Approved by the delegate of the Chief Executive, Department of Natural Resources, Mines and Energy until 4 April 2022.
Ibis Creek Dam

EMERGENCY ACTION PLAN
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PREPARATION AND AUTHORISATION

This Emergency Action Plan was prepared by the Mareeba Shire Council in liaison with the Local Disaster Management Group.

AUTHORISATION:

Approved by: ............................................................................................
(Chief Executive Officer Mareeba Shire Council)

Date: 21/09/2020
EMERGENCY ACTION PLAN
Ibis Creek Dam

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APPENDIX 8   AUTOMATED ALERT MESSAGES
APPENDIX 9   DATA
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LIST OF ABBREVIATIONS USED IN THIS TEXT

<table>
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<th>Description</th>
<th>Acronym</th>
<th>Description</th>
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<tr>
<td>AEP</td>
<td>Annual Exceedance Probability</td>
<td>ID</td>
<td>Identification</td>
</tr>
<tr>
<td>AFC</td>
<td>Acceptable Flood Capacity</td>
<td>IEAust</td>
<td>Institute of Engineers Australia</td>
</tr>
<tr>
<td>AHD</td>
<td>Australian Height Datum (shown in text as mAHD - metres AHD)</td>
<td>LDC</td>
<td>Local Disaster Coordinator (MSC CEO)</td>
</tr>
<tr>
<td>AMTD</td>
<td>Adopted Middle Thread Distance</td>
<td>LDMG</td>
<td>Local Disaster Management Group</td>
</tr>
<tr>
<td>ARR</td>
<td>Australian Rainfall and Runoff</td>
<td>ML</td>
<td>Megalitres (1000,000 L)</td>
</tr>
<tr>
<td>BoM</td>
<td>Bureau of Meteorology</td>
<td>MSC</td>
<td>Mareeba Shire Council</td>
</tr>
<tr>
<td>DCL</td>
<td>Dam Crest Level</td>
<td>MSC CEO</td>
<td>Mareeba Shire Council Chief Executive Officer</td>
</tr>
<tr>
<td>DDC</td>
<td>District Disaster Coordinator (Police)</td>
<td>MWW</td>
<td>Manager Water &amp; Waste</td>
</tr>
<tr>
<td>DDMG</td>
<td>District Disaster Management Group</td>
<td>PAR</td>
<td>Population at Risk</td>
</tr>
<tr>
<td>DIS</td>
<td>Director Infrastructure Services</td>
<td>PMF</td>
<td>Probable Maximum Flood</td>
</tr>
<tr>
<td>DN</td>
<td>Diameter Nominal</td>
<td>PMP</td>
<td>Probable Maximum Precipitation</td>
</tr>
<tr>
<td>DNRME</td>
<td>Department of Natural Resources Mines and Energy</td>
<td>QPS</td>
<td>Queensland Police Service</td>
</tr>
<tr>
<td>DSR</td>
<td>Dam Safety Regulator</td>
<td>RPEQ</td>
<td>Registered Professional Engineer of QLD</td>
</tr>
<tr>
<td>EAP</td>
<td>Emergency Action Plan</td>
<td>SCADA</td>
<td>Supervisory Control and Data Acquisition</td>
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<tr>
<td>ECM</td>
<td>Enterprise Content Management</td>
<td>SDCC</td>
<td>State Disaster Coordination Centre</td>
</tr>
<tr>
<td>EL</td>
<td>Elevation Level</td>
<td>SOP</td>
<td>Standard Operating Procedures</td>
</tr>
<tr>
<td>FIA</td>
<td>Failure Impact Assessment</td>
<td>SWR</td>
<td>Supervisor Water Reticulation</td>
</tr>
<tr>
<td>FSL</td>
<td>Full supply level is the level of the water surface of the dam when the water storage is at maximum operating level when not affected by flood (825.5 mAHD)</td>
<td>SWT</td>
<td>Supervisor Water Treatment</td>
</tr>
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1. **INTRODUCTION**

Ibis Creek Dam was originally constructed, as a concrete-faced rock-fill dam, in 1907. The dam has undergone two rebuild/refurbishments since that time, with the most recently completed in 2013. It is located on the Ibis Creek 2.5 kilometres upstream of the township of Irvinebank. The dam is approximately 82 kilometres south-west of Cairns.

The dam is owned and operated by the Mareeba Shire Council. Non-potable water is supplied, under agreement, to the townspeople for their use. A 1.4 kilometre pipeline runs north-west from the dam to supply two reservoirs located on a ridge above the town. Supply is then gravity fed to each property within Irvinebank.

Stage 3 upgrade of the dam was completed in June 2013 and the dam now has capacity to handle a 1:72,000 AEP event; which is the Acceptable Flood Capacity (AFC) for the dam. The largest known floods to have passed over the Dam were due to rainfall associated with cyclone Larry in 2006 and cyclone Tasha Christmas Day 2010. These events were approximately 7% of AFC.

During a site visit of Irvinebank and Ibis Dam, in preparation for the latest Failure Impact Assessment report, Loudon Dam was inspected for stability against possible cascade failure. It was determined that subsequent cascade failure would be inevitable with the failure of Ibis Dam. The residents of the School Teachers house would therefore be at risk with any failure of Ibis and Loudon Dams. It was included in all cases with the exception of the Probable Maximum Flood (PMF): where all houses downstream of Loudon Dam would already be flooded with or without failure of Loudon Dam.

The current Failure Impact Assessment states that up to 45 people would be impacted by a Sunny Day Failure (SDF) of the dam (when the dam is at Full Supply 825.5 mAH) and an incremental Population at Risk (PAR) of 61 people would be impacted during the 1 in 100 AEP event (Ibis Dam Risk Assessment, RHDHV June 2020).

It is estimated that a Dam Crest Flood (DCF) or SDF Flood event would reach the first house in as little as 14 minutes. This would leave little time available to warn the people of Irvinebank.

Ibis Dam and Ibis Creek have the following flood characteristics:

- The steep terrain and short distance between Ibis Dam and Irvinebank result in short travel times for any failure event at Ibis Dam;
- The downstream limit of people who would be flooded is contained within Irvinebank;
- The town will be fragmented into four sections when flooded;
- The Herberton-Irvinebank Road is impassable (from both directions) during high rainfall events due to local flooding of creeks;
- Communications have been established at the Dam wall, Mt Orman, Repeater Station and Museum with an installed voice radio/speaker system which uses data radios (using NextG system);
- There is mobile phone coverage within Irvinebank and at the dam;
- Verbal communication across McDonald Creek is impossible during flood events due to the noise of the running water; and
- Some of the population at risk are elderly and frail.
This Emergency Action Plan outlines the necessary actions by Council, Queensland Police, the Local Disaster Management Group (LDMG) and affected persons in the event of an emergency event or potential emergency event associated with Ibis Dam.

Section 2 Control copy and notification list has been redacted
3. **EMERGENCY EVENTS AND ACTIONS**

The maximum storage height on record is EL 826.1 mAHDS which was reached in March 2006 due to cyclone Larrak, and cyclone Tasha on Christmas Day 2010. The maximum depth of water over the deck of McDonald Creek Bridge, at the bottom of Jessie Street, was reported as 850 mm for the same events (Deck level – EL 742.92 mAHDS). Any overflow events that do not reach these levels are regarded as small to medium events. The procedures to be followed for these events are outlined in Standing Operating Procedures for Small to Medium Spillway Overflows (SOP 14). A copy of this procedure is included as APPENDIX 7 – STANDING OPERATING PROCEDURE FOR SPILLWAY OVERFLOWS.

The following events are defined as emergency events:

- Flooding Event – Reservoir level approaching EL 826 mAHDS and heavy rainfall continuing in the catchment;
- Embankment Stability Events – Sunny Day Failure or Structural Damage to Dam due to: Terrorism, Earthquake, Explosion, Tremor or Landslide into the storage;
- Seepage Events – increase in seepage, not due to storage rise, and/or additional cracking or increased crack widths in dam wall; and
- Other Events – Flow slide, landslide, structural cracking, abnormal instrument readings and chemical/toxic spill within storage/catchment.

The activation and alert levels are listed for these events as well as the actions that are to be undertaken by relevant officers.

Should there be an emergency event and the Sirens sound, there will be an automated SMS and voice message sent simultaneously to each of the Population at Risk (PAR) whom have a mobile phone (in consecutive order). The PAR whom have a landline phone only, an automated voice message will be sent (in consecutive order). Those PAR whom have neither a mobile phone or landline (refer to Appendix 5) will be contacted by the EAP officer.

The Dam is likely to be difficult to get to by road after heavy rainfall due to local runoff and slippery roads. The Emergency Action Plan (EAP) Officer and other on-call Council officers can monitor storage levels and rainfall at the dam by remote access through the SCADA system. During a heavy rainfall event the height gauge at the dam and the rain fall should be monitored at one-hour intervals until the storage height approaches EL 826.0 mAHDS. The monitoring frequency should be increased to half hourly intervals if the storage height further increases above EL 826.0 mAHDS. The SCADA instrumentation readings are permanently recorded within Council’s Historian.

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2 SCADA: Supervisory Control and Data Acquisition. SCADA generally refers to an industrial computer system that monitors and controls a process. In this situation the SCADA system monitors and records (within the MSC Historian - computer system, which is backed up and has an alternate power supply if required): rainfall (at the dam wall and on top of Mt Orman); dam water height; flow over the v-notch weir at the foot of the dam wall; and the siren system within the township of Irvinebank. Should there be a fault in any of the system or an emergency event the SCADA system is programmed to notify selected persons as required.

3 Historian: a computer storage system, similar to a Database, which monitors the SCADA network and permanently stores data.
### 3.1 MAJOR OVERFLOW

Table 2: Procedures to follow when Major Overflow occurs

<table>
<thead>
<tr>
<th>Activation</th>
<th>General Characteristics</th>
<th>When and what to check</th>
<th>What needs to be done and by whom</th>
</tr>
</thead>
</table>
| **Alert**  | Storage full, heavy rainfall expected/continuing and storage level rising | Before overtopping:  
▪ visually inspect dam for deficiencies, and  
▪ monitor seepage from internal drains.  
After Overtopping  
▪ continue monitoring storage height and rainfall. | EAP Officer will  
▪ visual inspect dam in person (only if safe to do so);  
▪ monitor storage height and rainfall at hourly intervals (via SCADA); and  
▪ notify SWR & MWW. |
| **Lean Forward** | Spillway discharging, heavy rainfall expected/continuing and storage level approaching 826.0 mAHD | Storage height and rainfall. | EAP Officer will  
▪ continue monitoring and reporting as per SOP 14 (Appendix 7).  
▪ notify SWR & MWW.  
MWW will notify DIS and LDC. |
| **Stand up** | Storage level greater than 826.0 mAHD, heavy rainfall expected/continuing, and storage level expected to rise further | Storage height and rainfall.  
Visual inspection of dam for deficiencies. | EAP Officer will  
▪ continue monitoring and reporting storage height and rainfall;  
▪ carry out early warning process;  
▪ notify MWW; and  
▪ ensure sirens are turned off.  
MWW will:  
▪ review the reports;  
▪ notify the DIS & LDC.  
LDC will:  
▪ activate EAP (after storage level reaches 826 mAHD); and  
▪ notify QPS. |
| | Storage level approaching 827.5 mAHD | Storage height and rainfall. | EAP Officer will standby for instructions from MWW.  
MWW will: |

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4 EAP Officer can inspect spillway via remote camera and take photos (remotely) as required. Visual inspection may only be required if the camera malfunctions or it's deemed necessary for other reasons.
# Activation

## General Characteristics

<table>
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<tr>
<th>When and what to check</th>
<th>What needs to be done and by whom</th>
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<tr>
<td>▪ advise DIS &amp; LDC of storage height and that flooding of houses will start when storage level reaches 827.5 mAH and recommend evacuation. ▪ standby to assist QPS with evacuation.</td>
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</tr>
<tr>
<td>▪ advise QPS of Storage height.</td>
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</tbody>
</table>

## Overtopping imminent or high risk of failure initiating

| Visual inspection of dam for deficiencies. | As above |

## Storage levels dropping to FSL

| Prepare Emergency Event Report. Check for damage and undertake special inspection and remedial works as necessary. | EAP Officer: ▪ inspect dam (once safe to do so); ▪ notify MWW and SWR that Storage level is dropping; ▪ await further instructions from MWW to notify residents that event is over; and ▪ once event has been declared over, prepare report on event for MWW. MWW will: ▪ review the reports; ▪ notify the DIS & LDC; and ▪ write report for Director, Dam Safety. LDC will: ▪ coordinate with MWW, DIS and QPS; and ▪ once satisfied that situation has stabilised and no further danger exists, declare event over and give direction to stand-down. |

### Stand down

|▪ inspect dam (once safe to do so); ▪ notify MWW and SWR that Storage level is dropping; ▪ await further instructions from MWW to notify residents that event is over; and ▪ once event has been declared over, prepare report on event for MWW. MWW will: ▪ review the reports; ▪ notify the DIS & LDC; and ▪ write report for Director, Dam Safety. LDC will: ▪ coordinate with MWW, DIS and QPS; and ▪ once satisfied that situation has stabilised and no further danger exists, declare event over and give direction to stand-down. |

### 3.1.1 Detailed actions

The **EAP Officer** will:
- Monitor the dam instrumentation and BoM website for potential events;
- Visually inspect dam before overtopping; and
- Act in accordance with SOP 14 for small to medium spillway overflows.
When the storage level reaches 826.0 mAHĐ, heavy rainfall is expected and/or continuing and further storage level rise is predicted, the EAP Officer shall:

- At direction of MWW, carry out the Early Warning Process (see Section 5.2);
- Deactivate the automatic sirens: because the downstream trigger is set at 1.5 m over the V-Notch and increased flows are likely to exceed this trigger;
- Read storage height gauge, rain gauge and depth of water over the deck of the bridge at bottom of Jessie Street at half-hour intervals;
- Notify the MWW of the storage height gauge, rainfall, rate of rise of the storage, and the depth of water over the deck of the bridge;
- Update MWW every half-hour (or at intervals determined by MWW) during the event;
- On authorisation from MWW, notify the evacuated people that the Emergency Event is at an end;
- Revert to Standing Operating Procedures for Small to Medium Spillway Overflows (SOP 14); and

After the event:

- Make an inspection of the dam (once safe to do so) and report findings to the MWW;
- If the dam is considered safe, advise the MWW that the emergency event is at an end;
- If not, advise the Local Disaster Coordinator (LDC) that the evacuation will continue until the dam can be made safe
- Compile an Emergency Event Report and forward to MWW; and
- Notify the MWW when the storage level is below 826.0 mAHĐ.

The MWW will:

- Notify the LDC and the DNRME hotline⁵ that a significant flood is in progress, and maintain contact as the situation demands (or as mutually agreed between each officer);
- Review the reports from the EAP Officer and determine if evacuation is required. If storage level is approaching 827.5 mAHĐ, then evacuation is recommended;
- Notify the LDC that evacuation plan has been activated;
- Provide regular (at a mutually agreed interval to be determined between each officer) updates to the LDC;
- Notify the DIS and the LDC when the storage level has fallen below 826.0 mAHĐ; and
- Provide a report to Director, Dam Safety within 30 days of the events completion.

This Event ends when the preceding two-hour rainfall is less than 50 mm and the storage height gauge is less than EL826.0 mAHĐ and falling, and the LDC has determined it to be ended.

The LDC will:

- Coordinate the response and implement the local disaster management plans as required;

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⁵ DNRME - 24 hour contact telephone number (as per Control Copy and Notification List)
− Notify the Police Communications Centre, Cairns if an evacuation is required; and
− Notify the Police Communications Centre, Cairns and the Emergency Queensland Watch
  Desk Officer, and all operational personnel that the Emergency Event has ended.

3.1.2 Preventative actions for Major Overflow Events:
− Public awareness of the siren system and what action should be taken if it is activated;
− Public awareness of the evacuation plan;
− Provide early warning to the population at risk;
− Monitor BoM weather radar and storage height gauge; and
− EAP training and Scenario Event exercises annually.
3.2 EMBANKMENT STABILITY ISSUES

Characteristics and causation:

− Signs of distress in embankment such as cracking or deformation/sliding;
− Terrorism associated activities;
− Abnormal instrumentation readings; and
− Earthquakes and Sunny Day Failures.

Table 3: Procedures to follow if embankment stability issues occur

<table>
<thead>
<tr>
<th>Activation</th>
<th>General Characteristics</th>
<th>When and what to check</th>
<th>What needs to be done and by whom</th>
</tr>
</thead>
</table>
| Alert      | Identification during routine inspection\(^{6}\) of initial signs of embankment distress such as cracks. | Inspect affected area of embankment to watch for signs of cracking progressing. Undertake remedial action if practical. | EAP Officer will:
  • Inspect and monitor;
  • Notify MWW; and
  • Maintain communications with MWW.
MWW will:
  • Authorise remedial action if practical; and
  • Notify LDC & DIS. |
| Lean Forward | Cracking becoming significant to the point where stability may be starting to be impaired. | Continue monitoring. Upgrade efforts at remedial works or load reduction if practical. | As above |
| Stand up | Loads on embankment increasing or cracking/deformation increasing to state where the safety of the dam is significantly impaired | Upgrade efforts at remedial works or the reductions of embankment loads if practical. Continue monitoring of dam. Issue notifications as required. | EAP Officer will:
  • As above; and
  • Lower storage level (only if safe to do so)
MWW will:
  • Continue to appraise both DIS and LDC;
  • Coordinate evacuation of residences if deemed necessary.
LDC will:
  • Activate EAP; |

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\(^{6}\) Routine Inspection - MSC personnel inspect the dam in person once per month. SCADA instruments monitor the dam continuously (24 hours per day 7 days per week) and all the data is recorded on MSC's Historian. The spillway can be viewed remotely and recorded (via fixed camera) as required.
3.2.1 Detailed Actions

The most likely event that may cause a Sunny Day Failure is an earth tremor or landslide into the dam.

If the there is a Sunny Day Failure, the depth of water over the v-notch will trigger the sirens in Irvinebank to automatically activate and send automated alerts to the MWW, SWR and LDC.

The EAP Officer will:

– Notify SWR and MWW of event and maintain communications with SWR and MWW;
– Turn the sirens off after people have evacuated;
– Visually check the dam (if safe to do so);
– Read the storage height gauge and downstream height gauge at five-minute intervals for 15 minutes;
– Report readings and results of inspection to MWW;
– Open the valves7 (if safe to do so);
– When situation has stabilised and the situation is deemed safe, after instruction from MWW, let all evacuees return to their residences; and

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7 When the dam is overflowing it is not possible to access the outlet valves. Therefore, the valves will only be accessible when the dam is not overflowing. There is a floating intake within the dam connected via a ND125 polyethylene pipe attached to two outlet valves (DN250 & DN300) on the spillway. The estimated maximum outflow rate, when the dam is full but not overflowing, is less than 50 L/s. The flow at the McDonald Creek Bridge (once it reaches the bridge) will be monitored periodically to observe the water level at the bridge and corresponding storage level.
Monitor the dam as directed by the MWW.

If the EAP Officer notices an explosion or earth tremor of II or more on the Modified Mercalli Scale\(^8\) (that is, felt by most indoors, similar to the passing of a light truck) or becomes aware of structural damage to the dam, he must:

- Manually activate the sirens in Irvinebank;
- Notify the MWW that the evacuation process has been activated;
- Turn the sirens off after people have evacuated;
- Check the dam (if safe to do so);
- Monitor storage height and downstream height via SCADA at five-minute intervals for 15 minutes; and
- Report readings and results of inspection to MWW.

The MWW will:

- Review the readings and results of inspection.

If the dam is not considered to be safe:

The MWW will:

- Notify the LDC (Mareeba LDMG) and the DNRME hotline that the evacuation plan has been activated and will continue until the Council can be certain that the dam is safe;
- Direct the EAP Officer to release water from the dam by fully opening both outlet valves (if safe to do so);
- Arrange for inspection of the dam by an RPEQ Engineer as soon as possible;
- After situation has stabilised and after receiving notification from the LDC, instruct EAP Officer to advise the residents that the emergency event has finished, and they can return to their residences; and
- Stand down the EAP Officer.

The LDC will:

- Notify the Police Communications Centre, Cairns (000) that an evacuation is required;
- Coordinate the response and implement the local disaster management plans as required;
- After situation has stabilised notify MWW that the emergency event is over.

If the dam is considered safe:

The EAP Officer will:

- Notify the evacuated people that the Emergency Event is at an end; and
- Compile an Emergency Event Report and forward to MWW.

---

\(^8\) For more information regarding the Modified Mercalli Scale refer to: [https://earthquake.usgs.gov/learn/topics/mercalli.php](https://earthquake.usgs.gov/learn/topics/mercalli.php)
The **MWW** will:
- Notify the LDC that the evacuation plan had been activated, but has been cancelled because a review of the inspection indicated that the dam is now considered to be safe;
- Advise the EAP Officer that the emergency event is at an end; and
- Provide a report to Director, Dam Safety within 30 days of the event.

The **LDC** will:
- Notify the Police Communications Centre, Cairns (000) that an evacuation **is not** required.

### 3.2.2 Preventative actions for Embankment Stability Issues:
- Individual Evacuation Plans have been issued to each of the effected residential dwellings;
- Each house is to be visited to explain:
  - what to do,
  - where to go, and
  - when the emergency is over.
- Independent gauging system installed and monitored;
- Gauging Station to monitor flows downstream of the dam and provide automatic siren when the depth of flow reaches a level where there is concern over the integrity of the dam;
- Public awareness of the siren system and what action should be taken if it is activated; and
- Public awareness of the evacuation plan.

### 3.3 SEEPAGE EVENTS

**Characteristics:**
- Increase in seepage or additional cracking or increased crack widths in dam wall.

<table>
<thead>
<tr>
<th>Table 4: Procedures to follow if abnormal seepage occurs</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Activation</strong></td>
</tr>
</tbody>
</table>
| Alert | Identification of new areas of seepage or growth in existing areas of seepage | Look for source of seepage. | EAP Officer will:  
  - inspect and monitor;  
  - notify MWW of incident; and  
  - maintain communications.  
MWW will:  
  - seek expert advice; and  
  - authorise remedial action (if possible/practical). |
| Lean Forward | Detection of signs of cloudy water in seepage – look for the source of | Continue monitoring. Undertake remedial works if | EAP Officer will:  
  - continue monitoring; and  
  - maintain communications with MWW and LDC. |
<table>
<thead>
<tr>
<th>Activation</th>
<th>General Characteristics</th>
<th>When and what to check</th>
<th>What needs to be done and by whom</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stand up</td>
<td>cloudy water</td>
<td>practical. Reduce storage level if possible.</td>
<td>MWW will: ▪ determine remedial works; and/or ▪ lower storage level; and ▪ maintain communications with LDC.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>EAP Officer will: ▪ continue monitoring and reporting situation; ▪ carry out early warning process; ▪ notify LDC, MWW; and ▪ turn sirens off (if activated). MWW will: ▪ review the reports; ▪ assess if evacuation is required; and ▪ notify LDC and QPS.</td>
</tr>
<tr>
<td>Stand down</td>
<td>Seepage developing further. Discharge is clouding and increasing (piping failure has started)</td>
<td>Continue monitoring from safe location.</td>
<td>EAP Officer will: ▪ sound siren; and ▪ advise MWW that evacuation is necessary. MWW will: ▪ notify LDC and QPS; and ▪ standby to assist QPS with evacuation.</td>
</tr>
<tr>
<td></td>
<td>Progressive internal Erosion of the embankment or foundation to form an open conduit or pipe</td>
<td></td>
<td>Once emergency event has completed and LDC has issued instructions to stand down MWW will: ▪ advise EAP Officer to stand down; and ▪ Write report for Director, Dam Safety.</td>
</tr>
</tbody>
</table>

### 3.3.1 Detailed Actions

If leakage rates rise for no corresponding rise in storage level or if additional cracking or increased cracking in the concrete face is observed:

The EAP Officer will:
- Visually assess the increase in seepage and observe the turbidity of the seepage flow;
- Inspect the upstream concrete face for any signs of new cracks, displacements across cracks or joints, or whirlpools that might indicate the source of new or increased seepage;
- Report results of inspection to the MWW;
- Initiate the evacuation plan at the direction of the MWW;
- Release water from the dam by fully opening both outlet valves (if safe to do so) at the direction of MWW;
- Monitor, record and take photographs at regular intervals until advised otherwise by MWW;
- Provide regular reports to MWW; and
- Monitor and record and take photographs at regular intervals until advised otherwise by MWW.

The MWW will:
- Review the readings and results of inspection.

If the dam is not considered to be safe:

The MWW will:
- Direct the EAP Officer to initiate the evacuation plan;
- Notify the LDC, the DNRME hotline, Queensland Fire and Emergency Services Watch Desk Officer and Police Communications Centre, Mareeba that an evacuation is required;
- Direct the EAP Officer to release water from the dam by fully opening both outlet valves (if safe to do so);
- Request the EAP Officer to inspect the dam at regular intervals;
- Arrange for inspection of the dam by a RPEQ Engineer; and
- Provide regular updates to the LDC.

If the dam is considered safe:

The MWW will:
- Advise the EAP Officer that the emergency event is at an end;
- Notify the LDC that the evacuation plan had been activated, but has been cancelled because a review of the inspection indicated that the dam is now considered to be safe; and
- Provide a report to Director, Dam Safety within 30 days of the event.

This Event ends when advised by MWW.

The EAP Officer will:
- On authorisation from MWW, notify the evacuated people that the Emergency Event is at an end; and
- Compile an Emergency Event Report and forward to MWW.

The LDC will:
Coordinate the response and implement the local disaster management plan as required.
3.3.2 Preventative actions for Seepage Events:
- SCADA monitoring and Historian recording of instrumentation at the dam;
- SCADA is pre-set to alarm if abnormalities occur (refer to Appendix 8);
- Visual inspections;
- Monthly inspections; and
- Monthly inspections to be reviewed by an RPEQ Engineer.

3.4 ACTS OF TERRORISM

An act of Terrorism may take the form of:
- An explosive device (set to destabilise the dam wall);
- Toxic chemicals released into the dam;
- A cyber-attack on the SCADA system.

Should an explosive device be found or detected, or a chemical attack be found or suspected ring 000 immediately, ask for QLD Police and await further instructions.

Should a Cyber-attack be detected or suspected within the SCADA system at any time contact the Manager Water and Waste immediately and await further instructions.

The following table outlines the procedures the EAP Officer will follow if informed of or witnesses an act of terrorism in relation to Ibis Dam.

Table 5: Procedures to follow if a terrorist activity occurs

<table>
<thead>
<tr>
<th>Activation</th>
<th>General Characteristics</th>
<th>When and what to check</th>
<th>What needs to be done and by whom</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alert</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lean Forward</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stand up</td>
<td></td>
<td>• Telephone 000 immediately, communicate all information pertinent to incident to QPS and await further instructions from QPS and/or MWW.</td>
<td>• Telephone/communicate information to MWW.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• MWW will notify DIS and LDC, and liaise with QPS.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• LDC will notify Director, Dam Safety.</td>
</tr>
<tr>
<td>Stand down</td>
<td></td>
<td>• Await notification from the MWW that the terrorism incident has ended, then provide the MWW with all the details recorded or remembered during the incident.</td>
<td>• MWW will liaise with DIS and LDC before writing a report to Director, Dam Safety.</td>
</tr>
</tbody>
</table>
### 3.5 OTHER DAM SAFETY EVENTS

#### Table 6: Procedures to follow if other abnormal issues occur

<table>
<thead>
<tr>
<th>Activation</th>
<th>General Characteristics</th>
<th>When and what to check</th>
<th>What needs to be done and by whom</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flow slide</td>
<td>Collapse and flow of soil around the storage periphery.</td>
<td>During routine inspection(^9) and especially with sedimentary/ colluvial soils – look for material displacement around the storage rim.</td>
<td>Inspection Officer to report in routine inspections. MWW to follow up.</td>
</tr>
<tr>
<td>Landslide</td>
<td>Mass movement of soil or rock from slopes and valley walls around the storage.</td>
<td>During routine inspection – look for material displacement.</td>
<td>Inspection Officer to report in routine inspections. MWW to follow up.</td>
</tr>
<tr>
<td>Movement or cracking in structural concrete work</td>
<td>Failure of mechanical components such as pipes, gates etc.</td>
<td>During routine inspection or when mechanical problems such as a burst pipe or a jammed gate occur – look for any movement or cracking of the structural concrete work to determine the cause.</td>
<td>Inspection Officer to report in routine inspections. MWW to follow up.</td>
</tr>
<tr>
<td>Failure of appurtenant structures or operating equipment such as abnormal operation of gates and valves or failure of components of the dam</td>
<td>Loss of ability to supply water.</td>
<td>After detecting an operational anomaly – identify and investigate the cause.</td>
<td>MWW to follow up.</td>
</tr>
<tr>
<td>Abnormal instrument readings (if</td>
<td>A sudden change in the values of instrument readings.</td>
<td>On detection – check for equipment malfunction and investigate the</td>
<td>EAP Officer is to notify MWW.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>MWW will notify LDC.</td>
</tr>
</tbody>
</table>

\(^9\) Routine Inspection - MSC personnel inspect the dam in person once per month. SCADA instruments monitor the dam continuously (24 hours per week 7 days per week) and all the data is recorded on MSC’s Historian. The spillway can be viewed remotely and recorded, via fixed camera as required.
### Activation

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>When and what to check</th>
<th>What needs to be done and by whom</th>
</tr>
</thead>
<tbody>
<tr>
<td>installed)</td>
<td>cause</td>
<td>EAP Officer is to close outlet valves at the dam and try to identify contaminant and immediately notify MWW. MWW will notify LDC.</td>
</tr>
</tbody>
</table>

#### 3.5.1 Detailed Actions for Toxic Spills

Note: Under no circumstances shall EAP officers approach spills where the nature or toxicity of the substance is not known.

On detection or notification of a toxic or hazardous substance contaminating the catchment or storage the:

The **EAP Officer** will:
- In the event of an emergency telephone Queensland Fire and Rescue Services on 000;
- Identify the hazardous substance or chemical, if possible;
- Identify the location of the spill;
- Isolate the Irvinebank pipeline by closing valves;
- For non-emergency advice contact Queensland Fire and Rescue Services, by dialling 13 QGOV (13 74 68), in regard to the nature of the hazard; and
- Notify the MWW.

The **MWW** will:
- Assess the situation and advise if further action is required, for example:
  - Notify landowners downstream of the dam and visitors to the dam site who may be affected;
  - Take reasonable steps to isolate the spill or containment from the dam by construction of a containment embankment, or prevent further contamination; and
- Notify the LDC.

This Event ends when the spill has been contained or removed or is no longer considered to be a toxic hazard.

The **EAP Officer** will:
- Make a final inspection of the Dam and report back to MWW.

If the MWW considers the Event is over:
The **EAP Officer** will:
- Notify landowners downstream of the dam that the event has ended;
- Open the valves on the Irvinebank pipeline (if safe to do so); and
- Compile an Emergency Event Report and forward unedited copies to MWW.

The **MWW** will:
- Notify the EAP Officer to re-open the valves (if safe to do so) as directed;
- Notify the LDC and the DNRME hotline, and appraise each of the situation; and
- Provide a report on the event to the Director, Dam Safety within 30 days.

The **LDC** will:
- Coordinate the response and implement the local disaster management plans as required.

### 3.5.2 Preventative actions for Other Dam Safety Events:
- Secure site; and
- Routine inspections.
4. ROLES AND RESPONSIBILITIES

4.1 EAP OFFICER

The **EAP Officer** will:

- Monitor the dam instrumentation and Bureau of Meteorology website for any potential emergency events;
- Follow the Emergency Action Plan in time of emergency;
- During an emergency event, report to and receive instructions from the MWW or if he cannot be contacted, the SWR;
- In an emergency event, take steps to ensure personal safety and the safety of other EAP Officers and the public;
- Record details of the Emergency Events in the Storage Logbook and take relevant photographs. Details which should be recorded are time and date, storage level readings, rain gauge readings, details of all phone calls, actions and directions from MWW or SWR;
- Provide regular reports to the MWW for evaluation during the emergency or if he cannot be contacted, the SWR;
- During an emergency event, the EAP Officer will refer the media to the LDC;
- Keep the Emergency Action Plan in a clean, secure facility; and
- After an emergency event, prepare an Emergency Event Report and send it to the MWW.

4.2 MANAGER WATER AND WASTE

The **MWW** will:

- Review the Emergency Action Plan in consultation with MSC and District Disaster Management Group by 1st September each year;
- Ensure the Emergency Action Plan is distributed according to the Distribution List and that the police and disaster management groups are conversant with the plan;
- Ensure this Emergency Action Plan is implemented;
- Ensure that the Population at Risk in Irvinebank are visited annually and informed of the EAP and the expectations of them in dam safety emergency events;
- Notify the LDC, QFES Watch Desk Officer and the DNRME hotline, when the evacuation plan has been activated;
- Monitor all emergency events;
- Provide regular updates during emergency events to the LDC (as required by the situation or as mutually determined as the situation changes);
- Evaluate reports from EAP Officers and provide directions where required in this plan; and
- Within thirty (30) days of an event, present an Emergency Event Report to Director Dam Safety.

4.3 LOCAL DISASTER COORDINATOR

The **Chief Executive Officer** Mareeba Shire Council is the **Local Disaster Coordinator** and will:

- Review the Emergency Action Plan in consultation with the MWW by 1st September each year;
− Authorise this Emergency Action Plan; and
− Notify the Police Communications Centre, Cairns (000) when an evacuation is required in accordance with this plan.

The following excerpt is taken from Disaster Management Act 2003:

The Local Disaster Coordinator has the following functions (excerpt taken after the Disaster Management Act 2003):

(a) to coordinate disaster operations for the local group;
(b) to report regularly to the local group about disaster operations; and
(c) to ensure, as far as practicable, that any strategic decisions of the local group about disaster operations are implemented.

4.4 QUEENSLAND POLICE COMMUNICATION CENTRE, CAIRNS
The Queensland Police Communication Centre, Cairns will:
− Contact Herberton Police and advise them that evacuation is required, and facilitation of evacuation will be necessary for the Population at Risk (PAR).

4.5 MAREEBA LOCAL DISASTER MANAGEMENT GROUP (LDMG)
The Mareeba LDMG will:
− Coordinate the operational response of the LDMG;
− Develop comprehensive Local Disaster Management Planning strategies;
− Design and maintain public education / awareness programs;
− Design, maintain and operate a Local Disaster Coordination Centre, including the training of sufficient personnel to operate the Centre;
− Coordinate support to response agencies;
− Carry out reconnaissance and impact assessments;
− Provide public information prior to, during and following disaster event impacts;
− Make recommendations regarding areas to be considered for authorised evacuation;
− Pre-arrange evacuation areas and warnings with Queensland Fire and Emergency Services;
− Provide public advice re voluntary evacuation;
− Identify, resource, staff and operate Evacuation Centres;
− Invite the MWW to LDMG meetings;
− Coordinate the operational response in accordance with the Local Disaster Management Plans; and
− Issue emergency alerts and warnings to the population at risk.
5. **EVACUATION PROCEDURE**

5.1 **GENERAL**

The gauging station at Ibis Dam has been programmed to activate the sirens in Irvinebank when the storage level in the dam reaches 827 m or when there is 1.5 m of water flowing through the v-notch weir downstream of the dam. When the sirens activate, people at risk should immediately implement their individual evacuation plans, otherwise they should evacuate to assembly points at the school or the rural fire shed (as per Appendix 10).

The EAP Officer can also manually activate the sirens to provide early warning of a potential emergency event, for example when the storage level is approaching 827 m and there is heavy rain in the catchment or provide evacuation warning if the telemetry system fails.

5.2 **EARLY WARNING**

If the storage level in Ibis Dam is approaching 827 m and there is heavy rain in the catchment, the EAP Officer will:

- Manually activate the public warning siren(s) for 20 seconds; and
- notify all residents whom cannot be contacted by telephone (assisting anyone who requires assistance); and
- determine the whereabouts of any people who cannot be contacted.

5.3 **EVACUATION WARNING**

The sirens will be automatically activated when the storage level in the dam reaches 827 m or when there is 1.5 m of water flowing through the v-notch weir downstream of the dam.

The evacuation warning can be recognised by continuous sounding of the sirens. (These should be switched off after the population at risk have evacuated.)

When this warning is heard, people at risk should immediately implement their individual evacuation plans if there has not been any early warning, otherwise they should evacuate to assembly points at the school or the rural fire shed.

The EAP Officer will:

- Advise population at risk to evacuate; and
- Check that people have evacuated.

5.4 **SITUATION MONITORING**

The EAP Officer will:

- Provide updates to the evacuated people.

5.5 **END OF EVENT**

The EAP Officer will:

- Activate the public warning siren(s) for 20 seconds; and
- Advise people that the event has ended and thank them for their understanding and
5.6 INDIVIDUAL EVACUATION PLANS

Individual Evacuation Plans have been prepared for and distributed to residents at risk. They are advised to implement their Evacuation Plan if they hear the Evacuation Warning or become aware of or suspect that an emergency event has occurred. See APPENDIX 6 - INDIVIDUAL EVACUATION PLANS.
6. **PREDICTED FLOOD LEVELS AND FLOOD TRAVEL TIMES**

6.1 **PREDICTED DEPTH OF FLOODING**

Table 7: Procedures to follow if other abnormal issues occur

<table>
<thead>
<tr>
<th>Scenario</th>
<th>MacDonald Creek Bridge</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Inundation Depth above Bridge Deck (m)</td>
<td>Time to Peak (min) from start of Breach</td>
</tr>
<tr>
<td>Sunny Day Breach</td>
<td>3.0</td>
<td>24</td>
</tr>
<tr>
<td>Acceptable Flood Capacity</td>
<td>6.0</td>
<td>84</td>
</tr>
<tr>
<td>- With breach</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Without breach</td>
<td>4.0</td>
<td>108</td>
</tr>
</tbody>
</table>

Note: Gauge Board readings at this location are independent and have no relation to levels at other locations and are not related to AHD or GDA.

The deck level of MacDonald Creek Bridge is EL 742.92 mAHD.

6.2 **FLOOD WAVE TRAVEL TIMES**

Flood wave travel times within Ibis Creek have been modelled for the above Scenarios. The travel distance to the first house is 1850 metres.

The observations shown in Table 8 should be used as a guide.

Table 8: Travel time to first house

<table>
<thead>
<tr>
<th>Flow Scenario</th>
<th>Annual Exceedance Probability</th>
<th>Travel Time to first house (min)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dam Crest Flood Failure</td>
<td>1:9,300</td>
<td>14</td>
</tr>
<tr>
<td>Acceptable Flood Capacity Failure</td>
<td>1:72,000</td>
<td>11</td>
</tr>
<tr>
<td>Probable Maximum Flood Failure</td>
<td>1:10,000,000</td>
<td>5</td>
</tr>
</tbody>
</table>

There is considerable uncertainty in the values of flood travel times and thus prompt warning should be given to population at risk on being aware of a potential dam break event.
7. COMMUNICATIONS

The primary means of communications between the EAP Officer and parties external to Irvinebank shall be by telephone.
8. **STORAGE LOGBOOK**

The EAP Officer shall ensure that events and appropriate data are recorded in the Storage Logbook. All new entries are to be copied and forwarded to MWW monthly.

Entries shall be a record of storage levels, weather observations, inspections, actions that are carried out, telephone conversations that are related to the emergency event, and comments identifying problems and unusual events.

All entries shall be written legibly and be unedited and signed by the person making the entry. Errors made shall be struck out and initialled.

The Storage Logbook shall be kept permanently in the EAP Officer residence. It must be available on request and its location known to MWW.
9. DAM DETAILS

9.1 DAM DETAILS

Table 9: Details of Ibis Dam

<table>
<thead>
<tr>
<th>Item</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name of Dam</td>
<td>Ibis Creek Dam</td>
</tr>
<tr>
<td>Other Names</td>
<td>None</td>
</tr>
<tr>
<td>Location</td>
<td>Latitude 17° 26’ 02”&lt;br&gt;Longitude 145° 12’ 59”</td>
</tr>
<tr>
<td>DNRME Region</td>
<td>North</td>
</tr>
<tr>
<td>Shire</td>
<td>Mareeba Shire Council</td>
</tr>
<tr>
<td>Nearest Town</td>
<td>Irvinebank</td>
</tr>
<tr>
<td>Stream and AMTD</td>
<td>Ibis Creek 2.1 km</td>
</tr>
<tr>
<td>Licence No</td>
<td>N/A</td>
</tr>
<tr>
<td>Safety Condition Schedule</td>
<td>Ibis Dam (ID # 096), Dam Safety Condition Schedule&lt;br&gt;(ECM#3096021), June 2015.</td>
</tr>
<tr>
<td>Current Owner</td>
<td>Mareeba Shire Council</td>
</tr>
<tr>
<td>Designer (Date)</td>
<td></td>
</tr>
<tr>
<td>Original</td>
<td>Completed 1907</td>
</tr>
<tr>
<td>Stage 2 – Stabilisation</td>
<td>Completed 1997</td>
</tr>
<tr>
<td>Stage 3 - Stabilisation</td>
<td>Completed June 2013</td>
</tr>
<tr>
<td>Construction Authority</td>
<td></td>
</tr>
<tr>
<td>Original</td>
<td>Not Known</td>
</tr>
<tr>
<td>Stage 2 – Stabilisation</td>
<td>GHD (Gutteridge Haskins and Davey Pty Ltd)</td>
</tr>
<tr>
<td>Stage 3 - Stabilisation</td>
<td>SunWater</td>
</tr>
<tr>
<td>Construction Details</td>
<td></td>
</tr>
<tr>
<td>Construction Contractor</td>
<td></td>
</tr>
<tr>
<td>Original</td>
<td>Not Known (1907)</td>
</tr>
<tr>
<td>Stabilisation</td>
<td>QBridge (1997)</td>
</tr>
<tr>
<td>Stage 3 Upgrade Design</td>
<td>SunWater (2013)</td>
</tr>
<tr>
<td>Stage 3 Construction</td>
<td>RoadTek (2013)</td>
</tr>
<tr>
<td>Safety Review</td>
<td>2010 (SunWater)</td>
</tr>
<tr>
<td>Next Safety Review</td>
<td>1 September 2032</td>
</tr>
<tr>
<td>Storage characteristics</td>
<td></td>
</tr>
<tr>
<td>Full supply level (FSL)</td>
<td>EL 825.5 mAHD</td>
</tr>
<tr>
<td>Storage capacity</td>
<td>225 ML</td>
</tr>
<tr>
<td>Surface area</td>
<td>4 Ha at FSL</td>
</tr>
<tr>
<td>Length of shoreline</td>
<td>1.64 km (derived from aerial photo)</td>
</tr>
<tr>
<td>Main Spillway capacity</td>
<td>224 m³/s at EL 828 mAHD (AEP 1:100,000)</td>
</tr>
<tr>
<td>Dam crest level (DCL) - ogee</td>
<td>EL 825.5 mAHD</td>
</tr>
<tr>
<td></td>
<td>EL 826.0 mAHD</td>
</tr>
</tbody>
</table>
**Catchment area** | 610 ha  
**Catchment description** | Steep hills covered in medium vegetation  
**Design Rainfall Review and methodology** | Chapter 5 of *Ibis Dam Risk Assessment*, Royal HaskoningDHV June 2020  
**Probable Maximum Flood** | *Ibis Dam Risk Assessment*, Royal HaskoningDHV June 2020  
**PMF Level** | EL 829.64 mAHD  
**PMF Volume** | 4,254 ML  
**PMF Peak Discharge** | 813 m³/s  
**Historical Maximum Storage Level** | EL 826.1 m (Cyclone Larry in 20/03/2006 & Cyclone Tasha 25/12/2010)  

**Description of dam wall**  
**US Wall Type-Main Wall** | Mass concrete with rock core and central ogee spillway  
**Wall Height (above lowest D/S toe)** | 17.5 m  
**Raised Abutment Elevation** | EL 828 mAHD  
**Wall Length** | 56 m  
**Materials Description** | Mixture of coarse and fine river gravel, natural river sand  

**Description of spillway**  
**Spillway Description** | The spillway is a central uncontrolled ogee crest with broad crested weirs on either side  
**Spillway Details**  
**Ogee Crest** | EL 825.5 mAHD  
**Broad Crest** | EL 826.0 mAHD  
**Spillway Width - Ogee Crest** | 13 m  
**Spillway Width - Broad Crest**  
  - Left Bank | 17 m  
  - Right Bank | 10 m  
**Energy Dissipation Method** | Natural rock in the creek bed at the toe  
**Design Head** | Unknown  
**Control Description** | Uncontrolled  
**Auxiliary spillway** | N/A  

**Description of outlet works**  
**River Release** | DN 300 mm Outlet Pipe  
**Conduit Description** | DN 250 mm Outlet Pipe  
**Intake Works** | The intake to the river release pipe is a floating intake valve  
**Regulator Description** | DN 250 mm and DN 300 mm gate valves.  

**Trigger Points for Sirens**
9.2 FLOOD HANDLING CAPABILITY

The stage III stabilisation works, designed and managed by SunWater (completed in June 2013), raised the abutments by 0.5 m. This work was undertaken to enable a flood with an Annual Exceedance Probability (AEP) of 1 in 72,000 to pass over the dam. This has been determined as the Acceptable Flood Capacity (AFC) for the dam.

9.3 POTENTIAL PROBLEM IDENTIFICATION

Officers inspect the dam monthly and complete an inspection checklist. An RPEQ Engineer visits the dam periodically and reviews the monthly inspection report. Monthly inspection checklists are sent to MWW who will check and evaluate these reports.

It is important that the dam is inspected during an emergency event or shortly thereafter by the EAP officer, providing it is safe to do so. Potential problems that can be identified during these inspections are discussed in APPENDIX 3 -POTENTIAL PROBLEM IDENTIFICATION. Any abnormalities shall be immediately brought to the attention of MWW.

\[\text{Storage Level} \quad \text{EL 827 mAHD}^{10}\]

| Downstream V-Notch | 1.5 m over the weir – based on 1.2 m estimated depth of flow over the weir on 25/12/2010, plus 0.3 m margin. This should be revised if more data becomes available. |

---

\(^{10}\) Flooding of houses will start when storage level reaches 827.5 mAHD. EL 827.9 mAHD is the AFC for 1:72,000 AEP
10. **EMERGENCY EVENT REPORT**

The EAP Officer shall prepare an Emergency Event Report after each emergency event and forward it to the MWW within 15 days of the event.

The report maybe free format but shall contain at least:
- A description of the event summarised from the Storage Logbook;
- Description of any observed damage or other consequences;
- Photographs;
- A summary of data recorded during the event and the times of these recordings such as:
  - Rainfall,
  - Storage level,
  - Seepage flows and observations.
- Details of communication which took place during the emergency;
- Comment on the adequacy of the Emergency Action Plan;
- Any recommendations or suggested changes to the Emergency Action Plan; and
- Any further comments considered necessary.

The MWW shall provide a report on the event to the Director, Dam Safety within 30 days of the event.
11. **REVISION OF EVACUATION PLANS**

Each year in July the EAP Officer shall visit each house/structure at risk and revise the evacuation plan. The revised plan shall be forwarded to MWW.

The MWW will ensure that revised plans are posted or delivered to each resident.
12. REFERENCES

Workplace Health and Safety Act 2011
Ibis Creek Dam - Storage Logbook
Ibis Dam - Hydraulics and Hydrology Flood Study, SunWater, September 2006
Final Design Report, Ibis Creek Dam Stage 3 Remedial Works, SunWater, December 2010
Ibis Dam 2016 Comprehensive Surveillance Report, August 2016
Ibis Dam Risk Assessment, Royal Haskoning DHV, June 2020
APPENDIX 1

LOCALITY PLAN
APPENDIX 2

CATCHMENT BOUNDARY
APPENDIX 3

POTENTIAL PROBLEM IDENTIFICATION
<table>
<thead>
<tr>
<th>TYPE OF DEFICIENCY</th>
<th>LOOK FOR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seepage</td>
<td>Quantity/quality of drain outflows, seepage and its source(s).</td>
</tr>
<tr>
<td></td>
<td>Location, type and extent of deteriorated concrete.</td>
</tr>
<tr>
<td></td>
<td>Extent of moist, wet or saturated areas.</td>
</tr>
<tr>
<td></td>
<td>Wet areas or areas where the vegetation appears greener or lusher in the toe area.</td>
</tr>
<tr>
<td></td>
<td>An increase in the amount of water being released from toe drains or through the v-notch weirs. (Remember to take into account changes in the reservoir level.)</td>
</tr>
<tr>
<td></td>
<td>Turbidity or cloudiness of the seepage.</td>
</tr>
<tr>
<td></td>
<td>Any change in conditions.</td>
</tr>
<tr>
<td>Cracking/Movement</td>
<td>Location, length, displacement and depth of cracks.</td>
</tr>
<tr>
<td></td>
<td>Desiccation Cracking: A random honeycomb pattern of cracks usually found on the crest and the downstream slope.</td>
</tr>
<tr>
<td></td>
<td>Transverse Cracking: Cracks that are perpendicular to the length of the dam usually found on the crest.</td>
</tr>
<tr>
<td></td>
<td>Longitudinal Cracking: Cracks that are parallel to the length of the dam. Longitudinal cracks may be associated with stability problems in the slopes.</td>
</tr>
<tr>
<td></td>
<td>Cracking concrete deterioration.</td>
</tr>
<tr>
<td></td>
<td>Disintegration.</td>
</tr>
<tr>
<td></td>
<td>Spalling.</td>
</tr>
<tr>
<td></td>
<td>Efflorescence.</td>
</tr>
<tr>
<td></td>
<td>Drummy concrete.</td>
</tr>
<tr>
<td></td>
<td>Popouts.</td>
</tr>
<tr>
<td></td>
<td>Pitting.</td>
</tr>
<tr>
<td></td>
<td>Scaling.</td>
</tr>
<tr>
<td></td>
<td>Surface defects.</td>
</tr>
<tr>
<td></td>
<td>Misalignment.</td>
</tr>
<tr>
<td></td>
<td>Differential movement in cracks.</td>
</tr>
<tr>
<td></td>
<td>Conditions of joints.</td>
</tr>
</tbody>
</table>

Note: This tabulation taken from Queensland Dam Safety Management Guidelines-February 2002.

**WHEN TO GET FURTHER ASSISTANCE**

Several of the deficiencies covered above are very serious. If you observe any significant deficiency, you should advise the Director Infrastructure Services and Manager Water and Waste as soon as possible.
APPENDIX 4

INUNDATION PLANS
INUNDATION PLANS

The following pages are reproduced here from the 2020 FIA:

- SDF PAR Map
- DCF (1 in 2 AEP) PAR Map
- 1 in 100 AEP PAR Map
- Old DCF (1 in 9,300 AEP) PAR Map
- AFC (1 in 72,000 AEP) PAR Map
- PMF (1 in 10,000,000 AEP) PAR Map

**NOTE:**
The black numbers in the white boxes on each Map are the original numbering system used by Royal Haskoning DHV in the 2020 FIA Report. The larger light blue numbers with were used by MSC in Appendices 4,5 & 6 for convenience.
Project: Ibis Dam FIA
Figure: DCF (1 in 2 AEP) PAR Map

Legend:
- Failure PAR
- Buildings
- Cadastral Boundaries
- No Failure Extents >0.3m Depth

Failure Depth (m)
- <=0.3
- 0.3-0.4
- 0.4-0.5
- 0.5-0.75
- 0.75-1
- 1-1.5
- 1.5-2
- >2

Light blue coloured No's were added by MSC, at the end or start of each address, to enable cross referencing with the EAP.

Scale: 1:10,000

0 100 200 300 400 500 m

Disclaimer: While all reasonable care has been taken to ensure the information contained on this map is up to date and accurate, this map contains data from a number of sources - no warranty is given that the information contained on this is free from error or omission. Any reliance placed on such information shall be at the sole risk of the user. Please verify the accuracy of all information prior to using it. This map is not a design document.
Project: Ibis Dam FIA
Figure: 1 in 100 AEP PAR Map

Legend:
- Failure PAR
- No Failure PAR
- Buildings
- Cadastral Boundaries
- No Failure Extents >0.3m Depth

Failure Depth (m)
- <=0.3
- 0.3-0.4
- 0.4-0.5
- 0.5-0.75
- 0.75-1
- 1-1.5
- 1.5-2
- >2

## light blue coloured No's were added by MSC, at the end or start of each address, to enable cross referencing with the EAP.

Scale: 1:10,000

Disclaimer: While all reasonable care has been taken to ensure the information contained on this map is up to date and accurate, this map contains data from a number of sources - no warranty is given that the information contained on this is free from error or omission. Any reliance placed on such information shall be at the sole risk of the user. Please verify the accuracy of all information prior to using it. This map is not a design document.
Project: Ibis Dam FIA
Figure: Old DCF (1 in 9,300 AEP)
PAR Map

Legend:
- Failure PAR
- No Failure PAR
- Buildings
- Cadastral Boundaries
- No Failure Extents >0.3m Depth

Failure Depth (m)
- <=0.3
- 0.3-0.4
- 0.4-0.5
- 0.5-0.75
- 0.75-1
- 1-1.5
- 1.5-2
- >2

Light blue coloured No’s were added by MSC, at the end or start of each address, to enable cross referencing with the EAP.

Scale: 1:10,000

Disclaimer: While all reasonable care has been taken to ensure the information contained on this map is up to date and accurate, this map contains data from a number of sources - no warranty is given that the information contained on this is free from error or omission. Any reliance placed on such information shall be at the sole risk of the user. Please verify the accuracy of all information prior to using it. This map is not a design document.
Appendix 5 has been redacted
APPENDIX 6

INDIVIDUAL EVACUATION PLANS
EVACUATION PLAN – HOUSE 1

Evacuate up the hill to corrugated iron water tank

Concrete Water Tank

Corrugated Iron Water Tank

Evacuate when siren sounds: Go up the hill to corrugated water tank unless directed to go to assembly point by the EAP Officer

Evacuation Plan
For

Ibis Creek
EVACUATION PLAN — HOUSE 2

Evacuate up the hill to corrugated iron water tank

Evacuate when siren sounds:— Go up the hill to corrugated water tank unless directed to go to assembly point by the EAP Officer
Evacuation Plan
For

Evacuate when siren sounds:- Go up the hill to corrugated water tank unless directed to go to assembly point by the EAP Officer.
EVACUATION PLAN — HOUSE 4

Evacuate up the hill to the water tank

Evacuate when siren sounds: - Go up the hill to the water tank unless directed to assembly point by EAP Officer
EVACUATION PLAN — HOUSE 5

Evacuate up the hill to the first intersection on Annie St

Evacuate when siren sounds:- Go up the hill to the first intersection in Annie St unless directed to assembly point by EAP Officer
EVACUATION PLAN — HOUSE 6

Evacuate when siren sounds:— Go up the hill unless directed to assembly point by EAP Officer

Evacuation Plan
For

Macdonald Creek
EVACUATION PLAN – HOUSE 7

Evacuate up the hill to the twin fork Iron Bark tree

Property Access

Macdonald Creek

Evacuate when siren sounds: Go up the hill to the twin fork Iron Bark tree unless directed to assembly point by EAP Officer

Evacuation Plan For
Evacuate when siren sounds:- Go up the hill to the large gum tree unless directed to assembly point by EAP Officer

Evacuation Plan
For

Macdonald Creek
Evacuation Plan

Evacuate when siren sounds: Go up the hill to the neighbouring house unless directed to assembly point by EAP Officer.

For

Macdonald Creek
Evacuation Plan
For
House 10

Evacuate when siren sounds:- Go up Maude Street unless directed to assembly point by EAP Officer
Evacuate when siren sounds: Go up the hill to Loudoun House Museum via Jessie St

Evacuate up the hill to Loudoun House Museum

Evacuation Plan

For

Evacuation Plan – House 11

September 2020

MSC - IBIS EAP

11
Evacuate when siren sounds:- Go up the hill to Loudoun House Museum via Jessie Street.

Evacuation Plan

For
Evacuate when siren sounds:- Go up the hill to Loudoun House Museum via Jessie St
EVACUATION PLAN — SCHOOL OF ARTS 14

Evacuate when siren sounds:- Go up the hill to Loudoun House Museum via Jessie St

Evacuate up the hill to Loudoun House Museum

Evacuation Plan
For

September 2020
MSC - IBIS EAP
EVACUATION PLAN — HOUSE 14

Evacuate up the hill to the School

Evacuate when siren sounds:- Go up the hill to the School unless directed to assembly point by EAP Officer
Evacuation Plan
For
Macdonald Creek
Herberton-Petford Rd
Evacuate when siren sounds:- Go up the hill to the School unless directed to assembly point by EAP Officer
Evacuate when siren sounds:- Go up the hill to the School

Evacuation Plan
For

September 2020
MSC - IBIS EAP
Evacuate when siren sounds: Go up the hill to the School unless directed to assembly point by EAP Officer.
Evacuate when siren sounds: - Go up Gordon St unless directed to assembly point by EAP Officer

Evacuation Plan for Tavern
Evacuate up the hill to higher ground

Evacuate when siren sounds: - Go up the hill to Stannary Hills Tramline Cutting unless directed to assembly point by EAP Officer

Evacuation Plan
For

September 2020
MSC - IBIS EAP
Evacuate up the hill to Stannary Hills Tramline Cutting

Evacuate when siren sounds:— Go up the hill to Stannary Hills Tramline Cutting unless directed to assembly point by EAP Officer

Evacuation Plan
For
Evacuate when siren sounds: - Go up the hill to Stannary Hills Tramline Cutting unless directed to assembly point by EAP Officer.
Evacuation Plan
For

Evacuate when siren sounds: - Go up the hill to Stannary Hills Tramline Cutting unless directed to assembly point by EAP Officer.

Evacuate up the hill to Stannary Hills Tramline Cutting
Evacuation Plan For Herberton-Petford Rd

Evacuate when siren sounds:- Go up the hill to Stannary Hills Tramline Cutting unless directed to assembly point by EAP Officer
Evacuate when siren sounds: - Go up the hill to high structure unless directed to assembly point by EAP Officer.
Evacuate when siren sounds: - Go up the hill to high structure unless directed to assembly point by EAP Officer.
Evacuate when siren sounds: Go up the hill to high structure unless directed to assembly point by EAP Officer

Evacuation Plan
For

September 2020
MSC - IBIS EAP
APPENDIX 7

STANDING OPERATING PROCEDURE FOR SPILLWAY OVERFLOWS
Standing Operating Procedures
Small to Medium Spillway Overflows

Ibis Dam

SOP 14

Standing Operating Procedures
for

Small to Medium Spillway Overflows

Adopted from QLD State Government Documents
Table of Contents

1. Purpose 1
2. Scope 1
3. Personnel Affected and Responsibilities 1
4. Procedures 2
5. References 2

Appendices

Appendix A – Inspecting for Deficiencies
1. Purpose
Ibis Dam is owned, managed and maintained by Council. Monthly monitoring is carried out by the local dam safety trained officer (employed by Council) and the Supervisor Water Reticulation. The local officer is the Emergency Action Plan officer (EAP officer).

SCADA monitors the dam continuously and the data is recorded on a Historian. The spillway can be viewed remotely via a fixed camera and photos recorded as necessary.

In accordance with the dam safety management program the Dam is to be inspected immediately before the spillway starts to overflow.

2. Scope
This Procedure applies to spillway overflow events that are less than the historical maximum event (EL 826.1 mAHD). The EAP Officer is listed in the EAP and associated documentation for Ibis Dam.

3. Personnel Affected and Responsibilities

<table>
<thead>
<tr>
<th>Supervisor Water Reticulation</th>
<th>Officer based in Mareeba who manages all aspects of the day to day operation of Ibis dam.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Emergency Action Plan Officer (EAP Officer)</td>
<td>Officer based at Irvinebank responsible for carrying out EAP procedures for the Dam and this Standing Operating Procedure.</td>
</tr>
<tr>
<td>Water &amp; Waste Engineer</td>
<td>Based in Mareeba. A Registered Professional Engineer Queensland, responsible for overseeing monthly inspections of the dam and ensuring all documentation is current and correct.</td>
</tr>
<tr>
<td>Manager Water &amp; Waste</td>
<td>Officer based in Mareeba, with the following responsibilities:</td>
</tr>
<tr>
<td></td>
<td>1. Approving: Standing Operating Procedure; the Operation and Maintenance Manual; person(s) undertaking the role of EAP Officer(s).</td>
</tr>
<tr>
<td></td>
<td>2. Authorise the management, receival, storage and integrity of data for the Ibis Dam.</td>
</tr>
<tr>
<td></td>
<td>3. Reviewing and authorising documentation produced by the Water and Waste Engineer and consultants.</td>
</tr>
<tr>
<td></td>
<td>4. Initiating investigations into abnormal behaviour of the dam.</td>
</tr>
<tr>
<td></td>
<td>5. Manage the distribution, approval and revision control of documentation relating to this Procedure.</td>
</tr>
<tr>
<td>Director Infrastructure Services</td>
<td>Responsible for reviewing all Dam Safety documentation.</td>
</tr>
<tr>
<td>Local Disaster Coordinator (MSC Chief Executive Officer)</td>
<td>The person responsible for approving the Emergency Action Plan.</td>
</tr>
</tbody>
</table>
4. Procedures
The EAP Officer should be aware of the storage height and rainfall conditions and be able to estimate when the spillway is likely to overflow.

- Two hours before the spillway is estimated to overflow, The EAP officer shall visit the dam if safe access is possible, and visually inspect the Dam for any deficiencies.
- Check for new cracking or increased crack widths in the spillway face. Appendix A gives a guide for inspecting the Dam for deficiencies.
- Read the storage height gauge and rain gauge (via SCADA) at the EAP Officer’s residence at one-hour intervals.
- Notify the Manager Water and Waste (MWW) and Supervisor Water Reticulation (SWR) that a spillway discharge is likely.
- Notify the MWW and SWR of storage height and that a spillway discharge is likely. Regularly update MWW and SWR during the rainfall event: at least daily or as directed by the MWW.
- If the storage level is predicted to reach EL 826.0 mAHD, the EAP Officer is to continue monitoring and await instructions from the MWW.
- MWW will notify Director Infrastructure Services (DIS) and Local Disaster Coordinator (LDC) if the storage water is deemed close to reaching EL 826.0 mAHD and rainfall/runoff is likely to continue.
- Implementation of the Major Overflow Event in the EAP (section 3.1) is to be followed from this point on.
- When the preceding twelve-hour rainfall is less than 50 mm and the storage height gauge is less than EL 825.75 mAHD and falling, and local stream rises have fallen sufficiently to allow access to and egress from the site, the EAP Officer is to make an inspection of the Dam and advise the MWW.
- EAP Officer is to advise the MWW that there is no longer the possibility of a major overflow event continuing/occurring.
- MWW notifies Director Infrastructure Services and LDC that there is no longer a major overflow occurring or likely to occur.
- Once LDC has declared that the event has finished MWW can stand-down personnel managing event.

5. References
- Emergency Action Plan, Ibis Dam.
### INSPECTING FOR DEFICIENCIES: SUMMARY

<table>
<thead>
<tr>
<th>TYPE OF DEFICIENCY</th>
<th>LOOK FOR</th>
</tr>
</thead>
</table>
| SEEPAGE            | A water flow or sand boil on the lower portion of the downstream slope or toe area, especially at the groins.  
Leakage around conveyance structures such as outlet works.  
Wet areas or areas where the vegetation appears greener or lusher on the embankment slope or toe area.  
Blocked toe drains.  
An increase in the amount of water being released from toe drains. (Remember to take into account changes in the reservoir level.)  
Turbidity or cloudiness of the seepage. |
| CRACKING           | Desiccation Cracking: A random honeycomb pattern of cracks usually found on the crest and the downstream slope.  
Transverse Cracking: Cracks that are perpendicular to the length of the dam usually found on the crest.  
Longitudinal Cracking: Cracks that are parallel to the length of the dam. Longitudinal cracks may be associated with stability problems in the slopes. |
| INSTABILITY        | Slides on the upstream or downstream slopes.  
Bulging, especially at the toe of the dam. |
| DEPRESSIONS        | Misalignment in the crest and embankment slopes found by sighting along fixed points.  
Sinkholes found by checking and probing each depression.  
Remember, sinkholes have steep, bucket like sides while minor depressions have gently sloping, bowl like sides. |
| MAINTENANCE CONCERNS | Inadequate Slope Protection: Check for bald areas or areas where the protection is sparse or damaged.  
Surface Runoff Erosion: Check for gullies or other signs of erosion. Make sure to check the low points along the upstream and downstream shoulders and groins since surface runoff can collect in these areas.  
Inappropriate Vegetative Growth: Check for excessive and deep rooted vegetative growth. |
<table>
<thead>
<tr>
<th>TYPE OF DEFICIENCY</th>
<th>LOOK FOR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Debris:</td>
<td>Check for debris on and around the dam, especially near outlet works or spillway inlets.</td>
</tr>
<tr>
<td>Animal Burrows:</td>
<td>Check for damage caused by burrowing animals.</td>
</tr>
</tbody>
</table>

Note: This tabulation taken from Dam Safety Surveillance Field Manual-August 2005

**WHEN TO GET FURTHER ASSISTANCE**

Several of the deficiencies covered above are very serious. If you observe any of the following deficiencies, you should consult with the MWW immediately:

- Sand boils or turbid seepage.
- Seepage that has increased since the last inspection (taking the reservoir level into consideration).
- Cracking that extends below the reservoir level or potential reservoir level.
- Transverse and longitudinal cracking.
- Deep seated slides or bulging associated with slides.
- Sinkholes or other large depressions.
- Deep rooted vegetation that might need to be removed.

If you are unsure whether a condition poses a threat to the safety of the dam, you should discuss your findings with the MWW.
APPENDIX 8

SCADA MONITORING & AUTOMATED ALERT MESSAGES
OVERVIEW

The monitoring instrumentation for Ibis Dam consists of:

- Rain gauges at the Dam Wall and Mt Orman (top of the Dargo Range (approx. 2.9 km ENE);
- Dam Height measurement;
- V-Notch weir flow measurement;
- Monitoring station and controls (Louden House and Mareeba Shire Offices); and
- Town warning system (refer to Figure 1).

Ibis Dam telemetry system has been replaced with hardware compatible with existing MSC telemetry, using:

- Kingfisher RTU's;
- the same radio equipment used throughout MSC; and
- installation of Citect server (HMI) at the museum.

Data collected from the dam is sent to both the Mareeba SCADA system and to the Irvinebank Museum computer: both sites can control the system.

A repeater site has been constructed on the hill above the museum (refer to Figure 2).

Mt Orman is the hub for all of the sites, communicating with Mareeba SCADA via NextG, Ibis Dam via licensed data radio network, and the Museum and three siren sites using licensed radio via the new repeater site located near the town reservoirs.

Internet and telemetry are provided to the Museum computer via NextG modem at Mt Orman via the repeater site: set points and sirens can be adjusted remotely from Mareeba. The speed is limited by the capability of the NextG modem at Mt Orman.

Voice radio is now available at the Dam wall, Mt Orman, Repeater and Museum with an installed voice radio/speaker system using data radios.

SIREN SYSTEM

1. If the **Critical** siren system triggers the following will occur:

   - sirens on towers within Irvinebank will sound, and
   - the alert messages to specified mobile and landline phones will be sent.

The following scenarios will cause the **Critical** siren to occur:

- the dam water height reaches 827 mAH and/or
- height of water over the weir reaches 1.5 m.

*NOTE: Should some or all the sirens trigger for no apparent reason they can be isolated: at the siren(s); or the museum; or remotely via the SCADA system.*

The siren will continue until it is manually turned off.

Appendix 8 pages 3 to 5 have been redacted
IBIS DAM MONITORING SYSTEM

Ibis Dam Trends
Rainfall
Siren Status

Invermay Reservoir Information obtained via Invermay Repeater, so call Repeater (072) for updates

Figure 1
Figure 3 Polygon Alert System Coverage Area
APPENDIX 9

DATA
EMERGENCY ACTION PLAN – IBIS DAM

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**Ibis Dam - Discharge Curve**

Storage level (m AHD) vs. Discharge (m³/s)

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**Rainfall Runoff - Ibis Dam during Cyclone Larry**

Height of water over bridge (mm) vs. Rainfall (mm) over time (hrs)
APPENDIX 10

EVACUATION CHECKLIST

Sunny day failure and flood event checklists have been redacted
<table>
<thead>
<tr>
<th>Action Item</th>
<th>V</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Notify the Local Disaster Coordinator</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Provide an Environmental Incident Alert</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Provide updates</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The yellow numbers shown below correspond to the numbers listed in the FIA Inundation Plans (Appendix 4) and the Individual Evacuation Plans (Appendix 6).

Residences not listed in the FIA Inundation Plans (Appendix 4) that are listed here (they are subject to flooding though not directly as a result of Ibis Dam failure) include: 6, 8, 17 & 19.