Expedition Road, Yarrabilba Detention Basin - Emergency Action Plan

Registered dam ID: 2617
Current as at: 28 August 2019
Approved to: 3 October 2021

Dam Owner

Name: Logan City Council
Date: 28 August 2019
## Document Control

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damsafety@dnrme.qld.gov.au                                                        |               |                  |
| PO Box 15456, City East QLD 4002                                                  |               |                  |
### Approval and Authorisation

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<th>ABBREVIATION/ACRONYM</th>
<th>DESCRIPTION</th>
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<tbody>
<tr>
<td>AHD</td>
<td>Australian Height Datum</td>
</tr>
<tr>
<td>ARI</td>
<td>Annual Reoccurrence Interval</td>
</tr>
<tr>
<td>BOM</td>
<td>Bureau of Meteorology</td>
</tr>
<tr>
<td>DM</td>
<td>Disaster Management Program Leader</td>
</tr>
<tr>
<td>DNRM</td>
<td>Department of Natural Resources Mines and Energy</td>
</tr>
<tr>
<td>EAP</td>
<td>Emergency Action Plan</td>
</tr>
<tr>
<td>EER</td>
<td>Emergency Event Report</td>
</tr>
<tr>
<td>FIA</td>
<td>Failure Impact Assessment</td>
</tr>
<tr>
<td>LDC</td>
<td>Local Disaster Coordinator</td>
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<tr>
<td>ML</td>
<td>Mega Litres</td>
</tr>
<tr>
<td>PAR</td>
<td>Population at Risk</td>
</tr>
<tr>
<td>PMF</td>
<td>Probable Maximum Flood</td>
</tr>
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<td>RCE</td>
<td>River and Catchment Engineering Program Leader</td>
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<td>RCM</td>
<td>Roads Maintenance Program Leader</td>
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1. Introduction

1.1. Background

This report on the dam Emergency Action Plan (EAP) for Expedition Road, Yarrabilba detention basin in Yarrabilba, Queensland, has been prepared by Snowy Mountain Engineering Corporation (SMEC) for Lendlease and Logan City Council. This EAP for the Expedition Road, Yarrabilba Detention Basin ensures that the correct protocols and procedures are in place so that the dam owner, local government and disaster management group can coordinate emergency responses and issue notification and warnings for people downstream of the referable detention basin.

The Expedition Road, Yarrabilba Detention Basin provides flood mitigation as part of the Yarrabilba development. The detention basin is located on a tributary of upper Quinzech Creek which flows in a generally northern direction before discharging to the Logan River, approximately 6.5 km downstream of the basin. The detention basin is formed by an embankment on Expedition Road. The location of Expedition Road, Yarrabilba Detention Basin (The Basin on Expedition Rd) is shown in Figure 1-1.

![Figure 1-1: Expedition Road, Yarrabilba Detention Basin Locality Map](image)

The basin has a storage capacity of 770 ML at full supply level (FSL), which corresponds to the dam crest level (road sag level) of 29.3 m AHD, as shown in Figure 1-3. The basin has two controlled outlets: a low flow culvert set just below the basin floor level at 24.8 m AHD, and two high flow culverts set as 27.5 m AHD.
The Failure Impact Assessment (FIA) performed by SMEC (2017) tested a series of storm durations and events to represent the flooding characteristics in a breach and no-breach scenario. The hydraulic modelling was completed to determine if the breaching of the basin would result in an incremental PAR (i.e. putting properties at risk who were previously not at risk).

### 1.2. Existing Flooding Conditions

An Interim Flood Warning and Retreat Study for Upper Quinzeh Creek was produced by DesignFlow in 2016, which was commissioned by Lendlease. This report is a very useful reference and describes the risks and
evacuation planning associated with Natural Flooding in the community. The DesignFlow (2016) study found that the Quinzeh Creek floodplain and main channel have sufficient capacity to accommodate the majority of minor floods. However, once floodwaters overtop road crossings, floodwaters breakout from the main channel, causing inundation of dwellings, sheds and yard areas.

DesignFlow (2016) has identified the cause of flooding from short duration rainfall, with the critical storm duration generally in between 1-4 hours. In the 100-year ARI storm event assessed by DesignFlow (2016), the flows within the main channel of Quinzeh Creek break out of the channel and onto the western overbanks. One of the key locations identified as a breakout point is at Pineview Road. Floodwaters in the overbank areas intersect public and private roadways, and result in above floor ponding for some properties. The properties inundated during these storm events have a safety risks.

Figure 1-4 shows the developed flood extents produced by DesignFlow (2016) for the 100-year ARI critical storm event. It is evident from this figure that existing properties, particularly around Pineview Road, are inundated during this storm event prior to considering possible upstream basin failures. The Failure Impact Assessment (FIA) undertaken by SMEC (2017), showed most of these properties did not trigger an incremental Population At Risk (PAR) as they are outside the failure impact zone. Some of the properties adjacent to the one house identified as PAR are included in the notification listing to allow for the occupants safe and effective evacuation during a Dam Hazard or Dam Emergency Event.

![Figure 1-4: 100-year ARI Flood Depth – Natural Flooding (Source: DesignFlow 2016)](image-url)
1.3. Previous Studies

The Expedition Road, Yarrabilba Detention Basin sizing including the hydrologic and hydraulic modelling was undertaken in Yarrabilba (Quinzeh Creek) Flood Study – Version 1 (DesignFlow, 2017) which forms the latest EDQ endorsed flood study for the Lendlease development within the Quinzeh Creek catchment portion of site.

More recently, Economic Development Queensland endorsed a Compliance Assessment Condition for Flood Warning (Ref DEV2016/821 Condition 26) by DesignFlow (2018). This assessment focused on the available warning times including hydraulic hazards at houses and roads in natural flood events (i.e. no basin breach).

In 2017, SMEC undertook an FIA in accordance with the Failure Impact Assessment Guidelines (State of Queensland, 2012) to assess the number of persons at risk if the Expedition Road, Yarrabilba Detention Basin were to fail, and to define the failure impact rating category. Two types of PAR were considered in the FIA- the population already at risk due to the existing flooding conditions (PAR), and the population that becomes newly at risk due to the failure of the upstream Expedition Road, Yarrabilba Detention Basin (incremental PAR).

The FIA identified an incremental PAR of 3 people (1 property) within the failure impact zone, meaning the structure is a referable dam with a Category 1 Failure Impact Rating. As the potential loss of life and damage is low, the basin satisfies the very low consequence conditions. The hydraulic hazard at the property identified with a PAR is low (depth velocity product of 0.2 m²/s) and the estimated Potential Loss of Life (PLL) is 0.005 persons. Based on ANCOLD (2014), this equates to a very low consequence category. Recent approvals by DNRME confirms that Expedition Road, Yarrabilba Detention Basin will satisfy the very low consequence conditions which are less onerous than the full set of conditions for high risk dams. The failure impact zone is generally limited to the areas adjacent to Precinct 3, just downstream of Expedition Road, Yarrabilba, where proposed properties are to be constructed above the PMF plus basin failure water levels.

The PAR was identified for the property at [redacted] as it satisfies the following criteria:

1. Within the failure impact zone.
2. the non-failure depth at the house slab is approximately 3 mm, while the failure depth is approximately 410 mm.

This EAP will consider the adjoining roads to this property to allow safe evacuation during a dam hazard or Dam Emergency Event. This EAP will not be limited to this one property. A generic evacuation plan for the Logan Village residents has been considered. It is noted that the proposed Yarrabilba Precinct 3 development is immune in a PMF failure scenario and therefore will not require evacuation.

1.4. Objectives of this Report

Lendlease has an obligation to ensure that the basin is incorporated as part of the proposed development, which pose a potential threat to the community, have adequate capacity and protection to prevent structural failure. This EAP has been prepared for the purpose of minimising the risk of harm to persons or property, if the Expedition Road, Yarrabilba Detention Basin were to fail. The EAP is to be implemented in line with the responsibilities of the Logan City Local Disaster Management Group (LDMG) pursuant to the Disaster Management Act 2003 (Qld).

The LDMG comprises of key staff from Logan City Council and are supported by liaison officers representing the SES, police and other relevant state agencies. The EAP is intended to provide the relevant information and planning to support decisions of the LDMG for potential dam failure emergency scenarios.

The overtopping events and therefore potential failure scenarios, are caused by long durations (greater than 9 hours) infrequent design events (100-year ARI) or rare (> 200-year ARI) short duration (<3 hours) events. The SMEC (2017) FIA showed that in rare flood events a basin failure did not have an incremental impact on downstream properties with local flooding dominating flood levels. For this reason, when considering flood warning for extreme events and short duration events the DesignFlow 2016 Interim Flood Warning and Retreat Study for Upper Quinzeh Creek study is more relevant. This EAP considers the infrequent (100 year ARI) long
duration flood events which have potential to overtop the basin and have an incremental impact on downstream properties.

1.5. Requirements
The EAP for Referable Dam Guideline (2017) by the Department of Natural Resources, Mines and Energy states that an EAP must meet the following requirements:

- be consistent with the Disaster Management Act 2003
- identify dam hazards, dam hazard events and dam emergency events
- state the processes to be followed to minimise the risk of harm to persons or property if a dam hazard event or emergency event for the dam happens (s 352E(2))
- state the roles and responsibilities of all parties during planning, activation and testing for an event
- state who (in priority order), when and how the notification and warning messages are to be delivered to persons who may be harmed or, whose property may be harmed
- state who (in priority order), when and how the dam owner will notify the relevant entities who have a role in the implementation of the EAP if and when a dam hazard event/s and/or a dam emergency event/s occur
- state the dam owners training schedule for EAP officers, local government/s and relevant disaster management personnel to effectively implement and test the effectiveness of the EAP
- demonstrate collaboration between dam owners and local government/s in the provision of education strategies tailored to the knowledge and experience of the downstream residents to provide knowledge and tools to become proactive and self-reliant during an emergency event
- demonstrate collaboration between dam owners, local governments and disaster management groups in the development of the EAP.
2. Dam Information

The basin location and ownership details are summarised in Table 2-1 and Table 2-2.

Table 2-1: Detention Basin Location

<table>
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<tr>
<th>DAM PROPERTY</th>
<th>VALUE</th>
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<tr>
<td>Name of Dam</td>
<td>Expedition Road, Yarrabilba Detention Basin</td>
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<tr>
<td>Location</td>
<td>27°49'04.00&quot;S, 153°07'35.00&quot;E</td>
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<tr>
<td>Locality Description</td>
<td>2.5 km east of Waterford-Tamborine Road</td>
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<tr>
<td>Watercourse</td>
<td>Quinzeh Creek</td>
</tr>
<tr>
<td>Status of Dam</td>
<td>Constructed</td>
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<tr>
<td>Low Level Outflow Culverts</td>
<td>3/1200 x 900 RCBC (US IL 24.8 m AHD) (0.3 m below basin invert)</td>
</tr>
<tr>
<td>High Level Outflow Culverts</td>
<td>2/3000 x 2400 RCBC (US IL 27.5 m AHD)</td>
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<td>Basin Invert Level</td>
<td>25.1 m AHD</td>
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<td>Embankment overtopping level</td>
<td>29.3 m AHD (Road Sag)</td>
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<td>Last Failure Impact Assessment</td>
<td>Completed by SMEC on 04/01/18</td>
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Table 2-2: Ownership and Contact Details

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<tr>
<td>Current Owner</td>
<td>Logan City Council</td>
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<tr>
<td>Owner Contact Details</td>
<td>150 Wembley Road, Logan Central Qld 4114</td>
</tr>
<tr>
<td></td>
<td>07 3412 3412</td>
</tr>
<tr>
<td>Waterworks License No. (issued)</td>
<td>N/A</td>
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3. Dam Location

A layout plan is included in Figure 3-1 which identifies key features. Flood 16 Basin embankment is located directly upstream of Expedition Road, Yarrabilba Detention Basin however it provides little attenuation due to the relatively large culvert configuration. Flood 16 Basin contributes to the overall storage capacity of Expedition Road, Yarrabilba Detention Basin.

Figure 3-1: Key Catchment Features (extracted from Design Flow 2017)
4. Dam Owner Responsibilities

In accordance with the Disaster Management Act 2003 (Qld), the Dam Owner is responsible for the following:

- Develop an EAP in consultation and collaboration with local government and disaster management group/s who may be affected by a dam hazard identified in the plan.
- Provide a copy of the EAP to each local government and disaster management group who may be affected by a dam hazard identified in the plan. These stakeholders have 30 business days to review the plan. The local government must provide a notice back to the dam owner within the 30 business days, the disaster management group may provide a notice, however it is not compulsory.
- The local government assessment notice of the EAP against the Disaster Management Plan and all notices received by the dam owner from the chairperson/s of the district (disaster management) group/s must be provided to DNRME at the time of EAP submission.
- Submit the EAP to the chief executive for assessment. The EAP must be accompanied by each notice given by a local government (must have), disaster management group for the plan (if received) and any notice responses by the dam owner.
- Maintain and update documents annually (before 1 October each year).
- Distribute current approved EAP to all parties listed in the distribution list.
- Respond in accordance with the approved EAP in all dam relevant incidents.
- Activate the EAP and maintain an incident log (including visual inspection of the dam and any notifications that have been made).
- Provide timely and accurate notifications to all relevant parties mentioned in the notification list in a relevant dam hazard event or emergency event.
- Report all incidents and failures in writing to the chief executive within forty-eight (48) hours of becoming aware of the incident or failure.
- Prepare Emergency Event Report (EER) and submit to the chief executive within 30 business days after the end of the emergency event.
- Ensure the Population at Risk (PAR) have an appropriate evacuation plan in the event of a dam failure.
- Ensure the Population at Risk (PAR) have an understanding of the purpose of the warning and notifications in the event of a dam emergency or dam hazard. The communication strategy to address the PAR is discussed in Section 5 of this EAP.
- Council are to ensure there is appropriate standards of procedure in place to:
  - Undertake periodic testing of EAP to ensure telephone numbers are correct and the notification priority list is logical. Make appropriate dam safety related decisions based on advice from a consulting engineer where appropriate. The dam owner is also responsible for authorising any immediate expenditure so that urgent repair work will not be delayed.
- Undertake regular on-site monitoring and visual inspection of the conditions at the dam. The dam owner is responsible for conducting a safety evaluation of the dam and to identify any deficiency in the dam’s safety. Where deficiencies exist, the dam owner is required to take appropriate steps to minimise the potential risk of dam failure from these deficiencies.

Council has nominated the Local Disaster Coordinator as the standby operator, of whom will undertake all the roles and responsibility of this EAP in the absence of Council’s Chief Executive Officer.
5. Warning and Communication Plan

5.1. Communication Modes

There are high community expectations that all dam owners will provide timely warnings and notifications of a dam hazard event or emergency event. For this reason, the Act requires the Dam Owner to state within the EAP when and how PAR and relevant entities will be contacted in the event of a dam emergency (including priority order).

The target audience of emergency warnings is the incremental PAR, as well as affected properties that are not classified as incremental PAR, however have a high flood risk. The purpose of the emergency warnings is to inform the target audience of an impending or current threat and promote an appropriate responsive action.

The key outcomes of an effective warnings are defined by the Emergency Management Assurance framework (Component 7) as:

- communities at risk of impact from an event are defined and can be targeted with contextualised warnings
- communities at risk of impact from an event, receive fit-for-purpose, consistent, accurate warnings through all phases of events.

Council’s multi-modal communication framework will be utilised to disseminate warnings as necessary. In line with the Disaster Management Act 2003 (Qld), determination of the most fit-for purpose communication method and implementation of warnings is the responsibility of the Logan City Local Disaster Management Group (LDMG).

The Queensland Fire and Emergency Services provides the Emergency Alert service which allows phone messages and text messages to be distributed based on a specific area of impact. Council may consider registering an Emergency Alert campaign for the target audience that may be used if the Expedition Road, Yarrabilba Detention Basin fails.

The Emergency Alert Campaign will be developed for Dam Hazard and Dam Emergency Events, and include:

- Advice
- Watch and Act
- Emergency Warning.

Activation of an Emergency Alert will be at the discretion of the Local Disaster Coordinator as a member of the Local Disaster Management Group. An example of the Emergency Alert text is shown in Table 5-2. The multi-modal warning model for Logan City Council is outlined in Table 5-2 and Table 5-3.

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<th>MEDIUM</th>
<th>MESSAGE TO BE CONVEYED</th>
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<tr>
<td>Advice</td>
<td>Voice Message</td>
<td>This is a Flood Advice from the Logan City Council. Areas near Expedition Road Yarrabilba are likely to experience rapidly rising water levels, and possible property inundation over the next 2 hours, posing a possible danger to residents. You should warn neighbours, secure your belongings, and move to higher ground now. For more information listen to local radio, or visit <a href="http://www.disaster.logan.qld.gov.au">www.disaster.logan.qld.gov.au</a></td>
</tr>
<tr>
<td></td>
<td>Text Message</td>
<td>Flood Advice from Logan City Council. Potential flood for properties near Expedition Rd Yarrabilba. Listen to local radio or visit <a href="http://www.disaster.logan.qld.gov.au">www.disaster.logan.qld.gov.au</a></td>
</tr>
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Watch and Act
Voice Message
This is a Watch and Act message from Logan City Council. Areas near Expedition Road Yarrabilba are likely to experience rapidly rising water levels, and property inundation over the next 2 to 5 hours, posing an immediate danger to residents. You should warn neighbours, secure your belongings, and move to higher ground now. For more information listen to local radio or visit www.disaster.logan.qld.gov.au

Text message

Emergency Warning
Voice Message
Emergency. Emergency. This is a Flood Warning from Logan City Council. Areas near Expedition Road Yarrabilba are likely to experience rapidly rising water levels, and property inundation over the next 5 hours, posing an immediate danger to residents. You should warn neighbours, secure your belongings, and move to higher ground now. For more information listen to local radio or visit www.disaster.logan.qld.gov.au

Text message
Emergency. Flood Warning. Properties near Expedition Rd Yarrabilba. Evacuate to higher ground. Warn neighbours. Listen to radio or visit www.disaster.logan.qld.gov.au

The Emergency Alert system utilises the Emergency Alert polygon specifically developed for this purpose. It is targeted at the community downstream of Expedition Road, Yarrabilba Detention Basin. The Emergency Alert polygon is shown in Figure 5-1. Limitations in the number of polygon vertices allowed by QFES under the Emergency Alert Guidelines mean any properties in the vicinity of the failure impact zone identified in the Failure Impact Assessment will receive specific warning message, with adequate time to evacuate or take refuge.

Table 5-2: Council’s Multi-Modal Communications Framework - general Communication

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<tr>
<th>GENERAL</th>
<th>More quickly disseminated</th>
<th>Logan-specific models</th>
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<td>Radio</td>
<td>Frequently Used</td>
<td>Media Release</td>
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<td>Television</td>
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<td>News bulletin</td>
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<td>Internet/web-based</td>
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<td>Disaster Dashboard and Council website</td>
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<td>Community notice boards</td>
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<td>Not considered effective in immediate instance for EAP</td>
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<td>Newspapers</td>
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<td>Not considered effective in immediate instance for EAP</td>
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Table 5-3: Council’s Multi-Modal Communications Framework- Specific Communication

<table>
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<tr>
<th>SPECIFIC</th>
<th>More quickly disseminated</th>
<th>Logan-specific models</th>
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<tbody>
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<td>Telephone</td>
<td>Frequently Used</td>
<td>Emergency Alert Campaign</td>
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<td>Computer</td>
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<td>Logan Early Warning</td>
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<td>Two-way</td>
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<td></td>
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<tr>
<td>Loud hailers</td>
<td></td>
<td>As per the activation and notification tables in Section 4 and Section 6, and in accordance with Local Disaster Coordination Centre Standard Operating Procedures (ID: 12191391)</td>
</tr>
<tr>
<td>Door knocking</td>
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More slowly disseminated
5.2. **Catchment Flooding Characteristics**

The FIA undertaken by SMEC (2017) tested a series of storm durations and events to represent the flooding characteristics in a breach and no-breach scenario. The modelling was completed to determine if the breaching of the basin would result in an incremental PAR (i.e. putting properties at risk who were previously not at risk). The TUFLOW assessment results indicated that the majority of the downstream properties are inundated in the 100-year ARI storm event without breaching of the basin (refer to Appendix A for relevant flood maps). One property was flagged as having an incremental PAR (defined as having a non-breach scenario flood depth approximately 0 mm and a breach scenario flood depth greater than 300 mm) and within the failure impact zone.

The Interim Flood Warning and Retreat Strategy for Upper Quinzeh Creek prepared by DesignFlow (2016) identifies the Quinzeh catchment as a ‘small flash flood catchment’, meaning that flood forecasting is not supported by BOM. The catchment’s main flood warning infrastructure is the flood monitoring station located on Quinzeh Creeks channel at Pineview Road (BOM reference ‘540726 Upper Quinzeh Alert’). The station is located adjacent to the incremental PAR identified in Table 5-5. Natural flooding will occur in response to short (1 hour) duration rainfall events- which results in limited effective flood warning time (typically from 1-2 hours between the time of peak rainfall and peak runoff) discussed in the Yarrabilba (Quinzeh Creek) Flood Study –
Version 1 by DesignFlow, 2017. As such, timely notification of affected downstream properties (PAR) is required for Expedition Road, Yarrabilba Detention Basin.

### 5.3. Notification Listing

A list of relevant agencies which will need to be notified upon breaching of Expedition Road, Yarrabilba Detention Basin are provided in Table 5-4.

*Table 5-4: Agency Notification*

<table>
<thead>
<tr>
<th>Notification Agency</th>
<th>Location</th>
<th>Contact Details</th>
<th>Notification Responsibility</th>
<th>Notification requirement</th>
<th>Priority Order</th>
</tr>
</thead>
<tbody>
<tr>
<td>SDCC Watchdesk (QFES)</td>
<td>Kedron, Brisbane</td>
<td></td>
<td>LDMG</td>
<td>Request Emergency Alert Release</td>
<td>1</td>
</tr>
<tr>
<td>Local Disaster Management Group</td>
<td>Logan</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Logan City Council (LDMG),</td>
<td>Logan</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
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<tr>
<td>Logan City Council</td>
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<td>Logan City Council</td>
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<tr>
<td></td>
<td></td>
<td>(07) 3412 3412</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(Council 24 hr number)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Queensland Police Service, District Disaster Coordinator (DDC)</td>
<td>Logan</td>
<td>Logan Police HQ</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(07) 3826 1888</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Version 1 by DesignFlow, 2017. As such, timely notification of affected downstream properties (PAR) is required for Expedition Road, Yarrabilba Detention Basin.

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<td>LDMG</td>
<td>Request Emergency Alert Release</td>
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</tr>
<tr>
<td>Local Disaster Management Group</td>
<td>Logan</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Logan City Council (LDMG),</td>
<td>Logan</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
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<tr>
<td>Logan City Council</td>
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<td>(07) 3412 3412</td>
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</tr>
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<td>Logan Police HQ</td>
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<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(07) 3826 1888</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
5.4. Downstream Affected Properties

The SMEC (2017) FIA TUFLOW modelling indicated that in the 100-year ARI storm event (low flow culvert 50% blockage, high flow culvert 25% blockage) breaching of Expedition Road, Yarrabilba Detention Basin will result in the incremental PAR of 1 house (equating to three people). The property is located downstream of Yarrabilba Precinct 3. In the 100-year ARI the property has a predicted non-failure flood depth of 3 mm, and a failure flood depth of 410 mm. The notification details of the incremental PAR are shown in Table 5-5 and are shown visually in Figure 5-1. The affected property (incremental PAR) in relation to the Expedition Road, Yarrabilba Detention Basin is shown in Figure 5-2.

For the purposes of developing the Emergency Action Plan, the PAR within the failure impact zone has been identified. To ensure disaster planning is effective, Council’s unique property identifier - ‘Property Key’ has been adopted for the purposes of identifying affected properties. The Property Key is integrated into Council GIS and operational tools.
### Table 5-5: Downstream Affected Properties (Incremental PAR)

<table>
<thead>
<tr>
<th>NAME</th>
<th>LOCATION</th>
<th>PROPERTY KEY</th>
<th>NOTIFICATION REQUIREMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Provide necessary information regarding the developing dam hazard event or emergency event at regular interval.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Immediately request to evacuate if the dam is likely to fail.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Engagement:</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>o Dam Hazard Event – ‘Watch and Act’ Emergency Alert</td>
</tr>
</tbody>
</table>

Additional properties have been included in the notification listing in Table 5-6 and are shown visually in Figure 5-1. Whilst the properties are not identified as incremental PAR from the SMEC (2017) FIA, they have been included as they are adjacent to the failure impact zone. A list of PAR within proximity to the incremental PAR is shown in Table 5-6 and shown in Figure 5-2.

### Table 5-6: Additional Downstream Flood Affected Properties

<table>
<thead>
<tr>
<th>NAME</th>
<th>LOCATION</th>
<th>PROPERTY KEY</th>
<th>NOTIFICATION REQUIREMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Provide necessary information regarding the developing dam hazard event or emergency event at regular interval.</td>
</tr>
<tr>
<td></td>
<td></td>
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<td>• Immediately request to evacuate if the dam is likely to fail.</td>
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<td></td>
<td></td>
<td></td>
<td>• Engagement:</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>o Dam Hazard Event – ‘Watch and Act’ Emergency Alert</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>o Emergency Event - 'Emergency Warning' Emergency Alert</td>
</tr>
</tbody>
</table>

1 The property key refers to Council's unique identifier, which is integrated into Council GIS and operational tools.
2 The property key refers to Council's unique identifier, which is integrated into Council GIS and operational tools.
5.5. Flood Evacuation Strategy

A flood evacuation strategy for the properties located within the notification polygon has been developed. The aim of the strategy is to inform the flood affected properties about suggested safe refuge areas. Affected properties are advised not to cross flooded roads. Refuge areas will not be formally staffed.

The identified PAR residing on Louise Court will be required to evacuate via Pineview Road to the west. It is noted in the Compliance Assessment Condition for Flood Warning (Ref DEV2016/821 Condition 26) by DesignFlow (2018) that evacuation from Louise Court is constrained by flooding over Pineview Road/Steele Road intersection and Pineview Road causeway. Figure 16 in Appendix A shows the 100 year ARI flood depths on Pineview and Steele Road under natural flooding conditions (i.e. non-breach case).

It is noted that Council may wish to enforce a regional flood evacuation strategy, and that the strategy identified in Figure 5-2 is for informative purposes only and may not be adopted by Council.
Figure 5-2: Evacuation Strategy of Properties within Alert Notification Polygon
Figure 5-3: Downstream Affected Properties (PAR)
6. Dam Hazard, Dam Hazard Event and Dam Emergency Event

Under the Act, the term dam hazard refers to a reasonable foreseeable situation or condition that may either:

- cause or contribute to the failure of the dam, if the failure of the dam may cause harm to People or property; or
- require an automatic or controlled release of water from the dam, if the release of water from the dam may cause harm to people or property.

The main purpose of an EAP is to minimise the risk of harm to persons and property if a dam hazard event or an emergency event for the dam happens. The difference between a ‘dam hazard event’ and an ‘emergency event’ will relate to the scale and severity of an event.

Under s 358A of the Act, the term dam hazard event is defined as an event arising from a dam hazard if:

- persons or property may be harmed because of the event
- a coordinated response involving two or more of the relevant entities mentioned in paragraphs (b) to (d) (in the Act) of the definition relevant entity is unlikely to be required to respond to the event
- the event is not an emergency event.

In other words, a dam hazard event is an event or a point in time, related to a dam hazard, when the dam owner plans to respond under the dam owner’s emergency action plan.

An emergency event for a dam is defined under s 358A of the Act as an event arising from a dam hazard if:

- persons or property may be harmed because of the event
- any of the following apply:
  - a coordinated response involving 2 or more of the relevant entities mentioned in paragraphs (b) to (d) (in the Act) of the definition ‘relevant entity’ is likely to be required to respond to the event
  - the event may arise because of a disaster situation declared under the Disaster Management Act
  - an entity performing functions under the State disaster management plan may, under that plan, require the owner of the dam to give the entity information about the event’.

The Emergency Action Plan for Expedition Road, Yarrabilba Detention Basin, considers the following specific dam hazard and emergency events relevant to the dam:

- flood event (leading to overtopping) including flood routing of design flood events from 50-year ARI to PMF
- terrorism or high energy impact.
7. Training

Responsible personnel within Logan City Council will receive appropriate dam safety training based primarily around "on the job" training in the maintenance of the dam in combination with practical exercising from time to time.

The training will aim to ensure that responsible personnel understand:

- the location, construction and other relevant Dam Information;
- the Emergency Action Plan;
- their role in the monitoring and activation of the Emergency Action Plan; and
- the dam safety routine inspection and surveillance procedures.

Training will include, but not be limited to:

- internal training and desktop exercising to test the effectiveness of the EAP - annually; and
- exercising of the EAP will occur at least every five years.
8. Monitoring

The watershed of the Expedition Road, Yarrabilba Detention Basin is approximately 630 ha (refer Figure A.1 in Appendix A). The basin attenuates flows significantly and as a result the critical duration for the basin is relatively long (> 9 hours) for the relatively small catchment size. It is important to consider available monitoring approaches for activation of the EAP and for community awareness and warning. Engagement with the PAR and the flood affected properties will include awareness of the relevant, available monitoring and warning tools.

As discussed previously, infrequent events for long durations are critical for this EAP assessment. The Bureau of Meteorology Intensity-Frequency-Duration chart indicates infrequent rainfall depths associated with the PAR are approximately 220 mm (100yr ARI 9hour total depth).

8.1. Rainfall Monitoring

The rainfall gauge (Upper Quinzeh Alert station #540726) located at Pineview Road, Logan Village is located 1.7km to the north of the Expedition Road, Yarrabilba Detention Basin and is the closest gauge to be monitored as an indication of rainfall totals in the catchment and to assist with determining the EAP activation.

8.2. Water Level Gauge

A water level gauge has been installed at Expedition Road, Yarrabilba Detention Basin to allow monitoring of water levels upstream of the Detention Basin embankment. The Expedition Road level gauge is monitored by Council’s River and Catchment Engineering staff via Council’s internal telemetry dashboard.

An additional water level gauge (Upper Quinzeh Alert rainfall station #540726) is located at Pineview Road, Logan Village. The gauge is located adjacent to the incremental PAR and does not offer advanced warning times for at risk properties, but may provide insights into peak water levels downstream of the Detention Basin.

8.3. Operations and Monitoring

The decision to activate the EAP should be guided by available information, including but not limited to:

- Forecasts issued by the Bureau of Meteorology;
- Condition assessments;
- Flood levels at the Detention Basin;
- Near-real-time closed circuit television of the spillway, monitored by River and Catchment Engineering as part of Council’s telemetry network; and
- Rainfall gauges.

Disaster operations, including response and recovery activities are to be implemented in line with the Logan City Local Disaster Management Plan and Council’s subordinate Flood - Standard Operation Procedure.
8.4. Inspections

In addition to the above monitoring process, routine inspections will be undertaken to minimise the risk of a dam hazard event occurring.

Logan City Council schedules and completes general inspections and detailed inspections as outlined in the Detailed Operation and Maintenance Manual. The frequency of inspections are in accordance with the dam safety conditions issued by the Queensland Government and are scheduled:

- General Inspection – yearly;
- Detailed Inspection – every five years; and
- By exception - following forecast of extreme rainfall in the area.

These inspections are undertaken by a suitably qualified and experienced engineer.

Inspections should seek to identify and monitor potential indicators of structural damage to the dam. There are many potential indicators of the structural damage to a dam. The significance of these will depend on the particular event and the circumstances at the dam.
9. EAP Activation

This EAP will be activated when a ‘dam hazard event’ or ‘dam emergency event’ occurs at Expedition Road, Yarrabilba Detention Basin and there is the potential for the dam to place persons and property at risk.

There may be no need to activate this EAP if minor incidents happen that will not endanger the integrity of the basin. However, minor incidents need to be investigated, monitored and adequate works completed to prevent further deterioration.

Section 8.2 provides event escalation tables for possible dam hazard and dam emergency events.

9.1. Emergency Management

The purpose and responsibility of Emergency Management is as follows:

- be alert to potential developments and maintain close vigilance during extreme events or perceived abnormal behaviour of the dam
- maintain safety requirements at all times during response actions
- take actions as outlined in the event escalation tables
- maintain communication equipment in working order.

A list of accountable officers and their contact details are shown in Table 8-1.

<table>
<thead>
<tr>
<th>Accountable Officer</th>
<th>Acronym</th>
<th>Contact</th>
</tr>
</thead>
<tbody>
<tr>
<td>River and Catchment Engineering Program Leader</td>
<td>RCE</td>
<td></td>
</tr>
<tr>
<td>Disaster Management Program Leader</td>
<td>DM</td>
<td></td>
</tr>
<tr>
<td>Roads Maintenance Program Leader</td>
<td>RCM</td>
<td></td>
</tr>
<tr>
<td>Local Disaster Coordinator</td>
<td>LDC</td>
<td></td>
</tr>
</tbody>
</table>

9.2. Event Phases and Warning Times

The Emergency Action Plan for Referable Dam Guideline (2017) states that communities living downstream of dams may have an expectation that they will be notified as soon as possible when dam issues emerge, during the event and when the event has concluded. In consultation with local government/s, dam owners will need to develop notification and warning messages including frequency of messages that will address community expectations.

There are four phases of an event, including: Alert, Lean Forward, Stand Up and Stand Down (as shown in Figure 8-1). Generally, EAP notification and warning messages continue through all phases of the event until the event is over. However, the frequency may depend on outcomes of community consultation to be held by Lendlease.

![Figure 9-1: Four Phases of an Event. Source: Emergency Action Plan for Referable Dam Guideline (2017)](image-url)
An assessment on the water elevation level over time indicates the following:

- That the basin fills to \( \frac{3}{4} \) of the crest elevation within the first 2-hours of the 100-year ARI critical 9-hour duration storm event.
- At an elevation of 28.0 m AHD, the ‘Alert’ phase of the EAP will be activated.
- From a period of 2-hours to 5-hours the rate of elevation rise in the basin slows.
- The ‘Lean Forward’ phase of the EAP is activated at 28.5 m AHD.
- The ‘Stand Up’ alert phase is to be activated upon gauge readings in the basin reaching 29.0 m AHD, 0.3 m below the Dam crest (Road Sag). There is approximately one-hour between the ‘Stand Up’ alert activation and breaching of the basin, as shown in Figure 8-2. The ‘Stand Down’ phase will be initiated when the basin’s water elevation level reduces to 28.0 m AHD. The flood extents for the 100-year ARI storm event, as well as the 85-year, 200-year, 500-year and PMF storm events can be found in Appendix A.

![Figure 9-2: Flood Elevation vs Time for the Dam Crest Flood 100yr ARI (Including Blockage) at Basin](image)

A comparison of hydrographs directly downstream of the basin and at the downstream affected properties was undertaken to predict the available warning time given to the PAR in between their notifications and the peak of the critical storm occurring at their location.

As shown in Figure 8-3, there is a 5.5 hour time period between the initial notification to PAR and the peak flow rate at the affected downstream property. There is a predicted 2-hour period in between the ‘Emergency Alert’ notification (as described in Section 5.1 of this report) and the peak flow rate at the affected downstream property. This notification strategy will provide ample time for a safe and effective evacuation from the flood affected area. Figure 8-3 also shows that there is only 45 minutes between the failure at the basin occurring and the flood wave reaching the affected downstream property and therefore warnings will be required before the potential failure.
As discussed in the Compliance Assessment Condition for Flood Warning (Ref DEV2016/821 Condition 26) by DesignFlow (2018) the roads (egress routes) from the subject area in and around Pineview/Steele Road are rapidly inundated from the flashy nature of the major flood event in side tributaries which occurs well before the peak of the flood within the main Quinzeh Creek.

Figure 9-3: Hydrograph Comparison at Basin Outlet and Downstream Affected Property
### 9.3. Dam Hazard Event and Emergency Event Escalation Table

**Table 9-2: Flooding Events Notifications and Actions**

<table>
<thead>
<tr>
<th>Responsibility</th>
<th>Accountable Officer</th>
<th>Contact</th>
</tr>
</thead>
<tbody>
<tr>
<td>RCE</td>
<td>River and Catchment Engineering Program Leader</td>
<td></td>
</tr>
<tr>
<td>DM</td>
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<td>RCM</td>
<td>Roads Maintenance Program Leader</td>
<td></td>
</tr>
<tr>
<td>LDC</td>
<td>Local Disaster Coordinator</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Emergency level</th>
<th>Characteristics (Trigger)</th>
<th>Actions</th>
</tr>
</thead>
</table>
| ALERT           | Basin gauge reading is at 28.0 m AHD - 3.2 m above basin invert (0.5m depth in high flow culverts) – (Spillway 1). OR | Liaise with DM if required. request Advice Notification for PAR  
If requested by Dam Owner, seek approval from SDCC/QFES for release of EA Advice Notification  
Advice Notification to Incremental PAR and surrounding flood affected properties alerting them to the situation. The intent of the message is to advise PAR that there is no immediate danger however, they should keep themselves up-to-date with developments  
If EA notification required, seek approval from SDCC/QFES for release of EA Notification  
Preliminary Warning Watch and Act:  
Update notifications to those who received previous notifications plus notifications to the chief executive and those who might be impacted by increasing spillway discharges.  
The message should convey that it is likely that they will be impacted by the emergency. That they will be in danger and should start taking action to protect their life and that of their family.  
Updates should be scheduled for example, to be provided every four hours, but may need to be more frequent when deemed appropriate | Monitor rainfall gauges at Upper Quinzeh Alert station.  
Monitor water level rises at the dam spillway and provide updates to DM and Dam Owner every 12 hours.  
Notify the LDC of potential to activate lean forward arrangements.  
In consultation with the LDC liaise with emergency services to advise of potential future situation.  
As for the above, however provide updates to DM and the Dam Owner every 2 hours or when deemed appropriate  
Recommend to the LDC for activation of the LDC if triggers are met.  
Liaise with emergency services at the direction of the LDC.  
As above, updates expected every 24 hours or as determined by the LDC/LDMG.  
Prepare to support with road closures if required. |
| LEAN FORWARD    | Culvert flows increasing but as yet are unlikely to impact on downstream PAR and infrastructure. AND Basin gauge reading is at 28.5 m AHD - 3.7 m above basin invert (1 m depth in high flow culverts) – (Spillway 1). AND No signs of overtopping. AND Rainfall radar intensities in the vicinity of the dam and in the direction of the dam exceed 100 mm. | Continue monitoring the issue.  
Notify LDMG of a change of activation.  
If EA notification required, seek approval from SDCC/QFES for release of EA Notification  
Preliminary Warning Watch and Act:  
Update notifications to those who received previous notifications plus notifications to the chief executive and those who might be impacted by increasing spillway discharges.  
The message should convey that it is likely that they will be impacted by the emergency. That they will be in danger and should start taking action to protect their life and that of their family.  
Updates should be scheduled for example, to be provided every four hours, but may need to be more frequent when deemed appropriate |
<table>
<thead>
<tr>
<th>Emergency level</th>
<th>Characteristics (Trigger)</th>
<th>Actions</th>
</tr>
</thead>
<tbody>
<tr>
<td>STAND-UP</td>
<td>Recorded rainfall at the Upper Quinzeh Alert rainfall station (#540726) exceeds 200 mm within the last 9 hours. OR Basin failure is initiated. OR Culvert discharge increasing with flows that are likely to impact on downstream PAR and infrastructure. AND If flood activity continues a basin failure may occur due to overtopping. OR Basin gauge reading is greater than 29.0 m AHD (0.3 m below road overtopping level).</td>
<td>Liaise with the DM and Chair of the LDMG as appropriate. Advise the chief executive of dam failure as soon as reasonably possible after those who are likely to be affected are notiﬁed. Notify the Dam Safety Regulator of emergency event. Notify LDMG of a change of activation. If EA notiﬁcation required, seek approval from SDCC/QFES for release of EA Notiﬁcation. <strong>Prepare to take action messages</strong> to all relevant entities and PAR as listed in Section 5.4. Notify downstream PAR as listed in Section 5.4 using emergency warning alert. Updates expected every 1 hour or as determined by the LDC/LDMG. As for the above, however provide updates every hour or when deemed appropriate by the LDC/LDMG. As above, with increased frequency as determined by the LDC/LDMG.</td>
</tr>
<tr>
<td>STAND-DOWN</td>
<td>- Rainfall ceases and dam levels falling</td>
<td>Prepare emergency event report to the Dam Safety Regulator (see Section 10). Issue a final notiﬁcation advising the end of the emergency event. Advise DM and the Dam Owner that the basin level has fallen to 28.0 m AHD. Confirm that there’s no risk of dam failure. Confirm that there’s no risk of basin failure. Remedial works as required.</td>
</tr>
</tbody>
</table>

As above, potentially remotely, with increased update every 6 hrs or as determined by the Dam Owner and LDC. Prepare to support with road closures if required.
9.4. **Terrorist of High Energy Impact**

In the unlikely event that a terrorist activity occurs during a flood event, Council’s Disaster Management Plan specifies that the following actions are recommended:

- immediately report the incident to Queensland Police Service by calling 000
- report the incident to National Security Hotline by calling 1800 123 400
- take photographs of the damage or incident site
- if possible and safe to do so, record and photograph unusual vehicle details including registration, description, time, date etc.
- barricade the impacted area to enable the incident site to be inspected and investigated
- conduct a dam safety inspection.
10. Emergency Event Report

In accordance with the Act and the Dam Standard Operating Procedures, the dam owner will prepare an emergency event report (EER) and submit it to the chief executive within 30 business days (or another period agreed in writing with the chief executive) at the conclusion of an emergency event which has resulted in the activation of the EAP, where:

- a person or property has been or may have been harmed because of the event
- any of the following applies:
  - a coordinated response involving two or more relevant entities
  - an event arose because of disaster situation declared under the Disaster Management Act Queensland (2003)
  - an entity performing functions under the State Disaster Management Plan, required the dam owner to provide information about the event.

An emergency event ends when the dam hazard, that triggered the event, no longer presents a material risk to persons or property.

The EER is to provide a timeline of events, including monitoring and inspection data (rainfall, seepage etc.), which were used to make EAP activation decisions. The EER should also outline responsibilities associated with emergency communications between the dam owner, governments (local and state), disaster management groups (local and district) and the PAR and the wider community (if relevant). The EER should include photographs of the event.
11. Appendix A Maps

The following maps are provided in this section:

- Catchment Map
- 85-year ARI Flood Depth Map – Non-breach case
- 85-year ARI Flood Depth Map – Breach case
- 85-year ARI Failure Impact Map – Breach case
- 100-year ARI Flood Depth Map – Non-breach case
- 100-year ARI Flood Depth Map – Breach case
- 100-year ARI Failure Impact Map – Breach case
- 200-year ARI Flood Depth Map – Non-breach case
- 200-year ARI Flood Depth Map – Breach case
- 200-year ARI Failure Impact Map – Breach case
- 500-year ARI Flood Depth Map – Non-breach case
- 500-year ARI Flood Depth Map – Breach case
- 500-year ARI Failure Impact Map – Breach case
- PMF- Flood Depth Map – Non-breach case
- PMF - Flood Depth Map – Breach case
- PMF - Failure Impact Map – Breach case
- 85-year ARI Flood Depth Map – Non-breach case.
- 100-year ARI Flood Depth Map – Non-breach case
- 200-year ARI Flood Depth Map – Non-breach case
- 500-year ARI Flood Depth Map – Non-breach case
- PMF - Flood Depth Map – Non-breach case
Catchment Map
85-year ARI Flood Depth Map – Non-breach case
85-year ARI Failure Impact Map - Breach case
100-year ARI Flood Depth Map - Non-Breach Case

Legend:
- Properties
- Precinct 3 Proposed Lot Layout
- Cadastral Boundary

Depth (mm):
- 0 to 300
- > 300

 EXPEDITION ROAD
YARRABILBA DETENTION BASIN

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FIGURE TITLE: 100YR ARI FLOOD DEPTH MAP (300mm CUT-OFF) - NON-BREACH CASE
PROJECT TITLE: LOW FLOW CUVERT (50% BLOCKAGE)/HIGH FLOW CUVERT (25% BLOCKAGE)
PROJECT NO: 30031993
FIGURE NO: 4
DATE: 10-07-2019
CREATED BY: S.C.
SOURCES: NEARMAP PTY LTD
COORDINATE SYSTEM: GDA 94 / MGA ZONE 56
PAGE SIZE: A4
SCALE: 1:30000

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CONSULTANT: SMEC AUSTRALIA PTY LTD

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ABN 47 005 475 140

Approved: 11 October 2019
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100-year ARI Failure Impact Map - Breach Case

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200-year ARI Flood Depth Map - Non-breach case

LEGEND
- Properties
- Precinct 3 Proposed Lot Layout
- Cadastral Boundary
- Depth (mm)
  - 0 to 300
  - > 300

EXPEDITION ROAD
YARRABILBA DETENTION BASIN

200YR ARI FLOOD DEPTH MAP (330mm CUTOFF) - NON-BREACH CASE
LOW FLOW CULVERT (0% BLOCKAGE)/HIGH FLOW CULVERT (5% BLOCKAGE)
YARRABILBA FIA

FIGURE TITLE: 200YR ARI FLOOD DEPTH MAP (330mm CUTOFF) - NON-BREACH CASE
PROJECT TITLE: LOW FLOW CULVERT (0% BLOCKAGE)/HIGH FLOW CULVERT (5% BLOCKAGE)
PROJECT NO: 30031093
FIGURE NO: 7
DATE: 10-07-2019
CREATED BY: S.C.
SOURCES: NEARMAP PTY LTD
COORDINATE SYSTEM: GDA 94 / MGA ZONE 56
PAGE SIZE: A4
SCALE: 1:30000

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200-year ARI Flood Depth Map - Breach case
200-year ARI Failure Impact Map - Breach case

**LEGEND**
- Properties
- Cadastral Boundary
- Precinct 3 Proposed Lot Layout
- Failure Impact Zone (mm)
- > 300
- Flood Extent Increase (due to breach)
- Was dry, now wet
- Flood Extent

**FIGURE TITLE:** 200YR ARI FAILURE IMPACT MAP - BREACH CASE

**PROJECT TITLE:** YARRABILBA FIA

**PROJECT NO.:** 30031993

**FIGURE NO.:** 9

**DATE:** 10-07-2019

**CREATED BY:** S.C.

**SOURCES:** NEARMAP PTY LTD

**COORDINATE SYSTEM:** GDA 94 / MGA ZONE 56

**PAGE SIZE:** A4

**SCALE:** 1:30000

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**EXPERIENCE ROAD**

**YARRABILBA DETENTION BASIN**

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500-year ARI Flood Depth Map - Non-breach case
500-year ARI Flood Depth Map - Breach case

FIGURE TITLE: 500YR ARI FLOOD DEPTH MAP (300mm CUTOFF) - BREACH CASE
PROJECT TITLE: YARRABILBA HA
PROJECT NO: 30031993
FIGURE NO: 11
DATE: 10-07-2019
CREATED BY: S.C.
SOURCES: NEARMAP PTY LTD
COORDINATE SYSTEM: GDA 94 / MGA ZONE 56
PAGE SIZE: A4
SCALE: 1:30000

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500-year ARI Failure Impact Map - Breach case
PMF- Flood Depth Map - Non-breach case

Figure Title: PMF FLOOD DEPTH MAP (300mm CUTOFF) - NON-BREACH CASE
Low Flow Cuirvert (0% Blockage)/High Flow Cuirvert (0% Blockage)

Project Title: YARRABILBA HA
Project No.: 30031993
Figure No.: 13
Date: 10-07-2019
Created by: S.C.
Sources: NEARMAP Pty Ltd
Coordinate System: GDA 94 / MGA Zone 56
Page Size: A4
Scale: 1:30000

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PMF- Flood Depth Map - Non-breach case
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PMF- Flood Depth Map - Breach case

EXPEDITION ROAD
YARRABILBA DETENTION BASIN

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100-year ARI Flood Depth Map - Non-breach case
200-year ARI Flood Depth Map - Non-breach case

 EXPEDITION ROAD
 YARRABILBA DETENTION BASIN

LEGEND
Properties
Precinct 3 Proposed Lot Layout
Cadastral Boundary

Depth (m)
0 - 0.25
0.25 - 0.5
0.5 - 1
1 - 2
> 2

FIGURE TITLE: 200YR ARI FLOOD DEPTH MAP - NON-BREACH CASE
PROJECT TITLE: YARRABILBA FIA
PROJECT NO: 30031993
FIGURE NO: 18
DATE: 15-07-2019
CREATED BY: S.C.
SOURCES: NEARMAP PTY LTD
COORDINATE SYSTEM: GDA 94 / MGA ZONE 56
PAGE SIZE: A4
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500-year ARI Flood Depth Map - Non-breach case
PMF Flood Depth Map - Non-breach case

LEGEND
- Properties
- Precinct 3 Proposed Lot Layout
- Cadastre Boundary

Depth (m)
- 0 - 0.25
- 0.25 - 0.5
- 0.5 - 1
- 1 - 2
- > 2

EXPEDITION ROAD
YARRABILBA DETENTION BASIN

FIGURE TITLE: PMF FLOOD DEPTH MAP - NON-BREACH CASE
PROJECT TITLE: YARRABILBA HA
PROJECT NO.: 30031993
DATE: 15-07-2019
CREATED BY: S.C.
SOURCES: NEARMAP Pty Ltd
COORDINATE SYSTEM: DGDA 94 / MGA ZONE 56
PAGE SIZE: A4
SCALE: 1:300000

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