Guidance on referable dams planning

July 2017

Queensland Government

This publication has been compiled by Dam Safety, Queensland Department of Energy and Water Supply, in conjunction with the Department of Infrastructure, Local Government and Planning.

Contents

Part 1 Overview

1.1 Introduction

State code 20: Referable dams (the code), contained in the State Development Assessment Provisions (SDAP), applies to the assessment by the chief executive administering the *Planning Act 2016* of referable dams as defined in section 1.2 below.

The purpose of this guidance material is to assist applicants in preparing development applications for referable dams and to provide assistance in meeting performance outcomes under the code.

1.2 Referable dams

The term 'referable dam' is defined within the *Water Supply (Safety and Reliability) Act 2008* (Water Supply Act), which is administered by the chief executive of Department of Energy and Water Supply. Essentially a dam is referable if:

- a failure impact assessment was required for the dam
- the assessment found the dam has a failure impact rating and
- the assessment has been accepted by the chief executive administering the Water Supply Act.

A dam is required to be failure impact assessed if any of the following applies:

- After its construction the dam will be:
  (a) more than 10m in height and have a storage capacity of more than 1500ML; or
  (b) more than 10m in height and have a storage capacity of more than 750ML and a catchment area that is more than 3 times its maximum surface area at full supply level.
- Because of any works proposed to be carried out in relation to an existing dam which is a non-referable dam[1] under the Water Supply Act, it will meet the criteria stated in (a) or (b) after the works are carried out.
- If an existing dam which is a non-referable dam under the Water Supply Act meets the criteria in (a) or (b) and because of any works proposed to be carried out in relation to the dam, the storage capacity of the dam will increase by more than 10% after the works are carried out.
- If, because of any works proposed to be carried out in relation to a referable dam, the storage capacity of the dam will increase by more than 10% after the works are carried out.

A dam is given a failure impact rating if the failure impact assessment completed in accordance with the published guidelines determines there are two or more persons at risk were the dam to fail. Only dams which have been given a failure impact rating in this manner are required to be referred under the Planning Act, and to be assessed against the relevant provisions of SDAP. Referral under the Planning Act and subsequent assessment against SDAP is not required if the failure impact assessment determines the population at risk in the event of dam failure is less than two persons.

Note that dams which are considered hazardous waste dams, or a weir that does not have a variable flow control structure on the crest of the weir, are not regulated under the Water Supply Act and are therefore not referable dams under either the Planning Act or the Water Supply Act.

[1] See the Guideline Glossary for the definition of a referable dam. A non-referable dam is a dam which does not meet the criteria set out in the definition of referable dam.

1.2.1 Failure impact assessment

For a referable dam, the completion and acceptance of a failure impact assessment in accordance with the Water Supply Act is a prerequisite to the making of a development application. The methodology for preparing a failure impact assessment is contained within the Guidelines for failure impact assessment of water dams. The failure impact assessment must be undertaken by a suitably experienced professional engineer who is registered under the *Professional Engineers Act 2002* in Queensland (RPEQ) who is **not** any of the following:

- the owner of the proposed dam
- the operator of the proposed dam
- an employee of the owner of the proposed dam
- an employee of the operator of the proposed dam.

Apart from determining whether a dam is referable or not, the outcome of the failure impact assessment is important in the application of the code since the scale of failure consequences are critical to the determination of the performance standards required at the dam.

Since dams engineering is a diverse and complex science, it is expected that suitably qualified and experienced professionals will be closely involved in preparing the proposal and supporting information that accompanies the application. Where engineering services are provided in aspects of the assessment these must be conducted by a suitably experienced engineer who is a RPEQ.

1.3 Using the guidance material

This guidance material consists of the following parts:

- Part 1 – provides an introduction
- Part 2 – provides an overview of the development assessment process for referable dams; an explanation of the types of development to which the code and guideline apply; and advice about pre-lodgement processes.
- Part 3 – provides context and advice on supporting actions and methodology intended to assist the applicant in demonstrating compliance with the performance outcomes or purpose of the code.

Please note that the use of this guideline alone does not guarantee compliance with all planning and environmental management requirements for a development that includes a referable dam. This guideline should be interpreted as advice only for development applications under the Planning Act that include a referable dam.

Part 2 Assessment framework

2.1 State Assessment and Referral Agency

The State Assessment and Referral Agency (SARA) is responsible for delivering a co-ordinated, whole-of-government approach to the state's assessment of development applications. The chief executive of the Planning Act, the Director-General of the Department of Infrastructure, Local Government and Planning (DILGP) is the assessment manager or referral agency for development applications where the state has a jurisdiction.

Schedule 10 of the Planning Regulation 2017 prescribes that operational work that is the construction of a referable dam is assessable development. An applicant for a referable dam development is therefore required to make an application to SARA in accordance with the development assessment process summarised in Figure 1. Development applications for a referable dam will be assessed by SARA against State code 20: Referable dams under

SDAP. Accordingly, applicants are advised to demonstrate compliance with the relevant provisions of the code in order to assist in minimising requests for further information, and to speed up the assessment process.

2.2 State Development Assessment Provisions

The provisions provide assessment benchmarks for the assessment of development applications where the chief executive administering the Planning Act, is the assessment manager or a referral agency..

An operational works development application for a referable dam development will be assessed by SARA against SDAP's State code 20: Referable dams.

2.3 Other approvals

In addition to requiring a development application for operational works for a referable dam, an applicant may be required to meet additional statutory requirements under the Planning Act (and other legislation) for further aspects of the development. Additional development applications or permits may be required to be made to a local government, SARA or another entity as prescribed under the Planning Regulation. This guidance material does not cover such additional statutory requirements.

Under the Water Supply Act, a dam which is referable is required to have an approved emergency action plan. For more information on emergency action plans, please refer to the requirements of the Water Supply Act and the provisional guideline on Emergency Action Planning for Referable Dams

2.4 Pre-lodgement

A pre-lodgement meeting with SARA is recommended prior to lodging the development application for a referable dam. This meeting will assist an applicant in understanding the requirements for technical assessments against the code based on the individual circumstances of the proposed development.

To determine if there are any additional approvals (e.g. material change of use, building works, reconfiguration of a lot, other permits, etc.) that may be required to support the operational works application to SARA, it is strongly recommended that the applicant consults with the relevant local government. This consultation may occur before or in conjunction with the pre-lodgement meeting with SARA.

Figure 1 Development assessment process for referable dams

For further and more detailed information on the development assessment framework, visit the SARA website at www.dilgp.qld.gov.au/planning/development-assessment.html

Part 3 Assessment criteria

This part of the guideline provides additional information to assist applicants with demonstrating compliance with the performance outcomes of the code. Because dams can be complex structures and extremely variable in their size, type of construction, operation and failure consequences, no definitive acceptable outcomes are provided for in this code. Note that if a development application does not comply with one or more of the performance outcomes in the code then it will be assessed by SARA against the purpose statement in the code.

Each section is written to correspond with the relevant provision in the code and provides context around the provision of supporting information, and actions that may be required to demonstrate compliance. This includes the methodology to be applied for technical assessments that may be required.

The department has published the Queensland dam safety management guidelines and guidelines on acceptable flood capacity for water dams, containing information about the requirements for the design and construction, and the on-going operation, management and maintenance of referable dams.

Development applications for referable dams will be assessed against the requirements of these guidelines, including referenced documents. It is therefore important that applicants take the content of the guidelines into account when preparing supporting documentation for their development application.

Applicants are reminded that the supporting actions contained in this section cover the minimum standards required to respond to the criteria and additional assessments may be required dependent on individual project and site circumstances.

3.1 Meeting performance outcomes: referable dams

3.1.1 Performance Outcome 1 (PO1) design and construction of referable dams

Performance outcomes	Acceptable outcomes
PO1 The dam is designed and constructed in a manner which: 1. Is in accordance with appropriate dam engineering practices and standards 2. Minimises the potential for dam failure 3. Minimises any of the impacts resulting from a failure of the dam 4. Is appropriate for the site conditions where the dam is located	No acceptable outcome is prescribed

Supporting actions

The following actions support an applicant in demonstrating compliance with PO1:

The applicant should demonstrate that the risk of dam failure is mitigated through the adoption of suitable design and construction practices and standards for the site conditions encountered and to an extent commensurate with the level of failure consequences.

In particular, applicants will be expected to demonstrate in their supporting documentation that:

- appropriate investigations have been completed to establish site conditions, and
- the proposed works comply with current engineering standards and accepted practices.

Following is a list of issues that applicants may need to consider while preparing an application. The list is not exhaustive. Careful consideration should be given to the proposal and its potential impacts to determine which issues are relevant to the application. It is expected that consideration of these issues will be site and dam type specific.

Potential design issues:

- consequence assessment
- hydrologic and hydraulic data and analyses
- spillway adequacy
- foundation conditions and treatment
- suitability of construction materials
- embankment design and stability analyses
- instrumentation installed
- construction specification.

The supporting documentation submitted should also include:

- a summary of the principal data about the dam
- plans of the dam and associated works drawn on a contour plan of the site
- arrangements, elevations and sections showing details of the proposed structures, including foundation details.

3.1.2 Performance Outcome 2 (PO2) Management and maintenance of referable dams

Performance outcomes	Acceptable outcomes
PO2 The dam will be managed and maintained in a manner which: 1. Is in accordance with appropriate dam engineering practices and standards 2. Ensures the ongoing safe operation of the dam 3. Minimises the risks of dam failure 4. Is appropriate for the site conditions where the dam is located	No acceptable outcome is prescribed

Supporting actions

The following actions support an applicant in demonstrating compliance with PO2.

The applicant should indicate how the risk of dam failure will be mitigated through the adoption of management and maintenance practices and standards suitable for the magnitude of consequences were the dam to fail.

Referable dams are generally required to perform satisfactorily over an extended life period. Therefore, responsible operation of the dam and maintenance to prevent deterioration of the structure are important to its continuing performance

In particular, the applicant should consider the following while preparing the application:

- monitoring systems to detect the development of any abnormal behaviour at the dam
- operational and maintenance procedures for the safe management of the dam, and
- regular inspection requirements for the dam, including by experienced dams engineers.

The on-going dam management requirements will generally be reinforced through conditions attaching to any development approval.

3.2 Meeting the purpose of the code

The purpose of the code is to reduce the risk to the community from the failure or other impacts of referable dams by ensuring appropriate safety standards are utilised in the design, construction, management and maintenance of dams.

Development will comply with the code if it can be shown to meet the code's purpose statement. The purpose provides the overall context for the code and holistically defines what the code seeks to manage and/or protect. For this reason, if a development application does not comply with one or both of the performance outcomes described above, the applicant should instead demonstrate how the purpose of the code can be achieved by the proposal.

Abbreviations

Abbreviation	Meaning
FIA	Failure Impact Assessment
IDAS	Integrated Development Assessment System
RPEQ	Registered Professional Engineer of Queensland
SARA	State Assessment Referral Agency
SDAP	State Development Assessment Provisions
Water Supply Act	*Water Supply (Safety and Reliability) Act 2008*

Glossary

Term	Meaning
Catchment area	The land surface area, which drains into a dam or to a specific point.

Dam	Dam means:
	• Works that include a barrier, whether permanent or temporary, that does or could impound water; and the storage area created by the works.
	• The term includes an embankment or other structure that controls the flow of water and is incidental to works mentioned above
	• The term does not include the following:
	  • rainwater tank
	  • water tank constructed of steel or concrete or a combination of steel and concrete
	  • water tank constructed of fibreglass, plastic or similar material.
	For the purposes of the Planning Regulation, a dam includes a proposed dam.

Emergency action plan	An emergency action plan provides guidance for actions required during an emergency event at the dam, including downstream releases from dams as well as potential failure scenarios.
Failure impact assessment	A failure impact assessment of a water storage dam is defined under the Water Supply Act, and is in general terms the process used to determine the number of people whose safety could be at risk should a dam fail (population at risk). The results of the assessment are used to determine whether a dam is referable and the failure impact rating of a dam. A failure impact assessment must be certified by a suitably experienced and independent Registered Professional Engineer of Queensland.
Failure impact rating	A failure impact rating is a measure of the population at risk should a dam fail. There are two categories:

Term	Meaning
	• Category 1—between two to 100 people at risk by the dam failing. • Category 2—more than 100 people at risk by the dam failing. All category 1 and category 2 dams are referable dams under the Water Supply Act. If less than two people are at risk by the dam failing, then the dam is not given a failure impact rating and is not referable under the Water Supply Act. The chief executive imposes dam safety conditions on dams that are referable under the Water Supply Act based partly on the failure impact rating. Dam safety conditions can be imposed either when a development permit relating to a dam which is a referable dam under the Water Supply Act is granted or, after the dam has been constructed (as safety conditions under the Water Supply Act, which are taken to form part of a development permit for the dam).
Full supply level	Full supply level, for a dam, means the level of the water surface of the dam when the water storage is at maximum operating level and the dam is not affected by flood.
Hazardous waste dams	Hazardous waste dam means a dam containing, or that after its construction will contain: • a substance, whether liquid, solid or gaseous, derived by, or resulting from, the processing of minerals that tends to destroy life or impair or endanger health, or • ash resulting from the process of power generation. The term includes a dam that is used, or after its construction will be used, to prevent contamination of the environment by storing waste or a contaminant within the meaning of the *Environmental Protection Act 1994*.
Height	Height, for a dam, means the measurement of the difference in level between the natural bed of the watercourse at the downstream toe of the barrier or, if the barrier is not across a watercourse, between the lowest elevation of the outside limit of the barrier of the dam and the top of the barrier.
Megalitres (ML)	A unit of capacity equal to one million litres.
Notice accepting a failure impact assessment	A notice issued by the Chief Executive under section 350 of the Water Supply Act accepting a failure impact assessment for an existing or proposed dam.
Population at risk	Population at risk means the number of persons, calculated under the failure impact assessment guidelines, whose safety will be at risk if the dam, or the proposed dam after its construction, fails.
Referable dam	Any dam that has been failure impact assessed under the Water Supply Act, and been accepted by the chief executive administering the Water Supply Act as having either a category 1 or category 2 failure impact rating.

Term	Meaning
Registered Professional Engineer (Queensland) - RPEQ	A person registered as a registered professional engineer under the *Professional Engineers Act 2002*.
Storage capacity	The volume of water that is stored by the dam when the water storage is at maximum operating level and the dam is not affected by flood.
Surface area	The area upstream of the dam that is inundated by the dam when the water storage is at maximum operating level and the dam is not affected by flood.
Variable flow control structure (Weir)	A variable flow control structure on the fixed crest of a weir is a component that can be adjusted to impound water above the level of fixed weir or to control the rate of flow over the fixed weir. Examples are assorted types of gates and inflatable bags.
Weir	A barrier constructed across a watercourse below the banks of the watercourse that hinders or obstructs the flow of water in the watercourse.

References

Queensland *Water Supply (Safety and Reliability) Act 2008* (Water Supply Act)

Queensland Government, Department of Energy and Water Supply, Guidelines for failure impact assessment of water dams, 2012.

Queensland Government, Department of Energy and Water Supply, Queensland dam safety management guidelines, 2002.

Queensland Government, Department of Energy and Water Supply, Guidelines on acceptable flood capacity for water dams, 2016

Queensland Government, Department of Energy and Water Supply, Provisional Guideline; Emergency Action Planning For Referable Dams, 2013