFFER project FRM07 - Collecting Flood Data in Scotland. SEPA will have a key role in co-ordinating the outputs from the two.

Community models for self-help

Position statement

14. Scotland does not have a national forum to represent people and communities affected by flooding. Representatives from the National Flood Forum in England have however attended this Sub-Committee and FIAC meetings and advised on how community engagement can help raise awareness.

Outputs

15. The Sub-Committee identified the importance of coordinating work and activities on raising flood awareness in a bid to stop duplication and sending out mixed messages. Members discussed ideas for a more joined-up approach and how an organisation similar to the National Flood Forum would help this process in Scotland. They also recognised the role of SNIFFER and the RISE website in pulling together current work.

16. Members called for a forum similar to the National Flood Forum in England to be set up in Scotland. Arrangements have been made for SEPA, the Executive and the National Flood Forum to meet to discuss how this might be taken forward and the role that such an organisation might play in Scotland.

The introduction of additional flood warning systems including dissemination

Position statement and responsibilities

17. SEPA now has a flood forecasting system for the Clyde, Irvine & Kelvin catchments that will provide timely warning information for key stakeholders. Although, the schemes were not formally launched until 6 March 2007, following training of staff in the new system and development of response procedures, the system has been used effectively during recent wet spells of weather.

18. After the coastal flooding in January 2005, SEPA received a number of requests for new coastal flood warning schemes from local authorities. The Executive encouraged SEPA to consider options for coastal flood warning and suggested that the development of a coastal flood warning strategy would be the first step. SEPA has developed its strategy based on its vision of a future flood warning service.

19. From February 2007, SEPA provides a coastal Flood Watch service for nine broad coastal areas covering the entire Scottish coastline. This is based on Storm Tide Forecasting Service (STFS) alerts provided by the Met Office. Flood Watches are issued via Floodline

and directly to local authorities on receipt of alerts from the STFS. The messages contain a general alert to the possibility of flooding over nine broad coastal Flood Watch areas.

20. SEPA's strategy proposes the future development of a coastal flood warning service for specific communities at risk. This is a bigger challenge and will represent a significant change to SEPA's business.

21. SEPA agreed to be responsible for disseminating flood warnings to ensure that a more focussed approach is taken across Scotland. It has conducted a scoping study and business case, which considers various options for disseminating warnings to present to the Executive. SEPA favours a multi-media system adopted by the Environment Agency (EA). This business case was passed to the Executive in February 2007 for consideration of the options and guidance on how this initiative might be funded.

Outputs

22. Members were involved at an early stage of SEPA's Coastal Flood Warning Strategy and offered advice on how SEPA might develop the strategy.

23. Members agreed that a multi-media system for flood warning dissemination would be the best option for SEPA. They advised that based on the EA's experience it will most likely take a couple of years to develop a system in Scotland. It was agreed that it would be helpful to approach the National Flood Forum for its advice here.

Other issues

24. Members discussed resilience in terms of services and people and recognised the important role that building standards can play here.

25. Members considered a paper from Dr John Riddell on the risk to life from flooding (copy attached at Annex B below). The paper highlight potential flood risks and warns that in future an inquiry could reach a verdict of unlawful killing as it did with deaths during a flood event at Glanrhyd Bridge in Wales in 1987. They agreed that local authorities need to be aware of sites where there is the potential for the type of flooding incidents that might pose a risk to life and to consider how the emergency services might be made aware of these risks.

26. Members discussed the particular problem of SEPA not being able to recruit suitably qualified hydrologists and the general problem of attracting graduates to this area. Members agreed that as millions of pounds will be spend on flood prevention schemes in future it is essential that we have sound hydrometric data and expertise to base these decisions on.

Cross-cutting issues

27. The Sub-Committee discussed and took account of the cross cutting issues listed in the FIAC workplan.

28. Recommendation 5 should link the Flood Risk Map to the Civil Contingencies Act and should flag up the issue of awareness raising at temporary sites.

Recommendations and next steps

29. The Awareness and Assistance Sub-Committee recommends that:
1. current work on raising awareness of flooding in Scotland, including information from the flood map, the asset data base and SNIFFER, needs to be collated and held centrally to avoid duplication of work and to learn from best practice.
 2. more has to be done to help people, including transient communities and temporary gatherings, understand their ‘vulnerability’ to flooding; enabling communities to become more proactive.
 3. a forum is set up in Scotland to help people and communities become more proactive.
 4. a future FIAC must engage with the Scottish Buildings Standards Agency to fully consider the role building standards can play in increasing resilience to flooding both in future developments and existing building schemes.
 5. local authorities and SEPA need to be aware of sites where there is the potential for the type of flooding incidents that might pose a risk to life. SEPA should use links with civil contingency plans to help make communities and emergency services aware of these risks.
 6. a scoping study is carried out to determine how flood warning can be delivered to specific at-risk coastal communities.
 7. public bodies and academia work together to ensure that there are suitably qualified hydrologists to support future flood risk management programmes.

Conclusions

30. Members ask that FIAC:
- notes the outcomes from the Awareness and Assistance Sub-Committee and
 - agrees to the recommendations and next steps at paragraph 29 above.

**FIAC Awareness and Assistance Sub-Committee
June 2007**

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Membership

David Faichney, SEPA - Chair

Carolyn Girvan, Scottish Executive, Climate Change and Air Division

Jill Boulton, Norwich Union

Alistair Dyer, Scottish Water

Prof. Charles Ainger, MWH UK Ltd./Chartered Institution of Water and Environmental Management

Alan Motion, Met Office

Stephen McLachlan, East Lothian Council

Dr. Andrew Black, University of Dundee

Paul Hendy, National Flood Forum

Steven Merrett, Environment Agency

Martyn Tulloch, Comhairle nan Eilean Siar

Lynn Mills, Scottish Executive, Civil Contingencies Unit

FIAC Secretariat

June 2007

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Risk to Life from Flooding

Introduction

1. While persons travelling in cars have died during recent flood events in Scotland (River Kelvin 1994, Western Isles 2005) there have been no direct deaths from drowning within the home or business. Nevertheless there have been situations where loss of life during a flood has only been narrowly avoided. The Perth flooding of 1993 that caused the collapse of a floodbank protecting many houses in the Muirton area of the City is one example. The bursting of a large diameter water main in the Bearsden area of East Dunbartonshire in the 1970s that resulted in water rapidly flooding houses situated in a depression is another.

2. When persons are drowned during a flooding incident in Scotland it is usual that a fatal accident inquiry will be held to investigate the cause of death. Should a significant number of persons be drowned while in their homes or place of business there is also likely to be a demand for a formal independent public inquiry. If such an inquiry was to determine that no steps had been taken to identify the possibility of the incident occurring, or that no steps had been taken after identification to manage the risk, flood alleviation authorities could be severely criticised.

3. Although all flooding incidents have the potential to kill, those with the potential to cause loss of life are ones likely to involve a very sudden and rapid rise in water level. As a rapid rise in water level is usually accompanied by high flow velocities there is also the risk to life from structural damage to buildings and other infrastructure caused both by the flow of water and from waterborne debris. Should the rapid rise in water level occur at night when occupants are asleep the risk of death will be greatly increased.

4. A very quick and unexpected rise in water level not only presents a significant risk to life but is also likely to be a situation where death is possible before the emergency services are able to intervene to provide assistance. It would thus seem prudent to identify, assess and manage potential flood death situations before the event could occur.

5. The following are foreseen as potential life threatening situations.

Wall and Embankment Failure

6. It is common to defend land and property against flooding by constructing walls and banks between the sea, estuary or river and the land it is desired to protect. It is also possible that a wall or bank not intended as a flood defence structure could act as such a structure in times of high water level.

7. During potential flooding situations the walls or banks will result in the water level on the water side of the defence being at a higher level than land and property on the defended side. Should the wall or bank fail there is then the likelihood of water flooding the defended

land to some depth. Failure may be by overtopping as a result of a water level higher than the defence level, or by structural collapse. While overtopping may give time for reinforcement or evacuation, structural collapse can be sudden and release large volumes of fast flowing water.

8. Structural failure can occur with both walls and embankments. Failure of the former is most likely when the wall, typically of masonry construction, has not been designed as a flood retaining structure and collapses due to the pressure of water (Water of Leith, 2000). Structural failure of an embankment may be caused by erosion following overtopping (Dalguise 2006) but can also result from saturation (Muirton 1993).

9. While most formal flood defence walls and banks have been constructed as part of a flood alleviation scheme promoted under the Flood Prevention (Scotland) Act 1961, there are many examples of single or groups of residential properties protected by banks or walls which have been constructed to reduce flood risk to agricultural land or as part of transport infrastructure. The standard of these informal defences both in terms of design and construction is usually unknown. Even where formal walls and banks exist the recent study of 1961 Act defences undertaken by the Scottish Executive demonstrated the considerable variation in the standard of defence now provided.

10. The level of the sea, an estuary or a river can rise above the height of a wall or bank for many reasons. The main one is likely to be an event more severe than the design event, although occurrences such as debris blockage may also be a cause. Such events do occur. Yet it has not been the practice to take account of the possibility. Flood alleviation defences, for example, continue to be designed to a uniform standard throughout their length with no identification of 'first choice' preferred flooding areas that would reduce the failure risk in areas where lives could be lost.

11. Although the increasing introduction of flood warning schemes should reduce the risk of sudden or unexpected failure of a flood wall or bank, not all properties potentially at risk are in areas where warnings are available. There are thus likely to be a significant number of properties throughout Scotland where the overtopping or structural failure of a wall or bank will result in loss of life.

Flash Floods

12. Localised high intensity rainfall can result in sudden and rapid rises in water level in normally small watercourses and the creation of water levels higher than ever expected or previously known. Flash flooding can also result in high flow velocities and the movement of dangerous debris such as trees and boulders. The typical flash flood situation is a small, steep, largely undeveloped, upland catchment where the watercourse in its lower reaches flows close to individual houses or a small community and to leisure developments like chalets and caravan parks. The usual cause is a 'thunderstorm' type event, and because the actual rainfall may be in the upper catchment the first warning of flooding may be a rapid rise in watercourse level. Flash flooding often occurs in late summer or early autumn when leisure use of the catchment can be greater than at other wetter times of year. The random and very localised nature of such flooding makes specific warnings very difficult.

13. Boscastle was a typical example of such an event although perhaps the best known in Scotland is the Carrbridge flood of 1914 that washed away a railway bridge and resulted in the death of five persons.

14. It is noted that following Boscastle the Environment Agency initiated a study to identify similar catchments where a serious risk to life might exist (Making Space for Water Programme Project RF7 *Rapid Response Catchments*)

Depression Flooding

15. Flooding of areas with no surface watercourse and which because of man-made topography form a depression or bowl with drainage dependent on road gullies and surface water sewers can present a risk to life if the relief level is above the lowest property level and there is a sudden and rapid inflow of a large volume of water. Water inflow could result from pluvial flooding during a high intensity localised rainfall event, but the large volume likely to result in a risk to life will probably come from overflow from a watercourse, possibly one some distance away, or from the bursting of a large diameter water main. During the failure of the Loch Katrine main in Bearsden it took many hours to locate and close valves in which time water ponded to a depth as high as bungalow eaves level. Depression flooding is particularly dangerous because it is so unexpected, the at risk area usually neither being near a watercourse nor having any flooding history.

Reservoir Failure

16. While reservoirs with a capacity above natural ground level of 25,000 cubic metres or more are subject to the statutory requirements of the Reservoirs Act 1975 and are very unlikely to present any flood risk to downstream property, there are many smaller reservoirs where standards of inspection and maintenance are not so rigorous. Such reservoirs were often constructed to provide water to an associated industrial operation with the premises where the water was used being in the same ownership and control as the reservoir and dam. Today many of these industrial operations have ceased and the site of the former mill or factory sold off and redeveloped for housing.

17. In most such cases the property developer has declined to take ownership of the reservoir, and indeed that ownership after the sale of the housing site may be far from clear. There are thus locations where new housing is located a short distance downstream of a dam of uncertain condition and legal responsibility, yet very dependent upon the security of the dam – a situation quite different from that when the land was in single ownership. Should the dam breach there is then a significant risk to the new housing, with the potential for risk to life.

Culverted Embankments

18. There are many thousands of culverts passing through road, rail and canal embankments, including many disused railway embankments now forming part of recreational routes. Some of the embankments are substantial in length and height. Often there is no ready access to the culvert inlet. But culvert barrels and inlets, including debris and safety screens, can block with debris, particularly during high flow situations. As the flow area through the culvert reduces, often quite quickly, water levels upstream of the

embankment rise. As inflow from upstream continues the culvert inlet becomes submerged and disappears from sight.

19. The situation can then be created where the embankment acts as a dam, potentially holding back a volume of water which if contained within a reservoir would make the embankment subject to the requirements of the Reservoirs Act. Yet the road or rail embankment will not have been designed as a dam, there is no impermeable cut-off, no spillway and no scour valve. The culvert inlet is submerged to some depth and it is impossible to safely clear the blockage. As water continues to pond to some depth the embankment fill becomes saturated and suddenly and catastrophically the embankment fails. Very fast flowing water then inundates properties downstream.

Awareness

20. All of the foregoing scenarios are believed to be realistic and the fact that the occurrence of one of them has not resulted in loss of life in Scotland in recent years is more by good luck than the taking of steps to identify and manage the risk. The biennial reports produced by local authorities as part of the duties of the Flood Prevention and Land Drainage (Scotland) Act 1997 show little evidence of any awareness of the risk to life that could result from such causes while SEPA's Indicative Flood Maps do not take into account any of these potential dangers.

21. Any flooding brings misery and loss to those affected and quite properly considerable steps are being taken to reduce the flood risk to both existing and new property. However, while property flooding will continue to be a cause of concern, it is suggested that the occurrence of death or serious injury during a flood will be regarded very differently by the public, by the media and by politicians.

22. As an illustration of what could happen it is suggested that a comparable situation is that experienced after the collapse during a flood of the railway bridge at Glanrhyd in Wales in 1987. Although the drowning of four persons as a result of the flood was the first such death on the railway since the 1914 Carrbridge failure, and despite the many persons killed in the intervening years on the railway in other incidents, the inquest jury returned a verdict of 'unlawful killing'. This verdict was given even although the Coroner advised the jury 'that a failure to appreciate that there was such a risk is not by itself sufficient to amount to recklessness'.

23. It is suggested that a recommendation be made to Scottish Ministers that action be taken to identify these locations where a risk to life might exist from one or other of the causes outlined above, and following such identification that consideration be given as to how the risk can be managed.

John Riddell
January 2007