

SMALL DAM SAFETY



Information for Queensland
small dam owners

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Queensland
Government

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SMALL DAMS IN QUEENSLAND

There are thousands of small water dams throughout Queensland. Many of these dams are on private properties and play a vital role in providing water for farming, livestock and natural resource industries. Communities throughout Queensland also rely on small dams for their town water supply.

Small dams are often simple earth structures. Depending on the surrounding land, they may be configured as gully dams, hillside storages or ring tanks (turkey's nests).

They can also be highly variable structures in terms of the:

- condition of the embankment and spillway (or bywash)
- size of the spillway to adequately pass inflows from rainfall
- construction materials used to build the dam
- experience of the contractor who built the dam
- age of the dam and the standards it was built to at the time.

THIS POCKETBOOK PROVIDES A SIMPLE CHECKLIST TO ASSIST YOU TO MANAGE YOUR DAM EFFECTIVELY. IT ALSO OUTLINES DAM SAFETY RESPONSIBILITIES AND REGULATIONS THAT APPLY FOR SMALL DAMS IN QUEENSLAND.

SMALL DAM SAFETY

As a dam owner, you are responsible for the consequences of dam failure. Failure or unexpected releases of water from small dams can potentially impact life, property and the environment and you may not be able to obtain an income from any stored water.

You are responsible for appropriately operating, inspecting and maintaining your dams at all times even during times of drought when there is no yield. If you neglect your dam, substantial repair work may be required before you can reliably use it again.

Awareness of the impact of dams is increasing. If a dam safety incident occurs, emergency services may need to evacuate downstream residents and engage engineers at short notice to assess the situation. Such incidents can result in attention from the community and media as well as unexpected expense.

FOR THE PURPOSES OF THIS POCKETBOOK:

- a small dam is considered to be one less than 10 metres in height and storing less than 1,500 megalitres
- the term ‘dam safety’ refers to the risk of failure or uncontrolled releases from a dam, rather than risks associated with drowning by falling into a dam.

QUEENSLAND DAM SAFETY REGULATIONS

Under the *Water Supply (Safety and Reliability) Act 2008* (Act), the Queensland Government is responsible for the regulation of water dams that would put two or more people at risk if they failed. These dams are called ‘referable’ dams and the people at risk are called ‘population at risk’.

Queensland dam safety regulations are in place to ensure that dams that could pose a risk to people if they failed are appropriately managed and maintained.

Any size of water dam can become a referable dam if there are people at risk, regardless of its height or storage capacity. However, there are exclusions that include:

- dams containing hazardous waste
- weirs that do not have variable flow control structures on the crest of the weir
- large fabricated water tanks.



HOW ARE REFERABLE DAMS IDENTIFIED?

A dam becomes referable if shown to have two or more people at risk if it were to fail. This is usually done through a failure impact assessment, but we can deem dams as referable in some situations.

A failure impact assessment is an engineering calculation to identify any buildings that will be flooded by over 300 mm of water released through a dam failure.

Our *guideline for failure impact assessment of water dams* outlines the methods to undertake this assessment. A suitably qualified and experienced Registered Professional Engineer of Queensland (RPEQ) must certify failure impact assessments before submission.

For more information, read the guideline for failure impact assessment of water dams on www.qld.gov.au, search '**dam failure impact assessment**'.

IDENTIFYING LARGER REFERABLE DAMS

If your dam is going to exceed the following criteria then, according to the Act, you must conduct a failure impact assessment at your own expense:

- more than 10 metres high, with a storage capacity of more than 1500 megalitres or
- more than 10 metres high, with a storage capacity of more than 750 megalitres and a catchment area that is more than three times its maximum surface area at full supply level.

For most small dams full supply level is usually the level when the water is at the spillway base level, but the dam is not spilling.

IDENTIFYING SMALL REFERABLE DAMS

If a dam is not going to exceed the height and size criteria described in the Act, but could still put two or more people at risk if it were to fail, then it may become referable. We have two options in this instance:

1

Issue a notice requiring a failure impact assessment

We issue a notice for you to undertake a failure impact assessment if we believe it will show the dam to be referable. You must arrange for an RPEQ certified assessment of your dam at your own expense. The assessment must be submitted to us for review and acceptance within the specified timeframe.

Two above removes the need for you to self-fund the assessment. We will generally only use this option for small, privately-owned dams where there are low numbers of people at risk.

2

Issue a referable dam notice

We perform an internal assessment of the dam and issue a referable dam notice. The dam then becomes referable, unless you contest the notice by lodging your own RPEQ certified failure impact assessment to demonstrate otherwise.

IF YOU OWN A DAM LESS THAN THE HEIGHT AND SIZE CRITERIA, YOU SHOULD CONTACT US IF YOU HAVE CONCERNS THAT PEOPLE MAY BE AT RISK IF IT WERE TO FAIL.

WHAT HAPPENS AFTER A DAM IS ASSESSED?

FAILURE IMPACT RATINGS

Once we have made a decision, the dam will be given one of the following failure impact ratings, according to the number of people at risk:

- **no failure impact rating:** less than 2 people at risk
- **category 1 failure impact rating:** 2 to 100 people at risk
- **category 2 failure impact rating:** more than 100 people at risk.

Only dams given a category 1 or category 2 failure impact rating will be considered referable dams.

FUTURE FAILURE IMPACT ASSESSMENTS

Requirements for future failure impact assessments will be included in our acceptance letter and notice. This accounts for future changes to the dam or surrounding area, for example, new developments. Note that a failure impact assessment may be required in future even if the dam is not referable now.

WHAT HAPPENS WHEN A DAM BECOMES REFERABLE?

- We send you a letter and notice informing you that the dam is referable.
- We provide you with a set of dam safety conditions that will form the basis for the dam's management program. These conditions may include requirements for inspections, repairs, upgrades and recordkeeping.
- We provide guidance on preparing your emergency action plan, including a timeframe for completion. You must have an emergency action plan that outlines the steps to follow and people to contact if a dam emergency occurred. The plan must be shared with relevant local government and district groups and submitted to the regulator for approval. Approval is for a period of up to five years and plans must be periodically reviewed and renewed.
- We can assist you in developing and implementing a dam safety management program and emergency action plans if your dam ever becomes referable.

SUPPORT FOR SMALL DAM OWNERS

The following ensures that regulations for small dams remain simple, practical and affordable:

- If your dam is deemed referable, you don't need to engage RPEQs for initial failure impact assessments.
- We can apply safety conditions that are appropriate for dams with low failure impacts to simplify the process and reduce compliance costs.
- We can suggest ways to reduce the impacts of dam failure.
- We have developed an emergency action plan template specifically for dams with lower failure impacts, which you can complete yourself or we can assist if necessary.

PURCHASING A PROPERTY WITH A DAM

When there is a change in ownership of a referable dam, the former dam owner must provide us with details of the new owner within **ten business days** and ensure all dam safety documentation has been provided to the new owner.

Owners of dams that are not referable are not required to notify us when there is a change of ownership. Please contact us if you are unsure if a dam on a property you are purchasing is referable or if you are concerned that your dam has a population at risk.

APPROVALS FOR NEW DAM OR DAM UPGRADE

DAM SAFETY APPROVALS

Under the *Planning Act 2016* and State Development Assessment Provisions (State code 20: Referable dams), a development permit is required to construct or modify a dam if:

- works result in a dam that exceeds the height and size criteria (as outlined previously)
- it meets the height and size criteria, and if upgraded, the storage capacity will increase by more than 10 per cent
- the accepted failure impact assessment for the dam states it has or will have, a category 1 or 2 failure impact rating. The assessment must be submitted to us for acceptance before applying for the development permit.

Contact us if you intend to construct a dam that is below the height and size criteria but may put people at risk if it failed.

OTHER APPROVALS

Dam safety is only one of the aspects that may trigger the need for a development application under the *Planning Act 2016*.

The following list is not complete; however, other works, which may occur during the construction of a small dam and require approval could include:

- taking or interfering with water (water in a watercourse, lake or spring)
- waterway barrier works
- removal of quarry materials from watercourses or lakes
- clearing native vegetation.

The State Assessment and Referral Agency is the central point of lodgement and assessment for Queensland development applications. Further information is available at www.dsdmip.qld.gov.au by searching 'State Development Assessment Provisions'.

You should also contact your:

- local Queensland Government office to check if any water licences are required for taking and interfering with surface water (water in a watercourse, lake or spring), groundwater or overland flow water—depending on the water plan and *Water Act 2000* requirements in the subject area.
- local council to ask about any local planning scheme requirements that may apply.

THINGS TO THINK ABOUT WHEN CONSTRUCTING OR UPGRADING

Even if no approvals are required for the construction, you should consider the impacts that your new dam may have on downstream properties—both when it is operating, and if it were to fail.

Dams are a common source of dispute between neighbours. To reduce the chance of a complaint, consider who the dam may affect before construction starts and consult with any nearby people who may be impacted by the construction, or by redirected flow from the dam.

A poorly constructed dam can cause you ongoing expense and may not reliably store water. Design and construction works should be done by a contractor with previous experience with dams.

Where possible, consult with a suitably qualified and experienced RPEQ as part of the process. This is a requirement for construction work on referable dams. Using the services of an RPEQ protects your interests by ensuring a competent professional has supervised the work. A register of RPEQs is available at www.bpeq.qld.gov.au.

HOW DO SMALL DAMS FAIL?

DAMS CAN FAIL IN MANY DIFFERENT WAYS. THE TWO MOST COMMON TYPES OF FAILURES FOR SMALL EARTHEN DAMS ARE KNOWN AS ‘OVERTOPPING FAILURES’ AND ‘SUNNY DAY’ FAILURES.

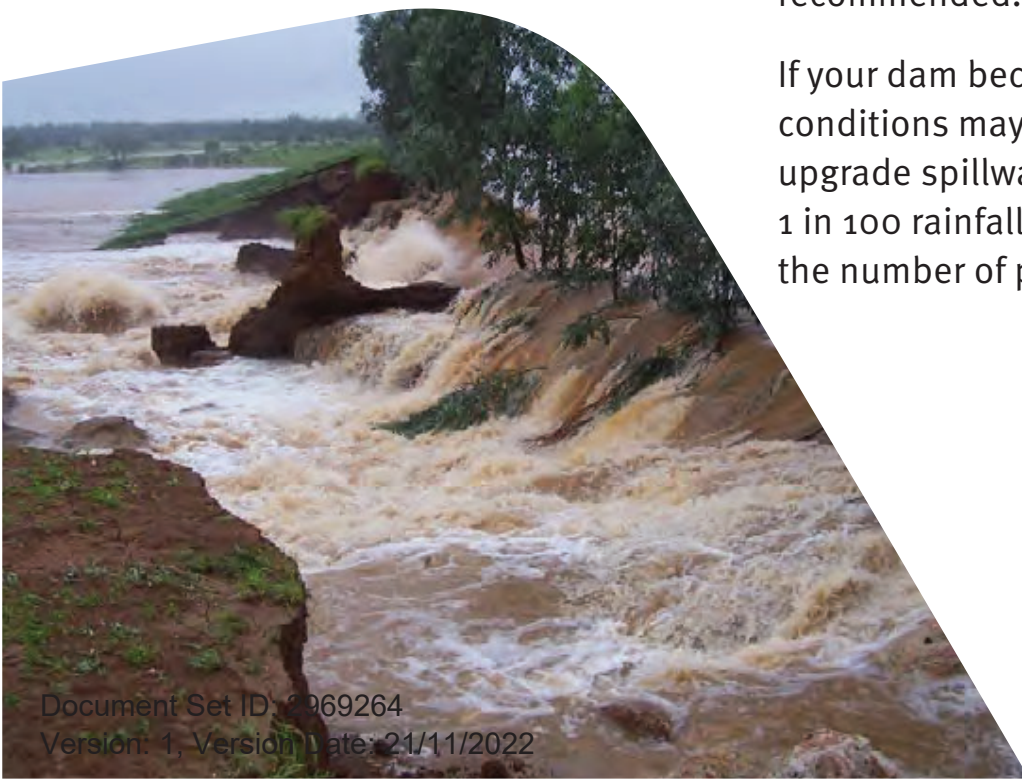
OVERTOPPING FAILURE

Dams may overtop during flood events, failure of pumps to turn off, or from the failure of an upstream dam. Many small dams are made of earth or rock, which can rapidly erode and fail if overtopped. This can happen when the flow capacity of the spillway (or bywash) is exceeded and reservoir water levels rise. Dams can also fail when spillways erode during high flows. This can additionally lead to erosion of the downstream dam wall.

The risk of overtopping can be reduced by making sure the spillway or bywash is sized to pass at least a 1 in 100 year rainfall event (or, more correctly, a one per cent annual exceedance probability event). Even offstream ring tank or turkey’s nest storages should have a small spillway sized to pass either the pump capacity, should it fail to shut off, or a 1 in 100 rainfall event.

Spillways should be kept free of debris to ensure they can pass water to their full capacity—regular inspection of the crest checking for low areas due to settlement is recommended.

If your dam becomes referable, conditions may be placed to upgrade spillways in excess of a 1 in 100 rainfall event, depending on the number of people at risk.



SUNNY DAY OR PIPING FAILURE

Sunny day or piping failures can occur at any time without warning or a wet weather event. They can be caused by water finding its way through existing voids in the dam wall, which can lead to internal material being washed out. Eventually, the wall may partially or fully collapse.



These internal voids can occur:

- during the construction phase due to poor material selection or lack of compaction
- tree roots growing into the wall, or animals burrowing.

Sunny day failures often occur during periods when the dam is rapidly filled, such as a first rainfall event after a dry period. Small dams may be built from soil types that crack under dry conditions. There can be a temptation to overfill dams following periods of drought. The risk of failure may be higher when the dam is refilled under these conditions.

The risk of sunny day failure can be reduced by regularly inspecting your dam and keeping an eye out for potential defects such as seepage, sinkholes, trees or animal burrows.



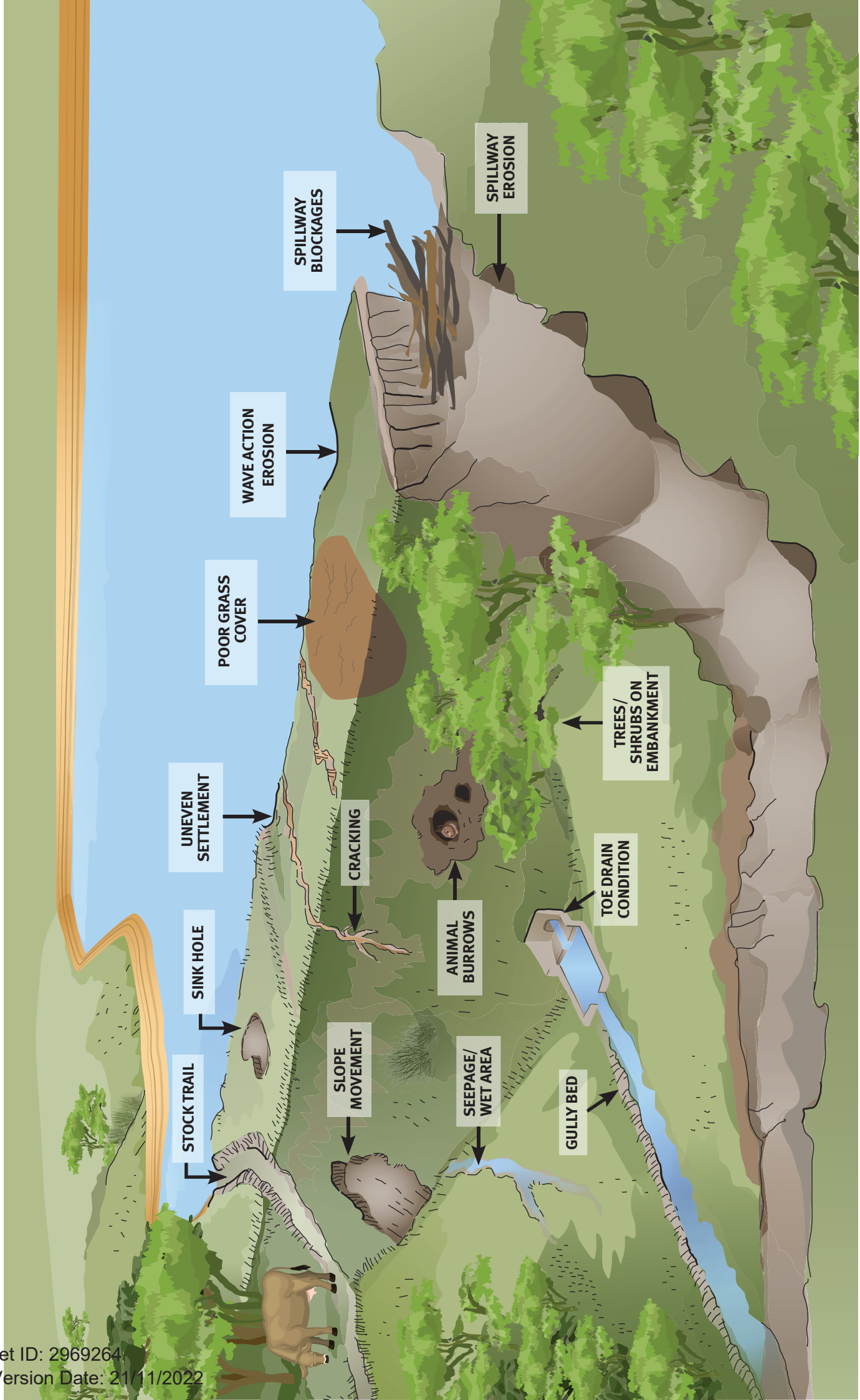
BASIC DAM INSPECTION AND MAINTENANCE

Small dams need regular inspections and maintenance to keep them functioning well. Referable dams have dam safety conditions, which require dam owners to do regular inspections. It is suggested that most small dams should be inspected at least monthly.

The following picture summarises common issues that can occur in small earthen dams, which could lead to eventual failure if left unresolved. Please also see the safety checklist on the back page of this pocketbook.

IF YOU SEE ANYTHING YOU ARE CONCERNED ABOUT, CONSIDER ENGAGING AN RPEQ TO DISCUSS AND INSPECT YOUR DAM.

THINGS TO LOOK FOR WHEN INSPECTING YOUR DAM





SAFETY CHECKLIST FOR SMALL DAM OWNERS

HERE IS A SUMMARY OF THINGS YOU SHOULD REGULARLY CONSIDER WITH YOUR DAM.

DAM FAILURE OR UNEXPECTED WATER RELEASE

- Who lives downstream of your dam and could they be at risk?
- Do you know them and have their contact details so you can warn them?
- If your dam is referable, is your emergency action plan (EAP) up-to-date? (search 'EAP' at www.dnrme.qld.gov.au to find all current EAPs).
- Are there any preparations you can do to avoid or minimise downstream consequences?

DAM OVERTOPPING

- What is the safe operating level of your dam?
- If your dam was to overtop, how and where would that occur?
- Does the dam have a bywash or spillway that is large enough to pass flood flows?
- Is the spillway clear of debris and vegetation? Can it pass inflows to its full capacity?
- Is your dam and spillway adequately protected so that the material will not erode during rainfall events?
- If your dam is a ring tank, what measures are in place to keep your dam at a safe operating level during pumping?

SAFETY AND MAINTENANCE

- Have you recently inspected your dam and can you see any of the defects presented in the illustration?
- Are there any large plants or animal burrows on the embankment that could introduce a failure pathway?
- Are there any settling or erosion issues that need to be addressed?
- Are there any marsh areas, or vegetation patches, which could indicate seepage issues?
- If you are unsure, have you considered specialist advice?
Consider engaging an RPEQ to discuss and inspect your dam.

CONCERNED ABOUT YOUR DAM?

For emergencies regarding a dam failing where lives may be in immediate danger, call emergency services immediately on **000**. Where possible and safe to do so, try to warn any neighbours who may be impacted.

For general dam safety concerns and questions, email us at **damsafety@rdmw.qld.gov.au** with the following information:

- description of the issue
- location or address
- nearby watercourses
- approximate height of the wall and volume of the dam
- distance to the nearest property
- available photos that will help to illustrate the issue to us.

Further information on dam safety is available at **www.qld.gov.au** search 'dam safety regulations'.





