

# Emergency action plan for referable dam guideline

---

### Contact details

All enquiries regarding this document should be directed to Water Regulation and Planning, Department of Natural Resources, Mines and Energy

Email: [damsafety@dnrme.qld.gov.au](mailto:damsafety@dnrme.qld.gov.au)

Mailing Address:

Department of Natural Resources, Mines and Energy

Water Supply Division

PO Box 15216, City East Qld 4002

© State of Queensland, 2017

The Queensland Government supports and encourages the dissemination and exchange of its information. The copyright in this publication is licensed under a Creative Commons Attribution 4.0 International (CC BY 4.0) licence.

Under this licence you are free, without having to seek our permission, to use this publication in accordance with the licence terms.



You must keep intact the copyright notice and attribute the State of Queensland as the source of the publication.

Note: Some content in this publication may have different licence terms as indicated.

For more information on this licence, visit <https://creativecommons.org/licenses/by/4.0/>.

The information contained herein is subject to change without notice. The Queensland Government shall not be liable for technical or other errors or omissions contained herein. The reader/user accepts all risks and responsibility for losses, damages, costs and other consequences resulting directly or indirectly from using this information

## Table of contents

<b>1. Introduction</b>	<b>5</b>
1.1 Purpose	5
1.2 What is a referable dam?	5
1.3 What is an EAP and what must it contain?	6
1.4 What is an effective EAP?	7
1.5 EAPs for very low or low consequence category referable dams	8
1.6 When is an EAP required for a new dam?	8
1.7 What is the approval period of the EAPs?	8
<b>2 What are the requirements under the Act?</b>	<b>9</b>
2.1 What is the intent of the Act requirements?	10
2.2 Why have the requirements for EAPs changed?	10
2.3 How does the Act affect the preparation of an EAP?	11
<b>3 Developing an EAP</b>	<b>12</b>
3.1 Completing the dam hazard identification	13
3.2 When does a dam hazard become a dam hazard event?	14
3.3 When does a dam hazard event become a dam emergency event?	16
3.4 Community education	16
3.5 Training	17
3.6 Exercises	17
3.7 Escalation levels of an EAP	17
3.8 Preparing the dam hazard event and dam emergency event inundation maps	19
3.9 Preparing the (prioritised) entity notification information	21
3.10 EAP notification and warning message requirements	22
3.11 What are notification and warning messages?	23
3.12 Who receives an EAP notification and/or warning message?	23
3.13 Who is responsible for delivering the notification and warning message?	24
3.14 Arrangements to deliver notification and warnings on dam owner's behalf	25
3.15 When is the notification and warning delivered?	26
3.16 How are the notification and warning messages delivered?	26
3.17 Notification call register	27
3.18 Early warning notification service	28
3.19 National emergency alert system	28

<b>4</b>	<b>Submitting the EAP to the chief executive</b>	<b>31</b>
4.1	Local government and district disaster management group notices	31
4.2	How to submit the EAP to the chief executive for approval	33
4.3	What will the chief executive consider when undertaking the assessment?	34
4.4	When will the EAP be approved?	34
4.5	Undertaking the EAP annual review	35
4.6	Annual reviews resulting in a change by agreement	35
4.7	Annual reviews resulting in substantive amendments	36
4.8	EAP reviews triggered by the chief executive	37
4.9	Renewal of the EAP	37
	<b>Appendix 1: Examples of escalation of dam hazards</b>	<b>38</b>
	Escalation of dam hazards examples for: flood issues, incoming floods	38
	Escalation of dam hazards examples for: scouring of or severe damage to spillway	39
	Escalation of dam hazards examples for: embankment scouring issues	40
	Escalation of dam hazards examples for: embankment stability issues	41
	Escalation of dam hazards examples for: seepage related issues	42
	Other potential dam hazards	43
	<b>Appendix 2: Examples of maps</b>	<b>44</b>
	Location map	44
	Area of interest map	45
	Catchment map	46
	Dam failure inundation map	47
	<b>Appendix 3: Common abbreviations and definitions</b>	<b>48</b>
	Abbreviations	48
	Definitions	50
	Bibliography	56

# 1. Introduction

The chief executive, Department of Natural Resources, Mines and Energy (DNRME), administers the *Water Supply (Safety and Reliability) Act 2008* (the Act). The guideline should be read in conjunction with the Act. A copy of the Act can be found at the website [www.legislation.qld.gov.au](http://www.legislation.qld.gov.au).

Following the Queensland state election on 25 November 2017, a machinery of government change was affected during the final stages of this guidelines' development. The department responsible for this guideline and the associated legislation is now the Department of Natural Resources, Mines and Energy (DNRME). At the time of consultation on the draft guideline it was the Department of Energy and Water Supply (DEWS), subsequently all references to DEWS have been changed to reflect this.

## 1.1 Purpose

The purpose of this guideline is to assist referable dam owners and key stakeholders in developing emergency action plans (EAP). It also outlines the criteria that will be used by the chief executive to assess the plans.

This guideline contains information on what should be in an EAP, how to submit an EAP for approval, and how to perform an annual review of an EAP.

An effective EAP requires agreement between key parties in the dam safety disaster management areas. All parties who have a role in implementation of the EAP need to agree on their roles and responsibilities.

It is important to note that these are guidelines only. They are designed to assist referable dam owners to draft their EAP. Notwithstanding anything in this guideline that might be interpreted to the contrary, the provisions of the Act hold force.

Emergency action planning should be viewed as a continual improvement process that incorporates detailed disaster risk management principles, aligns with relevant disaster management plans and demonstrates collaboration with all stakeholders in the identification, agreement and understanding of the roles and responsibilities under such plan.

## 1.2 What is a referable dam?

Dams are built to control and store water for purposes such as irrigation, hydroelectric, flood mitigation, recreation, and water quality control. Dams can be made from earth, rocks, concrete and are usually constructed on rivers.

Not all dams are referable dams. A dam only becomes a 'referable' dam if it would put population at risk (PAR) if it were to fail. A dam becomes referable if:

- a failure impact assessment (FIA) of the dam is carried out under the Act
- the assessment states the dam has or will have a category 1 or category 2 failure impact rating (FIR)
- the chief executive has accepted the assessment.

Only referable dams are regulated for dam safety purposes. The process by which a dam is made referable is detailed in the Act. A dam is not referable if there are fewer than two persons at risk. Referable dams are divided into two categories: category 1 FIR (2 or more persons at risk) and category 2 FIR (more than 100 persons at risk).

Further information on guidelines associated with referable dams is available on the website [www.dnrme.qld.gov.au](http://www.dnrme.qld.gov.au)

### 1.3 What is an EAP and what must it contain?

The Act (s 352E and s 352F) requires dam owners to develop and have approved by the chief executive, an EAP for each referable dam.

An EAP is a standalone plan that is consistent with the disaster management plan/s; it provides the procedures to enable dam owners to respond collaboratively with disaster management groups, local government/s and emergency agencies to manage the consequences of a dam hazard event and a dam emergency event.

An EAP is a tool the dam owner, relevant disaster management group/s and local government/s will use during an event aimed at protecting people and property. The better the EAP, the more effectively it can be implemented.

An EAP must:

- be consistent with the Act
- identify dam hazards, dam hazard events and dam emergency events
- state the processes to be followed *to minimise the risk of harm to persons or property if a dam hazard event or emergency event for the dam happens* (s 352E(2))
- state the roles and responsibilities of all parties during planning, activation and testing for an event
- state who (in priority order), when and how the notification and warning messages are to be delivered to persons who may be harmed or, whose property may be harmed
- state who (in priority order), when and how the dam owner will notify the relevant entities who have a role in the implementation of the EAP if and when a dam hazard event/s and/or a dam emergency event/s occur
- state the dam owners training schedule for EAP officers, local government/s and relevant disaster management personnel to effectively implement and test the effectiveness of the EAP
- demonstrate collaboration between dam owners and local government/s in the provision of education strategies tailored to the knowledge and experience of the downstream residents to provide knowledge and tools to become proactive and self-reliant during an emergency event
- demonstrate collaboration between dam owners, local governments and disaster management groups in the development of the EAP.

An effective EAP requires all parties who have a role in implementation of the EAP to agree on their specific role and responsibility.

The EAP is not an operational document for the day-to-day operation of a dam. The EAP is restricted to the necessary safety activities to be undertaken by the dam owner with support from the local government/s and/or disaster management group/s *to minimise the risk of harm to persons or property if a dam hazard event or emergency event for the dam happens* (s 352E(2)).

It is important to acknowledge that the circumstances of each referable dam are not the same. While all referable dams are required to have an approved EAP in place, the complexity of the EAP is directly related to the level of (adverse) consequence or impact the dam presents to the downstream community.

The Act (s 352M(3)) requires the approved EAP to be publicly available (all personal information is redacted) and to be published on the website at [www.dnrme.qld.gov.au](http://www.dnrme.qld.gov.au).

### 1.4 What is an effective EAP?

An effective EAP is a plan that can demonstrate the following disaster management standard attributes.

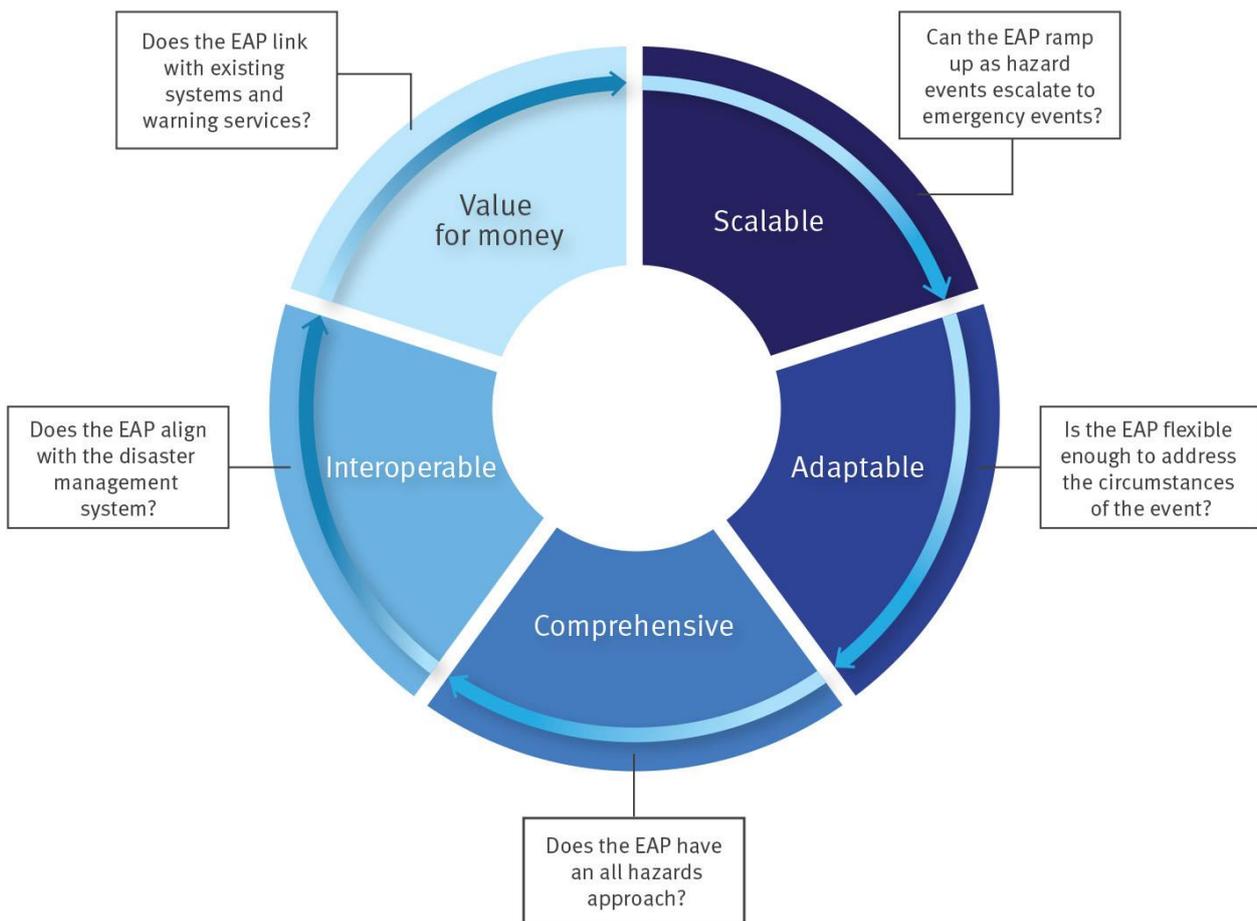


Diagram 1: attributes of an effective EAP

For further information on the disaster management standards, as issued by the Office of the Inspector-General Emergency Management (IGEM), visit [www.igem.qld.gov.au](http://www.igem.qld.gov.au).

## 1.5 EAPs for very low or low consequence category referable dams

The Act does not make a distinction between EAP requirements for referable dams of different sizes and different consequence categories. All referable dam owners are required to prepare and submit an EAP to the chief executive for approval.

For dams that have been assessed within the 'Very Low' or 'Low' consequence category (as determined in accordance with the Acceptable Flood Capacity Guideline and/or the appropriate ANCOLD guideline) the dam owner can utilise a simplified EAP template available on the website [www.dnrme.qld.gov.au](http://www.dnrme.qld.gov.au) to guide the development of the EAP. This should result in a simpler EAP which fits the level of risk the dam poses. The proximity of persons or property if a dam hazard event or dam emergency event happens will determine the degree of simplification possible whilst still maintaining an effective EAP.

An EAP prepared using a template will be assessed on a case by case basis to ensure the plan is effective, having regard to the nature of the particular dam and its dam hazards.

The EAP should be flexible and suitable for the size and level of risk the dam poses to the persons and property at risk during a dam hazard or emergency event.

## 1.6 When is an EAP required for a new dam?

Dam owners who are proposing to construct a new dam are encouraged to contact the department via email at [damsafety@dnrme.qld.gov.au](mailto:damsafety@dnrme.qld.gov.au) to seek information on dam safety requirements including how to assess whether the dam is referable and if an EAP might be required.

The Act (s 352F) requires an EAP to be submitted to the chief executive for approval within four months after the dam construction is finished. However, if the chief executive gives the dam owner a notice requiring the EAP before the construction is completed, the EAP will be due within the period of at least 30 business days or a longer period as stated in the notice.

## 1.7 What is the approval period of the EAPs?

The chief executive approval for the EAP must be for a period of no more than five years. The approval period is to be stated within the approved plan (s 352K(2)).

## 2 What are the requirements under the Act?

The EAP must be developed:

*“to minimise the risk of harm to persons or property if a dam hazard event or emergency event for the dam happens” (s 352E(2)).*

As stated in s 352H of the Act, the minimum requirements for the content of an EAP are:

(1) *The emergency action plan must:*

(a) *identify each dam hazard for the dam; and*

(b) *for each dam hazard:*

(i) *identify the area likely to be affected by a dam hazard event or emergency event arising from the dam hazard, including, for example, by attaching to the plan maps showing areas vulnerable to flooding if the event were to happen; and*

(ii) *identify each circumstance that indicates a material increase in the likelihood of the dam hazard event or emergency event happening; and*

*Examples for subparagraph (ii):*

- *an unusual amount of seepage from the dam*
- *rainfall in the catchment area of the dam*

(iii) *state when and how the owner of the dam plans to warn persons who may be harmed, or whose property may be harmed, by the dam hazard event or emergency event, if a circumstance mentioned in subparagraph (ii) arises or the dam hazard event or emergency event happens, including the order of priority in which the persons or categories of persons are to be warned, and*

(iv) *state when and how the owner plans to notify the relevant entities for the dam if a circumstance mentioned in subparagraph (ii) arises or the dam hazard event or emergency event happens, including the order of priority in which the relevant entities are to be notified; and*

(v) *state the actions the owner plans to take in response to a dam hazard event or emergency event; and*

(c) *be accompanied by each notice given by a local government or district group under section 352HB(3) or 352HC(2) for the plan, and any notice responses by the owner; and*

(d) *include any other relevant matter prescribed by regulation.*

(2) *For subsection (1)(b)(iii) the emergency action plan may provide for the dam owner to make arrangements with a relevant entity for warnings to be given by the relevant entity on behalf of the dam owner in appropriate circumstances*

A copy of the Act is available on the website at [www.legislation.qld.gov.au](http://www.legislation.qld.gov.au)

## 2.1 What is the intent of the Act requirements?

The responsibility placed on dam owners to develop an EAP is intended to formalise the identification of dam hazard events and dam emergency events, and the processes to be followed to minimise the risk of harm to people and property.

An effective EAP is achieved when dam owners develop a partnership with local governments and disaster management groups and engage these stakeholders in all aspects of the EAP, from development, testing, activation, annual review and renewal of the EAP.

It is essential the dam owner proactively engages with the local government/s and the disaster management group/s with the view to sharing information regarding the:

- identification of dam hazards and the escalation of dam hazard events to dam emergency events
- identification of people who may be harmed and whose property may be harmed as a result of the dam hazard events or dam emergency events
- agreement on who (in priority order), when and how the notifications and warning messages are delivered to the identified people who may be harmed and whose property may be harmed as a result of the dam hazard events or dam emergency events
- agreement on who will deliver the notifications and messages
- agreement on the pre-formatted wording of the notification and warning messages
- agreement on the roles and responsibilities of each party for implementing the EAP.

Emergency action planning must identify each dam hazard for the dam, and determine which dam hazards could become a dam hazard event and which could become a dam emergency event (see description of terminologies below).

## 2.2 Why have the requirements for EAPs changed?

Since the 1970s, the EAP has been required as part of dam safety conditions applied to dams. In 2013, following a number of extreme weather events and the recommendations of the 2011-12 Queensland Floods Commission of Inquiry, the EAP became a legislative requirement when amendments were introduced to the Act.

However, subsequent flood events resulted in dam owners being criticised by downstream residents for dam emergency event procedures, particularly the issuing of warnings. In 2015, the Office of the Inspector-General Emergency Management (IGEM) conducted a review of the Seqwater and SunWater Warnings and Communications and the 2015 Callide Creek Flood Review. The Queensland Government supported the Office of the IGEM review findings and recommendations, and DNRME developed and implemented a dam safety program to:

- strengthen the requirement for dam owners to issue notifications and warnings
- improve the effectiveness of emergency planning for referable dams
- better integrate dam safety and disaster management into dam safety guidelines.

There are high community expectations that dams will be operated safely and dam owners will provide timely and easily understood notification and warning messages before, during and after an event. In order to meet this expectation, the preparation and implementation of an EAP must be the result of appropriate collaboration between dam owners, local governments and disaster management groups to ensure:

- consultation has been undertaken during the development, testing and annual review of the EAP
- notification and warning messages are timely, contextualised, informative, consistent and understandable
- dam operational staff and relevant disaster management group/s participate in a joint exercise and are competent in the implementation of the EAP
- the potentially affected downstream residents have received appropriate education on the EAP.

Information on the Office of the IGEM Review of the Seqwater and SunWater Warnings and Communications is available at the website [www.igem.qld.gov.au](http://www.igem.qld.gov.au)

### 2.3 How does the Act affect the preparation of an EAP?

The recommendations from the Office of the IGEM Review of Seqwater and SunWater Warnings and Communications prompted a number of amendments to the Act. These amendments came into effect on 1 July 2017 and include:

- improving the effectiveness of an EAP by better integration between dam safety and disaster management frameworks and actions
- the EAP process to require each affected local government to assess the EAP and consider if the EAP is consistent with its disaster management plan. The local government/s must provide the dam owner with a notice (within 30 business days) stating consistency or otherwise of the plan/s (s 352HB)
- the EAP process to require the dam owner to provide the chair of the district disaster management group/s a copy of the EAP and to provide 30 business days for the chair to review the EAP (s 352HC) for consistency with the group/s disaster management plan/s. The chair may provide the dam owner with a notice stating consistency or otherwise of the group/s plan/s
- clarification that dam owners are responsible for ensuring notification and warning messages are provided in a timely manner for persons who may be harmed, or whose property may be harmed. This may include the assistance of a relevant entity to provide warning messages directly in emergent circumstances where people need to act in a timely manner (s 352H (1)(b)(iii) and 352H (2)).

Other changes:

- The main purpose of the EAP is to minimise the risk of harm to persons or property if a dam hazard event or emergency event for the dam happens (s 352E(2)); this implies flexibility and redundancy in EAP process.
- The chief executive's approval process will consider the disaster management standards as issued by Office of the IGEM under the *Disaster Management Act 2003*, as a means to evaluate the effectiveness of the EAP.

Further information on amendments to the Act are available on the website at [www.dnrme.qld.gov.au](http://www.dnrme.qld.gov.au).

### 3 Developing an EAP

To prepare an effective EAP the dam owner should work in partnership with the local government/s and the disaster management group/s to complete the following steps:

- identify dam hazards, dam hazard events and dam emergency events
- identify people who may be harmed and whose property may be harmed as a result of the dam hazard events or dam emergency events
- identify and prioritise the relevant entities that have a role in the implementation of the EAP
- reach an agreement on the roles and responsibilities of all parties who have a role in the implementation of the EAP
- identify how, when and the content of the notification and warning messages to be disseminated to the people who may be harmed and whose property may be harmed as a result of the dam hazard events or dam emergency events
- identify who will deliver the notifications and messages
- ensure staff are trained in the EAP
- test the effectiveness of the EAP in an exercise.

To complete the above activities all parties who have a role in the developing, drafting, reviewing, testing and implementation of the EAP need to agree on their roles and responsibilities.

The EAP becomes a record of the agreement made by the parties to provide resources and work cooperatively in the implementation of the EAP.

For more information on tools available to assist parties to understand and/or reach an agreement on the EAP roles and responsibilities, email [damsafety@dnrme.qld.gov.au](mailto:damsafety@dnrme.qld.gov.au).

The aim is to develop an EAP to enable the dam owner and the disaster management group/s to respond to dam hazard events or dam emergency events in a timely and effective manner.

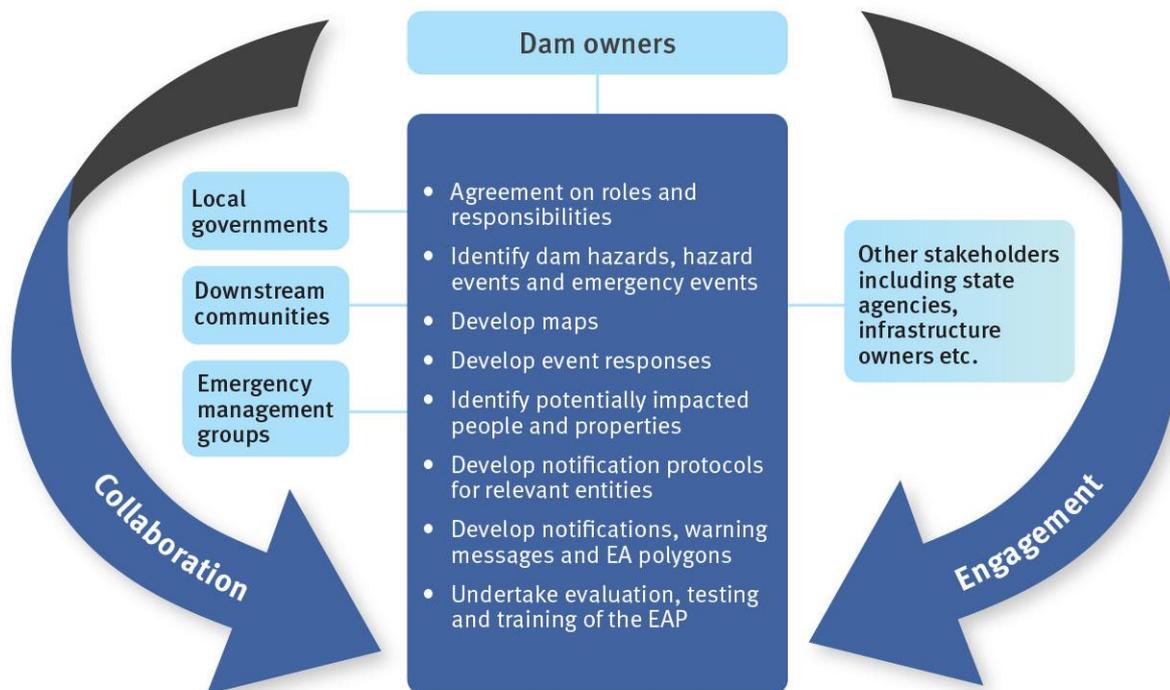


Diagram 2: Stakeholder engagement in the EAP development process

### 3.1 Completing the dam hazard identification

Emergency action planning must identify each hazard for the dam, and determine which dam hazards could become a dam hazard event and which could become a dam emergency event (see description of terminologies below).

It is recommended the dam owner/s work in partnership with the local government/s and disaster management group/s through the process to identify all dam hazards, dam hazard events and dam emergency events and ensure that consistency with disaster management planning is achieved. An agreement should be reached on the standard or methodology to identify and assess the risks from dam hazards.

For more information on undertaking an emergency risk assessment refer to the Australian Government National Emergency Risk Assessment (NERAG) Guideline (2010). The NERAG provides a contextualised emergency risk assessment methodology consistent with the Australian/New Zealand Standard AS/NZS ISO 31000:2009 Risk management – Principles and guidelines.

A **dam hazard (s 352A)**, means a reasonably foreseeable situation or condition that may:

*“(a) cause or contribute to the failure of the dam, if the failure may cause harm to persons or property; or*

*(b) require an automatic or controlled release of water from the dam, if the release of the water may cause harm to persons or property.”*

The dam hazards to be considered for inclusion in an EAP will vary depending on the type of dam and the consequences of the escalation from a dam hazard to dam hazard event or dam emergency event.

These may include:

- **dam flooding** from a significant rainfall event within the dam catchment, resulting in an increase in the storage level and spillway discharge
- **embankment stability** hazards which can result in distress or abnormalities in embankments such as cracking or deformation, sliding or any structural damage that has the potential to escalate to a dam failure (dam emergency event). Embankment stability hazards can occur as a result of significant rainfall, earthquake, landslide, or in very rare occurrences, from an act of terror
- **seepage** hazards, new seepage or an increase in the observed seepage detected during routine inspections has the potential to become a dam hazard event or escalate to a dam emergency event
- **acts of terrorism** on a referable dam will generally pose a very low risk to the safety of a dam. The chief executive has a responsibility to implement the Queensland Government's - Queensland Counter-Terrorism Strategy 2013-18, and as such the EAP is to acknowledge that acts of terrorism are a dam hazard which could escalate to an emergency event. To assist in a Queensland Police Service (QPS) response, the following contacts and notification priority order is to be stated within the EAP:
  - Priority 1 National Security Hotline (1800 123 400)
  - Priority 2 Queensland Police Service Counter-Terrorism Liaison Officer (the local disaster management group can provide the dam owner with the appropriate contact number)
  - Priority 3 Triple zero.

While it may not be possible to identify every type of emergency, the EAP should provide sufficient general guidance to assist flexible and adaptable response to unforeseen situations.

### 3.2 When does a dam hazard become a dam hazard event?

A dam hazard becomes a **dam hazard event** when persons or property may be harmed due to the event but the actions undertaken by the dam owner is **unlikely** to require a coordinated response involving two or more relevant entities.

The 'relevant entities' mentioned above are:

- the local government whose local government area may be affected by the event
- the relevant local disaster management group/s
- the relevant district disaster management group/s
- the chief executive
- other entities such as the Queensland Fire and Emergency Service (QFES) or the QPS.

For example, significant rainfall resulting in increased dam inflows may be a dam hazard and could become a dam hazard event when spillway releases from the dam reach a level that may harm people or property downstream.

Not all spillway releases need to be treated as a dam hazard event. If the rainfall results in a spillway release flow which is contained within the 'bed and banks' of the watercourse, this is not a dam hazard event as a coordinated response involving two or more of the relevant entities specified above is unlikely to be required to respond to this event. Further, if the dam owner, local government/s and the directly affected stakeholders agree that notification is unnecessary, then the hazard is not a dam hazard event and the EAP is not required to be activated.

A spillway release hazard is escalated to a dam hazard event when the resulting spillway flow cannot be contained within bed and banks, thereby activating the EAP to the Alert / Stand up level, as a coordinated response by relevant entities (as specified in the Act) may be required and the directly affected stakeholders agree notification is necessary.

For each dam hazard event identified (and the potential escalation to a dam emergency event, see next section) the EAP is to have an escalation table that provides clear and concise instructions to enable dam operation personnel to complete the associated level tasks (s 352H(1)(b)(v)).

The timely activation of the EAP is critical for an effective response to a developing dam hazard event and preparation for a potential dam emergency event. The nature of operations under an EAP will be dependent upon a number of factors including:

- the rate of development of the event
- the time required to provide adequate notifications and/or warning messages to entities
- the time required for downstream residents notified or warned to act effectively.

Outflows from dams are only one potential source of floodwater contributing to increased flows and water levels downstream.

It may be beneficial for dam owners to include in their EAP and/or associated community educational material, information which puts the significance of dam outflows into context with localised riverine flooding that may result from significant rainfall within the broader catchment area.

### 3.3 When does a dam hazard event become a dam emergency event?

A **dam emergency event** is an event arising from a dam hazard where persons or property may be harmed due to the event and any of the following apply:

- a coordinated response to the event involving two or more relevant entities specified in section 3.2
- the event is arising from a disaster situation declared under the *Disaster Management Act 2003* and/or
- an entity performing functions under the State Disaster Management Plan may, under that plan, require the owner of the dam to give the entity information about the event.

Providing notification to other entities is not a coordinated response. A coordinated response involves these entities taking action to respond to the dam emergency event under the EAP.

For example, rainfall from a tropical cyclone may be a dam hazard and could become a dam emergency event if resultant inflows place the integrity of the dam at risk, requiring the dam owner to coordinate a response with the local government/s, the local disaster management group/s, the QFES and QPS.

Spillway releases occurring when the disaster management group is at stand up (activated under the *Disaster Management Act 2003*) in response to a disaster are not automatically a dam emergency event. Such releases become a dam emergency event when the dam hazard escalates to a trigger level where the dam owner needs to respond under the plan as a part of a coordinated response to the event involving two or more entities.

Dam emergency events may be rare, depending on the dam. Some very low and low consequence dams or remote dams may not have a dam hazard event escalate to a dam emergency event.

### 3.4 Community education

Dam owners are encouraged to work in partnership with local governments to incorporate relevant dam EAP information into local disaster management community awareness and resilience programs.

The inclusion of an overview of the education strategies and/or activities the dam owner will undertake within the EAP demonstrates collaboration between dam owners and local government/s to provide the community with the knowledge and tools to become proactive and self-reliant during dam emergency events.

For more information on developing community education programs see Emergency Management Australia: [Guidelines for the Development of Community Education, Awareness and Engagement Programs \(Manual 45 \(2010\)\)](#).

### 3.5 Training

Dam operational staff training is a key component of the dam owner's dam safety program. Extending the training to include key stakeholders such as the local disaster management group/s, particularly for those with roles and responsibilities in implementing the EAP can improve the effectiveness of the plan.

The EAP should include an overview of the dam owner's EAP training program to test the effectiveness of the EAP.

### 3.6 Exercises

In addition to the staff training program, dam owners are encouraged to extend an invitation to key stakeholders to participate in EAP activation scenario exercises to evaluate the plan's effectiveness. It is recommended scenario exercises are undertaken at least biannually prior to each wet season.

Analysing the plan effectiveness during an exercise and post-emergency event response enables a more effective review process in identifying plan deficiencies and training requirements.

Flexibility and agility in planning, rather than rigidity, ensures the EAP remains relevant, realistic and risk-based.

### 3.7 Escalation levels of an EAP

The four levels of EAP activation, with descriptions of conditions defining each level, are described in Table 1. It is disaster management best practice to colour code the escalation table yellow, amber, red and green.

Dam owners can self-assess the hazard identification and risk assessment process against the Office of the IGEM Standard for Disaster Management in Queensland, available online at [www.igem.com.au](http://www.igem.com.au).

Dam owners are encouraged to engage with the local government/s and disaster management group/s when developing and testing the effectiveness of the escalation table to ensure the actions and communications align with the disaster management plan/s and all stakeholders have a clear understanding of their roles and responsibilities in the activation of the EAP.

Table 1 Escalation levels for EAPs

Level	Conditions
Alert	<ul style="list-style-type: none"> <li>• A heightened level of vigilance due to the possibility of an event occurring that requires increased frequency of monitoring. Duration of this level is dependent on the rate of development of the potential failure condition.</li> <li>• During the alert level, agreement on the need for and frequency of situational reports should be discussed with the disaster management group.</li> <li>• No further action may be required. However, the situation may need to be monitored by someone capable of assessing the potential of the threat.</li> </ul>
Lean forward	<ul style="list-style-type: none"> <li>• A heightened level of situational awareness of a potential dam hazard event. The disaster management group and dam operational staff are placed in a state of operational readiness to move to the 'Stand-up' level of activation in the event of an emergency event occurring or to mitigate the consequences of such an event.</li> <li>• The chief executive is advised of the status of the potential disaster event.</li> <li>• An increase in frequency of monitoring is undertaken.</li> <li>• Situational reports to the disaster management group and chief executive should continue as previously arranged or otherwise requested.</li> </ul>
Stand up	<ul style="list-style-type: none"> <li>• The disaster management group and the dam owner have mobilised resources and personnel as part of the EAP activation.</li> <li>• Any works that may become necessary at the dam site to minimise the risk of dam failure or minimise the consequences of failure should be undertaken.</li> <li>• Situational reports should be provided to the disaster management group and chief executive according to agreed timelines.</li> </ul>
Stand down	<ul style="list-style-type: none"> <li>• Transition from responding to an event back to normal core business and/or continuance of recovery operations.</li> <li>• The disaster management group and chief executive are advised of the end of the event.</li> <li>• There is no longer a requirement to respond to the event and the threat is decreasing.</li> </ul>

Further examples of escalation tables are provided in Appendix 1.

There may be situations where a dam emergency event has a series of escalating trigger events that reflect the escalating level of risk.

For example, the dam is approaching the flood record; in preparation the EAP goes to Stand Up activation level. The event is forecasted to continue and flood levels exceed the record. There is a significant escalation of risk level.

Under this situation it may be appropriate to develop sequential Stand Up triggers (Stand Up 1, Stand Up 2, etc.) to enable the escalation table and associated notifications and warnings to be relevant to the emergency event and the level of risk posed.

### 3.8 Preparing the dam hazard event and dam emergency event inundation maps

The EAP must identify the area likely to be affected by each dam hazard event and each dam emergency event arising from the dam hazard. This can include, *for example, attaching maps showing areas vulnerable to flooding if the event were to happen*" (s 352H (1)(b)(i)).

The intent of the mapping is to assist in the identification of people and/or property that may be harmed as a direct result of an event.

Mapping is vital for the effectiveness of the EAP as it visually defines the extent of the potential inundations arising from dam hazard events and dam emergency events.

Dam owners are encouraged to consult with the local government/s and disaster management group/s regarding the maps (and complexity of the associated modelling) to achieve consistency of terms and alignment with relevant disaster management plan/s. For example, the disaster management group/s may prefer maps to show the expected height of water over a road instead of an absolute peak water elevation to Australian Height Datum.

The accuracy and limitation of the information supplied on the maps and how best to use the map/s should be specified and described on the maps and within the EAP. This is discussed further below.

In meeting the EAP map requirements, the following may need to be considered:

- Where there is a concurrent inflow near the dam, discussion with the disaster management group/s and other stakeholders should occur to identify if reliable mapping of outflows is feasible and/or adds value to the EAP.
- Each dam hazard event or dam emergency event is to be linked to inundation mapping contained within the EAP, developed at a scale sufficient to be used for identifying downstream-inhabited areas that could be or are likely to be within the area subject to the dam hazards and/or dam emergency events. Topographic maps or photo images may assist in the preparation of the map/s.
- The detail and number of maps provided should be directly related to the identified dam hazards and dam emergency events identified within the EAP. However, this does not necessarily mean there should be an individual map for each potential event. For instance, a sunny day piping failure might produce essentially the same impacts as a sunny day embankment instability and the one map may be appropriate for each type of event (see Appendix 1 for a description of potential failure terms).
- A key map may be required where it is necessary to use multiple maps to adequately represent the impacted area for a particular event and to enable quick reference during the management of an event.

- Mapping of impacted areas for dam failure will normally require at least two types of scenarios:
  - a **sunny day failure event** to cover the potential consequences of dam failure associated with no other flooding.
  - a **dam failure event** associated with a major flood event passing through the dam and concurrent flooding downstream of the dam in the case of a dam failure associated with a flood event, the inundation mapping for EAPs needs to cover the combined inundation area from both causes. Such maps need to display the inundations that would occur with and without the effects of dam failure.
- The identification of events associated with dam releases that are not the result of a dam failure, but need to be mapped due to downstream hazard, must be agreed in conjunction with the local government/s and the disaster management group/s. Such flows through a spillway or otherwise are usually smaller than any flood wave arising from a dam failure and downstream conditions may be more critical as roads may be cut and irrigation activities immediately below dams may be adversely impacted.
- It may not be possible to assess the incremental impact of a dam release or dam failure within a broader flood event in real time, unless calibrated models and practised procedures are in place involving all relevant entities.
- Where it is found there are likely to be significant impact zones arising from releases downstream from the dam, it may prove more practicable to provide a table of critical sites in the EAP rather than attempt to provide more complete impact mapping which may not specifically apply to the particular real time situation encountered during an actual event.
- It may also be appropriate in some cases to supplement the inundations shown on the map/s with water surface profiles showing the elevation before failure, the peak water surface elevation after failure, and the location of structures at critical locations.
- The magnitude of the adopted breach and associated concurrent flooding for dam failure events is required to be clearly marked on the maps.
- The text within the EAP and the event inundation maps will need to adequately cover access to the dam at relevant times by relevant personnel and emergency access routes or paths to higher ground for the general public in the event of evacuation being required.
- Inclusion of the following supplementary information should be considered on the inundation map/s (as relevant to the particular dam situation):
  - travel times (in hours and minutes) of the leading edge of the dam failure flood wave
  - potential peak water surface elevations
  - estimated duration of inundation.
- Electronic copies of failure impact zones modelled should be included with the submission where possible. These should be included for all significant failure cases modelled. The files may be submitted in .shp or .kml file formats.
- For low or very low consequence dams, simplified maps depicting direct presentation of potential impacts on specific sites may be adequate.
- If arrangements are in place for the dam owner to issue notification and warning messages to particular impacted people downstream of the dam and for other groups such as the local disaster management group to notify and warn others, the demarcation as to who will warn whom should be marked on the inundation maps.

- Other pertinent information identified as a result of consultation with the appropriate emergency management authorities and other relevant stakeholders or entities may also need to be included.
- The inundation map/s should be updated periodically to reflect changes in downstream areas and better understanding of downstream flooding.

As discussed above, users of inundation mapping associated with each EAP need to be made aware of the significant limitations to the potential accuracy of this mapping and make adjustments to suit the actual circumstances of the event. These potential limitations can include:

- the accuracy of the available terrain data and calibration data to facilitate modelling of dam hazard events and dam emergency events and the calibration of these models
- the ability to numerically model the actual physical river systems
- the magnitude and timing of any potential dam breaches may be different to that assumed in the associated modelling. For example, if the actual breach is larger or occurs more rapidly than assumed, inundation is likely to be greater
- if the breach initiates at a different lake level or location than that assumed, inundations will be different
- because the incremental impact of both a potential dam failure or dam release can be very dependent on the magnitude of downstream concurrent flooding and the distance of potentially impacted zones from the dam, the magnitude of the concurrent flooding assumed in the modelling needs to be specified in the mapping.

Examples of maps are provided in Appendix 2.

### 3.9 Preparing the (prioritised) entity notification information

The EAP is required to contain notification information for entities that have roles and responsibilities in the event the EAP is activated (s 352H(1)(b)(iv)). For example, a notification table/flowchart that states:

- the name, position title, organisation of the entity contact person (or a 24 hour disaster management hotline)
- when each person will be contacted and by who, for each stage of the hazard or emergency event (clearly numbered in order of priority)
- how contact will be made i.e. via phone, email, fax, radio.

Notifications for the Dam Safety Regulator are to be directed to:

Priority 1 DNRME Incident Hotline 1300 596 709 (24 hours 7 day)  
 Priority 2 Director Dam Safety 31994848 (W) 0436 658 451 (AH) (email)  
[damsafety@dnrme.qld.gov.au](mailto:damsafety@dnrme.qld.gov.au)

To achieve this, the EAP must first identify:

- each local government, which local government area may be affected by a dam hazard event or emergency event
- each local disaster management group and district disaster management group, whose area could be affected by a dam hazard and/or dam emergency event
- the chief executive for the department that administers that Act
- other relevant entities as appropriate, such as the QFES and QPS.

The notification information is to be tailored to the needs and priorities of each dam. The accuracy of the contact information is critical for the timely notification of those responsible for making decisions and issuing instructions within their organisations to ensure the EAP is activated in a timely manner.

It is best disaster management practice that one person be responsible for contacting no more than three or four other parties. At a minimum, the notification table should designate who, when and how dam owners will contact and who, when and how the relevant Disaster Management Coordinator will be contacted.

Note, names and contact details are redacted from the published EAP.

### 3.10 EAP notification and warning message requirements

Dam owners are responsible to provide notifications and messages to those persons whose property may be affected as a direct result of the dam hazard events or dam emergency event.

It is recommended dam owners, in partnership with local governments, develop and distribute information to the downstream community to assist residents in becoming self reliant during disaster events. The aim is to assist the community further downstream to be proactive in self monitoring weather events and taking reasonable action to be informed, prepared, stay safe and to recover from disaster events.

The EAP is required to state **who** (in order of priority i.e. numbered in order of priority of contact), **when** (at which trigger level) and **how** (phone, sms, door knock, media) notification and warning messages, will be provided to people who may be harmed and whose property may be harmed as a direct result of the dam hazard events or dam emergency events identified in the EAP (s 352H(1)(b)(iii)).

The EAP is to include the pre-formatted wording of notification and warning messages to be disseminated to persons who may be harmed as a result of a dam hazard and/or dam emergency event within the agreed notification area.

To achieve this effectively, the dam owner and the local government/s, in consultation with its disaster management group must agree on who is to receive the notification and warning messages and who will have responsibility to provide the notification and warning messages.

### 3.11 What are notification and warning messages?

A **notification** provides appropriate information and advice on a heightened risk to enable those potentially involved to make informed decisions about preparedness and safety.

A **warning** is the dissemination of an urgent message signalling an imminent hazard event, or emergency event and provides advice on protective measures.

The warning messages involve more than notifying people about the technical nature of a release of water from the dam. The message includes telling people if, when, and potentially even how, they need to act to protect life or property.

Warning messages inform those at risk, or whose property is at risk, of an impending escalation of an emergency event and aims to prompt an appropriate response or action from those persons. The required action is contained in the warning message, for example, 'seek further information', 'take shelter', 'evacuate' or 'activate your personal emergency plan'.

### 3.12 Who receives an EAP notification and/or warning message?

As there can be significant differences in the warning times available to warn different groups of people downstream of the dam, it may be appropriate to categorise these people into sub-groups in order to better facilitate prioritisation of the notification and warning messages. Dam owners could consider illustrating the demarcation between highest and lesser priority via categories on an inundation map.

In consultation with the local government/s and the disaster management group/s, the dam owner is to **identify and prioritise** the persons (or categories of persons such as those at imminent risk) and/or property that may be harmed as a result of dam hazard events or dam emergency events identified within the EAP (s 352H (1) (b) (iii) and (iv)).

The dam owner and local government/s should then identify and reach an arrangement on when and how the 'priority' people (those at the highest risk in the event of a dam emergency event) will receive notification and warning messages, and who (the dam owner, local government, or other relevant entity) has the responsibility to issue those notification and warnings.

The EAP is to state the outcome of this arrangement (i.e. within the roles and responsibilities section) and provide details of who, when and how the notification and warnings will be made and the content of those messages.

For those identified as a 'lower' priority (those who have time to take appropriate actions to prevent loss of life and property, and/or other interested parties), the EAP must document the agreement for the provision of notification and warning messages. The EAP must provide information on this category of persons and who, when and how the notification and warning messages will be delivered and the content.

There are around 633 000 people that live downstream from referable dams.

Demographics can influence how effective notifications and warnings are received and actioned by the community.

Dam owners and local government/s are encouraged to consider the messaging needs of the target audience and undertake community education on the EAP. This may assist in the management of community expectations on the content and frequency of notification and warning messages.

### 3.13 Who is responsible for delivering the notification and warning message?

This must be agreed between the dam owner, local government/s or relevant entity. Some local government/s may prefer to take responsibility for the issuing of all notifications and warnings, others may prefer the dam owner to retain the responsibility.

It is important there is no confusion amongst the community between notifications and warning messages provided by a dam owner and those provided by local government/s or the Bureau of Meteorology (BoM). It is recommended the dam owner, local government/s or relevant entity reach an agreement as to who is going to deliver the messages. This agreement is to be clearly stated within the 'roles and responsibilities' section of the EAP. In addition, the wording and delivery mode of the notifications and warnings are to be clearly documented within the EAP.

A typical division of responsibilities is outlined below:

- The **dam owner** ensures provision of notification and warning messages to people who may be harmed and whose property may be harmed as a direct result of the dam hazard events or dam emergency events identified in the EAP. The dam owner may achieve this through agreement with a third party or via provisions in place. It is important to note it is not the dam owner's role to provide notifications and warnings for the wider community outside of the identified dam hazard/emergency event inundation area. The issue of notifications and warnings to the wider community is at the agreement of the dam owner and local government/s.
- The **local government** provides warnings of flash flooding within its local government area. Many local government/s have stream gauging stations to monitor stream heights to inform flash flood warnings.
- The **Bureau of Meteorology** (BoM) is the lead agency for issuing warnings for riverine flooding. However, not all rivers have a flood warning service. For information on services provided by the BoM, visit their website at [www.bom.gov.au](http://www.bom.gov.au).

### 3.14 Arrangements to deliver notification and warnings on dam owner's behalf

The dam owner is responsible for the provision of notification and warning messages to people who may be harmed and whose property may be harmed as a result of the dam hazard events or dam emergency events. This may be achieved by arrangement with another entity to distribute notifications and warnings on their behalf.

If the dam owner has an agreement with another relevant entity to provide the notification and warnings on its behalf, the EAP is to provide details of the arrangement. The arrangement does not exempt the EAP from stating the who, in order of priority, when and how the messages will be delivered or the requirement for the inclusion of the pre-prepared message wording or EA polygon within the EAP (see

National emergency alert system section 3.19 for a definition of polygons used for issuing warning messages via the EA System).

It is recognised a community may respond more confidently to information coming from a relevant entity it considers to be an authority on the dam hazard events and/or dam emergency events.

The following may assist when considering the most relevant entity to distribute the notification and warning messages on the dam owner's behalf:

- Who would those at risk normally look to for the provision of flood notifications and warnings?
- Are there existing early warning notification systems in place in the local government area?
- How effective are the early warning notification systems likely to be for a dam hazard event or a dam emergency event?
- Who is best positioned to issue the warnings and is there sufficient time for normal emergency management system warning processes to operate?
- What back-up is available in the event the agreed messaging distribution system fails?
- What residual risks remain if the arrangement fails?

As it may take time to mobilise the local disaster management group, the priority is to notify and warn those persons immediately at risk downstream of the dam. It may be reasonable for one entity to complete the notifications and warnings to those closest to the dam and another entity to undertake the notifications and warnings to those further downstream of the dam hazard or dam emergency event.

To test the effectiveness of the arrangement, it may be useful to consult with community representatives on who they believe is the most relevant entity to deliver the notifications and messages.

It is recommended dam owners and local government/s work together to develop strategies on educating downstream residents and the wider community on the purpose of the messages from each entity and how the message relates to their personal safety.

### 3.15 When is the notification and warning delivered?

Communities living downstream of dams may have an expectation they will be notified as soon as possible when dam issues emerge, during the event and when the event has concluded. In consultation with local government/s, dam owners will need to develop notification and warning messages including frequency of messages that will address community expectations.

Generally, EAP notification and warning messages continue through all phases of the event until the event is over. However, the frequency may depend on outcomes of community consultation.

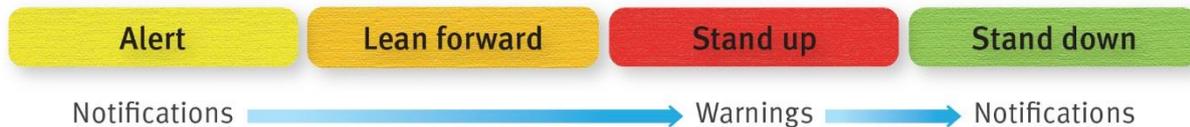


Diagram 3: escalation of notifications to warnings

For timeliness of notifications and messages, the *Australia Disaster Resilience Handbook Collection, Manual 21, Flood Warnings*, indicates there is no convention in Australia for acceptable warning time. However, the guidelines provided in *Manual 23 – Emergency Management Planning for Floods Affected by Dams* suggest warning time for evacuation needs to be considered in time blocks of not less than one hour to ensure that action plans can be realistically implemented. Each dam is to be considered on its individual circumstances.

Travel times of the leading edge of the dam failure flood wave should also be considered when determining warning times and the methods of notification.

Downstream residents at risk of inundation from a dam hazard or dam emergency event should receive contextualised, consistent, accurate notifications and warnings through all phases of the event.

### 3.16 How are the notification and warning messages delivered?

Notification and warning messages enable and empower downstream residents to take appropriate action during an event. No matter which communication mode is utilised to issue the EAP notification and warning messages, it is important to achieve maximum coverage in the impacted areas. Depending on the location and extent of the impacted area and the number or frequency of messages needed to be issued, the use of a combination of communication modes will assist in the effectiveness of the delivery.

Communication modes could include:

- personalised phone calls or door knocks to vulnerable persons (if appropriate, practical and safe to conduct)
- mass notification and warning messages via voice message to landlines and SMS to mobile phones
- mainstream media news coverage i.e. radio and television
- social media i.e. websites (local government/s and dam owner), Facebook, Twitter, Instagram
- sirens or other direct means of localised warnings.

Traditional media such as ABC radio and television interviews continue to be a main source of information accessed by the community during an emergency event.

Recent disaster events in Queensland have highlighted the importance of utilising multiple modes of communication to ensure those at highest risk of being harmed and/or whose property may be harmed and the wider downstream community receive up-to-date information through all phases of the emergency event. The ability to receive information may be limited when power supply and mobile phone reception has been interrupted by extreme weather events.

The dam owner should consider multiple means of communications and redundancies in critical systems in order to maximise the chance of the notification and warning messages being received with sufficient time to adequately respond. The multi-modal communication approach is also more likely to reach transient populations identified in emergency event areas.

### 3.17 Notification call register

If the dam owner or other entity, by agreement, is delivering the notification and warning messages via personalised telephone calls, then it may be more effective to include the contact list within the EAP for ease of reference by the actioning officer and other relevant entities. Note, this information will be redacted from the EAP prior to it being published on the DNRME website.

If personalised calls are to be made, dam owners are encouraged to reach an agreement with the local government/s on the most efficient way to maintain the call register.

If the notification call register is extensive, or the dam owner and local government/s determine it is not appropriate for inclusion within the EAP, then the EAP is to state:

- how the call register was generated
- process to ensure the list is up to date
- who holds the list
- who will make the calls
- priority order in which the calls will be made.

The notification call register will be required to be produced on request by the chief executive.

### 3.18 Early warning notification service

Early warning notification services are a tool for dam owners and local government/s to deliver notification messages to persons at risk and other interested community members.

Dam owners and local government/s are encouraged to engage with those persons identified as a 'priority' contact (those immediately downstream of the dam), and other categories of persons who may be at risk of harm, to gain an understanding of their expectations for the provision of dam notification messages and the suitability of the early notification service to meet their expectation.

If dam owners and/or the local government/s have an early warning notification service for their EAP notifications, parties are encouraged to include the registration details, or alternatively details on how to download the App within the EAP.

The EAP should state the strategies dam owners and/or local government/s will employ to encourage those people / property at the highest risk of being harmed to subscribe to the service, and additional communication modes that will be used to maximise the number of people to receive notifications.

### 3.19 National emergency alert system

The national emergency alert system (EA system) administered in Queensland by QFES, is a tool dam owners, local government/s and other relevant entities use to distribute warnings for dam emergency events or a declared state disaster event. The EA system sends preformatted warning messages to mobile phones and landlines within a specified geographic area, identified by a polygon shape file.

**The EA system is used for warnings only.** Therefore, it is not an appropriate system for EAP notification messaging at the alert, lean forward or stand down stages of an event.

The EA system uses a polygon (i.e. an electronic predefined geographic area for use in a Geographic Information System (GIS)) to define the area in which the warning message will be distributed (via voice message to landlines and SMS messages to mobile phones).

The purpose of the inclusion of the polygon within the EAP is to show the public and relevant entities the dam owner has identified areas at risk as a result a dam emergency event, and has provisions in place to distribute warnings to those who may be in those areas.

Lodging the Emergency Alert polygon and preformatted message with the State Disaster Control Centre (SDCC) Watch Desk (QFES) prior to an event, significantly enhances the speed with which they can be delivered.

Dam owners **are required** to prepare and submit polygons and the associated pre-formatted wording to the SDCC Watch Desk (QFES) or via the QFES Disaster Management Portal **prior** to the EAP being submitted to the chief executive for approval. All polygons will be checked as part of the assessment of the EAP.

However, there may be circumstances where the EA system is not appropriate. For example, if the at risk area has poor mobile phone reception or where it is more efficient to contact the people

directly. For all other dam owners, the EAP is to include the polygons to be used to deliver the pre-formatted warning message via the EA system.

Large dam owners who have developed multiple polygons to cover the relevant risk areas may include within the EAP only those polygons associated with the highest 'priority' persons and associated areas at risk.

Further information on preparing polygons using predefined GIS polygon with emergency alerts is available at the website [www.disaster.qld.gov.au](http://www.disaster.qld.gov.au).

For more information about the best practice in the creation and dissemination of emergency warnings, see the *Best Practice guide for Warning Originators* available at the website [www.aq.gov.au](http://www.aq.gov.au).

**Example of the notification and warning escalation table**

Emergency trigger level	Developing flood in the dam catchment	Potential notifications (as pre determined with the relevant disaster group)
<b>Alert</b>	Significant rainfall in catchment with lake levels rising towards full supply level (FSL) and a spillway discharge expected.	<p><b>EAP notification</b></p> <p>Delivered to disaster management group/s and persons at risk of harm alerting them to the situation.</p> <p>The intent of the message is to advise persons at risk of harm there is no immediate danger however, they should keep themselves up-to-date with developments.</p>
<b>Lean forward</b>	Spillway flows increasing but as yet are unlikely to impact on downstream persons at risk of harm.	<p><b>EAP notification</b></p> <p>An updated notification to those who received the alert notification plus additional people who might be impacted by increasing spillway discharges.</p> <p>The message should convey the likelihood persons at risk will be impacted by the emergency event. Message will instruct persons in danger to start taking action to protect life and property.</p>
<b>Stand up</b>	Spillway discharge increasing with flows that are likely to impact on downstream persons at risk of harm.	<p><b>EAP warning</b></p> <p><u>Prepare</u> to take action messages to all relevant entities and persons at risk of harm.</p> <p><b>Escalated EAP warning</b></p> <p>Take <u>immediate</u> action messages to all relevant entities, persons at risk of harm.</p>
<b>Stand down</b>	Flood receding with lake levels dropping back towards FSL. Dam releases are unlikely to impact on others.	<p><b>EAP notification</b></p> <p>Delivered to relevant entities and persons at risk of harm advising the end of the emergency event.</p>

## 4 Submitting the EAP to the chief executive

There are a number of steps to be completed before an EAP can be submitted to the chief executive for approval. These steps **must** be completed within legislated timeframes and should be factored into the dam owner's schedule for the development and submission of the EAP.

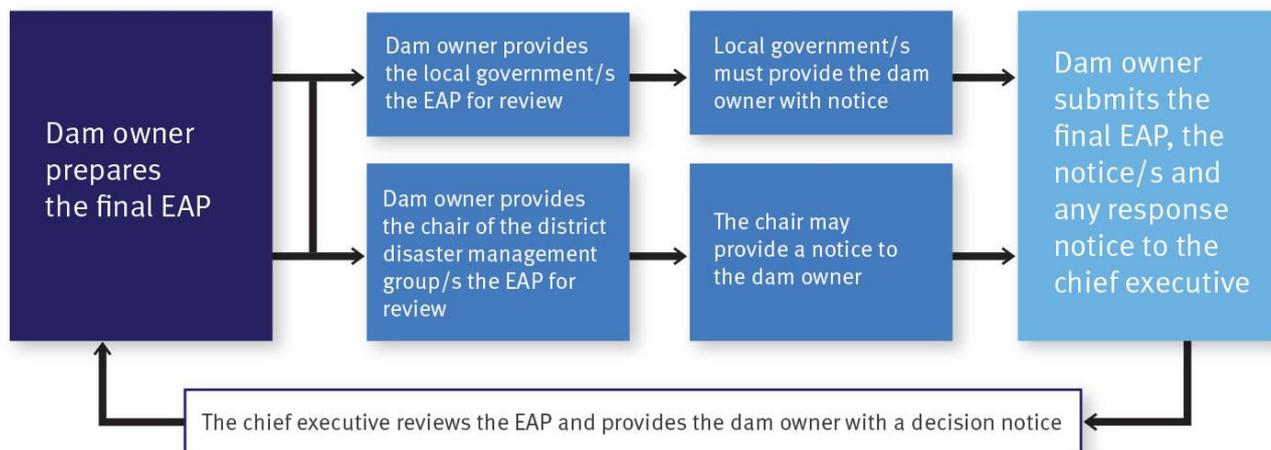


Diagram 4: preparing the EAP for submission to the chief executive.

The Dam Safety team is available to assist to all stakeholders throughout the EAP development and submission process.

### 4.1 Local government and district disaster management group notices

The local government and chair of the district disaster management group must be provided the EAP for consideration for 30 business days prior to the dam owner submitting it to the chief executive for approval.

The Act (s 352HA) requires the dam owner to provide a copy of the EAP to each local government and district disaster management group whose local government area or district area may be affected by a dam hazard identified in the plan, to ensure the EAP is consistent with the disaster management plans. These stakeholders have 30 business days to assess or review the plan.

On receipt of the EAP from the dam owner, the local government **must in consultation with its local disaster management group**, assess the EAP for consistency with its disaster management plan.

The local government **must within 30 business days after receiving the EAP**, give the dam owner a **notice** stating whether the **local government considers the EAP is consistent** with its disaster management plan. If the local government considers the plan is not consistent, the notice must outline the reasons why the EAP is not consistent. The chief executive officer or the appropriate delegate of the local government should sign the local government notice.

The chair of the district disaster management group/s is also provided 30 business days to review the EAP for consistency with the groups disaster management plan. The chair may **(not compulsory)** provide a notice to the dam owner. If it is the decision of the chair not to provide a notice to the dam owner, the chair is encouraged to advise the dam owner to submit the EAP to the chief executive for approval.

Support tools for local government/s and the chair of the district disaster management group/s to assist in assessing and reviewing the EAP against the disaster management plan and a suggested format for the notice are provided at the website [www.dnrme.qld.gov.au](http://www.dnrme.qld.gov.au)

If the dam owner receives a notice from the local government/s or the chair of the district disaster management group/s, the dam owner may prepare a written response to the notice (a notice response) and include this response to the EAP when submitting the EAP to the chief executive for approval (s 352H(c)).

The dam owner cannot submit the EAP to the chief executive prior to the 30 business days having elapsed since provision of the EAP to both entities unless, a notice from the local government/s, and a notice or definitive advice from the chair of the district disaster management group/s has been received.

Any notices received by the dam owner **must be provided** to the chief executive when submitting the EAP for approval.

An EAP can only be submitted to the chief executive for approval if it has a local government notice and/or evidence the EAP has been provided to the local government/s and the chair of the district disaster management group/s. Alternatively a statement needs to be provided outlining why the notice has not been provided. Otherwise the submission will be considered incomplete and the EAP will be refused.

If the dam owner has not received a notice from the local government within the 30 day business day period, the dam owner can submit the EAP to chief executive providing the dam owner can demonstrate to the chief executive it has:

- engaged with the local government during the drafting, reviewing and/or testing of the EAP
- provided a final copy of the EAP to the local government for assessment
- engaged with the local government to resolve any outstanding issues
- escalated the absence of the notice within the local government in an attempt to receive the notice prior to submitting the EAP to the chief executive.

The notice/s provided by local government/s and the chair of the district disaster management group/s are a mechanism used by the chief executive to ensure that collaboration has occurred, and the EAP is effective and consistent with the disaster management plans.



Diagram 5: Example timeline for an EAP submission.

## 4.2 How to submit the EAP to the chief executive for approval

The EAP can be lodged by email at [damsafety@dnrme.qld.gov.au](mailto:damsafety@dnrme.qld.gov.au).

If the EAP file size is large, consider using electronic file sharing e.g. 'Dropbox', 'Google Drive'. Alternatively, please provide an electronic copy placed on a USB stick, flash drive or thumb drive and forward by mail to:

Chief Executive  
 Department of Natural Resources, Mines and Energy  
 Water Supply Division  
 PO Box 15216 City East Qld 4002

Note the 30-business day assessment timeframe will commence from the business day following the day of receipt of the EAP and accompanying notice/s is received by the department.

### 4.3 What will the chief executive consider when undertaking the assessment?

The chief executive will undertake an assessment of the EAP within 30 business days from the date after receiving the submission and notice/s. While assessing the EAP, the chief executive will consider:

- content and effectiveness, including:
  - roles and responsibilities of all parties in the implementation of the EAP
  - identification of dam hazard events, dam emergency events and associated escalation tables and supporting information
  - inundation maps and supporting material
  - prioritised entity notification tables
  - identification of persons and/or property at risk
  - notification and warning message protocols
  - pre-formatted notification and warning message wording
  - EA polygon maps and preformatted messages lodged via the QFES portal
  - demonstrated effectiveness of the plan e.g. evidence the plan has undergone testing either through a joint disaster management exercise or desk top scenario exercise; and integration of dam personnel training
  - downstream residents educational information on the EAP and the intent and frequency of EAP notifications and messaging
  - demonstrated collaboration between dam owners, local government/s and disaster management group/s
- each notice given by a local government/s, and chair of a district disaster management group/s
- any notice responses prepared by the owner of the dam
- any disaster management standards under the *Disaster Management Act 2003*
- this guideline
- relevant dam safety standards and industry best practice.

Support tools, including templates, to assist dam owners to prepare an EAP are available at the website [www.dnrme.qld.gov.au](http://www.dnrme.qld.gov.au)

### 4.4 When will the EAP be approved?

If the chief executive approves the EAP, the chief executive must:

- give a notice of approval to the owner of the dam
- give a copy of the approved plan to the emergency management chief executive (QFES)
- publish the approved plan on the website [www.dnrme.qld.gov.au](http://www.dnrme.qld.gov.au) with redacted name, address and contact details of individuals.

The Act (s 352K(2)) states the chief executive can approve an EAP for a period of no more than five years.

If the chief executive decides to refuse to approve the EAP, the chief executive must give the dam owner:

- an information notice about the decision.
- a notice directing the dam owners to prepare a new EAP and resubmit to the chief executive within a stated period of at least 30 business days (the dam owner must comply with the notice or provide a reasonable excuse as penalty units apply).

If the chief executive has not made a decision within the 30 business day period, the EAP is deemed to be approved for a period of two years. If the EAP is deemed to be approved, the dam owner will receive advice confirming the deemed approval (s 352K(4)).

#### 4.5 Undertaking the EAP annual review

Under the Act (s 352P), before 1 October each year, dam owners are required to undertake a review of the approved EAP and provide a notice to the chief executive stating whether the dam owner proposes an amendment of the EAP.

In undertaking the review, the dam owner should consider:

- relevant legislative amendments
- references to relevant entities in the EAP are correct
- contact details and prioritisation of relevant entities, including the PAR are correct
- currency of flood inundation models and associated maps
- approved or proposed residential and/or commercial development which may impact on the EAP
- wording and frequency of notification and warning messages are relevant
- wording of notifications and warning messages are understood by downstream residents
- if the pre prepared EA System GIS polygons are appropriate, tested and lodged with the SDCC Watch Desk (QFES)
- if the EAP is consistent with the disaster management plan/s
- learnings from any Emergency Event Reports (EER) submitted in the previous 12 months
- learnings from EAP training exercises
- if the EAP reflects industry best practice
- schedule of dam updates within the next 12 months.

#### 4.6 Annual reviews resulting in a change by agreement

Once reviewed by the dam owner, a complete EAP may be submitted to the chief executive under s 352Q of the Act to amend the approved EAP to:

- correct a minor error  
or
- make a change that is not a change of substance, for example: update contact phone numbers, minor changes to warning messages.

The amendments must be minor in nature and must not change the intent of the EAP. Substantive changes to the triggers for escalation of hazards to emergency events, increases in the number of PAR beyond a change in the number of persons within a household, or new modelling associated with the production of inundation maps will be assessed as substantive in nature.

Dam owners must share the proposed changes with the local government/s and the disaster management group/s to ensure all contact details are correct and amendments to the EAP do not conflict with the disaster management plan/s.

For EAPs that are being changed by agreement, the local government/s and disaster management group/s **are not** required to complete an assessment or provide the dam owner with a notice.

Once the changes have been finalised the dam owner can lodge the amended EAP document in full including all attachments (with amendments in tracked changes) to the chief executive for approval.

Change by agreement submissions and attachments are to be lodged via email at [damsafety@dnrme.qld.gov.au](mailto:damsafety@dnrme.qld.gov.au).

On receipt of the amended (change by agreement) EAP including all attachments, the chief executive will, within 10 business days:

- decide to approve or refuse the amendment
- give the owner notice of the decision.

If the dam owner has not received a notice of the decision within this timeframe, the EAP as amended is to be taken as (deemed) approved for the remaining approval period (s 352Q(4)).

However, in the event the chief executive subsequently determines the proposed EAP amendment is a change of substance, the chief executive will invoke the provision of s 352R of the Act.

Partial EAPs and draft EAP submissions are likely to be considered an incomplete submission resulting in the EAP submission being refused.

#### 4.7 Annual reviews resulting in substantive amendments

If the dam owner is proposing amendments to any of the following, then the changes are considered a substantive change to the EAP and will require a new EAP assessment and approval by the chief executive:

- the dam structure
- the triggers for escalation of a dam hazard event and/or dam emergency event
- additional dam emergency events added to the EAP
- an increase in PAR
- changes in the format, number or frequency of warnings
- changes to inundation maps and/or associated information.

If the dam owner is uncertain as to whether the changes in the EAP are substantive in nature, they are encouraged to contact the Dam Safety group via email at [damsafety@dnrme.qld.gov.au](mailto:damsafety@dnrme.qld.gov.au).

To submit a substantially amended EAP refer to section 4.2 *How to submit the emergency action plan to the chief executive for approval*.

## 4.8 EAP reviews triggered by the chief executive

The Act (s 352O) provides the chief executive with the authority to direct a dam owner to review the EAP for their dam at any time if it is considered that the EAP is no longer effective in the management of a dam hazard.

This might occur, for instance, if an Emergency Event Report (EER) recommends a change to the Plan or the local government advises the chief executive that the EAP needs amendment to make it consistent with their disaster management plans.

## 4.9 Renewal of the EAP

The dam owner is required to undertake a comprehensive review of the EAP at the end of the approval period. It is recommended that the dam owner undertakes the process as outlined within , section 3 *Developing an EAP*.

## Appendix 1: Examples of escalation of dam hazards

The following examples of dam hazards and associated information is not complete or exhaustive; it is intended as a guide for selection of activation levels in response to potential dam hazards with the aim of maximising preparedness and minimising the consequences of dam failure.

The dam owner response to a dam hazard will need to be tailored to suit the circumstances at the dam; the characteristics and the consequences of dam failure.

The activation levels by the dam owner may not necessarily be sequential and should be applied with flexibility and adaptability by the dam owner. Further, there may not be a corresponding level of activation by the relevant disaster management groups. However, disaster management groups do need to be kept informed of the levels of activation and understand the associated risks.

### Escalation of dam hazards examples for: flood issues, incoming floods

Potential problem	Activation level	General characteristics	When and what to check
Flooding issues: Incoming floods	Alert	Storage full and water level rising	During periods of excessive rainfall, undertake visual inspection and monitoring of any instrumentation.  Check water levels and rates of rise of water level.
	Lean forward	Spillway discharging	Continue monitoring and inspections.
	Stand up	Downstream release hazard flows anticipated  or  Highest recorded flood levels in dam anticipated or occurring  or  Overtopping imminent or high risk of failure initiated	Continue monitoring and inspections at increased frequency.  Undertake remedial works if safe to do so.  Issue notifications and warnings as required.
	Stand down	Lake levels dropping to FSL	Prepare EER (if required).  Check for damage and undertake special inspection and remedial work as necessary.

Escalation of dam hazards examples for: scouring of or severe damage to spillway

Potential problem	Activation level	General characteristics	When and what to check
Scouring of or severe damage to spillway	<b>Alert</b>	Significant scouring/damage identified not yet endangering the dam.	Monitor extent of scour or damage and take steps to remediate problem if practical.
	<b>Lean forward</b>	Significant erosion/damage identified which could progress to failure of the dam.	Monitor extent of scour or damage and take steps to remediate problem if practical.
	<b>Stand up</b>	Scouring progressing to state where the safety of the dam is significantly impaired.	Continuous monitoring of extent of scour or damage and upgrade efforts to remediate if practical. Issue notifications and warnings as required.
	<b>Stand down</b>	Risk of dam failure diminished to tolerable levels.	Prepare EER (if required). Continue routine dam safety inspections.

Escalation of dam hazards examples for: embankment scouring issues

Potential problem	Activation level	General characteristics	When and what to check
Embankment scouring issues	<b>Alert</b>	Identification of scouring or gullyng of embankment notching of the upstream face of embankments by waves.	Inspect affected area of embankment to watch for signs of scoring progressing. Undertake remedial action if practical.
	<b>Lean forward</b>	Cause of scour continuing and erosion becoming significant.	Continue monitoring. Upgrade efforts at remedial works if practical.
	<b>Stand up</b>	Scouring progressing to state where the safety of the dam is significantly impaired.	Upgrade efforts at remedial works if practical. Continue monitoring of dam at increased frequency. Issue notifications and warnings as required.
	<b>Stand down</b>	Cause of erosion abates and risk of failure drops significantly.	Prepare EER (if required). Remedial works are undertaken to significantly mitigate risk.

Escalation of dam hazards examples for: embankment stability issues

Potential problems	Activation level	General characteristics	When and what to check
Embankment stability issues: <ul style="list-style-type: none"> <li>• signs of distress in embankment such as cracking or deformation/sliding</li> <li>• abnormal instrumentation readings</li> <li>• earthquake</li> <li>• differential movements of walls etc.</li> </ul>	<b>Alert</b>	Identification during routine inspection of initial signs of embankment distress such as cracks or scarps near the crest and bulges at the toe.	Inspect affected area of embankment to watch for signs of cracking progressing or deformation increasing.  Undertake remedial action if practical.
	<b>Lean forward</b>	Cause of scour continuing and erosion becoming significant to the point where stability may be starting to be impaired.	Continue monitoring.  Upgrade efforts at remedial works or load reduction if practical.
	<b>Stand up</b>	Loads on embankment increasing or cracking/deformation increasing to state where the safety of the dam is significantly impaired.	Continue monitoring of dam at increased frequencies.  Issue notifications and warnings as required.  Upgrade efforts at remedial works if practical or the reductions of.
	<b>Stand down</b>	Remedial works completed and risk of failure drops significantly.	Prepare EER (if required).  Remedial works are undertaken to significantly mitigate risk.

## Escalation of dam hazards examples for: seepage related issues

Potential problem	Activation level	General characteristics	When and what to check
<p>Seepage related issues:</p> <ul style="list-style-type: none"> <li>• seepage erosion or piping</li> <li>• new springs, seeps or boggy areas</li> <li>• increase in seepage along outlet conduit</li> <li>• rapid increases or cloudy appearance of seepage</li> <li>• increase in gallery seepage.</li> </ul>	<b>Alert</b>	Identification of new areas of seepage growth in existing areas of seepage.	Look for source of seepage, environmental changes such as vegetation damage, salt scalds, etc.
	<b>Lean forward</b>	<p>Detection of signs of cloudy water in seepage.</p> <p>Look for the source of cloudy water.</p>	<p>Continue monitoring.</p> <p>Undertake remedial works if practical.</p> <p>Reduce lake level if possible.</p>
	<b>Stand up</b>	<p>Seepage developing further.</p> <p>Discharge is clouding and increasing (piping failure has started).</p>	Continue monitoring.
	<b>Stand down</b>	Remedial works completed or cause of seepage removed.	<p>Prepare EER (if required).</p> <p>Continue routine monitoring.</p>

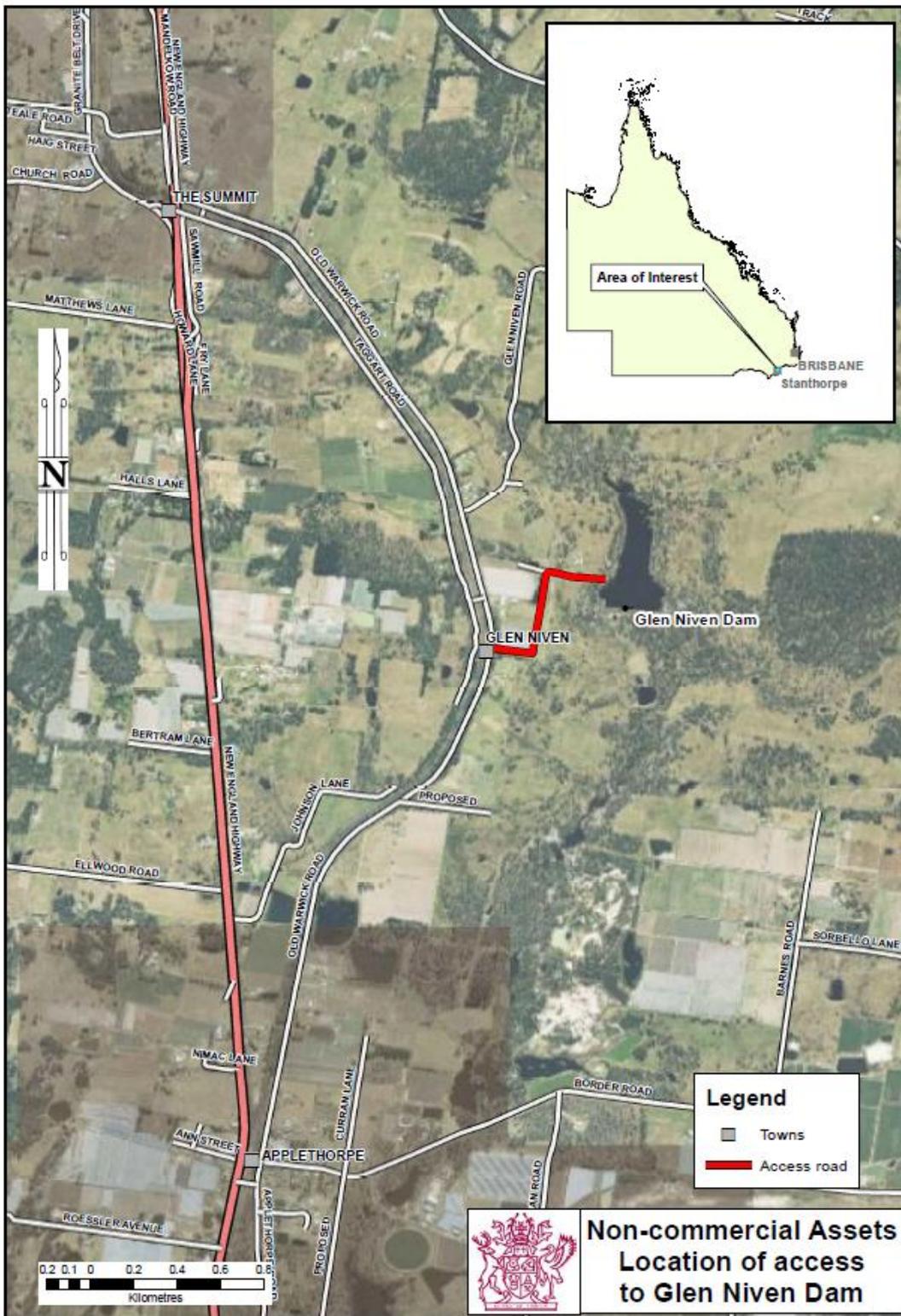
## Other potential dam hazards

Potential problem	General characteristics	When and what to check
Flow slide	Collapse and flow of soil around the storage periphery.	During routine inspection and especially with sedimentary/colluvial soils, look for material displacement around the storage rim.
Landslide	Mass movement of soil or rock from slopes and valley walls around the storage.	During routine inspection, look for material displacement.
Movement or cracking in structural concrete work	Failure of mechanical components such as pipes, gates etc.	During routine inspection of when mechanical problems such as a burst pipe or a jammed gate occur, look for any movement or cracking of the structural concrete work to determine the cause.
Failure of appurtenant structures of operating equipment such as abnormal operations of gates and valves or failure of components of the dam	Loss of ability to supply water or discharge floods safely.	After detecting an operational anomaly, identify and investigate the cause.
Abnormal instrument readings (if installed)	A sudden change in the values of instrument readings.	On detection, check for equipment malfunction and investigate the cause.

## Appendix 2: Examples of maps

### Location map

The map (example only) is to illustrate the location of the dam, including the nearest town and the route to the dam.

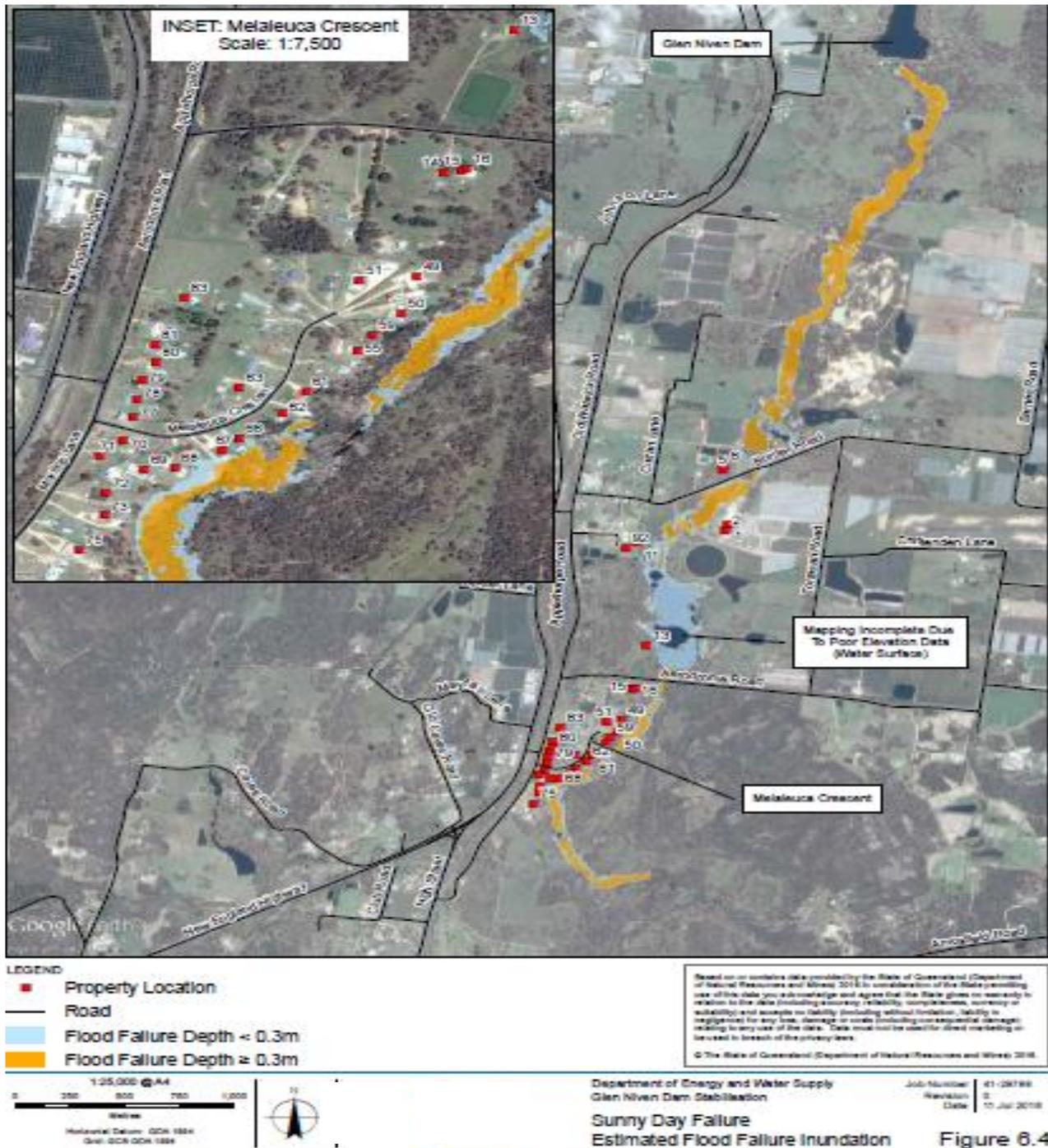


## Area of interest map

The area of interest map is to indicate the individual PAR locations. The level of detail required varies depending on the circumstances of each referable dam.

For example, for a small referable dam (farm dam), it may be appropriate for a mud map to be provided. However, it is preferable for a Google Earth image or another type of map to clearly show the locations of each individual PAR location.

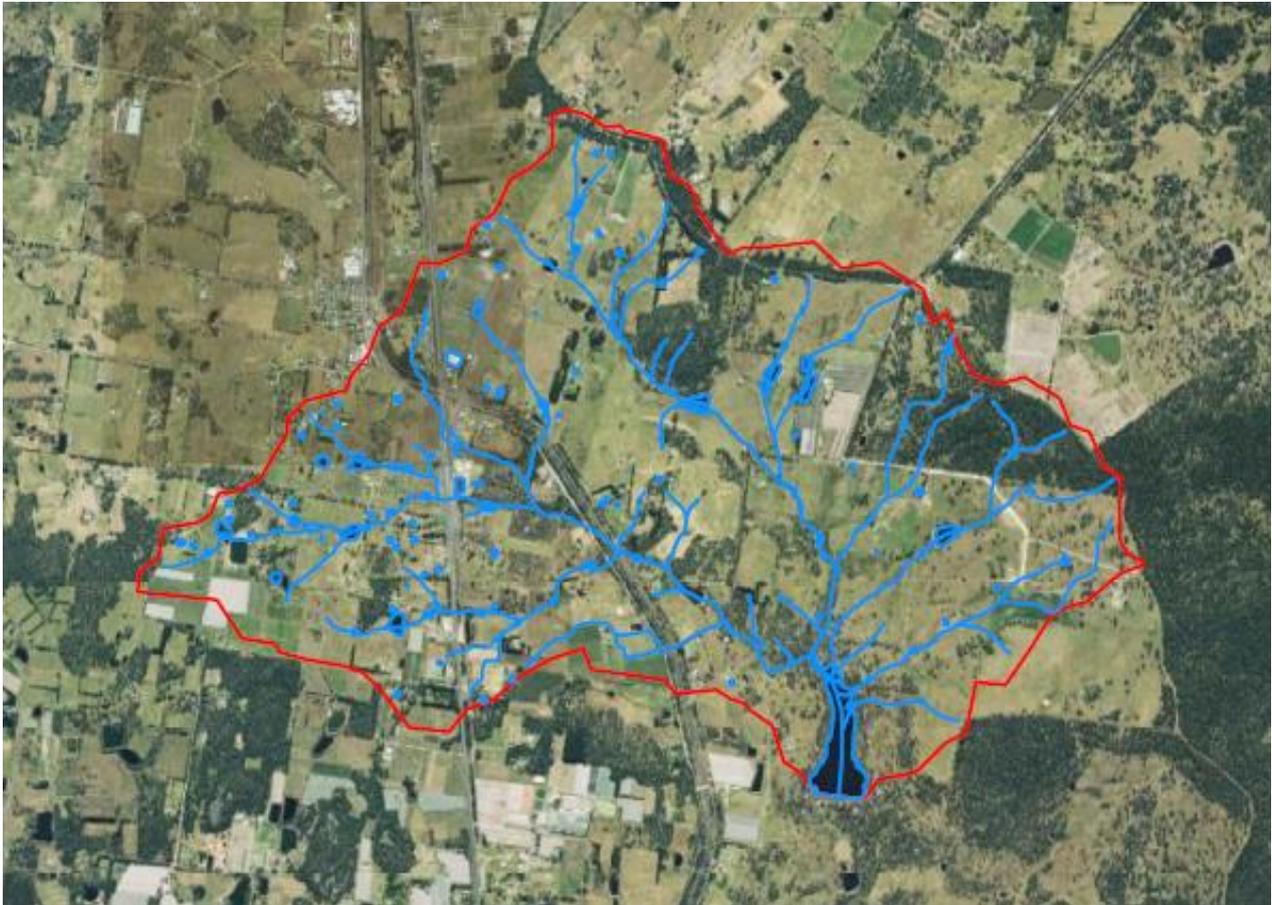
Glen Niven Dam example only.



## Catchment map

The catchment map provides context to the EAP risks and hazards. A Google Earth image with catchment boundaries is a quick and easy method to prepare this map.

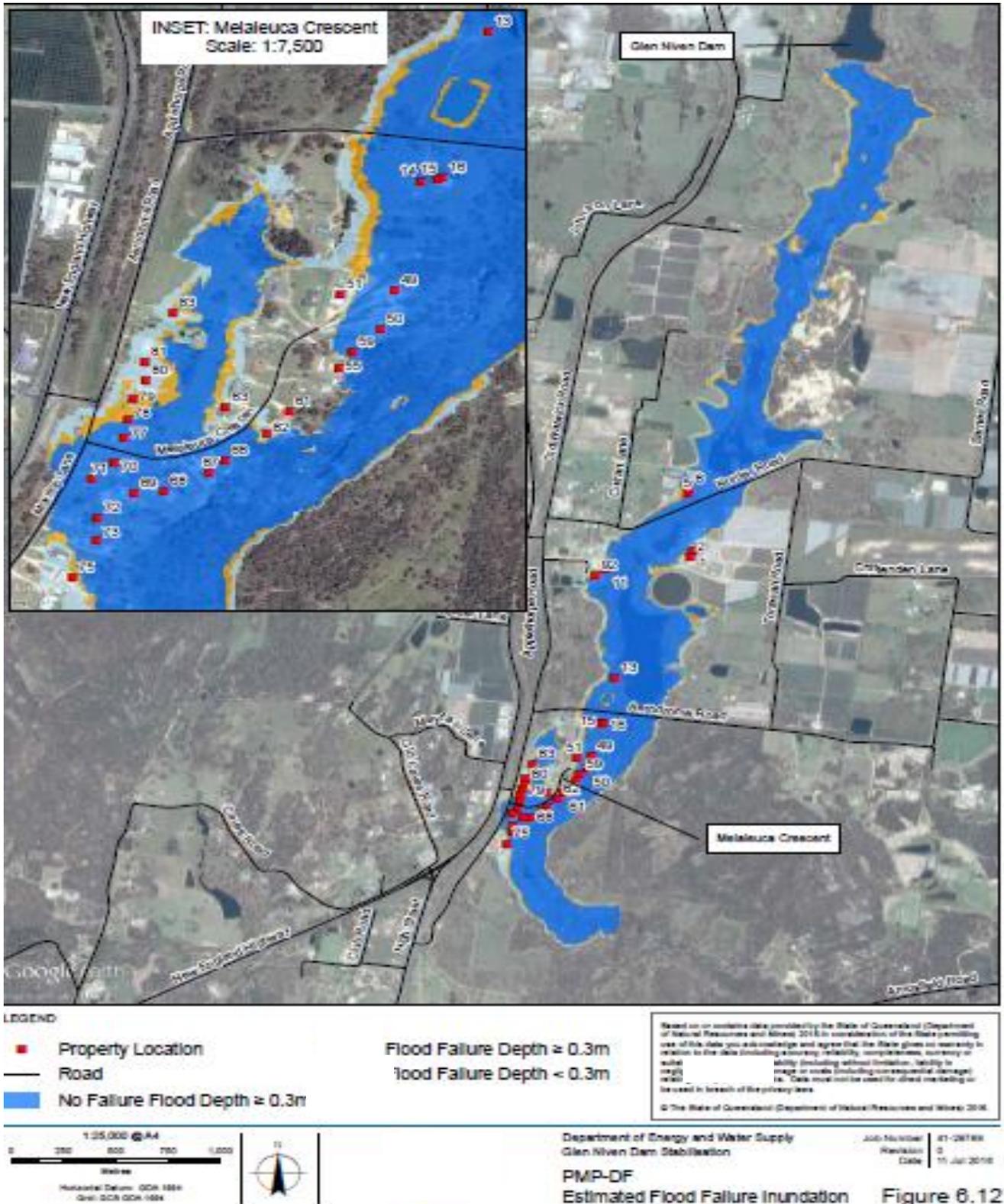
Glen Niven Dam example only.



## Dam failure inundation map

Inundation maps may have been prepared as part of the Failure Impact Assessment. If there are no inundation maps available, the chief executive can provide advice on the individual case of the dam and the required level of detail.

Glen Niven Dam example only.



## Appendix 3: Common abbreviations and definitions

The following are common abbreviations and definitions, which have been utilised within this guideline and are common in EAPs and disaster management documents.

### Abbreviations

The Act	<i>The Water Supply (Safety and Reliability) Act 2008</i>
AHD	Australian height datum
ANCOLD	Australian National Committee on Large Dams
BoM	Bureau of Meteorology
DCF	Dam crest flood
DMG	Disaster management group
DDMG	District disaster management group
DM	Disaster management
DM Act	<i>Disaster Management Act 2003</i>
DMSPF	Disaster management strategic policy framework
DNRME	Department of Natural Resources, Mines and Energy
EA	Emergency alert
EAP	Emergency action plan
EER	Emergency event report
EMAF	The emergency management assurance framework
FIR	Failure impact rating
FSL	Full supply level
GS	Gauging station
GIS	Geographic information system
km	Kilometre
LDC	Local disaster coordinator
LDMG	Local disaster management group
LDMP	Local disaster management plan
LG	Local government
ML	Mega litre

PAR	Population at risk
PMF	Probable maximum flood
PMP	Probable maximum precipitation
PMPDF	Probable maximum precipitation design flood
PPRR	Prevention, preparedness, response and recovery
QDMA	Queensland disaster management arrangements
QDSMG	Queensland dam safety management guideline
QFCoI	Queensland Floods Commission of Inquiry
QFES	Queensland Fire and Emergency Services
QPS	Queensland Police Service
SDCC	State Disaster Coordination Centre
SDMG	State Disaster Management Group
SES	State Emergency Service
The office of the IGEM	The Office of the Inspector-General Emergency Management

## Definitions

The Act	<i>Water Supply (Safety and Reliability) Act 2008</i>
(EAP) Activation	<p>Is defined as actions undertaken by the dam owner as per the EAP in response to a dam event if:</p> <ol style="list-style-type: none"> <li>1. persons or property may be harmed, because of the event</li> <li>2. a coordinated response involving two or more of the following relevant entities is likely to be required to respond to the event: <ul style="list-style-type: none"> <li>• each local group (LDMG) and district group (DDMG) for the emergency action plan</li> <li>• each local government whose local government area may be affected if a dam hazard event or emergency event were to happen for the dam</li> <li>• the DNRME chief executive</li> <li>• another entity the dam owner considers appropriate i.e. QPS, QFES.</li> </ul> </li> </ol>
Alert	The first stage of emergency response whereby a heightened level of vigilance is maintained due to the possibility of an emergency event occurring. Action is required to ensure the situation is monitored by someone capable of assessing the potential of the threat.
Approved emergency action plan	<i>An emergency action plan that is approved under s 352I(1)(a) or taken to be an approved emergency action plan under s 352Q(2).</i> (Refer s 352A of the Act.)
Approval period (for an EAP)	The period of approval for the EAP can be for a period of no more than five years and must be stated in the approved EAP (refer s 352K(2)).
Chief Executive	<p>In this guideline, unless otherwise specifically given a different meaning, references to the ‘chief executive’ or the Dam Safety Regulator are to be interpreted as references to the Director-General of the Department of Natural Resources, Mines and Energy or the Director-General’s delegate.</p> <p>Correspondence to the Director-General’s delegate can be sent to:</p> <p>Chief Executive Department of Natural Resources, Mines and Energy Water Supply Division PO Box 15216, City East QLD 4002 or via email to: <a href="mailto:damsafety@dnrme.qld.gov.au">damsafety@dnrme.qld.gov.au</a></p>
Controlled document	Having an EAP issued as a ‘controlled document’ means that specified copies of a document are kept up to date in a controlled manner using a system that distributes updated versions/pages of the document as they are issued and retrieves superseded versions/pages of the document as they become redundant. In this way, only the current version of the document is used during any event.

	<p>A controlled document requires the following metadata to be recorded in the document and securely archived:</p> <ul style="list-style-type: none"> <li>• contents, versions and dates of versions</li> <li>• name and role of the person approving each version and details of any prior consultation undertaken</li> <li>• names and roles of persons issued with copies.</li> </ul>
Dam hazard	<p>Dam hazard, for a dam, means a reasonably foreseeable situation or condition that may:</p> <p>(a) cause or contribute to the failure of the dam, if the failure may cause harm to persons or property or</p> <p>(b) require an automatic or controlled release of water from the dam, if the release of the water may cause harm to persons or property.</p> <p>(Refer s 352A of the Act.)</p>
Dam hazard event	<p>An event arising from a dam hazard if persons or property may be harmed because of the event and</p> <p>(a) a coordinated response involving 2 or more of the relevant entities mentioned in paragraphs (b) to (d) of the definition relevant entity is unlikely to be required to respond to the event</p> <p>(b) the event is not an emergency event.</p> <p>(Refer s 352A of the Act.)</p>
Dam Safety Team	<p>Group of engineers and professionals working in the administering state government agency</p>
District group	<p>The district group for an emergency action plan, means a district group established under the <i>Disaster Management Act 2003</i> (DM Act), s 22 whose disaster district under that Act could, under the plan, be affected by a dam hazard.</p>
District disaster management group	<p>District disaster management group/s established under the DM Act, comprise representatives from regionally based Queensland Government agencies, which provide and coordinate whole-of-government support and resource gap assistance to disaster-stricken communities. The district group/s perform a 'middle management' function within the disaster management arrangements by coordinating the provision of functional agency resources when requested by local group/s on behalf of local government/s.</p>
Disaster management plan (DMP)	<p>A local or District Disaster Management Group's disaster management plan under the DM Act.</p>
Disaster risk assessment	<p>The process used to determine risk management priorities by evaluating and comparing the level of risk against predetermined standards, target risk levels or other criteria (Council of Australian Governments (COAG), Natural Disasters in Australia: Reforming mitigation, relief and recovery arrangements: 2002). Incorporates the processes of risk identification, risk analysis and risk evaluation (refer to ISO Guide 73:2009 Risk management - Vocabulary).</p>

Dam Safety Regulator	Refer to the 'chief executive' above.
Emergency alert	The emergency alert (EA) system is a national telephone warning system administered in Queensland by the Queensland Fire and Emergency Service. The EA systems provides emergency authorities with a rapid mass notification service to deliver preformatted messages via landline and mobile telephones within a defined geographic area.
Emergency event	An event arising from a dam hazard if persons or property may be harmed because of the event, and any of the following apply: <ul style="list-style-type: none"> <li>i. A coordinated response where two or more of the relevant entities, mentioned in paragraphs (b) to (d) of the definition <i>relevant entity</i>, are likely to be required to respond to the event.</li> <li>ii. The event may arise because of a disaster situation declared under the DM Act.</li> <li>iii. An entity performing functions under the State disaster management plan may, under that plan, require the owner of the dam to give the entity information about the event.</li> </ul> (Refer s 352A of the Act)
Emergency event interim report	An interim report on the performance of the dam and the functioning of the EAP during an emergency event, which is submitted to the chief executive prior to the end of the event at the request of the chief executive. (Refer s 352U(2)(a) of the Act)
Emergency event report (EER)	A report on the performance of the dam and the functioning of the EAP during an emergency event which is presented to the chief executive following the <i>end</i> of the event. (‘End’ of an emergency event means when the dam hazard giving rise to the event is no longer a risk to persons or property.) (Refer s 352T(2) of the Act)
Failure impact assessment	It is a process used under the Act to determine the number of people whose safety could be at risk should the dam fail. This assessment must be certified by a Registered Professional Engineer Queensland (RPEQ) in accordance with the Act.
Failure impact rating	A failure impact rating is a measure of the population at risk should the dam fail. There are two categories for referable dams: <ul style="list-style-type: none"> <li>• category 1: 2 to 100 people at risk if the dam were to fail</li> <li>• category 2: more than 100 people at risk if the dam were to fail.</li> </ul>
Flood mitigation manual	A manual of the operational procedures for flood mitigation for a dam that complies with s 371D of the <i>Water Supply (Safety and Reliability) Act 2008</i> .
Hazard	A source of potential harm, or a situation with a potential to cause loss ( <i>Emergency Management Australia, 2004</i> ).

Lean forward	The stage of emergency response prior to 'stand-up' whereby a heightened level of situational awareness of a disaster event (either current or impending) is maintained and a state of operational readiness is developed. Personnel at dam are on standby, ready to activate the EAP.
Local disaster coordinator	An officer appointed under the DM Act who is responsible for the coordination of disaster operations for the local disaster management group.
Local disaster management group	Local disaster management groups are established to support local government disaster management activities. The local group is supported by the relevant district group if and when disaster management activities exceed the capacity of a local group. The functions of the local group include (but are not limited to): <ul style="list-style-type: none"> <li>• developing, regularly reviewing and assessing effective disaster management</li> <li>• assisting local government for its area to prepare a local disaster management plan</li> <li>• ensuring the community is aware of ways of mitigating the adverse effects of an event, and preparing for, responding to and recovery from a disaster</li> <li>• identifying and coordinating the use of resources that may be used for disaster operations</li> <li>• managing disaster operations in the area under policies and procedures decided by the State group</li> <li>• ensuring disaster management and disaster operations in the area are consistent with the State group's strategic policy framework for disaster management for the State.</li> </ul>
Notice	A statement provided to the dam owner from the local government and/or the disaster management group on the outcomes of the assessment and review of the EAP.
Notice response	A statement of reply from the dam owner to the local government and/or disaster management group on the information provided within the notice of assessment.
Early warning notification system	Non-government, commercial subscription based warning/alert system that provides SMS, landline, email, and social media alert messages. The community is required to register to receive the notification service.
Population at risk (PAR)	The number of people calculated under the failure impact assessment guideline, whose safety will be at risk if the dam, or the proposed dam after its construction, fails.
Probable maximum precipitation (PMP)	The theoretical greatest depth of precipitation for a given duration that is physically possible over a particular drainage basin.
Probable maximum flood (PMF)	The flood resulting from PMP, snowmelt, coupled with the worst flood-producing catchment conditions that can be realistically expected in the prevailing meteorological conditions.

<p>Queensland disaster management arrangements</p>	<p>Queensland's whole-of-government disaster management arrangements are based upon partnerships between government, government-owned corporations, non-government organisations (NGOs), commerce and industry sectors and the local community. These arrangements recognise each level of the disaster management arrangements working collaboratively to ensure the effective coordination of planning, services, information and resources necessary for comprehensive disaster management.</p> <p>The Australian disaster management arrangements are formed around three levels of government, Local, State and the Australian Government. The Queensland Disaster Management Arrangements acknowledge these three levels of government, however are based on a four tiered system to include an additional State government tier, between local and state governments and known as disaster districts. This enables a more efficient and effective operational service delivery to support local communities.</p> <p>Further details of the Queensland Disaster Management arrangements are available at</p> <p><a href="http://www.disaster.qld.gov.au/About_disaster_management/Pages/Disaster-management-arrangements.aspx">www.disaster.qld.gov.au/About_disaster_management/Pages/Disaster-management-arrangements.aspx</a></p>
<p>Risk identification and management process</p>	<p>The systematic application of management policies, procedures and practices to the activities of communicating, consulting, establishing the context, and identifying, analysing, evaluating, treating, monitoring and reviewing risk (Refer to ISO Guide 73:2009 Risk management – Vocabulary and the ANCOLD Guidelines on Risk Assessment).</p>
<p>Referable dam</p>	<p>A dam, or a proposed dam after its construction will be a referable dam if:</p> <ul style="list-style-type: none"> <li>(a) a failure impact assessment of the dam, or the proposed dam, is required to be carried out under the Act</li> <li>(b) the assessment states the dam has, or the proposed dam after its construction will have, a category 1 or category 2 failure impact rating</li> <li>(c) the chief executive has, under s 349 of the <i>Water Supply (Safety and Reliability) Act 2008</i>, accepted the assessment.</li> </ul> <p>(Refer s 341 of the Act)</p>
<p>Relevant entities</p>	<p>Means each of the following under the emergency action plan for the dam:</p> <ul style="list-style-type: none"> <li>(a) the persons who may be affected, or whose property may be affected, if a dam hazard event or emergency event were to happen for the dam E.g. owners of parcels of farmland adjacent to the dam, residents of a township</li> <li>(b) each local group and district group for the emergency action plan; and each local government whose local government area may be affected if a dam hazard event or emergency event were to happen for the dam</li> <li>(c) the chief executive</li> <li>(d) another entity the owner of the dam considers appropriate. E.g. the Queensland Police Service.</li> </ul> <p>(Refer to s 352A of the Act.)</p>

SitRep	A situational report which provides an update of the incident when requested by the department.
Stand down	The final stage of emergency response when there is no longer a requirement to respond to the event and the threat is no longer present. At 'stand down' there is a transition from responding to an event back to normal core business and/or recovery operations.
Stand up	The operational state following 'lean forward' whereby resources are mobilised, personnel are activated and operational activities commenced. Moving into this operational state triggers the requirement for an EER.
State disaster coordinator	The officer appointed under the DM Act who is responsible for the coordination of disaster response operations for the State Disaster Management Group.
Sunny day failure	The failure of a dam without any other general flooding or spillway discharges.

## Bibliography

Acts and Subordinate legislation. 2017. *Acts and Subordinate legislation, Disaster Management Act 2003*, viewed 30 August 2017, <[https://www.legislation.qld.gov.au/Acts\\_SLs/Acts\\_SL\\_D.htm](https://www.legislation.qld.gov.au/Acts_SLs/Acts_SL_D.htm)>.

Attorney-General's Department. 2017. *Best Practice Guide for Warning Originators*, viewed 30 August 2017, <<https://www.ag.gov.au/Publications/Pages/Best-Practice-Guide-for-Warning-Originators.aspx>>.

Attorney-General's Department 2017 National Emergency Risk Assessment Guideline (2010) viewed 30 August 2017, <https://www.scribd.com/document/246766551/National-Emergency-Risk-Assessment-Guidelines-October-2010>.

Department of Energy and Water Supply. 2017. *Water Legislation (Dam Safety) Amendment Act 2017*, viewed 30 August 2017, <<https://www.dews.qld.gov.au/water/dams/safety/amendment>>.

Safeguarding Queensland 2017. *Queensland Government's - Queensland Counter-Terrorism Strategy 2013-18*, viewed 30 August 2017, <<http://www.safeguarding.qld.gov.au>>.

The Office of the Inspector-General Emergency Management. 2017. *Emergency Management Assurance Framework*, viewed 30 August 2017, <<https://www.igem.qld.gov.au/assurance-framework/Pages/default.aspx>>.

The Office of the Inspector-General Emergency Management. 2017. *The Cyclone Debbie Review Report 1:2017-18*, viewed 20 October 2017, <[https://www.igem.qld.gov.au/reports-and-publications/Documents/Cyclone%20Debbie%20Review%20Rpt1-17-18\\_PUBLIC\\_WEB.pdf](https://www.igem.qld.gov.au/reports-and-publications/Documents/Cyclone%20Debbie%20Review%20Rpt1-17-18_PUBLIC_WEB.pdf)>.

The Office of the Inspector-General Emergency Management Review of the Seqwater and SunWater Warnings and Communications, viewed 30 August 2017, <<https://www.igem.qld.gov.au/reports-and-publications/documents/DamWarningsCommunications.pdf>>.

Office of the Queensland Chief Scientist. 2017, *Flooding in Sandy Creek Catchment, Mackay, following Tropical Cyclone Debbie*, viewed 30 August 2017, <<http://www.chiefscientist.qld.gov.au/component/content/article/721-publications/5562-reviews-audits?highlight=WyJzYW5keSlmNyZWVrliwic2FuZHKgY3JlZWsiXQ==>>.

Queensland Fire and Emergency Services, Policies, Guidelines and Forms. 2017. *Policies, Guidelines and Forms – Queensland Emergency Alert Guidelines*, viewed 30 August 2017, <<http://www.disaster.qld.gov.au/Disaster-Resources/Pages/pgf.aspx>>.