

**TRANSMITTAL ADVICE**

Date: [REDACTED]

TO: [REDACTED]

Attention: [REDACTED]

PO Box 15536
City East
Q 4002

DESCRIPTION

Emergency Action Plan – Kroombit Dam -
Telephone and Radio Notification List – Section 3;
Controlled Copy sheet Update – Section 1

Attached is a revised insert for the Emergency Action Plan for the above Dam.
Please:

- Place the new pages into Sections 1 and 3 and discard the superseded pages
- Sign the receipt advice below and return same by mail or Fax

RECEIPT ADVICEReceived by [REDACTED]

.....Date. [REDACTED]

Designation [REDACTED]**Return this Transmittal Advice to:**

Principal Engineer Dam Safety,
Infrastructure Management
SunWater
PO Box 15536,
City East, Qld 4002

Or Fax to [REDACTED]**QFCI**

Date:

27/05/11

Jm

Exhibit Number:

512

SECTION 1

TABLE OF CONTENTS

SECTION 1	Table of Contents, Controlled Copy Distribution List and Document Control Sheet
SECTION 2	Emergency Evaluation Procedures
SECTION 3	Notification & Emergency Communication List
SECTION 4	Introduction to EAP, Responsibilities & Dam Description

SECTION 5	Emergency Identification, Evaluation and Actions <ul style="list-style-type: none"> • Scenario 1: Flood Operation • Scenario 2: Rapid Drawdown • Scenario 3: Sunny Day Failure (Earthquake or Piping) • Scenario 4: Chemical / Toxic Spill • Scenario 5: Terrorist Activity (Threat / Hoax) 	SunWater Internal Copies Only	Dam Regulator & SunWater Internal Copies Only
SECTION 6	Emergency Event Operation Recording Procedures <ul style="list-style-type: none"> • Emergency Event Recording Sheets • Flood Operation record sheet • Sunny Day Failure (Earthquake) record sheet • Sunny Day Failure (Piping) record sheet • Chemical / Toxic Spill record sheet • Terrorist Activity record sheet 		
SECTION 7	Emergency Access Routes & Preventative Actions <ul style="list-style-type: none"> • Preventative Actions • Alternative Access Routes • Locality Plan 		
SECTION 8	Lowering Storage Level, Discharge and Storage Curves <ul style="list-style-type: none"> • Lowering the Storage Level • Spillway Discharge Rating Curves • Storage Curve 		

SECTION 9	Flood Impact Downstream, River Cross-sections & Inundation Maps
SECTION 10	Definitions and Analysis <ul style="list-style-type: none"> • Incident, Emergency Response, Crisis and Business Continuity Management Manual • Flood Event Definitions and Abbreviations • Earthquake Assessment (Modified Mercalli Scale) • Queensland Disaster Management System • Weather Information (Flood Warning)

CONTROLLED COPY DISTRIBUTION

Copy Number	Position	Location
1	Storage Operator, Kroombit Dam	SunWater – Biloela Depot
2	Service Manager/ EEC	SunWater – Biloela Depot
3	Area Operations Manager- Central (Bundaberg)	SunWater - Area Operations Centre – Central (Bundaberg)
4	Manager, Asset Management	SunWater, Brisbane
5	Director, Dam Safety (Water Supply), Water Industry Compliance	DERM (Dept of Environment and Resource Management), Brisbane
6	Counter Disaster Executive Officer	Banana Shire Council - Biloela
7	Officer in Charge - Biloela Police	Police, Biloela
8	District Disaster Coordinator (Gladstone)	Police, Gladstone
9	Director disaster Management Services, Emergency Management Queensland (EMQ)	State Disaster Coordination Centre – Department of Community Safety, Brisbane
Note: For Phone numbers and addresses of 'Controlled Copy Holders' - See Section 3.		

DOCUMENT CONTROL SHEET

CONTROLLED COPY NUMBER: 4

AUTHORISATION:

Approved by:



Date: November 2010

(Manager, Asset Management, Infrastructure Management)

REVISION STATUS:

Issue-Revision Number	Revision Description	Section	Revision Date
Issue 2-0	Significant changes of Callide Dam Emergency Action Plan to reflect SunWater Management Structure and other minor changes.		May 2008

Note: Future updates to the Notification and Emergency Communication List (Section 3) as required by the Regulator (See Dam Safety Condition Schedule – Section 10) shall be compiled by the relevant SunWater Area Operations Centres and saved in HB File 08-000388/001. Once updating has been finalised the Area Operations Manager/Service Manager shall notify the Senior Engineer Headworks (SEH) – Brisbane, and the SEH will approve and organise the printing and distribution of this updated information to the 'Controlled Copy Holders' (see Section 3 for Phone numbers and addresses).

AMENDMENTS:

Amendment Number	Description	Section	Amendment Date
	Note: Any suggestion or comment should be forwarded to Principal Engineer Dam Safety, Brisbane.		
Issue 2-1 2A	Amendments to Sections 1, 2, 3, 5, and 10 Controlled Copy Sheet updates	1,P2	November '10

SECTION 2

EMERGENCY EVALUATION PROCEDURES

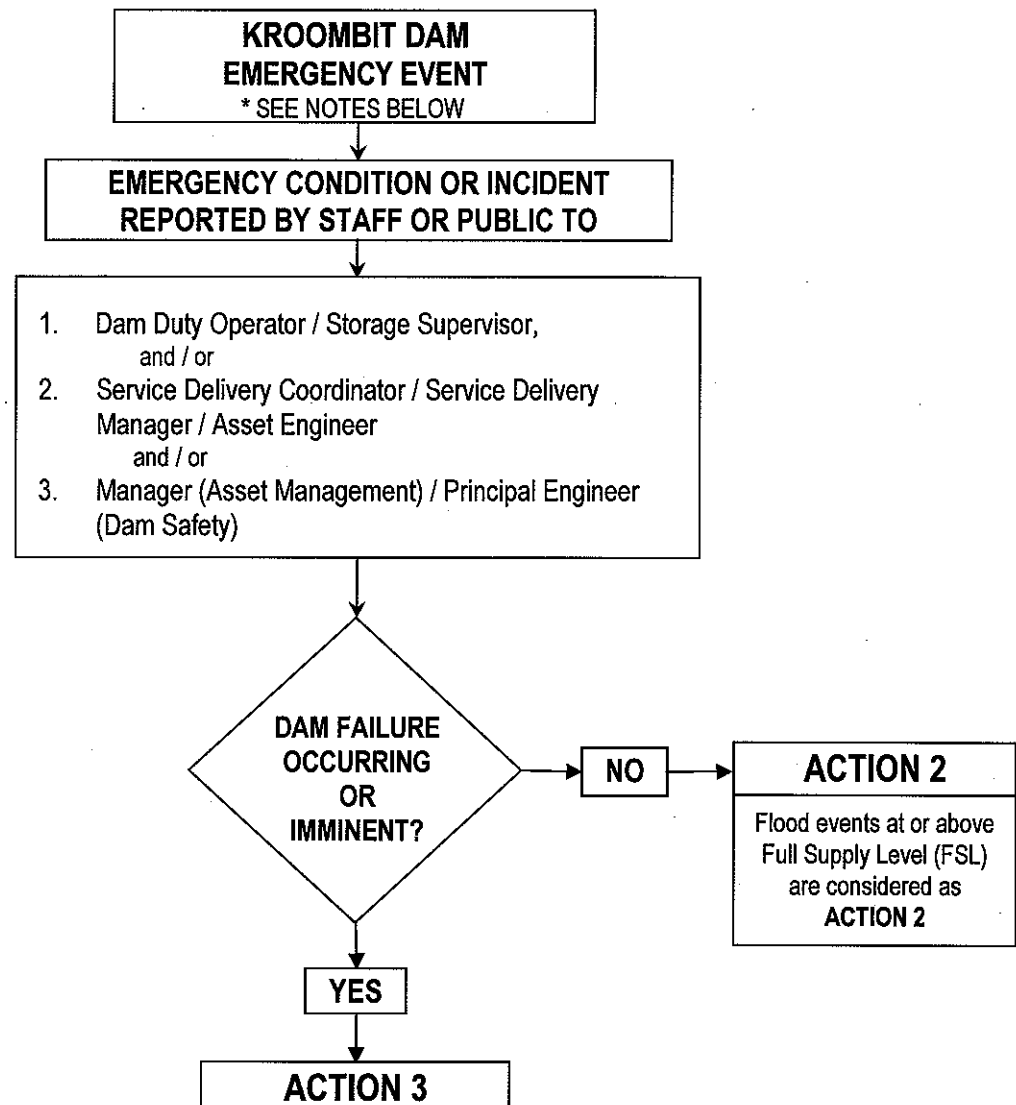
Incident Level Description

ACTION 1	Localised Incidents / Near Miss Will generally not escalate to an emergency Incident managed by routine procedures and existing site resources.
ACTION 2	Emergency May or may not result in activation of Crisis management Plan Required a coordinated local response together with overview, advice and action from subject matter expert in the Brisbane Office.
ACTION 3	Crisis Critical / Catastrophic Consequences. Significant diversion of management attention, time, energy and resources away from normal operation.

EMERGENCY ACTION PLAN - KROOMBIT DAM

EMERGENCY EVALUATION PROCEDURE

FIGURE 1



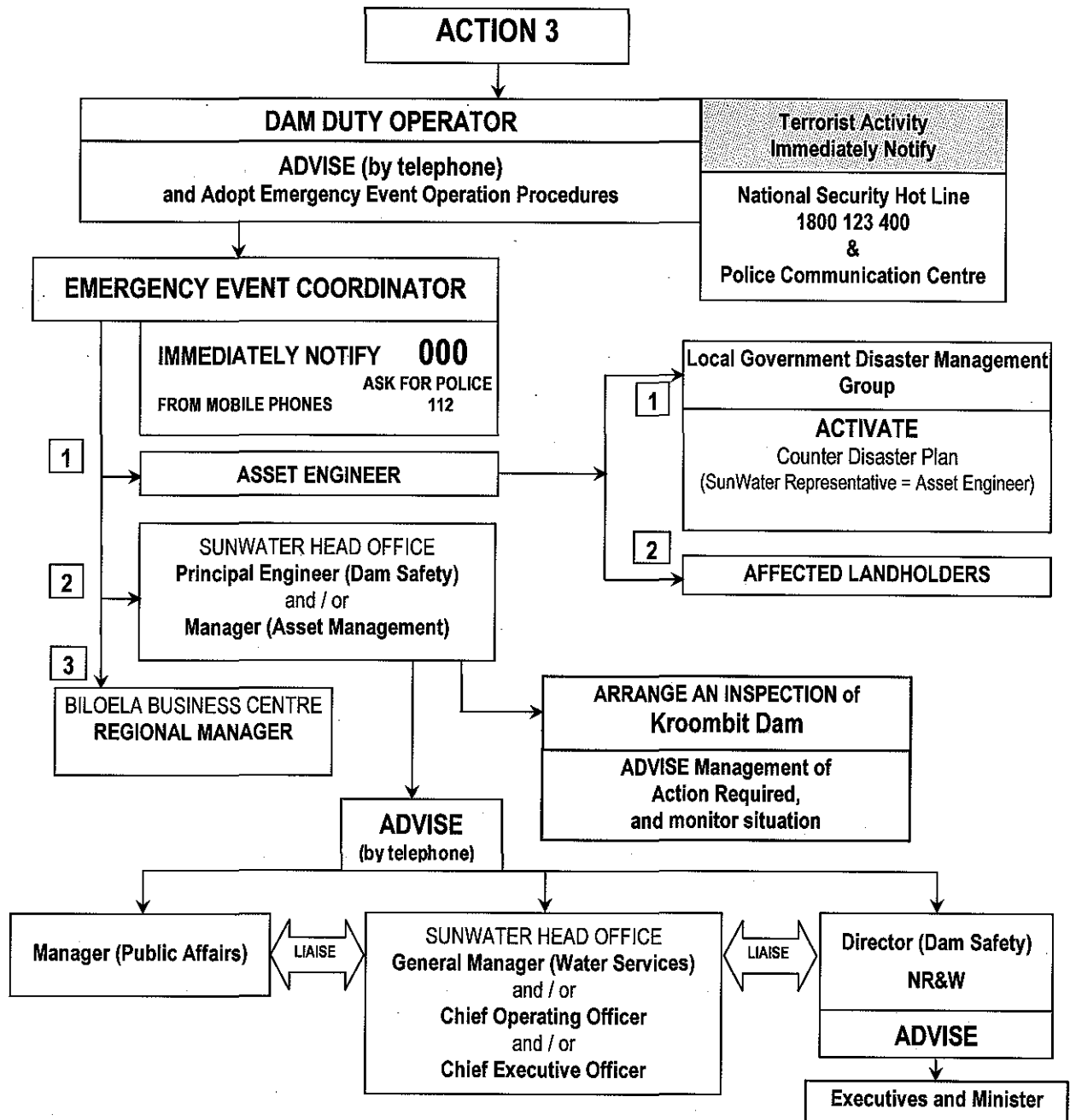
NOTES

1. All communication (advise) to be conducted in person, or via telephone.
2. The Procedure is intended to cover short term Emergency or Dam Safety Incident.
3. The Procedure is not intended for activation as a result/outcome of an extended analytical safety review of the dam.
4. Telephone numbers are available in the Notification & Emergency Communication List in Section 3.

EMERGENCY ACTION PLAN – KROOMBIT DAM

EMERGENCY EVALUATION PROCEDURE

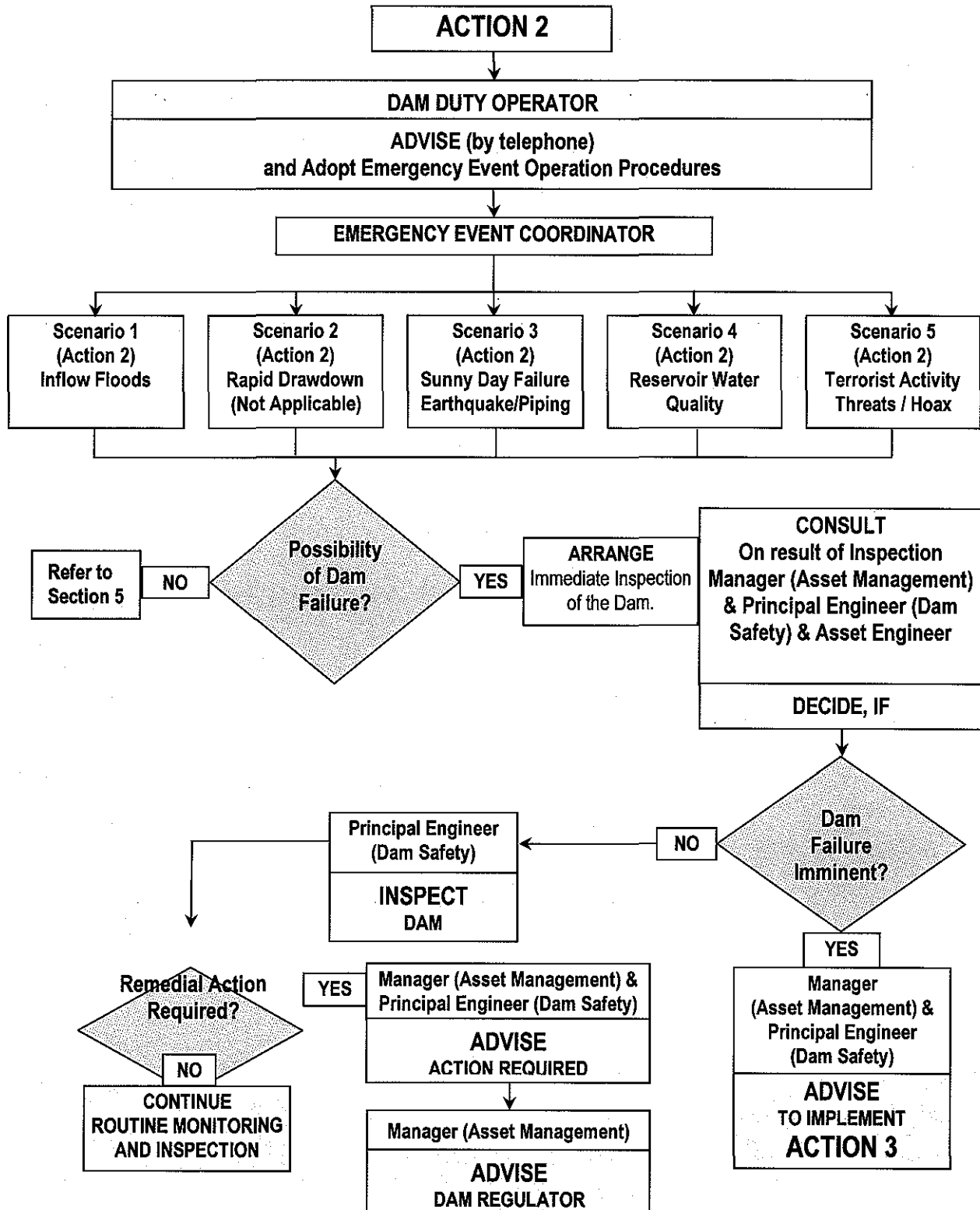
FIGURE 2



EMERGENCY ACTION PLAN - KROOMBIT DAM

EMERGENCY EVALUATION PROCEDURE

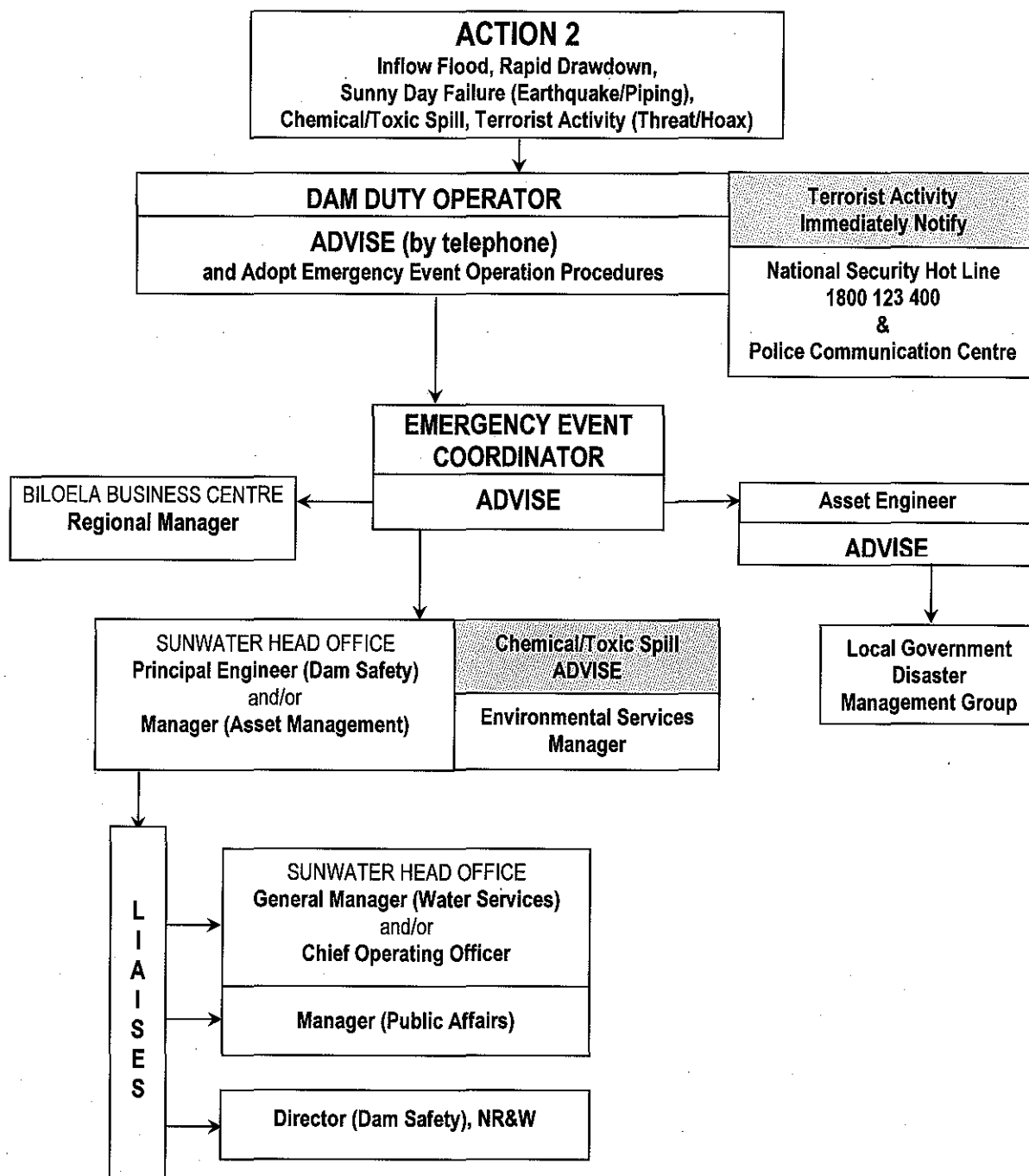
FIGURE 3



EMERGENCY ACTION PLAN – KROOMBIT DAM

EMERGENCY EVALUATION PROCEDURE

FIGURE 4




SECTION 3

NOTIFICATION & EMERGENCY COMMUNICATION LIST**Telephone and Radio Notification List and Emergency Communication List****and****List of Equipment available during an Emergency**

(# 593465 in HB File 08-000388/001)

AUTHORISATION:

Approved by:		Date:	November 2010
	Senior Engineer Headworks (SEH)		

AMENDMENT STATUS:

Amendment Number	Description	Amendment Date
3	Issue 2-2 Update Telephone & Radio Notification List	November 2010

TELEPHONE & RADIO NOTIFICATION LIST

Central Office Management (Brisbane)					
TITLE/NAME	Phone Business	Phone Mobile	Phone A/H	Fax	Controlled Copy Holder Addresses

Controlled EAP Copy Holders shown numbered (e.g. 2) and shaded grey

Note: All contacts required by the EAP are expected, in the first instance, to be by voice (phone) with email only used to confirm or provide additional details

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SunWater
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Counter Disaster Groups					
TITLE/NAME	Phone Business	Phone Mobile	Phone A/H	Fax	Controlled Copy Holder Addresses
	Department of Environment and Resource Management (DERM)				

Controlled EAP Copy Holders shown numbered (e.g. 2) and shaded grey

Note: All contacts required by the EAP are expected, in the first instance, to be by voice (phone) with email only used to confirm or provide additional details



Police					
Police Communication Centre – [REDACTED]					
TITLE/NAME	Phone Business	Phone Mobile	Phone A/H	Fax	Controlled Copy Holder Addresses
[REDACTED]	[REDACTED]				[REDACTED]
National Security Hotline 1800 123 400					

Controlled EAP Copy Holders shown numbered (e.g. 2) and shaded grey

Note: All contacts required by the EAP are expected, in the first instance, to be by voice (phone) with email only used to confirm or provide additional details

EMERGENCY ACTION PLAN - KROOMBIT DAM



TITLE/NAME	Phone Number/Call Sign/Mobile #	Comment
Stream Gauging Stations		
	NOTE: Tailwater capillary height at bed of creek = 0.178 Dam level recorder does not register until EL 252.00	
	Landholders Downstream of Kroombit Dam	
	</	

EMERGENCY CONTACTS

Please note: for a **chemical spill emergency** please phone (000) and ask for **Department of Community Safety**.

For general advice regarding chemical spills and hazardous waste please phone 31095099 (Dept of Community Safety)



Queensland Government
Department of Community Safety

PHONE: 000 for emergencies

Hazardous Industries & Chemicals Branch

For advice on large amounts of **chemicals stored**:

Chemical Hazards and Emergency Unit

<http://www.deir.qld.gov.au/workplace/chem/index.htm>

PHONE: 3109 0811

If you are not sure as to how to treat **poisons** contact Queensland Health



Poisoning

on

13 11 26

<http://www.health.qld.gov.au/PoisonsInformationCentre/default.htm>

<http://www.dcs.qld.gov.au>

Department of Community Safety



Queensland Government
State Disaster Management Group

The **State Disaster Management Group** is the principal organisation for disaster management throughout the State. This group is responsible for disaster mitigation and disaster planning and preparation at a state level and for conducting whole of Government response and recovery operations prior to, during and after a disaster impact. This includes accessing interstate and/or Commonwealth assistance when Local and State resources are exhausted or not available.

Emergency Management Queensland (EMQ), a division of the Department of Community Safety, provides the core policy and support staffing for the State Group. This includes the provision of disaster management training, management of the State Disaster Coordination centre, maintenance of the State Disaster Plan as well as training and equipment support to local volunteer SES units.

EMQ has regional staff across the State who assist Local Governments and State agencies in their counter disaster responsibilities.

PHONE: 3247 8943 (State Disaster Coordination Centre – 24 hr number)

Use of this number is to be restricted to emergency use only.

OR EMQ Regional Duty Officer (Areas and Contact Numbers shown on the map on the following page).

State Duty Officer – Brisbane: PHONE: 3364 3512

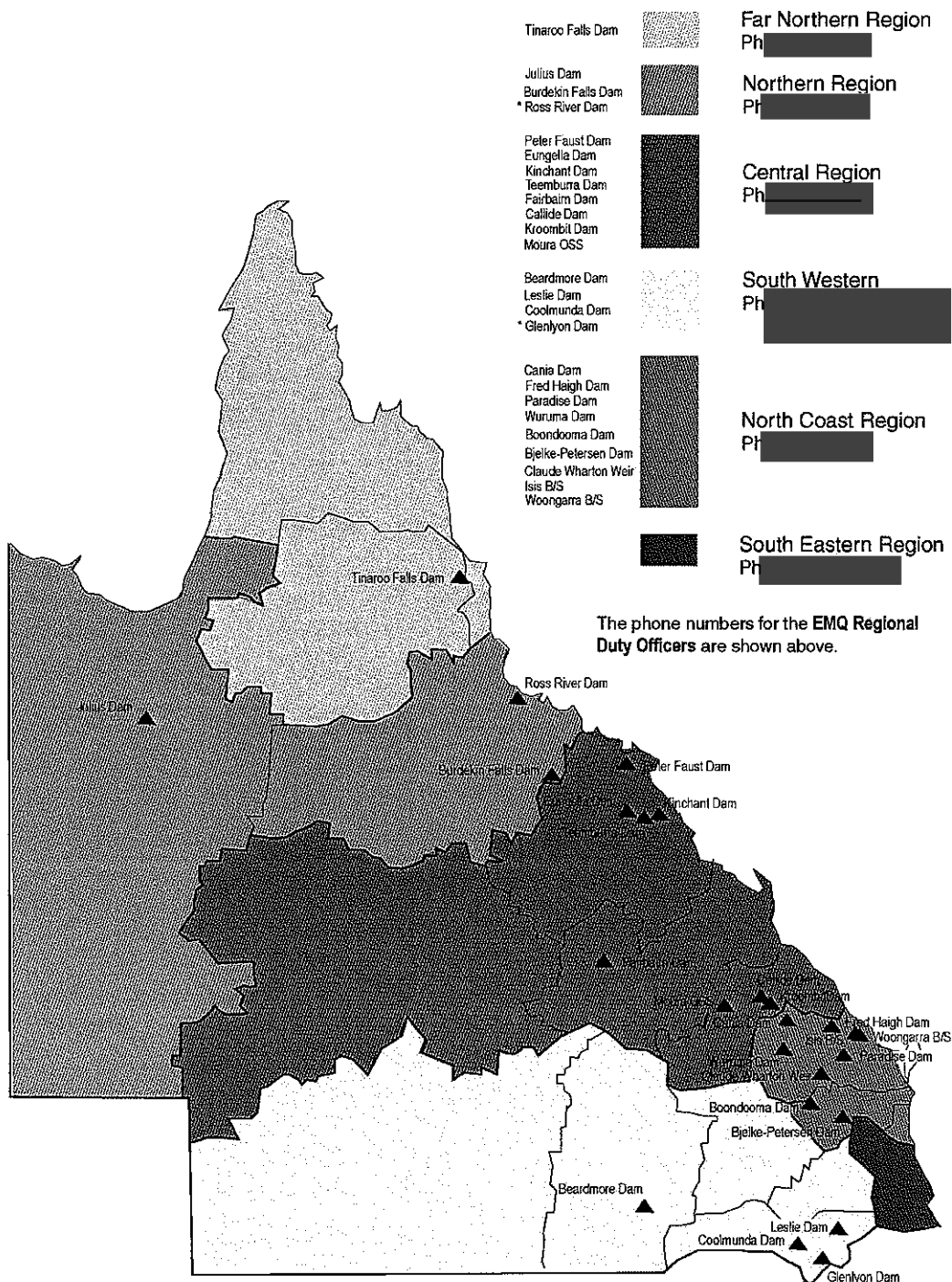
Communications Branch

Level 5 Police Headquarters – 200 Roma St Brisbane 4000





EMQ Boundaries (and SunWater owned/ * managed infrastructure within the relevant boundary)





LIST OF EQUIPMENT AVAILABLE DURING AN EMERGENCY

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SECTION 4

INTRODUCTION TO EAP & RESPONSIBILITIES

4.0 INTRODUCTION

4.1 PURPOSE

This Plan defines responsibilities and procedures designed to identify conditions, including those which may endanger Kroombit Dam, in time to take remedial action, and to notify the appropriate Authorities, Emergency Agencies and Public Officials of possible, impending, or actual failure of the dam. The location and description of the dam are provided in Section 7.

The main purpose of the Plan is to ensure that timely warning is provided to the appropriate authorities and emergency agencies in the event of a major incident impacting on the dam, and to provide relevant information for use in the emergency response to the situation.

The Plan identifies emergency conditions at the dam, and describes procedures to be followed by SunWater staff to investigate those conditions and provide warning to appropriate authorities and emergency agencies, so that they can implement measures for protection of the downstream communities and properties if necessary. The Plan also provides direction to operating staff for handling unsafe or emergency conditions, so that the dam can be returned to a safe operating condition with minimal delay.

4.2 Classification Category

According to Queensland Dam Safety Management Guidelines 2002, Kroombit Dam is classified with Category 2 Failure Impact Rating, having a population in excess of 100 people at risk.

4.3 Role of Emergency Event Coordinator (EEC)

Emergency Event Coordinator (EEC) is a role created in all SunWater Business Centres. The role will be activated during an emergency event (all hours) until the emergency is over. In the event of an emergency, the EEC will implement appropriate emergency procedures for which they have been trained.

Under normal operational conditions, the Asset Engineering Manager, Service Delivery Manager, Service Manager, or Service Delivery Coordinator/Supervisor will perform this role. During an emergency condition any personnel trained for this role can serve as the Emergency Event Coordinator.

4.4 RESPONSIBILITIES

Organisation	Responsible Position / (s)	General Responsibilities	Emergency Responsibilities
SunWater Business Centre	Regional Manager	<ul style="list-style-type: none"> Overall responsibility for water supply in the Business Centre. 	<ul style="list-style-type: none"> ➤ Liaison with SunWater Management
	Service Delivery Manager / Coordinator	<ul style="list-style-type: none"> Dam Management and Supervision. • Provide Training for EEC 	<ul style="list-style-type: none"> ➤ Local Media Liaison in conjunction with Manager, Public Affairs. ➤ Site management coordination.
	Asset Engineering Manager (AEM)	<ul style="list-style-type: none"> Delivering of Dam Safety Program in the Business Centre. • Provide Training for EEC 	<ul style="list-style-type: none"> ➤ Liaison with MAM, and PEDS, in Brisbane. ➤ Liaison with Emergency Event Coordinator. ➤ Activation of Emergency Response.
	Emergency Event Coordinator (EEC)	<ul style="list-style-type: none"> • See Section 4.3 	<ul style="list-style-type: none"> ➤ Liaison with the internal management of SunWater.
	Dam Duty Operator (DDO)	<ul style="list-style-type: none"> Dam Maintenance, Surveillance and Operation 	<ul style="list-style-type: none"> ➤ Identification & notification of unsafe condition. ➤ Implement preventive measures as directed by EEC or AE.
Head Office	Manager, Asset Management (MAM)	<ul style="list-style-type: none"> Overall responsibility for safe operation & maintenance of SunWater infrastructure in Queensland. 	<ul style="list-style-type: none"> ➤ Advise SunWater Management ➤ Advise Dam Regulator ➤ Advise Manager, Public Affairs ➤ Liaison with Management & Regulator
	Principal Engineer, Dam Safety (PEDS)	<ul style="list-style-type: none"> Formulation and implementation of Dam Safety Management Program & analysis of dam behaviour. 	<ul style="list-style-type: none"> ➤ Advise Business Centres on Dam Safety Issues ➤ Warning for dam failure and protective measures. ➤ Analysis of information & recommendations
	Manager, Public Affairs	<ul style="list-style-type: none"> Responsible for media relations, communications and public relations activities. 	<ul style="list-style-type: none"> ➤ Liaison with Management ➤ Liaison with Regulator ➤ Liaison with Business Centre ➤ Liaison with media

4.4 RESPONSIBILITIES (Cont'd)

Organisation	Responsible Position / (s)	General Responsibilities	Emergency Responsibilities
Police	District Disaster Coordinator	<ul style="list-style-type: none"> Preparation of disaster plans and conduct of emergency operations. 	<ul style="list-style-type: none"> Co-ordinate & support to SunWater during a declared emergency at the dam.
	Local Police	<ul style="list-style-type: none"> Liaison with relevant organisations. 	<ul style="list-style-type: none"> Evacuation of persons, if required. Control of essential traffic. Security of specific area.
State Counter Disaster Organisation	Counter Disaster & Rescue Services	<ul style="list-style-type: none"> Liaises in the preparation of disaster plans and conduct emergency operations. 	<ul style="list-style-type: none"> Point of contact for State Government response to emergency situations.
	District Disaster Coordinator	<ul style="list-style-type: none"> Preparation of district disaster management plans and coordinates district response. 	<ul style="list-style-type: none"> To provide and coordinate whole-of-government support to disaster stricken communities
	Local Government Disaster Management Group	<ul style="list-style-type: none"> Preparation of local disaster management plans and coordinates local response. Decide what resources are needed, when they are needed and how best to apply such resources so as to minimise hardship and suffering. 	<ul style="list-style-type: none"> Provision and control of Council manpower and equipment as required. Provision of emergency accommodation.
	Counter Terrorism Liaison Officer	<ul style="list-style-type: none"> Identifies area of concern during the preparation of disaster plans. 	
Dam Safety, NR&W	Director, Dam Safety	<ul style="list-style-type: none"> Oversight of Dam Safety practice at all referable dams in Queensland. 	<ul style="list-style-type: none"> Liaison with relevant Minister on necessary actions.

DAM DESCRIPTION SHEET

(Data obtained from *Dam Safety Review, December 2001*)

Main Dam Type	RCC Gravity Dam with Zoned Earth and Rockfill Embankments
Full Supply Level (FSL)	EL 265.80 m
Storage Capacity at FSL	14,600 ML
Storage Area at FSL	289 ha
Overall Length of Dam	910 m
Right and Left Embankments	
Type	Earth and Rockfill Embankments
Crest Elevation	EL 270.70 m
Max. Height Above Foundation	25 m
Left Embankment Crest Length	235 m
Right Embankment Crest Length	425 m
Spillway	
Spillway Type	Uncontrolled Ogee Crest Spillway
Spillway Crest Level	EL 265.80 m
Spillway Crest Length	250 m
Spillway Design Capacity (DCF)	6260 m ³ / sec
Outlet Works	
Description	1200 mm dia RC pipe in Right Abutment Concrete with 450mm dia. Fixed Cone Dispersion Regulator Valve in Outlet Valve downstream Outlet Structure.
Outlet Capacity	2.3 m ³ / sec at FSL

SECTION 5

EMERGENCY IDENTIFICATION, EVALUATION AND ACTIONS

The dam has been designed to conform to the latest accepted design standards, so that its failure is highly unlikely. In order to maintain the dam in a safe condition and detect any emergency conditions, as soon as it begins to develop, or becomes apparent, the following is applicable to Kroombit Dam.

5.1 Inspections

The following inspections are conducted at Kroombit Dam:

- Routine Visual Inspection - Conducted Weekly
- Detailed Inspection - Conducted Annually
- Comprehensive Inspection - Conducted Five-yearly

5.2 Instrumentation and Monitoring

To confirm the structural behaviour and safety of the embankment the following Instrumentation was installed, and are monitored, at Kroombit Dam.

- The only instruments at Kroombit Dam are a water level recorder and an automatic rain gauge

5.3 Emergency Identification

Five major possible emergencies have been identified at SunWater Dams, which are:

- Emergency Event due to extreme inflow floods overtopping the Dam.
- Emergency Event due to rapid drawdown of the reservoir.
- Emergency Event due to a rapidly deteriorating structural deficiency such as may be induced by an extreme earthquake or erosion of the foundations and abutments.
(This is the so-called “**Sunny Day**” Failure, i.e. not induced by an inflow flood).
- Emergency Event due to a chemical/toxic spill.
- Emergency Event due to a terrorist activity (threat/hoax).



5.4 EVALUATION OF INCIDENTS

It is considered that **ACTION 1 – Localised Incident/Near Miss**, is to be locally contained, with a short-term impact (generally reported in the Monthly Dam Surveillance Report). Although each emergency condition will be evaluated and responded to individually, the action of most emergencies will be similar and follow procedures outlined below.

5.4.1 Flood Operation

All flood events, at or above Full Supply Level EL 265.80 m, will require the Dam Duty Operator to inform the Emergency Event Coordinator, who will further activate the following Emergency Evaluation Procedure

ACTION 2

5.4.2 Imminent Dam Failure

At Kroombit Dam, if a staff member observes evidence of an imminent dam failure, such as water flowing through a breach in the dam, he/she will inform the Dam Duty Operator and/or Emergency Event Coordinator, who will activate the following Emergency Evaluation Procedure

ACTION 3

5.4.3 Unsafe or Unusual Conditions

If during a routine inspection, or at any other time, an unsafe or unusual condition is detected, the Kroombit Dam staff will immediately notify the Dam Duty Operator and/or Service Delivery Coordinator Biloela, who will advise the Principal Engineer (Dam Safety), and/or Manager (Asset Management), so that an evaluation of the situation can be carried out and a determination can be made on the condition of the dam.

If the Asset Engineering Manager, and/or Service Delivery Manager, following an inspection of the dam, and in consultation with Principal Engineer (Dam Safety), and/or Manager (Asset Management), determine that potential for the failure of the dam exists then he/she will activate the following Emergency Evaluation Procedure

ACTION 3

If the unsafe or unusual condition will not lead to failure of the dam in the short term the Asset Engineering Manager, and/or Service Delivery Manager, will activate the following Emergency Evaluation Procedure

ACTION 2

EMERGENCY ACTION PLAN - KROOMBIT DAM

Scenario 1: Flood Operation

Under normal conditions, the operation of the storage is controlled by the on-site Storage Supervisor (Dam Duty Operator) on advice from the Service Delivery Coordinator.

During flood events, the dam will be continuously manned and will be controlled from the Biloela Business Centre. The head office at Brisbane will transmit any information received from the Bureau of Meteorology to the Biloela Business Centre.

The Dam Duty Operator, Cania Dam, will keep the Emergency Event Coordinator informed of discharge through the spillway. The Emergency Event Coordinator will inform the Asset Engineer, who will further keep the Local Government Disaster Management Group (LGDMG) informed of the discharge through the spillway. In particular, the following alerts will be sent to the District Disaster Coordinator and Counter Disaster & Rescue Services in Brisbane.

The flood emergency event will start after the storage level has reached Full Supply Level (EL 265.80 m). In all other cases, follow the Operation and Maintenance Manual, and Standing Operating Procedures.

Reservoir Level at Kroombit Dam	AEP	Flood Alert Level Colour Code	Discharge Volume (MLD)
Storage Level at EL 264.80 m, and Rising	-		Flood Operation Preparedness
Storage Level approaching Full Supply Level EL 265.80 m	-		Spillway Discharge Imminent
Storage Level approaching EL 269.33 m	1:5,000		76,300
Storage Level approaching Dam Crest Level EL 270.70 m (DCF)	1:108,500		120,000 Overtopping Imminent
Storage Level approaching EL 271.57 m	1:1,000,000		159,000 Dam at Critical Safety Levels
Storage Level approaching EL 271.95 m (PMP)	1:2,967,000		180,000 Dam at Critical Safety Levels

EMERGENCY ACTION PLAN - KROOMBIT DAM

Scenario 1: Flood Operation Preparedness

Stage/Alert Level		ACTION TO BE TAKEN BY			ALL ACTION MUST BE TAKEN WHEN IT IS SAFE TO DO SO (e.g. taking photographs/video, dam inspections, instrument readings)
		Dam Duty Operator (DDO)	Emergency Event Coordinator (EEC)	Asset Engineering Manager (AEM)	
<div>FLOOD OPERATION PREPAREDNESS</div> <div>Reservoir level approaching 100% and rising Heavy rainfall and/or inflow expected</div>	FOR RECORD: Use Sheets from Section 6 and 6A	<ul style="list-style-type: none">Notify the Standby Officer (who shall be available for duty for the duration of a flood or Emergency Event)Monitor & record the Reservoir Level - 4 hourly intervalsRecord Rainfall - dailyRecord all communicationLog book entries as per SOP 12 & 22See note # below	<ul style="list-style-type: none">Advise the Dam Duty Operator of upstream river flows and direct the spillway discharge rateRecord all communicationSee note # below	<ul style="list-style-type: none">Advise the Dam Duty Operator of any inflow flood information obtained from Bureau of Meteorology (Page 7, Section 10) *www.bom.gov.auRecord all communication	
		Table of Personnel to be notified			
		<div>Notify as often as requested</div> <ul style="list-style-type: none">Standby OfficerEmergency Event Coordinator	<div>Notify as often as requested</div> <ul style="list-style-type: none">Asset Engineering ManagerService Delivery Manager, Biloela	<div>Notify as often as requested</div>	
<div># After the Event, an Emergency Event Report shall be jointly compiled by the Emergency Event Coordinator and Dam Duty Operator, and unedited copies to be forwarded to the Service Delivery Manager, and Manager (Asset Management), Brisbane.</div>		<div>• IMPORTANT When the storage level peaks and begins to fall at a constant rate, the Asset Engineering Manager shall notify the Local Government Disaster Management Group, and Dam Duty Operator</div>			

EMERGENCY ACTION PLAN - KROOMBIT DAM

Scenario 1: Flood Operation [STAGE 1]

Stage/Alert Level		ACTION TO BE TAKEN BY			
		Dam Duty Operator (DDO)	Emergency Event Coordinator (EEC)	Asset Engineering Manager (AEM)	
STAGE 1 Reservoir Level approaching 150m ASL (145m to 150m) Spillway Discharge Imminent	FOR RECORD: Use Sheets from Section 6 and 6A	<ul style="list-style-type: none">Monitor & record the Reservoir Level - 4 hourly intervalsRecord Rainfall - dailyRecord all communicationLog book entries as per SOP 12 & 22See note # below	<ul style="list-style-type: none">Advise the Dam Duty Operator of upstream river flows and direct spillway discharge rateFax the flood operation sheet to all personnel listed in the table belowRecord all communicationSee note # below	<ul style="list-style-type: none">Advise the Dam Duty Operator of any inflow flood information obtained from Bureau of Meteorology (Page 7, Section 10) *www.bom.gov.auInform spillway discharge to all personnel listed in the table belowRecord all communication	ALL ACTION MUST BE TAKEN WHEN IT IS SAFE TO DO SO (e.g. taking photographs/video, dam inspections, instrument readings)
		Table of Personnel to be notified			
		<p>Notify as often as requested</p> <ul style="list-style-type: none">Standby OfficerEmergency Event Coordinator	<p>Notify as often as requested</p> <ul style="list-style-type: none">Asset Engineering ManagerPrincipal Engineer (Dam Safety)Manager (Asset Management)Service Delivery Manager, Biloela<ul style="list-style-type: none">Affected Landholders	<p>Notify as often as requested</p> <ul style="list-style-type: none">Local Disaster Management Group, Banana Shire Council<ul style="list-style-type: none">Police, Biloela	
<p># After the Event, an Emergency Event Report shall be jointly compiled by the Emergency Event Coordinator and Dam Duty Operator, and unedited copies to be forwarded to the Service Delivery Manager, and Manager (Asset Management), Brisbane.</p>		<ul style="list-style-type: none">IMPORTANT When the storage level peaks and begins to fall at a constant rate, the Asset Engineering Manager shall notify the Local Government Disaster Management Group, and Dam Duty Operator			

EMERGENCY ACTION PLAN - KROOMBIT DAM

Scenario 1: Flood Operation [STAGE 2]

ACTION TO BE TAKEN BY

Stage/Alert Level	Dam Duty Operator (DDO)		Emergency Event Coordinator (EEC)	Asset Engineering Manager (AEM)	ALL ACTION MUST BE TAKEN WHEN IT IS SAFE TO DO SO (e.g. taking photographs/video, dam inspections, instrument readings)	
STAGE 2 Reservoir Level approaching EL 269.33 m Spillway discharge up to 76,300 MLD (Flow up to 3.53 m above spillway) AEP up to 1:5,000	FOR RECORD: Use Sheets from Section 6 and 6A	<ul style="list-style-type: none">• Monitor & record the Reservoir Level - 2 hour intervals• Monitor and record river height at the Tailwater Guage - 2 hour intervals or as requested• Record Rainfall at dam - daily• Monitor and record the leakage in the galleries - 12 hour intervals - Report any flow increase• Monitor Tailwater and Photograph any turbulent areas• Record all communication• Log book entries as per SOP 12 & 22• See note # below	<ul style="list-style-type: none">• Advise the Dam Operator of upstream river flows and direct spillway discharge rate• Fax the flood operation sheet to all personnel listed in the table below at 4 hourly intervals or as requested.• Record all communication• See note # below	<ul style="list-style-type: none">• Advise the Dam Duty Operator of any inflow flood information obtained from Bureau of Meteorology (Page 7, Section 10) *www.bom.gov.au• Inform spillway discharge to all personnel listed in the table below.• Record all communication		
		Table of Personnel to be notified				
		Notify as often as requested <ul style="list-style-type: none">• Standby Officer• Emergency Event Coordinator	Notify as often as requested <ul style="list-style-type: none">• Asset Engineering Manager• Principal Engineer (Dam Safety)• Manager (Asset Management)• Service Delivery Manager, Biloela<ul style="list-style-type: none">• Affected Landholders	Notify as often as requested <ul style="list-style-type: none">• Local Disaster Management Group, Banana Shire Council<ul style="list-style-type: none">• Police, Biloela		
# After the Event, an Emergency Event Report shall be jointly compiled by the Emergency Event Coordinator and Dam Duty Operator, and unedited copies to be forwarded to the Service Delivery Manager, and Manager (Asset Management), Brisbane.		<ul style="list-style-type: none">• IMPORTANT When the storage level peaks and begins to fall at a constant rate, the Asset Engineering Manager shall notify the Local Government Disaster Management Group, and Dam Duty Operator				

EMERGENCY ACTION PLAN - KROOMBIT DAM

Scenario 1: Flood Operation [STAGE 3]

ACTION TO BE TAKEN BY				
Stage/Alert Level	Dam Duty Operator (DDO)		Emergency Event Coordinator (EEC)	Asset Engineering Manager (AEM)
<div>STAGE 3</div> <div>Reservoir Level approaching EL 270.70 m (DCL)</div> <div>OVERTOPPING IMMINENT</div> <div>Spillway discharge between 76,300 - 120,000 MLD (Flow up to 4.9 m above spillway)</div> <div>AEP between 1:5,000 - 103,500</div>	FOR RECORD: Use Sheets from Section 6 and 6A	<ul style="list-style-type: none">Monitor & record the Reservoir Level - 1 hour intervalsRecord Rainfall at dam - dailyMonitor and record the leakage in the galleries - 12 hour intervals - Report any flow increasePhotograph the Spillway and Tailwater areas - several times a dayRecord all communicationLog book entries as per SOP 12 & 22See note # below	<ul style="list-style-type: none">Advise the Dam Operator of upstream river flows and direct spillway discharge rateFax the flood operation sheet to all personnel listed in the table below as often as requested.Record all communicationSee note # below	<ul style="list-style-type: none">Advise the Dam Duty Operator of any inflow flood information obtained from the Bureau of Meteorology (Page 7, Section 10) *www.bom.gov.auInform spillway discharge to all personnel listed in the table belowRecord all communication
		Table of Personnel to be notified		
		<div>Notify as often as requested</div> <ul style="list-style-type: none">Standby OfficerEmergency Event Coordinator	<div>Notify as often as requested</div> <ul style="list-style-type: none">Asset Engineering ManagerPrincipal Engineer (Dam Safety)Manager (Asset Management)Service Delivery Manager, Biloela<ul style="list-style-type: none">Affected Landholders	<div>Notify as often as requested</div> <ul style="list-style-type: none">Local Disaster Management Group, Banana Shire Council<ul style="list-style-type: none">Police, Biloela
# After the Event, an Emergency Event Report shall be jointly compiled by the Emergency Event Coordinator and Dam Duty Operator, and unedited copies to be forwarded to the Service Delivery Manager, and Manager (Asset Management), Brisbane.		<ul style="list-style-type: none">IMPORTANT When the storage level peaks and begins to fall at a constant rate, the Asset Engineering Manager shall notify the Local Government Disaster Management Group, and Dam Duty Operator		

EMERGENCY ACTION PLAN - KROOMBIT DAM

Scenario 1: Flood Operation [STAGE 4]

ACTION TO BE TAKEN BY				
Stage/Alert Level	Dam Duty Operator (DDO)		Emergency Event Coordinator (EEC)	Asset Engineering Manager (AEM)
<div>OVERTOPPING IS OCCURRING</div> <div>DAM AT CRITICAL SAFETY LEVELS</div>	FOR RECORD: Use Sheets from Section 6 and 6A	<ul style="list-style-type: none">Monitor & record the Reservoir Level - 1 hour intervalsRecord Rainfall at dam - dailyMonitor and record the leakage in the galleries - 12 hour intervals - Report any flow increasePhotograph the Spillway and Tailwater areas - several times a dayRecord all communicationLog book entries as per SOP 12 & 22See note # below	<ul style="list-style-type: none">Advise the Dam Operator of upstream river flows and direct spillway discharge rateFax the flood operation sheet to all personnel listed in the table below as often as requested.Record all communicationSee note # below	<ul style="list-style-type: none">Advise the Dam Duty Operator of any inflow flood information obtained from the Bureau of Meteorology (Page 7, Section 10) *www.bom.gov.auInform spillway discharge to all personnel listed in the table belowRecord all communication
		Table of Personnel to be notified		
		<div>Notify as often as requested</div> <ul style="list-style-type: none">Standby OfficerEmergency Event Coordinator	<div>Notify as often as requested</div> <ul style="list-style-type: none">Asset Engineering ManagerPrincipal Engineer (Dam Safety)Manager (Asset Management)Service Delivery Manager, Biloela<ul style="list-style-type: none">Affected Landholders	<div>Notify as often as requested</div> <ul style="list-style-type: none">Local Disaster Management Group, Banana Shire Council<ul style="list-style-type: none">Police, Biloela
# After the Event, an Emergency Event Report shall be jointly compiled by the Emergency Event Coordinator and Dam Duty Operator, and unedited copies to be forwarded to the Service Delivery Manager, and Manager (Asset Management), Brisbane.		<ul style="list-style-type: none">IMPORTANT When the storage level peaks and begins to fall at a constant rate, the Asset Engineering Manager shall notify the Local Government Disaster Management Group, and Dam Duty Operator		
ALL ACTION MUST BE TAKEN WHEN IT IS SAFE TO DO SO (e.g. taking photographs/video, dam inspections, instrument readings)				

ALL ACTION MUST BE TAKEN WHEN IT IS SAFE TO DO SO
(e.g. taking photographs/video, dam inspections, instrument readings)

EMERGENCY ACTION PLAN - KROOMBIT DAM

Scenario 1: Flood Operation [STAGE 5]

		ACTION TO BE TAKEN BY			
Stage/Alert Level		Dam Duty Operator (DDO)	Emergency Event Coordinator (EEC)	Asset Engineering Manager (AEM)	
OVERTOPPING IS OCCURRING	FOR RECORD: Use Sheets from Section 6 and 6A	<ul style="list-style-type: none"> Monitor & record the Reservoir Level - 30 minute intervals Record rainfall - as often as necessary Monitor and record the leakage in the galleries - 12 hour intervals - Report any flow increase Frequently photograph the Spillway and Tailwater areas, and after overtopping of the downstream abutment Record all communication Log book entries as per SOP 12 & 22 See note # below 	<ul style="list-style-type: none"> Advise the Dam Duty Operator of upstream river flows and direct spillway discharge rate Notify the personnel listed in the below for the estimated time of overtopping. Fax the record sheet to all personnel listed in the table below. Record all communication See note # below 	<ul style="list-style-type: none"> Advise the Dam Duty Operator of any inflow flood information obtained from the Bureau of Meteorology (Page 7, Section 10) *www.bom.gov.au Record all communication Inform spillway discharge to all personnel listed in the table below 	ALL ACTION MUST BE TAKEN WHEN IT IS SAFE TO DO SO (e.g. taking photographs/video, dam inspections, instrument readings)
DAM AT CRITICAL SAFETY LEVELS		Table of Personnel to be notified			
		Notify as often as requested <ul style="list-style-type: none"> Standby Officer Emergency Event Coordinator 	Notify as often as requested <ul style="list-style-type: none"> Asset Engineering Manager Principal Engineer (Dam Safety) Manager (Asset Management) Service Delivery Manager, Biloela Affected Landholders 	Notify as often as requested <ul style="list-style-type: none"> Local Disaster Management Group, Banana Shire Council Police, Biloela 	
# After the Event, an Emergency Event Report shall be jointly compiled by the Emergency Event Coordinator and Dam Duty Operator, and unedited copies to be forwarded to the Service Delivery Manager, and Manager (Asset Management), Brisbane.			<ul style="list-style-type: none"> IMPORTANT When the storage level peaks and begins to fall at a constant rate, the Asset Engineering Manager shall notify the Local Government Disaster Management Group, and Dam Duty Operator. 		

EMERGENCY ACTION PLAN - KROOMBIT DAM

Scenario 3A: 'Sunny Day' Failure, due to Earthquake

(Event due to a rapidly deteriorating structural deficiency such as may be induced by an extreme earthquake)

		ACTION TO BE TAKEN BY			
Stages		Dam Duty Operator (DDO)	Emergency Event Coordinator (EEC)	Asset Engineering Manager (AEM)	
STAGE 1 Earthquake felt in the area Intensity less than 5 MM (refer to Section 10 for Modified Mercalli Scale) Use Page 1, Section 6C	FOR RECORD: Use Sheets from Section 6 and 6C	<ul style="list-style-type: none">Inspect the Embankment, Spillway Structure, and Abutments, and fax report to the EECCheck for springs, deformation, erosion, and concrete damage		Arrange an inspection of the dam and assess its condition	ALL ACTION MUST BE TAKEN WHEN IT IS SAFE TO DO SO (e.g. taking photographs/video, dam inspections, instrument readings)
		Notify as often as requested <ul style="list-style-type: none">Standby OfficerEmergency Event Coordinator	Notify as often as required <ul style="list-style-type: none">Asset Engineering Manager	Notify as often as required <ul style="list-style-type: none">Principal Engineer (Dam Safety)Manager (Asset Management)	
STAGE 2 Earthquake felt in the area Intensity greater than 5 MM (refer to Section 10 for Modified Mercalli Scale) Use Page 1, Section 6C		<ul style="list-style-type: none">Immediately inspect the Embankment, Spillway Structure, and AbutmentsRepeat the inspection every 12 hours	<ul style="list-style-type: none">If unstable condition is established, Implement ACTION 2 (Page 3, Section 2)	<ul style="list-style-type: none">If unstable condition is established, advise the Dam Duty Operator to lower reservoir level	
		Notify as often as requested <ul style="list-style-type: none">Standby OfficerEmergency Event Coordinator	Notify as often as required <ul style="list-style-type: none">Asset Engineering ManagerPrincipal Engineer (Dam Safety)Affected Landholders	Notify as often as requested <ul style="list-style-type: none">Executive Officer Local Disaster Management Group, Banana Shire Council	
STAGE 3 DAM FAILURE IMMINENT Water Level at Full Supply Level 307.30 m Use Page 1, Section 6C		<ul style="list-style-type: none">Lower reservoir levelPhotograph the damage from a safe pointVacate the immediate vicinity of the dam	<ul style="list-style-type: none">Implement ACTION 3 (Page 2, Section 2,) See note # below.	<ul style="list-style-type: none">Implement ACTION 3 (Page 2, Section 2)	
		Notify as often as required <ul style="list-style-type: none">Standby OfficerEmergency Event Coordinator	Notify as often as required <ul style="list-style-type: none">All personnel listed in ACTION 3 (Page 2, Section 2)	Notify as often as required <ul style="list-style-type: none">All personnel listed in ACTION 3 (Page 2, Section 2)	
# After the Event, an Emergency Event Report shall be jointly compiled by the Emergency Event Coordinator and Dam Duty Operator, and unedited copies to be forwarded to the Service Delivery Manager, and Manager (Asset Management), Brisbane.		<ul style="list-style-type: none">IMPORTANT When the storage level peaks and begins to fall at a constant rate, the Asset Engineering Manager shall notify the Local Government Disaster Management Group and Dam Duty Operator.			

EMERGENCY ACTION PLAN - KROOMBIT DAM

Scenario 3B: 'Sunny Day' Failure, due to Piping

(Event due to a rapidly deteriorating structural deficiency such as may be induced by piping through the embankment, foundation or abutments)

ACTION TO BE TAKEN BY					ALL ACTION MUST BE TAKEN WHEN IT IS SAFE TO DO SO (e.g. taking photographs/video, dam inspections, instrument readings)	
Stages		Dam Duty Operator (DDO)	Emergency Event Coordinator (EEC)	Asset Engineering Manager (AEM)		
STAGE 1 Increasing Leakage through the Embankment. Use Page 1, Section 6D	FOR RECORD: Use Sheets from Section 6 and 6D	<ul style="list-style-type: none">Monitor flows until a decreasing trend is observable or as directed by the EEC	<ul style="list-style-type: none">If rapidly increasing trend is observed initiate ACTION 2 (Page 3, Section 2)	<ul style="list-style-type: none">Arrange an inspection of the dam and assess its condition		
		Notify as often as requested <ul style="list-style-type: none">Standby OfficerEmergency Event Coordinator	Notify as often as required <ul style="list-style-type: none">Asset Engineering Manager	Notify as often as required <ul style="list-style-type: none">Principal Engineer (Dam Safety)		
STAGE 2 Large Increasing Flows through the Embankment with cloudy water Use Page 1, Section 6D		<ul style="list-style-type: none">Monitor flows until a decreasing trend is observable or as directed by the EEC	<ul style="list-style-type: none">If piping condition is established, Implement ACTION 2 (Page 3, Section 2)	<ul style="list-style-type: none">If piping condition is established, advise the Dam Duty Operator to lower reservoir level		
		Notify as often as requested <ul style="list-style-type: none">Standby OfficerEmergency Event Coordinator	Notify as often as required <ul style="list-style-type: none">Asset Engineering ManagerPrincipal Engineer (Dam Safety)Affected Landholders	Notify as often as requested <ul style="list-style-type: none">Executive Officer Local Disaster Management Group, Banana Shire Council		
STAGE 3 DAM FAILURE IMMINENT DUE TO PIPING Water Level at Full Supply Level 307.30 m Use Page 1, Section 6D		<ul style="list-style-type: none">Lower reservoir level.Photograph the seepage and piping from a safe pointVacate the immediate vicinity of the embankment and complete the event report	<ul style="list-style-type: none">Implement ACTION 3 (Page 2, Section 2)See note # below.	<ul style="list-style-type: none">Implement ACTION 3 (Page 2, Section 2)		
		Notify as often as required <ul style="list-style-type: none">Standby OfficerEmergency Event Coordinator	Notify as often as required <ul style="list-style-type: none">All personnel listed in ACTION 3 (Page 2, Section 2)	Notify as often as required <ul style="list-style-type: none">All personnel listed in ACTION 3 (Page 2, Section 2)		
# After the Event, an Emergency Event Report shall be jointly compiled by the Emergency Event Coordinator and Dam Duty Operator, and unedited copies to be forwarded to the Service Delivery Manager, and Manager (Asset Management), Brisbane.		<ul style="list-style-type: none">IMPORTANT When the storage level peaks and begins to fall at a constant rate, the Asset Engineering Manager shall notify the Local Government Disaster Management Group, and Dam Duty Operator.				

ALL ACTION MUST BE TAKEN WHEN IT IS SAFE TO DO SO
(e.g. taking photographs/video, dam inspections, instrument readings)

EMERGENCY ACTION PLAN - KROOMBIT DAM

Scenario 4: Chemical / Toxic Spill

ACTION TO BE TAKEN BY				ALL ACTION MUST BE TAKEN WHEN IT IS SAFE TO DO SO (e.g. taking photographs/video, dam inspections, instrument readings)
Stages	Dam Duty Operator (DDO)	Emergency Event Coordinator (EEC)	Asset Engineering Manager (AEM)	
STAGE 1 Large amount of Chemical / Toxic Spill found in the reservoir/catchment Use Page 1, Section 6E	* Sketch, measure, photograph and locate its position in the reservoir/catchment * Forward event report to EEC			
	Notify as often as required <ul style="list-style-type: none"> Emergency Event Coordinator 	Notify as often as required <ul style="list-style-type: none"> Asset Engineering Manager Affected Landholders 	Notify as often as required <ul style="list-style-type: none"> Environmental Services Manager Who will then make an assessment on whether to notify the Health Department in accordance with the Emergency Response Plan)	
STAGE 2 Large amount of Chemical / Toxic Spill found in the reservoir/catchment Use Page 1, Section 6E	• Sketch, measure, photograph and locate its position in the reservoir/catchment • Close all outlet structures • Forward event report to EEC (see note # below)	• Inspect the reservoir and assess its water quality for water supply • Coordinate with the Environmental Services Manager, and the Health Department		
	• Mobile Spill Response Unit of the State Government Chemical Hazards and Emergency Unit • and if it is a very large spill then also notify the District Disaster Co-ordinator	Notify immediately State Government Chemical Hazards and Emergency Unit		
FOR RECORD: Use Sheets from Section 6 and 6E				
# After the Event, an Emergency Event Report shall be jointly compiled by the Emergency Event Coordinator and Dam Duty Operator, and unedited copies to be forwarded to the Service Delivery Manager, and Manager (Asset Management), Brisbane.				Notify as often as requested <ul style="list-style-type: none"> Emergency Event Coordinator Affected Landholders
				IMPORTANT When the storage level peaks and begins to fall at a constant rate, the Asset Engineering Manager shall notify the Local Government Disaster Management Group and Dam Duty Operator.

EMERGENCY ACTION PLAN - KROOMBIT DAM



SECTION 6

EMERGENCY EVENT OPERATION RECORDING PROCEDURES

- **Emergency Event Recording Sheets**
 - Emergency Event Record ** (Page 3, this Section)
 - Record of Communication ** (Page 4, this Section)
 - Log of Events / Actions ** (Page 5, this Section)

** Note: These sheets must be completed for all Emergency Event Scenarios, and included in the Emergency Event Report.

- **Operating Procedure**
 - Flood Operation (See Section 6A)
- **Operating Procedure**
 - Rapid Drawdown (Not applicable at Kroombit Dam)
- **Operating Procedure**
 - Sunny Day Failure (Earthquake) (See Section 6C)
 - Sunny Day Failure (Excessive Seepage → Piping) (See Section 6D)
- **Operating Procedure**
 - Chemical / Toxic Spill (See Section 6E)
- **Operating Procedure**
 - Terrorist Activity (Threat/Hoax) (See Section 6F)

Emergency Event Recording Sheets

- **Emergency Event Record sheet**
- **Record of Communication sheet**
- **Log of Events / Action sheet**

Note: These sheets must be completed for all Emergency Event Scenarios and be included in the Emergency Event Report

EMERGENCY ACTION PLAN - KROOMBIT DAM

EMERGENCY EVENT RECORD

COMPLETE THIS COVER SHEET AND ATTACH RELEVANT RECORDING SHEETS FROM SECTION 6.

1. NATURE OF THE EVENT (circle the event)

Spillway discharge Earthquake Piping Water Quality Terrorist Activity

Commencing: Time ____:____ am/pm; Date ____/____/____ Finishing: Time ____:____ am/pm; Date ____/____/____

2. DESCRIPTION OF THE EVENT

Attach relevant sheets from Section 6.

3. STATISTICS

Total inflow	Megalitres
Total discharge	Megalitres
Capacity of Storage prior to inflow	%
Volume prior to inflow	Megalitres
Maximum inflow	MLD
Maximum discharge	MLD

4. EVENT PROGRESS

Attach copies of the Spillway Level versus Time Graph, the Record of Communication, the Log of Events / Actions, and Rainfall during a Flood Event. (Section 6A)

5. GENERAL COMMENTS

Include in this section any observations or comments regarding the Event, such as Equipment malfunctions, improved Reporting, Safety issues, or any suggestions which may improve monitoring of the Event

6. DAMAGE REPORT

Detail any damage to the Embankment, Spillway, Abutments or Stream bank in the downstream area of the Dam. **Attach photos.**

Name:.....Signed:.....Designation:.....Date...../...../.....

EMERGENCY ACTION PLAN - KROOMBIT DAM

KROOMBIT DAM - EMERGENCY ACTION PLAN RECORD OF COMMUNICATION

DATE	TIME	CONTACT PERSON / TELEPHONE NO.	CALL IN / OUT	MESSAGE	RECORDED BY (INITIALS)

EMERGENCY ACTION PLAN - KROOMBIT DAM

KROOMBIT DAM - EMERGENCY ACTION PLAN LOG OF EVENTS / ACTIONS

DATE	TIME	EVENT / ACTION DESCRIPTION	RECORDED BY (INITIALS)

KROOMBIT DAM EAP**Flood Operation**

Visual Inspection and Storage Report

Note: Refer to Page 2 for recording instructions **

Date:

	SUN	MON	TUE	WED	THU	FRI	SAT
Stored Water Level FSL 265.8 m							
Tail Water Level (m)							
Daily Rainfall (mm) Morning 9am							
Evening 3pm							
STAGE 1 at EL 265.8 m	STAGE 2 up to EL 269.33 m		STAGE 3 up to EL 270.7 m		STAGE 4 up to EL 271.57 m		STAGE 5 up to EL 271.95 m
Visual Inspection				First Inspection	Second Inspection (+6 hrs)	Third Inspection (+12 hrs)	
(Walk OR Drive at 10 km/hour. Write 'W' for walk and 'D' for Drive)							
Main Embankment							
Upstream Face (Use binoculars) General condition							
Damage, deterioration of concrete, movement, displacement							
Displacement of riprap material, subsidence, slides, erosion							
Sign of seepage							
Downstream face General condition							
Damage, deterioration of concrete, movement, displacement							
Displacement of riprap material, subsidence, slides, erosion							
Sign of seepage							
Spillway General condition							
Concrete Structure Damage, deterioration							
Apron Damage, deterioration							
Inlet Tower (within Right Abutment) General condition							
Damage, deterioration							
Outlet Works General condition							
Damage, deterioration							
Reservoir Rim (Use binoculars) General condition							
Slumps, slips							
Area Downstream of Dam General condition							
Seepage from any location apart from seepage point							
New seepage point							
Details of significant changes. New occurrences and issues warranting further attention							
.....							
.....							
.....							
.....							
.....							
Inspecting Officer's initials							
Fax to (tick if faxed)				Asset Engineering Manager / Service Delivery Manager [REDACTED]			
				Principal Engineer (Dam Safety) [REDACTED]			

**** INSTRUCTIONS FOR COMPLETING SHEET - Flood Operation**

VISUAL INSPECTION

Frequency of visual inspection required is indicated by

**STAGE 1
ONCE A DAY**

**STAGES 2 - 4
TWICE A DAY**

**STAGES 5 & 6
As Often as
Requested**

Additional Inspections should be made

- When specifically requested

Show results of inspections as follows:-

- New Seepage point.
- Significant increase (> 30%) or change in condition.
- Slight increase (> 10%) or change in condition.
- NIL change of condition.
- Slight decrease (< 10%) or change in condition.

NEW

SG-INC

INC

NIL

DEC

Significant Changes

Any changes which, in the opinion of the inspecting officer, are more than just slight changes must be advised to the Principal Engineer (Dam Safety). The degree of urgency of this advice varies with the nature of the issue.

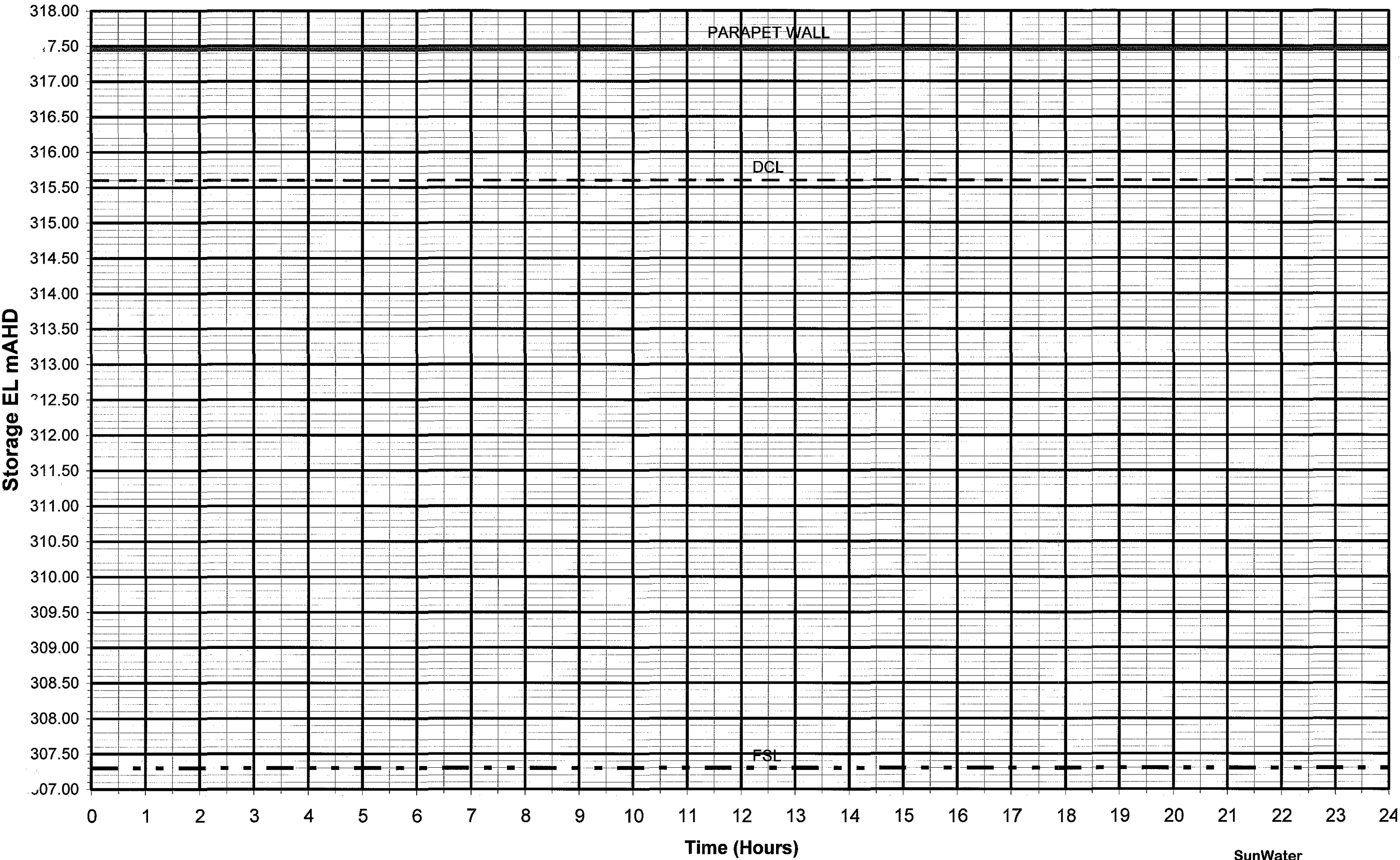


TABLE 1

RECORD OF RAINFALL DURING A FLOOD COMMENCING AT/...../.....

[illegible]

STORAGE LEVEL AT SPILLWAY VERSUS TIME



Sunny Day Failure (Earthquake)

Visual Inspection and Storage Report

Note: Refer to Page 2 for recording instructions **

Date:

	SUN	MON	TUE	WED	THU	FRI	SAT
Stored Water Level FSL 265.8 m							
Daily Rainfall (mm)							
Earthquake Intensity felt:.....MM VISUAL INSPECTION	First Inspection	Second Inspection (+12hrs)	Third Inspection (+24hrs)	Fourth Inspection (+36hrs)			
Date							
Time							
(Walk OR Drive at 10 km/hour. Write 'W' for walk and 'D' for Drive)							
Main Embankment							
Upstream Face (Use binoculars) General condition							
Damage, deterioration of concrete, movement, displacement							
Displacement of riprap material, subsidence, slides, erosion							
Sign of seepage							
Downstream face General condition							
Damage, deterioration of concrete, movement, displacement							
Displacement of riprap material, subsidence, slides, erosion							
Sign of seepage							
Spillway General condition							
Concrete Structure Damage, deterioration							
Apron Damage, deterioration							
Inlet Tower (within Right Abutment) General condition							
Damage, deterioration							
Outlet Works General condition							
Damage, deterioration							
Reservoir Rim (Use binoculars) General condition							
Slumps, slips							
Area Downstream of Dam General condition							
Seepage from any location apart from seepage point							
New seepage point							
Details of significant changes. New occurrences and issues warranting further attention							
.....							
.....							
Inspecting Officer's initials							
Fax to (tick if faxed)				Asset Engineering Manager / Service Delivery Manager			
				Principal Engineer (Dam Safety)			

**** INSTRUCTIONS FOR COMPLETING SHEET - Sunny Day Failure (Earthquake)**

VISUAL INSPECTION

Frequency of visual inspection required is indicated by

Earthquake Less than 5MM
COMPLETE FIRST VISUAL
INSPECTION ONLY

Earthquake greater than 5MM
COMPLETE ALL VISUAL
INSPECTIONS AND
INSTRUMENTATION DATA AS
WELL

Additional Inspections should be made, when:

- New cracks, settlements or sinkholes which requires further action
- When specifically requested

Show results of inspections as follow:-

- New Observation.
- Significant increase (> 30%) or change in condition.
- Slight increase (> 10%) or change in condition.
- NIL change of condition.
- Slight decrease (< 10%) or change in condition.

NEW

SG-INC

INC

NIL

DEC

Significant Changes

Any changes which, in the opinion of the inspecting officer, are more than just slight changes must be advised to the Principal Engineer (Dam Safety). The degree of urgency of this advice varies with the nature of the issue.

Sunny Day Failure (Piping)

Note: Refer to Page 2 for recording instructions **

Date:

	SUN	MON	TUE	WED	THU	FRI	SAT
Stored Water Level FSL 265.8 m							
Daily Rainfall (mm)							
VISUAL INSPECTION (Walk OR Drive at 10 km/hour. Write 'W' for walk and 'D' for Drive)	First Inspection	Second Inspection (+24hrs)	Third Inspection (+36hrs)	Fourth Inspection (+48hrs)			
Date							
Time							
Location of Seepage							
Describe approximate location in words							
New Seepage point	estimated flow						
Clear or Turbid (Tick for clear)							
Old Seepage point	estimated flow						
Clear or Turbid (Tick for clear)							
Large increase of seepage (30% or more)							
Main Embankment							
Subsidence, sloughing, erosion							
Signs of erosion, sand boils							
Spillway							
Subsidence, sloughing, erosion							
Signs of erosion, sand boils							
Seepage measurements							
Clear or Turbid (Tick for clear)							
Main Embankment V-Notch (mm)							
Sandy Creek Embankment V-Notch (mm)							
Details of significant changes. New occurrences and issues warranting further attention, Source of seepage (if known)							
.....							
.....							
.....							
Sketch, locate, measure and photograph if possible. (sketch the problem area on the General Arrangement Plan)							
Inspecting Officer's initials							
Fax to (tick if faxed)		Asset Engineering Manager / Service Delivery Manager					
		Principal Engineer (Dam Safety)					

**** INSTRUCTIONS FOR COMPLETING SHEET - Sunny Day Failure (Piping)**

VISUAL INSPECTION

Frequency of visual inspection required is indicated by

STAGE 1
ONCE A DAY

STAGE 2
TWICE A DAY

STAGE 3
AS DIRECTED

Additional Inspections should be made, when:

- New seepage which requires further action
- When specifically requested

Show results of inspections as follow:-

- New Seepage appeared.
- Significant increase (> 30%) or change in condition.
- Slight increase (> 10%) or change in condition.
- NIL change of condition.
- Slight decrease (< 10%) or change in condition.

NEW

SG-INC

INC

NIL

DEC

Significant Changes

Any changes which, in the opinion of the inspecting officer, are more than just slight changes must be advised to the Principal Engineer (Dam Safety). The degree of urgency of this advice varies with the nature of the issue.

KROOMBIT DAM EAP**Chemical / Toxic Spill**

Visual Inspection and Storage Report

Note: Refer to Page 2 for recording instructions **

Date:

	SUN	MON	TUE	WED	THU	FRI	SAT
Stored Water Level FSL 265.8 m							
Outlet discharge MLD							
Daily Rainfall (mm)							

VISUAL INSPECTIONFirst
InspectionSecond
Inspection
(+24hrs)Third
Inspection
(+48hrs)

Date

Time

Reservoir

Location of the chemical/toxic spill (provide as much detail as possible of the extent of the spill, and note changes over time, and areas threatened by the emergency):

Condition of spill

Description of the Chemical/Toxic Spill

Approx distance from dam wall

Location of Spill in the Reservoir/Catchment

OR DEFINE ITS LOCATION AS AN AMTD DISTANCE

Chemical Spill Management

(tick if action taken)

DATE

TIME

1. Outlet structures closed
2. Water Treatment facility closed
3. Source of spill located & isolated (if safe and possible)?
4. Area isolated from public/staff access (if possible)?

Details of significant changes. New occurrences and issues warranting further attention, Source of seepage (if known)

Sketch, measure, photograph and locate if possible. Locate the position of Algal Bloom / Spill on a Plan (if available)

Inspecting Officer's initials

Fax to

(tick if faxed)

Asset Engineering Manager / Service Delivery
Manager

Principal Engineer (Dam Safety)

**** INSTRUCTIONS FOR COMPLETING SHEET - Chemical/Toxic Spill**

VISUAL INSPECTION

Frequency of visual inspection required is indicated by

ONCE A DAY

Additional Inspections should be made, when

- Large developments of Algal Bloom are evident which require further action
- When specifically requested

Show results of inspections as follow:-

- New Seepage appeared
- Significant increase ($> 30\%$) or change in condition.
- Slight increase ($> 10\%$) or change in condition.
- NIL change of condition.
- Slight decrease ($< 10\%$) or change in condition.

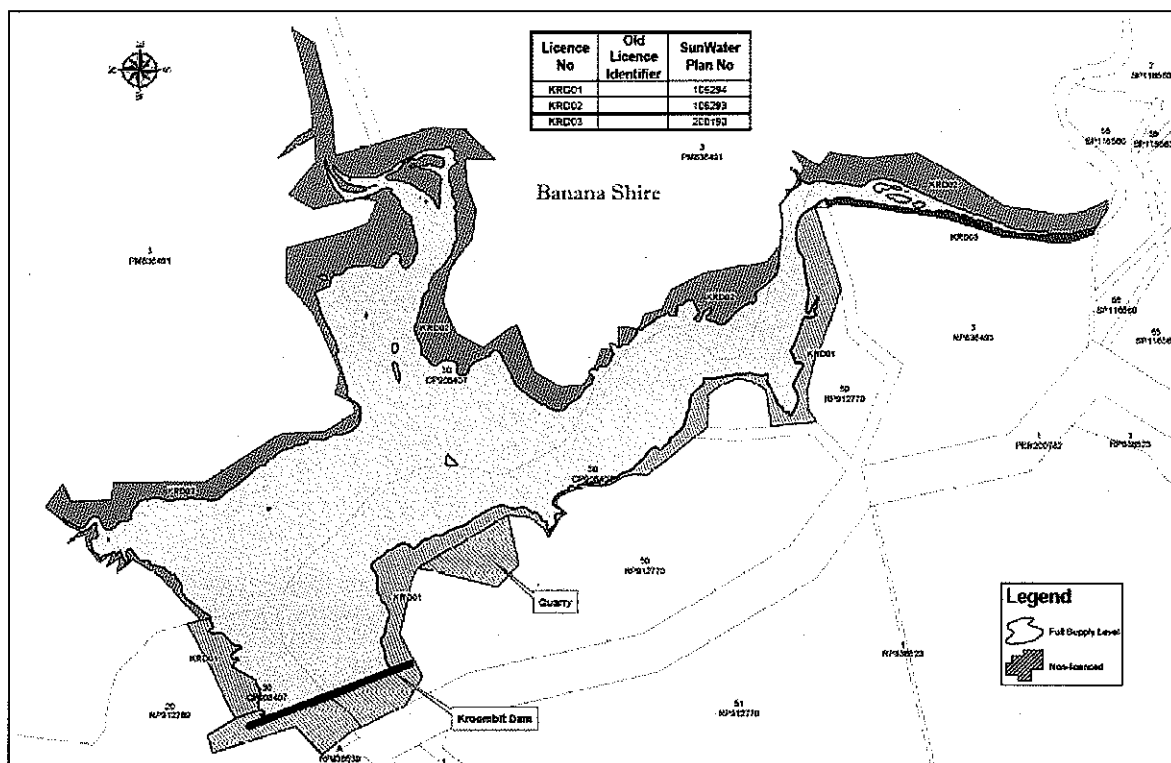
NEW**SG-INC****INC**

NIL

DEC

Significant Changes

Any changes which, in the opinion of the inspecting officer, are more than just slight changes must be advised to the Principal Engineer (Dam Safety). The degree of urgency of this advice varies with the nature of the issue.



KROOMBIT DAM EAP**Terrorist Activity (Threat / Hoax)**

Visual Inspection and Storage Report

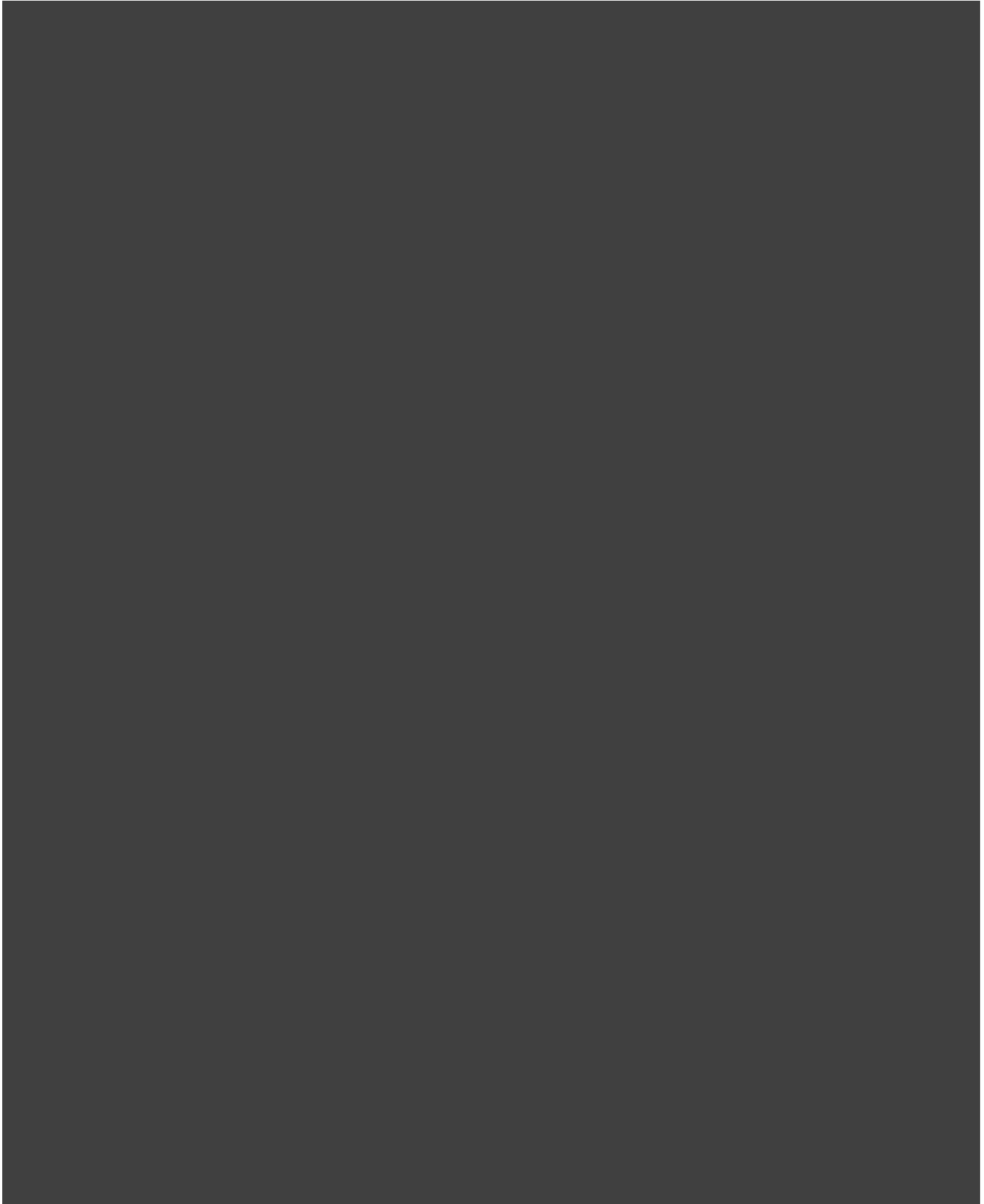
Note: Refer to Page 2 for recording instructions **

Date:

	SUN	MON	TUE	WED	THU	FRI	SAT
Stored Water Level FSL 265.8 m							
Daily Rainfall (mm)							
VISUAL INSPECTION							
Date							
Time							
(Walk OR Drive at 10 km/hour. Write 'W' for walk and 'D' for Drive)							
Main Embankment							
Upstream Face (Use binoculars) General condition							
Damage, deterioration of concrete, movement, displacement							
Displacement of riprap material, subsidence, slides, erosion							
Sign of seepage							
Downstream face General condition							
Damage, deterioration of concrete, movement, displacement							
Displacement of riprap material, subsidence, slides, erosion							
Sign of seepage							
Spillway General condition							
Concrete Structure Damage, deterioration							
Apron Damage, deterioration							
Inlet Tower (within Right Abutment) General condition							
Damage, deterioration							
Outlet Works General condition							
Damage, deterioration							
Reservoir Rim (Use binoculars) General condition							
Slumps, slips							
Area Downstream of Dam General condition							
Seepage from any location apart from seepage point							
New seepage point							
Details of significant changes. New occurrences and issues warranting further attention							
.....							
.....							
.....							
.....							
New Cracks or Movements: Sketch, measure, photograph, and locate if possible. Sketch on the Plan (see over)							
Inspecting Officer's initials							
Fax to (tick if faxed)					Asset Engineering Manager / Service Delivery Manager [REDACTED]		
					Principal Engineer (Dam Safety) [REDACTED]		

**** INSTRUCTIONS FOR COMPLETING SHEET - Terrorist Activity (Threat/Hoax)**

VISUAL INSPECTION



SECTION 7

EMERGENCY ACCESS ROUTES & PREVENTATIVE ACTIONS

7. EMERGENCY ACCESS ROUTES

Alternative Access Routes and Locality Plan are shown on Pages 2 and 3 of this section.

7.1 PREVENTATIVE ACTIONS

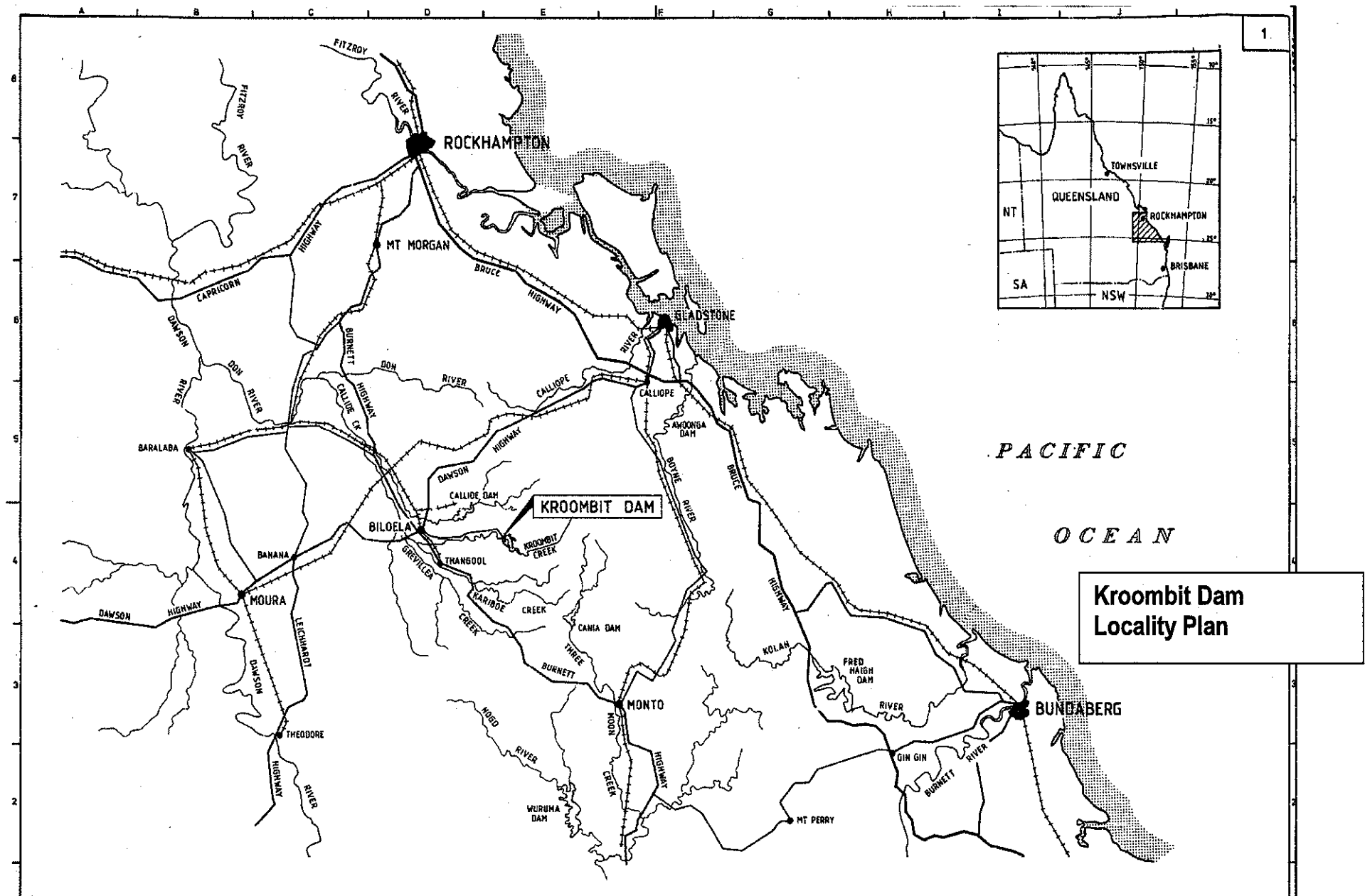
In the event of a rapidly deteriorating structural deficiency which is likely to threaten the security of the dam (for example, due to internal erosion or following a major earthquake), the Dam Duty Operator or Standby Officer, having reported a potential emergency situation, should follow the preventive actions set out below:-

1. Ensure that a responsible person with portable communication is left in a safe position at the dam to monitor the emergency condition.
2. Restrict access to the dam area.
3. Liaise with Emergency Event Coordinator and Asset Engineering Manager who will liaise with Emergency Management Authorities.
4. If possible, document the emergency condition with photographs and or video camera.
5. Update Emergency Event Coordinator from time to time of any change in the emergency condition.
6. Do not take any unnecessary risks in undertaking the above actions.

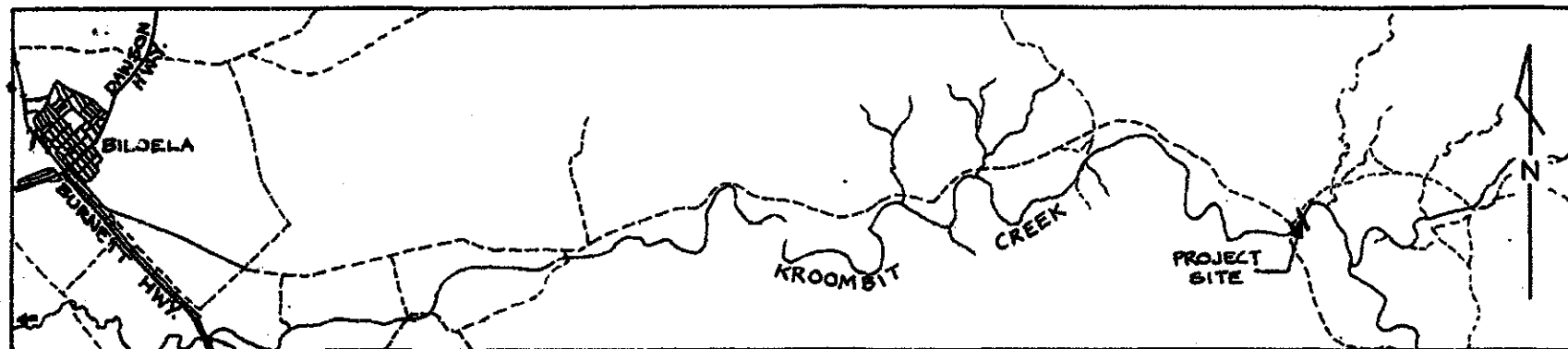
Since the most likely scenarios for a dam failure at Kroombit Dam is from Sunny Day Failure, the stability may be increased by using available earth and rockfill material as a stabilising berm. A list of equipment (earthmoving), available during an emergency, is provided in Section 3.

It may become necessary during an emergency to lower the reservoir level of the dam to decrease seepage and/or loading on the structure, and to minimise the impact of any failure. This would only be an option where an emergency condition was identified in the early stages. Instructions for operation of the outlet works are given in Section 2.7 of the Operation and Maintenance Manual for the dam.

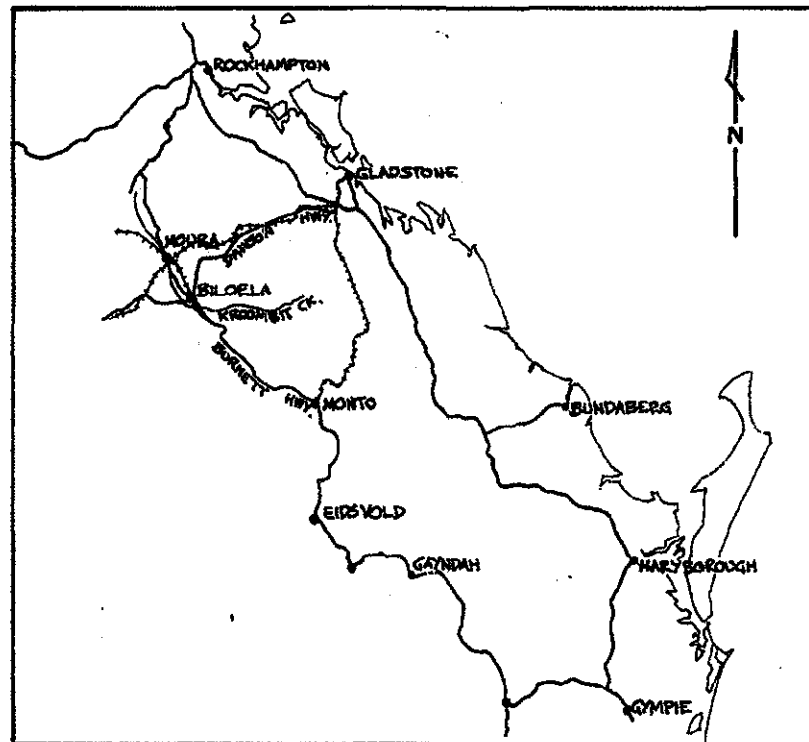
EMERGENCY ACTION PLAN - KROOMBIT DAM



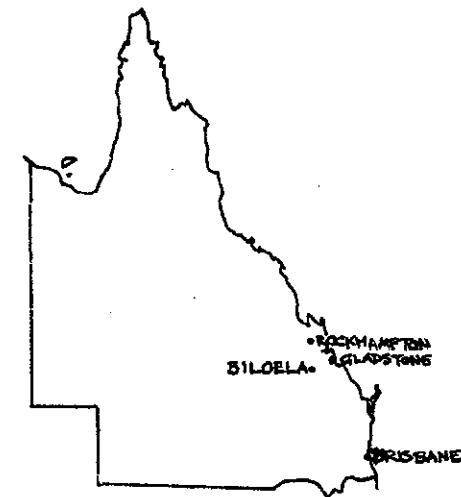
EMERGENCY ACTION PLAN - KROOMBIT DAM



LOCALITY PLAN



REGIONAL PLAN



Kroombit Dam
Alternative Access Routes

SECTION 8

LOWERING STORAGE LEVEL, STORAGE CAPACITY CURVE & DATA AND TAILWATER RATING CURVE

8.0 LOWERING THE STORAGE LEVEL

It may become necessary during an emergency to lower the Kroombit Dam storage level to decrease seepage and/or loading on the structure to minimise the impact of any failure. This would only be an option when an emergency condition has been identified in its early stages.

8.1 Kroombit Dam Constraints

There are two constraints that need to be considered when evaluating lowering of the storage level. These are:

1. Maximum possible releases from Kroombit Dam reservoir; and,
2. Flooding impacts downstream.

8.1.1 Maximum possible releases from Kroombit Dam

The release rate from the storage may be governed by the storage level at the time of drawdown. Kroombit Dam has only one possible mechanism, which is:

1. The Outlet Pipe consists of a 1200 RC pressure pipe, with steel pipe reducers, leading to a 600 dia. Butterfly Guard Valve, and ending in a 450 nominal dia. Cone Dispersal Regulator Valve; and,
2. For low flows, an independent 200 dia. Low-flow Line ending in a 200 nominal dia. Cone Dispersal Regulating Valve.

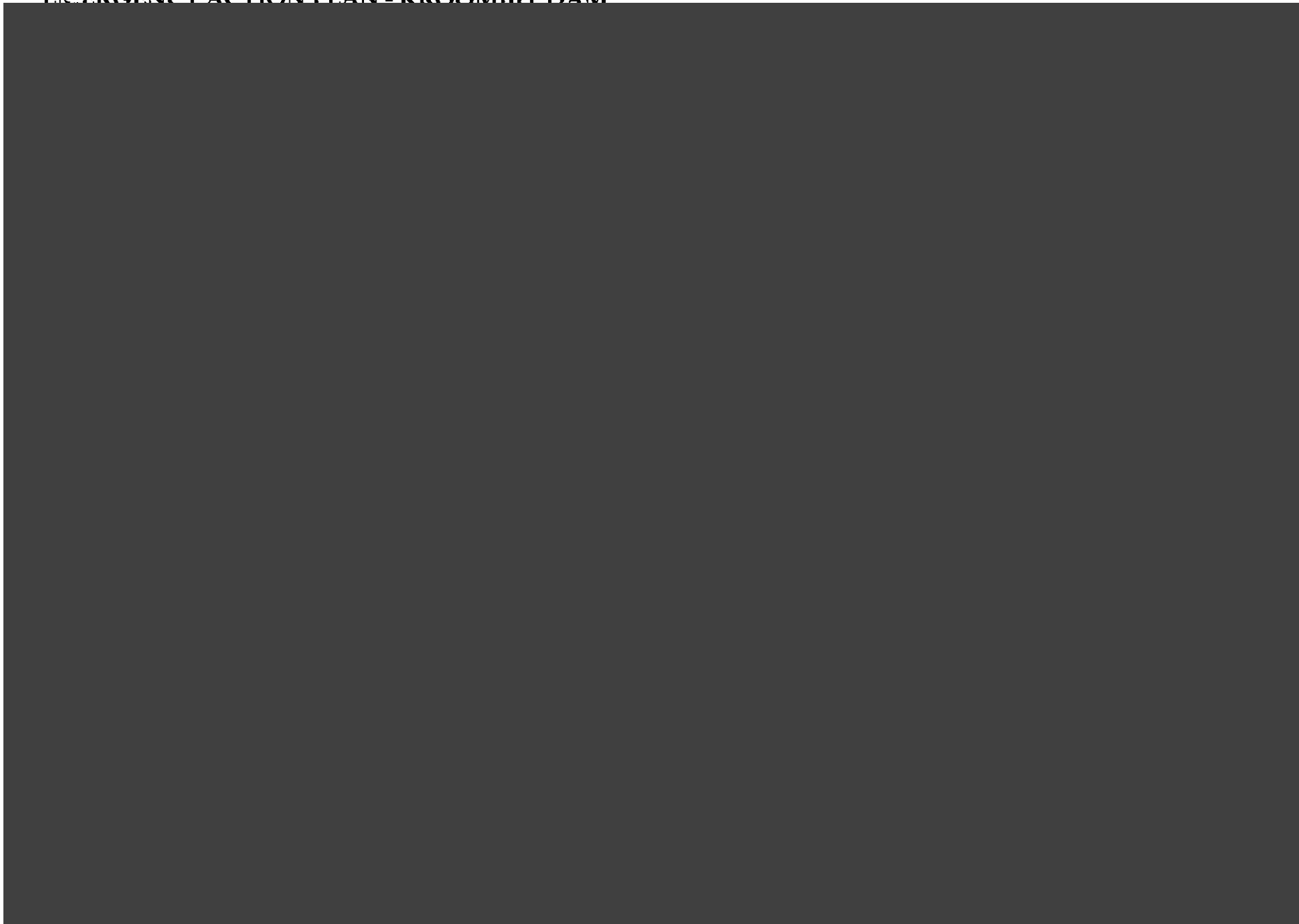
The following table indicates the total number of days required to dewater Kroombit Dam from Full Supply Level using the available outlets. A spillway discharge curve is included on page 3.

Dewatering Options	Inflow	Number of Days required to Lower the Reservoir level
One 1200 Outlet Pipe	No Inflow	TBA
	With Inflow	Not Possible



Storage Capacity Curve & Data and Tailwater Rating Curve

EMERGENCY ACTION PLAN - KROOMBIT DAM



EMERGENCY ACTION PLAN - KROOMBIT DAM



SECTION 9

FLOOD IMPACT DOWNSTREAM, RIVER CROSS-SECTIONS & INUNDATION MAPS

FLOODING IMPACTS DOWNSTREAM

The flooding impact of Kroombit Dam releases may be assessed by the flooding effects at key locations along the Creek (Table 9.1). The Probable Maximum Precipitation with Dam Failure (PMPDF) scenario generates highest flood levels. Tables 9.1 to 9.9 below show the summarised information of the Dam Break Study conducted by SunWater in January 2005.

Table 9.1: Key Locations

Description	AMTD (km)	Model Chainage (m)
CALLIDE CREEK		
Linkes Road Crossing	73.3	6,800
Dawson Highway Crossing	69.5	10,600
Paines Road	64.8	15,300
Burnett Highway Crossing	44.9	35,200
Jambin Township	38.1	42,000
Goovigen Township	24.9	55,200
KROOMBIT CREEK		
Burnett Highway Crossing	35.8	24,800
Dawson Highway Crossing	24.8	32,950
KARIBOE CREEK		
Secondary Road Crossing	13.2*	1,400
GREVILLEA CREEK		
Dawson Highway Crossing	3.4	17,100
BELL CREEK		
Burnett Highway Crossing	5.2	6,400

* The AMTD values used for Kariboe Creek (and shown in attached plans) differs from that on official AMTD maps (WRC) by 2.4 km as its junction with Kroombit Creek has moved downstream, as evidenced by aerial photography.

The key locations are shown on Drawing No. 222510 (Appendix B).

PEAK DISCHARGE, FLOOD LEVELS AND DEPTHS

The peak discharges from Cania Dam are summarised in Table 9.2, with the peak flood levels and flood depths at key locations summarised in Table 9.3.

Table 9.2: Peak Discharge from Kroombit Dam (AMTD 68.8 km)

Scenario	Peak Discharge (m ³ /s)	Time to Peak Discharge (hh:mm)
Sunny Day Failure	7,720	0:10
DCF No Failure	6,310	4:10
DCF Failure	9,540	6:10
PMP Design Flood Failure	15,150	4:40

The table below summarises the peak flood levels at key locations for the various dam failure scenarios considered. Figure 9.3 shows the peak flood level profiles along Kroombit Creek and Callide Creek respectively for the various dam failure scenarios considered.

Table 9.3: Peak Flood Levels (m AHD)

Stream	AMTD (km)	Location & Cross-Section	Sunny Day Failure	DCF - Dam Failure	DCF - No Dam Failure	PMP Design Flood - Dam Failure
Kroombit	68.8	Kroombit Dam, SK00	265.8	270.7	270.7	271.6
Kroombit	35.8	Burnett Hwy, SK23	181.7	183.9	183.7	184.4
Kroombit	24.8	Dawson Hwy, SK31	163.4	168.7	168.7	169.4
Callide	73.3	Linkes Rd, SC07	173.9	178.0	178.0	178.5
Callide	69.5	Dawson Hwy, SC10	169.1	173.8	173.6	174.7
Callide	64.8	Paines Rd, SC14	163.9	168.4	168.3	168.7
Callide	44.9	Burnett Hwy, SC29	139.6	143.0	142.9	143.6
Callide	38.1	Jambin, SC34	131.0	135.0	134.8	135.6
Callide	24.9	Goovigen, SC42	120.3	128.4	128.2	128.9
Kariboe	13.2	Secondary Rd, SKB01	189.8	198.3	198.3	198.3
Grevillea	3.4	Dawson Hwy, SG13	167.1	168.8	168.8	169.4
Bell	5.2	Burnett Hwy, SB04	122.5	130.3	130.2	130.6

TIME TO PEAK FLOOD LEVELS

Tables 9.4 to 9.7 summarise the estimated time until the water level starts to rise (TFR) and the estimated time when the peak flood levels (TPL) are attained, for the various scenarios. The summarised data provides an indication of the available response time for each of the indicated sites.

Table 9.4: Flood Timing for Sunny Day Failure (hh:mm)

Stream	AMTD (km)	Location & Cross-Section	Time to Start of Rise	Time Flooding Starts	Time to Peak Flood Level	Time Flooding Stops
Kroombit	68.8	Kroombit Dam, SK00	0:00		0:00	
Kroombit	35.8	Burnett Hwy, SK23	3:50	N/F	5:30	N/F
Kroombit	24.8	Dawson Hwy, SK31	3:10	N/F	12:40	N/F
Callide	73.3	Linkes Rd, SC07	0:30	4:09	6:10	10:30
Callide	69.5	Dawson Hwy, SC10	0:30	N/F	6:50	N/F
Callide	64.8	Paines Rd, SC14	2:40	N/A	9:10	N/A
Callide	44.9	Burnett Hwy, SC29	11:00	N/F	21:00	N/F
Callide	38.1	Jambin, SC34	14:30	N/F	26:10	N/F
Callide	24.9	Goovigen, SC42	21:10	N/F	40:20	N/F
Kariboe	13.2	Secondary Rd, SKB01	0:40	N/F	27:00	N/F
Grevillea	3.4	Dawson Hwy, SG13	7:10	N/F	9:50	N/F
Bell	5.2	Burnett Hwy, SB04	21:40	N/F	33:19	N/F

Note: The flood timings shown are from the start of breach development (occurring at the start of the simulation). NF = not flooded; N/A = not applicable

Table 9.5: Flood Timing for DCF - Dam Failure (hh:mm)

Stream	AMTD (km)	Location & Cross-Section	Time to Start of Rise	Time Flooding Starts	Time to Peak Flood Level	Time Flooding Stops
Kroombit	68.8	Kroombit Dam, SK00	0:00		4:00	
Kroombit	35.8	Burnett Hwy, SK23	1:30	N/F	8:00 (1:50)	N/F
Kroombit	24.8	Dawson Hwy, SK31	1:00	4:09	8:40 (2:30)	21:40 (15:30)
Callide	73.3	Linkes Rd, SC07	0:30	0:50	7:00 (0:50)	24:00 (17:50)
Callide	69.5	Dawson Hwy, SC10	0:30	N/F	8:10 (2:00)	N/F
Callide	64.8	Paines Rd, SC14	0:10	N/A	8:40 (2:30)	N/A
Callide	44.9	Burnett Hwy, SC29	0:10	0:00	11:50 (5:40)	45:00 (38:50)
Callide	38.1	Jambin, SC34	0:30	8:30 (2:20)	12:50 (6:40)	27:00 (20:50)
Callide	24.9	Goovigen, SC42	0:10	N/F	19:10 (13:00)	N/F
Kariboe	13.2	Secondary Rd, SKB01	0:30	1:00	3:20	8:30 (2:20)
Grevillea	3.4	Dawson Hwy, SG13	0:50	1:40	6:20 (0:10)	20:40 (14:30)
Bell	5.2	Burnett Hwy, SB04	0:10	11:30 (5:20)	13:50 (7:40)	21:10 (15:00)

Note: The flood timings shown are from the onset of rain. The time from start of breach development (at 6 hr 10 min from the onset of rain) is shown following in brackets, italicised. NF = not flooded; N/A = not applicable

Table 9.6: Flood Timing for DCF – No Dam Failure (hh:mm)

Stream	AMTD (km)	Location & Cross-Section	Time to Start of Rise	Time Flooding Starts	Time to Peak Flood Level	Time Flooding Stops
Kroombit	68.8	Kroombit Dam, SK00	0:00	0:00	4:00	0:00
Kroombit	35.8	Burnett Hwy, SK23	1:30	N/F	6:40	N/F
Kroombit	24.8	Dawson Hwy, SK31	1:00	4:09	6:40	22:00
Callide	73.3	Linkes Rd, SC07	0:30	0:50	6:40	25:00
Callide	69.5	Dawson Hwy, SC10	0:30	N/F	7:30	N/F
Callide	64.8	Paines Rd, SC14	0:10	N/A	7:50	N/A
Callide	44.9	Burnett Hwy, SC29	0:10	0:00	11:20	45:50
Callide	38.1	Jambin, SC34	0:30	8:30	12:30	27:20
Callide	24.9	Goovigen, SC42	0:10	N/F	19:20	N/F
Kariboe	13.2	Secondary Rd, SKB01	0:30	1:00	3:20	8:30
Grevillea	3.4	Dawson Hwy, SG13	0:50	1:40	6:20	21:00
Bell	5.2	Burnett Hwy, SB04	0:10	11:30	13:30	20:40

Note: The flood timings shown are from the onset of rain. NF = not flooded; N/A = not applicable

Table 9.7: Flood Timing for PMP Design Flood - Dam Failure (hh:mm)

Stream	AMTD (km)	Location & Cross-Section	Time to Start of Rise	Time Flooding Starts	Time to Peak Flood Level	Time Flooding Stops
Kroombit	68.8	Kroombit Dam, SK00	0:00	0:00	3:10	0:00
Kroombit	35.8	Burnett Hwy, SK23	1:30	N/F	6:10 (1:30)	N/F
Kroombit	24.8	Dawson Hwy, SK31	1:00	4:09	7:30 (2:50)	21:50 (17:10)
Callide	73.3	Linkes Rd, SC07	0:30	0:50	6:20 (1:40)	24:20 (19:40)
Callide	69.5	Dawson Hwy, SC10	0:30	5:50 (1:10)	6:40 (2:00)	8:10 (3:30)
Callide	64.8	Paines Rd, SC14	0:10	N/A	7:10 (2:30)	N/A
Callide	44.9	Burnett Hwy, SC29	0:10	0:00	10:40 (6:00)	45:20 (40:40)
Callide	38.1	Jambin, SC34	0:30	2:30	11:30 (6:50)	27:10 (22:30)
Callide	24.9	Goovigen, SC42	0:10	N/F	17:50 (13:10)	N/F
Kariboe	13.2	Secondary Rd, SKB01	0:30	1:00	3:20	8:30 (3:50)
Grevillea	3.4	Dawson Hwy, SG13	0:50	1:40	7:30 (2:50)	21:00 (16:20)
Bell	5.2	Burnett Hwy, SB04	0:10	4:40 (0:00)	12:40 (8:00)	21:40 (17:00)

Note: The flood timings shown are from the onset of rain. The time from start of breach development (at 4 hr 40 min from the onset of rain) is shown following in brackets, italicised. NF = not flooded; N/A = not applicable

PEAK DISCHARGE AND VELOCITIES

Peak Discharge

Table 9.8 below summarises the peak discharges at key locations for the various dam failure scenarios considered.

Table 9.8: Peak Discharge (m³/s)

Stream	AMTD (km)	Location & Cross-Section	Sunny Day Failure	DCF - Dam Failure	DCF - No Dam Failure	PMP Design Flood - Dam Failure
Kroombit	68.5	d/s Kroombit Dam	7,930	9,540	6,310	15,150
Kroombit	35.8	Burnett Hwy, SK23	450	6,590	4,540	11,650
Kroombit	24.8	Dawson Hwy, SK31	60	1,670	1,490	2,680
Callide	73.3	Linkes Rd, SC07	240	2,380	2,380	2,600
Callide	69.5	Dawson Hwy, SC10	510	4,110	3,800	5,800
Callide	64.8	Paines Rd, SC14	560	6,380	5,870	8,860
Callide	44.9	Burnett Hwy, SC29	150	7,200	6,620	10,060
Callide	38.1	Jambin, SC34	290	10,130	9,260	14,050
Callide	24.9	Goovigen, SC42	240	6,540	5,940	7,710
Kariboe	13.2	Secondary Rd, SKB01	10	660	660	660
Grevillea	3.4	Dawson Hwy, SG13	40	1,030	1,030	1,030
Bell	5.2	Burnett Hwy, SB04	10	4,340	4,340	5,780

Peak Velocities

Table 9.9 summarises the peak mean velocities at key locations for the various dam failure scenarios considered.

Table 9.9: Peak Mean Velocities (m/s)

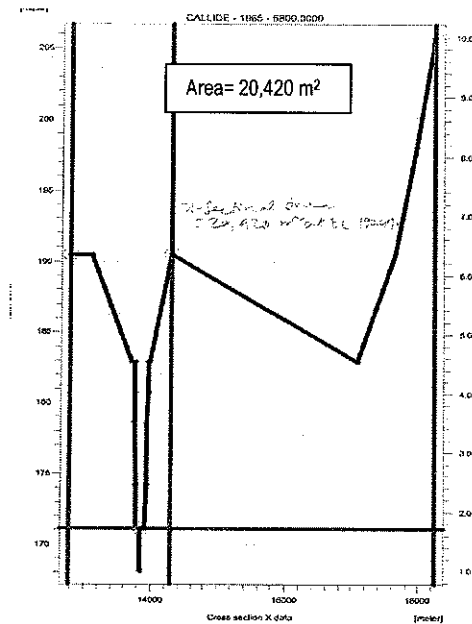
Stream	AMTD (km)	Location & Cross-Section	Sunny Day Failure	DCF - Dam Failure	DCF - No Dam Failure	PMP Design Flood - Dam Failure
Kroombit	68.5	d/s Kroombit Dam	2.6	2.2	3.2	2.7
Kroombit	35.8	Burnett Hwy, SK23	2.4	2.4	2.4	2.4
Kroombit	24.8	Dawson Hwy, SK31	1.7	1.7	1.7	1.7
Callide	73.3	Linkes Rd, SC07	2.2	2.2	2.2	2.2
Callide	69.5	Dawson Hwy, SC10	3.2	3.2	3.2	3.2
Callide	64.8	Paines Rd, SC14	2.2	2.2	2.2	2.2
Callide	44.9	Burnett Hwy, SC29	1.2	1.2	1.2	1.2
Callide	38.1	Jammin, SC34	1.0	1.0	1.1	1.1
Callide	24.9	Goovigen, SC42	1.0	1.0	1.0	1.0
Kariboe	13.2	Secondary Rd, SKB01	1.5	1.5	1.5	1.5
Grevillea	3.4	Dawson Hwy, SG13	1.1	1.1	1.1	1.1
Bell	5.2	Burnett Hwy, SB04	1.2	1.9	1.9	1.9

RIVER CROSS-SECTIONS

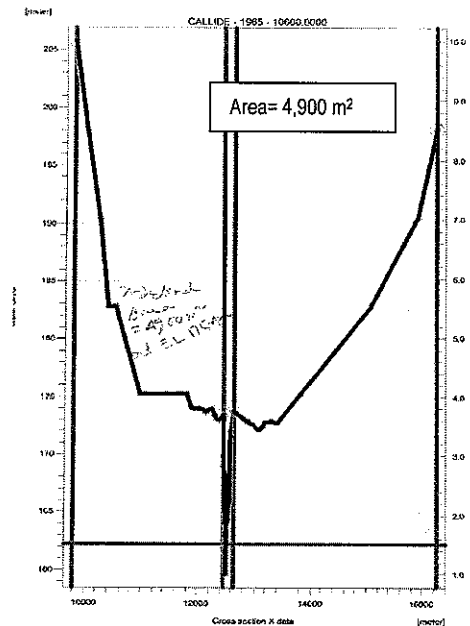
Comprehensive hydrologic and hydraulic modelling has simulated flood inundation that would occur for the following scenarios.

- (i) **"Failure Due To Flood"**:- The inflow of an extreme flood into the storage causes overtopping leading to erosion failure of abutment or foundations.
- (ii) **"Sunny Dam Failure"**:- In which the dam fails under a normal inflow situation. Any flood inundation would result from water held in the storage.

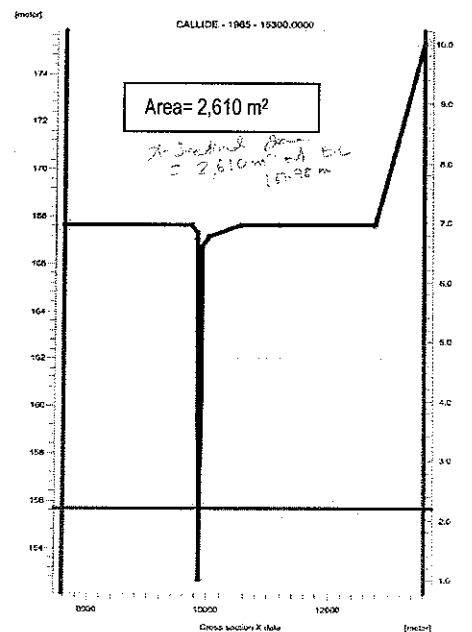
EMERGENCY ACTION PLAN - KROOMBIT DAM



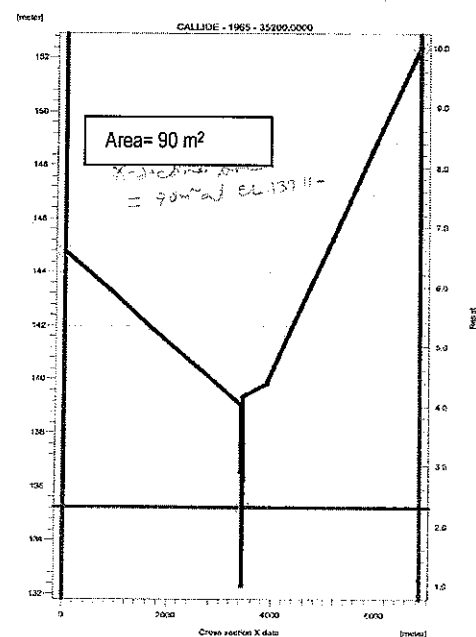
River x-section at Linkes Road Crossing



River x-section at Dawson Highway Crossing

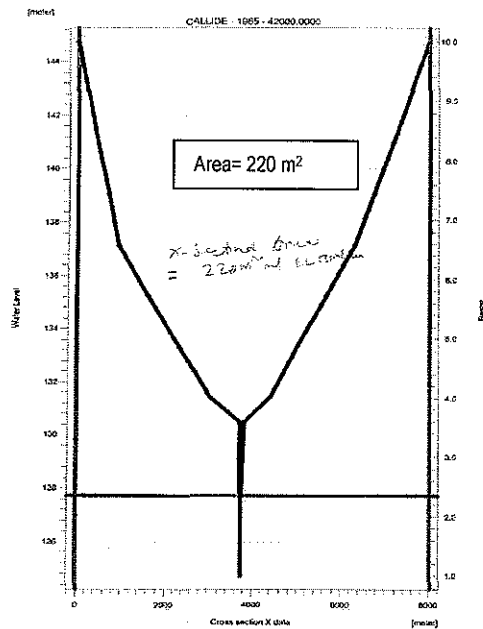


River x-section at Paines Road

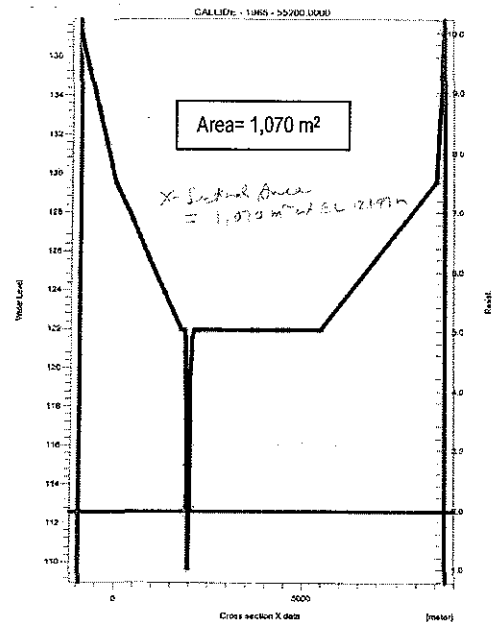


River x-section at Burnett Highway Crossing

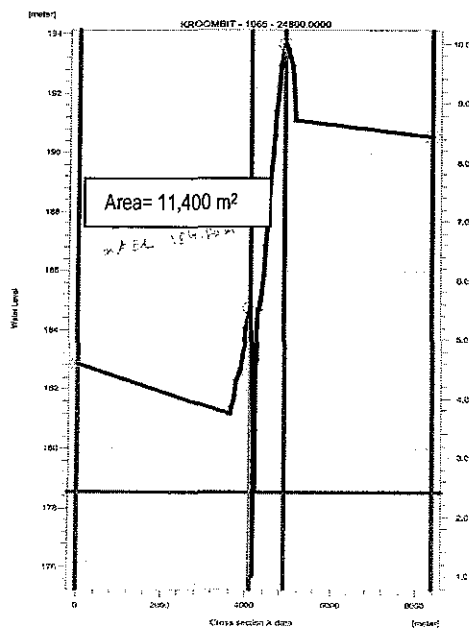
EMERGENCY ACTION PLAN - KROOMBIT DAM



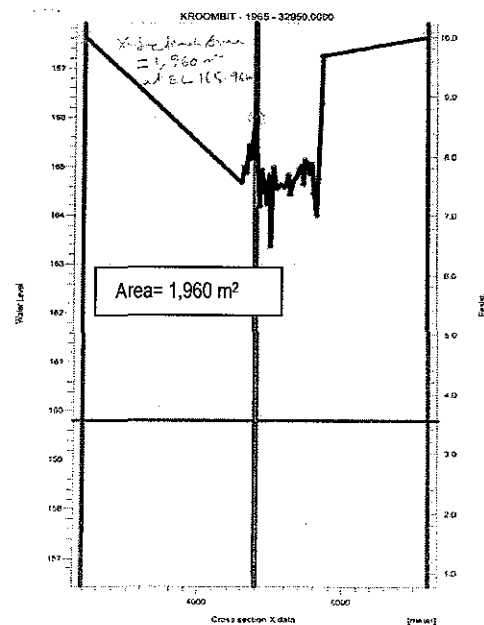
River x-section Jambin Township



River x-section at Goovigen Township

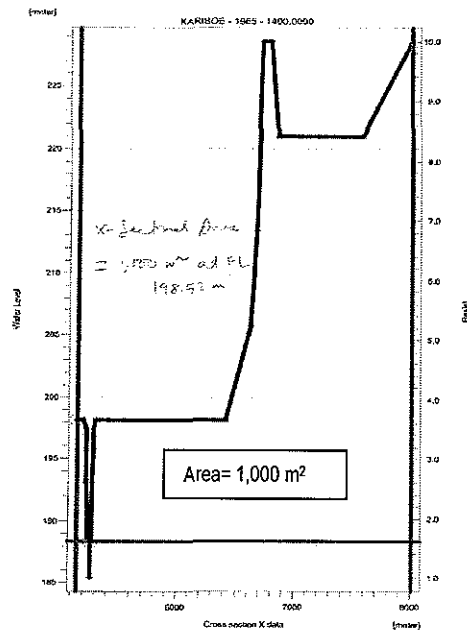


Kroombit Creek x-section at Burnett Highway Crossing

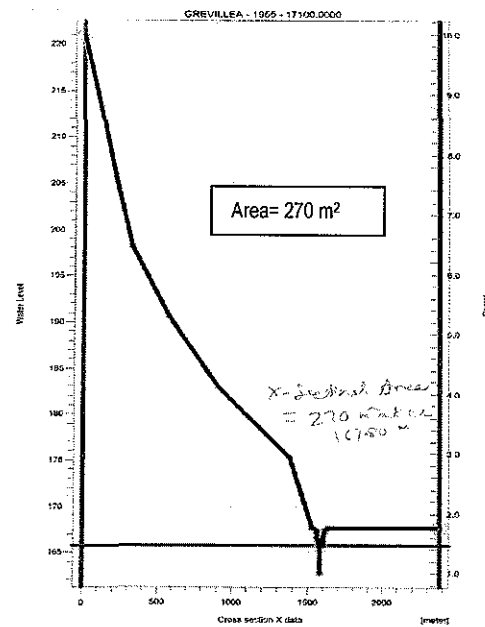


Kroombit Creek x-section at Dawson Highway Crossing

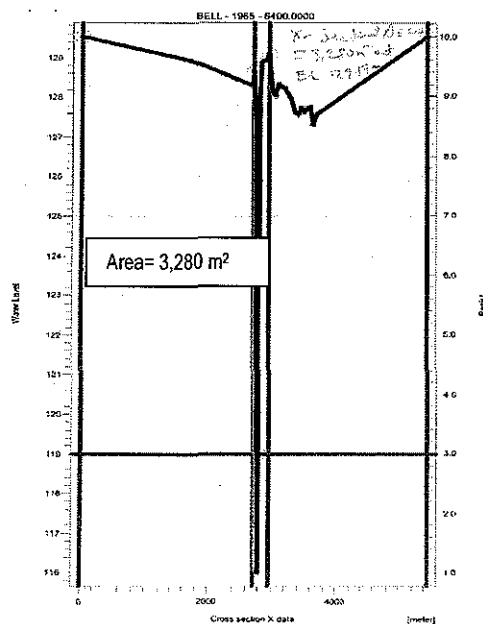
EMERGENCY ACTION PLAN - KROOMBIT DAM



Kariboe Creek x-section at Secondary Road Crossing



Grevillea Creek x-section at Dawson Highway Crossing



Bell Creek x-section at Burnett Highway Crossing

INUNDATION MAPS

Drawings

222502
222503
222504
222505
222506
222507
222508
222509







SECTION 10

DEFINITIONS & ANALYSIS

- Incident, Emergency Response, Crisis and Business Continuity Management Manual
- Flood Event Definitions and Abbreviations
- Earthquake Assessment (Modified Mercalli Scale)
- Queensland Disaster Management System
- Weather Information (Flood Warning)



INCIDENT, EMERGENCY RESPONSE, CRISIS AND BUSINESS CONTINUITY MANAGEMENT MANUAL

PURPOSE

The purpose of the Manual is to provide a description of the framework that SunWater applies in managing various levels of incidents, from locally managed incidents through to emergency, crisis and business continuity management. It includes:

- definitions for the terminology used in incident management
- a description of the documentation for the different levels of an Incident / Emergency / Crisis
- a roadmap of the different levels of incident within SunWater and how they are to be managed, including a description of the escalation process when an Emergency worsens to become a Crisis
- a description of the phases of management of the different levels of incident, and how these may interrelate.

The Incident/Near Miss Management Plan (IMP), Emergency Management Plan (EMP), Crisis Management Plan (CMP) and Business Continuity Plan (BCP) must be read in conjunction with the Manual.

FLOOD EVENT DEFINITIONS AND ABBREVIATIONS

FLOODING EVENT DEFINITIONS

- **"DCF" or**
"Dam Crest Flood" (Formerly IFF or Impending Failure Flood)
 The flood Event which when routed through the Reservoir just threatens failure of the Dam.
 The Reservoir is assumed to be initially at Full Storage Level
- **"PMF" or**
"Probable Maximum Flood"
 The flood resulting from the Probable Maximum Precipitation, coupled with the worst flood producing catchments conditions that can be realistically expected in the prevailing meteorological conditions
- **"PMP" or**
"Probable Maximum Precipitation"
 The theoretical greatest depth of precipitation for a given duration that is physically possible over a particular drainage system.
- **"SUNNY DAY FAILURE"**
 Unexpected failure of a dam not associated with flooding or natural disaster.

State of Emergency

As defined by the State Emergency and Rescue Management Act (1989)

OR As defined by the Dams Safety Act (1978)

ABBREVIATIONS

ANCOLD	Australian National Committee on Large Dams
DEMO	District Emergency Management Officer
DEOCON	District Emergency Operations Controller
DFL	Design Flood Level
DLWC	Department of Land and Water Conservation, NSW
DSU	Dam Safety Unit, Department of Land & Water Conservation, NSW
FSL	Full Supply Level
LEOCON	Local Emergency Operations Controller
MDBC	Murray Darling Basin Commission
MLD	Megalitres per Day
MRMW	Manager, River Murray Works
OIC	Officer-In-Charge, Hume Dam
SES	State Emergency Service
UHF	Ultra High Frequency
VHF	Very High Frequency
EL	Elevation Level
AEP	Annual Exceedence Probability
DCL	Dam Crest Level

EARTHQUAKE ASSESSMENT (MODIFIED MERCALLI SCALE)

- MM 1** Not felt by humans, except in especially favourable circumstances, but birds and animals may be disturbed. Reported mainly from the upper floors of buildings more than 10 storeys high. Dizziness or nausea may be experienced. Branches of trees, chandeliers, doors and other suspended systems of long natural period may be seen to move slowly. Water in ponds, lakes reservoirs, etc. may be set into wave oscillation of short to long durations.
- MM 2** Felt by a few persons at rest indoors, especially by those on upper floors or otherwise favourably placed. The long-period effects listed under MM 1 may be more noticeable.
- MM 3** Felt indoors, but not identified as an earthquake by everyone. Vibration may be likened to passing of light traffic. It may be possible to estimate the duration, but not the direction. Hanging objects may swing slightly. Standing motorcars may rock slightly.
- MM 4** **Generally noticed indoors, but not outside.** Very light sleepers may be awakened. Vibration may be likened to the passing of heavy traffic, or to the jolt of a heavy object falling or striking the building. Walls and frame of buildings are heard to creak. Doors and windows rattle. Glassware and crockery rattles. Liquids in open vessels may be slightly disturbed. Standing motorcars may rock, and the shock can be felt by their occupants.
- MM 5** **Generally felt outside, and by almost everyone indoors.** Most sleepers awakened. A few people frightened. Direction of motion can be estimated. Small unstable objects are displaced or upset. Some glassware and crockery may be broken. Some windows cracked. A few earthenware toilet fixtures cracked. Hanging pictures move. Doors and shutters swing. Pendulum clocks stop, start, or change rate.
- MM 6** **Felt by all.** People and animals alarmed. Many run outside. Difficulty experienced in walking steadily. Some plaster cracks or falls. Isolated cases of chimney damage. Windows, glassware, and crockery broken. Objects fall from shelves, and pictures from walls. Heavy furniture moved. Unstable furniture overturned. Small church and school bells ring. Trees and bushes shake, or are heard to rustle. Loose material may dislodge from existing slips, talus slopes, or shingle slides.
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- MM 7 General alarm.**
Difficulty experienced in standing.
Noticed by drivers of motorcars.
Trees and bushes strongly shaken. Large bells ring.
A few instances of damage to masonry.
Loose brickwork and tiles dislodged.
Un-braced parapets and architectural ornaments may fall.
Stone walls cracked. Weak chimneys broken, usually at the roof-line.
Domestic water tanks burst.
Concrete irrigation ditches damaged.
Waves seen on ponds and lakes.
Water made turbid by stirred-up mud.
Small slips, and caving-in of sand and gravel banks.
- MM 8 Alarm may approach panic.**
Steering of motorcars affected.
Masonry damaged, with partial collapse.
Chimneys, factory stacks, monuments, towers, and elevated tanks twisted or brought down.
Panel walls thrown out of frame structures.
Some brick veneers damaged.
Decayed wooden piles broken.
Frame houses not secured to the foundation may move.
Cracks appear on steep slopes and in wet ground.
Landslips in roadside cuttings and unsupported excavations.
Some branches may be broken off.
Changes in the flow or temperature of springs and wells may occur.
Small earthquake fountains.
- MM 9 General Panic.**
Masonry heavily damaged, sometimes collapsing completely.
Frame structures racked and distorted.
Damage to foundations general.
Frame houses not secured to the foundations shifted off.
Brick veneers fall and expose frames.
Cracking of the ground conspicuous.
Minor damage to paths and roadways.
Sand and mud ejected in alleviated areas, with the formation of earthquake fountains and sand craters.
Underground pipes broken.
Serious damage to reservoirs.
- MM 10 Most masonry structures destroyed, together with their foundations.**
Some well built wooden buildings and bridges seriously damaged.
Dams, dykes and embankments seriously damaged.
Railway lines slightly bent.
Concrete and asphalt roads and pavements badly cracked or thrown into waves.
Large landslides on river banks and steep coasts.
Sand and mud on beaches and flat land moved horizontally.
Large and spectacular sand and mud fountains.
Water from rivers, lakes, and canals thrown up on the banks.
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Earthquake Effects

Earthquake Intensity

The effects of earthquake waves at a particular point is assigned using an intensity scale. This is an arbitrary scale based on observations of phenomena such as:

- the type and extent of damage,
- whether sleeping people were woken,
- whether items fell from shelves,
- whether the event was felt or heard.

The most common intensity scale used in Australia is the 12-point Modified Mercalli (MMI) scale. On this scale, intensities up to 5 are felt but cause no damage, while intensities from 6 to 12 cause increasing amounts of damage.

Modified Mercalli Intensity (MMI) Scale	
1	Not felt. Recorded by seismographs.
2	Rarely felt, usually only on top floors of high buildings.
3	Felt indoors, like a passing light truck.
4	Windows, dishes, doors rattle. Like passing train.
5	Felt by all. Small objects upset.
6	Books off shelves. Trees shake. Isolated damage.
7	Difficult to stand. Many poor buildings damaged.
8	Significant damage. Branches broken from trees.
9	General panic. Serious damage. Ground cracking.
10	Most buildings destroyed. Rails bent slightly.
11	Rails bent greatly. Pipelines destroyed.
12	Near total damage. Objects thrown into the air.

Other intensity scales have been defined; the RF (Rossi-Forel) scale was introduced in the late 19th century, the JMA (Japan Meteorological Agency) scale is used in Japan and Taiwan; and the MSK and the more recent EMS (European Macroseismic Scale) are used in Europe. Most of these scales have twelve degrees of intensity which can be roughly (but not exactly) correlated between scales.

While all intensity scales are semi-qualitative they can be most useful for assessing historic earthquakes for which no seismic records exist.

Intensity Variability

An earthquake has a single magnitude, but intensity varies with distance. Maximum intensity normally occurs near the earthquake epicentre, with intensity values generally decreasing with distance.

Many factors affect surface ground motion, including topography and near-surface geology, especially soft surface sediments. These variations can be considerable, even over short distances. It is common to find intensities ranging by ± 1 unit in a neighbourhood, and not unusual to find values ± 2 or more.

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QUEENSLAND DISASTER MANAGEMENT SYSTEM

The Queensland Disaster Management System operates on three distinct levels. These are:

- Local Government
- Disaster District
- State Government

A fourth level, The Commonwealth, is also included in our Disaster Management System recognising that Queensland may need to seek Commonwealth support in times of disaster.

Each of these levels within the Queensland Disaster Management System has as its basis a committee structure supported by a disaster coordination centre. These committees and coordination centres are activated when required to manage and coordinate support for disaster stricken communities. When not activated, these committees meet to prepare for and practice their role within the Disaster Management System.

Figure 1 depicts the Queensland Disaster Management System including the link to the Commonwealth for National-level support when required.

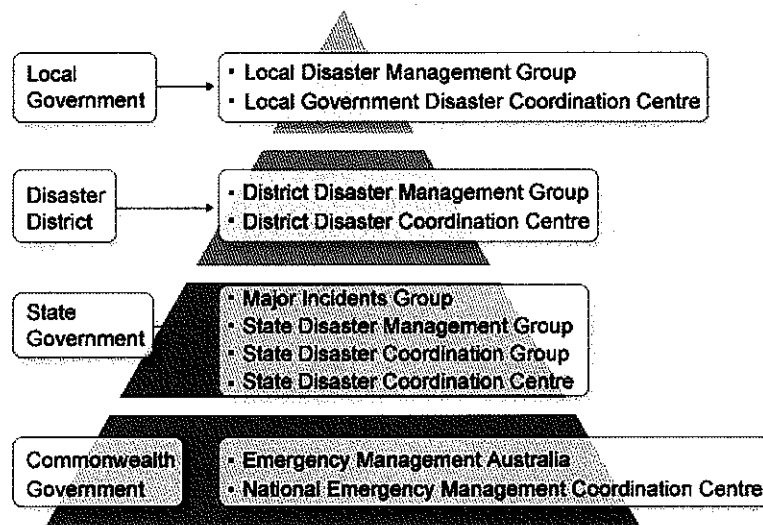


Figure 1 - The Queensland Disaster Management System

Description of the System

The Queensland Disaster Management System has three principal tiers that quickly provide both technical and tangible assistance to disaster stricken communities.

Management of a disaster at the community level is conducted by Local Government who are responsible for the implementation of their Local Disaster Management Plan. If Local Governments require additional resources to manage the event, they are able to request support from their Disaster District Coordinator. This allows for the rapid mobilisation of resources at a regional or district level. If Disaster Districts resources are inadequate or inappropriate, requests for assistance can be passed to State via the State Disaster Coordination Centre. Finally, when State resources are inadequate or inappropriate, support from the Commonwealth can be obtained via Emergency Management Australia (EMA).

Reference: <http://www.disaster.qld.gov.au/about/>

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A brief summary of each of the key components of the Queensland Disaster Management System is set out below:

- **Local Disaster Management Group.** (Formerly called Local Government Counter Disaster Committee). Local Disaster Management Groups (local groups) coordinate the response to a disaster at a local level. The Committees are usually chaired by the Mayor and the Local Government Chief Executive Officer is usually the Executive Officer of the committee. Local Government Counter Disaster Committees develop and maintain Counter Disaster Plans for their Shire. These Local Government Committees are best placed to decide what resources are needed, when they are needed and how best to apply such resources so as to minimise hardship and suffering. They play a key role in the Queensland Disaster Management System.
- **District Disaster Management Group** (formerly called Disaster District Control Group). There are 23 Disaster Districts in Queensland which are based on the Police Districts. The senior Police Officer in each district is designated as the Disaster District Coordinator who Chairs a Disaster District Control Group. These Disaster District Control Groups comprise representatives from regionally-based Queensland Government departments who are able to provide and coordinate whole-of-government support to disaster stricken communities. The Disaster Districts perform a 'middle' management function within the Disaster Management System by providing coordinated State Government support when requested by Local Governments.
- **The State Disaster Coordination Group (SDCG)** is the working body of the State Disaster Management Group (State Group) at State-level. SDCG members are designated liaison officers from each of the Departments represented on the State Group. This Group is the primary mechanism through which coordinated whole-of-government State-level support is provided to disaster-stricken communities.
- **The State Disaster Management Group.** The State Disaster Management Group (State Group) is established as the principal organisation under the new Act for the purposes of disaster management throughout the State. It replaces the State Counter-Disaster Organisation and its executive, the Central Control Group. In particular, the State Group is responsible for disaster mitigation and disaster planning and preparation at a State level and for coordinating whole-of-Government response and recovery operations prior to, during and after a disaster impact. This includes accessing interstate and/or Commonwealth assistance when local and State resources are exhausted or not available.

The State Group comprises Chief Executive Officers (CEO's) from all Queensland Government Departments. The CEO of the Department of the Premier and Cabinet is the Chair, while the Executive Director of Counter Disaster and Rescue Services is the Executive Officer.
- **Major Incidents Group (MIG).** The Queensland Government has established a MIG to provide high level Ministerial guidance and support in the event of a significant incident with major community consequences. Conceptually, membership of the MIG would be determined on an incident-by-incident basis and may include, but not be limited to:
 - Premier (Chair)
 - Treasurer
 - Attorney-General
 - Minister for Police
 - Minister for Emergency Services
 - Minister for Health

Reference: <http://www.disaster.qld.gov.au/about/>

WEATHER INFORMATION (FLOOD WARNING)

Using the Internet
http://www.bom.gov.au/

WARNINGS & CURRENT
Forecast for Wednesday
Sydney 21° Rain in evening
Melbourne 14° Rain easing
Brisbane 24° Mostly fine
Perth 19° Fine Windy
Adelaide 16° Shower or two
Hobart 13° Mainly fine
Canberra 11° Rain periods
Darwin 33° Fine, partly cloudy

Latest Weather
Sydney 20° 0.0 mm
Melbourne 10° 5.2 mm
Brisbane 23° 0.0 mm
Perth 13° 0.0 mm
Adelaide 13° 0.0 mm
Hobart 10° 0.0 mm
Canberra 9° 0.0 mm
Darwin 28° 0.0 mm

Flood Warning

Radar Images

Radar Images
Australian Weather Watch Radar

Disclaimer: While every effort will be made to ensure that Bureau of Meteorology radar imagery is available on these web pages, there may be occasions when equipment or communications failure make this impossible. The Bureau's ability to restore the radar display following an outage may be limited by the priority to maintain forecasting and warning services. For some major cities the Bureau can ensure the quality of its *forecast radar* images.

Adelaide, Brisbane, Canberra, Darwin, Hobart, Melbourne, Perth, Sydney.

Brisbane

Weather Watch radars are very effective tools for the detection of rain. Bureau forecasters can interpret the patterns and intensity of the radar images to provide warnings of major weather events such as severe thunderstorms, tropical cyclones and areas of heavy rainfall. The radar may sometimes detect echoes from aircraft, areas of smoke/ash from large fires, swarms of insects, flocks of birds or even the ground or sea surface when unusual atmospheric conditions send the radar beam back down to the surface. So users should be aware that there may be patterns on the radar images that do not represent falling rain.

Our radar images show the location of rain in relation to local features such as the coastline, with different colours used to depict rainfall intensity. For example off-white represents light drizzle while dark red is used to depict very heavy rain (possibly containing hailstones). There are three levels of rainfall intensity shown - see the colour-coded key below each radar image. The images are in scales of 120 km radius and 250 km radius. State boundaries are indicated, as are abbreviated state and town names. We strongly recommend that you refer to *Interpreting Weather Watch Radar Images* for further information.

Radar images are normally updated every 10 minutes, however note that there are *full and partial time radars*. Full time radars have scheduled daily outages.

RADSLIP - The Radar Network & Doppler Services Upgrade Project

Click on a radar name to see the latest radar image, or use the Table below.

EMERGENCY ACTION PLAN - KROOMBIT DAM

