

## **VALUING COMMUNITY SAFETY IN THE MANAGEMENT OF DAMS: DEVELOPING THE PARTNERSHIP BETWEEN DAM AGENCIES, THE COMMUNITIES AT RISK AND EMERGENCY MANAGERS IN NSW**

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### **ABSTRACT**

Dam safety planning is a team game. There are many players involved and there is a need for information to be shared and actions to be properly coordinated. The State Emergency Service is the legislated combat agency for flooding in New South Wales and is responsible for planning for and conducting the warning and evacuation of communities at risk from floods, including floods affected by dams. The successful execution of these responsibilities is dependent upon the continuing development of a strong, cooperative relationship between the dam owners and managers, dam regulators and emergency managers and the effective incorporation of community expectations in dam safety planning. This paper explores some of the ways that this relationship can help to meet well accepted community expectations in respect of risk to life and property and outlines progress made in dam safety planning to date. The emergency response aspect of dam failure planning is still a relatively immature field in Australia, and it follows that there are lessons to be learned as we proceed. In that context, the paper also describes some of the difficulties the State Emergency Service has encountered in its role as the response planning agency and suggests some guiding principles to enhance future interactions between the key stakeholders.

### **1 INTRODUCTION**

Dam owners/managers and the New South Wales (NSW) State Emergency Service (SES) have separate but strongly overlapping interests in floods affected by dams. One as the owner of the infrastructure and the water resource it contains and the other as the combat agency for the management of floods. While dams provide many benefits for communities, including flood mitigation, they may, on rare occasions, create a flood hazard. At the extreme, if dams fail and uncontrollably release their contents, the resulting 'dam break' flood can be disastrous for the communities downstream (Emergency Management Australia, 2001). Both parties must continue to work together for the management of the risks associated with living and working below large dams and to meet the needs and expectations of the third and most important group of stakeholders – the communities at risk. Put quite simply, these needs and expectations are the safety and security of life and property.

It is only about a decade or so since the dam safety community in NSW began to become aware of the scale of the potential dam failure problem in terms of the sheer number of dams, large and small, which could be categorised as being liable to failure. In assessing dams once believed capable of containing very large floods, consideration had to be given to the worldwide trend in reviewing Probable Maximum Precipitation (PMP) estimates that was occurring at about that time. Following the record rainfall recorded in Dapto, NSW in 1984, in which 520 mm of rain fell in 6 hours, a near PMP event (Dams Safety Committee, 2003) and other defining events, it became clear that floods, much greater than previously experienced, or even conceived were possible in Australia. Some dams are also considered structurally deficient regardless of PMP estimates. The Dams Safety Committee (DSC) in NSW currently lists 18 of the State's dams as deficient.

The outcome of this risk rating is that the dam owner is required to find and put in place a

permanent solution to reduce the risk of dam failure to a tolerable level. Such solutions however, do not come cheap and may take many years to research, design and implement. The consequences of this timeframe are threefold and affect each of the stakeholder groups listed previously in the following ways:

- The communities downstream of the structure continue to live with an intolerable risk until the deficiency is fixed;
- The SES is required to plan for and respond to flooding with the added risk posed by the continuing operation of the unsafe structure; and
- The dam owner must plan for emergencies occurring as a result of the deficiency and in some cases, implement an interim operational or engineering solution.

In spite of the short length of time we have been actively addressing the risks from large dams, much has been achieved in terms of reducing these risks in NSW. Many of these methods only serve as interim solutions such as installation of telemetry and warning systems, inclusion of specific dam failure warning and evacuation procedures in SES local flood plans, temporary repair and upgrade works and modifying dam operating procedures to increase warning times. Some structures have also had permanent fixes applied. In some cases the dam has either been removed or rendered inoperable. Many more dams have had, or are in the process of having permanent upgrade works carried out to deal with the deficiency. Also, one of the significant achievements in the last decade is greater awareness of the need to involve the community in living with and managing the risk from large dams. Taking this awareness into action this is one of the key areas for future works.

There is still room for improvement in our management of the risks from large dams and many lessons have been learned from our experiences so far. This paper outlines some examples of good and poor practice in dam safety planning in recent years and suggests some guiding principles for the future interactions of dam owners and managers, the SES and the communities at risk. Through this analysis, the benefits that will accrue to all parties through a stronger partnership between them is demonstrated.

## **2 THE ROLE OF THE SES**

Under the emergency management legislation in NSW, the SES is the combat agency for floods and storms. This includes floods affected by dams. Within this role the SES's main responsibility, which relates to the service's interactions with dam owners and managers is to plan for and respond to flood emergencies. SES planning is conducted at the local, division (regional) and state levels. Each flood plan prepared by the SES is a sub-plan of the Disaster Plan at the relevant level and is endorsed by the relevant Emergency Management Committee, as appropriate. The SES is a member of each of these committees across the state and is responsible for representing flood and storm interests at these forums. NSW flood plans are written under the authority of the NSW emergency management legislation, namely the State Emergency and Rescue Management Act, 1989 and the State Emergency Service Act, 1989.

Prior to 1990, there were very few detailed SES flood plans in this state and response operations were mostly carried out based on brief flood warning documents and Standing Operating Procedures. This is true also of the SES's involvement in dam failure planning. Although some examples of detailed dam safety planning existed, such as the arrangements for Googong, Dungowan, Burrinjuck and Chichester dams prepared in the mid-1980's, most arrangements were ad-hoc and varied greatly from dam to dam. Historically, there was a tendency for planning for dam safety to occur somewhat separately from general community emergency management planning. As the aim of planning by both dam owners and emergency management agencies is community protection, such separation increases risks (Emergency Management Australia, 2001).

The change in the early 1990's was a move to the development of local flood plans for over 130 local government areas identified as having a flood problem in NSW. These plans were done relatively quickly to fill the risk gap and in many cases, consultation with the communities at risk and other agencies was less than desirable. The documents did however, serve as a locally specific set of arrangements to guide communities through episodes of flooding.

At about the same time as this initial flood planning work was underway, it was realised that the SES can provide advice in relation to the potential public safety and property protection dimensions of floods affected by dams. The SES began to be seen as being able to assist dam owners and managers in the discharge of their risk management responsibilities.

As a result, in 1993, the SES and the NSW DSC formed the Emergency Management Sub-Committee of the DSC. The function of the Emergency Management Sub-Committee is to 'ensure the State approaches emergency management related to dams in a fully integrated and comprehensive manner' (Keys, 1997b). This body was charged with devising a list of high priority dams requiring specific flood planning arrangements (the SES only conducts detailed planning for those dams listed as priority 1 or 2) and ensuring that the SES was provided with appropriate information on such things as likely failure modes, the time frames over which failure could develop, the areas which would be inundated and the travel times of flood waves. In addition, it formalised the communication between the SES, the DSC and the owners of the dams themselves (Keys, 1997a). The sub-committee acts as a conduit for the passage of information between the three groups and as a forum for discussion of procedural arrangements to guide the planning process.

Since that time the SES has become increasingly involved in the provision of advice to dam owners for emergency management of deficient dams. The focus of the service's input is on the public safety dimension and this sometimes brings it into disagreement with dam owners and managers seeking to manage their corporate interests such as privacy issues, competition, corporate image and public liability.

Some significant progress has been made though, which will help to improve both the process of writing Dam Safety Emergency Plans (DSEPs) and also to streamline the way dam owners and managers can make contact with emergency management agencies during actual or potential dam failure situations. In April of 2003, the Emergency Management Sub-Committee of the DSC and the Senior Operations Officer of the State Emergency Operations Centre signed off on the contact arrangements to be utilised during dam

failure emergencies (see Figures 1 and 2). These diagrams have been documented in DSC 12-1 (an addendum to DSC 12) and are available on the DSC website at [www.damsafety.nsw.gov.au](http://www.damsafety.nsw.gov.au). These diagrams should be used in the preparation of emergency contact flow-charts for inclusion in all DSEPs prepared by dam owners in NSW.

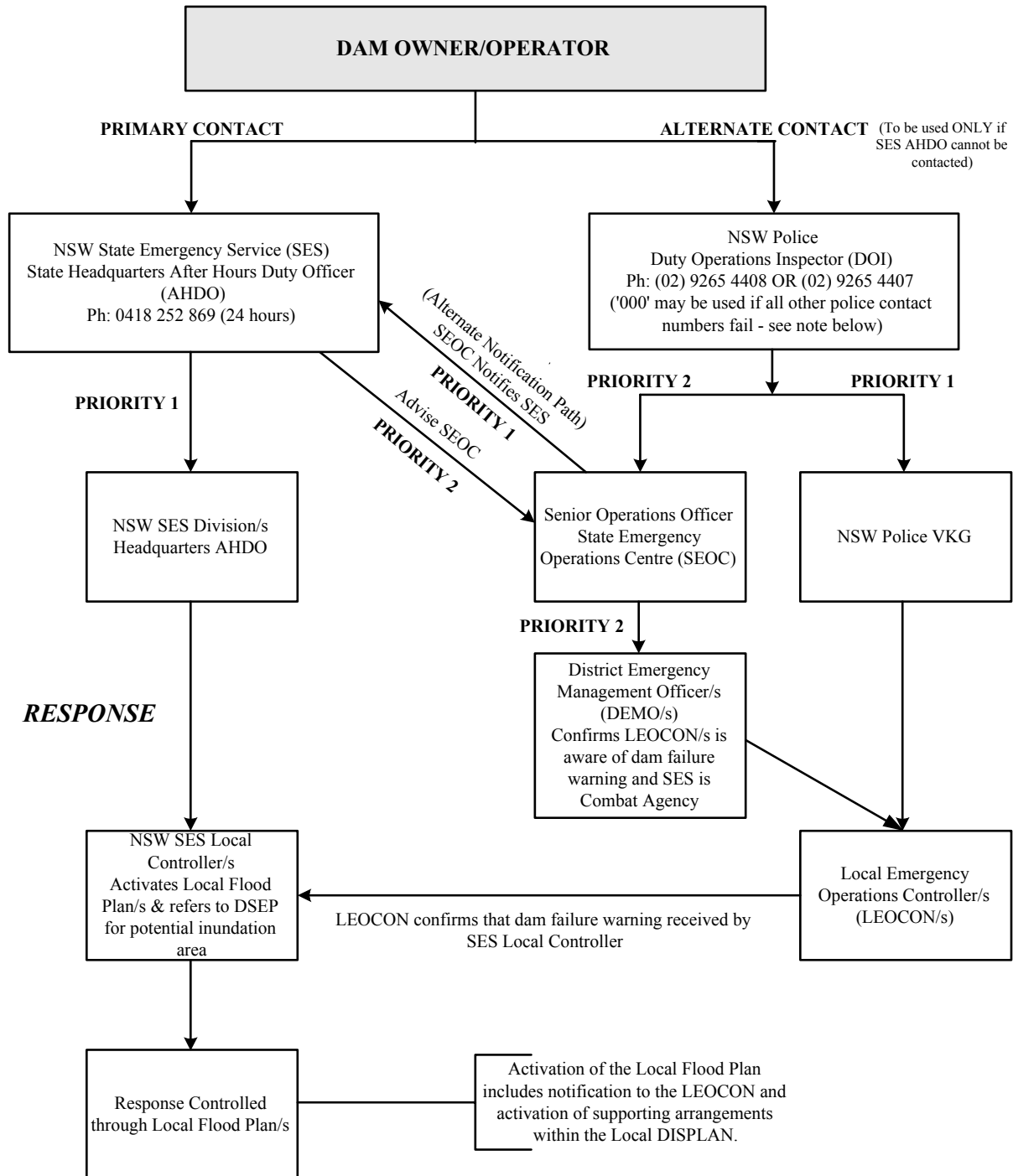
For the past decade now, the SES has been actively reviewing the first generation of local flood plans to produce more detailed, more consultative and more operationally useful flood plans. There should be no doubt that several flood operations in NSW in recent times have progressed much more successfully than would have been the case had the plans not been produced (Keys & Opper, 2001). Some of these plans are in their third generation and many now include specific arrangements for the management of flood risks other than those caused by riverine flooding, including dam failure flooding. In many cases, due to the short warning times available and large volumes of water involved in dam failure floods, the arrangements in the SES flood plans need to be extremely detailed, even down to property level. The need for clear, accurate and timely advice from the dam owner in relation to the flood risk is therefore essential to carrying out this planning and ultimately the flood response.

As noted in Keys, 1997b, on receipt of the appropriate information from the dam owner, the SES then:

- Determines the type of flood plan required;
- Leads in the development of that plan or revision of an existing flood plan;
- Advises the dam owner on warning requirements;
- Advises the dam owner on what assistance is available in the management of dam safety emergencies and acts as the link between the dam owner and appropriate Emergency Management Committees at District and/or Local level; and
- Provides the DSC and the dam owner (or the Department of Commerce for Council dams) with copies of appropriate plans at each of the key stages of development.

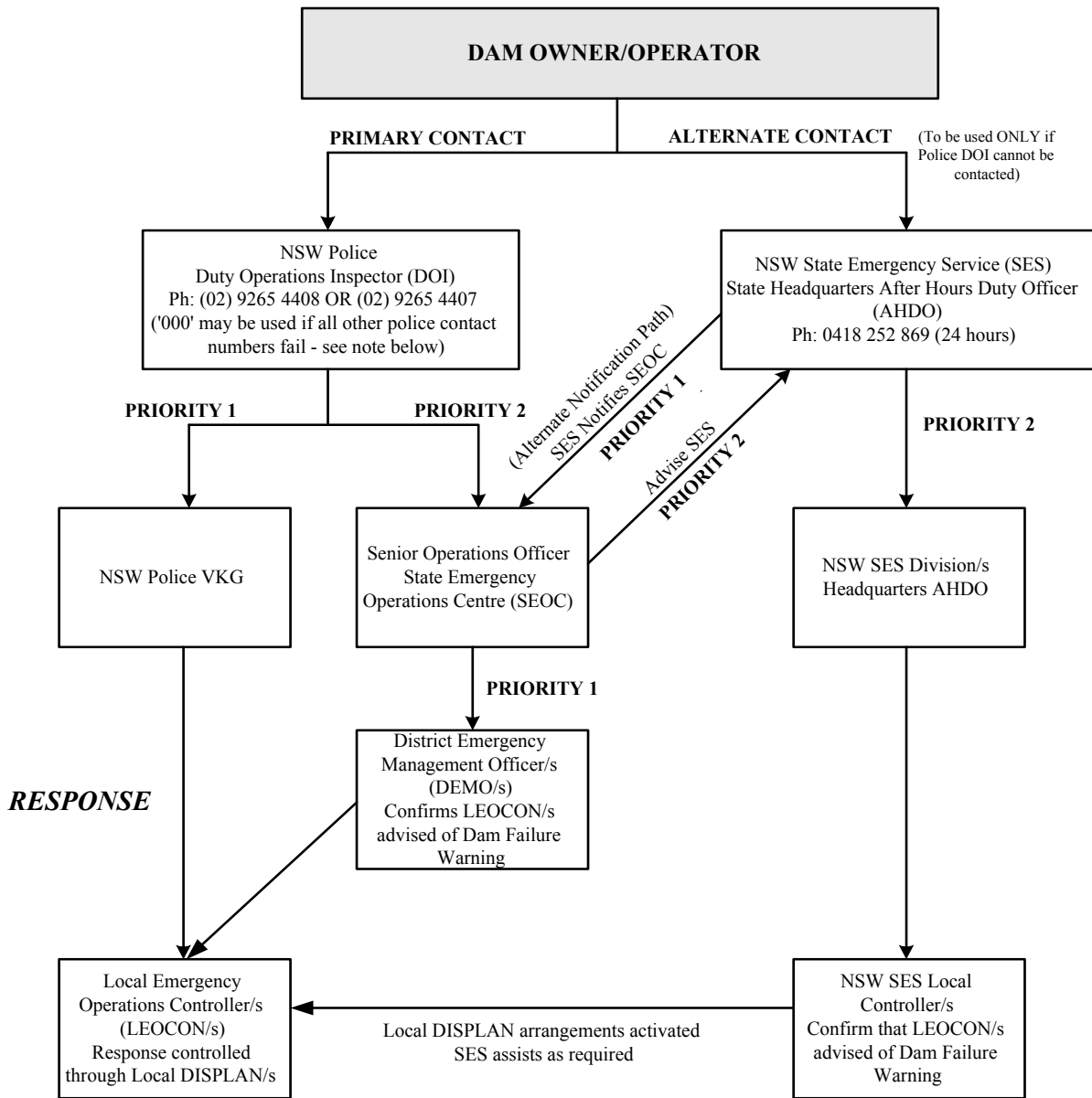
The SES has also been developing an exercise policy to test flood and other plans and operational

**Figure 1:**  
**Notification Flowchart for Potential Dam Failure in an area**  
**where there is an SES Local Flood Plan**



**NOTE:** Dam owners should make every attempt to call the SES AHDO in the first instance and only use the NSW Police Duty Operations Inspector (DOI) if the SES AHDO cannot be contacted.  
 The '000' emergency contact number is not the preferred method of contacting the NSW Police in the context of dam failure. It is likely that the 000 operators will have difficulty dealing with the very unusual case of potential or actual dam failure. If 000 is used, the caller **must** give the details of the incident to the 000 operator **before** asking to be transferred to the DOI.

**Figure 2:**  
**Notification Flowchart for Potential Dam Failure in an area**  
**where there is no SES Local Flood Plan**



**NOTE:** Dam owners should make every attempt to call the NSW Police Duty Operations Inspector (DOI) in the first instance and only use the NSW SES After Hours Duty Officer (AHDO) if the NSW Police DOI cannot be contacted. The '000' emergency contact number is not the preferred method of contacting the NSW Police in the context of dam failure. It is likely that the 000 operators will have difficulty dealing with the very unusual case of potential or actual dam failure. If 000 is used, the caller **must** give the details of the incident to the 000 operator **before** asking to be transferred to the DOI.

procedures. These exercises have provided an excellent means of ensuring that SES personnel and the personnel of other agencies are educated about the flood threat and what can be done to manage it.

Much has also been achieved in terms of building the SES's capability for the flood management role in terms of educating community members about how they can manage their own interests during times of flooding. By increasing awareness of the flood risk, the capacity of the community to understand and respond to warnings in a timely fashion is also increased. Such education campaigns have successfully been implemented in many communities across NSW, however, their use in relation to dam failure flooding has yet to be fully developed.

The role of the SES is a complex one and one that requires a great deal of assistance from other stakeholders to carry out effectively. In particular, the planning process can be hampered by incomplete information or failure by other parties to consult early and at the appropriate level with the SES.

### **3 THE ROLE OF THE DAM OWNER/MANAGER**

The ANCOLD Guidelines on Dam Safety Management, which were accepted at the 1993 ANCOLD Conference, make it quite clear that planning for downstream communities is the responsibility of emergency management authorities and not dam owners. This does not, of course, absolve the dam owner from assisting the emergency management authorities (Haines, 1995). The core concern, should circumstances exist in which dam failure is possible, must be the saving of human life downstream of the dam (Keys, 1992) and this concern should impact upon the management and operation of dams in NSW. It should also be noted however, that the existence of warning systems and flood emergency plans does not release the dam owner from the responsibility to protect the structure. Warning systems and response plans are no substitute for structural upgrading (Haines, 1995) and should only be viewed as short-term, interim measures.

Dam owners in NSW are required to prepare DSEPs for all prescribed dams with populations in downstream areas. Prescribed dams include all

dams over 15 metres in height and those smaller dams which could cause a threat to public safety, property or the environment (NSW SES, 2001).

DSEPs outline the required operational procedures to protect a dam in the event of an emergency which may threaten the security of the dam. They outline the actions required of dam owners and their operators in response to a range of possible emergency situations. Where relevant, these DSEPs also include arrangements for notifying downstream emergency managers of spills and releases which might contribute to flooding, and for the passage of information on any potential or actual dam failure situation that might develop.

Dam owners are required under the guidelines, to liaise with the SES during the preparation of DSEPs to ensure that the DSEP reflects current emergency management arrangements including contact details. During the planning process, contact with the SES should be established as early as possible and this contact should be maintained throughout the preparation and review of the DSEP. Dam owners should also liaise closely with the DSC both prior to and during the preparation of their DSEPs to ensure they have all of the relevant guidelines and advice to carry out their planning and to keep abreast of any changes or updates to these guidelines (such as DSC 12-1 implemented in April 2003).

One of the most important roles that dam owners need to address is their responsibilities in relation to managing needs of the community at risk downstream of their structures. The concerns and expectations of these people need to be addressed and balanced in the emergency management of dams. The best way to do this, of course, is to keep the community informed and involved in the planning processes, which potentially can have profound effects on their personal safety and the safety of their property.

Where a high or significant hazard dam has been classed as deficient by the DSC in NSW, it is requested that dam owners provide additional information to the NSW SES for planning and response operations for floods affected by dams. According to the NSW State Flood Plan (NSW SES, 2001) a dam may be included on the DSC's list of deficient dams because it:

- Cannot safely pass very severe floods up to the PMF, which means that failure could occur as a result of an inflow flood (the 'flood failure' mode); and/or
- Has structural weaknesses relating to stability, piping or the condition of outlets which could cause failure even without an inflow flood (the 'sunny-day failure' mode).

It is agreed under national and state guidelines which have been negotiated and agreed to by the relevant stakeholders that dam owners will provide specific cause and effect details for dam failure to the SES. These include: Section Eight of the ANCOLD 'Guidelines on Dam Safety Management'; Guide 7 of the Australian Emergency Manual Series Part III, 'Emergency Management Planning for Floods Affected by Dams' produced by Emergency Management Australia; and the NSW State Flood Plan. Under all of these guidelines, there is one common thread which emerges. This is that in order for emergency managers to fulfill their role in planning and carrying out flood response operations, dam owners and managers must provide sufficient risk and consequence information to enable detailed flood response planning.

A reference in the NSW State Flood Plan, (NSW SES, 2001), agreed to by the DSC, provides a concise list of exactly what types of additional information are required to allow special dam failure warning and evacuation arrangements to be devised by the SES. This list is included here and is consistent with the ANCOLD Guidelines:

- The nature of the dam's deficiency with respect to potential flood failure or sunny-day failure;
- The Annual Exceedance Probability (AEP) of the Dam Crest Flood (DCF), (for dams with a flood deficiency only);
- A description of the hydrometeorological conditions which might lead to the development of a DCF or greater flood (for dams with a flood deficiency only);
- The period over which dam failure might occur;
- A description of DCF conditions downstream of the dam, including the impact of inflows from downstream tributaries (inundation map);

- Descriptions of 'sunny day failure', 'DCF without dam break', 'DCF plus dam break' and PMF conditions (inundation maps);
- Travel times for the flood wave to reach critical downstream locations (indicating both the front of the wave and its crest where possible);
- Flood inundation durations; and
- Flow velocities and depths.

#### **4 SOME SPECIFIC SES NEEDS**

In addition to the support required of dam owners and managers as detailed in the National and the NSW guidelines on dam safety management, the NSW SES has a number of further needs. Some of these have been addressed within the context of the Emergency Management Sub-Committee of the DSC and the arrangements documented. Others are merely general principles which are, for the most part, implied in existing guidelines but not described specifically.

The first relates to the way in which contact is made with the SES by dam owners and managers during the dam safety emergency planning process. The SES structure comprises approximately 230 local community-based volunteer units across the state. These volunteers are supported by a small number of staff located in 18 division (district) offices and the State Headquarters, located in Wollongong. The local volunteers are best placed to provide advice on specific local issues including local flooding and community issues. However, we seek to provide some level of protection for our volunteers to prevent them from being overwhelmed by the timeframes, priorities and technicalities of other agencies.

The SES protocol requires that any initial contact with the local SES Units is referred to the Emergency Risk Management Branch (formerly the Planning Section) of the State Headquarters. Information and tasking is then passed, as appropriate, down through the appropriate Division to the Unit and responses and timetables can be coordinated and agreed upon internally. These contact arrangements help to discipline the process to ensure that there is consistency in our advice, that the relevant issues are properly considered and the advice is tendered by officers with the appropriate strategic expertise. They also ensure that

emergency risk management priorities within the SES are set by agreement at all levels of the organisation and give consideration to external agencies whose priorities, understandably, differ. These contact arrangements for the review of DSEPs have been agreed to by the Emergency Management Sub-Committee of the DSC and are documented in DSC 12-1.

On another issue, in a few recent cases, very early drafts of DSEPs have been submitted to the SES for comment and review. Whilst it is desirable for emergency managers to be involved early in the consultation process for these plans, in these instances, a significant amount of work was required by the SES contact officer to steer the planning in the right direction. It appeared that the dam owners and the consultants preparing the DSEPs were unaware of the general emergency management arrangements in NSW and did not follow the guidelines provided by the NSW DSC. In one instance, a dam owner had contracted an inter-state consultancy to undertake the planning work. The consultant then based the plan on the emergency management arrangements and the associated terminology used in their own state. Despite being referred to the appropriate legislation and policies for NSW, the draft was submitted to the SES a further two times for comment, still containing arrangements only relevant in another state.

The SES is more than willing to provide input to these plans and liaise with dam owners to ensure contact arrangements are correct and appropriate and that the responsibilities of emergency management agencies are accurately described in DSEPs. However, the SES is not in the business of rewriting poorly researched or poorly documented DSEPs. The dam owner needs to take responsibility for ensuring that their plans at least meet DSC guidelines. During the August 2004 meeting of the Emergency Management Sub-Committee of the DSC, it was agreed that the SES would no longer provide comment on such poorly prepared plans. Instead, these will be referred back to the dam owner to be rectified before they are resubmitted to the SES for review and sign-off.

A vital ingredient for the dam failure sections of SES flood plans is the information contained in dam break studies including inundation maps and

databases or lists of properties potentially at risk. This information allows flood consequences to be anticipated and appreciated before they occur, with accompanying management benefits related to increasing the potential time to be used effectively to mitigate against the effects of rising flood waters. Key elements of dam break studies are used by the SES when writing the dam failure warning annex of relevant flood plans along with the decisions they will stimulate: as a result, the service will increasingly be able to fulfil the promise which dam failure warning systems provide.

Unfortunately, many of the inundation maps included in DSEPs do not cover the full extent of the inundation area needed for SES dam failure warning and evacuation planning and often cease at some seemingly arbitrary point without sufficient explanation as to why that particular limit was chosen. Also, these maps are sometimes reproduced in reduced size hard copy in the DSEPs and are therefore illegible and/or not to scale. Furthermore, the dam break studies commissioned by the dam owner for the preparation of these DSEPs are often done without any prior consultation with the SES in relation to the required GIS data format and the extent of the inundation mapping. As a result, the DSEPs and dam break studies received by the SES often contain inadequate information for our planning needs.

In the case of floods resulting from dam failure, there is one principal feature which must be understood if the plan for it is to have utility. This feature is warning time and this is a critical variable in planning the emergency response to flooding and ensuring that the impacts of floods are effectively mitigated. This is particularly so in the case of dam-failure floods which, almost by definition, arise more quickly and affect more people than do 'natural' floods and which create more difficult problems in terms of the need to mount larger scale evacuation operations under more severe time constraints (Keys, 1992).

Any procedure or arrangement which maximises the amount of warning time available to emergency managers will therefore have numerous benefits to the downstream community. In a study of 24 major deaths from dam failures and flash floods conducted by Brown and Graham (1988), it was shown that increases in warning time from a few minutes to 90



minutes or more reduced deaths by over 90 percent. With regard to gated dams in particular, the SES views the following principles as the key requirements for effective flood management:

- The onset of downstream flooding should be delayed for as long as is possible provided that doing so does not increase the extent or severity of downstream flooding; and
- Conversely, pre-releases aimed at reducing flood peak height must not compromise evacuation operations by resulting in earlier closure of roads.

During the development of SES flood plans containing dam failure arrangements over the last decade or so, a convention has arisen that most of the plans define three alerting levels, labelled for convenience 'White', 'Orange' and 'Red' and each with its own defined notification and warning (or evacuation) actions. Generally, the White level involves no more than the notification of response organizations and some monitoring activity, while Orange is used to indicate initial warning of the population at risk (usually by several warning modes, including doorknocks) and Red indicates the advice to evacuate immediately. In the case of some of the smaller dams, the intermediate level is omitted because of the very short period of time which could elapse between the point at which concerns for the dam's security are first felt and the point at which failure becomes possible. In these instances, attempts have been made to ensure that the White and Red levels are more conservatively defined than might be the case elsewhere (Keys, 1997b).

Dam owners need to understand that these evacuation alert levels relate specifically to the warning and evacuation tasks to be performed by the emergency managers and the communities at risk downstream. As far as possible, these alert levels should be set to maximise the amount of warning time available. This may mean that the drivers for alert levels used by the SES differ to those used by the dam owner to carry out emergency operations at the dam. When preparing DSEPs and flood operating procedures, dam owners should liaise closely with the SES to ascertain the warning requirement. This requirement is dependent upon the population at risk and the emergency service resources, among other things.

For example, the dam owner/manager should not expect that a single SES unit can by any means evacuate a population of say 1,000 people in a warning period of only a small number of hours from the White Alert level to the Imminent Failure Flood (IFF) level. Whilst most dams cannot be operated to increase this warning time, particularly during an inflow flood scenario, some dams can accommodate pre-release strategies or lower alert levels and greater air space margins to provide greater warning times. In some cases, different sets of alert levels may be required – those needed for the dam owner/operator to carry out functions to protect the dam and its supporting infrastructure and those needed for the emergency management agency to initiate actions to help protect the lives and property of downstream residents.

## **5 BENEFITS TO OWNERS AND MANAGERS OF DAMS FROM SES INVOLVEMENT**

Where a dam safety deficiency exists, the dam owner and emergency managers must work cooperatively to achieve the level of planning appropriate to the risk. Expertise and resources may need to be shared to optimise the outcome (Emergency Management Australia, 2001). One obvious benefit to dam owners/managers of SES involvement in dam safety planning is that plans containing the correct contact details, response arrangements and correctly described roles of emergency managers, are more likely to succeed on the day. This is not merely because the correct telephone numbers have been recorded on the document (although this is clearly essential), but also because the SES has been involved in the planning process. As with all plans, the process of planning and the research, discussion and documentation involved in this process are just as important, if not more essential than the plan itself. Those involved in the process are more likely to remember the time spent in preparing the plan than if they were just handed the completed document. In addition, through their involvement, participants in the process gain ownership of the DSEP.

Likewise, the SES should, from time to time, be involved to some extent, in the exercising of DSEPs. Although it is not possible for SES resources to stretch to allow participation in every dam safety exercise conducted across the state, by

using the lessons gleaned from SES involvement in say, a major dam failure exercise conducted on a regional basis once per year or so, dam safety planning will continually move towards best practice in this field. The SES and the DSC have agreed to facilitate this type of cooperation, including the incorporation of DSEP tests into some SES flood exercises. Exercising DSEPs with the participation of emergency management agencies accrues benefits to both parties through gaining a greater understanding of the roles and responsibilities of the key stakeholders and it also provides a forum for open communication between stakeholders to improve procedures.

The involvement of the SES in dam safety management also provides the best means of creating interim solutions, in the form of annexes to SES local flood plans, while the owner pursues the complex problem of dam upgrade works to permanently remove or fix a deficient dam. However, an over-reliance on these plans or lengthy delays to implementation of long-term solutions must be avoided. SES flood plans and the arrangements contained within them provide an opportunity for the dam owner to research, design and implement the most appropriate and cost effective engineering solution to deal with a deficient dam.

As described earlier in this paper, the establishment of the Emergency Management Sub-Committee of the DSC in 1993 has provided significant benefits to both emergency managers and dam owners in NSW in terms of our progress in dam safety and flood planning in this state. By providing a reliable means of communication between emergency management agencies, the DSC and dam owners and managers, many issues which were previously dealt with on an ad-hoc basis now have standardised procedures. There is also some quality control for the planning process as both dam owners and the SES have a means of recourse if the duties or obligations of one party are not being met.

The dam owners also have an indirect link to the emergency management system in NSW through SES involvement in dam safety management. Whilst DSEPs are not formally part of the emergency management structure in this state, floods and flood plans have a key role. The NSW SES, as the agency responsible for the management

of flood response operations, is able to represent the interests of the dam owner, as they relate to the emergency management of floods affected by dams, at relevant Emergency Management Committees. This also means that through the inclusion of dam failure warning and evacuation procedures in SES plans, the SES has a documented agreement with other agencies in the NSW emergency management system for the management of these rare but potentially catastrophic floods should they occur.

Perhaps the most important benefit of involving emergency managers in dam safety planning in NSW is that the SES, with a 9000 strong local volunteer base across the state, is in a unique position to act as a conduit for community consultation and education. Local SES resources have a significant advantage in their local knowledge of the history of flood effects and the local response to flooding in past events. The knowledge and skills of the SES volunteers has proven invaluable across the state in preparing the 130 local flood plans which currently exist. Only with the assistance of these resources has the essential task of consultation and negotiation with local agencies, councils, other volunteer organisations, private companies and the community at large been possible during the flood planning process. By no means is it being suggested that consultation with the SES should replace the wide ranging community consultation required to implement DSEPs and warning procedures for communities at risk. A formal community consultation process should form an essential part of all planning, however local SES volunteers are a valuable component of many at risk communities and can make an important contribution to the dam safety planning process.

The advice of the service's volunteers is also sought by the SES to gauge community perceptions of flooding and to determine how best to conduct community education campaigns in a particular area. This leads on to the final benefit for dam owners from SES involvement in dam safety management. This is the fact that by dealing with all scales of flooding together, the difficult but necessary task of community education for areas at risk from dam failure flooding required to be undertaken by dam owners may be more achievable. If the public education for 'natural' and dam failure flooding is conducted jointly by both

parties as part of one campaign, the potential dam failure problem can more easily be kept in perspective. Conversely, many of the same principles and tools can be applied to extreme floods as for small-scale events.

## **6 BENEFITS TO THE COMMUNITY FROM SES INVOLVEMENT**

The consequence of a deficiency rating for a dam on the community downstream is that they will have to live, for a time, with the real, though usually remote, threat of extreme flooding which inevitably would occur after dam failure (Keys, 1992). This risk threatens some of the core values of any society – those of life, property and personal safety. Any community whose core values are threatened by a manageable risk have a vested interest and a right to express their concerns in relation to the management of that risk. It has also been observed that the impact of floods affected by dams, including dam break floods, on communities can be greatly reduced if the communities have recognised the risk beforehand and put in place emergency plans and other appropriate measures (Emergency Management Australia, 2001). The first step in preparing the community then, is to inform them of the risks they face.

Local flood plans go some way to addressing this by including information about the nature of the threat, the warning system and the sorts of responses that might be required of community members and the support that will be available to people having to evacuate (Keys, 1997a). However, this is not the most appropriate forum as the flood plans, whilst they are publicly available in local libraries and such, are quite bulky, technical documents containing much greater detail than the average community member requires to protect their home and family. Targeted education campaigns are required in such communities and these campaigns should have as their aim the provision of the following benefits:

- Information on the flood risk, evacuation routes and responses required of the community in relation to warnings;
- Opportunities for the community to be involved in and influence the planning process;

- Access to accurate and timely information during emergency events; and
- Confidence in the emergency management arrangements.

Such information will have as its reward a more effective preparedness on behalf of both the emergency services and the public which they serve, (Keys, 1992).

The responsibility for implementing this education however is a shared one. In order to have an alert, informed and prepared community, cooperation between emergency management agencies, dam owners and dam safety regulators (Emergency Management Australia, 2001) in the education process is required. Input from the community itself is also essential to ensure that the education campaign and the types of solutions applied reflect community values and community needs.

This type of education has successfully been undertaken in a number of areas in NSW by various means by dam owners in partnership with the SES. Public meetings have been held, newsletters and information packages provided, newspaper articles written, community specific FloodSafe brochures prepared and councils briefed. Where radios and pagers are installed, their periodic testing constitutes a means of reminding people of the existence of the problem (Keys, 1997a) but more is needed.

Unfortunately, there appears to be a concern by some dam agencies about creating undue panic in the community by providing too much information on the risks associated with dam failure. It can however, be argued that if the education campaign is carried out thoughtfully, with an appropriate level of community involvement in the planning phase, if the dam failure flood problem is kept in perspective and if the dam owner has the support of the local emergency managers, local council and other agencies, then the benefits of such activities to the community at risk far outweigh the negative effects. Dam owners are again reminded here that the SES in NSW should be viewed to some extent as local community representatives. By consulting early and often with the SES during the DSEP, the dam owner has an inroad to communicating dam management issues effectively with the community at risk and increasing that community's understanding of and preparedness for that risk.

## **7 THE FUTURE**

Both dam owners and emergency management agencies operate within a framework of risk management. The dam owners apply this approach to their portfolio of assets (specifically flood operations and dam safety) whilst emergency management organisations apply it to state-wide community safety (Emergency Management Australia, 2001). These closely aligned but different foci can result in conflicting priorities in dam safety management. This is a key issue and the SES can perform its role best, of course, if dam owners involve it properly by bringing the service in early in the decision making process. Likewise, SES plans for the warning and evacuation of communities at risk downstream of dams will benefit if we involve dam owners and operators early in our planning processes.

In a recent Emergency Management Sub-Committee meeting of the DSC, it was discussed whether an exemplar or template DSEP could be made available to assist in the preparation of these documents. This is a logical tool to develop as it would certainly remove a great deal of the guess work involved in carrying out emergency planning - a task that may be outside the experience of the dam agency. It would also help to ensure that all of the requirements of the DSC and the SES were included in the planning. Templates and exemplars can however, be fraught with problems if they are not prepared correctly. It is difficult for one document to contain all of the contingencies which will need to be considered by dam owners and managers. Exemplars or templates can also have the effect of restricting the planning process. A high level of flexibility needs to be maintained by those who are using the template in order for the plan to have relevance and utility.

The emergency management community must also acknowledge more fully the need to establish and maintain contact with the people at risk of dam failure flooding (Keys, 1997a). Another area in which the SES and dam owners are increasingly becoming involved is that of educating community members about the potential flood threat from dams, its management at the agency level and what individual residents and business people can do in their own interests to manage coming floods. Community education will need to be further

developed in future in terms of the number and type of educational tools prepared, the frequency of the education campaigns in each community and the number of communities to be addressed. The SES now has two full-time Community Education Officers and is now better equipped to develop generic flood safety information as well as community and hazard specific information for issues such as floods affected by dams in communities throughout NSW. Education is necessary to ensure that warnings will be understood and treated seriously when action is required in the face of fast-rising flooding of a scale well outside the community's experience.

The SES has implemented an exercise management policy to test plans and operating procedures for floods, storms and our other supporting roles. It is agreed that there is a need for the SES to allocate some space in the service's annual exercise timetable both to participate in Dam Safety Emergency exercises and to include dam owners and the DSC in SES flood exercises for areas downstream of high and significant hazard deficient dams. The arrangements for this interagency participation in exercising plans will be negotiated during the coming year.

The community, dam owners, emergency managers and dam regulators, all have an interest in ensuring that emergency management planning is undertaken to reduce the impact of floods affected by dams. This common interest requires the sharing of information and joint efforts in developing strategies that will benefit all parties (Emergency Management Australia, 2001). A stronger, fuller partnership will be of benefit to the community downstream and help to protect community values in respect of life, property and personal safety.

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