Paluma Dam

Emergency Action Plan

2020

Approved by the delegate of the Chief Executive, Department of Natural Resources, Mines and Energy until 31 July 2023.
Emergency Alerts, Notifications and Warning Messages

As this Emergency Action Plan and the hazards that it refers to, have a direct impact on downstream residents residing in the Charters Towers Local Government Area, all early warnings, emergency alerts, notifications and warning messages are managed directly through early and proactive advice to the Charters Towers Disaster Management Group.

In the event that this EAP is activated, downstream residents are provided with information by the Charters Towers Regional Council (CTRC), as detailed in the Event Alert Tables following.

If the CTRC is not contactable during an Emergency Event or when otherwise required, the Paluma Dam Operator is authorised to make direct contact and advise of emergency event status.

A copy of the approved (redacted) Paluma Dam EAP is available to the public on the DNRME website.

A link to the DNRME website can be found on the TCC website under the Dams and Catchments section.
Emergency Activation Quick Reference Guide

This EAP Paluma Dam covers five (5) emergency conditions. Use the following table to select the relevant section of the EAP that deals with the emergency condition.

<table>
<thead>
<tr>
<th>Activation Level</th>
<th>Alert</th>
<th>Lean Forward</th>
<th>Stand Up</th>
<th>Stand down</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Activation triggers for emergency conditions relating to dam release hazards</strong></td>
<td><strong>Flood Event</strong> <em>(Refer to Pg. 21)</em></td>
<td><strong>Significant Contamination</strong> <em>(Refer to Pg. 28)</em></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Flood Event</strong> <em>(Refer to Pg. 21)</em></td>
<td>EL893.12 and rising (.25m above FSL)</td>
<td>Suspected chemical spill or toxic conditions in the storage or catchment.</td>
<td>Evidence of chemical spill or toxic conditions in the storage or catchment.</td>
<td>Serious contamination threatening water supply.</td>
</tr>
<tr>
<td><strong>Significant Contamination</strong> <em>(Refer to Pg. 28)</em></td>
<td><strong>EL893.37 and rising (.50m above FSL)</strong></td>
<td><strong>Evidence of chemical spill or toxic conditions in the storage or catchment.</strong></td>
<td><strong>Serious contamination threatening water supply.</strong></td>
<td><strong>Storage water quality returns to an acceptable quality.</strong></td>
</tr>
<tr>
<td><strong>Activation triggers for emergency conditions relating to dam failure hazards</strong></td>
<td><strong>Dam Distress - Seismic Event</strong> <em>(Refer to Pg. 21)</em></td>
<td><strong>Earthquake in area less than 5MM.</strong></td>
<td><strong>Earthquake in area greater than 5MM.</strong></td>
<td><strong>Evidence of Dam Distress.</strong></td>
</tr>
<tr>
<td><strong>Dam Distress - Piping and Seepage</strong> <em>(Refer to Pg. 24)</em></td>
<td><strong>Increased seepage rate observed.</strong></td>
<td><strong>Increase in seepage rate with cloudy water evident.</strong></td>
<td><strong>Dam distress evident - including an increase in seepage water flow rate, cloudy seepage water, evidence of deformation or erosion, upstream vortex.</strong></td>
<td><strong>Storage stabilised and no immediate downstream risk.</strong></td>
</tr>
<tr>
<td><strong>Terrorist Activity/Threat/Hoax</strong> <em>(Refer to Pg. 31)</em></td>
<td><strong>Possible terrorist activity noticed or reported</strong></td>
<td><strong>Serious incident that could threaten the integrity of the dam, such as explosion of aircraft strike.</strong></td>
<td><strong>Threat to dam integrity confirmed</strong></td>
<td><strong>Storage stabilised and no immediate downstream risk.</strong></td>
</tr>
</tbody>
</table>
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PD0023 Paluma Dam Emergency Action Plan 2020
Effective Date: 27/05/2020

Authorised by: General Manager Townsville Water & Waste N00636
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<td>1</td>
<td>Director Infrastructure and Operations</td>
<td>Townsville City Council</td>
</tr>
<tr>
<td>2</td>
<td>General Manager Townsville Water and Waste</td>
<td>Townsville Water and Waste</td>
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<tr>
<td>3</td>
<td>Team Manager Engineering Major Infrastructure</td>
<td>Townsville Water and Waste</td>
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<td>4</td>
<td>Team Leader Raw Water Quality</td>
<td>Townsville Water and Waste</td>
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<td>5</td>
<td>Paluma Dam Operator (Paluma Dam)</td>
<td>Townsville Water and Waste</td>
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<td>6</td>
<td>Paluma Dam Operator (Paluma Village)</td>
<td>Townsville Water and Waste</td>
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<td>7</td>
<td>Paluma Dam Operator (Personal)</td>
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<tr>
<td>8</td>
<td>Local Disaster Coordinator</td>
<td>Townsville Local Disaster Management Group</td>
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<td>9</td>
<td>Executive Officer</td>
<td>Charters Towers Local Disaster Management Group</td>
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<td>Local Disaster Coordinator</td>
<td>Charters Towers Regional Council</td>
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<td>11</td>
<td>Mayor</td>
<td>Charters Towers Regional Council</td>
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<tr>
<td>12</td>
<td>District Disaster Coordinator</td>
<td>Queensland Police Service</td>
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<tr>
<td>13</td>
<td>Duty Engineer – Flood Warning Centre</td>
<td>Bureau of Meteorology</td>
</tr>
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<td>14</td>
<td>Executive Director</td>
<td>Queensland Fire and Emergency Service</td>
</tr>
<tr>
<td>15</td>
<td>Director Dam Safety (Regulator)</td>
<td>Department of Natural Resources, Mines and Energy, Brisbane (DNRME)</td>
</tr>
</tbody>
</table>
# 1. References and Abbreviations

## 1.1 References

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<th>Document title</th>
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<tr>
<td>PD Personnel Training and Procedural Matters</td>
<td>PD SOP-001</td>
</tr>
<tr>
<td>PD Emergency Action and Incident Reporting</td>
<td>PD SOP-002</td>
</tr>
<tr>
<td>PD Critical Operating Procedures</td>
<td>PD SOP-003</td>
</tr>
<tr>
<td>PD Monitoring and Surveillance</td>
<td>PD SOP-004</td>
</tr>
<tr>
<td>PD Maintenance of Dam Log Book</td>
<td>PD SOP-005</td>
</tr>
<tr>
<td>PD Detailed Operation and Maintenance Manual</td>
<td>PD DOMM 001</td>
</tr>
<tr>
<td>SMEC Paluma Dam Break Assessment</td>
<td>Paradigm</td>
</tr>
<tr>
<td>Thrice-Weekly Event Data Collection Check Sheet</td>
<td>QAF0565 PD Thrice-Weekly and Event Data Collection Sheet</td>
</tr>
<tr>
<td>Routine and Event-Post Event Inspection Checklist Sheet</td>
<td>QAF0564 PD Routine and Event-Post Event Inspection Checklist Sheet</td>
</tr>
<tr>
<td>Record of Communication</td>
<td>PD Record of Communication</td>
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## 1.2 Abbreviations and Acronyms

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
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<tbody>
<tr>
<td>ADR</td>
<td>Assistant Dam Ranger</td>
</tr>
<tr>
<td>AHD</td>
<td>Australian Height Datum</td>
</tr>
<tr>
<td>ANCOLD</td>
<td>Australian National Committee on Large Dams</td>
</tr>
<tr>
<td>BOM</td>
<td>Bureau of Meteorology</td>
</tr>
<tr>
<td>CEO</td>
<td>Chief Executive Officer</td>
</tr>
<tr>
<td>CTRC</td>
<td>Charters Towers Regional Council</td>
</tr>
<tr>
<td>DMG</td>
<td>Disaster Management Group</td>
</tr>
<tr>
<td>DDMG</td>
<td>District Disaster Management Group</td>
</tr>
<tr>
<td>DNRME</td>
<td>Department of Natural Resources, Mines and Energy</td>
</tr>
<tr>
<td>DSL</td>
<td>Dead Storage Level</td>
</tr>
<tr>
<td>DSR</td>
<td>Dam Safety Regulator</td>
</tr>
<tr>
<td>DSTA</td>
<td>Dam Safety Technical Advisor</td>
</tr>
<tr>
<td>EA</td>
<td>Emergency Alert</td>
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<tr>
<td>EAP</td>
<td>Emergency Action Plan</td>
</tr>
<tr>
<td>EER</td>
<td>Emergency Event Report</td>
</tr>
<tr>
<td>EL</td>
<td>Elevation</td>
</tr>
<tr>
<td>FiR</td>
<td>Failure Impact Rating</td>
</tr>
<tr>
<td>FSL</td>
<td>Full Supply Level</td>
</tr>
<tr>
<td>GS</td>
<td>Gauging Station</td>
</tr>
<tr>
<td>GIS</td>
<td>Geographical Information System</td>
</tr>
<tr>
<td>Km</td>
<td>Kilometre</td>
</tr>
<tr>
<td>LDC</td>
<td>Local Disaster Coordinator</td>
</tr>
<tr>
<td>GM TWW</td>
<td>General Manager Townsville Water and Waste</td>
</tr>
<tr>
<td>LDMG</td>
<td>Local Disaster Management Group</td>
</tr>
<tr>
<td>LMMP</td>
<td>Local Disaster Management Plan</td>
</tr>
<tr>
<td>ML</td>
<td>Mega litre</td>
</tr>
<tr>
<td>MM</td>
<td>Modified Mercalli</td>
</tr>
<tr>
<td>MSCL</td>
<td>Mild Steel Cement Lined</td>
</tr>
<tr>
<td>NRW</td>
<td>Natural Resources and Water</td>
</tr>
<tr>
<td>PAR</td>
<td>Population at Risk</td>
</tr>
<tr>
<td>PDO</td>
<td>Paluma Dam Operator</td>
</tr>
<tr>
<td>PMF</td>
<td>Probable Maximum Flood</td>
</tr>
<tr>
<td>PMP</td>
<td>Probable Maximum Precipitation Design Flood</td>
</tr>
<tr>
<td>QFCol</td>
<td>Queensland Flood Commission of Inquiry</td>
</tr>
<tr>
<td>QFES</td>
<td>Queensland Fire and Emergency Service</td>
</tr>
<tr>
<td>QPS</td>
<td>Queensland Police Service</td>
</tr>
<tr>
<td>REPEIR</td>
<td>Routine &amp; Event Post Event Inspection Report</td>
</tr>
<tr>
<td>SDCC</td>
<td>State Disaster Coordination Centre</td>
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<tr>
<td>SDMG</td>
<td>State Disaster Management Group</td>
</tr>
<tr>
<td>SES</td>
<td>State Emergency Service</td>
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<tr>
<td>SOP</td>
<td>Standard Operating Procedure</td>
</tr>
<tr>
<td>TCC</td>
<td>Townsville City Council</td>
</tr>
<tr>
<td>TLDMG</td>
<td>Townsville Local Disaster Management Group</td>
</tr>
<tr>
<td>TLRWQ</td>
<td>Team Leader Raw Water Quality</td>
</tr>
<tr>
<td>TM EMI</td>
<td>Team Manager Engineering Major Infrastructure</td>
</tr>
<tr>
<td>TWW</td>
<td>Townsville Water and Waste</td>
</tr>
<tr>
<td>WEDCCS</td>
<td>Weekly and Event Data Collection Check Sheet</td>
</tr>
<tr>
<td>WHS</td>
<td>Workplace Health and Safety</td>
</tr>
<tr>
<td>WQ</td>
<td>Water Quality</td>
</tr>
<tr>
<td>WQO</td>
<td>Water Quality Officer</td>
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</tbody>
</table>
2. **Scope**

This EAP covers the situation at Paluma Dam itself and actions to be taken by nominated TCC personnel. The **Charters Towers Regional Council** local government area is directly downstream of the Dam and as such the Council must be informed of emergency events so they can also implement an appropriate response.

The CTLDMG may be responsible for:

- Issuing community wide notices alerting of an event;
- If required closing roads of affected areas;
- Coordinating with local SES, QFES and QPS.

The main population at risk is at or nearby to Hidden Valley, located along the Running River. Refer to Figure 1 for a general locality map.

![Figure 1 - General Locality Map](image-url)
3. **Purpose**

The main purpose of this emergency action plan for Paluma Dam is to minimise the risk of harm to person or property if a dam hazard event or emergency event for the dam happens by:

- Ensuring compliance with the relevant sections of the *Water Supply (Safety and Reliability) Act 2008*;
- Ensuring adequate activation and deactivation of this EAP;
- Addressing levels of attendance prior to and during and after an emergency event;
- Defining responsibilities, procedures and appropriate remedial actions during flooding and other specific emergency events;
- Providing timely notification to authorities managing downstream local government areas and where necessary, downstream landholders;
- Ensuring the EAP is current and relevant staff are familiar with its implementation.

This EAP identifies emergency scenarios and describes the procedures to be followed by TCC staff to monitor emergency events and provide timely notification to the appropriate authorities.

If required, measures to protect downstream communities and properties will also be implemented.
4. Dam Details

4.1 General Dam Details

<table>
<thead>
<tr>
<th>Name of infrastructure</th>
<th>Paluma Dam</th>
</tr>
</thead>
</table>
| Location of Infrastructure | Stream Name: Swamp Creek, Running River Catchment.  
General Location: West catchment side of Paluma Range.  
E415,514.53 N7,901,272.52 (AGD84 Zone 55)  
Refer to Figure 1 of this document for a map showing the general location of Paluma Dam. |
| Description of Water Infrastructure | Embankment: Earth core rock embankment approximately 255m long, 5m wide at crest and twenty (20) m high at the embankment toe. A 600mm high wave barrier extends along the upstream side of the embankment crest for its full length.  
Spillway: Concrete ogee control section with an unlined chute returning to the creek. The spillway is 60.9m in width and has been augmented with mild steel weir plates increasing its level to 892.87m AHD.  
Saddle Dam 1: Located approximately 200m south east of the main embankment. It comprises a similar cross-section to the main embankment, with a crest length of 130m and a height of 6m.  
Saddle Dam 2: Located on the right bank approximately 200m north of the spillway. It has a similar cross-section to the main embankment, with a crest length of 120m and a height of approximately eight (8) m. This crest is approximately 2.4m higher than the main embankment (897.10m AHD). |
| Storage Capacities and Water Levels | Total storage capacity: 11,496ML  
Dead storage capacity: 80ML  
Useable storage capacity: 11,416ML  
Full supply level (FSL): 892.87m AHD  
Dead storage level (DSL): 880.07m AHD  
Crest level: 894.70m AHD  
Catchment area: 8.9km² |
| Outlet Provisions from Storage other than Spillway | Outlet works: Floating intake raft supporting a submerged 710mm diameter inlet pipe. A trash rack is attached to the intake pipe for primary screening. The inlet pipe is attached to the second of three intakes of the 3.0m diameter reinforced concrete intake tower which is located approximately 50m on the upstream side of the dam wall. Water is delivered from the dam to the Crystal Creek natural channel through a 4.5km long length of MSCL pipe of varying diameter. The discharge point into the Crystal Creek is approximately 13km upstream of the Crystal Creek intake.  
Outlet works: Located approximately 50m on the left-hand side of the dam spillway. Maximum outlet capacity: 43.2ML/day.  
Provisions for selective release: Release from the dam into the Crystal Creek catchment is manually controlled using a valve located on the downstream side of the dam wall. Releases supplement supply required by the Crystal Creek intake. |
<p>| Flow Measurement | Ultrasonic flow metering is used at the outlet works for flows discharging to Crystal Creek. |</p>
<table>
<thead>
<tr>
<th>Name of infrastructure</th>
<th>Paluma Dam</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Pass flows:</strong></td>
<td></td>
</tr>
<tr>
<td>1. Environmental provisions</td>
<td>Nil</td>
</tr>
<tr>
<td>2. Volume of first flush currently passed through structure</td>
<td>Nil</td>
</tr>
<tr>
<td>3. Riparian, stock and domestic flows</td>
<td>Nil</td>
</tr>
<tr>
<td>4. Other compensation flows</td>
<td>Nil</td>
</tr>
<tr>
<td>5. Flow variations</td>
<td>Min – 0 L/sec</td>
</tr>
<tr>
<td></td>
<td>Avg – Varies</td>
</tr>
<tr>
<td></td>
<td>Max – @500 L/sec</td>
</tr>
<tr>
<td>6. Maximum allowable release rates</td>
<td>Note: The dam is operated to maintain a required weir level at the Crystal Creek Intake. Hence flows vary depending on the natural flow in Crystal Creek. 43.2 ML/day</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Operational constraints:</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Minimum operating level/capacity of storage</td>
</tr>
<tr>
<td>2. Operation of fabri-dams or gates</td>
</tr>
<tr>
<td>3. Flood mitigation arrangements</td>
</tr>
</tbody>
</table>

| Management of storage and/or release water quality | Regular raw water testing program and floating intake level adjustment as required. |
| Referred Dam category | Category 1 (high) |
| Population at risk | Sunny day failure – 29  |
|                       | Probably Maximum Flow Dam Failure (incremental) - 9 |

### 4.2 Spillway Adequacy – Acceptable Flood Capacity

The Dam Safety Review completed by SMEC in 2012, using the NRW “Guidelines on Acceptable Flood Capacity for Dams” determined that the spillway has the capacity to discharge the “probable maximum precipitation – design flood” with approximately 0.550m of freeboard to the Dam Crest, making an overtopping failure scenario extremely unlikely.
5. Preparation

5.1 EAP Review

In accordance with the Act, the Guidelines, and SOP-002 Register of Emergency Contacts:

- The EAP shall be reviewed by October 1st each year to ensure its currency and effectiveness in consultation with the relevant LDMG’s, the EAP shall be consistent with the Disaster Management Plans for the relevant Disaster Management Group/s;
- Those involved in the implementation of the EAP shall be adequately trained and familiar with their responsibilities under the EAP;
- An updated version of the EAP (or the affected pages) shall be distributed to all persons on the distribution list in a controlled and timely manner.

5.2 Personnel

A 24hr rolling roster shall be developed and distributed prior to November 1st each year.

For safety reasons during the activation of an EAP, the PDO shall be supported by an assistant whenever possible. If shifts are required, as would be the case during 24hr surveillance, a second shift of suitably qualified and trained personnel shall be provided for the duration of the event.

5.3 Training

Refresher training specific to the operation of Paluma Dam and the implementation of this EAP is conducted annually in October for all relevant operational staff.

In addition, all operational personnel are required to successfully complete formal Dam Safety Awareness training.

Records of all training are maintained on TCC’s training database.

5.4 Maintaining food and water supplies

Due to situations where personnel may be required to attend the Dam, and could be cut off due to road conditions, the PDO shall maintain suitable supplies of food, water and other essentials at the Dam, sufficient for a minimum period of fourteen (14) days for two (2) people.
6. Emergency Activation and Deactivation

6.1 Dam Emergency Organisation

The Paluma Dam emergency management framework utilises the Townsville City Council (TCC) management hierarchy in liaison with the Local Disaster Coordinator (LDMG) and other specialised dam safety expert input as illustrated in Figure 2 below.

![TCC / TWW Paluma Dam Emergency Response Structure](image)

**Figure 2 - TCC/TWW Emergency Response Organisation**

6.2 Overview

Only those employees within TWW who are familiar with Paluma Dam, and have and have delegation, are authorised to activate the EAP. These includes:

- PDO and Assistant (Only in situations if there is no communication from the Dam to the Team Leader, Team Manager or General Manager)
- Team Leader Raw Water Quality
- Team Manager Engineering Major Infrastructure.

The PDO will regularly assess the Dam’s emergency status. The EAP should be activated when any of the following emergency conditions are triggered:

- Flood Event
- Dam Distress (Seismic Event)
- Embankment Piping and Seepage
- Significant Contamination Event
- Terrorist Threat/Hoax/Other Event
6.3 Escalation Levels

In accordance with the Guidelines, the level of EAP escalation should be consistent with those applied by the relevant Disaster Management Group, hence this EAP is activated using an escalation model based on the following levels:

<table>
<thead>
<tr>
<th>Level</th>
<th>Description</th>
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</table>
| Alert       | • A heightened level of vigilance due to the possibility of an event occurring. It will tend to require increased monitoring with the frequency of monitoring being dependent upon the rate of development of the potential failure condition.  
  • During the ALERT level of EAP activation the need for, and the frequency of situational reports should be discussed with the relevant Disaster Management Group.  
  • No further action may be required; however, the situation may need to be monitored by someone capable of assessing the potential of the threat. |
| Lean Forward| • An operational state characterised by a heightened level of situational awareness and a state of operational readiness. 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.  
  • It will require increased monitoring with the frequency of monitoring being dependent upon the rate of development of the emergency condition. Situational reports to the relevant DMG should continue as previously arranged or otherwise requested. Personnel at the Dam should be on standby, ready 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. |
| Stand up    | • An operational state where resources are mobilised, personnel are activated, and operational activities are commenced as part of the EAP activation in response to an emergency event occurring or the need to mitigate the consequences of such an event occurring.  
  • 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.  
  • Situational reports should be provided to the relevant DMG and Dam Safety Regulator (DSR) according to agreed timelines. Activation of this level of response will trigger the requirement to develop and Emergency Event Report (EER) in accordance with the provisions of the Act. |
| Stand down  | • Transition from responding to event back to normal core business and/or continuance of emergency recovery operations.  
  • The movement through these levels of activation is not necessarily sequential and should be applied with flexibility and adaptability and be tailored to the location and event.  
  • Triggering of one of these levels of activation may not necessarily mean a similar activation of relevant DMG’s however the provision of information to relevant group members regarding the risks associated with a pending hazard impact should still occur.  
  • There is no longer a requirement to respond to the event and the threat is decreasing. |

6.4 Mobilisation

The PDO and Assistants are required to mobilise and attend the dam on a daily basis or for longer durations as directed by the TLRWQ or TMEMI. If required, a second team may be placed on stand-by once an initial assessment is carried out by the PDO.

It is recognised that early mobilisation for Emergency Condition – Flood Event is paramount to the effective activation of the EAP due to the site’s remote location and access issues resulting from sustained rainfall and adverse weather.

Mobilisation is required under the following situations:

- Any spillway discharges above +.250m
• Any other event that is likely to result in the triggering of the EAP.

In addition, the TLRWQ or TMEMI may direct the PDO to mobilise earlier if required.

In some circumstances the PDO may elect to self-mobilise. To assist in making the decision to self-mobilise the PDO shall monitor regional weather patterns, news and radio bulletins and relevant websites such as Bureau of Meteorology, Department of Transport and Main Roads. Geoscience Australia or US Geological Survey.
7. Emergency Communication

The PDO has the following communication resources:

Paluma Dam:
- Radio telephone
- Wireless internet
- Dedicated UHF network
- Standalone power (micro-hydro, solar array and backup generator)

Paluma Village:
- Landline
- Dedicated UHF Network
- Broadband Internet
- Standby generator power

Paluma Vehicles:
- Fixed and handheld UHF
- Satellite telephone (PDO vehicle only)

Note: There is currently no reliable mobile telephone communications on the Mount Spec Forestry Road, Paluma Dam or downstream areas. Telstra mobile service is available in the Paluma Village.

Each of the abovementioned communication resources are checked at least monthly by the PDO.

7.1 Communication Confirmation

Immediately following ANY communication initiated by ANY person that will result in the PDO triggering the EAP, the PDO shall immediately call back and confirm the message received. This is to prevent triggering the EAP based on unauthorised or fraudulent calls.

7.2 Loss of Communications

**Paluma Dam Operator or Assistant Ranger:**
This person will have the best understanding of the situation and is authorised to take immediate and appropriate local actions. In the event of loss of communication at the Dam and/or Paluma Township during or leading up to an event the Paluma Dam Operator may:

- Attempt to mitigate impacts on downstream communities by directly communicating to the CTRCLDMG and/or Hidden Valley Cabins where a UHF radio is currently based that communicates with local residents.
- Preserve Dam infrastructure integrity.
- Prevent significant contamination from reaching Crystal Creek intake.

**Team Leader Raw Water Quality or Team Manager Engineering Major Infrastructure:**
In the situation where there is a loss of communications, the TLRWQ or TM WW shall judge the seriousness of the situation and may:

- Inform CTRC of a potential emergency
- Arrange attendance to the Dam by various means within the timeframe commensurate with the situation.
8. Emergency Condition – Flood Event

8.1 Overview

The emergency actions described in this section relates to a condition where natural catchment inflows fill Paluma Dam and the rate of inflow exceeds the capacity of the outlet works. The spillway will then discharge water downstream into Running River.

During flood events, the Dam will be monitored by the PDO in accordance with QAF0565 Weekly and Event Data Collection Check Sheet (WEDCCS) and collected information will be forwarded to the TLRWQ.

It should be noted that the Paluma Dam catchment area is very small in relation to the immediate downstream catchment of Running River. As a result, minor spillway discharges (<=0.25m) pose minimal risk and do not constitute a downstream release hazard.

Refer to Appendix A for maps of the areas likely to be affected by a spillway release.
## 8.2 Monitoring and Notification - Event Alert Table - Flood Event

<table>
<thead>
<tr>
<th>Activation Level</th>
<th>Alert (Water Level Rising)</th>
<th>Lean Forward</th>
<th>Stand Up</th>
<th>Stand Down (Water Level Falling)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Storage Level Ref FSL</td>
<td>+0.25m</td>
<td>+0.50m</td>
<td>+0.75m</td>
<td>+0.25m</td>
</tr>
<tr>
<td>Storage level EL</td>
<td>893.12m AHD</td>
<td>893.37m AHD</td>
<td>893.62m AHD</td>
<td>893.12m AHD</td>
</tr>
<tr>
<td>ARI</td>
<td>1 in 3 years</td>
<td>1 in 20 years</td>
<td>1 in 1000 years</td>
<td>1 in 3 years</td>
</tr>
<tr>
<td>Discharge m3/s</td>
<td>&lt;15</td>
<td>40</td>
<td>80</td>
<td>&lt;15</td>
</tr>
</tbody>
</table>

### Flood Alert Notes
- Minor flow event. Little downstream flood risk.
- Event Increasing. Downstream flood risk developing depending upon regional rainfall.
- Almost certainly significant rainfall in the Running River Catchment downstream of Paluma Dam which may lead to inundation of some low-lying properties.
- Minor flow event. Little downstream flood risk.

### Actions PDO

**Consider early mobilisation depending upon conditions. (Day Shift, 8.5 Hrs.)**
- Daily monitoring as per Paluma Dam SOP4 6.1.1: WEDCCS Parts A & B
- Rainfall
- Lake level
- Catchment conditions
- Forecasts
- Notify:
  - TLRWQ
  - If communication with TLRWQ or alternate is unavailable, notify Charters Towers LDMG.

**Mobilise to site. (24 Hr. in 2x12 Hr.)**
- 4-Hourly monitoring as per Paluma Dam SOP4 6.1.1: WEDCCS Parts A & B
- Rainfall
- Lake level
- Catchment conditions
- Forecasts
- Record all communications on log sheet.
- Forward twice-daily reports to TLRWQ.
- Notify:
  - TLRWQ
  - If communication with TLRWQ, TMEMI or alternate is not available, notify Charters Towers LDMG.

**Prepare information for EER and provide to TLRWQ.**
- Notify:
  - TLRWQ
  - If communication with TLRWQ, TMEMI or alternate is not available, notify Charters Towers LDMG and downstream landholders.
## Activation Level

<table>
<thead>
<tr>
<th>Alert (Water Level Rising)</th>
<th>Lean Forward</th>
<th>Stand Up</th>
<th>Stand Down (Water Level Falling)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Actions TLRWQ</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| Gather technical advice from Dam Safety Technical Advisor as required. Notify: | If significant rainfall forecast:  
  - If required seek advice from Dam Safety Technical Advisor  
  - Mobilise additional assistants  
  - Provide twice-daily reports to TMEMI | If significant rainfall forecast:  
  - Seek advice from Dam Safety Technical Advisor  
  - Mobilise additional assistants  
  - Provide twice-daily reports to TMEMI | Gather technical advice from Dam Safety Technical Advisor for EER. Notify:  
  - TMEMI |
| **Actions TMEMI**          |              |          |                                  |
| Gather technical advice from Dam Safety Technical Advisor as required. Notify:  
  - GMTWWWTCC LDC  
  - Charters Towers LDMG | Notify in order:  
  - GMTWW  
  - TCC LDC  
  - Charters Towers LDMG  
  Provide SitRep updates to TCC LDMG as required. | Notify:  
  - GMTWW  
  - TCC LDC  
  - Charters Towers LDMG  
  - Downstream landholders (PAR) will be contacted by phone sequentially as listed in Table 14 (pg34,35) priority will be based on residences distance from the spillway.  
  Provide SitRep updates to TCC LDMG as required. | Notify:  
  - Charters Towers LDMG GMTWW |
| **Actions GMTWW**          |              |          |                                  |
| Consult with DSTDM  
 Consult with FODM | Consult with DSTDM  
 Consult with FODM  
 Take up position in LDCC | Consult with DSTDM  
 Consult with FODM  
 Take up position in LDCC | Advise DSTDM  
 Advise FODM  
 Advise LDCC |
9. Emergency Condition – Dam Distress - Seismic Event

9.1 Overview

The emergency action described in this section relates to a potential dam failure hazard due to a seismic event causing damage to the dam embankment (main dam), saddle dams, foundations or dam abutment. Indications of damage might include:

- Increased seepage
- Change in seepage turbidity
- Cracking of embankment or spillway
- Slumping of embankment
- Embankment deformation
- Land slips

Seismic events above 5MM (see below) may result in dam distress. If damage occurs due to a seismic event a dam failure may result.

<table>
<thead>
<tr>
<th>Magnitude (Mw)</th>
<th>Modified Mercalli Scale (MM)</th>
<th>Seismic Event Effects</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;4.9Mw</td>
<td>&lt; 5MM</td>
<td>May be felt indoors and outdoors. Windows may rattle. Standing motor vehicles may rock.</td>
</tr>
<tr>
<td>4.9Mw+</td>
<td>5MM+</td>
<td>Felt by everyone. Dishes and windows break. Unstable objects overturned.</td>
</tr>
</tbody>
</table>

During seismic events the Dam will be monitored by the PDO in accordance with the Event Data Check Sheet and SOP-004 Data Reporting and collected information will be forwarded to the TLRWQ.

Refer to Appendix A for maps of the areas likely to be affected by a dam way failure.
### 9.2 Monitoring and notification - Event Alert Table - Seismic Event

<table>
<thead>
<tr>
<th>Activation Level</th>
<th>Alert</th>
<th>Lean Forward</th>
<th>Stand Up</th>
<th>Stand Down</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Activation Trigger</strong></td>
<td>Earthquake reported or felt in the area, less than 5MM</td>
<td>Earthquake reported or felt in the area, greater than 5MM on the Modified Mercalli Scale.</td>
<td>Earthquake reported or felt in the area and dam distress is evident.</td>
<td>No immediate downstream risk identified.</td>
</tr>
<tr>
<td><strong>Actions PDO</strong></td>
<td>Immediately record piezo and seepage readings. Complete Event Data Collection Check Sheet (WEDCCS form Parts A &amp; B) (Appendix A) as required by Paluma Dam SOP004. Undertake surveillance inspections of embankments, spillway and abutments. Check for leaks, deformation, erosion and concrete damage using REPEIR form (Appendix A) Immediately report results to TLRWQ. Record all communications. Complete event log. Notify:</td>
<td>Immediately record piezo and seepage readings. Complete Event Data Collection Check Sheet (WEDCCS form Parts A &amp; B) Appendix A) as required by Paluma Dam SOP004. Undertake surveillance inspections of embankments, spillway and abutments. Check for leaks, deformation, erosion and concrete damage using REPEIR form (Appendix A) Immediately report results to TLRWQ. Record all communications. Complete event log. <strong>If dam distress is evident immediately move to STAND UP.</strong> Notify:</td>
<td>Notify TLRWQ immediately. Lower storage level if safe to do so. Confirm with TLRWQ that Charters Towers LDMG and Landholders have been notified. Photograph damage from safe point. Record all communications. Complete event log. Notify:</td>
<td>Prepare information for emergency event report and supply to TEMEMI. Notify:</td>
</tr>
<tr>
<td></td>
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<td></td>
</tr>
<tr>
<td><strong>TLRWQ</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>TLRWQ</strong></td>
<td></td>
<td><strong>TLRWQ</strong></td>
<td></td>
<td><strong>TLRWQ</strong></td>
</tr>
<tr>
<td><strong>If communication with TLRWQ, TEMEMI or alternate is not possible notify Charters Towers LDMG and downstream landholders.</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Activation Level</td>
<td>Alert</td>
<td>Lean Forward</td>
<td>Stand Up</td>
<td>Stand Down</td>
</tr>
<tr>
<td>------------------</td>
<td>-------</td>
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<td>------------</td>
</tr>
<tr>
<td>Actions TLRWQ</td>
<td>Based on inspection and instrument readings, increase the frequency of recordings as per PD SOP004. Gather technical advice from Dam Safety Technical Advisor if required. <strong>NOTE:</strong> If an alert is received from a seismic monitoring organisation, immediately notify the PDO and arrange an inspection of the dam to assess condition. Notify: • TEMEI</td>
<td>Based on inspection and instrument readings, increase the frequency of recordings as per Paluma Dam SOP004. Gather technical advice from Dam Safety Technical Advisor if required. <strong>If dam distress is evident immediately move to STAND UP.</strong> Notify: • TEMEI</td>
<td>Mobilise additional assistants to site. Gather technical advice from Dam Safety Technical Advisor. Provide twice daily reports to TEMEI. Notify: • TEMEI</td>
<td>Gather technical advice from the Dam Safety Technical Advisor for Emergency Event Report. Notify: • TEMEI</td>
</tr>
<tr>
<td>Actions TEMEI</td>
<td>Notify: • GMTWW SitRep updates to TCC LDMG as required.</td>
<td>Notify in order: • GMTWWTCC LDC • Charters Towers LDMG Downstream Landholders (PAR) will be contacted by phone sequentially as listed in Table 14 (pg34,35) priority will be based on residences distance from the spillway. SitRep updates to TCC LDMG as required.</td>
<td>Notify: • GMTWWTCC LDC • Charters Towers LDMG • Downstream landholders. SitRep updates to TCC LDMG as required.</td>
<td>Notify: • GMTWWTCC LDC • Charters Towers LDMG. • Downstream landholders.</td>
</tr>
<tr>
<td>Actions GMTWW</td>
<td>Consult with DSTDM <strong>NOTE:</strong> If an alert is received from a seismic monitoring organisation, immediately notify the PDO and arrange an inspection of the dam to assess condition.</td>
<td>Consult with DSTDM</td>
<td>Consult with DSTDM</td>
<td>Advise DSTDM</td>
</tr>
<tr>
<td></td>
<td>Take up position in LDCC</td>
<td>Take up position in LDCC</td>
<td></td>
<td>Advise LDCC</td>
</tr>
</tbody>
</table>
10. Emergency Condition – Embankment Piping and Seepage

10.1 Overview

The emergency action described in this section relates to a potential dam failure hazard due to a piping condition through the embankment, foundations or dam abutments.

Early indications of a piping condition may include:

- Increased seepage
- New areas of seepage
- Change in the colour or clarity of seepage

If a piping condition occurs and/or continues a dam failure may result.

Remedial measures to mitigate the risk of a dam failure due to piping should occur as soon as the piping is noticed. These measures should be directed by an appropriately qualified Dam Safety Technical Advisor.

Refer to Appendix A for maps of the areas likely to be affected by a dam wall failure.
## 10.2 Monitoring and Notification - Event Alert Table - Embankment Piping and Seepage

<table>
<thead>
<tr>
<th>Activation Level</th>
<th>Alert</th>
<th>Lean Forward</th>
<th>Stand Up</th>
<th>Stand Down</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Activation Trigger</strong></td>
<td>Increased seepage rate observed.</td>
<td>Increased seepage rate observed with increased turbidity.</td>
<td>Dam Distress evident. Increased seepage rate with increased turbidity. Evidence of deformation or erosion. Upstream vortex identified.</td>
<td>Storage stabilised and no immediate downstream risk.</td>
</tr>
<tr>
<td><strong>Actions PDO</strong></td>
<td>Monitor piezo and seepage readings for observable trends. Undertake surveillance inspections of embankments, spillway and abutments. Complete Event Data Collection Check Sheet (WEDCCS form Parts A &amp; B) (Appendix A) as required by Paluma Dam SOP004. Record all communications. Complete Logbook entries. Notify: • TLRWQ</td>
<td>Immediately record piezo and seepage readings. Undertake surveillance inspections of embankments, spillway and abutments. Complete Event Data Collection Check Sheet (WEDCCS form Parts A &amp; B) (Appendix A) as required by Paluma Dam SOP004. Photograph where possible. Record all communications. Complete logbook entries. <strong>If piping condition is established or dam distress is evident immediately move to STAND UP.</strong> Notify: • TLRWQ • If communication with TLRWQ, TMEMI or alternate is unavailable notify Charters Towers LDMG.</td>
<td>Notify TLRWQ immediately. Lower storage level if safe to do so. Confirm with TLRWQ that Charters Towers LDMG and landholders have been notified. Photograph event from safe point. Record all communications. Complete logbook entries. Notify: • TLRWQ • If communication with TLRWQ, TMEMI or alternate is unavailable notify Charters Towers LDMG.</td>
<td>Prepare information for Emergency Event Report and supply to TLRWQ.</td>
</tr>
<tr>
<td>Activation Level</td>
<td>Alert</td>
<td>Lean Forward</td>
<td>Stand Up</td>
<td>Stand Down</td>
</tr>
<tr>
<td>------------------</td>
<td>-------</td>
<td>--------------</td>
<td>----------</td>
<td>------------</td>
</tr>
<tr>
<td><strong>Actions TLRWQ</strong></td>
<td>Based on inspection and instrument readings, instruct PDO to increase the frequency of recordings as per SOP004. Arrange inspection by Dam Safety Technical Advisor. Notify: • TEMEI</td>
<td>Based on inspection and instrument readings, instruct PDO to increase the frequency of recordings as per SOP004. Arrange inspection by Dam Safety Technical Advisor. Notify: • TEMEI</td>
<td>Notify Charters Towers LDMG and downstream landholders. Mobilise additional assistants to site. Gather technical advice from the Dam Safety Technical Advisor. Provide twice-daily reports to TMEMI. Notify: • TEMEI</td>
<td>Gather technical advice from the Dam Safety Technical Advisor for emergency event report. Notify: • TEMEI</td>
</tr>
<tr>
<td><strong>Actions TM WW</strong></td>
<td>Notify: • GMTWW SitRep updates to TCC LDMG as required.</td>
<td>Notify in order: • GMTWW TCC LDC Charters Towers LDMG and downstream landholders (PAR) will be contacted by mobile phone sequentially as listed in Table 14 (pg34,35) priority will be based on residences distance from the spillway. SitRep updates to TCC LDMG as required.</td>
<td>Notify: • GMTWW TCC LDC • Charters Towers LDMG and downstream landholders SitRep updates to TCC LDMG as required.</td>
<td>Notify: • GMTWW TCC LDC • Charters Towers LDMG • Downstream landholders SitRep updates to TCC LDMG as required.</td>
</tr>
<tr>
<td><strong>Actions GMTWW</strong></td>
<td>Consult with DSTDM</td>
<td>Consult with DSTDM Take up position in LDCC</td>
<td>Consult with DSTDM Take up position in LDCC</td>
<td>Advise DSTDM Advise LDCC</td>
</tr>
</tbody>
</table>

**Activation Level**
- **Alert**
  - Based on inspection and instrument readings, instruct PDO to increase the frequency of recordings as per SOP004.
  - Arrange inspection by Dam Safety Technical Advisor.
  - Notify: TEMEI
- **Lean Forward**
  - Based on inspection and instrument readings, instruct PDO to increase the frequency of recordings as per SOP004.
  - Arrange inspection by Dam Safety Technical Advisor.
  - Notify: TEMEI
- **Stand Up**
  - Notify Charters Towers LDMG and downstream landholders.
  - Mobilise additional assistants to site.
  - Gather technical advice from the Dam Safety Technical Advisor.
  - Provide twice-daily reports to TMEMI.
  - Notify: TEMEI
- **Stand Down**
  - Gather technical advice from the Dam Safety Technical Advisor for emergency event report.
  - Notify: TEMEI

**Actions**
- **TLRWQ**
  - Notify: TEMEI
- **TM WW**
  - Notify in order: GMTWW TCC LDC Charters Towers LDMG and downstream landholders (PAR) will be contacted by mobile phone sequentially as listed in Table 14 (pg34,35) priority will be based on residences distance from the spillway. SitRep updates to TCC LDMG as required.
- **GMTWW**
  - Consult with DSTDM
  - Consult with DSTDM Take up position in LDCC
  - Consult with DSTDM Take up position in LDCC
  - Advise DSTDM Advise LDCC

**State**
- Current
11. Emergency Condition – Significant Contamination

11.1 Overview

The emergency condition described in this section refers to the presence of chemicals or other toxic contaminants that can create a downstream hazard:

- Herbicides
- Pesticides
- Fuels/oils
- Organic contaminants.

Refer to Appendix A for maps of the areas likely to be affected by contamination should it occur as the dam is spilling.
### 11.2 Monitoring and Notification - Emergency Event Table – Significant Contamination

<table>
<thead>
<tr>
<th>Activation Level</th>
<th>Alert</th>
<th>Lean Forward</th>
<th>Stand Up</th>
<th>Stand Down</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Activation Trigger</strong></td>
<td>Suspected chemical spill or toxic conditions in storage or catchment.</td>
<td>Evidence of chemical spill or toxic conditions in storage or catchment.</td>
<td>Serious contamination threatening water supply.</td>
<td>Stored water returns to an acceptable quality.</td>
</tr>
<tr>
<td><strong>Actions PDO</strong></td>
<td>Immediately forward observations to TLRWQ. Record all communications. Complete Logbook entries. Notify: • TLRWQ</td>
<td>Immediately forward observations to TLRWQ. Undertake surveillance inspections of storage and catchment. Embankments, spillway and abutments inspections may also be required. Complete Event Data Collection Check Sheet (WEDCCS form Parts A &amp; B) (Appendix A) as required by Paluma Dam SOP004. Photograph where possible. Record all communications. Complete logbook entries. Based on risk, close recreation area. Notify: • TLRWQ</td>
<td>Close all outlet structures to cease all water releases to Crystal Creek. Sketch, photograph and locate contaminated positions within storage. Notify: • TLRWQ</td>
<td>Prepare information for Emergency Event Report and supply to TLRWQ.</td>
</tr>
<tr>
<td><strong>Actions TLRWQ</strong></td>
<td>Assess risk to water supply and recreational users. Arrange sampling and testing to confirm contamination and risk. Notify: • TMEMI</td>
<td>Based on health risk, instruct PDO to close public access to recreation area. Notify: • TMEMI</td>
<td>Arrange immediate sampling and testing of water quality to assess suitability for water supply. Notify: • TMEMI</td>
<td>Gather technical information for submission to TMEMI. Notify: • TMEMI</td>
</tr>
</tbody>
</table>
## Activation Level

### Alert

**Actions TMEMI**
- Assess risk to water supply and recreational users.
- Arrange sampling and testing to confirm contamination and risk.
  - Notify:
    - GM TWWTrility
    - SitRep updates to TCC LDMG as required.
- Based on health risk, instruct TLRWQ to cease water releases to Crystal Creek Intake.
- Notify in order:
  - GM TWWTrility
  - TCC LDC
  - Charters Towers LDMG
  - Downstream Landholders (PAR) will be contacted by phone sequentially as listed in Table 14 (pg34,35) priority will be based on residences distance from the spillway.
  - SitRep updates to TCC LDMG as required.

### Lean Forward

**Actions GMTWW**
- Consult with DSTDM
- Determine reporting requirements to Qld Water Supply Regulator and/or Queensland Health.
  - Consult with DSTDM
  - Take up position in LDCC

### Stand Up

**Notify:**
- GM TWWTrility
- TCC LDC
- If storage is spilling, notify Charters Towers LDMG and downstream landholders.
  - SitRep updates to TCC LDMG as required.

### Stand Down

**Notify:**
- GM TWWTrility
- TCC LDC
- Charters Towers LDMG.
  - If relevant, notify Charters Towers LDMG and downstream landholders

**Actions GMTWW**
- Consult with DSTDM
- Advise DSTDM
- Advise LDCC

---

**Uncontrolled When Printed**

**Status:** Current

**Version No:** 1.0

**Next Review Date:** 1/10/2020

12.1 Overview

The emergency condition described in this section relates to a potential dam failure hazard due to terrorist activity, threat or a hoax. It is also applicable to a high energy impact on the Dam.

This may include:

- Aircraft crash
- Meteorite impact
- Bomb or related explosion.

Refer to Appendix A for maps of the areas likely to be affected by a dam wall failure.
### 12.2 Monitoring and Notification - Emergency Event Alert Table - Terrorist Activity/Threat/Hoax/High-Energy Impact

If there is a chemical contamination threat associated with this emergency condition, Activate 10. Emergency Condition – Significant Contamination immediately.

<table>
<thead>
<tr>
<th>Activation Level</th>
<th>Alert</th>
<th>Lean Forward</th>
<th>Stand Up</th>
<th>Stand Down</th>
</tr>
</thead>
<tbody>
<tr>
<td>Activation Trigger</td>
<td>Possible terrorist activity noticed, reported or threatened.</td>
<td>Serious incident that could threaten the integrity of the dam such as an explosion or aircraft strike.</td>
<td>Threat to dam integrity confirmed.</td>
<td>Storage stabilised and no immediate downstream risk.</td>
</tr>
</tbody>
</table>

**Actions PDO**

<table>
<thead>
<tr>
<th>Action</th>
<th>Description</th>
</tr>
</thead>
</table>
| **Possible terrorist activity noticed, reported or threatened.** | Follow bomb threat checklist (Appendix B). Record all conversations and observations. Inspect/observe if safe to do so, identify possible threat and evacuate immediate area if necessary. Record all communications. Complete Logbook entries. Notify:  
- TLRWQ  
- Police 000  
- National Security Hotline (1800 123 400) |
| **Serious incident that could threaten the integrity of the dam such as an explosion or aircraft strike.** | Immediately notify Police/Emergency Services (000). Inspect if safe to do so. Immediately report results to TLRWQ. Based on risk, close recreation area. Notify:  
- TLRWQ |
| **Threat to dam integrity confirmed.** | Notify TLRWQ immediately. Lower storage level if safe to do so. Confirm with TLRWQ that Charters Towers LDMG and landholders have been notified. Undertake surveillance inspections of embankments, spillway and abutments. Check for leaks, deformation, erosion and concrete damage using REPEIR form (Appendix A). Photograph damage from safe point. Record all communications. Complete event log. Notify:  
- TLRWQ  
- If communication with TLRWQ, TMEMI or alternate is not possible notify Charters Towers LDMG and downstream landholders |
| **Storage stabilised and no immediate downstream risk.** | Prepare information for Emergency Event Report and supply to TLRWQ |
### Activation Level

<table>
<thead>
<tr>
<th>Action</th>
<th>Alert</th>
<th>Lean Forward</th>
<th>Stand Up</th>
<th>Stand Down</th>
</tr>
</thead>
<tbody>
<tr>
<td>Actions TLRWQ</td>
<td>Provide technical information to authorities as requested. Notify: • TMEMI</td>
<td>Based on inspection and instrument readings, instruct PDO to increase the frequency of recordings as per SOP004. Arrange inspection by Dam Safety Technical Advisor. Notify: • TMEMI</td>
<td>Mobilise additional assistants to site. Gather technical advice from the Dam Safety Technical Advisor. Provide twice-daily reports to TMEMI. Notify: • TMEMI</td>
<td>Gather technical advice from the Dam Safety Technical Advisor for emergency event report. Notify: • TMEMI</td>
</tr>
<tr>
<td>Actions TMEMI</td>
<td>Notify: • GM TWW Charters Towers LDMG • Downstream Landholders SitRep updates to TCC LDMG as required</td>
<td>Notify in order: • GMTWWTCC LDC • Charters Towers LDMG and downstream landholders (PAR) will be contacted by phone sequentially as listed in Table 14 (pg34,35) priority will be based on residences distance from the spillway. SitRep updates to TCC LDMG as required.</td>
<td>Notify Charters Towers LDMG and downstream landholders. Notify: • GMTWWTCC LDC • Charters Towers LDMG and downstream landholders SitRep updates to TCC LDMG as required.</td>
<td>Notify: • GMTWWTCC LDC • Charters Towers LDMG and downstream landholders</td>
</tr>
<tr>
<td>Actions GMTWW</td>
<td>Consult with DSTDM Take up position in LDCC</td>
<td>Consult with DSTDM Take up position in LDCC</td>
<td>Advise DSTDM ADVISE LDCC</td>
<td></td>
</tr>
</tbody>
</table>

---

**Sections 13 and 14 have been redacted**
15. Normal and Emergency Access Routes

15.1 Emergency Road Access

Figure 3 - Emergency Road Access Route
15.2 Normal Access Route

Figure 4 - Normal Access Route
15.3 Secondary Access

Figure 5 - Emergency Road Access Route
16. Paluma Dam Storage, Rainfall and Storage Curve

16.1 Flood Frequency Probability

Palumam - Peak Flow (m$^3$/s) based on 12 hour duration design storm events
(Based on Dam at Full Supply Level at start of event)

Figure 6 - Flood Frequency Probability
16.2 Paluma Dam Storage Curve

Figure 7 – Paluma Dam Storage Curve
16.3 Significant Rainfall

Rainfall (Q50, Q100 & PMP) Vs Duration (6, 12 & 24 hr Events)

Figure 8 – Significant Rainfall
16.4 Spillway Rating Curve

Figure 9 – Spill Rating Curve

Spillway Discharge Curve based on Broad Crested Weir formula
\[60.9 \times 1.8 \times H^{1.5}\]

Discharges above Crest Level include above formula plus crest flows based on Broad Crested Weir formula
\[130 \times 1.4 \times H^{1.5}\]

(Reference Paluma Dam Risk Assessment, Maunsell 2001)
17. Flood Travel Times

17.1 Flood Level Profile

Figure 10 – Flood Level Profile
17.2 Flood Travel Time – Probable Maximum Flood Failure

![Diagram of flood travel time](image)

*Figure 11 – Probable Maximum Flood Failure*
17.3 Flood Travel Time – Sunny Day Failure

![Graph](image)

*Figure 12 – Sunny Day Failure*
Appendices

Appendix A - Probable Maximum Flood Including Dam Break Inundation Maps

Appendix B - Probable Maximum Flood Inundation Maps

Appendix C - Sunny Day Failure Inundation Maps
PROBABLE MAXIMUM FLOOD INCLUDING DAM BREAK INUNDATION MAPS

Legend
Depth (metres)
- 0.0 to 0.05
- 0.05 to 0.1
- 0.1 to 0.2
- 0.2 to 0.3
- 0.3 to 0.4
- 0.4 to 0.5
- 0.5 to 0.6
- 0.6 to 0.7
- 0.7 to 0.8
- 0.8 to 0.9
- 0.9 to 1.0
- 1.0 and above

Legend
- Flood Level (m AHD)
- Roads
- Property Boundaries
- Property

VALLEY ROAD

N/A

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COORDINATE SYSTEM: Datum: GDA94, Projection: MGA Zone 55
PAGE SIZE: A3, SCALE: 1:2,000
PROJECT NO: 30031390, PROJECT TITLE: PALUMA DAM MAPPING
TITLE: MAP B: PROBABLE MAXIMUM FLOOD WITH DAM BREAK

CREATED BY: K. TAN, DATE: 22-11-2016
DRAWING NO: 4B, REVISION:
STATUS: DRAFT

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South Brisbane, Qld 4101
www.smeccom
MAP C: PROBABLE MAXIMUM FLOOD WITH DAM BREAK
APPENDIX B

PROBABLE MAXIMUM FLOOD INUNDATION MAPS

Legend

Depth (metres)

0.0 to 0.05
0.05 to 0.1
0.1 to 0.2
0.2 to 0.3
0.3 to 0.4
0.4 to 0.5
0.5 to 0.6
0.6 to 0.7
0.7 to 0.8
0.8 to 0.9
0.9 to 1.0
1.0 and above

Roads
Property boundaries
Paluma Dam
Property

COORDINATE SYSTEM  Datum: GDA94  Projection: MGA Zone 55
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CREATED BY  K.TAN  DATE  22-11-2016
TITLE  KEY MAP: PROBABLE MAXIMUM FLOOD WITHOUT DAM BREAK

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CONSULTANT
SMEC
MAP A: PROBABLE MAXIMUM FLOOD WITHOUT DAM BREAK
PROBABLE MAXIMUM FLOOD INUNDATION MAPS

Legend
Depth (meters)
- 0.0 to 0.05
- 0.05 to 0.1
- 0.1 to 0.2
- 0.2 to 0.3
- 0.3 to 0.4
- 0.4 to 0.5
- 0.5 to 0.6
- 0.6 to 0.7
- 0.7 to 0.8
- 0.8 to 0.9
- 0.9 to 1.0
- 1.0 and above

Legend
- Flood Level (m AHD):
  - Flood Level:

- Roads
- Property Boundaries
- Property

Title: MAP B: PROBABLE MAXIMUM FLOOD WITHOUT DAM BREAK

COORDINATE SYSTEM: Datum: GDA94, Projection: MGA Zone 55
PAGE SIZE: A3, SCALE: 1:2,000
PROJECT NO.: 30031390
PROJECT TITLE: PALUMA DAM MAPPING
CREATED BY: K. TAN
DATE: 22-11-2016
STATUS: DRAFT

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PROBABLE MAXIMUM FLOOD INUNDATION MAPS

Legend

Depth (metres)

0.0 to 0.05
0.05 to 0.1
0.1 to 0.2
0.2 to 0.3
0.3 to 0.4
0.4 to 0.5
0.5 to 0.6
0.6 to 0.7
0.7 to 0.8
0.8 to 0.9
0.9 to 1.0
1.0 and above

xx xx

Flood Level (mAH16)

---

Roads
Property Boundaries
Property

C. 2016 DigitalGlobe - 2016 GeoEye - 2016 Microsoft Corporation

COORDINATE SYSTEM: Datum: GDA94  Projection: MGA Zone 56
PAGE SIZE: A3  SCALE: 1:2,000
PROJECT NO: 30031390  PROJECT TITLE: PALUMA DAM MAPPING
CREATED BY: K. TAN  DATE: 22-11-2016
DRAWING NO: 3F  REVISION: -  STATUS: DRAFT

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MAP F: PROBABLE MAXIMUM FLOOD WITHOUT DAM BREAK

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MAP G: PROBABLE MAXIMUM FLOOD WITHOUT DAM BREAK
MAP H: PROBABLE MAXIMUM FLOOD WITHOUT DAM BREAK
APPENDIX E3

SUNNY DAY FAILURE INUNDATION MAPS

Legend
Depth (metres)
0.0 to 0.05
0.05 to 0.1
0.1 to 0.2
0.2 to 0.3
0.3 to 0.4
0.4 to 0.5
0.5 to 0.6
0.6 to 0.7
0.7 to 0.8
0.8 to 0.9
0.9 to 1.0
1.0 and above

Flood Level (mAHD)

N/A

Roads
Property Boundaries
Property

Legend

VALLEY ROAD

C. 2015 DigitalGlobe; 2011 GeoEye; 2016 Microsoft Corporation

COORDINATE SYSTEM Datum: GDA94 Projection: MGA Zone 56
PAGE SIZE A3 SCALE 1:2,000
PROJECT NO. 30031390 PROJECT TITLE PALUMA DAM MAPPING
CREATED BY K. TAN DATE 22-11-2016
DRAWING NO. 2B REVISION - STATUS DRAFT

SUMMARY OF INFORMATION

TITLE MAP B: SUNNYDAY DAM BREAK

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SUNNY DAY FAILURE INUNDATION MAPS

Legend

Depth (metres)

- 0.0 to 0.05
- 0.05 to 0.1
- 0.1 to 0.2
- 0.2 to 0.3
- 0.3 to 0.4
- 0.4 to 0.5
- 0.5 to 0.6
- 0.6 to 0.7
- 0.7 to 0.8
- 0.8 to 0.9
- 0.9 to 1.0
- 1.0 and above

* * * * * Flood Level (mAHD)

Legend

- Roads
- Property Boundaries
- Property

COORDINATE SYSTEM: Datum: GDA94 Projection: MGA Zone 56
PAGE SIZE: A3 SCALE: 1:2,000
PROJECT NO: 30031390 PROJECT TITLE: PALUMA DAM MAPPING
TITLE: MAP C: SUNNYDAY DAM BREAK

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APPENDIX E3

SUNNY DAY FAILURE INUNDATION MAPS

Legend

Depth (metres)

0.0 to 0.05
0.05 to 0.1
0.1 to 0.2
0.2 to 0.3
0.3 to 0.4
0.4 to 0.5
0.5 to 0.6
0.6 to 0.7
0.7 to 0.8
0.8 to 0.9
0.9 to 1.0
1.0 and above

N/A

xx xx Flood Depths (m)

Roads
Property Boundaries
Property

COORDINATE SYSTEM  Datum: GDA94  Projection: MGA Zone 55
PAGE SIZE  A3  SCALE  1:2,000
PROJECT NO.  30031390  PROJECT TITLE  PALUMA DAM MAPPING
CREATED BY  K. TAN  DATE  22-11-2016
DRAWING NO.  2J  REVISION  -  STATUS  DRAFT

TITLE  MAP J: SUNNYDAY DAM BREAK

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