

# FLOOD WATCH & SOME ISSUES ABOUT THEM

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## Abstract

The Flood Watch is one product from a comprehensive suite of weather and warning products produced by the Commonwealth Bureau of Meteorology (CBM). The Flood Watch represents an attempt by the CBM (and the SES with whom the Bureau works closely) to maximise the warning lead time available to people who are at risk due to riverine flooding. Rather than being a prediction of flooding, a Flood Watch is a forecast of the likelihood of flooding. Inherent in a Flood Watch therefore, is the uncertainty associated with any weather forecast. This uncertainty creates a risk management challenge that must be confronted by the community, the SES and CBM. This paper considers some of these risk management issues.

**Key Words: flood, risk, SES, warning, prediction, forecast**

## Introduction

Flood warning is potentially a highly effective means of flood loss mitigation. Experiences of flooding have shown that early warnings have the capacity to enhance public safety and reduce flood damages, by allowing people adequate time to evacuate and to lift or remove property (Handmer & Smith, 1995). Brown and Graham (1988) in a study of the benefits of early warning concluded that increases in warning time from a few minutes to 90 minutes reduced deaths by over 90 percent. Australian research into avoided tangible losses such as Gissing, (2002), Smith & Gissing, (2001) and Smith, (1981) have illustrated the high level of loss reduction achievable through flood warning systems.

As a key player with a legislated role in flood warning, the NSW State Emergency Service (SES) has continued to develop and promote flood warning systems in partnership with the Commonwealth Bureau of Meteorology (CBM) and local councils. One of the main challenges facing the SES in this role is the communication of 'Flood Watches' to the public, and in particular the uncertainty

associated with them. This paper discusses Flood Watches; what they are; the appropriate responses to their release; and the issues associated with their communication.

## Flood Warning Responsibilities

The SES is the 'combat agency' for flood in NSW, meaning it is the government agency responsible for controlling the response to floods in NSW. The combat role is comprehensive encompassing floodplain risk management; community education for floods; flood planning; and flood response. In NSW the SES is responsible for the establishment of warning systems (in partnership with the CBM and Councils), interpretation of height predictions, construction of warning messages, communication of warning messages to the public and the provision of advice on the appropriate responses to flooding. The CBM is responsible for providing a flood forecasting service and provides the SES with Flood Watches, severe weather warnings and Flood Warnings. Each of these products is intended to alert the community to

flooding but each does so in slightly different ways.

Though Flood Watches and Flood Warnings are both products intended to alert at risk communities about floods they differ in their degree of specificity. A Flood Watch is a notification of the **potential** for a flood to occur as a result of a developing weather situation and consists of short generalised statements about the developing weather including forecast rainfall totals, description of catchment conditions and indicates streams at risk. The CBM will also attempt to estimate the magnitude of likely flooding in terms of the adopted flood classification levels of minor, moderate and major. Flood Watches would normally be announced 24 to 36 hours in advance of likely flooding. In summary, a Flood Watch is a 'heads-up' for potential flooding rather than a specific warning of imminent flooding (CBM, 2004).

A Flood Warning on the other hand is a **gauge specific** forecast of **actual or imminent** flooding. Flood Warnings specify the river valley, the locations expected to be flooded, the likely severity of the flooding and when it is likely to occur (CBM, 2004).

A Flood Warning is based on actual rainfall measurements and streamflow based models of catchment behaviour that also take account of likely future rainfall. In contrast, Flood Watches are based on meteorological forecasts and current catchment wetness only (CBM, 2004). Flood Warnings therefore, are likely to represent a higher level of confidence about future events than can be the case for Flood Watches.

Since, Flood Warnings are issued for specific river reaches (gauge reference areas) they do not provide forecast flood information to persons living outside the limits on these reaches. Flood Watches however, are issued on a catchment wide basis (or even for multiple catchments) and provide warning to persons not living on major rivers covered by a flood gauge to which the CBM provides Flood Warnings.

Other CBM products which may include information about flooding include general weather forecasts, Severe Thunderstorm

Warnings and Severe Weather Warnings. Severe Thunderstorm Warnings and Severe Weather Warnings provide among other things advice on the potential for flash flooding.

## Short History of NSW Flood Warning Services

Flood warning systems in NSW have been developing since the early 1900's when the Commonwealth Meteorologist began to issue 'Flood Signals' (Keys, 1992). During the 1930's local river warning systems began to appear which involved the passing of observed river heights downstream by telephone in the hope that some warning lead time could be given (Keys, 1992). Such systems were highly reactive and gave little real opportunity for action that might require some time to complete. The limited forecasts of flood magnitude by local 'gurus' were largely based on 'rules of thumb'.

Following the devastating floods of 1949 and 1950's the Commonwealth Government decided a more advanced hydro-meteorologically based Flood Warning service was required (McKay, 2001). This service was established by the Commonwealth Bureau of Meteorology (CBM) in the early 1960's, leading to river height predictions being issued based on rainfall-runoff models (Keys, 1992). There were still problems with warning dissemination and so in the 1970's formal warning arrangements were signed between the main players the CBM, the SES, and the water management agencies (Keys 1992). In 1991 the NSW State Flood Plan was published and contained detailed arrangements for Flood Warning formulation and dissemination. This plan, which was most recently revised in 2001, details the Flood Warning requirements for the state.

## The Origin of Flood Watch

In the late 1960's, in an attempt to increase the time available for organisations like the SES to prepare for a possible flood, the CBM began to issue Confidential Flood Advices. These were issued only to the SES and some

other key agencies but were not considered suitable for public dissemination. The Confidential Flood Advises were based on what forecasters were indicating could develop by way of flood producing rain in the days to come and an assessment of existing catchment conditions.

In the last decade or so, weather forecasting science has continued to improve, assisted mostly by advances in the sophistication of numerical weather models and the availability of the high speed computers needed to run them. With the ability to run several different weather models concurrently and then compare the results, meteorologists have become more confident in the reliability of 1 to 4 day weather outlooks as a broad scale indicator of future weather patterns.

This steady improvement in meteorology has spilled over into the field of hydrology. Flood forecasters can use the rainfall estimates in the one, two, or three day weather outlook as input to their catchment flood models, running 'what-if' scenarios for the possibility of flooding. The four day outlook, however, is still considered to contain too much uncertainty for the basis of issuing a Flood Watch (CBM, 2004).

Based on these improvements the CBM began to issue advice of potential flooding to the public through the SES in the form of the 'Flood Alert' in the mid 1990's. In 2001 the Flood Alert product was renamed, Flood Watch.

### **Some Statistics on Flood Watches**

A Flood Watch may be issued for large geographical areas, for example the entire north east of NSW and the catchments within that area. As the forecast weather develops, a flood may not eventuate in all identified catchments and perhaps will only develop in one of them. This is because the numerical models may suggest rainfall in a specific location but the rain that actually falls has only to drift over the line separating nearby catchments to give a very different result.

It is obvious therefore that a Flood Watch cannot be a 100% accurate warning product.

In fact, the CBM generally will only issue a Flood Watch when the chance of flooding is considered to be about 70% or more. According to the CBM's own Flood Warning performance monitoring however, about 70% of all floods that occur are preceded by the issue of a Flood Watch. More importantly, over 90% of major floods are preceded by a Flood Watch. This last statistic reflects the fact that smaller floods are the result of less significant meteorological events that are more likely to depart from modelled behaviour.

The correlation between Flood Watches and specific river systems is probably not this high.

It is also worth noting that according to Keys (2004) Flood Warning accuracy has been steadily improving. Between 1983 and 2002 the proportion of the flood height forecasts issued by the Bureau which proved to be accurate to within  $\pm 0.3$  metres increased from 50 percent to 75 percent (Robinson and McKay, 2003).

### **SES Flood Watch Policy**

By agreement with the CBM the NSW SES has adopted a policy on Flood Watches (see Annex A). When a Flood Watch is issued by the CBM the SES will act to disseminate it by including safety messages and releasing a Flood Watch Bulletin through the media outlets identified in Local Flood Plans.

The policy specifically requires that before the bulletin is released an assessment is made of the current conditions in each location covered by the Flood Watch. This assessment is used to fine tune the safety messages to reflect the environment in which the community will hear of the Flood Watch.

It may be that at the time of issue the sun is shining and no one would suspect flooding is a possibility. In such cases the message will be softened to encourage people to, for example, simply consider their travel plans – will they be in the area to take action if a flood develops in the coming days? Or, consider preparations to move highly exposed

livestock and equipment to a less flood prone location.

If, on the other hand, the weather is obviously deteriorating or rain has already commenced to fall, the message will be firmed up to recommend moving livestock and equipment out of the reach of flooding, cancel travel plans or make sure someone else can take action.

### **Why does the SES need to respond to a Flood Watch so early?**

For the SES, a Flood Watch represents an opportunity to ensure contingency planning for a possible flood is activated while there is plenty of time and before the weather intervenes. This is especially true of resource deployments. The NSW Government and the community are fortunate to have the services of a highly flexible SES volunteer workforce which has consistently demonstrated a preparedness to travel anywhere in the state to help other communities. When a Flood Watch is issued decisions are made about such deployments. The people and materials are moved before the weather deteriorates to the point where air travel in particular is hampered.

Flood Watches also give the SES an opportunity to maximise SES unit readiness by opening headquarters, assessing resources and forecasting requirements, notifying other emergency services and organisations (including councils) and by re-familiarisation with flood intelligence and flood plans.

One example of the Flood Watch's value in allowing the SES to respond early was the Tamworth, January 2004 flood (Figure 1), where up to 3500 campers were evacuated from low-lying floodplains adjacent to the Peel River. In this instance a Flood Watch was issued approximately 60 hours before the onset of minor flooding, enabling the SES to deliver prior warning and advice to campers about the possibility of flooding and precautions to take to ensure an efficient evacuation if one was required. Education through Flood Watch messages allowed the SES to educate campers about the risk

posed by flooding to their campsites. The SES was able to activate its local flood plan for the council area, which included arrangements specifically for the evacuation of campers during the Tamworth Country Music Festival and establish liaison with other emergency services and organisations to ensure adequate resources were available. Most importantly the 'heads up' provided the SES with the cue to closely monitor the situation and prepare to act when necessary.

Once flood waters began to quickly rise and Flood Warnings were issued by the CBM, the SES acted by disseminating Flood Warning messages through the media, evacuating campers and closing affected roads.

In order to improve the awareness of campers during the country music festival this year the SES in partnership with Tamworth Regional Council produced a FloodSafe guide aimed at educating campers about flooding in Tamworth. This brochure included information on what actions to take on receipt of a Flood Watch or SES Evacuation Warning.

**Figure 1: Tamworth, Camping Grounds Flooded, 2004.**



Since 1997, the SES has been developing a model for the evaluation of evacuations and the time required for this process (Opper, 2004). This process uses an adaptation of what is known as a critical path analysis, a common project management tool. The evacuation time line was originally developed to assess the time relationships within the evacuation of the communities in the Hawkesbury-Nepean valley. In that context



the analysis revealed how long it could take to complete the evacuation of the at-risk population before floodwater closed evacuation routes. The results were alarming and indicated that evacuation decisions would need to be made many hours before all flood producing rain had fallen. The NSW Government has since allocated over \$57 million to reduce this risk in the Hawkesbury Nepean Valley (NSW Government, 1997)

The SES has continued to refine the evacuation time line and is applying it to the evaluation of flood risk in other communities. In many of these cases the results are similar to that found in the Hawkesbury-Nepean Valley.

In the circumstances just described, a Flood Watch can provide the SES with an opportunity to consider evacuation contingencies well ahead of actual flooding. In particular, the SES can take steps to better prepare for its response. This can be inconvenient if flooding does not develop as forecast, but to the SES this is neither an over reaction nor a waste of time. To wait until a flood materialises will be too late and may create unacceptable risks to public safety.

The SES through its flood planning and flood exercise programs, continues to develop its volunteers' understanding of Flood Watches and the actions that should be taken on their issue.

### **How Should the Community Respond to a Flood Watch?**

Since a Flood Watch is a notification of the potential for flooding to occur, it presents a perfect opportunity for the at-risk community to prepare to take action in case a flood was to eventuate. For example a caravan park owner on receipt of a Flood Watch should ensure that vans situated on low-lying land are in moveable condition in case flooding eventuates and evacuation becomes necessary. Flood Watch messages usually encourage people to monitor weather and stream conditions, prepare to take action if flooding eventuates and to continue listening

to radio stations for further updates on the situation.

Gissing, (2002) argued after the Kempsey, 2001 flood that better flood preparedness would have resulted in lower flood losses suffered by Kempsey businesses. This point illustrates the importance of Flood Watches in encouraging people at risk to be prepared to act in case flooding was to occur as predicted.

Just as for the SES, action taken by the community in the event of a Flood Watch must not be viewed as a waste of time or effort if no flood develops. If a flood does occur the early action could be the difference between reduced losses and a large **avoidable** damage bill.

The term Flood Watch is relatively new and with the relatively dry conditions in recent years the vast majority of the community does not understand what it means. This has led to inappropriate responses when Flood Watches have been issued. The SES community education program aims to develop the community's understanding of Flood Watches. It is also hoped that continued use of Flood Watches when conditions warrant their issue will further develop the community's understanding of the product.

### **I Thought they Said 'Flood Warning' Over The Radio?**

On a few occasions when the SES has issued Flood Watches to the media for dissemination, media outlets have inadvertently incorrectly announced the Flood Watch as a 'Flood Watch Warning' or a 'Flood Warning'. This has created confusion and an unnecessary level of community anxiety and frustration. The SES continues to address this issue with local media officers building relationships with the media, and educating them about the various warning products which they may be asked to disseminate.

## Conclusion

The key to reducing risk to life and potential damage, especially to easily moveable property and possessions, is early warning of flooding. The Flood Watch product represents an extra opportunity to take some appropriate action, beyond that available in the subsequent Flood Warnings that may be issued. A Flood Watch is, by nature, a less accurate warning product and this creates a risk management challenge for people living on a floodplain. Should they act on a Flood Watch or wait for the apparent certainty of an actual flood prediction? Any logical risk assessment will find that taking protective action that, only with hindsight, proves to have been occasionally un-necessary, will out way the much higher risk of waiting for the water to appear before deciding to act.

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## Author Biography



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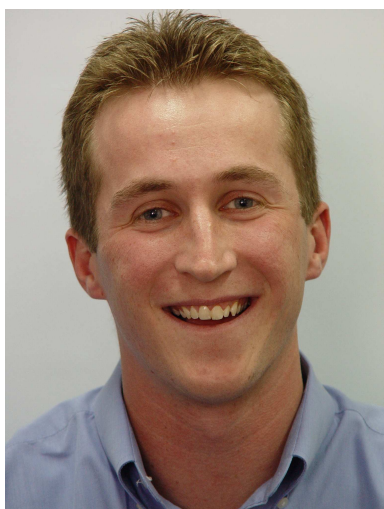
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Steve has written papers on flood emergency risk management for state, national and international forums and was in the writing team for the EMA guide for Emergency Management Planning for Floods Affected by Dams.

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