Hawkesbury City Council

Attachment 8 to item 1

Hawkesbury City Local Flood Plan

date of meeting:7 September 2021
location:by audio-visual link
time: 5.30 p.m.

HAWKESBURY CITY

LOCAL FLOOD PLAN

A SUB-PLAN OF

HAWKESBURY CITY
LOCAL DISASTER PLAN (DISPLAN)

Chair, Local Emergency
Management Committee

SES Local Controller

December 2010 Edition

To be reviewed no later than December 2015

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AMENDMENT LIST

Proposals for amendments to this plan should be forwarded to:

The Local Controller
State Emergency Service
Hawkesbury Unit

Amendments promulgated in the amendment list below have been entered in this plan.

Amendment List Number	Date	Amendment Entered By	Date

LIST OF ABBREVIATIONS

The following abbreviations have been used in this plan:

AEP	Annual Exceedance Probability
AHD	Australian Height Datum
AIIMS	Australasian Inter-service Incident Management System
ARI	Average Recurrence Interval (Years)
ALERT	Automated Local Evaluation in Real Time
AWRC	Australian Water Resources Council
Bureau	Australian Government Bureau of Meteorology
DCF	Dam Crest Flood
DECCW	Department of Environment, Climate Change and Water
DSC	Dams Safety Committee
DISPLAN	Disaster Plan
DSEP	Dam Safety Emergency Plan
DVR	Disaster Victim Registration
NOW	NSW Office of Water
GIS	Geographic Information System
GRN	Government Radio Network
IFF	Imminent Failure Flood
LEMO	Local Emergency Management Officer
LEOCON	Local Emergency Operations Controller
OAP	Operational Action Plan
PMF	Probable Maximum Flood
PMR	Private Mobile Radio
PMP	Probable Maximum Precipitation
RTA	Roads and Traffic Authority
SEOCON	State Emergency Operations Controller
SERCON	State Emergency Recovery Controller
SES	NSW State Emergency Service
SEWS	Standard Emergency Warning Signal
VRA	Volunteer Rescue Association
WICEN	Wireless Institute Civil Emergency Network

GLOSSARY

Annual Exceedance Probability (AEP). The chance of a flood of a given or larger size occurring in any one year, usually expressed as a percentage. For example, if a peak flood level (height) has an AEP of 5%, there is a 5% chance (that is, a one-in-20 chance) of such a level or higher occurring in any one year (see also Average Recurrence Interval).

Assistance Animal. A guide dog, a hearing assistance dog or any other animal trained to assist a person to alleviate the effect of a disability (Refer to Section 9 of the Disability Discrimination Act 1992).

Australian Height Datum (AHD). A common national surface level datum approximately corresponding to mean sea level.

Average Recurrence Interval (ARI). The long-term average number of years between the occurrence of a flood as big as, or larger than, the selected event. For example, floods reaching a height as great as, or greater than, the 20 year ARI flood event will occur on average once every 20 years.

Catchment (river basin). The land area draining through the main stream, as well as tributary streams, to a particular site. It always relates to an area above a specific location.

Coastal Erosion. The loss of land along the shoreline predominantly by the offshore movement of sand during storms.

Dambreak Study. A Dambreak Study is undertaken to determine the likely downstream inundation areas in case of a dam failure. Modelling is undertaken for a range of dam breach possibilities and design floods. The dambreak study includes information such as the extent of flooding, flood travel times and flood water velocities. The study can assist dam owners, regulators, and emergency agencies in the preparation of evacuation plans, dam break and other flood warning systems, and hazard classification of affected areas.

Dam Failure. The uncontrolled release of a water storage. The failure may consist of the collapse of the dam or some part of it, or excessive seepage or discharges. The most likely causes of dam failure are:

- **Flood Induced Dam Failure:** Dam failure caused by flood, either due to overtopping erosion or by subsequent structural failure.
- **Sunny Day Dam Failure:** Dam Failure as a result of factors other than flood ie other than flood flow into the reservoir. Causes of "Sunny Day" dam failure can include internal erosion, landslide, piping, earthquake or sabotage.

Dam Safety Emergency Plan (DSEP). A DSEP outlines the required actions of owners and their personnel at dams in response to a range of possible emergency situations. The NSW Dam Safety Committee requires a quality controlled DSEP, with associated dambreak warning procedures to be prepared for prescribed dams where persons may be at risk downstream, if the dam failed.

Design flood (or flood standard). A flood of specified magnitude that is adopted for planning purposes. Selection should be based on an understanding of flood behaviour and the associated flood risk, and take account of social, economic and environmental considerations. There may be several design floods for an individual area.

DisPlan (Disaster Plan). The object of a Displan is to ensure the coordinated response by all agencies having responsibilities and functions in emergencies.

Emergency Alert. A national telephony based alerting system available for use by emergency service agencies to send SMS and voice messages to landlines and/or mobile telephones (by billing address) in times of emergency.

Essential services. Those services, often provided by local government authorities, that are considered essential to the life of organised communities. Such services include power, lighting, water, gas, sewerage and sanitation clearance.

Evacuation. The temporary movement (relocation) of people from a dangerous or potentially dangerous place to a safe location, and their eventual return. It is a safety strategy which uses distance to separate people from the danger created by the hazard.

Evacuation Order. Notification to the community, authorised by the SES, when the intent of an Operations Controller is to instruct a community to immediately evacuate in response to an imminent threat.

Evacuation Warning. Notification to the community, authorised by the SES, when the intent of an Operations Controller is to warn a community of the need to prepare for a possible evacuation.

Flash flooding. Flooding which is sudden and often unexpected because it is caused by sudden local or nearby heavy rainfall. It is sometimes defined as flooding which occurs within six hours of the rain that causes it.

Flood. Relatively high water level which overtops the natural or artificial banks in any part of a stream, river, estuary, lake or dam, and/or local overland flooding associated with drainage before entering a watercourse, and/or coastal inundation resulting from super-elevated sea levels and/or waves overtopping coastline defences, including Tsunami.

Flood classifications. Locally defined flood levels used in flood warnings to give an indication of the severity of flooding (minor, moderate or major) expected. These levels are used by the State Emergency Service and the Australian Government Bureau of Meteorology in flood bulletins and flood warnings.

Flood intelligence. The product of collecting, collating, analysing and interpreting flood-related data to produce meaningful information (intelligence) to allow for the timely preparation, planning and warning for and response to a flood.

Flood fringe. The remaining area of flood prone land after floodway and flood storage have been defined

Flood liable land (also referred to as flood prone land). Land susceptible to flooding by the Probable Maximum Flood. (PMF) event. This term also describes the maximum extent of a floodplain which is an area of a river valley, adjacent to the river channel, which is subject to inundation in floods up to this event.

Flood of record. Maximum observed historical flood.

Floodplain Management Plan. A plan developed in accordance with the principles and guidelines in the New South Wales Floodplain Development Manual. Such a plan usually includes both written and diagrammatic information describing how particular areas of flood prone land can be used and managed to achieve defined objectives.

Flood Plan. A response strategy plan that deals specifically with flooding and is a sub-plan of a Disaster Plan. Flood plans describe agreed roles, responsibilities, functions, strategies and management arrangements for the conduct of flood operations and for preparing for them. A flood plan contains information and arrangements for all floods whereas an OAP is for a specific flood/event.

Flood Rescue. The rescue or retrieval of persons trapped by floodwaters.

Flood storage areas. Those parts of the floodplain that are important for the temporary storage of floodwaters during the passage of a flood. The extent and behaviour of flood storage areas may change with flood severity, and loss of flood storage can increase the severity of flood impacts by reducing natural flood attenuation.

Floodway. An area where a significant volume of water flows during floods. Such areas are often aligned with obvious naturally-defined channels and are areas that, if partially blocked, would cause a significant redistribution of flood flow which may in turn adversely affect other areas. They are often, but not necessarily, the areas of deeper flow or the areas where higher velocities occur.

Flood Watch. A Flood Watch is a notification of the potential for a flood to occur as a result of a developing weather situation and consists of short generalised statements about the developing weather including forecast rainfall totals, description of catchment conditions and indicates streams at risk. The Bureau will also attempt to estimate the magnitude of likely flooding in terms of the adopted flood classifications. Flood Watches are normally issued 24 to 36 hours in advance of likely flooding. Flood watches are issued on a catchment wide basis.

Flood Warning. A Flood Warning is a gauge specific forecast of actual or imminent flooding. Flood Warnings specify the river valley, the locations expected to be flooded, the likely severity of flooding and when it will occur.

Functional Area. means a category of services involved in the preparations for an emergency, including the following:

- Agriculture and Animal Services;
- Communication Services;

- Energy and Utility Services;
- Engineering Services;
- Environmental Services;
- Health Services;
- Public Information Services;
- Transport Services; and
- Welfare Services.

Geographic Information System (GIS). A computerised database for the capture, storage, analysis and display of locationally defined information. Commonly, a GIS portrays a portion of the earth's surface in the form of a map on which this information is overlaid.

Inundation. See definition for Flood.

Indirect Effect. Indirect effects are generally a consequence of infrastructure damage or interruption of services and can affect communities distant from the actual flood footprint i.e. floodplain. Indirect effects can also refer to indirect losses due to disruption of economic activity, both in areas which are inundated or isolated. Indirect effects are one of the three primary sources of risk in the context of flooding (the other two are inundation and isolation).

Isolation. Properties and/or communities where flooding cuts access to essential services or means of supply. Isolation is one of the three primary sources of risk in the context of flooding (the other two are inundation and indirect effects).

Local overland flooding. Inundation by local runoff rather than overbank discharge from a stream, river, estuary, lake or dam.

Major flooding. Flooding which causes inundation of extensive rural areas, with properties, villages and towns isolated and/or appreciable urban areas flooded.

Minor flooding. Flooding which causes inconvenience such as closing of minor roads and the submergence of low-level bridges. The lower limit of this class of flooding, on the reference gauge, is the initial flood level at which landholders and/or townspeople begin to be affected in a significant manner that necessitates the issuing of a public flood warning by the Australian Government Bureau of Meteorology.

Moderate flooding. Flooding which inundates low-lying areas, requiring removal of stock and/or evacuation of some houses. Main traffic routes may be covered.

Operational Action Plan (OAP). An action plan for managing a specific flood event. Information from the Local Flood Plan is used to develop the OAP.

Peak height. The highest level reached, at a nominated gauging station, during a particular flood event.

Prescribed Dam. "Prescribed" dams are those listed in Schedule 1 of the Dams Safety Act 1978. The NSW Dam Safety Committee will prescribe those dams with the potential for a

failure which could have a significant adverse effect on community interests.

Probable Maximum Flood (PMF). The largest flood that could conceivably be expected to occur at a particular location, usually estimated from probable maximum precipitation. The PMF defines the maximum extent of flood prone land, that is, the floodplain. It is difficult to define a meaningful Annual Exceedance Probability for the PMF, but it is commonly assumed to be of the order of 10^4 to 10^7 (once in 10,000 to 10,000,000 years).

Runoff. The amount of rainfall which ends up as streamflow, also known as 'rainfall excess' since it is the amount remaining after accounting for other processes such as evaporation and infiltration.

Stage height. A level reached, at a nominated gauging station, during the development of a particular flood event.

Stream gauging station. A place on a river or stream at which the stage height is routinely measured, either daily or continuously, and where the discharge is measured from time to time so as to develop a relationship between stage and discharge or rating curve.

Part 1 - Introduction

1.1 Purpose

1.1.1 This plan covers the preparedness measures, the conduct of response operations and the co-ordination of immediate recovery measures for all levels of flooding on the Hawkesbury River and its tributaries within the boundaries of the Hawkesbury City.

1.1.2 The extent and complexity of operations required to deal with a severe to extreme flood in the Hawkesbury-Nepean Valley, dictate the need for a set of management arrangements for operational control different to those used for less severe levels of flooding in the valley. For the purpose of planning, a flood in the Hawkesbury-Nepean Valley can be classified as either a Level 1 flood or a Level 2 flood according to the degree of severity.

1.1.3 A Level **1 flood** is defined as one in which the water level of the Hawkesbury-Nepean River is not expected to exceed 15.0 metres on the Windsor gauge. For such a flood, the operation is within the scope of normal arrangements detailed in the respective SES Region and Local Flood Plans and the respective District and Local DISPLAN's.

1.1.4 A **Level 2 flood** is defined as one in which the water level of the Hawkesbury-Nepean River is expected to exceed 15.0 metres on the Windsor gauge. Additional arrangements are contained in the Hawkesbury Nepean Flood Emergency Sub Plan.

1.2 Authority

1.2.1 This plan is issued under the authority of the State Emergency and Rescue Management Act 1989 and the State Emergency Service Act 1989. It has been accepted by the SES Sydney Western Region Controller and the Hawkesbury Local Emergency Management Committee.

1.2.2 This plan is also to be regarded as a sub-plan of the SES Sydney Western Region Flood Plan.

1.2.3 The plan is also to be regarded as a sub-plan of the Hawkesbury Nepean Flood Emergency Sub Plan.

1.3 Area Covered by the Plan

1.3.1 The area covered by the plan is the Hawkesbury local government area.

1.3.2 Hawkesbury City covers an area of 2,793 square kilometres and has a population of 62,100 (as of 2006 census). The City has a mixture of residential, commercial, industrial, rural and environmentally protected areas.

1.3.3 The council area and its principal rivers and creeks are shown in Map 1.

1.3.4 The council area is in the SES Sydney Western Region and for emergency management purposes is part of the Sydney West Emergency Management District.

1.4 Description of Flooding and its Effects

1.4.1 The nature of flooding in the Hawkesbury Council area is described in Annex A.

1.4.2 The effects of flooding on the community are detailed in Annex B.

1.5 Responsibilities

1.5.1 The general responsibilities of emergency service organisations and supporting services (functional areas) are listed in the Local Disaster Plans (DISPLAN). Some specific responsibilities are expanded upon in the following paragraphs. The extent of their implementation will depend on the severity of flooding.

1.5.2 **SES Hawkesbury Local Controller**. The SES Local Controller is responsible for dealing with floods as detailed in the State Flood Plan, and will:

Preparedness

a. Maintain a Local Headquarters in accordance with the SES Controllers' Handbook and the SES Operations Manual.

b. Ensure that SES members are trained to undertake operations in accordance with current policy as laid down in the SES Controllers' Handbook and the SES Operations Manual.

c. Develop and operate a flood intelligence system.

d. Coordinate the development and operation of a warning service for the community.

e. Participate in floodplain risk management initiatives organised by the Hawkesbury City Council.

f. Coordinate a public education program.

g. Identify and monitor people and/or communities at risk of flooding and tsunami.

h. Ensure that the currency of this plan is maintained.

Response

i. Control flood operations. This includes:

   i. Directing the activities of the SES units operating within the council area.
   ii. Coordinating the activities of supporting agencies and organisations and ensuring that liaison is established with them.

j. Provide an information service in relation to:

- Flood heights and flood behaviour
- Coastal erosion / inundation
- Road conditions and closures
- Advice on methods of limiting property damage
- Confirmation of evacuation warnings

k. Direct the conduct of flood rescue operations.

l. Direct the evacuation of people and/or communities.

m. Provide immediate welfare support for evacuated people.

n. Coordinate the provision of emergency food and medical supplies to isolated people and/or communities.

o. Coordinate operations to protect property, for example by:

- Arranging resources for sandbagging operations
- Lifting or moving household furniture
- Lifting or moving commercial stock and equipment
- Moving farm animals

p. Arrange for support (for example, accommodation and meals) for emergency service organisation members and volunteers assisting them.

q. If SES resources are available, assist with emergency fodder supply operations conducted by Department of Industry and Investment.

r. If SES resources are available, assist the NSW Police Force, RTA and Council with road closure and traffic control operations.

s. Exercise financial delegations relating to the use of emergency orders as laid down in the SES Controllers' Handbook.

t. Coordinate the collection of flood intelligence.

u. Submit Situation Reports to the SES Sydney Western Region Headquarters and agencies assisting within the council area. These will contain information on:

- Road conditions and closures
- Current flood behaviour
- Current operational activities
- Likely future flood behaviour
- Likely future operational activities
- Probable resource needs

v. Keep the Local Emergency Operations Controller advised of the flood situation and the operational response.

w. Issue the 'All Clear' when flood operations have been completed.

x. Ensure that appropriate Debriefs/After Action Reviews (AAR) are held after floods.

Recovery

y. Assist in the establishment and deliberations of the Recovery Coordinating Committee.

1.5.3 SES Hawkesbury Unit Members

a. Carry out flood and tsunami response tasks. These may include:

- The management of the SES Hawkesbury Local Headquarters Operations Centres
- Gathering flood and coastal erosion/inundation intelligence
- Flood rescue
- Evacuation
- Providing immediate welfare for evacuated people
- Delivery of warnings and information
- Resupply
- Levee monitoring
- Sandbagging
- Lifting and/or moving household furniture and commercial stock
- Moving farm animals
- Assisting in repairing or improving levees
- Assisting with road closure and traffic control operations
- Assisting with emergency fodder supply operations

b. Assist with preparedness activities.

c. Undertake training in flood operations and coastal erosion/inundation.

1.5.4 Animal & Agricultural Services Functional Area

a. Coordinate the supply and delivery of emergency fodder.

b. Provide advice on dealing with dead and injured farm animals.

c. Provide financial, welfare and damage assessment assistance to flood affected farm people.

d. Coordinate the operation of animal shelter compounds, facilitate for the domestic pets and companion animals of evacuees.

1.5.5 Australian Government Bureau of Meteorology (BoM)

a. Provide Flood Watches for the Hawkesbury River

b. Provide Flood Warnings, incorporating height-time predictions, for:

- North Richmond
- Windsor
- Lower Portland
- Sackville
- Webbs Creek at Wisemans Ferry
- Colo

c. Provide Severe Weather Warnings and/or Severe Thunderstorm Warnings when flash flooding is likely to occur.

1.5.6 Rail Corporation NSW (RailCorp)

a. Close and re-open railway lines as necessary and advise the SES Hawkesbury Local Controller.

b. Arrange trains for evacuations and/or commuting purposes.

1.5.7 Caravan Park Proprietors

a. Prepare a Flood Management Plan for the Caravan Park.

b. Ensure that owners and occupiers of caravans are aware that the caravan park is flood liable and what they must do to facilitate evacuation and van relocation when flooding occurs.

c. Ensure that occupiers are informed of flood warnings and flood watches.

d. Coordinate the evacuation of people and the relocation of moveable vans when floods are rising and their return when flood waters have subsided.

e. Inform the SES of the progress of evacuation and/or van relocation operations and of any need for assistance in the conduct of these tasks.

1.5.8 Childcare Centres and Preschools

a. Childcare centres in flood affected areas are to be contacted by the SES in the event of possible flooding.

b. When notified, the child care centres should:

- Liaise with the SES and arrange for the early release of children whose travel arrangements are likely to be disrupted by flooding and/or road closures.
- Assist with coordinating the evacuation of preschools and childcare centres

1.5.9 Communications Services Functional Area

a. Assist the SES to identify infrastructure at risk of flooding for incorporation into planning and intelligence.

b. Provide additional telecommunications support for the SES Local Headquarters as required.

c. Maintain telephone services.

d. Repair and restore telephone facilities damaged by flooding.

1.5.10 Department of Environment, Climate Change and Water

a. Provide specialist advice to the SES regarding flooding.

1.5.11 Hawkesbury Local Emergency Operations Controller

a. Monitor flood operations.

b. Coordinate support to the SES Local Controller if requested to do so.

1.5.12 Hawkesbury Local Emergency Management Officer

a. Provide executive support to the LEOCON in accordance with the Hawkesbury Local Disaster Plan.

b. At the request of the SES Local Controller, advise appropriate agencies and officers of the activation of this plan.

1.5.13 Hawkesbury City Council

Preparedness

a. Establish and maintain a floodplain risk management committee and ensure that key agencies are represented.

b. Provide flood studies and floodplain risk management studies to the SES.

c. Maintain Dam Safety Emergency Plans and provide copies to the SES.

d. Provide information on the consequences of dam failure to the SES for incorporation into planning and flood intelligence.

e. Contribute to the development and implementation of a public education program on flooding within the council area.

f. Maintain a plant and equipment resource list for the council area.

Response

g. At the request of the SES Local Controller, deploy personnel and resources for flood-related activities and assist with warning of residents of evacuations.

h. Close and re-open council roads (specified other roads nominated by agreement with the RTA) and advise the SES Local Controller, the Police and people who telephone the council for road information.

i. Assist with the removal of caravans from caravan parks.

j. Provide back-up radio communications.

k. Provide vehicles capable of passing through shallow floodwaters.

l. In the event of evacuations, set up and operate animal shelter compound facilities for the domestic pets and companion animals of evacuees.

Recovery

m. Provide for the management of health hazards associated with flooding. This includes removing debris and waste.

n. Ensure premises are fit and safe for reoccupation and assess any need for demolition.

o. Arrange for storage of evacuees' furniture as required.

1.5.14 Health Services Functional Area

a. When requested by SES;

- Activate Healthplan if required;
- Ensure that appropriate business continuity plans are developed for essential health infrastructure and are activated during floods;

- Provide medical support to the SES;
- Establish health surveillance in affected areas;
- Assess potential public health risks that either acutely endanger the health of human populations or are thought to have longer term consequences;
- Provide environmental health advice;
- Provide public health warnings and advice to affected communities;
- Assist the SES with the warning and evacuation of hospitals.

b. Ambulance Service of NSW

- Assist with the evacuation of at risk communities (in particular elderly and/or infirm people)
- Deploy ambulance resources to cover the North Richmond, Wilberforce, Colo, Webbs Creek and Macdonald River Sectors if access is expected to be lost due to inundation of one or more of the North Richmond Bridge, Windsor Bridge, Lower Portland Ferry, Sackville Ferry, Webbs Creek Ferry and Wisemans Ferry.

1.5.15 Integral Energy

a. Provide advice to the SES Local Controller of any need to disconnect power supplies or of any timetable for reconnection.

b. Clear or make safe any hazard caused by power lines or electrical reticulation equipment.

c. Assess the necessity for and implement the disconnection of customers' electrical installations where these may present a hazard.

d. Make available information regarding availability or otherwise of electrical supply.

e. Inspect and reconnect customers' electrical installations as conditions allow.

f. Assist the SES to identify infrastructure at risk of flooding for incorporation into planning and intelligence.

1.5.16 Jemena (Gas)

a. Maintenance and repair of facilities.

1.5.17 Marine Rescue NSW

a. Assist with the delivery of evacuation warnings.

b. Assist with the conduct of evacuations.

1.5.18 NSW Fire Brigades

a. Assist with the delivery of evacuation warnings.

b. Assist with the conduct of evacuations.

c. Provide equipment for pumping flood water out of buildings and from low-lying areas.

d. Assist with cleanup operations, including the hosing out of flood affected properties.

e. Deploy NSWFB resources to cover the area of North Richmond within the Richmond / Windsor Fire District to cover any fire and Hazardous Material response requirements if access is expected to be lost due to inundation of North Richmond Bridge, staged within a suitable pre-determined location.

1.5.19 NSW Police Force, Hawkesbury Local Area Command

a. Assist with the delivery of evacuation warnings.

b. Assist with the conduct of evacuation operations.

c. Conduct road and traffic control operations in conjunction with council and/or the Roads and Traffic Authority (RTA).

d. Ensure evacuees at evacuation centres in the council area are registered.

e. Secure evacuated areas.

1.5.20 Roads and Traffic Authority (RTA)

a. Close and reopen RTA roads affected by flood waters and advise the SES Local Controller.

1.5.21 RAAF Base Richmond

a. If resources are available provide the 'RAAF Rising River Team' containing personnel and vehicles to assist with evacuations.

1.5.22 Rural Fire Service (RFS), Hawkesbury District

a. Provide personnel in rural areas and villages to:

- Inform the SES Local Controller about flood conditions and response needs in the RFS District, and

- Disseminate flood information.

b. Provide vehicles capable of passing through shallow floodwaters.

c. Assist with the delivery of evacuation warnings.

d. Assist with the conduct of evacuations.

e. Provide equipment and operators for pumping flood water out of buildings and from low-lying areas.

f. Assist with the removal of caravans.

g. Provide back-up radio communications.

h. Assist with cleanup operations, including the hosing of flood affected properties.

i. Provide equipment, communications and trained personnel for air base/support operations.

j. Assist with monitoring roads closed by flooding and rates of rise in back creeks.

1.5.23 School Administration Offices including Catholic Education Office, Department of Education & Training and Private Schools

a. Liaise with the SES and arrange for the early release of students whose travel arrangements are likely to be disrupted by flooding and/or road closures.

b. Pass information to school bus drivers/companies and/or other school principals on expected or actual impacts of flooding.

c. Assist with coordinating the evacuation of the schools

1.5.24 Transport Services Functional Area

a. Arrange transport facilities for evacuations and/or commuting purposes.

b. On request, provide a liaison officer to the SES Hawkesbury Local Controller or SES Sydney Western Region Headquarters as required.

c. On request attend/contribute to the post event AAR/debrief.

1.5.25 Welfare Services Functional Area

a. Manage evacuation centres designated in this plan.

b. Provide clothing, accommodation, food and welfare services for flood affected people, including stranded travellers.

Part 2 - Preparedness

2.1 Maintenance of this Plan

2.1.1 The SES Local Controller will maintain the currency of this plan by:

a. Ensuring that all agencies, organisations and officers mentioned in it are aware of their roles and responsibilities.

b. Conducting exercises to test arrangements.

c. Reviewing the contents of the plan:

- After each flood operation.
- When significant changes in land use or community characteristics occur.
- When new information from flood studies becomes available.
- When flood control or mitigation works are implemented or altered.
- When there are changes, which alter agreed plan arrangements.

2.1.2 In any event, this plan is to be reviewed no less frequently than every five years.

2.2 Floodplain Management

2.2.1 The SES Local Controller will ensure that the SES:

a. Participates in floodplain management committee activities.

b. Consults with the flood prone community about the nature of the flood problem and its management.

c. Informs the SES Sydney Western Region Headquarters of involvement in floodplain management activities.

2.3 Development of Flood Intelligence

2.3.1 Flood intelligence describes flood behaviour and its effects on the community.

2.3.2 The SES will develop and maintain a flood intelligence system.

2.4 Development of Warning Systems

2.4.1 The SES will maintain a flood warning system for areas affected by flooding. This requires:

a. An identification of the potential clients of flood warning information at different levels of flooding (ie. who would be affected in floods of differing severities).

b. Available information about the estimated impacts of flooding at different heights.

c. Identification of required actions and the amount of time needed to carry them out.

d. Appropriate means of disseminating warnings to different clients and at different flood levels.

2.5 Public Education

2.5.1 The SES Hawkesbury Local Controller with the assistance of the Hawkesbury City Council, the SES Sydney Western Region Headquarters and SES State Headquarters, is responsible for ensuring that the residents of the council area are aware of the flood threat in their vicinity and how to protect themselves from it.

2.5.2 Specific strategies to be employed include::

a. Dissemination of emergency kits, flood-related brochures, booklets and locally tailored flood action guides in flood liable areas.

b. Talks (including public meetings and FloodSafe Community Information Nights) and visual displays (including photographs and video) oriented to community organisations and schools.

c. Publicity given to this plan and to flood-orientated SES activities through local media outlets, including articles in local newspapers about the flood threat and appropriate responses.

2.6 Training

2.6.1 Throughout this document there are references to functions that must be carried out by the members of the SES Hawkesbury City Unit. The SES Local Controller is responsible for ensuring that the members are:

a. Familiar with the contents of this plan.

b. Trained in the skills necessary to carry out the tasks allocated to the SES.

2.7 Resources

2.7.1 The SES Local Controller is responsible for maintaining the condition and state of readiness of:

a. SES equipment,

b. The SES Local Headquarters.

Part 3 - Response

Control

3.1 Control Arrangements

3.1.1 The SES is the legislated combat agency for floods and is responsible for the control of flood operations. This includes the co-ordination of other agencies and organisations for flood management tasks.

3.1.2 Flood operations can occur in one or more of the following river/creek systems at the same or different times:

a. Hawkesbury River

b. Colo River

c. Webbs Creek

d. Macdonald River

e. South Creek

3.1.3 A **Level 1 flood operation** will be dealt with using those arrangements detailed in the SES Sydney Western Region Flood Plan and this Local Flood Plan.

3.1.4 A **Level 2 flood operation** will be dealt with using the arrangements described in Hawkesbury-Nepean Flood Emergency Sub Plan augmented by those Level 2 flood arrangements described within the SES Sydney Western Region Flood Plan and this Local Flood Plan.

3.1.5 The decision to commence a Level 2 flood operation is driven primarily by the potential need to completely evacuate whole communities before mainstream flooding inundates evacuation routes. A Level 2 operation may also be required to manage a large-scale resupply operation to affected areas. This may apply to the Pitt Town, McGraths Hill, Windsor, Bligh Park, Windsor Downs and Richmond areas.

3.1.6 The Local DISPLAN will operate to provide support as requested by the SES Local Controller.

3.2 Start of Response Operations

3.2.1 This plan is always active to ensure that preparedness actions detailed in this plan are completed.

3.2.2 Response operations will begin:

a. On receipt of the first of a BoM Flood Watch, Preliminary Flood Warning or Flood Warning for one or more of the Nepean, Hawkesbury and Colo Rivers.

b. When other evidence leads to an expectation of flooding within the council area.

3.2.3 Contact with the BOM to discuss the development of flood warnings will normally be through the SES Sydney Western Region Headquarters.

3.2.4 The following persons and organisations will be advised of the start of response operations by the SES Local Controller regardless of the location and severity of the flooding anticipated:

a. SES Sydney Western Region Headquarters

b. Local SES Wardens

c. Hawkesbury Local Emergency Operations Controller

d. Hawkesbury Local Emergency Management Officer (LEMO), for transmission to appropriate council officers and departments, including the Mayor, Hawkesbury City Council.

3.2.5 Other agencies listed in this plan will be advised by the LEMO on the request of the SES Hawkesbury Local Controller as appropriate to the location and nature of the threat.

3.3 Designation of Start Time

3.3.1 In Level 2 flood operations on the Hawkesbury River the SES Sydney Western Region Controller will designate the "Start Time" to help Controllers at all levels calculate the timings that apply to their areas of responsibility. This will be done with the assistance of the Bureau of Meteorology, normally based on a Flood Warning. The "Start Time" will be based on the time the Hawkesbury River reached, or is expected to reach, 6 metres on the Windsor flood gauge.

3.4 Strategies

3.4.1 The key strategy for flood operations is:

a. **Provision of warnings, information and advice to communities**

Inform the community regarding the potential impacts of a flood and what actions to undertake in preparation for flooding.

Provide timely and accurate information to the community.

3.4.2 The response strategies for flood operations include:

a. **Property protection**

Protect the property of residents and businesses at risk of flood damage.

Assistance with property protection by way of sandbagging and the lifting or transporting of furniture, personal effects, commercial stock and caravans;

Assistance with the protection of essential infrastructure;

b. Evacuation

The pre-emptive movement of people away from areas that will be affected by flooding.

c. Rescue

Rescue of people from floods.

d. Resupply

Minimise disruption upon the community by resupplying towns and villages which have become isolated as a consequence of flooding.

Ensure supplies are maintained to property owners by coordinating the resupply of properties which have become isolated as a consequence of flooding.

The provision of fodder to farm animals.

3.4.3 In Level 1 flood operations the SES Local Controller will select the appropriate response strategy to deal with the expected impact of the flood in each sector. The impact may vary from sector to sector so a number of different strategies may have to be selected and implemented across the whole operational area.

3.4.4 In Level 2 flood operations the SES Sydney Western Region Controller will select the appropriate response strategy to deal with the expected impact of the flood in each sector. The impact may vary from sector to sector so a number of different strategies may to be selected and implemented across the whole operational area. The available strategies for each sector are explained in detail in Part 6 of the Hawkesbury Nepean Flood Emergency Sub Plan.

3.4.5 Supporting strategies include:

a. Protect the community from incidents involving fire and hazardous materials

b. Maintain the welfare of communities and individuals affected by the impact of a flood.

c. Minimise disruption to the community by ensuring supply of essential energy and utility services.

d. Ensure coordinated health services are available to and accessible by the flood affected communities.

e. Maintain the welfare of animals affected by the impact of a flood.

3.4.6 The execution of these supporting strategies is detailed in the Emergency Services and Functional Area sections below.

3.5 Operations Centres

3.5.1 The SES Operations Centre is located at:

SES Hawkesbury City Local Headquarters
Corner Kurmond Road & McKinnon Road
Wilberforce

3.5.2 Supporting Emergency Operations Centres (EOC's) are located as follows:

a. Hawkesbury City Local Emergency Operations Centre - SES Hawkesbury City Local Headquarters, Corner Kurmond Road and McKinnons Road, Wilberforce.

b. Hawkesbury City Rural Fire Service Control Centre, Macquarie Road, Wilberforce.

3.6 Operational Management

3.6.1 Flood operations will be controlled initially on a Sector basis. The Sectors are listed below and a description and map is included at Map 2:

a. McGraths Hill Sector
b. Pitt Town Sector
c. Windsor Sector
d. Bligh Park Sector
e. Windsor Downs Sector
f. Richmond Sector
g. Richmond Lowlands Sector
h. Oakville/Cattai Sector
i. Lower Reaches Sector
j. North Richmond Sector
k. Wilberforce Sector
l. Yarramundi Sector

3.6.2 In Level 1 flood operations all Sectors will initially be controlled direct from the SES Hawkesbury City Local Headquarters as not all Sectors will be active in the earlier stages of flooding.

3.6.3 The SES Local Controller may activate the following Sector Command Centres, before the Windsor Bridge is inundated at 7 metres AHD, to coordinate possible low level evacuations, provide a local information service and provide a point of contact to the population:

a. Pitt Town

b. McGraths Hill

c. Windsor

3.6.4 As flood operations progress the following Divisions will be established:

Division	Sectors	Comments
Hawkesbury Flood Islands Division	McGraths Hill Pitt Town Windsor Bligh Park Windsor Downs Richmond	This Division includes the flood island sectors
Lower Hawkesbury River Division	Yarramundi Richmond Lowlands North Richmond Wilberforce Oakville/Cattai Colo Webbs Creek Macdonald River	This Division includes the sectors along the Lower Hawkesbury River
Flood Rescue Division		This Division controls local and out of area flood rescue resources. The area of operations covered by this Division will expand into the areas inundated in the other Divisions.

3.6.5 In Level 2 flood operations the SES Local Controller will, as required, activate the following Sector Command Centres within the Hawkesbury Flood Islands Division to control evacuations:

Sector	Localities	Sector Command Centre
McGraths Hill	McGraths Hill, Mulgrave and Vineyard areas	McGraths Hill Community Centre Philip Place, McGraths Hill If rendered inoperable by flooding - moved to Oakville Fire Shed, Corner Hanckel and Bocks Roads, Oakville.

Sector	Localities	Sector Command Centre
Pitt Town	Pitt Town area	St James Church Hall Bathurst Street Pitt Town
Windsor	Windsor, South Windsor	St Matthews Church Hall Moses Street, Windsor
Bligh Park	Bligh Park	Tiningi Community Centre Cnr Rifle Range Road and Colonial Drive Bligh Park
Windsor Downs	Windsor Downs	Tiningi Community Centre Cnr Rifle Range Road and Colonial Drive Bligh Park
Richmond	Richmond, East Richmond, Clarendon, Hobartville, and Agnes Banks areas	Richmond Public School Windsor Street Richmond
Oakville/Cattai	Oakville and Cattai areas	Oakville Fire Shed Cnr Hanckel and Bocks Roads Oakville

3.6.6 As flood operations become more complex (as is the case in Level 2 flood operations) in the more heavily populated areas of the Hawkesbury LGA the SES Sydney Western Region Controller may, in consultation with the SES Hawkesbury and SES Hills Local Controllers, transfer control of the Webbs Creek and Macdonald River Sectors to the SES The Hills Controller.

3.7 Liaison

3.7.1 At the request of the SES Hawkesbury Local Controller, each agency with responsibilities identified in this plan will provide liaison (including a liaison officer where necessary) to the SES Hawkesbury Operations Centre.

3.7.2 The following agencies are to provide a liaison officer initially to the SES Hawkesbury City Local Headquarters.

a. NSW Police Force

b. Rural Fire Service

c. NSW Fire Brigades

3.7.3 Other agencies with responsibilities identified in this plan are to maintain regular contact with the SES Hawkesbury Local Headquarters or provide liaison officers as required by the SES Local Controller.

3.7.4 Liaison officers are to:

a. Have the authority to deploy the resources of their parent organisations at the request of the SES Hawkesbury Local Controller,

b. Advise the SES Hawkesbury Local Controller on resource availability for their service, and

c. Be able to provide communications to their own organisations.

3.8 All Clear

3.8.1 When the immediate danger to life and property has passed the SES Sydney Western Region Controller or the SES Local Controller will issue an 'all clear' message signifying that response operations have been completed. The message will be distributed through the same media outlets as earlier evacuation messages. The relevant Controller will also advise details of recovery coordination arrangements, arrangements made for clean up operations prior to evacuees being allowed to return to their homes, and stand-down instructions for agencies not required for recovery operations.

3.8.2 A template guide to the content of an All Clear message is contained in Annex E – Template Evacuation Warning, Evacuation Order and All Clear.

Planning

3.9 Collating Situational Information

Strategy

3.9.1 The SES maintains and records situational awareness of current impacts and response activities.

Actions

3.9.2 The SES Hawkesbury Local Headquarters collates information on the current situation in the Hawkesbury LGA and incorporates in Situation Reports.

3.9.3 The SES Sydney Western Region Headquarters collates Region-wide information for inclusion in Region SES Situation Reports.

3.9.4 Sources of flood intelligence during flood operations include:

a. **Agency Situation Reports.** Agencies and functional areas provide regular situation reports (SITREPs) to the SES.

b. **Active Reconnaissance.** The SES Hawkesbury Local Controller is responsible for coordinating the reconnaissance of impact areas, recording and communicating observations. Reconnaissance can be performed on the ground and using remote sensing (more commonly aerial).

c. The **Bureau of Meteorology's Flood Warning Centre** provides river height and rainfall information and is available on the website http://www.bom.gov.au/hydro/flood/nsw/

d. The Department of Services, Technology and Administration's, **Manly Hydraulics Laboratory** automated river watch system funded by the Department of Environment, Climate Change and Water. This system provides river height and rainfall readings for a number of gauges as indicated in Annex C. Recent data from this system is available on the Manly Hydraulic Laboratory website: http://www.mhl.nsw.gov.au. A history of area floods is also available upon request via the website.

e. **NSW Office of Water.** This office advises flow rates and rates of rise for the Hawkesbury River. Daily river reports containing information on gauge heights and river flows are available from the website: http://waterinfo.nsw.gov.au/

f. **SES Sydney Western Region Headquarters.** The Region Headquarters provides information on flooding and its consequences, including those in nearby council areas (this information is documented in Bulletins and Situation Reports).

g. **Community Members.** SES gauge readers, RFS personnel and other members of the community provide information on flooding.

3.9.5 During flood operations sources of information on roads closed by flooding include:

a. Hawkesbury City Council

b. Hawkesbury Police

c. Hawkesbury Rural Fire Service

d. SES Sydney Western Region Headquarters

3.9.6 Situational information relating to consequences of flooding and/or coastal erosion should be used to verify and validate SES Flood Intelligence records.

3.10 Providing Flood Information

Strategy

3.10.1 The SES Hawkesbury Local Headquarters provides advice to the SES Sydney Western Region Headquarters on current and expected impacts of flooding in the Hawkesbury LGA.

Actions

3.10.2 The SES Hawkesbury Local Controller will ensure that the SES Sydney Western Region Controller is regularly briefed on the progress of operations.

3.10.3 SES Hawkesbury Local Headquarters operations staff will be briefed regularly so that they can provide information in response to inquiries received in person or by

other means such as phone or fax.

3.10.4 **BOM Flood Warnings** The SES Sydney Western Region Headquarters will send a copy of BOM Flood Warnings to the SES Hawkesbury Unit. On receipt the SES Local Controller will provide the SES Sydney Western Region Headquarters with information on the estimated impacts of flooding at the predicted heights for inclusion in SES Region Flood Bulletins.

3.10.5 **SES Region Flood Bulletins** The SES Sydney Western Region Headquarters will regularly issue SES Region Flood Bulletins (using information from BOM Flood Warnings and SES Local Flood Advices) to SES units, media outlets and agencies on behalf of all SES units in the Region.

3.10.6 **SES Low Pump Warnings** As required, the SES Local Controller will issue Low Level Pump Warnings for the Hawkesbury River through the Lowland Farmers Warden System. They will also be provided to local radio stations for broadcast.

3.10.7 **SES Local Flood Advices** The SES Local Controller may issue Local Flood Advices for locations not covered by the BOM Flood Warnings. They may be provided verbally in response to phone inquiries but will normally be incorporated into SES Region Flood Bulletins. They will be distributed to

a. SES Sydney Western Region Headquarters
b. Sector Command Centres (where established)
c. Hawkesbury Radio
d. Hawkesbury City Council
e. Hawkesbury Police Local Area Command
f. Hawkesbury Rural Fire Service
g. SES Wardens
h. Specified individuals and local agencies

3.10.8 The SES Hawkesbury City Local Headquarters will operate a “phone-in” information service for the community in relation to:

a. river heights,
b. flood behaviour,
c. road conditions,
d. closures of local and main roads and advice,
e. advice on safety matters and means of protecting property.

3.10.9 In Level 1 flood operations the SES Local Controller may request the SES Sydney Western Region Controller to provide an overflow “phone-in” information service at SES Sydney Western Region HQ for the community in relation to:

a. river heights,

b. flood behaviour,

c. road conditions,

d. closures of local and main roads and advice,

e. advice on safety matters and means of protecting property.

3.10.10 In Level 2 flood operations the Joint Media Information Centre (established under the Hawkesbury Nepean Flood Emergency Sub Plan) will coordinate the provision of all information to the media relating to the flood event.

3.10.11 The Public Information and Inquiry Centre (operated by the Police Force) will answer calls from the public regarding registered evacuees.

3.10.12 The RTA Traffic Info Line will provide advice to callers on the status of roads.

3.10.13 Collation and dissemination of road information is actioned as follows:

a. The SES Local Controller provides road status reports for roads in the council area to the SES Sydney Western Region Headquarters Road Information Cell and to the Windsor Police Force Local Area Command.

b. The Road Information Cell also obtains information from the NSW Police Force, Council and the RTA.

c. The SES Sydney Western Region Headquarters distributes information on roads to SES units, media outlets and agencies as part of SES Flood Bulletins.

d. The Road Information Cell also provides a "phone-in" service to the public.

Operations

3.11 Communications Systems

3.11.1 The primary means of office-to-office communications is by telephone, email and facsimile.

3.11.2 The primary means of communication to and between deployed SES resources is by the Government Radio Network (GRN).

3.11.3 Backup communications will be provided in two ways:

a. The SES has installed a Private Mobile Radio (PMR) network, consisting of 5 repeaters, for the Hawkesbury Nepean to operate if the GRN fails.

b. To cater for the possible failure of the telephone or mobile telephone network (primarily within the flooded area) sufficient ground station independent satellite telephones are maintained by the SES to provide essential links between Sector Command Centres and the SES Hawkesbury Local Headquarters.

3.11.4 All liaison officers will provide their own communication links back to their parent agencies.

3.11.5 All other agencies will provide communications as necessary to their deployed field teams.

3.12 Preliminary Deployments

3.12.1 When flooding is expected to be severe enough to cut road access to the McGraths Hill Sector and Windsor Sector from the SES Local Headquarters, the SES Local Controller may relocate resources (including vehicles and floodboats) and personnel to these sectors.

3.12.2 When North Richmond Bridge and/or Windsor Bridge is expected to be inundated by flooding, the SES Local Controller will :

a. Consider relocating local SES resources (including vehicles and floodboats) and personnel to one or more of the McGraths Hill, Windsor and Pitt Town Sectors.

b. Advise appropriate local agencies so that resources (including fire fighting appliances, ambulances etc) can be deployed to ensure that their operational capability is maintained.

3.13 Road Control

3.13.1 A number of roads within the council area are affected by flooding. Details are provided in Annex B.

3.13.2 The council closes and re-opens its own roads.

3.13.3 The RTA closes and re-opens State roads.

3.13.4 The NSW Police Force has the authority to close and re-open roads but will normally only do so (if the council or the RTA have not already acted) if public safety requires such action or to secure, control and keep clear evacuation routes.

3.13.5 When resources permit, the SES assists Council or the Police by erecting road closure signs and barriers.

3.13.6 Police, RTA or Council officers closing or re-opening roads or bridges affected by flooding are to advise the SES Hawkesbury Local Headquarters, which will then provide a road information service to local emergency services, the public and the SES Sydney Western Region Headquarters. All such information will also be passed to the Police, RTA and the Council.

3.14 Traffic Control

3.14.1 In the event of major flooding, the SES Hawkesbury Local Controller may direct the imposition of traffic control measures. The entry into flood affected areas will be controlled in accordance with the provisions of the State Emergency Service Act, 1989 (Part 5, Sections 19, 20, 21 and 22) and the State Emergency Rescue Management Act, 1989 (Part 4, Sections 60KA, 60L and 61).

3.14.2 During Level 2 flood operations the road evacuation routes for the Richmond, Windsor, Bligh Park, Windsor Downs, McGrath's Hill and Pitt Town Sectors will be managed under arrangements detailed in the Hawkesbury-Nepean Flood Emergency Sub Plan.

3.15 Aircraft Management

3.15.1 Aircraft can be used for a variety of purposes during flood operations including evacuation, rescue, resupply, reconnaissance and emergency travel.

3.15.2 Air support operations will be conducted under the control of the SES Region Headquarters, which may allocate aircraft to units if applicable. The SES Local Controller may task aircraft allocated by the Region Headquarters for flood operations within the Council area.

3.15.3 **Helicopter Landing Points.** Suitable landing points are located at:

Sector	**Location**
Windsor Sector	McQuade Park On the St Matthews Church side. 22m to 24m AHD South Windsor Park Next to the water towers Bounded by Mileham St and Drummond St
Bligh Park	Bligh Park Primary School Alexander St 23 to 25m AHD
McGraths Hill	Clearing at the corner of Pitt Town Road and Windsor Road (opposite the pub). This clearing can be used up to 16m AHD
Pitt Town	Area bounded by Bathurst Street/Johnson Street/Bootles Lane (24 to 26m AHD)
Richmond	Icely Park (bounded by Dight St/Andrew St/Faithful Street/Clarendon St (22 to 23 AHD)

Wilberforce	Woodlands Oval Ironbark Drive Wiberforce
	SES Hawkesbury Local HQ

3.15.4 **Airport.** RAAF Richmond Airbase may be used to stage aircraft subject to Defence operations. However it starts to become flooded from 19m AHD.

3.16 Assistance for Animals

3.16.1 Matters relating to the welfare of livestock, companion animals and wildlife are to be referred to Agriculture and Animal Services.

3.16.2 Requests for emergency supply and/or delivery of fodder to stranded livestock, or for livestock rescue, are to be referred to Agriculture and Animal Services.

3.16.3 Requests for domestic animal rescue should be referred to the SES.

3.17 Stranded Travellers

3.17.1 Flood waters can strand travellers. Travellers seeking assistance will be referred to Welfare Services Functional Area liaison officer for the arrangement of temporary accommodation.

3.18 Affected Communities

3.18.1 Annex F deals with the arrangements relating to the evacuation of residents and the removal of caravans.

Initial Evacuations

3.18.2 A number of evacuations are required during the relatively frequent floods.

a. **Richmond Lowlands Sector** - A small number of evacuations are required during the relatively frequent floods of Minor and Moderate classification. The levels of flooding referred to are between 4.3 and 11.0 metres AHD at North Richmond Bridge.

b. **Windsor Sector** - A small number of evacuations are required during the relatively frequent floods of Minor and Moderate classification. The levels of flooding referred to are between 5.8 and 12.2 metres AHD at Windsor Bridge.

c. **Pitt Town Sector** - Some evacuations are required in low lying areas (including Pitt Town Bottoms) of this Sector.

d. **McGrath's Hill Sector** - Some early evacuations in Level 1 flood operations are required.

e. **Bligh Park Sector** - Some early evacuations in Level 1 flood operations are required.

f. **Oakville/Cattai Sector** - Some early evacuations in Level 1 flood operations are required.

g. **North Richmond Sector** - Some early evacuations in Level 1 flood operations are required.

h. **Wilberforce Sector** - A number of early evacuations in Level 1 flood operations are required. During Level 1 operations a series of discrete evacuations are required from individual sub-sectors to the evacuation centre at Hawkesbury High School. Note that some depend on the Singleton Road being open. If it is closed, alternate evacuation routes are described which will take them to the evacuation centre at Colo High School.

3.18.3 In the Richmond Lowlands Sector there may be some residual population which did not evacuate during the early stages of flooding and may need to be rescued.

Isolated Properties and Towns/Villages

3.18.4 The Yarramundi area is isolated from the eastern side of the Hawkesbury River when the Yarramundi Bridge is inundated at the bridge deck level of 5.4 metres AHD. From that height the only road access to the Yarramundi area is via the Hawkesbury Road from Glenbrook. When the Hawkesbury Road is inundated the Yarramundi area is fully isolated.

3.18.5 For low levels of flooding on the Hawkesbury and for low levels of flooding on the Macdonald River the Macdonald Valley is isolated when:

a. The Webbs Creek ferry is taken out of service for low levels of flooding on the Haweksbury River. This cuts access to St Albans Road.

b. St Albans Road is cut at 1.47m AHD about 2km from the confluence of the Hawkesbury River and Macdonald River.

c. The ferry at Wisemans Ferry is taken out of service for low levels of flooding on the Haweksbury River. This cuts access to Settlers Road.

d. Settlers Road cut at 1.88m AHD about 1km from the confluence of the two rivers.

Evacuations in Level 2 Flood Operations

3.18.6 In Level 2 flood operations flood islands may be formed in the following sectors:

a. McGraths Hill Sector

b. Pitt Town Sector

c. Windsor Sector

d. Bligh Park Sector

e. Richmond Sector

3.18.7 **McGraths Hill Sector:** If the flood level exceeds 13.5 metres at the Windsor gauge then the entire population will have to be evacuated to assigned evacuation centres. On leaving the Sector these persons will be moved under traffic management arrangements (detailed in the Hawkebury Nepean Flood Emergency Sub Plan) to assigned evacuation centres.

3.18.8 **Windsor Sector:** During Level 2 flood operations a significant percentage of the population (up to 25 percent) may have to be evacuated even for floods less than 15m AHD. If flooding is expected to exceed 17.3m AHD the entire population will be evacuated to assigned evacuation centres. On leaving the Sector these persons will be moved under traffic management arrangements (detailed in the Hawkesbury Nepean Flood Emergency Sub Plan) to the evacuation centres.

3.18.9 **Pitt Town Sector:** If the flood level exceeds 17.3m metres at the Windsor gauge then the entire population will have to be evacuated during Level 2 flood operations to assigned evacuation centres. On leaving the Sector these persons will be moved under traffic management arrangements (detailed in the Hawkesbury Nepean Flood Emergency Sub Plan) to evacuation centres.

3.18.10 **Bligh Park Sector:** During Level 2 flood operations a significant percentage of the population (up to 25 percent) may have to be evacuated even for floods less than 16m AHD. If flooding is expected to exceed 17.3m AHD the entire population will be evacuated to assigned evacuation centres. On leaving the Sector these persons will be moved under traffic management arrangements (detailed in the Hawkebury Nepean Flood Emergency Sub Plan) to the evacuation centres.

3.18.11 **Richmond Sector:** If the flood level is expected the exceed 20.2m AHD at the Windsor gauge then the entire population will be evacuated to assigned evacuation centres. On leaving the Sector these persons will be moved under traffic management arrangements (detailed in the Hawkesbury Nepean Flood Emergency Sub Plan) to designated evacuation centres.

3.18.12 **Oakville/Cattai Sector:** Only some parts of these areas will need evacuation during Level 2 flood operations. On leaving the Sector these persons will be moved under traffic management arrangements (detailed in the Hawkesbury Nepean Flood Emergency Sub Plan) to assigned evacuation centres.

3.18.13 **North Richmond Sector:** During Level 2 flood operations the population at threat will be evacuated to the evacuation centre at Colo High School.

3.19 Managing Property Protection Operations

Strategy

3.19.1 Protect the property of residents and businesses at risk of flood damage.

Actions

3.19.2 The SES is the responsible agency for the coordination of operations to protect property.

3.19.3 Property may be protected by:

a. Lifting or moving of household furniture

b. Lifting or moving commercial stock and equipment

c. Sandbagging to minimise entry of water into buildings

3.19.4 The SES Hawkesbury Local Headquarters maintains a small stock of sandbags, and back-up supplies are available through the SES Sydney Western Region Headquarters. A motorised sandbag-filling machine is available through the SES Sydney Western Region Headquarters. The Hawkesbury City Council also has stocks of sand and bags and can provide supplies of filled bags on request. Alternatively, local concrete trucks may be used.

3.19.5 Property protection options are, however, very limited in the Hawkesbury Local Government Area due to the large number of properties that can be affected and the depth of floodwaters arising from severe flooding on the Hawkesbury River and backup flooding on South Creek from the Hawkesbury River.

3.20 Managing Flood Rescue Operations

Strategy

3.20.1 Rescue people from floods.

Actions

3.20.2 The SES Local Controller controls flood rescues in the Local Government Area.

3.20.3 The SES may request other agencies to undertake flood rescues on behalf of the SES. Assisting agencies must supply information regarding rescues performed to the SES.

3.20.4 Flood rescues may be carried out using flood rescue boats and, under some circumstances, high-clearance vehicles or helicopters.

3.20.5 Additional flood rescue boats and crews can be requested through the SES Sydney

Western Region Headquarters. These resources must be utilised in conjunction with appropriate local resources.

3.21 Managing Evacuation Operations

Strategy

3.21.1 Evacuations will take place when there is a risk to public safety. Circumstances may include:

a. Evacuation of people when their homes or businesses are likely to flood.

b. Evacuation of people who are unsuited to living in isolated circumstances, due to flood water closing access.

c. Evacuation of people where essential energy and utility services have failed or where buildings have been made uninhabitable.

Actions

3.21.2 The evacuation operation will have the following stages:

a. Decision to Evacuate

b. Mobilisation

c. Evacuation Warning/Order Delivery

d. Withdrawal

e. Shelter

f. Return

3.21.3 Evacuations will be controlled using the Sectors described in para 3.6.1.

3.21.4 The following means of evacuation will be used (in order of priority and where appropriate) for the flood island sectors:

a. Road

b. Rail

c. Fixed wing aircraft from Richmond Air Force Base (only for Richmond Sector)

d. Helicopters

e. Boats

3.21.5 The most effective means of evacuation is via road using private cars and buses. However, the other means of evacuation may also be used as backups.

3.21.6 If there is sufficient time between the activation of this plan and the evacuation of communities, the SES Sydney Western Region Controller will discuss the temporary

closure of appropriate schools with the Regional Director, Western Sydney Region, Department of Education and Training (Kingswood). This will enable pupils to stay at home or be returned home so they can be evacuated (if required) with their families.

3.21.7 In the early stages of flooding, school principals in the Hawkesbury LGA often close schools that are likely to be affected.

3.21.8 The Department of Education and Training will coordinate the evacuation of schools (High School, Primary School, Child Care facilities) if not already closed.

3.21.9 The Health Services Functional Area will coordinate the evacuation of hospitals, health centres, aged care facilities (including nursing homes).

3.21.10 The SES Local Controller is to provide the following reports to the SES Sydney Western Region Headquarters:

a. Advice of commencement of the evacuation of each Sector;

b. Half-hourly progress reports (by Sectors) during evacuations;

c. Advice of completion of the evacuation of each Sector.

Decision to Evacuate

3.21.11 During floods evacuations will be controlled by the SES. Small-scale evacuations will be controlled by the SES Local Operations Controller. Should the scale of evacuation operations be beyond the capabilities of local resources control may be escalated to the SES Sydney Western Region Operations Controller. Evacuations will be conducted in two levels:

a. **Level 1:** Evacuations of areas inundated or at threat of isolation by floods less than the 15.0 metre level at the Windsorgauge. The SES Local Controller controls these evacuations.

b. **Level 2:** Evacuations of areas threatened by floods of higher levels. It is expected that if such evacuations are required, the Hawkesbury Nepean Flood Emergency Sub Plan will be activated and evacuations throughout the valley will be co-ordinated centrally from the SES Sydney Western Region Headquarters.

3.21.12 In most cases the decision to evacuate rests with the SES Local Operations Controller who exercises his/her authority in accordance with Section 22(1) of The State Emergency Service Act 1989. However, the decision to evacuate will usually be made after consultation with the SES Sydney Western Region Operations Controller and the Local Emergency Operations Controller.

3.21.13 In events that require large scale evacuations, the decision to evacuate may be escalated to the Region or the State Operations Controller.

3.21.14 Some people will make their own decision to evacuate earlier and move to alternate

accommodation, using their own transport. This is referred to as self-motivated evacuation.

Mobilisation

3.21.15 The SES Local Controller will mobilise the following resources to provide personnel for doorknock teams for designated Sectors:

a. SES Hawkesbury Unit members,

b. RFS Hawkesbury District members via the RFS Fire Control Officer,

c. Local Police Force officers.

3.21.16 The SES Sydney Western Region Controller will mobilise any additional personnel required to assist with doorknock teams using:

a. SES members from the SES Sydney Western Region and surrounding SES Regions

b. NSWFB personnel arranged via the NSWFB Liaison Officer located at SES Sydney Western Region Headquarters

c. RFS personnel arranged via the RFS Liaison Officer located at SES Sydney Western Region Headquarters

3.21.17 The SES Local Controller will request the Hawkesbury City LEMO to provide Council personnel to assist with traffic coordination within the McGraths Hill, Windsor, Pitt Town, Bligh Park, Windsor Downs and Richmond Sectors.

3.21.18 The SES Local Controller will arrange liaison officers for Sector Command Centres.

3.21.19 The SES Sydney Western Region Controller will mobilise the required number of buses for Sectors via the Transport Services Functional Area Coordination Centre. Sector Commanders may request the SES Local Controller to provide additional buses.

Delivery of Evacuation Warnings and Evacuation Orders

3.21.20 The SES will advise the community of the requirements to evacuate. The SES will issue an **Evacuation Warning** when the intent of an SES Operations Controller is to warn the community of the need to prepare for a possible evacuation. The SES will issue an **Evacuation Order** when the intent of the SES Operations Controller is to instruct a community to immediately evacuate in response to an imminent threat. A template guide to the content of evacuation warning and order messages is provided at Annex E.

3.21.21 In Level 1 flood operations the SES Local Controller will prepare Evacuation

Warnings and Evacuation Orders and distribute them via local flood warning systems and to the SES Sydney Western Region Controller.

3.21.22 In Level 2 flood operations Evacuation Orders will be issued under the direction of the SES Sydney Western Region Controller. These will be distributed to:

a. The SES State Operations Centre

b. The SES Hawkesbury Local Controller

c. Metropolitan media outlets via the Joint Media Information Centre.

d. Affected communities via dial-out warning systems where installed or applicable

3.21.23 In Level 2 flood operations the SES Local Controller will distribute Evacuation Warnings to:

a. Sector Command Centres (where established)

b. Hawkesbury Local Emergency Operations Centre

c. Hawkesbury City Council

d. Hawkesbury Police Local Area Command

e. Hawkesbury Rural Fire Service Control Centre

f. Local SES Wardens

g. Hawkesbury Radio 89.9FM

h. Other local agencies and specified individuals

3.21.24 The Standard Emergency Warning Signal (SEWS) may be used to precede all Evacuation Warnings broadcast on Hawkesbury Radio.

3.21.25 The SES Sydney Western Region Controller will distribute Evacuation Warnings and Orders to metropolitan media outlets.

3.21.26 Sector Command Centres, where established, will distribute Evacuation Orders via Emergency Service personnel in doorknock teams to areas under threat of inundation.

3.21.27 Doorknock teams will work at the direction of:

a. The Sector Commander if a Sector Command Centre is established.

b. The relevant Division Commander where a Sector Command Centre has not been established

3.21.28 Field teams conducting doorknocks will record and report back the following information to their Sector Commander:

a. Addresses and locations of houses doorknocked and/or evacuated.

b. The number of occupants.

c. Details of support required (such as transport, medical evacuation, assistance to secure house and/or property and raise or move belongings).

d. Details of residents who refuse to comply with the Evacuation Order.

3.21.29 **Refusal to evacuate**. Field teams cannot afford to waste time dealing with people who are reluctant or refuse to comply with an Evacuation Order. These cases are to be referred to the NSW Police Liaison Officer who will arrange for Police to ensure their evacuation.

Withdrawal

3.21.30 In each Sector, evacuations will generally be done in stages starting from the lowest areas and moving progressively to higher areas.

3.21.31 Sector Commanders will direct evacuees who require accommodation or welfare assistance to designated evacuation centres. Evacuees who have their own accommodation arrangements will not be directed to Evacuation Centres. It is not possible to determine in advance how many will fall into this category.

3.21.32 The SES Local Controller, through Sector Commanders, will manage the evacuation of people within each Sector up to the point where people enter the Sector's designated regional road evacuation route.

3.21.33 Evacuees will:

a. Move under local traffic arrangements from the relevant Sectors to the route Entry Point as detailed in the evacuation Annexes;

b. Move under traffic management arrangements to the route Exit Points;

c. Continue along the suburban road network to allocated Evacuation Centres.

3.21.34 In the flood island Sectors evacuees will be directed onto regional evacuation routes established under arrangement in the Hawkesbury Nepean Flood Emergency Sub Plan.

3.21.35 **Management of Pets and Companion Animals of Evacuees**: Assistance animals (guide dogs, hearing assistance animals, etc) will normally remain in the care of their owners throughout the evacuation. This includes transport and access into evacuation centres etc. However, due to safety restrictions, it may not be possible to allow companion animals to accompany their owners when being transported via aircraft or flood rescue boats. Animal and Agricultural Services will make separate arrangements for the evacuation, care and return of companion animals.

3.21.36 **Transport and storage**: Transport and storage of furniture from flood threatened properties will be arranged as time and resources permit.

3.21.37 **Security**: The NSW Police Force will provide security for evacuated areas.

Shelter

3.21.38 **Evacuation centres/areas**. The usual purpose of evacuation centres is to meet the immediate needs of victims, not to provide them with accommodation. Evacuees will be advised to go to or be taken to the nearest accessible evacuation centre, which may initially be established at the direction of the SES Hawkesbury Local Controller, but managed as soon as possible by Welfare Services.

3.21.39 **Registration**: The NSW Police Force will ensure that all evacuees are registered on arrival at the designated evacuation centres.

3.21.40 **Animal shelter compounds**: Animal shelter compounds will be set up for the domestic pets and companion animals of evacuees if required. Facilities will be managed by Agriculture and Animal Services.

Return

3.21.41 Once it is considered safe to do so, the SES Local Controller will authorise the return of evacuees to their normal or alternative place of residence. This decision will be made in consultation with the following:

a. Health Services Functional Area Coordinator (public health),

b. Engineering Services Functional Area Co-coordinator (electrical safety of buildings),

c. Transport Services Functional Areas Coordinator (status of State roads),

d. Hawkesbury Council (public health, status of local roads),

e. SES Region Controller

3.21.42 The return will be controlled by the SES Local Controller and may be conducted, at their request, by Welfare Services.

3.21.43 In Level 2 flood operations the return will be coordinated by the SES Sydney Western Region Controller.

3.22 Managing Resupply Operations

Resupply of Isolated Towns and Villages

Strategy

3.22.1 Minimise disruption upon the community by resupplying towns and villages which have become isolated as a consequence of flooding.

Actions

3.22.2 The SES is responsible for the coordination of the resupply of isolated communities.

3.22.3 If flood predictions indicate that areas are likely to become isolated, the SES Local Operations Controller should advise retailers that they should stock up.

3.22.4 When isolation occurs, retailers will be expected to place orders with suppliers where they have a line of credit and to instruct those suppliers to package their goods and deliver them to loading points designated by the SES.

3.22.5 The SES is prepared to deliver mail to isolated communities but may not be able to do so according to normal Australia Post timetables.

3.22.6 The SES will assist hospitals with resupply of linen and other consumables where able.

Resupply of Isolated Properties

Strategy

3.22.7 Ensure supplies are maintained to property owners by coordinating the resupply of properties which have become isolated as a consequence of flooding.

Actions

3.22.8 The resupply of isolated properties is a common requirement during floods and coordination can be difficult because requests can emanate from a variety of sources. Isolated properties may call their suppliers direct, place their orders through their own social networks or contact the SES.

3.22.9 The principles to be applied when planning for the resupply of isolated properties are:

a. The SES will coordinate resupply and establish a schedule.

b. Some isolated households will not have the ability to purchase essential grocery items due to financial hardship. If an isolated household seeks resupply from the SES and claims to be, or is considered to be, in dire circumstances, he/she is to be referred to Welfare Services for assessment of eligibility. Where financial eligibility criteria are met, Welfare Services will assist with the purchase of essential grocery items. Welfare Services will deliver the essential grocery items to the SES designated loading point for transport.

c. Local suppliers will liaise with the SES regarding delivery of resupply items to the designated loading point.

d. Local suppliers are responsible for packaging resupply items for delivery.

3.22.10 A flowchart illustrating the Resupply process is shown in Annex G. Please note that the flowchart outlines the resupply process but does not encompass all potential situations and/or outcomes.

Logistics

Strategy

3.22.11 Maintain resources to ensure operational effectiveness.

Actions

3.22.12 If local SES and other local resources are insufficient or likely to be exhausted, additional SES resources (people and equipment) within the relevant SES Region may be deployed by the SES Sydney Western Region Headquarters. If further SES resources are required from other Regions, they will be deployed by the SES State Headquarters.

3.22.13 The SES may request support directly from a supporting agency whilst keeping the appropriate Emergency Operations Controller informed or request the relevant Emergency Operations Controller to coordinate support to it.

3.22.14 As far as possible, supporting agencies are to provide their own logistic support in consultation with SES where appropriate.

Emergency Services

Strategy

3.22.15 Protect the community from incidents involving fire, hazardous materials and care and transport of patients.

Actions

3.22.16 NSW Fire Brigades respond to fire and land based HAZMAT incidents in the flood affected areas as detailed in the NSW HAZMAT Plan.

3.22.17 The Rural Fire Service will respond to fire in rural fire districts within flood affected areas.

3.22.18 NSW Ambulance will provide:

a. Pre-hospital care

b. Ambulance service management of multiple evacuation sites where ambulance assistance in facilities / patient evacuations is necessary

c. Aero-medical evacuation.

3.22.19 In Sectors that will be completely evacuated the emergency services will need to coordinate their operations with the SES Sydney Western Region Headquarters, via their Liaison Officers, so that their personnel and assets can be safely evacuated from the area before evacuation routes are inundated.

Functional Areas

3.22.20 The SES Local Controller will ensure that the providers of essential services (electricity, water, sewerage, medical and public health) are kept advised of the flood situation. Essential service providers must keep the SES Local Controller abreast of their status and ongoing ability to provide their services.

3.22.21 The Functional Areas identified in NSW DISPLAN will provide support to the SES in the conduct of flood operations. The Functional Areas will provide liaison arrangements to the SES Local Controller as per the Local DISPLAN. However, in Level 2 operations the provisions of the Hawkesbury Nepean Flood Emergency Sub Plan will apply.

3.23 Agriculture and Animal Services

Strategy

3.23.1 Maintain the welfare of animals affected by the impact of a flood.

Actions

3.23.2 Matters relating to the welfare of livestock, pets, companion animals and wildlife (including feeding) are to be referred to the Agriculture and Animal Services Functional Area.

3.23.3 Requests for emergency supply and/or delivery of fodder to stranded livestock, or for livestock rescue, are to be passed to the Agriculture and Animal Services Functional Area.

3.23.4 All matters relating to the primary production, manufacturing, processing and handling of all food from “paddock/ocean” to retail, inclusive of all restaurants, food services and catering businesses should be referred to the NSW Food Authority through the Agriculture and Animal Services Functional Area.

3.23.5 During Level 2 flood operations the provisions relating to Agriculture and Animal services in the Hawkesbury Nepean Flood Emergency Sub Plan will apply.

3.24 Communications Services

3.24.1 The Communications Services Functional Area will coordinate the restoration of telecommunications.

3.24.2 During Level 2 flood operations the provisions relating to Communications Services in the Hawkesbury Nepean Flood Emergency Sub Plan will apply.

3.25 Energy and Utilities

Strategy

3.25.1 Minimise disruption to the community by ensuring supply of essential energy and utility services.

Actions

3.25.2 The Energy and Utilities Functional Area will minimise disruption to the community by ensuring supply of essential energy and utility services.

3.25.3 During Level 2 flood operations the provisions relating to Energy and Utilities in the Hawkesbury Nepean Flood Emergency Sub Plan will apply.

3.26 Engineering Services

3.26.1 The Engineering Services Functional Area will coordinate the restoration of critical public buildings for example hospitals.

3.26.2 During Level 2 flood operations the provisions relating to Engineering Services in the Hawkesbury Nepean Flood Emergency Sub Plan will apply.

3.27 Health Services

Strategy

3.27.1 Ensure coordinated health services are available to and accessible by the flood affected communities.

Actions

3.27.2 The Health Services Functional Areas will:

a. Treat sick and injured people, including the provision of pre-hospital care and transport by Ambulance Service of NSW.

b. Provide and coordinate immediate mental health support to persons both directly and indirectly affected.

c. Assess public health risks and provide advice to emergency services and communities

d. Provide environmental health advice

3.27.3 During Level 2 flood operations the provisions relating to Health Services in the Hawkesbury Nepean Flood Emergency Sub Plan will apply.

3.28 Transport Services

3.28.1 During Level 2 flood operations the provisions relating to Transport Services in the Hawkesbury Nepean Flood Emergency Sub Plan will apply.

3.29 Welfare Services

Strategy

3.29.1 Maintain the welfare of communities and individuals affected by the impact of a flood.

Actions

3.29.2 The Welfare Services Functional Area will manage evacuation centres for affected residents and travellers.

3.29.3 The Welfare Services Functional Area is to activate the Welfare Services Functional Area Supporting Plan if required to coordinate disaster welfare services to communities affected.

3.29.4 SES will provide immediate welfare for evacuees where required but will hand the responsibility over to the Welfare Services Functional Area as soon as possible. In these cases the SES will brief the Welfare Services Functional Area at the earliest opportunity regarding the assistance provided.

3.29.5 Details of all residents assisted must be available to the Welfare Services Functional Area as early as possible so that they can conduct follow-up visits.

3.29.6 During Level 2 flood operations the provisions relating to Welfare Services in the Hawkesbury Nepean Flood Emergency Sub Plan will apply.

Part 4 - Recovery

4.1 Recovery Coordination at the Local Level

4.1.1 In Level 1 flood operations the SES Local Controller will ensure that planning for long-term recovery operations begins at the earliest opportunity, initially through briefing the Local Emergency Management Committee (LEMC). As soon as possible the LEMC will meet to discuss recovery implications including the need for a Local Recovery Committee. The LEMC will consider any impact assessment in determining the need for recovery arrangements. This is conveyed in the first instance to the State Emergency Operations Controller (SEOCON) for confirmation with the State Emergency Recovery Controller (SERCON).

4.1.2 Once the need for recovery has been identified, the SERCON, in consultation with the SEOCON, may recommend the appointment of a Local Recovery Coordinator and nominate an appropriate candidate to the Minister for Emergency Services.

4.1.3 The SERCON may send a representative to the LEMC and subsequent recovery meetings to provide expert recovery advice and guidance.

4.1.4 The SES Local Controller and Local Emergency Operations Controller (LEOCON) attend recovery meetings to provide an overview of the emergency response operation.

4.1.5 The SES Region Operations Controller, the District Emergency Management Officer (DEMO) and appropriate District Functional Area Coordinators will be invited to the initial local meeting and to subsequent meetings as required.

4.1.6 The recovery committee will:

a. develop and maintain a Recovery Action Plan with an agreed exit strategy

b. monitor and coordinate the activities of agencies with responsibility for the delivery of services during recovery

c. ensure that relevant stakeholders, especially the communities affected, are involved in the development and implementation of recovery objectives and strategies and are informed of progress made

d. provide the SERCON with an end of recovery report

e. ensure the recovery is in line with the National Principles of Disaster Recovery and the NSW tenets

4.2 Recovery Coordination at the District and State Level

4.2.1 In the event that an emergency affects several local areas, a District Emergency Management Committee (DEMC) will meet to discuss recovery implications

including the need for a District Recovery Committee. This is conveyed in the first instance to the SEOCON for confirmation with the SERCON.

4.2.2 In the event of an emergency which affects multiple districts, or is of state or national consequence, or where complex, long term recovery and reconstruction is required, it may be necessary to establish a State Recovery Committee and the appointment of a State Recovery Coordinator.

4.2.3 For Level 2 flood operations recovery operations will be coordinated as per the recovery arrangements in Part 8 of the Hawkesbury Nepean Flood Emergency Sub Plan.

4.3 Arrangements for Debriefs / After Action Reviews

4.3.1 As soon as possible after flooding has abated, the SES Local Controller will advise participating organisations of details of response operations after action review arrangements.

4.3.2 The SES Local Controller will ensure that adequate arrangements are in place to record details of the after action review and each item requiring further action is delegated to an organisation or individual to implement.

4.3.3 The SES Local Controller will pass the results of the debrief to the SES Sydney Western Region Controller.

4.3.4 Follow-up to ensure the satisfactory completion of these actions will be undertaken by the Hawkesbury Local Emergency Management Committee.

Annex A
The Flood Threat

Landform and River/Creek Systems

1. Flooding can occur on one or more of the following rivers:

    a. Grose River
    b. Hawkesbury River
    c. Colo River
    d. Macdonald River

2. The major tributaries of the Hawkesbury River are:

    a. Rickabys Creek
    b. South Creek
    c. Cattai Creek

3. The main influences for flooding on the Hawkesbury River include:

    a. Nepean River
    b. Warragamba River
    c. Grose River

4. Flooding on the Hawkesbury can be described by reference to the following:

    a. Hawkesbury (from Yarramundi bridge toSackville)
    b. Lower Hawkesbury (from Sackville to Wisemans Ferry)

5. Flooding on the Colo River can influence flood levels on the Hawkesbury River upstream of the confluence of the Colo River and Hawkesbury River.

6. Local and overland flooding can occur in the following areas:

    a. Hobartville
    b. Bligh Park

Hawkesbury River

Geography

7. The Hawkesbury-Nepean catchment area is around 22,000 square kilometres stretching from Goulburn in the south and almost to Singleton in the north-west. From its mouth at Broken Bay to its most distant source near Goulburn, the Hawkesbury River is about 480 kilometres in length. The major tributaries of the Hawkesbury-Nepean River System are the following rivers: Colo, Coxs, Grose, Kowmung, MacDonald Rivers, Nattai, Nepean, Warragamba and Wollondilly.

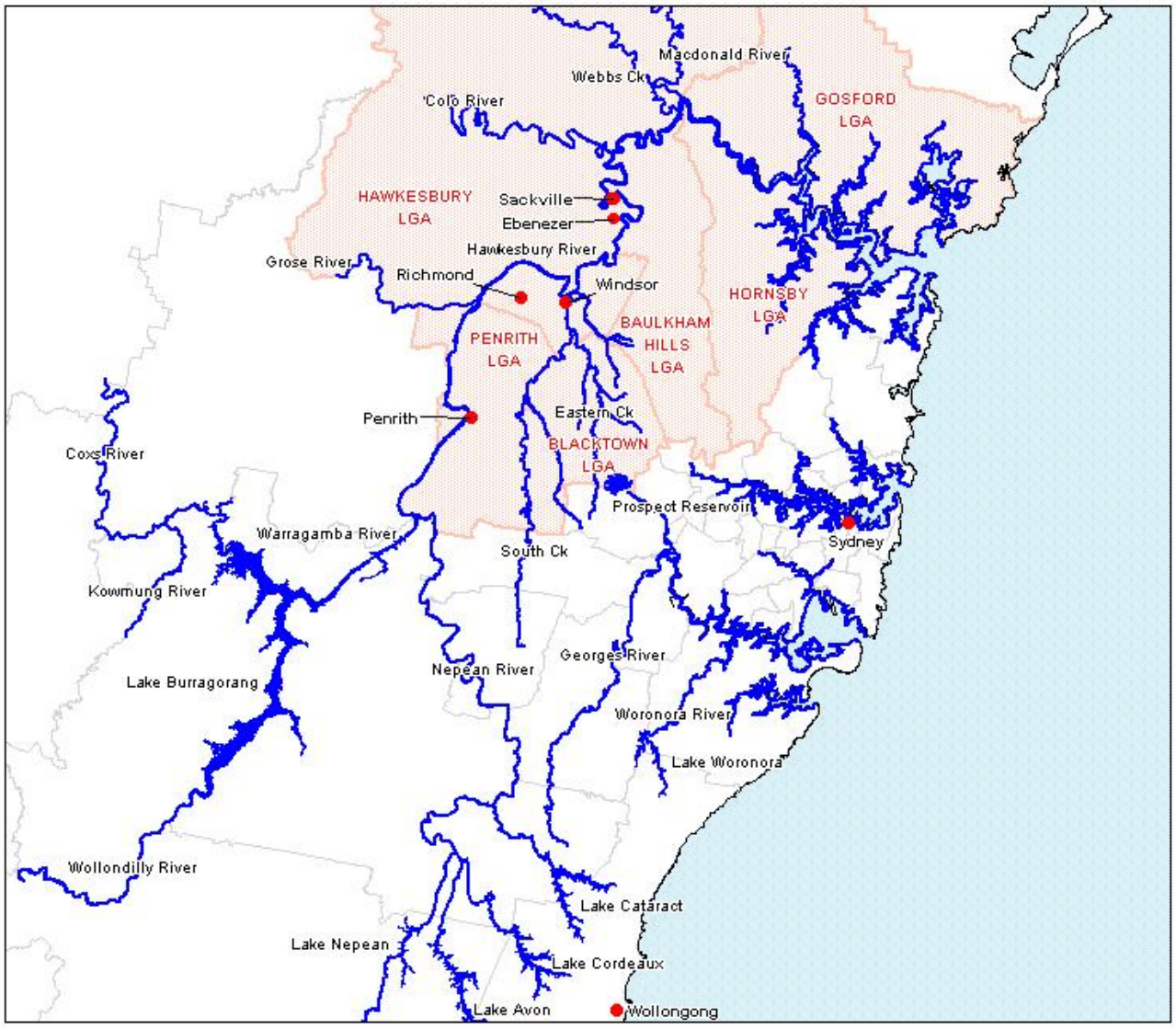


Figure 1 – Hawkesbury Nepean River System

Catchment Sections

8. **The southern section** of the catchment is drained by the Wollondilly, Nattai, Wingecarribee and Cockbundoon Rivers. These streams flow northward traversing hilly to undulating country at an elevation of between 600-750 metres. The Wollondilly River flows into the Warragamba River which in turn flows into Lake Burragorang. This lake is formed by the Warragamba Dam.

9. **The western section** of the catchment consists of steep and rugged land with an elevation of between 900- 1050 metres. The major streams in this section are the Coxs and Kowmung Rivers which flow generally in an east to south east direction. These streams also flow into Lake Burragorang. The Warragamba Dam controls 9,000 square kilometres or 41% of the total catchment.

10. **The eastern section** of the catchment is in a high rainfall area and feeds the Nepean River. It has an area of around 1,800 square kilometres. It is bounded by the Illawarra escarpment which forms the headwaters of the Nepean River tributaries, the Avon, Cataract and Cordeaux rivers. These streams flow in a north-westerly direction and Dams have been constructed on all of them. The Nepean River joins the Warragamba River 3.5 kilometres below Warragamba Dam.

11. **The Grose River section** joins the Nepean River upstream of North Richmond and the Nepean River becomes known as the Hawkesbury River from this junction. This is a relatively small part of the total catchment (650 square km) but drains a high rainfall area and can produce significant flood flows. This can happen early in floods affecting the whole Hawkesbury-Nepean Valley.

12. **The northern section** of the catchment, with an area of around 6,300 square kilometres, is drained by the Colo and MacDonald Rivers. The Colo River accounts for 4,600 of the 6,300 square kilometres. Elevation of the terrain here varies between 750-900 metres in the west and 150-300 metres in the east. About 40% of the total Hawkesbury-Nepean catchment area is downstream of Sackville, a reach of about 100 kilometres down to Broken Bay.

Floodplains

13. There are two identifiable floodplains within the Hawkesbury-Nepean Valley and they are referred to as the primary and secondary floodplains.

The Primary Floodplain

14. The primary floodplain covers about 350 square kilometres in the lower central part of the catchment. It flanks much of the western edge of metropolitan Sydney and is generally around 60 kilometres from Sydney CBD. This floodplain consists of a series of smaller relatively wide areas of undulating land connected by narrower constrictions. The primary floodplain is mostly located within the Penrith, Hawkesbury, Blacktown and Baulkham Hills local government areas.

15. The main area of urban development in the Hawkesbury-Nepean Valley is in the primary floodplain. This can be sub-divided into several distinctive sub-floodplain areas and these are identified as follows:

Camden

16. The furthest upstream sub-floodplain is on the Nepean River in the eastern section of the valley. It is in the vicinity of Camden.

Wallacia

17. The River leaves the Camden area through the very narrow gorge upstream of Bents Basin and enters a smaller sub-floodplain around Wallacia. Downstream of Wallacia another gorge conveys water to a point just upstream of Emu Plains. The Warragamba River joins the Nepean River in this gorge.

Emu Plains/Castlereagh

18. From Emu Plains to Castlereagh there is another sub-floodplain but this is a narrow, slightly elevated area and the sub-floodplain does not come into effect until very high flows occur (above about 26m on the Penrith gauge).

Richmond/Windsor/Wilberforce

19. Downstream of the constriction at Castlereagh the River enters a distinct basin extending from North Richmond to Wilberforce. This is the largest sub-floodplain of the primary floodplain and can be further sub-divided into several sections:

    a. Richmond Lowlands;

    b. Rickabys Creek;

    c. South Creek (incorporating Eastern Creek) and

    d. Bushells Lagoon.

The Secondary Floodplain

20. The secondary floodplain takes in the area from Sackville downstream to Spencer. It starts at the lower end of the primary floodplain where the river flows through a very narrow gorge that starts near Ebenezer. This area downstream of Ebenezer is generally referred to as the Lower Hawkesbury. The secondary floodplain is mostly located within the Baulkham Hills, Hornsby and Gosford local government areas.

Ebenezer/Wisemans Ferry/Spencer

21. Below Ebenezer the River enters the narrow Hawkesbury Gorge which continues through to Wisemans Ferry and then on to Broken Bay, a river distance of around 100 kilometres. Unlike the upstream constrictions near Wallacia and Castlereagh, which are relatively short, this gorge consists of a long and very narrow waterway. The section of the Hawkesbury Gorge from Sackville downstream to Wisemans Ferry, is called Sackville Gorge. After Wisemans Ferry the Hawkesbury gorge continues and opens up only slightly in the next section downstream to Spencer. Below Spencer the valley opens out into the wide basin of Broken Bay.

Weather Systems and Flooding

22. The occurrence of flooding in the valley is not linked to any particular seasonal pattern. The Hawkesbury-Nepean catchment displays wide variation in rainfall distribution. The annual average rainfall for the whole catchment is approximately 1000 millimetres however the annual average rainfall over the headwaters of the Nepean is 1500 millimetres while on the southern extremity of the basin near Goulburn the figure is about 625 millimetres. The majority of the rainfall occurs in the summer months but floods may be experienced during any part of the year.

23. There are many localities in the valley that have received 175 millimetres of rainfall in a 24 hour period. Falls in excess of 250 millimetres a 24 hour period have been recorded at Katoomba, Lawson, Springwood and Rylstone. It should be noted that these rainfall totals can often result from sustained falls of only 10-15 millimetres per hour and can produce severe floods.

24. The rainfall that produces severe flooding in the Hawkesbury-Nepean Valley will almost always come from East Coast Low Pressure Systems. These systems develop off the state's coast, usually during the cooler months, and direct moist winds onto the coast. Usually, but not exclusively, they move in a southerly direction. Orographic uplift of these air masses when they strike coastal ranges such as the Illawarra escarpment or the Great Dividing Range often produces very high rates of rainfall and heavy rain.

25. Sea conditions can also influence flooding in the lower river reaches. Along the coast, oceanic storm surges and large waves may result from East Coast Low Pressure Systems and their associated gales and storm-force winds. Such conditions may lead to incursions of seawater onto land that is usually not flooded and to the retarding of flood flows from the Hawkesbury River. The larger floods that have occurred on the Hawkesbury-Nepean River have often been accompanied by a storm surge of 0.1-0.3 metres in Broken Bay. These effects are most apparent if storm surge conditions occur during periods of spring or extreme tides.

26. Several of the most severe floods experienced on the Hawkesbury-Nepean River have resulted from East Coast Low Pressure Systems. Among these was the flood of record in June 1867. More recently, flooding in 1964, 1978 and 1986 resulted from similar weather systems.

27. Several flood-producing East Coast Low Pressure Systems may be experienced annually in New South Wales. During the 1990s for example, there were between two and five such occurrences in most years. This can result in multiple flood events on the same river system within the same year.

The Probable Maximum Flood

28. For planning to be capable of being effective in all circumstances, it must take into account the worst floods that could occur. Information about the full range of possible

flooding is obtained from scientific studies that have determined how bad the worst floods are likely to be. The greatest depth of rainfall possible over a given area in a nominated time period (eg 24hrs or 72hrs) is called the Probable Maximum Precipitation (PMP). The highest possible flood level is called the probable maximum flood (PMF).

29. For the Hawkesbury-Nepean Valley it is when the PMP distributed over the whole catchment in a 72 hour period that the greatest depth of flooding results i.e. the 72 hour PMF. The modelling for the 72 hour PMF in the Hawkesbury-Nepean Valley assumes the following conditions:

    a. Full storage at the Warragamba Dam;

    b. A fully saturated (wet) catchment;

    c. Rainfall in the order of 770 millimetres across the Warragamba catchment in a 72 hour period (72 hour PMP). Note that this requires an average of only about 11 millimetres /hour.

30. A PMP in the Hawkesbury-Nepean Valley and the resulting PMF is estimated to have one chance in 100,000 each year of occurring. This means they are very rare events. Rainfall heavy enough to support the idea of PMP has been observed in various places around the world including Australia (Wollongong 1984 – 440 millimetres in 6 hours over a 100 square kilometre area). Flood records from around the world demonstrate that PMF events have occurred.

31. The PMP distributed over other time periods and the floods that would produce, have been modelled for the Hawkesbury-Nepean Valley. As an example, the PMP over a 24-hour period would cause flooding to occur more quickly because the river would rise faster but would not reach the same peak levels achieved in a 72 hour event.

32. At Warragamba Dam, the PMF would have a peak inflow of 38,000 cubic metres of water each second and an outflow of approximately 31,200 cubic metres of water each second. This compares with an estimated peak inflow of 16,000 cubic metres of water each second and an outflow of 14,600 cubic metres of water each second in the flood of record in 1867.

33. The 1867 flood was equivalent to about 40% of the volume of water in a 72 hour PMF. By comparison the measured peak outflow in the November 1961 flood was 7,590 cubic metres of water each second or about 24% of the 72 hour PMF volume.

Physical Features Affecting River Levels

River Level Gauging

34. In the monitoring of floods and in the planning that takes place to deal with floods, river water levels are related to river gauging stations. These gauges measure the height of the water surface at points along a river. In the Hawkesbury-Nepean Valley most of the gauges used are calibrated to give the height relative to a fixed reference level called the Australian Height Datum or AHD. The Australian Height Datum can be considered to

be the approximate height of sea level. As an example a reading of 10 metres on the gauge at Windsor Bridge indicates that the surface of the water is about 10 metres above sea level. The normal river level at Windsor is about 1.5-2 metres AHD and is affected by tidal influence despite being some 150km (by river) from the sea.

35. The key reference flood gauges for the Hawkesbury Nepean Valley, and for which the Bureau of Meteorology provides flood predictions are (AWRC Gauge number shown in parentheses):

Gauge	AWRC Gauge No	Gauge Zero (m AHD)	Comments
Wallacia	212202	29.646m	This telemetered gauge is located near the Victoria Bridge
Penrith near Victoria Bridge	212201	14.136m	This telemetered gauge is located near the Victoria Bridge.This is the gauge the BoM uses in Flood Warnings. There is also an older set of manually read gauge posts near and on the bridge.
Richmond near North Richmond Bridge	212902	0.34m	This telemetered gauge is located near the Richmond Bridge. This is the gauge the BoM uses in Flood Warnings. There is also an older set of manually read gauge posts near and on the bridge.
Windsor near Windsor Bridge	212903	0.15m	This telemetered gauge is located near the Windsor Bridge. This is the gauge the BoM uses in Flood Warnings. There is also an older set of manually read gauge posts near and on the bridge.

Sackville Gorge

36. The Hawkesbury-Nepean Valley has a unique feature that dramatically affects the behaviour of floods. On a typical coastal river the valley progressively widens as it approaches the ocean outflow. The Hawkesbury-Nepean Valley has a natural constriction in the floodplain as the river enters the Sackville Gorge and this has a marked influence on flood behaviour upstream of this point. Floodwater flows freely into the Richmond/Windsor basin of the primary floodplain but cannot escape at the same rate through the Sackville Gorge. As a result, water levels around Richmond and Windsor rise well above the level that would be expected on a typical coastal floodplain.

At Windsor for example, the river level could rise from a normal non-flood level of 1.5 metres up to about 26.4 metres in the PMF.

37. Another effect of the gorge results from the fact that the Colo River flows into the Hawkesbury River within the Gorge. The Colo River can inject a large flow into the Hawkesbury at Lower Portland. During periods of low Hawkesbury River flow, this can cause backup flooding along the Hawkesbury River towards Sackville. At higher Hawkesbury River flows, the effect can be to slow down the rate of drainage from the primary floodplain and this holds up flood levels in the Richmond/Windsor area.

The Grose River

38. Flood flows from this tributary can result in the river level at North Richmond rising markedly before floodwater arrives from upstream on the Hawkesbury River. There is only one rainfall and river level gauging station in the Grose Valley and no river gauge at its junction with the Hawkesbury River. The short travel time from the confluence of the Grose and Hawkesbury Rivers to North Richmond, means that warning time can be short. Flood flows from the Grose river alone can produce moderate to major flooding from Richmond and into the lower Hawkesbury.

Dams and Reservoirs

39. There are a number of water supply reservoirs on tributaries upstream of Penrith. Warragamba Dam is the largest and has a gated spillway while the others have non-gated overflow spillways. These non-gated dams (Avon, Cataract, Cordeaux and Nepean) do have a slight mitigating effect on small, short duration floods even if they are full. This is because the hydraulic head (pressure of water) required to start a spill is caused by the water level in the dam rising higher than the spillway lip. This high water level stores a small part of the incoming flood water in the reservoir delaying the flood flow downstream and slightly reducing the level.

40. Warragamba Dam being much larger and having gates, can to some extent modify the timing, peak height and/or duration of relatively large floods (say up to 17 metres at Windsor) originating upstream of the dam. Recent mathematical modelling has shown that a 17 metres flood at Windsor might be reduced to around 16 metres through modified gate operation. The volume of water in severe floods (say above 17 metres at Windsor) is so great that even large dams like Warragamba can have little effect. It has to be remembered that several significant tributaries (Nepean, Grose, Colo, MacDonald) also flow into the valley below Warragamba Dam.

Flood History

41. The Hawkesbury-Nepean River Valley has experienced numerous serious floods since the earliest days of European settlement. Floods have occurred in all months of the year.

42. The highest recorded flood in the Hawkesbury-Nepean River occurred in 1867 when a height of 19.3 metres AHD was reached at Windsor. This flood was also the worst that has occurred in terms of lives lost and the destruction of property and livestock.

43. The next highest flood was experienced in November 1961 (there was also a lesser flood in 1961). Peak heights recorded in November 1961 were:

North Richmond (Pump Station)	16.33m;
Windsor Bridge	15.09m.

44. A flood of slightly lesser magnitude occurred in June 1964. Peak heights recorded were:

North Richmond (Pump Station)	15.47 metres;
Windsor Bridge	14.51 metres;
Camden Bridge	14.10 metres (estimated).

45. Other major floods in the valley and their height at Windsor were:

Year	Height (m AHD)
1864	14.64
1870	13.72
1873	12.66
1879	12.19
1949	11.97
1956	13.70
1961	15.09
1964	14.51
1978	14.31
1988	12.65
1990	13.36

Flood Frequency

46. The probability of various key floods occurring is summarised below. This probability is expressed in two ways. The Annual Exceedance probability (AEP) is a percentage eg tossing a coin gives a 50% chance of landing heads. The Average Recurrence Interval (ARI) is expressed as a chance eg 1 chance in 2 of tossing heads is written as 1:2. For floods it is a chance each year of having a particular level of flooding eg 1:100 means one chance in hundred each year on average:

Probability		Windsor Flood level (at Windsor Bridge) m AHD
AEP	ARI	
20%	1 in 5	11.1
10%	1 in 10	12.3
5%	1 in 20	13.7
2%	1 in 50	15.7
1%	1 in 100	17.3
0.4%	1 in 250	19.3 [(a)]
0.2%	1 in 500	20.2
0.1%	1 in 1000	21.9
0.001%	1 in 100,000	26.4 [(b)]

Notes:

(a) 1867 Flood of Record
(b) PMF – see section on Probable Maximum Flood for explanation.

47. Periods of both more frequent and more severe flooding than have been seen in recent times must be expected in the future. Under the influence of global warming the pattern of flooding may change. Although average annual rainfall for the Hawkesbury Nepean catchment may decrease, severe rainfall events may be more common than at present. In other words floods in general may be more frequent and there may be more frequent severe floods.

Lower Hawkesbury River

Landform

48. The total catchment area of the Hawkesbury River is about 22,000 square kilometres. A catchment area of 9,000 square kilometres or approximately 40 percent of the total catchment is below Sackville.

49. The Lower Hawkesbury River area is bounded upstream from Sackville and downstream to Broken Bay. The following rivers and tributaries flow into the area:

    a. Colo River

    b. Webbs Creek

    c. Macdonald River

50. The major tributary of the Hawkesbury River downstream of Sackville is the Colo River which has a catchment area of about 4,600 square kilometres.

51. The table below details catchment areas at selected locations along the Hawkesbury River and its tributaries.

River	Location	Catchment Area (km^2)
Hawkesbury	Sackville	12,950
	Lower Portland	13,450
	Wisemans Ferry	18.150
Colo	Upper Colo	4,350
	Morans Rock	4640
Macdonald	St Albans	1,680

52. The Lower Hawkesbury River is characterised by relatively rugged terrain, with several small townships and communities along the river. The main communities are Brooklyn, Spencer, Gunderman, Wisemans Ferry, Leets Vale, Lower Portland and Sackville.

53. The Lower Hawkesbury River meanders through steep gorges downstream of Sackville to Spencer where the topography changes and the river widens into the drowned valley. The important feature of the Lower Hawkesbury River is the relatively narrow floodplains compared to the wide floodplains between Richmond and Windsor.

54. The floodplains of the Hawkesbury River between Sackville and Brooklyn are generally small and narrow and are confined between the river and the steep escarpment of the gorges. The geomorphologic processes of the river have created these alluvial floodplains where in places small communities have been established. At some locations the level of the floodplain tends to be relatively low when compared to normal tide levels in the river. At Spencer the level of the floodplain is just above normal high tide level while at Sackville the floodplain level is about 4 to 6 m above high tide.

Characteristics of Flooding

55. The combination of flooding from the Hawkesbury and Colo Rivers is an important factor in determining the design flood levels, particularly from Lower Portland to Spencer.

56. The Lower Hawkesbury Flood Study adopted a 35-hour difference between the flood peaks at Sackville and Upper Colo, the historical coincidence of flood flows from the Colo and Hawkesbury Rivers and a derived relationship of Sackville flows, Upper Colo flows and flows at the confluence of the two rivers.

57. The results showed that the 1% AEP flood levels at Wisemans Ferry (Webbs Creek Ferry) could vary by 0.4 m depending on the combination of design floods originating for either the Colo or Hawkesbury Rivers.

58. The flood behaviour of the Lower Hawkesbury River can be influenced by the joint occurrence of floods from the Hawkesbury River upstream of Sackville and major tributaries below Sackville. This is potentially significant when large flood flows from the Colo and Hawkesbury Rivers combine. As well as this joint occurrence, flood conditions in the lower reaches can be influenced by the combination of rainfall runoff flooding and tidal variations.

59. Flooding along the Hawkesbury River and its tributaries between Sackville and Broken Bay is confined within relatively deep and narrow river gorges. This results in steep flood gradients and very high flow velocities both within the river channel and the limited adjoining floodplains.

60. Located along these floodplains and river banks are a number of small communities. These can be significantly affected by major floods where the risk of damage to developments and the hazard to occupants can be very high. There are many locations which present significant hazards because emergency exit and/or safe refuge is made more difficult by the presence of high cliffs and rugged ridges immediately surrounding the floodplains.

61. The main communities on the Lower Hawkesbury within the Hawkesbury LGA include:

    a. Lower Portland

    b. Sackville

    c. Leets Vale

    d. Wisemans Ferry

62. In addition to the above communities, there are a number of small dispersed developments sited along the river foreshores, often in the form of single dwellings on farms. Water skiing is also very popular in the area and several caravan parks and resorts have been established to cater for recreational activities.

Flood History

63. The March 1978 flood was the largest flood event recorded in the Lower Hawkesbury River over the last 30 years. Flood levels for this event were recorded by staff gauge readers, and DPWS pegged and surveyed flood levels during the event and additional levels from flood debris marks. The results of this flood survey are presented in report PW 1979.

64. Since the commissioning of the continuous water level recorders, six flood events have occurred. The August 1990 flood was the largest measured, having a frequency of occurrence of around 5% AEP. Table 6.3 summarises the flood levels recorded for these six floods. Figure 6.1 shows the flood profiles for these events together with the 1978 and pegged 1867 flood levels. The origin of the data on the 1867 flood is unclear.

Table - Recorded Peak Flood Levels by Continuous Stations

Date	Windsor (m AHD)	Sackville (m AHD)	Lower Portland (m AHD)	Webbs Creek (m AHD)
Jul 1988	10.96	NR	5.85	2.78
Apr 1989	NR	5.36	4.55	2.14
Feb 1990	7.69	4.59	NR	1.97
Apr 90	8.72	5.65	5.1	2.58
Aug 90	13.46	9.97	7.46	4.3
Feb 92	10.82	7.51	5.77	NR

65. Analysis of historical floods indicates:

a. The largest flood recorded in the Colo River occurred in March 1978 and was about a 1% AEP event. The 1978 event also caused a major flood in the Macdonald River with a frequency of occurrence of about 3% AEP. The same flood in the Hawkesbury River at Windsor had a frequency of occurrence of about 3% AEP.

b. Comparing the flooding at Windsor with that occurring in the Colo River, over a similar period of record (1910 to 1994), there were four significant flood events with the following probability of occurrence:

1956	Windsor (13.83 m AHD) 4% AEP	Colo (15.26 m AHD) 3% AEP
1961	Windsor (14.95 m AHD) 2.5% AEP	Colo (9.3 m AHD) 50% AEP
1964	Windsor (14.57 m AND) 3% AEP	Colo (14.61 m AHD) 7% AEP
1978	Windsor (14.46 m AND) 3% AEP	Colo (20.72 m AND) 1% AEP

c. When there is a flood in the Colo River, there is a reasonable chance of a flood occurring in the Macdonald River

d. While the historical analysis of the flood data does not conclusively suggest any particular joint occurrence of floods in the Colo and Hawkesbury Rivers, the results do suggest there is an envelope of joint occurrences.

Flood Frequency

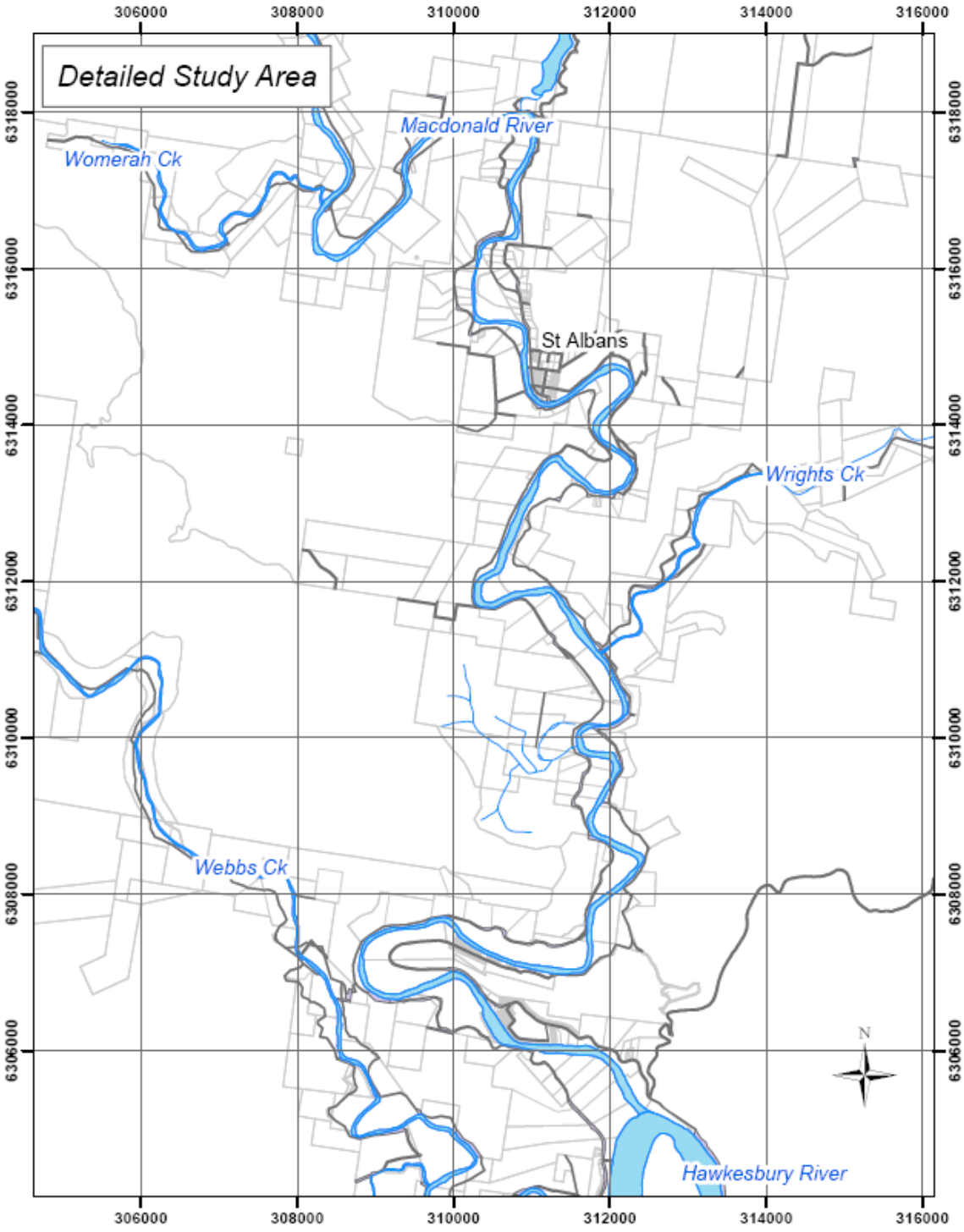
66. The March 1978 flood levels on the Hawkesbury River are estimated to be around a 3% AEP flood event at Windsor and a 1% AEP flood at the Colo River. This event was significant in the Hawkesbury because of the magnitude of the flows from the Colo River. The Colo River flood peaked at about 3,800 m3/s, and in the Hawkesbury River at Sackville the flood peak was about 6,100 m3/s.

Macdonald River

Catchment Description

67. The Macdonald River is a tributary of the Hawkesbury River and drains a catchment area of approximately 1845 km2 (Figure 1). The catchment consists of steeply vegetated slopes up to elevations of around 800 m. The upper portions of the catchment consist predominantly of natural bushland terrain. Downstream of the Womerah Creek confluence, the Macdonald River floodplain is constrained by the steep relief of the surrounding hills and is typically between 300-500 m in width.

68. The majority of development within the catchment consists of scattered free standing dwellings located on rural acreages. The density of development increases in the downstream reaches of the valley. The highest concentration of residential development is located approximately 1-2km upstream of the Hawkesbury River junction, along the eastern side of the Macdonald River floodplain.



General Morphology and Flood History

69. Flooding within the valley is primarily a consequence of surface runoff generated in the upper reaches and from local catchments. The lower reaches of the Macdonald River can also be affected by backwater effects from the Hawkesbury River during periods of coincident flooding.

70. Due to the long history of settlement within the Lower Macdonald valley, there is also an established history of flooding with significant events known to have occurred in 1978,

1964, 1949 and as far back as 1889. In particular, several successive major floods occurred on the Macdonald River between 1949 and 1955. The most recent notable flood event on record occurred in August 1990.

71. The nature and form of the Macdonald River within the immediate study area is known to have undergone significant changes over the last 150 years. An initial geomorphological analysis of the Macdonald River floodplain is presented in Reference 1 (for completeness, this reference has been reproduced in Appendix B). From a combination of available survey information and anecdotal evidence provided by a range of local land owners, Reference 1 identifies several key changes in the morphology of the river including:

- Significant changes to the in-channel geometry resulting from the deposition of sand along a significant length of the river extending from upstream of St Albans (near Marlo Creek) down to Wrights Creek. Reference 1 presents evidence indicating that the magnitude of bed aggradation in some areas is as much as three (3) metres.

- Major changes in the shape and form of the overbank/floodplain areas immediately adjacent to the main river channel. Reference 1 concludes that significant bank erosion occurred during the major floods which followed the June 1949 event. It is suggested that the sediment eroded from the immediate banks has contributed in large part to the level of bed aggradation observed in the lower reaches of the Macdonald River.

- The formation of permanent lagoons in the lower reaches. Several of the low-lying smaller tributaries were formed into permanent lagoons as a consequence of the bed aggradation of the main river channel that resulted from the floods of the early 1950's.

72. Definitive information quantifying the overall changes in the longitudinal profile of the channel bed over time is not available. However, in response to the aggradation of the channel bed, the available information indicates that the width of the main river channel has been substantially widened (as expected). For example, in the reach extending from 2km upstream of the Mogo Creek junction down through to St Albans, anecdotal evidence suggests that the typical channel width has increased up to five-fold following the 1949 flood event. The subsequent floods that occurred between 1952 and 1955 were noted to result in significant bank erosion forming the broad benched-type of overbank geometry that typifies the present floodplain within the immediate study area. In the absence of more detailed information, the precise behaviour of the river in the future is uncertain. For example, the gradual movement of the tidal limit upstream and the deepening of the channel in the lower reaches of Wrights Creek (noted in Reference 1) provide some evidence of bed recovery. However, Reference 1 also notes that the presence of indurated bed conditions within a cut-off meander of the Macdonald River (located approximately 2kms upstream of Wrights Creek confluence) is likely to limit the rate of bed recovery for these lower reaches.

73. Regardless of the precise behaviour of the river in the future, it is clear that the river and floodplain can be considered to be morphologically active. From a flooding perspective, the aggraded bed is likely to result in an increase in the occurrence of overbank flooding,

although the magnitude of the corresponding impacts on flood levels experienced during more extreme events will be relatively lower (as flooding during the larger events occurs across the overall floodplain).

74. Importantly, for the present study, the presence of underlying changes in river morphology also makes the precise interpretation of historical flood behaviour difficult to achieve. Within the context of the present investigation, the level of morphological activity adds an element of uncertainty into the design flood behaviour ultimately obtained. From a planning perspective, the potential for ongoing channel widening and/or significant bank erosion should be also be taken into account (in addition to flooding considerations) when siting developments within the floodplain. These types of analyses are further complicated by the sparseness of available historical information.

Historical Flood Levels

75. A number of flood level records exist for different sites throughout the Lower Macdonald River floodplain. For the present study, historical information was obtained from a number of sources including Council records and existing hydrologic and technical reports related to the area.

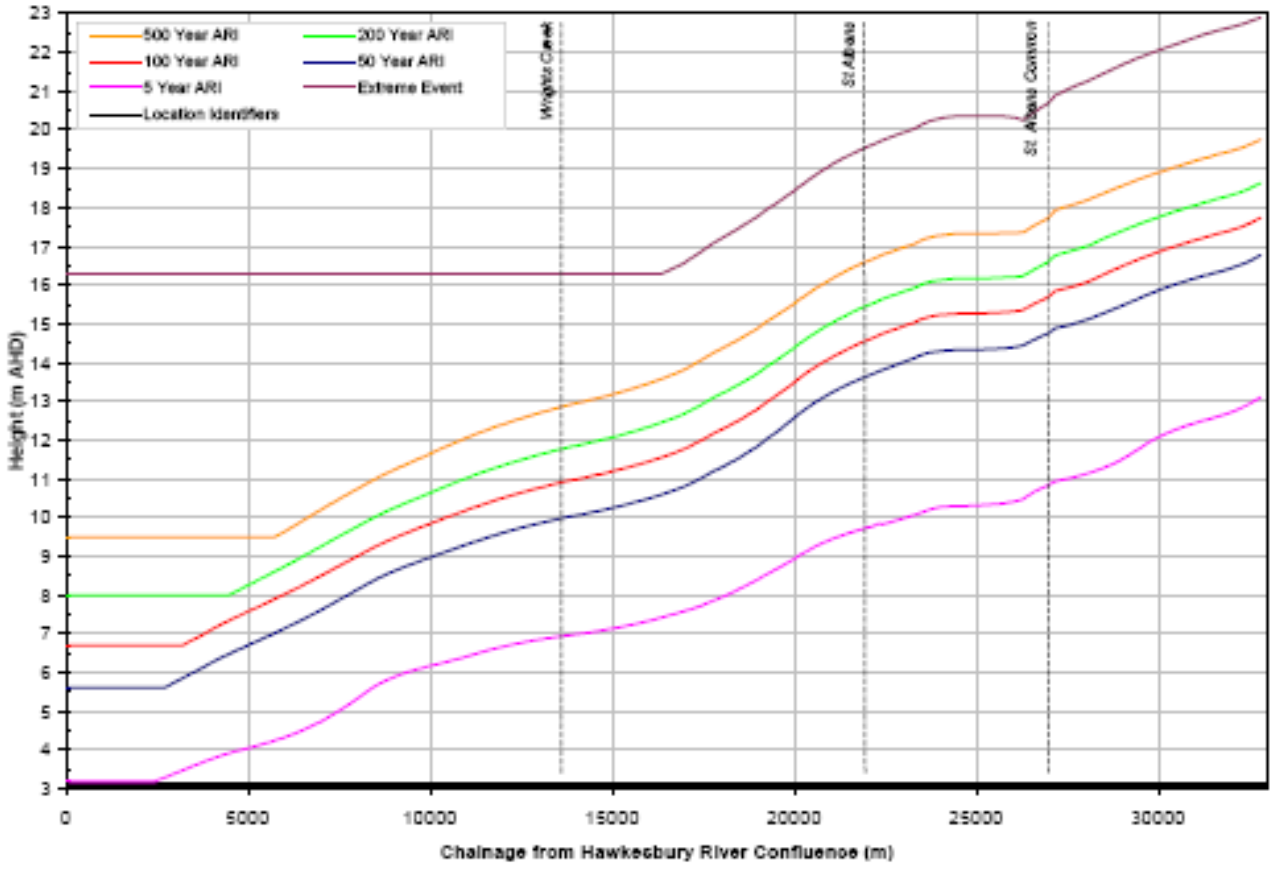
76. In addition, local residents were canvassed during the initial stages of the present study for information relating to past floods. Where possible, this information was used to provide flood height estimates, the levels of which were surveyed during the compilation of overbank cross-section data. A summary of available information is presented in Table 3.

Event	Location	Chainage from Hawkesbury River (m)	Level (mAHD)	Source (see footnote)	Council Point Reference No
1896	Wrights Ck Junction	13890	9.3	Council Profile 1984	-
1949		29440	15.83	Council Survey 2003	108
1949		28110	14.99	Council Survey 2003	503
1949		27140	14.2	Council Survey 2003	526
1949	~200m U/S of St Albans	22185	15.1	Council Survey 2004	1000
1949	St Albans	22185	14.3	Council Survey 2003	549
1949	St Albans	22185	14.65	Council Profile 1984	-
1949	Wrights Ck Junction	13890	8.8	Council Profile 1984	-
1949	Wrights Ck Junction	13890	10.6	Council Survey 2003	441
Mar 1978		29440	14.64	Council	105

Event	Location	Chainage from Hawkesbury River (m)	Level (mAHD)	Source (see footnote) Survey 2003	Council Point Reference No
Mar 1978		27140	13.2	Council Survey 2003	525
Mar 1978		16570	10.6	Council Survey 2003	151
Mar 1978	St Albans	22185	11.25	Council Profile 1984	-
Mar 1978	Wrights Ck Junction	13890	7.65	Council Profile 1984	-
Mar 1978		1910	4.9	Council Profile 1984	-
Aug 1990	St Albans	22185	8.75	Sydney Catchment Auth.	-

NOTE: 'Council Profile 1984' refers to a Flood Profile plan established by Council in 1984.

Flood Heights



Annex B
Effects of Flooding on the Community

Introduction

1. The consequences of flooding are best described relative to heights that can be measured on flood gauges at points along the Hawkesbury-Nepean River system. The gauges used are located at: Richmond (North Richmond Bridge), and Windsor (Windsor Bridge.

2. The North Richmond and Windsor river gauges relate to the major population centres affected by flooding. Windsor Bridge in particular, is the reference gauge for the largest part of the valley from Richmond downstream to Sackville. The main consequences of flooding are therefore described with reference to these gauges in the following paragraphs.

The Effects of the Probable Maximum Flood

3. The Probable Maximum Flood (PMF) is an extremely rare event having a probability of around one chance in 100,000 per year. The effects of a flood of this magnitude define the upper limit of what could happen. The PMF would directly affect over 15,000 residences and 53,000 persons through floodwater inundation alone. In the 72 hour PMF the following river levels could be reached:

   a. Richmond – 26.5 metres;
   b. Windsor – 26.4 metres.

   The main impacts at these flood levels are likely to be:

   a. 100% of Windsor flooded;
   b. 100% of Bligh Park flooded;
   c. 100% of Richmond flooded;
   d. 100% of McGraths Hill flooded;
   e. 100% of Pitt Town flooded;
   f. 50% of North Richmond flooded;
   g. 50% of Wilberforce flooded;
   h. 50% of the Riverstone and Marsden Park area flooded;
   i. All rural lands on the floodplain inundated;
   j. Telecommunications disabled with no PSTN or mobile telephone in Richmond, Windsor, Bligh Park, Pitt Town or Wilberforce for months;
   k. Gas supply to Richmond and Windsor cut off;

l. All electricity supply to the flooded area and surrounds lost for up to 6 months and substantial power disruption affecting up to 180,000 people;

m. The loss of electricity will shut water supply pumping and telephone exchanges (even if repaired) for Richmond, Windsor, Wilberforce and Glossodia;

n. Sewage treatment plants (STP's) will be inoperable and take from 3 months to 1 year to rebuild. Raw sewage will discharge into the river. STP's affected are Richmond, Riverstone, McGraths Hill and Windsor.

The Effects of a Flood Similar to the 1867 Flood of Record

4. In 1867 the most severe flood recorded to date (the flood of record) occurred in the valley. The flood is estimated to have reached levels equivalent to the following gauge heights:

a. 19.3 metres on the Windsor Bridge gauge with an AEP of 1:250;

b. 26.1-26.9 metres at Penrith and an AEP of 1:170;

c. No height recorded but at Camden an AEP of only about 1:15.

The reason for these differences in probability is that most of the flood flow came out of the Warragamba and Grose River catchments. The 1867 flood was not the most severe flood at all locations.

If a flood similar to the 1867 flood occurred in the present time the main impacts at these flood levels are likely to be:

a. 100% of McGraths Hill flooded, depths up to 3 metres over floor level;

b. 80% of Pitt Town flooded and 20% left as a flood island;

c. 50% of Windsor flooded, depths up to 3 metres over floor level and 50% left as a flood island;

d. 50% of Bligh Park flooded, depths up to 3 metres over floor level;

e. 20% of Richmond flooded and 20% left as a flood island;

f. Backwater flooding up South Creek to Werrington Creek confluence, up Ropes Creek to Forrester Road, and up Eastern Creek to Richmond Road at Quakers Hill;

g. Most rural lands on the floodplain inundated;

h. Telecommunications severely disrupted and no PSTN telephone in Windsor, Bligh Park, Pitt Town or Wilberforce;

i. Gas supply to Richmond and Windsor cut off;

j. All electricity supply to the flooded area shut down, substantial power disruption affecting up to 80,000 people including nearby areas for 2-5 weeks;

k. Water supply pumping for Richmond, Windsor, Wilberforce and Glossodia shut off due to the loss of electricity;

l. Where communities still have water, household sewer systems will function but most sewage treatment plants (STP's) will be inoperable. Raw sewage will discharge into the river. STPs affected are Richmond, Riverstone, McGraths Hill and Windsor.

The Impact of Less Severe Floods

5. For floods that are predicted to peak no higher than around 15.0 metres at Windsor (ie a Level 1 flood) there will be no need to completely evacuate the major population centres in the valley. The main effects of a flood around this level in the areas downstream of Richmond are:

   a. Windsor Rd, the only evacuation route for McGraths Hill, is cut at 13.5 metres;

   b. Much of the older developed area of McGraths Hill is inundated by 14 metres (ie below the previous 16 metres planning level);

   c. The Richmond/Blacktown Rd, one of the two evacuation routes for Windsor is cut by mainstream backup flooding on South Creek at 13.7 metres (the other route is The Northern Road);

   d. A significant number of the lower streets of Windsor are inundated;

   e. Access between Windsor and Richmond is cut at 14.2 metres;

   f. Up to 5000 people may need to be evacuated from rural areas in the Lowlands areas of Hawkesbury City Local Government Area and parts of the Lower Reaches (Cattai, Sackville, Lower Portland and Wisemans Ferry) in The Hills Shire.

6. Planning to deal with Level 1 flooding is contained in SES Local and SES Region Flood Plans.

Classifying Flood Affected Communities

7. Communities are classified according to the impact that flooding has on them. Flood affected communities are those in which the normal functioning of services is altered either directly or indirectly because a flood results in the need for external assistance. This impact relates directly to the operational issues of evacuation, resupply and rescue.

8. The five classifications used are described below.

   NOTE: These definitions are described in terms of the impact of a PMF. Because of the difference in flood effects at lower levels, the operational classification of an area during an actual flood of lower severity could be different to the PMF planning classification. The defining flood level must therefore be stated for any classification.

Flood Islands

These are inhabited areas of high ground within a floodplain linked to the

flood-free valley sides by a road along a low ridge. The road can be cut by floodwater, closing the only evacuation route and creating an island.

After closure of the road the only access to the area is by boat or by aircraft.

Flood islands are classified according to what can happen after the evacuation route is cut.

Category FH: The flood island is higher than the limit of flooding (ie above the PMF). The island is surrounded by floodwater but there is no direct risk to life or property on the island from inundation. The area will require resupply by boat or air if not evacuated before the road is cut. If it will not be possible to provide adequate support during the period of isolation, evacuation will have to take place before isolation occurs.

Category FL: The flood island is lower than the limit of flooding (ie below the PMF). If floodwater continues to rise after it is isolated, the island will eventually be completely covered. People left stranded on the island will drown and property will be inundated.

Areas Accessible Overland (Category O)

These are inhabited areas on flood prone ridges jutting into the floodplain or on the valley side. The access road/s cross lower lying flood prone land.

Evacuation can take place by road only until access roads are closed by floodwater. Escape from rising floodwater will be possible by walking overland to higher ground. Anyone not able to walk out must be reached by using boats and/or aircraft. If people cannot get out before inundation, rescue will most likely be from rooftops.

Areas Accessible by Road (Category R)

These are inhabited areas on flood prone ridges jutting into the floodplain or on the valley side with access road/s rising steadily uphill and away from the rising floodwaters. The community can not be completely isolated before inundation reaches its maximum extent.

Evacuation can take place by vehicle or on foot along the road as floodwater advances. People should not be trapped unless they delay their evacuation. For example people living in two storey homes may initially decide to stay but reconsider after water surrounds them.

These communities contain low-lying areas from which persons will be progressively evacuated to higher ground as the level of inundation increases. This inundation could be caused either by direct flooding from the river system or by localised flooding from creeks.

Landlocked Areas (Category L)

These are inhabited areas above the PMF so there is no risk of inundation of homes by floodwater but the only access road/s are across flood prone land.

Road access may be closed during a flood. In some cases normal access to the area is by boat but flood conditions may prevent usual boat access.

Due to isolation these areas are likely to require resupply. If it is not possible to provide adequate support, evacuation will have to take place before isolation occurs.

Indirectly Affected areas (Category I)

There will be areas outside the limit of flooding which will not be inundated and will not lose road access. Never the less they may be indirectly affected as a result of flood damaged infrastructure. Due to the loss of transport links, electricity supply, water supply, sewerage or telecommunications services they may require resupply or in the worst case, evacuation.

The Operational Implications of Flood Consequences

9. There are several likely operational scenarios during severe floods. The response operation will have to deal with one or more of the issues described below (refer to para 7 for category descriptions):

   a. The need to evacuate large numbers of people from potential flood islands of category FL and potential areas of isolation of category O and to do this **before road access is cut**;

   b. The need to continue to evacuate or commence to evacuate, large numbers of people **after road access is cut** to areas of category FL or category O ie mass rescue before the area is inundated;

   c. The need to resupply substantial numbers of people in isolated communities. Note that for lower levels of flooding there will be relatively more areas that are isolated than in the case of a PMF. In a PMF isolation only applies to flood islands of category FH and areas of Category L because all lower land will be under water;

   d. The need to sustain numbers of people (largest in number for a PMF), in the indirectly affected areas ie Category I areas.

10. The scale of these likely flood operations is indicated by the population figures in the following table. The numbers based on the 2006 census are:

Table 1 - Population Figures

Pitt Town	1308
McGraths Hill	2470
Windsor Downs	1276
Bligh Park	6494
Windsor/South Windsor	7528

Richmond	7,575
Total	**27,903**

11. The consequences previously described and therefore the need for the operations dealing with them, are essentially dependent on the level of flooding at Windsor being likely to exceed a level of between 14 to 16 metres at the Windsor Bridge gauge. Because of the inherent uncertainty in the early stages of a developing flood, the decision to activate this Flood Emergency Sub Plan will be made on the basis of any information which indicates that a level of 15 metres at Windsor may be exceeded. This is explained more fully in Part 6 – Concept of Operations.

Duration of Evacuations

12. Because of the wide variation in flood behaviour between different flood events, it is difficult to predict how long homes might be inundated or areas isolated. However, an indication for some of the more severe events might be gained from the following:

    a. During a 17.3 metres AHD flood , levels of flooding at Richmond and Windsor (above 10 metres AHD) could last for about 4 to 5 days;

    b. During a repeat of the 1867 flood (19.3 metres AHD at Windsor), river levels could remain above 25 metres AHD for a day at Penrith and above 16 metres AHD for about 3 days at Richmond and Windsor. Access to Windsor could be cut for an additional half day;

    c. During the PMF river levels could remain above 25 metres AHD for up to 3 days at Penrith and above 16 metres AHD for as long as 4 days at Richmond and Windsor. Access to Windsor could be cut for an additional half day.

13. Once floodwaters have receded, recovery operations and the restoration of services could take some time. For example, even though road access was possible 6 days after the evacuation of Nyngan in April 1990, it was 3 days later before residents were able to visit to inspect homes, assess damage, sort goods and assist with the clean up. It was an additional 12 days before residents were able to begin occupying their homes.

Description of Sectors

Sector Name	Sub-Sectors
Yarramundi	
McGraths Hill	McGraths Hill Mulgrave Vineyard North

Pitt Town	Pitt Town Pitt Town Bottoms Pitt Town South Pitt Town East Pitt Town North
Windsor	Windsor North Windsor Central Windsor South Windsor
Bligh Park	Bligh Park West Bligh Park East
Windsor Downs	Windsor Downs
Richmond	Clarendon East Richmond Richmond Hobartville Agnes Banks
Richmond Lowlands	Cornwallis Agnes Banks Lowlands
North Richmond	North Richmond North Richmond Lowlands Grose Wold
Wilberforce	Wilberforce Glossodia Freemans Reach Freemans Reach Lowlands East Kurrajong Gronos Point Ebenezer Lower Portland
Oakville/Cattai	Oakville Cattai
Colo River	Upper Colo Central Colo Colo Heights
Webbs Creek	Webbs Creek Leetsvale
Macdonald River	Lower Macdonald

Central Macdonald
St Albans
Upper Macdonald

Lower Level Flooding

14. A number of areas within the City are affected by Minor and Moderate levels of flooding (5.8 to 12.2 metres AHD at the Windsor Bridge). They are mainly fertile river flats used for farming or leisure facilities (caravan parks and picnic grounds). The areas are relatively sparsely populated with a total of about 30 residences (70 persons) and a 'permanent' caravan park population of about 60 families. The weekend and holiday population can be significantly higher. Also of concern is the livestock that needs to be evacuated from these lowland areas.

15. The areas affected are:

    a. Agnes Banks Lowlands.

    b. Cornwallis.

    c. Richmond Lowlands.

    d. Gronos Point.

    e. Freemans Reach Lowlands.

    f. Pitt Town Bottoms.

    g. The river bank areas less than 10m AHD downstream of Pitt Town.

Isolated Areas

16. The Yarramundi area is isolated from the eastern side of the Hawkesbury River when the Yarramundi Bridge is inundated at the bridge deck level of 5.4 metres AHD. From that height the only road access to the Yarramundi area is via the Hawkesbury Road from Glenbrook. When the Hawkesbury Road is inundated the Yarramundi area is fully isolated.

17. The City area west of the Hawkesbury River, north of the Grose River and south of Webbs Creek is progressively isolated from the eastern side when the:

    a. North Richmond Bridge is inundated at the bridge deck level at 8.4 metres AHD.

    b. Windsor Bridge is inundated at the bridge deck level at 7.0 metres AHD.

    c. Vehicular ferry services at Sackville and Lower Portland cease to operate when the river height reaches 3.0m AHD at Windsor. Webbs Creek and Wiseman Ferries are normally taken out of service later.

18. When the North Richmond Bridge, Windsor Bridge and the Sackville, Lower Portland

and Webbs Creek ferries are taken out of service, the western parts of the City from North Richmond to Webbs Creek become more isolated. The only road access to this area is via the Bell Lines of Road and the Putty Road.

19. For low levels of flooding on the Hawkesbury and for low levels of flooding on the Macdonald River, the Macdonald Valley is isolated when:

    a. The Webbs Creek ferry is taken out of service for low levels of flooding on the Hawkesbury River. This cuts access to St Albans Road.

    b. St Albans Road is cut at 1.47m AHD about 2km from the confluence of the Hawkesbury River and Macdonald River.

    c. The ferry at Wisemans Ferry is taken out of service for low levels of flooding on the Hawkesbury River. This cuts access to Settlers Road.

    d. Settlers Road cut at 1.88m AHD about 1km from the confluence of the two rivers.

Flood Islands

McGraths Hill Sector

20. The relevant gauge for this Sector is the Windsor gauge (gauge zero 0.15m AHD). The flood surface in the McGraths Sector can be considered flat, to a reasonable degree of approximation, relative to the Windsor flood gauge.

21. **McGrath's Hill Sub-Sector** – the area is progressively isolated and becomes a flood island due to access roads being inundated as follows:

    a. At 6.19m AHD Pitt Town Road is inundated at McKenzies Creek. This isolates McGraths Hill from Pitt Town.

    b. At 6.75 m AHD Windsor Road is inundated on the flat between Windsor and McGraths Hill.

    c. At 8.251m AHD the Old Hawkesbury Road is inundated just south of McGrath Road in McGraths Hill.

    d. At 8.85m AHD Mulgrave Road, Mulgrave, is inundated.

    e. At 13.5m AHD Windsor Road is inundated at a number of points from Curtis Road to Henry Road. Windsor Road is the last evacuation route out of the Sector.

    f. For floods greater than 13.5m AHD the McGraths Hill area is a flood island.

22. **Mulgrave Sub-Sector** – the area is progressively isolated due to access roads being inundated as follows:

    a. At 6.75 m AHD Windsor Road is cut on the flat between Windsor and McGraths Hill.

b. At 8.251m AHD the Old Hawkesbury Road is inundated just south of McGrath Road in McGraths Hill.

c. At 8.85m AHD Mulgrave Road, Mulgrave, is flooded.

d. At 13.5m AHD Windsor Road is flooded at a number of points from Curtis Road to Henry Road. Windsor Road is the last evacuation route out of the Sector.

Pitt Town Sector

23. The relevant gauge for this Sector is the Windsor gauge (gauge zero 0.15m AHD). The flood surface in the Pitt Town Sector can be considered flat relative to the Windsor flood gauge.

24. The Pitt Town Sector consists of the following sub-sectors:

a. Pitt Town South East

b. Pitt Town South

c. Pitt Town

d. Pitt Town North

e. Pitt Town East

f. Pitt Town North East

25. **Pitt Town Bottoms Sub-Sector** – the area is progressively isolated due to access roads being cut as follows:

a. At 5.64m AHD the southern end of Pitt Town Bottoms Road is inundated.

b. At 6.34m AHD (6.19m gauge height) at road point RL2007, the northern end of Pitt Town Bottoms Road is inundated. This isolates Pitt Town Bottoms from Pitt Town.

26. **Pitt Town North Sub-Sector** - becomes a flood island when Hall Street is cut by flooding at 7.32m AHD (7.18m gauge height). The last road evacuation route is via Hall Street to Pitt Town. This island is fully submerged at 16.613m AHD (16.463m gauge height).

27. **Pitt Town South Sub-Sector** - progressively becomes an overland access area when:

a. At 6.19m AHD Pitt Town Road is inundated at the bridge over McKenzies Creek. This isolates Pitt Town from McGrath Hill.

b. At 7.839m AHD (7.689m gauge height) Pitt Town Road is inundated (road point RL2019) isolating the sub-sector from Pitt Town.

c. At approximately 11.0m Saunders Road, the last road evacuation route is inundated resulting in the complete isolation of the Sub-Sector.

28. **Pitt Town Central Sub-Sector** becomes a flood island at 15.92m AHD (15.78m gauge

height). The access roads are inundated progressively as follows:

a. Cattai Road is inundated at 5.168m AHD (5.018m gauge height) at road pont RL2035.

b. Pitt Town Road is inundated at 6.85m AHD (6.7m gauge height).

c. Old Pitt Town Road is inundated at approximately 10-11m AHD near the intersection of Cattai Road.

d. Pitt Town-Dural Road is inundated at 10.853m AHD (10.703m gauge height).

29. The northern part of the Pitt Town Central Sub Sector has a portion which is flood free above 24m AHD (PMF). This would be a last resort as a refuge area from which people could be evacuated.

30. **Pitt Town East Sub-Sector** becomes a road access area as the following road points are inundated:

a. Pitt Town Road is inundated at 6.85 m AHD (6.7m gauge height) near the intersection with Glebe Road.

b. Pitt Town Road is inundated at 7.839m AHD (7.689m gauge height).

31. Sector evacuation routes leading out of this Sub-Sector include:

a. Schofield Road onto the Pitt Town Evacuation Route

b. Glebe Road turning left onto Old Stock Route Road then right onto Pitt Town Evacuation Route

c. Old Pitt Town Road onto Pitt Town Evacuation Route

d. Avondale Road onto Schofield Road onto Pitt Town Evacuation Route

32. **Pitt Town North East Sub-Sector** becomes a road access area. The first properties are flood around 9-10m AHD (8.85-9.85m gauge height).

33. Note that this Sub-Sector is separated by floodwaters from Marayla (in the Oakville-Cattai Sector).

Windsor Sector

34. The relevant gauge for this Sector is the Windsor gauge (gauge zero 0.15m AHD). The flood surface in the Windsor Sector can be considered flat, to a reasonable degree of approximation, relative to the Windsor flood gauge.

35. The Windsor Sector consists of the following sub-sectors:

a. Windsor North

b. Windsor Central

c. Windsor

d. Windsor South

36. The community of South East Windsor (James Meehan Stteet/Harris Street and Chisholm Place) is situated adjacent to South Creek and immediately north of the railway line. Approximately 60 properties are located below the 1 in 50 flood level of 15.7m AHD.

37. **Windsor North Sub-Sector** becomes a flood island when the road evacuation routes are inundated as follows:

a. Corner of Pitt Street and Palmer Street is inundated at approximately 10m AHD

b. George Street near Palmer Street is inundated at approximately 10m AHD.

38. There are only a small number of properties in this Sub-Sector.

39. **Windsor Central Sub-Sector** becomes a flood island at approximately 14m AHD (13.85m gauge height). The access roads are inundated progressively as follows:

a. Corner of Pitt Street and Palmer Street is inundated at approximately 10m AHD.

b. George Street near Palmer Street is inundated at approximately 10m AHD.

c. George Street near Holland St in front of the Windsor Riverview Shopping Centre is inundated at approximately 14m AHD

d. Pedestrian access through the shopping centre to 17.3m AHD.

40. **Windsor Sub-Sector** becomes a flood island at 17.3m AHD when the Jim Anderson Bridge over South Creek is inundated. The access roads are inundated progressively as follows:

a. At 6.75m AHD (6.60 m gauge height) Windsor Road is cut on the flat between Windsor and McGraths Hill.

b. At 7m AHD (6.85m gauge height) the Windsor Bridge is flooded. This isolates the western side of the Hawkesbury River from Windsor

c. At 8.61m AHD (8.46m gauge height) Greenway Crescent, Windsor, at Rickabys Creek is inundated on the flat between Windsor and Cornwallis.

d. At 14m AHD (13.85m gauge height) the Richmond Road at Rickabys Creek is inundated. This isolates Windsor from Richmond.

e. George Street is inundated at the railway underpass at 12m AHD (11.85 m gauge height) at road point RL

f. George Street near Holland Street in front of the Shopping Centre is inundated at approximately 14m AHD (check height)

g. Macquarie Street is inundated at the railway underpass at 12m AHD (11.85 m gauge height)

h. At 15m AHD (14.85m gauge height) George Street is cut near Rifle Range Road at Bligh Park.

i. For floods greater than 17.3m AHD the Windsor area is a flood island.

41. **Windsor South Sub-Sector** becomes a flood island at 17.3m AHD when the Jim Anderson Bridge over South Creek is inundated. The access roads are inundated progressively as follows:

a. At 6.75m AHD Windsor Road is cut on the flat between Windsor and McGraths Hill.

b. At 7m AHD the Windsor Bridge is flooded. This isolates the western side of the Hawkesbury River from Windsor

c. At 8.61m AHD Greenway Crescent, Windsor, at Rickabys Creek is inundated on the flat between Windsor and Cornwallis.

d. George Street is inundated at the railway underpass at 12m AHD (11.85 m gauge height) at road point RL

e. Macquarie Street is inundated at the railway underpass at 12m AHD (11.85m gauge height)

f. At 14m AHD the Richmond Road at Rickabys Creek is inundated. This isolates Windsor from Richmond.

g. At 15m AHD (14.85 gauge height) George Street is inundated near Rifle Range Road at Bligh Park. Currently this is the last evacuation route out of the Windsor/South Windsor area.

h. For floods greater than 15m AHD the Windsor area is a flood island.

42. Note that the Cox Street railway crossing is inundated at approximately 19-20m AHD. When George Street and Macquarie Street are inundated at the railway underpasses then this the only road link between the Windsor South and Windsor Sub-Sectors.

Bligh Park Sector

43. The relevant gauge for this Sector is the Windsor flood gauge (gauge zero 0.15m AHD). The flood surface in the Bligh Park Sector can be considered flat, to a reasonable degree of approximation, relative to the Windsor flood gauge.

44. The Bligh Park area is progressively isolated due to access roads being cut as follows:

a. At 14.38m AHD the Blacktown-Richmond Road is cut by Rickabys Creek between the bridge on Rickabys Creek and George Street. This cuts direct access between Richmond and Bligh Park

b. At 15.0m AHD Collith Street, South Windsor, is cut just north of Tasman Place.

c. At 15m AHD George St is cut near Rifle Range Road. This isolates Bligh Park from Windsor.

d. At 15m AHD the low spot (12.15m AHD) on Rifle Range Road at the corner of Mileham Street is inundated by floodwaters. This results in Bligh Park being isolated from South Windsor.

e. At 17.3m AHD the Thorley Street flood evacuation exit is cut. This is the last road evacuation route out of theBligh Park Sector.

f. For floods greater than 17.3m AHD the Bligh Park area is a flood island.

Richmond Sector

45. The relevant gauge for most of this Sector is the Windsor flood gauge (gauge zero 0.15m AHD) due to backwater flooding along Rickabys Creek being the main effect of flooding in this Sector until floodwaters breach the bank of the Hawkesbury River in the Richmond Lowlands.

46. The flood surface in the Richmond Sector can be considered flat, to a reasonable degree of approximation, relative to the Windsor flood gauge.

47. **Richmond** – the area is progressively isolated due to access roads being cut as follows:

a. At 14m AHD the Windsor-Richmond Road is cut by Rickabys Creek . This cuts Windsor off from Richmond.

b. At 14.38m AHD the Blacktown-Richmond Road is cut by Rickabys Creek between the bridge on Rickabys Creek and George Street. This cuts direct access between Richmond and Bligh Park

c. At 18m AHD Londonderry Road is cut by Rickabys Creek north of Namatjira Avenue, Londonderry.

d. At 20m AHD The Driftway is cut between Castlereagh Road and Bonner Road.

Annex C
Gauges Monitored by the Hawkesbury SES Local Headquarters

Stream	Gauge Name	Gauge Number	Flood Classification (metres)			1% AEP	PMF	Flood of Record (metres)	Flood Warnings by BOM	Local Flood Advices provided by SES
			Minor	Moderate	Major					
Hawkesbury River	North Richmond Bridge *	212902	4.3	8.4	11.0	17.5	29.0	20.1 (1867)	Yes	
	Windsor Bridge *	212903	5.8	7.0	12.2	17.3	26.0	19.3 (1867)	Yes	
	Sackville Ferry *	212406	4.6	7.3	9.7	12.0		15.6 (1867)	Yes	
	Lower Portland (Ferry) *	212407	4.6	6.1	7.6	8.8		11.5 (1867)	Yes	
	Webbs Creek (Wisemans Ferry)	212408	-	3.5	4.2	6.7	16.3	6.0 (1867)	Yes	
Colo River	Putty Road (Colo River) *	212908	2.7	5.7	10.7			15.9 (1978)	Yes	

Notes:

1. The SES holds a Flood Intelligence Card for the gauges marked with an asterisk *.

Annex D
Dissemination Options for SES Flood Information and Warning Products

The Sydney Western Region Headquarters distributes SES Flood Bulletins, SES Evacuation Warnings and SES Evacuation Orders to the following regional media outlets and agencies:

Television Stations

ABN Channel 2
ATN Channel 7
TCN Channel 9
Channel 10 NSW
SBS TV
Sky News Australia
NHK Sydney (Japan Broadcasting Corporation)

Commercial Radio Stations

2CH
2UE
2GB
2SM
702 ABC Sydney
Radio National
SBS Radio Sydney
96.1 The Edge FM
Mix 106.5 FM
Nova 96.9 FM
2 Day FM
Triple J (National)
Triple M Sydney
WS FM 101.7
Hawkesbury Radio 89.9 FM

Newspapers and other Print Media

News Limited
Fairfax Limited
Sydney Morning Herald
The Australian
Daily Telegraph
Sunday Telegraph
Sun Herald

Other Agencies

All other agencies listed under this plan will be sent flood bulletins.

Annex E
Template Evacuation Warning, Evacuation Order and All Clear

Flood Evacuation Warning

[name] SES Region Headquarters

[Enter address]
[########]

Telephone: (02)

Fax: (02)

[########]
Issued *[day] [date]* at *[time in civilian format (am,pm)]*

Email: [#########]

Radio stations are asked to immediately broadcast this message and repeat it.

Use of the Standard Emergency Warning Signal (SEWS) with this message is authorized.

Flood Evacuation Warning for [Enter location/s]

Authorised By: [(name and operational position title)]

As a result of the flood level predicted by the Bureau of Meteorology for [***location***] at [***date/time***] the State Emergency Service recommends that residents within the nominated areas should prepare to evacuate within the next [***number***] hours.

Residents should monitor the situation and be prepared to evacuate when instructed to do so. A Flood Evacuation Order will be issued by the SES if evacuation is required.

You can choose to go to friends or relatives. Alternatively, evacuation centres will be established at [***location/s***] where you can obtain temporary accommodation and other help.

To prepare for possible evacuation you should:

- Raise belongings by placing them on tables, beds and benches. Put electrical items on top. You may be able to place light weight items in the roof space.
- Collect together medicines, personal and financial documents, mementos and photos
- If possible, check to see if your neighbours need help
- Make arrangements for care of pets or other animals, or take your pets with you when you evacuate
- Take three days' supply of clothing and medicines
- Find out where to turn off the electricity and gas
- Continue to listen to a local radio station for updates

Don't walk ride or drive through floodwaters – this is the main cause of death and injury during floods

For emergency assistance telephone the SES on 132 500

Web site: www.ses.nsw.gov.au

End SES Flood Evacuation Warning

[Enter next update and currency details]

Flood Evacuation Order

[name] SES Region Headquarters

[Enter address]
[########]

[########]
Issued *[day] [date]* at *[time in civilian format (am,pm)]*

Telephone: (02)

Fax: (02)

Email: [#########]

Radio stations are asked to immediately broadcast this message and repeat it.

Use of the Standard Emergency Warning Signal (SEWS) with this message is authorized.

Flood Evacuation Order for [Enter locations]

Authorised By: [*(name & operational position title)*]

As a result of the flood level predicted by the Bureau of Meteorology for [***location***] at [***date/time***] the State Emergency Service is directing residents within the nominated areas to evacuate within the next [***number***] hours.

Do not delay your evacuation. Roads will be congested or closed. You could become trapped and need rescue. Remaining in flooded areas is dangerous and may place your life at risk.

You can choose to go to friends or relatives. Alternatively, evacuation centres will be established at [***location/s***] where you can obtain temporary accommodation and other help.

Delete as required {If you don't have a car, buses may operate where possible on normal routes. Special transport can also be provided on request if necessary, telephone [***telephone number***]}

As you evacuate you should:

- Take your important documents, mementos and photos
- Take your spare clothing and medicines
- If possible, check to see if your neighbours need help
- Turn off the electricity and gas
- Don't walk ride or drive through floodwater
- Continue to listen to a local radio station for updates

For emergency assistance telephone the SES on 132500

SES web site: www.ses.nsw.gov.au

End SES Flood Evacuation Order

This Flood Evacuation Order remains current until the All Clear has been issued

ALL CLEAR
[name] SES Region Headquarters

[Enter address]
[########]

[########]
Issued *[day] [date]* at *[time in civilian format (am,pm)]*

Telephone: (02)

Fax: (02)

Email: [#########]

Radio stations are asked to immediately broadcast this message and repeat it.

All Clear for [Enter locations]

Authorised By: [*(name & operational position title)*]

[Describe the condition that justify the All Clear including any special precautions/conditions and safety advices that people must take]

The SES has issued the ALL CLEAR for [enter locations] at [time / date]. This means that it is now safe to return to [enter locations].

People with access to transport can return to their properties now.

[People who/If you] require transport assistance you should contact [insert contact details] for further information on arrangement for return.

For emergency assistance telephone the SES on 132500

SES web site: www.ses.nsw.gov.au

End SES All Clear

Annex F
Arrangements for the Evacuation of Caravan Parks and the Relocation of Caravans

Advising Procedures

1. Caravan Park proprietors will ensure that the owners and occupiers of caravans are:

   a. Made aware that the caravan park is flood liable by:

      i. Handing a printed notice to occupiers taking up residence. The notice will indicate that the caravan park is liable to flooding and outline the evacuation and van relocation arrangements as detailed in this Annex.
      ii. Displaying this notice prominently in each van.

   b. Made aware that if they are expecting to be absent from their vans for extended periods, they must:

      i. Provide the manager with a key; in a sealed envelope; to the van.
      ii. Provide a contact address and telephone number.
      iii. Inform the manager if a vehicle will be required to relocate the van during flood time.
      iv. Leave any mobile van in a condition allowing it to be towed in an emergency (ie: tyres inflated, jacks wound up, personal effects secured and annexes and lines for water, sewer, electricity and gas readily detachable).

   c. Informed when a flood is rising. At this time, occupiers will be advised to:

      i. Ensure that they have spare batteries for their radios.
      ii. Listen to a local radio station for updated flood information.
      iii. Prepare for evacuation and van relocation.

2. The SES Local Controller will ensure that the managers of caravan parks are advised of flood warnings and the details of any evacuation order.

Evacuation of Occupants and Relocation of Vans

3. Caravan park proprietors will install flood depth indicators and road alignment markers within their caravan parks.

4. When an evacuation order is given:

   a. Occupiers of non-movable vans should:

      i. Secure their vans by tying them down to prevent flotation.
      ii. Isolate power to their vans.

iii. Collect personal papers, medicines, a change of clothing, toiletries and bedclothes.

iv. Lift the other contents of their vans as high as possible within the van.

v. Move to a designated evacuation centre in [enter location] if they have their own transport, or move to the caravan office to await transport.

b. Where possible, vans that can be moved will be relocated by their owners. Park managers will arrange for the relocation of mobile vans whose owners do not have a vehicle. Council and SES personnel will assist if required and may be able to provide additional vehicles. Vans are to be moved to the following locations:

5. Caravan park managers will:

a. Ensure that their caravan park is capable of being evacuated.

b. Advise the SES Local Controller of:

- The number of people requiring transport.
- Details of any medical evacuations required.
- Whether additional assistance is required to effect the evacuation.

c. Check that no people remain in non-removable vans that are likely to be inundated

d. Inform the SES Local Controller when the evacuation of the caravan park has been completed.

e. Provide the SES Local Controller with a register of people that have been evacuated.

Return of Occupants and Vans

6. The SES Local Controller, using council resources as necessary, will advise when it is safe for the caravan parks to be re-occupied.

7. Vans will be towed back to the caravan park(s) by van owners or by vehicles and drivers arranged by the park managers. Again, Council and SES personnel will assist if available.

Annex G
Resupply Flowchart

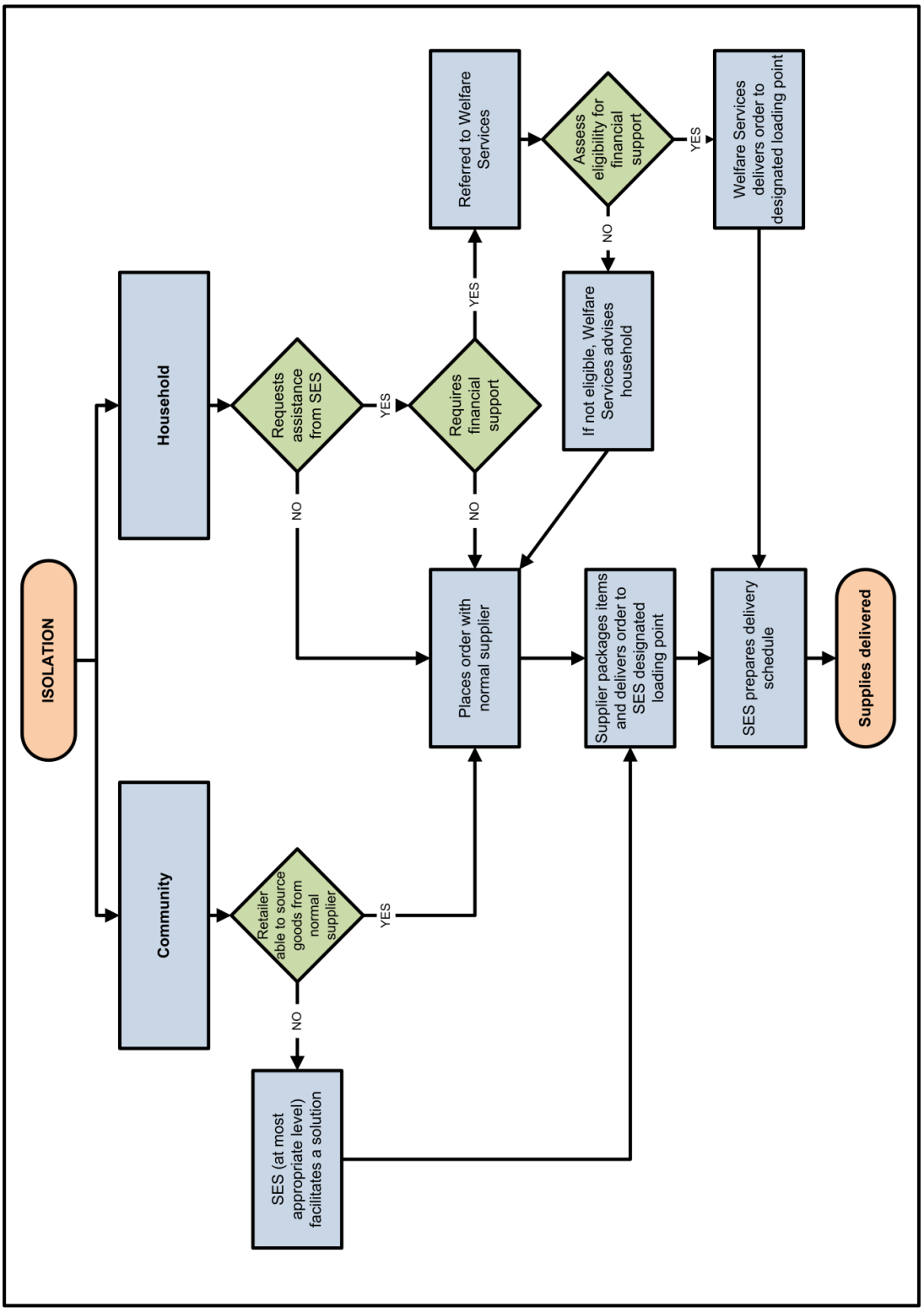


Figure G 1: Resupply Flowchart. Please note that the flowchart outlines the resupply process but does not encompass all potential situations and/or outcomes.