EVALUATION OF WORONORA VALLEY FLOOD PREPAREDNESS PROGRAM EFFECTIVENESS

MOLINO STEWART

INTEGRATED SUSTAINABLE SOLUTIONS

FINAL REPORT

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Final Report

for

EMERGENCY MANAGEMENT AUSTRALIA

by

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1 INTRODUCTION

1.1 WORONORA FLOODPLAIN MANAGEMENT PLAN

The Woronora River is located in southern Sydney and runs through a narrow floodplain along its final 11 kilometres. Most of the development in this area is concentrated around the suburb of Woronora. However, other development in the floodplain occurs in the suburbs of Bonnet Bay, Como, Illawong and the estates of Deepwater Estate and Shackleton Estate. In a Probable Maximum Flood it is estimated that up to 500 houses in the floodplain would experience above floor flooding.

In 1995, a Floodplain Management Study identified homes in Woronora, Deepwater Estate, Shackles Estate and Bonnet Bay at risk of flooding. Later that year, a floodplain management plan was completed with the assistance of the local community. The plan proposed four strategies:

- Non structural options - including improved flood forecasting and warning systems, community preparedness and building and planning controls;
- Voluntary house raising;
- Improved evacuation access; and
- A levee bank.

The community decided not to proceed with the levee and the evacuation access has been improved. A new development control plan was drafted which designates minimum habitable floor levels for new buildings on the floodplain and a voluntary house raising scheme was funded and implemented.

1.2 THE PROJECT

Subsequent to the preparation of the Woronora Floodplain Management plan, Molino Stewart prepared a Community Preparedness Strategy for Sutherland Shire Council in November 1998. This strategy recommended measures to communicate key flood preparedness messages to the Woronora Valley community. Some of the techniques to communicate the messages and the way they were integrated represented some ground-breaking ideas on flood preparedness.

Council began implementing some of the measures detailed in the Strategy in 1999 but has not evaluated the program to determine the effectiveness of the measures in communicating the key messages.

This project evaluated the effectiveness of the Strategy implementation by:

- Reviewing the measures implemented by Council and other floodplain information available to residents and comparing it to similar strategies and their evaluation in Australia and overseas;
- Undertaking a survey of residents within the floodplain exposed to the messages of the strategy to determine the extent of awareness, comprehension and action regarding floodplain management issues; and
- Analysing the research and survey data to identify the most and least successful measures and to identify opportunities for improving communication about floodplain management.

The project will be beneficial in providing Council, the NSW State Emergency Service (SES) and other flood prone communities with information about the effectiveness of different education strategies. For Council and the SES in particular, the results will be important in determining whether existing communication mechanisms to residents in the Woronora Valley are appropriate or whether they should be revised to more effectively communicate messages about flooding. Ensuring that flood preparedness messages are effectively communicated can maximise the number of residents who are aware of flooding in their community, are prepared for a flood, are familiar with procedures to be undertaken during a flood and can take measures to minimise damage to their properties as a result of a flood.

Additional information about the context is provided in Section 2.

1.3 COMMUNITY ENGAGEMENT

Until recently, community engagement had a low profile in flood warning in Australia. The emphasis was on technical issues of flood detection and warning dissemination and response. This emphasis has however changed recently. For example, the following key research priorities were identified at the Emergency Management Australia flood warning scoping meeting in April 2002 (Handmer, 2002):

- How to engage with communities; and
- How to measure success.

The Woronora Flood Preparedness Evaluation Project addresses both priorities.

1.4 PRE-EVENT AWARENESS AND EDUCATION

Community engagement, communication and education regarding flood preparedness are often seen as paramount in reducing loss of life and property during a flood. However, as detailed in Section 9, there has been no report offering evidence of the effectiveness of pre-flood communication and education.

Handmer (2002) advised that even though a "majority of post-flood disaster reports advocate pre-event public awareness raising and education" these are not always the answer. Sorensen (2000) highlighted that "There is no conclusive evidence regarding whether or not a public education or information program actually makes a significant difference of increasing human response to warnings". Sorensen pointed out that this could be because many programs are poorly designed or executed whilst Rohrmann (1999) noted that the assessments are poorly designed or executed.

The Woronora Flood Preparedness Evaluation is an attempt to evaluate the effectiveness of pre-event communication and education. Community awareness and preparedness evaluation criteria have been developed as explained in Section 4. Baseline data for the Woronora community is provided in Section 5. The effectiveness of the strategy is evaluated against these criteria in Sections 6 and 7. Warning dissemination and community response and recovery evaluation criteria have also been developed as explained in Section 4. However, as no flood has occurred since the strategy was implemented, it is not possible at this stage to evaluate the strategy against all criteria.

2 THE CONTEXT

Any community education exercise occurs with reference to a specific physical, geographical, social and historical context. Awareness of these contextual aspects is important if the effectiveness of an education campaign is to be evaluated and its lessons applied elsewhere. This section outlines the context of the Woronora Flood Preparedness Strategy.

2.1.1 Location and Geography

The Woronora River is in the Sutherland Shire, 20km south of the Sydney CBD (see Figure 1). Its upper reaches are relatively undeveloped and managed by the Sydney Catchment Authority. Woronora Dam provides drinking water for the Sutherland Shire and some surrounding suburbs and has a catchment of about 80 square kilometres.

Downstream of the dam the river passes through sandstone gorge terrain. Much of these 95 square kilometres of catchment are covered in eucalypt forest but there is increasing urban development along the catchment's ridgelines.

There is also residential development along the banks and narrow floodplain of the final 11 kilometres of the Woronora River before it joins the Georges River near Como Bridge.

The reach of river along which floodplain development occurs is tidal. The main riverside suburbs are shown in Figure 2.

The study area for this project is defined as the area in which the Community Preparedness Strategy has been implemented by Council and the SES.

2.1.2 Climate

The Bureau of Meteorology has a weather station at ANSTO in Lucas Heights. Climatic data have been recorded at this weather station since 1958, with the most recent record being 2001.

Climatic trends in the area are similar to those experienced in Sydney. Historically, mean annual rainfall is lowest in winter and highest around summer / late spring / early autumn. The mean number of rain days per month ranges from 12.5 in March to 8.3 in August. The mean annual rainfall at the Lucas Heights weather station is 1047.3mm. The mean annual maximum daily temperature is 21.4°C and mean annual minimum daily temperature is 12.3°C.

Figure 1: Location of Woronora River

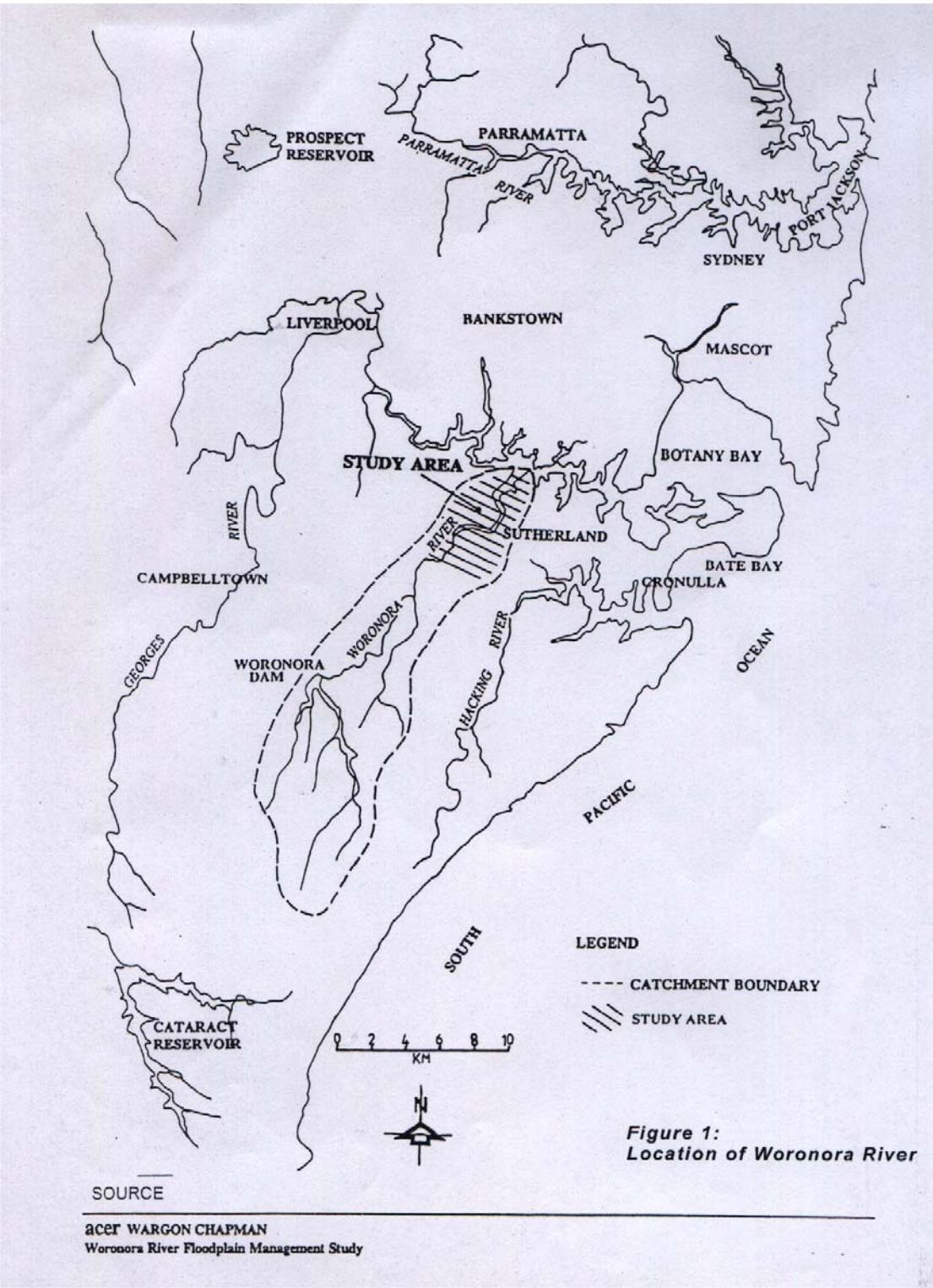

Figure 2: Main Woronora River Suburbs

2.1.3 Development

Most of the population consists of permanent residents who commute to work outside of the Woronora Valley. There are approximately 500 houses in the study area. Most of these houses (approximately 400) are in the suburb of Woronora, a suburb which nestles around a narrow floodplain on either side of the river. The two halves of the suburb are linked by the old Woronora Bridge. Many of the houses in this suburb are built on the floodplain. Others are built further up the Valley sides but most of these would have their road access cut by low level flooding (Molino and Rogers, 1999).

Upstream of Woronora proper, houses are also built in Deepwater Estate. This is a strip of homes built right on the banks of the river for a distance of about two kilometres. These homes can only be reached by boat or pedestrian access from a water front road in Woronora. All of these thirty homes could be affected by flooding. Opposite Deepwater Estate and stretching upstream is Shackles Estate. The homes are built further up the valley sides and have pedestrian and/or vehicular access from ridgeline roads. Only a few of these homes are low enough to be affected by the more extreme floods (Molino and Rogers, 1999).

Downstream of Woronora is Bonnet Bay. This suburb was substantially developed in the 1970s and only a fraction of this suburb is within the PMF zone. Nevertheless approximately 120 homes, yards and access roads could be flooded. Further downstream, scattered houses are built along the riverbank at Como and Illawong. These homes have boat access as well as

pedestrian access from ridgeline roads. The levels of these houses vary but some are built very close to the high water mark (Molino and Rogers, 1999).

Seventy five per cent of flood-affected houses are in Woronora/Deepwater and 22 per cent in Bonnet Bay. The remaining flood-affected houses are spread between three suburbs: eight in Como, six in Shackles Estate and one in Illawong.

2.1.4 Community profile

Statistics have been obtained regarding the population and economic base for the flood-affected suburbs in Woronora Valley. This information was based on data from the 2001 census.

The statistics were obtained for the entire suburb or for the relevant census collection district rather than only for the flood-affected area. However, for the purpose of this report, it was assumed that the flood-affected areas were representative subsets of the suburb and that, as a result, statistics for the flood-affected areas would be similar to the statistics for the whole suburb.

Information from the 2001 census indicated that 69% of the Woronora population had been there for more than five years. If it is assumed that a similar turn over rate has occurred for the last 34 years then less than 10% of the population which was residing in Woronora during the 1969 flood (the most recent significant flood) would still be living there.

Considering that parts of Woronora have only been developed in the last 30 years, then very few of the existing residents would have experienced significant flooding in the Woronora River. This stretch of the river accounts for nearly 90% of houses affected by flooding up to the 1 in 100 event. None of the flood-affected areas at Bonnet Bay were developed in 1969 so those residents have no significant flood experience. In fact floods higher than the 1933 flood would be needed before homes in this area are flooded.

In the upstream areas of Shackles Estate and Deepwater Estate which account for fewer than 10 per cent of flood affected properties, the census data suggest a higher population turnover. Perhaps only 3 per cent of the 1969 population still live in the area.

The 2001 census data suggest that 95 per cent of homes at Bonnet Bay, Deepwater Estate and Shackles Estate are owner occupied. In Woronora and Como there is about 90 per cent owner occupancy. This level of ownership is much higher than the Sydney average. If homeowners have a higher financial and emotional tie to their dwelling than tenants, they may be more concerned than tenants about flood damage. There is no evidence to shed light on this idea.

The average household size is 2.8 people for Como and Woronora, 3.1 for Bonnet Bay and 3.4 for Illawong. In the areas affected, more than 90 per cent of the population speak only English and a high proportion of the remaining population speak it well or very well. Fifty six per cent of residents had completed year 12: 65 per cent year 11 or above and 93 per cent year 10 or above. This means that information communicated in written and spoken English should be understood by virtually the entire community.

2.1.5 Flood hazard

A flood study was undertaken in 1991 for the lower 11 kilometres of the Woronora River. The results were revised slightly as part of a 1995 floodplain management study. The results are summarised in Table 1 for each of the main residential areas. The mean high water level is about 0.5m AHD.

Table 1: Design Flood Levels (m AHD)

Suburb	5%	2%	1%	PMF
Como/Illawong	1.5	1.6	1.9	4.2
Bonnet Bay	2.5	2.8	3.1	6.6
Woronora Bridge	3.0	3.3	3.6	7.4
Woronora	3.0-3.6	3.3-3.9	3.6-4.2	7.4-8.3
Deepwater Estate	3.5-3.7	3.8-4.0	4.1-4.3	8.1-8.4
Shackles Estate	3.5-3.9	3.9-4.3	4.2-4.6	8.4-8.8

Source: Acer Wargon Chapman (1995)

As can be seen from the table there can be up to 4.6 metres variation in flood level along the river for the same event and up to 4.9 metres variation at the same location for different events.

In terms of flood damages, Table 2 summarises the number of properties and the number of houses affected by the various design flood levels.

Table 2: Flooded Properties

Design Flood	Number of houses with flooded yards	Number of houses with flooded yards and above floor flooding
5%	246	200
2%	283	254
1%	323	289
PMF	503	497

Source: Acer Wargon Chapman (1995)

As is apparent from the table, most houses with flooded yards would have above floor flooding in the same events.

The study did not calculate design flood levels for events smaller than the 5% event. Floor levels in the property database suggest that as many as a dozen homes could experience above floor flooding in an event which was only 1.5m AHD at Woronora Bridge and up to 60 homes would flood in an event which reached 1.8m AHD at the same location.

The two main access roads out of Woronora would be flooded at about 1.5m AHD.

The present worth of the average annual residential damages was estimated to be $6.6 million (Acer Wargon Chapman, 1995). This included building and contents damages.

2.1.6 Flood history

A community which has previously experienced flooding is likely to be more aware of and better prepared for floods. Over the last 100 years the Woronora River has not experienced as many large floods as one would statistically expect.

There have been just over 20 recorded floods on the Woronora River since 1898. A flood in that year is thought to have reached the level of a 2% event but since then the highest flood has been a 5% event which occurred in 1926. The last flood of any note was in 1969 which was about half a metre lower than the 1926 flood. The 1933 and 1961 events were between the levels of the 1969 and 1926 event. Events in 1949 and 1956 reached the same levels as the 1969 flood. The most recent flood was in 1988 but it only reached about 1.7m AHD at Woronora Bridge.

2.1.7 Flood communication history

As far as can be ascertained, community consultation undertaken as part of the 1995 Floodplain Management Study was the first real attempt to communicate flood risks and hazards to the Woronora River communities. Discussions with those involved in its preparation indicated that the Woronora River communities were not only inexperienced in flooding but also sceptical that the estimated floods could occur (Bruce Ginn, personal communication reported in Molino Stewart, 1998).

No further significant flood communication occurred until the flood preparedness strategy was launched. The only communication from Sutherland Shire Council to property owners in respect of flood risk was by way of notification on Section 149 certificates issued at the time of a sale or transfer of title of a property.

Properties below the 1% flood level received information about flooding on the certificates prior to the preparedness program. The notation on the Section 149 certificates simply said yes or no to the question of whether Council had formally "resolved to restrict development of the property because of the likelihood of flooding." This notation was only applied where Council had carried out a flood study, as was the case for the Woronora River. There were a number of studies, or estimates of flood levels in the earlier days, for the Woronora. Each time a new study/estimate was done, more properties were determined to be flood prone and notations were then added to the Section 149 certificate database for these additional properties. Some properties had different wording on their Section 149 certificates that said the property was "affected by flooding" instead of "Council has resolved to restrict development because of the likelihood of flooding." (Mike Rogers, former Sutherland Council Stormwater Manager, personal communication).

The information provided on the certificate was limited to the notation and perhaps a referral to contact Council for more information. If a person contacted Council there was a strict embargo on giving out any oral advice or information for legal reasons. Information was given, however, in written form if it was requested, so a copy could be placed on file for future reference if needed. Enquirers were also referred to the public library where they could peruse and copy parts of the flood studies if they wished. Council officers could not make interpretations orally except for explaining basic, technical terms like AHD (Mike Rogers, personal communication).

As part of the flood preparedness program, properties affected by any flood up to the PMF were included on the Section 149 certificates database. Theoretically anyone who has purchased a property below the Woronora PMF since 1999 should have been advised via the Section 149 certificate that “Council has resolved to restrict development because of the likelihood of flooding”.

3 THE FLOOD PREPAREDNESS STRATEGY

Molino Stewart, in association with Professional Public Relations, designed a flood preparedness strategy for the residents of the Woronora Valley in 1998 on behalf of the Woronora Flood Alert Network Working Party. This strategy was part of a package of measures to reduce flood risks to people and property in the Valley.

The strategy was based on flood level and flood impact investigations which were documented in the Woronora Flood Study and the Woronora Floodplain Management Study. The strategy was prepared in consultation with the State Emergency Service and with reference to the Draft Local Flood Plan.

The strategy was based on an agreed colour categorisation of flooding which will be used in all flood warnings for the river (Table 3).

Table 3: Woronora Flood Categories

Flood Category Descriptor	Range at Woronora Bridge (m AHD)	Comments
Green Category	1.5 - 2.3	Onset of flooding with roads cut and some houses flooded through to many homes flooded
Blue Category	2.3 -3.1	Hundreds of homes flooded. Upper end of category floods low level bridge and corresponds to flood on record
Yellow Category	3.1 - 3.9	Hundreds more homes flooded. Upper end of category is current planning level[1].
Red Category	Above 3.9	Up to 500 homes flooded. Flooding of homes which would not have received notification of flood risk on 149 certificate.

Where applicable, throughout the campaign, the various strategies were identified by the same colour coding for simplicity and consistency. The Strategy proposed a set of messages for flood awareness, preparedness, warning, response and recovery modes which were to be delivered via diverse media.

[1] Planning level is the level above which the habitable rooms of any development must be built. On the Woronora River this is 0.5m above the 1% flood level.

The Working Party recommended the following components for the preparedness strategy:

- Flood signs on the western approach to the low level Woronora Bridge at Woronora and in Lakewood City Reserve, Bonnet Bay;
- Colour coded flood totems marked on street signs and supplemented with strategically erected posts;
- Printed stickers for each house indicating which category of flooding would enter that home;
- A householder kit to be delivered door to door by the SES and containing a brochure, booklet, fridge magnet and children's colouring sheet;
- A public meeting following householder kit distribution to explain the strategy and to answer residents' questions; and
- The use of the Standard Emergency Warning Signal, announcements on local and regional radio, public address systems on emergency service vehicles and vessels and door knocking by SES personnel and local flood wardens as the primary means of delivering warning messages.

The Working Party also recommended consideration be given to adopting the following ideas:

- Hot stamping wheelie bins with a simple flood message subject to community support and availability of resources;
- Organising events to launch components of the strategy subject to availability of resources;
- Media releases for the launch of strategy components subject to availability of resources;
- Preparation of display materials to be used at regular community events subject to availability of resources;
- Organisation of a flood awareness week each year subject to availability of resources; and
- Use of PC COPS as an additional means of delivering flood warning and flood preparedness messages subject to:
    - Satisfactory performance during a trial elsewhere in the Shire;
    - Provision of resources for its ongoing use; and

- Improved reliability of Menai telephone exchange in wet weather.

PC COPS is a computer controlled telephone system with dial-in and dial-out capabilities. It works differently in the two different modes.

In the dial-out mode PC COPS would ring out to all houses in the flood zone. Those who answer the phone will be told that there is a warning message and they will be instructed to press a key on the phone to receive the message. If they choose to do so they will hear a recorded flood alert providing flood category and timing of peak. This message can also advise residents to tune to the local radio station for updates and more detailed information.

The computer will keep dialling numbers until all phones have been answered, each number has been tried a specific number of times or the flood peak has passed.

The system relies on a database of potentially affected addresses being entered into the computer well in advance. It uses a reverse telephone directory to look up the phone number of each of those addresses. Should a number be unlisted then the explicit permission of the householder needs to be obtained via Telstra for the number to be added to the list. It can be programmed to only ring a selection of the numbers, for example only those that will be affected by the predicted “blue category” flood.

In the dial-in mode it provides the ability to dial in for an information message. It uses a hierarchy of menus and, on first ringing through, one might have to select an option such as police, fire services or SES.

The PC Cops system was to be trialled for industrial incident warnings on the Kurnell Peninsula and shoplifter activity warnings at Miranda Fair Shopping Centre.

4 STRATEGY EVALUATION

4.1 CONTEXT

In recent times a lot of emphasis has been placed on the need for flood preparedness education. The commonly held opinion is that an effective education campaign should encourage communities at risk to be prepared for a serious flood. Education should increase knowledge and awareness of floods and should also influence behaviour change to prevent loss of life and reduce property damage in a flood (Young and O'Neill, 1999).

There is evidence that after receiving sufficient flood warning, well-prepared residents are able to avoid substantial flood damages (Gissing, 2002). Smith (1990) quoted savings of over 80 per cent for commercial properties where owners were informed of their flood problem and took reasonable precautions. Such findings have encouraged floodplain managers to use community education as one tool for reducing flood impacts.

While there have been an increasing number of flood education strategies implemented in recent years, formal evaluation of the effectiveness of these community education strategies appears scarce (see Section 9). It was in this context that funding from EMA was sought and received for investigating the effectiveness of one such strategy.

4.2 THE WORONORA STRATEGY

The objectives of the Woronora Flood Preparedness Strategy were to raise the level of flood awareness in communities at risk and also to ensure that these communities were prepared for flooding. Ongoing flood awareness and preparedness would ensure that warning messages would be easily understood and quickly and appropriately responded to (Molino and Rogers, 1999). This project aims to evaluate whether the Woronora Strategy has achieved its objectives.

Ideally, an evaluation needs to be outcomes focussed. Have the residents not only retained the information delivered to them but have they also acted upon that information? In other words, has a behaviour change occurred? The SES defines flood ready communities as "communities whose people are capable of responding appropriately and in timely fashion to warnings" (Pfister and Rutledge, 2002a). In order for the Woronora flood preparedness program to be considered effective, increasing levels of flood awareness and knowledge are not enough unless behaviour change is an outcome (Young and O'Neill, 1999).

Ultimately the Woronora strategy can be assess to be effective if residents respond appropriately to a flood warning. The outcomes in terms of life saved and property loss avoided would be the ultimate indicators of effectiveness. A major difficulty in evaluating the Woronora Flood Preparedness Strategy is that a measure of the final outcomes and effectiveness will not be possible until after a flood has occurred in the area.

Nevertheless, there are ways of measuring the effectiveness of the strategy to date, even in the absence of a major flood. These include evaluation criteria which measure outcomes in terms of delivery of messages, reception of messages, comprehension of messages and the willingness and ability of residents to respond.

4.3 EVALUATION CRITERIA

Table 4 sets out the evaluation criteria proposed for assessing the effectiveness of the Woronora Strategy. It lists all outcomes and associated messages and performance indicators.

Only the first four outcomes can be evaluated at this stage, namely whether:

- The information has been delivered to residents;
- The information has been received by residents;
- The information has been understood and retained by residents; and
- Residents are prepared.

It cannot be assumed that residents who have received and retained the information will have acted upon that information. In the absence of the event, residents can only report their intended actions in a flood or pre-flood actions already taken. This is one way of measuring whether residents are prepared. For example, the residents may have kept the magnet on their fridge or prepared an emergency kit. The other outcomes listed in the table cannot be evaluated at this stage, namely, whether:

- Residents have been warned;
- Residents have responded appropriately to the flood warning; and
- Residents have recovered.

Nevertheless performance measures for those outcomes are also included for completeness. The evaluation criteria are summarised in Table 4. The evaluation methodology is explained in Section 4.4.

Table 4: Strategy Evaluation Criteria

Outcome	Message	Performance Indicator
Information has been delivered to residents	They live in a flood prone area	All messages were delivered to residents (number of kits distributed, house labels attached to electricity box etc).
	There are different categories of flooding	
	There is a plan to help them	
	The plan includes action by them	
Information has been received by residents	They live in a flood prone area	Proportion of residents who received the information.
	There are different categories of flooding	
	There is a plan to help them	
	The plan includes action by them	
Information has been understood and retained by residents	I live in a flood prone area	Proportion of residents who are aware that the Woronora floods and proportion who are aware that their property may be at risk from flooding.
	There are different categories of flooding	Proportion of residents who know the four categories of flooding. Proportion of residents who know what category of flooding affects them.
	There is a plan to help me	Proportion of residents who are aware of the Woronora plan.
	The plan includes actions by me	Proportion of residents who know what to do before/during/after flood.
Residents are prepared	Not applicable	Proportion of residents who are planning to take action to reduce the impact of flooding. Proportion of residents who have taken action to reduced the impact of flooding for example emergency kit handy (brochure, radio, torch), magnet on fridge.

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Outcome	Message	Performance Indicator
Residents have been warned	A “colour” category flood is expected Tune to local radio station for regular updates Check electricity meter box if not sure what colour category flood enters your house Refer to your Woronora Flood Preparedness booklet or tune to the local radio station for details on how to respond SES contact number for enquiries	Proportion of residents who received warning messages (sirens, door knocks, radio etc) and time taken to reach them.
Residents have responded	Not applicable	Proportion of residents who responded by doing what was recommended before/during/after a flood. Proportion of residents who have evacuated in time.
Residents have recovered	Not applicable	Outcomes in terms of life saved and property loss avoided following a flood. Satisfaction with warnings by those at risk. Proportion of residents confident in the warning system.

4.4 EVALUATION METHODOLOGY

The evaluation methodology involved seven steps

4.4.1 Step 1

The first step was to establish, if possible, the levels of awareness and preparedness which existed in the Woronora Valley prior to strategy implementation. To this end a survey commissioned by the State Emergency Service which included Woronora residents, as well as flood prone communities elsewhere in the state, was examined. The results of this step are discussed in Section 5 of this report titled "Pre Strategy Survey".

4.4.2 Step 2

The second step was to determine which aspects of the strategy had been implemented to date and details regarding when, where and how they were implemented. Research was also undertaken to determine what other flooding information was available to residents, such as listings on Section 149 certificates. This assessed that the messages outlined in Table 4 had indeed been delivered to residents, namely:

- They live in a flood prone area;
- There are different categories of flooding;
- There is a plan to help them; and
- The plan includes actions by them.

Information about delivery of the various components was sourced from Sutherland Shire Council and the State Emergency Services (SES). The previous Stormwater Manager at Sutherland Shire Council (Mike Rogers) who assisted with the design and implementation of the Strategy and the current Stormwater Manager (Guy Amos) and Stormwater Engineer (Joga Jayanti) were contacted. Relevant Council files were accessed within Council's premises. David Monk (Local Controller, Sutherland SES) and Chas Keys (Deputy Director, SES) were also contacted.

Results of this research are provided in Section 6 of this report, 'Information Delivery'.

4.4.3 Step 3

The next step was to assess whether residents had 'received' the information and the messages mentioned previously. The proportion of residents who 'received' the various information components was evaluated. There was not necessarily a direct link between information delivery and reception of that information. For example, if a resident had moved into the area recently they may not have received elements of the Strategy such as the household kit even if it had been delivered to that address. These residents also may not be aware that household labels are in their electricity meter box. The proportion of residents who had received components of the strategy was generally assessed by way of a post strategy survey conducted by Molino Stewart in 2003.

One hundred resident were surveyed within the study area and the survey results analysed. The survey covered the four subcategories of residents within the study area. These were based on the division of the study area of the four flood risk categories (Table 3), which equate to flood descriptors used in the Community Preparedness Strategy. Section 7 of this report discussed the results of this part of the survey.

4.4.4 Step 4

The fourth step was to evaluate whether the information was 'retained' by residents and whether they were 'prepared' for a flood. The survey of residents described in Step 3 included questions to determine the extent of awareness, comprehension and action regarding floodplain management issues. Contact details for residences within the study area were obtained from the SES in the form of a spreadsheet. Information retention and resident preparedness results are outlined in Section 7.

4.4.5 Step 5

The post strategy survey results were compared with the pre strategy survey results and differences noted. The purpose of this step was to determine, to the fullest extent possible, what changes in community awareness, attitude and behaviours, if any, could be attributed to the Woronora Flood Preparedness Strategy.

4.4.6 Step 6

The next step was to research what had been done in terms of flood preparedness evaluation in New South Wales, other States and other countries. This was achieved by Internet searches, reading of relevant articles and conference proceedings including the Floodplain Management

Authorities Conferences and relevant Emergency Management Australia papers.

People who could have provided relevant information were contacted either by phone or email. A list of people contacted is provided in Section 12 of this report. Research results are outlined in Section 9 of the report. These various flood preparedness strategies were then compared to the Woronora Flood Preparedness Strategy.

4.4.7 Step 7

The final step was to evaluate the research and survey data to identify the most and least successful measures and to identify opportunities for improving communication about floodplain management.

5 PRE STRATEGY SURVEY

5.1 BACKGROUND

The Centre for Social Marketing, on behalf of the State Emergency Service, worked with Rush Social Research at Colmar Brunton Social Research to undertake research to provide input into the development of an effective communications strategy as part of the Hawkesbury Nepean Floodplain Management Strategy.

This research consisted of consultations, desk research, qualitative interviews, focus groups and a baseline quantitative survey. The baseline quantitative survey comprised interviews with residents from flood prone communities in Richmond, Windsor, Woronora and Lismore.

In Woronora random households were selected from streets identified by the SES as being at risk of flooding. Eighty 10-minute interviews were conducted in Woronora in March 1999 (Centre for Social Marketing, 1999). Only the results of the Woronora surveys are described below.

The results of this survey were only made available by the SES to Molino Stewart after all of the post strategy surveys had been conducted for this project.

5.2 MAIN FINDINGS

5.2.1 Awareness and Concern about the Risk of a Serious Flood

Respondents were asked to rate on a scale of 1 to 10, where 1 was extremely unaware and 10 was extremely aware, how aware or unaware they were about the risk of a serious flood in the area. Woronora respondents expressed an average rating of 6.4. This was the lowest of the four communities, the other three ranging from 7.3 to 8.5. Residents from Woronora were also relatively unconcerned about the risk to life of a serious flood in their area. The average rating on a scale of 1 to 10, where 1 was extremely unconcerned and 10 extremely concerned about the risk to life was 4.5. This compared to a range of 5.4 to 7.1 at the other three locations.

5.2.2 Level of Confidence in Dealing with a Serious Flood

The residents were asked to imagine a situation where the SES instructed their household to evacuate immediately because of a serious flood. Seventy one per cent said they were extremely likely to be able to evacuate immediately, 18 per cent very likely, three per cent quite likely, three per cent neither likely nor unlikely, one per cent quite unlikely, three per cent very unlikely and three per cent extremely unlikely.

5.2.3 Level of Preparedness in the Event of a Serious Flood

Forty four per cent of respondents in Woronora answered that they would need someone else to help them evacuate. A further three per cent were unsure. Forty three per cent would need to rely on public/emergency transport to take them out of their area. A further three per cent were unsure.

Thirty three per cent had an emergency or disaster plan for their household. Ten per cent of Woronora respondents said that they had an emergency/disaster kit. Eighty five per cent of respondents were aware of the closest evacuation route. Fifty six per cent had actually practiced their closest evacuation route.

Sixty five per cent of respondents were not aware of the warning signal for an evacuation in the event of a serious flood and one per cent was unsure.

Respondents were asked to describe their attitudes towards evacuating in a serious flood. They were asked to rate how they felt, using a scale from 1 to 10, where 1 was strongly disagree and 10 was strongly agree. The rating for the statement “I feel totally confident in my ability to safely evacuate in a serious flood” was 7.6 (higher than the other centres which ranged from 6.6 to 7.5). The average rating for the statement “I would like more information so that I can work out a plan to evacuate my household in a serious flood” was 7.1 (others 5.1-7.3). The rating for the statement “I am not worried about evacuating in a flood because someone else will take care of the situation if it ever happens” was 2.8 (3.0-3.1). The rating for the statement “I am worried about evacuated in a serious flooding and will need help” was 4.9 (4.3-5.8).

5.2.4 Knowledge about Safety of Walking or Driving though Six Inches of Flood Water

Only thirty eight per cent of Woronora respondents were aware that walking or driving through six inches of floodwater was unsafe. Eight per cent were unsure. This could mean that over half the population may think that they can delay evacuation until after floodwaters have entered their property.

5.2.5 Perceptions of Involvement by Emergency Agencies and Sources of Information

Unprompted, Woronora residents named the following emergency services that would help in the case of a serious flood: the SES (49 per cent), Bush Fire Brigade (75 per cent) and the Police (29 per cent). No one had cited Council. When prompted, 95 per cent of Woronora respondents expected the SES to help in a serious flood. These numbers were down to 86 per cent for the Police and 31 per cent for Council Staff.

Unprompted, respondents named the following as sources of additional information about what to do in a flood: Council Staff (50 per cent), the SES (44 per cent), the Bush Fire Brigade (11 per cent) and the Police (four per cent). Eight per cent of respondents were unsure where to get additional information.

5.2.6 Received Information about Flooding

Only 20 per cent of respondents said they had received information about flooding. Information about the risk of flood in their area (81 per cent) was the most common type of information they had been received. Twenty five per cent of those who had received information said it was in regard to the flood warning system, 13 per cent had received information about how to prepare for a flood and about the evacuation routes. It should be noted that this survey preceded any implementation of the Woronora Flood Preparedness Strategy.

5.2.7 Level of Interest in Receiving Information in Different Types of Format

Using a scale of 1 to 10, where 1 is extremely uninterested and 10 is extremely interested, the levels of interest in receiving about flooding for the various formats were:

- 7.7 for fridge magnet: quick tips;
- 7.5 for brochure/leaflet;
- 7.2 for each of radio, local newspaper and letter;
- 7.0 for television;
- 6.3 for local community groups;
- 5.5 for exhibition at Council;
- 5.3 for public meetings;

- 5.2 for exhibitions at local shows; and
- 3.0 for the Internet.

6 INFORMATION DELIVERY

This section details when, where and how aspects of the Strategy were implemented and this is summarised in Table 5.

6.1 FLOOD SIGNS

The flood signs were erected near the old Woronora Bridge and at Lakewood City Reserve, Bonnet Bay. These show the actual level of historic floods relative to the coloured flood categories.

6.1.1 Woronora Bridge

A double-sided freestanding 2.5m wide by 3 m tall flood sign was installed mid-1999 on the footpath outside the caravan park in Menai Road on the western side of the old Woronora River Bridge. The text is of suitable size to be read by passing motorists (Figure 3).

It was originally erected perpendicular to the direction of traffic flow to maximise visibility but following complaints from residents the sign was turned to be parallel to the traffic flow.

At the time the sign was installed, it was believed that a large proportion of the target audience would pass the sign almost daily. The old bridge was the only means of crossing the Woronora River in the study area.

However a new high level Woronora Bridge has since been constructed across the River. The new bridge was opened on 3rd February 2001. The old Woronora Bridge is now only used for access to the suburb of Woronora.

Residents from Bonnet Bay, Shackles Estate, Illawong and Como would use the new Bridge to cross the Woronora River and would not pass in front of the sign unless they were visiting Woronora itself.

Residents from Woronora West (Prices Circuit, Manilla Place, Boomi Place, Yanko Close and Nundah Place) would pass in front of the sign daily because it is at the T intersection of Prices Circuit with Menai Road which is the only access point in and out of this part of Woronora.

Table 5: Flood Preparedness Strategy

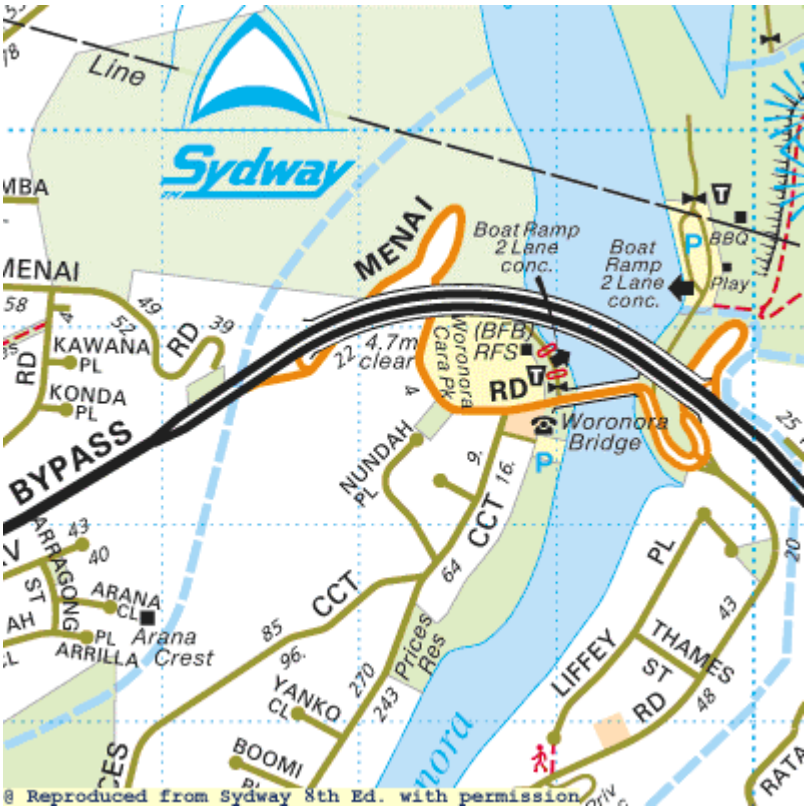
PROPOSED	IMPLEMENTED	YEAR
Flood Signs on western approach to low level Woronora Bridge and in Lakewood City Reserve	Flood sign on western approach to low level Woronora Bridge and in Lakewood City Reserve.	Mid 1999
Coloured bands corresponding to flood categories painted on 50 street name sign posts	17 Colour strips on metal street sign poles	End 1999
Individually printed labels showing floor level in relation to the four flood categories placed in electrical fuse box	Printed stickers indicating flood category placed in the electricity meter box by SES volunteers.	Early 2000 – mid 2003 - ongoing
Household Kit containing a booklet, children's colouring sheet, fridge magnet and brochure	Household kit containing booklet (Woronora Flood – Are you ready), children's colouring sheet and After the Flood Booklet distributed in 2000-01. New Fridge magnet and new brochure distributed in July/August 2002.	Early 2000 – mid 2003 - ongoing July/August 2002
Public meeting organised following householder kit distribution	Public meeting organised before the distribution of kit	November 1999
Use of standard emergency warning signal	Standard emergency signal operational	1999
Hot stamping wheelie bins with short flood message	Not implemented	NA
Organising events to launch strategy	Not implemented	NA
Media releases	Published in local newspapers *The Leader* and *Our Voice*	September and November 1999
PC COPS	Three month trial of the PC Cop System in late 1998 not adopted due to lack of resources	Late 1998
Display materials	Not implemented	NA
Flood Awareness Week	Not implemented	NA

Residents from Woronora East (Liffey Place, Prince Edward Park Road and Thames Street etc) would pass in front of the sign if they cross the old bridge to visit Woronora West or if they wish to travel further West of Woronora. Although the new high level bridge bypasses the flood sign, these residents would also pass in front of the sign when using the new bridge. Not when they are driving east but when they return to their homes because of the left on/left off arrangement on the high level bridge which takes them over the old bridge (Figure 4).

All residents crossing the Woronora River would have passed the sign prior to February 2001, when the Bridge was opened. It is safe to assume that residents from Deepwater Estate and Woronora itself still pass in front of the flood sign daily and that residents from Bonnet Bay, Como, Illawong and Shackles Estate do not pass in front of the sign unless they are visiting Woronora. Therefore the sign would be seen on a regular basis by 75 per cent of flood-affected residents in the study area.

Figure 3: Flood Sign, Woronora Bridge

Figure 4: New Woronora Bridge



6.1.2 Lakewood City Reserve

The 1.5m wide by 3 m high single sided flood sign at Lakewood City Reserve at Bonnet Bay (Figure 5) was installed in mid 1999. It was placed on the wall of the Vodafone building near the tennis courts so that it was visible from Coolidge Crescent.

However there were objections from two residents. Two meetings were held with the objectors and Council's Stormwater Manager, Mike Rogers, Cr Emerson and the Deputy Manager of the SES, Chas Keys. The residents objected to the primary colours as these affected the view of the reserve from their property. It was decided to move the sign to the Amenities building where it would be at right angles to the previous sign alignment and parallel to the line of sight of the two objectors.

The Bonnet Bay sign was supposed to be temporarily relocated for 3 months each year to a spot in the riverside reserve near the boat ramp near Harrison Avenue. Council's Stormwater Manager picked a spot for the sign but the sign was not moved there in mid-2002, as there was a house for sale right opposite the chosen spot. Council did not want to affect the sale hence left the move until after the sale.

As of September 2003, the flood sign in Bonnet Bay was still next to the Amenities building near the tennis courts. The sign is not visible from the street. Only residents going into Lakewood City Reserve would see the sign. It is probable that only Bonnet Bay residents living close by (Coolidge Crescent, Wilson Place, Johnson Close, Lower Washington Drive) would visit the park.

Figure 5: Flood Sign, Lakewood Reserve

6.2 FLOOD TOTEMS

The Strategy suggested that coloured bands corresponding to flood categories be painted on 50 street name signposts. Council's Stormwater Manager used strips of coloured heavy-duty plastic adhesive tape instead (Figure 6), which worked well and this method was easier to implement than paint.

Figure 6: Flood Totem

The totems were placed on the metal street name sign posts in the streets in the Woronora and Bonnet Bay areas.

Seventeen totems were installed in the following streets:

- Washington Drive, Bonnet Bay (near Lower Washington Drive intersection);
- Washington Drive, Bonnet Bay (intersection of Wilson Place);
- Washington Drive, Bonnet Bay (intersection of Harrison Avenue);
- Washington Drive, Bonnet Bay (near McKinley Avenue);
- Liffey Place, Woronora;
- Liffey Place, Woronora (intersection Thames Street);

- Prince Edward Park, Woronora (three totems);
- Prince Edward Park Road, Woronora (two totems);
- End of Park Street, Woronora;
- Prices Crescent, Woronora;
- Manilla Place, Woronora (two totems);
- Boomi Place, Woronora; and
- Yanco Place, Woronora.

The residents living on the following flood affected streets would pass flood totems: Liffey Place, Thames Street, Prince Edward Park Road, Prices Crescent, Manilla Place, Boomi Place and Yanko Place (Woronora); Wilson Place, Johnson Close, Coolidge Crescent, Washington Drive, Harrison Avenue and McKinley Avenue (Bonnet Bay).

Residents from the following flood-affected streets would more than likely not pass in front of a flood totem: Wiggens Avenue and Bonnet Avenue (Como); Arthur Street, Lower Washington Drive (Bonnet Bay); The Crescent, Thorp Road and eastern side of Prince Edward Park Road (Woronora); Deepwater Estate and Shackles Estate.

6.3 HOUSEHOLD KITS

Household kits containing an 8 page B5 colour brochure '*The Woronora Floods – Are you ready'* (see Figure 7 and Appendix A), DL sized card with magnet (see Appendix B) and the Emergency Management Australia booklet *What to do Before, During and After the Flood* were distributed by SES volunteers.

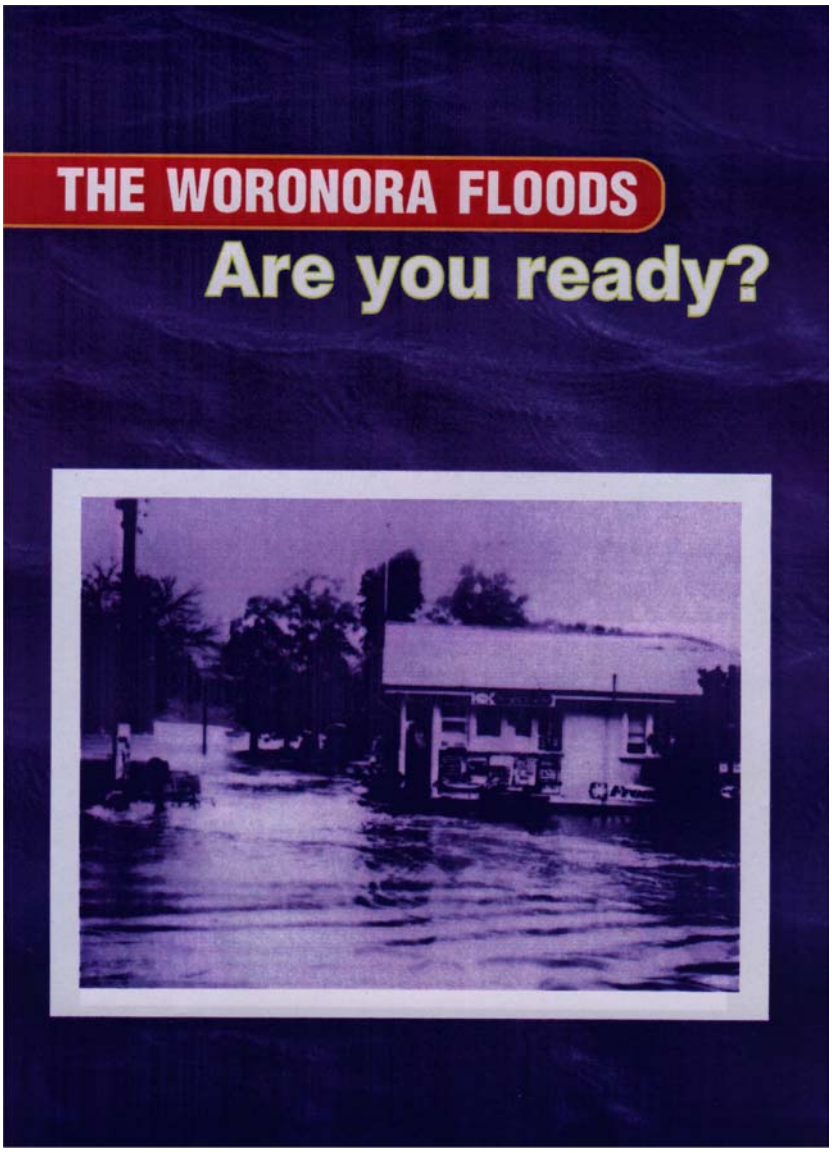
A flood label (Section 6.4) was produced for every flood-affected property on the database and they were available for distribution at the same time as the household kits. The kits and labels were delivered personally by SES volunteers in their orange overalls to approximately 500 houses starting in early October 2000 and ending around July 2001. The volunteers explained what the kit and labels meant and the role of Council and the SES in case of a flood etc. Occupants were then asked to sign a sheet recording that they had received the household kit. Copies of these signed sheets were used to assess how many properties had been delivered the household kit and labels.

David Monk, Sutherland SES, organised volunteers to make the deliveries. Around 80 per cent of properties in Woronora (or 324 properties) were reached whilst only 19 per cent of properties in Bonnet Bay (or 22 houses) were contacted. None of the Como properties were contacted. The SES

carried out distribution over a number of weekends over quite a few months and as of October 2003 had not managed to contact everyone as some people weren't home and the kits were to be given personally to home occupants. The SES still has to deliver the kits to around 95 properties in Bonnet Bay and 80 properties in Woronora.

Two or three household kits were also posted in 2000/01. The Stormwater Manager also delivered some kits at public meetings (Mike Rogers, personal communication).

Figure 7: First Brochure



6.4 FLOOD LABELS

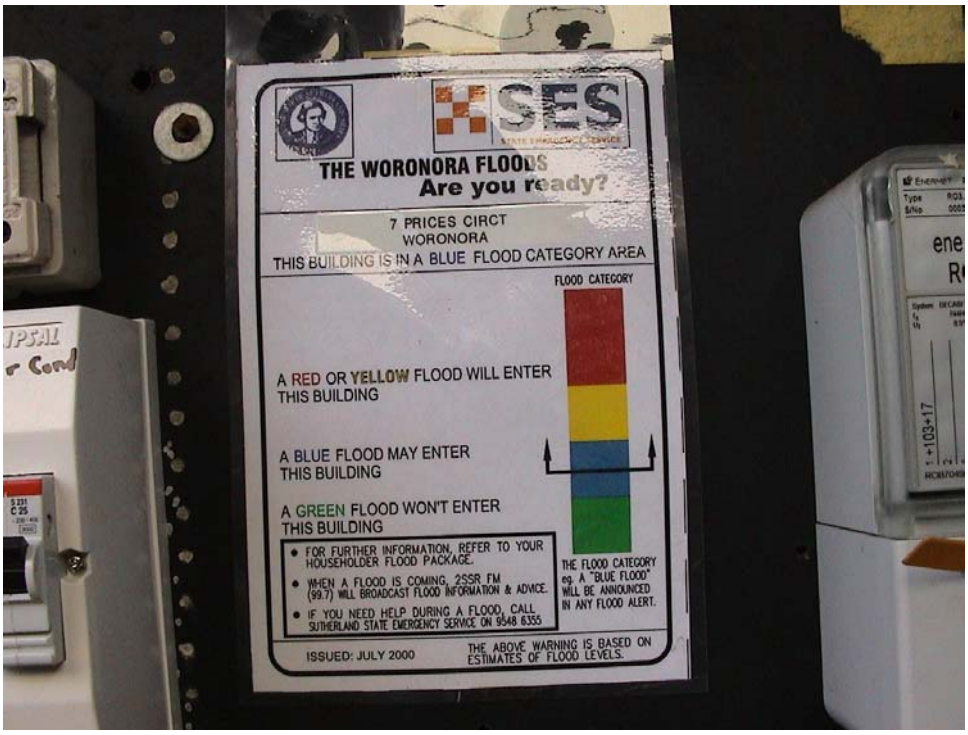
The flood labels were individually printed to show the dwelling's floor level in relation to the four flood categories. It was optional for occupants to accept a label but if they did it was mandatory that the labels be installed in the electricity box by the SES volunteers mentioned in the previous section.

The information provided on the label (see Figure 8) included:

- The logos of both Sutherland Shire Council and the SES on the top;
- The warning "The Woronora Floods: Are You Ready?";
- The address of the residence;
- The note "This house is in a (colour) flood category area";
- The remarks "A (colour categories higher than colour category of house) flood will enter this building"; a (colour category of house) flood may enter this building and "a (colour categories lower than colour category of house) flood won't enter this building;
- The advices "For further information refer to your householder flood package", "When a flood is coming 2SSR FM (99.7) will broadcast flood information and advice" and "If you need help during a flood call Sutherland Shire Council on 9548-6355";
- The warning "The flood category e.g. a (colour) flood will be announced in any flood alert"; and
- The caveat" The above is based on estimates of flood levels".

David Monk indicated that around 90 per cent of residents were happy to have the labels installed but around 10 per cent did not want the label. The majority of those who objected did not want a label with the Council logo in their electricity box and were very negative about Council. The Sutherland SES Local Controller thinks this approach is good as an additional way to promote flood preparedness and the image of the SES.

Figure 8: House label



6.5 PUBLIC MEETINGS

The Strategy recommended that public meetings be held to explain the preparedness strategy to residents and answer their questions.

A two-hour public meeting was held on Saturday 27 November 1999 at the Woronora River Lifesaving Building at Prince Edward Park, Woronora. The Bonnet Bay residents were letter-boxed and attended the Prince Edward Park meetings.

The meeting was advertised by two notices in *The Leader* on 16 November 1999 and 23 November 1999. Fliers were letterbox dropped to affected residents early on the week of the meeting. Twenty four residents attended the meeting.

The Agenda of the meeting was:

- Welcome by Councillor Dawn Emerson
- Background on flood study by Sutherland Shire Council Stormwater Manager (Mike Rogers)
- Presentation on flood warning system by Bureau of Meteorology Engineer/Hydrologist (Hugh Bruist)

- State Emergency Service Perspective by the SES Deputy Director General (Dr Chas Keys)
- Questions
- Preparedness campaign (Mike Rogers)
- Questions
- Need for Community Contacts by SES (Alan Jenkins)
- Voluntary House Raising Scheme (Mike Rogers)
- Questions

The SES asked for volunteers to help distribute the household kits and labels mentioned previously. According to Chas Keys, most of the people attending the meeting were very supportive of the program.

Two residents were opposed to some of the initiatives undertaken, the order of the initiatives or the impact of the signs to the visual amenity of the area.

6.6 MEDIA RELEASES

A short article, "Be Advised: be prepared", with a picture of the Stormwater Manager and the Woronora Bridge Flood Sign appeared in *The Leader* on 9 September 1999 (Figure 9). The article mentioned the signs near the Woronora Bridge and at Lakewood City Reserve and the early warning flood system.

The article also mentioned the flood "totems", information packs and the public meeting. It explained that totems or "coloured bands painted on street sign posts and council buildings indicate the severity of a flood". The colour coding system and content of the information pack were also outlined.

Another small release was published in *Shape the Shire*, Sutherland Shire Council's official newsletter. The article mentioned the two flood signs, the early warning flood alert system, the resident information package and public meeting.

A small article was published in *The Leader* on 25 November 1999. The article invited Woronora Valley residents to attend the public meeting. The article mentioned the flood preparedness campaign and the two installed flood signs. It advised that the campaign would also include flood "totems" and information packs to be distributed in early 2000.

Figure 9: Media release in Leader (9/9/99)

■ STORM water manager Mike Rogers with the flood signs

Be advised: be prepared

ANYONE living in a floodplain would be advised to follow the boy scout's motto and always be prepared.

With this in mind, Sutherland Shire Council has erected signs near the Woronora Bridge and at Lakewood City Reserve in Bonnet Bay which highlight historic and estimated flood levels on the river.

The signs are part of a campaign which aims to increase community awareness of the river's potential flood hazard and guide residents on what action to take in the event of a flood.

Councillor Steve Simpson said the campaign was born out of council's 1995 floodplain management study and plan to identify and manage issues relating to potential flood.

"Council has already installed an early warning flood system which proved very beneficial during major storms in July," Cr Simpson said.

The flood preparedness campaign would also include flood "totems", information packs and a public meeting to explain the strategy and address any community inquiries, he said.

The totems or coloured bands painted on street sign posts and council buildings indicate the severity of a flood.

A green band indicates a flood level of between 1.5m and 2.3m at the bridge, blue between 2.3m to 3.1m, yellow between 3.1m and 3.9m, and red above 3.9m.

As part of the campaign, households will also receive an information package comprising an eight-page colour brochure on flood preparedness, a booklet on what to do before, during and after a flood; a fridge magnet and other items for children.

The latest flood recorded at the bridge was in 1988.

That measured 2m (a green flood) while the largest recorded flood of 3m (low-yellow) occurred in 1898.

6.7 WARNING SYSTEM

The Woronora Flood River Network Party decided to adopt the following for the warning system:

- Public address system on SES and police vehicles;
- SES to notify 2SSR FM and 2WS radio stations with flood warning information;
- Emergency personnel and uniformed local wardens to deliver door to door messages to each household; and
- SES to advise appropriate authority of the need for a Standard Emergency Warning Signal when advisable.

PC COPS was trialled for Sutherland Shire Council in other areas. However costs for ongoing use could not be met and it did not become part of the Woronora Valley Flood Warning System.

6.8 SECOND BROCHURE AND FRIDGE MAGNET

In 2002, a second brochure (see Figure 10) and fridge magnet were created for residents in the vicinity of the Woronora River who have the potential to be affected by flooding. The brochure and magnet reinforced and built on key messages contained in previous flood awareness materials prepared as part of the initial information campaign devised by Sutherland Shire Council and Molino Stewart in 1998.

Figure 10: Second Brochure

The brochure comprised 4 x A4 pages, in full colour, on quality paper and included a photograph of the area affected and cartoons (see Appendix C). The magnet was illustrated with a cartoon and with contact number for flood warning information and bandwidth for 2SSR FM was also produced. One thousand magnets and copies of the brochure were supplied to Council prior to the end of June 2002.

The brochures and magnet were distributed in July/August 2002 to those properties that were considered to be potentially liable to flooding. The majority of brochures and magnets were posted. However, Council engaged someone to deliver some of the brochures and magnets to mailboxes. These brochures and magnet were simply put in the mailboxes. There was no face-to-face contact between the person who delivered the brochures/magnets and the residents. This method of delivery was thought to be cheaper than posting all brochures/magnets (Guy Amos, personal communication).

7 POST STRATEGY SURVEY

7.1 BACKGROUND TO SURVEYS

As mentioned in Section 4, a post strategy survey of residents exposed to the messages of the strategy was undertaken for this project. In total, 100 surveys within the study area were done. Twenty five residents were surveyed in each of the colour categories. Seventy seven households (77 per cent) were surveyed in Woronora, 19 in Bonnet Bay (19 per cent) and four in Como (four per cent). This is close to the 75/22/1 per cent split mentioned in section 2.1.3.

Seventy five phone surveys were undertaken during November 2003. Residents were contacted randomly from the list of the flood-affected properties provided by the SES. Phone numbers were obtained by using the CD ROM Phone Disc. The phone surveys were done both during the week and the weekend. A preliminary analysis of the first 75 surveys was done.

In-person surveys had been suggested in the grant proposal to Emergency Management Australia in order to help assess the accuracy of the phone survey responses. For example, if a survey question asked a respondent whether he/she kept a flood emergency kit, the interviewer could then have requested the respondent to provide evidence of the kit. This would have verified the accuracy of the telephone surveys. Two consultants went to the area to do the in person surveys on Wednesday 3rd December 2003. The response rate was extremely poor. Only five persons agreed to the survey in a three-hour period. In addition, none of the people surveyed in person declared possessing an emergency kit or having a house label in their electricity meter box. The consultants checked the latter. The consultants then made the decision that the response rate for the in-person surveys was too low and the requisite number of surveys would not be completed in this way. This survey method was therefore abandoned and the remaining 20 surveys were done on the phone.

The questionnaires consisted of 39 questions (see Appendix D). The first two questions were asked to ensure that the people answering the surveys were adults. Some of the questions were only asked if the respondent had provided a positive answer to the previous question.

A single person was responsible for the phone surveys, the data entry and interpretation of the results provided on the forms, which guaranteed consistency. Quality assurance included double entry of answers and computer comparison of the two sets of entries. One of Molino Stewart's principals then checked the interpretations and computer comparisons.

When Molino Stewart had to make additional assumptions to enter or analyse the data, these are outlined under the appropriate question in Section 7.2.

7.2 RESULTS

One hundred surveys were completed and analysed. The total number of flood-affected properties on the SES list was 538. The surveys analysed correspond to approximately 19 per cent of the population of interest. A copy of the survey form is included in Appendix D. A table of results (see Table 6) is provided at the end of Section 7.2.2 which also includes a breakdown of results according to the flood risks to the property.

7.2.1 Overall results

Overall results of the survey are provided in this section. The analysis of responses to each question in the survey is outlined below.

Q3. Is this your principal place of residence?

All of the respondents answered that they had been contacted at their principal place of residence.

Q4. How long have you lived in your current home?

Respondents had lived an average of 15 years in their current home. The minimum length of time spent in their current residence was three months and the longest 60 years with a median of 12 years.

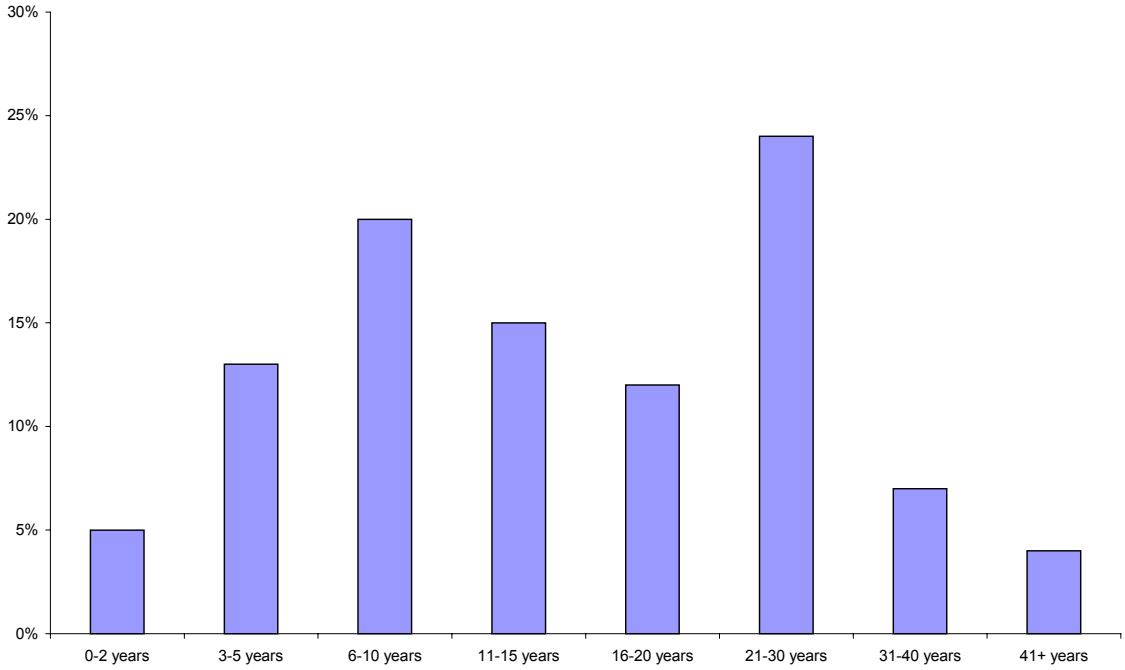
Q5. How long have you lived in the Woronora Valley?

This question verified that the residents still lived in the Woronora Valley, as it was possible that people had kept their old phone number whilst moving out of the area. Surveys with respondents declaring that they didn't live in the Woronora Valley were terminated at this stage.

Respondents had lived an average of 17 years in the Valley, with a minimum of three months, a maximum of 60 years and a median of 15 years (see Figure 11).

It is noted that the largest proportion have lived in the Valley for 21-30 years. Judging by their architecture, all of the houses in Bonnet Bay and many of the homes which are in the streets set back from the River in Woronora would have been built that long ago. It is possible that many of the residents in these homes are the original residents.

Figure 11: Time spent in Woronora Valley

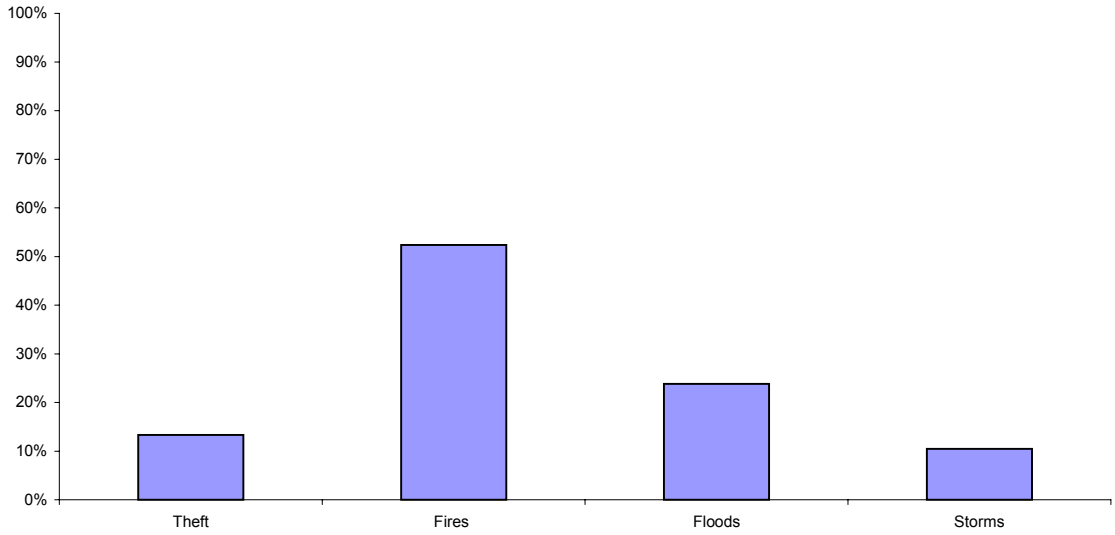


Q6. What do you believe is the biggest threat to your property?

The four possible threats to their property were read out and people were asked to choose a single option. In six cases, the respondents were unable to pick a single threat to their property and selected more than one option. One person thought that none of the options provided was a threat to his property.

Fires were regarded as the biggest threat to their property by 52 per cent of respondents, followed by floods by 24 per cent of respondents then theft by 13 per cent and finally storms by 10 per cent (Figure 12). Two persons responded that fires and floods were equal threats to their property; two persons believed that theft and fires were equal threats and one person declared that fires, floods and storms were equal threats in the area.

Figure 12: Biggest threat to their property



Q7. Do you live in a flood prone area?

Ninety one per cent of respondents declared that they lived in a flood prone area. The other nine per cent declared that they did not live in a flood prone area.

Q8. Is your house at risk of being flooded?

Forty five per cent of respondents declared that their house was at risk of being flooded. Fifty four per cent of respondents said that their house was not at risk and one per cent didn't know whether their house was at risk. It has to be noted that when respondents said that 'Council says it is at risk but it is not', the answer was marked down as no throughout the surveys.

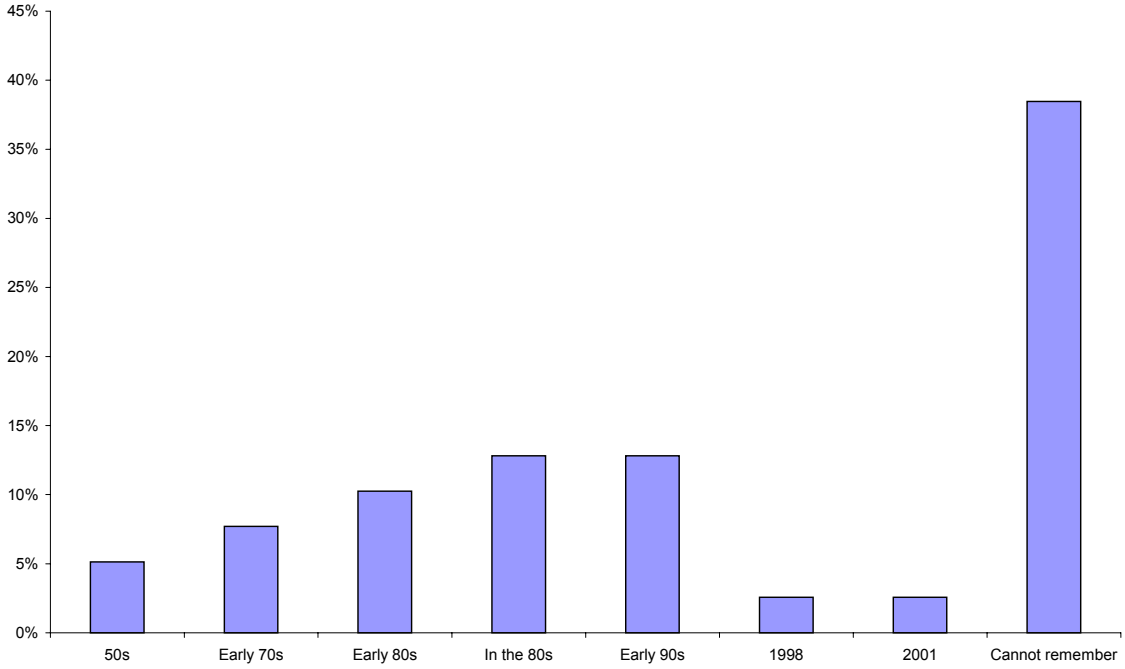
Q9. Have you experienced a flood in the Woronora Valley?

Thirty six per cent of respondents answered that they had experienced a flood in the Woronora Valley. These respondents were then asked in what year they experienced a flood.

Fifteen people or 38 per cent of respondents to this question did not remember when they had experienced a flood in the Woronora Valley. Two people or five per cent of respondents had experienced a flood back in the 1950s. Three people or eight per cent remembered a flood in the early 1970s, four people or ten per cent in the early 1980s, five people in the 1980s. Five people or 13 per cent experienced a flood in the early 1990s. One respondent recollected a flood in 1998 and one respondent in 2001 (see Figure 13).

It should be noted that there were floods in 1956, 1961, 1969 and 1988 as explained in Section 2.1.6. Only one respondent suggested he had experienced two floods but he could not remember when.

Figure 13: When did you experience a flood in the Woronora Valley?



Q10. Do you believe that larger floods than you have previously experienced are possible in the Woronora Valley?

Only those 36 respondents who had answered that they had experienced a flood in the Woronora Valley in question 9 were asked this question.

Fifty eight per cent of respondents thought that larger floods than the ones they had experienced were possible in the Valley. Twenty eight per cent thought that larger floods were not possible and 14 per cent did not know if larger floods were possible in the Woronora Valley.

Q11. Have you seen information about flooding in the Woronora Valley?

Ninety five per cent of respondents declared having seen information about flooding in the Valley. Five per cent of respondents said that they had not seen any information about flooding in the Valley.

Q12. What type of information have you seen?

This question was only asked to those 95 respondents who had seen information about flooding in the Valley. Options were not given to respondents during the survey. Instead the options that best reflected the respondents' comments were ticked on the survey form or the other option was completed. If the other option was ticked, the type of flood information noticed by the respondents was noted on the form. More than one answer was allowed.

Flood icons and/or signs were the most commonly cited type of flood information seen. Sixty four per cent of respondents mentioned flood signs, 51 per cent brochures, and eight per cent meter box stickers. Four per cent of respondents cited public meetings, fridge magnets and a letter from Sutherland Shire Council. Fifteen per cent of respondents provided other types of flood information unprompted (see Figure 14). These included:

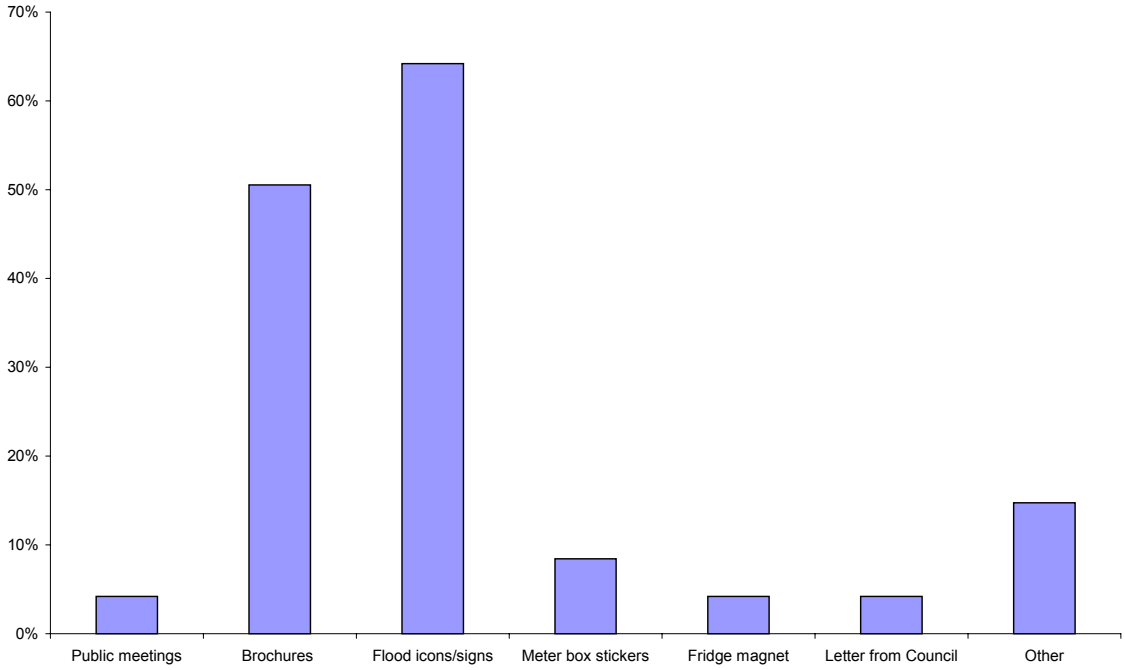
- Council charts;
- Flood Management Committee;
- Floodplain Management Plan;
- House raising scheme letter;
- SES letter or leaflet;
- Posters;
- Information provided to schools;
- Newspaper advertising;
- Illustrations;
- Surveys; and
- Mike Rogers (the former Stormwater Manager for Sutherland Shire Council).

None of the respondents mentioned Section 149 Certificates.

Q13. Have you noticed signs relating to flooding in the Woronora Valley?

All people surveyed were asked this prompted question, even those who had answered that they had not seen any flood information in the Valley. Ninety per cent of respondents had noticed signs relating to flooding in the Valley.

Figure 14: Type of flood information noticed by residents



Q14. Where have you noticed flood signs?

Only those 90 respondents who declared that they had noticed signs relating to flooding in the Valley in question 13 were asked this question. The various locations of the signs were not read out to the respondents and more than one answer was allowed.

Out of those respondents who had seen flood signs, 90 per cent had noticed the signs on the old Woronora Bridge, 10 per cent the sign at Lakewood City Reserve and 19 per cent the flood totems.

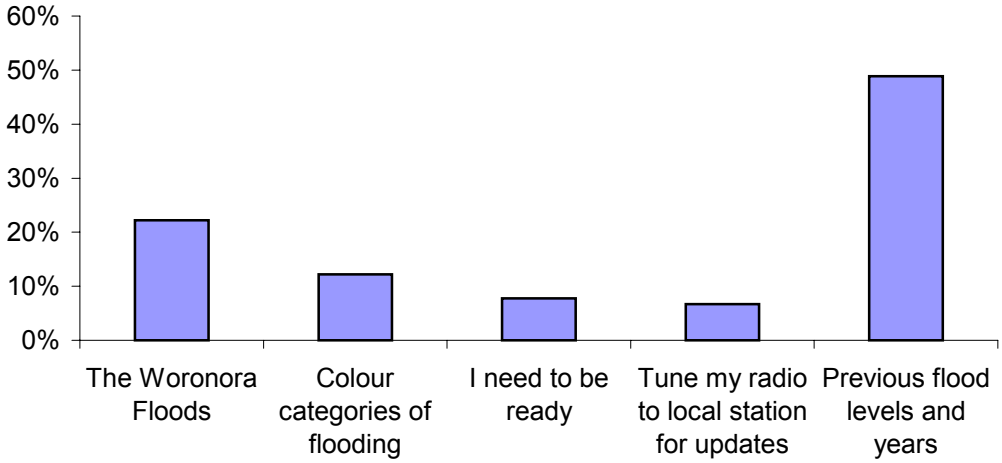
Q15. What messages do you remember from those signs?

Only those 90 respondents who declared that they had noticed signs relating to flooding in the Valley in question 13 were asked this question. Answers were not prompted. The options that best represented the respondent's comments were ticked on the form. More than one option could be ticked. If the 'other' option was ticked, the comments were described on the form. If the respondent did not remember any message from those signs then no option was ticked.

- Twenty seven per cent of respondents could not remember any message on the flood signs. Forty nine per cent of respondents recalled that the signs indicated previous flood levels and the years that these floods occurred. Twenty two per cent of respondents remembered that the messages mentioned the Woronora floods.

Twelve per cent recalled that the sign mentioned the various colour categories for flooding. Eight per cent of respondents remembered some warning that they needed to be ready for the floods. Seven per cent of respondents recalled that they were asked to tune their radio to the local station for updates in the case of a flood (see Figure 15).

Figure 15: Messages on the flood signs



Q16. Do you have a coloured flood label in your electricity meter box?

The 100 people surveyed were asked this question. When the respondent answered 'I am not sure' or 'I don't know', the answer was marked down as 'don't know'. If they answered categorically either yes or no, the answer was marked as 'yes' or 'no'.

Thirty seven per cent of respondents declared that they had a coloured flood label in their electricity meter box, 30 per cent that they did not have one and 33 per cent did not know whether they had a label or not.

During the five in-person surveys, the people either answered that they did not have a coloured flood label or did not know whether they had one. When the electricity meter boxes were checked, it was noticed that none had a sticker in their meter box. Subsequently, after the kit delivery list was received from the SES, six houses which had accepted a kit from the SES were randomly checked and all had stickers in their meter box.

Q17. Do you know there are colour codes for flooding in the Woronora Valley?

Sixty two per cent of respondents declared that they were aware of the colour codes for flooding in the Valley. The remaining 38 per cent did not know about the colour codes.

Q18. Can you tell me the colour code for your house?

The respondents who had replied that they were aware of the colour codes for flooding in the Valley in question 17 were asked this question. The colour given by the respondent was ticked on the survey form. If the respondents answered that they did not know, the 'don't know' option was ticked on the form. For analysis of the answers, the colour given by each respondent for his house was compared to the colour assigned by the SES to the respondent's property. The answers were then divided into three groups, namely:

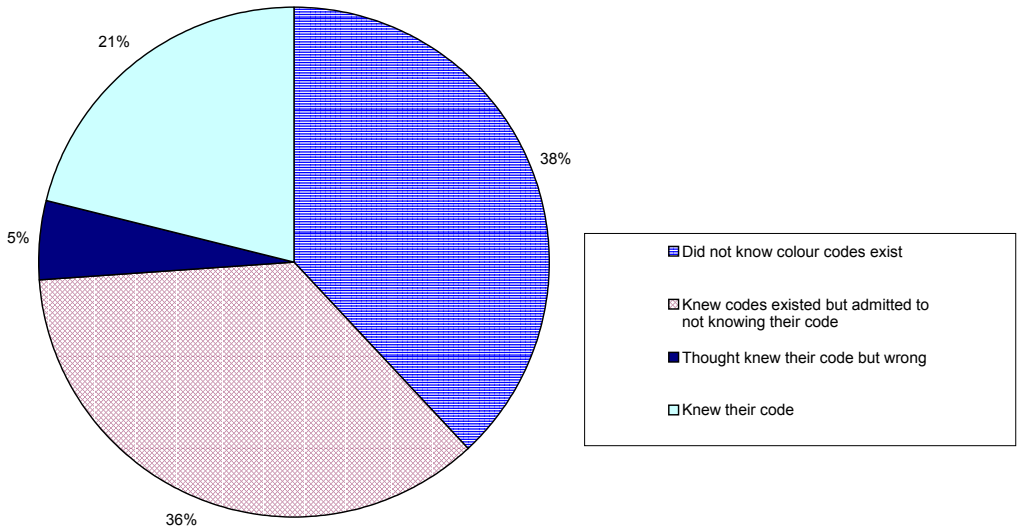
- The respondent knows the correct colour code for his house; or
- The respondent has given the wrong colour code for his house; or
- The respondent does not know the colour code for his house.

Thirty eight per cent of all respondents did not know that colour codes existed (see question 17). Thirty six per cent knew colour codes existed but admitted not knowing their code. Five per cent knew colour codes existed and thought they knew their code but were wrong. Twenty one per cent knew their colour code (see Figure 16)

Q19. What does the colour mean?

This question was only asked of the 26 people who had given a colour as an answer to question 18. Only nine respondents provided some reasonable explanation of what the colour meant. Most of them related their colour code to the propensity for their house to flood. For example the ones who had answered that their house was in the red category in question 18 would have then answered that their house was least likely to get flooded. Two respondents read from their meter box label. Nine respondents provided erroneous explanations and six people did not volunteer an answer and admitted they didn't know.

Figure 16: Knowledge of colour codes



Q20. Can you remember having a household kit delivered to your house by SES volunteers?

Around 10 per cent of respondents asked what was meant by a household kit. The answer provided to them was that the household kit consisted of a package containing flood information, which was hand delivered to their house a couple of years ago by SES volunteers.

Fifty three per cent of respondents remembered having a household kit delivered to their house by SES volunteers. Forty seven per cent did not remember receiving this information package. The SES distribution list was received after the surveys were completed and only 71 of the homes surveyed had a kit delivered to them. When only the homes which had kits delivered to current occupants is analysed, then 75 per cent of respondents remembered receiving the kit and 25 per cent did not remember receiving the kit. When it is considered that there is an average of 3.3 per dwelling and the adult who responded to the telephone survey may not have been the person who took delivery of the kit from the SES, this is a very high recollection rate. Of the remaining homes, two respondents who did not remember receiving the kit had moved in after 2000.

Q21. What was in the kit?

This question was only asked of people who had responded that they had received a household kit from SES volunteers in question 20. The respondents were not given a list of options to choose from but had to remember what was in the kit unprompted. When people responded that

they remembered a booklet with what to do during/before or after a flood, the EMA booklet option was ticked. When people mentioned a brochure or leaflet then the Woronora Flood brochure option was ticked. However it should be noted that, from the answers given by the respondents it was sometimes hard to distinguish between the two. In that case both options were ticked on the form.

Forty nine per cent of the respondents who remembered having received the kit could not remember what was in the kit. Forty two per cent remembered receiving the EMA booklet and 43 per cent the Flood Brochure. Thirteen per cent of respondents mentioned the magnet and two per cent the colouring sheet. Eight per cent mentioned other elements including the flood labels and emergency numbers.

Q22. Which elements of the kit, if any have you kept?

Only those respondents who had answered that they had received the household kit in question 20 were asked this question. When the respondents could not remember what was in the kit, the question was left blank except if they specifically indicated that they had not kept any of the elements of the kit. When respondents indicated that they had kept it all without specifying which elements they had kept, a tick was marked next to each of the elements mentioned in question 21 by these respondents.

Nineteen per cent of respondents who remembered receiving the kit declared that they had not kept any of the elements of the kit. Thirty two per cent indicated that they had kept the booklet, 30 per cent that they had kept the brochure and 13 per cent the magnet.

Q23. Did you receive a Woronora Flood brochure and a fridge magnet in your letterbox last year?

In order to distinguish between the first and the second brochure and between the DL-sized magnet and the second fridge magnet, the question was read out as “Did you receive a turquoise flood brochure and a small white fridge magnet in your letterbox last year”?

Forty per cent of respondents answered that they had received the brochure and magnet, 26 per cent that they had not received either. The remaining 34 per cent either didn’t know, weren’t sure or could not remember.

Q24. Is the magnet on your fridge at the moment?

Questions 24 through to 26 were only asked to those respondents who had declared that they had received the brochure and magnet in question 23. Seventy per cent of those 40 respondents said that the magnet was on their fridge at the moment. Twenty five per cent responded that the magnet was not on the fridge and five per cent that they did not know.

Q25. Did you read the brochure?

Seventy five per cent of respondents said that they had read the brochure; eight per cent that they had not read the brochure and 18 per cent could not remember if they had read the flood brochure.

Q26. Did you keep the brochure?

Fifty per cent of respondents declared that they had kept the brochure, 25 per cent that they had not kept the brochure and 25 per cent that they did not know.

Q27. How would you expect to know the Woronora River was about to flood?

Options were not suggested to the respondents who were allowed to give more than one answer to this question.

Fifty four per cent of respondents replied that they would know the Woronora River was about to flood because they could see it rising. Seventeen per cent expected to hear that the River was about to flood on the radio. Fourteen per cent of respondents would expect the River was about to flood it there had been heavy consistent rain for days. Ten per cent thought the River would flood only if this heavy rain was combined with king tides.

Nine per cent expected to be advised that the River was about to flood by door knocks, seven per cent to hear it on the television and six per cent to hear it from their neighbours. Five per cent responded that they would worry about the River flooding only if Woronora Dam was full and there was consistent heavy rain for a while. Eighteen per cent of respondents gave other responses (see Figure 17).

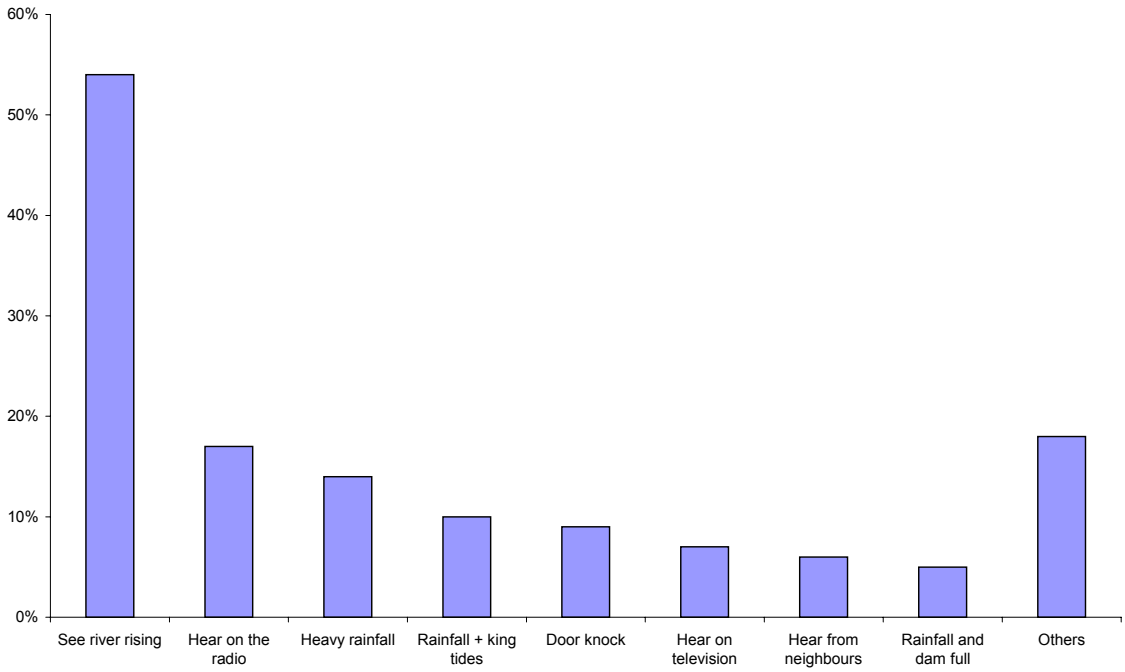
The other responses included:

- Familiarity with the River so know how it behaves (four per cent of respondents);
- SES Advice (three per cent of respondents);
- Sutherland Council would advise us (two per cent of respondents);
- A signal or alarm (two per cent of respondents);
- Announcements (two per cent of respondents);
- Emergency Services telephone (one per cent of respondents);
- Mail (one per cent of respondents); and

- Doesn't know (one per cent of respondents).

Two per cent of respondents expressed that the River was NOT going to flood and did not give any suggestions as to how they would expect to know that the Woronora River was about to flood.

Figure 17: Signs that the Woronora River was about to flood



Q28. After being warned of an imminent flood, where would you expect to get additional information about the flood and what you should do?

Options were not suggested to the respondents who were allowed to give more than one answer to this question.

Five per cent of respondents didn't know where to get additional information about the flood and what they should do. Forty one per cent of respondents said they would telephone the State Emergency Services, 37 per cent would call Sutherland Shire Council and 12 per cent the Bushfire Brigade. Seventeen per cent of respondents would turn to their local radio station and six per cent to another radio station. Three per cent would expect to find additional information on the Internet and the same proportion would expect to gain information from local residents and neighbours (see Figure 18).

Forty nine per cent of respondents did not nominate either call the SES or tune to local radio station. Twenty three per cent of respondents did not

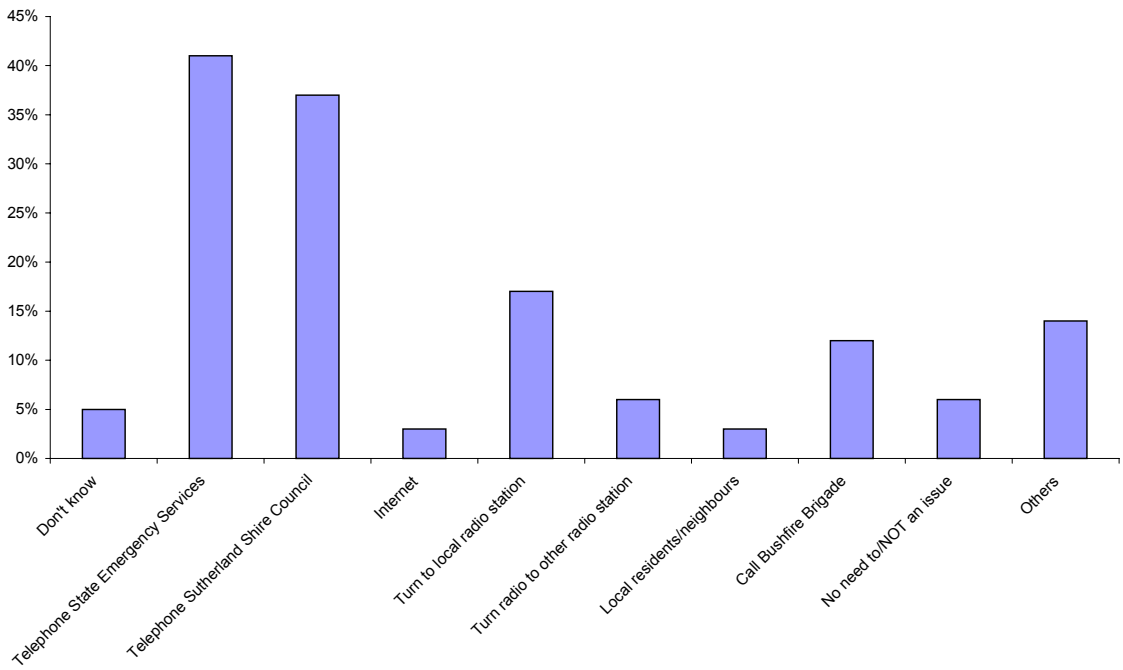
nominate either call SES, Sutherland Council or Fire Brigade or tune to local radio.

Six per cent of respondents answered that they wouldn't want any additional information. Fourteen per cent of respondents indicated another source of additional information in the case of a flood, namely:

- Television news (five per cent of respondents);
- Telephone Sydney Water (three per cent of respondents);
- Call the number but did not know what number (two per cent of respondents);
- Call the police (two per cent of respondents);
- Notification from the SES (one per cent of respondents); and
- Keep my eyes open, am sure they would let us know (one per cent of respondents).

None of the respondents said that they would call the Bureau of Meteorology or read the flood brochure for additional information about flooding and what they should do in the case of a flood.

Figure 18: Additional information



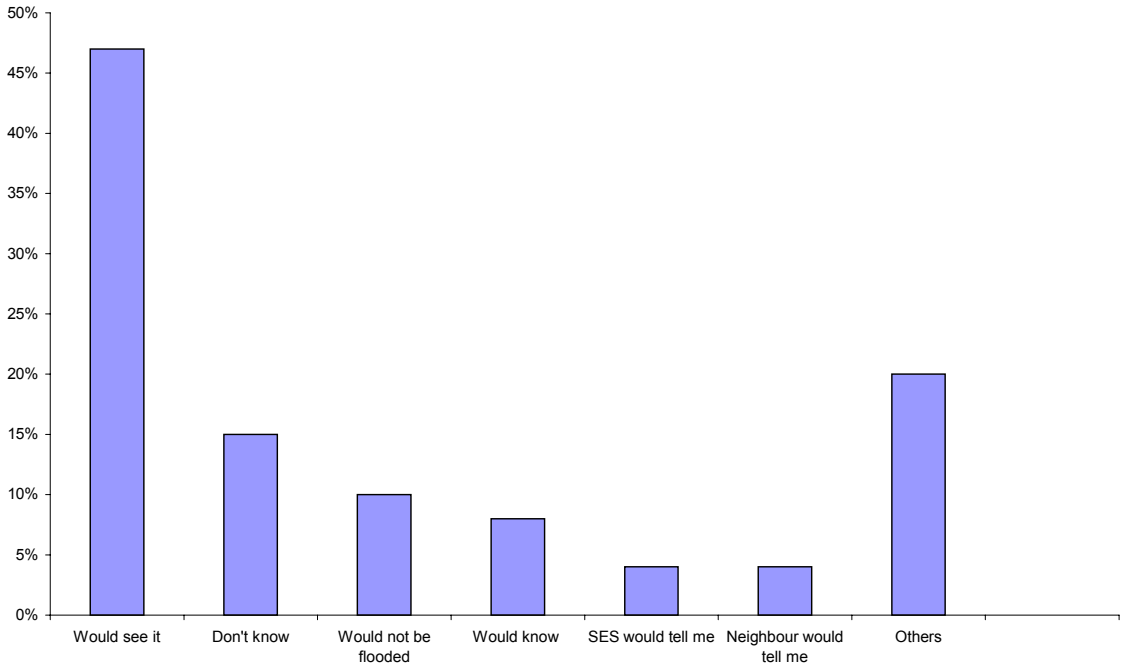
Q29. How would you know if your house was going to be flooded?

Options were not suggested to the respondents who were allowed to give more than one answer to this question.

Forty seven per cent of respondents declared that they would know their house was going to be flooded because they would see it. Eight per cent of respondents said they would just know their house was going to be flooded. Fifteen per cent of respondents answered that they didn't know. Four per cent of respondents said the SES would tell them and a similar proportion said their neighbours would tell them. Ten per cent of respondents answered that their house would not be flooded (see Figure 19). These were all people who had answered that their house was not at risk of being flooded in question 8. Twenty per cent of respondents provided other responses, including:

- Would see it affect other areas first (five respondents);
- Would know from televised news (four respondents);
- Would hear it on the radio (three respondents);
- It is not possible to know (two respondents);
- Would know that flood level of a certain colour would affect their house (two respondents);
- Would look in the brochure (one respondent);
- Would look at totem or street sign (one respondent); and
- Would receive a phone call (one respondent).

Figure 19: How would you know if your house was going to be flooded



Q30. What would you do in the case of a flood?

Options were not suggested to the respondents who were allowed to give more than one answer to this question.

Fifty six per cent of respondents said they would self evacuate. Eleven per cent said they would go on their boat and leave. Forty four per cent of respondents replied that they would raise their furniture and possessions. Fifteen per cent of respondents answered that they would remove their valuables from the house. Nine per cent of respondents said they would locate their pets. Five per cent of respondents declared they would switch off their electricity and gas. Three per cent of respondents would make a phone call. Six per cent of respondents said they would do nothing and four per cent said they didn't know what they would do (see Figure 20).

Three per cent of respondents said they would use sandbags, three per cent said that they would get their kids ready and three per cent that they would get the electrical items upstairs. Sixteen per cent of respondents made other suggestions, including:

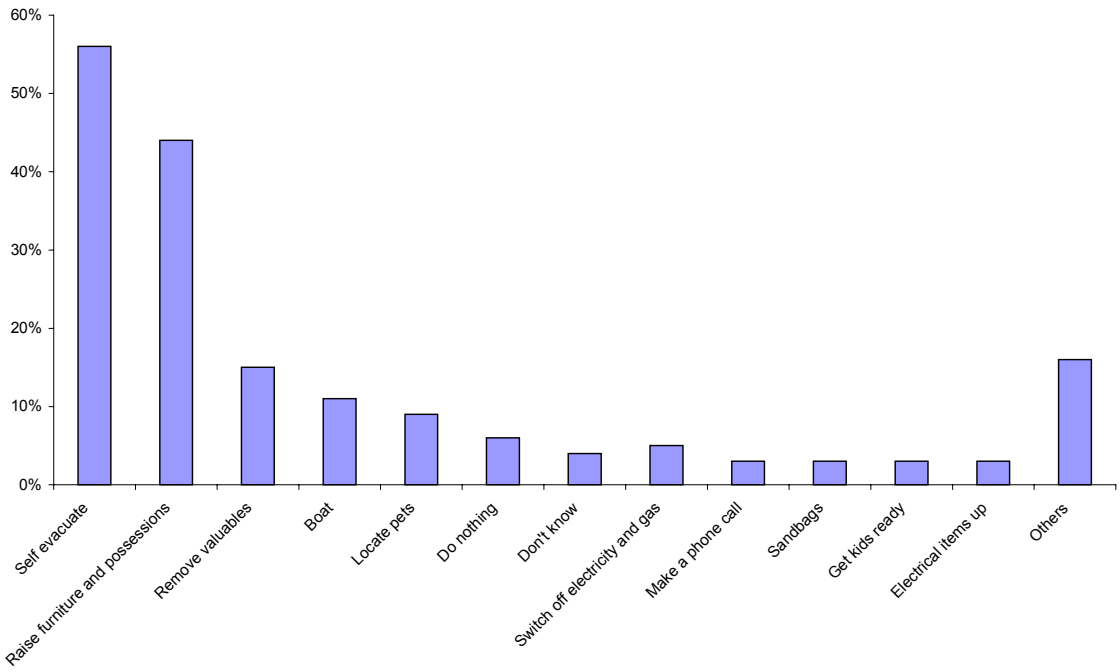
- Make sure everyone is safe or help others (three respondents);
- Preventing water from coming into their garage (one respondent);
- Would panic (one respondent);

- Stay home and do the best they can (one respondent);
- Remove documents from the house (one respondent);
- Move cars to higher grounds (one respondent);
- Tie furniture to the trees with a rope (one respondent);
- Dig a trench to let the stormwater out (one respondent); and
- Go upstairs (one respondent).

One respondent said that his house was built to take a flood and that the electricity points were not located on the ground floor. Another respondent was positive that a flood would never affect his house. One respondent was adamant that there would not be a flood in the area.

None of the respondents answered that they would get their emergency kit out or pack valuable and clothing in a **waterproof** bag. Similarly, no respondent answered that he would evacuate to a **notified** evacuation centre.

Figure 20: What would people do in the case of a flood



Q31. Which number would you call?

Only respondents who had declared that they would make a phone call in the case of a flood in question 30 were asked this question. Only three respondents had said they would make a call. Two respondents mentioned the SES and one the Fire Brigade.

Q32. Do you have an emergency kit for floods?

Only five respondents said that they had an emergency kit for floods.

Q33. What items are in your flood emergency kit?

Only the five respondents who had answered that they possessed an emergency kit for floods in question 32 were asked this question. Four respondents said they had a portable radio with batteries, four respondents a torch with spare batteries, two a first aid kit and manual and one the Woronora Brochure. One respondent could not remember what was in her kit.

Q34. Do you think that being prepared for a flood can reduce property losses?

Sixty three per cent of respondents thought that being prepared for a flood could reduce property losses. Twenty nine per cent of respondents thought that being prepared could not reduce property losses and eight per cent didn't know (see Figure 21).

Q35. Do you think that being prepared for a flood can improve your personal safety?

Eighty per cent of respondents thought that being prepared for a flood could improve personal safety, 12 per cent that it would not and eight per cent didn't know (see Figure 22).

Figure 21: Flood preparedness and property losses

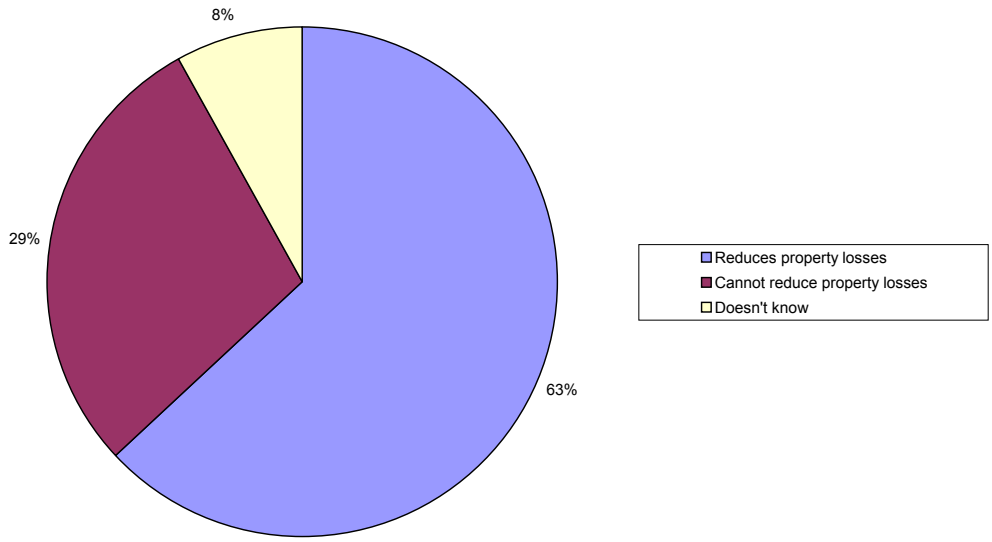
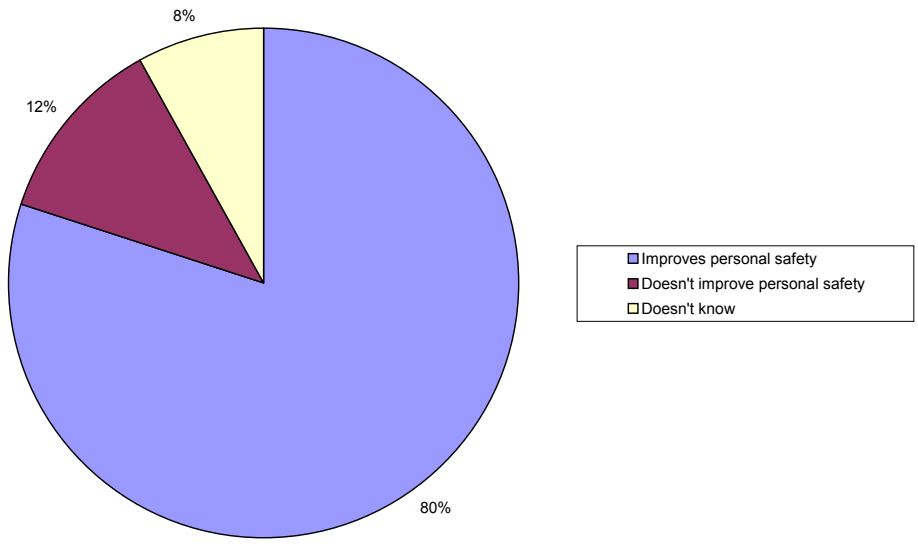


Figure 22: Flood preparedness and personal safety



Q36. What other benefits do you think being prepared for a flood could bring?

Twenty seven respondents out of the hundred people surveyed thought that being prepared could bring benefits in addition to reducing property losses and improving personal safety. These benefits included:

- Helping the community and/or others (six respondents);
- Being more aware of the dangers of flooding and improving knowledge (five respondents);
- Saving personal belongings and/or sentimental items (four respondents);
- Reducing panic and panic attacks (four respondents);
- Being ready for emergencies in general (three respondents);
- Keeping the family safe (two respondents);
- Reducing insurance claims (two respondents),
- Improving peace of mind (two respondents);
- Saving pets (one respondent);
- Minimising inconvenience (one respondent); and
- Cutting cost down (one respondent).

Q37. How many people live in this household?

The average number of people in the surveyed households was 3.3, with a minimum of one person per household and a maximum of 8.

Q38. What is the main language spoken at home?

Ninety nine per cent of people declared that English was the main language spoken at home, with one person refusing to answer the question.

Q39. Are you renting this house?

Five per cent of respondents were renting their house; the remaining ninety five per cent owned their house.

7.2.2 Correlating Results

The previous section outlined post survey results for the four flood categories combined. It could be expected that survey results could vary depending on the flood risk of the respondents. Table 6 shows how the responses to each question varied according to flood risk category.

Some of these results are discussed in this section where the information is thought to be of interest or significance. A statistical test was performed to assess whether differences between flood categories were statistically significant. Other correlations between respondent's circumstances and responses are also explored in this section.

3. How long have you lived in your current home?

Overall, respondents had lived an average of 15 years in their current home. Respondents in the green category had lived in their current home an average of 21 years, in the blue category an average of 16 years, in the yellow category an average of 12 years and in the red category an average of 14 years.

This showed that residents in the green category were longer term residents compared to the overall average length of residency. This may reflect the fact that many of these homes are high value homes with absolute water frontage from which people are reluctant to move.

6. What do you believe is the biggest threat to your property?

In the overall results, floods were seen as the biggest threat by 24 per cent of respondents. This proportion rose to 40 per cent amongst the blue category and 32 per cent amongst the green category. Twenty per cent of respondents in the yellow category see floods as the biggest risk. The proportion falls to a low eight per cent amongst respondents from the red category.

The only significant differences were between the red category and the green and the blue categories. Although not all differences were significant, they suggest that residents with a greater risk of flooding regard flood as the biggest threat to their house.

Those who considered flooding to be the main threat had lived in the area an average of 17.6 years which is slightly higher than the average for the total sample. Interestingly, only 28 per cent of those who had experienced a flood (question 9) believed flooding to be the greatest threat.

The last flood was in 1988. Thirty one per cent of those who had lived in the area at that time considered flooding to be the greatest threat but this is not statistically different to the average for the total sample.

7. Do you live in a flood prone area?

Ninety one per cent of respondents declared that they lived in a flood prone area. This proportion was as high as a 100 per cent amongst respondents in the green category, 96 per cent in the blue category and 92 per cent in the yellow category. Only 76 per cent of respondents in the red category believed they lived in a flood prone area.

There are significant differences between the proportion in the red category and both the green and the blue categories. None of the other differences are significant.

The proportion of respondents who declared that they lived in a flood prone area decreases as the flood category went from most likely to get affected by a flood (green) to least likely to get affected (red).

Of the residents who lived in the area in 1988, 98 per cent believed they lived in a flood prone area.

8. Is your house at risk of being flooded?

Forty five per cent of respondents had answered that their house was at risk of being flooded. This was 56 per cent amongst respondents in the green category, 52 per cent in the blue category and 48 per cent in the yellow category. The proportion went down to 24 per cent in the red category. There are significant differences between the red category and both the green and the blue categories. None of the other differences are significant.

As in the previous question, the observed pattern was that the proportion of respondents who declared that their house was at risk of being flooded decreased as the flood category went from most likely to get affected by a flood (green) to least likely to get affected (red).

Of those who lived there in 1988, 43 per cent believed their house was at risk. This is not significantly different to the average.

9. Have you experienced a flood?

Thirty six per cent of respondents declared having experienced a flood. Sixty per cent of respondents in the green category had experienced a flood. The proportions in the other categories are closer to the overall average, with 32 per cent in the blue category and 32 per cent in the red category. The proportion in the yellow category is slightly lower, with 20 per cent of respondents declaring having experienced a flood.

There are significant differences between the green category and the three other categories. This could be explained by the fact that residents in the green category are at a higher risk than all the other categories.

The last flood on the Woronora was in 1988. When only residents who lived in the Valley before 1988 are analysed it is found that 57 per cent say they have experienced a flood. It is probable that the 1988 flood was being referred to by the 14 residents who nominated the early 80s, 80s or early 90s as the date of the last flood. Only two people would appear to recall the 1956 flood and three the 1969 flood.

10. Do you believe that larger floods than you have previously experienced are possible in the Valley?

Fifty eight per cent of respondents had answered that they believed larger floods than the ones they had experienced were possible in the area. This proportion was smaller for respondents in the green (47 per cent) and yellow (40 per cent) categories and larger in the blue (75 per cent) and red (75 per cent) categories. The proportions in the first group (green and yellow) are significantly smaller than the ones in the second group (blue and red).

There is no discernibly logical reason for such a large disparity between risk categories.

11. Have you seen information about flooding in the Woronora Valley?

Ninety five per cent of respondents had declared having seen information about flooding in the Valley. However when the five respondents who said they had not seen any information were asked about the signs and kits, two said they had seen signs and two had received kits. The only remaining resident, who definitely had not seen any flood information lived at Como. No kits were delivered to Como and it is not necessary for Como residents to drive past the signs.

12. What type of flood information have you seen?

Sixty four per cent of respondents mentioned the flood signs unprompted. In the green category, 84 per cent of respondents mentioned these signs whereas in the red category only 38 per cent of respondents mentioned signs. Both these proportions were statistically different to the overall proportion. The proportions in the blue and yellow categories were pretty similar to the overall proportions (67 per cent and 64 per cent respectively).

13. Have you noticed signs relating to flooding in the Woronora Valley?

Ninety per cent of respondents answered that they had seen flood signs. This proportion rose to 100 per cent in the green category (statistically significant difference) then decreased with 92 per cent in the blue category, 88 per cent in the yellow and 80 per cent in the red category.

In Woronora 96 per cent of residents had noticed the signs but this dropped to 79 per cent in Bonnet Bay.

15. What messages do you remember from the signs?

While only 66 per cent of respondents in the whole sample had noticed the signs and remembered at least one message, in Woronora this was 79 percent.

18. Can you tell me the colour code for your house?

Thirty four per cent of respondents knew the correct colour code for their house. This proportion was higher, though not statistically significantly higher, in the green category (43 per cent). It was 33 per cent in the yellow, 31 per cent in the blue and 29 per cent in the red category respectively.

34. Do you think that being prepared for a flood can reduce property losses?

Sixty three per cent of respondents answered that they thought being prepared could reduce property losses. The proportions in the blue (64 per cent) and yellow (63 per cent) were similar. This proportion was slightly lower in the green category (58 per cent) and higher in the red category (68 per cent). None of these differences were statistically significant.

35. Do you think that being prepared for a flood can improve your personal safety?

Eighty per cent of respondents answered that they thought being prepared could improve personal safety. These proportions were similar in the green (83 per cent), yellow (83 per cent) and red (80 per cent) categories. This proportion was slightly lower, but not significantly, in the blue category (72 per cent).

Table 6: Survey Results

Question		Answer	Overall	Green	Blue	Yellow	Red
3	Principal place of residence	Yes	100%	100%	100%	100%	100%
4	Average length in home	Years	15.55	20.63	16.24	11.74	13.6
5	Average length in Woronora Valley	Years	17.48	23.86	17.36	13.02	15.67
6	Biggest threat to property	Theft	13%	20%	8%	16%	12%
		Fires	52%	36%	52%	64%	68%
		Floods	24%	32%	40%	20%	8%
		Storms	10%	8%	12%	8%	16%
7	Live in flood prone area	Yes	91%	100%	96%	92%	76%
8	House at risk of being flooded	Yes	45%	56%	52%	48%	24%
9	Experienced a flood	Yes	36%	60%	32%	20%	32%
10	Larger floods possible	Yes	58%	47%	75%	40%	75%
		No	28%	53%	13%	20%	13%
		Don't know	14%	0%	13%	40%	25%
11	Seen flood information	Yes	95%	100%	96%	100%	84%
12	Type of information	Brochures	51%	44%	54%	60%	43%
		Flood signs	64%	84%	67%	64%	38%
		Meter box stickers	8%	12%	13%	4%	5%
13	Signs in valley	Yes	90%	100%	92%	88%	80%
14	Where	Old Bridge	90%	100%	100%	77%	80%
		Lakewood	10%	0%	0%	27%	15%
		Totems	19%	16%	13%	27%	20%
16	Coloured label	Yes	37%	48%	32%	44%	24%
		No	30%	24%	28%	20%	48%
		Don't know	33%	28%	40%	36%	28%
17	Colour codes	Yes	62%	56%	64%	72%	56%
18	Colour for house	Correct	34%	43%	31%	33%	29%
		Wrong	8%	7%	6%	11%	7%

Question		Answer	Overall	Green	Blue	Yellow	Red
		Doesn't know	58%	50%	63%	56%	64%
20	Household kit	Yes	53%	56%	64%	48%	44%
21	EMA Booklet	Remember	42%	29%	38%	50%	55%
	Woronora Brochure	Remember	43%	29%	38%	58%	55%
	Magnet	Remember	13%	14%	19%	17%	0%
	Can't remember	Remember	49%	64%	44%	42%	45%
22	Did not keep	Not Kept	19%	36%	13%	17%	9%
	EMA Booklet	Kept	32%	21%	31%	33%	45%
	Woronora Brochure	Kept	30%	21%	25%	33%	45%
	Magnet	Kept	13%	14%	19%	17%	0%
23	Fridge magnet and brochure	Yes	40%	36%	44%	52%	28%
		No	26%	16%	20%	28%	40%
		Don't remember	34%	48%	36%	20%	32%
24	Magnet on fridge	Yes	70%	67%	73%	69%	71%
		No	25%	33%	18%	31%	14%
		Don’t know	5%	0%	9%	0%	14%
25	Read the brochure	Yes	75%	67%	73%	77%	86%
		No	8%	11%	9%	8%	0%
		Don't remember	18%	22%	18%	15%	14%
26	Keep the brochure	Yes	50%	67%	45%	38%	57%
		No	25%	22%	27%	31%	14%
		Don't remember	25%	11%	27%	31%	29%
34	Reduce property losses	Yes	63%	58%	64%	63%	68%
		No	29%	29%	28%	33%	24%
		Don't know	8%	13%	8%	4%	8%
35	Improve personal safety	Yes	80%	83%	72%	83%	80%
		No	12%	8%	16%	17%	8%
		Don't know	8%	8%	12%	0%	12%

7.2.3 Comments provided by respondents during the surveys

A number of comments were expressed during the surveys. The relevant comments are outlined in this section.

Some respondents were very aware that the area was at risk of flooding but loved living in the Woronora Valley. These were often long term residents who acknowledged that if you build in a flood prone area you have to be prepared for the associated risks. One such respondent expressed that people should be "encouraged to rely on themselves" and be prepared in the case of a flood or any disaster. In addition the respondent added that people living by the Woronora River should expect that floods could happen and should be prepared. Another respondent expressed his doubts about flood preparedness. In his opinion, water is a force much stronger than us and that there is not much anyone can do. His solution was to not build in flood prone areas to avoid risks.

Other residents, often long term residents, had lived in the area for years and never experienced a significant flood. They have become doubtful that a flood of any significance would occur in the Valley in their lifetime. A number of such respondents stressed that they were really not concerned with floods but that fire was a major issue. One respondent even strongly expressed that floods was the lowest issue of concern. A number of respondents declared that floods used to be an issue but were not an issue since the Woronora Dam was built. It should be noted that Woronora Dam was completed in 1941 before any of the respondents lived in their current homes.

For question 8, "Is your house at risk of being flooded?" quite a number of respondents expressed that Council told them that their house was at risk but that they still strongly believed that their house was not at risk. Two or three respondents declared that they would be quite interested for Council to explain to them how they calculated that their house would be at risk of being flooded. For a number of respondents it was puzzling as how their house had not been considered at risk of being flooded for years and was suddenly rezoned as flood prone. These respondents were sometimes dubious about the intentions of Sutherland Council.

A small number of respondents really did not think that floods were a risk in the area and expressed that the flood awareness campaign was a waste of time and money. One woman said that her husband immediately "threw out" the household kit. Another respondent said that flood information is "just something Council does to protect itself, for insurance purposes" and added that the concern over floods was "rubbish as there will be NO flood". The respondent really stressed that point and wanted it written down.

A small number of respondents were really impressed with the flood awareness campaign and what Sutherland Shire Council had achieved in that area. One such respondent thought that it was very good for Council to

provide them with flood information and that it would be good to receive some form of update in the mail quite regularly. Another respondent said that the State Emergency Services were really good at their job and very helpful. One respondent thought that the flood sign at the Old Bridge and the information provided were really interesting.

On the other hand a number of respondents strongly disagreed with the sign. One respondent said that the flood sign was “stupid” and could not really see how you could be prepared for a flood. A second respondent said that the flood signs were misleading as the previous floods mentioned on the signs all occurred prior to the Woronora Dam being built and that, since then, floods were no longer a problem in the area. Five respondents said that they were against the sign as it devalues the area. A sixth respondent said that the flood sign was a “waste of money”.

A number of respondents from Deepwater Estate had concerns with an emergency management issue that appears to be outside the scope of the flood preparedness campaign. They pertain to a long struggle between Council and local residents to get an access road to their properties. One respondent from Deepwater Estate refused to answer the survey questions but asked if they could have a road. Two respondents from Deepwater Estate claimed that they had only received half the household kit. They both said that some pages had been removed from their booklet. They pointed out their concern that their only access road was a four wheel drive track. Both thought this was a major concern for both fires and floods. They explained that the SES would have problems accessing the residents and evacuating them, as it would not be possible to travel via the Woronora River if there were a flood. They said that there was no real solution given to the 65 houses in Deepwater Estate about evacuation and that the flood preparedness campaign was thus only of limited interest and use to them.

Some respondents in other areas, including Bonnet Bay, expressed their concern that there was only one way out for them. For example one resident said that evacuation of Washington Drive would be a major issue as there is only one way in and one way out. One Bonnet Bay resident declared that she had not noticed any flood signs in the area. She added that she never goes near Lakewood City Reserve so did not see the sign there. She had not noticed any of the flood totems in Bonnet Bay.

8 COMPARISON WITH PRE-STRATEGY SURVEY

8.1 LIMITATIONS

As explained in Chapter 5, a survey of flood awareness and attitudes was conducted in the Woronora Valley as part of a state-wide study commissioned by the SES. A total of 80 people were interviewed in the Woronora Valley which is comparable to the 100 who were interviewed as part of this study.

The results of the pre-strategy survey were only made available to Molino Stewart after the survey questions for this study had been developed by Molino Stewart in consultation with the SES and the interviews conducted. Only limited comparisons can be made between the pre-strategy and post-strategy studies because most of the questions were different and many of the pre-strategy questions required respondents to self evaluate their own awareness and preparedness on a scale of 1 to 10. By comparison the post strategy survey tended to ask closed or open questions which enabled a percentage of respondents providing a particular answer to be calculated.

Nevertheless some quantitative and qualitative comparisons can be made between the two surveys.

8.2 COMPARISONS

Ninety one per cent of respondents now believe they live in a flood prone area and 45 per cent believe their house is at risk of being flooded. This was as high as 100% and 56% respectively in the green category and 96% and 52% in the blue category, both of which are below the 1 in 20 year (5%) flood level.

This compares with an average rating of 6.4 when respondents were asked in the pre-strategy survey how aware they were of the risk of a serious flood in the area. Quantitative comparisons are difficult because the pre-strategy required a subjective self evaluation without defining a serious flood or risk.

The pre strategy survey asked how likely it would be that they would *be able* to evacuate immediately if instructed by the SES. The post strategy survey asked an open question “What would you do in the case of a flood”. While direct comparisons cannot be made between these two questions it is interesting to note that six per cent of respondents said it would be very or extremely unlikely that they would be able to evacuate which is the same percentage who said they would do nothing in the case of a flood. Similar

three per cent were not sure if they would be able to evacuate and four per cent said they would not know what to do.

Another interesting comparison is that, unprompted, 56 per cent of respondents in the post survey said they would self evacuate while in the pre survey 44 per cent of respondents said, when prompted, that they would need help evacuating.

In the pre survey 33 per cent of respondents said they had an emergency or disaster plan for their house and ten per cent said they had an emergency/disaster kit. The post survey was more specific in that it asked respondents what specific actions they would take in a flood and whether they had an emergency kit for floods. Fifty six per cent of respondents said they would self evacuate and 44 per cent said they would raise the furniture. This suggests that now more than 33 per cent of respondents have a flood emergency plan. Five per cent of respondents said they have a flood emergency kit. It should also be noted that 63 per cent now believe that being prepared for a flood can reduce property losses and 80 per cent believe it can improve personal safety.

The pre survey suggested that unprompted 75 per cent of respondents expected the Bush Fire Brigade to help in a flood, 49 per cent the SES and 29 per cent the Police. When prompted 95 per cent expected the SES to help. This compares to 41 per cent nominating the SES as the source of additional flood information in the post survey followed by Sutherland Council 37 per cent and Bush Fire Brigade 12 per cent.

Twenty per cent of pre survey respondents said they had received information about flooding and 81 per cent of them said it related to flood risks. Twenty five per cent said they had received information about the flood warning system and 13 per cent information about evacuation routes. Given that the preparedness strategy did not start until after the pre survey was conducted, there were only three possible sources of information about flooding: Section 149 certificates which would have indicated whether the property had planning restrictions because of flooding, consultations in relation to the flood study and floodplain management plan and any local newspaper articles. Given the level of detail which people have nominated it is expected that the information they received came for the flood study and plan consultations.

This compares to 95 per cent who now say they have received information about flooding when responding in the post survey.

9 COMPARISON WITH FLOOD EDUCATION IN OTHER COMMUNITIES

Pfister and Rutledge (2002a) stated that it is now clear that to minimise flood damages people need clear, convincing warning messages. However, they also mentioned that these messages only work effectively when the community is prepared before flooding and already understands the nature of the flood threat. This is a common statement among people involved in flood management. In fact, the need for flood awareness education has been advocated by a wide variety of emergency services, government agencies and researchers both in Australia and overseas. It is interesting to assess whether this link between awareness, preparedness and damage minimisation has been demonstrated.

Research into the evaluation of flood preparedness in New South Wales, other States and Territories and overseas was undertaken. Internet searches of sites of agencies responsible for floodplain management and emergency response in Australia were conducted and relevant articles and conference proceedings were also consulted. The reference list is provided in Section 12. People involved in flood preparedness programs/disaster communication/risk perception were contacted either by phone or email. The list of people contacted is provided in Section 12. These people were asked whether they were aware of any pre- or post- flood preparedness evaluation studies in their localities or elsewhere and whether they could recommend any contacts.

The research outcomes are detailed below. It appears that little evaluation has been done in terms of the effectiveness of education activities. The results are compared to the Woronora Flood Preparedness Strategy survey results in Section 10.

9.1 AUSTRALIA

9.1.1 Bureau of Transport and Regional Economics (BTRE)

A series of consultations with key players in flood mitigation in each State and Territory, representatives from the Natural Disaster Management Section of the Department of Transport and Regional Services and Emergency Management Australia were held in 2001. During these sessions many agreed that there had been very few major flood events in the last 10 to 50 years and that, as a result, community awareness and knowledge of floods was generally poor.

Australian governments allocate resources to reduce the impact of floods through various forms of mitigation. However, little work has been done to assess the effectiveness of mitigation that has been tested by subsequent

flooding. The BTRE thus decided to research the benefits of flood mitigation in Australia (BTRE, 2002).

According to the BTRE, flood mitigation covers three categories: flood modification, property modification and response modification. Response modification consists of modifying "human behaviour through activities such as awareness campaigns, education, warning systems and planning" (BTRE, 2002). The BTRE recognises that people's reactions to floods and warnings have a significant effect on the losses. A specific study on the effectiveness of flood preparedness campaigns was not undertaken as part of the "Benefits of Flood Mitigation in Australia" study. The project leader advised that in fact there is not much available on either pre- or post-flood evaluation of flood preparedness education (Sharyn Kierce, personal communication).

9.1.2 New South Wales

a) State Emergency Services (SES)

The SES has been attempting to raise the level of flood awareness and ensure communities are prepared for flooding for years. Flood ready communities are defined as "communities whose people are capable of responding appropriately and in a timely fashion to warnings". The goal of the SES through community education is not only raising awareness but also "achievement of commitment to actions appropriate to the nature and severity of a coming flood" (Pfister and Rutledge, 2002a).

Before the nineties, public education for natural weather disasters, including flooding, had been limited to a small number of generic publications produced by the Natural Disasters Organisation and these publications were not widely distributed. Since then, the SES has worked to make these publications more readily available and more locality specific (Keys and Campbell, 1991). For example, FloodSafe guides have been customised to small areas within various local communities (Pfister and Rutledge, 2002b). The guides are foldout A3 or A4 full colour pamphlets customised to parts of council areas or flood liable towns. More than 40 of these guides have been produced. The SES has also conducted community education campaigns with local government and other stakeholder organisations.

The importance of "teachable moments" has also been recognised. Teachable moments are times at which the community's awareness of an issue is at a maximum and their receptiveness is high. Community education campaigns were organised to coincide with anniversaries of severe floods: the 40-year anniversary of the Hunter Valley flood of 1955, the 50-year anniversary of the 1949 Macleay River flood and the ten-year anniversary of the 1991 Inverell flood. In 2002, flood awareness weeks were held to commemorate the first anniversary of the 2001 floods in the Tweed Shire in Lismore, Grafton, Maclean and other Clarence River towns and in the Bellinger and Kempsey areas (Pfister and Rutledge, 2002b). Flood educational work was recently carried out in the valleys of the Shoalhaven

River and the Camden Haven River. Other recent SES education activities have included: public meetings, radio interviews, newspaper articles, flood videos, displays of flood photographs and guided tours. In several councils, markers have been put on power poles to denote the levels reached in past events and the estimated levels of the 1% and other floods.

Pfister and Rutledge (2002b) mentioned that the SES had not yet been able to assess the effectiveness of the guides and other public education initiatives due to financial and time constraints. Since then the SES commissioned a survey of Lismore residents in 2003 (see section on Lismore).

b) Tamworth

Floods have been a regular event in Tamworth. The Tamworth case study, which was part of the greater "Benefits of Flood Mitigation in Australia" study (BTRE, 2002), showed that the preparedness activities of businesses in the lead-up to the November 2000 floods saved more than 80 per cent of potential damage.

c) Kempsey

Kempsey is a small rural city of 10,000 residents located upon the Macleay River. Kempsey has suffered 21 major floods since 1838. The largest recorded in 1949 resulted in £2.5 Million damage at the time and six deaths (Dutton, 2000).

In 1999 the SES and Kempsey Shire embarked on an awareness campaign involving production of a video and newspaper supplement, public meetings, displays of photographs and memorabilia, distribution of flood safety brochures and other events. A flood icon was erected in Clyde Street Mall to allow a physical representation of the peak flood levels and some ongoing reminder of the 50th anniversary of the 1949 flood. The icon is a carved timber pole marked with coloured rings at the various historic and predicted flood levels and includes an explanatory plaque. The top of the pole (six metres above the pavement) shows the Probable Maximum Flood (PMF) at Kempsey (Dutton, 2000).

Post event surveys suggested that the awareness week had increased awareness in a community which had little flood awareness beforehand (Dutton, 2000). The Kempsey story is a good example of a flood awareness strategy put to the test by the floods of March 2001. The most recent flood prior to 2001 occurred in 1963. As a result, flood experience and preparedness in 2001 were low. Survey results indicated that 25 per cent of business managers had previously experienced flooding (Risk Frontiers – NHRC, 2002).

A post flood survey of 88 businesses damaged by the flood found that about 84 per cent of people took action to minimise flood damages incurred at their property. Actions included raising or moving building contents, stock,

personal belongings or moving motor vehicles to higher ground (Gissing, 2002).

However there was not an overwhelming response to the flood warnings and particularly to the call to evacuate. Reasons given for poor response to warnings included confusion about warnings, inadequate warning time and little flood experience or preparedness. Businesses expressed unhappiness about the warnings with 85 per cent indicating dissatisfaction. Many businesses were dissatisfied about not personally receiving warnings from emergency services. In addition, confusion occurred as the result of conflicting and inconsistent reports often through informal channels and being unable to relate gauge heights to their particular business (Gissing, 2003).

d) Inverell

Inverell's business district comprises approximately 250 commercial properties, all of which are flood prone. The district was last flooded in 1991. The damages were estimated at $15 million. After the flood, local authorities realised that damages could have been reduced if businesses had been better prepared. In response, a flood action plan is now required with any development application on flood prone land. A plan should contain a pre-defined course of action to reduce flood risk for a specific business. The plan should include details such as:

- Contact details of emergency services;
- List of emergency equipment and location; and
- Preparedness, response and recovery actions.

Sixty eight face to face interviews with business managers were conducted in July 2002. It was discovered that the content of the plans was mainly focused upon response procedures, largely neglecting preparedness and recovery. Response procedures included sandbagging, sealing doors, lifting or removal of contents, listening to the radio, installing flood shutters etc. An analysis of 27 documented plans indicated that 24 contained response procedures, only seven contained recovery procedures and no plans listed preparedness procedures. Survey results indicate that business flood action plans increased the flood awareness of businesses and enhanced their knowledge of appropriate actions (Gissing, 2003).

e) Grafton

In 2001, the Clarence Valley experienced two major floods within a month of each other. The SES surveyed Grafton residents after the March 2001 Clarence River flood. These surveys were done to find out why fewer than ten per cent of the population left the city during the nine hours that the evacuation operation was in effect. Two hundred and five people who were in Grafton during the 2001 flood were surveyed over the phone. A further twelve people participated in more in-depth face-to-face interviews (Pfister

and Rutledge, 2002a). Analysis of what went wrong with flood response and evacuation found problems with public awareness, namely that:

- Floods don't happen every year and people forgot what to do;
- The level of knowledge in the community has changed as new people had moved to town and old people passed on;
- People were simply too busy to worry about something which "might happen" and most of them left it until it was too late to react if the levee had overtopped; and
- People were reluctant to evacuate no matter what (Dinham, 2002).

Only 13 per cent of the survey respondents who lived in flood-prone areas had evacuated to a safe area. Ninety seven per cent of the respondents said they were aware that an evacuation warning had been issued. Most people did not believe that they were really at risk from the flood and had a low level of awareness of the flood threat. Most people had never experienced any direct effects of flooding apart from occasional disruptions to travel. Most people surveyed had never considered the possibility of having to evacuate. In fact the post-flood research found that the residents were not ready to respond and for most had no acceptance of the need to evacuate nor understanding of the evacuation strategy (Pfister and Rutledge, 2002a).

f) Lismore

Lismore City Council has made a special effort to communicate the severity of flood risk to individual houses and businesses. Fliers containing the depths of flooding that can be expected at a particular property in the event of a 1% event and 5% event have been sent to businesses and households annually for the past three years (Druery et al 2002; Lismore City Council, 2002).

Lismore Council's 'Flood Awareness Week' won the Australian Safer Communities Awards in 2002. The event involved activities from many groups including Council, the SES, Bureau of Meteorology, Kirklands coaches, Country Energy, Lismore Unlimited, and amateur radio operators.

The SES conducted a survey in Lismore to assess the preparedness and information needs of Lismore residents in emergencies. Questionnaires were mailed to residents. Seventy one per cent of respondents indicated that they were either 'prepared', 'quite prepared' or 'very prepared' for a flood. The surveys also found that the people who had received the SES information were more likely to have items of use in an emergency and believed they were more prepared for a flood (Scott and Vitartas, 2003).

g) Maitland

In 1995 events were held in Maitland to commemorate the fortieth anniversary of the 1955 floods. The education events were organised by the SES, Hunter Catchment Management Trust, Maitland City Council, the NSW Public Works, the Maitland Mercury and Singleton Argus (Keys, 199x).

Events included newspaper articles highlighting personal accounts of the disastrous 1955 floods, displays of memorabilia, street parades in Singleton and Maitland, street theatre with a flood theme and a tour of the flood mitigation system. Hundreds of residents participated in the tours and substantial interest was generated. However it remains unknown as to how much has been remembered or accepted, as the SES did not have the resources needed to carry out evaluation surveys (Opper, 2003).

h) Fairfield City

A flood icon was installed in Fairfield to raise flood awareness amongst residents. Fairfield City Council has not carried out any post implementation surveys for the Flood Icon. The only measure of awareness is anecdotal, when residents and other people ring to comment or enquire about the icon or recognise Council employees in the park and ask what the icon is about (Steve Frost, personal communication.).

9.1.3 Other States and Territories

a) Gold Coast

Gold Coast City Council evaluated the levels of community flood awareness as part of the Nerang River Flood Mitigation Community Consultation Project. D'Arcy (2003) states that the lack of a community flood memory was confirmed in the results of a flood awareness survey undertaken by AC Nielsen in May-June 2001. The results of the surveys showed that:

- Ten per cent of residents have experienced flooding of their dwellings and three per cent have been evacuated (flood experience);
- Two thirds of respondents believed that it was unlikely that their area would flood (perceptions of flood risk);
- Over half of residents did not state any action they could take if threatened by a major flood (flood preparedness);
- Twenty per cent believed they held flood insurance;
- Half of respondents were aware that Council undertakes flood studies, has mitigation measures in place and applies strict planning codes in assessing development proposals;

- There was limited awareness of: flood searches for individual properties, Counter Disaster and Emergency Response Planning, Council's Flood Alert System and preparedness brochures; and

- The preferred methods for delivering information about flooding and flood issues is via rate notices and newsletter/letterbox drops (D'Arcy, 2003).

The above results could be explained by several facts:

- The most recent major flood occurred in 1974;

- Gold Coast City Council experiences high population growth and mobility rate; and

- Council provides information on an individual property basis upon application only and not in the form of publicly available flood maps.

The AC Nielsen survey was undertaken as a means of providing a benchmark with which to compare the effectiveness of a range of awareness strategies which will be implemented throughout the project.

As a result of the AC Nielsen survey, Gold Coast City Council decided to:

- Reduce flood search fees;

- Provide flood information to the community in the form of brochures, newspapers lift-outs, video promoting Council's approach and achievements, displays at public events and a website;

- Approach community groups for presentations; and

- Add individuals with flood enquiries to the Register of Interest.

The key messages of the flood communication activities will be: "Floods Do Happen", "Floods Affect Everyone" and "Access your Flood Risk".

As of October 2003, Gold Coast City Council had already:

- Undertaken presentations to local community groups;

- Published a 2-page newspaper lift-out;

- Published a range of information on the Gold Coast City Council website http://www.goldcoastcity.com.au/floods ; and

- Distributed a brochure outlining proposed flood mitigation options.

Gold Coast City Council will be undertaking a formal evaluation of those measures as well as the outcomes of the project in 2004.

b) Charleville

Heatherwick (1990) found that communities did not believe that a flood would exceed the previous flood of record.

c) Maribyrnong City Council

Maribyrnong experienced a flood in September 1993. AMR:Quantum surveyed the residents post flood and found that:

- Overall the Flood Plan effectively gave residents advance warning to the danger of flooding;
- Sixty two per cent of residents claimed to have received a flood warning at some time;
- The information provided by the SES was considered to be clear by 83 per cent of respondents;
- Fifty per cent of respondents purported to have been able to take action to reduce flood damage while thirty five per cent claimed that they did not need to take any action;
- Thirty two per cent of respondents actually evacuated their houses; and
- Ninety per cent of residents considered the possibility of another flood within the next ten years as likely.

Maribyrnong City Council is coordinating a new Flood Preparedness Plan for the Maribyrnong River in conjunction with the VICSES and Melbourne Water. Maribyrnong is still in the product development stage with regard to drafting a Council flood risk management plan. Community consultation to develop the plan was extensive and was undertaken in consultation with the State Government through the Office of the Emergency Services Commissioner (OESC). At a later stage, it will develop a community information pack which will contain a personal flood chart for each affected property. This is considered to be an innovative step (Theo Pykoulas, personal communication).

9.2 OVERSEAS

9.2.1 National Flood Warning Centre, Environment Agency (United Kingdom)

The Environmental Agency views itself as a "one stop shop" for the environment. The Agency has the general supervisory duty on all matters relating to flood defence and is the lead organisation for warning the public about flooding across England and Wales (Haggett, 2002).

The National Flood Warning Centre enables the Environment Agency to improve the quality of flood warning service and is in charge of the national flood education strategy. A leading marketing communications consultancy was appointed to work with the Agency to design and deliver the program (Cook, 2002). The education strategy comprises:

- A national flood warning public communications database containing nearly two million addresses of homes and businesses in the floodplain;
- A National 24 hour telephone information service FLOODLINE;
- An annual public awareness campaign;
- Educational initiatives;
- Targeted mailing to those in risk areas;
- Leaflets and directories;
- Publicity material; and
- Working in partnership with local communities (Haggett, 2002).

The public awareness campaign aims to raise awareness of the risks of flooding and how to prepare for floods. It is a strategic campaign over a ten-year period adapted from the social marketing approach often used in health promotion (Haggett, 2002). The key themes for the campaign were (Cook, 2002):

- "Flooding is serious" (1999);
- "Flooding relates to me" (2000);
- "There are things I can do" (2001); and
- "Be prepared for flooding" (2002).

September 1999 marked the first annual national campaign to raise awareness with "Flood Action Week" at the centre of the campaign. The campaign consisted of television and radio advertisements and direct mail sent to 843,000 addresses in 2000 and about half that in 2001. The mail outs included a red card holding vital flood information whilst the TV and radio campaigns were targeted at C1, C2 and D socio-economic groups (C1 Lower Middle Class; C2 Skilled Working Class; D Other Working Class). The public education campaign is credited for raising awareness of flood risk from 48 per cent to 79 per cent over the last five years (BRMB, 2001a).

Since 1997 the Environment Agency Social Research Team have carried out 'At risk', an annual market survey research of the adult population to assess public awareness of flooding and examine whether the Agency has managed to effectively engage the public. The surveys draw a sample of 1,200 from the 1.8 million properties listed on the Flood Risk Address database. The surveys look at recall of advertising, key messages, awareness of preparations for flooding etc.

Notable findings of these surveys were as follows:

- Ninety five per cent of respondents thought that flooding was a serious issue;
- Approximately 60 per cent of respondents still remained unaware that they were at risk of flooding. This fell to 48 per cent in serviced areas. This also varied among regions with up to 60 per cent of respondents aware in the southern region;
- Homeowners, members of higher socio-economic groups and long term floodplain residents had marginally greater awareness of the dangers;
- Low numbers remembered the advertisements even after prompting. In 2001 only 34 per cent of respondents remembered seeing the advertisements. The majority of those who had agreed that the ads made them realise that flooding is serious;
- 102 members of the survey group had been sent the red card in 2001. Only 39 per cent recognised the card, even after prompting. This was regarded as a poor level of performance;
- Only 26 per cent of serviced respondents were aware of the new warning codes in 2001;
- In 2001, 83 per cent could think of preparations or precautions they could take compared with only 57 per cent the previous year;
- The proportion of respondents that had actively proceeded to take precautions remained static at eight per cent (BRMB, 2001).

Another finding of the research was that the colour coded system used by the Environment Agency was generally not understood. Byrne and Horner (1998) had also stated that "colour coded warnings appear to be misunderstood by nearly all who receive them…The interests of the public are not well served by warnings given on the colour coded basis".

9.2.2 Boulder Creek Local Flood Warning System

The Urban Drainage and Flood Control District and the Boulder City/County Office of Emergency Management funded the study 'An Evaluation of the Boulder Creek Local Flood Warning System'. A comprehensive survey was developed for two populations living in the Boulder Creek 100-year floodplain. Population A included year round, non-student residents and population B included residents of University of Colorado Student Family Housing. The survey was the first of its type for Boulder Creek and also the first study in Colorado since the Waterstone report in 1977 following the Big Thompson flood (University of Colorado Natural Hazards website, 2003).

Residents were surveyed about their knowledge of the 100-year floodplain, flood risk awareness, preferred warning methods, perceived response, impacts of false alarms, flood and weather information and to obtain general demographic information. Population A responded best but only 30 per cent of the respondents answered all flood knowledge questions correctly and 33 per cent were not aware that they lived in the 100-year floodplain. Population B results appeared to reflect the reduced local awareness of non-resident and international student families.

Generally, responses from both groups indicated that:

- Half of the respondents understood the term "100-year flood";
- Many have seen the "Climb to Safety" signs;
- A few had previously experienced a flash flood;
- The preferred flash flood warning mechanisms were sirens, direct phone calls, television, knocking on doors and the radio; and
- Most participants said they would prefer to receive more warnings than fewer if some were of these were false alarms.

The Natural Hazards Centre concluded that study findings indicate that Boulder Creek residents are more aware of flood hazards than 25 years ago but that public awareness is still lacking among those at risk.

9.2.3 The Netherlands

In Holland the safety levels are so high (1/1250 years) that practically nobody is prepared for floods. The return period of floods is extremely low, and that results in people hardly taking preventive measures themselves anymore (Erik Ruijgh, personal communication).

10 FINDINGS

10.1 INTRODUCTION

This chapter discusses the effectiveness of the elements of the Woronora Flood Preparedness Strategy in relation to each of the strategy evaluation criteria introduced in Section 4 and other lessons learned from flood preparedness communication in the Woronora Valley. It then provides an overall evaluation of each element and the strategy as a whole.

Before applying these lessons to other flood prone communities some important contextual information must be stressed.

The survey results supported the ABS 2001 census data information outlined in Section 2.1.4 of the report for the study area. The average household size was 3.3 people and all the respondents answered that English was the main language spoken at home. The pre strategy survey indicated that 36 of those respondents had a tertiary education and a further 37 per cent had a full secondary education. This suggests that there would be minimal language and communication barriers when communicating in written English with the Woronora Community.

Ninety five per cent of houses were owner occupied. This could imply a high financial and emotional tie to their dwelling. From the comments gleaned during the surveys and the average length of time spent in the area, it seems highly likely that in addition to the emotional link to their house, a high proportion of respondents could also be emotionally attached to the Woronora Valley. These factors may be important in influencing residents' willingness to be prepared for and act up flood warnings.

Only a small percentage of people have experienced a significant flood despite having lived in the area for a long time. The last flood which entered homes was in 1988 and a few dozen homes would have been flooded. Seventy three per cent of residents who were living in the area at that time recollect that flood. The 1969 flood would have flooded about 250 homes had they been built at the time. Only seven per cent of the respondents were living in their current homes in 1969.

The sides of the Woronora Valley are steep and heavily timbered. The bushland comes right into the yards of many of the homes in the Valley. This combined with the severe drought at the time of survey and significant fires in the region during the previous decade may explain why 52 per cent nominated bushfires fires as the major threat to their house.

10.2 INFORMATION DELIVERED TO RESIDENTS

Section 6 of this report explains how Sutherland Shire Council and the SES jointly delivered flood information to the residents. Various media were used to deliver the following messages:

- They live in a flood prone area;
- There are different categories of flooding;
- There is a plan to help them; and
- The plan includes actions by them.

10.2.1 Signs

The flood signs carry each of the above messages although the message is brief and sometimes it is implied. For example "The Woronora Floods Are You Ready?" implies rather than states that the plan requires actions by the residents. The most explicit message conveyed by the signs is that the area is flood prone.

The signs deliver their messages on a daily basis to at least 75% of flood affected residents but the placement of the sign in relation to travel routes is critical to their effectiveness in delivering messages.

For example the Woronora Bridge sign delivers the messages to 100% of Woronora residents because of its prominent and strategic location. The Lakeside Reserve sign on the other hand was moved from its prominent location and now is only seen by a small proportion of Bonnet Bay residents. Neither sign is likely to be seen by flood affected Como, Jannali or Shackles Estate residents.

A number of residents had issues with the signs, mainly concerns about the sign lowering property values or being unnecessarily alarming.

10.2.2 Totems

The totems on street signs do not deliver any explicit message but are there mainly for reference during a flood. Only 17 out of 50 recommended locations were marked and therefore these would not be visible to the majority of residents during a flood however they have been located in the most at the locations with greatest risk.

10.2.3 Household Kits

The household kits provided the greatest amount of detail with regard to each of the messages. However over the five years of the program they have only been delivered to 66 per cent of homes. This ranges from 80 per cent in Woronora to 18 per cent in Bonnet Bay and none in Jannali or Como. There have been two factors which have contributed to the low delivery rate: the time available to the SES volunteers to door knock; and the high proportion of homes which are unoccupied when visited. The SES has prioritised visitation to the homes most at risk.

10.2.4 Flood Labels

Delivery of the flood labels not only required the SES to be available to deliver them and a resident to be home but the resident also had to give the SES explicit permission to install the label. Although 90 per cent of residents accepted the label, the low delivery rate of household kits mentioned above means that only about 60 per cent of flood affected homes have the labels.

10.2.5 Public Meeting

The public meeting not only provided significant detail regarding the four messages but also allowed residents to ask questions and get clarification or more specific information. However, even though a letter box drop to all residents was used to ensure everyone knew it was on, only 24 people attended. Given that some households had two representatives at the meeting, this represents delivery to less that four per cent of the flood affected properties.

10.2.6 Media Releases

There were two local paper media releases and one Council newsletter article in relation to the project in 1999. These would have been delivered to virtually all residents and contained all four messages .

10.2.7 Second Brochure

The second brochure contained similar information to the first but instead of being delivered in person it was post or hand delivered to the mail box. In this way the four detailed messages were delivered to all households.

10.3 INFORMATION RECEIVED BY RESIDENTS

While there was significant variation in the effectiveness of different media to deliver the key messages to residents, a high delivery rate did not necessarily mean that a high proportion of residents received the information and vice versa.

For example, while less than four per cent of households were represented at the public meeting, it is almost certain that 100 per cent of those in attendance received the messages. Conversely, while close to 100 per cent of households had the media releases and newsletter delivered, a significantly smaller number would have read the articles and actually received the messages.

The post survey questions provide some indication of how effective the various means of communication were and the pre survey provides something of a benchmark to gauge this effectiveness against.

It was noted that in the pre survey 20 per cent of respondents said they had received information about flooding prior to the Preparedness Strategy being implemented. This could only have come from either work done as part of the Flood Study or Floodplain Management Plan or from Section 149 certificates. Given that people suggested they had received detailed information about flood risks and evacuation it was more likely to have come from the consultation in relation to the Floodplain Management Plan. Furthermore, during the post survey three per cent of people mentioned the Floodplain Management Plan unprompted as a source of information but none mentioned 149 certificates. The 20 per cent can therefore be used as a benchmark of flood awareness before the implementation of the Flood Preparedness Strategy.

It should be noted that the pre strategy survey was undertaken about four years after the Floodplain Management Strategy consultations had commenced which is a similar elapsed time between the Preparedness Strategy implementation and the post strategy survey.

The survey undertaken as part of this study suggests that now 95 per cent of residents recall having received information about flooding in the Woronora Valley. This is a significant increase and suggests that the strategy has been effective in people receiving flood information. There is little research elsewhere which can be used for comparison although it is noted that a UK study (BRMB, 2001) found that after two years of a nation wide social marketing campaign only 34 per cent recalled seeing the flood awareness advertisements even after prompting. Even where specific information had been sent to high risk residents only 39 per cent recalled having received the information after prompting. This suggests that the Woronora strategy has been very effective to the extent of people receiving the flood preparedness messages. An analysis of the effectiveness of each element in the Woronora strategy follows.

10.3.1 Flood Signs

Unprompted 64 per cent said they had seen flood signs (this included totems). This is slightly lower than the 75 per cent who are exposed to the signs. However, when asked if they had seen signs, ninety per cent said that they had and 90 per cent of those who had, said they had seen the one near Woronora Bridge, 10 per cent the one at Bonnet Bay and 19 per cent mentioned the totems.

These results suggest that the flood sign near Woronora Bridge has been highly effective in not only delivering the flood awareness messages but also ensuring that they are received.

The flood totems, while not meant as a principle means of communication on a day to day basis, have clearly had some effect.

It is clear that the Bonnet Bay sign in Lakewood City Reserve has not been very effective even taking into account that it has only one third the audience of the Woronora sign. Given that its content is the same as that of the Woronora Bridge sign, it seems its location is the problem.

10.3.2 Household Kits and Brochures

Fifty one per cent nominated brochures and four per cent nominated fridge magnets unprompted. These were contained in the household kits delivered by the SES and also in the later mail out by Sutherland Council. Subsequent prompted questions revealed that 75 per cent of those who had received a kit from the SES recalled receiving it. This compares to 40 per cent who recalled receiving the second brochure even though that had generally been delivered more recently.

When the proportion to whom the household kit was delivered is multiplied by the proportion who recall receiving it then it has effectively been received by about 50 per cent of the residents.

10.3.3 Flood Labels

While only eight per cent of residents mentioned meter box labels unprompted when asked what flood information they had received, 37 per cent knew they had a meter box label when asked. When only those who had received a household kit are considered, then 52 per cent knew that they had a meter box label. If the SES estimate is correct that only 10 per cent of those who were offered the label accepted one, and that percentage applies to these respondents, then 58 per cent of those people with a label in their meter box were aware that they had one.

This high awareness rate may be attributed to one or more of the following factors:

- They were personally delivered by the SES;
- The resident had to give explicit approval for the label to be installed; and
- The labels are seen every time the meter box is opened which is something most residents would do from time to time.

10.3.4 Public Meeting and Media Releases

Four per cent of respondents recalled the public meeting unprompted which is similar to the proportion who attended which suggests that a public meeting makes a significant impression on those who attend.

Only one per cent of respondents made reference to information in newspapers but it could be interpreted as the ad for the public meeting rather than one of the media releases.

10.4 INFORMATION UNDERSTOOD AND RETAINED

The preceding section showed that only a proportion of those who had the flood messages delivered to them actually received it. The proportion who understood and has retained the information is a smaller proportion again. Some people have retained the information mentally and were able to recall it either unprompted or prompted during the surveys. Others have retained the information physically (eg the magnet is on the fridge or they kept the information brochures). This section looks at those retention rates.

10.4.1 Flood Signs

While 90 per cent of respondents recalled seeing the signs, 27 per cent of those who saw the signs did not recall the messages. This means that only 66 per cent of the population is understanding and retaining messages from the signs.

The message which is understood by most people is that the Woronora Floods. Twenty per cent of all respondents nominated this message specifically or something similar, while 44 per cent made some mention of historical floods which are noted on the sign. Many nominated both so that overall only 56 per cent of all respondents nominated explicitly or implicitly that the Woronora Floods. The percentage is probably a little higher than this because some respondents made comments that they did not read it because it annoyed them or that flooding is not an issue. In which case they

have understood the sign's message and retained it but are not willing to accept it.

Eleven per cent of the population remember unprompted that there are different coloured flood categories, seven per cent that they need to be prepared and six per cent that they need to tune into the local radio station for flood warnings.

The signs have therefore been significantly more effective at raising community awareness than they have in increasing community preparedness. It would seem that from the signs alone, few have retained the messages about the different flood categories, the existence of a plan or the need for action on their part.

10.4.2 Flood Labels

Despite only eleven per cent of respondents remembering unprompted that the flood signs indicated different colour codes for flooding, 62 per cent of all respondents said they knew there were colour codes for flooding when asked. This means that some elements of the strategy are effective in residents retaining the message that there are colour codes for flooding but 38 per cent have still not understood or retained the colour code message.

The flood labels were the only information which gave specific information on the colour code for each house. The survey revealed that 41 per cent of the whole population know there are colour codes but do not know the colour code of their house. While the remaining 21 per cent know the colour code for their house.

If we assume that everyone who knows they have a flood label are included in those who know there are colour codes but do not know their specific colour code, then a total of 37 per cent of the population either know their colour code or know where to get immediate access to it. In fact, if we only consider those who have received a meter box sticker then almost 60 per cent of them know or know where to find the colour code for their house.

Only nine respondents were able to correctly articulate what the colour codes meant. This further suggests that there remains a low retention of the message "there is a plan to help them". This low comprehension rate suggests that any warning messages which use the colour codes will need to include a brief explanation of what the colour means. It is noted that the flood labels themselves include an explanation which could be read when people go to their meter box to check their colour code.

10.4.3 Household Kits

The EMA flood booklet and the Woronora Flood brochure were the two kit elements which made the biggest impact with about 32 per cent of the population who received the kit remembering both of these elements. About 24 per cent of those who received the kit said they have kept both documents and 10 per cent have kept the fridge magnet. This means that 17 per cent of the total population has received and retained the most detailed flood preparedness messages via these kits.

10.4.4 Second Brochure

Seventy five per cent of those who recalled that they had received a second brochure said that they had read it and 50 per cent of them have kept it. This means that 30 per cent of the population remember reading the second brochure and 20 per cent have kept it which is a similar proportion to those who kept the first brochure and booklet.

When the two brochures and the EMA booklet are considered, then 36 per cent of all respondents say they have kept one or more of these documents.

10.4.5 Combined Media

While it has been possible from some of the survey questions to determine whether specific information has been retained and understood from specific media, some of the messages are delivered by a combination of media and such a distinction is not possible.

The overall strategy has been responsible for the following messages being understood and retained by the following proportions of the population.

a) They live in a flood prone area

Forty five per cent of the population understands that their house is at risk of being flooded. This varies depending on the flood risk. Only a little more than 50 per cent of those whose floor levels are below the 5% flood level (green and blue categories) believe their house can be flooded and less than 25 per cent above the 1% flood level (red category) believe they can be flooded. Through their comments respondents in the red category indicated that the whole of Woronora would need to be flooded for their house to be flooded and so they did not think it was likely.

A 5% flood would enter 246 houses in the green and blue categories. Such a flood was last experienced in 1969 when many of the current houses did not exist and few of the current residents were there. A 2% flood would affect 283 houses in the green and blue categories and also the low end of the

yellow category. A 1% flood would be needed to affect the upper end of the yellow category.

The last flood was in 1988 and would have only affected some of the houses in the green category. Only 42 per cent of those interviewed lived in their current home at that time. Of those who remembered seeing floods in the Woronora Valley, more than half believe that larger floods could occur.

b) There are different categories of flooding

Sixty two per cent have retained this message

c) There is a plan to help them

There is little direct evidence from the survey questions that anyone has retained this message. However, the fact that 37 per cent of the populations knows they have flood labels and between 20 and 25 per cent of people who have received brochures have kept them, suggests that between 20 and 37 per cent of the population have understood there is a plan to help them

d) The plan includes action by them

Sixty two per cent of the respondents believed being prepared for a flood would reduce property losses and 80 per cent that it would improve personal safety. This means that these messages have been understood and retained by the majority of the population. When these proportions are compared to the number who appear to be aware of the 'plan', it would seem that while a significant proportion of the population understand they need to take actions they don't necessarily see this as part of a planned response but rather a spontaneous one on their part. The potential ramifications of this are discussed in the next section.

10.5 RESIDENTS ARE PREPARED

Although many people understanding that being prepared for a flood would be worthwhile, this needs to translate into appropriate preparedness responses.

Sixty per cent of respondents made no reference to receiving official warnings but indicated that they would rely upon their own observations of rainfall and river heights to determine if the river was about to flood. Fifty two per cent also indicated their own observations would tell them if their home was going be flooded and a further 10 per cent were adamant that their home would not flood. Being alert to official warnings would be an appropriate preparedness action and it would appear that as many as 62 per cent of the population are not prepared in this way.

The above statistics reinforce the impression given by responses to some of the other survey questions that there may be a generally low understanding in the community that there is a plan to help them. While it is important that residents know what actions to take, they need to take them a soon as the SES warns them rather than wait until they themselves think it is appropriate to do so.

Knowing where to get further information in the event of a flood warning is another preparedness action which can be taken now. Fifty one per cent of residents correctly nominated calling the SES or tuning into the local radio station. A further 26 per cent are expecting to get such information from Sutherland Shire Council or the Rural Fire Service. This can be compared with the pre strategy survey which found 50 per cent expecting to get additional information from Sutherland Council and 11 per cent from the Rural Fire Service. While the preparedness strategy has clearly helped this aspect of preparedness there is still a significant proportion of the population who will look to organisations other than the SES for flood information. It may therefore be effective for Sutherland Shire Council and the Rural Fire Service to have their own preparedness strategies so that they can direct callers to the SES or radio in the event of a flood.

Eighty two per cent of respondents nominated at least one appropriate flood response action when asked the open question “What would you do in the event of a flood?” Fifty six per cent said they would self evacuate and 44 per cent that they would raise their furniture and possessions. While this preparedness is encouraging, if they rely upon their own observations to determine if they are going to be flooded then they may have insufficient time to do either. Eleven per cent who said they would get in their boat which may be dangerous if they wait until water is entering their property and they are swept towards the old low level Woronora Bridge. Another six per cent nominated inappropriate actions.

Only five per cent of respondents claim to have an emergency kit for floods but none of them made mention of it unprompted when asked what they would do in the event of a flood. On more detailed questioning it would appear that four per cent of respondents have a kit which is adequate.

Four per cent of people said they didn’t know what to do. Six per cent said they would do nothing. This means that around 10 per cent of respondents are likely to not take action to reduce the impact of flooding.

10.6 OVERALL EVALUATION

10.6.1 Signs

The signs have clearly been a very effective element in raising community awareness of flooding with 90 per cent of the population noticing them and two thirds understanding and retaining a flood awareness message. They have not been effective in providing detailed messages or encouraging preparedness. The effectiveness of the signs is very dependent on their location.

10.6.2 Totems

These have been a useful adjunct to the signs in raising awareness but have been significantly less noticed or understood (about 20%). The real value of these could only be effectively evaluated after an actual flood as they are meant to be used as references during an event.

10.6.3 Brochures

These are the most effective means of detailing awareness and preparedness messages but that information is not necessarily received and retained. The way in which the brochure is delivered is important with delivery to the post box being the most effective means of delivering to all households over a short period of time but hand delivery by the SES over a long period gives slightly better results overall in terms of residents recalling receiving the information. These outcomes also need to be weighed up against the delivery costs and the other benefits of hand delivery such as improved community relations, SES training and delivery of flood labels.

It would appear that about 30 per cent of those who have received brochures by any means recall having read them and about 20-25 per cent have kept them for future reference.

Despite the low percentage of households which have kept the brochures, over 80 per cent of residents know at least one appropriate flood response action which was detailed in the brochures and magnets. It is not possible with the information to know how many of these people knew to take these actions before the strategy was launched.

10.6.4 Magnets

These have only been retained by about ten per cent of the population and since they have less information than the brochures it would seem that the brochures have been a more effective communication tool.

10.6.5 Labels

Where people have accepted flood labels it would appear that 100 per cent of them remain in the meter boxes and 60 per cent of the residents either know the flood colour category of their house or know to go to the label to find out. The label contains additional information which makes it clear what the implications of flooding are for the house and where residents can get additional information. The shortcoming of the labels is that not all homes have them. This is due to only two thirds of homes having had them delivered and of these ten per cent having refused to accept a label. It is interesting to note that about 10 per cent of the population is refusing to acknowledge that the Valley floods.

The advantage the labels have over the other detailed information media such as brochures and magnets is that they remain with the house when residents move and will be noticed when new residents go to the meter box as happens from time to time.

10.6.6 Meetings

These had a poor attendance rate but a high level of interest from attendees. While the survey indicates that these have not been an effective direct communications initiative it should be remembered that these meetings are often attended by a community's influencers and it is important for those people to properly understand the messages.

10.6.7 Media Releases

These also did not figure strongly in people's recollections of flood messages but probably were effective in preventing Sutherland Council and the SES being overwhelmed with enquiries when the flood signs were erected.

10.6.8 Total Strategy

With little benchmarking, it is difficult to gauge the overall contribution that the strategy has made to flood awareness and preparedness in the Woronora Valley. However much of the following outcomes would be largely due to the strategy:

- 95 per cent of people in the Valley recall that they have received information about flooding compared to 20 per cent prior to strategy implementation;
- 90 per cent believe they live in a flood prone area. This is likely to be significantly higher than it was prior to the strategy given the limited flood experience of residents and the low level of recollection of previously receiving flood information;
- 82 per cent know at least one appropriate action they can take in response to a flood;
- 80 per cent believe being prepared for a flood increases personal safety
- 62 per cent believe being prepared for a flood decreases property losses;
- 56 per cent are prepared to self evacuate in the event of a flood;
- 51 per cent know to ring the SES or tune into the local radio station for more specific flood information. This compares to 44 per cent who previously said they would contact the SES;
- 45 per cent believe their house is at risk of being flooded;
- 37 per cent know, or know where to get specific information on, how a particular flood would affect their house because they know they have a flood label on their house as part of the strategy. This may increase to about 60 per cent if labels are delivered by the SES to all houses;
- 25 per cent of the population has kept one or more booklets or brochures distributed as part of the strategy providing them with details of how to respond in a flood;
- 4 per cent have a flood emergency kit as a result of the strategy.

There is still significant room for improvement in these achievements particularly in regard to people being aware of the flood risks to their property and having access to more detailed information on how to respond appropriately.

Ten per cent of the Woronora Valley population does not believe flooding is an issue and about 60 per cent of the population expects to rely upon is own observations of the weather and river to decide whether the river is likely to enter their home. These proportions need to be reduced significantly if people are to have sufficient time to respond appropriately to flood warning messages.

11 RECOMMENDATIONS FOR FURTHER RESEARCH

One of the shortcomings of this research project is that there was little comparable quantitative flood awareness and preparedness data available before the strategy was implemented. It is recommended that before flood preparedness strategies are designed and implemented in other locations that base line surveys be undertaken not only to assist in the design of the strategy but also to allow quantitative evaluations to be made. This is a mandatory requirement of the NSW State Government for education strategies funded through its Stormwater Trust Grants program for example.

There may also be value in undertaking a follow up survey in the Woronora Valley in five years time to see what ongoing flood preparedness work has been undertaken and how that has affected community perceptions.

If there were a flood in the Valley then it would be valuable to undertake a survey of residents to see how the elements of the strategy helped or otherwise in them responding to the flood and how the flood has changed their perceptions and attitudes.

Ideally we would suggest a program of pre and post surveys and evaluations for flood preparedness strategies be implemented across New South Wales and maybe Australia to assess the effectiveness of these campaigns. .

12 LIST OF PEOPLE CONTACTED

- Mike Rogers, former Stormwater Manager, Sutherland Shire Council (cooee14@tpg.com.au) – August 2003
- Guy Amos, Stormwater Manager, Sutherland Shire Council (Gamos@ssc.nsw.gov.au) – July/September 2003
- Joga Jayanti, Stormwater Engineer, Sutherland Shire Council (Jjayanti@ssc.nsw.gov.au) – July/September 2003
- David Monk, Local Controller, Sutherland State Emergency Service
- Chas Keys, New South Wales State Emergency Service
- Andrew Gissing, Planning and Research Officer, New South Wales State Emergency Service (andrew.gissing@ses.nsw.gov.au) – October 2003
- Philip Campbell, Community Education Officer, State Emergency Service NSW (philip.campbell@ses.nsw.gov.au) – October 2003
- Steve Frost, Fairfield City Council
- Theo Pykoulas, Maribyrnong City Council
- Geoff Crapper, Service Delivery Group, Flood Warning and Drainage Operations, Melbourne Water
- Paul Rasmussen, Section Leader, Flood Warning & Waterway Operations, Service Delivery Group, Melbourne Water – September 2003 (paul.rasmussen@melbournewater.com.au)
- Dr Bernd Rohrmann, Associate Professor, Department of Psychology, University of Melbourne (rohrmann@unimelb.edu.au) – July 2003 (involved in evaluation of community-based approaches to bushfire preparedness; improving disaster preparedness through risk communication, assessment of “fire” websites)
- Anne D’Arcy, Gold Coast City Council – October 2003
- Joanne Reilly, Social Research Officer, National Flood Warning Centre, Environment Agency, United Kingdom (joanne.reilly@environment-agency.gov.uk)
- Russell Burton (russell.burton1@btopenworld.com) – July 2003
- Jim Elliott, Superintendent Hydrology, Bureau of Meteorology (J.Elliott@bom.gov.au) – July 2003

- Roger A. Pielke, Director of the Center for Science and Technology Policy Research, University of Colorado (sits on the editorial boards of Bulletin of the American Meteorological Society, and Natural Hazards Review)

- David Munro, Environment Waikato, New Zealand

- Sharyn Kierce, Project Leader, Benefits of Flood Mitigation in Australia, Bureau of Transport & Regional Economics, Department of Transport & Regional Services (Sharyn.Kierce@dotars.gov.au) - August 2003.

- Veronica O'Brien, Regional Flood Mitigation Programme, Department of Transport & Regional Services (Veronica.O'Brien@dotars.gov.au) – August 2003

- Erik Ruijgh, Flood Management and Hydrology Division, WL | Delft Hydraulics, Delft, The Netherlands (erik.ruijgh@wldelft.nl) – October 2003

- Dr. Ivan Obrusnik, Director, Czech Hydrometeorological Institute, Prague, Czech Republic (obrusnik@chmi.cz) - October 2003

- Mark Riebau, Project Manager, Association of State Floodplain Managers, Madison, United States (mark@floods.org) - October 2003

- Lakshman Rajaratnam, Senior Engineer/ Natural Resources, Department of Infrastructure, Planning & Environment, Palmerston, NT (lakshman.rajaratnam@nt.gov.au) – August 2003.

- Neville McPherson, Drysdale, Victoria (ctman1@pipeline.com.au) - August 2003 (responsible for several community consultation reviews of Councils performance with regard to local government service delivery).

- Duncan McLuckie, Floodplain Specialist, Flood Unit, Ecosystems Branch, Department of Infrastructure, Planning and Natural Resources (dmcluckie@dlwc.nsw.gov.au) - August 2003.

13 PROJECT FUNDING SOURCES AND EXPENDITURE

The staff of Molino Stewart Pty Ltd has undertaken the majority of the work in relation to this project with some assistance from Sutherland Shire Council and State Emergency Service Staff. The professional time and disbursement costs of Molino Stewart are summarised in Table 7 including a valuation of the work at standard consulting fees. Times for government personnel were not available.

Emergency Management Australia provided a $10,000 grant towards this project. Molino Stewart covered all other costs, other than Sutherland Council and SES staff time.

Table 7: Project Value

Person	Hours	Rate	Cost
Steven Molino	51.75	$140/hr	$7,245
Neil Dufty	6.00	$125/hr	$750
Jessica Huybrechs	169.25	$80/hr	$13,540
Danielle Lawley	6.00	$80/hr	$480
Disbursements			$566.30
Subtotal	233.00		$22,581.30
GST			$2,258.13
Total Value			$24,839.43

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APPENDIX A

FIRST HOUSEHOLDER BROCHURE

THE WORONORA FLOODS

Are you ready?

The Woronora River Floods

If you lived in the Woronora Valley in 1988 you probably remember a minor flood that closed Menai Road and flooded the Caravan Park. There have been plenty of floods higher than that this century.

The biggest flood recorded on the Woronora River occurred in 1898. It was a major flood, one and a half metres higher than the 1988 flood. If it occurred today the low level Woronora Bridge would be under water. Two hundred and fifty houses would be flooded.

Bigger floods are possible and have probably occurred many times in preceding centuries. More extreme flooding could happen at any time in the future. Up to 500 houses would be flooded.

Are You Ready?

There is a help available to protect you and your property from these floods:

- A flood forecasting and warning system operated by the State Emergency Service
- A local flood response co-ordinated by the State Emergency Service
- A community flood awareness and education strategy implemented by Sutherland Shire Council
- A house raising scheme funded by Sutherland Shire Council and the New South Wales State Government for those properties at greatest risk of flooding.

This brochure is part of the awareness and education strategy. It tells you how to be prepared for a flood and what to do when a flood warning is issued.

You'll get the most benefit out of the warning system if you know what to do in advance and then do it. So please read on.

Above: River Road outside Caravan Park. Taken 1961

Know

Know your flood risks. The table on the back of this brochure will help you identify whether your area would be affected by flooding. A sticker has been placed in your electricity meter box to tell you what category of flood would enter your house.

There are four different categories of flooding on the Woronora River. Each corresponds to a range of water levels. These categories will be used in flood warning messages so you need to know what they mean for your house.

Red category - up to 500 homes would be flooded and evacuated, loss of many low-lying houses.

Yellow category - hundreds of homes flooded and evacuated, low-lying houses flooded to eaves.

Blue category - water would enter many homes, including those set back from the river. Many homes would be evacuated.

Green category - water would cut Menai Road at the western end of the Woronora Bridge and flood the caravan park and public reserves. The yards of river front properties would flood. Water would enter the lowest-lying houses and a number of homes would be evcuated.

Ready

Make sure everything is ready now so that when a flood warning is issued you will be prepared.

- Read the booklet "What to do Before, During and After a Flood" which is in your Woronora Flood Action kit.
- Prepare an emergency kit. The kit should contain:
    - This brochure and the booklet
    - A portable radio and torch with spare alkaline batteries
    - A first aid kit and manual
    - Waterproof bag for clothing and valuables
    - Strong shoes and garden gloves
- Place the Woronora Flood Action Number sticker on your telephone
- Place the Woronora Flood Action Guide magnet on your fridge
- Ring XXXX XXXX if you have not received the booklet, sticker or magnet, or if you need more information.

Set

In times of heavy rain be prepared for a flood warning message. Tune your radio to 2SSR which is 99.7 on the FM band. Flood warnings will be regularly broadcast and updated. Warnings may also be delivered by telephone or door to door but do not wait for these. You can telephone 1800 XXX XXX at any time for flood warning information.

It is in your interest to take these warnings seriously and to act on them as soon as possible. The sooner you respond the safer you and your family will be.

Listen carefully to the warning message. You need to know what category of flooding is expected. Then check how it could affect your house by using the table on the back of this brochure and the sticker in your meter box.

Make sure that your children know what to do if there is a flood. Check your emergency kit and remember your pets.

The 1998 Wollongong floods.
Photo courtesy of The Illawarra Mercury.

Go

If your house could be affected by a predicted flood you must act as soon as possible.

- Get your emergency kit out
- Pack warm clothing, essential medication, valuables, personal papers, photos and mementos in the waterproof bag. Wear waterproof clothing and boots.
- Remember ROSES:

  Raise furniture and possessions by placing on a table, bench or cupboard (electrical items on top). Also raise chemicals, fuel and hazardous substances

  Open door of fridges and freezers and other heavy airtight items so they don't float and get damaged or cause damage

  Switch off electricity and gas supplies to the building and put sandbags in the toilet bowl and over laundry and bathroom drain holes to prevent sewage back-flow

  Evacuate as soon as possible to a notified evacuation centre, taking your bag of valuables and emergency kit with you

  Stay away from your property until the State Emergency Service gives the 'all clear' to return.
- **Avoid walking, driving or boating through flood waters, especially if there is a current.**
- **Keep away from power poles or power lines. They may still be live and have electrified the water.**

After

When the flood peak subsides follow ABCDEF to keep you and your family safe.

Avoid wading through floodwater as it may be contaminated. If you must enter shallow water, wear solid shoes and check the depth with a stick

Boil all drinking water unless it has been declared safe

Clean and salvage building and contents items (see booklet for detailed advice)

Dangerous snakes and spiders may have moved into drier areas of your house, so take care

Electricity or gas must not be reconnected or appliances used until they have been safety checked (if water has entered your house)

Food that has come in contact with flood waters may be contaminated and must not be eaten.

The 1998 Wollongong floods.
Photo courtesy of The Illawarra Mercury.

APPENDIX B

DL SIZED CARD WITH MAGNET

THE WORONORA FLOODS

Are you ready?

If you have received this fridge magnet in a householder's kit it means the Woronora River could flood your house. The following advice could help save your property or life. Please

Know your flood risks. The table on the back of the brochure in your householder's kit will help you identify whether your area would be affected by flooding. A sticker has been placed in your electricity meter box to tell you what category of flood would enter your house.

There are four different categories of flooding on the Woronora River.

Red category - up to 500 homes would be flooded and evacuated, loss of many low-lying houses.

Yellow category - hundreds of homes flooded and evacuated, low-lying houses flooded to eaves.

Blue category - water would enter many homes, including those set back from the river. Many homes would be evacuated.

Green category - water would cut Menai Road at the western end of the Woronora Bridge and flood the caravan park and public reserves. The yards of river front properties would flood. Water would enter the lowest-lying houses and a number of homes would be evcuated.

Make sure everything is ready now so that when a flood warning is issued you will be prepared.

- Read the booklet "What to do Before, During and After a Flood" which is in your Woronora Flood Action kit.
- Prepare an emergency kit. The kit should contain:
  - The brochure and the booklet
  - A portable radio and torch with spare alkaline batteries
  - A first aid kit and manual
  - Waterproof bag for clothing and valuables
  - Strong shoes and garden gloves
- Place the Woronora Flood Action Number sticker on your telephone and place this magnet on your fridge.

Set

In times of heavy rain, tune your radio to 2SSR 99.7FM for flood warning updates. You can telephone 1800 XXX XXX at any time for flood warning information.

Listen carefully to the warning message. You need to know what category of flooding is expected. Then check how it could affect your house by using the table on the back of the brochure and the sticker in your meter box.

Make sure that your children know what to do if there is a flood. Check your emergency kit and remember your pets.

If your house could be affected by a predicted flood you must act as soon as possible.

- Get your emergency kit out
- Pack warm clothing, essential medication, valuables, personal papers, photos and mementos in the waterproof bag. Wear waterproof clothing and boots.
- Remember ROSES:

  Raise furniture and possessions by placing on a table, bench or cupboard (**electrical items on top**). Also raise chemicals, fuel and hazardous substances

  Open door of fridges and freezers and other heavy airtight items so they don't float and get damaged or cause damage

  Switch off electricity and gas supplies to the building and put sandbags in the toilet bowl and over laundry and bathroom drain holes to prevent sewage back-flow

  Evacuate as soon as possible to a notified evacuation centre, taking your bag of valuables and emergency kit with you

  Stay away from your property until the State Emergency Service gives the 'all clear' to return.

- **Avoid walking, driving or boating through flood waters, especially if there is a current.**
- **Keep away from power poles or power lines. They may still be live and have electrified the water.**

If you have not received a full Woronora Flood Awareness kit, call the State Emergency Service on: xxxxxxxxxxxx

For flood warning information, call 1800 xxxxxxxx, and tune your radio to 2SSR 99.7FM.

APPENDIX C

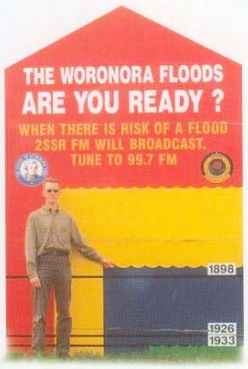
SECOND BROCHURE

SUTHERLAND SHIRE COUNCIL

THE WORONORA FLOODS...

ARE YOU READY?

Nobody likes to think that their home might be affected by a flood. However, the reality is that if you have received this brochure the Woronora River could flood your house. This may seem hard to imagine because there have not been any major floods in living memory - but records show that they have happened in the past. Major floods will happen again and could occur at any time. Floods can occur with little warning, endangering lives and property. You can take some basic steps right now to make yourself, your family and your property safer. This brochure tells you how to be prepared for a flood and what to do when a flood warning is issued. Please take a few minutes to read it.



Sign near the Woronora Bridge showing flood categories and levels of past floods

Lessons learnt from history

If you lived in the Woronora Valley in 1988, you probably remember a green category flood, which closed Menai Road and flooded the caravan park. Exactly 100 years beforehand, the biggest recorded flood in the history of the Woronora River occurred, reaching 1.5m higher than the 1988 flood. If it happened today the old Woronora Bridge would be underwater and 250 houses would be flooded. You can see the levels of these floods marked on the sign in the photo above.

The 1898 flood was only in the blue category. Bigger floods (ie yellow or red category) can occur and probably did many times in preceding centuries. One of these floods can happen at any time, flooding up to 500 houses and causing significant property loss and damage. Being prepared and responding promptly to a flood warning can improve your safety and reduce the damage to your property.

1. KNOW YOUR RISKS

Know your flood risks. The table and map on the back cover will help you identify how your house can be affected by flooding.

A sticker has been placed in your electricity meter box to tell you what category of flood would enter your house.*

There are four different categories of flooding along the Woronora River corresponding to a range of increasing water levels. These categories will be used in flood warning messages so you need to know what they mean for your house.

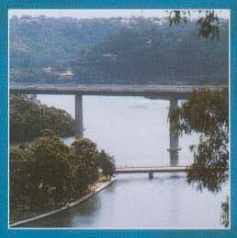
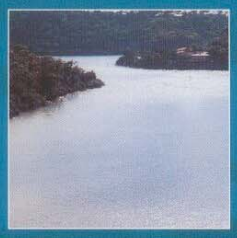
• RED CATEGORY	Up to 500 homes flooded and evacuated, loss of many low-lying houses.
• YELLOW CATEGORY	Hundreds of homes flooded and evacuated, low-lying houses flooded to eaves.
• BLUE CATEGORY	Water enters many homes, including those set back from the river. Many homes evacuated.
• GREEN CATEGORY	Water cuts Menai Road at the western end of the Woronora Bridge and floods the caravan park and public reserves. The yards of riverfront properties flood. Water enters lowest lying houses and a number of homes are evacuated.

2. READY

Make sure everything is ready now so that when a flood warning is issued you will be prepared.

- Prepare an emergency kit. The kit should contain:
  - this brochure
  - a portable radio and torch with spare batteries
  - a first aid kit and manual
  - waterproof bag for clothing and valuables
  - strong shoes and garden gloves
  - plastic bags to fill with soil or sand to seal sewer inlets.
- Place the magnet provided with this brochure on your fridge.
- Ring Sutherland Shire Council on 9710 0333 if you would like more information.

* If you do not have a sticker in your meter box, please contact the Sutherland State Emergency Service (SES) on 9548 6355 to arrange for a sticker to be put in place.


3. SET

In times of heavy rain be prepared for a flood warning message.

Tune your radio to **2SSR 99.7FM** for flood warnings and updates. You can phone the local **SES** unit on **9548 6355** at any time for flood warning information.

Listen carefully to the warning message. You need to know what category of flooding is expected. Then check how it could affect your house by using the table on the back cover of this brochure or the sticker in your meter box. Make sure that your children know what to do if there is a flood. Check your emergency kit and locate your pets.

4. GO

If your house could be affected by a predicted flood you must act as soon as possible.

- Get out your emergency kit.
- Pack warm clothing, essential medication, valuables, personal papers, photos and mementos in the waterproof bag. Wear waterproof clothing and boots.
- Remember ROSES

R	**Raise** furniture and possessions by placing on a table, bench or cupboard (electrical items on top). Also move chemicals, fuel and hazardous substances.
O	**Open** door of fridges and freezers and other heavy airtight items so they don't float and get damaged or cause damage.
S	**Switch** off electricity and gas supplies to the building and put sandbags in the toilet bowl and over laundry and bathroom drain holes to prevent sewage back-flow.
E	**Evacuate** as soon as possible to a notified evacuation centre, taking your bag of valuables, emergency kit and pets with you.
S	**Stay** away from your property until the SES gives the 'all clear' to return.

- Avoid walking, driving or boating through floodwaters, especially if there is a current.
- Keep away from power poles or power lines. They may still be live and they may have electrified the water.

5. AFTER

When the flood peak subsides follow ABCDEF to keep you and your family safe.

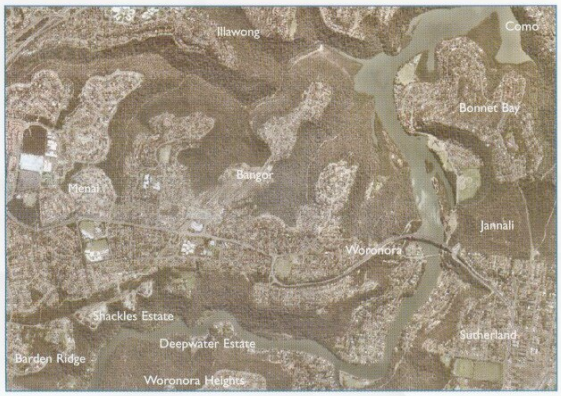
A	**Avoid** wading through floodwater as it may be contaminated. If you must enter shallow water, wear solid shoes and check the depth with a stick.
B	**Boil** all drinking water until it has been declared safe.
C	**Clean** and salvage building and contents.
D	**Dangerous** snakes and spiders may have moved into drier areas of your house, so take care.
E	**Electricity** or gas must not be reconnected or appliances used until they have been safety checked by a licensed electrician or gasfitter (if water has entered your house).
F	**Food** that has come in contact with floodwaters may be contaminated and must not be eaten.

Flood Totems

You may have noticed that a number of street sign poles in the Woronora area feature coloured bands. These bands show you the estimated depth in that specific location of the four flood categories described in this brochure.

6. HOW ARE YOU AFFECTED?

LOCATION	Shackles Estate	Deepwater Estate	Woronora- - Prince Edward Park Rd (south) - Thorp Rd	Woronora- - Prices Ct, Nundah Pl, Yanko Cl - Boomi Pl - Manila Pl	Woronora- - Liffey Pl, - Thames St, - Prince Edward Park Rd (north)	Woronora Caravan Park	Bonnet Bay- - Harrison Av - McKinley Av - Washington Dr	Bonnet Bay- - Wilson Pl - Johnson Cl - Washington Dr	Bonnet Bay Foreshores- - Arthur Pl - Lower Washington Dr	Illawong Foreshores- - Bignell St - Fowler Rd - Kinsela St - Sproule Rd - Hector St	Como Foreshores- - Central Av - Bonnet Av - Wigens Av
RED	• More than 3.6m deep • Strong currents • Houses flooded	• More than 2.8m deep • Strong currents • Houses flooded	• More than 3.0m deep • Strong currents • Houses flooded	• More than 2.7m deep • Strong currents • Houses flooded	• More than 2.0m deep • Strong currents • Houses flooded	• More than 2.0m deep • Strong currents • Vans flooded	• More than 1.4m deep • Houses flooded	• More than 1.5m deep • Houses flooded	• More than 1.5m deep • Houses flooded	• More than 1.5m deep • Houses flooded	• More than 1.5m deep • Houses flooded
YELLOW	• Up to 3.6m deep • Strong currents • Houses flooded	• Up to 2.8m deep • Strong currents • Houses flooded	• Up to 3.0m deep • Strong currents • Houses flooded	• Up to 2.7m deep • Strong currents • Houses flooded	• Up to 2.0m deep • Houses flooded	• Up to 2.0m deep • Strong currents • Vans flooded	• Up to 1.4m deep • Houses flooded	• Up to 1.5m deep • Houses flooded	• Up to 1.5m deep • Houses flooded	• Up to 1.5m deep	• Up to 1.5m deep • Houses flooded
BLUE	• Up to 2.8m deep • Strong currents	• Up to 2.0m deep • Strong currents • Houses flooded	• Up to 2.2m deep • Strong currents • Houses flooded	• Up to 1.9m deep • Houses flooded	• Up to 1.2m deep • Houses flooded	• Up to 1.2m deep • Strong currents • Vans flooded	• Up to 0.6m deep	• Up to 0.7m deep • Houses flooded	• Up to 1.0m deep • Houses flooded	• Up to 1.0m deep	• Up to 1.0m deep • Houses flooded
GREEN	• Up to 2.0m deep • Strong currents	• Up to 1.2m deep • Strong currents • Houses flooded	• Up to 1.4m deep • Strong currents • Houses flooded	• Up to 1.1m deep • Houses flooded	• Up to 0.4m deep • Houses flooded	• Up to 0.4m deep • Strong currents • Vans flooded	• Not affected	• Not affected	• Up to 0.5m deep	• Up to 0.5m deep	• Up to 0.5m deep • Houses flooded



• Depths are flood depths above ground level. To know whether floods will enter your house, refer to the sticker inside your meter box.

For further information on preparing for a flood, call Sutherland Shire Council on 9710 0333. For flood warning information call Sutherland SES on 9548 6355, and tune your radio to 2SSR 99.7FM.

SUTHERLAND SHIRE COUNCIL | SES STATE EMERGENCY SERVICE | LAND & WATER CONSERVATION

This project is an initiative of Sutherland Shire Council and has been assisted by the NSW Department of Land and Water Conservation through its Floodplain Management Program.
Published by Sutherland Shire Council, June 2002.

APPENDIX D

SURVEY FORMS

WORONORA FLOOD PREPAREDNESS PROGRAM EVALUATION
PHONE SURVEY - RESIDENTS

Use the following to introduce yourself.
"Good morning/afternoon. My name is …….. and I am helping Sutherland Shire Council improve the quality of life in your local area. Would you mind answering some questions to help us - the survey will only take a few minutes of your time."

A. INTRODUCTORY QUESTIONS

1. Are your 18 years of age or older?

If no go to question 2, if yes go to question 3

2. Is there someone 18 years or older whom I could speak with now?

If no thank you for you time, if yes go to question 3

3. Is this your place of principal residence?..... YES/NO

4. How long have you lived in this current home?.....

5. How long have you lived in the Woronora Valley?.....

6. What do you believe is the biggest threat to your property?

Give options below. Tick ☑ the option that represent the respondent's comments. Only one answer permitted

a. Theft..... ☐
b. Fires..... ☐
c. Floods..... ☐
d. Storms..... ☐

B. AWARENESS OF FLOOD ISSUES

7. Do you live in a flood prone area?..... YES/NO/DON'T KNOW

8. Is your house at risk of being flooded? .... YES/NO/DON'T KNOW

9. Have you experienced a flood in the Woronora Valley? .... YES/NO/DON'T KNOW

If yes, in what year? If no or don't know go to question 11

10. Do you believe that larger floods than you have previously experienced are possible in the Woronora Valley?
YES/NO/DON'T KNOW

11. Have you seen information about flooding in the Woronora Valley? ..... YES/NO/DON'T KNOW

If yes go to question 12 (If no or don't know go to question 13)

C. INFORMATION RECEPTION

12. What type of flood information have you seen?

Do NOT give options below. Tick ☑ the options that represent the respondent's comments or complete the "Other" option. More than one answer allowed.

a. Section 149 Certificates ☐
b. Newspaper advertising ☐
c. Public meetings ☐
d. Brochures ☐
e. Flood icons/signs ☐
f. Meter box stickers ☐
g. Other (describe) ☐

13. Have you noticed signs relating to flooding in the Woronora Valley? YES/NO

If yes go to question 14, if no go to question 16

14. Where have you noticed flood signs?

Do NOT give options below. Tick ☑ the options that represent the respondent's comments or complete the "Other" option. More than one answer allowed.

a. Woronora Bridge/Caravan Park ☐
b. Lakewood City Reserve ☐
c. Other (Describe) ☐

15. What messages do you remember from these signs?

Do NOT give options below. Tick ☑ the options that represent the respondent's comments or complete the "Other" option. More than one answer allowed.

a. The Woronora Floods ☐
b. There are four categories of flooding ☐
c. I need to be ready ☐
d. Tune my radio to local station for updates ☐
e. Other (Describe) ☐

16. Do you have a coloured flood label in your electricity meter box? YES/NO/DON'T KNOW

17. Do you know there are colour codes for flooding in the Woronora Valley? YES/NO

If yes go to question 18, if not go to question 20

18. Can you tell me the colour code for your house?

Do NOT give options below. Tick ☑ the options that represent the respondent's comments. Only one answer permitted

a. Red ☐
b. Yellow ☐
c. Blue ☐
d. Green ☐

e. Don't know ☐

If a colour is given as an answer to question 18, go to question 19. Otherwise go to question 20

19. What does the colour mean? .....

20. Can you remember having a household kit delivered to your house by SES volunteers? YES/NO

If yes go to question 21, if no go to question 23

21. What was in the kit?

Do NOT give options below. Tick ☑ the options that represent the respondent's comments or complete the "Other" option. More than one answer allowed.

a. EMA What To Do Before During and After a Flood booklet ☐
b. Woronora Flood Brochure ☐
c. Colouring sheet ☐
d. Magnet ☐
e. Can't remember ☐
f. Other (Describe) ☐

22. Which elements of the kit, if any have you kept?

Do NOT give options below. Tick ☑ the options that represent the respondent's comments or complete the "Other" option. More than one answer allowed.

a. Did not keep any of the elements of the kit ☐
b. EMA What To Do Before During and After a Flood booklet ☐
c. Woronora Flood Brochure ☐
d. Colouring sheet ☐
e. Magnet ☐

23. Did you receive a Woronora Flood brochure and fridge magnet in your letterbox last year? YES/NO/DON'T REMEMBER

If yes go to question 24, if no or don't remember go to question 27

24. Is the magnet on your fridge at the moment? YES/NO/DON'T KNOW

25. Did you read the brochure? YES/NO/DON'T REMEMBER

26. Did you keep the brochure? YES/NO/DON'T REMEMBER

D. PREPARATION

27. How would you expect to know the Woronora River was about to flood?

Do NOT give options below. Tick ☑ the options that represent the respondent's comments or complete the "Other" option. More than one answer allowed.

a. See river rising ☐
b. Hear from neighbours ☐

c. Hear on the radio ☐
d. Hear on television ☐
e. Door knock ☐
f. Emergency Services telephone ☐
g. BOM Website ☐
h. Other (describe) ☐

28. After being warned of an imminent flood, where would you expect to get additional information about the flood and what you should do?

Do NOT give options below. Tick ☑ the options that represent the respondent's comments or complete the "Other" option. More than one answer allowed.

a. Don't know ☐
b. Telephone State Emergency Services ☐
c. Telephone Sutherland Shire Council ☐
d. Telephone Bureau of Meteorology ☐
e. Internet ☐
f. Tune to local Radio station 2SSR ☐
g. Tune radio to other station ☐
h. Read flood brochure ☐
i. Local residents/neighbours ☐
j. Other (describe) ☐

29. How would you know if your house was going to be flooded?

Do NOT give options below. Tick ☑ the options that represent the respondent's comments or complete the "Other" option. More than one answer allowed.

a. Sticker in meter box ☐
b. Brochure ☐
c. Look at totem or street sign ☐
d. Radio would tell me ☐
e. SES would tell me ☐
f. Neighbour would tell me ☐
g. Phone call ☐
h. Don't know ☐
i. Other (describe) ☐

30. What would you do in the case of a flood?

Do NOT give options below. Tick ☑ the options that represent the respondent's comments or complete the "Other" option. More than one answer allowed.

a. Don't know ☐
b. Do nothing ☐
c. Wait for Council or the SES to tell me what to do ☐
d. Get emergency kit out ☐
e. Locate pets ☐
f. Pack warm clothing, essential medication and other valuables in bag ☐
g. Pack warm clothing, essential medication and other valuable in **waterproof** bag ☐

h. Raise furniture and possessions ☐
i. Open door of fridges, freezers and other heavy items ☐
j. Switch off electricity and gas ☐
k. Self Evacuate ☐
l. Evacuate to notified evacuation centre ☐
m. Keep away from power poles or power lines ☐
n. Make a phone call ☐
o. Other (describe) ☐

If answered n to question 30 go to question 31, otherwise go to question 32

31. Which number would you call?
a. 000 ☐
b. SES ☐
c. Council ☐
d. Fire Brigade ☐
e. Police ☐

32. Do you have an emergency kit for floods? YES/NO

If yes go to question 33

33. What items are in your flood emergency kit?

Do NOT read out options below. More than one answer allowed.

a. The Woronora Floods Are You Ready? Brochure ☐
b. A portable radio with spare batteries ☐
c. A torch with spare batteries ☐
d. A first aid kit and manual ☐
e. Waterproof bag for clothing and valuables ☐
f. Strong shoes ☐
g. Rubber gloves ☐

34. Do you think that being prepared for a flood can reduce property losses? YES/NO/DON'T KNOW

35. Do you think that being prepared for a flood can improve your personal safety? YES/NO/DON'T KNOW

36. What other benefits do you think being prepared for a flood could bring? _____

37. How many people live in this household? _____

38. What is the main language you speak at home? _____

39. Are you renting this house? YES/NO

Thank you for your time

Interviewer is to complete survey with following information from database.

ADDRESS _____