

LEARNING ABOUT FLOODS:

A STATE EMERGENCY SERVICE PERSPECTIVE

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INTRODUCTION

It is now nearly eight years since the State Emergency Service was restructured in New South Wales and began to operate under its present legislation (the State Emergency Service Act 1989). This Act defines the SES as the 'combat agency' for dealing with floods in our state and, unlike earlier legislation governing the Service, gives it a clear direction with regard to the flood management role. Significantly, the management of flooding is the first function which is listed. To fulfil its charter the SES now seeks actively to develop and maintain its expertise in the flood management field - a field which is broad and complex and which covers a considerable range of disciplines. To understand floods and how they should be managed requires an acquaintance with hydrology and various of the environmental sciences as well as some of the social sciences. It also requires an understanding of the principles of management.

Before the restructuring, SES volunteers tended to develop expertise in operational flood management by virtue of **experience** of floods. Some spent many years in the Service, observing a number of floods on the creeks and rivers of their areas and learning about flood behaviour and its consequences for their local communities. In some areas, of course, flooding was so infrequent that learning by experience was virtually impossible, and in any case the turnover of personnel within the organisation made it difficult to ensure that the benefits of learning were passed on and held in the SES. To compound these difficulties there were few opportunities for more formal learning about floods, their impacts and their management. SES personnel were often not invited to participate on council-led floodplain management committees, and the organisation's state headquarters promoted little networking with other flood-interested agencies. With no clear legislative charter to do so, it did not accord the development of flood knowledge and expertise a high priority.

During the 1990s, under the guidance of the present legislation, the situation has changed significantly as the Service has built a 'flood project' designed consciously to promote education and knowledge amongst its volunteers and paid staff. The project has incorporated the development of formal flood plans for all flood prone areas of the state and has sought to systematise the collection and utilisation of 'flood intelligence' for operational decision-making purposes and to better warn

communities about impending floods. It has also sought to ensure that SES personnel fully understand the range of flood types and severities with which they might have to contend, and to encourage them to participate in relevant flood forums such as local floodplain management committees which define flood problems and examine possible mitigation strategies. The project has, in short, the goal of creating an increasingly flood-educated Service which fully comprehends its responsibility for the co-ordination of real-time responses to flooding and understands the need to generate, augment and pass on to succeeding generations of members a body of flood management knowledge.

Such a service must be better able to serve the community in times of flooding, helping people to stay safe and reduce the damage caused by floods - the most costly of all the natural hazards we face in New South Wales in economic and financial terms (Australian Water Resources Council, 1992, 4-14). In this paper I outline the elements of the SES's flood project, indicate how the SES can contribute to council's floodplain management planning and show how councils can help us to produce a more professional, more flood-expert Service within their own areas.

THE SES FLOOD PROJECT

Expertise is gained in several ways - by experience, by networking, by research and by formal learning in workshop and 'classroom' discussions. The flood project encourages all of these and seeks to deliver information on flooding and its management in a number of ways. The SES conducts numerous conferences each year from its divisional (regional) offices, and these are used to impart information to senior personnel. The conference briefings, usually led by specialist flood managers from the organisation's State Headquarters but sometimes incorporating input from other sources (including the Bureau of Meteorology and the Department of Land and Water Conservation) are reinforced by later visits from headquarters staff. They are also backed up in training sessions held periodically at local SES unit level. Gradually, the Service is becoming more knowledgeable about flood plans, flood intelligence systems, best practice in the delivery of flood warnings and various other flood management issues, and the benefits are beginning to show themselves when floods occur. The actual elements of the project are outlined below.

Flood Planning

During 1991 the SES began to conduct flood planning 'clinics' designed to provide volunteers at divisional and local levels with the tools to produce flood plans for their own areas. These workshop discussions incorporated hazard analyses intended to familiarise personnel with the flood threats they might face and the information which was available to define their impacts, examinations about the nature and scale of the warning and evacuation tasks and how they should be managed, and questions about which agencies had the appropriate skills and resources to help carry out the myriad tasks which floods impose.

A generic 'model' plan format was devised to facilitate the plan-writing process, and over the next few years the plans were written, polished and taken to the appropriate District and Local Emergency Management Committees for briefings and to obtain endorsement. Now, six years after

the first clinic was conducted, 17 plans have been completed for SES Divisions and more than 130 for council areas (or, in a few cases, for parts of council areas or combinations of two or three of them). In addition there is a State Flood Plan. Many of these plans have been through several revisions and have become more complete and more operationally useful documents as a result. They are intended to be the central guiding documents for flood operations, and are publicly available through council libraries and elsewhere.

The standard format for a Local Flood Plan in New South Wales covers a wide range of issues arranged as follows:

- Introduction:** the purpose and authority of the plan; the area it deals with; the identified roles of the agencies involved (including the SES, Police Service, Council, NSW Fire Brigades and/or Bush Fire Brigades, Telstra, electricity authorities, NSW Agriculture, Roads and Traffic Authority, Disaster Welfare Service and other organisations as necessary, including other government agencies and service and sporting clubs) conditions for plan review.
- Preparedness:** public education; plan activation; sources of flood intelligence; types of warnings provided and means of disseminating them.
- Response:** control arrangements; operations centres, liaison requirements, communications systems used; provision of public information; road control; flood rescue; evacuations; logistics and resupply.
- Recovery:** welfare; registration; issue of 'all clear'; recovery co-ordination; debrief.
- Annexes:** the flood threat; areas affected by flooding; gauges monitored; guide to the content of evacuation warnings; dissemination of flood warnings and flood bulletins.
- Maps:** the council area(s); river and creek systems; communities at risk; flood mitigation devices and operational areas (sectors).

While the creation of a standard format may be seen as imposing a restraint, the model is used flexibly and considerable variations in content are possible within individual sections. In some circumstances the section on evacuation may be very brief, merely noting the potential scale of the task, the areas which may be affected and the evacuation centres that would be used, but in others it may be considerably enlarged to incorporate information on the control of evacuation routes, the deployment of engineering resources to 'shore up' low sections of roads and the need to stagger evacuations area by area from a town and to identify out-of-area destinations and special transport requirements. Likewise the control section may be relatively brief but, where decentralised control arrangements or forward control points are necessary, these are outlined at length. Additional sections may be added, as may additional annexes (for example to describe warning/alarm systems and evacuation arrangements relating to potential dam-failure flooding).

The preparation of a flood plan is a substantial learning experience for an SES Controller and his or her unit members, and once it is written it becomes an important educational document for other

agencies with roles to play and, indeed, for the citizens on whose behalf it is prepared. All Local Flood Plans are given wide distribution in the areas to which they apply.

Flood Intelligence

As recently as 1990 the amount of information available on the consequences of flooding of different severities along a river was strictly limited and in many cases unknown to SES personnel. Since then a concerted effort has been made to gather together from existing flood studies, floodplain management studies, floor-height records and the operational records of the SES and local councils a body of information on the effects of flooding in the areas around the hundreds of gauges on the state's rivers. This information is now recorded, relative to gauge height, on a flood intelligence card which has been created for each gauge, and as new flood studies are completed or further floods are experienced the information is checked and confirmed or altered and new material is added. The cards are under constant review to ensure that field operators are aware of the need to 'capture' flood events as they occur and to ensure that the information which is recorded is relevant, comprehensive and easily understood. It is essential that the cards meet high standards of quality so that they can inform operational decision making and the prioritisation of flood response actions and create an effective base for the provision of warnings to the community. An officer at State Headquarters, the Planning and Research Officer, has the maintenance and progressive upgrading of the flood intelligence cards as his key activity and this employee regularly addresses divisional conferences and works with Local Controllers to improve their cards.

Flood Warnings

Traditionally the task of flood warning has been in the province of the Commonwealth Bureau of Meteorology, whose hydrology unit in the New South Wales Regional Office in Sydney produces height-time predictions for gauges on streams experiencing flooding. For years these predictions were sent by the SES to regional radio stations for broadcast, and in some cases they generated other local warning services as well (including, in severe events, doorknocking). Such services were often developed only in an ad hoc fashion, however, but the State Emergency Service Act 1989 makes specific reference to the SES being involved in the 'development of flood warning systems' and considerable effort has been made to ensure that appropriate expertise is generated so that a significant contribution can be made. Broadly speaking the SES role is one of 'translating' the Bureau's predictions into effects on the community and then communicating these effects to people in the path of the coming flood. The likely impacts then become the platform for suggestions about what people should do to mitigate the flood's impact - whether this is by stocking up before isolation occurs, or moving farm animals and equipment from low-lying areas, or raising household belongings above the likely flood level, or gathering together essential and valuable items when evacuation becomes necessary. The flood intelligence cards are vital tools here, as is an awareness of who are the clients of the warning service in a particular area and what are the best means of communicating information to them when a flood is on the way.

SES Division Headquarters have also been encouraged to design pre-formatted warning messages for transmission by radio (and, if appropriate, television). These are devised for particular heights on specified gauges and give an indication of the likely consequences of a coming flood and what should be done by those who are expected to be affected. The messages can be fine-tuned at the time of an actual event and information which only becomes known at that time can easily be

incorporated. Two examples of these messages, for the case of Bathurst, are illustrated below: one relates to 'moderate' flooding and the other to flooding of greater severity. More explicit and detailed information will be provided, of course, in warnings delivered to individuals by telephone or doorknock, and in this regard local SES units are being encouraged to define clearly the 'market' for flood warnings for floods of differing severity.

5.5 metres: This flood will be similar to the flood of July, 1988 but less severe than the one of August, 1990. Low-lying properties in Hereford Street, Kefford Street, Stewart Street, Morrissett Street, Pye Street and Carlingford Street could be inundated by _____ (time) and residents in these areas should raise their furniture and furnishings and protect their valuables. For further advice and assistance, contact the Bathurst City State Emergency Service on _____.

6.5 metres: This flood will be similar to those of August, 1986 and August, 1990. Residents of low-lying areas of Bathurst and Kelso near the river (nominate streets) should prepare to evacuate to the Bathurst City Hall in William Street. Members of the emergency services will be doorknocking houses likely to be flooded and are able to assist people in evacuating. For further advice or assistance, contact the Bathurst City State Emergency Service on _____.

Attempts are also being made to ensure that the SES appreciates the need to ensure that the existence of warning services is known to the community **before** flooding strikes - for example, by publicising them in campaigns to raise community awareness of the flood hazard. Pre-recorded community service announcements have been provided to regional radio stations to educate people about floods, warning services and the importance of taking appropriate action when flooding is forecast. Commemorations of significant flood events have also been used, as in the case of Maitland in 1995, to heighten community knowledge of and interest in floods. In these endeavours, the input of local and divisional personnel has been sought as a means of encouraging in them the realisation that the flood combat agency must take responsibility for ensuring that the community is educated about flooding, its consequences, and how its effects can be reduced by appropriate actions at the level of individual households and businesses. Currently, in the Woronora area (in Sutherland Shire) an attempt is being made to engage the local community as well as the local SES in the planning of new warning services. This will ensure that there is a measure of awareness of the existence of the service before the next flood, and it will also help guarantee that the service is provided in ways the community believes are appropriate.

Flood Exercises

Because significant flooding on the rivers of New South Wales is not a regular phenomenon, and because some areas can go for years without experiencing floods, readiness for operational activity must be consciously sought outside flood time. Discussion exercises, based on flood plans, are being mounted in conference workshops to test the understanding of SES personnel about co-ordination and control arrangements, procedures for the provision of warning services, appropriate means of evacuating communities or parts of them, the potential scale of the resupply task and similar themes. Education about such matters accompanies skills training in floodboat operation and first aid. In some areas, 'scenario-based' exercises have been mounted in which the reactions of participants to simulated flood predictions are assessed and discussions are undertaken about what

actions will be required when floods are expected to reach certain nominated heights. Exercises of these sorts can be expected to be held frequently in SES conferences and in the training sessions run by individual local units: they are invaluable in reminding participants of the flood management role and encouraging them to recognise what they will need to do and what sorts of decisions will have to be made. Exercises can, in effect, be used to practise decision making and the management of the various tasks which will have to be met when floods occur.

Resources for the Educational Task.

A few years ago there were few published resources available to guide the SES flood project in New South Wales. There were no guides to flood planning, intelligence development or the provision of flood warnings (although some general emergency management experience was available in the organisation to create the building blocks), and what was done in these fields often reflected local traditions and local interest rather than notions of best practice. Now, however, a national guide on the provision of flood warnings is available, and three more flood-management documents - one each on floodplain management, flood planning and the management of flood response operations - are expected to be published by Emergency Management Australia before the end of 1997. All of these publications have had substantial input from the New South Wales State Emergency Service which has networked vigorously with other flood-interested agencies both within the state and elsewhere in Australia to upgrade its own expertise in the field and to contribute to the body of information on flood management. By the end of the year we will have four 'textbooks' in flood management which will be the guiding documents for educating the next generation of Australia's flood managers. These documents will deal with flood management in the broad, though, and there will still be a need for knowledge about particular flood environments to be developed. Here, councils can make a substantial contribution.

FLOODPLAIN MANAGEMENT, COUNCILS AND THE SES

As noted above, it has not always been the case that the SES is invited to participate in the deliberations of floodplain management committees which meet under the auspices of local councils. Non-involvement creates several undesirable consequences: it denies SES personnel an opportunity to learn from consultants, Department of Land and Water Conservation personnel, council employees and others about the local flood problem and its management, it denies the committee the benefit of SES experience, and potentially it restricts the scope of the floodplain management process itself. When flood mitigation was largely about structural and regulatory solutions to flood problems the consequences of the exclusion of the SES might not have been particularly serious except in terms of SES learning opportunities foregone, but now that matters relating to warning systems and evacuation procedures are being treated as integral to floodplain management any continued exclusion should not be countenanced. Fortunately the Department of Land and Water Conservation supports the participation of the SES on these forums and there are already signs that opportunities for SES involvement are increasing.

Improving Floodplain Management Information

The benefits of the SES being a full partner in floodplain management forums were alluded to in last year's conference of the Floodplain Management Authorities (Haines, 1996). Apart from the educational and networking benefits to SES personnel, the deliberations of floodplain management committees on matters beyond the structural and regulatory will be enhanced. For the SES, the opportunity to have the flood intelligence cards reviewed by the consultant will be valuable because the assessment of the consequences of flooding to different gauge heights will be improved. Similarly, the consultants will be able to comment on issues relating to the adequacy of existing warning systems and services and make suggestions as to additional gauging and/or the identification of the clients of warnings and the best means of communicating with them when floods are rising. Equally the consultants could be asked to carry out research on matters pertaining to evacuation - the amounts of time that would be available under different scenarios to evacuate an area, the problems of low points and points of probable bottlenecks on evacuation routes, and the problems of shrinking islands would be examples.

These issues have been examined in some areas - notably the Hawkesbury Shire on Sydney's north-western fringe - and the results of the examination have informed the flood plans and generated funding to raise a vital evacuation route. The overall result is likely to be a significant improvement in public safety in a severe flood. Beyond these matters, the consultants could be asked to comment on appropriate strategies and priorities for raising community flood awareness, and on possible future development areas which might need to be assessed in terms of emergency management measures relating to warning systems and evacuation procedures.

On several of these issues there is at present more guesswork than is desirable, especially along the coast where severe floods are likely to be especially dangerous in terms of human safety. More formal answers to the questions posed here than have hitherto been possible will give the SES a firmer base of knowledge from which to revise its flood plans and develop operational decisions. In short, the guesswork will be reduced and the number of cases in which the SES is caught by surprise when floods occur will diminish.

The SES wishes to facilitate the research process proposed here. To do so, it would furnish the consultant with an up-to-date copy of the Local Flood Plan(s), the relevant flood intelligence cards and an indication of which entries need to be checked and what kinds of additional information should be included, and the details of the stream gauges currently utilised (so that the results of the flood studies, including design events, can be related directly to these gauges).

For SES participation on local floodplain management committees to be maximally effective, it would be preferable for the organisation's State Headquarters to be advised that a committee was being struck (or, alternatively, re-activated). Given such advice, the nominated participant(s) could be briefed about the process, any studies which had already been completed and what might be sought by way of information from the consultant and the committee. Taking this approach would ensure that appropriate SES flood management expertise could be brought to bear and would heighten the effectiveness of the local SES's participation on the committee.

Some Problems Relating to Development Applications

The result of the process outlined here would be a better educated SES, with higher-quality information to incorporate in its training and its planning. Such things should give comfort to

councils as part-sponsors of SES, and there would be other benefits from a council perspective as well. Amongst these would be the input which would be provided to council decisions on Development Applications in flood liable locations. This is an area which has become rather confused in recent times, notably as a result of decisions about Local Environment Plans and by assessors of the Land and Environment Court.

Of particular concern is a recent determination made by the Land and Environment Court regarding a Development Application for a subdivision in an area known as The Hatch, on the lower reaches of the Maria River in the Hastings Council area. A council decision that the proposal represented inappropriate development for the location was successfully appealed in the court, which recommended that approval for the proposed development be sought again upon preparation of an 'evacuation plan'. This plan was subsequently prepared on behalf of the appellant, and Hastings Council approached the SES Local Controller to ascertain his views about it.

From an SES standpoint this whole process was of some concern, and for several reasons. Firstly, the question of what an 'evacuation plan' prepared on behalf of a private party should do and should mean is problematic. Presumably the Court saw the plan as an instrument for ensuring public safety - that is, a document which would facilitate evacuation when flooding was imminent. Unfortunately there was no quality control applied to the plan's preparation and, worse, the impression was created that having a plan would be tantamount to having an assured mechanism to guarantee the safety of the people covered by it. In fact, of course, no plan can be said to provide such a guarantee: people may fail to receive or heed flood warnings, or the flood warnings themselves may mis-state the severity of the coming flood. (In the case of the Maria River, it should be noted, there are no formal warnings produced by the Bureau of Meteorology). In addition, people may become complacent after a long flood-free period, particularly if the plan has no mechanism to encourage continuing awareness and readiness. It follows from all this that some individuals may not adhere to all the plan's provisions and one result could be that they will need to be rescued by the SES at a time when orderly evacuation is no longer possible because road access has been cut.

Such plans should be treated with caution, then, especially when they are privately written, without quality guidelines and in support of Development Applications. The potential for problems to arise is very high. Yet it does seem likely that further Development Applications will be accompanied by similar plans and that councils may, as a result, have difficulty in rejecting proposals which have followed the direction laid down by the Court. It is quite possible that the writing of 'private' evacuation plans could be the means by which developments which have previously been rejected could be permitted to go ahead - with considerable ramifications for floodplains and for long-held notions about what constitutes desirable or appropriate forms of land use upon them. The implications particularly for the north coast of New South Wales could be substantial and should be of concern to councils and the SES alike.

One distinct possibility is that the proliferation of residential developments on floodplains and backed by privately-written evacuation plans will generate increased demands for public investment in roads and other infrastructural facilities which will then require repair or replacement after being damaged or destroyed in floods. Intensified development on floodplains could do harm to our management of these areas and at the same time create an **increase** in society's exposure to flood damage - the very thing which floodplain management seeks to avoid. On this point it is perhaps

worth noting that the Commonwealth government appears to be moving in a direction which will make Natural Disaster Relief Arrangements (NDRA) funding more difficult to obtain if councils cannot demonstrate that they are behaving in ways which will mitigate the costs created by flooding. The SES, incidentally, will soon be seeking to meet with the Land and Environment Court to discuss the question of private evacuation plans and the stance the court has recently adopted on them.

One further point should be made on these plans. In the case of the Development Application at The Hatch, the council approached the SES Local Controller for advice about the validity and utility of the evacuation plan which had been written. This is not necessarily appropriate, given that such controllers are volunteers and may not have the expertise to provide the type of advice requested - though they may be able to comment on the implications of the proposed development in terms of potential rescue implications. But to be asked to 'referee' on such matters is likely to place a controller in an invidious position: he/she could be seen by the proposal's sponsor as running interference for council or alternatively could come into conflict with council by supporting a development which council seeks to oppose. This is not desirable from anyone's point of view regardless of the opinions of different parties on individual development proposals.

In future, when a council requires information relating to a Development Application for flood liable land, it would be appropriate to approach the State Headquarters of the SES where the relevant expertise is being built and where the necessary contacts exist. The headquarters will then liaise with the Local Controller, council officers and others to provide a recommendation. This will provide a more disciplined means of addressing the problem than the ones we have employed to date.

CONCLUSION

The SES is well down the path of ensuring that its personnel have genuine expertise in flood management. Considerable work has been done to define best practice in the fields of flood planning, flood intelligence development and flood warning, and to ensure that those who are volunteers at unit level are aware of and can apply the principles of these things in their own areas. Expertise about flooding and its consequences at the **local** level is best achieved by participating in local flood forums such as floodplain management committees. The SES will welcome council assistance in this matter in which both parties will benefit by being partners with the goal of protecting the community from the effects of flooding.

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