Paradise Dam Emergency Response Overview

Updated May 2021

Purpose

Sunwater is committed to ensuring the community has access to information on the risks of Paradise Dam and how they are managed.

This document has been revised and re-issued in May 2021 to include updated information about how our emergency response will be modified following completion of the Essential Works to lower and strengthen Paradise Dam.

What is a dam Emergency Action Plan?

Paradise Dam requires an Emergency Action Plan (EAP) by law as it is a referable dam; a dam that would put two or more people downstream in danger if it was to fail. This is known information and the dam has had an EAP since it was built.

An Emergency Action Plan identifies:

- dam hazards and possible emergency events
- the area likely to be affected by an emergency event
- circumstances that increase the likelihood of emergency events
- people who may be harmed and whose property may be impacted, and how these people are warned, and
- the actions to be taken in response to a dam hazard or emergency event and who is responsible.

What could cause Paradise Dam to fail?

Dams are complex structures that can be threatened by a natural event such as flooding or an earthquake, or a deliberate act such as a terrorist activity.

As examples, Paradise Dam could fail due to:

- Overturning and sliding: a large concrete block or section of wall (a monolith) moves or collapses and the water released cannot be controlled. This could occur under flood loading because of weakness in:
  - the Roller Compacted Concrete (RCC) within the wall, or
  - the dam foundation below the wall.
- Scouring and undermining: a flood may cause high velocity flows, damaging and scouring the area downstream and undercutting the dam wall.
- Piping: over time, water movement can lead to internal erosion which can result in a hole or “pipe” forming. If not detected and repaired, the pipe could expand and lead to the collapse of the dam.
- Terrorism or deliberate act: whilst unlikely, dam owners remain vigilant to this threat.

Background

Paradise Dam was damaged during flooding in 2011 and 2013 (with more significant damage in 2013), and flood repairs were completed by December 2013. Early-stage improvement works were carried out from 2015 to 2017. Over time more testing and risk assessments have identified more structural issues with Paradise Dam.

In September 2019, Sunwater confirmed the increased risk of shear (sliding) failure through reduced strength of the roller compacted lift joints making up the dam wall. This could have resulted in potentially large sections of the dam wall suddenly failing through sliding and overturning, should a major flood occur again at Paradise Dam. That is why the dam's storage level was reduced and Sunwater conducted Essential Works to lower and strengthen the primary spillway.

What works have been completed to reduce the risk of a dam failure?

Sunwater has lowered Paradise Dam's primary spillway by 5.8 metres, incorporating construction of a 0.6 metre thick reinforced concrete crest, and installed close to 600 steel anchors to secure the upper half of the dam and the layers of RCC. This work will reduce the pressure on the dam during a flood event and has significantly reduced the risk of a dam failure.

With the completion of work on the dam spillway, the risk of dam failure has been reduced to a 1 in 5000-year event. Prior to the start of the essential works, the dam failure risk was equivalent to a 1 in 200-year event, which is similar to what the community experienced in 2013.

Changes to evacuation triggers following the Essential Works

With the risk of a dam failure reduced, Sunwater has worked to amend the Paradise Dam Emergency Action Plan (EAP) evacuation triggers in consultation with the Bundaberg and North Burnett local disaster management groups.

The following table summarises how evacuations triggers have changed over time, and confirms the triggers in place from March 2021.

Before the Essential Works, evacuations would be activated when:	From May 2020, evacuations would be activated when:	From 24 September 2020, evacuations would be activated when:	From 17 March 2021, evacuations will be activated when:
The dam experienced a 1 in 50-year flood event	The dam experienced a 1 in 7-year flood event	The dam experiences a 1 in 50-year flood event	The dam experiences a 1 in 500-year flood event
Which was 6.9 metres over the original spillway crest level	Equivalent to 7.2 m at the Mount Lawless gauge (upstream of Paradise Dam)	Equivalent to 14.7 m at the Mount Lawless gauge (upstream of Paradise Dam)	Which is 11.5 metres over the temporary spillway crest level
Equivalent to 14.7 m at the Mount Lawless stream gauge			Mount Lawless is no longer a reference gauge for the Paradise EAP
Equivalent to 8.5 m at the Targo Street gauge in Bundaberg*	Equivalent to 3.4 m at the Targo Street gauge in Bundaberg*	Equivalent to 8.5 m at the Targo Street gauge in Bundaberg*	Equivalent to 10.2 m gauge height at the Targo Street gauge in Bundaberg*
Equivalent to 20.8 m at the Walla flood gauge*	Equivalent to 10.9 m at the Walla flood gauge*	Equivalent to 20.8 m at the Walla flood gauge*	Equivalent to 25.7 m gauge height at the Walla flood gauge*

**These numbers do not include any additional inflows downstream of the dam and should be used as a general guide only. Details on any forecast levels should always be sourced from the Bureau of Meteorology.*

The Paradise Dam EAP will be reviewed again once further strengthening and stabilising work is completed as part of the long-term remediation of Paradise Dam to meet dam safety guidelines.

What does this change mean for downstream communities?

The triggers have been revised to reflect the reduced risk of a dam failure. This ensures that the evacuation process takes into account the current conditions and understanding of risk to ensure public safety.

The likelihood of requiring evacuation of downstream residents is now significantly lower than it was before the spillway was lowered.

Sunwater and the local councils are focussed on protecting lives.

Any evacuations will be managed by the district and local disaster management groups.

Protecting lives and property

Sunwater monitors Paradise Dam daily and our EAP identifies specific actions to be taken as water rises. Figure one over the page shows the actions taken as the water level at the dam reaches specific heights.

Sunwater and local councils have shared evacuation information with residents within approximately 10 km of Paradise Dam.

It is critical that all residents respond to evacuation alerts.

Testing the Emergency Action Plan

The Emergency Action Plan is regularly tested with the local disaster management group and the district disaster management group. The most recent tests were held successfully in July and October 2020.

More information

- Access the Paradise Dam Emergency Action Plan at www.sunwater.com.au/wp-content/uploads/Home/Community/Preparing-for-weather-events/Emergency-Management/EAPs/Paradise_Dam_EAP.pdf[1]
- Refer to local disaster information at disaster.bundaberg.qld.gov.au/ and http://emergency.northburnett.qld.gov.au/
- Access interactive flood mapping: www.bundaberg.qld.gov.au/interactive-mapping-system

[1] This link is to be updated with the latest EAP Addendum following regulatory approval.

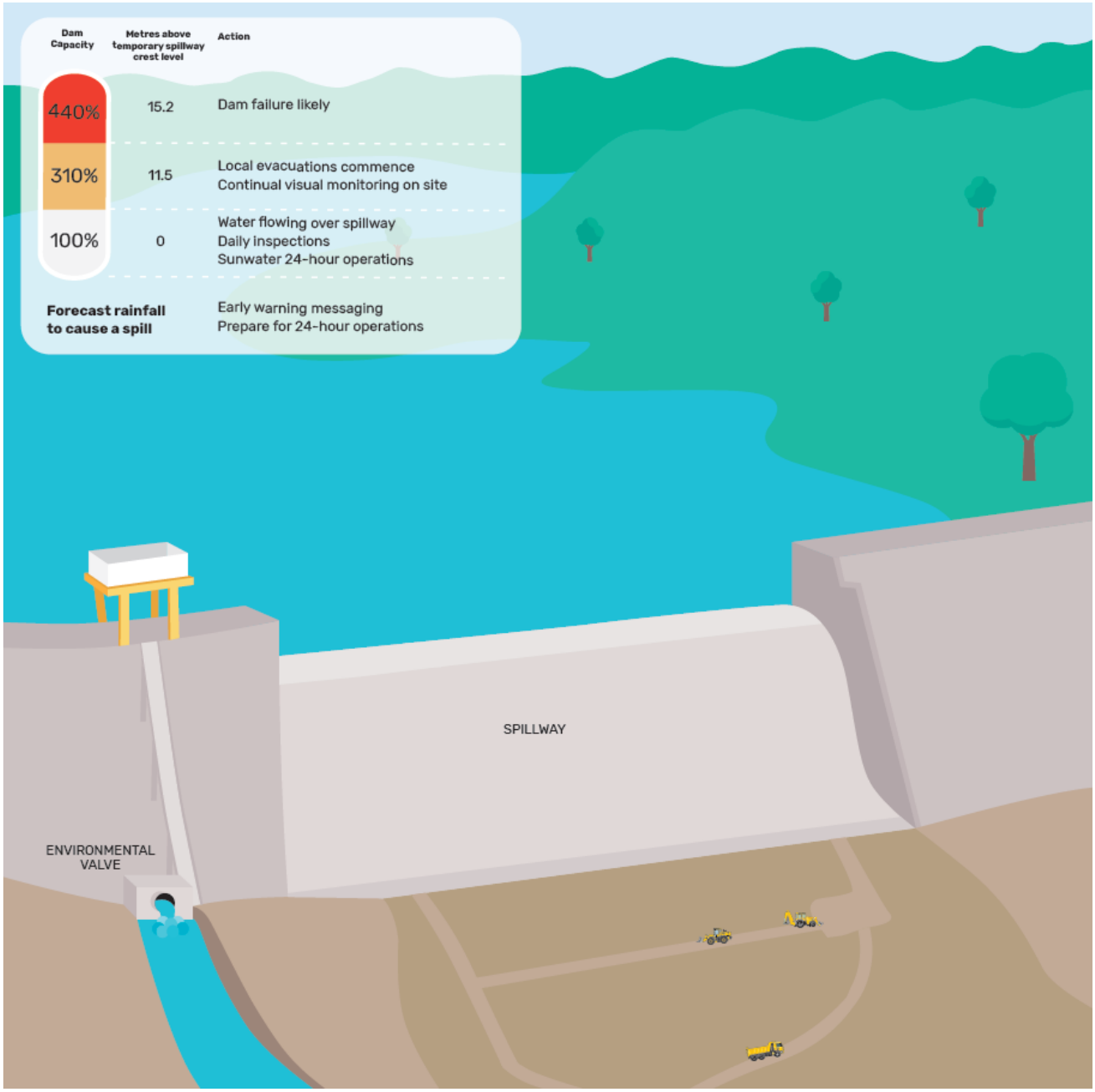

Figure 1: The actions taken as the water level at the lowered temporary spillway crest at Paradise Dam reaches specific heights.

The information presented in this flyer is current at the time of publication in May 2021. It may be updated over time in response to new information.

Refer to sunwater.com.au/projects/paradise-dam-essential-works/ for the latest information about Paradise Dam.