



# NSW NORTH COAST FLOOD SUMMARY MARCH 2017

Report MHL2535  
May 2017

Prepared for:



Additional data provided by:



Australian Government  
Bureau of Meteorology



**TWEED**  
SHIRE COUNCIL



**ballina**  
shire council



**lismore**  
city council



**North Byron  
Parklands**



Byron Shire Council

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# Foreword

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NSW government's professional specialist advisor, Manly Hydraulics Laboratory (MHL) was commissioned by NSW Office of Environment and Heritage (OEH) to summarise the March 2017 flood event on the New South Wales (NSW) north coast. The area of focus for this flood report includes the Tweed, Brunswick, Upper Rous, Richmond and Wilsons River regions. OEH manages an extensive data network in the NSW coastal zone. MHL operates and maintains the coastal data network with an annual contract to OEH.

Additional flood data is provided by WaterNSW (formerly Department of Primary Industries Water), Bureau of Meteorology, Tweed Shire Council, Byron Shire Council, Ballina Shire Council, North Byron Parklands and Lismore City Council.

An electronic copy of this report can be downloaded at [www.mhl.nsw.gov.au](http://www.mhl.nsw.gov.au).

Please note that all data has only had preliminary checks performed and data in this report is not quality controlled to a specified error margin. The data for OEH/MHL and WaterNSW stations are presented as 15 minute time series data and are recorded to Eastern Standard Time (EST). While all other data is event based and is recorded in Eastern Daylight Savings Time (EDST). Quality controlled data for MHL maintained stations can be supplied once field status checks have been conducted post flood through data request to MHL. Water level values in this report are reported to 2 decimal places, which is not necessarily an indication of accuracy.

## Executive summary

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In March 2017 heavy rainfall and strong winds occurred in northern New South Wales (NSW). A low in the Coral Sea reached Category 3 strength on 27 March 2017 and was named Cyclone Debbie. The cyclone reached the Queensland coast on 28 March 2017. Cyclone Debbie delivered significant rainfall and damaging to destructive winds as it travelled west-southwest through Queensland. The system then tracked in a south-easterly direction and impacted the far northern NSW coast and adjacent ranges on Thursday 30 March 2017 and Friday 31 March 2017, with very heavy rainfall and high winds. Ex-tropical cyclone Debbie then moved out into the Southern Coral Sea on Friday 31 March.

During the flood event MHL staff monitored flood situations via telemetry tools and provided clients and the public with near real time access to the rainfall and water levels via the Bureau of Meteorology (BoM) website [www.bom.gov.au/nsw/flood](http://www.bom.gov.au/nsw/flood) and NSW Government's Floods Near Me app <http://floodsnearme.manly.hydraulics.works/>, which displays latest recordings for water level recording stations. The MHL data management system experienced an outage on 31 March 2017, which prevented the presentation of data on the MHL website and as such Council and NSW State Emergency Service (SES) staff were directed to use the BoM website and the Floods Near Me app. MHL deployed a field team to the flood affected area to obtain flood status checks, in addition MHL's data team relayed critical data to users during the outage.

During the flood event, the BoM used water level and rainfall data, quantitative precipitation forecasts and radar information to generate predicted water levels at warning locations on the flood-affected rivers. The water level predictions were used by the BoM to issue flood watches, flood warnings and severe weather warnings for heavy rain and local flooding.

During the 30 March to 1 April 2017 flood event the Tweed River at North Murwillumbah and Billinudgel, the Richmond River at Kyogle, Coraki and Bungawalbin, and the Wilsons River at Lismore experienced a major flood event, based on the SES flood height classifications. On the Tweed River, Barneys Point (2.22m AHD peak water level), Billinudgel (4.45m AHD peak water level) and Murwillumbah Bridge (5.84m AHD peak water level) experienced their highest recorded water level, with the record beginning in 1987, 1986 and 2002 respectively. On the Richmond River, Coraki (5.97m AHD peak water level) experienced its highest recorded water level since the record began in 1987. The highest rainfall depths recorded in a 24 hour period were 747.0mm at Couchy Creek, 674.0mm at Numinbah, 663.0mm at Chillingham and 638.0mm at Eungella.

This flood event was the first time that the levee bank at Lismore was breached since its construction was completed in 2005. The levee is a 3km long wall with a height of around 11m AHD. During the flood event the water level gauge, Wilsons River at Lismore (203904), recorded a peak of 11.58m AHD; the levee overtopped causing major flooding throughout Lismore CBD.

This report presents water level, wave and rainfall hydrometric data collected during 14 March 2017 to 7 April 2017 in the north coast region of NSW. The extended period presented is to highlight the impact that the rainfall from the week preceding had on the behaviour of the river water levels at the time of the flood. This report incorporates water level and rainfall data provided from the BoM, WaterNSW, Tweed Shire Council, Ballina Shire Council, Byron Bay Shire Council, Lismore City Council and North Byron Parklands. Data presentation was undertaken by MHL for

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# 1. Introduction

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In March 2017 a tropical low pressure system developed over the Coral Sea and moved southwest towards Queensland. As the system moved back out to sea on Friday 30 March 2017 it brought widespread rainfall and flooding to the far north coast of NSW. Flood warnings were issued by the BoM for the NSW coast from the Queensland border to the Nambucca Valley and included the Tweed, Brunswick, Richmond, Wilsons, Clarence, Bellinger and Nambucca river valleys.

**Figure 1-1** presents atmospheric pressure charts and radar images at 00:00 on 27 March to 1 April 2017. **Figure 1-2** shows the total rainfall recorded across NSW during March 2017. **Figure 1-3** displays wind roses for Coolangatta (040717), Ballina (058198) and Evans Head (058212) for 14 March 2017 to 7 April 2017, where the strongest winds blew from the south to south-south-west, with maximum wind gusts of 81km/h recorded on 31 March 2017 at Coolangatta.

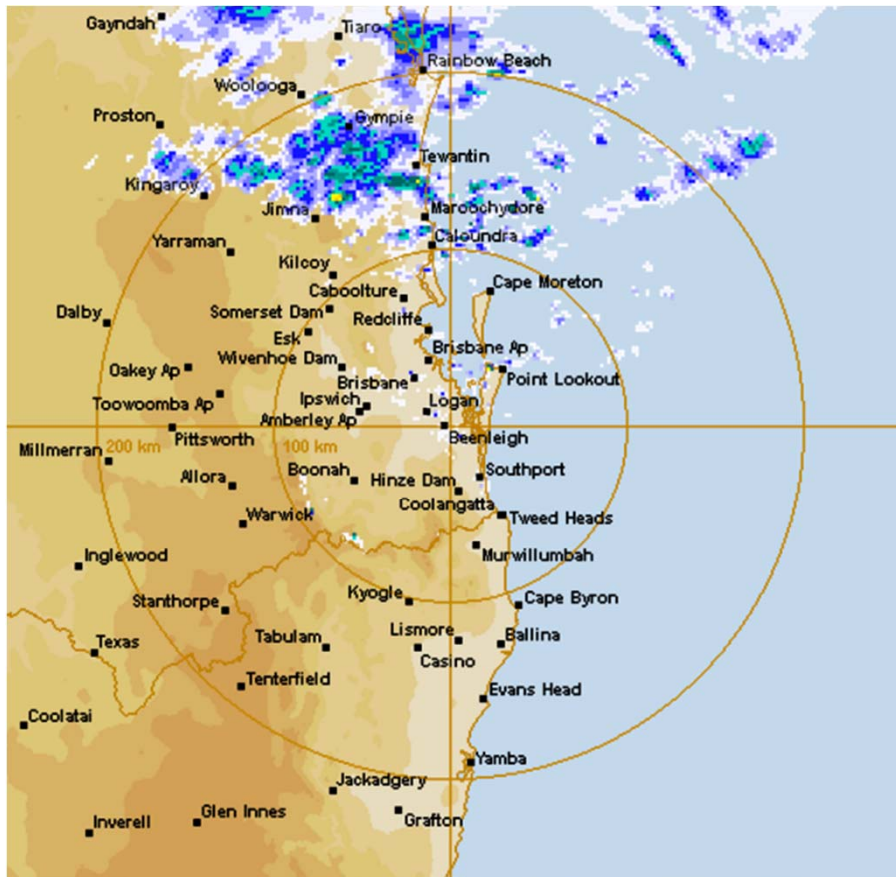
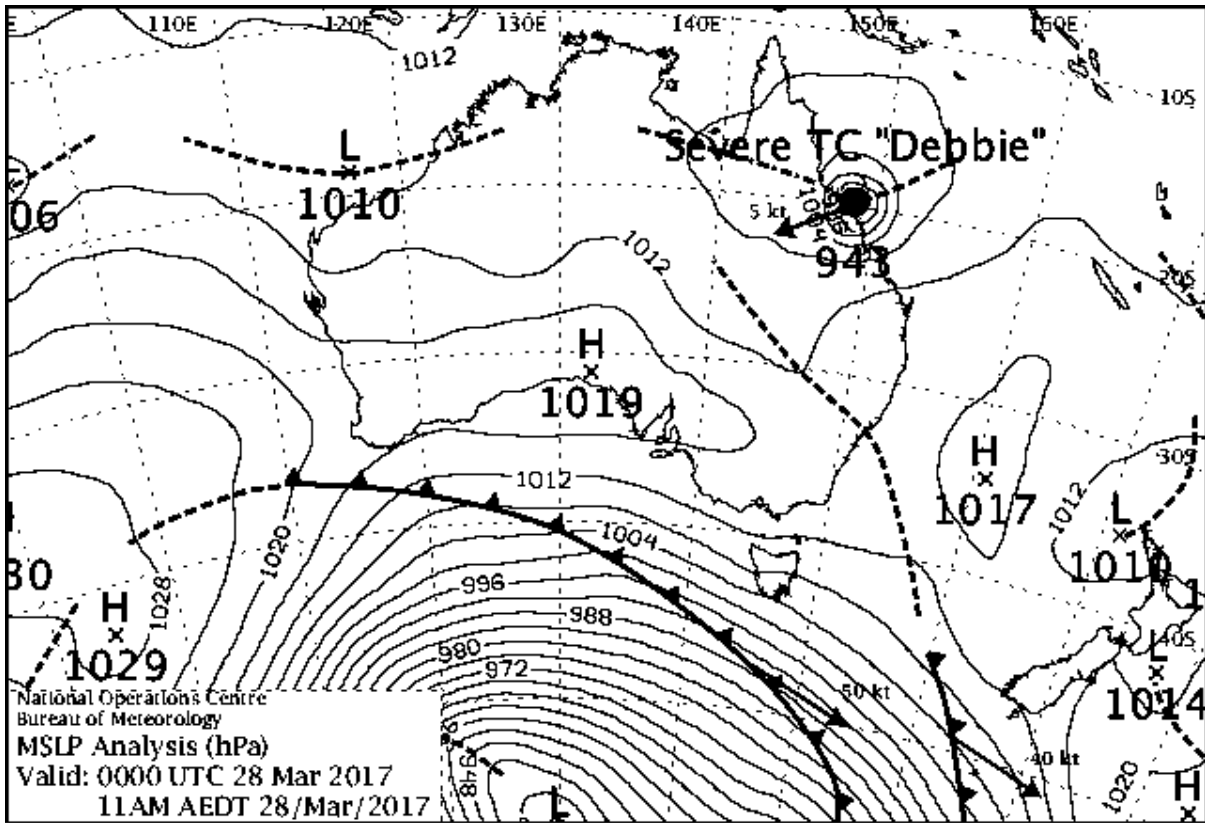
During the flood event, the monitoring networks of water level recorders and rainfall gauges operated by MHL, on behalf of the OEH, were used extensively by the BoM, the SES and local councils to generate flood warnings, emergency response and delivery of flood related services. Rainfall and water level data captured during the event is summarised by river region in Section 4 to 6 of this report. Station performance during the event is summarised in Appendix A. Photographs taken during the event are presented in Appendix B.

OEH commissioned MHL to prepare a report to summarise the March 2017 flood event, which includes supplementary flood data provided from BoM, WaterNSW, Tweed Shire Council, Ballina Shire Council, Byron Shire Council, North Byron Parklands and Lismore City Council.

Rainfall intensity frequency duration (IFD) curves have been generated using the Australian Rainfall and Runoff 1987 (ARR1987) format in millimetres per hour. In addition, IFD curves have been generated using the new IFD format, Australian Rainfall and Runoff 2016 (ARR2016), with results in millimetres (refer to Appendix C). This will allow this flood summary report to be comparable with past reports and future reports as agencies transition the IFD format to the ARR2016 version.

It is noted that data from at least 11 of the rainfall stations supplied by the BoM are affected by a severe loss of resolution, possibly caused by interruptions to radio signals during the event. In cases where this loss of resolution has affected the intensity frequency duration curves, the short duration event values have been removed as they are misleading. Impacted stations are noted. In addition, missing or incomplete supplied data is also noted. For third party stations, including those supplied by the BoM, it is recommended that further analysis is undertaken prior to interpretation and use of this data for decision making. Please contact the BoM for short duration statistics.

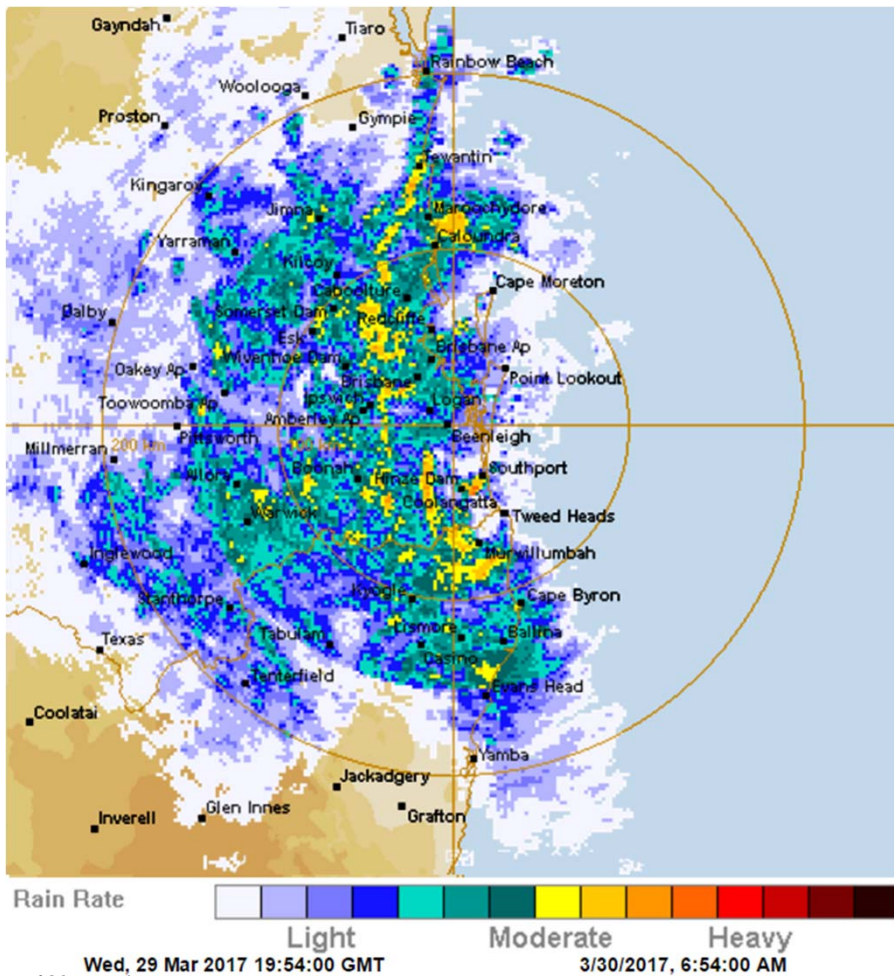
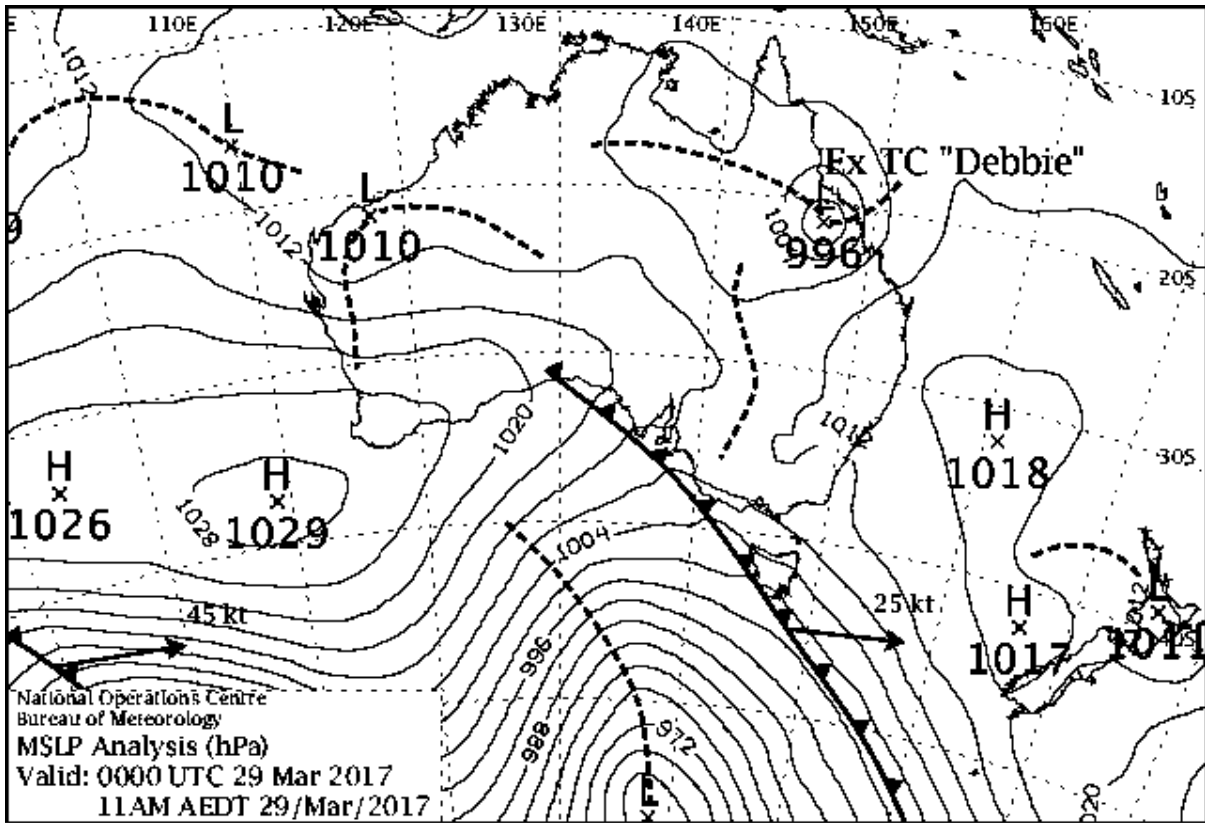
Please refer to Appendix D for convert WaterNSW's water level gauges from local gauge datum to Australian Height Datum (AHD).



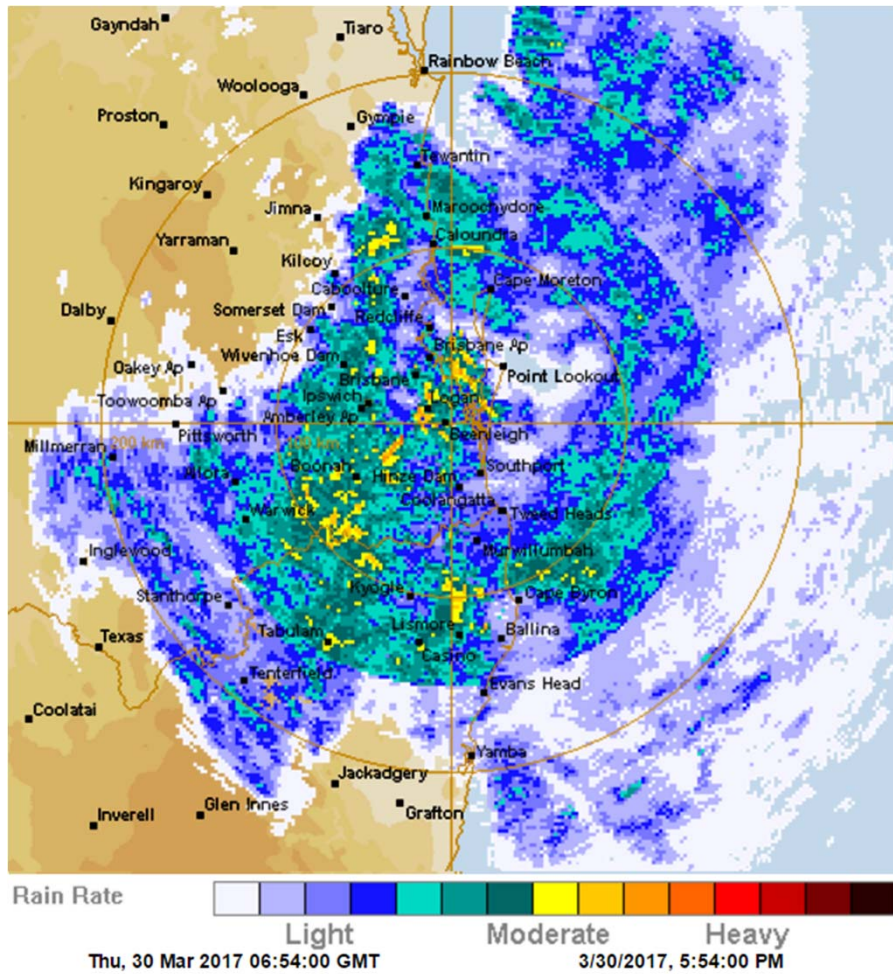
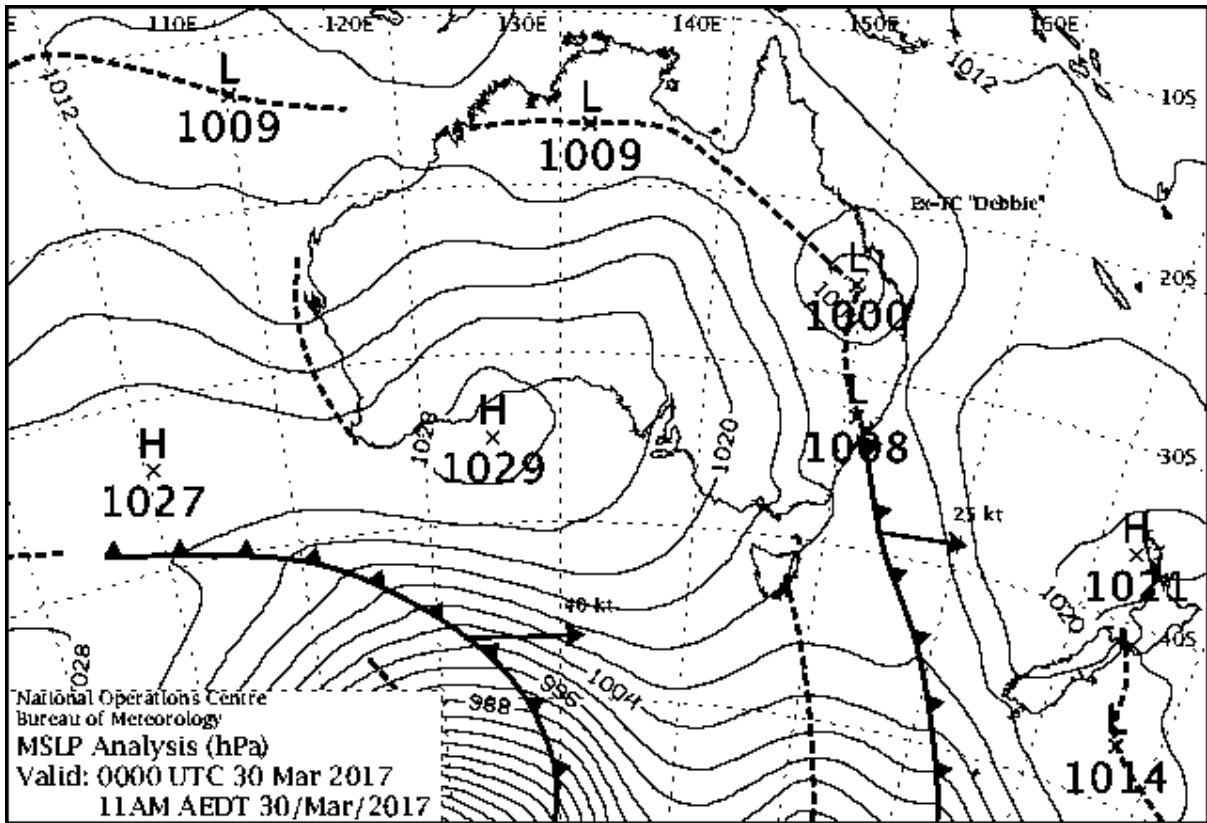
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3/29/2017, 10:48:00 AM

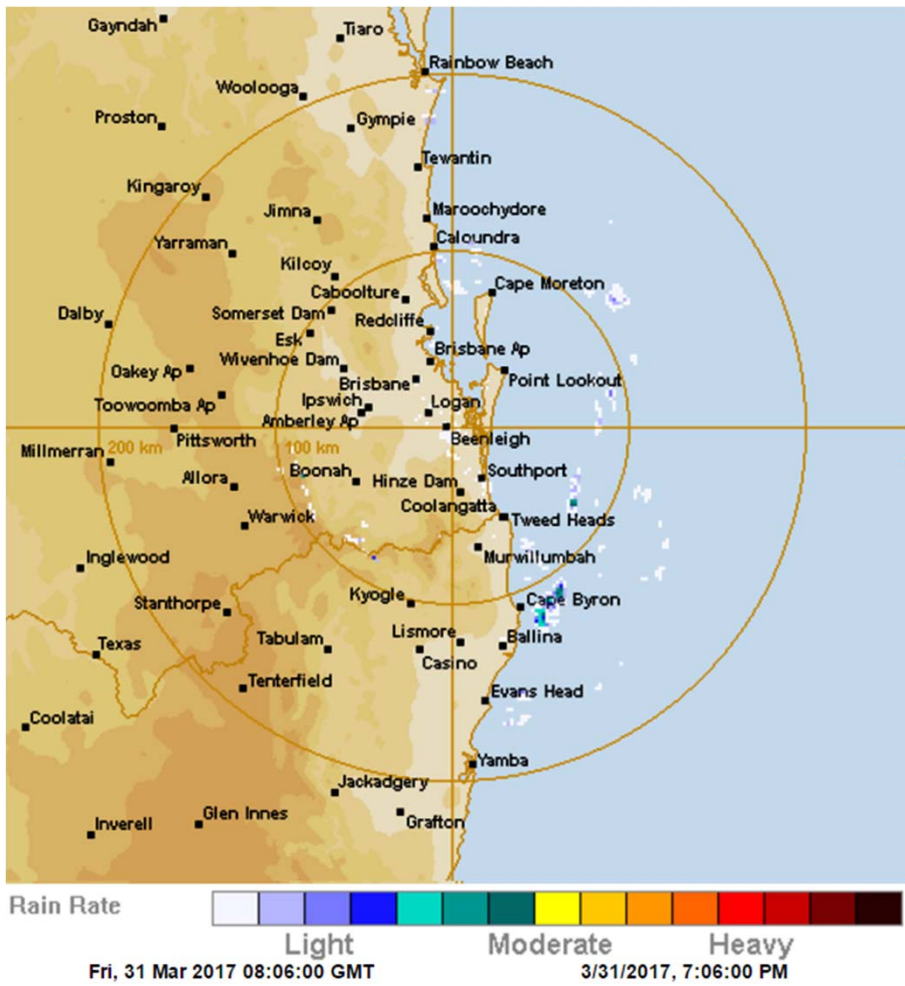
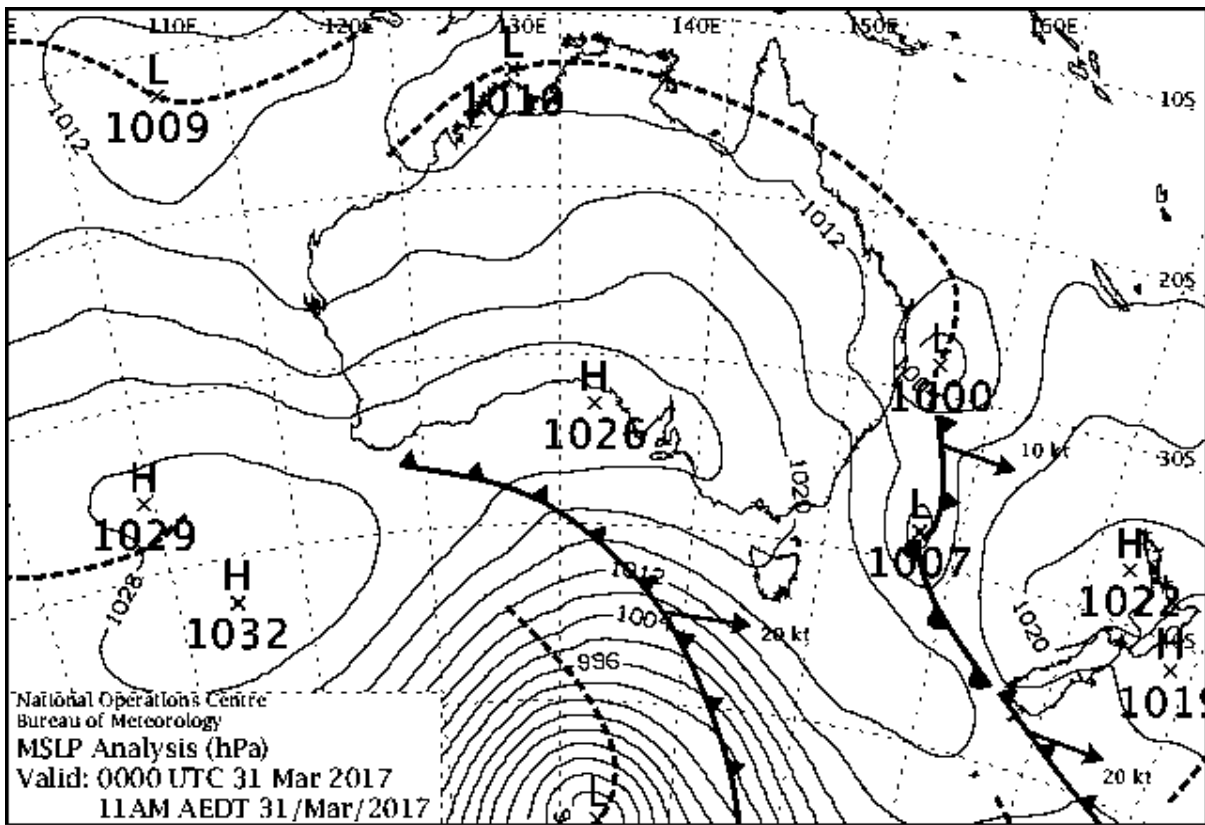
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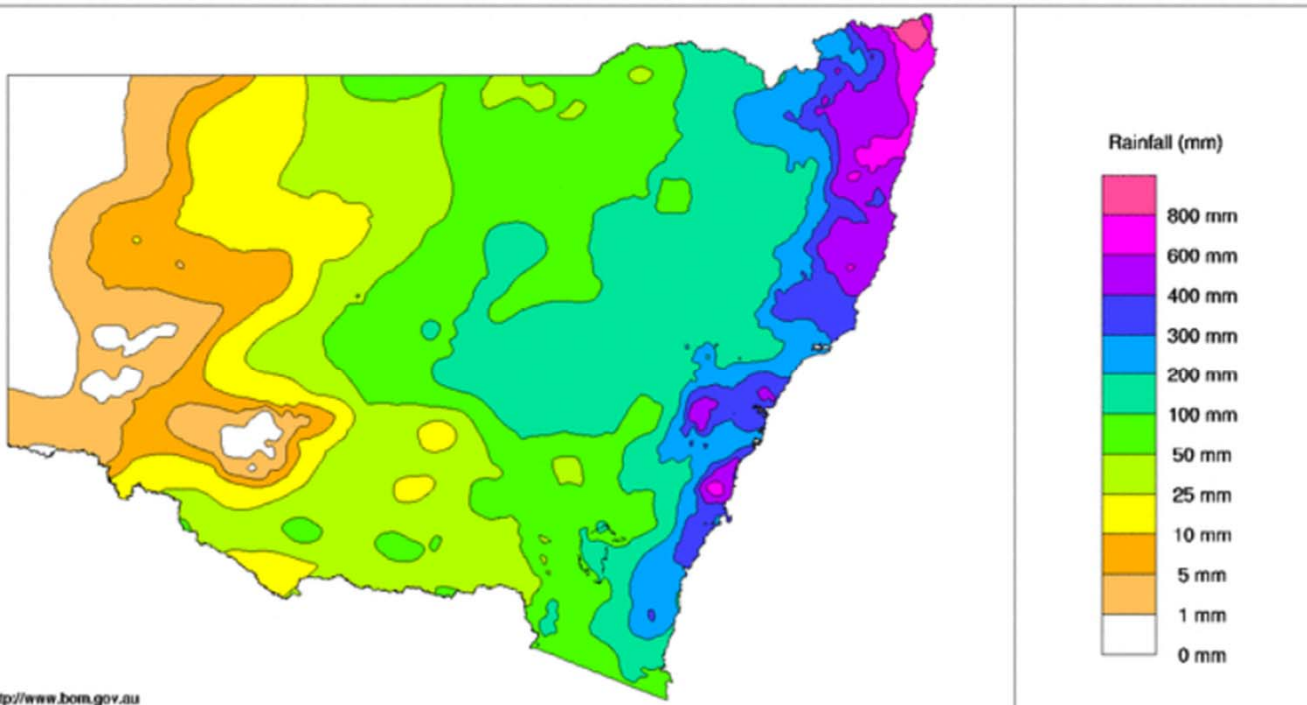
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Source: Australian Bureau of Meteorology, 2017



Source: Australian Bureau of Meteorology, 2017

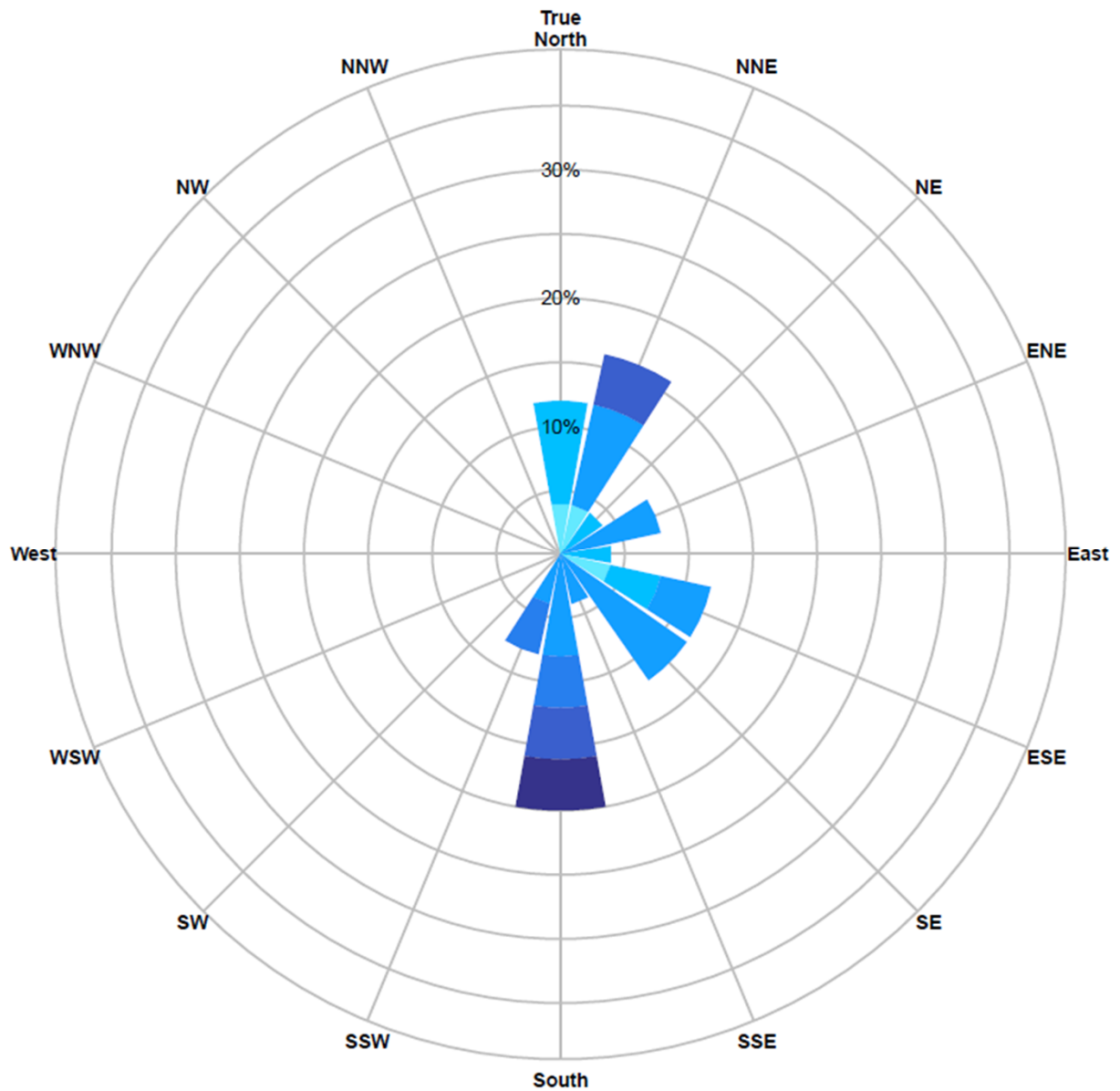


<http://www.bom.gov.au>

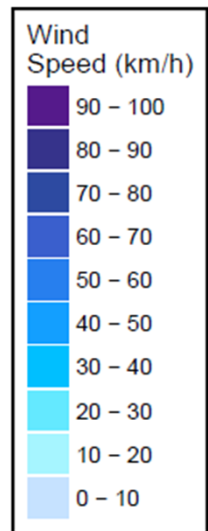
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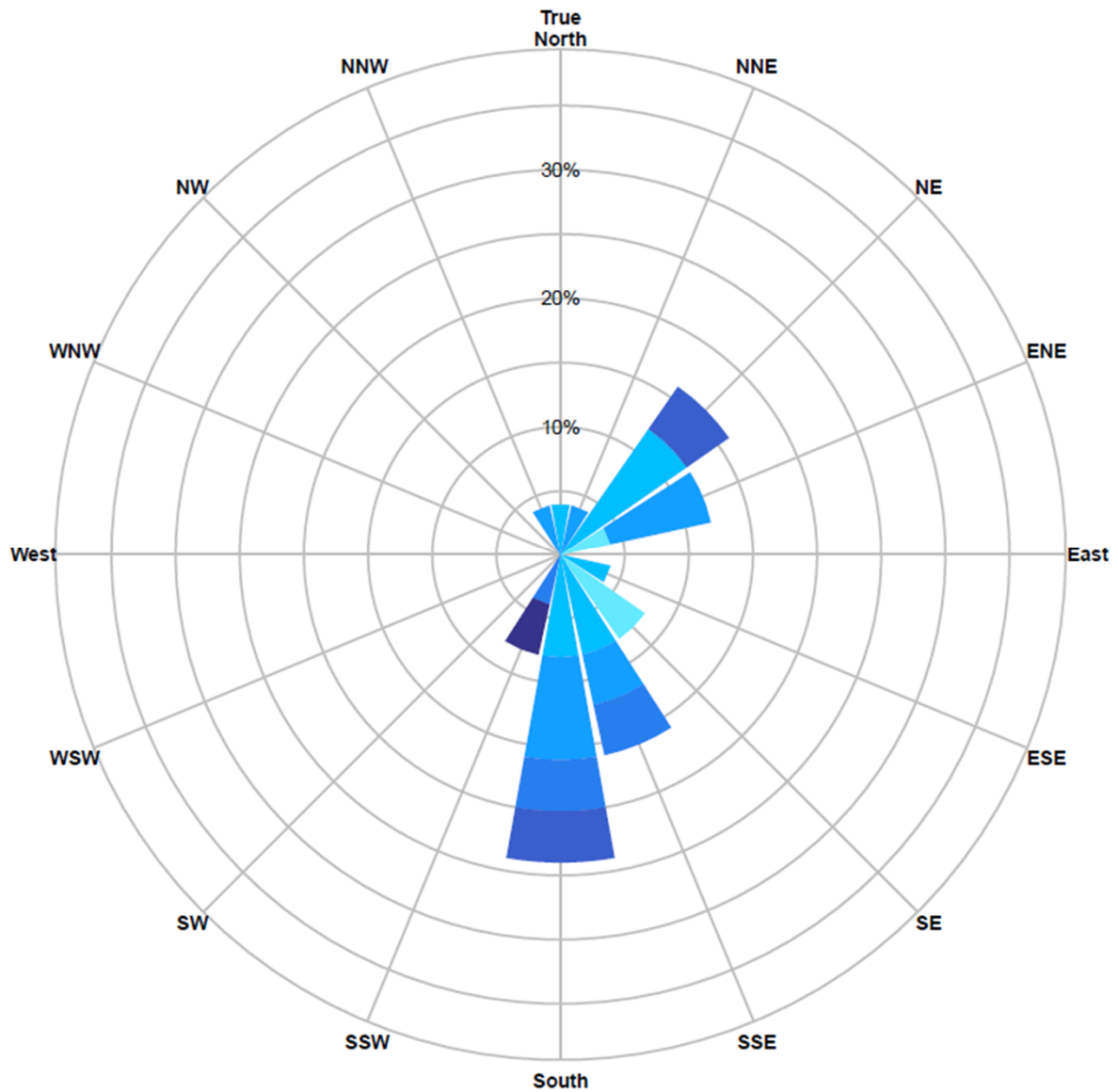
Source: Australian Bureau of Meteorology, 2017



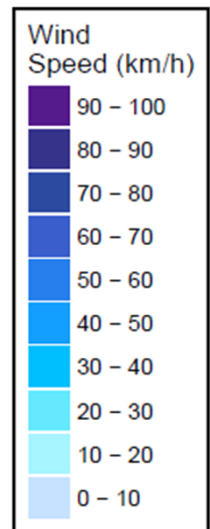
Wind Speed vs. Direction Rose
Site: Coolangatta
Start: 14 March 2017
Finish: 07 April 2017
Record Length (days): 24
N° of Records: 25



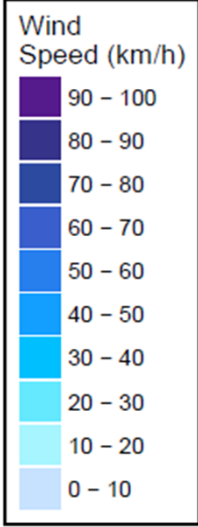
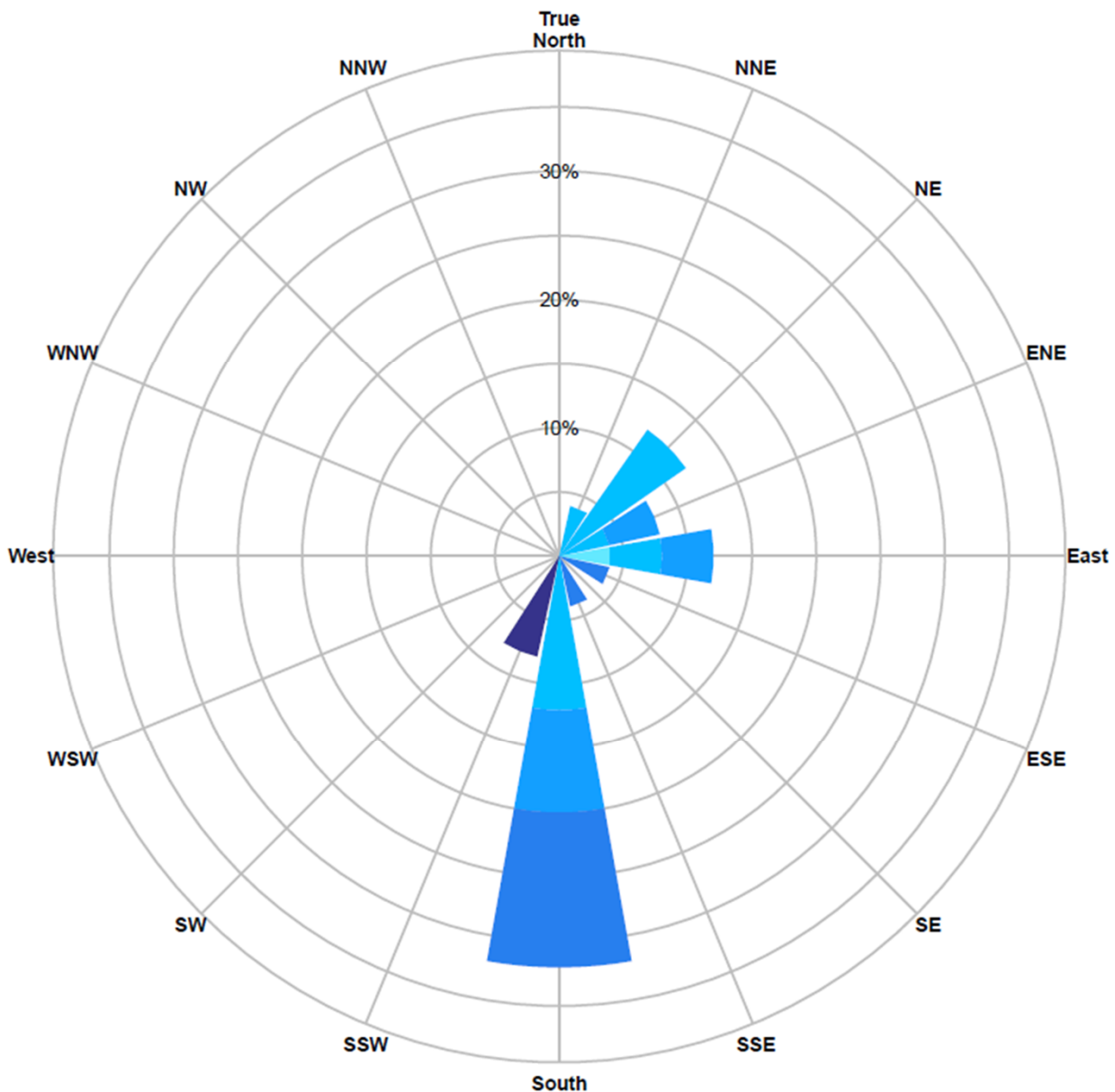
Data source: Australian Bureau of Meteorology 2017



Wind Speed vs. Direction Rose
Site: Ballina
Start: 14 March 2017
Finish: 07 April 2017
Record Length (days): 24
N° of Records: 25



Data source: Australian Bureau of Meteorology 2017



Wind Speed vs. Direction Rose
Site: Evans Head
Start: 14 March 2017
Finish: 07 April 2017
Record Length (days): 24
N° of Records: 25

Data source: Australian Bureau of Meteorology 2017



WIND ROSE FROM EVANS HEAD STATION  
14 MARCH 2017 – 7 APRIL 2017

MHL 2535  
Figure  
1-3c

## 2. Offshore wave data

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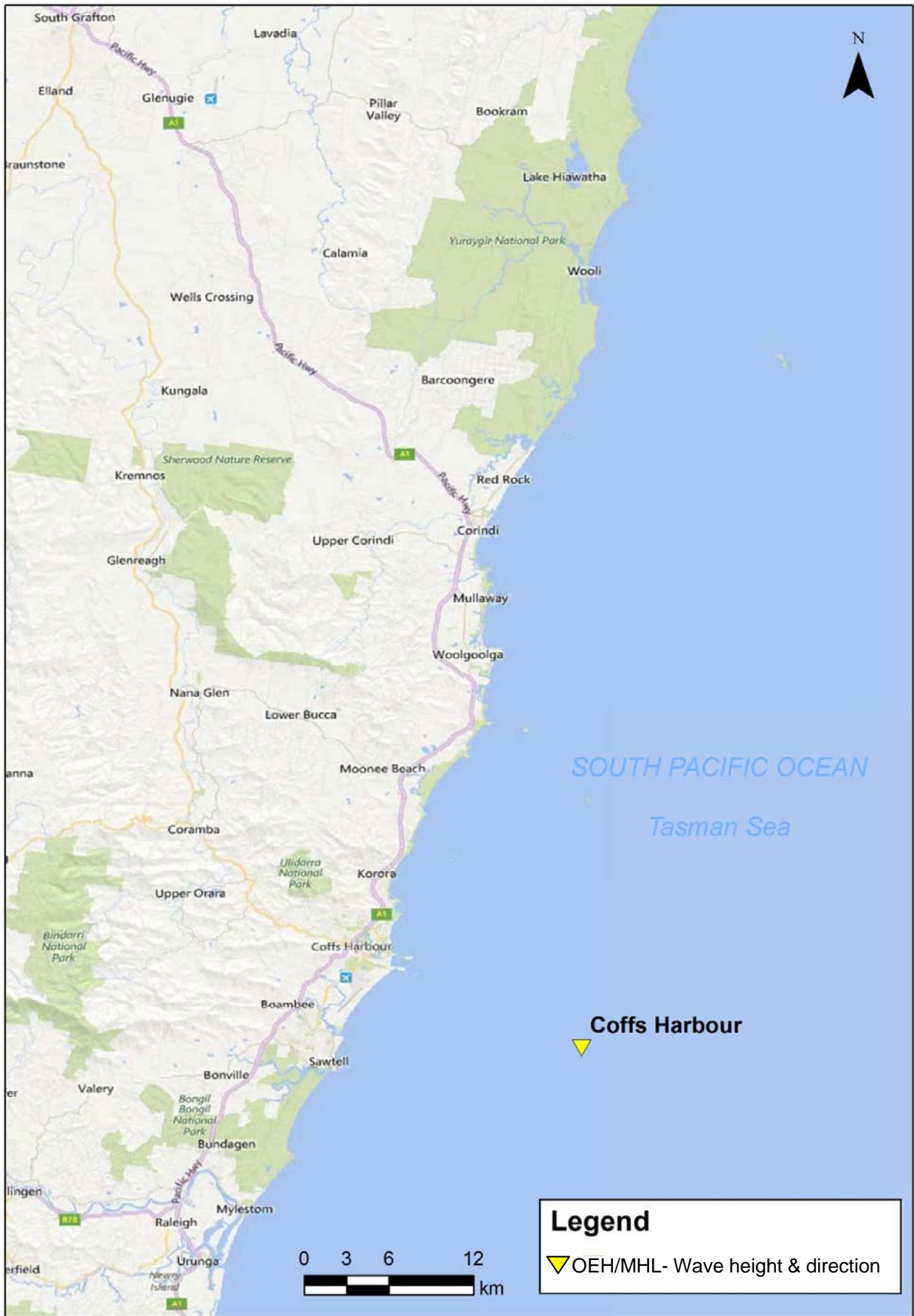
Ocean wave conditions have been monitored by the NSW Waverider buoy network, operated by MHL on behalf of OEH, since the first buoy was deployed off Port Kembla in 1974. Along the NSW north coast Waverider buoys are deployed off Byron Bay and Coffs Harbour. For the flood period wave data are not yet available from the Byron Bay Waverider station. Data telemetry problems have resulted in poor quality data being recorded at the Byron Bay Waverider receiving station. Data is however recorded by a memory card in the buoy and these data will be available for download and analysis when the buoy is recovered (currently scheduled for July 2017). This will be available through data requests to MHL upon data recovery.

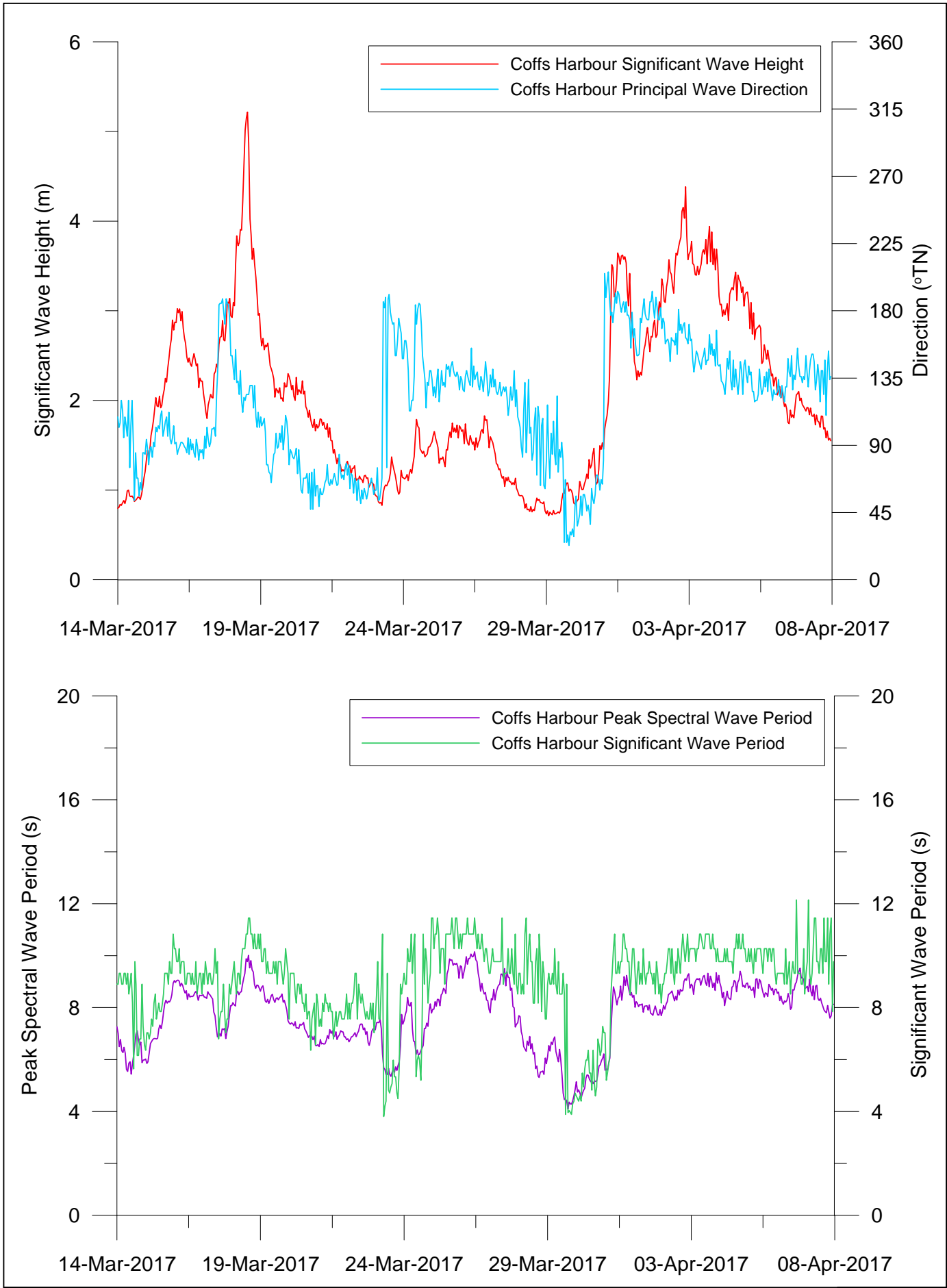
A summary of the ocean wave conditions recorded by the Coffs Harbour Waverider buoy for the March – April 2017 flood event is presented in **Table 2-1**. The location of the Coffs Harbour Waverider buoy is shown in **Figure 2-1**. Time series plots of wave height, period and direction during the flood event period are presented in **Figure 2-2**.

**Table 2-1 Ocean wave storm summary 14 March 2017 to 7 April 2017**

Wave conditions	Coffs Harbour
Peak significant wave height (m)	5.2
Date and time of peak significant wave height (hrs EST)	18/3/2017 @ 1300
Peak maximum wave height	9.7
Spectral peak wave period at storm peak (secs)	10.8
Wave direction at storm peak (°TN)	124
Storm duration for Hsig greater than 3m (hrs)	110
Storm duration for Hsig greater than 4m (hrs)	11
Average Recurrence Interval for storm peak Hsig (years)	1.0

During 31 March 2017, as ex-tropical cyclone Debbie moved into the south Coral Sea from Queensland, it generated strong winds resulting in moderate storm wave conditions along the NSW north coast. As summarised in **Table 2-1** the wave conditions recorded by the Coffs Harbour Waverider buoy were not severe with a maximum significant wave height (Hsig) of 5.2 m recorded during the flood event period. The maximum individual wave height recorded was 9.7 m. Based on the 40 year Coffs Harbour Waverider buoy station record the Average Recurrence Interval (ARI) for the peak Hsig of 5.2 was 1-year.





## 3. Water level and rainfall data

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### 3.1 Water level and rainfall overview

A number of hydrometric stations are maintained by agencies in the NSW north coast region including MHL on behalf of OEH, BoM, WaterNSW, Tweed Shire Council, Ballina Shire Council, Byron Bay Shire Council, Lismore City Council and North Byron Parklands. In this report there are 139 stations presented and **Table 3-1** provides the number of stations operated by individual agencies. A full list of stations for which data is presented in this summary report is provided in Appendix A.

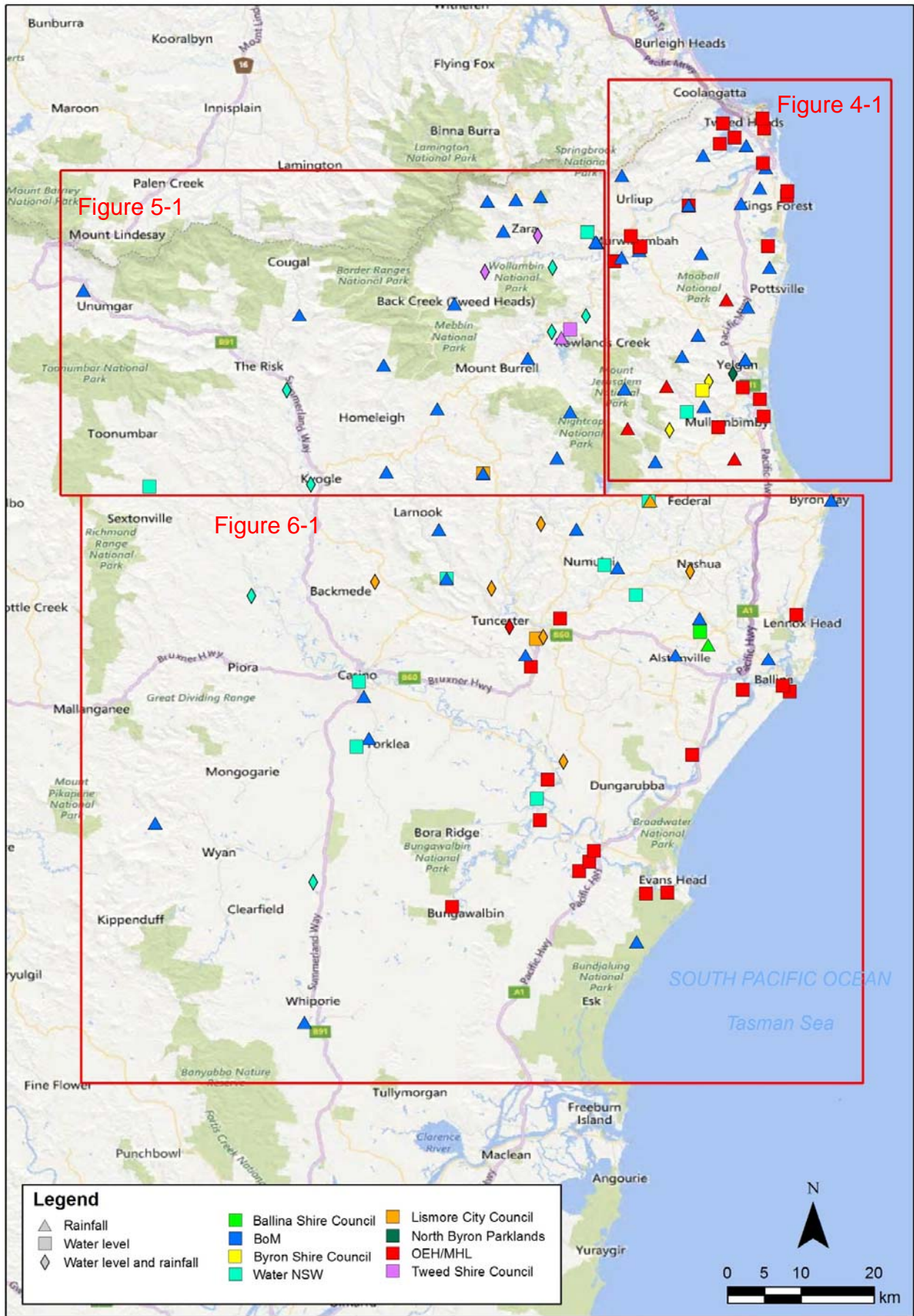
**Table 3-1 Water level and rainfall station summary**

Station Type	OEH/MHL	BoM	WaterNSW	Tweed Shire Council	Byron Shire Council	North Byron Parklands	Lismore City Council	Ballina Shire Council
Water Level	34	-	17	4	3	2	8	1
Rainfall	4	47	-	3	4	1	14	1
Wave	1	-	-	-	-	-	-	-

### 3.2 River region overview

An overview of water level and rainfall stations in the north coast region is provided in **Figure 3-1** in the maps at the start of each section. The north coast regions are grouped as follows:

- **Figure 4-1** – Tweed River region
- **Figure 5-1** – Upper Rous and upper Richmond River region
- **Figure 6-1** - Richmond River region



## 4. Tweed River region

### 4.1 Tweed River region – water level

The peak observed water levels for the Tweed River region are listed in **Table 4-1**. **Table 4-2** lists the SES flood classifications for Murwillumbah, Billinudgel and Mullumbimby. The locations of water level stations within the Tweed River region are shown in **Figure 4-1**. The water level and rainfall data for the period 14 March 2017 to 7 April 2017 are displayed graphically in **Figures 4-2 to 4-16**.

**Table 4-1 Tweed River region flood peaks**

Station name	Station No.	Owner	Datum	Level (m)
Tweed Entrance South	201472	OEH/MHL	AHD	1.26
Cobaki	201448	OEH/MHL	AHD	1.52
Letitia 2A	201429	OEH/MHL	AHD	1.31
Dry Dock	201428	OEH/MHL	AHD	1.23
Terranora	201447	OEH/MHL	AHD	1.58
Barneys Point	201426	OEH/MHL	AHD	2.22
Kingscliff	202418	OEH/MHL	AHD	1.05
Kingscliff Upstream	202434	OEH/MHL	AHD	*
Tumbulgum	201432	OEH/MHL	AHD	3.96
Kynnumboon	201422	OEH/MHL	AHD	5.69
Bogangar	202416	OEH/MHL	AHD	2.52
North Murwillumbah	201420	OEH/MHL	AHD	6.13**
Murwillumbah Bridge	201465	OEH/MHL	AHD	5.84
Bray Park Weir	201455	OEH/MHL	AHD	9.25
Wooyung Road	558095	North Byron Parklands	Local datum	4.83
Yelgun Creek at Yelgun	558096	North Byron Parklands	Local datum	4.84
Lacks Creek at Middle Pocket	202901	Byron Council	AHD	4.13
Billinudgel	202400	OEH/MHL	AHD	4.45
Marshalls Creek at The Pocket	202903	Byron Council	AHD	4.42
Orana Bridge	202475	OEH/MHL	AHD	2.02
Brunswick River at Sherrys Bridge	202001	Water NSW	Local datum	5.04
Brunswick Heads	202403	OEH/MHL	AHD	1.12
Mullumbimby	202402	OEH/MHL	AHD	4.27
Mullumbimby Creek at Mullumbimby Creek	202904	Byron Council	AHD	2.29

\* Kingcliff Upstream has been vandalised and did not capture the flood event.

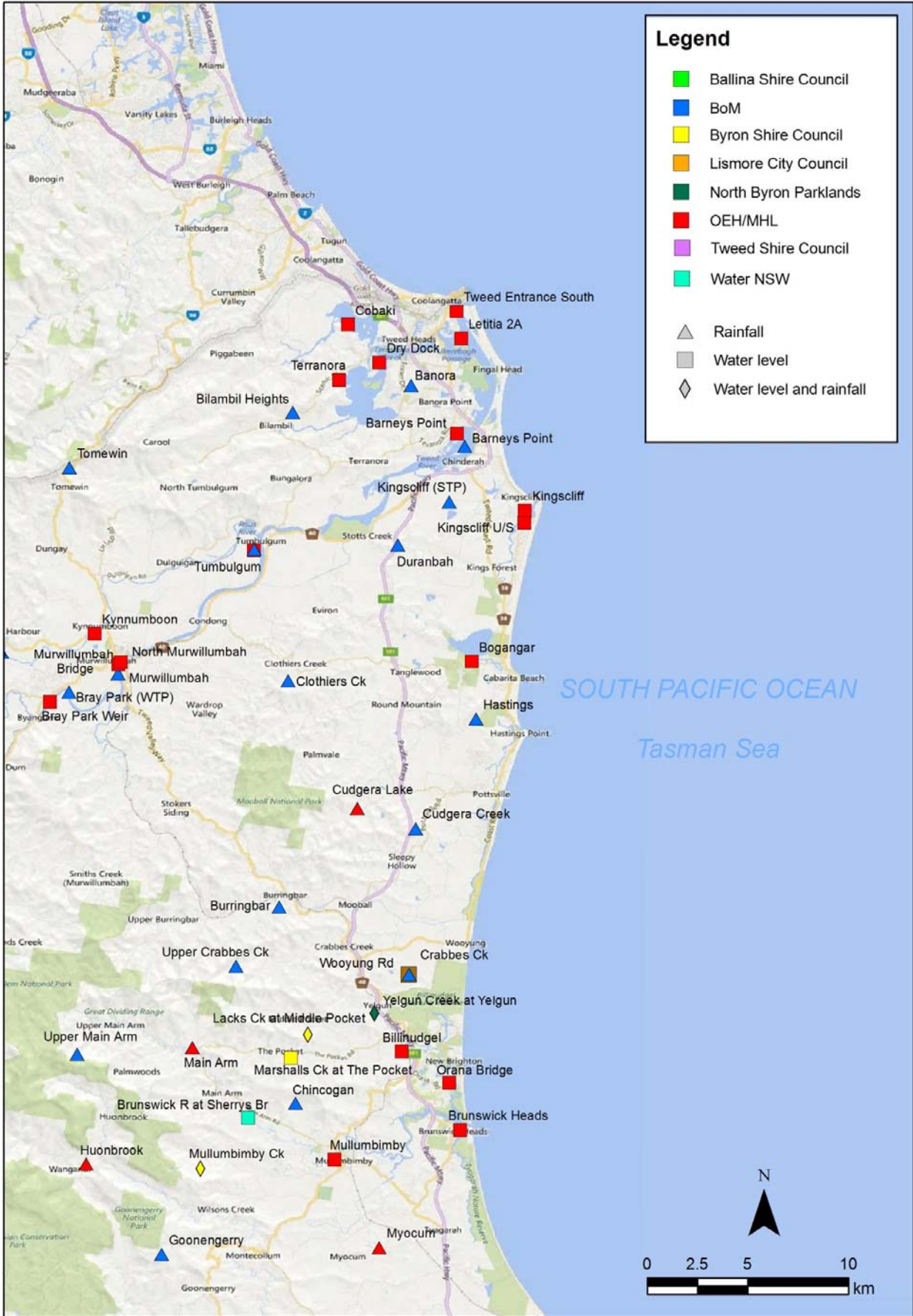
\*\* North Murwillumbah flood peak value should be treated with caution as the orifice line may have failed due to a large amount of scouring on that section of the river. This station will require inspection by a dive team to verify.

**Table 4-2 SES flood classification for North Murwillumbah, Billinudgel and Mullumbimby**

Station	Classification			Peak (m)	Classification
	Minor	Moderate	Major		
	Water Level (mAHD)				
North Murwillumbah	3.0	4.0	4.8	6.13**	Major
Billinudgel	2.5	3.0	3.5	4.45	Major
Mullumbimby	2.5	3.5	4.5	4.27	Moderate

Please note: Billinudgel and Mullumbimby are in Brunswick Flood Mitigation Datum (BFMD). The difference between the flood height classifications in Brunswick Flood Mitigation Datum and Australian Height Datum for Billinudgel and Mullumbimby is -0.019m and -0.010m respectively, which makes no difference to the value when expressed to one decimal place.

\*\* North Murwillumbah flood peak value should be treated with caution as the orifice line may have failed due to a large amount of scouring on that section of the river. This station will require inspection by a dive team to verify.



## 4.2 Tweed River region – rainfall

The water level and rainfall data for the period 14 March 2017 to 7 April 2017 are displayed graphically in **Figures 4-2 to 4-16**. 24 hour rainfall totals up until 9.00 a.m. are displayed in **Table 4-3 to 4-6** for the period 14 March to 7 April 2017. The rainfall intensities are displayed graphically in **Figures 4-17 to 4-41**, in ARR1987 format. Appendix C provides ARR2016 format.

**Table 4-3 Tweed River region daily rainfall totals**

Date	Banora (mm)	Bilambil Heights <sup>^</sup> (mm)	Barneys Point (mm)	Tomewin (mm)	Kingscliff (STP)* (mm)	Duranbah (mm)	Tumbulgum (mm)
	BoM	BoM	BoM	BoM	BoM	BoM	BoM
15/03/2017	46.0	-	36.0	62.0	0.0	74.0	153.0
16/03/2017	21.0	-	21.0	116.0	0.0	37.0	5.0
17/03/2017	0.0	-	0.0	1.0	0.0	0.0	0.0
18/03/2017	11.0	1.0	17.0	1.0	43.0	8.0	3.0
19/03/2017	7.0	0.0	12.0	71.0	8.0	27.0	32.0
20/03/2017	18.0	62.0	7.0	47.0	6.0	20.0	22.0
21/03/2017	34.0	0.0	35.0	57.0	3.0	35.0	31.0
22/03/2017	15.0	2.0	5.0	4.0	31.0	3.0	4.0
23/03/2017	0.0	0.0	0.0	3.0	0.0	0.0	0.0
24/03/2017	4.0	4.0	3.0	30.0	1.0	3.0	7.0
25/03/2017	1.0	1.0	3.0	5.0	0.0	13.0	0.0
26/03/2017	0.0	0.0	0.0	0.0	0.0	0.0	0.0
27/03/2017	1.0	2.0	1.0	3.0	0.0	4.0	1.0
28/03/2017	0.0	0.0	0.0	0.0	0.0	0.0	0.0
29/03/2017	0.0	0.0	0.0	0.0	0.0	0.0	1.0
30/03/2017	54.0	92.0	28.0	195.0	-	46.0	90.0
31/03/2017	193.0	261.0	192.0	352.0	-	227.0	265.0
01/04/2017	0.0	0.0	0.0	0.0	-	0.0	0.0
02/04/2017	0.0	0.0	0.0	0.0	-	0.0	0.0
03/04/2017	1.0	0.0	1.0	0.0	-	1.0	0.0
04/04/2017	2.0	0.0	3.0	1.0	-	1.0	2.0
05/04/2017	4.0	2.0	5.0	1.0	-	11.0	4.0
06/04/2017	11.0	2.0	10.0	6.0	-	3.0	3.0
07/04/2017	3.0	5.0	3.0	12.0	-	15.0	-

<sup>^</sup> Bilambil Heights data supplied from 18/3/2017 only.

\* Kingcliff (STP) data supplied up to 30/3/2017 only.

**Table 4-4 Tweed River region daily rainfall totals (cont.)**

Date	Murwillumbah (mm)	Clothiers Creek~ (mm)	Bray Park (WTP) (mm)	Hastings (mm)	Cudgera Lake (mm)	Cudgera Creek (mm)	Burringbar (mm)	Upper Crabbes Creek (mm)
	BoM	BoM	BoM	BoM	OEH/MHL	BoM	BoM	BoM
15/03/2017	63.0	49.0	55.0	63.0	67.5	51.0	88.0	62.5
16/03/2017	105.0	82.0	121.0	60.0	41.5	67.0	48.0	45.5
17/03/2017	0.0	15.0	0.0	0.0	0.0	0.0	0.0	0.0
18/03/2017	3.0	10.0	3.0	1.0	0.0	1.0	1.0	2.0
19/03/2017	105.0	9.0	108.0	15.0	25.5	14.0	46.0	50.5
20/03/2017	31.0	11.0	29.0	7.0	5.5	11.0	26.0	39.0
21/03/2017	25.0	1.0	25.0	9.0	31.5	9.0	29.0	28.0
22/03/2017	9.0	0.0	10.0	3.0	4.5	3.0	3.0	1.5
23/03/2017	6.0	0.0	22.0	0.0	0.0	0.0	8.0	9.0
24/03/2017	19.0	0.0	33.0	3.0	28.5	11.0	22.0	24.5
25/03/2017	7.0	0.0	1.0	1.0	0.0	3.0	1.0	2.0
26/03/2017	1.0	0.0	0.0	0.0	0.0	0.0	1.0	1.0
27/03/2017	0.0	0.0	0.0	0.0	2.0	0.0	0.0	0.0
28/03/2017	0.0	0.0	0.0	0.0	0.5	0.0	0.0	0.0
29/03/2017	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
30/03/2017	133.0	-	153.0	28.0	75.0	47.0	86.0	81.5
31/03/2017	327.0	-	369.0	226.0	320.5	336.0	357.0	376.5
01/04/2017	0.0	-	0.0	0.0	0.0	0.0	0.0	0.0
02/04/2017	0.0	-	0.0	0.0	0.0	0.0	0.0	0.0
03/04/2017	0.0	-	0.0	1.0	1.0	1.0	2.0	2.0
04/04/2017	1.0	-	1.0	0.0	1.5	4.0	5.0	7.0
05/04/2017	3.0	-	2.0	11.0	4.5	14.0	6.0	11.0
06/04/2017	3.0	-	8.0	2.0	3.0	6.0	9.0	9.5
07/04/2017	6.0	-	21.0	2.0	4.5	9.0	11.0	2.0

~ Clothiers Creek rainfall data supplied up to 30/3/2017 only.

**Table 4-5 Tweed River region daily rainfall totals (cont.)**

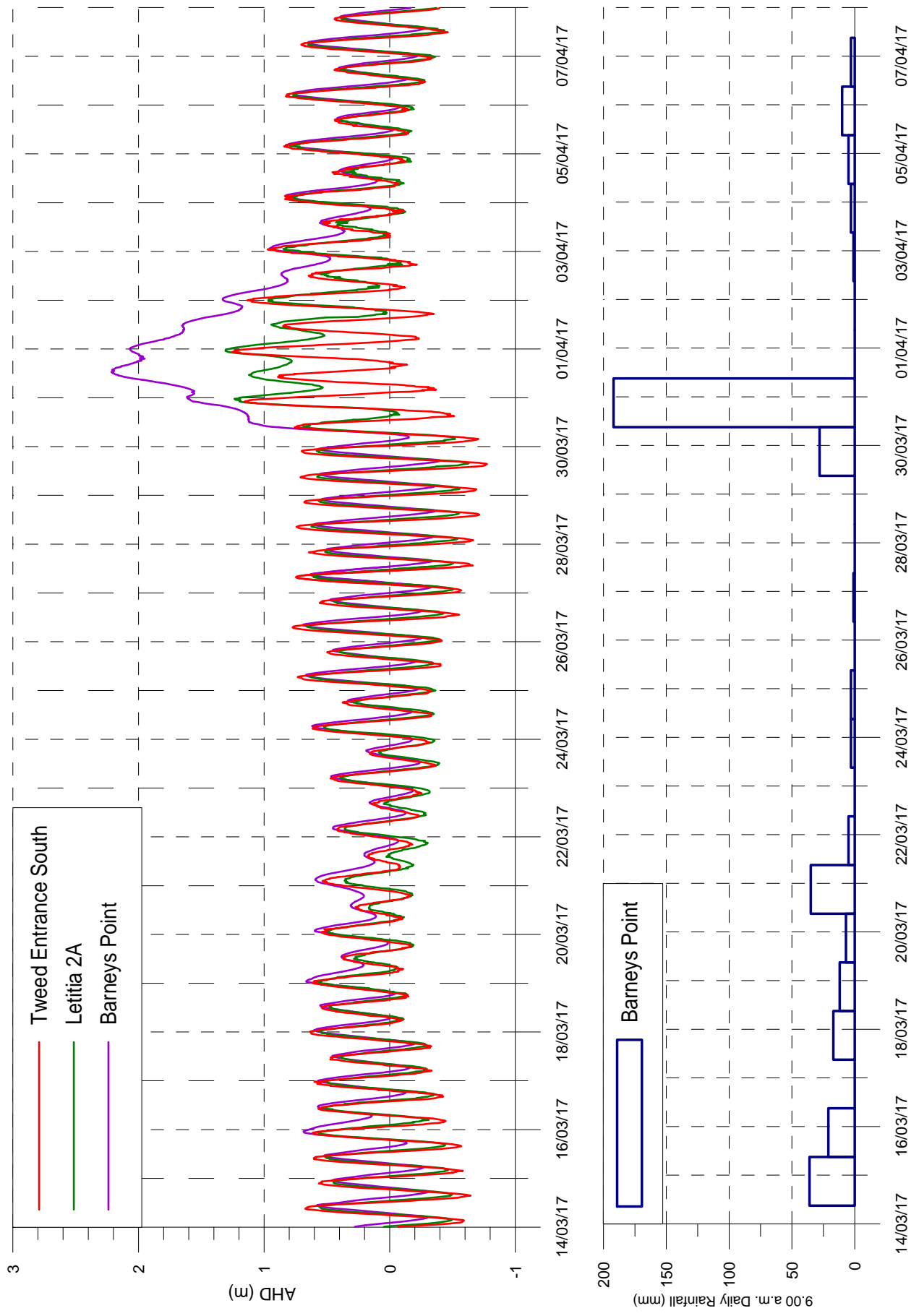
Date	Crabbes Creek# (mm)	Yelgun (mm)	Middle Pocket (mm)	Main Arm (mm)	Upper Main Arm (mm)	Chincogan* (mm)	Huonbrook (mm)
	BoM	North Byron Parklands	Byron Shire Council	OEH/MHL	BoM	BoM	OEH/MHL
15/03/2017	95.5	86.0	92.0	93.5	89.0	122.0	133.5
16/03/2017	66.0	61.5	52.0	71.0	70.0	82.0	78.0
17/03/2017	0.0	0.0	0.0	0.5	0.0	8.0	0.5
18/03/2017	0.5	1.0	1.0	5.0	8.0	13.0	4.5
19/03/2017	30.5	40.0	16.0	56.5	28.0	32.0	47.5
20/03/2017	18.5	23.0	41.0	73.0	93.0	55.0	132.0
21/03/2017	9.0	8.5	12.0	34.0	45.0	29.0	47.0
22/03/2017	1.0	2.0	10.0	2.5	14.0	16.0	14.5
23/03/2017	0.0	1.0	8.0	14.5	2.0	19.0	0.0
24/03/2017	16.0	22.0	26.0	18.0	23.0	31.0	21.5
25/03/2017	1.0	1.5	5.0	2.0	6.0	0.0	6.5
26/03/2017	0.5	0.0	0.0	0.5	2.0	1.0	0.0
27/03/2017	2.5	0.0	0.0	0.0	0.0	1.0	0.5
28/03/2017	0.0	0.0	0.0	0.0	0.0	6.0	0.0
29/03/2017	0.0	0.0	0.0	0.0	0.0	8.0	0.0
30/03/2017	58.0	69.5	77.0	137.0	188.0	59.0	191.0
31/03/2017	280.0	286.5	358.0	356.5	330.0	285.0	319.5
01/04/2017	-	0.5	0.0	0.0	1.0	7.0	0.5
02/04/2017	-	0.0	0.0	0.0	0.0	7.0	0.0
03/04/2017	-	4.0	2.0	1.0	8.0	-	4.0
04/04/2017	-	5.0	6.0	4.0	13.0	-	11.5
05/04/2017	-	12.0	10.0	6.0	18.0	-	15.5
06/04/2017	-	5.0	7.0	14.5	12.0	-	16.0
07/04/2017	-	7.5	4.0	5.0	9.0	-	4.5

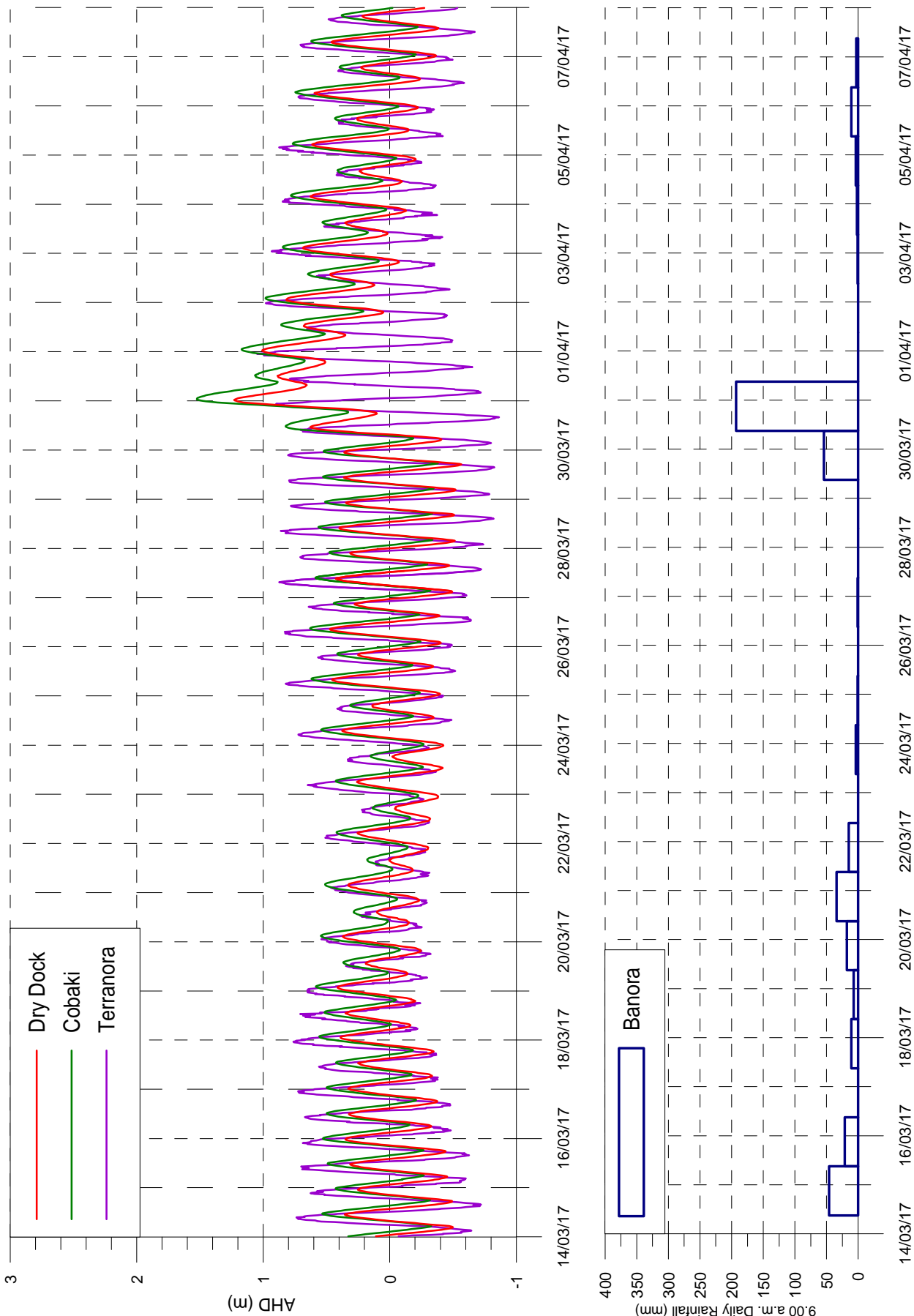
# Crabbes Creek rainfall data supplied up to 31/3/2017 only

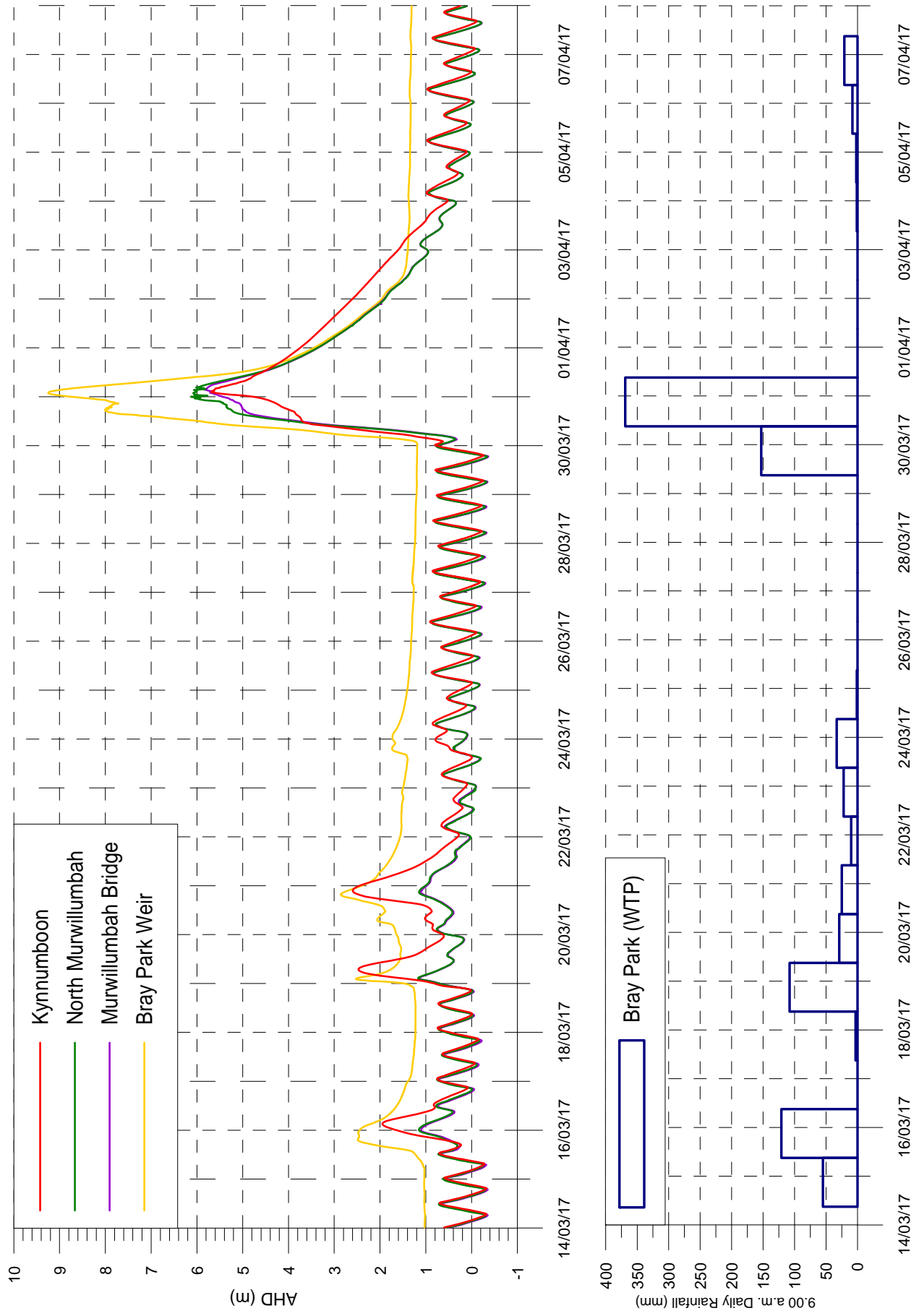
\* Chincogan rainfall supplied up to 3/4/17 only

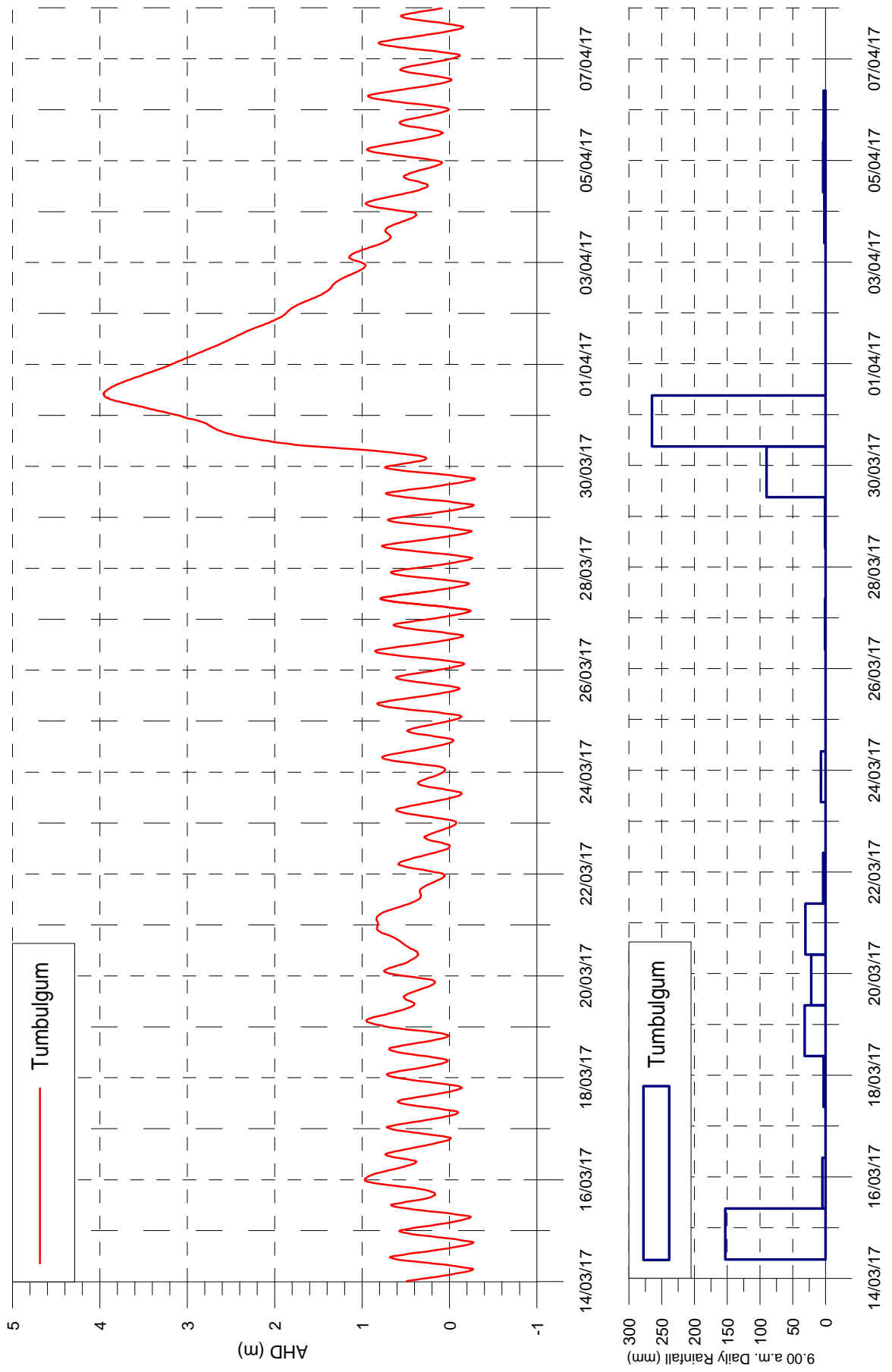
**Table 4-6 Tweed River region daily rainfall totals (cont.)**

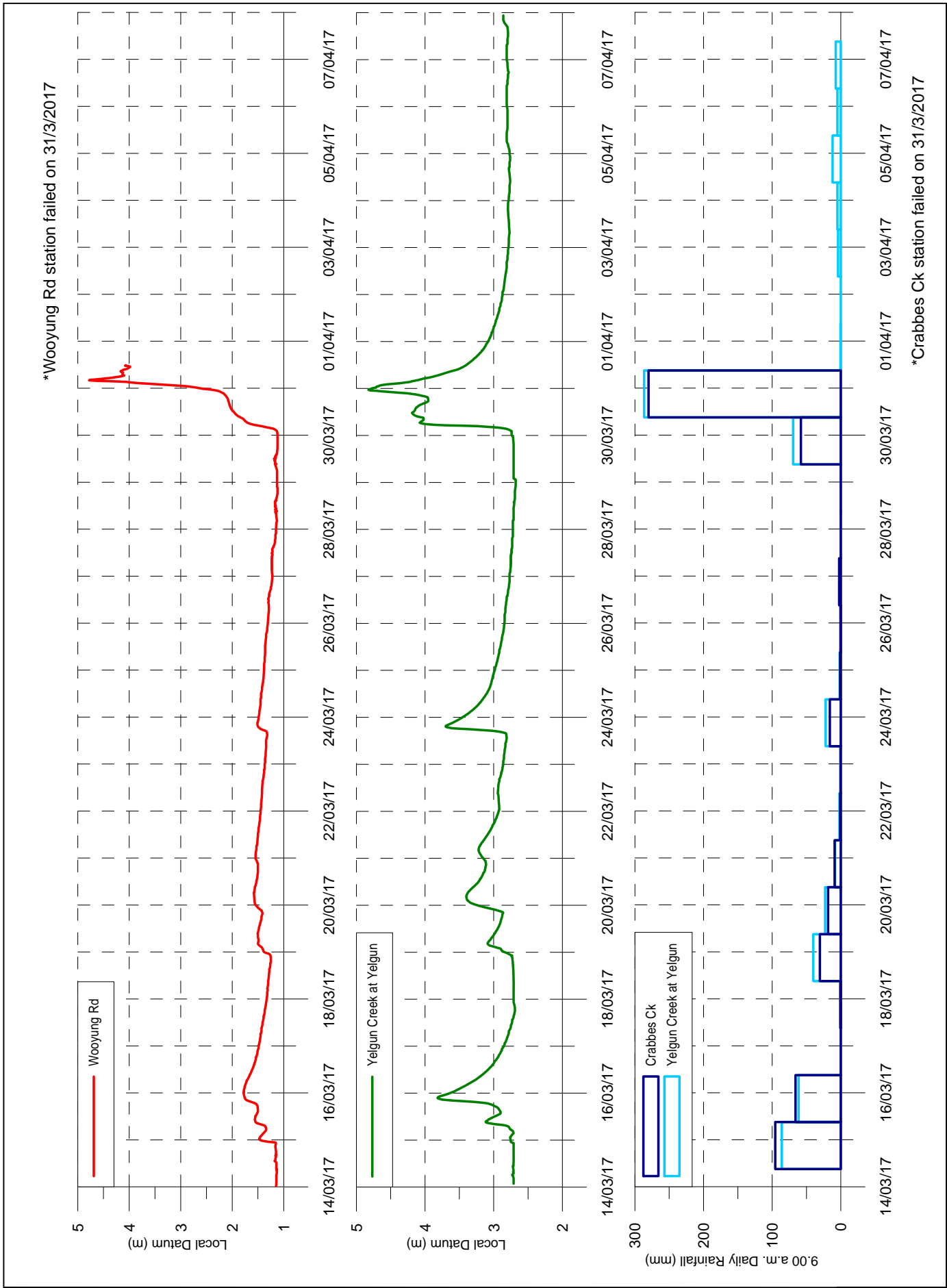
Date	Mullumbimby Ck (mm)	Myocum (mm)	Goonengerry (mm)
	Byron Shire Council	OEH/MHL	BoM
15/03/2017	89.0	75.5	182.0
16/03/2017	70.0	81.0	122.0
17/03/2017	0.0	0.0	0.0
18/03/2017	8.0	8.5	9.0
19/03/2017	28.0	56.5	16.0
20/03/2017	93.0	47.5	69.0
21/03/2017	45.0	12.5	46.0
22/03/2017	14.0	5.0	5.0
23/03/2017	2.0	3.0	2.0
24/03/2017	23.0	32.5	10.0
25/03/2017	6.0	0.5	7.0
26/03/2017	2.0	0.0	4.0
27/03/2017	0.0	0.0	0.0
28/03/2017	0.0	0.0	0.0
29/03/2017	0.0	0.0	0.0
30/03/2017	188.0	58.0	128.0
31/03/2017	330.0	207.5	324.0
01/04/2017	1.0	0.0	0.0
02/04/2017	0.0	0.5	0.0
03/04/2017	8.0	5.0	12.0
04/04/2017	13.0	13.0	14.0
05/04/2017	18.0	17.0	19.0
06/04/2017	12.0	13.0	20.0
07/04/2017	9.0	6.0	8.0



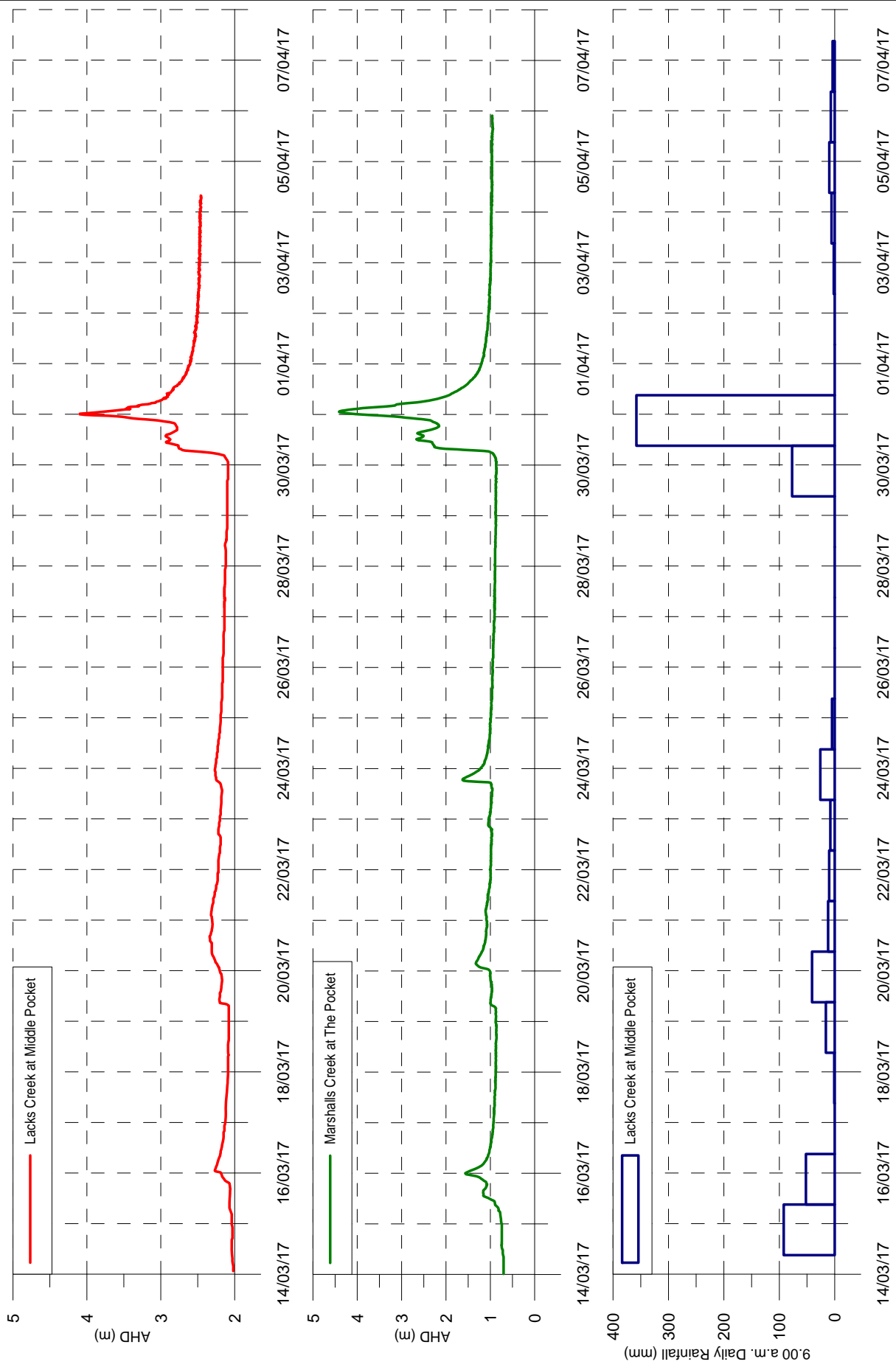


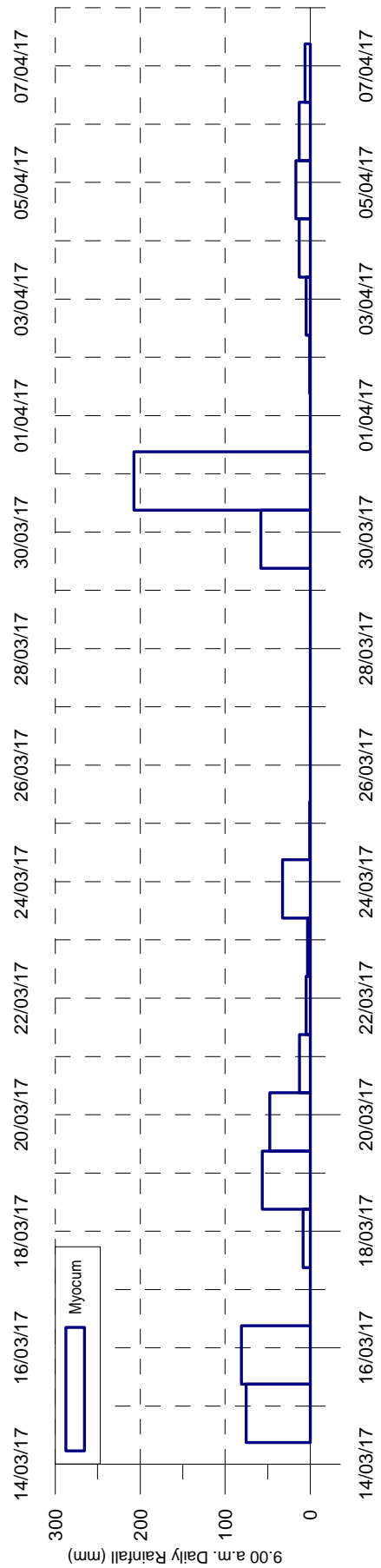
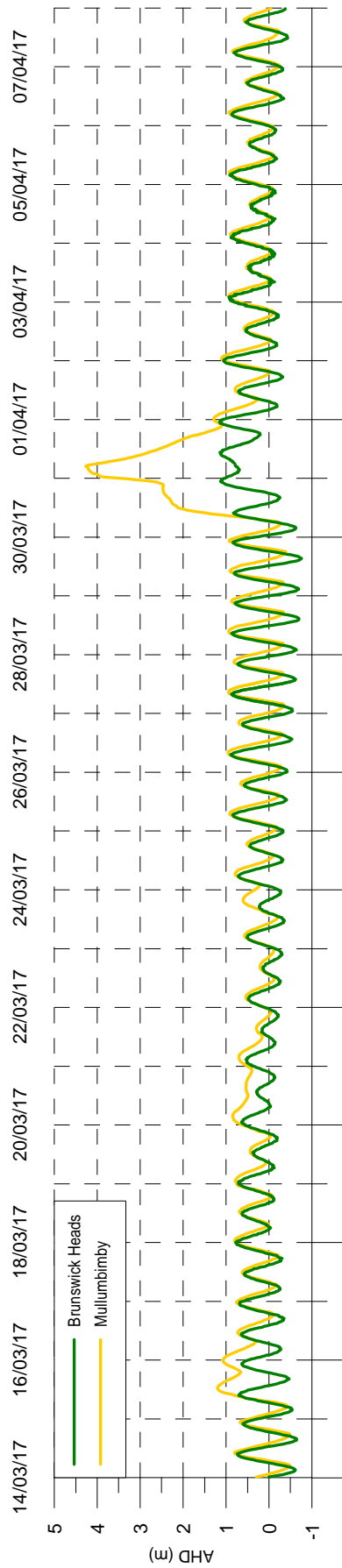
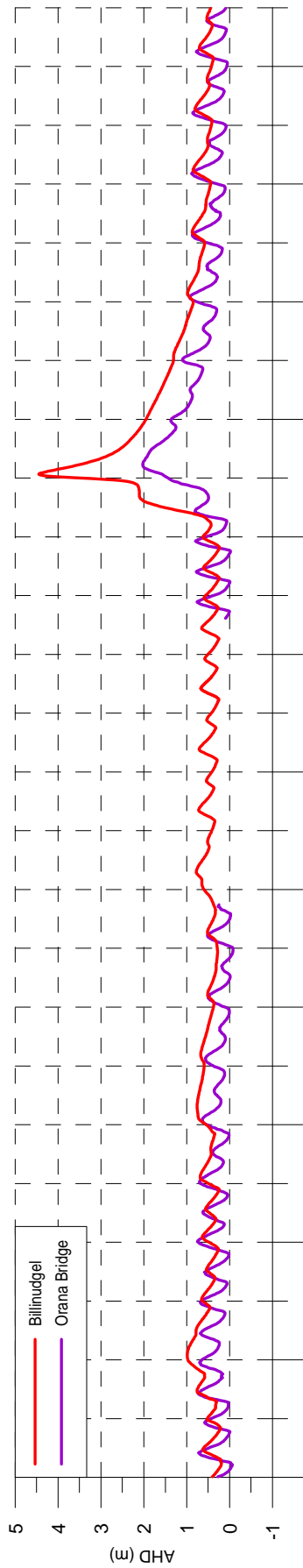


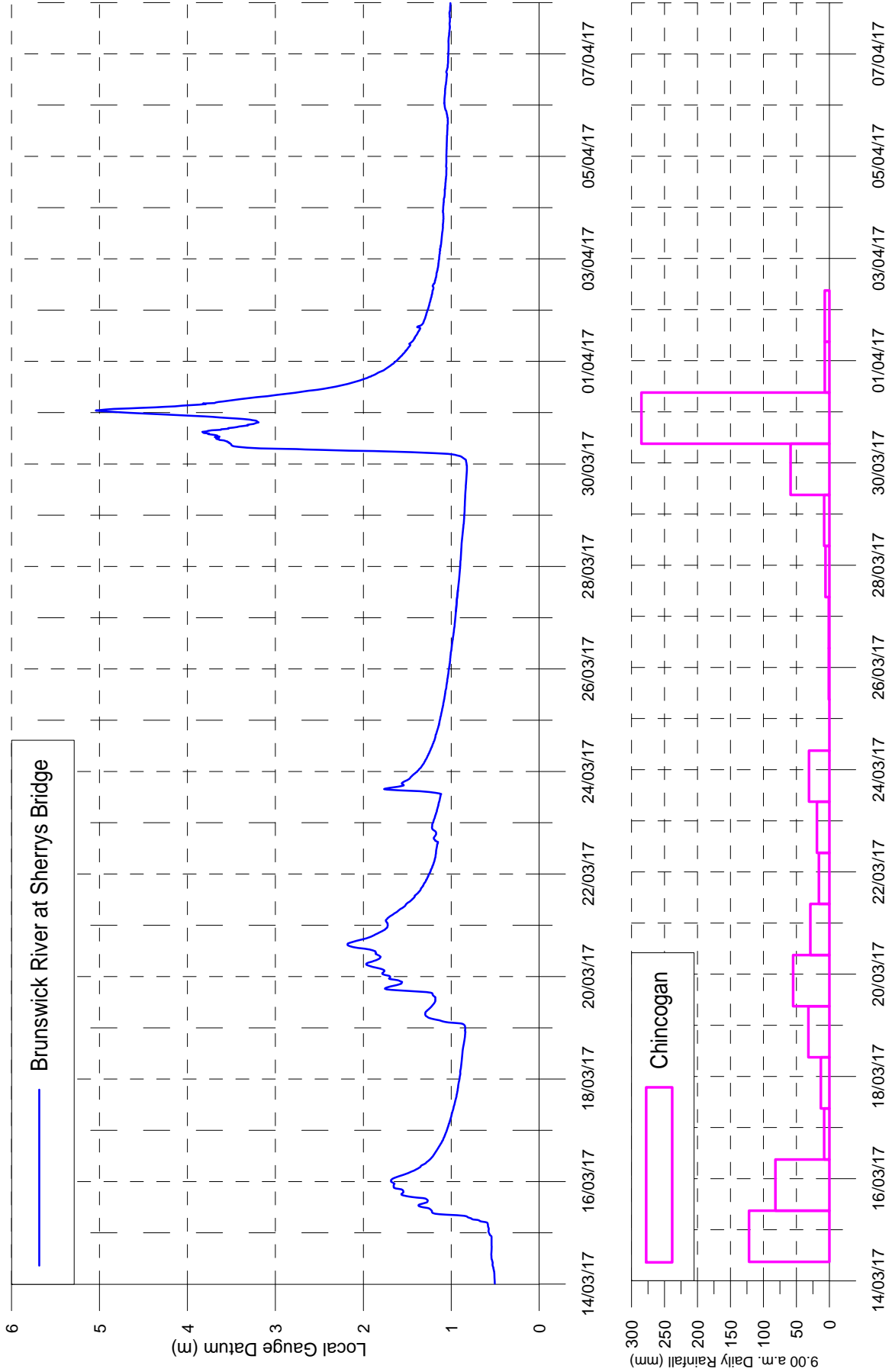


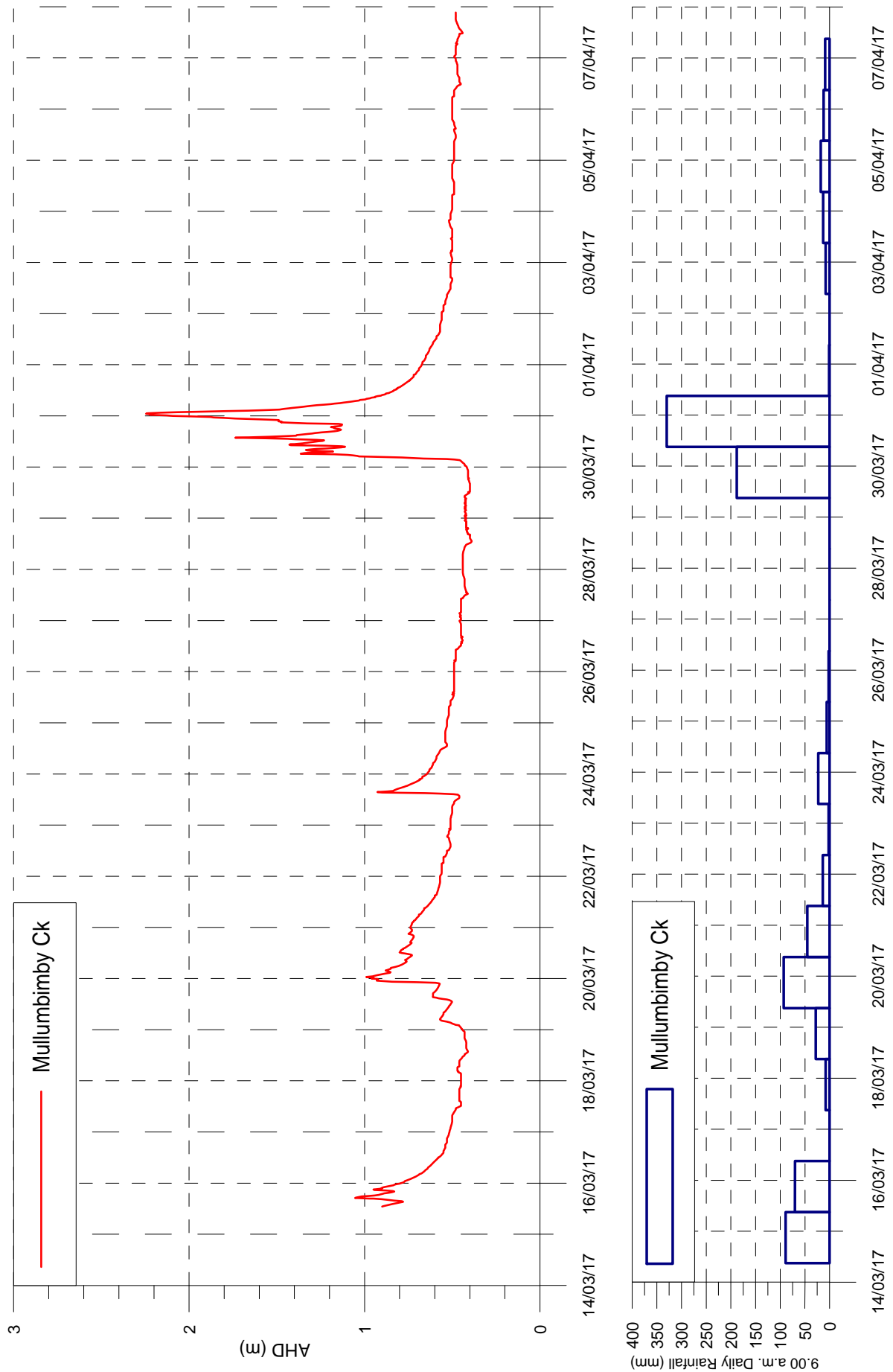


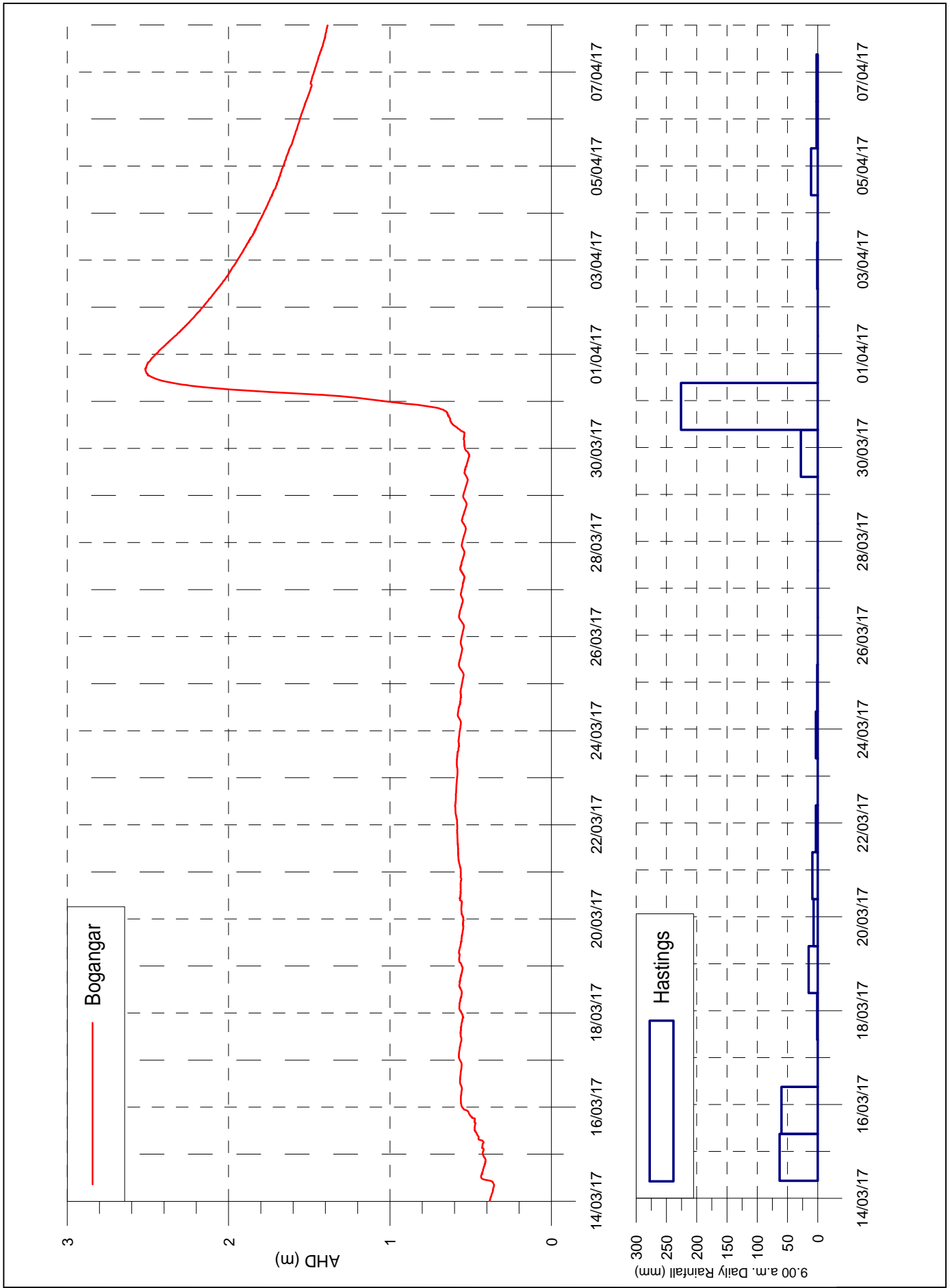
\*Crabbes Ck station failed on 31/3/2017

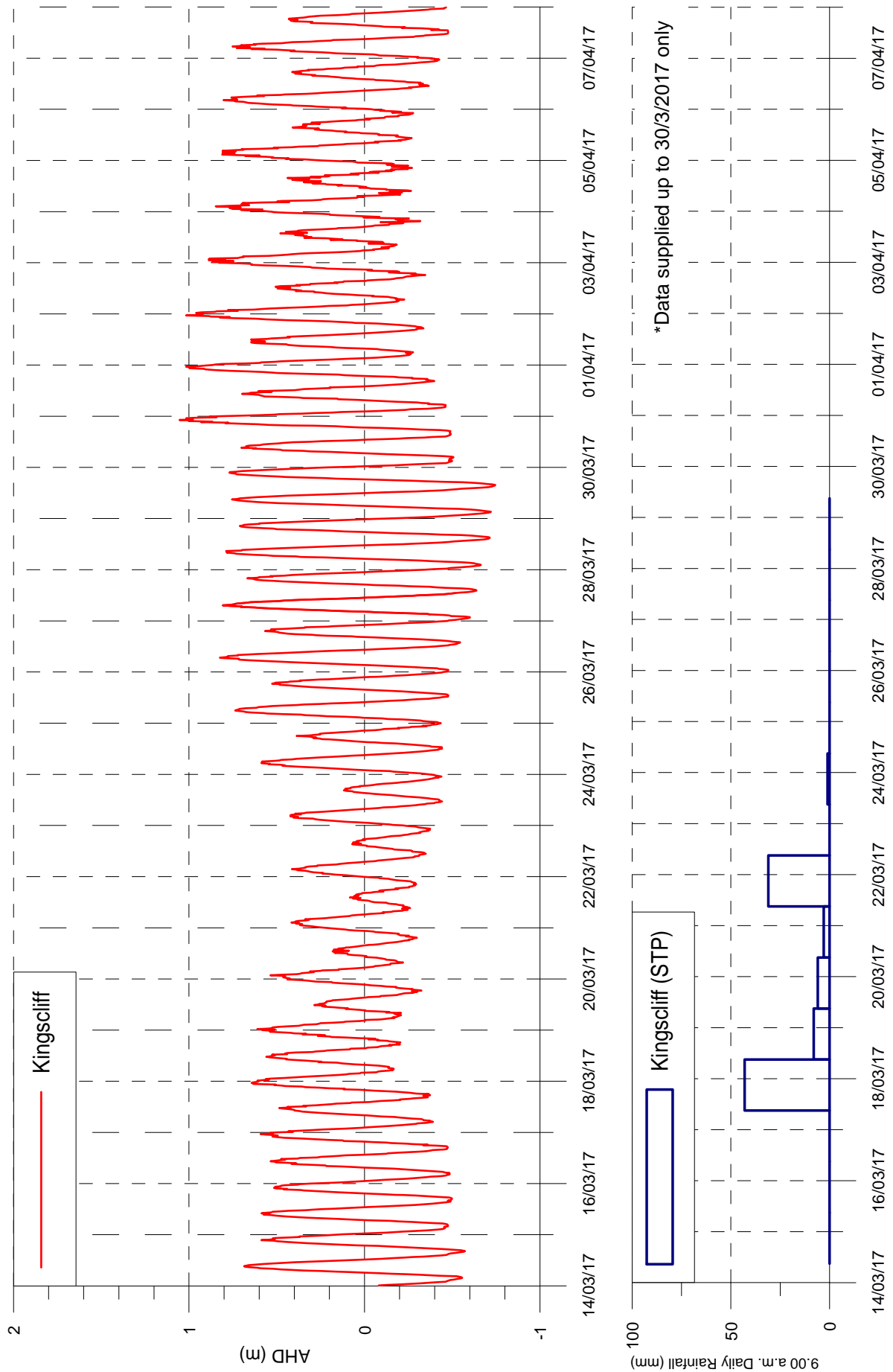


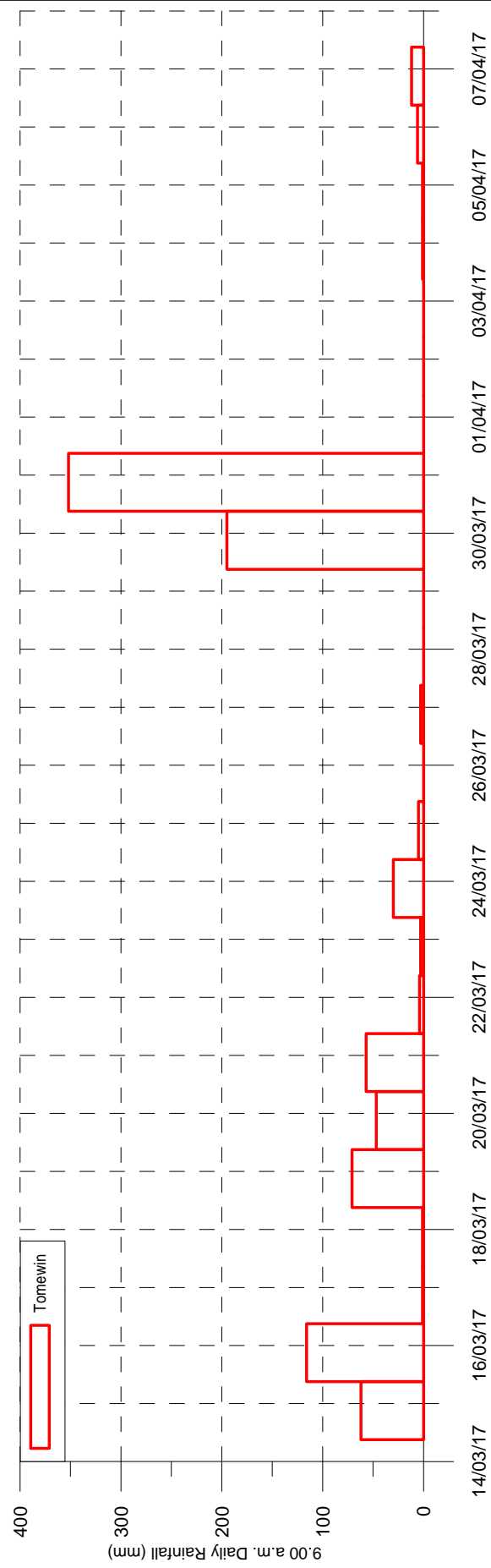
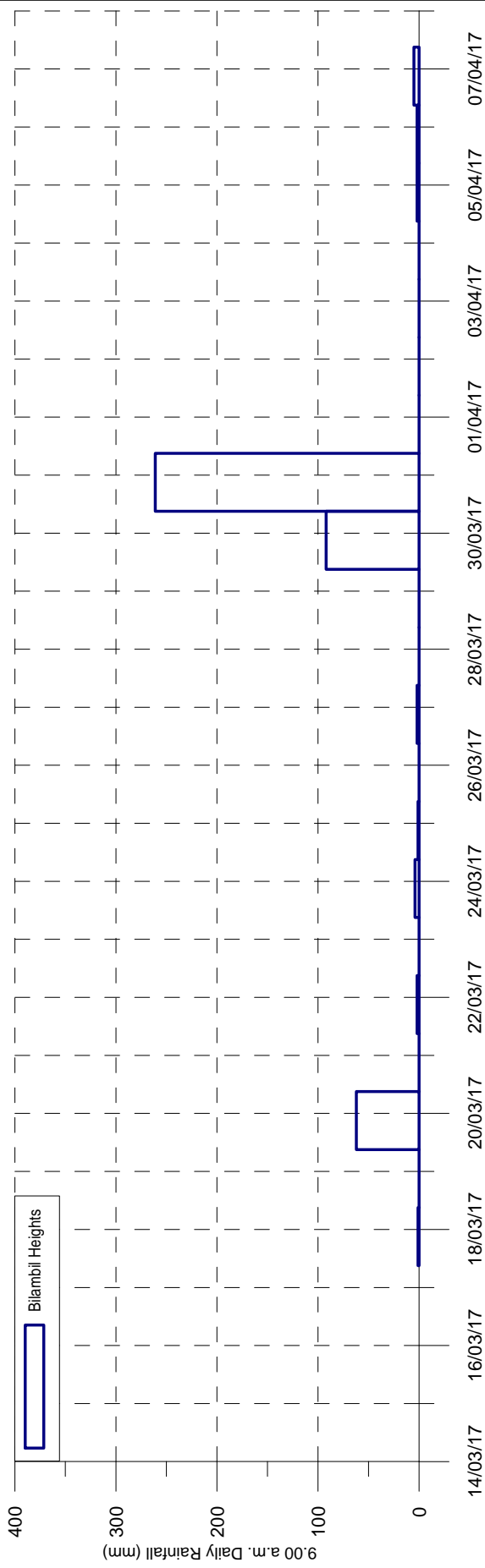


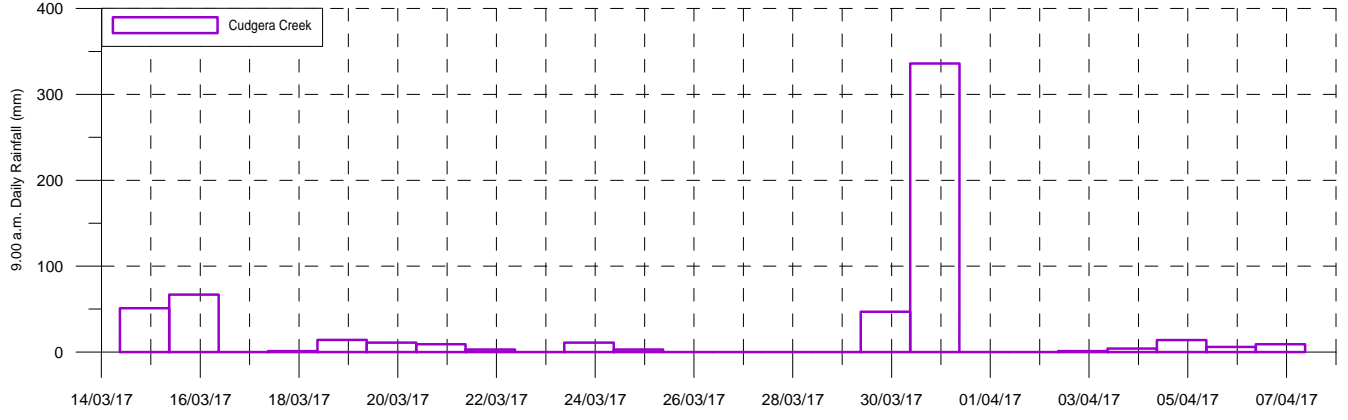
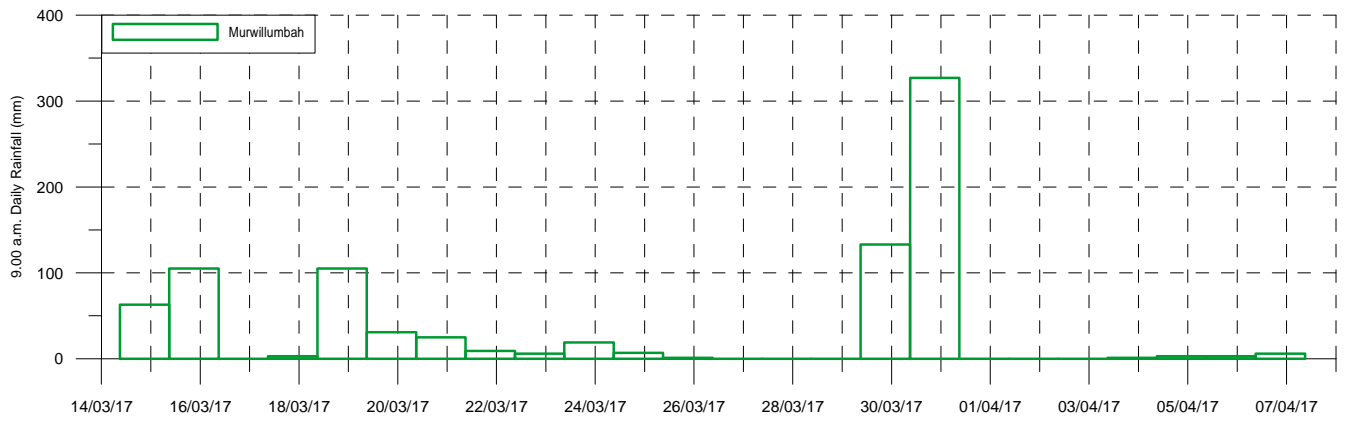
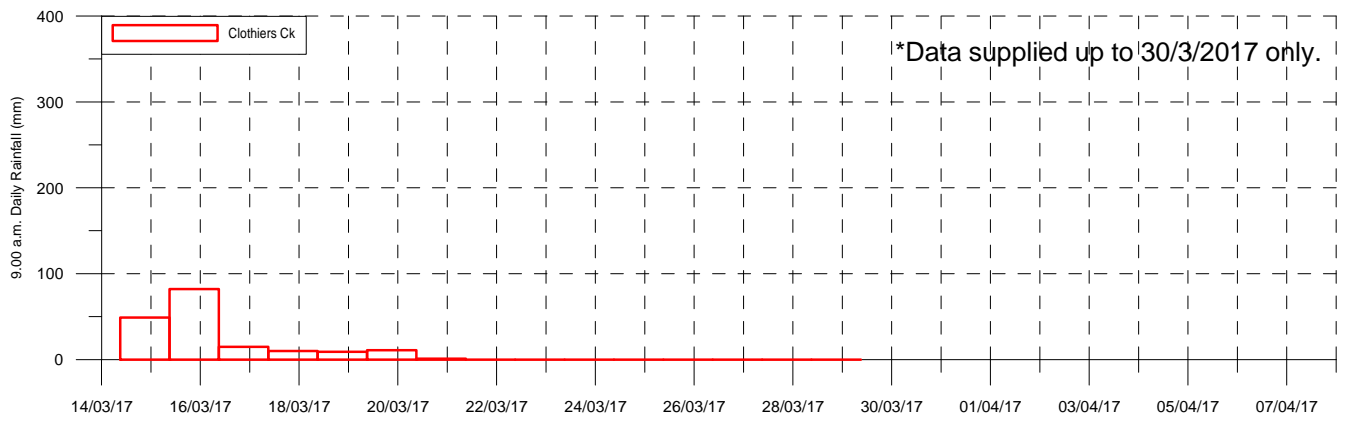
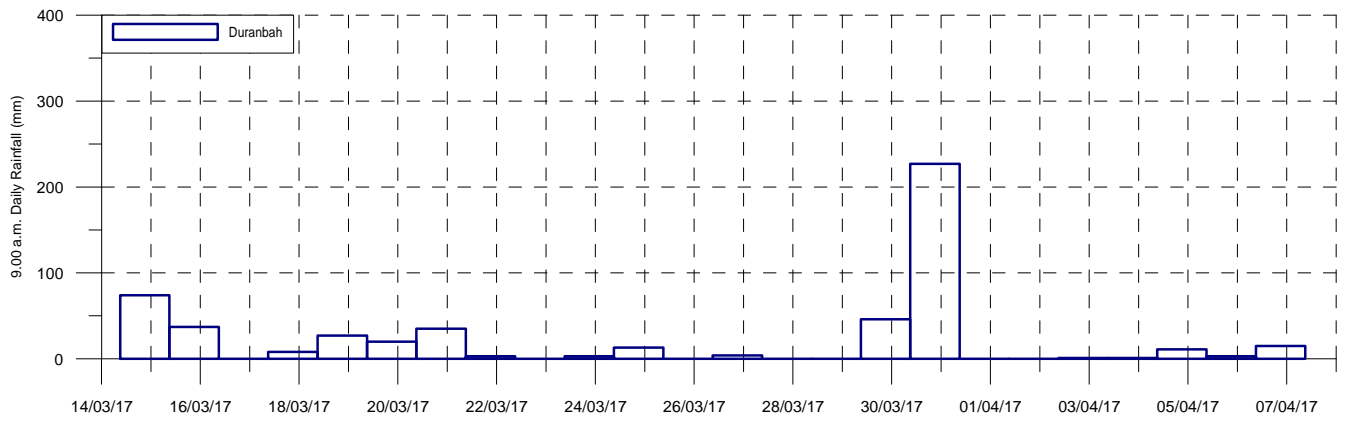


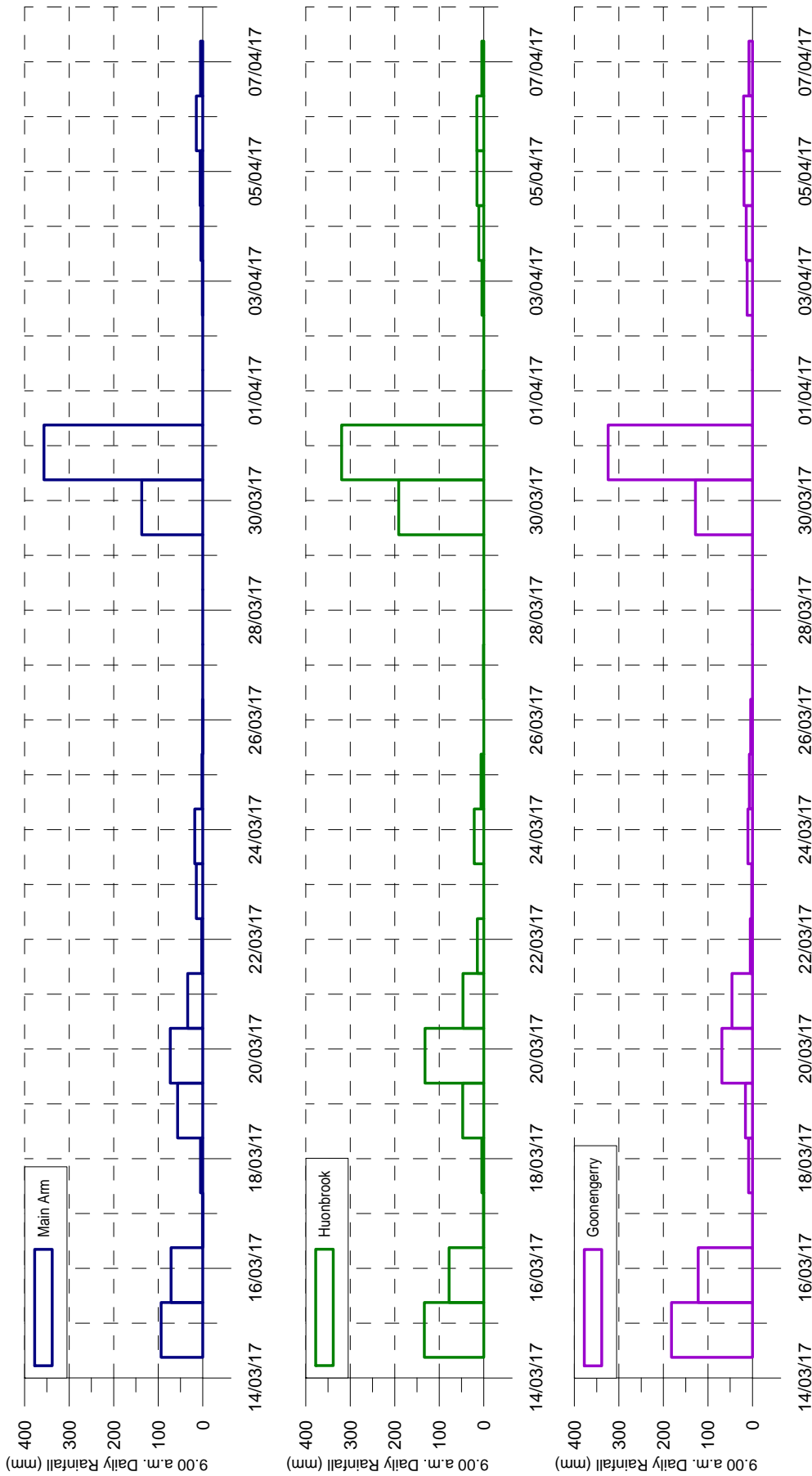


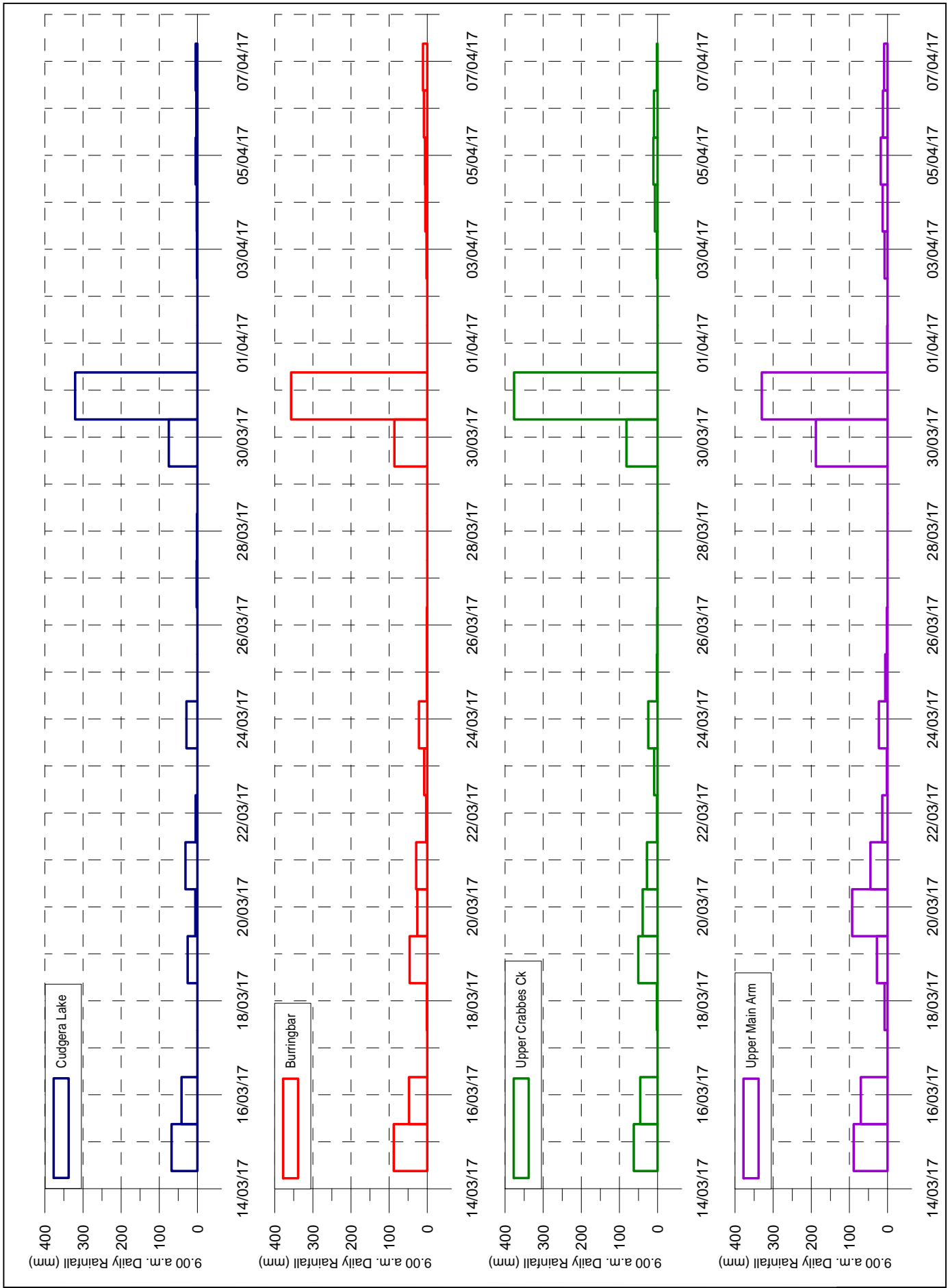


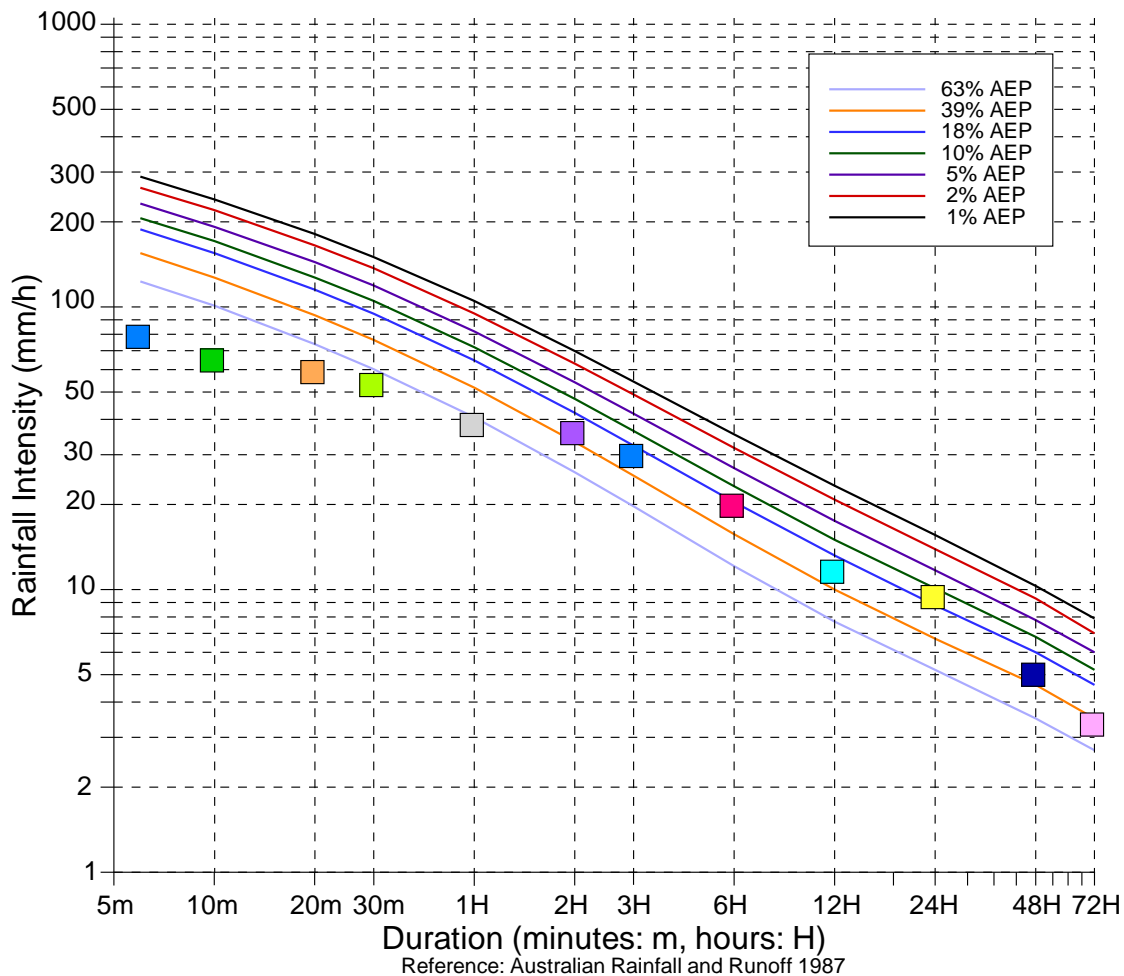






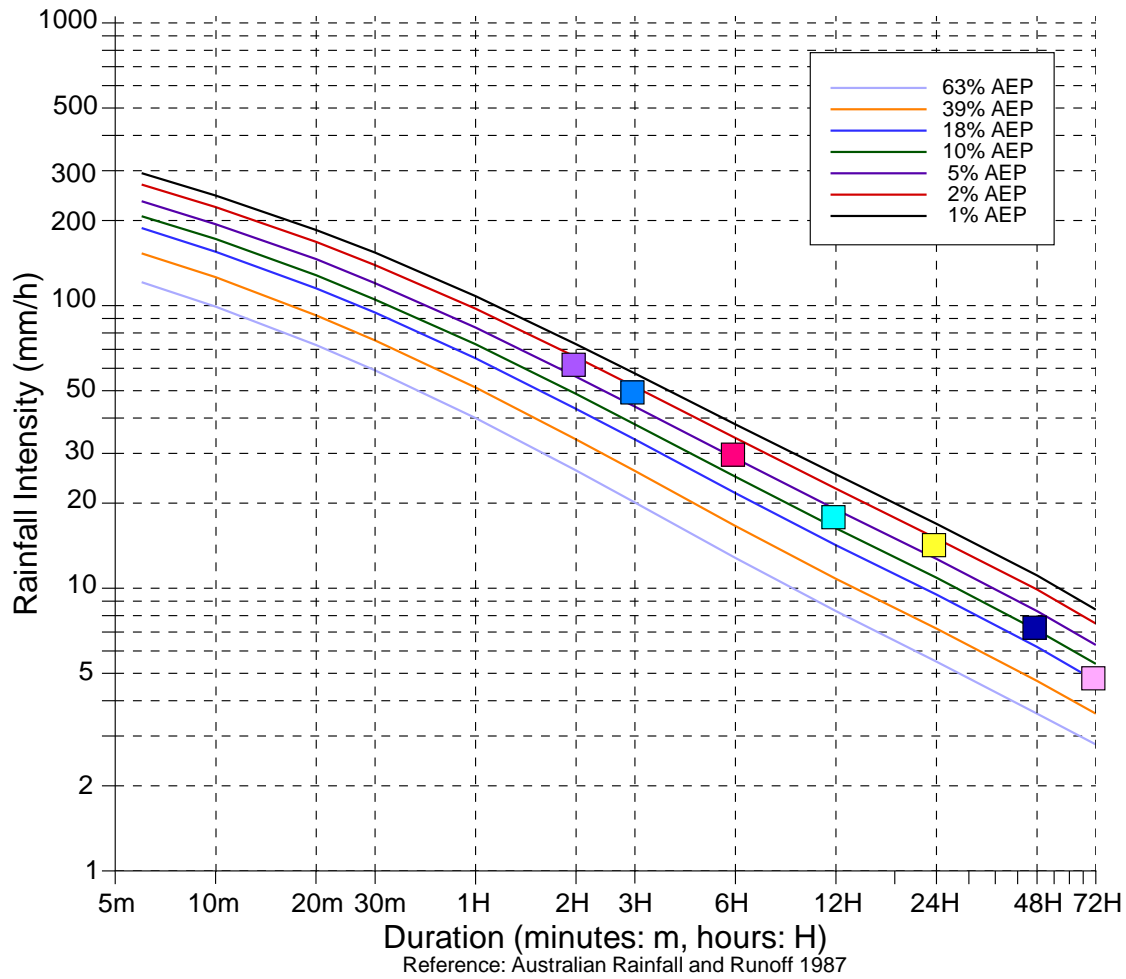






Duration (minutes: m) (Hours: H)	Rainfall Intensity (mm/h)	Time/Date
6m	80.0	21:36_30/03/2017
10m	66.0	21:38_30/03/2017
20m	60.0	22:52_30/03/2017
30m	54.0	22:42_30/03/2017
1H	39.0	21:18_30/03/2017
2H	36.5	21:16_30/03/2017
3H	30.3	20:22_30/03/2017
6H	20.2	19:16_30/03/2017
12H	11.8	17:04_30/03/2017
24H	9.6	01:26_30/03/2017
48H	5.1	18:20_29/03/2017
72H	3.4	18:20_29/03/2017

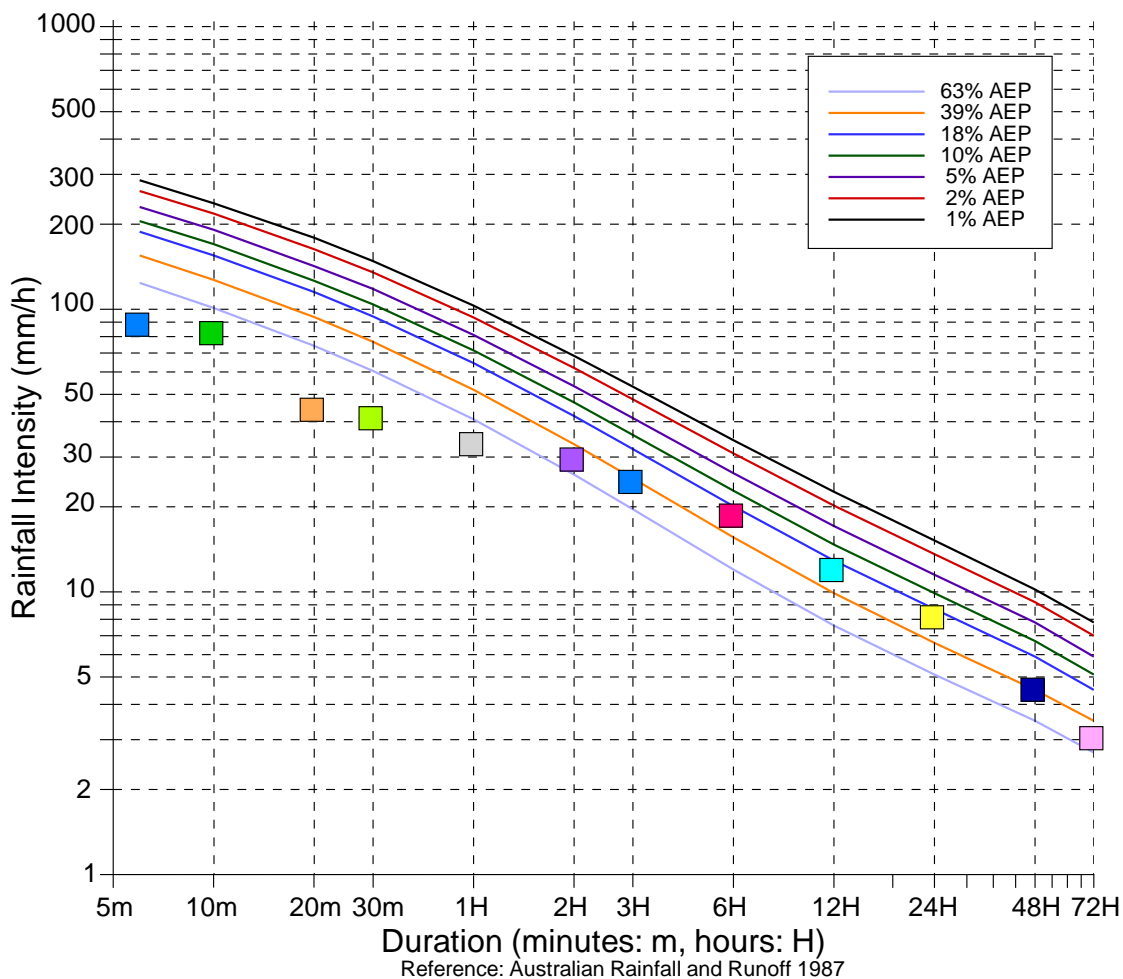
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Short duration rainfall data impacted by possible radio transfer interruptions. Suspect short duration IFD results removed by observation.

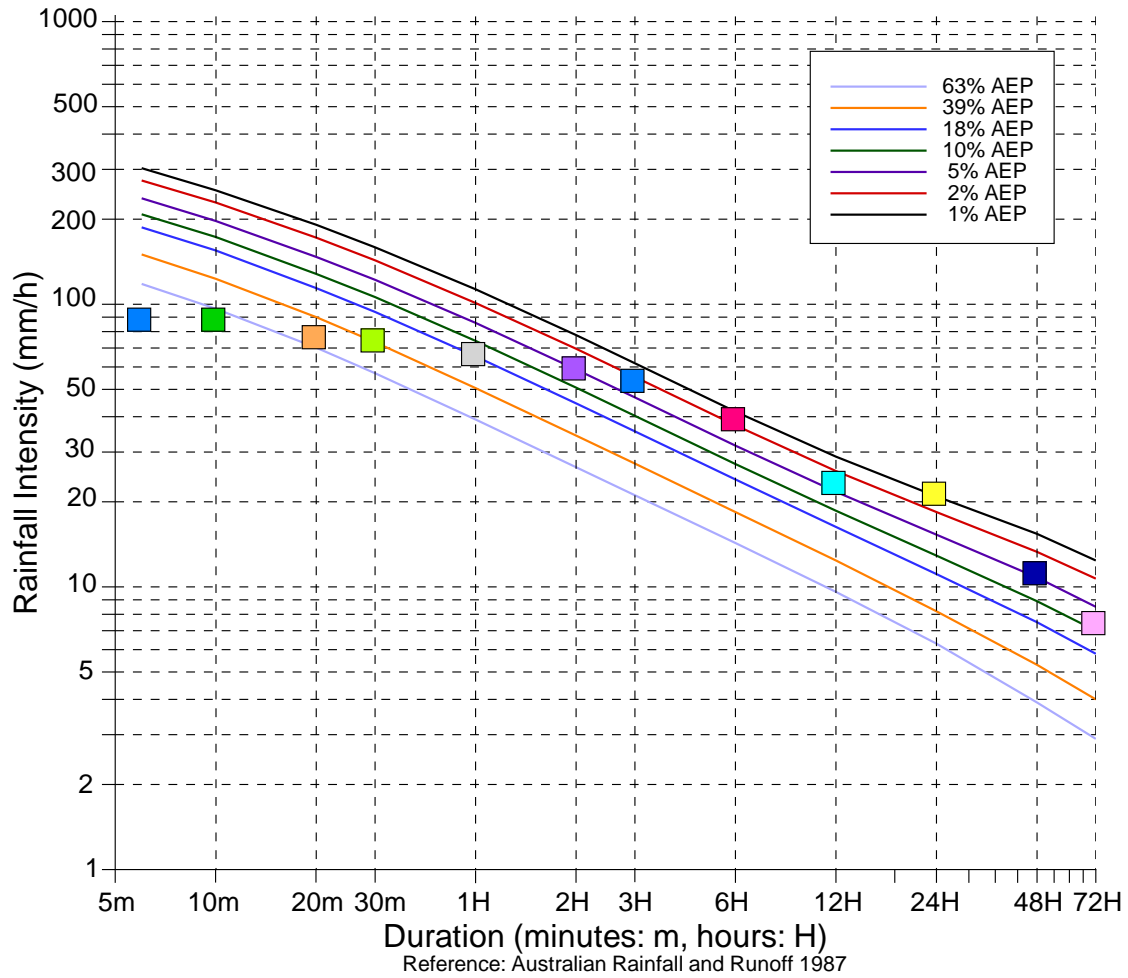
Duration (minutes: m) (Hours: H)	Rainfall Intensity (mm/h)	Time/Date
6m		
10m		
20m		
30m		
1H		
2H	63.0	21:26_30/03/2017
3H	50.3	20:28_30/03/2017
6H	30.3	17:36_30/03/2017
12H	18.2	11:30_30/03/2017
24H	14.5	01:26_30/03/2017
48H	7.4	17:20_29/03/2017
72H	4.9	17:20_29/03/2017

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 Adapted from: <http://www.bom.gov.au/water/designRainfalls/ifd-arr87/glossary.shtml>



Duration (minutes: m) (Hours: H)	Rainfall Intensity (mm/h)	Time/Date
6m	90.0	17:08_17/03/2017
10m	84.0	17:08_17/03/2017
20m	45.0	17:08_17/03/2017
30m	42.0	22:40_30/03/2017
1H	34.0	21:14_30/03/2017
2H	30.0	21:14_30/03/2017
3H	25.0	20:12_30/03/2017
6H	19.0	19:26_30/03/2017
12H	12.2	16:52_30/03/2017
24H	8.3	06:26_30/03/2017
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72H	3.1	22:34_29/03/2017

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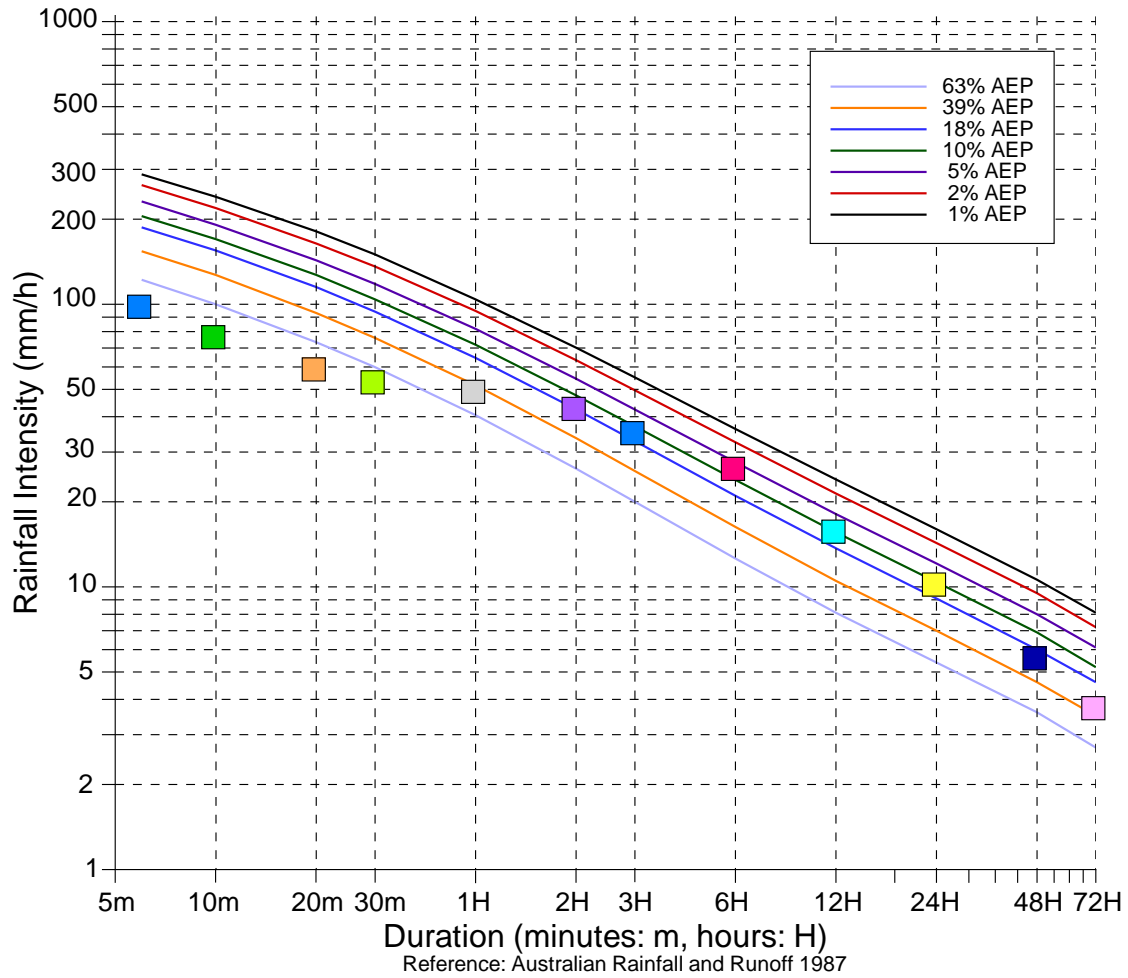


Duration (minutes: m) (Hours: H)	Rainfall Intensity (mm/h)	Time/Date
6m	90.0	21:18_30/03/2017
10m	90.0	20:58_30/03/2017
20m	78.0	20:56_30/03/2017
30m	76.0	20:56_30/03/2017
1H	68.0	20:34_30/03/2017
2H	60.5	20:36_30/03/2017
3H	54.7	19:50_30/03/2017
6H	40.0	18:14_30/03/2017
12H	23.8	11:24_30/03/2017
24H	21.8	00:28_30/03/2017
48H	11.4	14:00_29/03/2017
72H	7.6	14:00_29/03/2017

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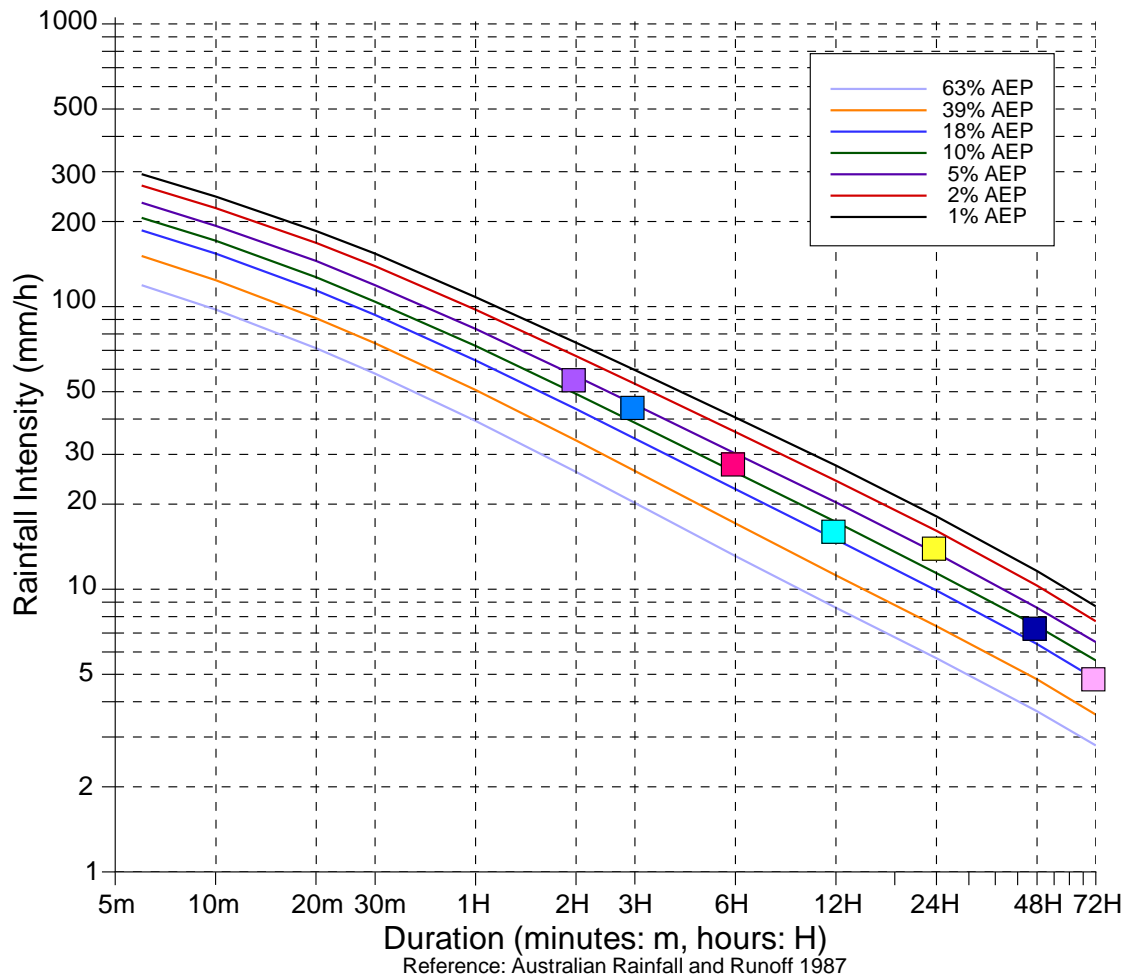
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Adapted from: <http://www.bom.gov.au/water/designRainfalls/ifd-arr87/glossary.shtml>



Duration (minutes: m) (Hours: H)	Rainfall Intensity (mm/h)	Time/Date
6m	100.0	02:32_19/03/2017
10m	78.0	02:28_19/03/2017
20m	60.0	22:54_30/03/2017
30m	54.0	22:42_30/03/2017
1H	50.0	21:22_30/03/2017
2H	43.5	21:18_30/03/2017
3H	35.7	20:40_30/03/2017
6H	26.7	20:16_30/03/2017
12H	16.0	16:50_30/03/2017
24H	10.4	02:20_30/03/2017
48H	5.7	21:48_29/03/2017
72H	3.8	21:48_29/03/2017

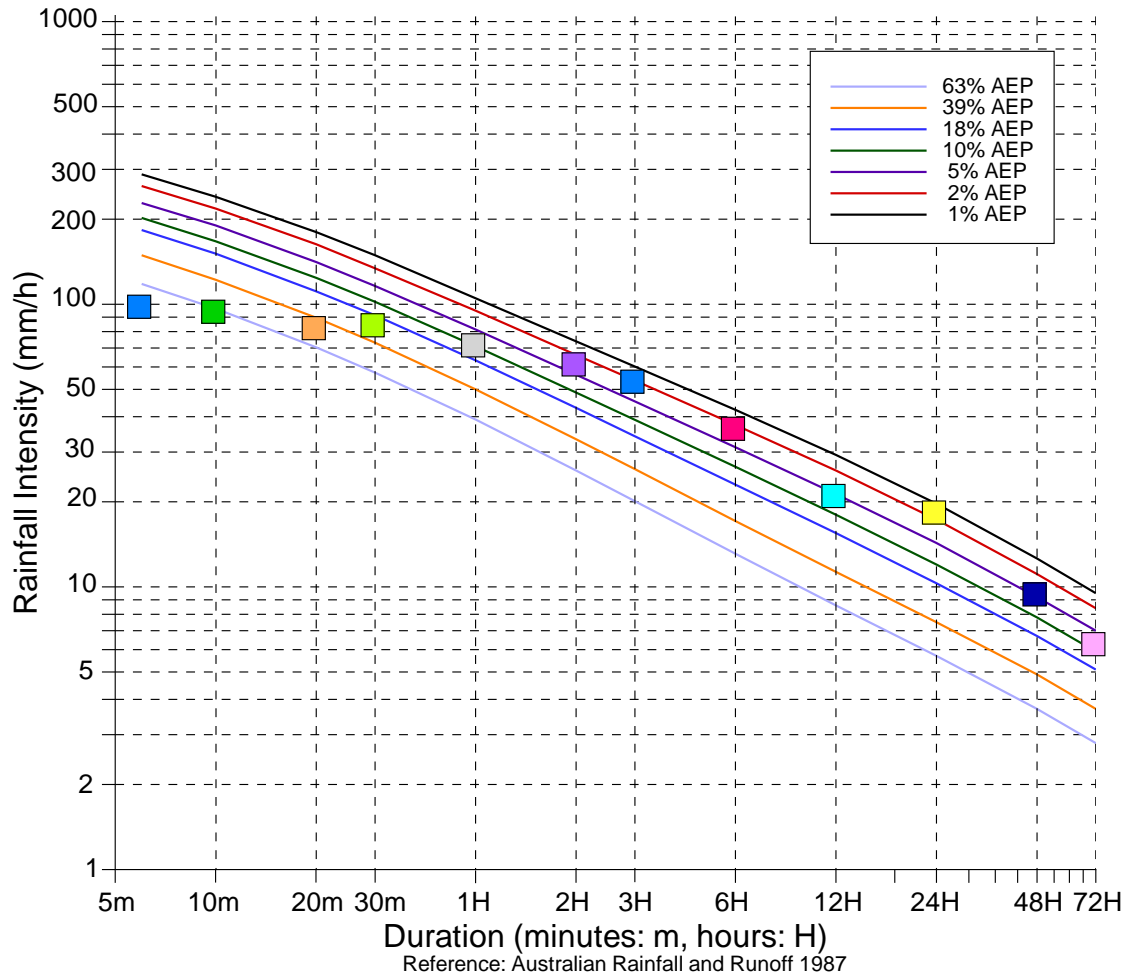
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Short duration rainfall data impacted by possible radio transfer interruptions. Suspect short duration IFD results removed by observation.

Duration (minutes: m) (Hours: H)	Rainfall Intensity (mm/h)	Time/Date
6m		
10m		
20m		
30m		
1H		
2H	56.0	21:12_30/03/2017
3H	44.7	20:14_30/03/2017
6H	28.2	19:16_30/03/2017
12H	16.3	15:30_30/03/2017
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 Adapted from: <http://www.bom.gov.au/water/designRainfalls/ifd-arr87/glossary.shtml>

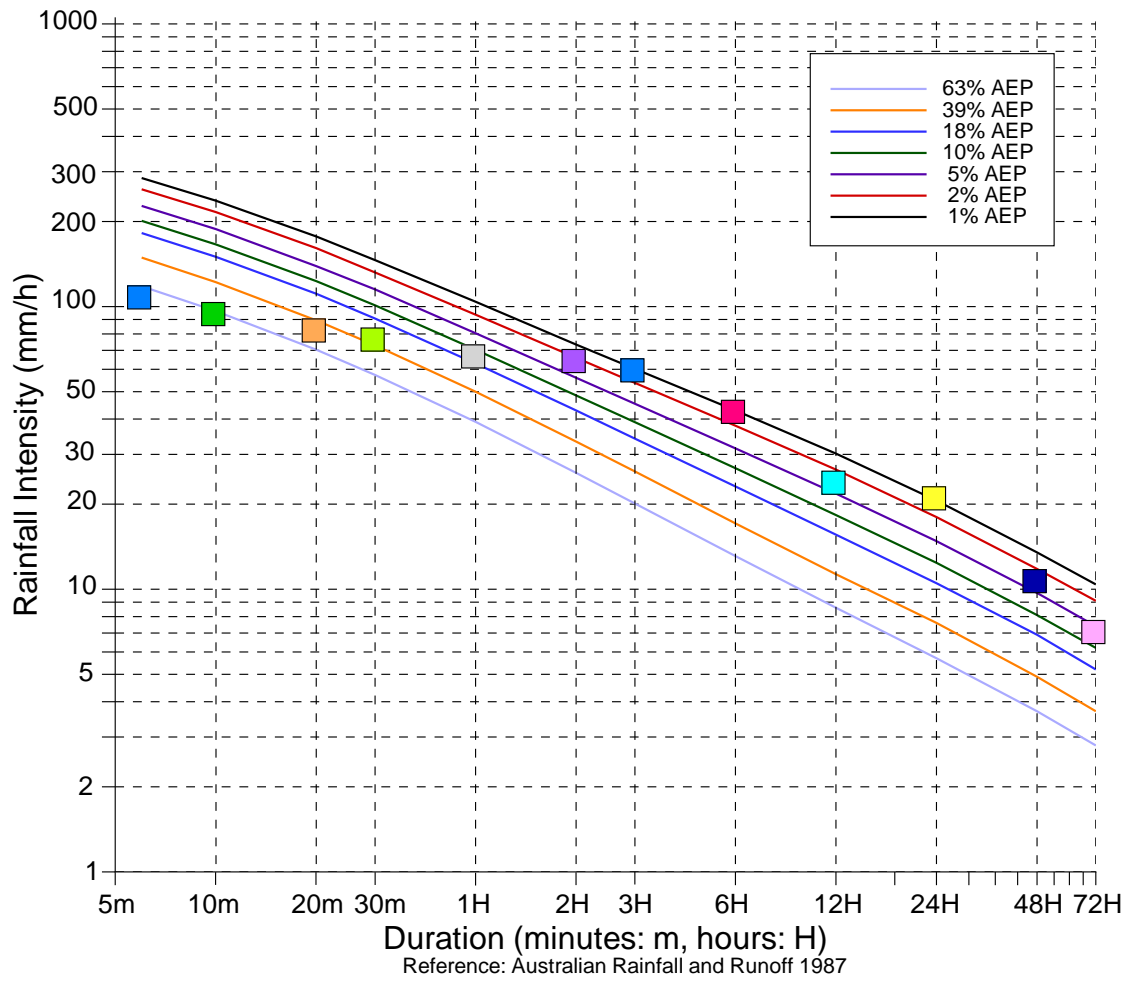


Duration (minutes: m) (Hours: H)	Rainfall Intensity (mm/h)	Time/Date
6m	100.0	23:42_30/03/2017
10m	96.0	23:06_30/03/2017
20m	84.0	23:14_30/03/2017
30m	86.0	23:06_30/03/2017
1H	73.0	22:54_30/03/2017
2H	62.5	21:54_30/03/2017
3H	54.3	20:56_30/03/2017
6H	37.0	19:18_30/03/2017
12H	21.4	12:42_30/03/2017
24H	18.7	01:42_30/03/2017
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72H	6.4	19:16_29/03/2017

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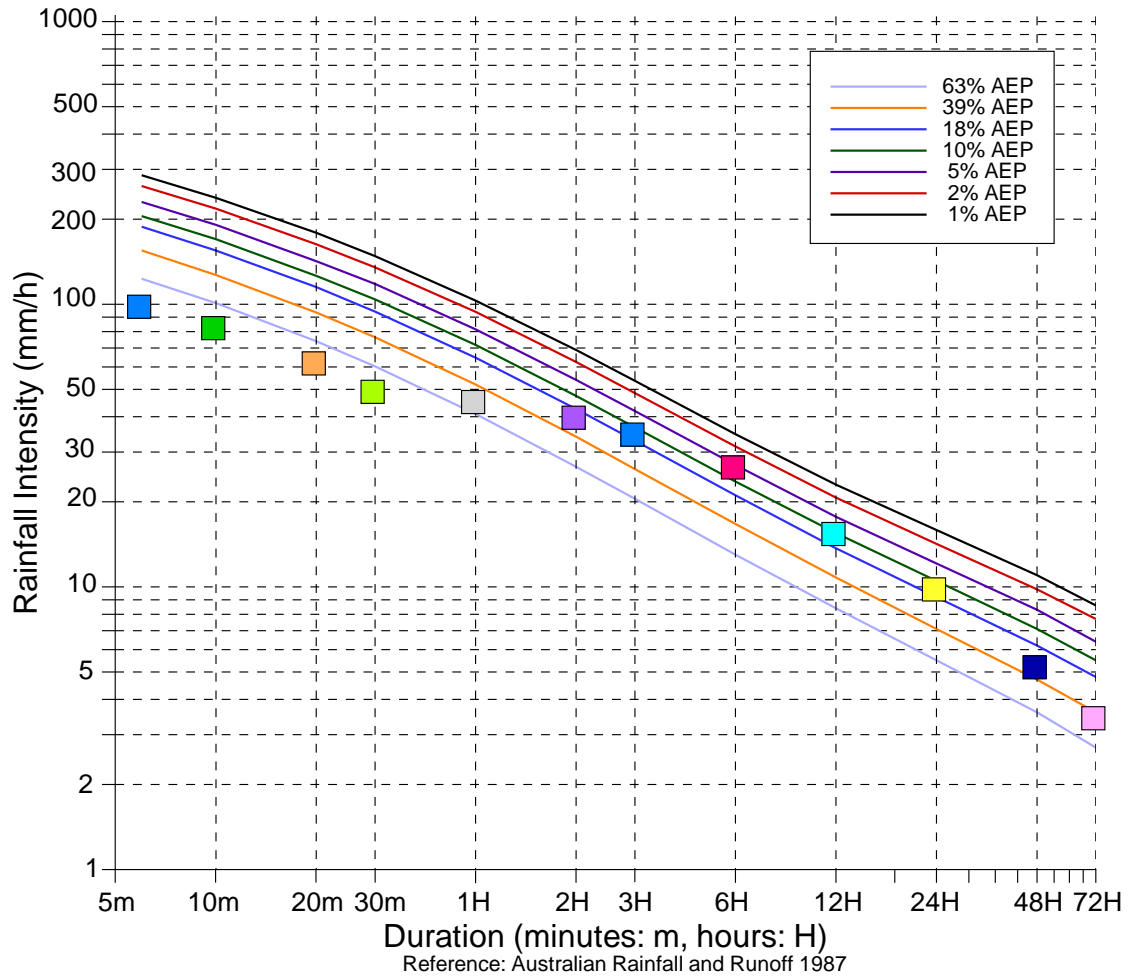
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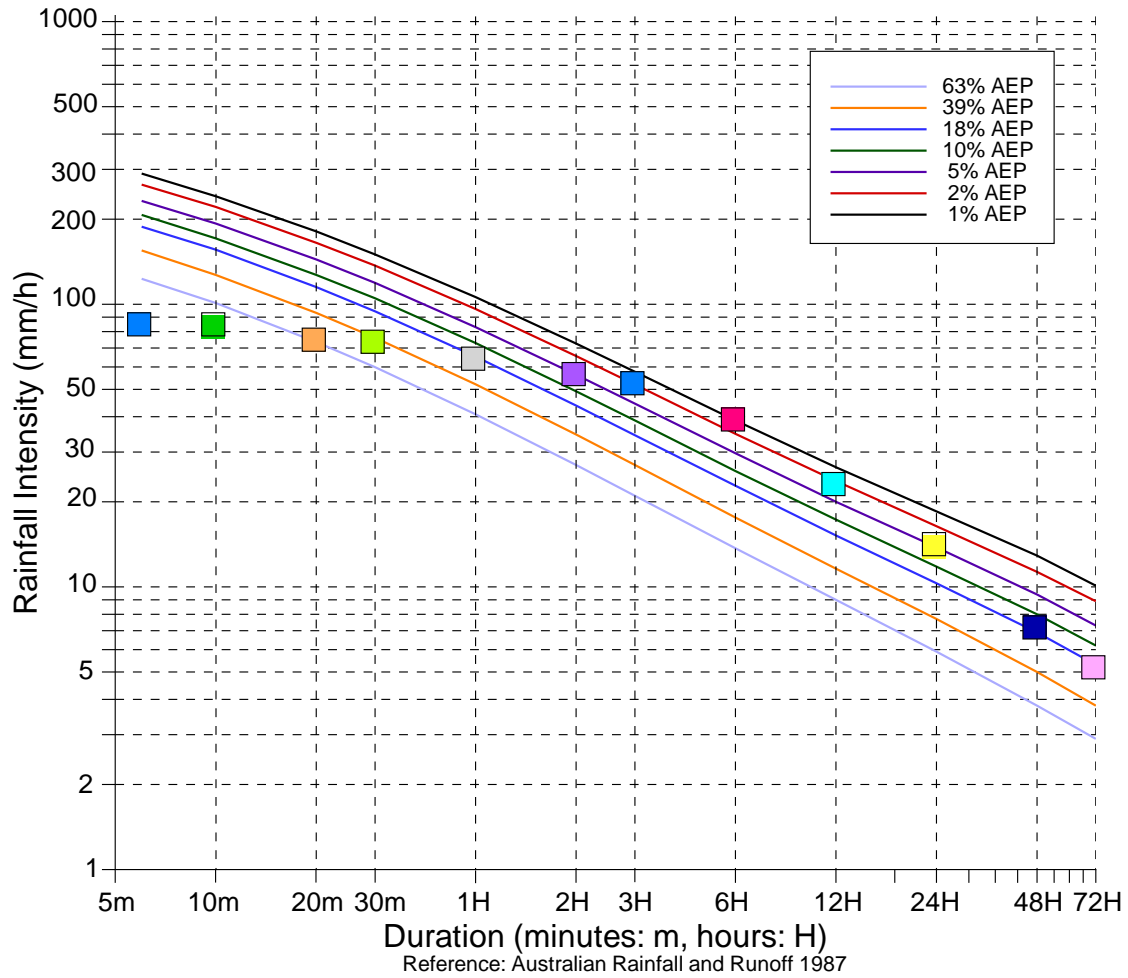
Duration (minutes: m) (Hours: H)	Rainfall Intensity (mm/h)	Time/Date
6m	110.0	00:24_31/03/2017
10m	96.0	00:24_31/03/2017
20m	84.0	00:20_31/03/2017
30m	78.0	23:24_30/03/2017
1H	68.0	23:32_30/03/2017
2H	65.5	22:58_30/03/2017
3H	60.7	21:58_30/03/2017
6H	43.3	19:28_30/03/2017
12H	24.3	13:02_30/03/2017
24H	21.4	01:46_30/03/2017
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72H	7.2	17:06_29/03/2017

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 Adapted from: <http://www.bom.gov.au/water/designRainfalls/ifd-arr87/glossary.shtml>



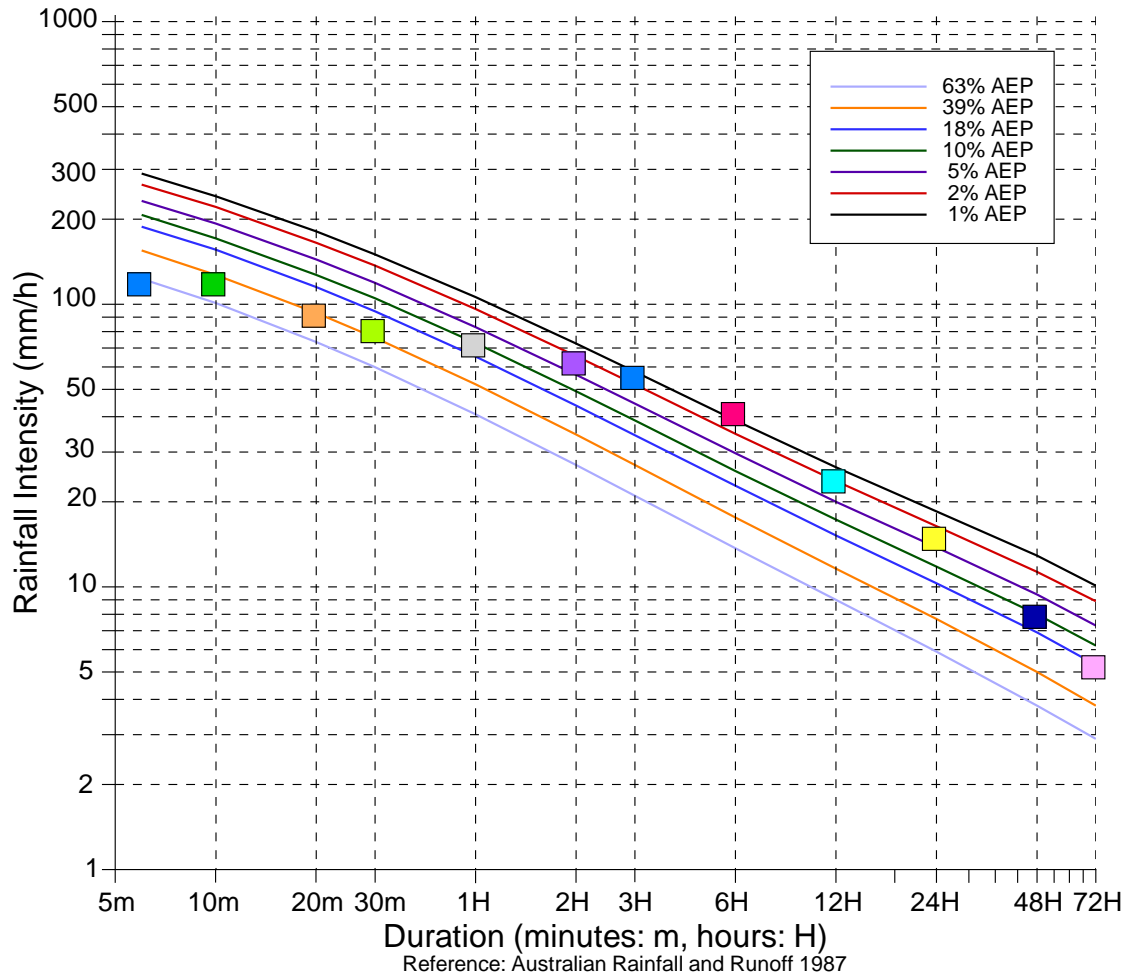
Duration (minutes: m) (Hours: H)	Rainfall Intensity (mm/h)	Time/Date
6m	100.0	08:10_15/03/2017
10m	84.0	23:22_30/03/2017
20m	63.0	23:12_30/03/2017
30m	50.0	23:06_30/03/2017
1H	46.0	22:32_30/03/2017
2H	40.5	21:32_30/03/2017
3H	35.3	21:40_30/03/2017
6H	27.0	20:40_30/03/2017
12H	15.7	16:32_30/03/2017
24H	10.0	04:54_30/03/2017
48H	5.3	23:16_29/03/2017
72H	3.5	23:16_29/03/2017

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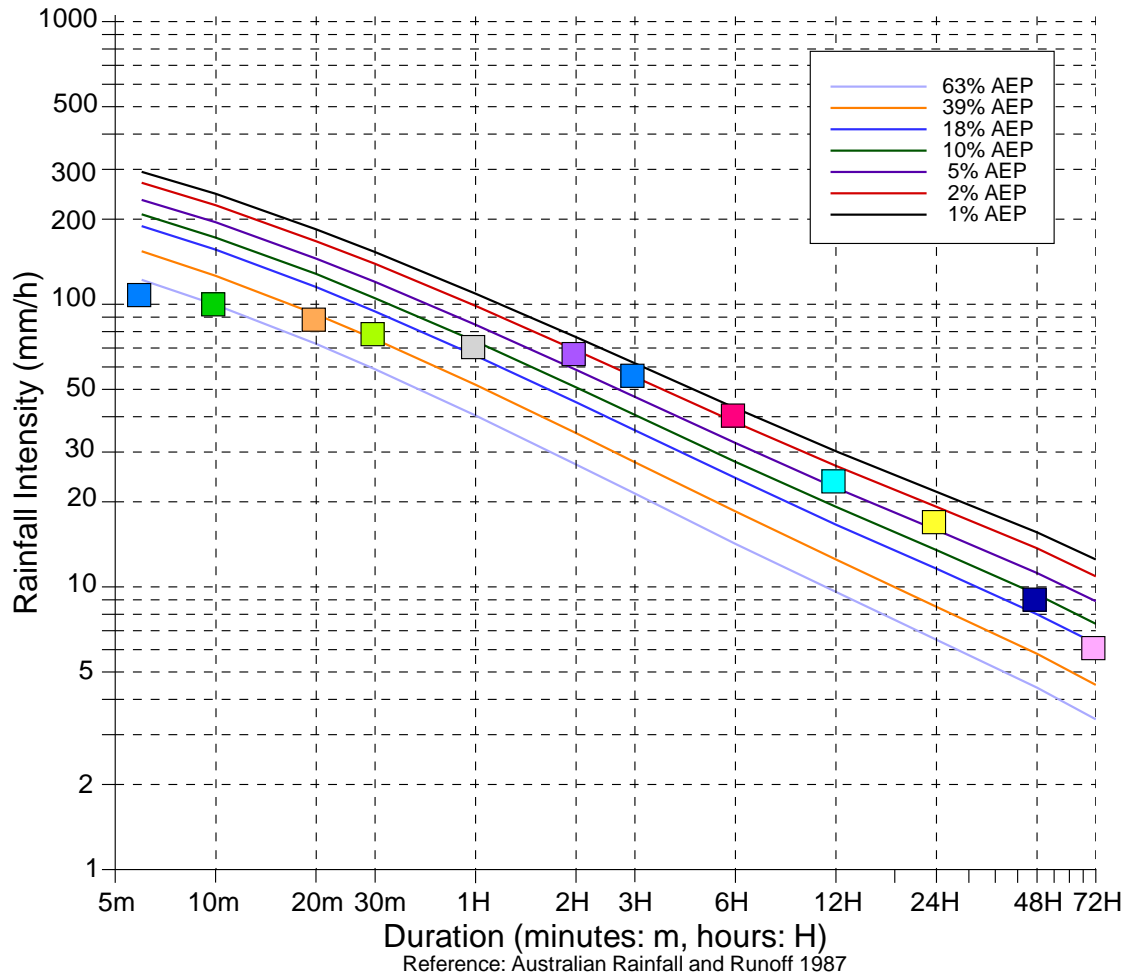
Duration (minutes: m) (Hours: H)	Rainfall Intensity (mm/h)	Time/Date
6m	85.0	22:46_30/03/2017
10m	81.0	22:48_30/03/2017
20m	76.5	22:22_30/03/2017
30m	73.0	22:28_30/03/2017
1H	66.5	21:58_30/03/2017
2H	58.5	21:44_30/03/2017
3H	55.0	21:04_30/03/2017
6H	41.3	19:20_30/03/2017
12H	24.0	15:52_30/03/2017
24H	15.3	01:38_30/03/2017
48H	8.2	22:32_29/03/2017
72H	5.5	22:32_29/03/2017

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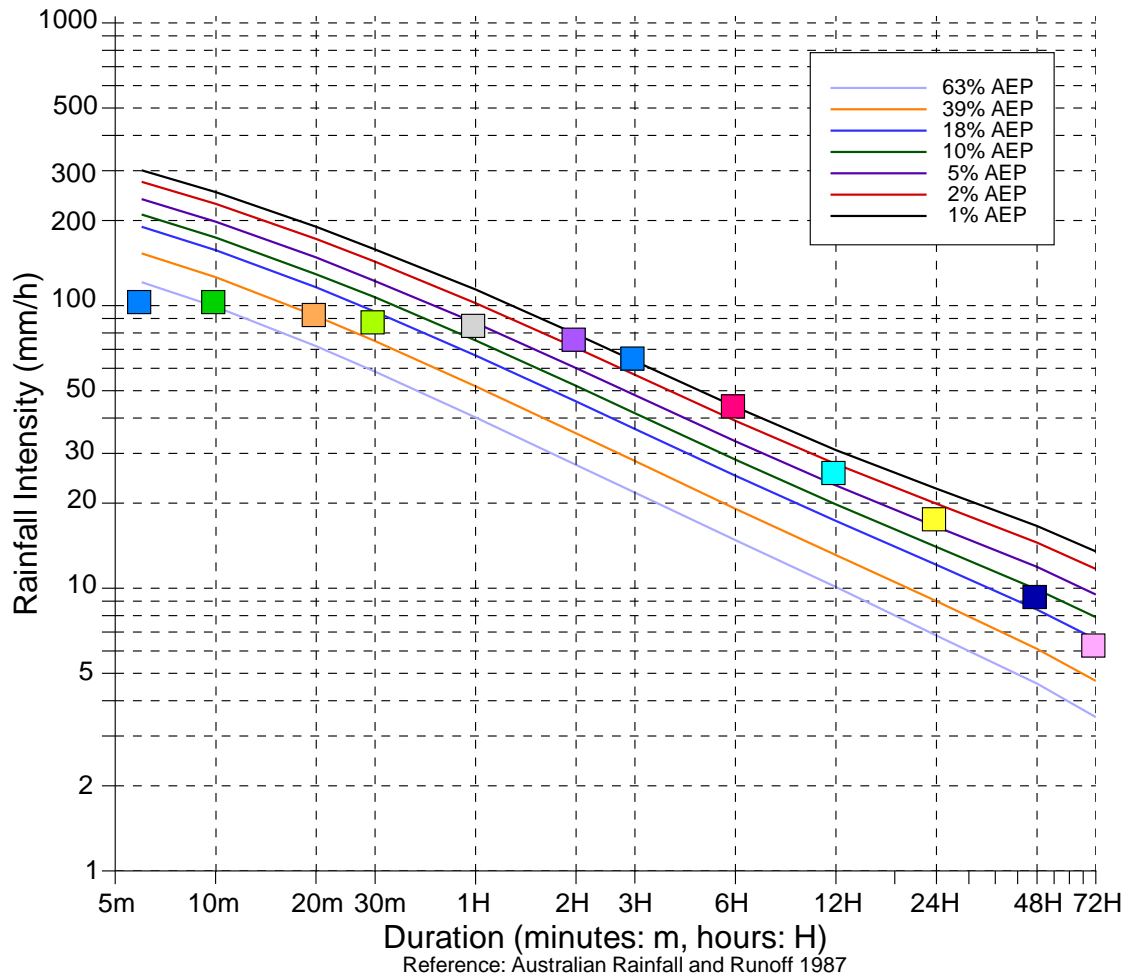
Duration (minutes: m) (Hours: H)	Rainfall Intensity (mm/h)	Time/Date
6m	120.0	23:46_30/03/2017
10m	120.0	08:16_15/03/2017
20m	93.0	08:10_15/03/2017
30m	82.0	23:22_30/03/2017
1H	73.0	22:58_30/03/2017
2H	63.0	22:36_30/03/2017
3H	56.0	21:52_30/03/2017
6H	41.7	20:34_30/03/2017
12H	24.1	16:52_30/03/2017
24H	15.1	04:58_30/03/2017
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 Adapted from: <http://www.bom.gov.au/water/designRainfalls/ifd-arr87/glossary.shtml>



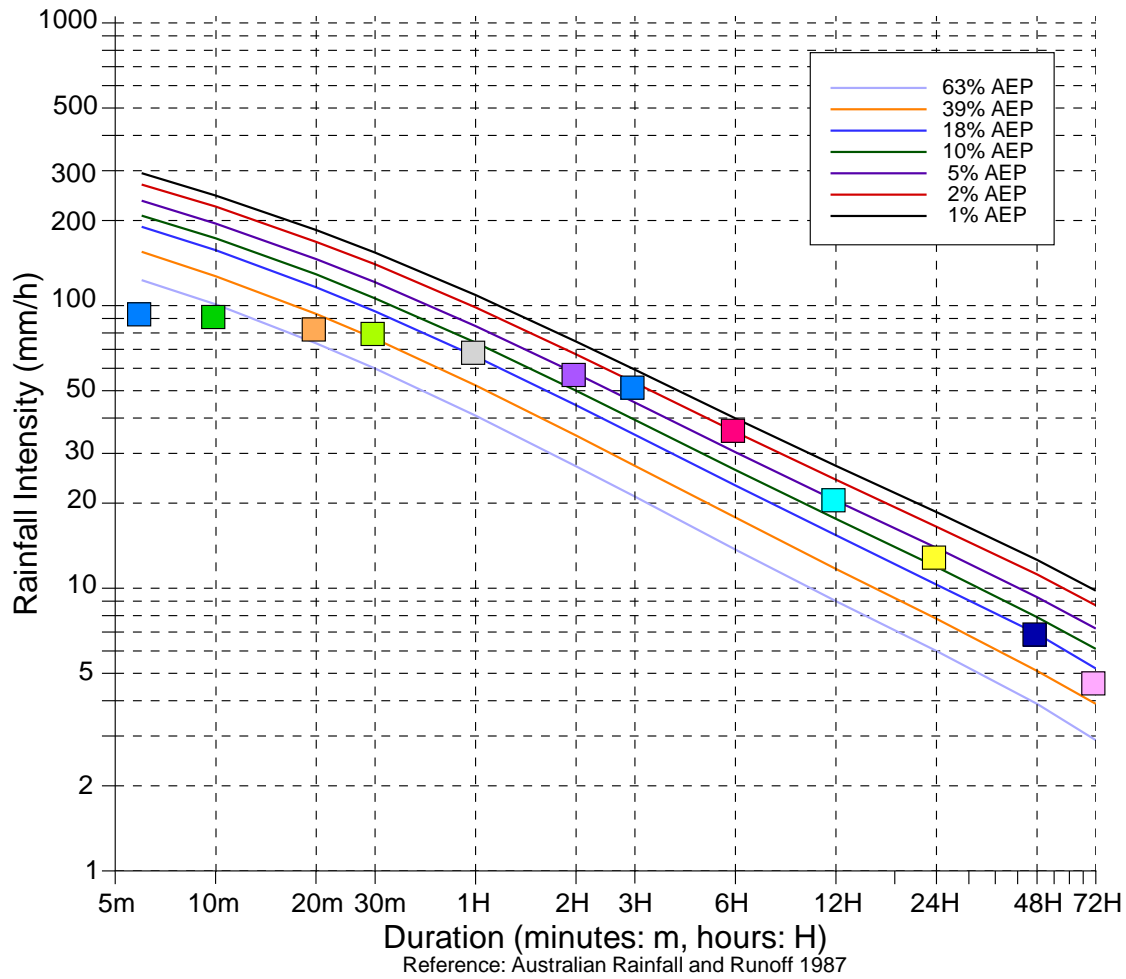
Duration (minutes: m) (Hours: H)	Rainfall Intensity (mm/h)	Time/Date
6m	110.0	00:00_31/03/2017
10m	102.0	00:00_31/03/2017
20m	90.0	23:52_30/03/2017
30m	80.0	23:42_30/03/2017
1H	72.0	23:46_30/03/2017
2H	68.0	23:14_30/03/2017
3H	57.0	22:16_30/03/2017
6H	41.2	19:54_30/03/2017
12H	24.1	16:46_30/03/2017
24H	17.3	02:16_30/03/2017
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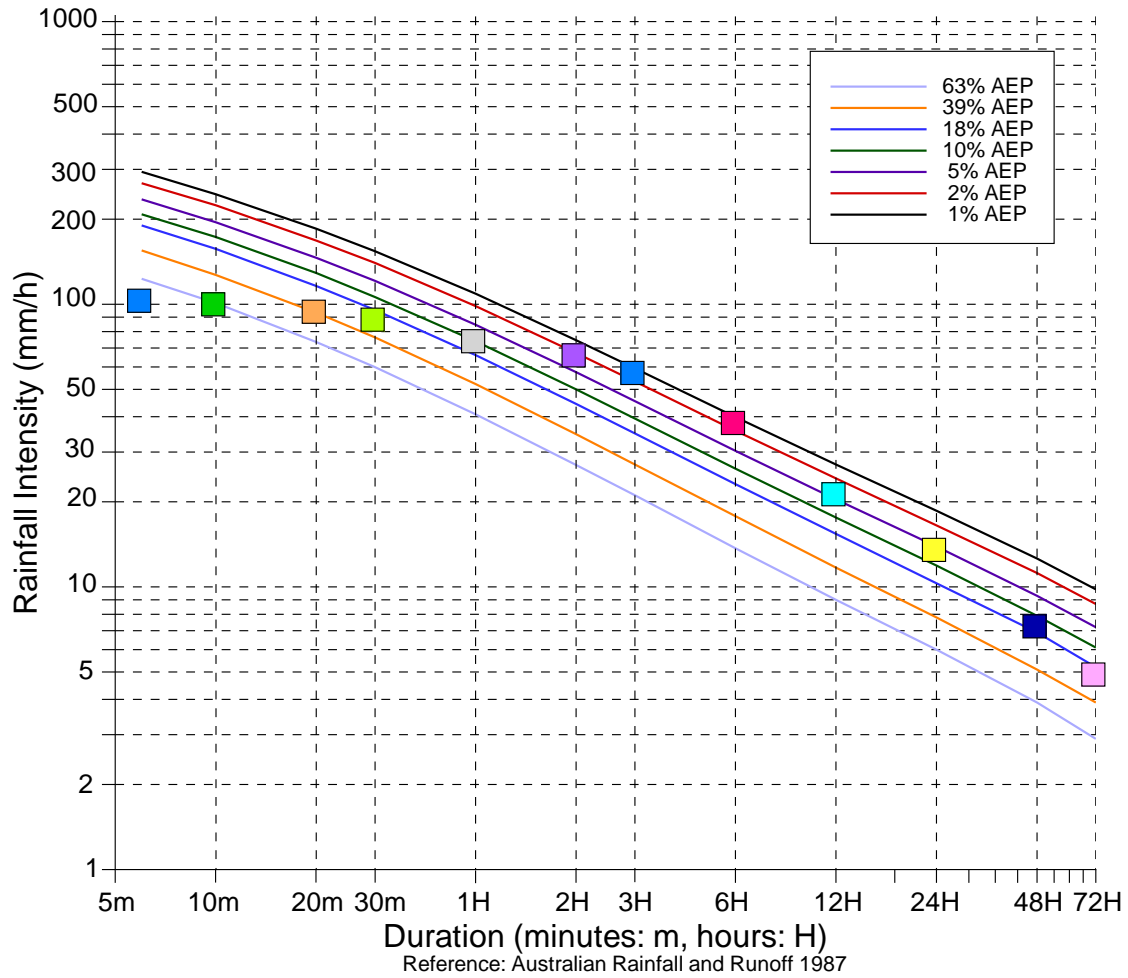
	Duration (minutes: m) (Hours: H)	Rainfall Intensity (mm/h)	Time/Date
■	6m	105.0	00:28_31/03/2017
■	10m	105.0	00:26_31/03/2017
■	20m	94.5	00:22_31/03/2017
■	30m	89.0	00:06_31/03/2017
■	1H	86.5	23:50_30/03/2017
■	2H	77.3	23:18_30/03/2017
■	3H	66.3	22:32_30/03/2017
■	6H	44.9	19:54_30/03/2017
■	12H	26.1	16:44_30/03/2017
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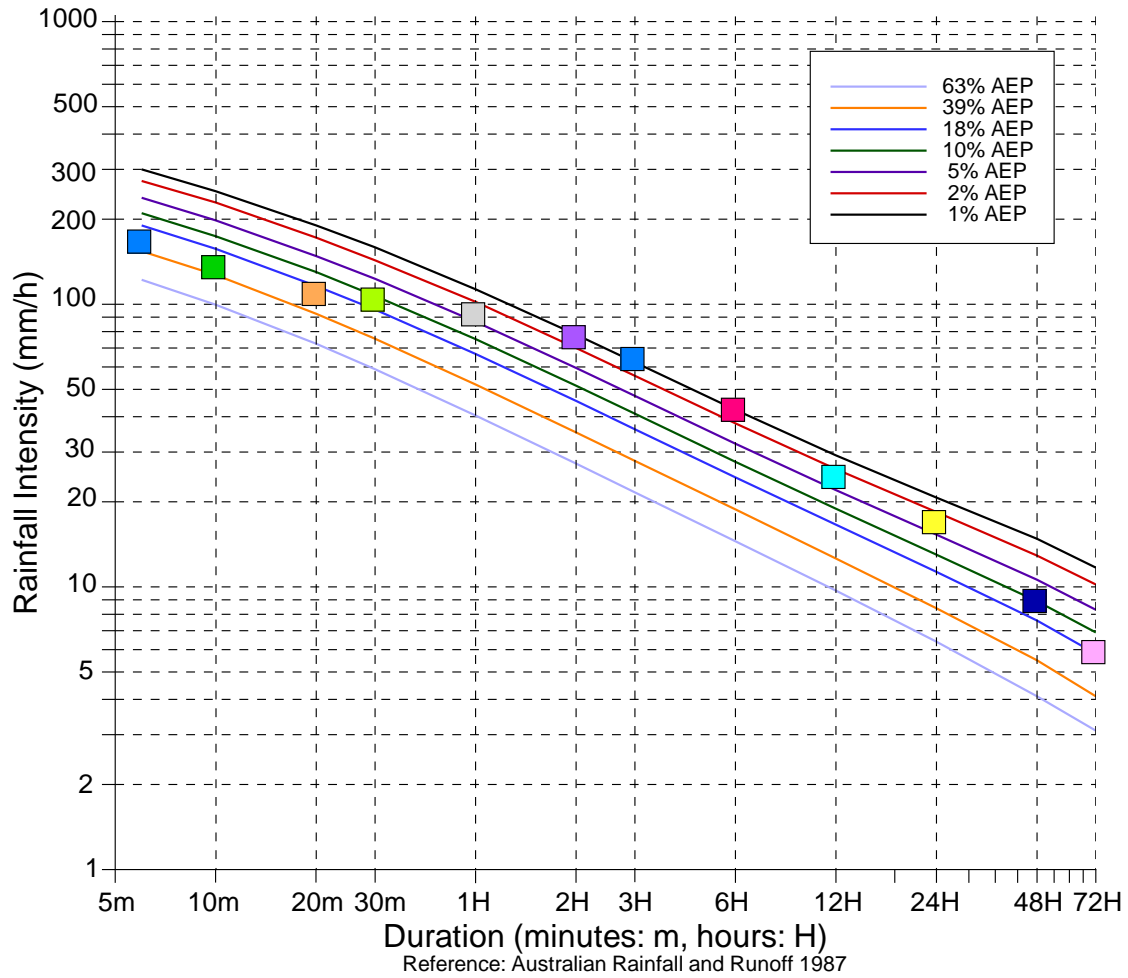
	Duration (minutes: m) (Hours: H)	Rainfall Intensity (mm/h)	Time/Date
■	6m	95.0	22:54_14/03/2017
■	10m	93.0	22:48_14/03/2017
■	20m	84.0	22:24_14/03/2017
■	30m	81.0	22:30_14/03/2017
■	1H	69.5	22:10_30/03/2017
■	2H	58.0	21:58_30/03/2017
■	3H	52.3	22:00_30/03/2017
■	6H	36.8	19:18_30/03/2017
■	12H	20.9	16:00_30/03/2017
■	24H	13.1	03:28_30/03/2017
■	48H	7.0	12:06_29/03/2017
■	72H	4.7	12:06_28/03/2017

Australian Rainfall and Runoff (Institute of Engineers Australia 1987), states:  
 "Use of the terms "recurrence interval" and "return period" has been criticised as leading to confusion in the minds of some decision makers and members of public. Although the terms are simple superficially, they are sometimes misinterpreted as implying that the associated magnitude is only exceeded at regular intervals, and that they are referring to the elapsed time to the next exceedance."  
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 Adapted from: <http://www.bom.gov.au/water/designRainfalls/ifd-arr87/glossary.shtml>



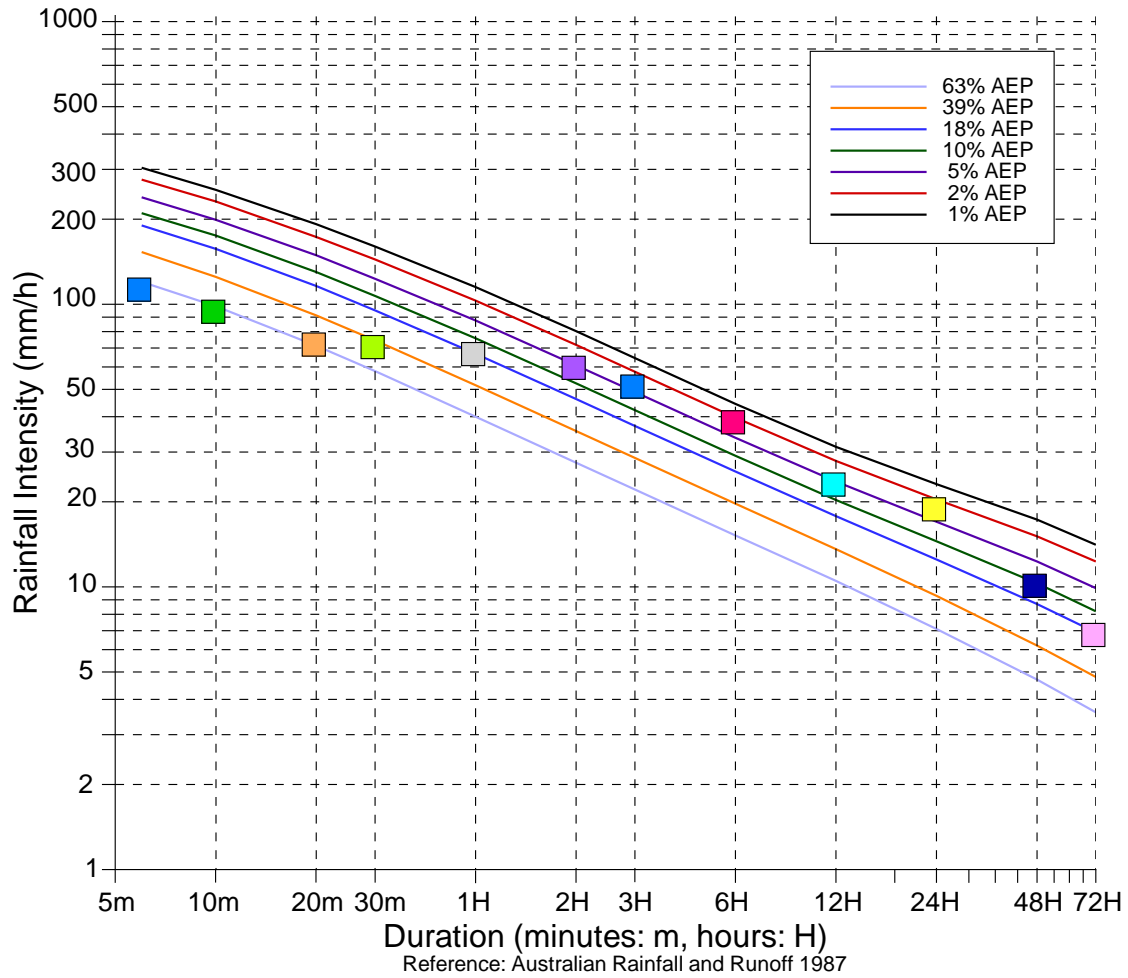
Duration (minutes: m) (Hours: H)	Rainfall Intensity (mm/h)	Time/Date
6m	105.0	22:52_30/03/2017
10m	102.0	22:54_30/03/2017
20m	96.0	22:52_30/03/2017
30m	90.0	22:46_30/03/2017
1H	75.5	22:18_30/03/2017
2H	67.3	22:02_30/03/2017
3H	58.3	22:02_30/03/2017
6H	38.8	19:24_30/03/2017
12H	21.7	16:24_30/03/2017
24H	13.8	02:32_30/03/2017
48H	7.4	22:56_29/03/2017
72H	5.0	22:56_29/03/2017

Australian Rainfall and Runoff (Institute of Engineers Australia 1987), states:  
 "Use of the terms "recurrence interval" and "return period" has been criticised as leading to confusion in the minds of some decision makers and members of public. Although the terms are simple superficially, they are sometimes misinterpreted as implying that the associated magnitude is only exceeded at regular intervals, and that they are referring to the elapsed time to the next exceedance."  
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 Adapted from: <http://www.bom.gov.au/water/designRainfalls/ifd-arr87/glossary.shtml>



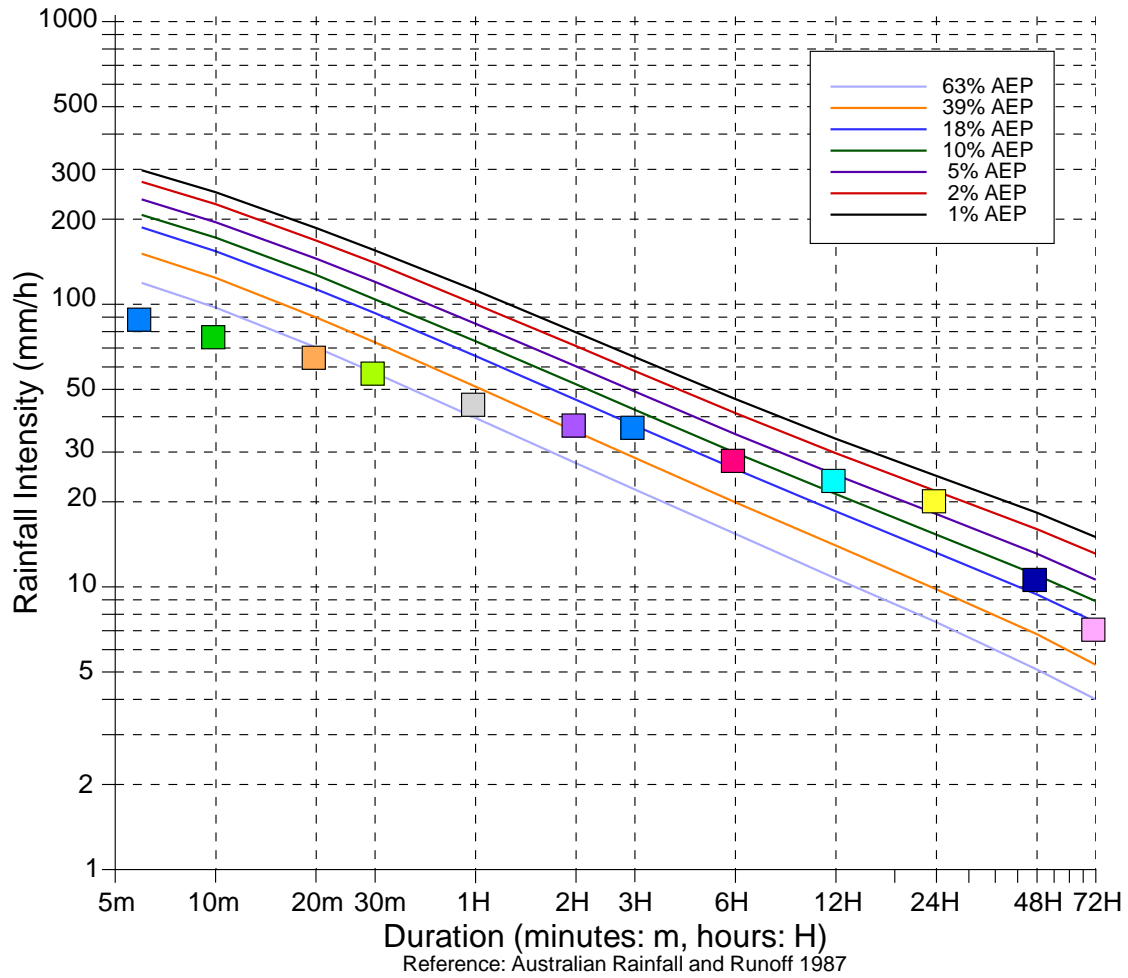
Duration (minutes: m) (Hours: H)	Rainfall Intensity (mm/h)	Time/Date
6m	170.0	23:22_30/03/2017
10m	138.0	00:14_31/03/2017
20m	111.0	00:04_31/03/2017
30m	106.0	00:14_31/03/2017
1H	94.0	23:58_30/03/2017
2H	78.0	23:08_30/03/2017
3H	65.3	22:38_30/03/2017
6H	43.2	19:52_30/03/2017
12H	25.0	16:04_30/03/2017
24H	17.3	03:32_30/03/2017
48H	9.1	23:24_29/03/2017
72H	6.0	23:24_29/03/2017

Australian Rainfall and Runoff (Institute of Engineers Australia 1987), states:  
 "Use of the terms "recurrence interval" and "return period" has been criticised as leading to confusion in the minds of some decision makers and members of public. Although the terms are simple superficially, they are sometimes misinterpreted as implying that the associated magnitude is only exceeded at regular intervals, and that they are referring to the elapsed time to the next exceedance."  
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 Adapted from: <http://www.bom.gov.au/water/designRainfalls/ifd-arr87/glossary.shtml>



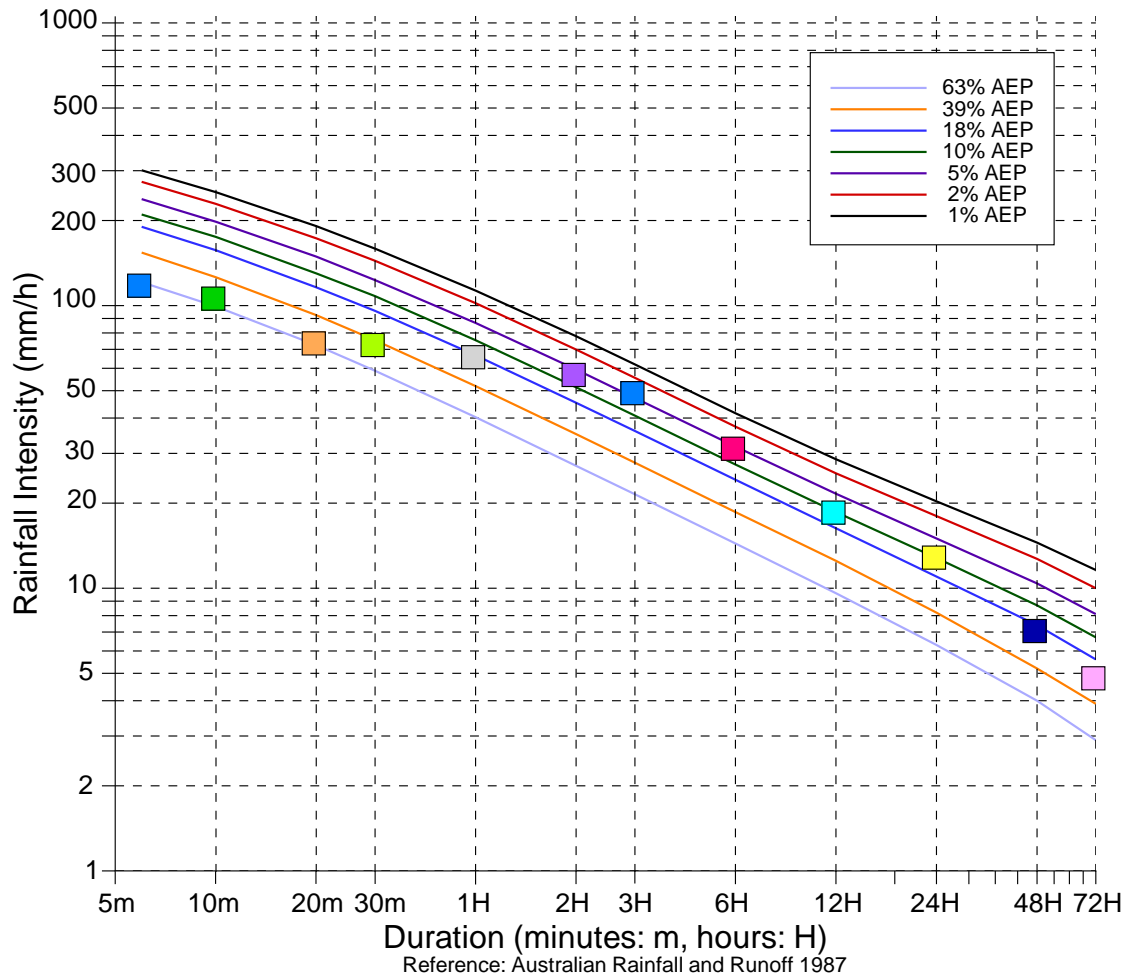
Duration (minutes: m) (Hours: H)	Rainfall Intensity (mm/h)	Time/Date
6m	115.0	05:06_15/03/2017
10m	96.0	05:04_15/03/2017
20m	73.5	23:08_30/03/2017
30m	72.0	22:58_30/03/2017
1H	68.0	23:00_30/03/2017
2H	60.8	22:14_30/03/2017
3H	52.2	21:26_30/03/2017
6H	39.0	18:56_30/03/2017
12H	23.5	14:50_30/03/2017
24H	19.2	01:24_30/03/2017
48H	10.3	17:36_29/03/2017
72H	6.9	17:36_29/03/2017

Australian Rainfall and Runoff (Institute of Engineers Australia 1987), states:  
 "Use of the terms "recurrence interval" and "return period" has been criticised as leading to confusion in the minds of some decision makers and members of public. Although the terms are simple superficially, they are sometimes misinterpreted as implying that the associated magnitude is only exceeded at regular intervals, and that they are referring to the elapsed time to the next exceedance."  
 The use of the term ARI can lead to confusion. It is preferable, therefore, to express the rarity of a rainfall event in terms of AEP.  
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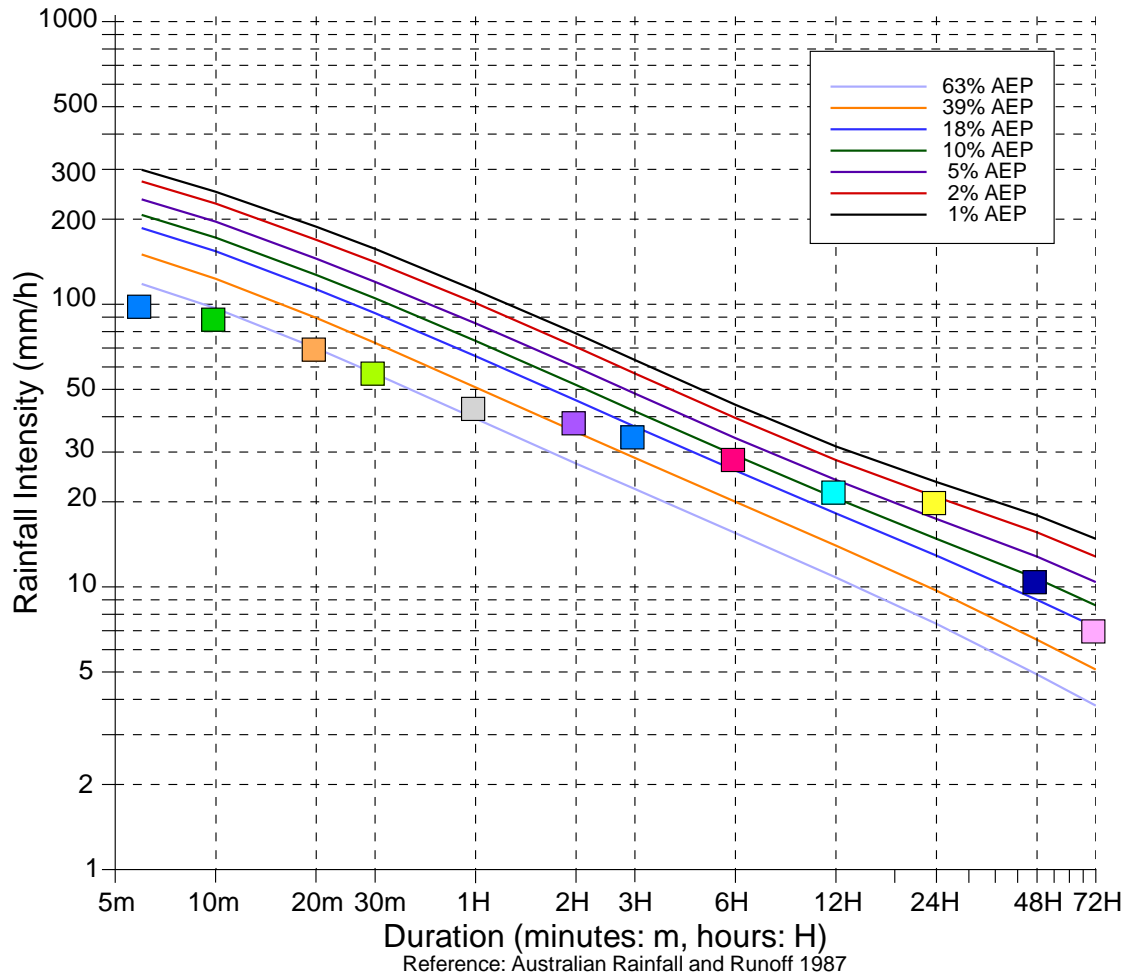
Duration (minutes: m) (Hours: H)	Rainfall Intensity (mm/h)	Time/Date
6m	90.0	13:26_30/03/2017
10m	78.0	13:26_30/03/2017
20m	66.0	02:46_30/03/2017
30m	58.0	02:36_30/03/2017
1H	45.0	02:14_30/03/2017
2H	38.0	02:36_30/03/2017
3H	37.3	02:14_30/03/2017
6H	28.5	02:14_30/03/2017
12H	24.2	02:12_30/03/2017
24H	20.5	02:12_30/03/2017
48H	10.8	16:28_29/03/2017
72H	7.2	16:28_29/03/2017

Australian Rainfall and Runoff (Institute of Engineers Australia 1987), states:  
 "Use of the terms "recurrence interval" and "return period" has been criticised as leading to confusion in the minds of some decision makers and members of public. Although the terms are simple superficially, they are sometimes misinterpreted as implying that the associated magnitude is only exceeded at regular intervals, and that they are referring to the elapsed time to the next exceedance."  
 The use of the term ARI can lead to confusion. It is preferable, therefore, to express the rarity of a rainfall event in terms of AEP. For example, a rainfall total of 141.4mm falling in 3 hours at Toukley has a 0.010 (i.e. 1%) probability of being equalled or exceeded in any one year can be easier to understand than the equivalent statement of a rainfall total of 141.4mm in 3 hours has an ARI of 100 years.  
 Adapted from: <http://www.bom.gov.au/water/designRainfalls/ifd-arr87/glossary.shtml>



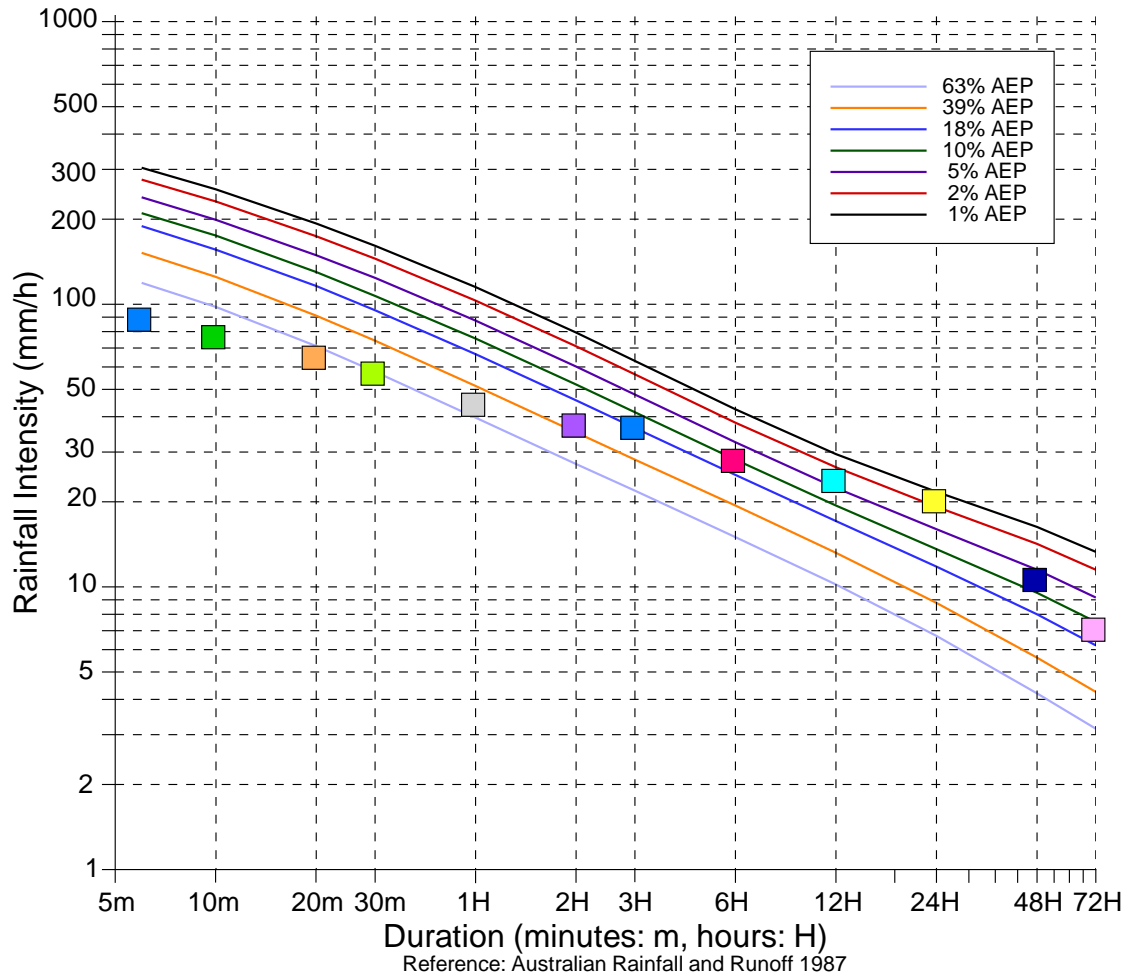
	Duration (minutes: m) (Hours: H)	Rainfall Intensity (mm/h)	Time/Date
■	6m	120.0	06:02_15/03/2017
■	10m	108.0	05:58_15/03/2017
■	20m	75.0	00:30_31/03/2017
■	30m	74.0	00:26_31/03/2017
■	1H	67.0	00:02_31/03/2017
■	2H	58.0	23:18_30/03/2017
■	3H	50.0	22:28_30/03/2017
■	6H	31.8	21:24_30/03/2017
■	12H	18.9	17:18_30/03/2017
■	24H	13.1	03:38_30/03/2017
■	48H	7.2	22:26_29/03/2017
■	72H	4.9	22:26_28/03/2017

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 Adapted from: <http://www.bom.gov.au/water/designRainfalls/ifd-arr87/glossary.shtml>



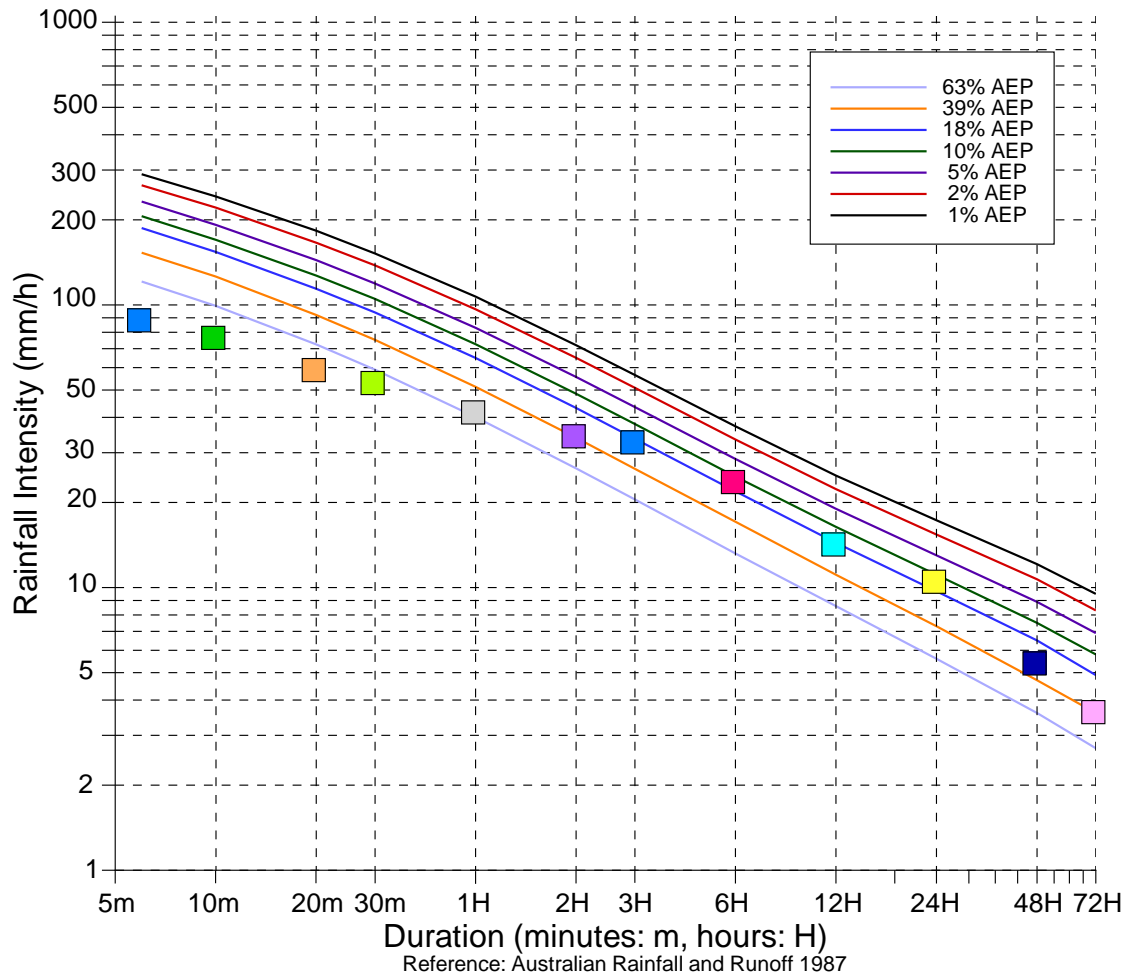
Duration (minutes: m) (Hours: H)	Rainfall Intensity (mm/h)	Time/Date
6m	100.0	05:12_15/03/2017
10m	90.0	05:12_15/03/2017
20m	70.5	05:10_15/03/2017
30m	58.0	03:14_30/03/2017
1H	43.5	23:04_30/03/2017
2H	38.7	22:32_30/03/2017
3H	34.5	21:32_30/03/2017
6H	28.7	18:50_30/03/2017
12H	22.0	01:22_30/03/2017
24H	20.2	01:18_30/03/2017
48H	10.6	18:00_29/03/2017
72H	7.1	18:00_29/03/2017

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 Adapted from: <http://www.bom.gov.au/water/designRainfalls/ifd-arr87/glossary.shtml>



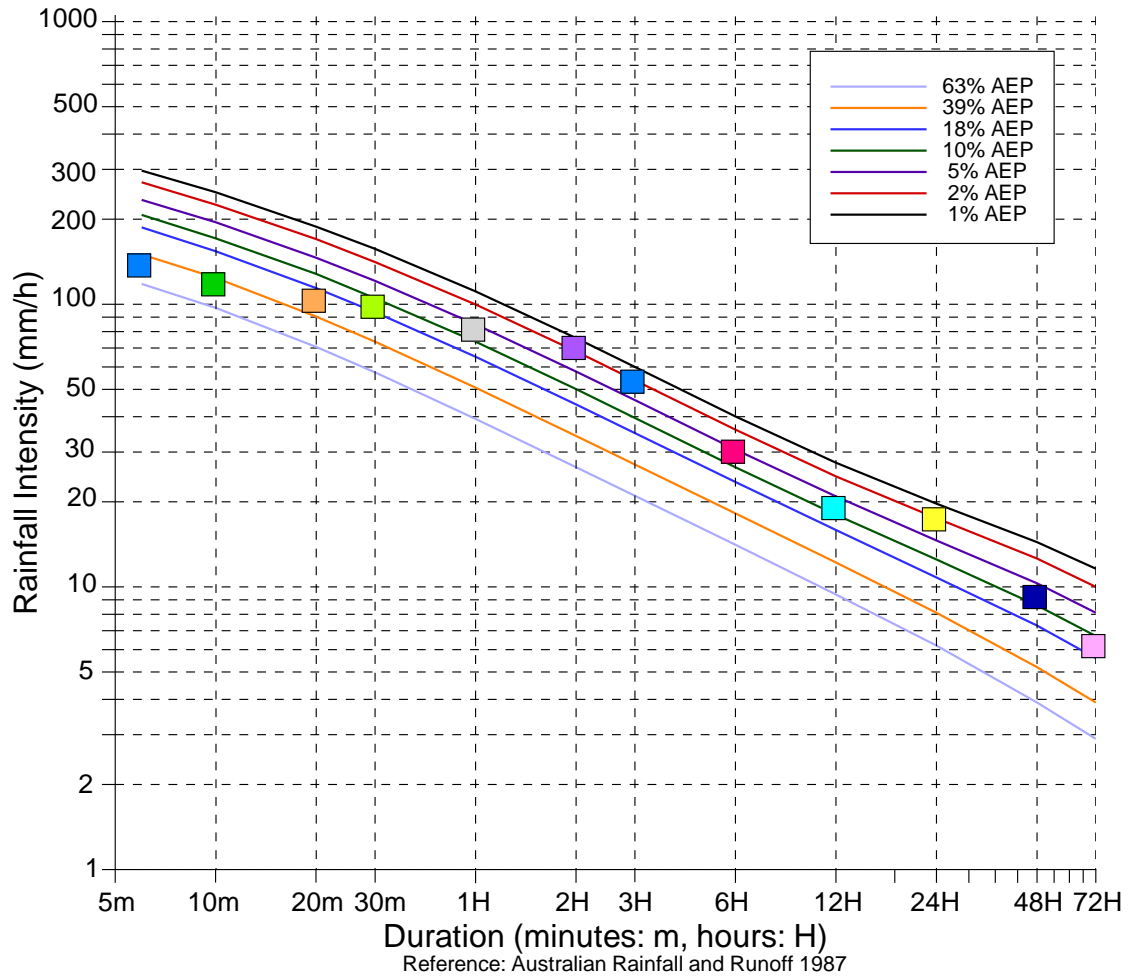
Duration (minutes: m) (Hours: H)	Rainfall Intensity (mm/h)	Time/Date
6m	90.0	13:26_30/03/2017
10m	78.0	13:26_30/03/2017
20m	66.0	02:46_30/03/2017
30m	58.0	02:36_30/03/2017
1H	45.0	02:14_30/03/2017
2H	38.0	02:36_30/03/2017
3H	37.3	02:14_30/03/2017
6H	28.5	02:14_30/03/2017
12H	24.2	02:12_30/03/2017
24H	20.5	02:12_30/03/2017
48H	10.8	16:28_29/03/2017
72H	7.2	16:28_29/03/2017

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Duration (minutes: m) (Hours: H)	Rainfall Intensity (mm/h)	Time/Date
6m	90.0	22:22_18/03/2017
10m	78.0	22:20_18/03/2017
20m	60.0	22:16_18/03/2017
30m	54.0	22:12_18/03/2017
1H	42.5	21:42_18/03/2017
2H	35.0	22:02_30/03/2017
3H	33.3	21:10_30/03/2017
6H	24.1	20:20_30/03/2017
12H	14.5	15:38_30/03/2017
24H	10.7	02:24_30/03/2017
48H	5.5	23:30_29/03/2017
72H	3.7	23:30_29/03/2017

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 Adapted from: <http://www.bom.gov.au/water/designRainfalls/ifd-arr87/glossary.shtml>



Duration (minutes: m) (Hours: H)	Rainfall Intensity (mm/h)	Time/Date
6m	140.0	08:24_15/03/2017
10m	120.0	08:24_15/03/2017
20m	105.0	08:14_15/03/2017
30m	100.0	08:20_15/03/2017
1H	83.0	08:06_15/03/2017
2H	71.5	07:26_15/03/2017
3H	54.3	06:26_15/03/2017
6H	30.7	06:22_15/03/2017
12H	19.4	06:22_15/03/2017
24H	17.7	03:06_30/03/2017
48H	9.4	20:04_29/03/2017
72H	6.3	20:04_29/03/2017

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 Adapted from: <http://www.bom.gov.au/water/designRainfalls/ifd-arr87/glossary.shtml>

## 5. Upper Rous River and upper Richmond River region

### 5.1 Upper Rous River and upper Richmond River region – water level

The peak observed water levels between the 30 and 31 March are listed in **Table 5-1**. **Table 5-2** lists the SES flood classifications for Wiangaree and Kyogle. The locations of water level stations within the upper Rous River and upper Richmond River region are shown in **Figure 5-1**. The water level data for the period 14 March 2017 to 7 April 2017 are displayed graphically in **Figures 5-2 to 5-12**.

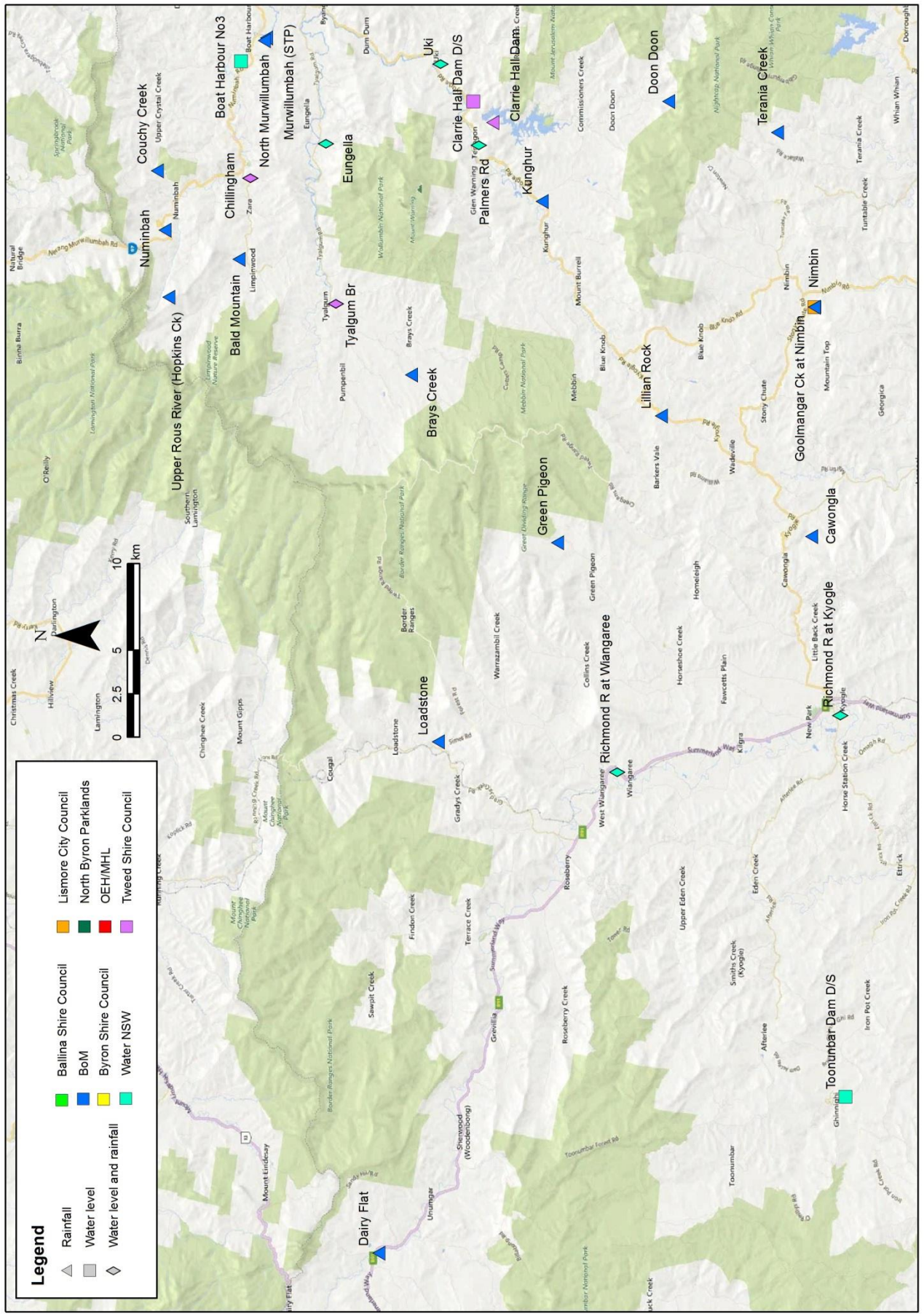
**Table 5-1 Upper Rous River and upper Richmond River region flood peaks**

Station name	Station No.	Owner	Datum	Level
Boat Harbour	201906	Tweed Shire Council	AHD	**
Rous River at Boat Harbour No 3	201005	Water NSW	Local datum	7.42
Chillingham	201008	Tweed Shire Council	AHD	**
Oxley River at Eungella	201001	Water NSW	Local datum	9.85
Tyalgum Bridge	558088	Tweed Shire Council	AHD	5.27
Tweed River at Uki	201900	Water NSW	Local datum	12.92
Clarrie Hall Dam D/S	201011	Tweed Shire Council	AHD	8.09
Tweed River at Palmers Road	201015	Water NSW	Local datum	8.77
Richmond River at Wiangaree	203005	Water NSW	Local datum	15.55
Goolmangar Creek at Nimbin	203901	Lismore City Council	Local datum	11.83
Richmond River at Kyogle	203900	Water NSW	Local datum	17.39
Toonunbar Dam D/S	203023	Water NSW	Local datum	3.17

\*\* Boat Harbour and Chillingham stations were damaged during the event.

**Table 5-2 SES flood classification for Wiangaree and Kyogle**

Station	Classification			Peak (m)	Classification
	Minor	Moderate	Major		
	Water Level (m local datum)				
Richmond River at Wiangaree	11.0	15.5	---	15.55	Moderate
Richmond River at Kyogle	12.0	14.4	16.0	17.39	Major



STATION LOCATIONS  
UPPER ROUS & UPPER RICHMOND RIVER REGION

MHL 2535

Figure  
5-1

## 5.2 Upper Rous River and upper Richmond River region – rainfall

The water level data for the period 14 March 2017 to 7 April 2017 are displayed graphically in **Figures 5-2 to 5-12**. 24 hour rainfall totals up until 9.00 a.m. are displayed in **Table 5-3 to 5-6** for the period 14 March to 7 April 2017. The rainfall intensities are displayed graphically in **Figures 5-13 to 5-39**, in ARR1987 format. Appendix C provides ARR2016 format.

**Table 5-3 Upper Rous River and upper Richmond River region daily rainfall totals**

Date	Couchy Creek (mm)	Numinbah (mm)	Upper Rous River (mm)	Bald Mt (mm)	Chillingham (mm)	Boat Harbour (mm)	Murwillumbah (STP)* (mm)
	BoM	BoM	BoM	BoM	Tweed SC	BoM	BoM
15/03/2017	63.0	63.0	54.0	61.0	93.0	51.0	-
16/03/2017	144.0	128.0	108.0	124.0	143.0	144.0	-
17/03/2017	0.0	1.0	3.0	0.0	0.0	0.0	-
18/03/2017	8.0	3.0	5.0	8.0	1.0	2.0	-
19/03/2017	123.0	70.0	31.0	47.0	98.0	148.0	-
20/03/2017	67.0	71.0	73.0	57.0	43.0	35.0	-
21/03/2017	110.0	102.0	112.0	110.0	92.0	40.0	-
22/03/2017	11.0	10.0	20.0	11.0	9.0	16.0	-
23/03/2017	2.0	14.0	16.0	21.0	8.0	3.0	-
24/03/2017	28.0	51.0	48.0	28.0	28.0	24.0	-
25/03/2017	11.0	13.0	1.0	0.0	1.0	0.0	-
26/03/2017	4.0	1.0	4.0	2.0	1.0	0.0	-
27/03/2017	4.0	11.0	18.0	17.0	5.0	1.0	-
28/03/2017	0.0	0.0	0.0	0.0	0.0	0.0	-
29/03/2017	0.0	0.0	0.0	0.0	0.0	0.0	-
30/03/2017	214.0	194.0	171.0	178.0	212.0	190.0	-
31/03/2017	565.0	506.0	461.0	435.0	469.0	478.0	-
01/04/2017	0.0	0.0	0.0	0.0	0.0	0.0	-
02/04/2017	0.0	0.0	0.0	0.0	0.0	0.0	-
03/04/2017	0.0	0.0	0.0	0.0	0.0	0.0	-
04/04/2017	2.0	3.0	3.0	3.0	2.0	2.0	-
05/04/2017	3.0	3.0	5.0	3.0	2.0	2.0	-
06/04/2017	20.0	16.0	14.0	8.0	9.0	12.0	-
07/04/2017	14.0	14.0	8.0	14.0	8.0	16.0	-

\* Murwillumbah (STP) data was declared bad.

**Table 5-4 Upper Rous River and upper Richmond River region daily rainfall totals (cont.)**

Date	Tyalgum Bridge (mm)~	Eungella (mm)	Brays Creek (mm)	Dairy Flat (mm)	Loadstone (mm)^	Uki (mm)	Palmers Rd (mm)
	Tweed SC	BoM	BoM	BoM	BoM	BoM	BoM
15/03/2017	-	59.0	25.0	7.4	-	82.0	77.0
16/03/2017	-	125.0	75.0	25.0	-	131.0	118.0
17/03/2017	-	0.0	1.0	0.2	-	0.0	0.0
18/03/2017	-	1.0	3.0	1.8	-	9.0	16.0
19/03/2017	-	104.0	20.0	56.2	-	109.0	13.0
20/03/2017	-	25.0	37.0	30.4	-	33.0	26.0
21/03/2017	75.0	43.0	66.0	22.8	-	32.0	29.0
22/03/2017	6.0	9.0	5.0	0.2	0.4	20.0	12.0
23/03/2017	8.0	9.0	0.0	0.0	0.0	2.0	1.0
24/03/2017	28.0	13.0	19.0	9.0	10.8	34.0	11.0
25/03/2017	0.0	0.0	1.0	1.6	3.4	0.0	0.0
26/03/2017	2.0	0.0	1.0	0.0	0.0	1.0	2.0
27/03/2017	12.0	0.0	8.0	2.4	0.0	0.0	0.0
28/03/2017	0.0	0.0	1.0	0.2	0.0	0.0	0.0
29/03/2017	0.0	0.0	0.0	0.0	0.0	0.0	0.0
30/03/2017	146.0	211.0	111.0	33.4	54.8	199.0	162.0
31/03/2017	374.0	442.0	338.0	180.0	145.8	404.0	413.0
01/04/2017	0.0	0.0	0.0	0.0	0.0	0.0	0.0
02/04/2017	0.0	0.0	0.0	0.0	0.0	0.0	0.0
03/04/2017	2.0	0.0	0.0	2.0	5.4	0.0	8.0
04/04/2017	6.0	2.0	2.0	6.0	4.0	2.0	11.0
05/04/2017	7.0	3.0	1.0	16.0	9.2	4.0	3.0
06/04/2017	4.0	7.0	2.0	17.0	13.0	7.0	5.0
07/04/2017	14.0	8.0	9.0	7.0	5.2	11.0	14.0

~ Tyalgum Bridge data provided from 20/3/2017 only.

^ Loadstone data provided from 22/3/2017 only.

**Table 5-5 Upper Rous River and upper Richmond River region daily rainfall totals (cont.)**

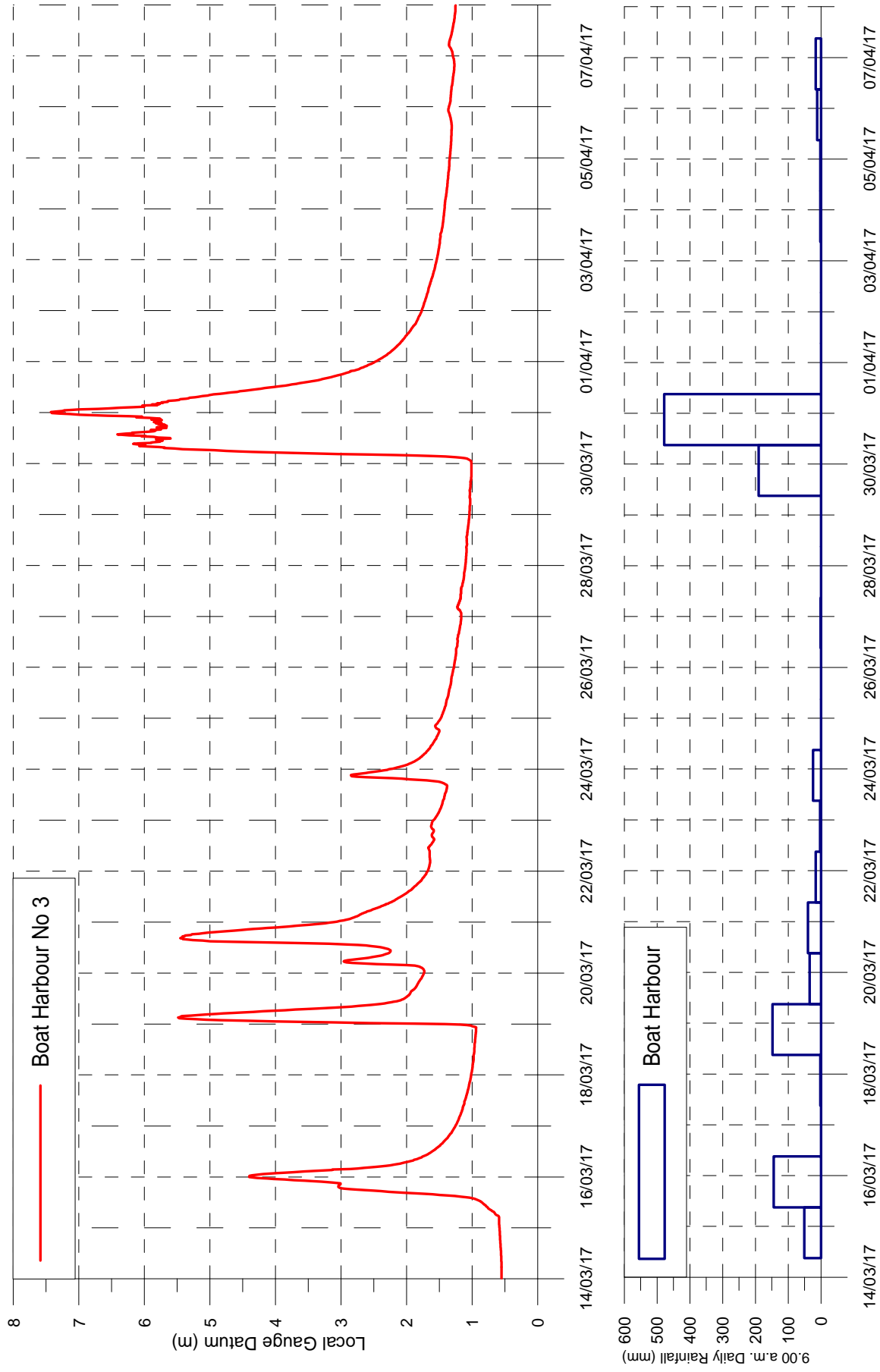
Date	Clarrie Hall Dam (mm)	Kunghur (mm)	Green Pigeon* (mm)	Wiangaree^ (mm)	Lillian Rock (mm)	Doon Doon (mm)	Terania Ck (mm)
	Tweed SC	BoM	BoM	BoM	Byron SC	BoM	Lismore CC
15/03/2017	76.0	77.0	-	-	35.0	116.0	68.0
16/03/2017	120.0	118.0	-	-	65.0	155.0	75.0
17/03/2017	0.0	0.0	-	-	0.0	0.0	12.0
18/03/2017	6.0	16.0	-	-	13.0	49.0	30.0
19/03/2017	44.0	13.0	-	-	24.0	30.0	34.0
20/03/2017	32.0	26.0	-	-	30.0	79.0	92.0
21/03/2017	32.0	29.0	-	-	35.0	46.0	36.0
22/03/2017	14.0	12.0	-	-	2.0	17.0	17.0
23/03/2017	6.0	1.0	-	-	3.0	2.0	11.0
24/03/2017	8.0	11.0	-	-	55.0	37.0	62.0
25/03/2017	1.0	0.0	-	-	8.0	10.0	26.0
26/03/2017	1.0	2.0	-	-	0.0	1.0	10.0
27/03/2017	1.0	0.0	-	-	0.0	3.0	9.0
28/03/2017	0.0	0.0	-	-	0.0	0.0	11.0
29/03/2017	0.0	0.0	-	-	0.0	0.0	11.0
30/03/2017	194.0	162.0	-	126.6	103.0	211.0	178.0
31/03/2017	399.0	413.0	211.2*	16.8	407.0	391.0	293.0
01/04/2017	0.0	0.0	25.0	0.0	0.0	1.0	10.0
02/04/2017	0.0	0.0	0.0	0.0	0.0	0.0	13.0
03/04/2017	1.0	8.0	0.6	1.8	3.0	22.0	33.0
04/04/2017	4.0	11.0	10.8	1.0	7.0	30.0	25.0
05/04/2017	5.0	3.0	18.0	4.8	13.0	23.0	29.0
06/04/2017	7.0	5.0	25.8	1.2	18.0	19.0	32.0
07/04/2017	3.0	14.0	13.4	6.6	14.0	7.0	16.0

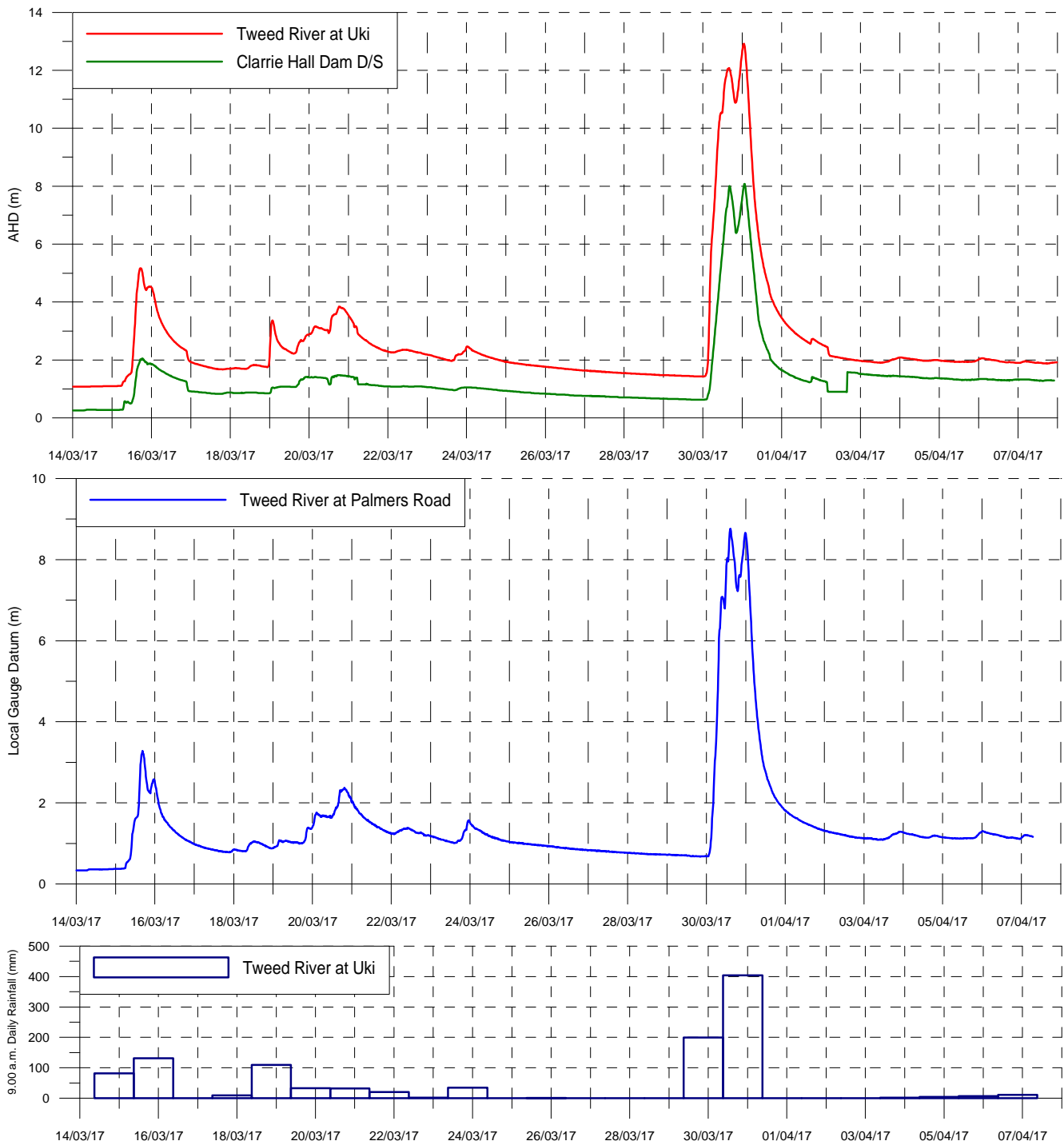
\* Green Pigeon rainfall data supplied from 30/3/2017 only.

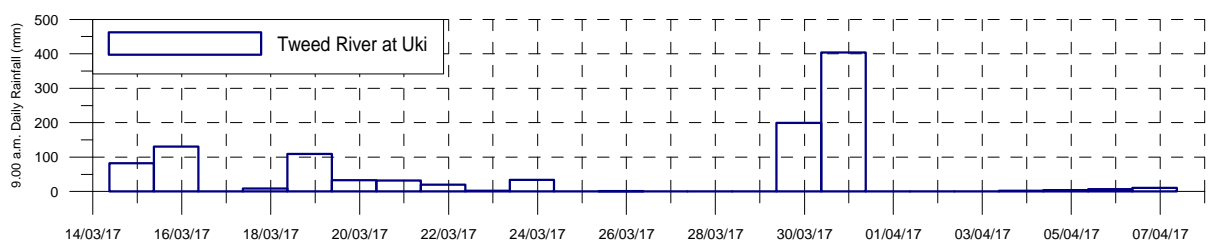
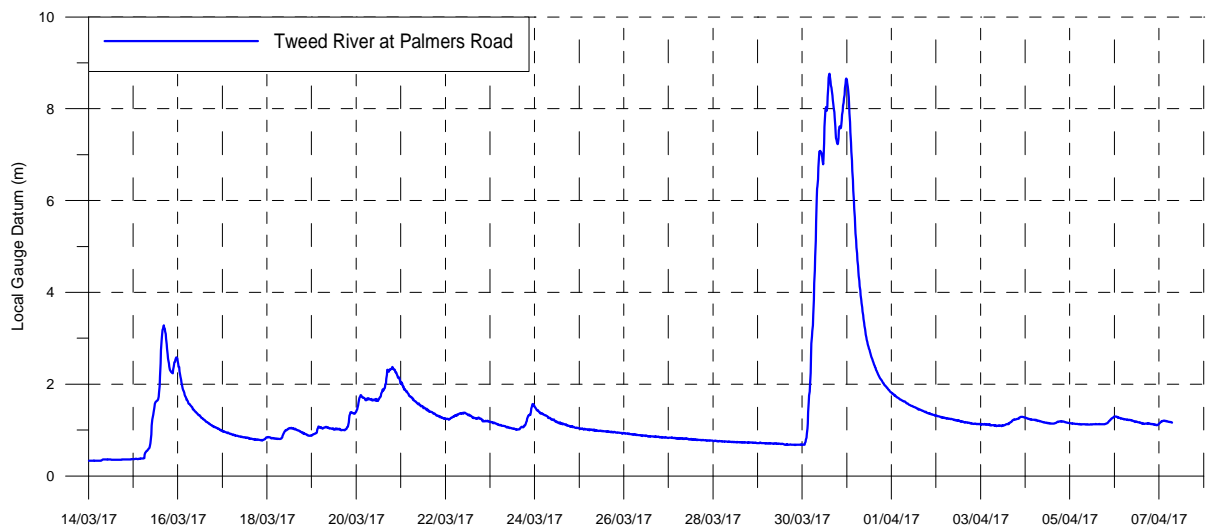
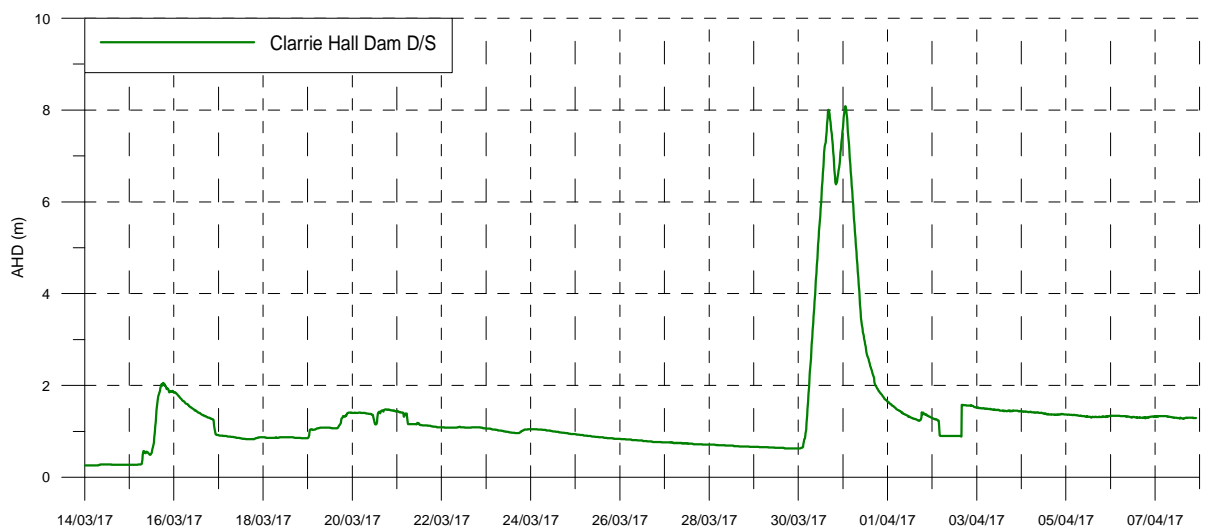
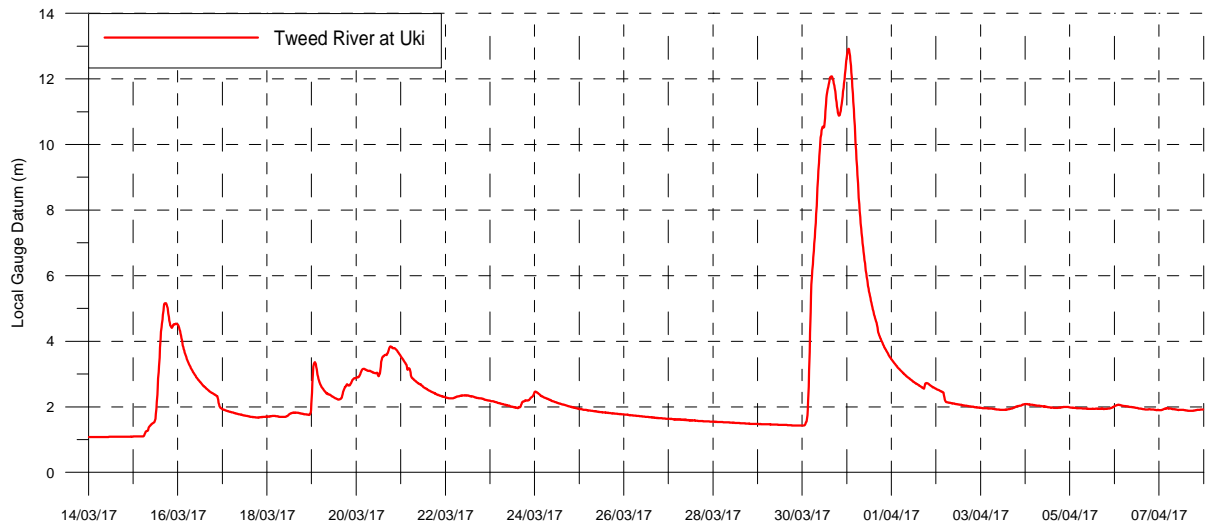
^ Wiangaree rainfall data supplied from 28/03/2017 only.

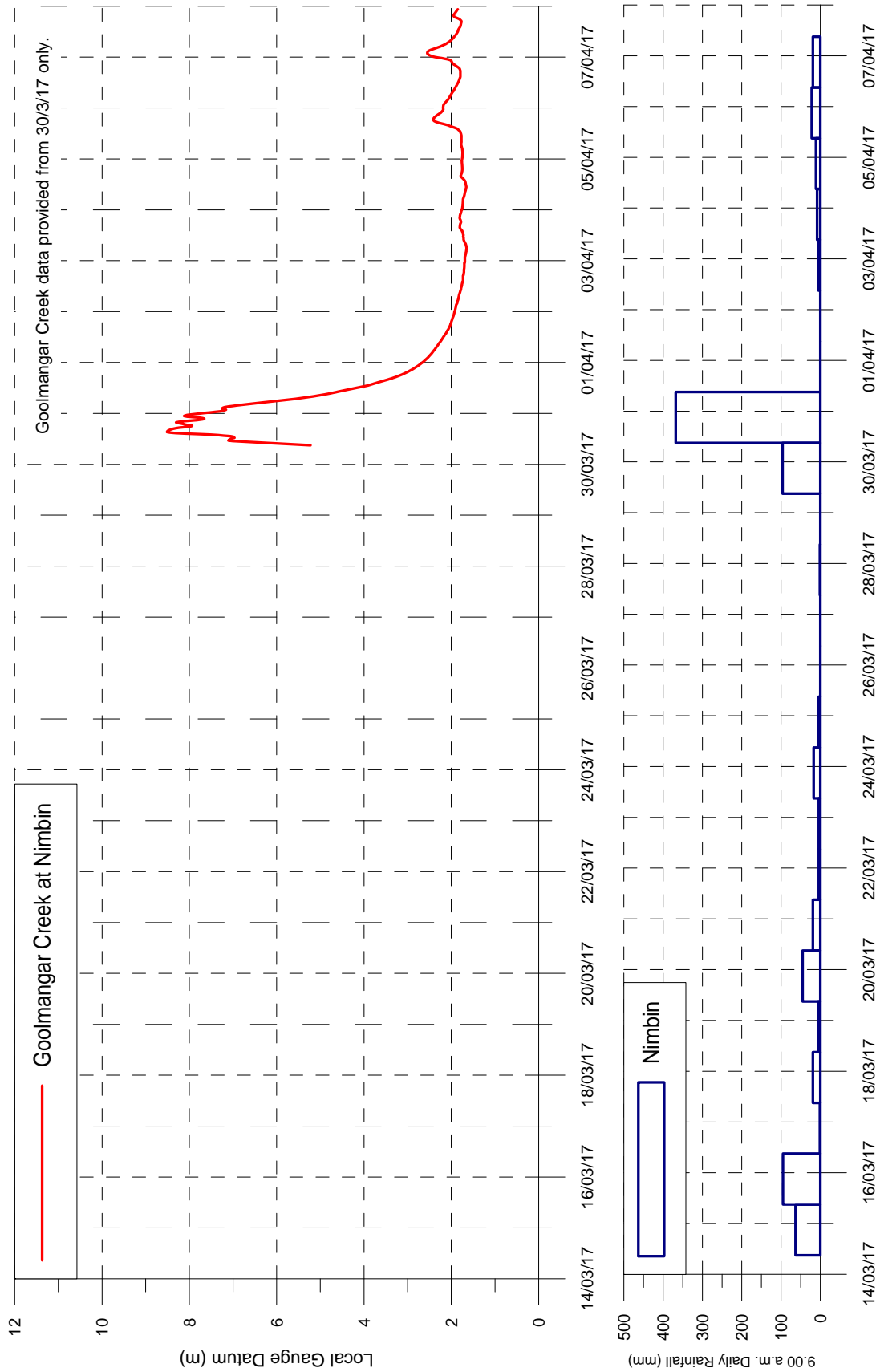
**Table 5-6 Upper Rous River and upper Richmond River region daily rainfall totals (cont.)**

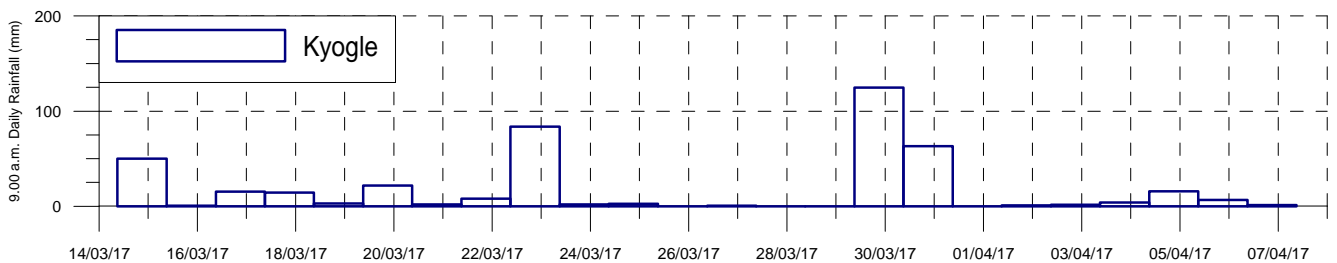
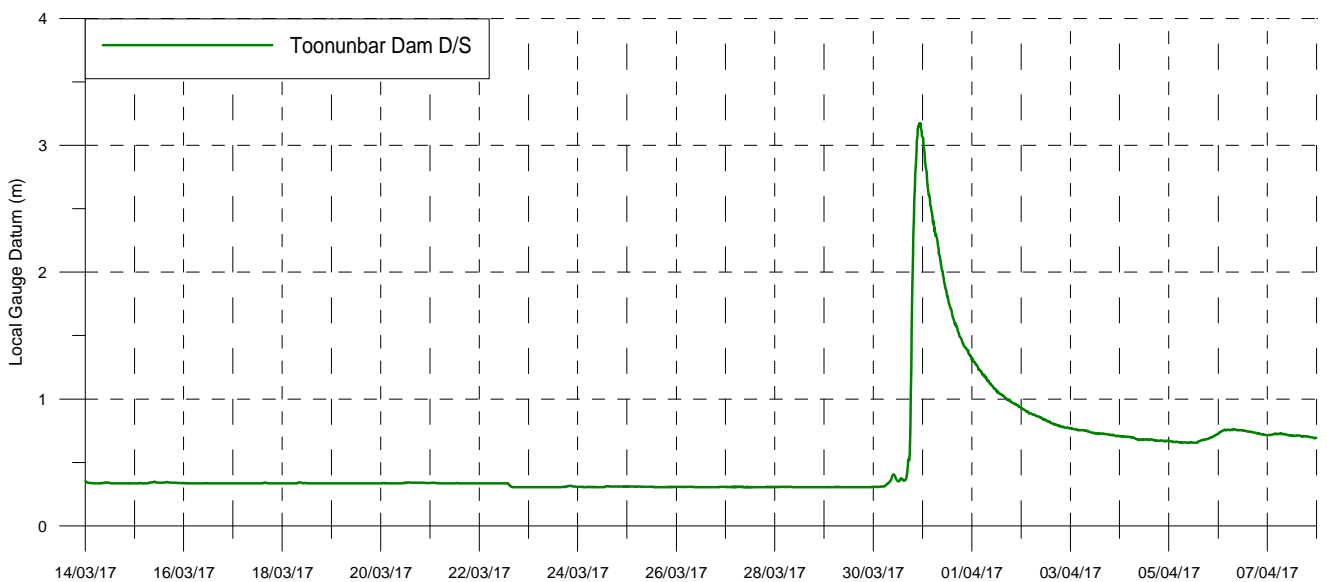
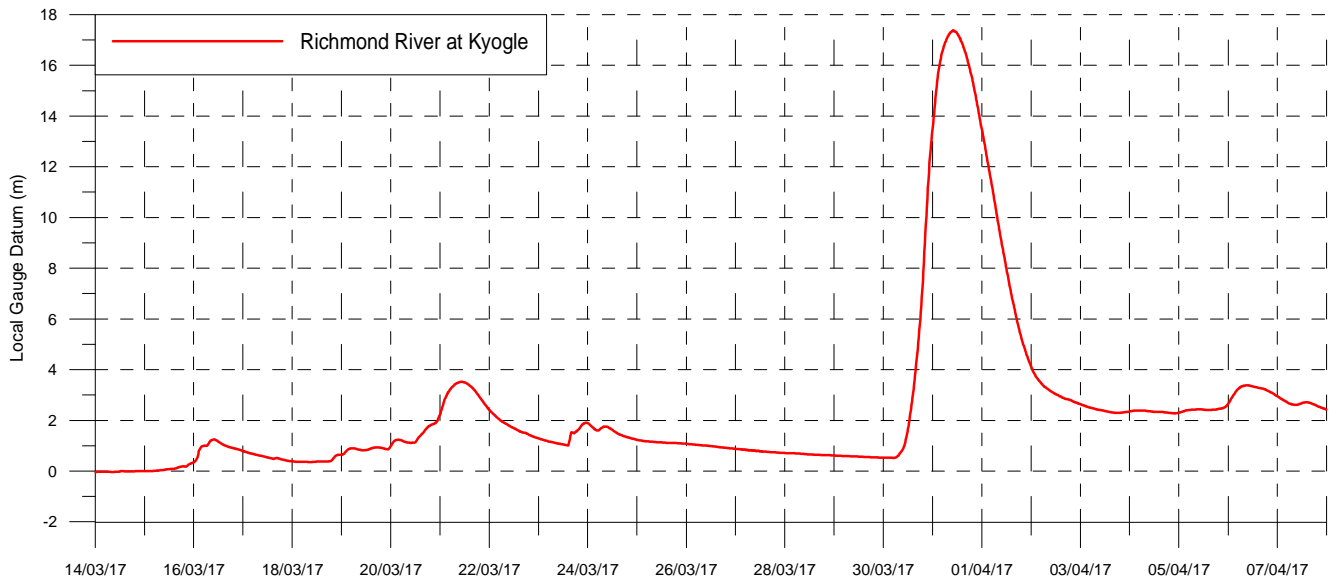
Date	Cawongla (mm)	Nimbin (mm)	Kyogle (mm)
	Lismore CC	BoM	BoM
15/03/2017	64.0	63.0	50.0
16/03/2017	1.0	95.0	0.6
17/03/2017	4.0	1.0	15.4
18/03/2017	6.0	19.0	14.4
19/03/2017	18.0	6.0	2.8
20/03/2017	32.0	45.0	21.8
21/03/2017	4.0	19.0	2.0
22/03/2017	0.0	4.0	8.0
23/03/2017	83.0	4.0	83.8
24/03/2017	2.0	17.0	2.0
25/03/2017	3.0	5.0	2.6
26/03/2017	0.0	0.0	0.0
27/03/2017	0.0	0.0	0.6
28/03/2017	0.0	1.0	0.0
29/03/2017	0.0	0.0	0.0
30/03/2017	230.0	96.0	125.0
31/03/2017	70.0	368.0	63.2
01/04/2017	0.0	0.0	0.0
02/04/2017	0.0	0.0	0.8
03/04/2017	4.0	5.0	1.8
04/04/2017	5.0	8.0	4.0
05/04/2017	17.0	11.0	15.8
06/04/2017	12.0	22.0	6.6
07/04/2017	4.0	19.0	1.2

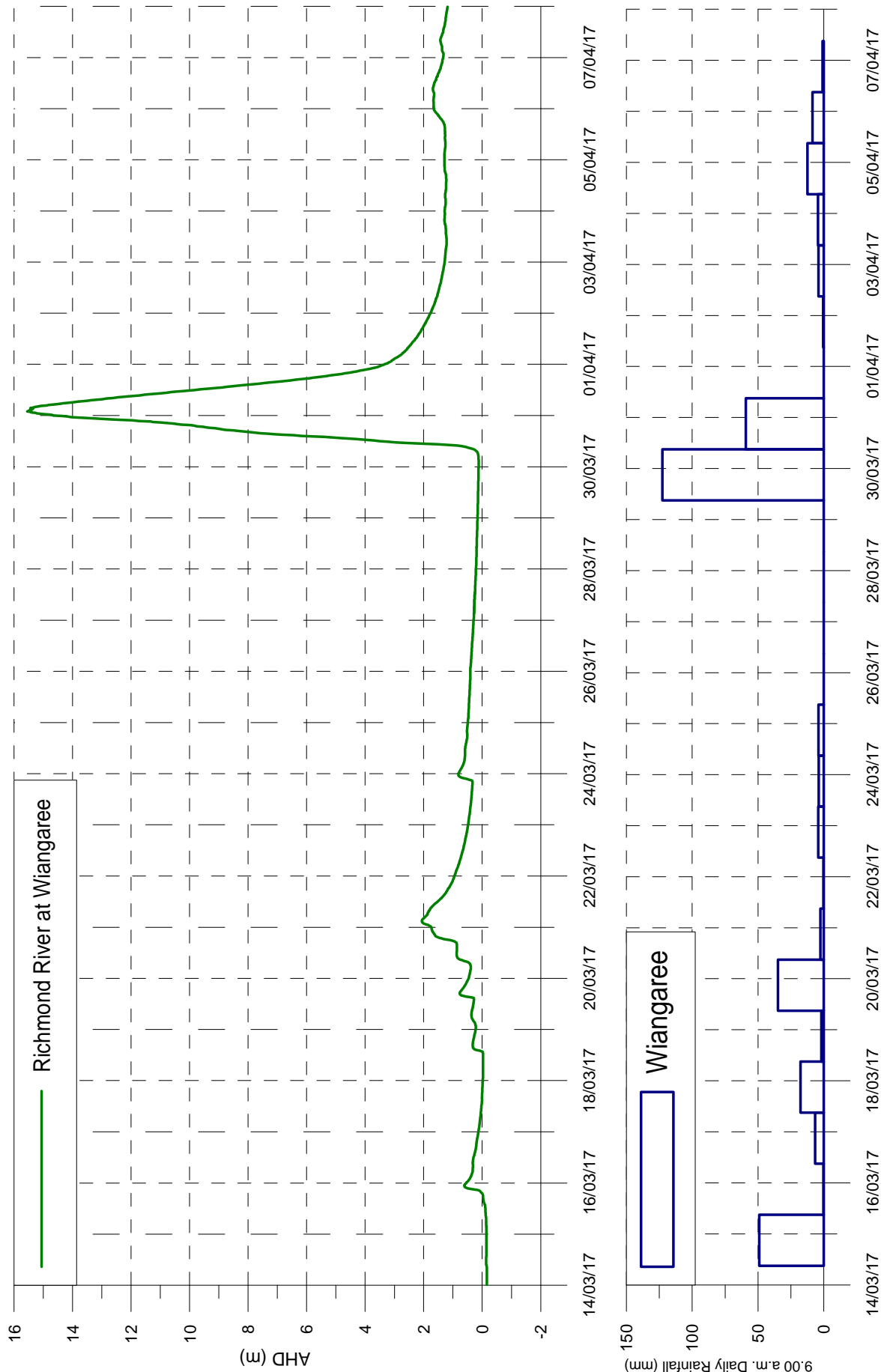


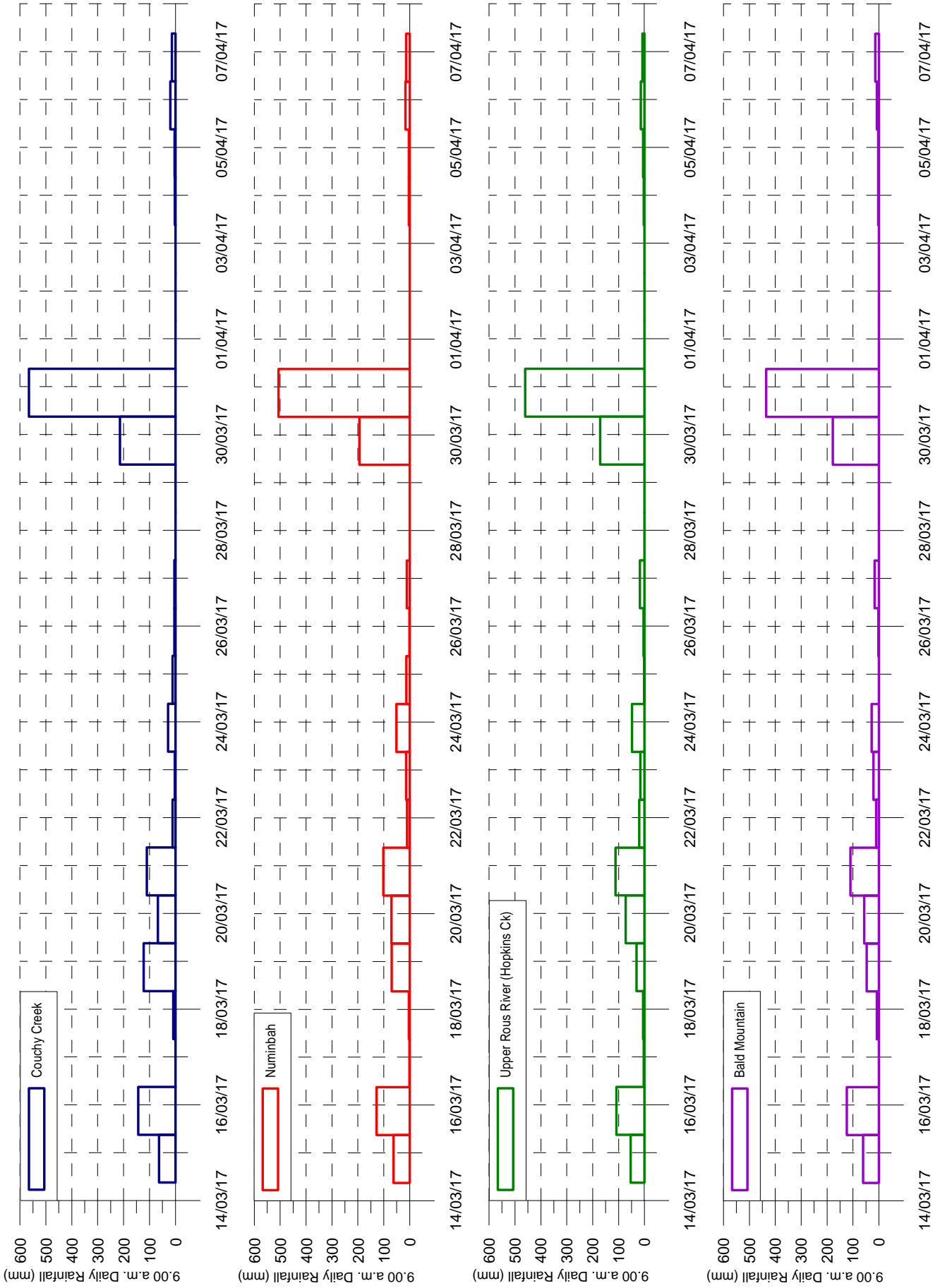


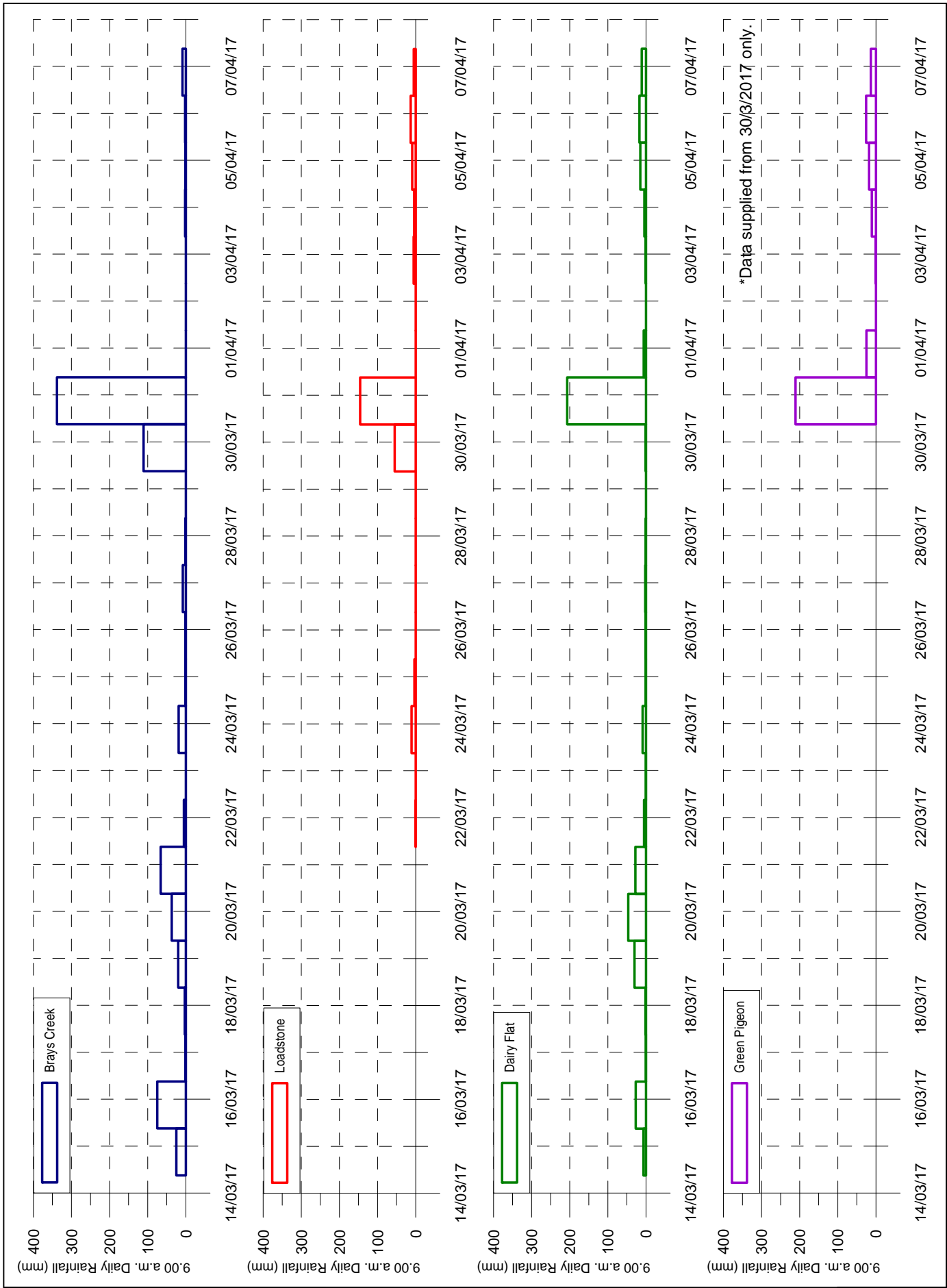


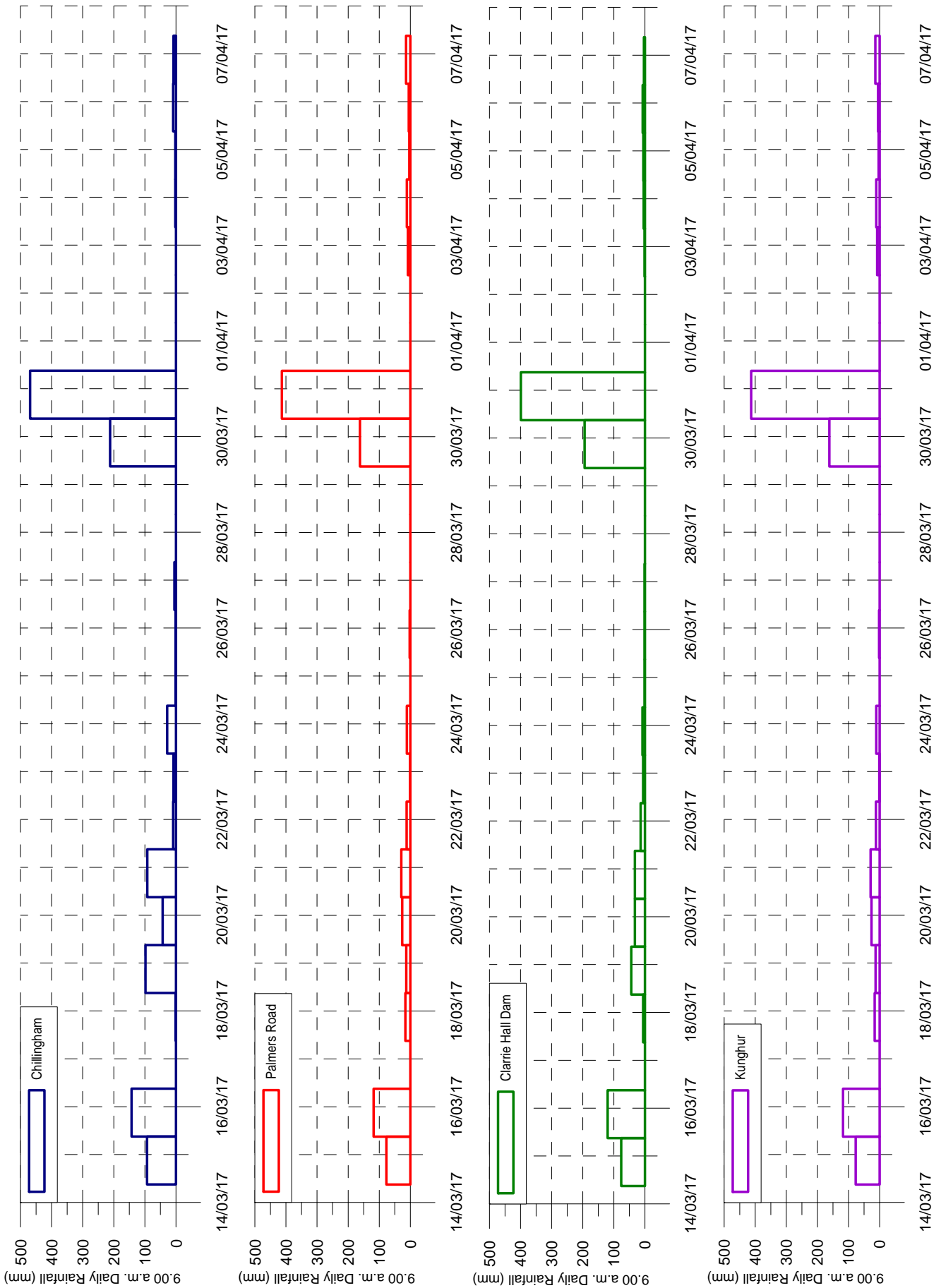


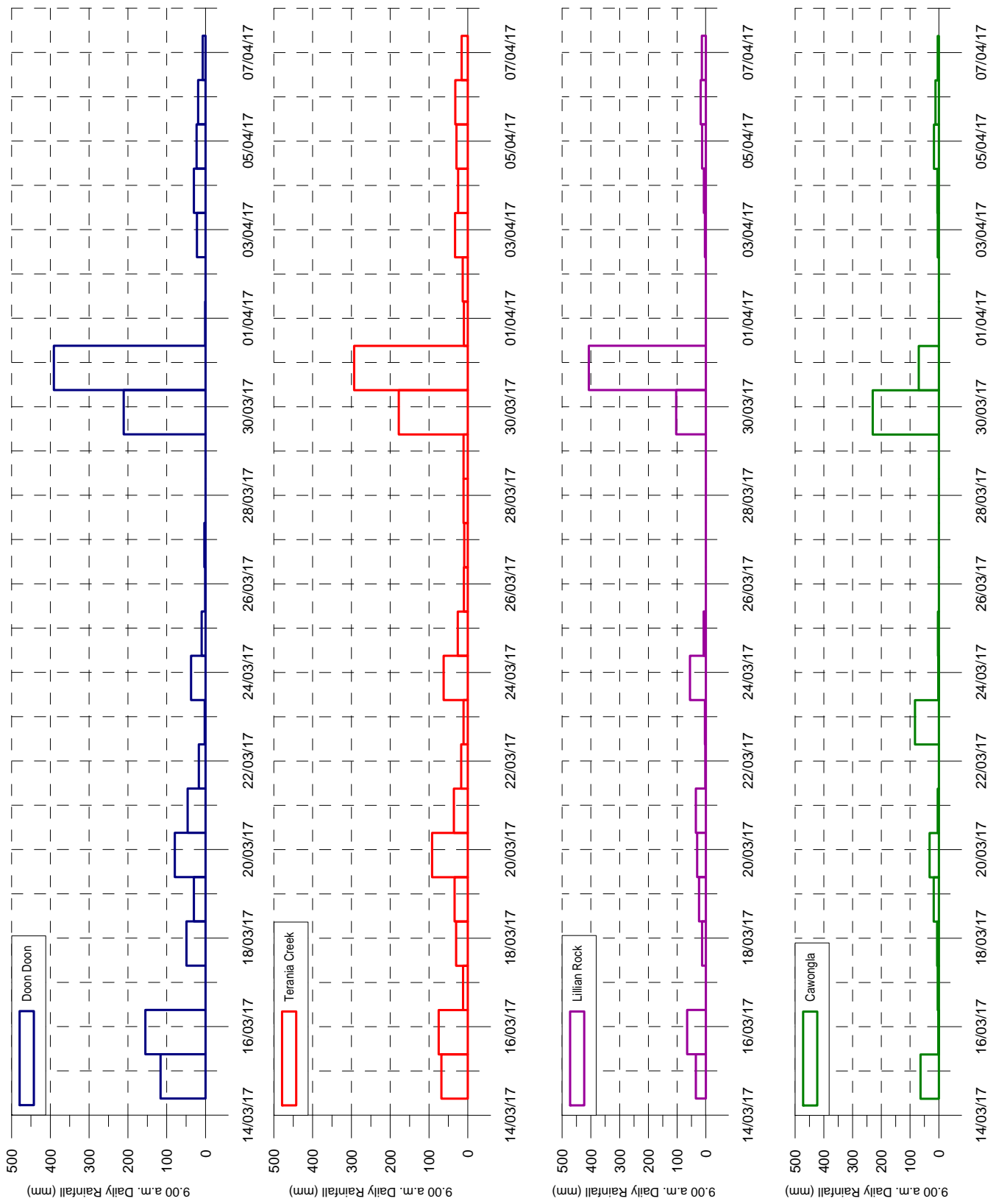


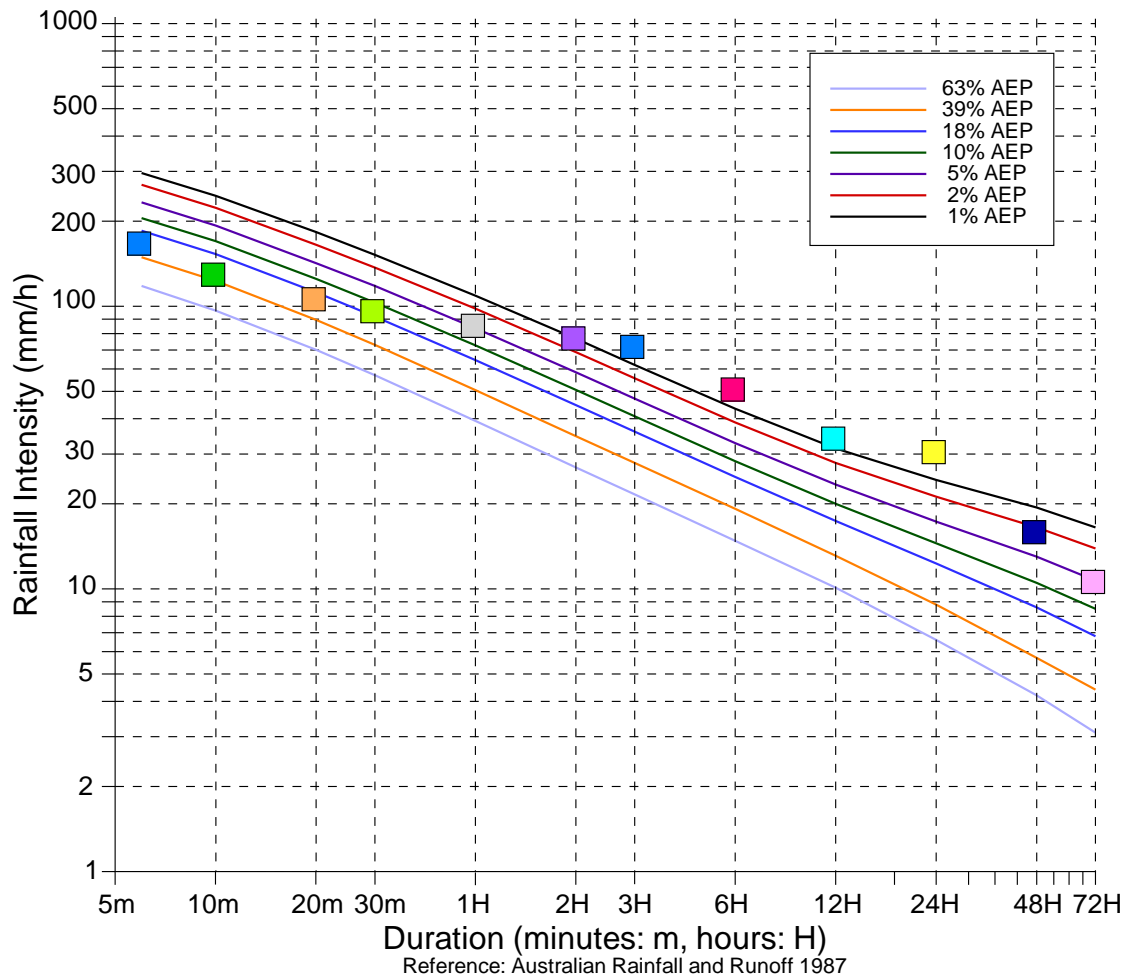






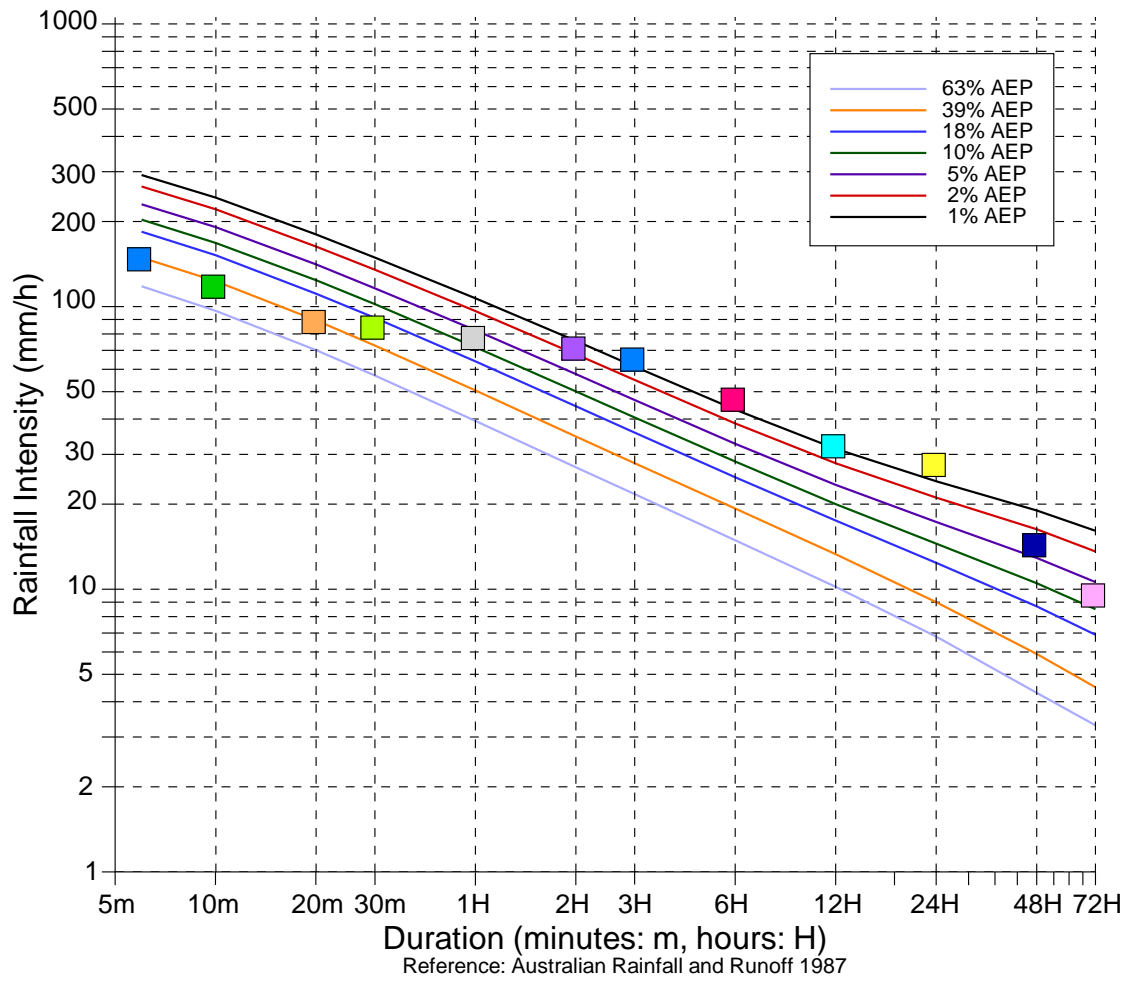






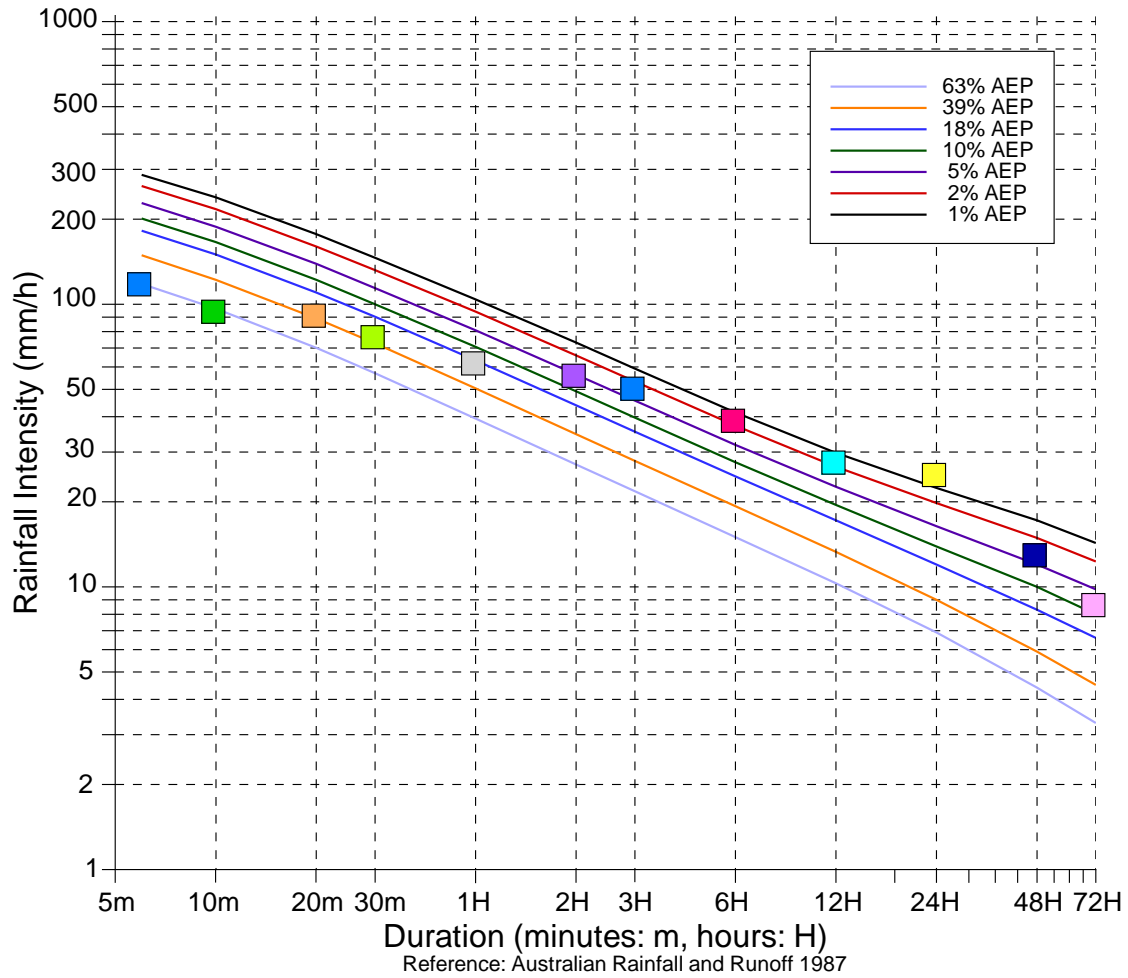
	Duration (minutes: m) (Hours: H)	Rainfall Intensity (mm/h)	Time/Date
■	6m	170.0	23:54_30/03/2017
■	10m	132.0	12:34_30/03/2017
■	20m	108.0	12:26_30/03/2017
■	30m	98.0	21:58_30/03/2017
■	1H	87.0	11:48_30/03/2017
■	2H	78.5	21:40_30/03/2017
■	3H	73.3	21:26_30/03/2017
■	6H	51.8	19:18_30/03/2017
■	12H	34.7	12:02_30/03/2017
■	24H	31.1	01:52_30/03/2017
■	48H	16.2	15:44_29/03/2017
■	72H	10.8	15:44_29/03/2017

Australian Rainfall and Runoff (Institute of Engineers Australia 1987), states:  
 "Use of the terms "recurrence interval" and "return period" has been criticised as leading to confusion in the minds of some decision makers and members of public. Although the terms are simple superficially, they are sometimes misinterpreted as implying that the associated magnitude is only exceeded at regular intervals, and that they are referring to the elapsed time to the next exceedance."  
 The use of the term ARI can lead to confusion. It is preferable, therefore, to express the rarity of a rainfall event in terms of AEP.  
 For example, a rainfall total of 141.4mm falling in 3 hours at Toukley has a 0.010 (i.e. 1%) probability of being equalled or exceeded in any one year can be easier to understand than the equivalent statement of a rainfall total of 141.4mm in 3 hours has an ARI of 100 years.  
 Adapted from: <http://www.bom.gov.au/water/designRainfalls/ifd-arr87/glossary.shtml>



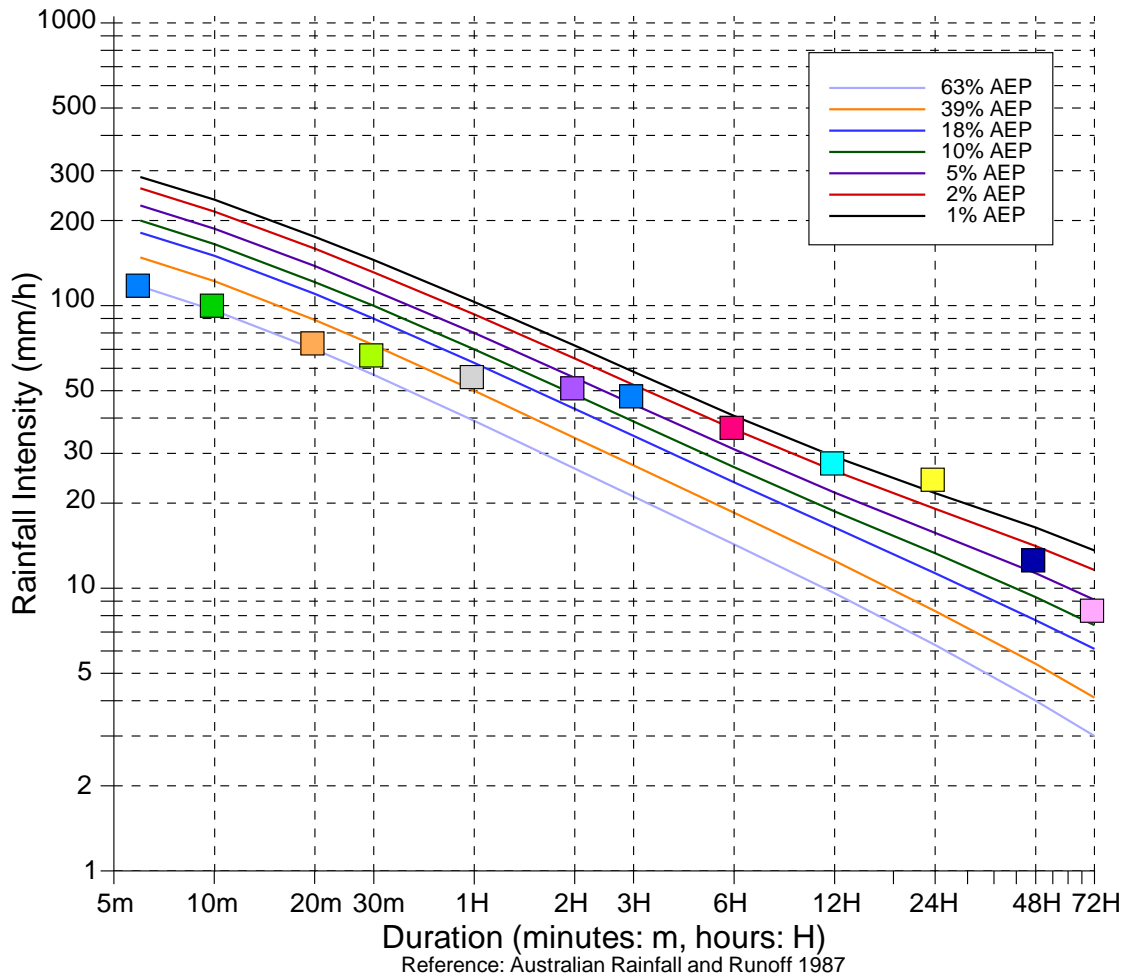
Duration (minutes: m) (Hours: H)	Rainfall Intensity (mm/h)	Time/Date
6m	150.0	00:14_31/03/2017
10m	120.0	23:56_30/03/2017
20m	90.0	22:08_30/03/2017
30m	86.0	22:16_30/03/2017
1H	79.0	22:08_30/03/2017
2H	72.5	22:06_30/03/2017
3H	66.3	21:36_30/03/2017
6H	47.8	19:04_30/03/2017
12H	32.7	12:20_30/03/2017
24H	28.1	02:00_30/03/2017
48H	14.6	16:44_29/03/2017
72H	9.7	16:44_29/03/2017

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 Adapted from: <http://www.bom.gov.au/water/designRainfalls/ifd-arr87/glossary.shtml>



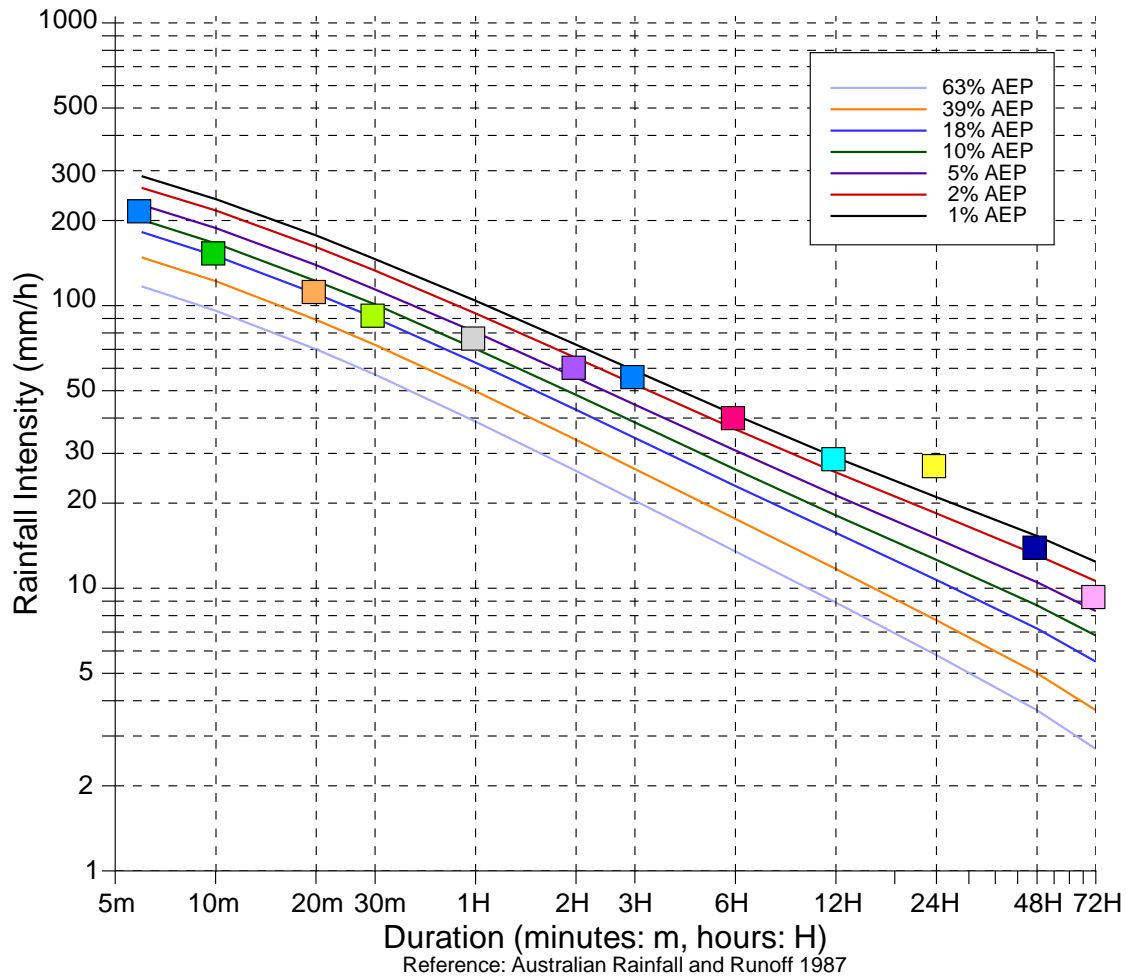
Duration (minutes: m) (Hours: H)	Rainfall Intensity (mm/h)	Time/Date
6m	120.0	22:12_30/03/2017
10m	96.0	22:08_30/03/2017
20m	93.0	21:58_30/03/2017
30m	78.0	21:48_30/03/2017
1H	63.0	21:52_30/03/2017
2H	57.0	21:54_30/03/2017
3H	51.3	21:40_30/03/2017
6H	39.5	19:20_30/03/2017
12H	28.1	12:20_30/03/2017
24H	25.4	03:26_30/03/2017
48H	13.2	16:32_29/03/2017
72H	8.8	16:32_29/03/2017

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 Adapted from: <http://www.bom.gov.au/water/designRainfalls/ifd-arr87/glossary.shtml>



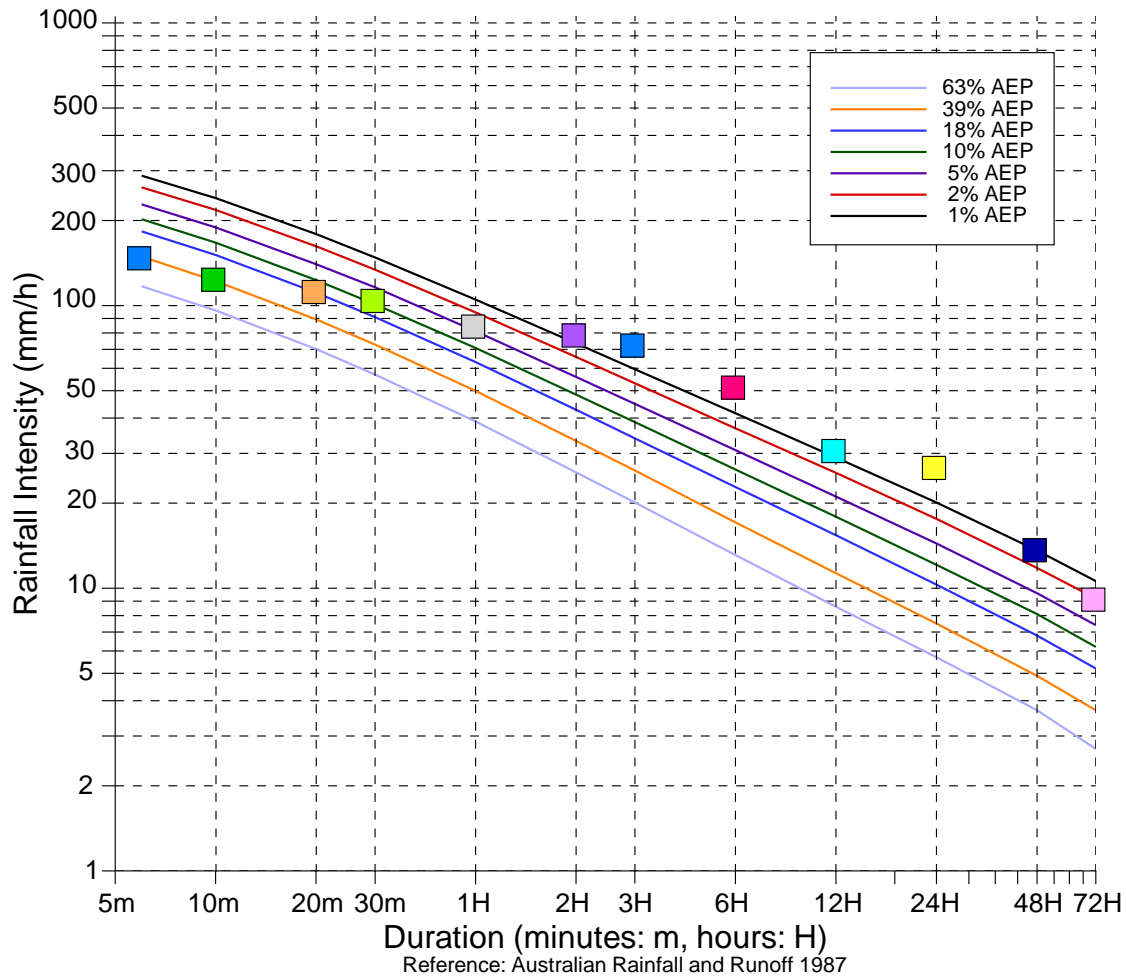
	Duration (minutes: m) (Hours: H)	Rainfall Intensity (mm/h)	Time/Date
■	6m	120.0	17:16_30/03/2017
■	10m	102.0	17:16_30/03/2017
■	20m	75.0	11:40_30/03/2017
■	30m	68.0	07:02_30/03/2017
■	1H	57.0	22:00_30/03/2017
■	2H	52.0	21:54_30/03/2017
■	3H	48.7	21:46_30/03/2017
■	6H	37.7	19:08_30/03/2017
■	12H	28.2	12:26_30/03/2017
■	24H	24.7	02:36_30/03/2017
■	48H	12.8	16:52_29/03/2017
■	72H	8.5	16:52_29/03/2017

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 Adapted from: <http://www.bom.gov.au/water/designRainfalls/ifd-arr87/glossary.shtml>



Duration (minutes: m) (Hours: H)	Rainfall Intensity (mm/h)	Time/Date
6m	220.0	11:58_30/03/2017
10m	156.0	11:54_30/03/2017
20m	114.0	11:56_30/03/2017
30m	94.0	11:54_30/03/2017
1H	78.0	11:54_30/03/2017
2H	61.5	22:16_30/03/2017
3H	57.0	21:40_30/03/2017
6H	40.8	19:14_30/03/2017
12H	29.2	02:12_30/03/2017
24H	27.6	02:06_30/03/2017
48H	14.2	15:14_29/03/2017
72H	9.5	15:14_29/03/2017

Australian Rainfall and Runoff (Institute of Engineers Australia 1987), states:  
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 For example, a rainfall total of 141.4mm falling in 3 hours at Toukley has a 0.010 (i.e. 1%) probability of being equalled or exceeded in any one year can be easier to understand than the equivalent statement of a rainfall total of 141.4mm in 3 hours has an ARI of 100 years.  
 Adapted from: <http://www.bom.gov.au/water/designRainfalls/ifd-arr87/glossary.shtml>

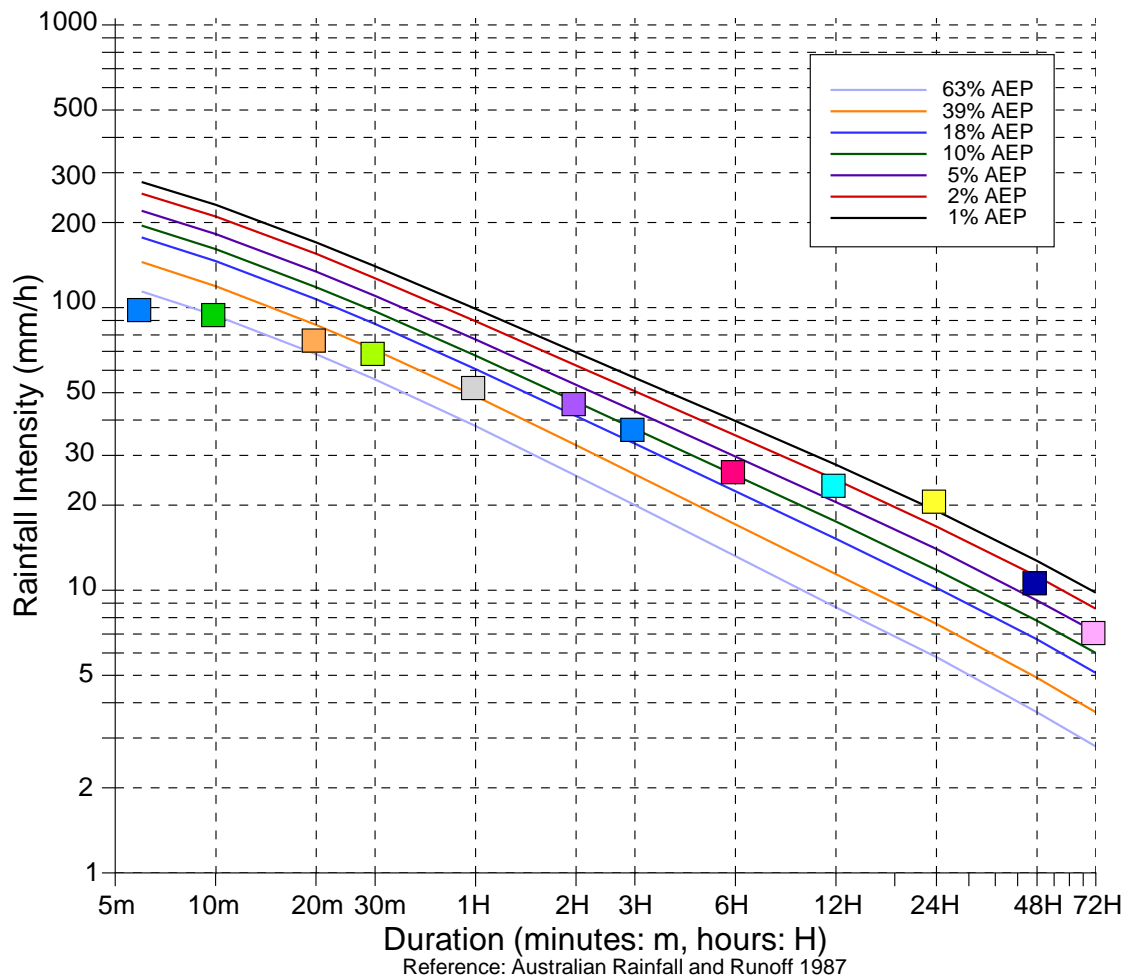


Duration (minutes: m) (Hours: H)	Rainfall Intensity (mm/h)	Time/Date
6m	150.0	12:52_30/03/2017
10m	126.0	23:44_18/03/2017
20m	114.0	23:28_30/03/2017
30m	106.0	23:26_30/03/2017
1H	86.0	23:28_30/03/2017
2H	80.0	22:56_30/03/2017
3H	73.7	22:00_30/03/2017
6H	52.3	19:22_30/03/2017
12H	31.2	12:52_30/03/2017
24H	27.2	01:56_30/03/2017
48H	13.9	19:08_29/03/2017
72H	9.3	19:08_29/03/2017

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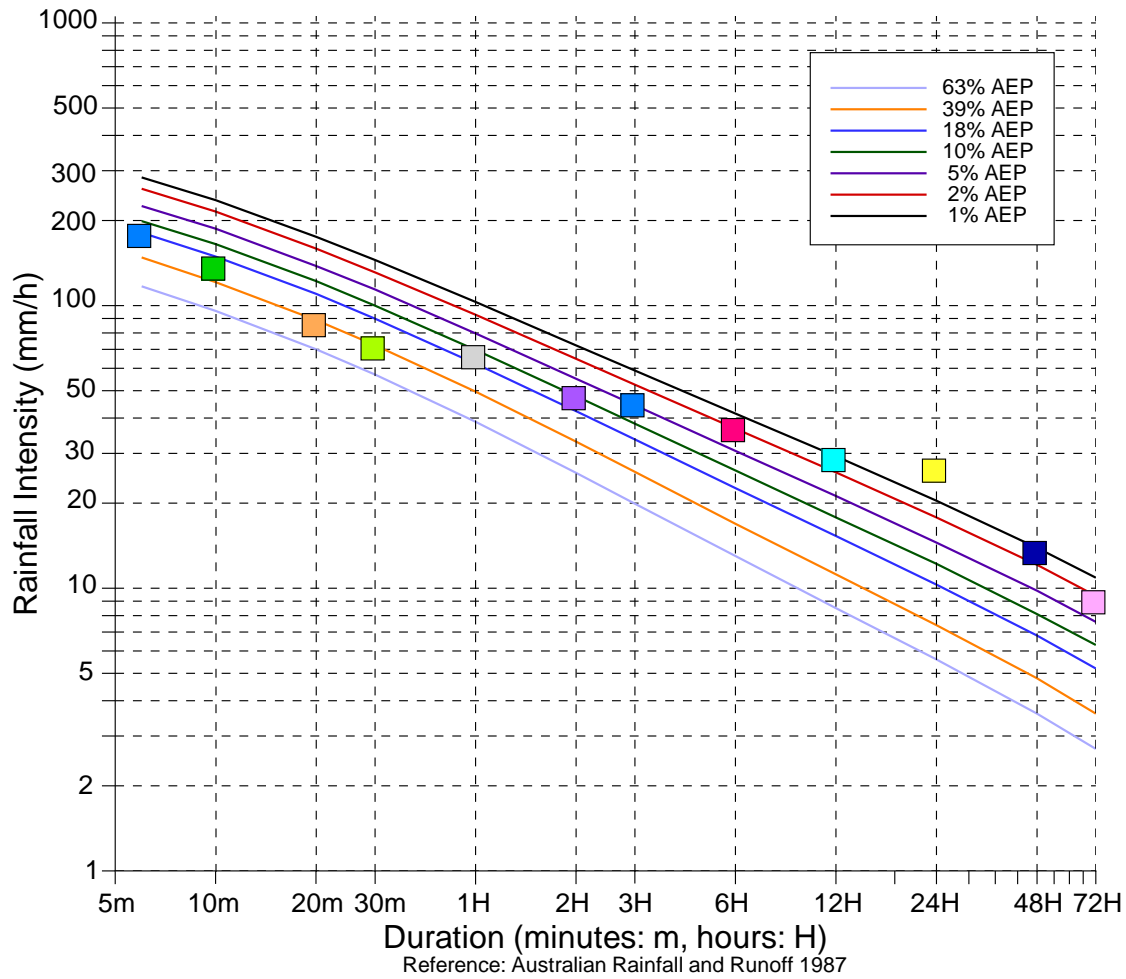
\* Station was not operational during the flood event. IFD analysis has not been undertaken.

*Australian Rainfall and Runoff* (Institute of Engineers Australia 1987), states:  
*"Use of the terms "recurrence interval" and "return period" has been criticised as leading to confusion in the minds of some decision makers and members of public. Although the terms are simple superficially, they are sometimes misinterpreted as implying that the associated magnitude is only exceeded at regular intervals, and that they are referring to the elapsed time to the next exceedance."*  
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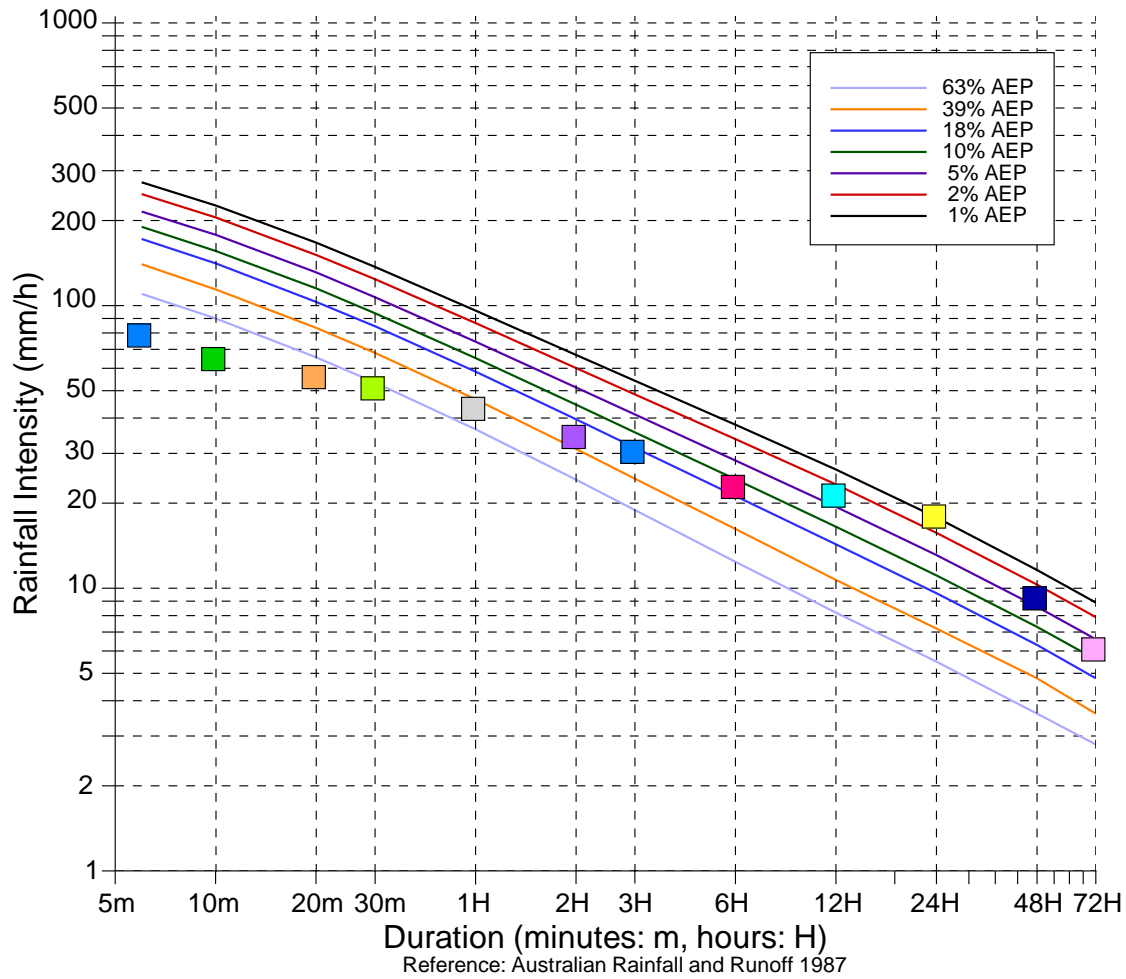
Duration (minutes: m) (Hours: H)	Rainfall Intensity (mm/h)	Time/Date
6m	100.0	07:32_30/03/2017
10m	96.0	07:28_30/03/2017
20m	78.0	07:20_30/03/2017
30m	70.0	07:08_30/03/2017
1H	53.0	06:48_30/03/2017
2H	46.5	05:48_30/03/2017
3H	37.7	05:02_30/03/2017
6H	26.7	19:04_30/03/2017
12H	23.9	11:50_30/03/2017
24H	21.0	03:36_30/03/2017
48H	10.8	17:00_29/03/2017
72H	7.2	17:00_29/03/2017

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 Adapted from: <http://www.bom.gov.au/water/designRainfalls/ifd-arr87/glossary.shtml>



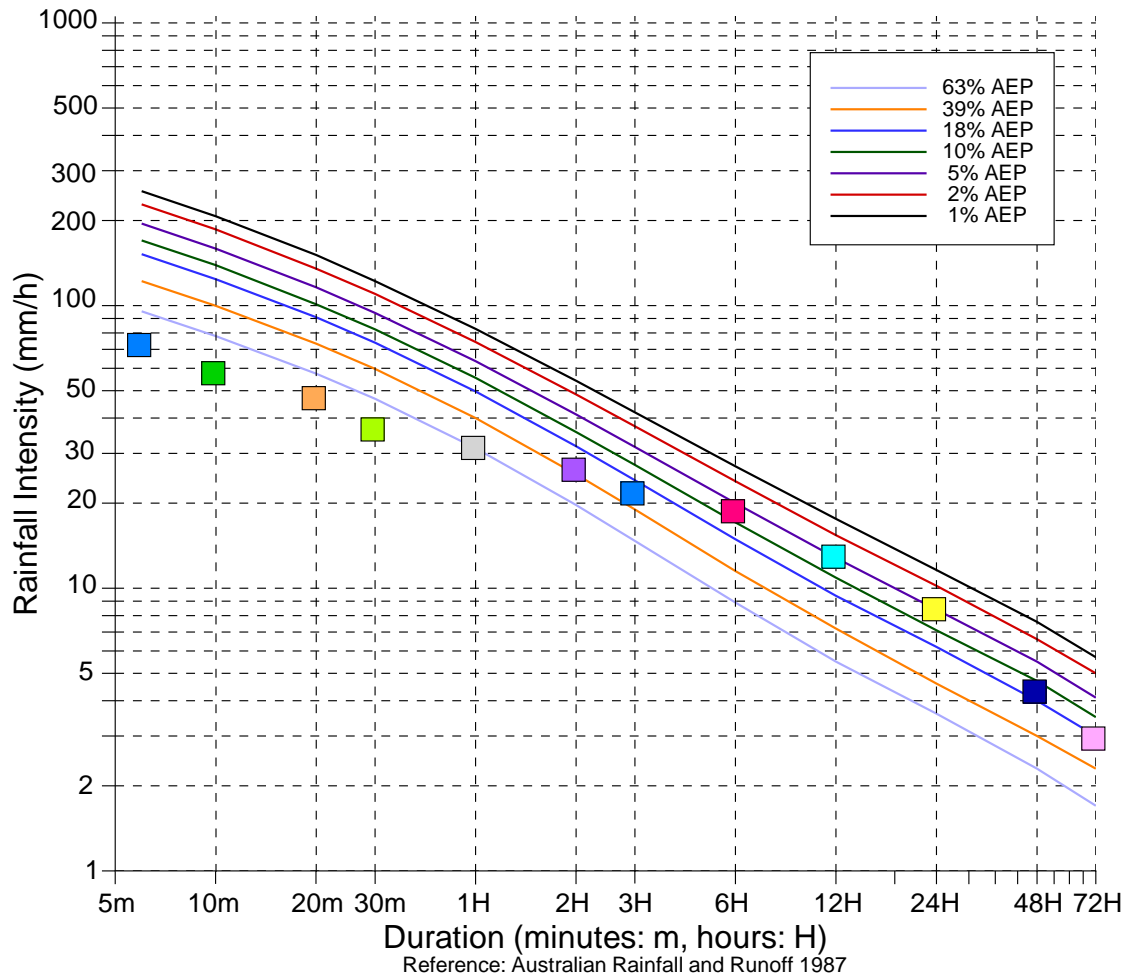
	Duration (minutes: m) (Hours: H)	Rainfall Intensity (mm/h)	Time/Date
■	6m	180.0	00:54_19/03/2017
■	10m	138.0	00:50_19/03/2017
■	20m	87.0	12:10_30/03/2017
■	30m	72.0	12:06_30/03/2017
■	1H	67.0	12:06_30/03/2017
■	2H	48.0	22:54_30/03/2017
■	3H	45.3	21:54_30/03/2017
■	6H	37.0	19:28_30/03/2017
■	12H	29.0	01:46_30/03/2017
■	24H	26.6	01:46_30/03/2017
■	48H	13.6	13:46_29/03/2017
■	72H	9.1	13:46_29/03/2017

Australian Rainfall and Runoff (Institute of Engineers Australia 1987), states:  
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 Adapted from: <http://www.bom.gov.au/water/designRainfalls/ifd-arr87/glossary.shtml>



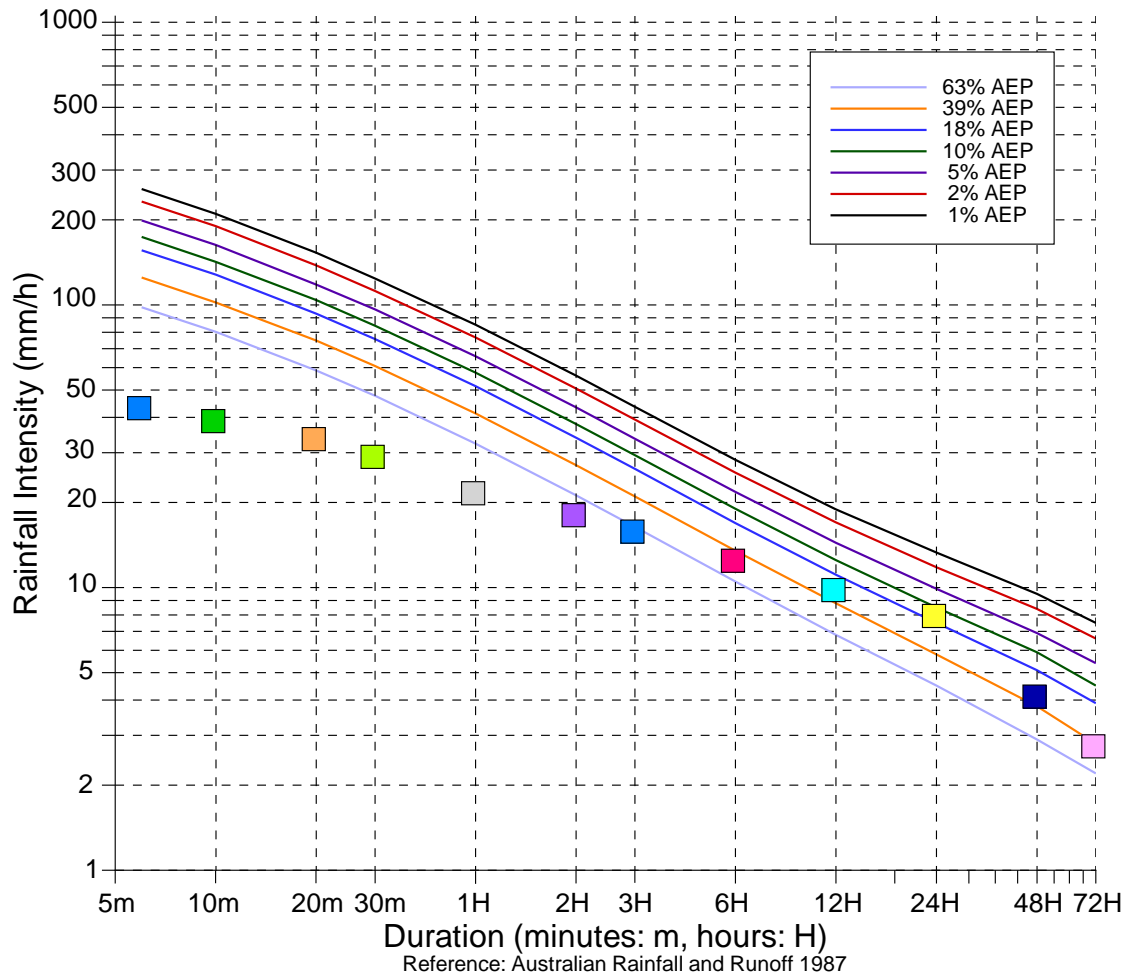
Duration (minutes: m) (Hours: H)	Rainfall Intensity (mm/h)	Time/Date
6m	80.0	11:50_30/03/2017
10m	66.0	11:50_30/03/2017
20m	57.0	11:50_30/03/2017
30m	52.0	11:42_30/03/2017
1H	44.0	11:10_30/03/2017
2H	35.0	11:02_30/03/2017
3H	31.0	11:08_30/03/2017
6H	23.3	11:02_30/03/2017
12H	21.7	11:06_30/03/2017
24H	18.3	03:02_30/03/2017
48H	9.4	19:22_29/03/2017
72H	6.2	19:22_29/03/2017

Australian Rainfall and Runoff (Institute of Engineers Australia 1987), states:  
 "Use of the terms "recurrence interval" and "return period" has been criticised as leading to confusion in the minds of some decision makers and members of public. Although the terms are simple superficially, they are sometimes misinterpreted as implying that the associated magnitude is only exceeded at regular intervals, and that they are referring to the elapsed time to the next exceedance."  
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 Adapted from: <http://www.bom.gov.au/water/designRainfalls/ifd-arr87/glossary.shtml>



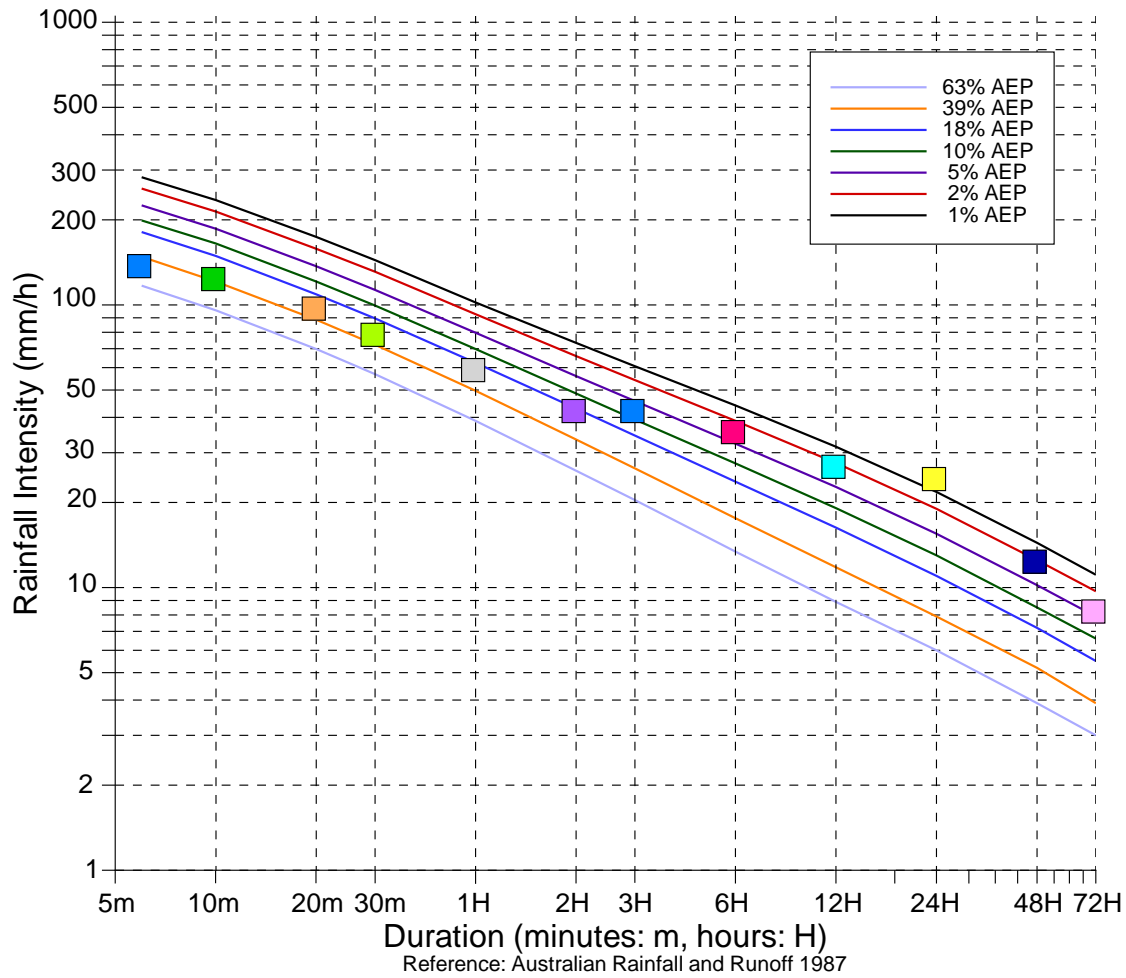
Duration (minutes: m) (Hours: H)	Rainfall Intensity (mm/h)	Time/Date
6m	74.0	01:00_19/03/2017
10m	58.8	01:02_19/03/2017
20m	48.0	01:00_19/03/2017
30m	37.2	00:58_19/03/2017
1H	32.0	19:36_30/03/2017
2H	26.8	19:06_30/03/2017
3H	22.1	18:06_30/03/2017
6H	19.1	15:40_30/03/2017
12H	13.2	08:48_30/03/2017
24H	8.6	01:00_30/03/2017
48H	4.4	18:58_29/03/2017
72H	3.0	18:58_29/03/2017

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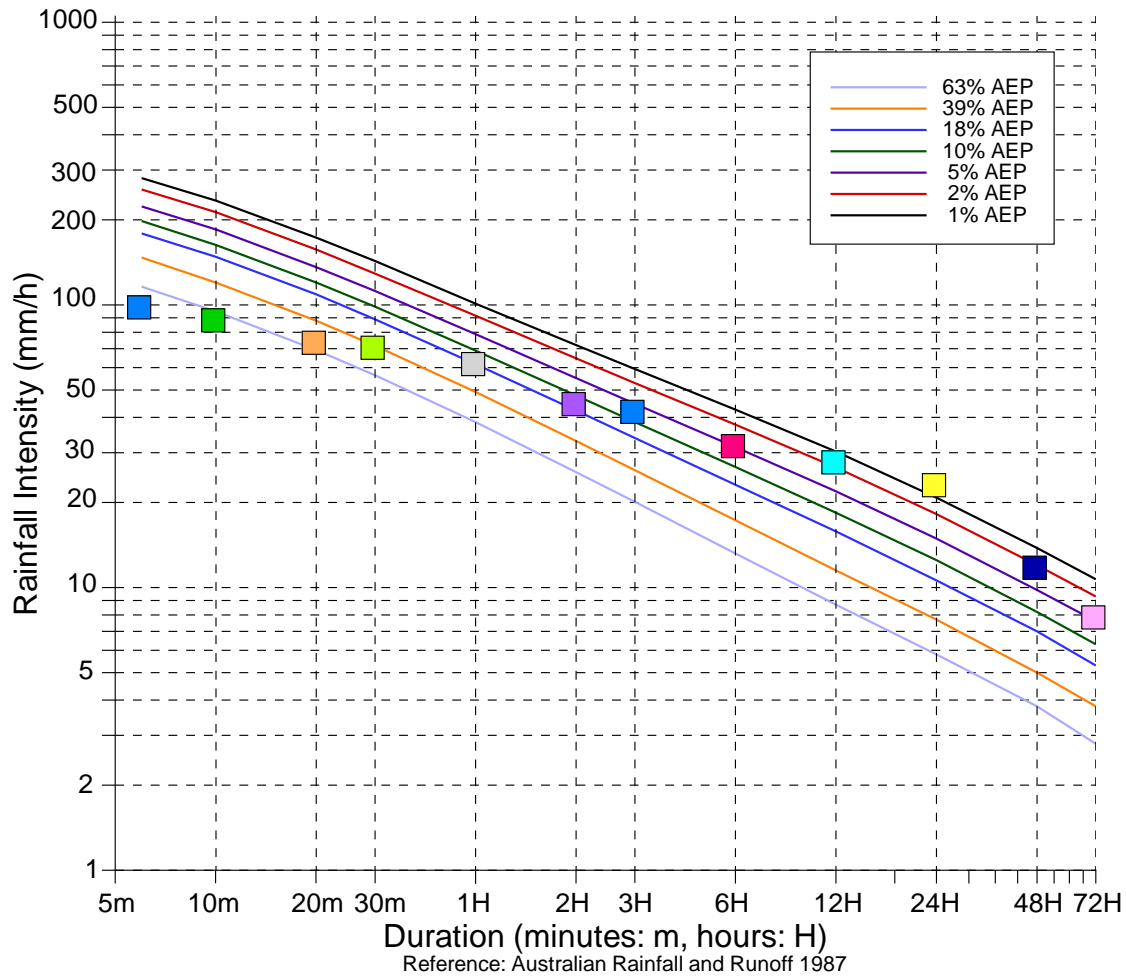
Duration (minutes: m) (Hours: H)	Rainfall Intensity (mm/h)	Time/Date
6m	44.0	05:54_30/03/2017
10m	39.6	11:06_30/03/2017
20m	34.2	10:58_30/03/2017
30m	29.6	10:50_30/03/2017
1H	22.0	19:26_30/03/2017
2H	18.4	19:16_30/03/2017
3H	16.1	18:40_30/03/2017
6H	12.7	16:10_30/03/2017
12H	10.0	10:12_30/03/2017
24H	8.1	03:12_30/03/2017
48H	4.2	15:58_29/03/2017
72H	2.8	15:58_29/03/2017

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 Adapted from: <http://www.bom.gov.au/water/designRainfalls/ifd-arr87/glossary.shtml>



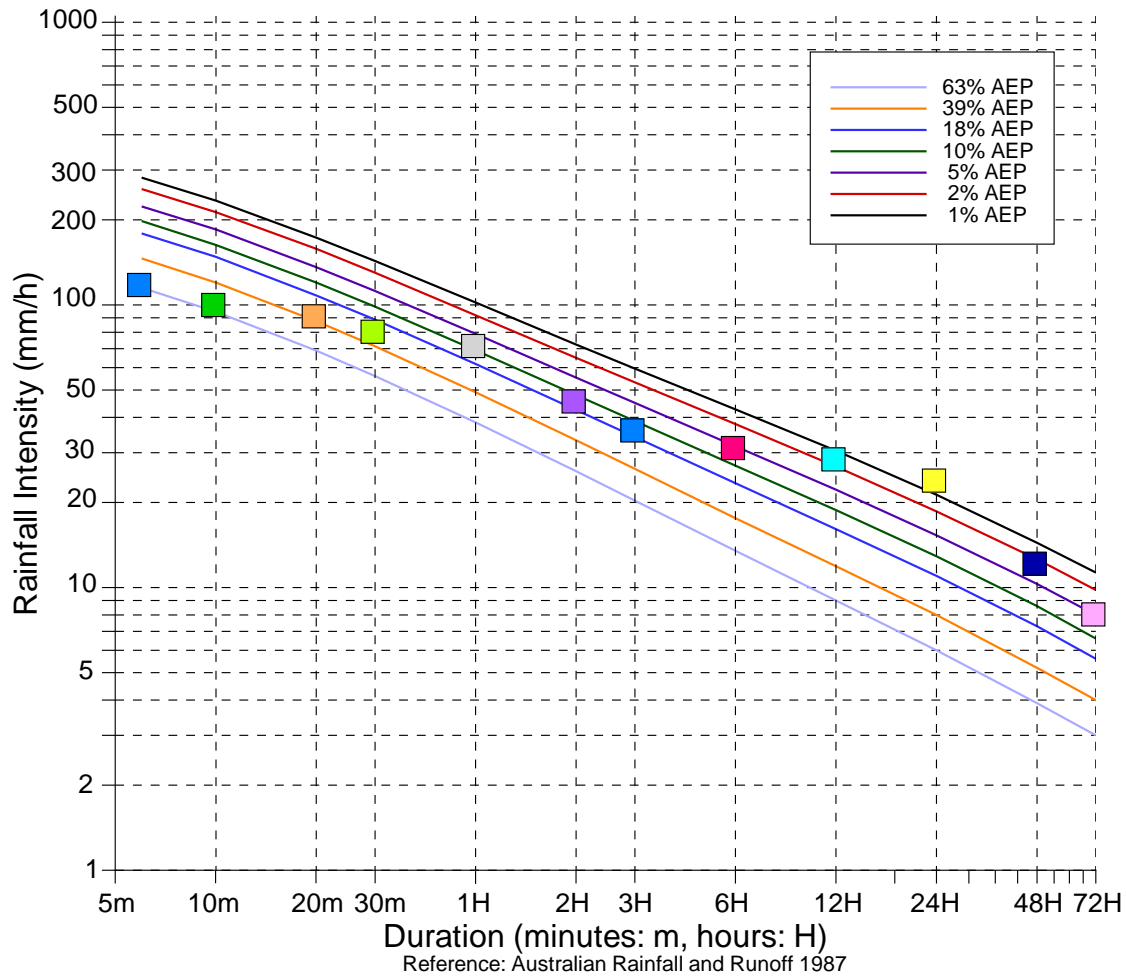
Duration (minutes: m) (Hours: H)	Rainfall Intensity (mm/h)	Time/Date
6m	140.0	13:00_30/03/2017
10m	126.0	12:56_30/03/2017
20m	99.0	12:52_30/03/2017
30m	80.0	12:42_30/03/2017
1H	60.0	12:30_30/03/2017
2H	43.0	23:00_30/03/2017
3H	43.0	21:54_30/03/2017
6H	36.2	19:18_30/03/2017
12H	27.3	02:00_30/03/2017
24H	24.7	02:00_30/03/2017
48H	12.6	17:14_29/03/2017
72H	8.4	17:14_29/03/2017

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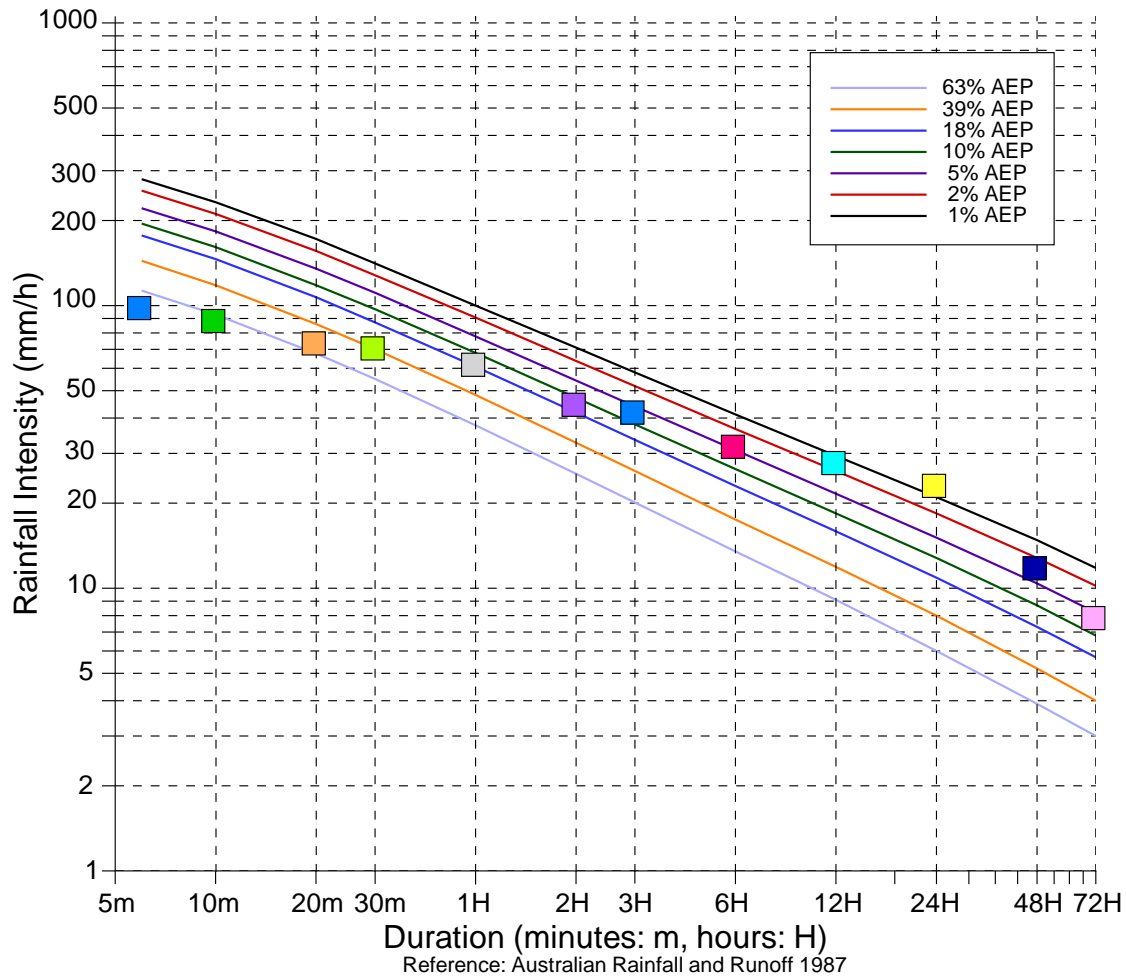
Duration (minutes: m) (Hours: H)	Rainfall Intensity (mm/h)	Time/Date
6m	100.0	08:06_30/03/2017
10m	90.0	08:06_30/03/2017
20m	75.0	12:12_30/03/2017
30m	72.0	12:06_30/03/2017
1H	63.0	12:04_30/03/2017
2H	45.5	11:26_30/03/2017
3H	42.7	11:52_30/03/2017
6H	32.3	07:14_30/03/2017
12H	28.3	05:58_30/03/2017
24H	23.5	02:26_30/03/2017
48H	12.0	20:28_29/03/2017
72H	8.0	20:28_29/03/2017

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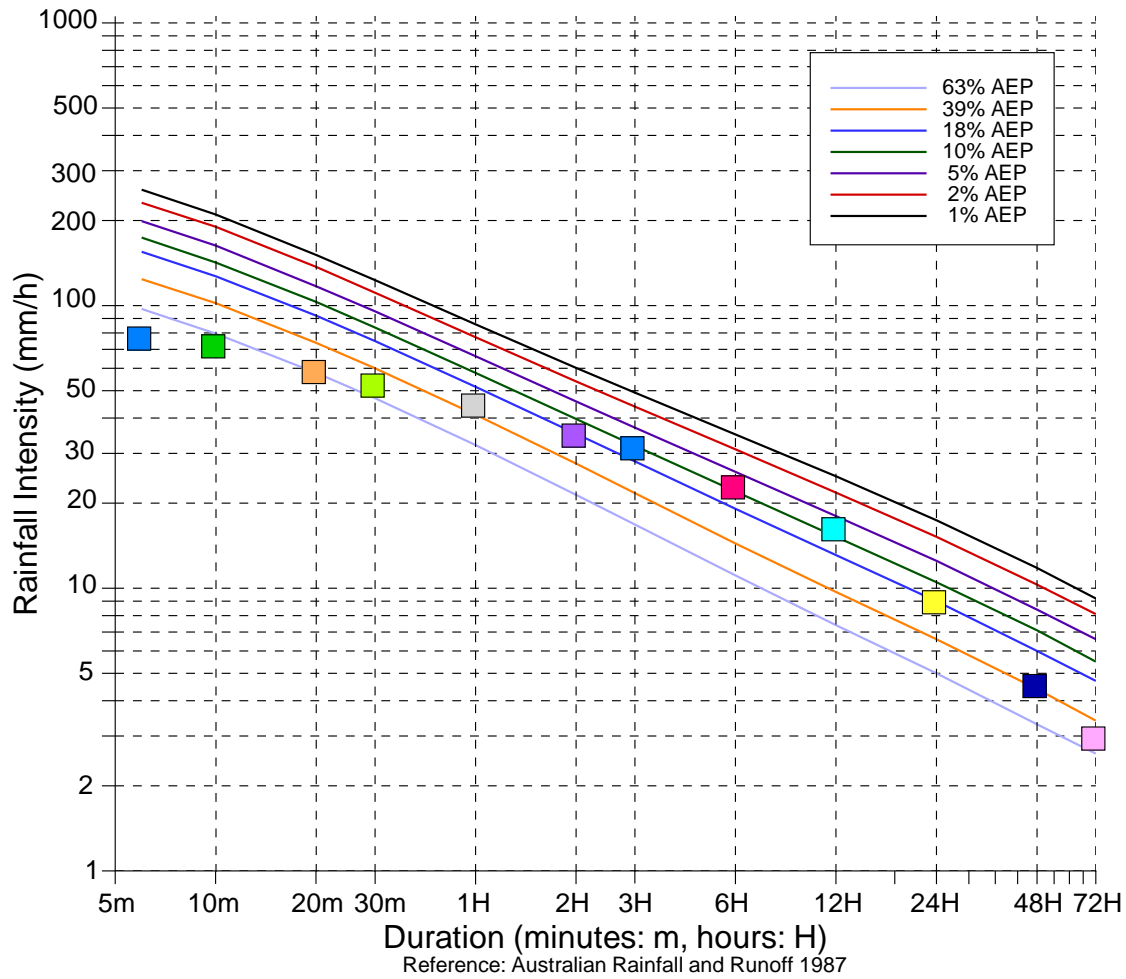
Duration (minutes: m) (Hours: H)	Rainfall Intensity (mm/h)	Time/Date
6m	120.0	06:46_15/03/2017
10m	102.0	12:56_30/03/2017
20m	93.0	12:50_30/03/2017
30m	82.0	12:44_30/03/2017
1H	73.0	12:14_30/03/2017
2H	46.5	11:52_30/03/2017
3H	36.7	12:10_30/03/2017
6H	31.8	07:48_30/03/2017
12H	29.0	02:12_30/03/2017
24H	24.4	02:12_30/03/2017
48H	12.4	20:06_29/03/2017
72H	8.2	20:06_29/03/2017

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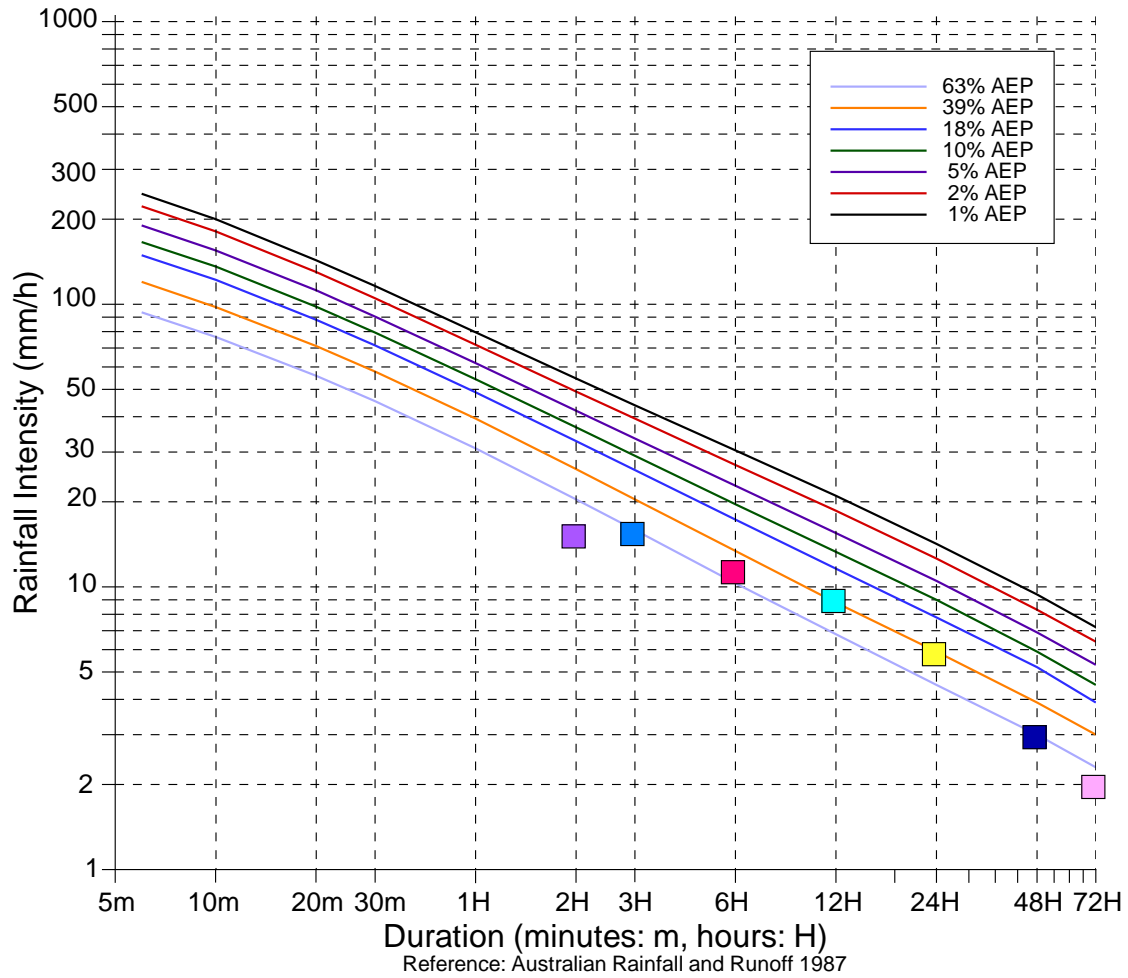
	Duration (minutes: m) (Hours: H)	Rainfall Intensity (mm/h)	Time/Date
■	6m	100.0	08:06_30/03/2017
■	10m	90.0	08:06_30/03/2017
■	20m	75.0	12:12_30/03/2017
■	30m	72.0	12:06_30/03/2017
■	1H	63.0	12:04_30/03/2017
■	2H	45.5	11:26_30/03/2017
■	3H	42.7	11:52_30/03/2017
■	6H	32.3	07:14_30/03/2017
■	12H	28.3	05:58_30/03/2017
■	24H	23.5	02:26_30/03/2017
■	48H	12.0	20:28_29/03/2017
■	72H	8.0	20:28_29/03/2017

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 "Use of the terms "recurrence interval" and "return period" has been criticised as leading to confusion in the minds of some decision makers and members of public. Although the terms are simple superficially, they are sometimes misinterpreted as implying that the associated magnitude is only exceeded at regular intervals, and that they are referring to the elapsed time to the next exceedance."  
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 Adapted from: <http://www.bom.gov.au/water/designRainfalls/ifd-arr87/glossary.shtml>



Duration (minutes: m) (Hours: H)	Rainfall Intensity (mm/h)	Time/Date
6m	78.0	19:54_30/03/2017
10m	73.2	19:50_30/03/2017
20m	59.4	19:44_30/03/2017
30m	53.2	19:50_30/03/2017
1H	45.2	19:32_30/03/2017
2H	35.4	18:54_30/03/2017
3H	31.9	19:04_30/03/2017
6H	23.2	16:14_30/03/2017
12H	16.5	13:24_30/03/2017
24H	9.1	12:06_30/03/2017
48H	4.6	12:06_30/03/2017
72H	3.0	12:06_30/03/2017

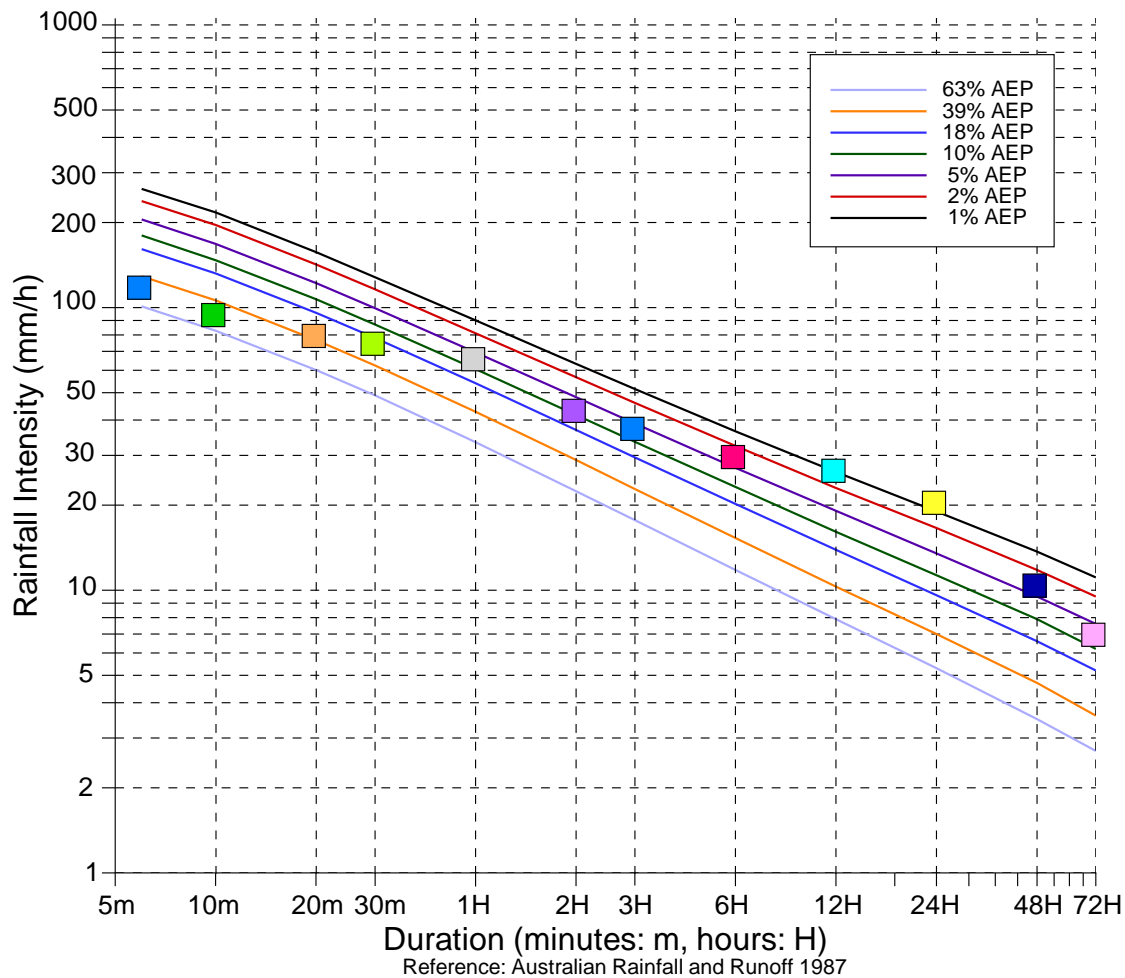
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Short duration rainfall data impacted by possible radio transfer interruptions. Suspect short duration IFD results removed by observation.

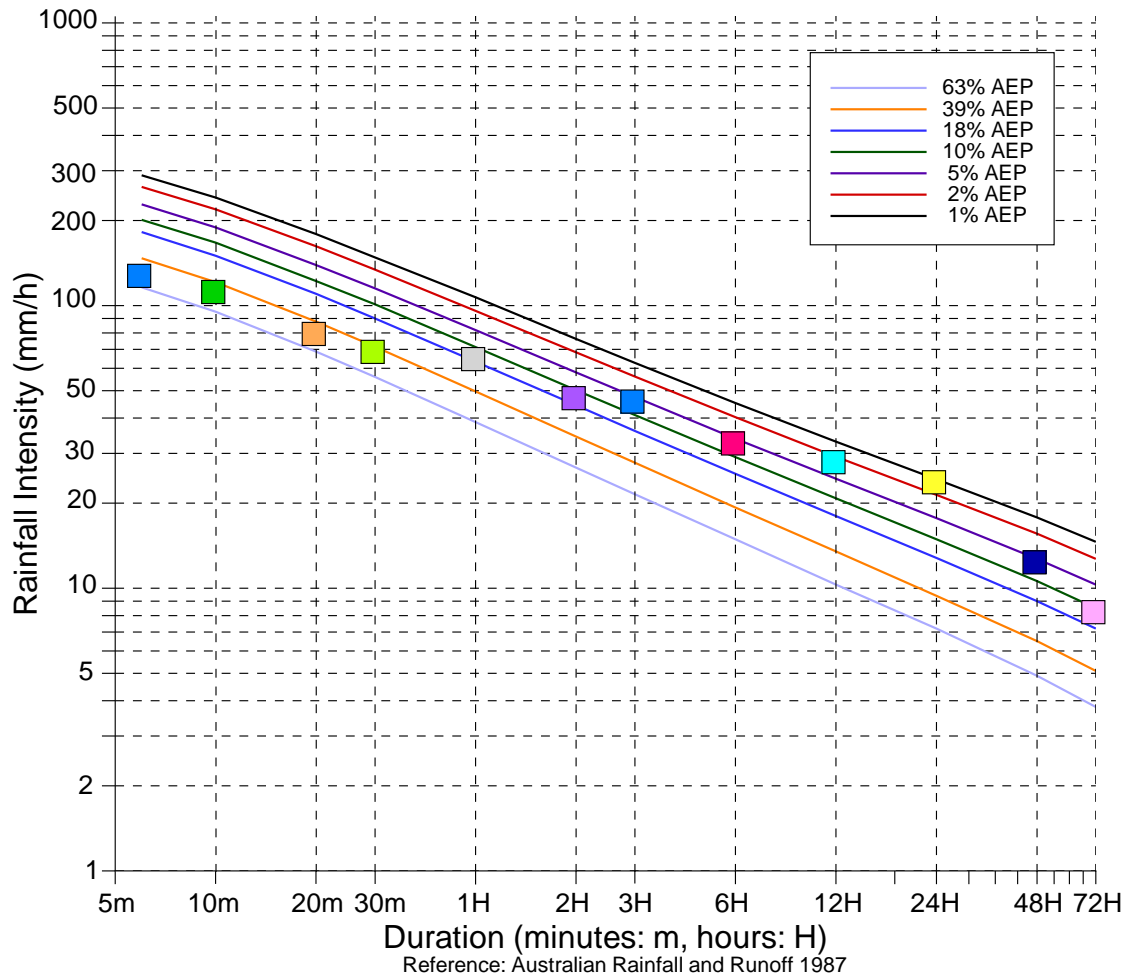
Duration (minutes: m) (Hours: H)	Rainfall Intensity (mm/h)	Time/Date
6m		
10m		
20m		
30m		
1H		
2H	15.4	22:58_29/03/2017
3H	15.7	21:58_29/03/2017
6H	11.5	21:58_29/03/2017
12H	9.1	21:58_29/03/2017
24H	5.9	17:58_29/03/2017
48H	3.0	13:58_29/03/2017
72H	2.0	13:58_29/03/2017

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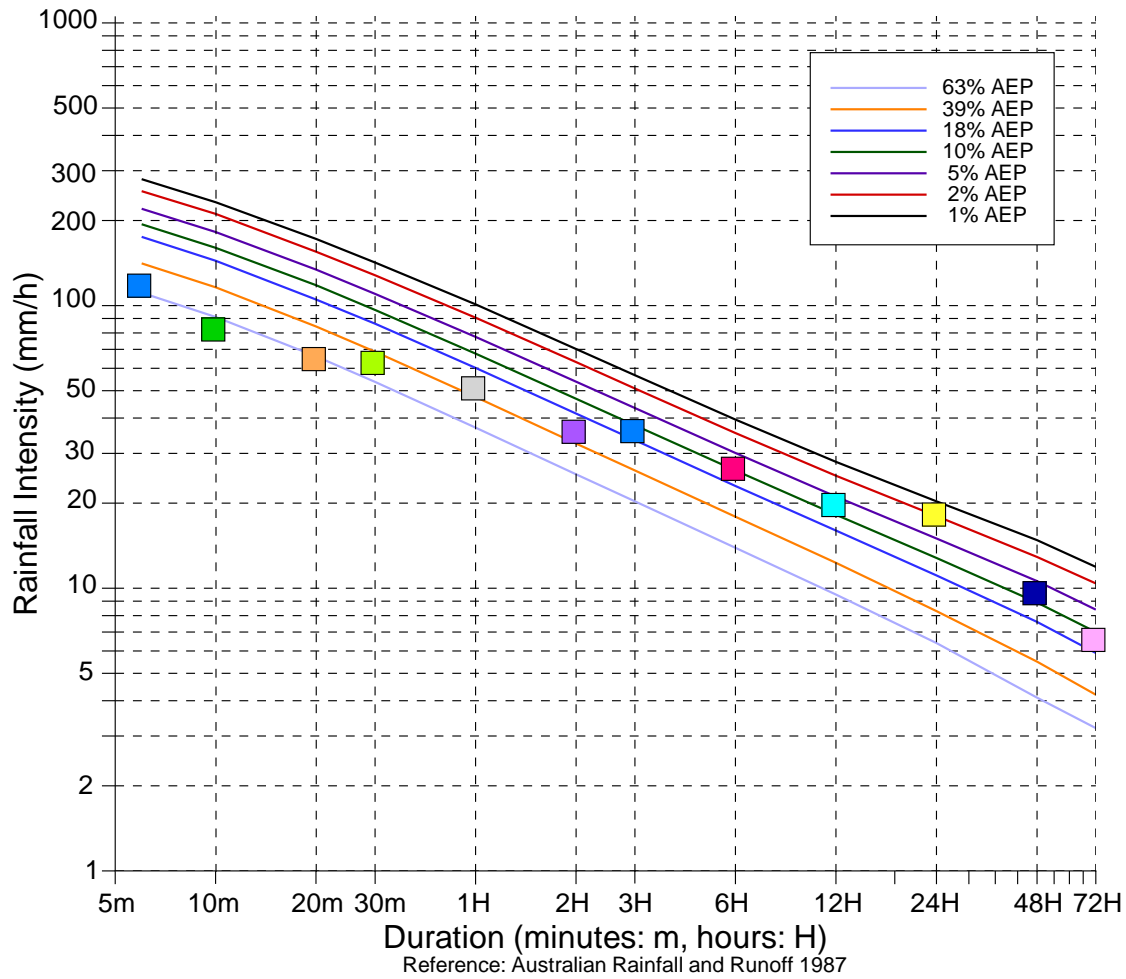
Duration (minutes: m) (Hours: H)	Rainfall Intensity (mm/h)	Time/Date
6m	120.0	14:44_23/03/2017
10m	96.0	11:34_30/03/2017
20m	81.0	11:38_30/03/2017
30m	76.0	11:28_30/03/2017
1H	67.0	11:16_30/03/2017
2H	44.0	19:26_30/03/2017
3H	38.0	19:26_30/03/2017
6H	30.2	16:12_30/03/2017
12H	27.0	10:48_30/03/2017
24H	20.8	04:14_30/03/2017
48H	10.6	19:54_29/03/2017
72H	7.1	19:54_29/03/2017

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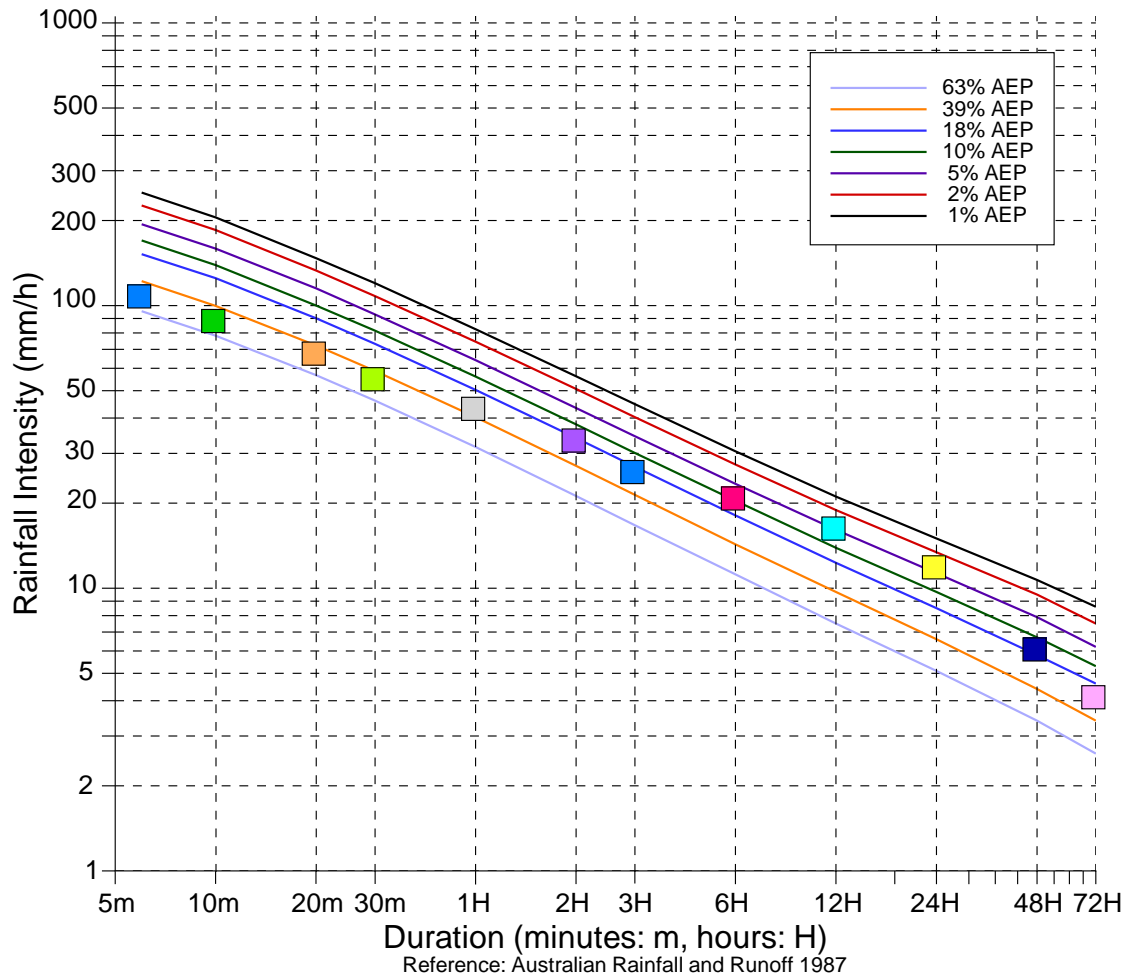
	Duration (minutes: m) (Hours: H)	Rainfall Intensity (mm/h)	Time/Date
■	6m	130.0	16:26_17/03/2017
■	10m	114.0	16:22_17/03/2017
■	20m	81.0	03:14_30/03/2017
■	30m	70.0	02:24_30/03/2017
■	1H	66.0	02:36_30/03/2017
■	2H	48.0	02:22_30/03/2017
■	3H	46.7	02:24_30/03/2017
■	6H	33.2	02:24_30/03/2017
■	12H	28.5	02:22_30/03/2017
■	24H	24.2	02:22_30/03/2017
■	48H	12.6	22:52_29/03/2017
■	72H	8.4	22:52_29/03/2017

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 Adapted from: <http://www.bom.gov.au/water/designRainfalls/ifd-arr87/glossary.shtml>



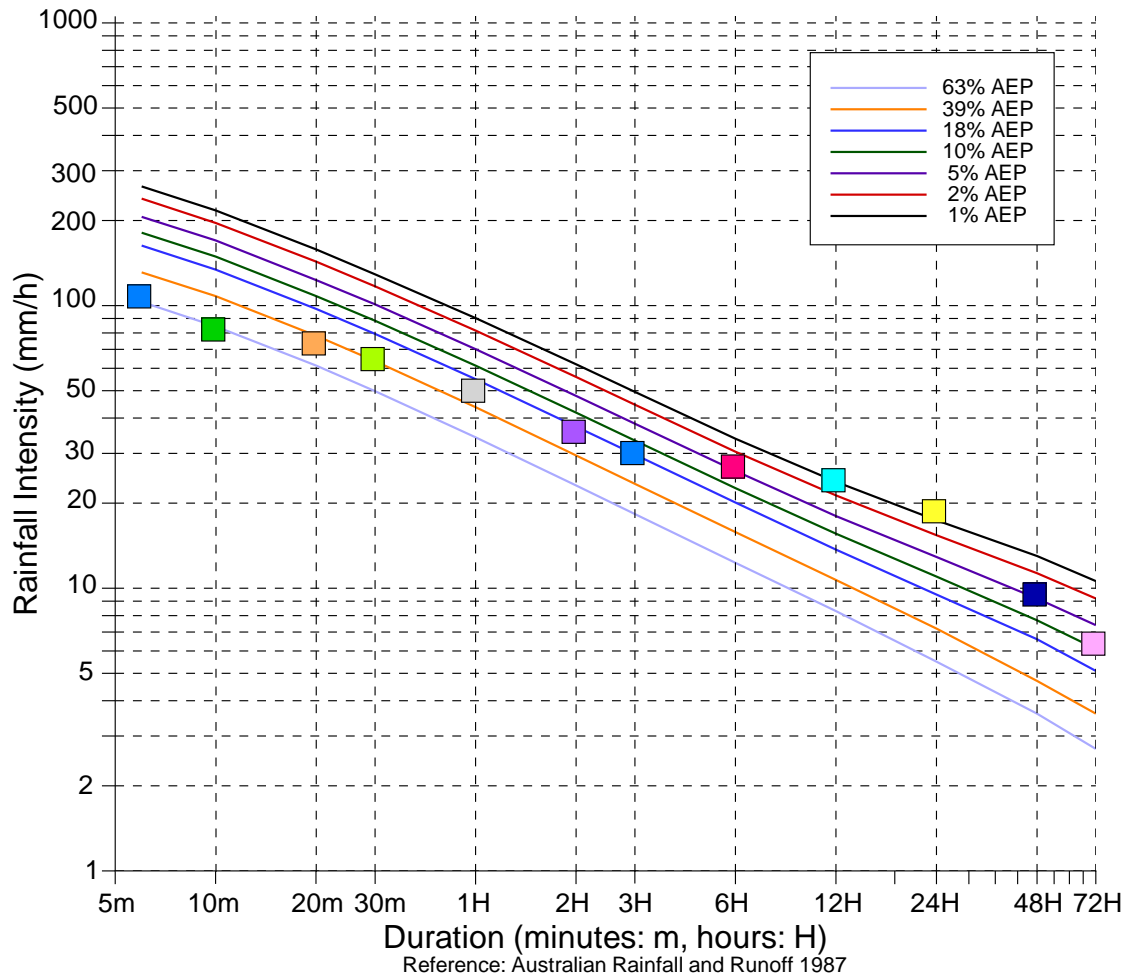
	Duration (minutes: m) (Hours: H)	Rainfall Intensity (mm/h)	Time/Date
■	6m	120.0	15:44_23/03/2017
■	10m	84.0	15:44_23/03/2017
■	20m	66.0	02:36_30/03/2017
■	30m	64.0	02:44_30/03/2017
■	1H	52.0	02:36_30/03/2017
■	2H	36.5	02:28_30/03/2017
■	3H	36.7	02:36_30/03/2017
■	6H	27.0	02:36_30/03/2017
■	12H	20.1	02:36_30/03/2017
■	24H	18.6	02:28_30/03/2017
■	48H	9.8	20:32_29/03/2017
■	72H	6.7	01:48_30/03/2017

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 Adapted from: <http://www.bom.gov.au/water/designRainfalls/ifd-arr87/glossary.shtml>



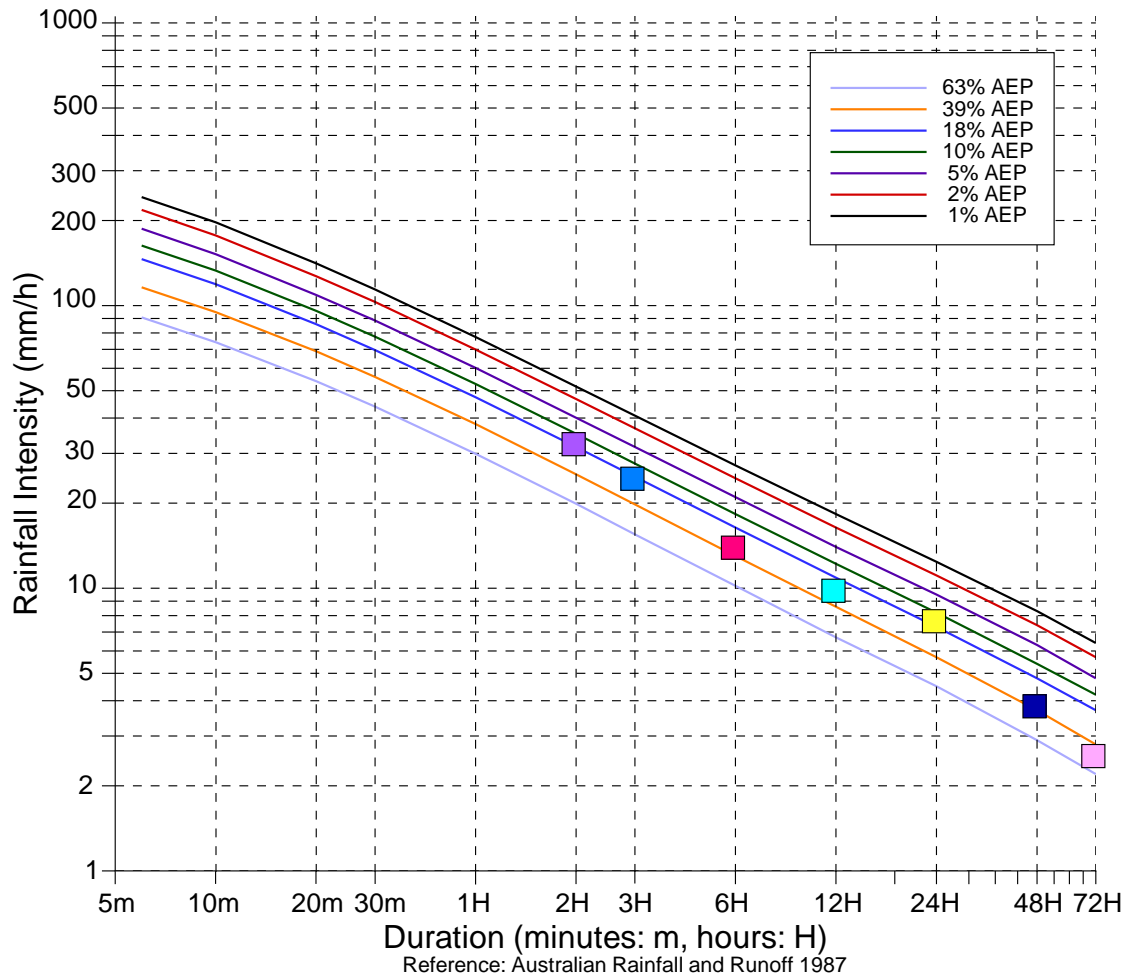
Duration (minutes: m) (Hours: H)	Rainfall Intensity (mm/h)	Time/Date
6m	110.0	06:24_30/03/2017
10m	90.0	06:24_30/03/2017
20m	69.0	06:12_30/03/2017
30m	56.0	05:06_23/03/2017
1H	44.0	05:40_30/03/2017
2H	34.0	05:00_23/03/2017
3H	26.3	04:18_23/03/2017
6H	21.2	05:22_30/03/2017
12H	16.6	00:18_30/03/2017
24H	12.1	17:46_29/03/2017
48H	6.2	11:26_29/03/2017
72H	4.2	11:26_29/03/2017

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 "Use of the terms "recurrence interval" and "return period" has been criticised as leading to confusion in the minds of some decision makers and members of public. Although the terms are simple superficially, they are sometimes misinterpreted as implying that the associated magnitude is only exceeded at regular intervals, and that they are referring to the elapsed time to the next exceedance."  
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Duration (minutes: m) (Hours: H)	Rainfall Intensity (mm/h)	Time/Date
6m	110.0	13:40_19/03/2017
10m	84.0	17:46_30/03/2017
20m	75.0	17:46_30/03/2017
30m	66.0	17:36_30/03/2017
1H	51.0	17:20_30/03/2017
2H	36.5	17:00_30/03/2017
3H	30.7	11:34_30/03/2017
6H	27.5	12:04_30/03/2017
12H	24.6	10:40_30/03/2017
24H	19.1	02:52_30/03/2017
48H	9.7	00:08_30/03/2017
72H	6.5	06:08_28/03/2017

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 Adapted from: <http://www.bom.gov.au/water/designRainfalls/ifd-arr87/glossary.shtml>



Short duration rainfall data impacted by possible radio transfer interruptions. Suspect short duration IFD results removed by observation.

Duration (minutes: m) (Hours: H)	Rainfall Intensity (mm/h)	Time/Date
6m		
10m		
20m		
30m		
1H		
2H	33.0	04:58_23/03/2017
3H	24.9	04:58_23/03/2017
6H	14.2	04:58_23/03/2017
12H	10.0	00:58_30/03/2017
24H	7.8	15:58_29/03/2017
48H	3.9	12:58_29/03/2017
72H	2.6	12:58_29/03/2017

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## 6. Richmond and Wilsons River region

### 6.1 Richmond and Wilsons River region – water level

The peak observed water levels between the 30 and 31 March are listed in **Table 6-1**. **Table 6-2** lists the SES flood classifications for Lismore, Casino, Coraki, Bungawalbin and Woodburn. The locations of water level stations within the Richmond and Wilsons River region are shown in **Figure 6-1**. The water level and rainfall data for the period 14 March 2017 to 7 April 2017 are displayed graphically in **Figures 6-2 to 6-20**.

**Table 6-1 Richmond and Wilsons River region flood peaks**

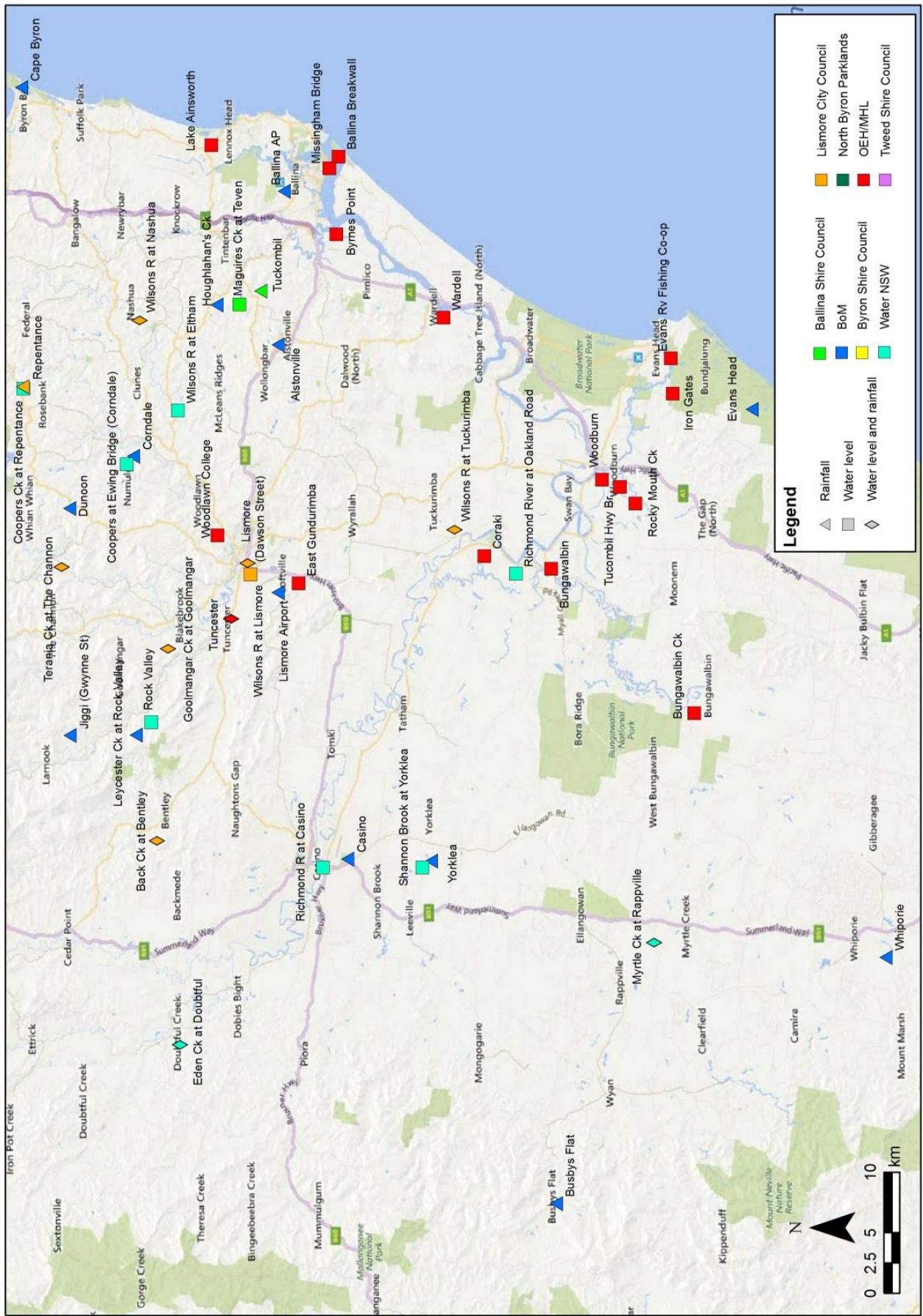
Station name	Station No.	Owner	Datum	Level
Coopers Creek at Repentance	203002	Water NSW	Local datum	5.58
Terania Creek at The Channon	203906	Lismore City Council	Local datum	11.97
Coopers at Ewing Bridge (Corndale)	203024	Water NSW	Local datum	10.47
Wilsons River at Nashua	203902	Lismore City Council	Local datum	7.79
Leycester Creek at Rock Valley	203010	Water NSW	Local datum	11.87
Back Creek at Bentley	203009	Lismore City Council	Local datum	11.22
Goolmangar Creek at Goolmangar	558075	Lismore City Council	Local datum	11.84
Wilsons River at Eltham	203014	Water NSW	Local datum	9.88
Eden Creek at Doubtful	203034	Water NSW	Local datum	14.07
Lake Ainsworth	203455	OEH/MHL	AHD	Rising*
Woodlawn College	203402	OEH/MHL	AHD	12.17
Tuncester	203443	OEH/MHL	AHD	13.66
Maguires Creek at Teven	558070	Ballina Shire Council	Local datum	1.93
Lismore (Dawson Street)	558087	Lismore City Council	AHD	11.34
Wilsons River at Lismore (mAHD)	203904	Lismore City Council	AHD	11.58
East Gundurimba	203427	OEH/MHL	AHD	10.34
Richmond River at Casino	203004	Water NSW	Local datum	12.97
Missingham Bridge Ballina	203465	OEH/MHL	AHD	1.12
Byrnes Point	203461	OEH/MHL	AHD	1.13
Ballina Breakwall	203425	OEH/MHL	AHD	1.11
Shannon Brook at Yorklea	203041	Water NSW	Local datum	9.70
Wardell	203468	OEH/MHL	AHD	1.48
Wilsons River at Tuckurimba	558076	Lismore City Council	Local datum	7.28
Coraki	203403	OEH/MHL	AHD	5.97
Richmond River at Oakland Road	203470	Water NSW	Local datum	6.26
Bungawalbin	203450	OEH/MHL	AHD	4.67
Woodburn	203412	OEH/MHL	AHD	3.22
Tucombil Highway Bridge	203480	OEH/MHL	AHD	3.24
Rocky Mouth Creek	203432	OEH/MHL	AHD	3.64
Myrtle Creek at Rappville	203030	Water NSW	Local datum	5.55
Evans River Fishing Co-op	203462	OEH/MHL	AHD	1.18
Iron Gates	203475	OEH/MHL	AHD	1.21
Bungawalbin Creek	2034133	OEH/MHL	AHD	8.76

\* Lake Ainsworth did not reach a flood peak between the 30 and 31 March.

**Table 6-2 SES flood classification for Lismore, Coraki, Bungawalbin and Woodburn**

Station	Classification			Peak (m)	Classification
	Minor	Moderate	Major		
	Water Level (mAHD)				
Wilsons River at Lismore	4.2	7.2	9.7	11.58	Major
Coraki	2.6	4.2	4.9	5.97	Major
Bungawalbin	2.2	3.7	4.2	4.67	Major
Woodburn	2.4	2.9	3.4	3.22	Moderate

Please note: The flood classifications as supplied by the SES for Coraki, Bungawalbin and Woodburn are expressed in Richmond River Valley Datum (RVD). The flood classifications for Coraki, Bungawalbin and Woodburn, as shown above, have been converted to metres AHD for comparison with the recorded flood peak.



## 6.2 Richmond and Wilsons River region – rainfall

The water level and rainfall data for the period 14 March 2017 to 7 April 2017 are displayed graphically in **Figures 6-2 to 6-20**. 24 hour rainfall totals up until 9.00 a.m. are displayed in **Table 6-3 to 6-6** for the period 14 March to 7 April 2017. The rainfall intensities are displayed graphically in **Figures 6-21 to 6-40**, in ARR1987 format. Appendix C provides ARR2016 format.

**Table 6-3 Richmond and Wilsons River region daily rainfall totals**

Date	Cape Byron <sup>^</sup>	Repentance	The Channon	Jiggi	Dunoon	Corndale	Nashua
	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)
	BoM	Lismore CC	Lismore CC	Lismore CC	BoM	Lismore CC	Lismore CC
15/03/2017	18.8	103.0	140.0	38.0	89.0	73.0	196.0
16/03/2017	162.0	119.0	8.0	57.0	92.0	128.0	19.0
17/03/2017	0.2	0.0	9.0	0.0	0.0	0.0	0.0
18/03/2017	13.8	11.0	10.0	21.0	12.0	12.0	25.0
19/03/2017	10.8	19.0	38.0	5.0	12.0	22.0	42.0
20/03/2017	32.4	57.0	64.0	39.0	53.0	51.0	77.0
21/03/2017	1.4	37.0	5.0	28.0	24.0	9.0	7.0
22/03/2017	0.0	4.0	2.0	1.0	1.0	3.0	12.0
23/03/2017	0.0	1.0	22.0	0.0	0.0	0.0	35.0
24/03/2017	10.8	29.0	2.0	38.0	12.0	15.0	2.0
25/03/2017	1.6	7.0	6.0	5.0	6.0	5.0	2.0
26/03/2017	0.2	2.0	0.0	0.0	1.0	1.0	0.0
27/03/2017	1.8	0.0	0.0	0.0	0.0	0.0	0.0
28/03/2017	0.2	0.0	0.0	0.0	0.0	0.0	1.0
29/03/2017	0.0	0.0	0.0	0.0	0.0	0.0	0.0
30/03/2017	14.6	100.0	418.0	67.0	143.0	88.0	135.0
31/03/2017	148.8	251.0	158.0	281.0	347.0	265.0	99.0
01/04/2017	0.0	0.0	0.0	0.0	0.0	0.0	0.0
02/04/2017	0.0	0.0	2.0	0.0	0.0	0.0	2.0
03/04/2017	9.8	10.0	7.0	3.0	4.0	2.0	17.0
04/04/2017	-	16.0	12.0	4.0	12.0	14.0	11.0
05/04/2017	-	22.0	23.0	18.0	13.0	10.0	18.0
06/04/2017	-	11.0	8.0	19.0	15.0	10.0	5.0
07/04/2017	-	20.0	7.0	2.0	14.0	5.0	9.0

<sup>^</sup> Cape Byron rainfall data provided up to 3/4/2017 only.

**Table 6-4 Richmond and Wilsons River region daily rainfall totals (cont.)**

Date	Rock Valley (mm)	Bentley (mm)	Goolmangar (mm)	Eden Creek (mm)	Houghlahan's Creek (mm)
	Lismore CC	Lismore CC	Lismore CC	BoM	Ballina SC
15/03/2017	58.0	-	57.0	39.5	63.0
16/03/2017	55.0	-	69.0	0.0	104.0
17/03/2017	0.0	-	0.0	37.5	0.0
18/03/2017	25.0	-	8.0	8.0	26.0
19/03/2017	5.0	-	2.0	24.0	29.0
20/03/2017	50.0	-	56.0	18.5	98.0
21/03/2017	15.0	1.0	15.0	2.0	12.0
22/03/2017	2.0	0.0	1.0	0.0	2.0
23/03/2017	1.0	3.0	0.0	7.0	0.0
24/03/2017	7.0	5.0	12.0	2.5	15.0
25/03/2017	3.0	4.0	4.0	1.5	5.0
26/03/2017	3.0	0.0	1.0	0.5	0.0
27/03/2017	0.0	0.0	0.0	0.0	0.0
28/03/2017	0.0	0.0	0.0	0.0	0.0
29/03/2017	0.0	0.0	0.0	0.0	0.0
30/03/2017	66.0	193.0	92.0	113.0	41.0
31/03/2017	260.0	72.0	316.0	47.0	149.0
01/04/2017	0.0	1.0	0.0	0.0	0.0
02/04/2017	0.0	0.0	0.0	0.5	0.0
03/04/2017	1.0	4.0	2.0	0.0	11.0
04/04/2017	2.0	5.0	3.0	2.0	17.0
05/04/2017	14.0	9.0	12.0	11.0	11.0
06/04/2017	15.0	5.0	15.0	7.0	12.0
07/04/2017	3.0	2.0	1.0	2.5	15.0

**Table 6-5 Richmond and Wilsons River region daily rainfall totals (cont.)**

Date	Tuncester (mm)	Lismore (Dawson St) (mm)	Tuckombil* (mm)	Lismore Airport^ (mm)	Alstonville STP~ (mm)	Ballina AP (mm)
	Lismore CC	Lismore CC	Ballina SC	BoM	Ballina SC	BoM
15/03/2017	83.0	77.0	-	133.6	-	143.6
16/03/2017	71.0	84.0	-	5.4	-	31.4
17/03/2017	1.0	0.0	-	8.2	-	0.0
18/03/2017	5.0	19.0	-	51.2	-	41.0
19/03/2017	3.0	56.0	-	26.4	17.6	34.0
20/03/2017	46.0	65.0	-	65.2	114.0	29.4
21/03/2017	10.0	8.0	-	1.8	19.6	0.0
22/03/2017	0.0	0.0	-	0.0	1.6	0.2
23/03/2017	0.0	0.0	-	2.4	0.8	3.0
24/03/2017	2.0	5.0	-	5.6	0.0	7.2
25/03/2017	4.0	6.0	-	3.6	2.8	1.8
26/03/2017	0.0	0.0	-	0.0	0.6	0.0
27/03/2017	0.0	0.0	-	0.0	0.0	0.0
28/03/2017	0.0	0.0	-	0.0	0.0	0.0
29/03/2017	0.0	0.0	-	0.0	0.0	0.0
30/03/2017	81.0	78.0	-	332.0	39.4	81.4
31/03/2017	277.0	308.0	-	-	139.6	93.0
01/04/2017	0.0	0.0	-	-	0.0	0.0
02/04/2017	0.0	0.0	-	-	0.0	0.0
03/04/2017	2.0	4.0	-	-	0.0	36.6
04/04/2017	0.0	9.0	-	-	0.0	33.0
05/04/2017	0.0	17.0	-	-	0.0	20.8
06/04/2017	0.0	9.0	-	-	0.0	2.8
07/04/2017	0.0	4.0	-	-	0.0	18.0

\* Tuckombil rainfall station was not operational during the March flood event due to a failed ERTS canister.

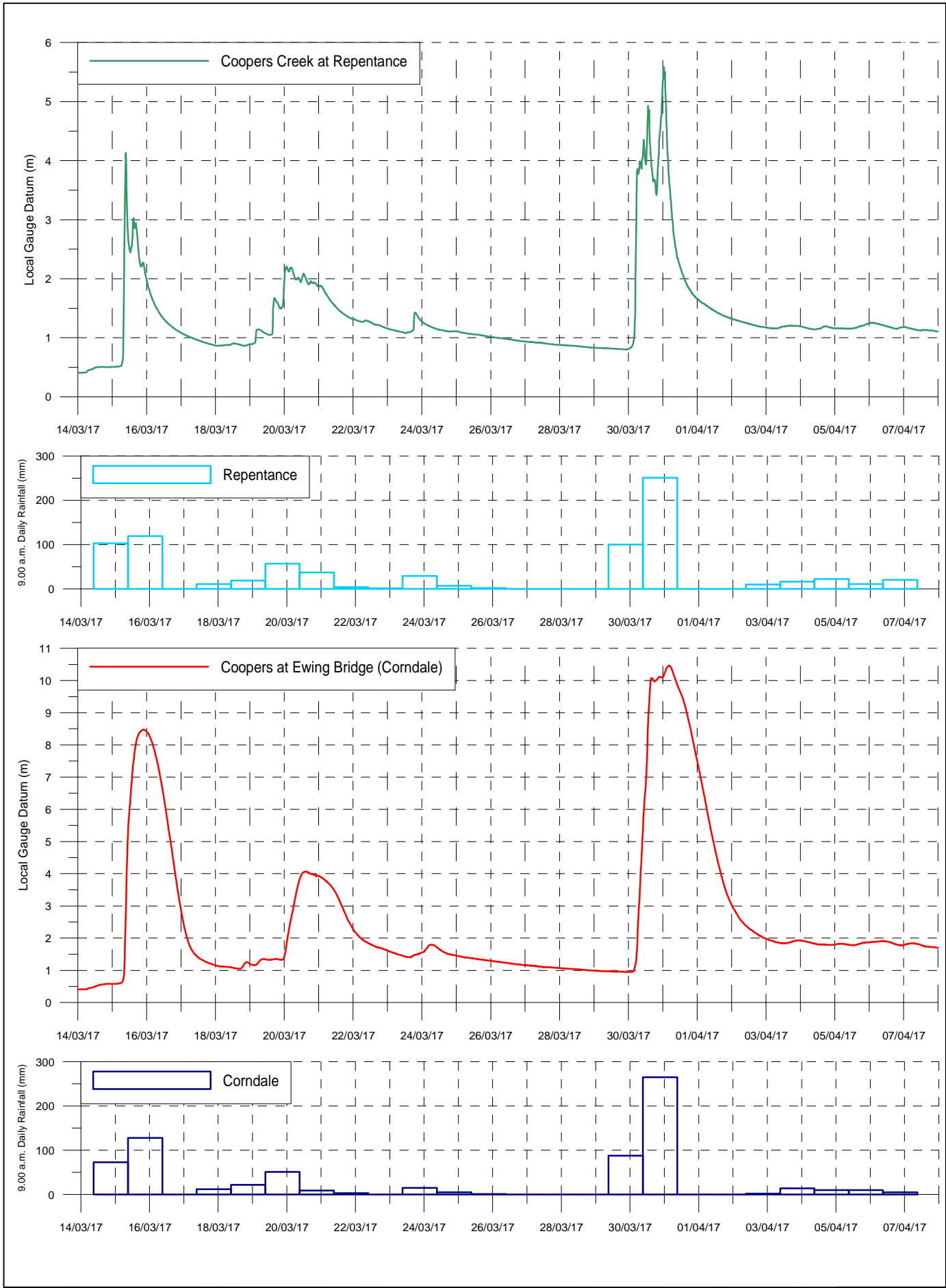
^ Lismore airport rainfall data provided up to 30 March 2017 only.

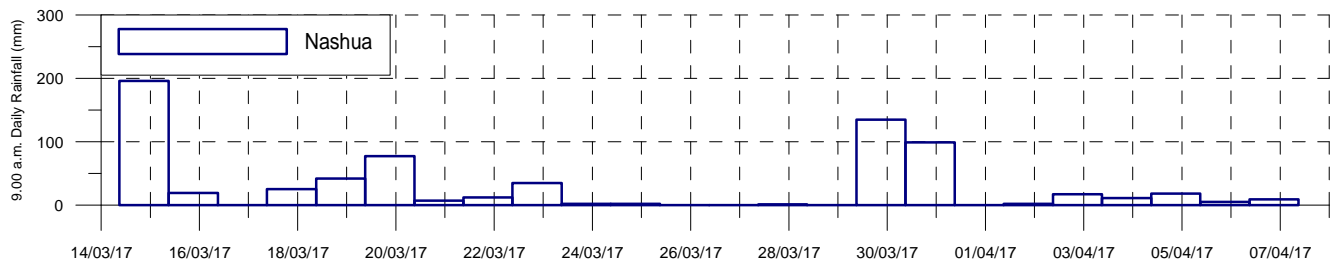
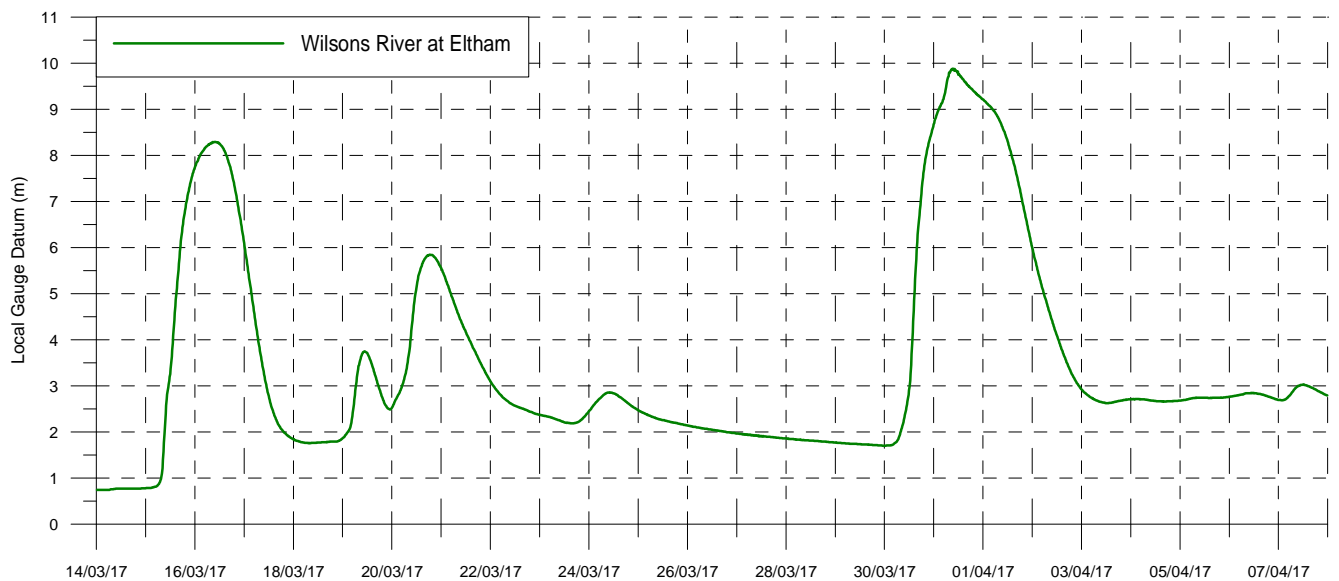
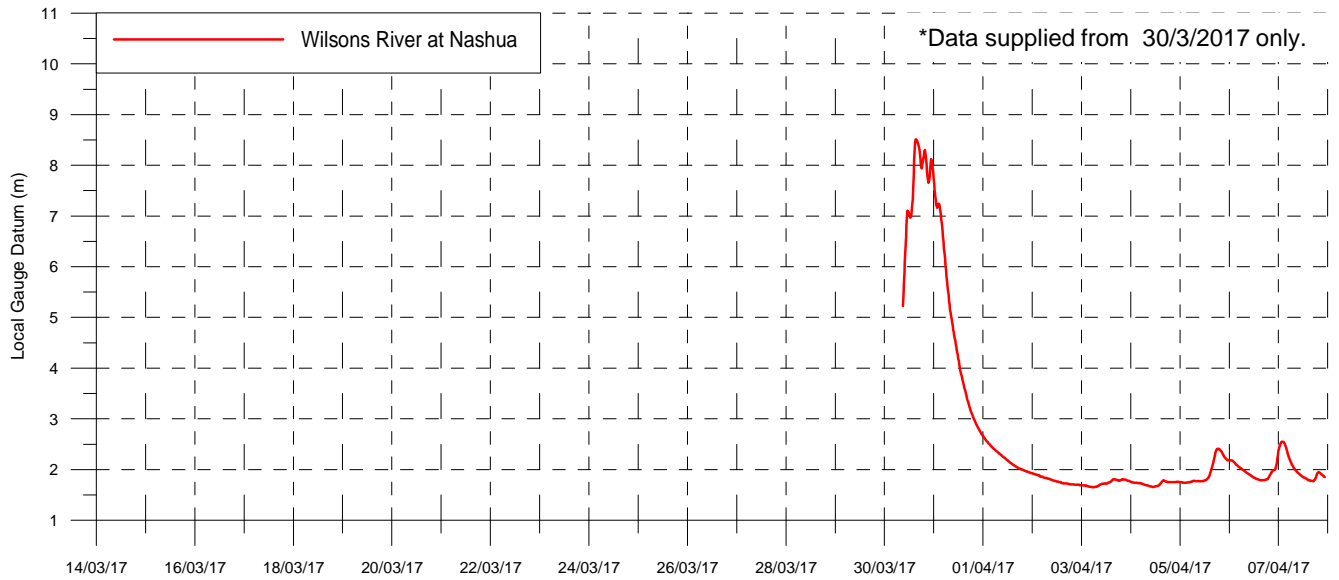
~ Alstonville STP rainfall data provided from 18 March 2017 only.

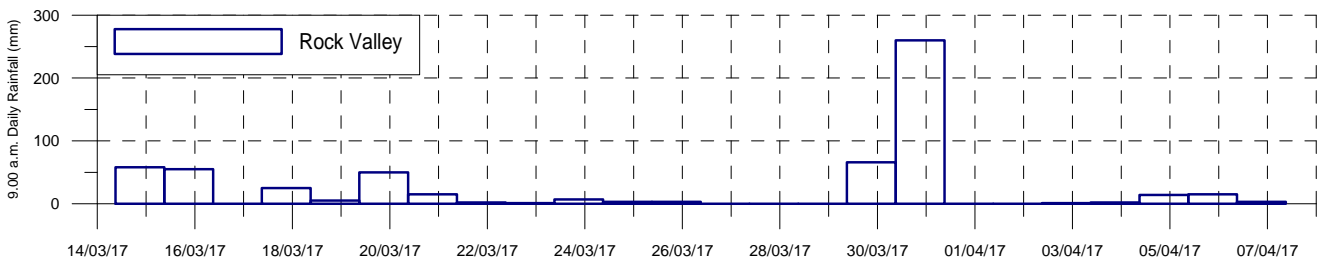
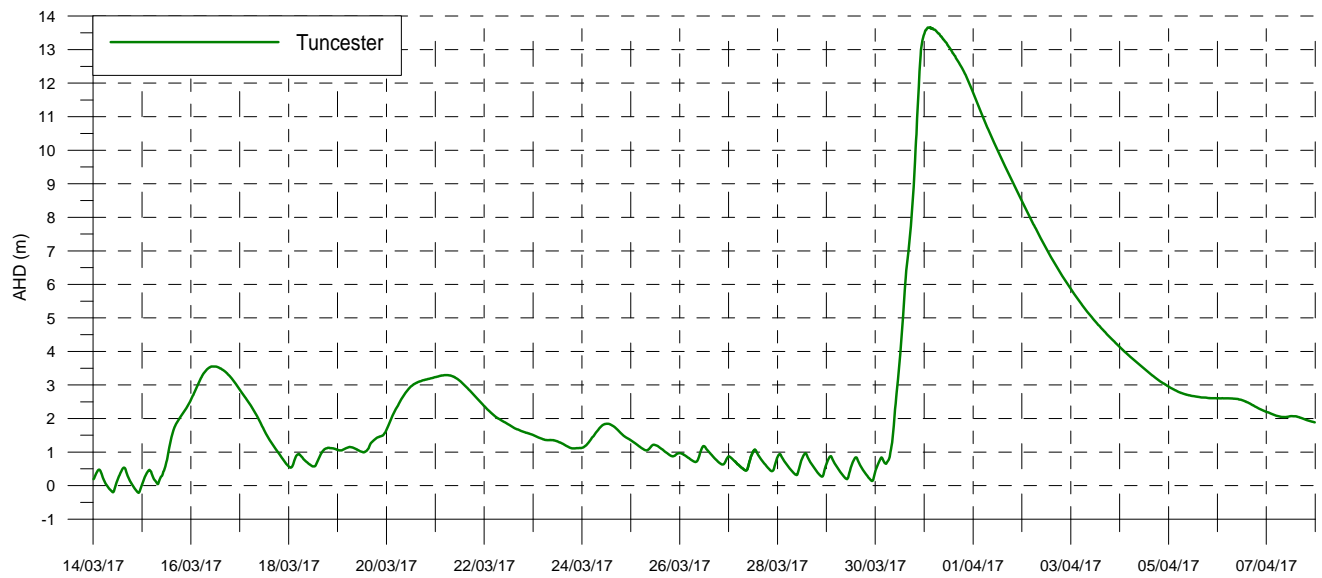
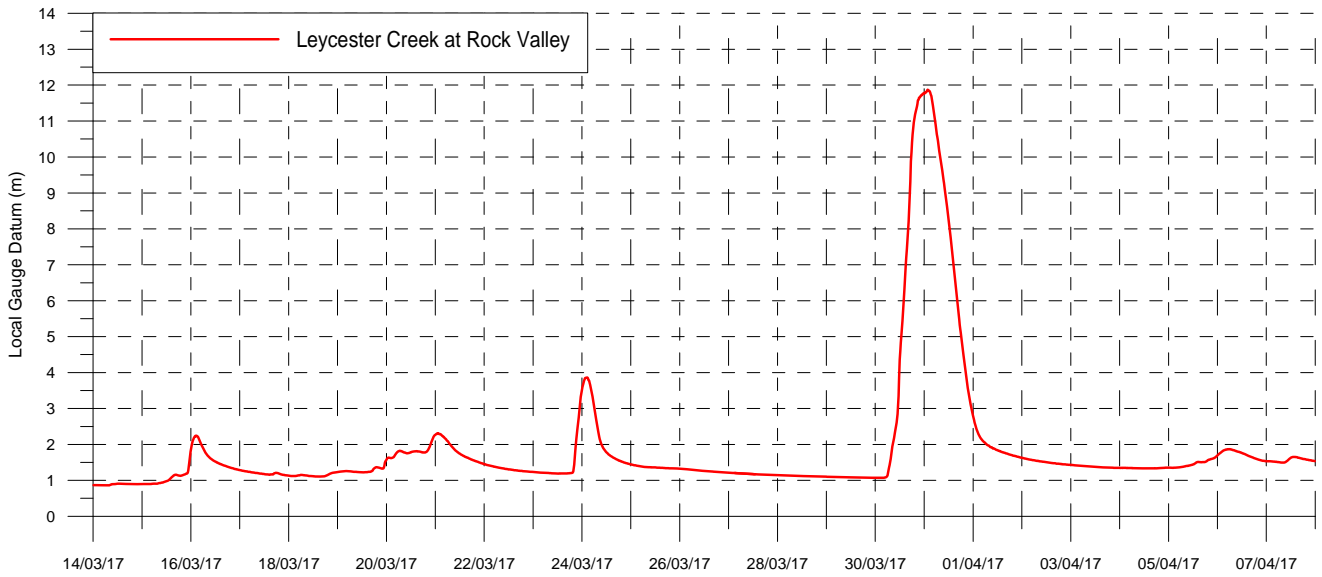
**Table 6-6 Richmond and Wilsons River region daily rainfall totals (cont.)**

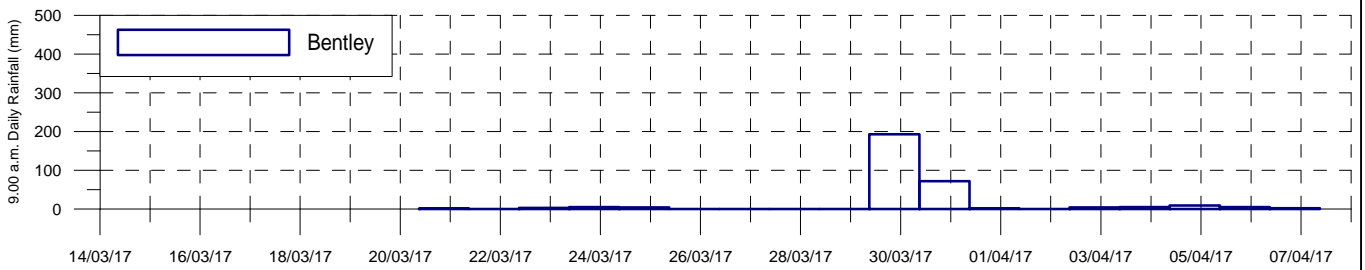
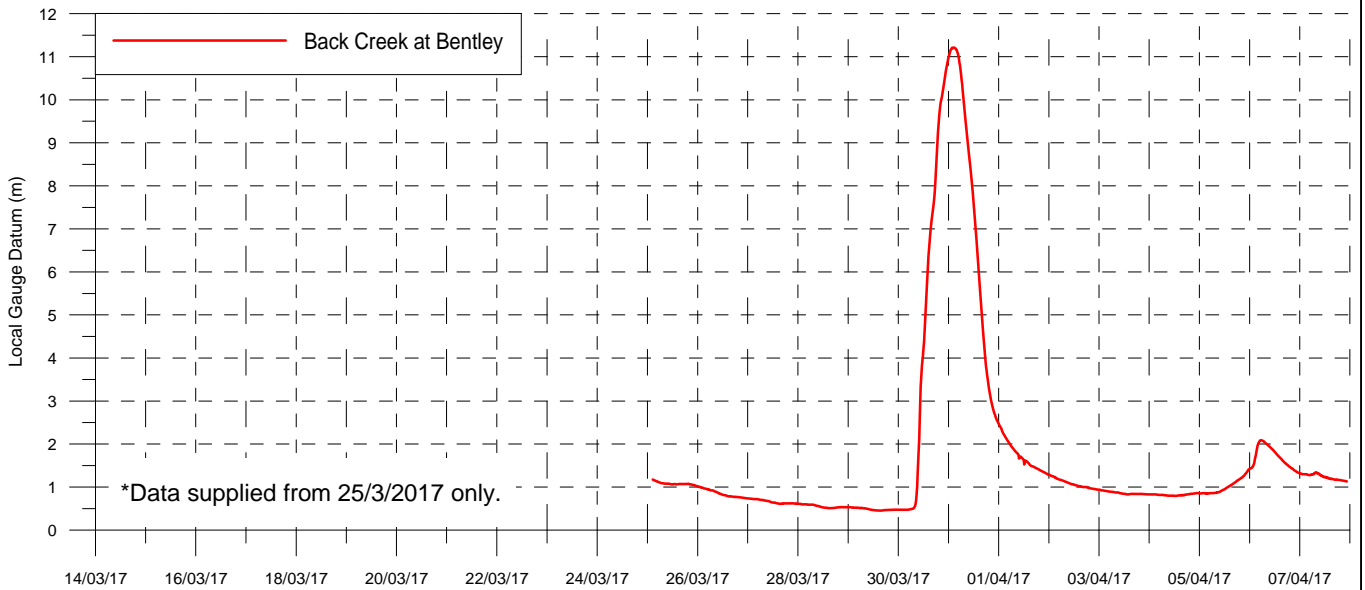
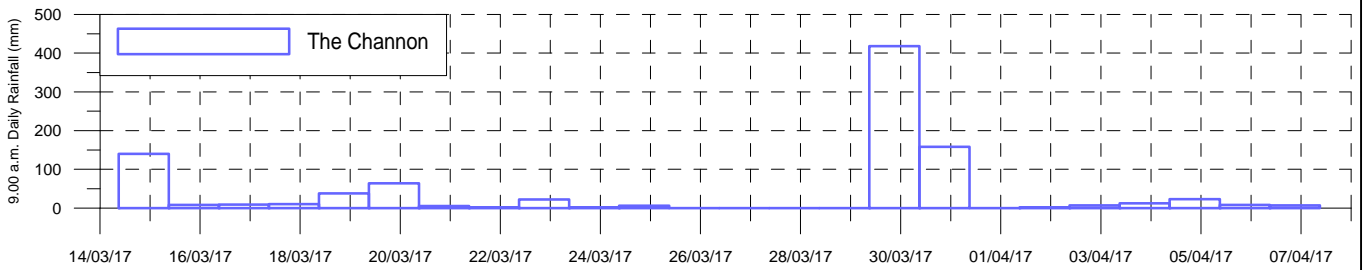
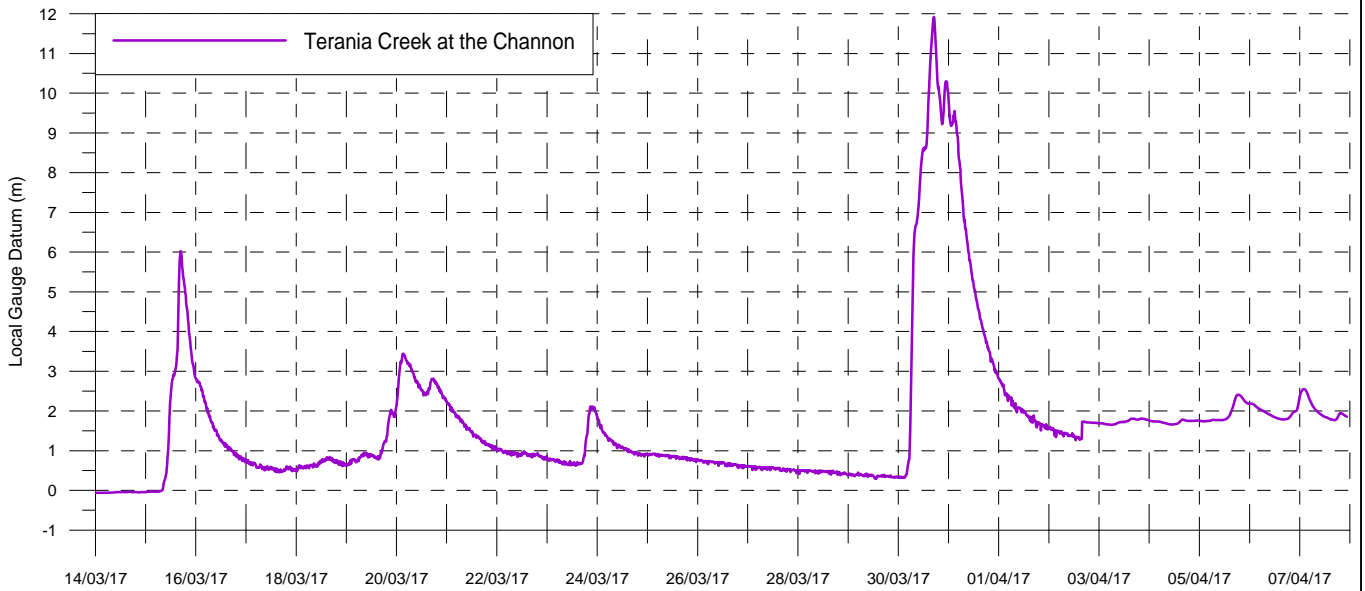
Date	Casino (mm)	Yorklea (mm)	Tuckurimba (mm)	Busbys Flat	Rappville (mm)	Evans Head (mm)	Whiporie* (mm)
	BoM	BoM	Lismore CC	BoM	BoM	BoM	BoM
15/03/2017	69.0	68.6	60.0	30.2	75.6	60.6	-
16/03/2017	1.6	2.0	86.0	0.2	1.0	81.4	-
17/03/2017	7.6	16.2	0.0	5.4	11.2	0.2	-
18/03/2017	18.4	43.6	20.0	90.6	164.0	86.6	-
19/03/2017	6.8	1.8	44.0	2.4	5.4	117.6	-
20/03/2017	46.4	0.2	136.0	58.8	38.2	7.8	-
21/03/2017	4.4	0.0	10.0	8.4	5.0	0.6	-
22/03/2017	0.0	0.0	0.0	2.0	0.0	0.0	-
23/03/2017	9.6	8.2	0.0	5.6	26.4	0.0	-
24/03/2017	1.0	5.8	0.0	4.8	0.2	1.6	-
25/03/2017	2.8	4.0	8.0	0.6	1.8	15.4	-
26/03/2017	0.0	0.0	0.0	4.4	0.0	0.0	-
27/03/2017	0.0	0.2	0.0	2.4	0.2	0.0	-
28/03/2017	0.0	0.0	0.0	0.0	0.0	0.0	-
29/03/2017	0.0	0.0	0.0	0.0	0.0	0.0	-
30/03/2017	173.0	160.2	0.0	93.8	133.0	39.0	126.6
31/03/2017	65.2	56.2	193.0	15.8	34.8	286.2	16.8
01/04/2017	0.0	0.0	0.0	0.0	0.2	0.0	0.0
02/04/2017	0.8	0.0	0.0	0.0	0.0	0.0	0.0
03/04/2017	0.0	0.0	2.0	0.6	0.0	5.8	1.8
04/04/2017	1.2	0.6	6.0	0.6	1.4	23.0	1.0
05/04/2017	15.8	5.2	16.0	1.6	1.6	22.6	4.8
06/04/2017	5.4	0.4	17.0	2.2	0.4	28.4	1.2
07/04/2017	0.2	0.2	7.0	4.0	2.2	1.6	6.6

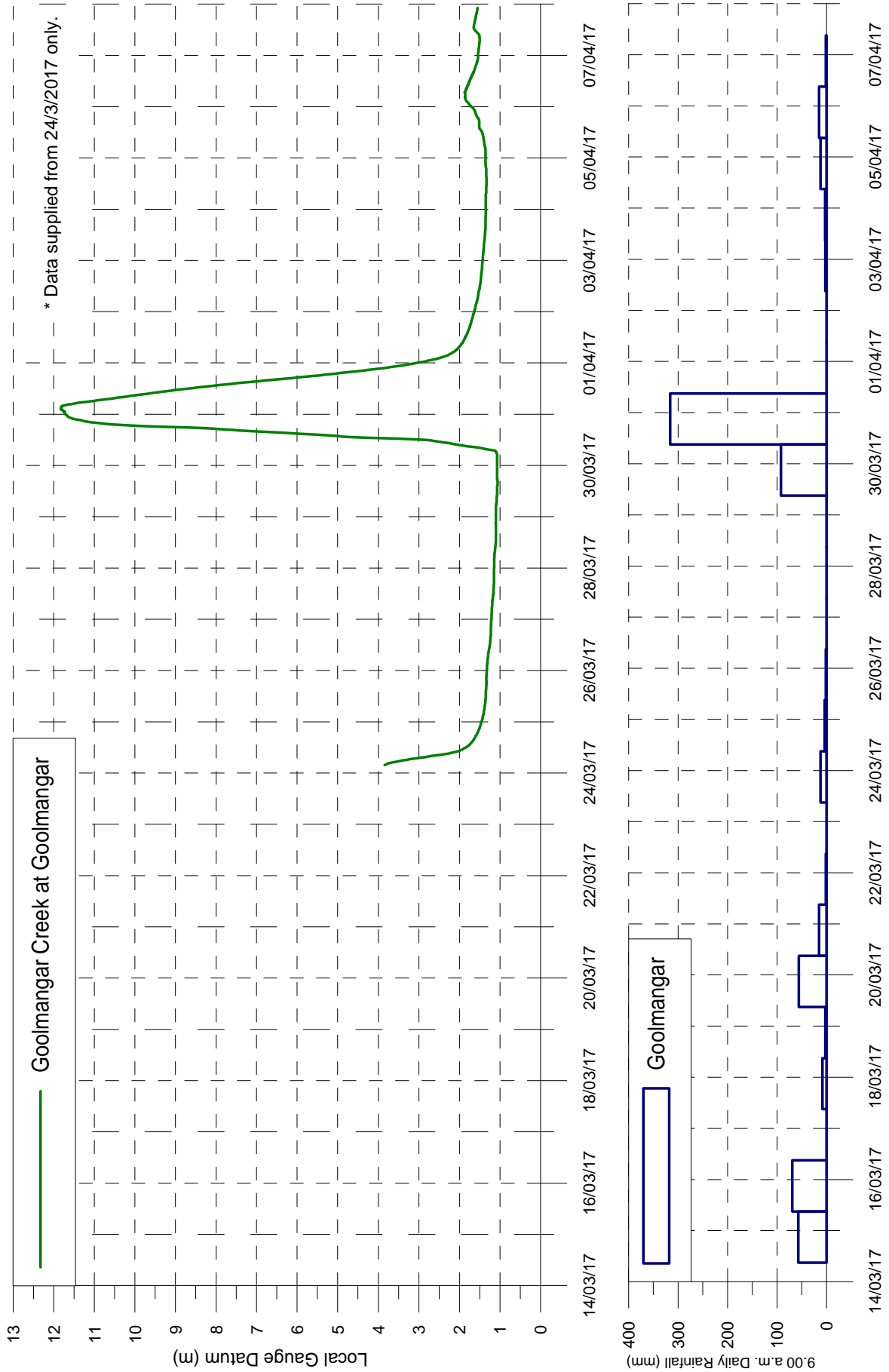
\*Whiporie rainfall data provided from 29 March 2017 only.

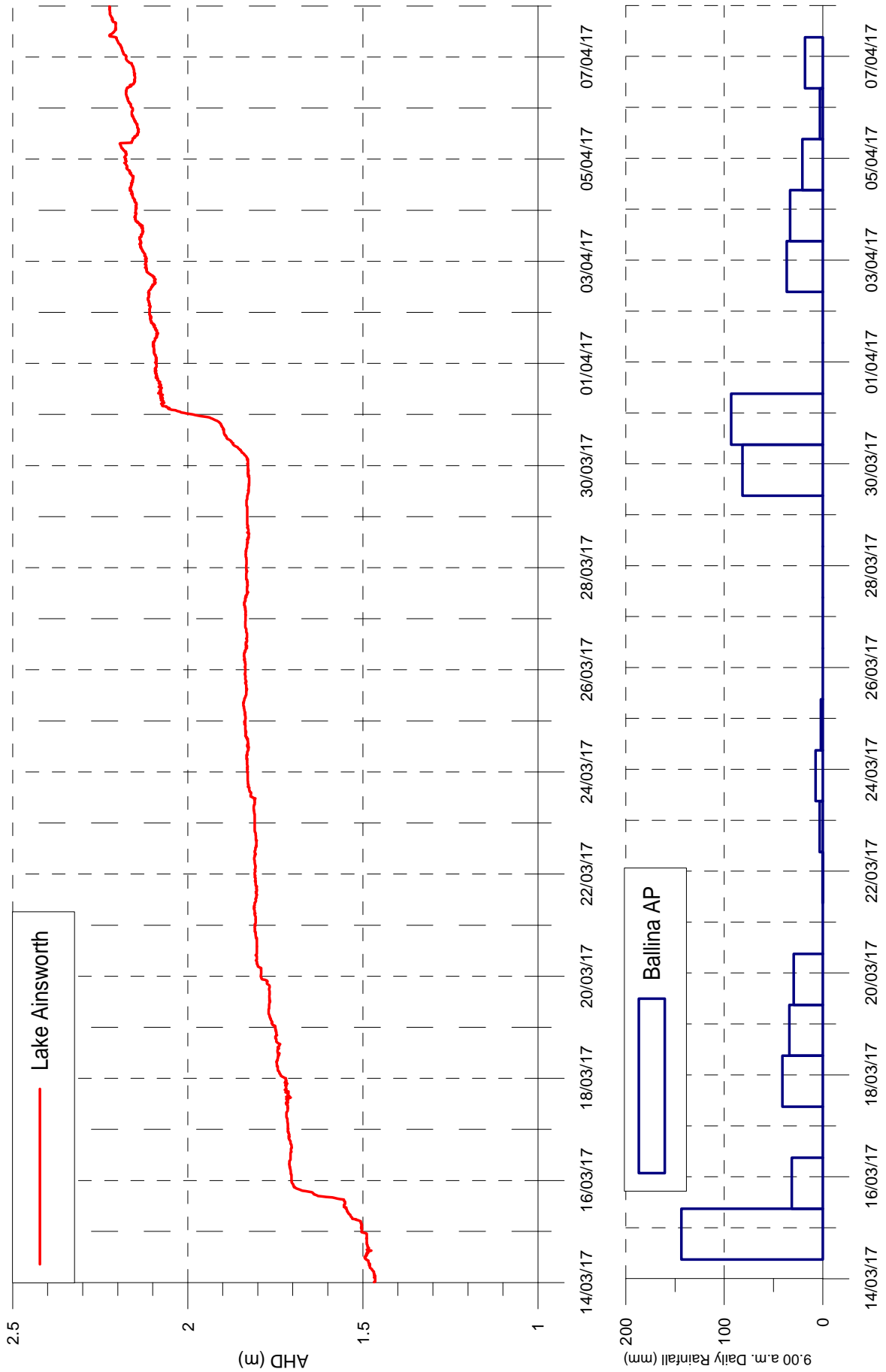




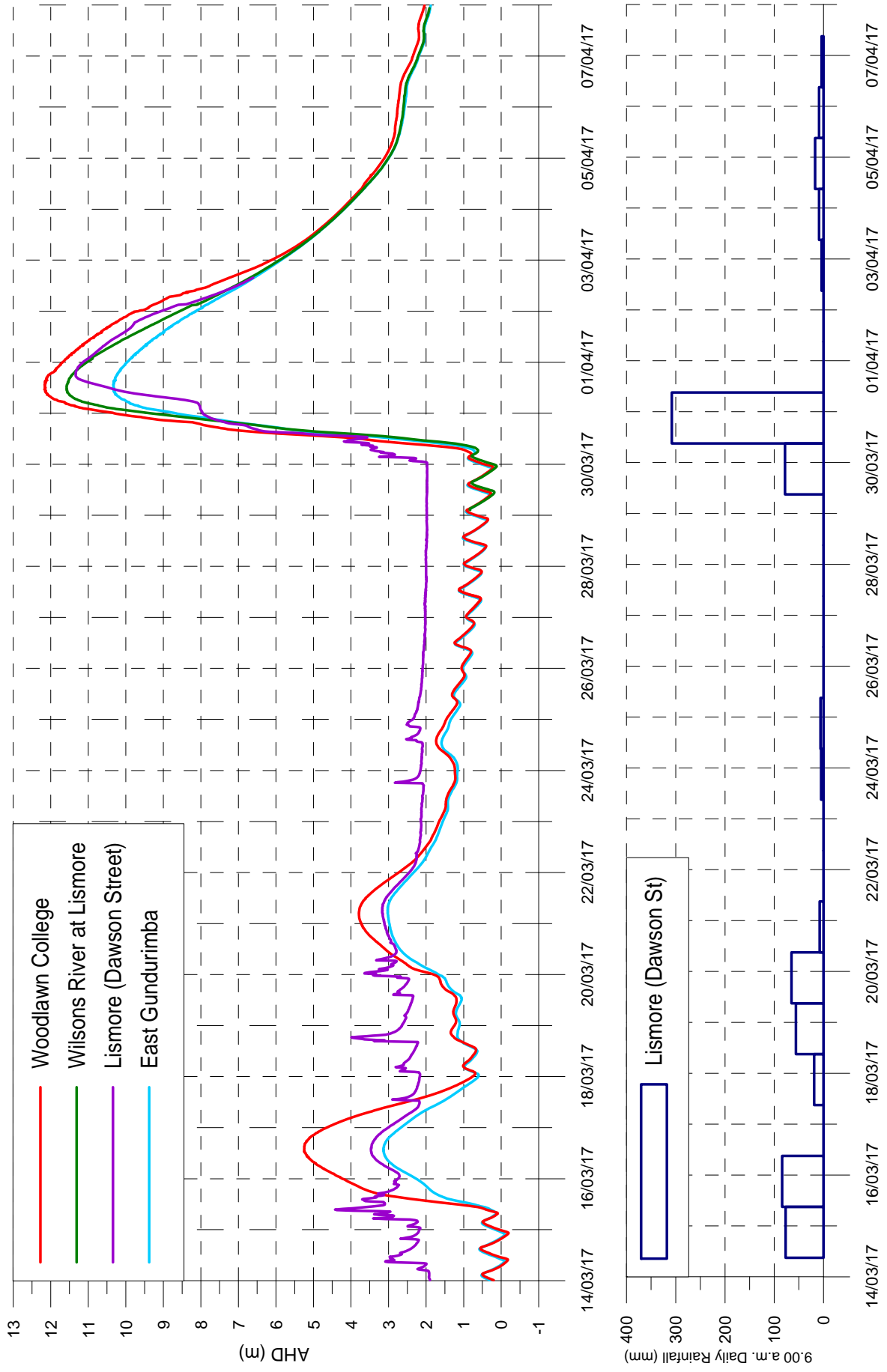


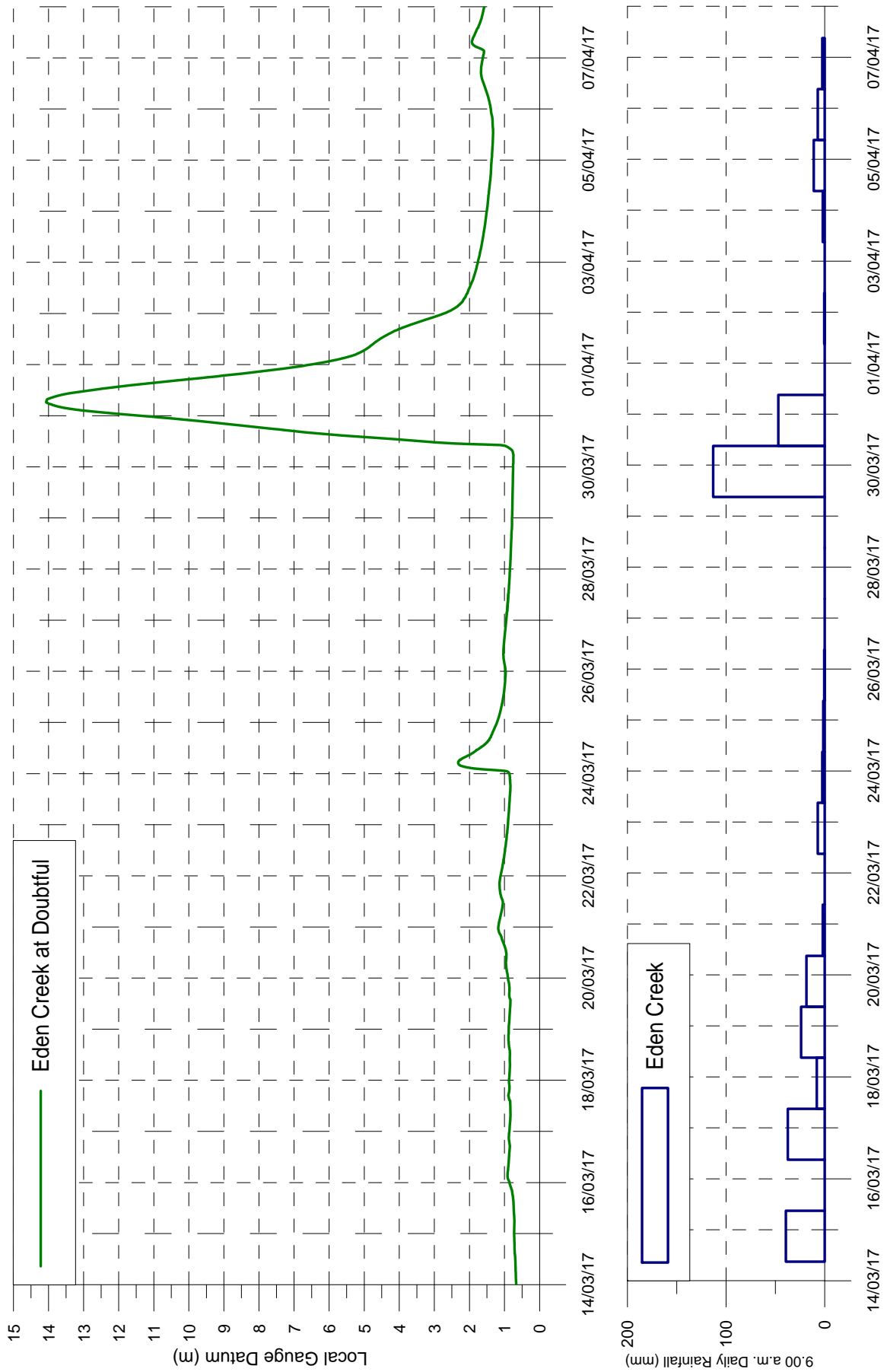


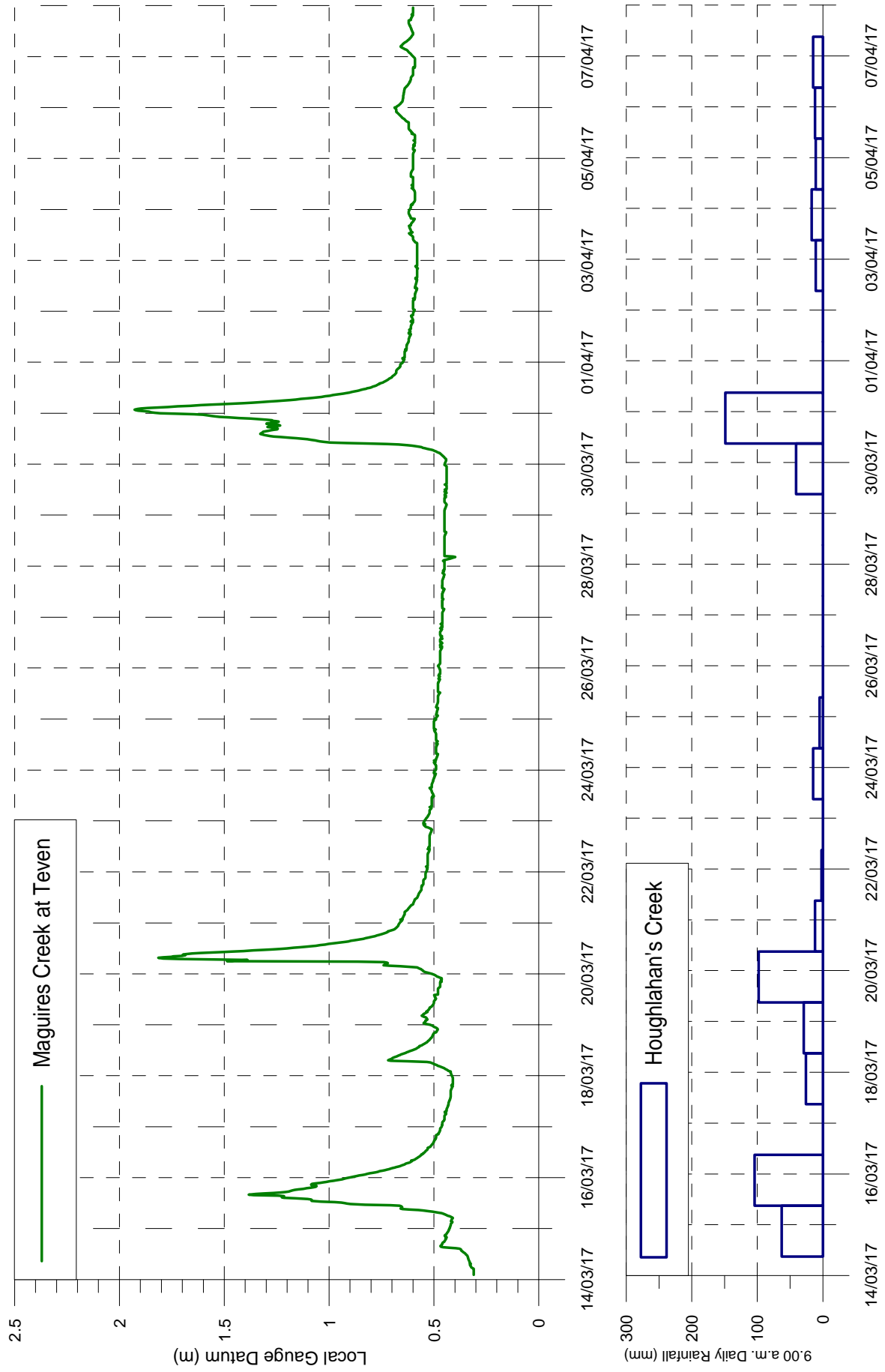


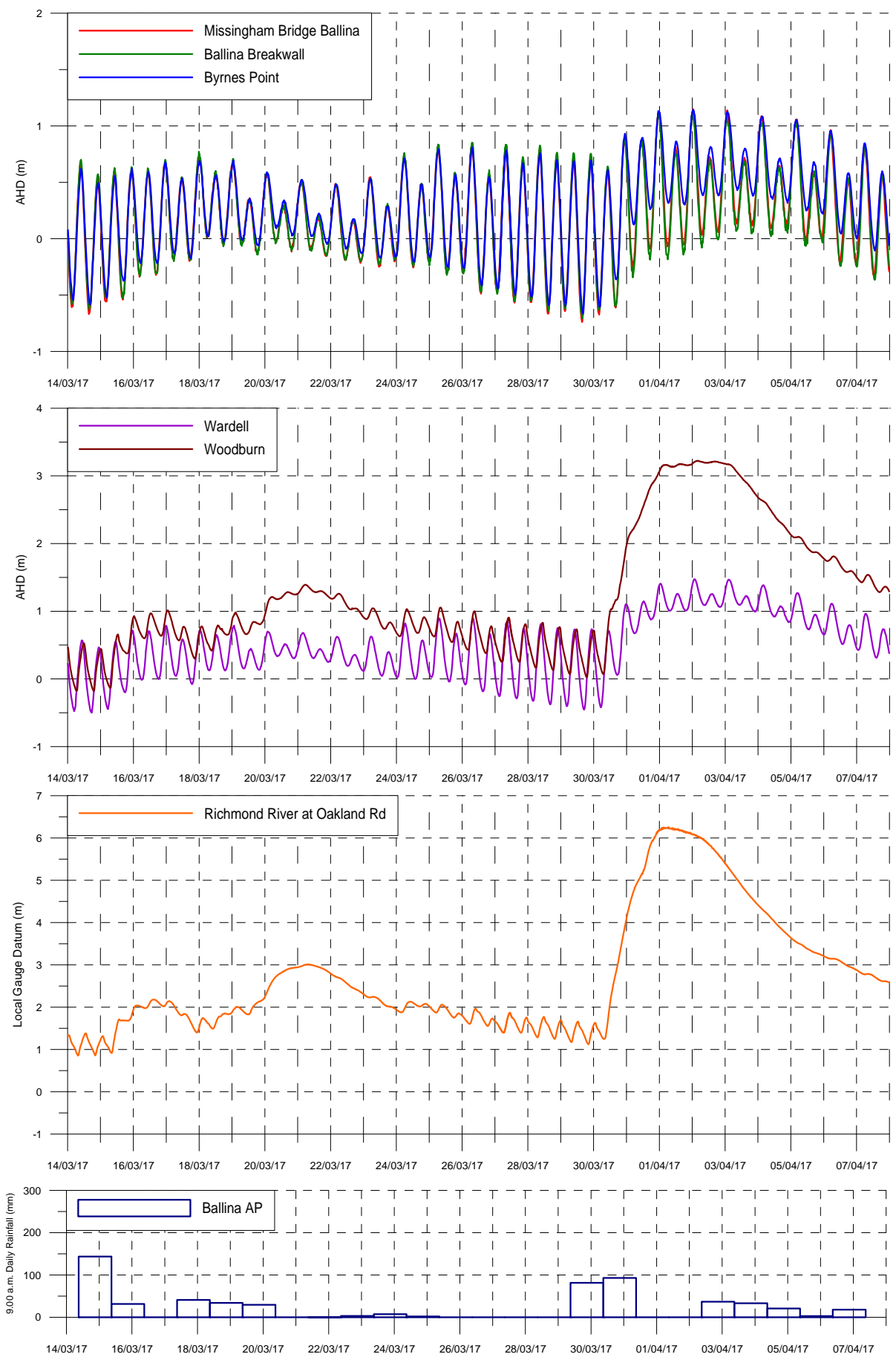


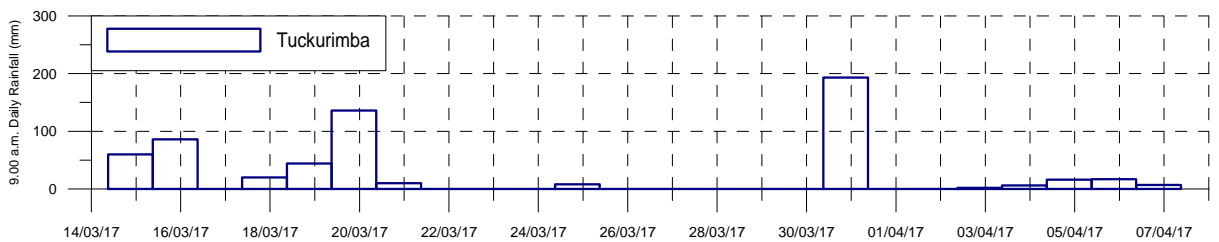
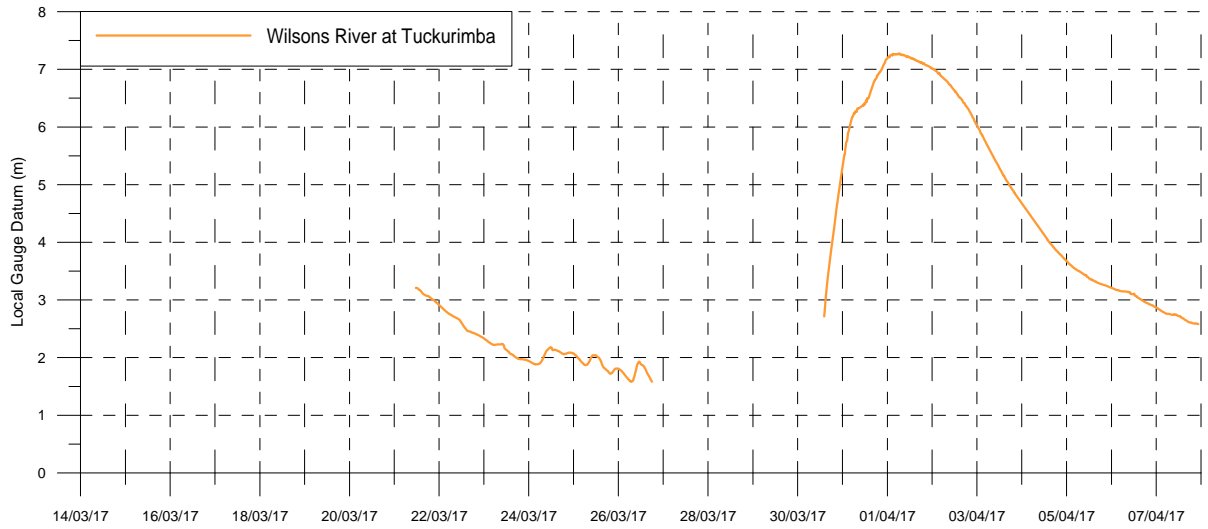
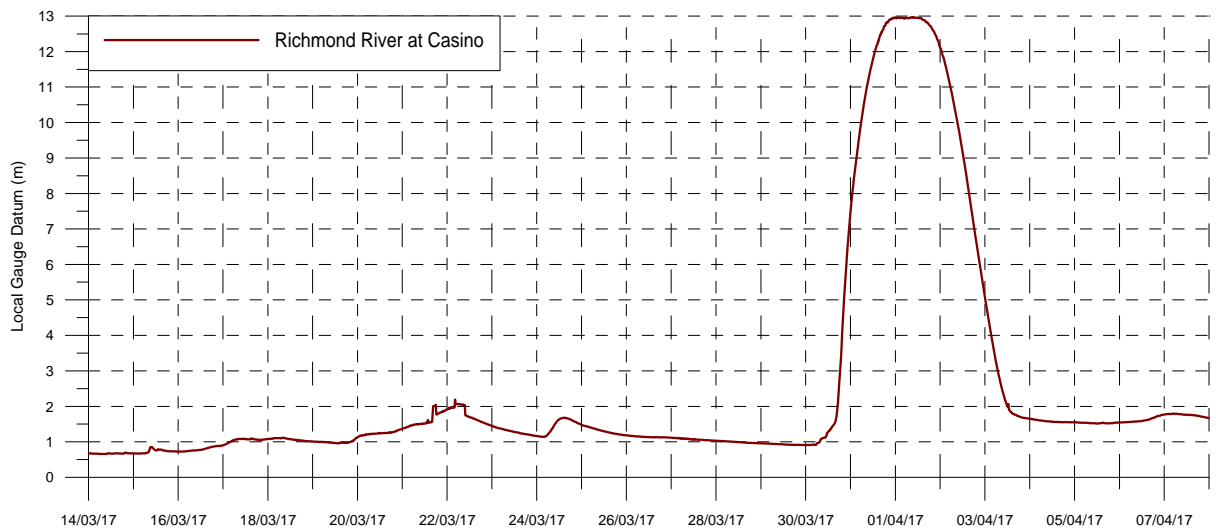
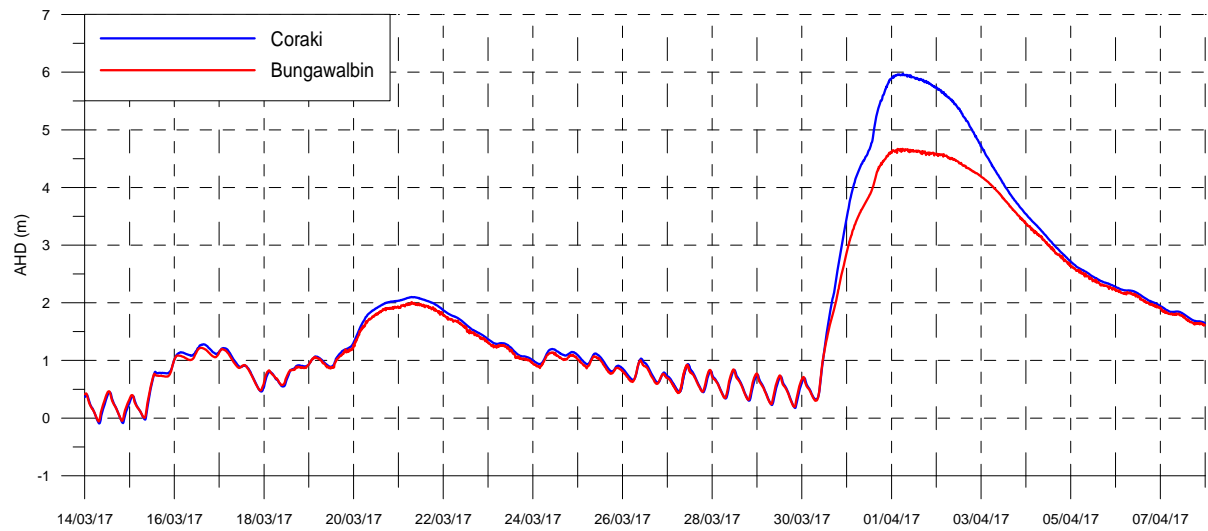
\*Data provided for Wilson River at Lismore from 29/3/17 only.

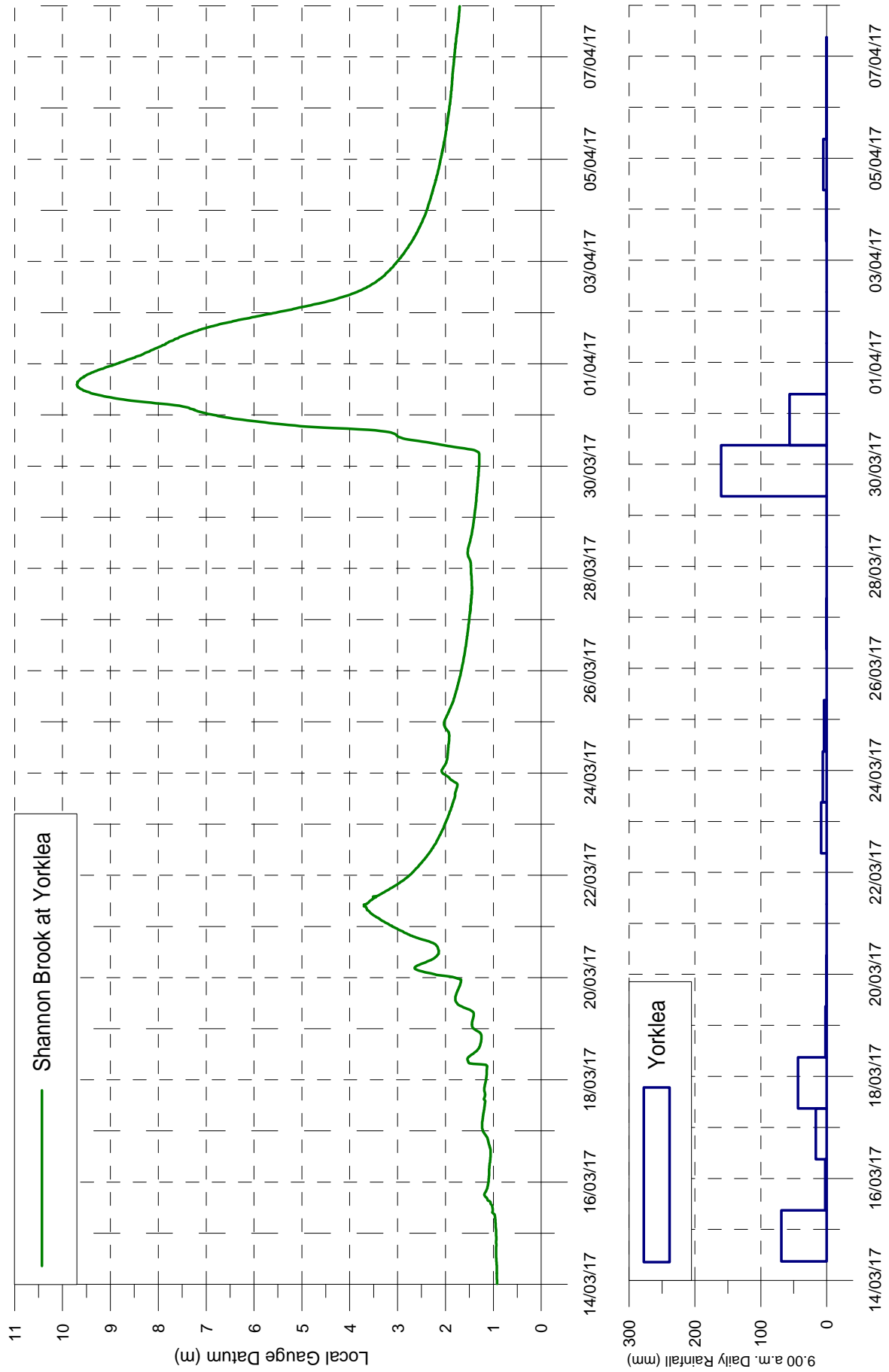


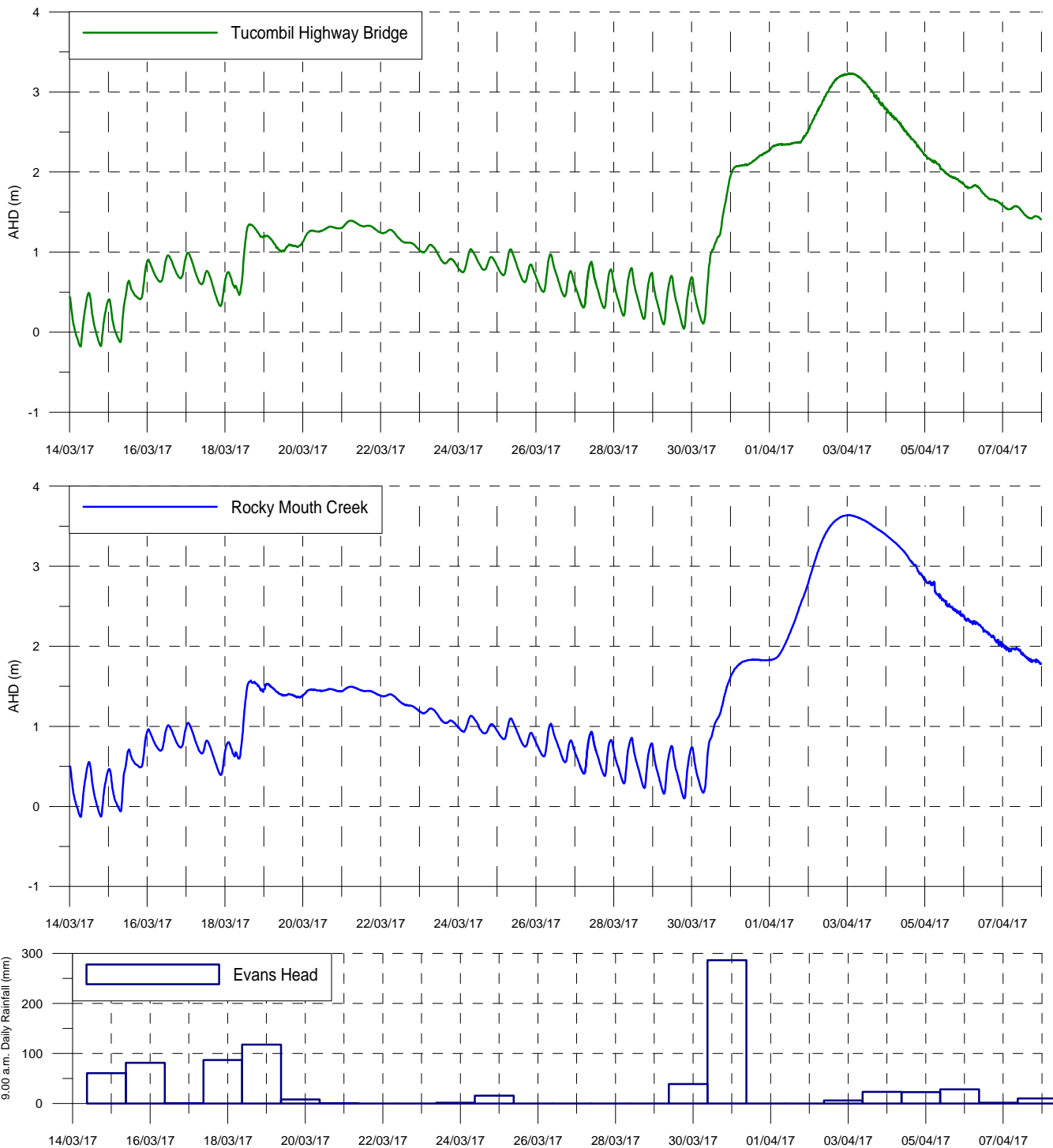


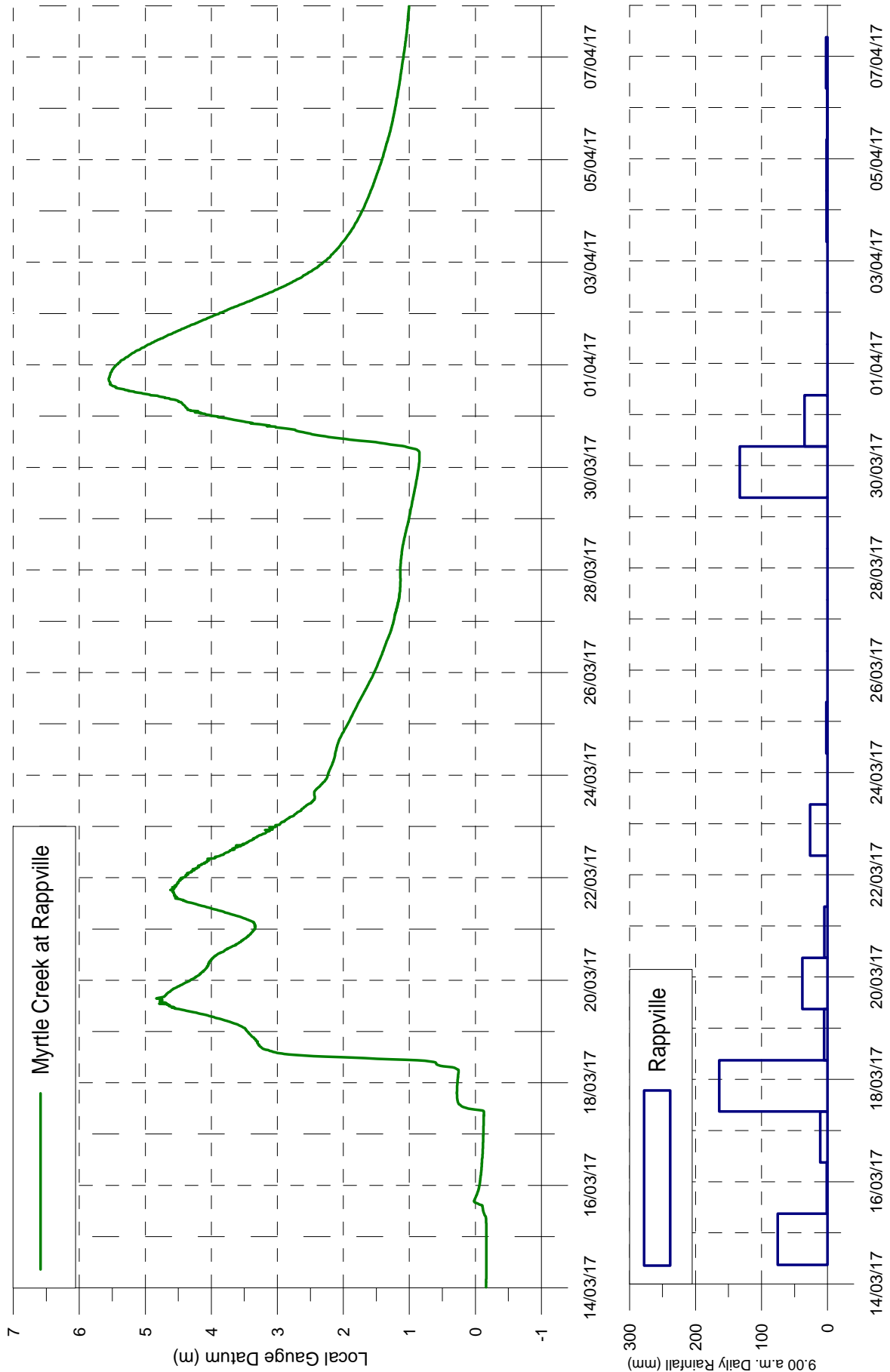


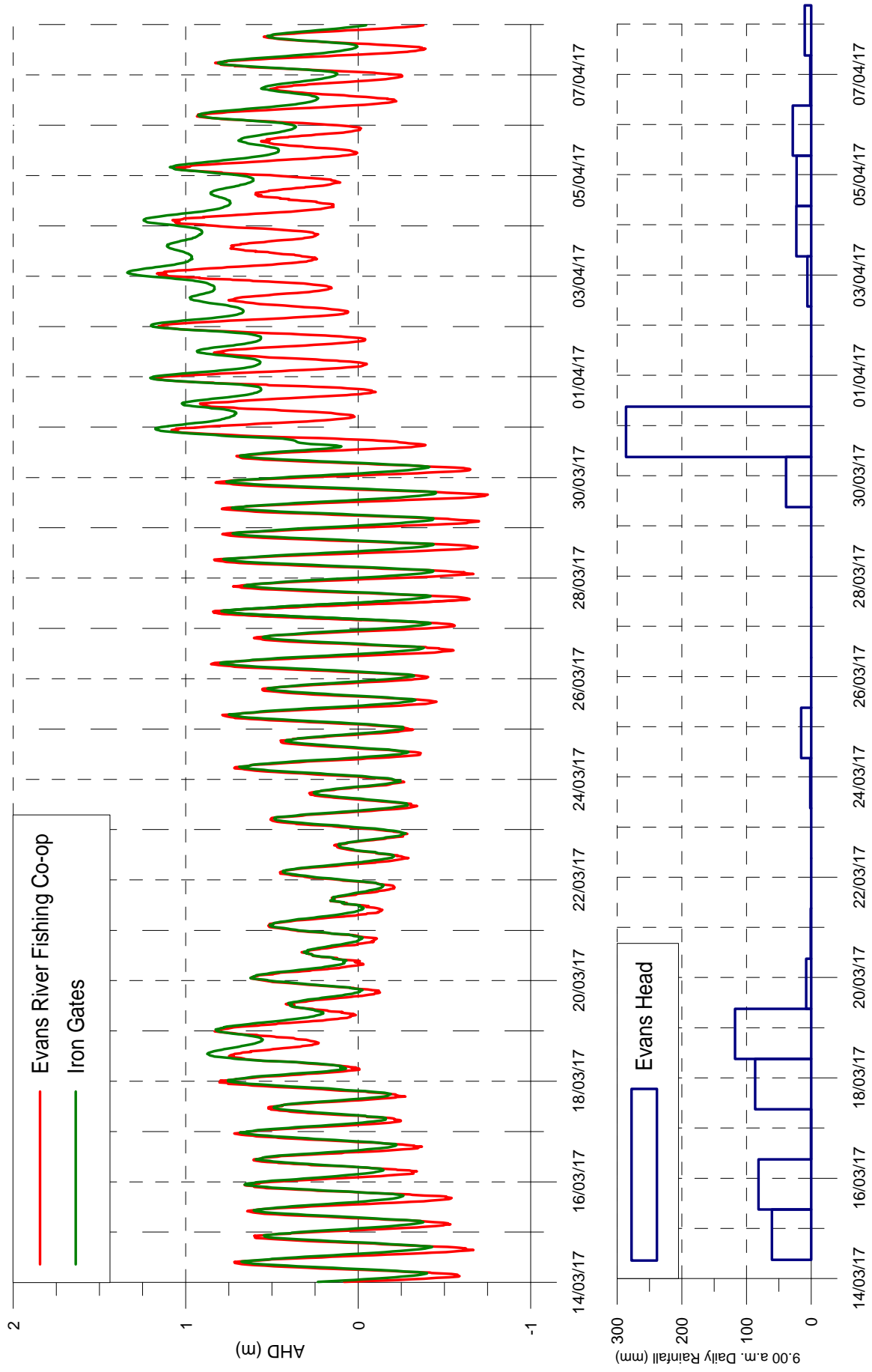


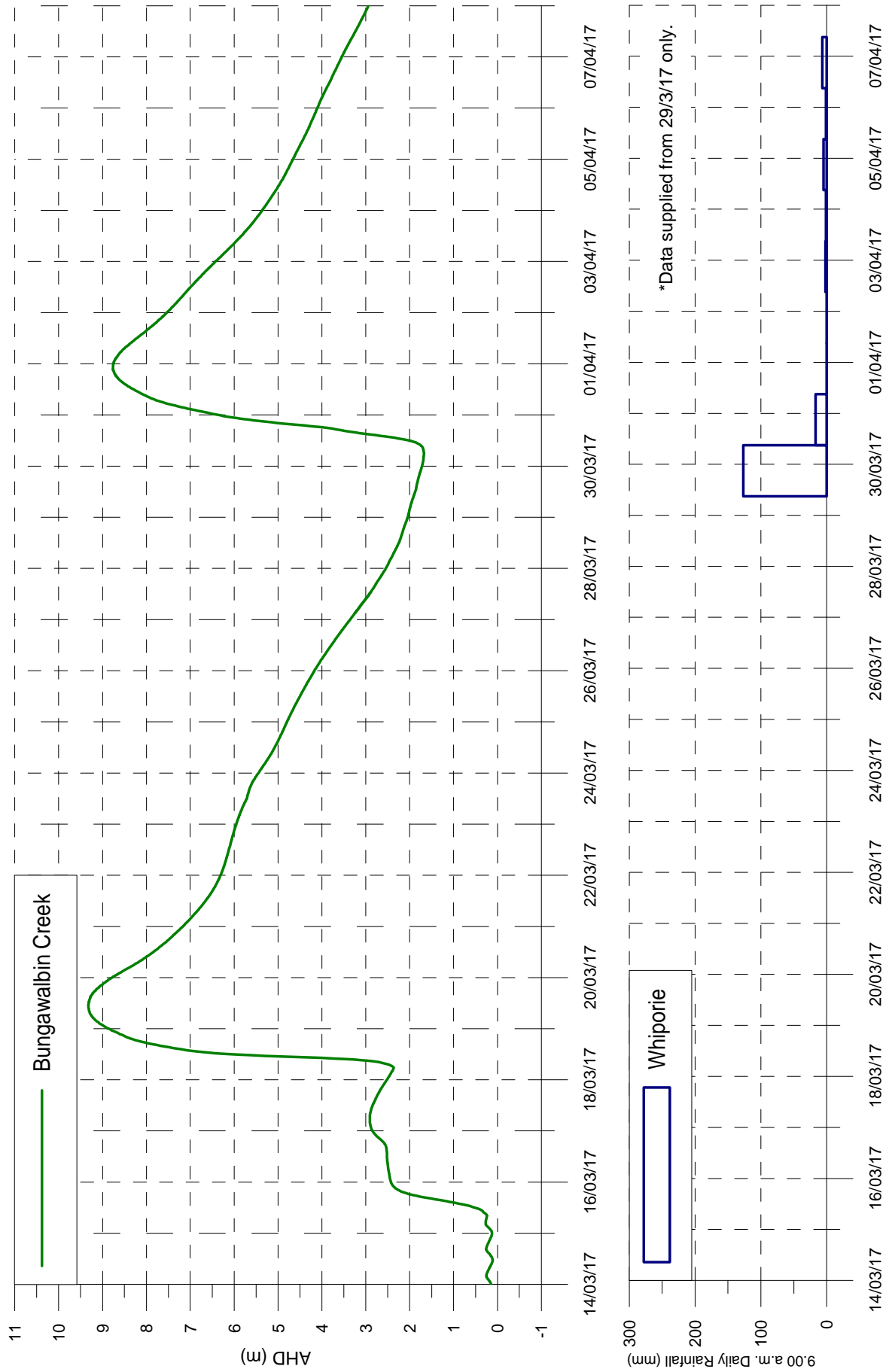




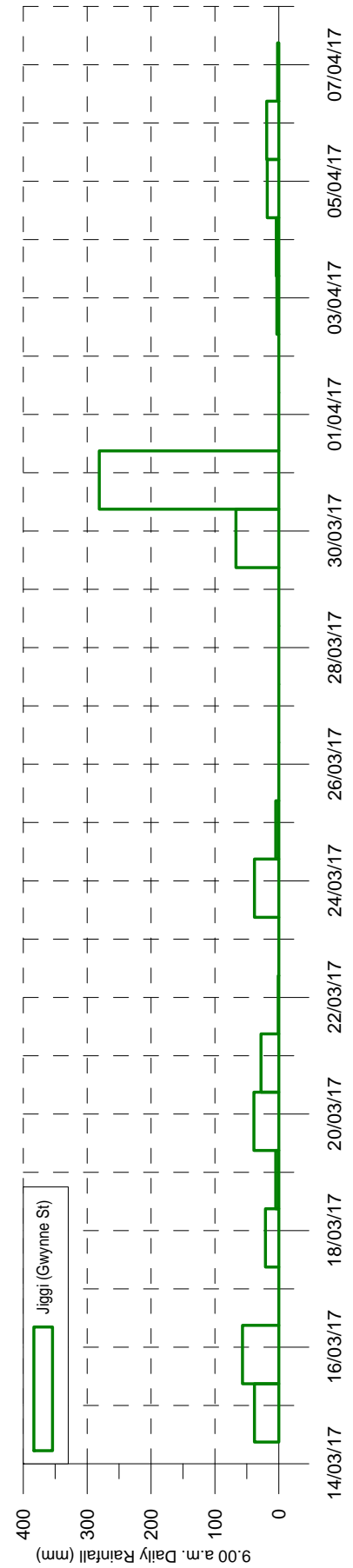
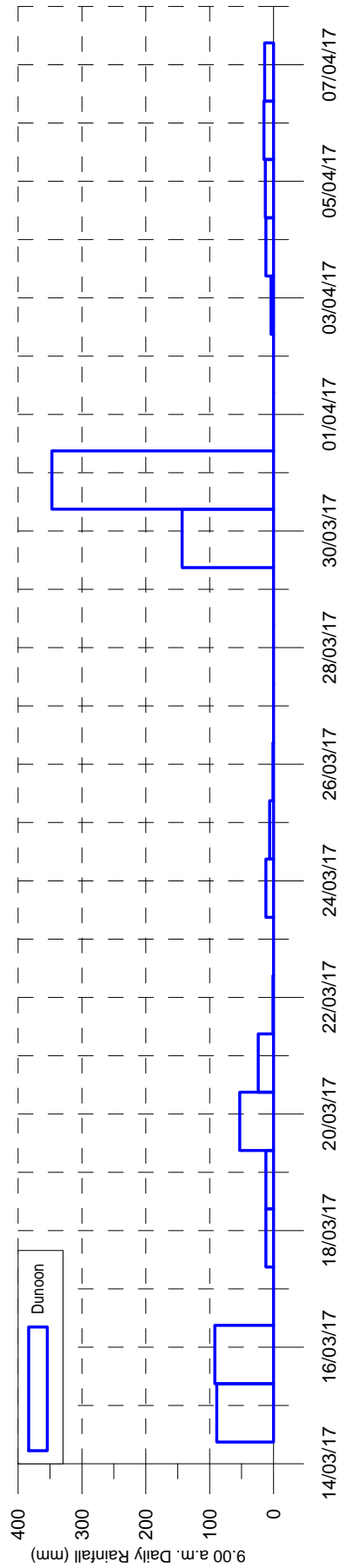
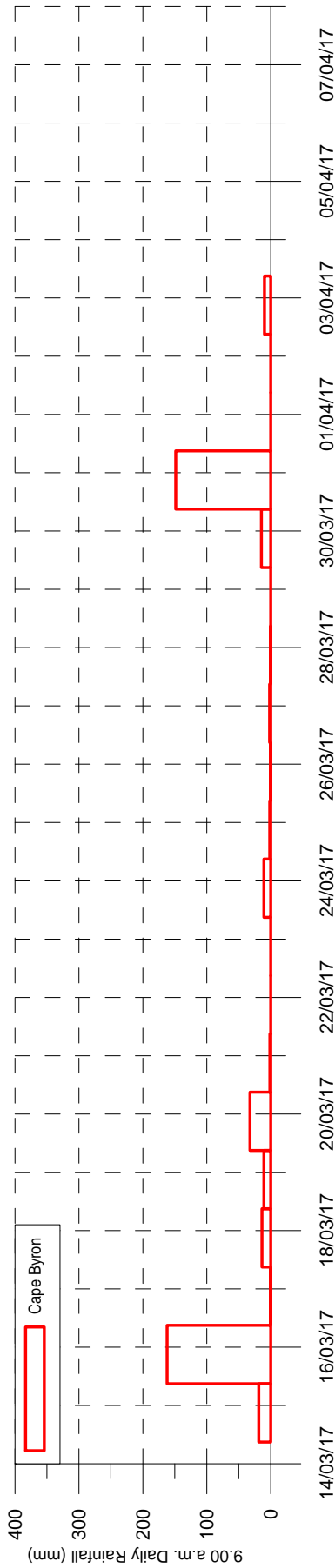


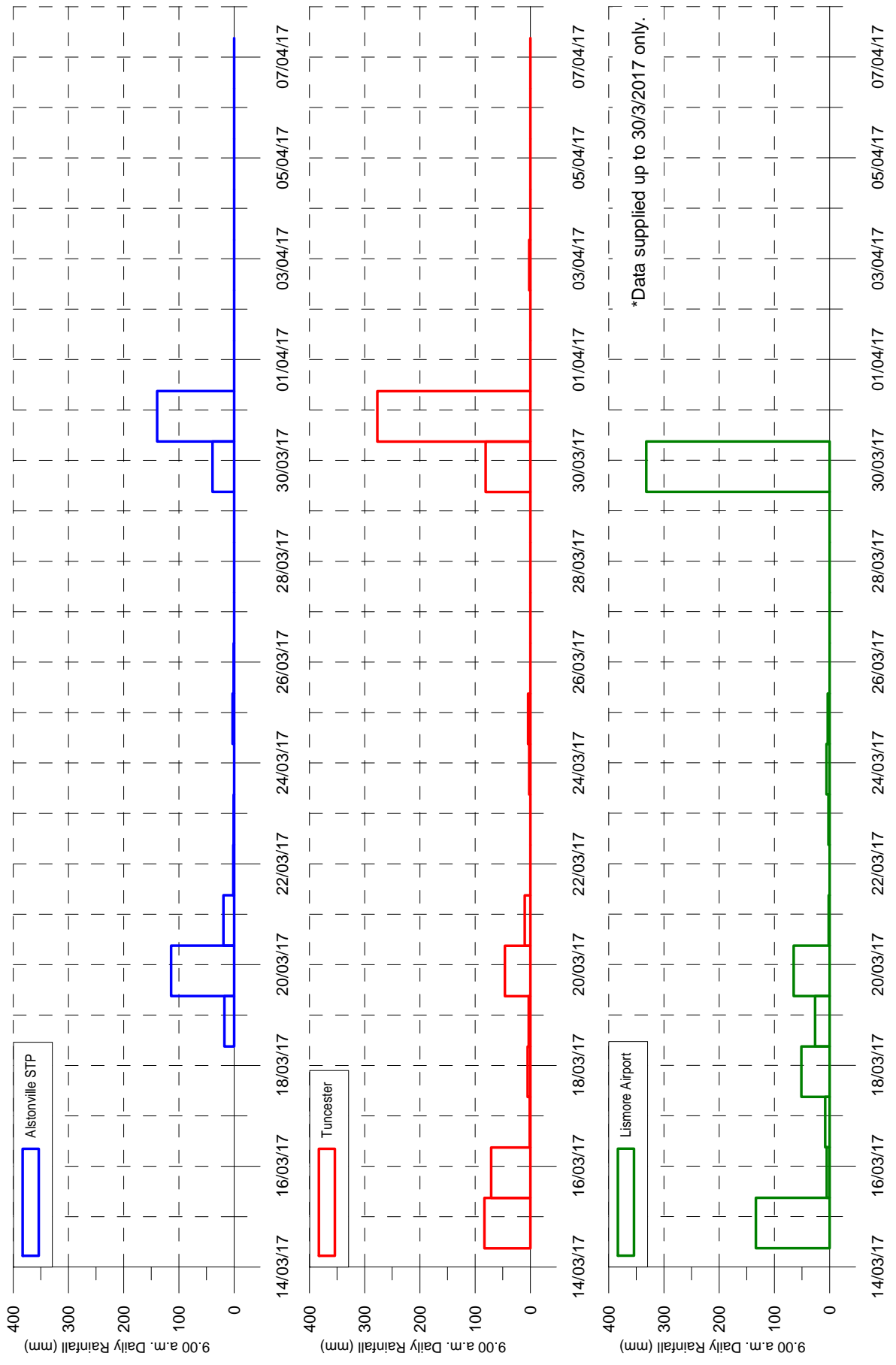


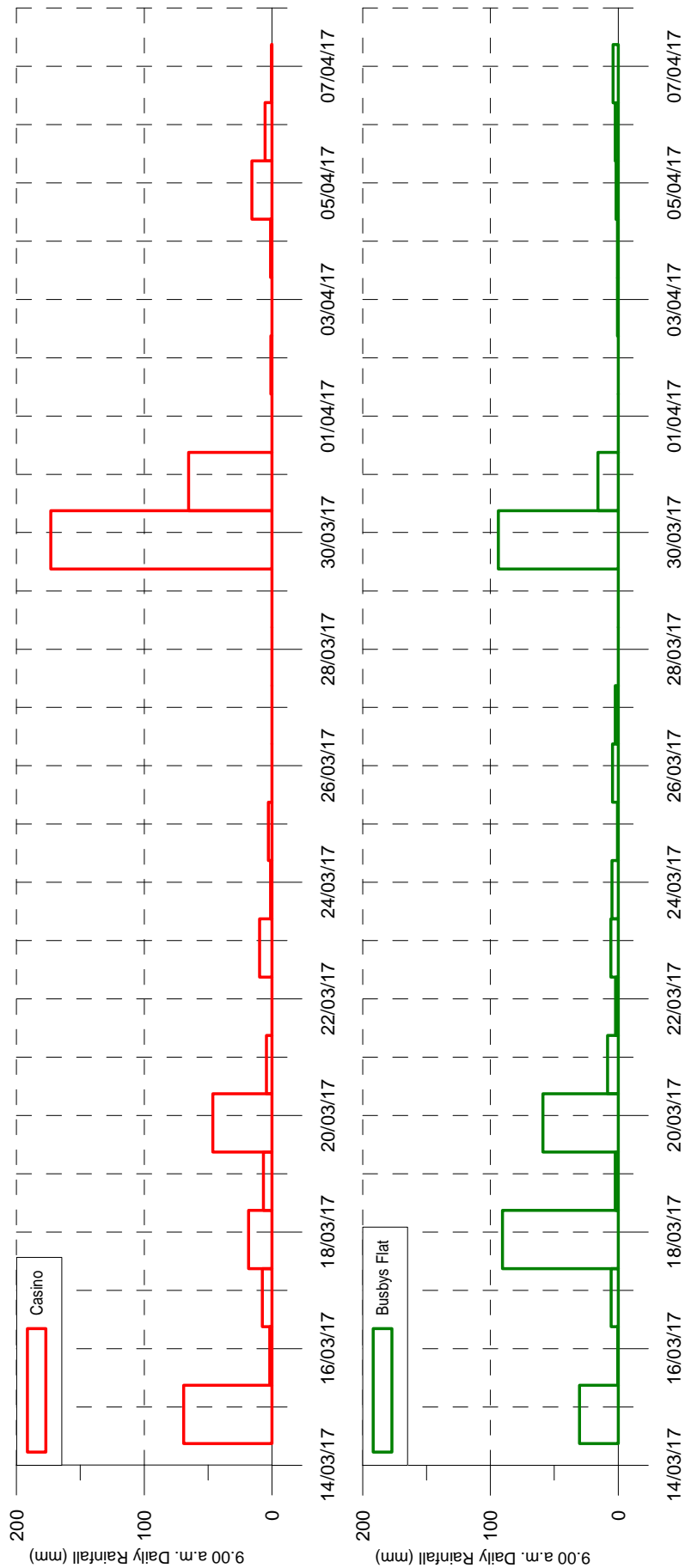


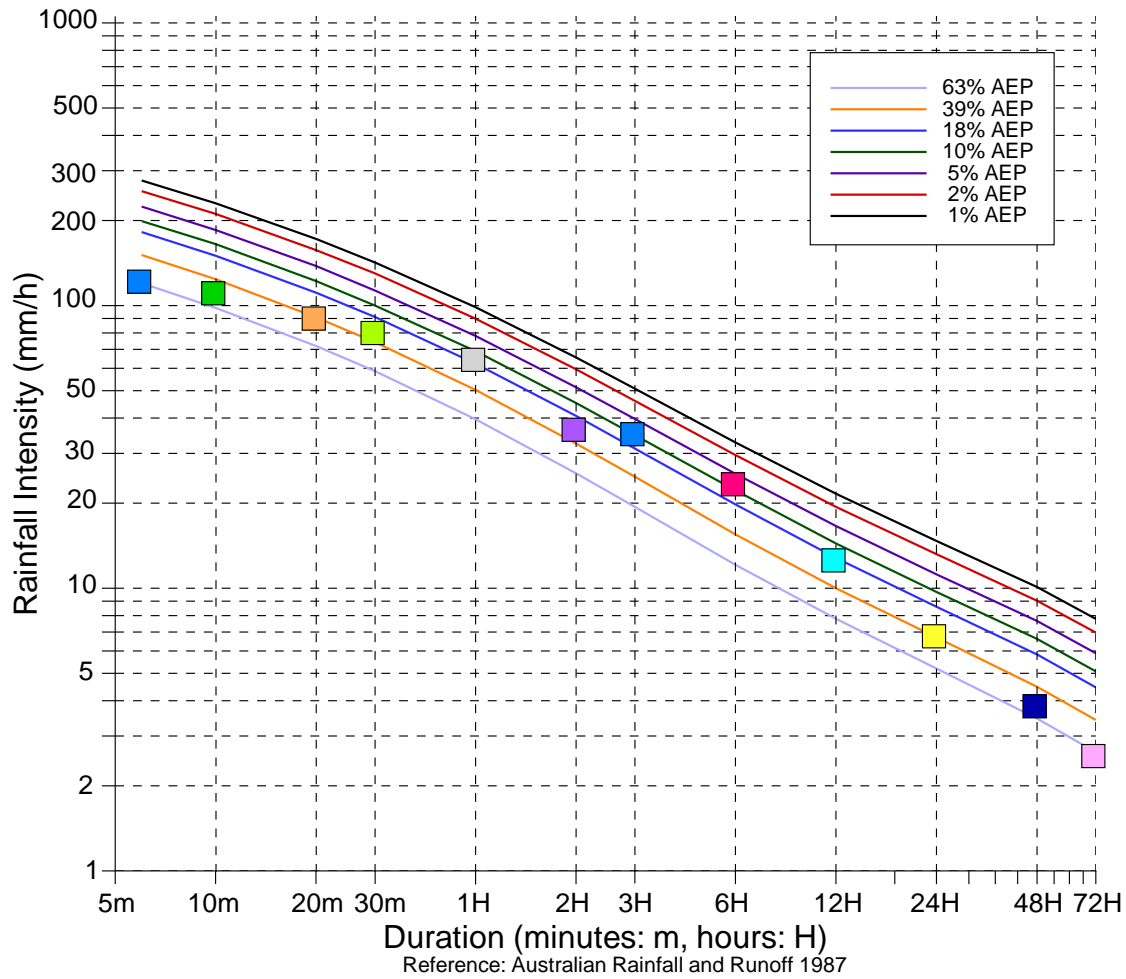


\*Data supplied from 29/3/17 only.



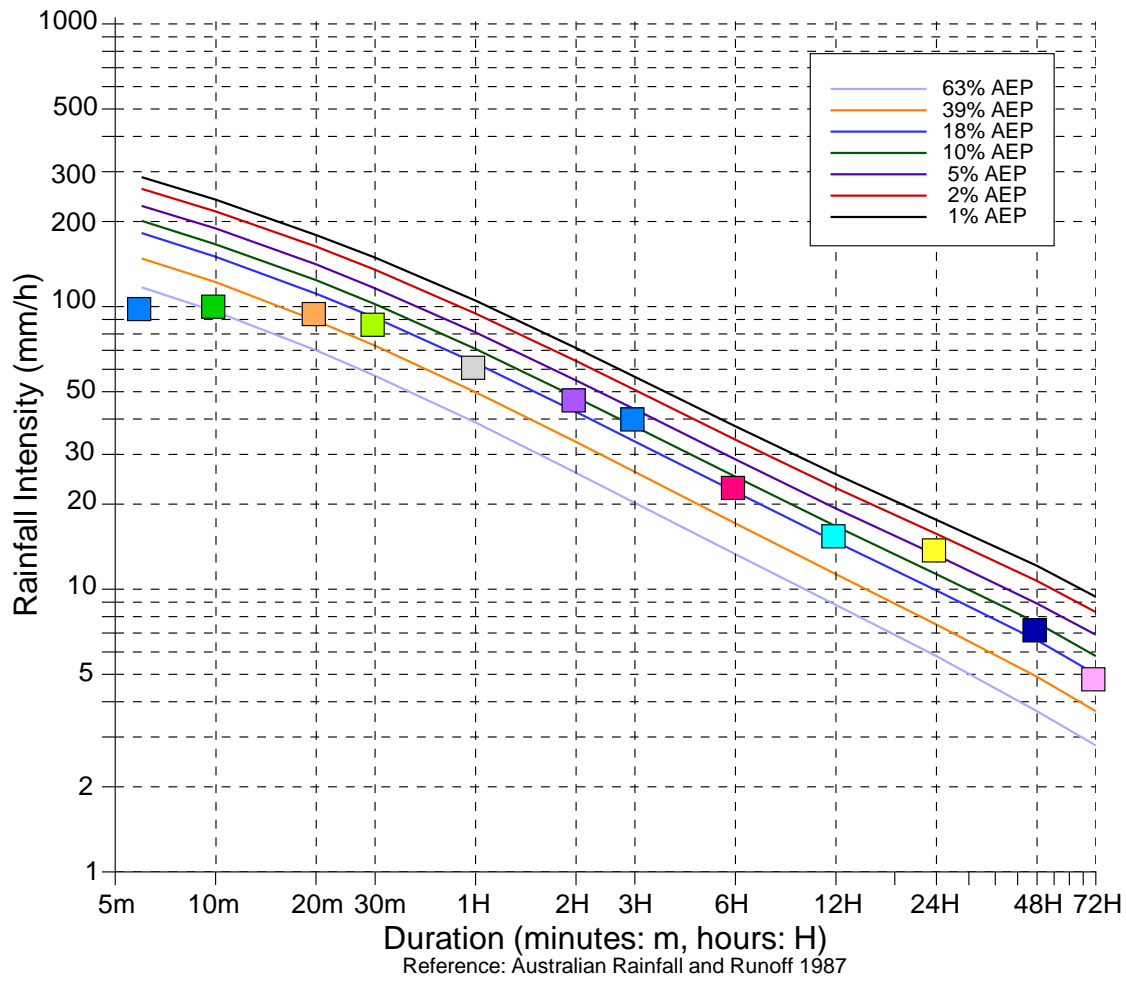






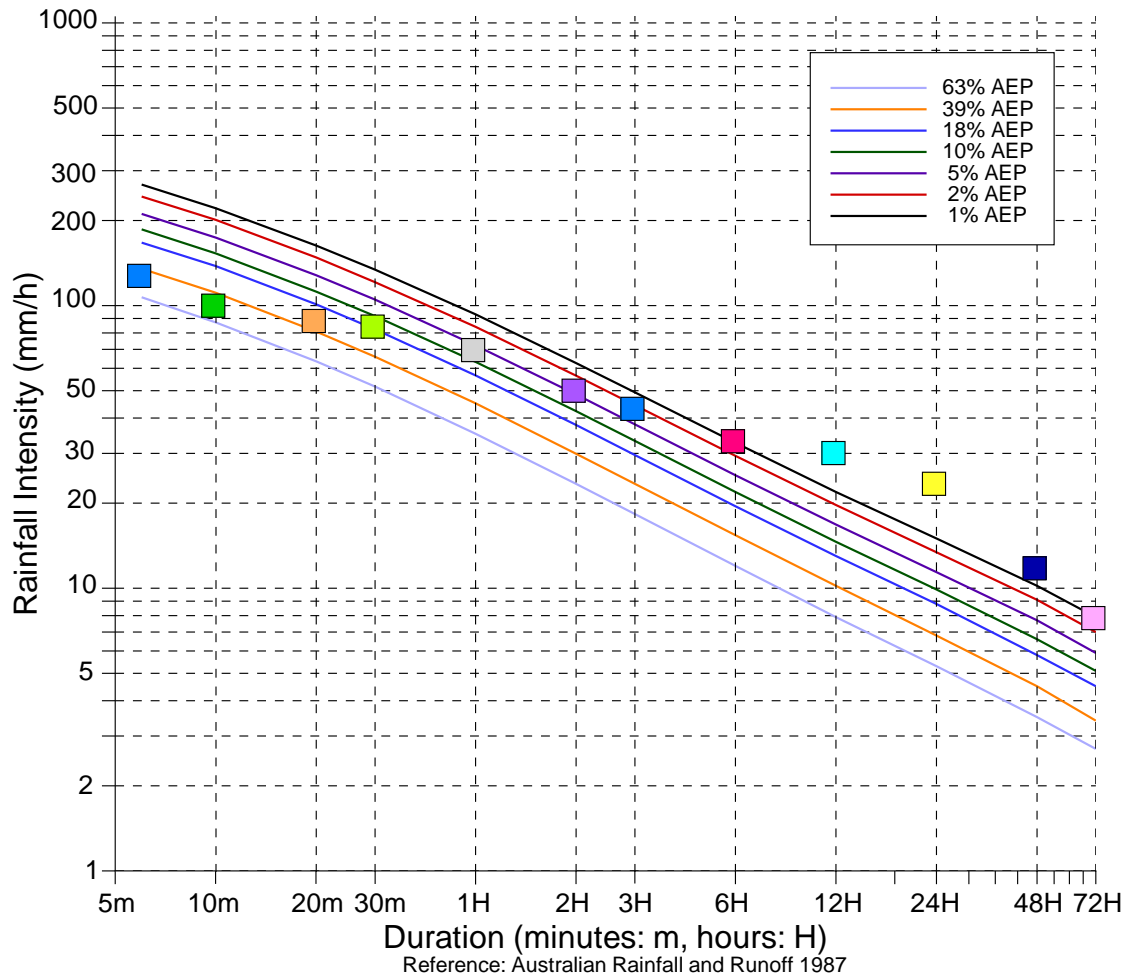
Duration (minutes: m) (Hours: H)	Rainfall Intensity (mm/h)	Time/Date
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10m	112.8	17:10_15/03/2017
20m	91.8	17:00_15/03/2017
30m	81.6	17:08_15/03/2017
1H	65.6	16:50_15/03/2017
2H	37.1	16:56_15/03/2017
3H	35.8	16:56_15/03/2017
6H	23.8	16:08_15/03/2017
12H	12.8	10:06_15/03/2017
24H	6.9	02:50_15/03/2017
48H	3.9	06:28_14/03/2017
72H	2.6	06:28_14/03/2017

Australian Rainfall and Runoff (Institute of Engineers Australia 1987), states:  
 "Use of the terms "recurrence interval" and "return period" has been criticised as leading to confusion in the minds of some decision makers and members of public. Although the terms are simple superficially, they are sometimes misinterpreted as implying that the associated magnitude is only exceeded at regular intervals, and that they are referring to the elapsed time to the next exceedance."  
 The use of the term ARI can lead to confusion. It is preferable, therefore, to express the rarity of a rainfall event in terms of AEP.  
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 Adapted from: <http://www.bom.gov.au/water/designRainfalls/ifd-arr87/glossary.shtml>



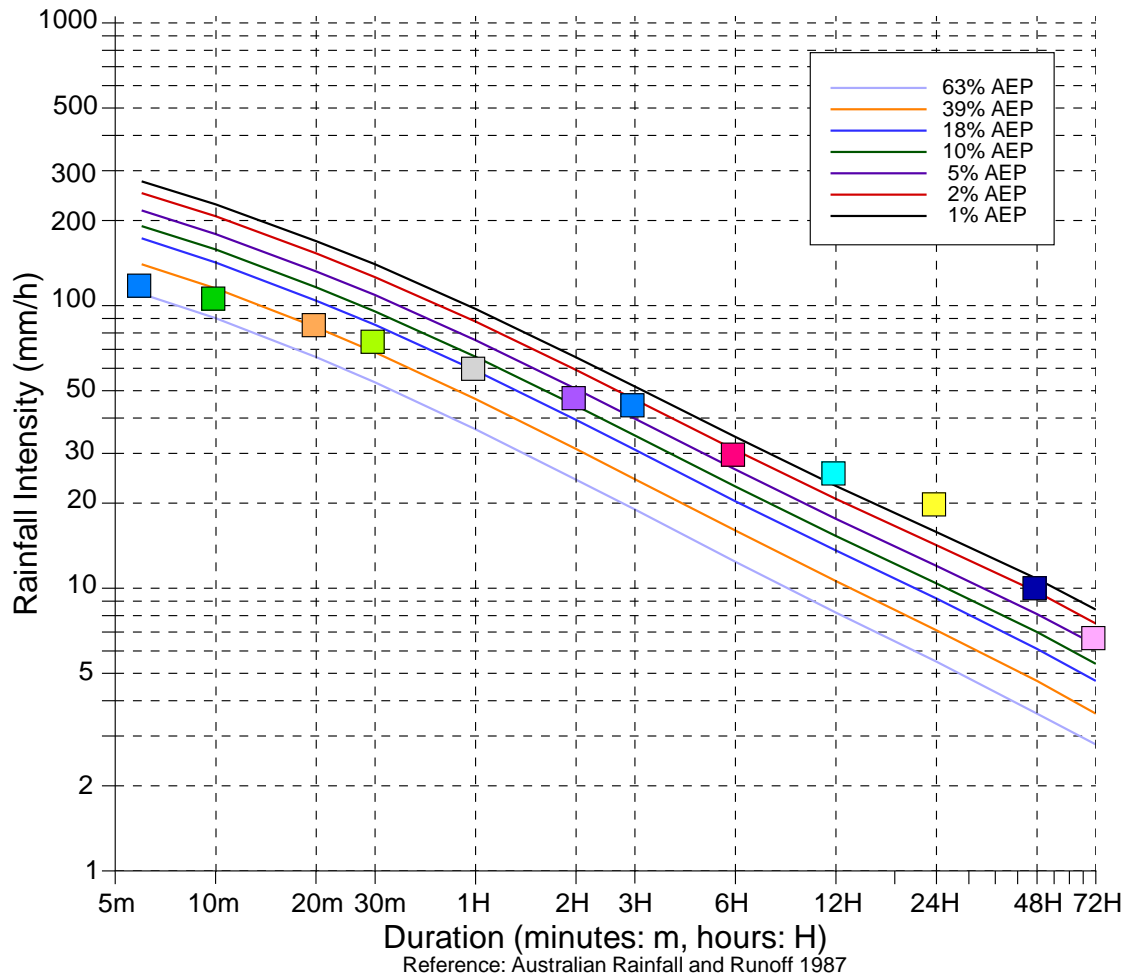
Duration (minutes: m) (Hours: H)	Rainfall Intensity (mm/h)	Time/Date
6m	100.0	08:38_15/03/2017
10m	102.0	08:30_15/03/2017
20m	96.0	08:30_15/03/2017
30m	88.0	08:26_15/03/2017
1H	62.0	08:14_15/03/2017
2H	47.5	07:20_15/03/2017
3H	40.7	07:16_15/03/2017
6H	23.3	07:32_15/03/2017
12H	15.7	06:36_15/03/2017
24H	14.0	03:12_30/03/2017
48H	7.3	20:44_29/03/2017
72H	4.9	20:44_29/03/2017

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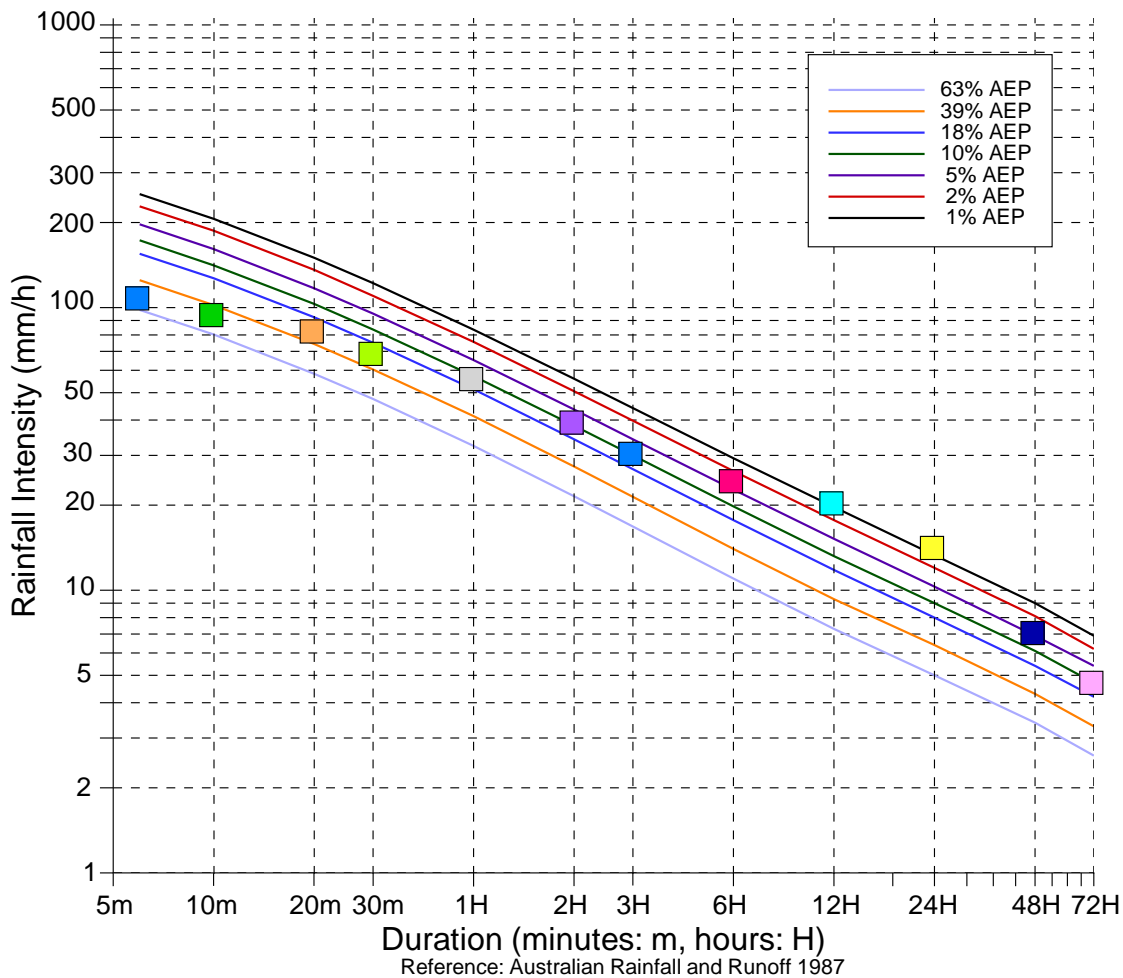
Duration (minutes: m) (Hours: H)	Rainfall Intensity (mm/h)	Time/Date
6m	130.0	03:30_30/03/2017
10m	102.0	09:54_30/03/2017
20m	90.0	09:46_30/03/2017
30m	86.0	09:48_30/03/2017
1H	71.0	09:36_30/03/2017
2H	51.0	09:00_30/03/2017
3H	44.0	01:30_30/03/2017
6H	33.8	01:30_30/03/2017
12H	30.7	22:58_29/03/2017
24H	23.9	15:40_29/03/2017
48H	12.0	15:40_29/03/2017
72H	8.0	15:40_29/03/2017

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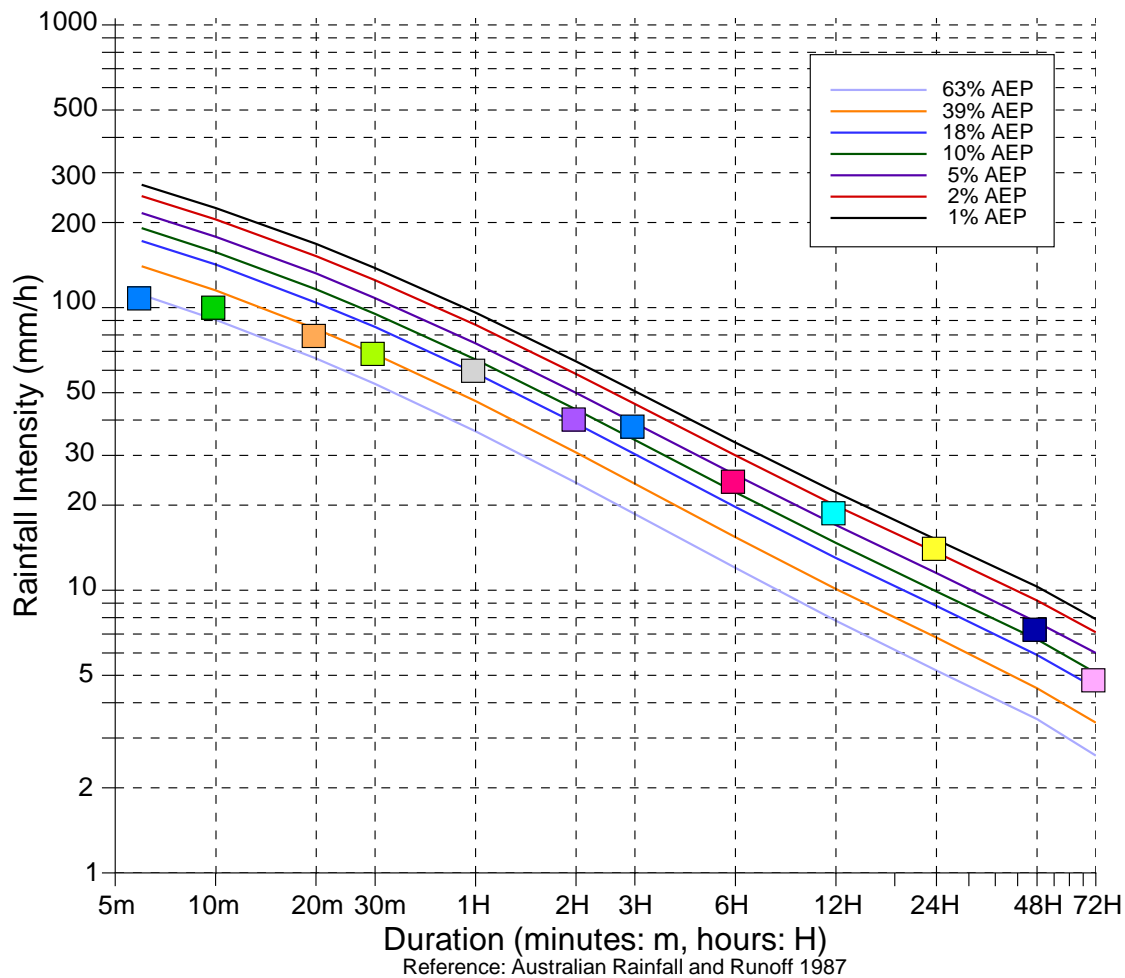
Duration (minutes: m) (Hours: H)	Rainfall Intensity (mm/h)	Time/Date
6m	120.0	15:34_30/03/2017
10m	108.0	15:34_30/03/2017
20m	87.0	15:24_30/03/2017
30m	76.0	07:48_15/03/2017
1H	61.0	14:42_30/03/2017
2H	48.0	13:52_30/03/2017
3H	45.3	12:52_30/03/2017
6H	30.3	09:52_30/03/2017
12H	26.0	04:16_30/03/2017
24H	20.2	02:44_30/03/2017
48H	10.2	20:28_29/03/2017
72H	6.8	20:28_29/03/2017

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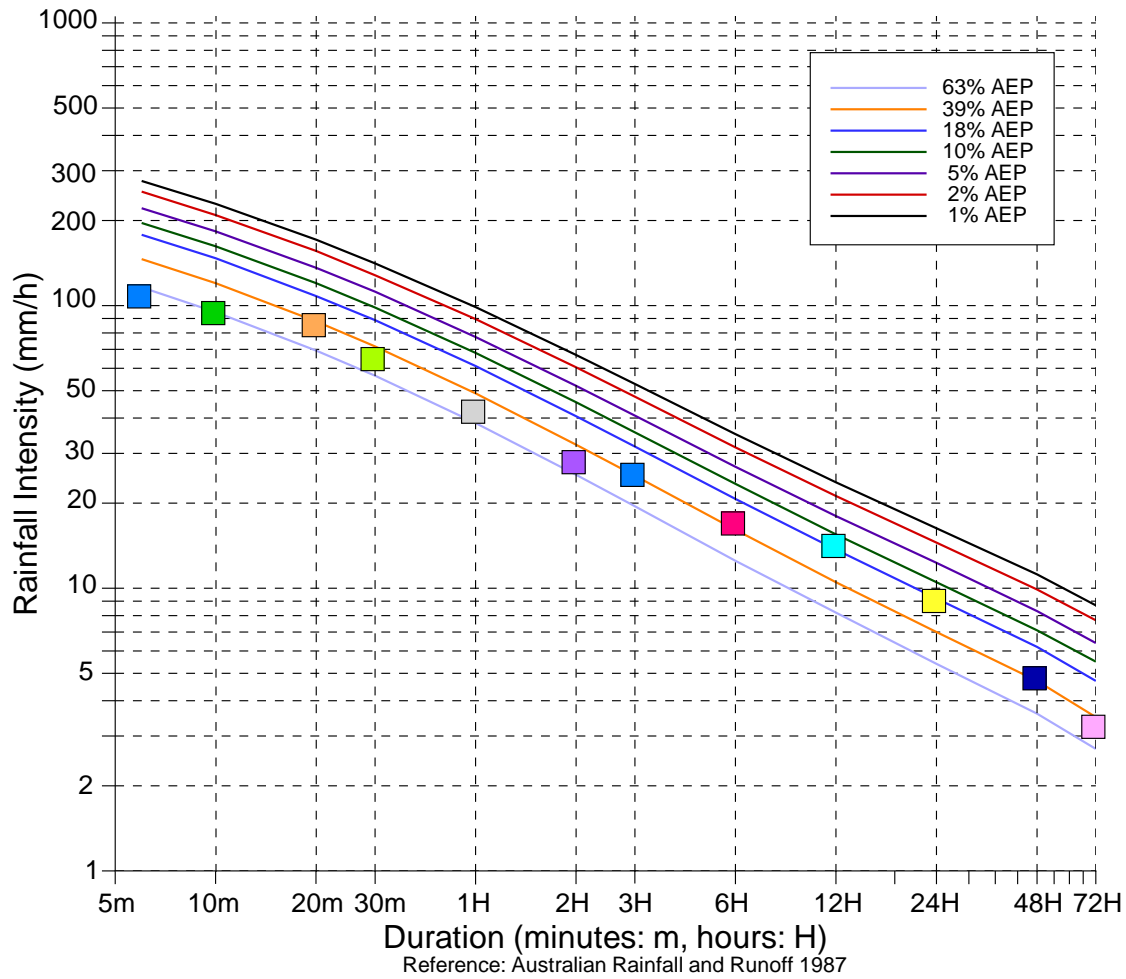
	Duration (minutes: m) (Hours: H)	Rainfall Intensity (mm/h)	Time/Date
■	6m	110.0	17:36_30/03/2017
■	10m	96.0	17:38_30/03/2017
■	20m	84.0	17:28_30/03/2017
■	30m	70.0	17:28_30/03/2017
■	1H	57.0	17:08_30/03/2017
■	2H	40.0	16:30_30/03/2017
■	3H	31.0	16:44_30/03/2017
■	6H	24.8	16:44_30/03/2017
■	12H	20.7	10:56_30/03/2017
■	24H	14.4	02:00_30/03/2017
■	48H	7.2	01:32_30/03/2017
■	72H	4.8	01:32_30/03/2017

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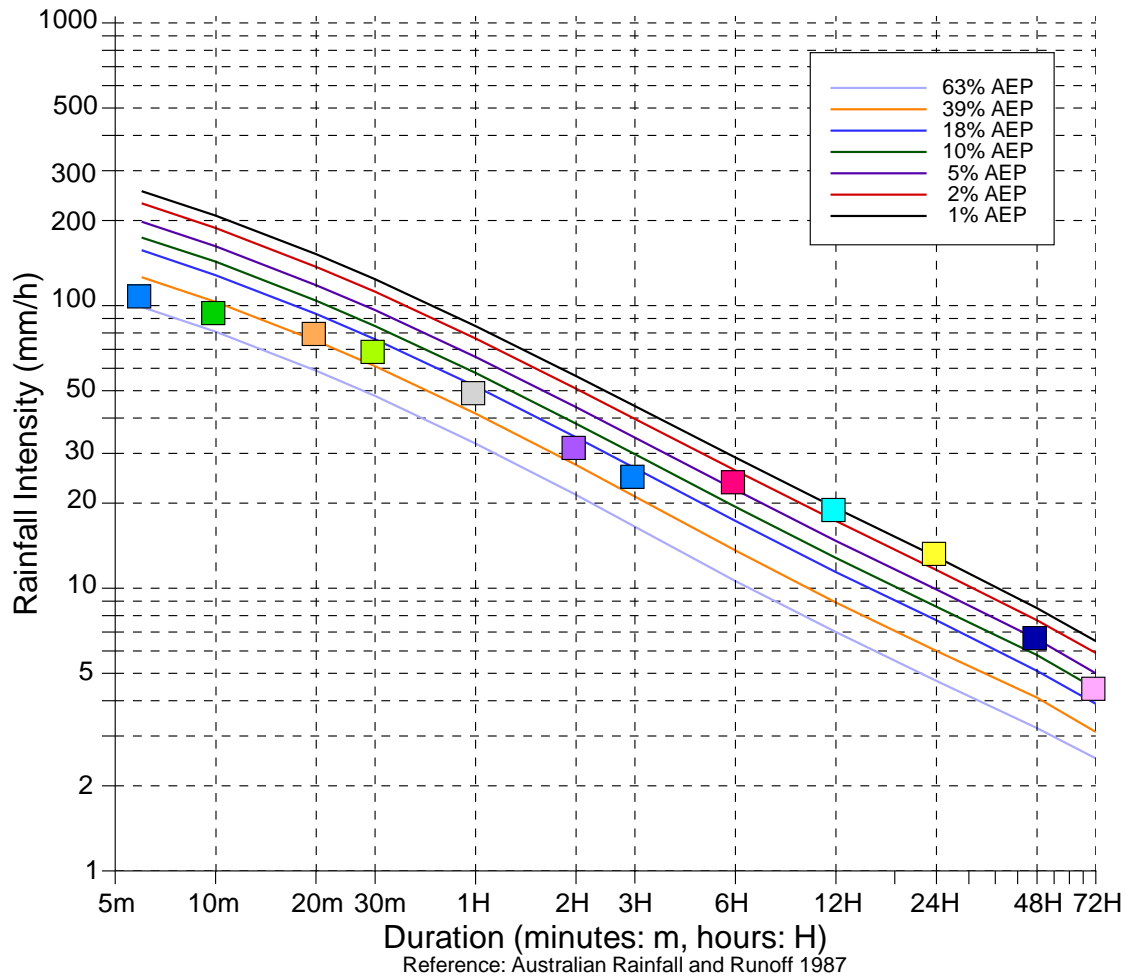
	Duration (minutes: m) (Hours: H)	Rainfall Intensity (mm/h)	Time/Date
■	6m	110.0	09:18_15/03/2017
■	10m	102.0	09:14_15/03/2017
■	20m	81.0	15:32_30/03/2017
■	30m	70.0	15:22_30/03/2017
■	1H	61.0	14:58_30/03/2017
■	2H	41.0	13:52_30/03/2017
■	3H	38.7	13:00_30/03/2017
■	6H	24.7	10:04_30/03/2017
■	12H	19.1	04:30_30/03/2017
■	24H	14.3	02:48_30/03/2017
■	48H	7.4	22:34_29/03/2017
■	72H	4.9	22:34_29/03/2017

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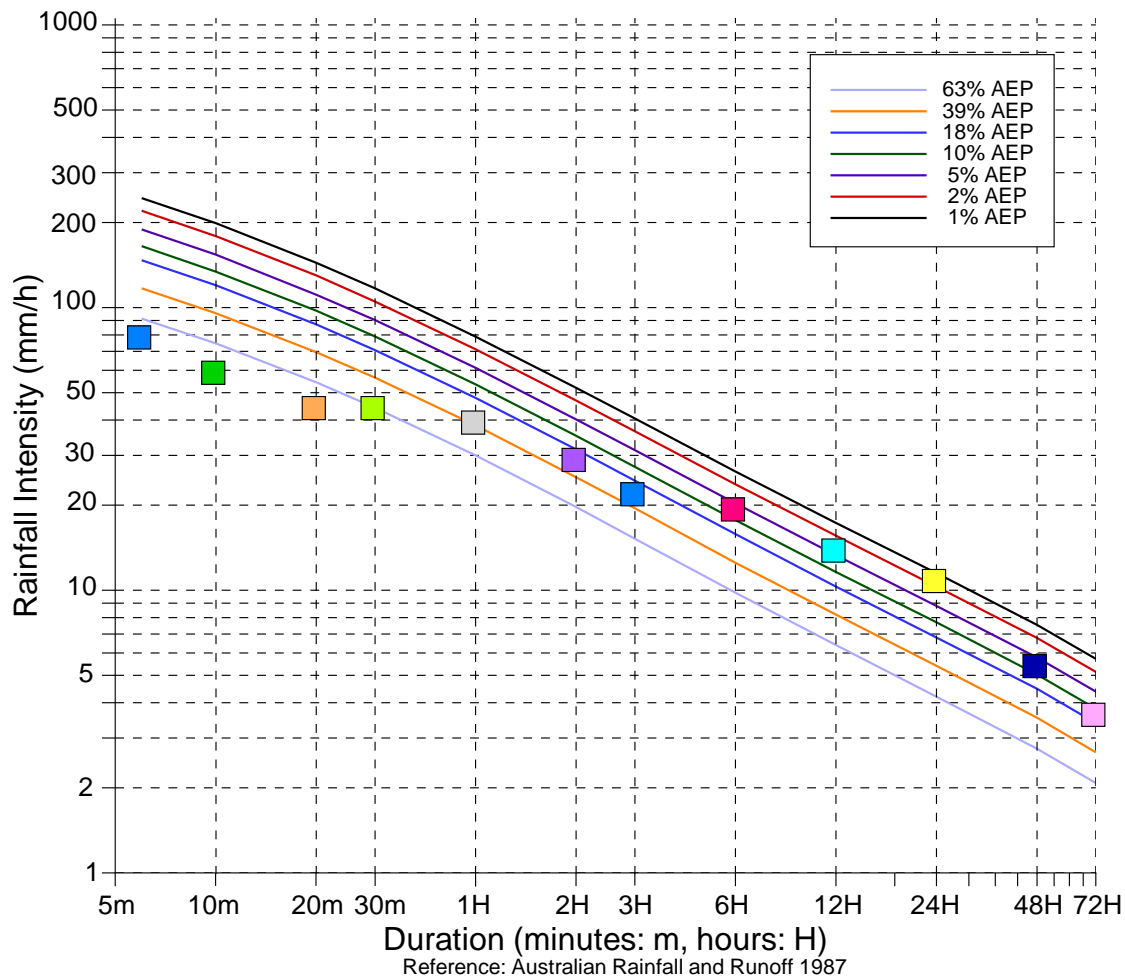
Duration (minutes: m) (Hours: H)	Rainfall Intensity (mm/h)	Time/Date
6m	110.0	21:30_14/03/2017
10m	96.0	21:30_14/03/2017
20m	87.0	21:24_14/03/2017
30m	66.0	21:24_14/03/2017
1H	43.0	21:24_14/03/2017
2H	28.5	21:04_14/03/2017
3H	25.7	19:20_14/03/2017
6H	17.3	19:20_14/03/2017
12H	14.4	17:34_14/03/2017
24H	9.2	16:24_29/03/2017
48H	4.9	13:48_29/03/2017
72H	3.3	17:44_27/03/2017

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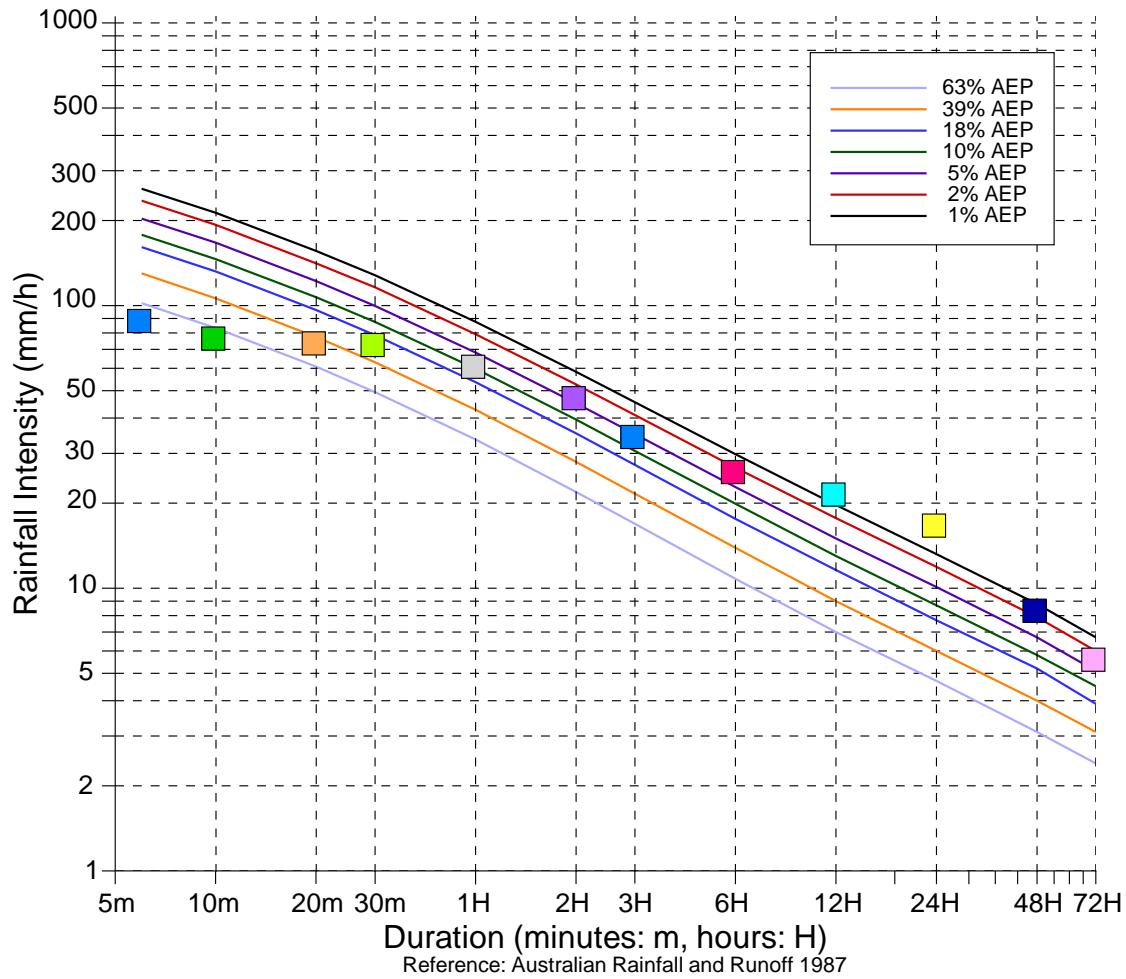
Duration (minutes: m) (Hours: H)	Rainfall Intensity (mm/h)	Time/Date
6m	110.0	17:50_30/03/2017
10m	96.0	17:46_30/03/2017
20m	81.0	17:40_30/03/2017
30m	70.0	17:40_30/03/2017
1H	50.0	17:16_30/03/2017
2H	32.0	16:44_30/03/2017
3H	25.3	16:50_30/03/2017
6H	24.2	16:36_30/03/2017
12H	19.3	11:38_30/03/2017
24H	13.5	02:28_30/03/2017
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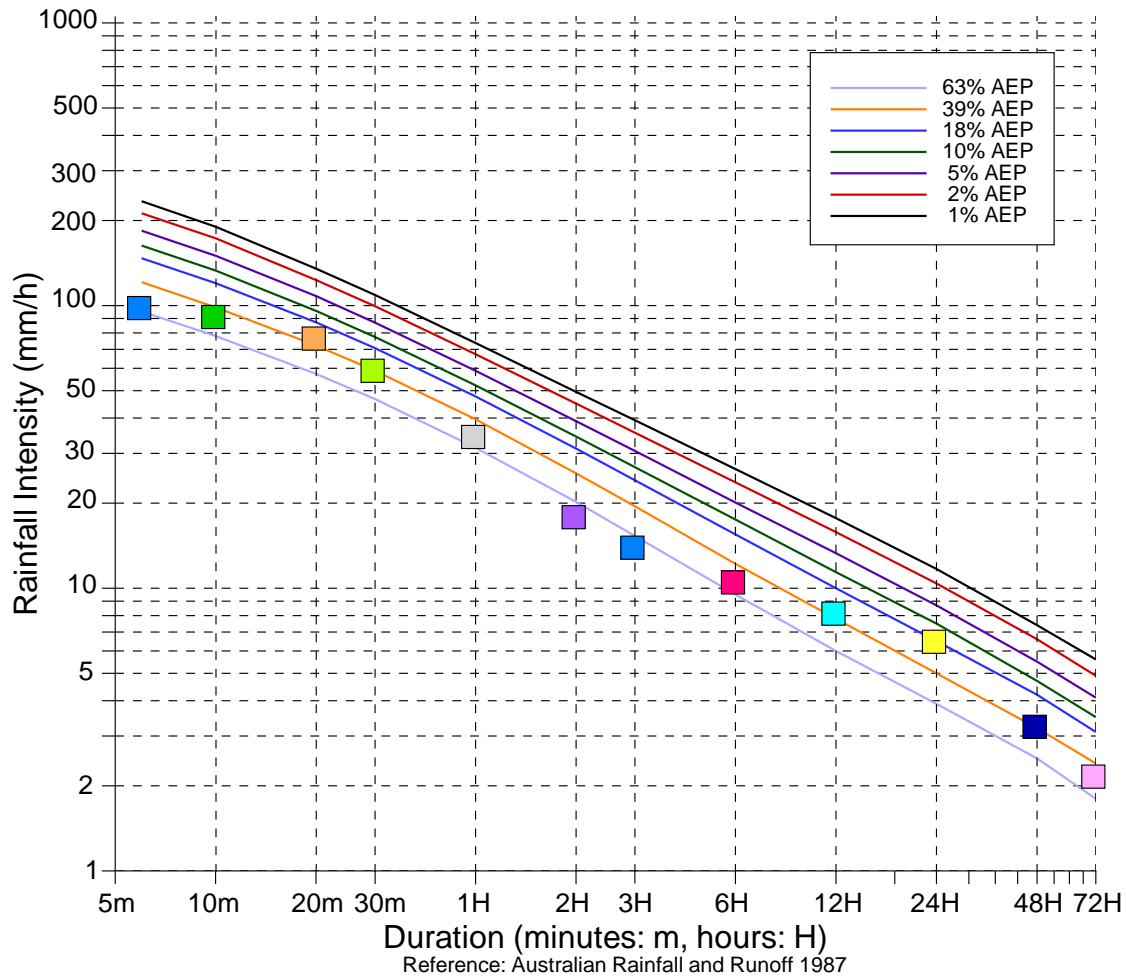
	Duration (minutes: m) (Hours: H)	Rainfall Intensity (mm/h)	Time/Date
■	6m	80.0	05:56_30/03/2017
■	10m	60.0	05:56_30/03/2017
■	20m	45.0	05:56_30/03/2017
■	30m	45.0	05:56_30/03/0000
■	1H	40.0	05:56_30/03/2017
■	2H	29.5	05:42_30/03/2017
■	3H	22.3	05:22_30/03/2017
■	6H	19.7	05:42_30/03/2017
■	12H	14.1	00:46_30/03/2017
■	24H	11.0	18:00_29/03/2017
■	48H	5.5	15:30_29/03/2017
■	72H	3.7	15:30_29/03/2017

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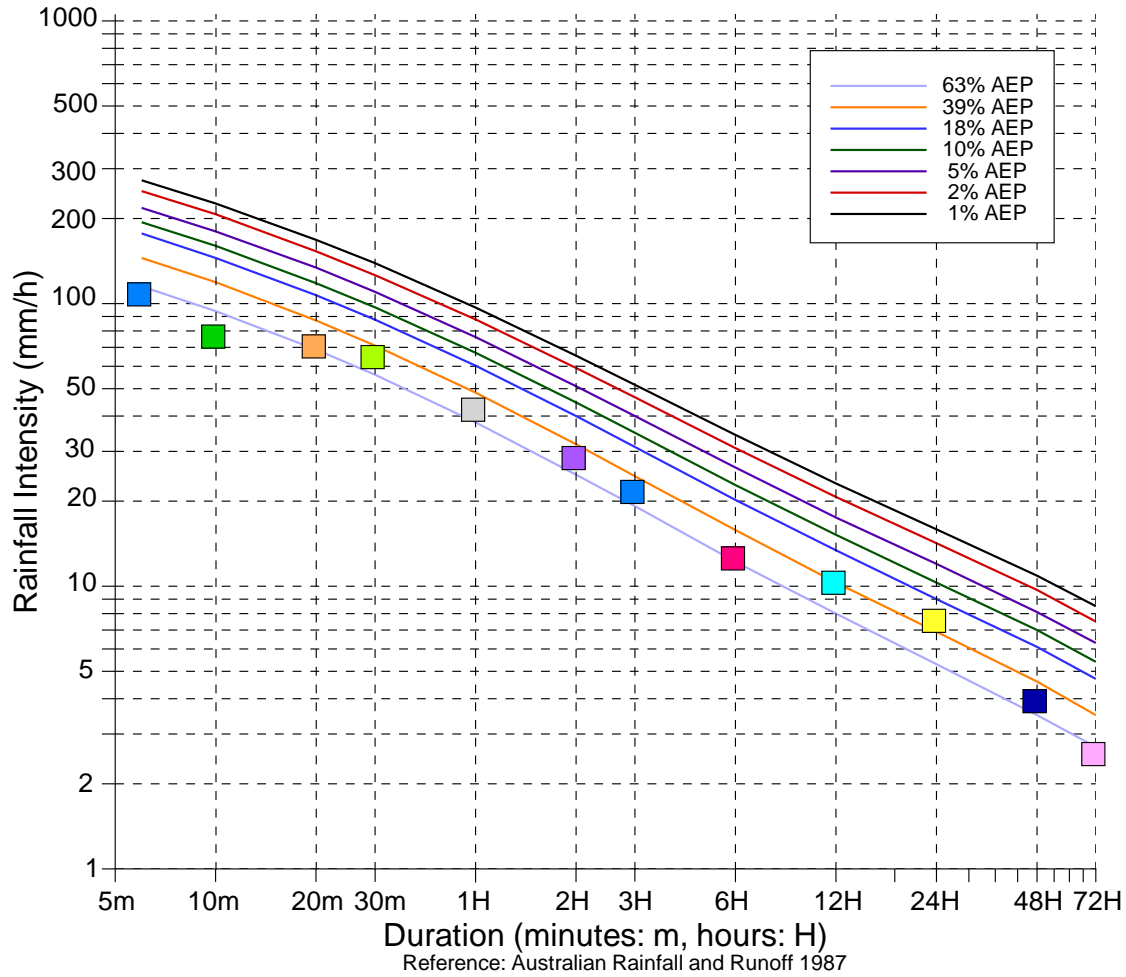
	Duration (minutes: m) (Hours: H)	Rainfall Intensity (mm/h)	Time/Date
■	6m	90.0	21:28_30/03/2017
■	10m	78.0	21:48_30/03/2017
■	20m	75.0	21:38_30/03/2017
■	30m	74.0	21:28_30/03/2017
■	1H	62.0	21:00_30/03/2017
■	2H	48.0	20:12_30/03/2017
■	3H	35.0	20:06_30/03/2017
■	6H	26.3	17:10_30/03/2017
■	12H	21.9	10:52_30/03/2017
■	24H	17.0	02:14_30/03/2017
■	48H	8.5	22:30_29/03/2017
■	72H	5.7	22:30_29/03/2017

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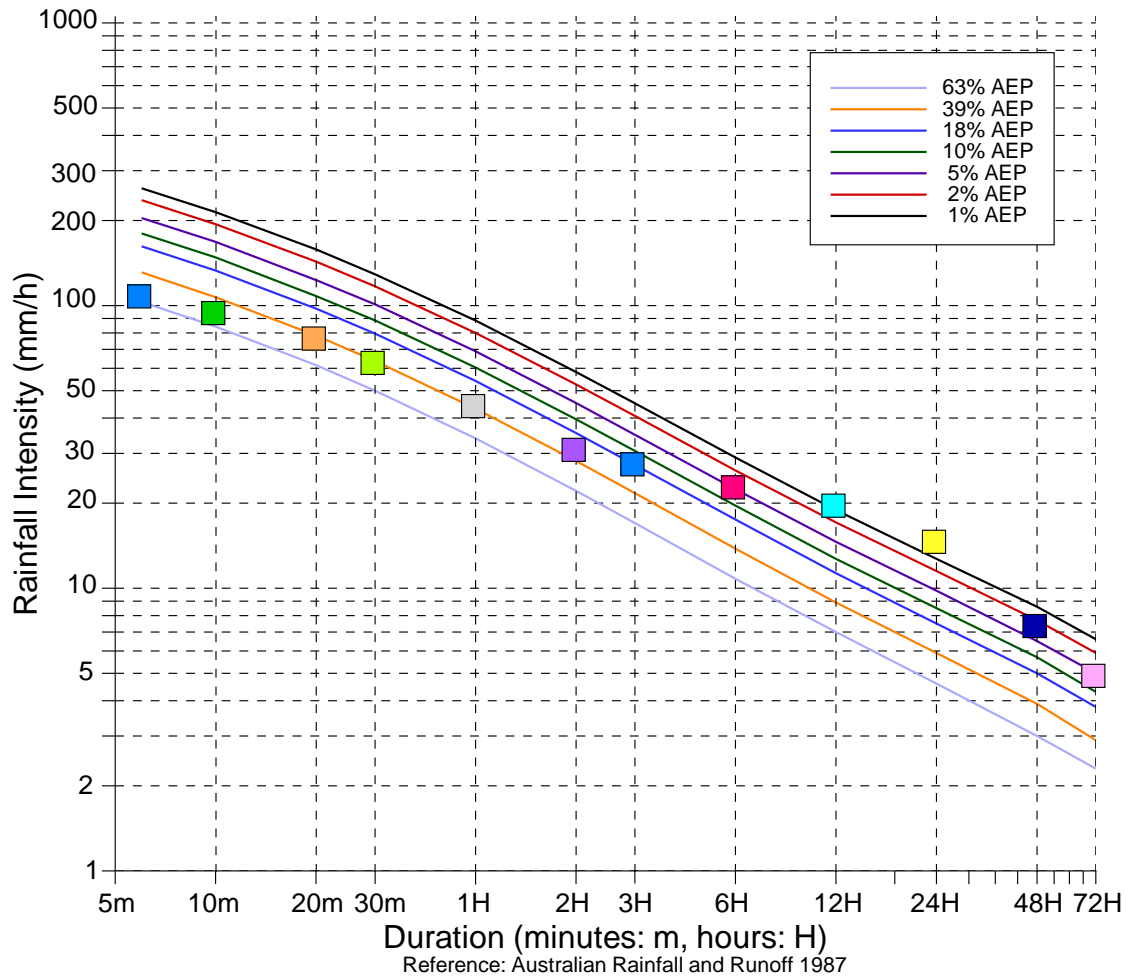
Duration (minutes: m) (Hours: H)	Rainfall Intensity (mm/h)	Time/Date
6m	100.0	04:24_17/03/2017
10m	93.0	04:22_17/03/2017
20m	78.0	04:22_17/03/2017
30m	60.0	04:22_17/03/2017
1H	35.0	04:20_17/03/2017
2H	18.2	04:20_17/03/2017
3H	14.2	20:00_29/03/2017
6H	10.7	19:46_29/03/2017
12H	8.3	20:02_29/03/2017
24H	6.6	17:20_29/03/2017
48H	3.3	13:26_29/03/2017
72H	2.2	13:26_29/03/2017

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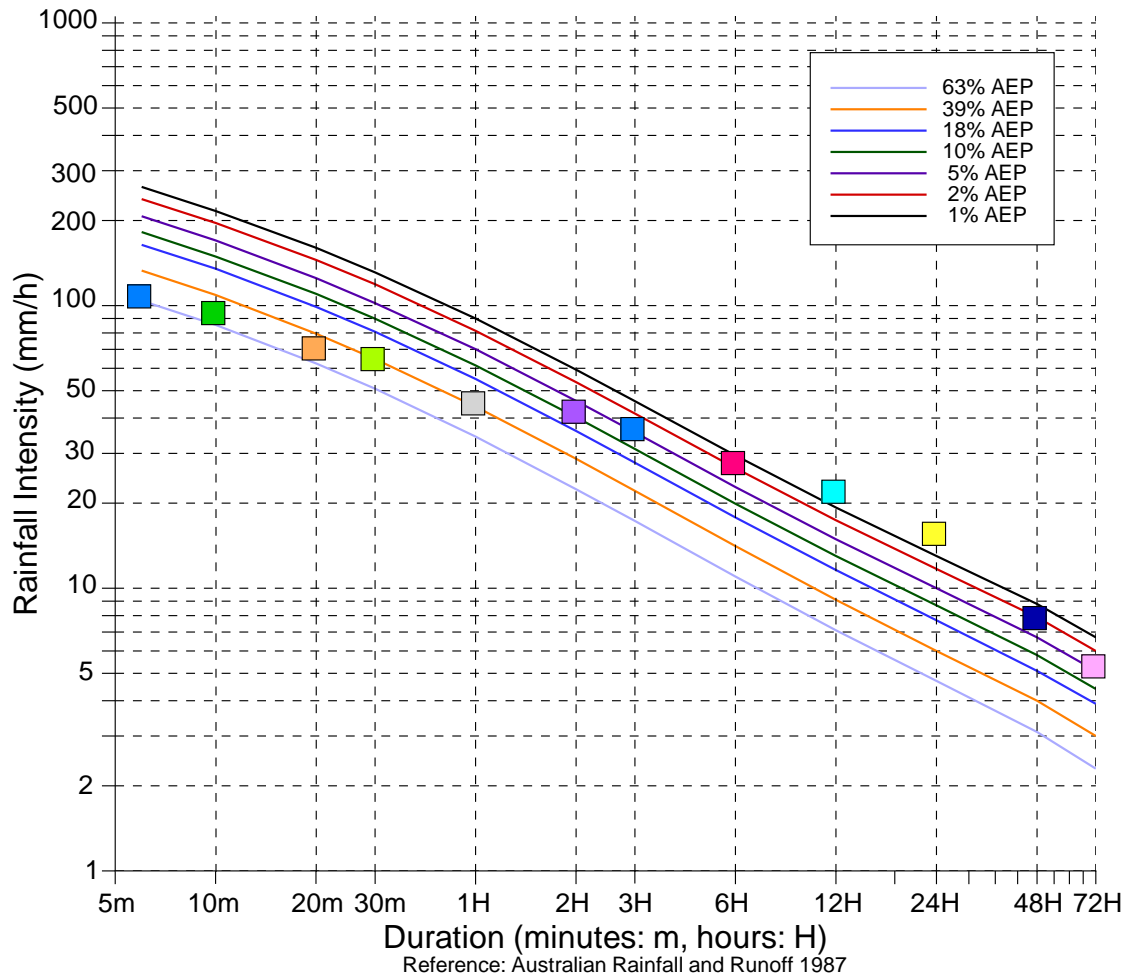
	Duration (minutes: m) (Hours: H)	Rainfall Intensity (mm/h)	Time/Date
■	6m	110.0	06:28_15/03/2017
■	10m	78.0	06:26_15/03/2017
■	20m	72.0	06:18_20/03/2017
■	30m	66.0	06:12_20/03/2017
■	1H	43.0	05:50_20/03/2017
■	2H	29.0	05:50_20/03/2017
■	3H	22.0	05:50_20/03/2017
■	6H	12.8	21:02_30/03/2017
■	12H	10.5	05:14_15/03/2017
■	24H	7.7	03:54_30/03/2017
■	48H	4.0	22:28_29/03/2017
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	Duration (minutes: m) (Hours: H)	Rainfall Intensity (mm/h)	Time/Date
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■	10m	96.0	18:08_30/03/2017
■	20m	78.0	18:00_30/03/2017
■	30m	64.0	17:56_30/03/2017
■	1H	45.0	17:52_30/03/2017
■	2H	31.5	17:28_30/03/2017
■	3H	28.0	12:18_30/03/2017
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■	12H	20.0	09:20_30/03/2017
■	24H	14.9	01:52_30/03/2017
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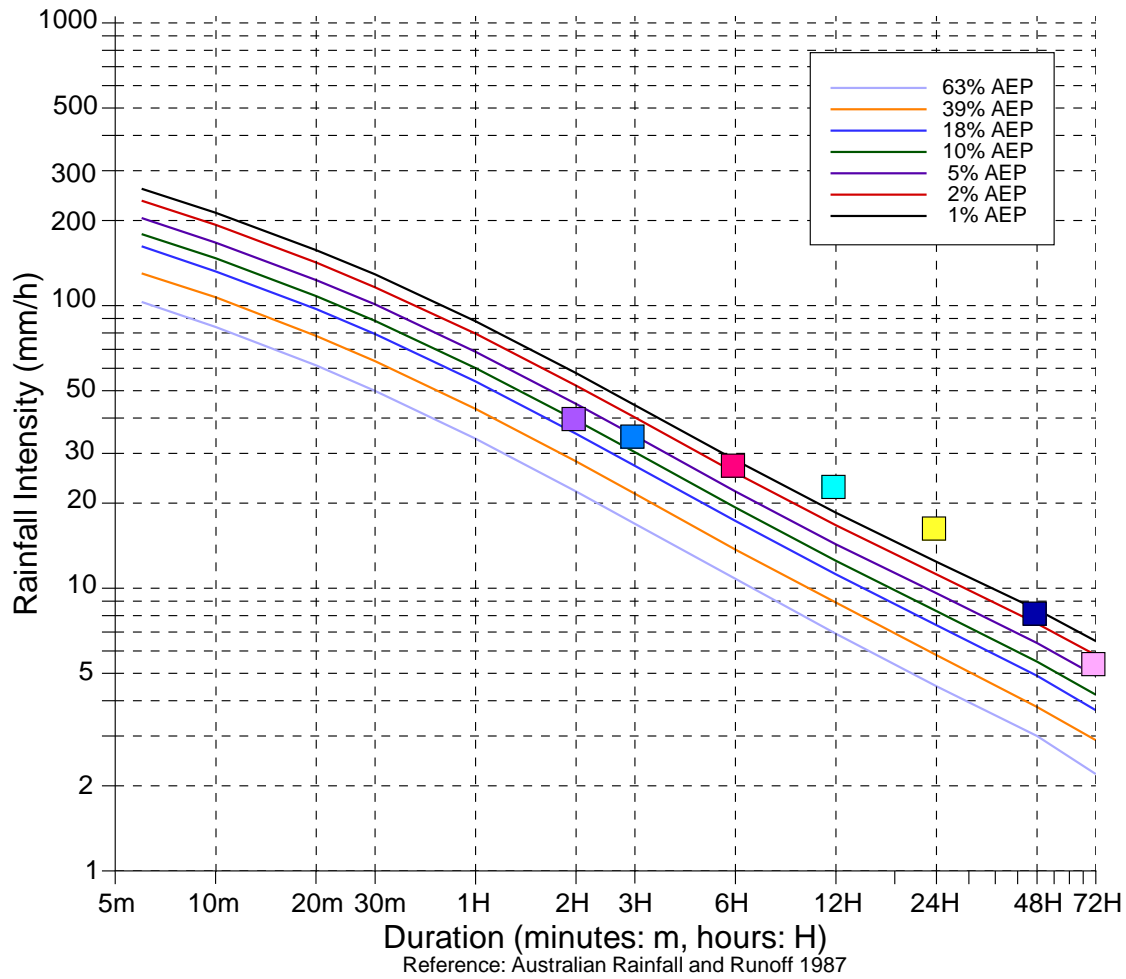


	Duration (minutes: m) (Hours: H)	Rainfall Intensity (mm/h)	Time/Date
■	6m	110.0	08:44_15/03/2017
■	10m	96.0	08:40_15/03/2017
■	20m	72.0	08:40_15/03/2017
■	30m	66.0	08:40_15/03/2017
■	1H	46.0	14:08_30/03/2017
■	2H	43.0	13:08_30/03/2017
■	3H	37.3	12:54_30/03/2017
■	6H	28.3	09:54_30/03/2017
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\* Station was not operational during the flood event. IFD analysis has not been undertaken.

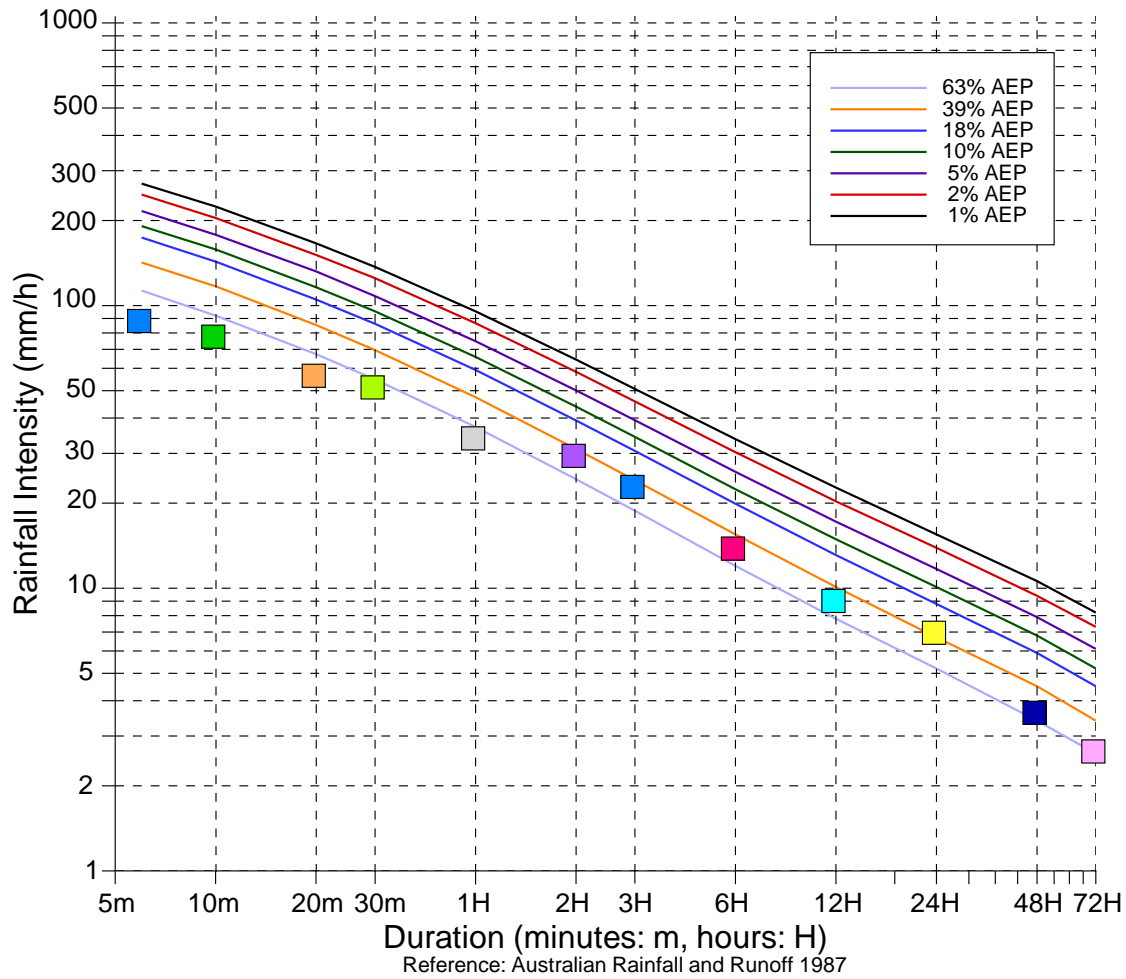
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Short duration rainfall data impacted by possible radio transfer interruptions. Suspect short duration IFD results removed by observation.

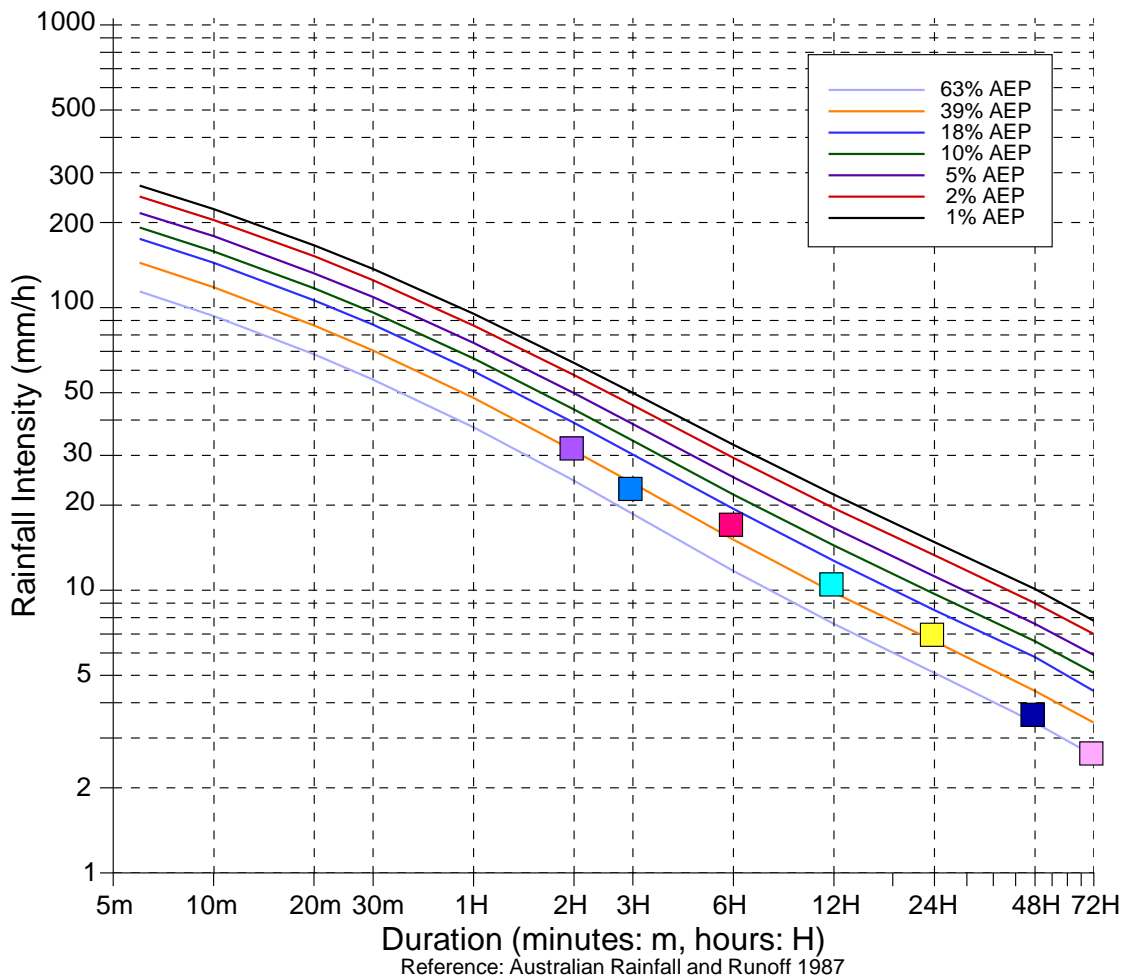
Duration (minutes: m) (Hours: H)	Rainfall Intensity (mm/h)	Time/Date
6m		
10m		
20m		
30m		
1H		
2H	40.5	02:58_30/03/2017
3H	35.1	01:58_30/03/2017
6H	27.7	02:58_30/03/2017
12H	23.3	22:58_29/03/2017
24H	16.6	15:58_29/03/2017
48H	8.3	16:00_28/03/2017
72H	5.5	16:00_27/03/2017

Australian Rainfall and Runoff (Institute of Engineers Australia 1987), states:  
 "Use of the terms "recurrence interval" and "return period" has been criticised as leading to confusion in the minds of some decision makers and members of public. Although the terms are simple superficially, they are sometimes misinterpreted as implying that the associated magnitude is only exceeded at regular intervals, and that they are referring to the elapsed time to the next exceedance."  
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 Adapted from: <http://www.bom.gov.au/water/designRainfalls/ifd-arr87/glossary.shtml>



	Duration (minutes: m) (Hours: H)	Rainfall Intensity (mm/h)	Time/Date
■	6m	90.0	07:40_20/03/2017
■	10m	79.2	07:36_20/03/2017
■	20m	57.6	07:28_20/03/2017
■	30m	52.4	06:26_20/03/2017
■	1H	34.6	06:00_20/03/2017
■	2H	30.0	06:00_20/03/2017
■	3H	23.3	04:52_20/03/2017
■	6H	14.1	04:50_20/03/2017
■	12H	9.2	23:04_19/03/2017
■	24H	7.1	03:08_30/03/2017
■	48H	3.7	16:38_29/03/2017
■	72H	2.7	02:02_18/03/2017

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 Adapted from: <http://www.bom.gov.au/water/designRainfalls/ifd-arr87/glossary.shtml>

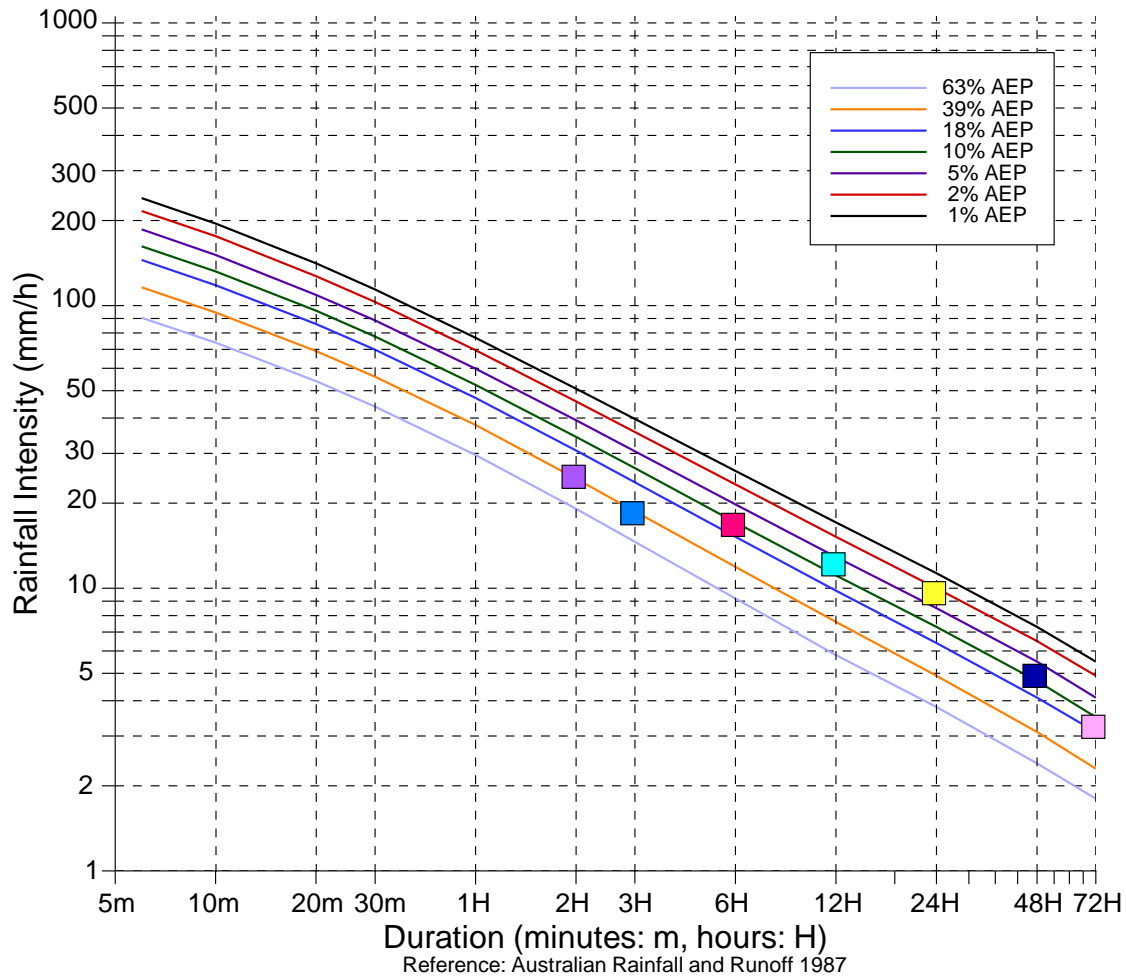


Reference: Australian Rainfall and Runoff 1987

Short duration rainfall data impacted by possible radio transfer interruptions. Suspect short duration IFD results removed by observation.

Duration (minutes: m) (Hours: H)	Rainfall Intensity (mm/h)	Time/Date
6m		
10m		
20m		
30m		
1H		
2H	32.4	05:58_15/03/2017
3H	23.3	05:58_15/03/2017
6H	17.4	05:58_15/03/2017
12H	10.7	23:58_14/03/2017
24H	7.1	13:58_14/03/2017
48H	3.7	00:58_14/03/2017
72H	2.7	19:58_14/03/2017

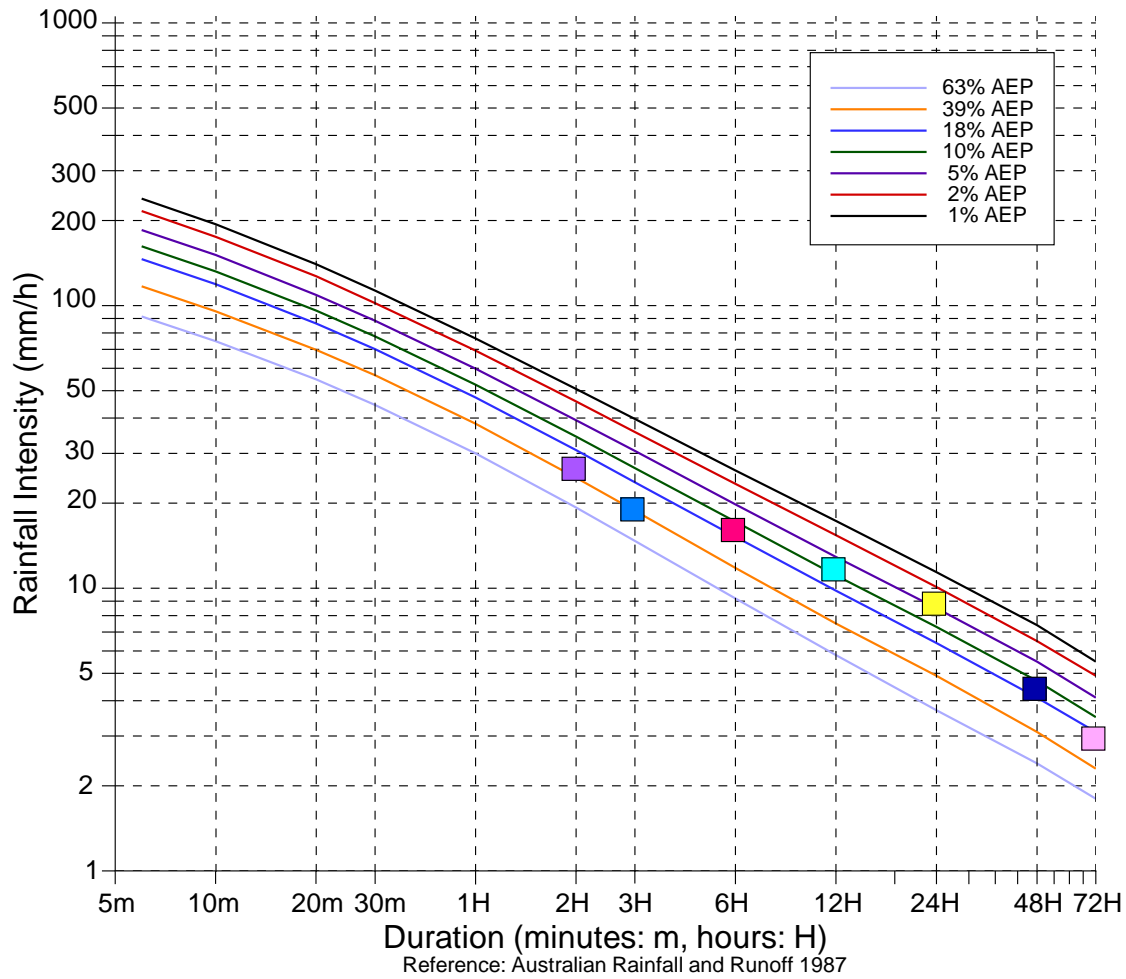
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 Adapted from: <http://www.bom.gov.au/water/designRainfalls/ifd-arr87/glossary.shtml>



Short duration rainfall data impacted by possible radio transfer interruptions. Suspect short duration IFD results removed by observation.

Duration (minutes: m) (Hours: H)	Rainfall Intensity (mm/h)	Time/Date
6m		
10m		
20m		
30m		
1H		
2H	25.3	06:58_30/03/2017
3H	18.8	05:58_30/03/2017
6H	17.1	06:58_30/03/2017
12H	12.4	01:58_30/03/2017
24H	9.8	16:58_29/03/2017
48H	5.0	15:58_29/03/2017
72H	3.3	15:58_29/03/2017

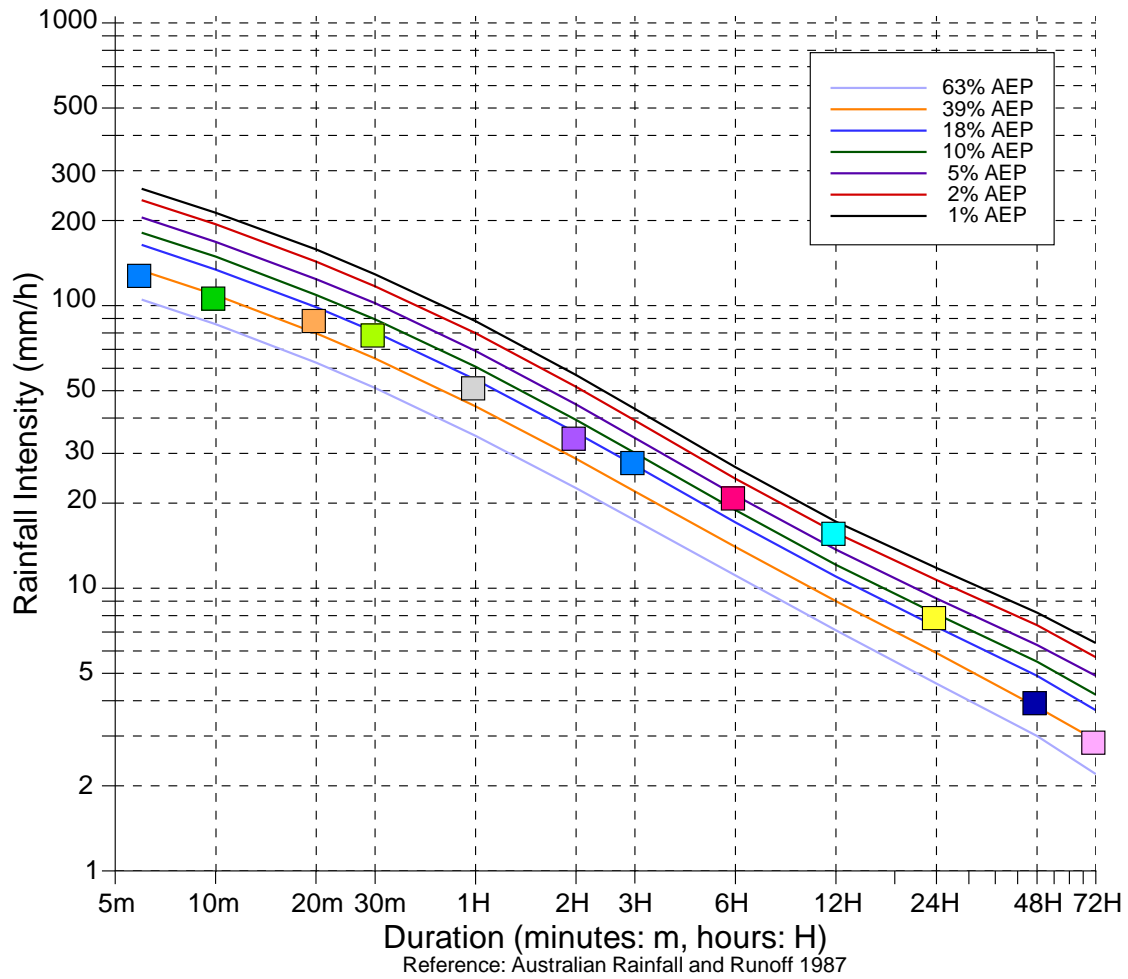
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 Adapted from: <http://www.bom.gov.au/water/designRainfalls/ifd-arr87/glossary.shtml>



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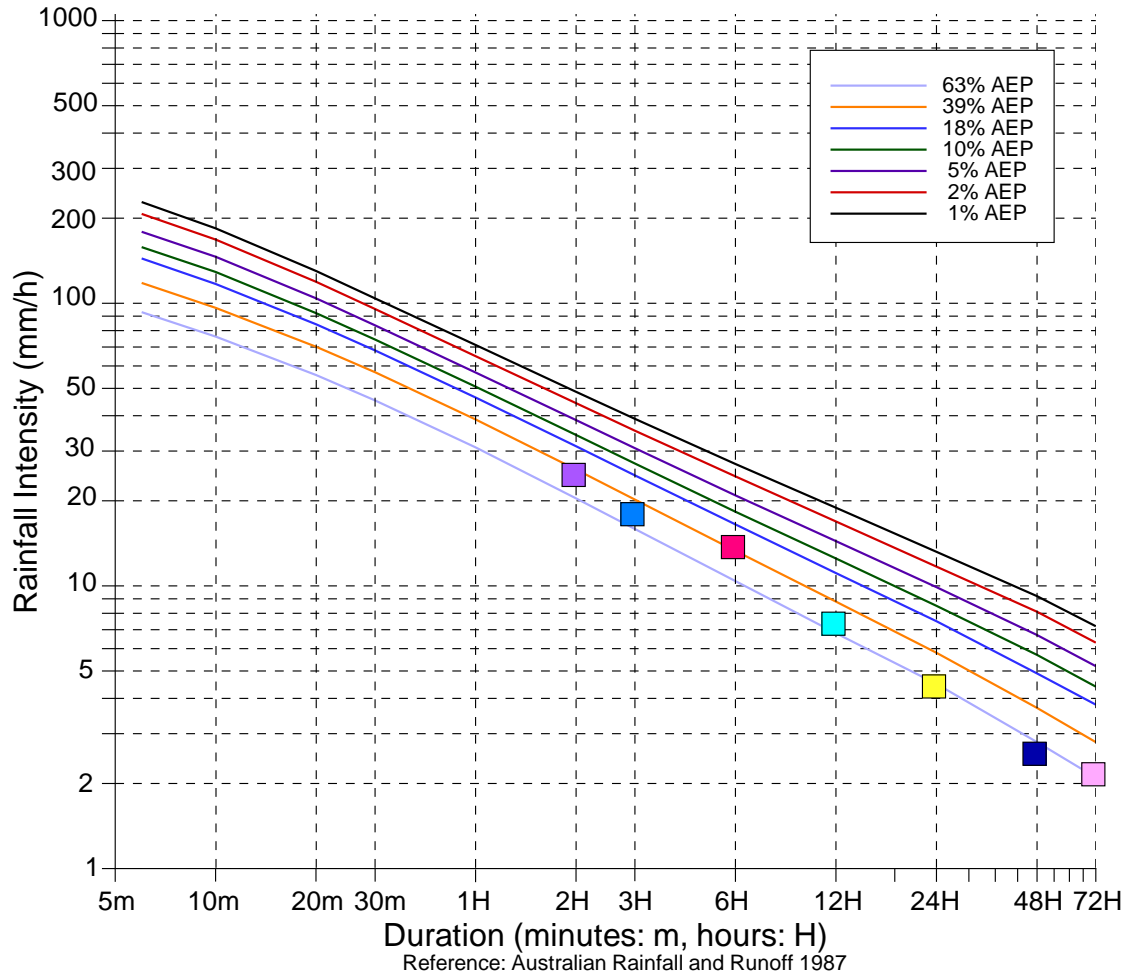
Duration (minutes: m) (Hours: H)	Rainfall Intensity (mm/h)	Time/Date
6m		
10m		
20m		
30m		
1H		
2H	27.0	06:58_30/03/2017
3H	19.4	06:58_30/03/2017
6H	16.4	06:58_30/03/2017
12H	11.9	20:58_29/03/2017
24H	9.0	17:58_29/03/2017
48H	4.5	16:58_29/03/2017
72H	3.0	16:58_29/03/2017

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 Adapted from: <http://www.bom.gov.au/water/designRainfalls/ifd-arr87/glossary.shtml>



Duration (minutes: m) (Hours: H)	Rainfall Intensity (mm/h)	Time/Date
6m	130.0	15:12_30/03/2017
10m	108.0	15:18_19/03/2017
20m	90.0	15:18_19/03/2017
30m	80.0	15:10_19/03/2017
1H	52.0	14:42_19/03/2017
2H	34.5	13:56_30/03/2017
3H	28.3	13:56_30/03/2017
6H	21.2	14:30_30/03/2017
12H	15.9	13:58_30/03/2017
24H	8.0	13:56_30/03/2017
48H	4.0	13:56_30/03/2017
72H	2.9	01:14_18/03/2017

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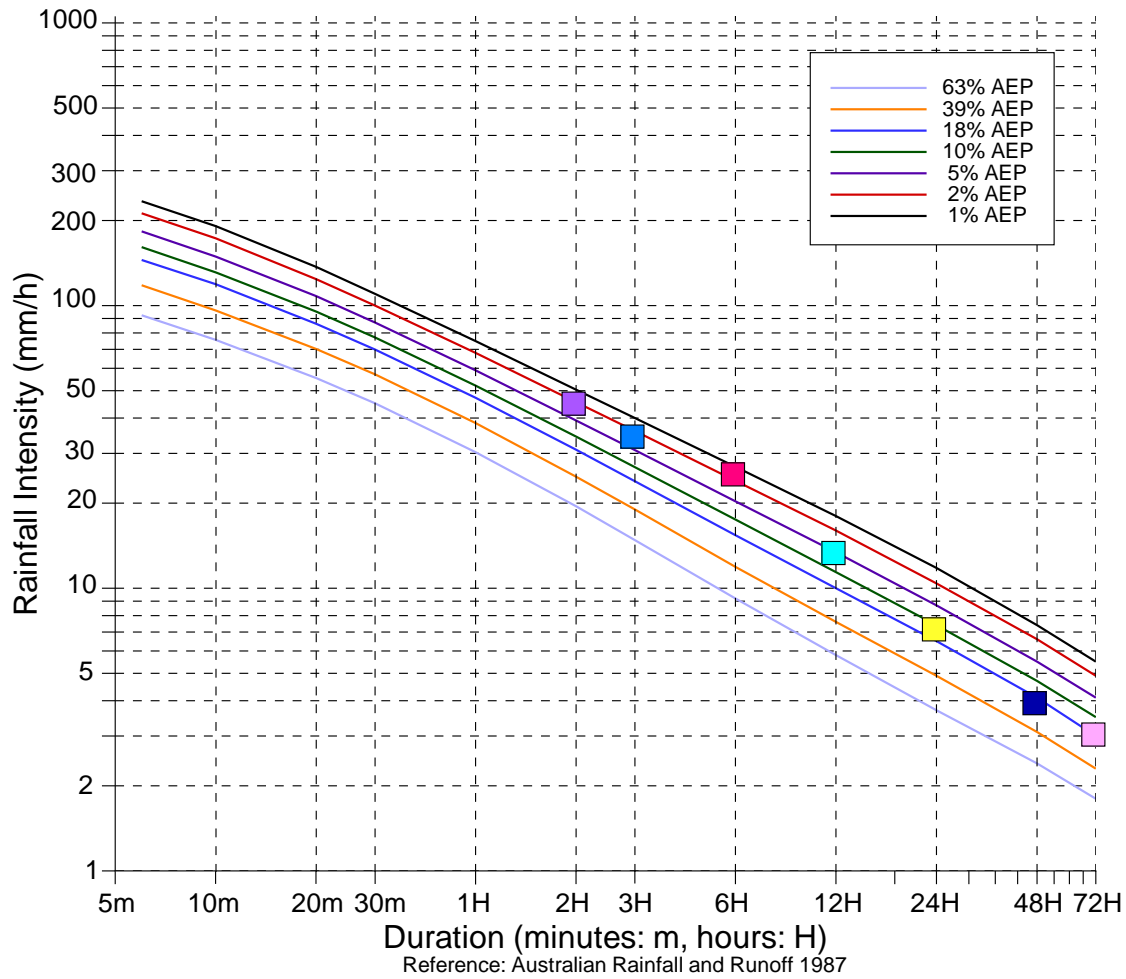


Reference: Australian Rainfall and Runoff 1987

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Duration (minutes: m) (Hours: H)	Rainfall Intensity (mm/h)	Time/Date
6m		
10m		
20m		
30m		
1H		
2H	25.2	00:58_18/03/2017
3H	18.3	23:58_17/03/2017
6H	14.0	20:58_17/03/2017
12H	7.5	18:58_17/03/2017
24H	4.5	17:58_29/03/2017
48H	2.6	19:58_17/03/2017
72H	2.2	17:58_17/03/2017

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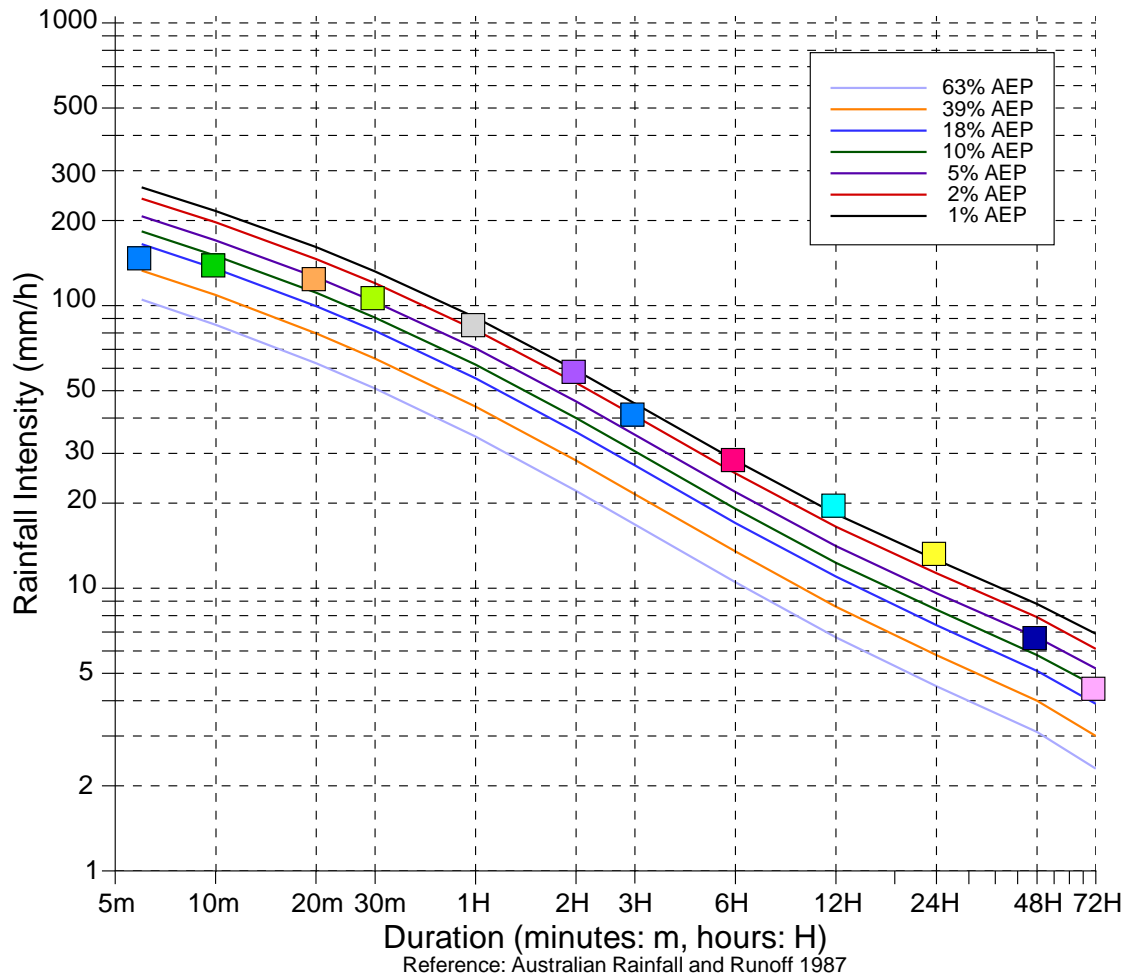


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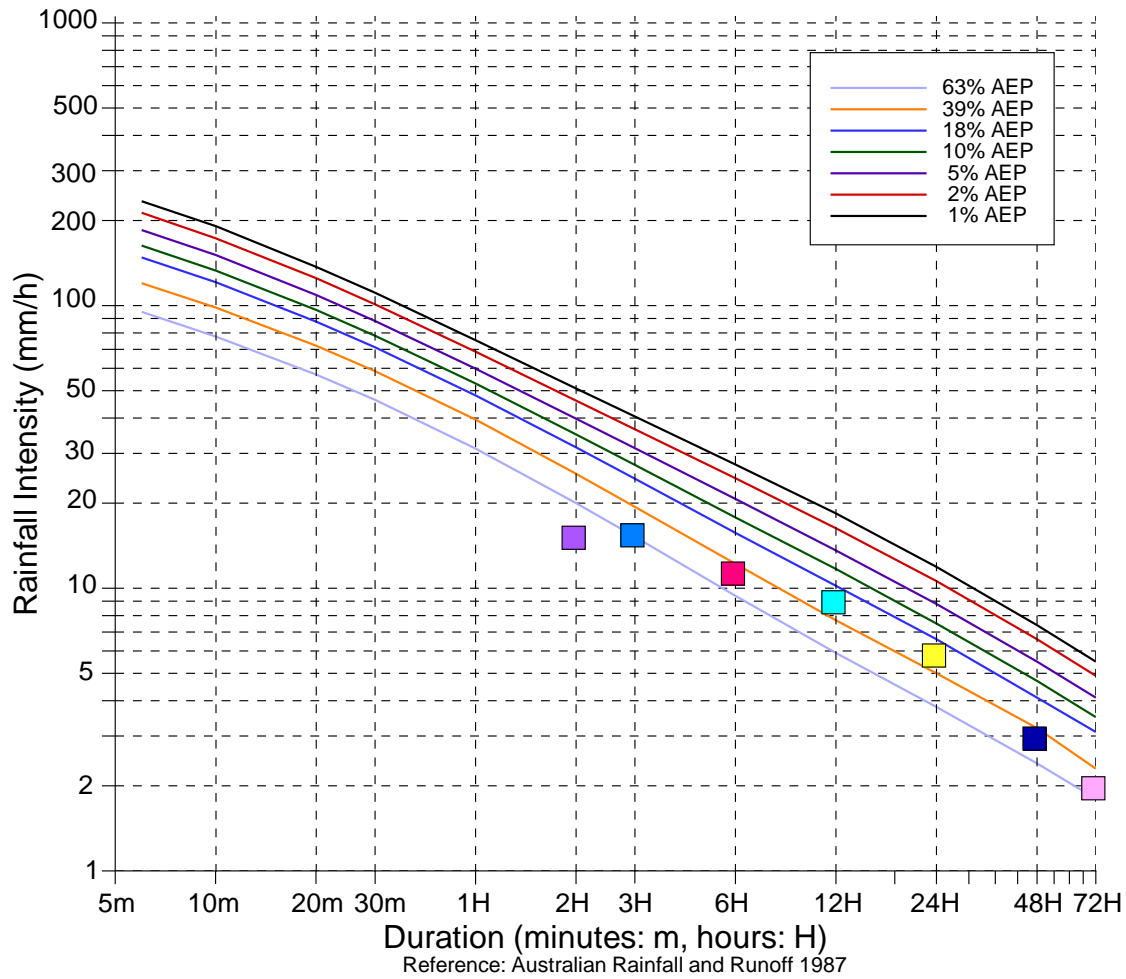
Duration (minutes: m) (Hours: H)	Rainfall Intensity (mm/h)	Time/Date
6m		
10m		
20m		
30m		
1H		
2H	45.9	23:58_17/03/2017
3H	35.1	23:58_17/03/2017
6H	25.8	20:58_17/03/2017
12H	13.6	15:58_17/03/2017
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Duration (minutes: m) (Hours: H)	Rainfall Intensity (mm/h)	Time/Date
6m	150.0	09:56_18/03/2017
10m	141.6	09:52_18/03/2017
20m	126.6	09:44_18/03/2017
30m	108.4	09:38_18/03/2017
1H	87.0	09:06_18/03/2017
2H	59.5	08:16_18/03/2017
3H	42.0	07:10_18/03/2017
6H	29.0	14:44_30/03/2017
12H	20.0	08:44_30/03/2017
24H	13.5	03:40_30/03/2017
48H	6.8	02:30_30/03/2017
72H	4.5	02:30_30/03/2017

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Duration (minutes: m) (Hours: H)	Rainfall Intensity (mm/h)	Time/Date
6m		
10m		
20m		
30m		
1H		
2H	15.4	22:58_29/03/2017
3H	15.7	21:58_29/03/2017
6H	11.5	21:58_29/03/2017
12H	9.1	21:58_29/03/2017
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# Appendix A – Station Performance

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This appendix provides an overview of data capture percentages of all stations presented in this report. In total, stations recorded an average of 94% data recovery.

During the flood period, MHL's data management system suffered an outage on Friday 31 March from approximately 11.00 to 22.00 Hrs AEDST. This affected the web based presentation at [www.mhl.nsw.gov.au](http://www.mhl.nsw.gov.au) and associated MHL web portals for the OEH hydrometric network, but did not affect the wave network and data recovery.

Data telemetry and data delivery to the BoM was not affected by this outage. The BoM NSW flood modelling system and the BoM web site were receiving data from MHL data dissemination services as expected.

During the flood event MHL staff monitored flood situations via telemetry tools and provided clients and the public with near real time access to the rainfall and water levels via the BoM web site [www.bom.gov.au/nsw/flood](http://www.bom.gov.au/nsw/flood) and NSW Government's Floods Near Me app <http://floodsnearme.manly.hydraulics.works/> which displays latest recordings for inter-agency water level stations. Council and SES staff were also directed to use the BoM website and the Floods Near Me app.

During typical data presentation periods, observers should be aware that the time taken for data to be presented on the MHL website from time of measurement is variable dependent on the polling interval and the web display processing functions. The typical lag time between data collection and presentation on the web is listed in **Table A-1**.

**Table A-1 Typical web presentation timing**

<b>Data process</b>	<b>Duration</b>
Logging interval (time between measurements)	15 minutes for water level stations instantaneous for rainfall
Polling (time between telemetry transfer from the station to database)	Hourly (BoM classified high priority stations) 3-8 hourly (BoM classified low to medium priority stations)
Web display (period for data to be presented from receipt in the database)	45 minutes

These expected times can be longer during busy periods such as flood events, for example Bungawalbin Creek that is on hourly polling was only updating on the MHL website at three hourly intervals during the March 2017 flood event (excluding the website outage period). Should a reduction in lag time between data measurement and web presentation be required, the use of high frequency data transfer networks could be considered.

**Table A-2 Station metadata and performance**

Station Name	Station code	Station Type	Owner	Data Capture	Datum	Latitude	Longitude	Comments
Tweed Entrance South	201472	Ocean tide	OEH/MHL	100%	AHD	-28.17063900	153.55118600	
Cobaki	201448	Water level	OEH/MHL	100%	AHD	-28.17663864	153.50267704	
Letitia 2A	201429	Water level	OEH/MHL	100%	AHD	-28.18295183	153.55328813	
Dry Dock	201428	Water level	OEH/MHL	100%	AHD	-28.19367417	153.51672538	
Terranora	201447	Water level	OEH/MHL	100%	AHD	-28.20142241	153.49882931	
Banora (STP)	558089	Rainfall	BoM	100%	NA	-28.20400000	153.53100000	
Bilambil Heights	558085	Rainfall	BoM	90%	NA	-28.21600000	153.47800000	
Barneys Point	201426	Water level	OEH/MHL	100%	AHD	-28.22535799	153.55147852	
Barneys Point	558010	Rainfall	BoM	100%	NA	-28.23100000	153.55500000	
Tomewin	540354	Rainfall	BoM	100%	NA	-28.24060000	153.37830000	
Kingscliff (STP)	558090	Rainfall	BoM	73%	NA	-28.25600000	153.54800000	
Kingscliff	202418	Water level	OEH/MHL	100%	AHD	-28.25966041	153.58177064	
Kingscliff Upstream	202434	Water level	OEH/MHL	0%	AHD	-28.26522220	153.58145420	Station vandalised
Couchy Creek	558079	Rainfall	BoM	100%	NA	-28.26620000	153.27900000	
Numinbah	558081	Rainfall	BoM	100%	NA	-28.27030000	153.24830000	
Upper Rous River (Hopkins Ck)	558080	Rainfall	BoM	100%	NA	-28.27220000	153.21340000	
Duranbah	558011	Rainfall	BoM	100%	NA	-28.27500000	153.52500000	
Tumbulgum	558014	Rainfall	BoM	100%	NA	-28.27690000	153.46080000	
Tumbulgum	201432	Water level	OEH/MHL	100%	AHD	-28.27724627	153.46060830	
Bald Mountain	558032	Rainfall	BoM	100%	NA	-28.30860000	153.23310000	
Rous River at Boat Harbour No 3	201005	Water level	Water NSW	100%	Local datum	-28.30960000	153.33600000	
Kynumboon	201422	Water level	OEH/MHL	100%	AHD	-28.31451111	153.38944004	Peak interpolated from flood debris survey.
Chillingham	201008	Water level	Tweed Shire Council	22%	AHD	-28.31460000	153.27500000	Data loss due to damage during the flood.
Chillingham	58011	Rainfall	Tweed Shire Council	100%	NA	-28.31460000	153.27500000	Data loss due to damage during the flood.
Boat Harbour	58204	Rainfall	BoM	100%	NA	-28.32170000	153.34670000	
Murwillumbah (STP)	558093	Rainfall	BoM	73%	NA	-28.32300000	153.34800000	
Bogangar	202416	Water level	OEH/MHL	100%	AHD	-28.32705338	153.55800094	
North Murwillumbah	201420	Water level	OEH/MHL	100%	AHD	-28.32736973	153.40121717	

Station Name	Station code	Station Type	Owner	Data Capture	Datum	Latitude	Longitude	Comments
Murwillumbah Bridge	201465	Water level	OEH/MHL	100%	AHD	-28.32840206	153.40009887	
Murwillumbah	58186	Rainfall	BoM	100%	NA	-28.33283000	153.40000000	
Clothiers Creek	558082	Rainfall	BoM	73%	NA	-28.33600000	153.47600000	
Bray Park (WTP)	558092	Rainfall	BoM	100%	NA	-28.34100000	153.37800000	
Bray Park Weir	201455	Water level	OEH/MHL	100%	AHD	-28.34535948	153.36945078	
Hastings (STP)	558091	Rainfall	BoM	100%	NA	-28.35300000	153.56000000	
Oxley River at Eungella	201001	Water level	Water NSW	100%	Local datum	-28.35380000	153.29300000	
Eungella	58193	Rainfall	BoM	100%	NA	-28.35380000	153.29300000	
Tyalgum Bridge	558088	Water level	Tweed Shire Council	100%	AHD	-28.35900000	153.21000000	
Tyalgum Bridge	558088	Rainfall	Tweed Shire Council	76%	NA	-28.35900000	153.21000000	
Dairy Flat	58194	Rainfall	BoM	100%	NA	-28.38110000	152.71740000	
Cudgera Lake	558046	Rainfall	OEH/MHL	100%	NA	-28.39293916	153.50700122	
Brays Creek	58005	Rainfall	BoM	100%	NA	-28.39810000	153.17310000	
Cudgera Creek (Pottsville)	558084	Rainfall	BoM	100%	NA	-28.40200000	153.53300000	
Loadstone	58141	Rainfall	BoM	73%	NA	-28.41190000	152.98270000	
Tweed River at Uki	201900	Water level	Water NSW	100%	Local datum	-28.41320000	153.33430000	
Uki	58167	Rainfall	BoM	100%	NA	-28.41470000	153.33390000	
Clarrie Hall Dam D/S	201011	Water level	Tweed Shire Council	100%	AHD	-28.43000000	153.31500000	
Tweed River at Palmers Road	201015	Water level	Water NSW	100%	Local datum	-28.43310000	153.29210000	
Palmers Road	558018	Rainfall	BoM	100%	NA	-28.43400000	153.29500000	
Burringbar	558083	Rainfall	BoM	100%	NA	-28.43700000	153.47200000	
Clarrie Hall Dam	558028	Rainfall	Tweed Shire Council	100%	NA	-28.44030000	153.30420000	
Upper Crabbes Creek	558094	Rainfall	BoM	100%	NA	-28.46350000	153.45260000	
Kunghur	58129	Rainfall	BoM	70%	NA	-28.46590000	153.26310000	
Crabbes Creek	558095	Rainfall	BoM	70%	NA	-28.46700000	153.53000000	
Wooyung Road	558095	Water level	North Byron Parklands	70%	Local Datum	-28.46714443	153.52994445	

Station Name	Station code	Station Type	Owner	Data Capture	Datum	Latitude	Longitude	Comments
Green Pigeon	58113	Rainfall	BoM	34%	NA	-28.47380000	153.08610000	
Yelgun Creek at Yelgun	558096	Water level	North Byron Parklands	100%	Local datum	-28.48483610	153.51440830	
Yelgun	558096	Rainfall	North Byron Parklands	70%	NA	-28.48500000	153.51400000	
Lacks Creek at Middle Pocket	202901	Water level	Byron Council	100%	AHD	-28.49440000	153.48470000	
Middle Pocket	558005	Rainfall	BoM	100%	NA	-28.49440000	153.48470000	
Main Arm	558053	Rainfall	OEH/MHL	100%	AHD	-28.50008333	153.43322222	
Billinudgel	202400	Water level	OEH/MHL	100%	AHD	-28.50161532	153.52679111	
Upper Main Arm	558034	Rainfall	BoM	100%	NA	-28.50310000	153.38170000	
Marshalls Creek at The Pocket	202903	Water level	Byron Council	100%	AHD	-28.50470000	153.47720000	
Richmond River at Wiangaree	203005	Water level	Water NSW	100%	Local datum	-28.50490000	152.96690000	
Orana Bridge	202475	Water level	OEH/MHL	100%	AHD	-28.51581170	153.54788303	
Wiangaree	58099	Rainfall	BoM	100%	NA	-28.51670000	152.96670000	
Chincogan	558025	Rainfall	BoM	80%	NA	-28.52500000	153.47920000	
Lillian Rock	58148	Rainfall	Byron Shire Council	100%	NA	-28.52760000	153.15190000	
Doon Doon	58019	Rainfall	BoM	100%	NA	-28.53140000	153.31510000	
Brunswick River at Sherrys Bridge	202001	Water level	Water NSW	100%	Local datum	-28.53150000	153.45800000	
Brunswick Heads	202403	Ocean tide	OEH/MHL	100%	AHD	-28.53702500	153.55276900	
Mullumbimby	202402	Water level	OEH/MHL	100%	AHD	-28.55002021	153.49662932	
Huonbrook	558049	Rainfall	OEH/MHL	100%	NA	-28.55212291	153.38564782	
Mullumbimby Creek at Mullumbimby Creek	202904	Water level	Byron Council	100%	AHD	-28.55420000	153.43670000	
Mullumbimby Creek	558008	Rainfall	BoM	100%	NA	-28.55420000	153.43670000	
Terania Creek	558078	Rainfall	Lismore City Council	100%	NA	-28.58800000	153.29890000	
Myocum	558036	Rainfall	OEH/MHL	100%	NA	-28.58944445	153.51673585	
Goonengerry	558033	Rainfall	Byron Shire Council	100%	NA	-28.59250000	153.41940000	
Cawongla	558024	Rainfall	Lismore City Council	100%	NA	-28.60560000	153.08920000	

Station Name	Station code	Station Type	Owner	Data Capture	Datum	Latitude	Longitude	Comments
Goolmangar Creek at Nimbin	203901	Water level	Lismore City Council	34%	Local datum	-28.60690000	153.20830000	
Nimbin	58180	Rainfall	BoM	100%	NA	-28.60690000	153.20830000	
Richmond River at Kyogle	203900	Water level	Water NSW	100%	Local datum	-28.62060000	152.99620000	
Kyogle	558002	Rainfall	BoM	100%	NA	-28.62170000	152.99500000	
Toonunbar Dam D/S	203023	Water level	Water NSW	100%	Local datum	-28.62310000	152.79850000	
Cape Byron	58216	Rainfall	BoM	100%	NA	-28.63990000	153.63580000	
Repentance	558000	Rainfall	Lismore City Council	100%	NA	-28.64080000	153.41310000	
Coopers Creek at Repentance	203002	Water level	Water NSW	100%	Local datum	-28.64120000	153.41160000	
Terania Creek at The Channon	203906	Water level	Lismore City Council	100%	Local datum	-28.66960000	153.27890000	
The Channon	58147	Rainfall	BoM	100%	NA	-28.66960000	153.27890000	
Dunoon	558031	Rainfall	Lismore City Council	100%	NA	-28.67560000	153.32250000	
Jiggi (Gwynne St)	558086	Rainfall	Lismore City Council	100%	NA	-28.67600000	153.15380000	
Coopers at Ewing Bridge (Corndale)	203024	Water level	Water NSW	100%	Local datum	-28.72130000	153.36230000	
Corndale	58206	Rainfall	Lismore City Council	100%	NA	-28.72310000	153.36140000	
Wilson's River at Nashua	203902	Water level	Lismore City Council	100%	Local datum	-28.72780000	153.46220000	
Nashua	58162	Rainfall	Lismore City Council	100%	NA	-28.72780000	153.46220000	
Leycester Creek at Rock Valley	203010	Water level	Water NSW	100%	Local datum	-28.73640000	153.16340000	
Rock Valley	58199	Rainfall	Lismore City Council	100%	NA	-28.73640000	153.16340000	
Back Creek at Bentley	203009	Water level	Lismore City Council	55%	Local datum	-28.74060000	153.07500000	
Bentley	58202	Rainfall	Lismore City Council	75%	NA	-28.74060000	153.07500000	

Station Name	Station code	Station Type	Owner	Data Capture	Datum	Latitude	Longitude	Comments
Goolmangar Creek at Goolmangar	558075	Water level	Lismore City Council	100%	Local datum	-28.74880000	153.21800000	
Goolmangar	558075	Rainfall	Lismore City Council	100%	NA	-28.74880000	153.21800000	
Wilson's River at Eltham	203014	Water level	Water NSW	100%	Local datum	-28.75610000	153.39550000	
Eden Creek at Doubtful	203034	Water level	Water NSW	100%	Local datum	-28.75760000	152.92350000	
Eden Creek	558037	Rainfall	BoM	100%	NA	-28.75910000	152.92220000	
Lake Ainsworth	203455	Water level	OEH/MHL	100%	AHD	-28.78075797	153.59282403	
Houghlahans Creek	558069	Rainfall	Ballina Shire Council	100%	NA	-28.78530000	153.47390000	
Woodlawn College	203402	Water level	OEH/MHL	100%	AHD	-28.78541179	153.30253893	Flood peak was interpolated from debris line survey.
Tuncester	203443	Water level	OEH/MHL	100%	AHD	-28.79575471	153.24019648	
Tuncester	58201	Rainfall	Lismore City Council	100%	NA	-28.79670000	153.23860000	
Maguires Creek at Teven	558070	Water level	Ballina Shire Council	100%	Local datum	-28.80170000	153.47440000	
Lismore (Dawson Street)	558087	Water level	Lismore City Council	100%	AHD	-28.80810000	153.28180000	
Lismore (Dawson St)	558087	Rainfall	Lismore City Council	100%	NA	-28.80810000	153.28180000	
Wilson's River at Lismore (mAHD)	203904	Water level	Lismore City Council	39%	AHD	-28.81000000	153.27330000	
Tuckombil	558071	Rainfall	Ballina Shire Council	65%	NA	-28.81780000	153.48420000	Data was lost due to ERTS canister failure.
Lismore Airport	58214	Rainfall	BoM	67%	NA	-28.83050000	153.26010000	
Alstonville STP	558072	Rainfall	Ballina Shire Council	83%	NA	-28.83060000	153.44440000	
Ballina AP	58198	Rainfall	BoM	100%	NA	-28.83530000	153.55850000	
East Gundurimba	203427	Water level	OEH/MHL	100%	AHD	-28.84570949	153.26689381	
Richmond River at Casino	203004	Water level	Water NSW	100%	Local datum	-28.86370000	153.05530000	
Missingham Bridge Ballina	203465	Water level	OEH/MHL	100%	AHD	-28.86874414	153.57587082	

Station Name	Station code	Station Type	Owner	Data Capture	Datum	Latitude	Longitude	Comments
Byrnes Point	203461	Water level	OEH/MHL	100%	AHD	-28.87376511	153.52668832	
Ballina Breakwall	203425	Ocean tide	OEH/MHL	100%	AHD	-28.87537745	153.58442879	
Casino	58208	Rainfall	BoM	100%	NA	-28.88240000	153.06180000	
Shannon Brook at Yorklea	203041	Water level	Water NSW	100%	Local datum	-28.94340000	153.06160000	
Yorklea	558038	Rainfall	BoM	100%	NA	-28.94470000	153.06030000	
Wardell	203468	Water level	OEH/MHL	100%	AHD	-28.95341219	153.46469697	
Wilson's River at Tuckurimba	558076	Water level	Lismore City Council	70%	Local datum	-28.96190000	153.30660000	
Tuckurimba	558076	Rainfall	Lismore City Council	100%	NA	-28.96190000	153.30660000	
Coraki	203403	Water level	OEH/MHL	100%	AHD	-28.98380196	153.28723405	
Richmond River at Oakland Road	203470	Water level	Water NSW	100%	Local datum	-29.00720674	153.27398168	
Bungawalbin	203450	Water level	OEH/MHL	100%	AHD	-29.03345559	153.27761472	
Busbys Flat	58207	Rainfall	BoM	100%	NA	-29.03740000	152.80550000	
Woodburn	203412	Water level	OEH/MHL	100%	AHD	-29.07109272	153.34413632	
Tucombil Highway Bridge	203480	Water level	OEH/MHL	100%	AHD	-29.08458239	153.33856060	
Rocky Mouth Creek	203432	Water level	OEH/MHL	100%	AHD	-29.09603047	153.32625613	
Myrtle Creek at Rappville	203030	Water level	Water NSW	100%	Local datum	-29.11000000	152.99940000	
Rappville	558015	Rainfall	BoM	100%	NA	-29.11190000	152.99830000	
Evans River Fishing Co-op	203462	Water level	OEH/MHL	100%	AHD	-29.12240415	153.43428897	
Iron Gates	203475	Water level	OEH/MHL	100%	AHD	-29.12369592	153.40808279	
Bungawalbin Creek	2034133	Water level	OEH/MHL	100%	AHD	-29.13985053	153.17026047	
Evans Head	58212	Rainfall	BoM	100%	NA	-29.18300000	153.39640000	
Whiporie	58099	Rainfall	BoM	41%	NA	-29.28230000	152.98860000	
Coffs Harbour	205470	Wave height and direction	OEH/MHL	100%	NA	-30.30286900	153.14614400	
<b>Overall average</b>				<b>94%</b>				

## Appendix B – Flood photographs March 2017 event

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This appendix provides flood photographs captured during and after the flood event, including debris lines indicating maximum water levels. Photographs are courtesy of David Griffin, Phil Lee and John Vaubell of MHL.



Tweed River entrance discharging silt to the ocean, 10.51am 31 March 2017 0.85m AHD



Tweed River downstream of Tumbulgum 1.59pm 31 March 2017 3.31m AHD



Tweed River, Barneys Point 12.28pm 31 March 2017 2.20m AHD



Tweed River at Byangum Bridge upstream of Bray Park Weir, 3.01pm 2 April 2017 1.44m AHD (post flood)



Tweed River, Tumbulgum 1.03pm 30 March 2017 2.25m AHD



Tweed River, Tumbulgum 10.50am 2 April 2017 1.40m AHD (post flood)



Tweed River, Dry Dock 11.34am 31 March 2017 0.88m AHD



Tweed River, Murwillumbah, 11.50am 2 April 2017 1.387m AHD (post flood)



Richmond River, Wardell 11.08am 5 April 2017 0.78m AHD (post flood)



Wilson's River, Winterton Parade North Lismore 12.39pm 4 April 2017 debris line on bridge



Leycester Creek, Tuncester 23 May 2017, hay bales lifted by the flood onto the railway tracks

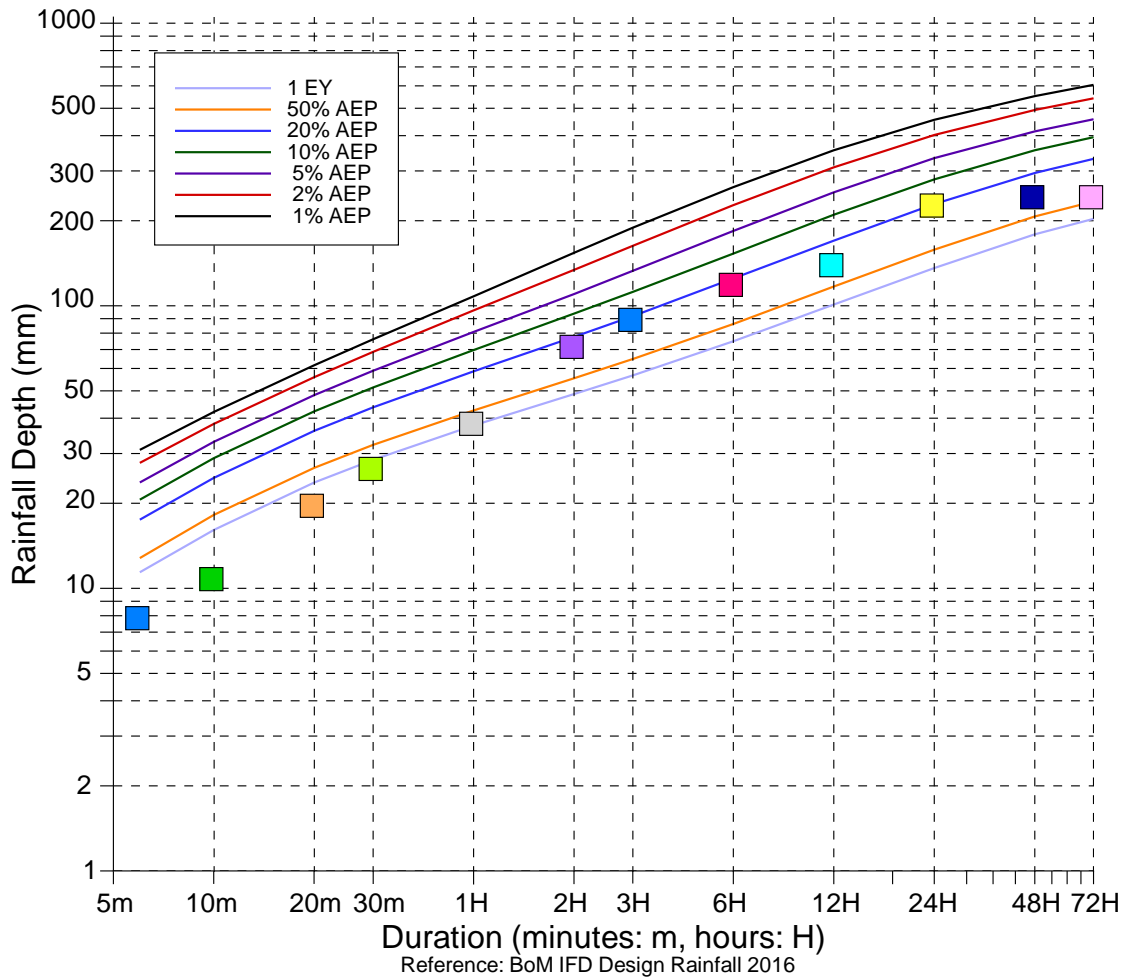
## Appendix C – 2016 Intensity-frequency-duration

This appendix displays the rainfall intensities in the ARR2016 format. Refer to **Table C-1** for a reference list of the 2016 intensity-frequency-duration (IFD) curves. Stations are ordered from north to south.

**Table C-1 2016 IFD figure reference list**

Figure reference	Station
C01	Banora (STP)
C02	Bilambil Heights
C03	Barneys Point
C04	Tomewin
C05	Kingscliff (STP)
C06	Couchy Creek
C07	Numinbah
C08	Upper Rous River (Hopkins Ck)
C09	Duranbah
C10	Tumbulgum
C11	Bald Mountain
C12	Chillingham
C13	Boat Harbour
C14	Murwillumbah (STP)
C15	Murwillumbah
C16	Clothiers Creek
C17	Bray Park (WTP)
C18	Hastings (STP)
C19	Eungella
C20	Tyalgum Bridge
C21	Dairy Flat
C22	Cudgera Lake
C23	Brays Creek
C24	Cudgera Creek (Pottsville)
C25	Loadstone
C26	Uki
C27	Palmers Road
C28	Burringbar
C29	Clarrie Hall Dam
C30	Upper Crabbes Creek
C31	Kunghur
C32	Crabbes Creek
C33	Green Pigeon
C34	Yelgun
C35	Middle Pocket
C36	Main Arm
C37	Upper Main Arm

C38	Wiangaree
C39	Chincogan
C40	Lillian Rock
C41	Doon Doon
C42	Huonbrook
C43	Mullumbimby Creek
C44	Terania Creek
C45	Myocum
C46	Goonengerry
C47	Cawongla
C48	Nimbin
C49	Kyogle
C50	Cape Byron
C51	Repentance
C52	The Channon
C53	Dunoon
C54	Jiggi (Gwynne St)
C55	Corndale
C56	Nashua
C57	Rock Valley
C58	Bentley
C59	Goolmangar
C60	Eden Ck
C61	Houghlahan's Creek
C62	Tuncester
C63	Lismore (Dawson St)
C64	Tuckombil
C65	Lismore Airport
C66	Alstonville STP
C67	Ballina AP
C68	Casino
C69	Yorklea
C70	Tuckurimba
C71	Busbys Flat
C72	Rappville
C73	Evans Head
C74	Whiporie

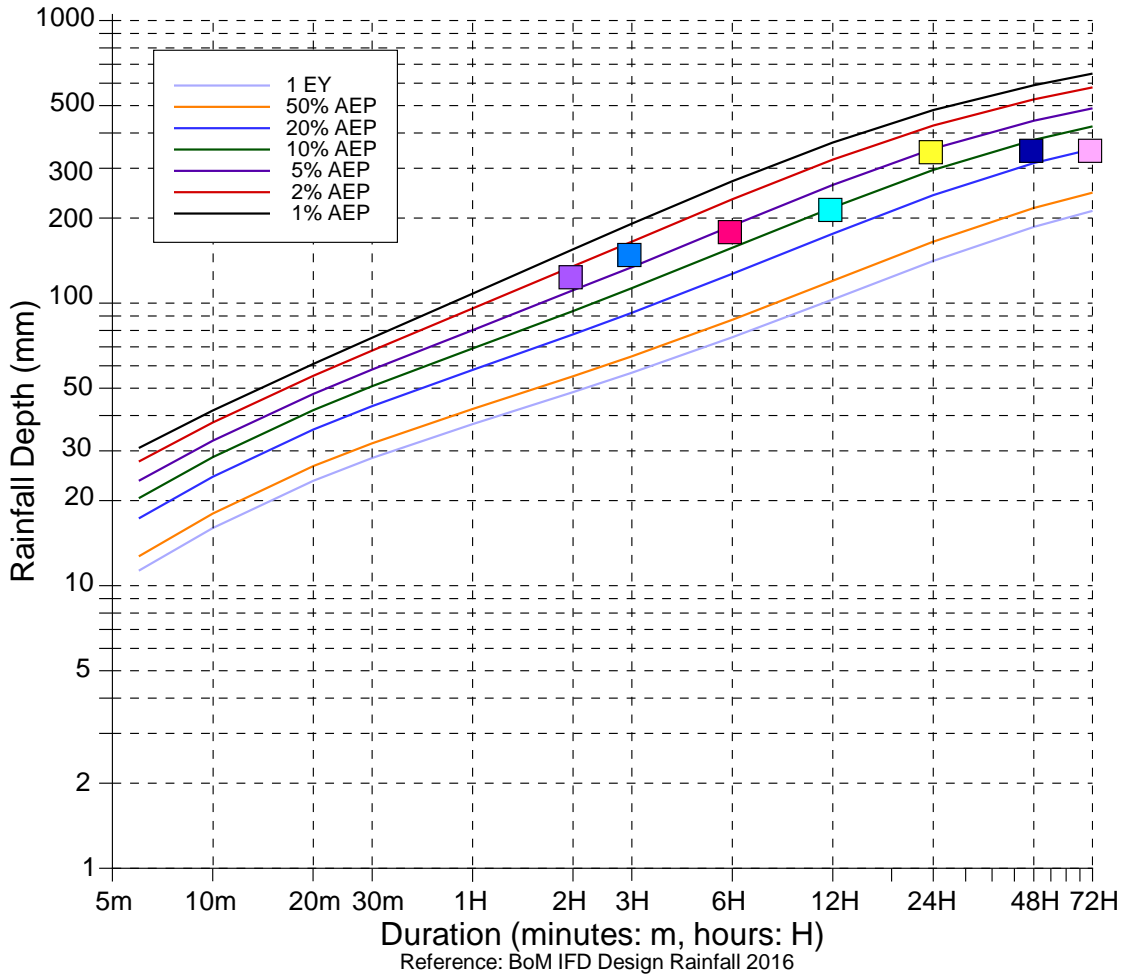


Duration (minutes:m Hours: H)	Rainfall Depth (mm)	Time/Date
6m	8.0	21:36_30/03/2017
10m	11.0	21:38_30/03/2017
20m	20.0	22:52_30/03/2017
30m	27.0	22:42_30/03/2017
1H	39.0	21:18_30/03/2017
2H	73.0	21:16_30/03/2017
3H	91.0	20:22_30/03/2017
6H	121.0	19:16_30/03/2017
12H	142.0	17:04_30/03/2017
24H	231.0	01:26_30/03/2017
48H	247.0	18:20_29/03/2017
72H	247.0	18:20_29/03/2017

The probability terminology used for the 2016 design rainfalls is consistent with the probability terminology for the new edition of Australian Rainfall and Runoff (ARR2016). Further details on the new probability terminology can be found in Book 1; Chapter 2; Section 2.2 Terminology of ARR2016 <http://arr.ga.gov.au/arr-guideline>. The main terms used to describe design rainfalls are:

- *Exceedances per year (EY)*: the number of times an event is likely to occur or be exceeded within any given year.
- *Annual exceedance probability (AEP)*: the probability or likelihood of an event occurring or being exceeded within any given year, usually expressed as a percentage.

For further information refer to BoM frequently asked questions: <http://www.bom.gov.au/water/designRainfalls/ifd/ifd-faq.shtml>



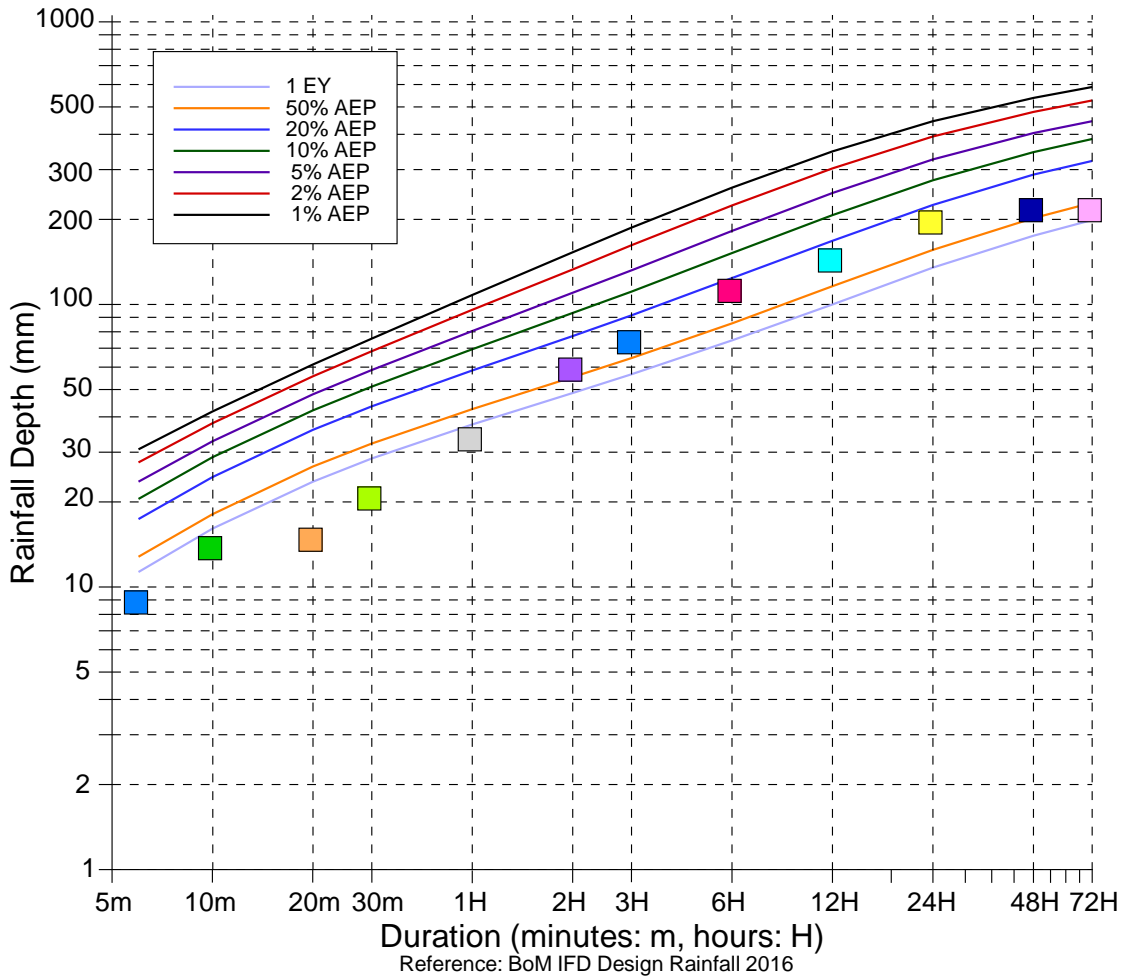
Short duration rainfall data impacted by possible radio transfer interruptions. Suspect short duration IFD results removed by observation.

Duration (minutes:m) (Hours: H)	Rainfall Depth (mm)	Time/Date
6m		
10m		
20m		
30m		
1H		
2H	126.0	21:26_30/03/2017
3H	151.0	20:28_30/03/2017
6H	182.0	17:36_30/03/2017
12H	218.0	11:30_30/03/2017
24H	349.0	01:26_30/03/2017
48H	353.0	17:20_29/03/2017
72H	353.0	17:20_29/03/2017

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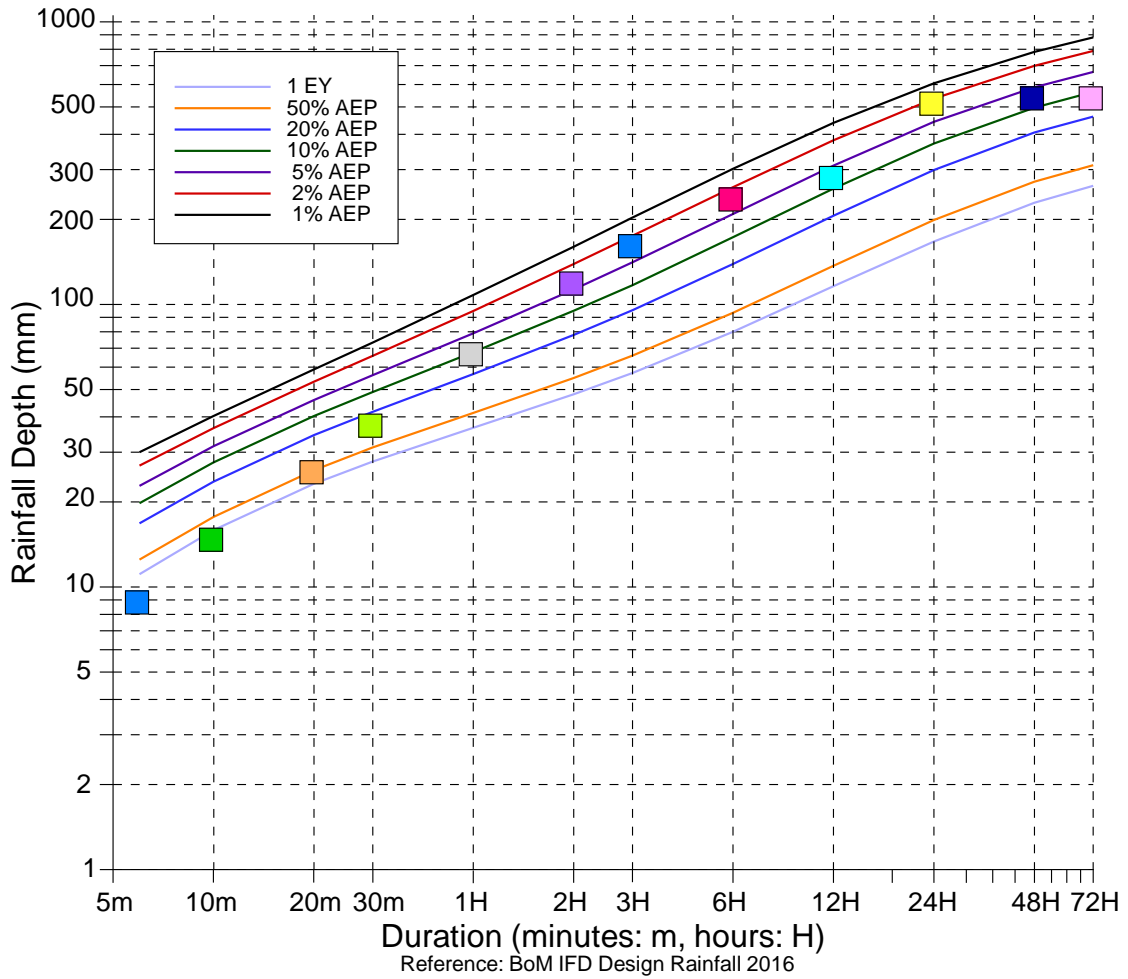


Duration (minutes:m Hours: H)	Rainfall Depth (mm)	Time/Date
6m	9.0	17:08_17/03/2017
10m	14.0	17:08_17/03/2017
20m	15.0	17:08_17/03/2017
30m	21.0	22:40_30/03/2017
1H	34.0	21:14_30/03/2017
2H	60.0	21:14_30/03/2017
3H	75.0	20:12_30/03/2017
6H	114.0	19:26_30/03/2017
12H	146.0	16:52_30/03/2017
24H	199.0	06:26_30/03/2017
48H	220.0	22:34_29/03/2017
72H	220.0	22:34_29/03/2017

The probability terminology used for the 2016 design rainfalls is consistent with the probability terminology for the new edition of Australian Rainfall and Runoff (ARR2016). Further details on the new probability terminology can be found in Book 1; Chapter 2; Section 2.2 Terminology of ARR2016 <http://arr.ga.gov.au/arr-guideline>. The main terms used to describe design rainfalls are:

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Duration (minutes:m) (Hours: H)	Rainfall Depth (mm)	Time/Date
6m	9.0	21:18_30/03/2017
10m	15.0	20:58_30/03/2017
20m	26.0	20:56_30/03/2017
30m	38.0	20:56_30/03/2017
1H	68.0	20:34_30/03/2017
2H	121.0	20:36_30/03/2017
3H	164.0	19:50_30/03/2017
6H	240.0	18:14_30/03/2017
12H	286.0	11:24_30/03/2017
24H	524.0	00:28_30/03/2017
48H	547.0	14:00_29/03/2017
72H	547.0	14:00_29/03/2017

The probability terminology used for the 2016 design rainfalls is consistent with the probability terminology for the new edition of Australian Rainfall and Runoff (ARR2016). Further details on the new probability terminology can be found in Book 1; Chapter 2; Section 2.2 Terminology of ARR2016 <http://arr.ga.gov.au/arr-guideline>. The main terms used to describe design rainfalls are:

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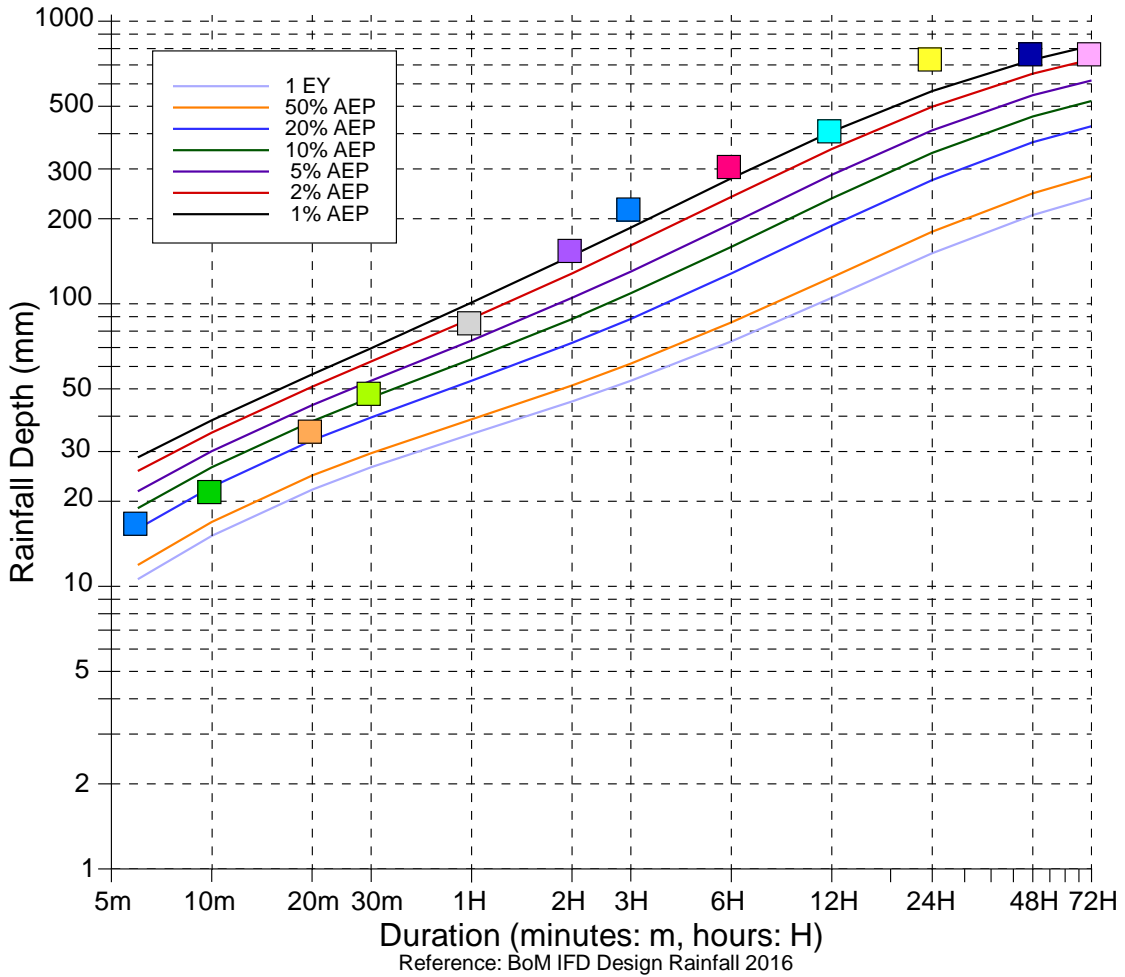
For further information refer to BoM frequently asked questions: <http://www.bom.gov.au/water/designRainfalls/ifd/ifd-faq.shtml>

\* Event data not available. IFD analysis has not been undertaken.

The probability terminology used for the 2016 design rainfalls is consistent with the probability terminology for the new edition of Australian Rainfall and Runoff (ARR2016). Further details on the new probability terminology can be found in Book 1; Chapter 2; Section 2.2 Terminology of ARR2016 <http://arr.ga.gov.au/arr-guideline>. The main terms used to describe design rainfalls are:

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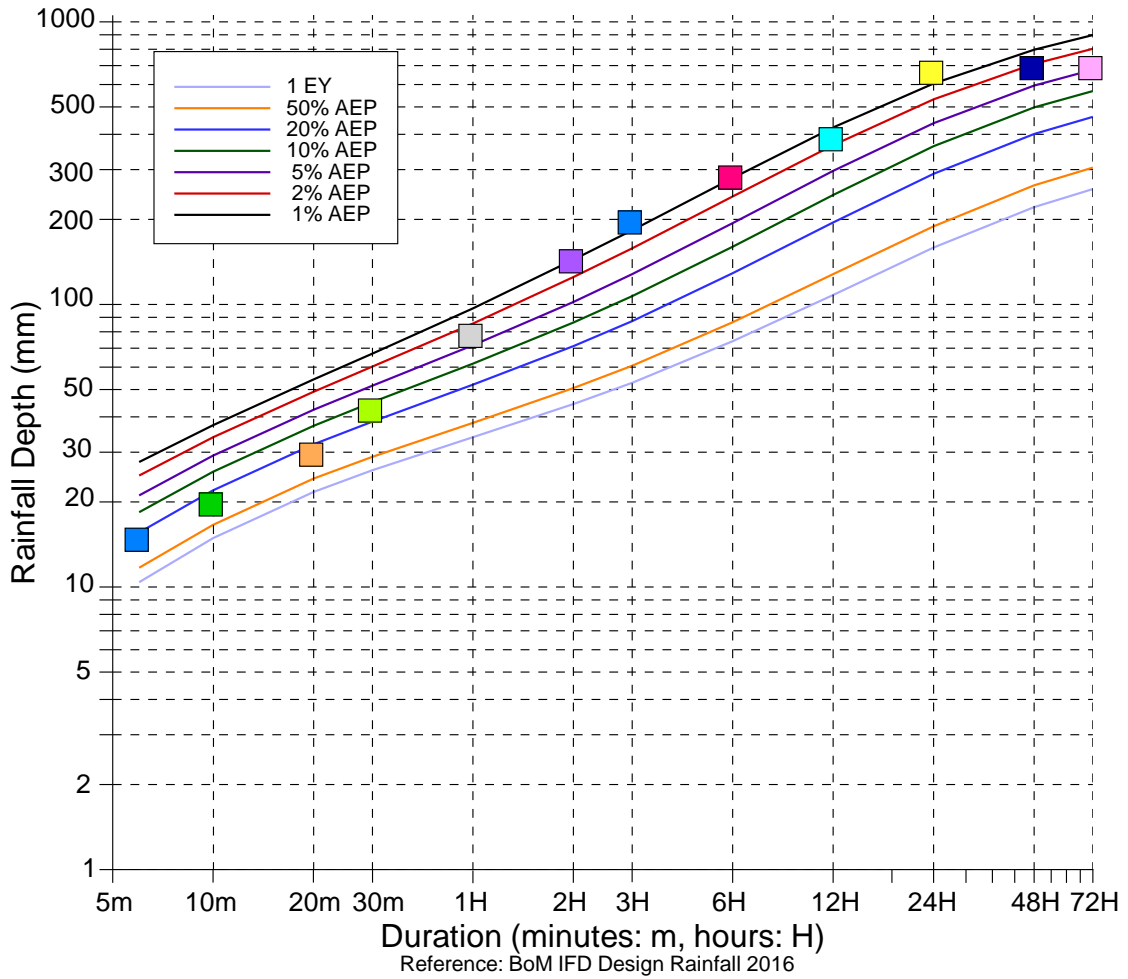


Duration (minutes:m Hours: H)	Rainfall Depth (mm)	Time/Date
6m	17.0	23:54_30/03/2017
10m	22.0	12:34_30/03/2017
20m	36.0	12:26_30/03/2017
30m	49.0	21:58_30/03/2017
1H	87.0	11:48_30/03/2017
2H	157.0	21:40_30/03/2017
3H	220.0	21:26_30/03/2017
6H	311.0	19:18_30/03/2017
12H	416.0	12:02_30/03/2017
24H	747.0	01:52_30/03/2017
48H	779.0	15:44_29/03/2017
72H	779.0	15:44_29/03/2017

The probability terminology used for the 2016 design rainfalls is consistent with the probability terminology for the new edition of Australian Rainfall and Runoff (ARR2016). Further details on the new probability terminology can be found in Book 1; Chapter 2; Section 2.2 Terminology of ARR2016 <http://arr.ga.gov.au/arr-guideline>. The main terms used to describe design rainfalls are:

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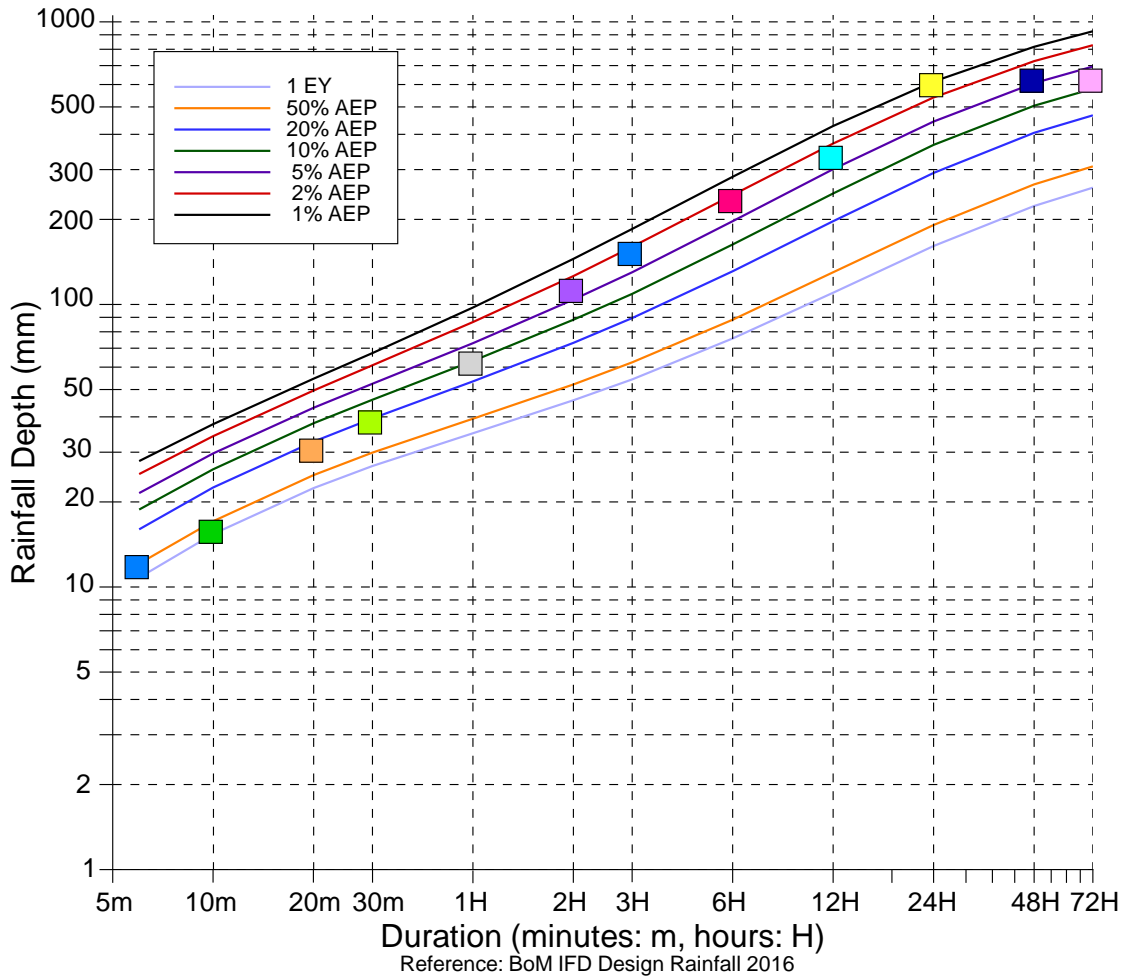


Duration (minutes:m) (Hours: H)	Rainfall Depth (mm)	Time/Date
6m	15.0	00:14_31/03/2017
10m	20.0	23:56_30/03/2017
20m	30.0	22:08_30/03/2017
30m	43.0	22:16_30/03/2017
1H	79.0	22:08_30/03/2017
2H	145.0	22:06_30/03/2017
3H	199.0	21:36_30/03/2017
6H	287.0	19:04_30/03/2017
12H	392.0	12:20_30/03/2017
24H	674.0	02:00_30/03/2017
48H	700.0	16:44_29/03/2017
72H	700.0	16:44_29/03/2017

The probability terminology used for the 2016 design rainfalls is consistent with the probability terminology for the new edition of Australian Rainfall and Runoff (ARR2016). Further details on the new probability terminology can be found in Book 1; Chapter 2; Section 2.2 Terminology of ARR2016 <http://arr.ga.gov.au/arr-guideline>. The main terms used to describe design rainfalls are:

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- Annual exceedance probability (AEP): the probability or likelihood of an event occurring or being exceeded within any given year, usually expressed as a percentage.

For further information refer to BoM frequently asked questions: <http://www.bom.gov.au/water/designRainfalls/ifd/ifd-faq.shtml>

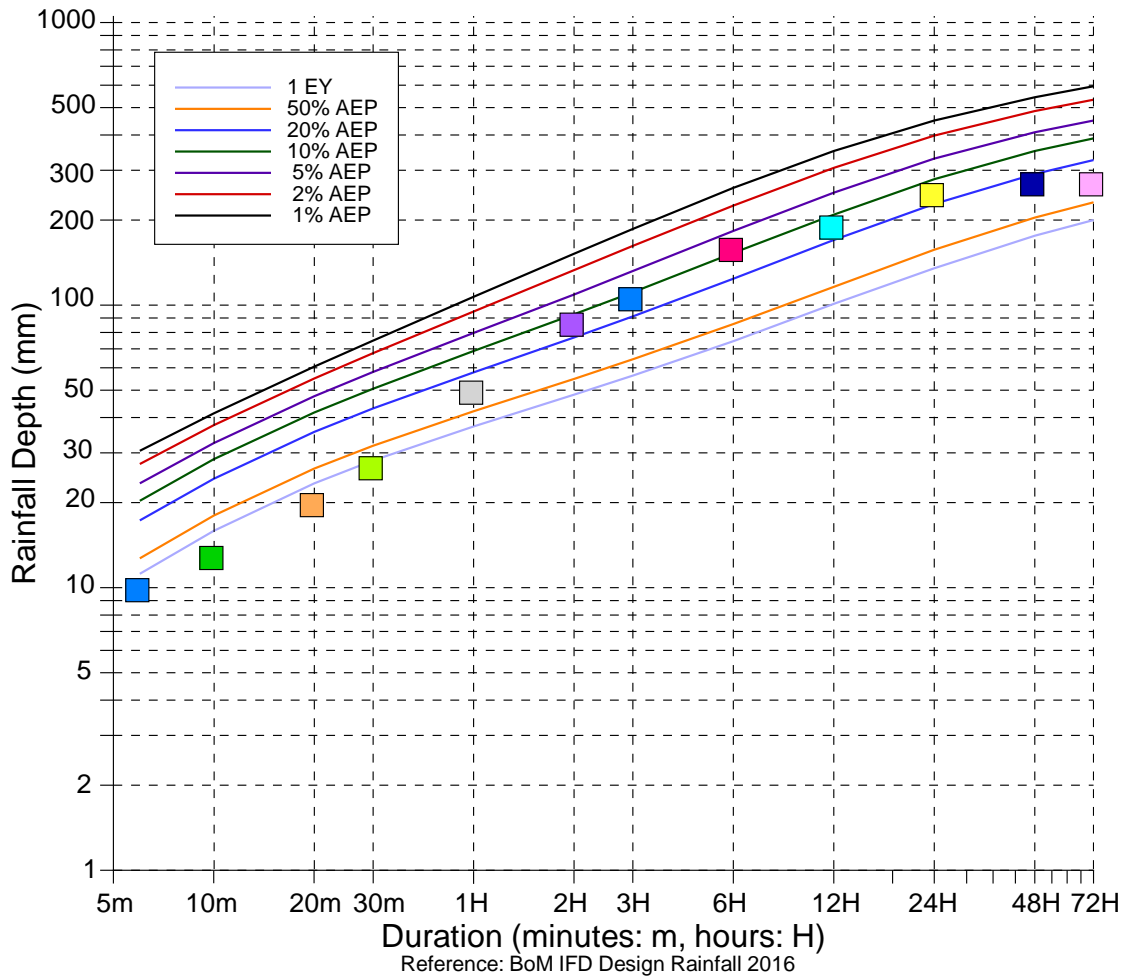


Duration (minutes:m) (Hours: H)	Rainfall Depth (mm)	Time/Date
6m	12.0	22:12_30/03/2017
10m	16.0	22:08_30/03/2017
20m	31.0	21:58_30/03/2017
30m	39.0	21:48_30/03/2017
1H	63.0	21:52_30/03/2017
2H	114.0	21:54_30/03/2017
3H	154.0	21:40_30/03/2017
6H	237.0	19:20_30/03/2017
12H	337.0	12:20_30/03/2017
24H	609.0	03:26_30/03/2017
48H	632.0	16:32_29/03/2017
72H	632.0	16:32_29/03/2017

The probability terminology used for the 2016 design rainfalls is consistent with the probability terminology for the new edition of Australian Rainfall and Runoff (ARR2016). Further details on the new probability terminology can be found in Book 1; Chapter 2; Section 2.2 Terminology of ARR2016 <http://arr.ga.gov.au/arr-guideline>. The main terms used to describe design rainfalls are:

- *Exceedances per year (EY)*: the number of times an event is likely to occur or be exceeded within any given year.
- *Annual exceedance probability (AEP)*: the probability or likelihood of an event occurring or being exceeded within any given year, usually expressed as a percentage.

For further information refer to BoM frequently asked questions: <http://www.bom.gov.au/water/designRainfalls/ifd/ifd-faq.shtml>

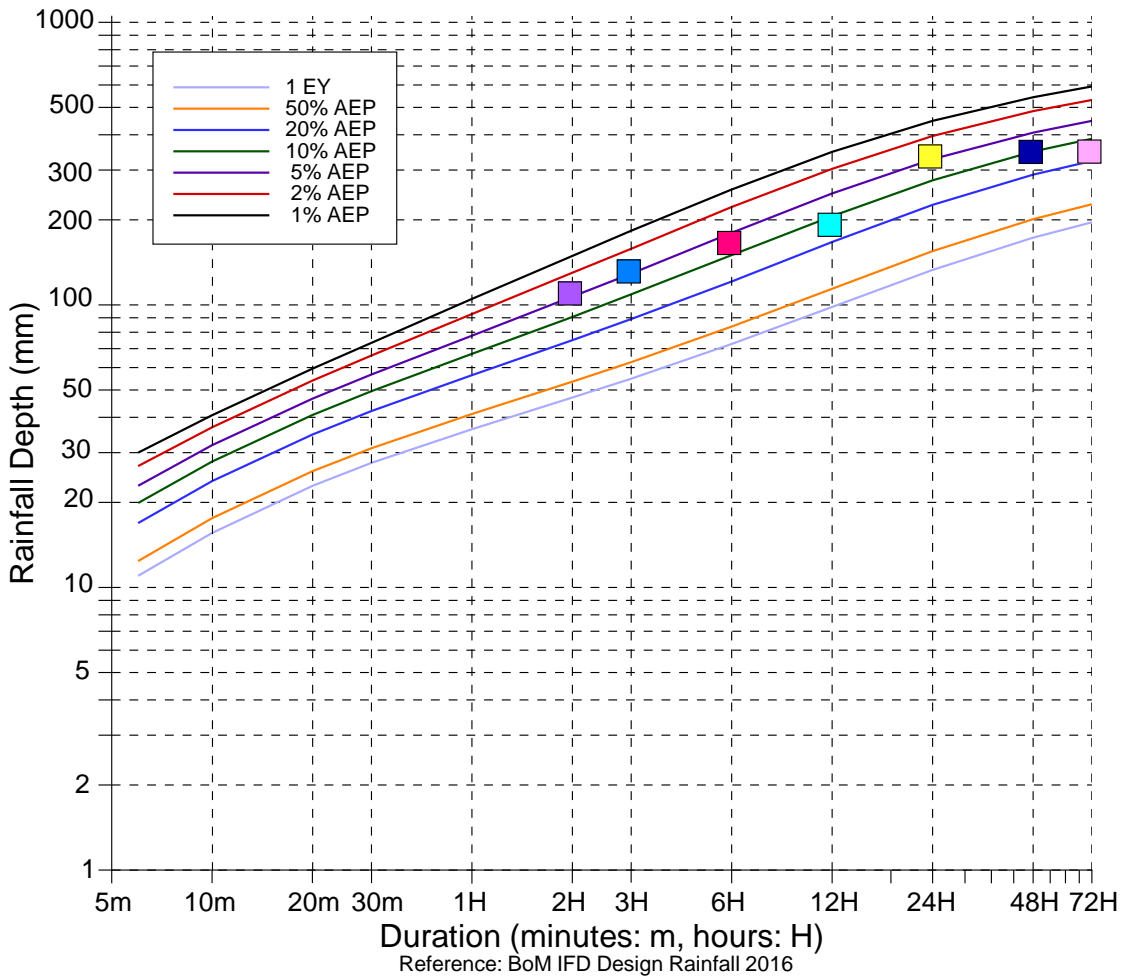


Duration (minutes:m) (Hours: H)	Rainfall Depth (mm)	Time/Date
6m	10.0	02:32_19/03/2017
10m	13.0	02:28_19/03/2017
20m	20.0	22:54_30/03/2017
30m	27.0	22:42_30/03/2017
1H	50.0	21:22_30/03/2017
2H	87.0	21:18_30/03/2017
3H	107.0	20:40_30/03/2017
6H	160.0	20:16_30/03/2017
12H	192.0	16:50_30/03/2017
24H	250.0	02:20_30/03/2017
48H	273.0	21:48_29/03/2017
72H	273.0	21:48_29/03/2017

The probability terminology used for the 2016 design rainfalls is consistent with the probability terminology for the new edition of Australian Rainfall and Runoff (ARR2016). Further details on the new probability terminology can be found in Book 1; Chapter 2; Section 2.2 Terminology of ARR2016 <http://arr.ga.gov.au/arr-guideline>. The main terms used to describe design rainfalls are:

- *Exceedances per year (EY)*: the number of times an event is likely to occur or be exceeded within any given year.
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For further information refer to BoM frequently asked questions: <http://www.bom.gov.au/water/designRainfalls/ifd/ifd-faq.shtml>



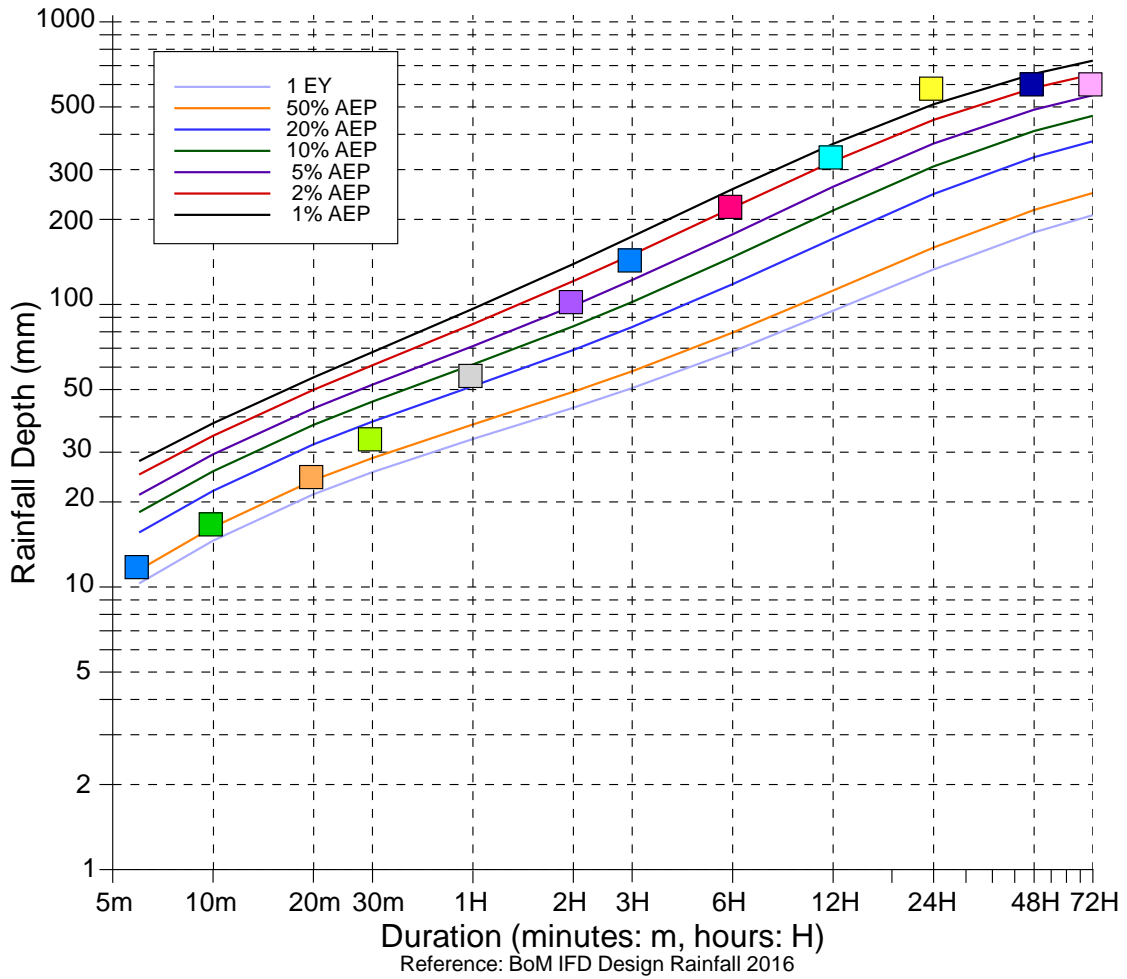
Short duration rainfall data impacted by possible radio transfer interruptions. Suspect short duration IFD results removed by observation.

Duration (minutes:m) (Hours: H)	Rainfall Depth (mm)	Time/Date
6m		
10m		
20m		
30m		
1H		
2H	112.0	21:12_30/03/2017
3H	134.0	20:14_30/03/2017
6H	169.0	19:16_30/03/2017
12H	196.0	15:30_30/03/2017
24H	342.0	01:40_30/03/2017
48H	355.0	22:40_29/03/2017
72H	356.0	01:40_29/03/2017

The probability terminology used for the 2016 design rainfalls is consistent with the probability terminology for the new edition of Australian Rainfall and Runoff (ARR2016). Further details on the new probability terminology can be found in Book 1; Chapter 2; Section 2.2 Terminology of ARR2016 <http://arr.ga.gov.au/arr-guideline>. The main terms used to describe design rainfalls are:

- Exceedances per year (EY): the number of times an event is likely to occur or be exceeded within any given year.
- Annual exceedance probability (AEP): the probability or likelihood of an event occurring or being exceeded within any given year, usually expressed as a percentage.

For further information refer to BoM frequently asked questions: <http://www.bom.gov.au/water/designRainfalls/ifd/ifd-faq.shtml>

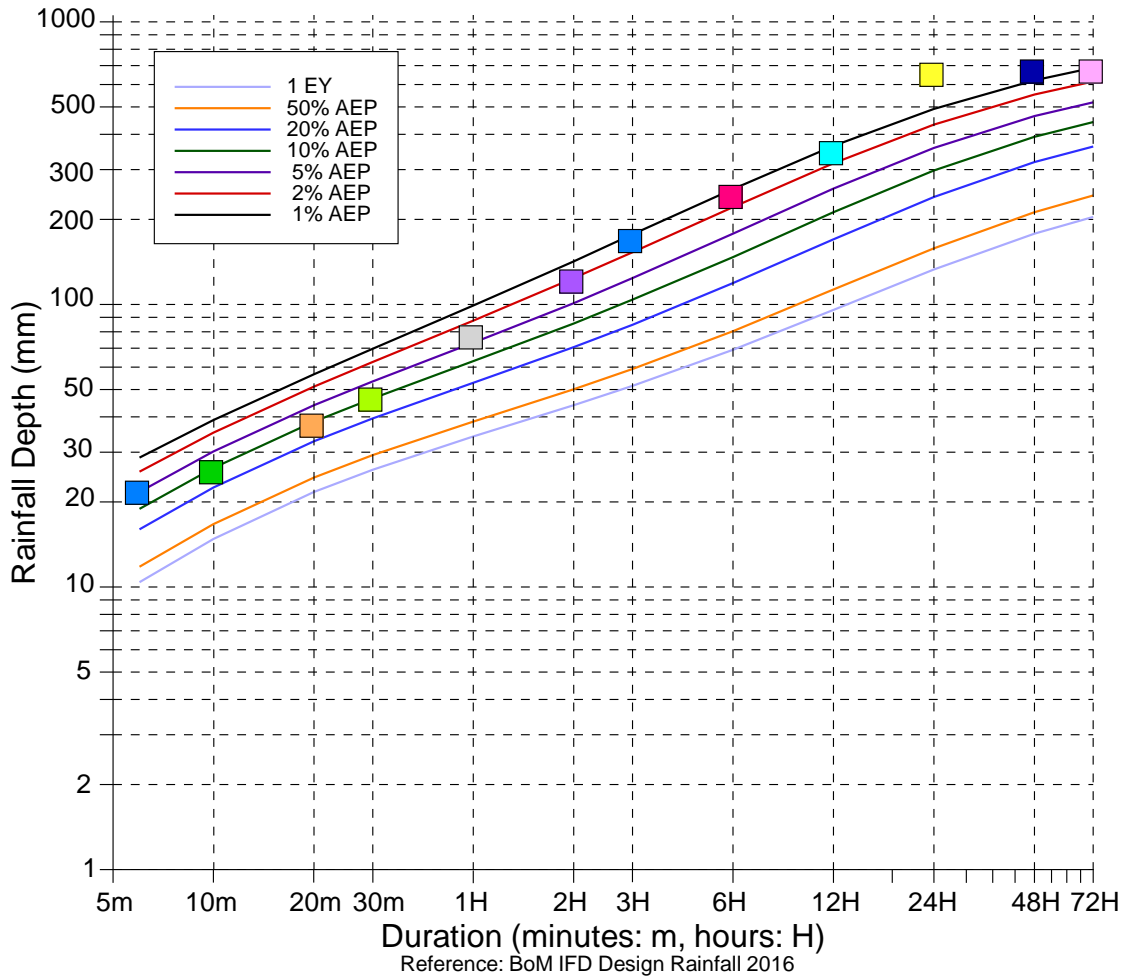


Duration (minutes:m) (Hours: H)	Rainfall Depth (mm)	Time/Date
6m	12.0	17:16_30/03/2017
10m	17.0	17:16_30/03/2017
20m	25.0	11:40_30/03/2017
30m	34.0	07:02_30/03/2017
1H	57.0	22:00_30/03/2017
2H	104.0	21:54_30/03/2017
3H	146.0	21:46_30/03/2017
6H	226.0	19:08_30/03/2017
12H	338.0	12:26_30/03/2017
24H	592.0	02:36_30/03/2017
48H	613.0	16:52_29/03/2017
72H	613.0	16:52_29/03/2017

The probability terminology used for the 2016 design rainfalls is consistent with the probability terminology for the new edition of Australian Rainfall and Runoff (ARR2016). Further details on the new probability terminology can be found in Book 1; Chapter 2; Section 2.2 Terminology of ARR2016 <http://arr.ga.gov.au/arr-guideline>. The main terms used to describe design rainfalls are:

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For further information refer to BoM frequently asked questions: <http://www.bom.gov.au/water/designRainfalls/ifd/ifd-faq.shtml>

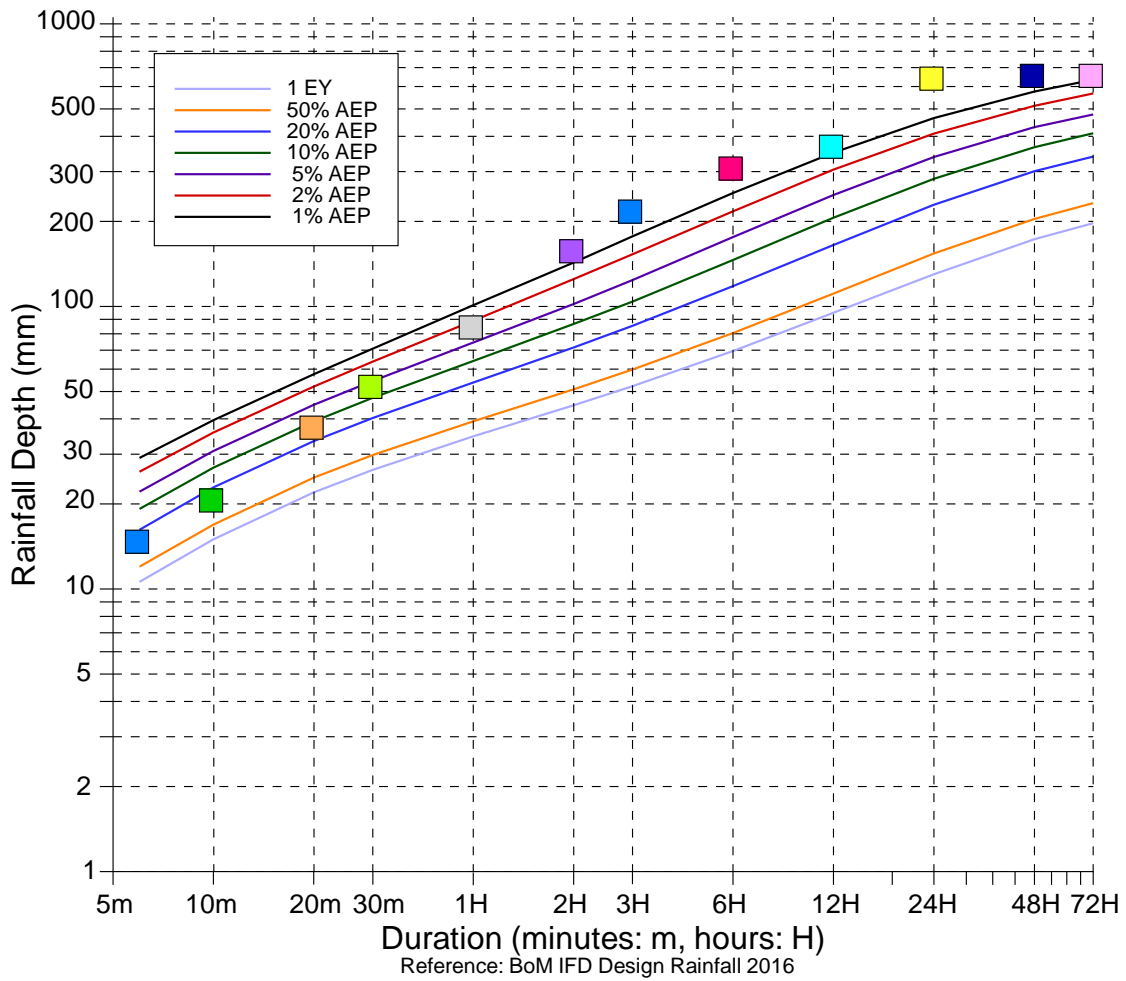


Duration (minutes:m) (Hours: H)	Rainfall Depth (mm)	Time/Date
6m	22.0	11:58_30/03/2017
10m	26.0	11:54_30/03/2017
20m	38.0	11:56_30/03/2017
30m	47.0	11:54_30/03/2017
1H	78.0	11:54_30/03/2017
2H	123.0	22:16_30/03/2017
3H	171.0	21:40_30/03/2017
6H	245.0	19:14_30/03/2017
12H	350.0	02:12_30/03/2017
24H	663.0	02:06_30/03/2017
48H	681.0	15:14_29/03/2017
72H	681.0	15:14_29/03/2017

The probability terminology used for the 2016 design rainfalls is consistent with the probability terminology for the new edition of Australian Rainfall and Runoff (ARR2016). Further details on the new probability terminology can be found in Book 1; Chapter 2; Section 2.2 Terminology of ARR2016 <http://arr.ga.gov.au/arr-guideline>. The main terms used to describe design rainfalls are:

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For further information refer to BoM frequently asked questions: <http://www.bom.gov.au/water/designRainfalls/ifd/ifd-faq.shtml>



Duration (minutes:m Hours: H)	Rainfall Depth (mm)	Time/Date
6m	15.0	12:52_30/03/2017
10m	21.0	23:44_18/03/2017
20m	38.0	23:28_30/03/2017
30m	53.0	23:26_30/03/2017
1H	86.0	23:28_30/03/2017
2H	160.0	22:56_30/03/2017
3H	221.0	22:00_30/03/2017
6H	314.0	19:22_30/03/2017
12H	375.0	12:52_30/03/2017
24H	653.0	01:56_30/03/2017
48H	668.0	19:08_29/03/2017
72H	668.0	19:08_29/03/2017

The probability terminology used for the 2016 design rainfalls is consistent with the probability terminology for the new edition of Australian Rainfall and Runoff (ARR2016). Further details on the new probability terminology can be found in Book 1; Chapter 2; Section 2.2 Terminology of ARR2016 <http://arr.ga.gov.au/arr-guideline>. The main terms used to describe design rainfalls are:

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- Annual exceedance probability (AEP): the probability or likelihood of an event occurring or being exceeded within any given year, usually expressed as a percentage.

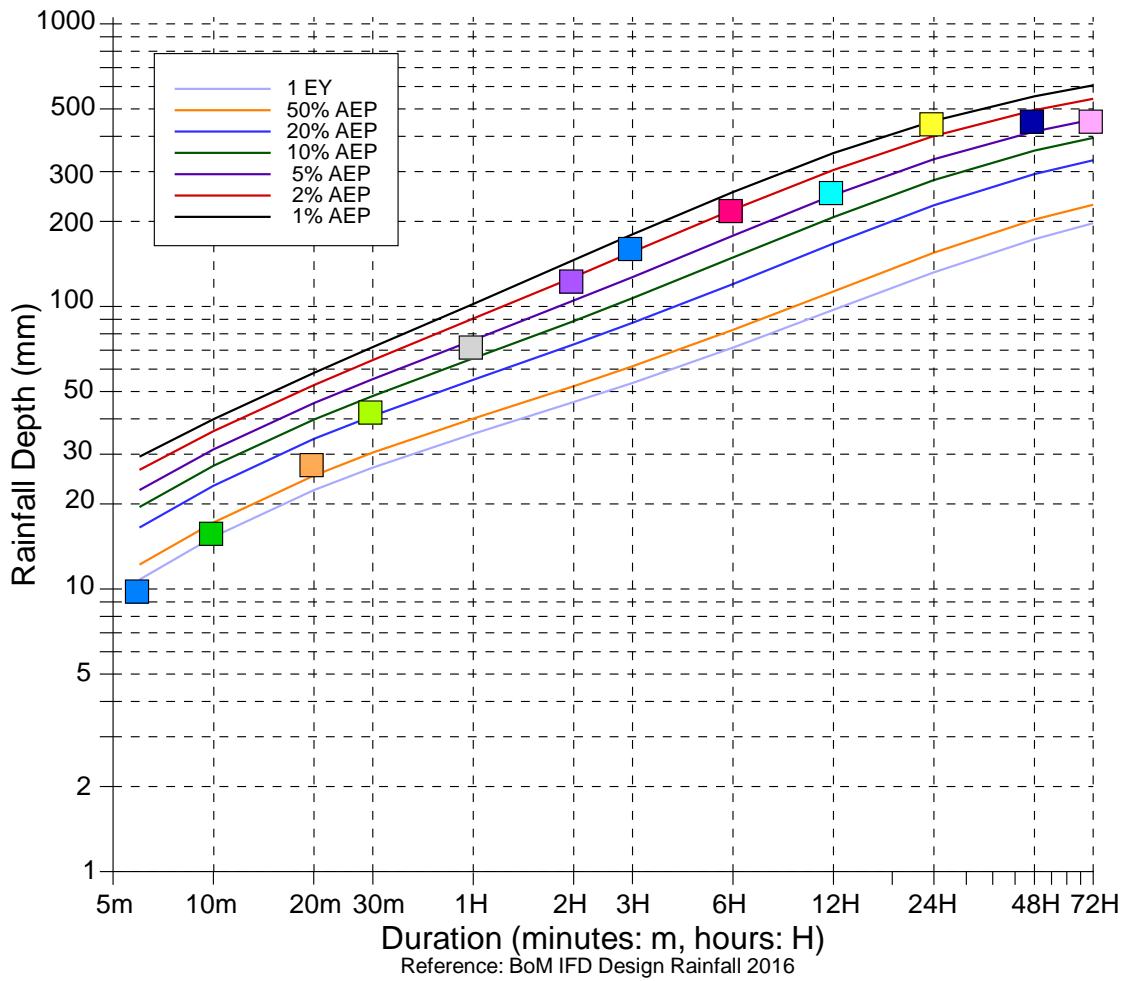
For further information refer to BoM frequently asked questions: <http://www.bom.gov.au/water/designRainfalls/ifd/ifd-faq.shtml>

\* Event data not available. IFD analysis has not been undertaken.

The probability terminology used for the 2016 design rainfalls is consistent with the probability terminology for the new edition of Australian Rainfall and Runoff (ARR2016). Further details on the new probability terminology can be found in Book 1; Chapter 2; Section 2.2 Terminology of ARR2016 <http://arr.ga.gov.au/arr-guideline>. The main terms used to describe design rainfalls are:

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For further information refer to BoM frequently asked questions: <http://www.bom.gov.au/water/designRainfalls/ifd/ifd-faq.shtml>



Duration (minutes:m) (Hours: H)	Rainfall Depth (mm)	Time/Date
6m	10.0	23:42_30/03/2017
10m	16.0	23:06_30/03/2017
20m	28.0	23:14_30/03/2017
30m	43.0	23:06_30/03/2017
1H	73.0	22:54_30/03/2017
2H	125.0	21:54_30/03/2017
3H	163.0	20:56_30/03/2017
6H	222.0	19:18_30/03/2017
12H	257.0	12:42_30/03/2017
24H	450.0	01:42_30/03/2017
48H	460.0	19:16_29/03/2017
72H	460.0	19:16_29/03/2017

The probability terminology used for the 2016 design rainfalls is consistent with the probability terminology for the new edition of Australian Rainfall and Runoff (ARR2016). Further details on the new probability terminology can be found in Book 1; Chapter 2; Section 2.2 Terminology of ARR2016 <http://arr.ga.gov.au/arr-guideline>. The main terms used to describe design rainfalls are:

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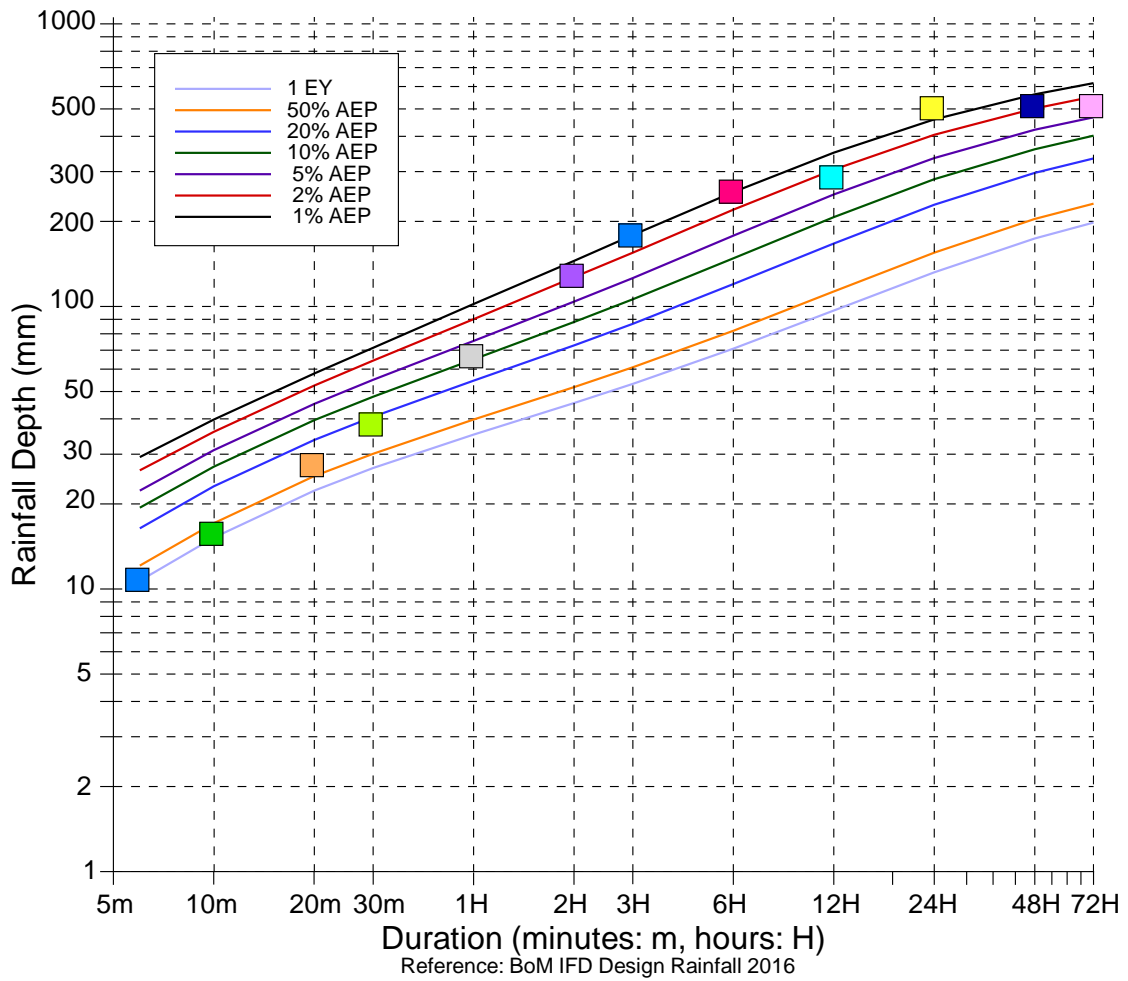
For further information refer to BoM frequently asked questions: <http://www.bom.gov.au/water/designRainfalls/ifd/ifd-faq.shtml>

\* Event data not available. IFD analysis has not been undertaken.

The probability terminology used for the 2016 design rainfalls is consistent with the probability terminology for the new edition of Australian Rainfall and Runoff (ARR2016). Further details on the new probability terminology can be found in Book 1; Chapter 2; Section 2.2 Terminology of ARR2016 <http://arr.ga.gov.au/arr-guideline>. The main terms used to describe design rainfalls are:

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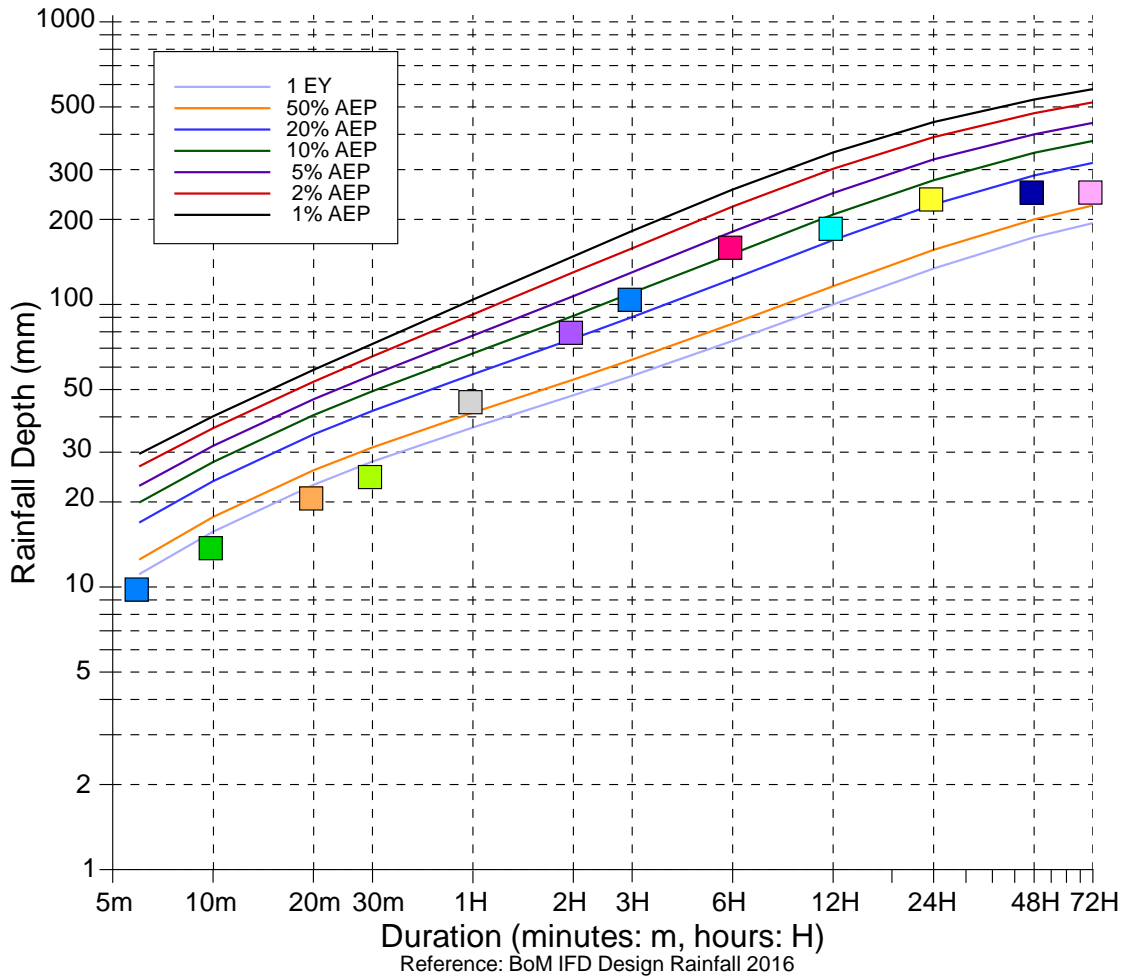


Duration (minutes:m (Hours: H)	Rainfall Depth (mm)	Time/Date
6m	11.0	00:24_31/03/2017
10m	16.0	00:24_31/03/2017
20m	28.0	00:20_31/03/2017
30m	39.0	23:24_30/03/2017
1H	68.0	23:32_30/03/2017
2H	131.0	22:58_30/03/2017
3H	182.0	21:58_30/03/2017
6H	260.0	19:28_30/03/2017
12H	292.0	13:02_30/03/2017
24H	513.0	01:46_30/03/2017
48H	522.0	17:06_29/03/2017
72H	522.0	17:06_29/03/2017

The probability terminology used for the 2016 design rainfalls is consistent with the probability terminology for the new edition of Australian Rainfall and Runoff (ARR2016). Further details on the new probability terminology can be found in Book 1; Chapter 2; Section 2.2 Terminology of ARR2016 <http://arr.ga.gov.au/arr-guideline>. The main terms used to describe design rainfalls are:

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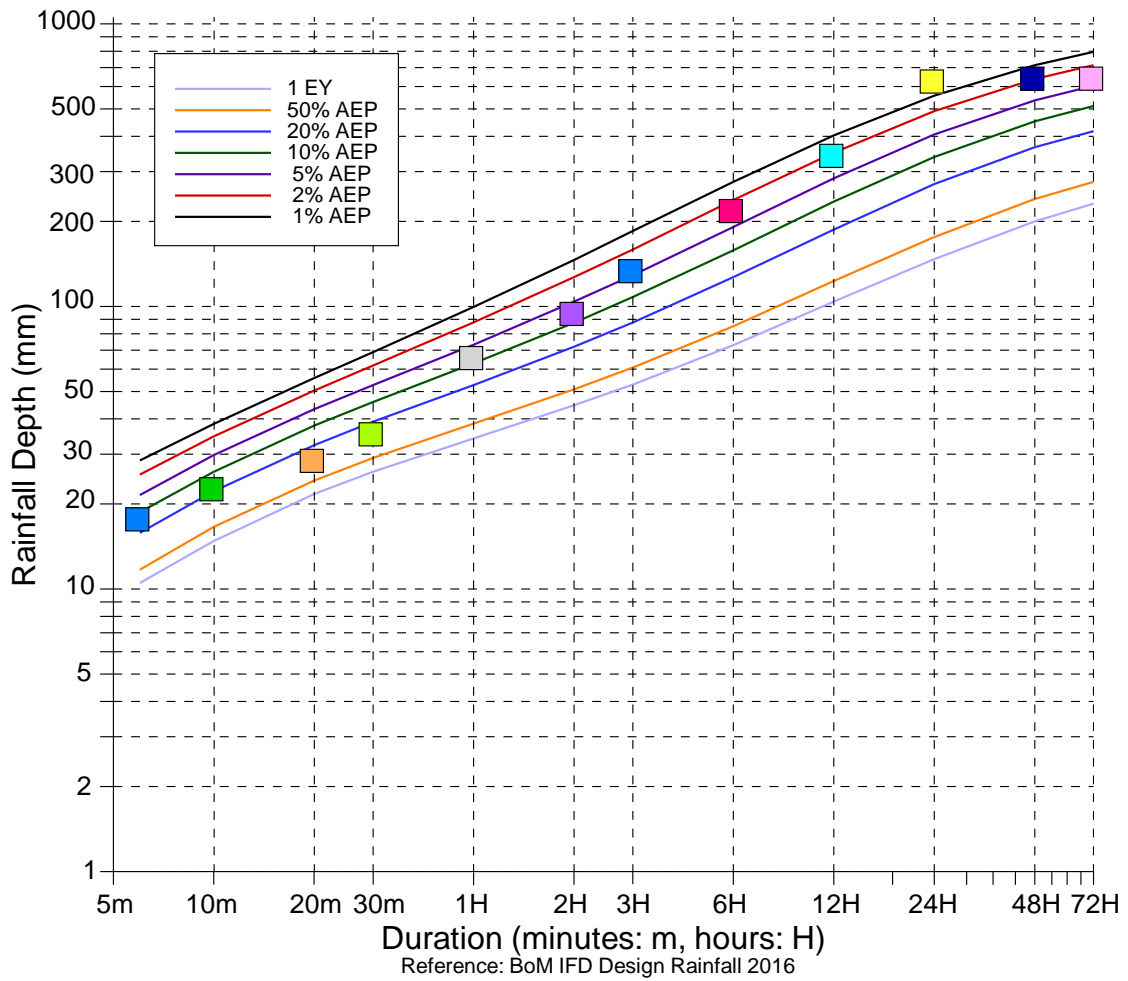


Duration (minutes:m) (Hours: H)	Rainfall Depth (mm)	Time/Date
6m	10.0	08:10_15/03/2017
10m	14.0	23:22_30/03/2017
20m	21.0	23:12_30/03/2017
30m	25.0	23:06_30/03/2017
1H	46.0	22:32_30/03/2017
2H	81.0	21:32_30/03/2017
3H	106.0	21:40_30/03/2017
6H	162.0	20:40_30/03/2017
12H	189.0	16:32_30/03/2017
24H	240.0	04:54_30/03/2017
48H	254.0	23:16_29/03/2017
72H	254.0	23:16_29/03/2017

The probability terminology used for the 2016 design rainfalls is consistent with the probability terminology for the new edition of Australian Rainfall and Runoff (ARR2016). Further details on the new probability terminology can be found in Book 1; Chapter 2; Section 2.2 Terminology of ARR2016 <http://arr.ga.gov.au/arr-guideline>. The main terms used to describe design rainfalls are:

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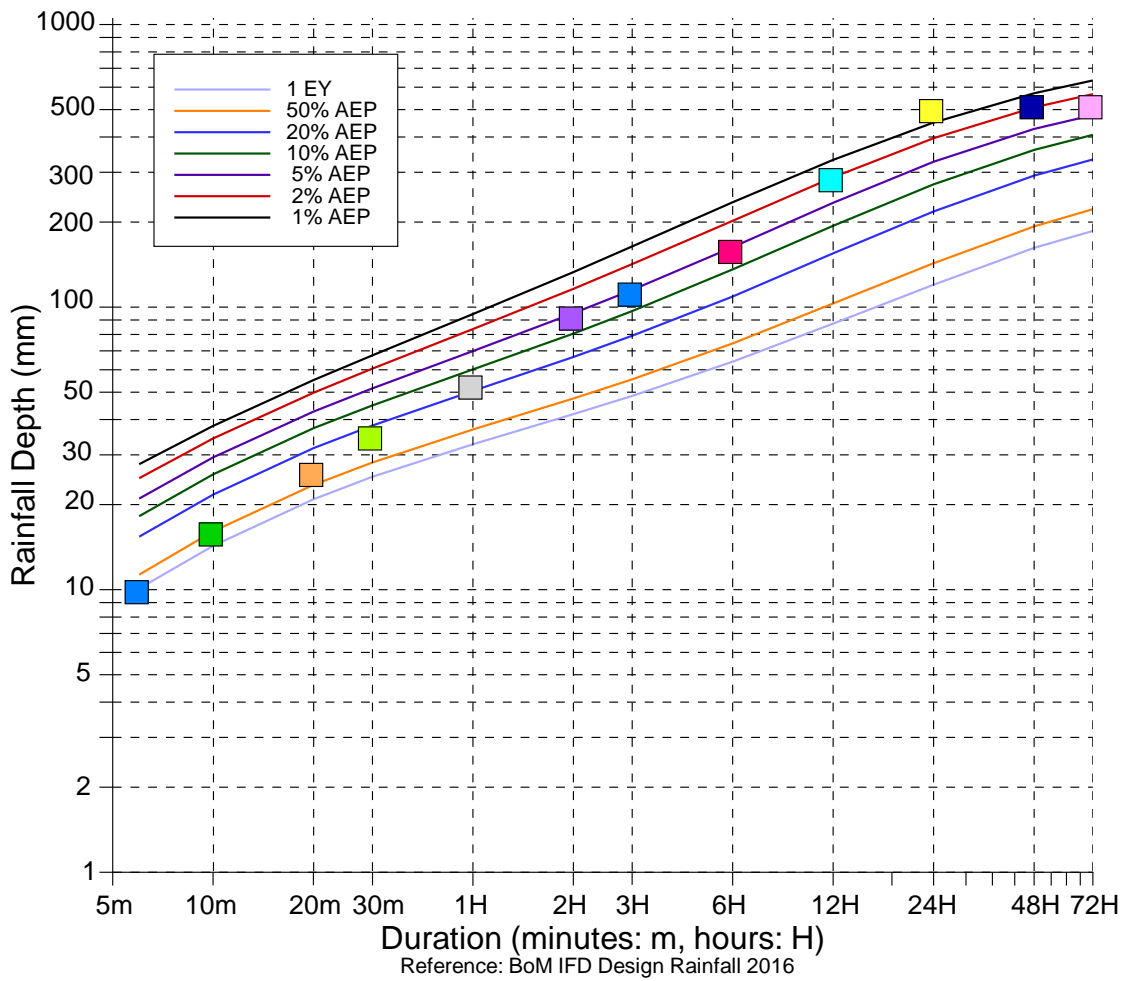


Duration (minutes:m Hours: H)	Rainfall Depth (mm)	Time/Date
6m	18.0	00:54_19/03/2017
10m	23.0	00:50_19/03/2017
20m	29.0	12:10_30/03/2017
30m	36.0	12:06_30/03/2017
1H	67.0	12:06_30/03/2017
2H	96.0	22:54_30/03/2017
3H	136.0	21:54_30/03/2017
6H	222.0	19:28_30/03/2017
12H	348.0	01:46_30/03/2017
24H	638.0	01:46_30/03/2017
48H	653.0	13:46_29/03/2017
72H	653.0	13:46_29/03/2017

The probability terminology used for the 2016 design rainfalls is consistent with the probability terminology for the new edition of Australian Rainfall and Runoff (ARR2016). Further details on the new probability terminology can be found in Book 1; Chapter 2; Section 2.2 Terminology of ARR2016 <http://arr.ga.gov.au/arr-guideline>. The main terms used to describe design rainfalls are:

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For further information refer to BoM frequently asked questions: <http://www.bom.gov.au/water/designRainfalls/ifd/ifd-faq.shtml>

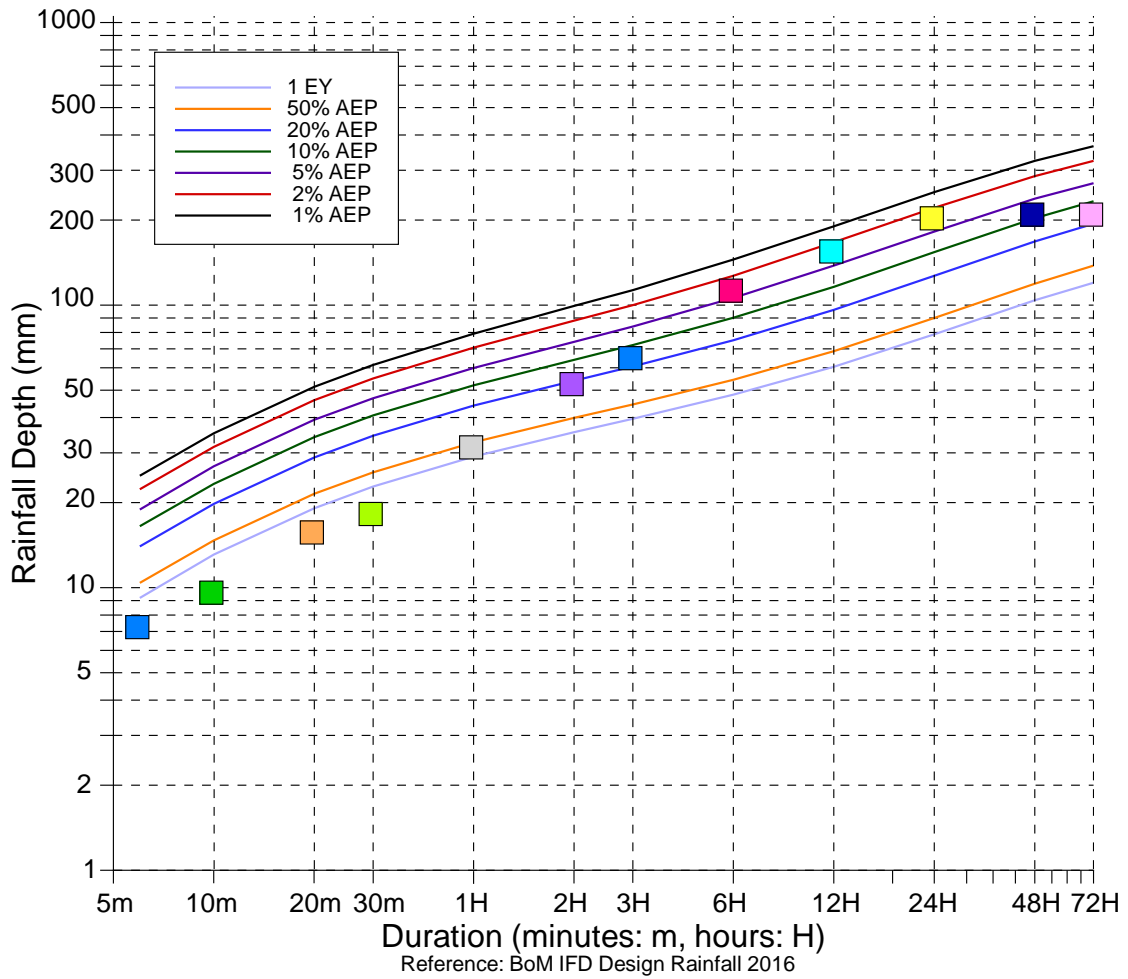


Duration (minutes:m) (Hours: H)	Rainfall Depth (mm)	Time/Date
6m	10.0	07:32_30/03/2017
10m	16.0	07:28_30/03/2017
20m	26.0	07:20_30/03/2017
30m	35.0	07:08_30/03/2017
1H	53.0	06:48_30/03/2017
2H	93.0	05:48_30/03/2017
3H	113.0	05:02_30/03/2017
6H	160.0	19:04_30/03/2017
12H	287.0	11:50_30/03/2017
24H	504.0	03:36_30/03/2017
48H	520.0	17:00_29/03/2017
72H	520.0	17:00_29/03/2017

The probability terminology used for the 2016 design rainfalls is consistent with the probability terminology for the new edition of Australian Rainfall and Runoff (ARR2016). Further details on the new probability terminology can be found in Book 1; Chapter 2; Section 2.2 Terminology of ARR2016 <http://arr.ga.gov.au/arr-guideline>. The main terms used to describe design rainfalls are:

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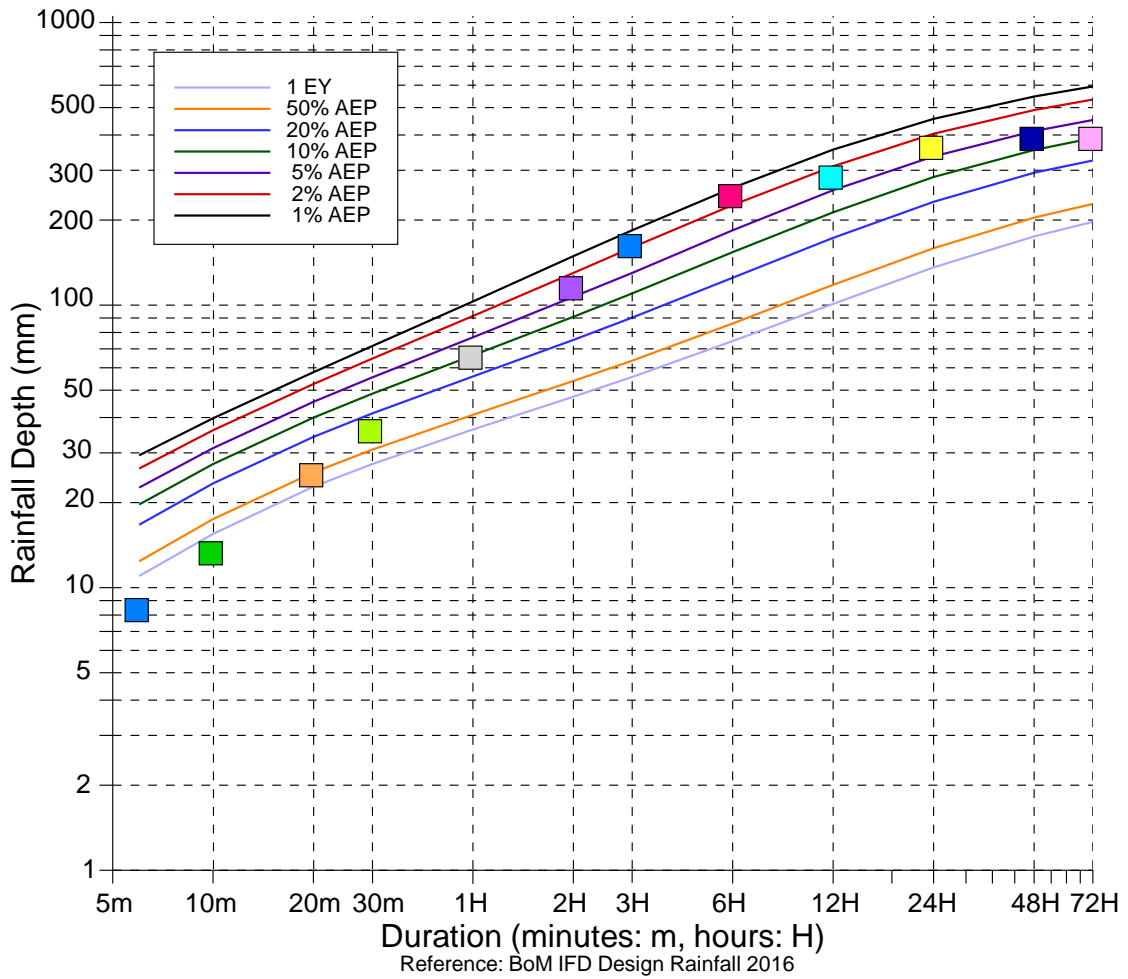


Duration (minutes:m) (Hours: H)	Rainfall Depth (mm)	Time/Date
6m	7.4	01:00_19/03/2017
10m	9.8	01:02_19/03/2017
20m	16.0	01:00_19/03/2017
30m	18.6	00:58_19/03/2017
1H	32.0	19:36_30/03/2017
2H	53.6	19:06_30/03/2017
3H	66.2	18:06_30/03/2017
6H	114.8	15:40_30/03/2017
12H	158.0	08:48_30/03/2017
24H	207.0	01:00_30/03/2017
48H	213.4	18:58_29/03/2017
72H	213.4	18:58_29/03/2017

The probability terminology used for the 2016 design rainfalls is consistent with the probability terminology for the new edition of Australian Rainfall and Runoff (ARR2016). Further details on the new probability terminology can be found in Book 1; Chapter 2; Section 2.2 Terminology of ARR2016 <http://arr.ga.gov.au/arr-guideline>. The main terms used to describe design rainfalls are:

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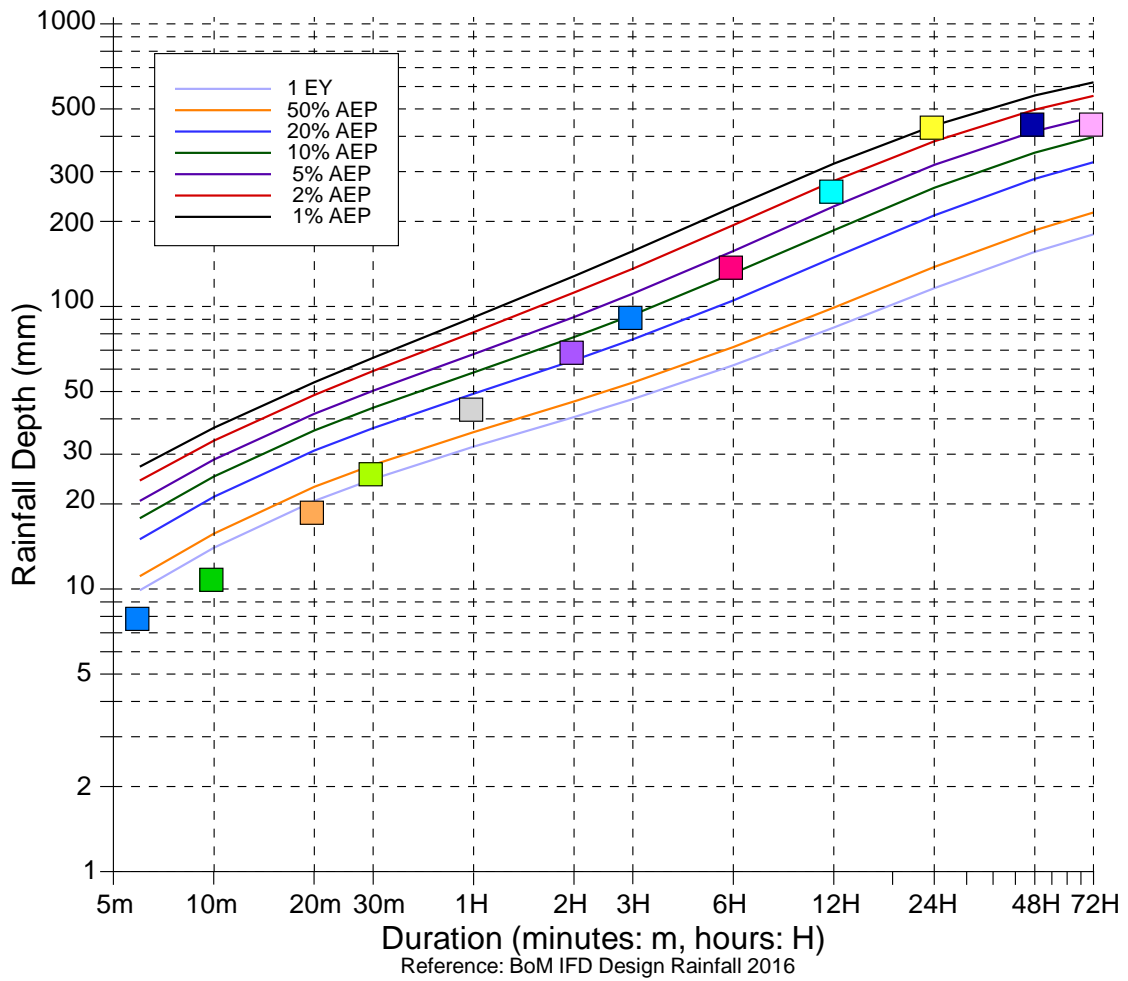


Duration (minutes:m) (Hours: H)	Rainfall Depth (mm)	Time/Date
6m	8.5	22:46_30/03/2017
10m	13.5	22:48_30/03/2017
20m	25.5	22:22_30/03/2017
30m	36.5	22:28_30/03/2017
1H	66.5	21:58_30/03/2017
2H	117.0	21:44_30/03/2017
3H	165.0	21:04_30/03/2017
6H	248.0	19:20_30/03/2017
12H	288.5	15:52_30/03/2017
24H	367.5	01:38_30/03/2017
48H	395.5	22:32_29/03/2017
72H	395.5	22:32_29/03/2017

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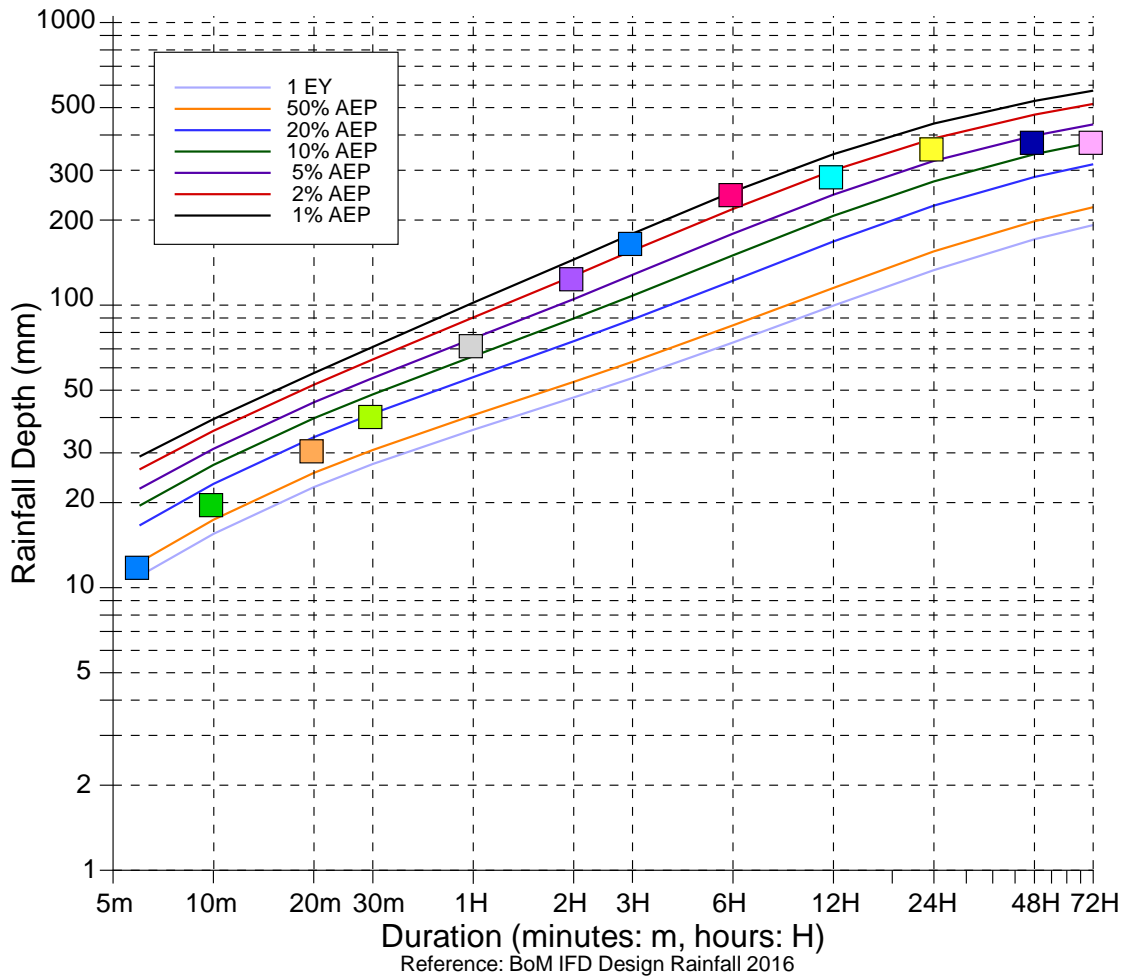


Duration (minutes:m (Hours: H)	Rainfall Depth (mm)	Time/Date
6m	8.0	11:50_30/03/2017
10m	11.0	11:50_30/03/2017
20m	19.0	11:50_30/03/2017
30m	26.0	11:42_30/03/2017
1H	44.0	11:10_30/03/2017
2H	70.0	11:02_30/03/2017
3H	93.0	11:08_30/03/2017
6H	140.0	11:02_30/03/2017
12H	260.0	11:06_30/03/2017
24H	438.0	03:02_30/03/2017
48H	449.0	19:22_29/03/2017
72H	449.0	19:22_29/03/2017

The probability terminology used for the 2016 design rainfalls is consistent with the probability terminology for the new edition of Australian Rainfall and Runoff (ARR2016). Further details on the new probability terminology can be found in Book 1; Chapter 2; Section 2.2 Terminology of ARR2016 <http://arr.ga.gov.au/arr-guideline>. The main terms used to describe design rainfalls are:

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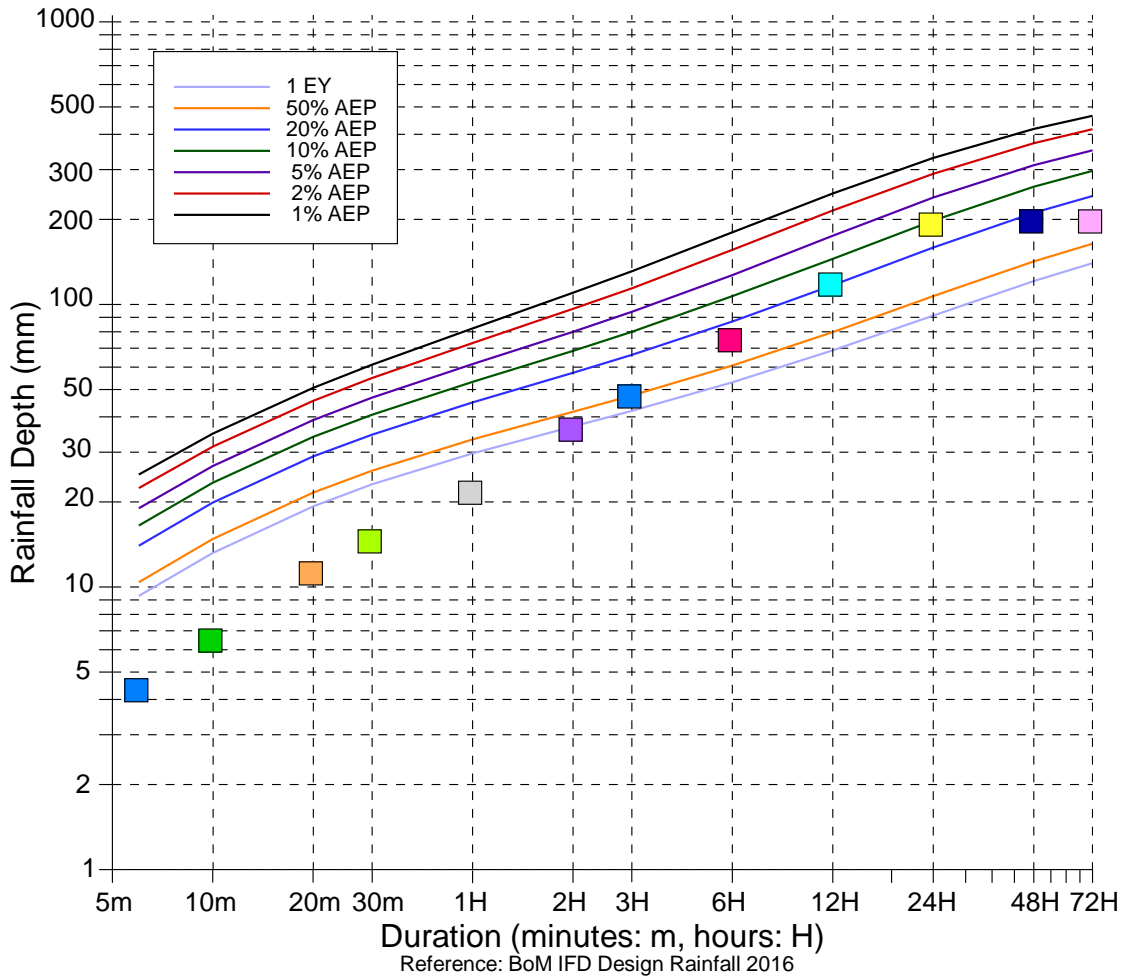


Duration (minutes:m Hours: H)	Rainfall Depth (mm)	Time/Date
6m	12.0	23:46_30/03/2017
10m	20.0	08:16_15/03/2017
20m	31.0	08:10_15/03/2017
30m	41.0	23:22_30/03/2017
1H	73.0	22:58_30/03/2017
2H	126.0	22:36_30/03/2017
3H	168.0	21:52_30/03/2017
6H	250.0	20:34_30/03/2017
12H	289.0	16:52_30/03/2017
24H	363.0	04:58_30/03/2017
48H	383.0	22:00_29/03/2017
72H	383.0	22:00_29/03/2017

The probability terminology used for the 2016 design rainfalls is consistent with the probability terminology for the new edition of Australian Rainfall and Runoff (ARR2016). Further details on the new probability terminology can be found in Book 1; Chapter 2; Section 2.2 Terminology of ARR2016 <http://arr.ga.gov.au/arr-guideline>. The main terms used to describe design rainfalls are:

- *Exceedances per year (EY)*: the number of times an event is likely to occur or be exceeded within any given year.
- *Annual exceedance probability (AEP)*: the probability or likelihood of an event occurring or being exceeded within any given year, usually expressed as a percentage.

For further information refer to BoM frequently asked questions: <http://www.bom.gov.au/water/designRainfalls/ifd/ifd-faq.shtml>

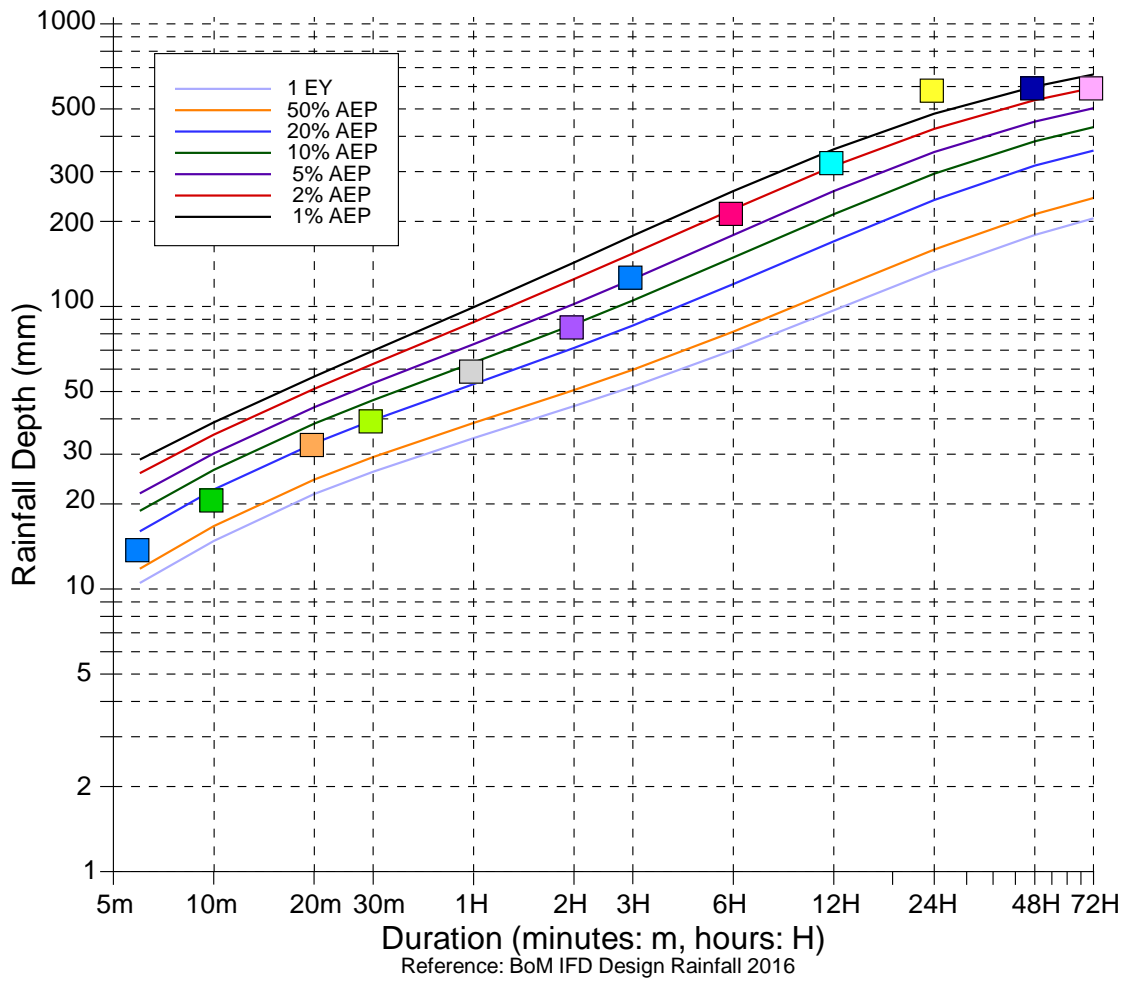


Duration (minutes:m) (Hours: H)	Rainfall Depth (mm)	Time/Date
6m	4.4	05:54_30/03/2017
10m	6.6	11:06_30/03/2017
20m	11.4	10:58_30/03/2017
30m	14.8	10:50_30/03/2017
1H	22.0	19:26_30/03/2017
2H	36.8	19:16_30/03/2017
3H	48.2	18:40_30/03/2017
6H	76.2	16:10_30/03/2017
12H	120.0	10:12_30/03/2017
24H	195.6	03:12_30/03/2017
48H	200.6	15:58_29/03/2017
72H	200.6	15:58_29/03/2017

The probability terminology used for the 2016 design rainfalls is consistent with the probability terminology for the new edition of Australian Rainfall and Runoff (ARR2016). Further details on the new probability terminology can be found in Book 1; Chapter 2; Section 2.2 Terminology of ARR2016 <http://arr.ga.gov.au/arr-guideline>. The main terms used to describe design rainfalls are:

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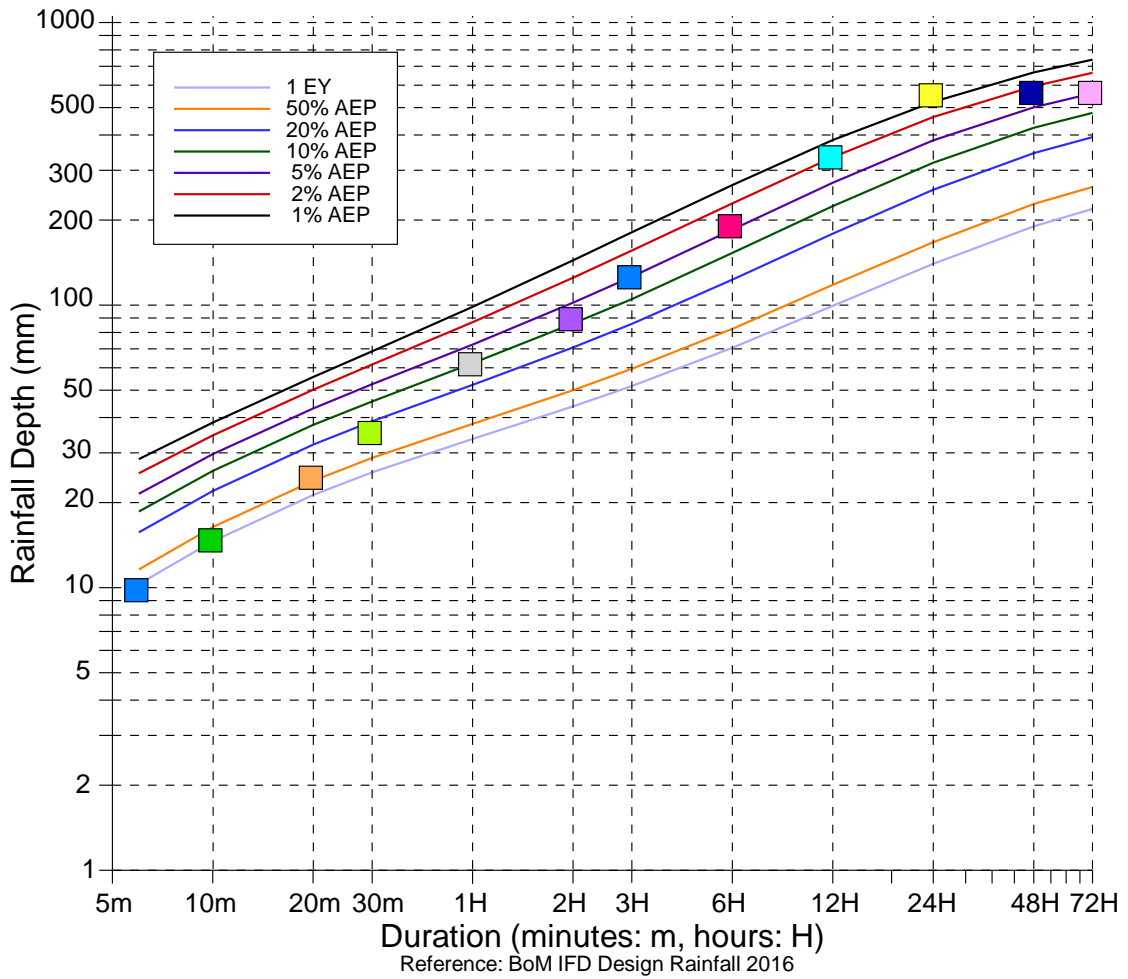


Duration (minutes:m (Hours: H)	Rainfall Depth (mm)	Time/Date
6m	14.0	13:00_30/03/2017
10m	21.0	12:56_30/03/2017
20m	33.0	12:52_30/03/2017
30m	40.0	12:42_30/03/2017
1H	60.0	12:30_30/03/2017
2H	86.0	23:00_30/03/2017
3H	129.0	21:54_30/03/2017
6H	217.0	19:18_30/03/2017
12H	328.0	02:00_30/03/2017
24H	592.0	02:00_30/03/2017
48H	603.0	17:14_29/03/2017
72H	603.0	17:14_29/03/2017

The probability terminology used for the 2016 design rainfalls is consistent with the probability terminology for the new edition of Australian Rainfall and Runoff (ARR2016). Further details on the new probability terminology can be found in Book 1; Chapter 2; Section 2.2 Terminology of ARR2016 <http://arr.ga.gov.au/arr-guideline>. The main terms used to describe design rainfalls are:

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For further information refer to BoM frequently asked questions: <http://www.bom.gov.au/water/designRainfalls/ifd/ifd-faq.shtml>

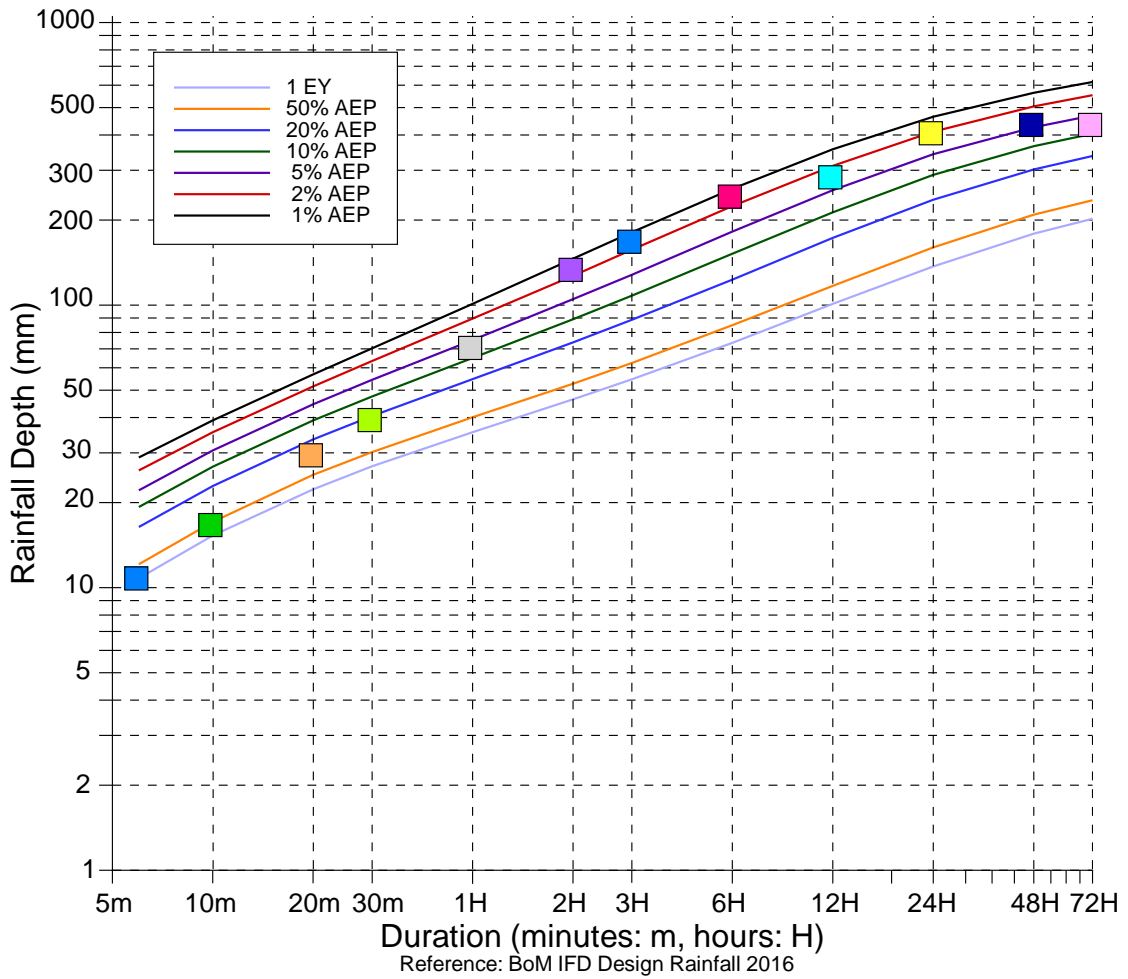


Duration (minutes:m) (Hours: H)	Rainfall Depth (mm)	Time/Date
6m	10.0	08:06_30/03/2017
10m	15.0	08:06_30/03/2017
20m	25.0	12:12_30/03/2017
30m	36.0	12:06_30/03/2017
1H	63.0	12:04_30/03/2017
2H	91.0	11:26_30/03/2017
3H	128.0	11:52_30/03/2017
6H	194.0	07:14_30/03/2017
12H	340.0	05:58_30/03/2017
24H	564.0	02:26_30/03/2017
48H	575.0	20:28_29/03/2017
72H	575.0	20:28_29/03/2017

The probability terminology used for the 2016 design rainfalls is consistent with the probability terminology for the new edition of Australian Rainfall and Runoff (ARR2016). Further details on the new probability terminology can be found in Book 1; Chapter 2; Section 2.2 Terminology of ARR2016 <http://arr.ga.gov.au/arr-guideline>. The main terms used to describe design rainfalls are:

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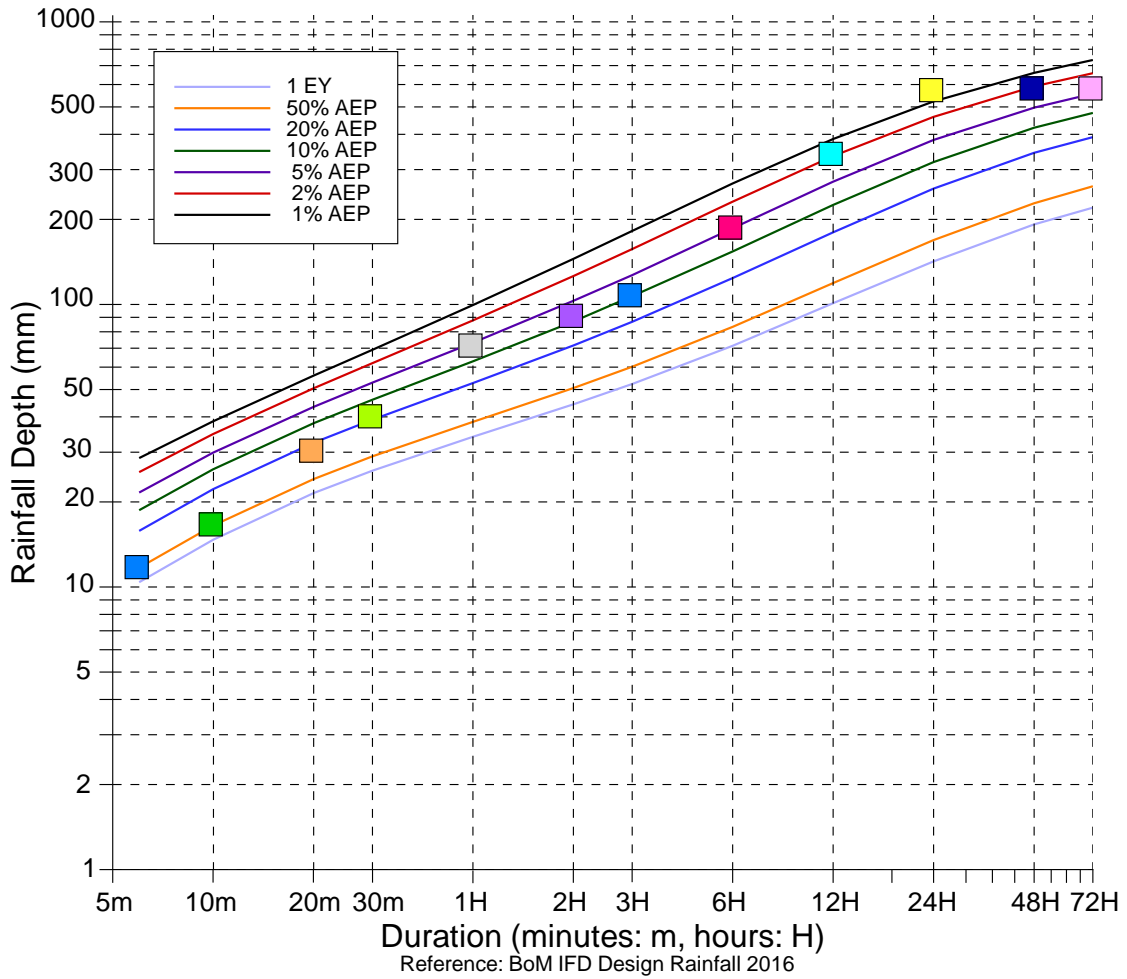


Duration (minutes:m Hours: H)	Rainfall Depth (mm)	Time/Date
6m	11.0	00:00_31/03/2017
10m	17.0	00:00_31/03/2017
20m	30.0	23:52_30/03/2017
30m	40.0	23:42_30/03/2017
1H	72.0	23:46_30/03/2017
2H	136.0	23:14_30/03/2017
3H	171.0	22:16_30/03/2017
6H	247.0	19:54_30/03/2017
12H	289.0	16:46_30/03/2017
24H	414.0	02:16_30/03/2017
48H	443.0	21:26_29/03/2017
72H	443.0	21:26_29/03/2017

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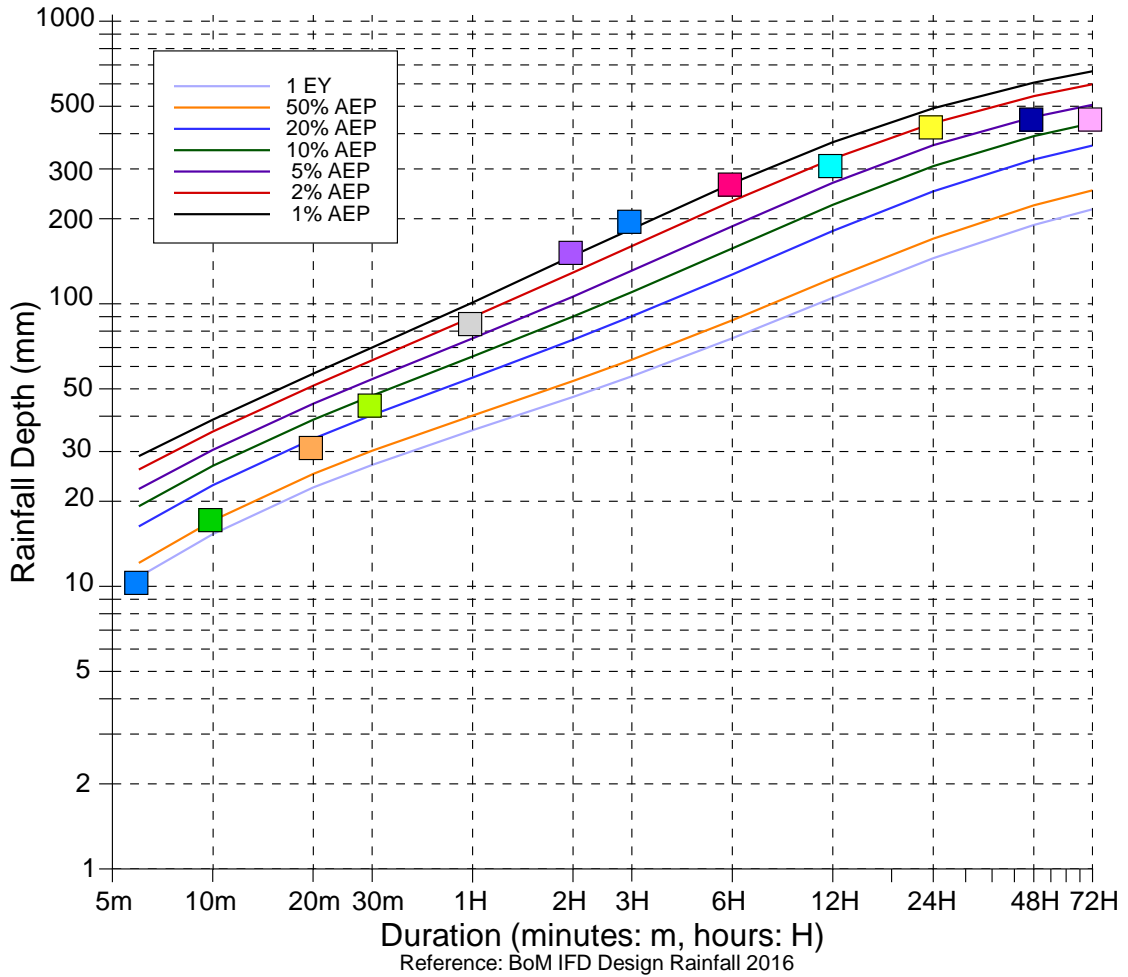


Duration (minutes:m) (Hours: H)	Rainfall Depth (mm)	Time/Date
6m	12.0	06:46_15/03/2017
10m	17.0	12:56_30/03/2017
20m	31.0	12:50_30/03/2017
30m	41.0	12:44_30/03/2017
1H	73.0	12:14_30/03/2017
2H	93.0	11:52_30/03/2017
3H	110.0	12:10_30/03/2017
6H	191.0	07:48_30/03/2017
12H	348.0	02:12_30/03/2017
24H	585.0	02:12_30/03/2017
48H	593.0	20:06_29/03/2017
72H	593.0	20:06_29/03/2017

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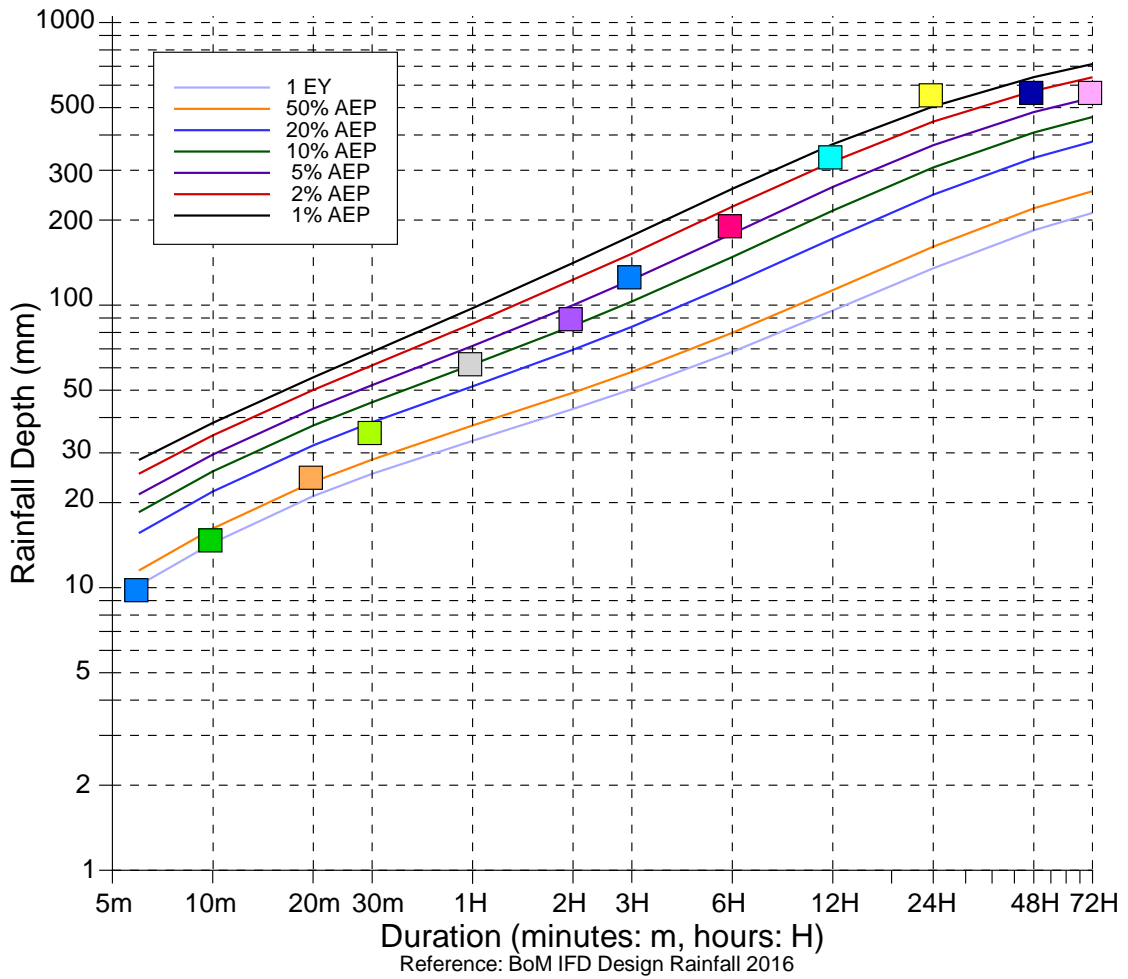


Duration (minutes:m) (Hours: H)	Rainfall Depth (mm)	Time/Date
6m	10.5	00:28_31/03/2017
10m	17.5	00:26_31/03/2017
20m	31.5	00:22_31/03/2017
30m	44.5	00:06_31/03/2017
1H	86.5	23:50_30/03/2017
2H	154.5	23:18_30/03/2017
3H	199.0	22:32_30/03/2017
6H	269.5	19:54_30/03/2017
12H	313.5	16:44_30/03/2017
24H	429.5	03:32_30/03/2017
48H	458.0	18:44_29/03/2017
72H	458.0	18:44_29/03/2017

The probability terminology used for the 2016 design rainfalls is consistent with the probability terminology for the new edition of Australian Rainfall and Runoff (ARR2016). Further details on the new probability terminology can be found in Book 1; Chapter 2; Section 2.2 Terminology of ARR2016 <http://arr.ga.gov.au/arr-guideline>. The main terms used to describe design rainfalls are:

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For further information refer to BoM frequently asked questions: <http://www.bom.gov.au/water/designRainfalls/ifd/ifd-faq.shtml>

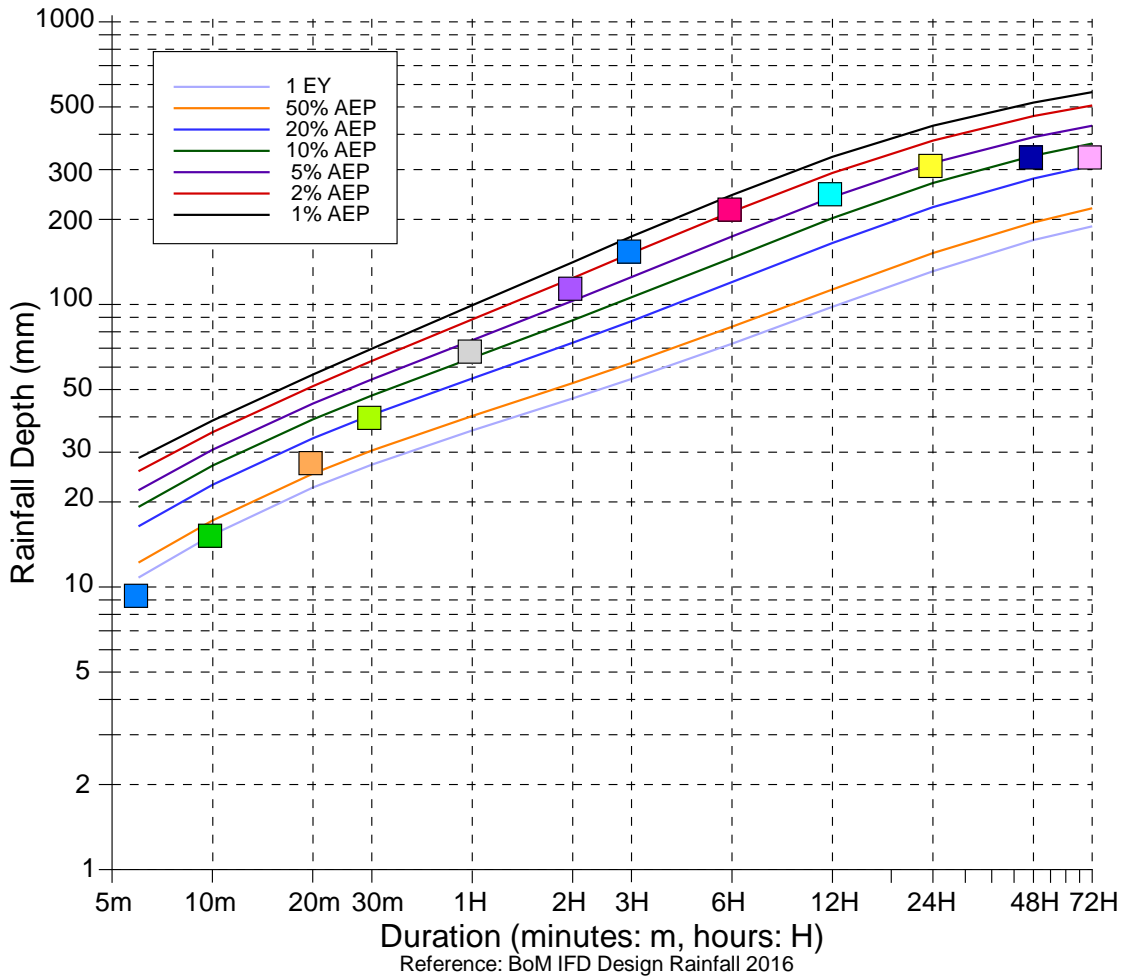


Duration (minutes:m) (Hours: H)	Rainfall Depth (mm)	Time/Date
6m	10.0	08:06_30/03/2017
10m	15.0	08:06_30/03/2017
20m	25.0	12:12_30/03/2017
30m	36.0	12:06_30/03/2017
1H	63.0	12:04_30/03/2017
2H	91.0	11:26_30/03/2017
3H	128.0	11:52_30/03/2017
6H	194.0	07:14_30/03/2017
12H	340.0	05:58_30/03/2017
24H	564.0	02:26_30/03/2017
48H	575.0	20:28_29/03/2017
72H	575.0	20:28_29/03/2017

The probability terminology used for the 2016 design rainfalls is consistent with the probability terminology for the new edition of Australian Rainfall and Runoff (ARR2016). Further details on the new probability terminology can be found in Book 1; Chapter 2; Section 2.2 Terminology of ARR2016 <http://arr.ga.gov.au/arr-guideline>. The main terms used to describe design rainfalls are:

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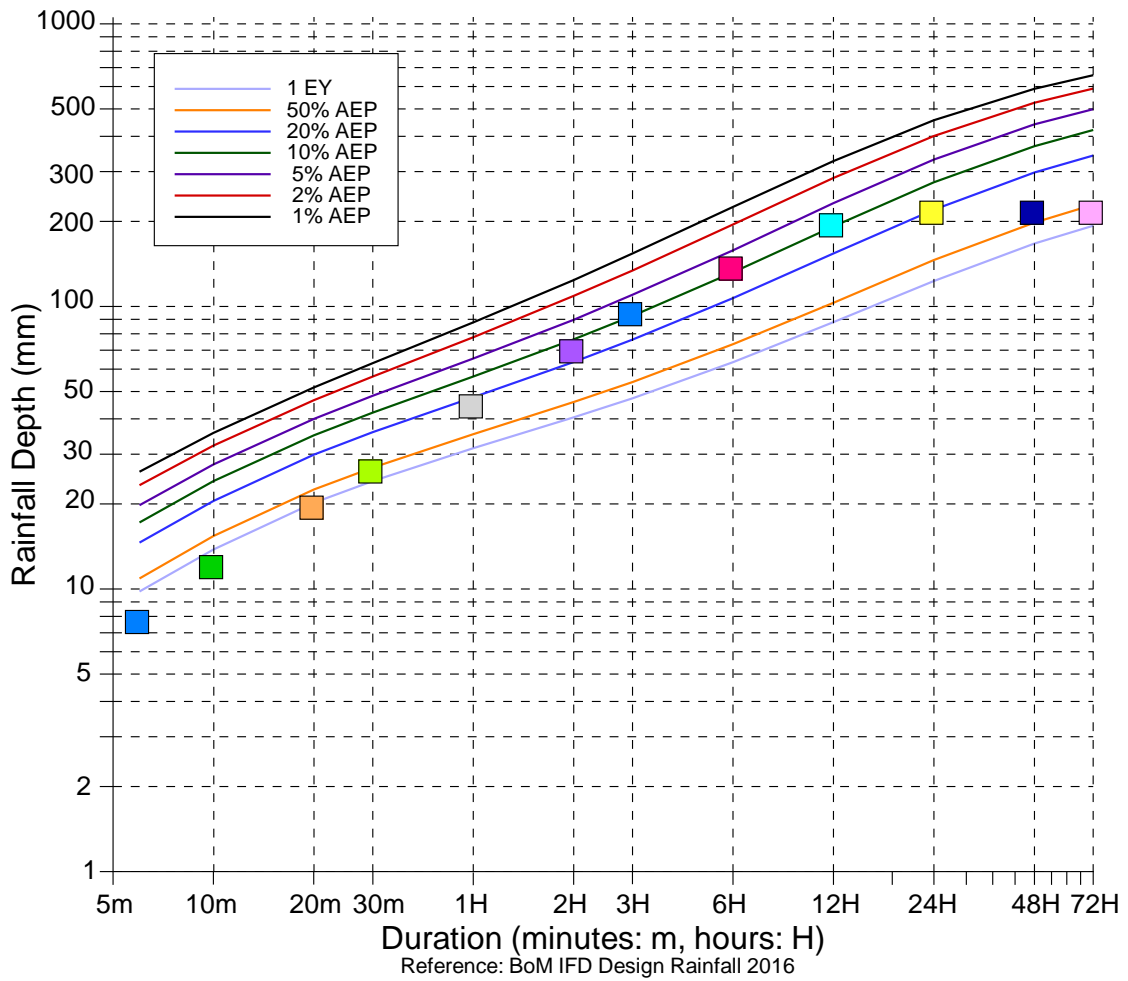


	Duration (minutes:m) (Hours: H)	Rainfall Depth (mm)	Time/Date
	6m	9.5	22:54_14/03/2017
	10m	15.5	22:48_14/03/2017
	20m	28.0	22:24_14/03/2017
	30m	40.5	22:30_14/03/2017
	1H	69.5	22:10_30/03/2017
	2H	116.0	21:58_30/03/2017
	3H	157.0	22:00_30/03/2017
	6H	221.0	19:18_30/03/2017
	12H	250.5	16:00_30/03/2017
	24H	315.5	03:28_30/03/2017
	48H	338.0	12:06_29/03/2017
	72H	338.0	12:06_28/03/2017

The probability terminology used for the 2016 design rainfalls is consistent with the probability terminology for the new edition of Australian Rainfall and Runoff (ARR2016). Further details on the new probability terminology can be found in Book 1; Chapter 2; Section 2.2 Terminology of ARR2016 <http://arr.ga.gov.au/arr-guideline>. The main terms used to describe design rainfalls are:

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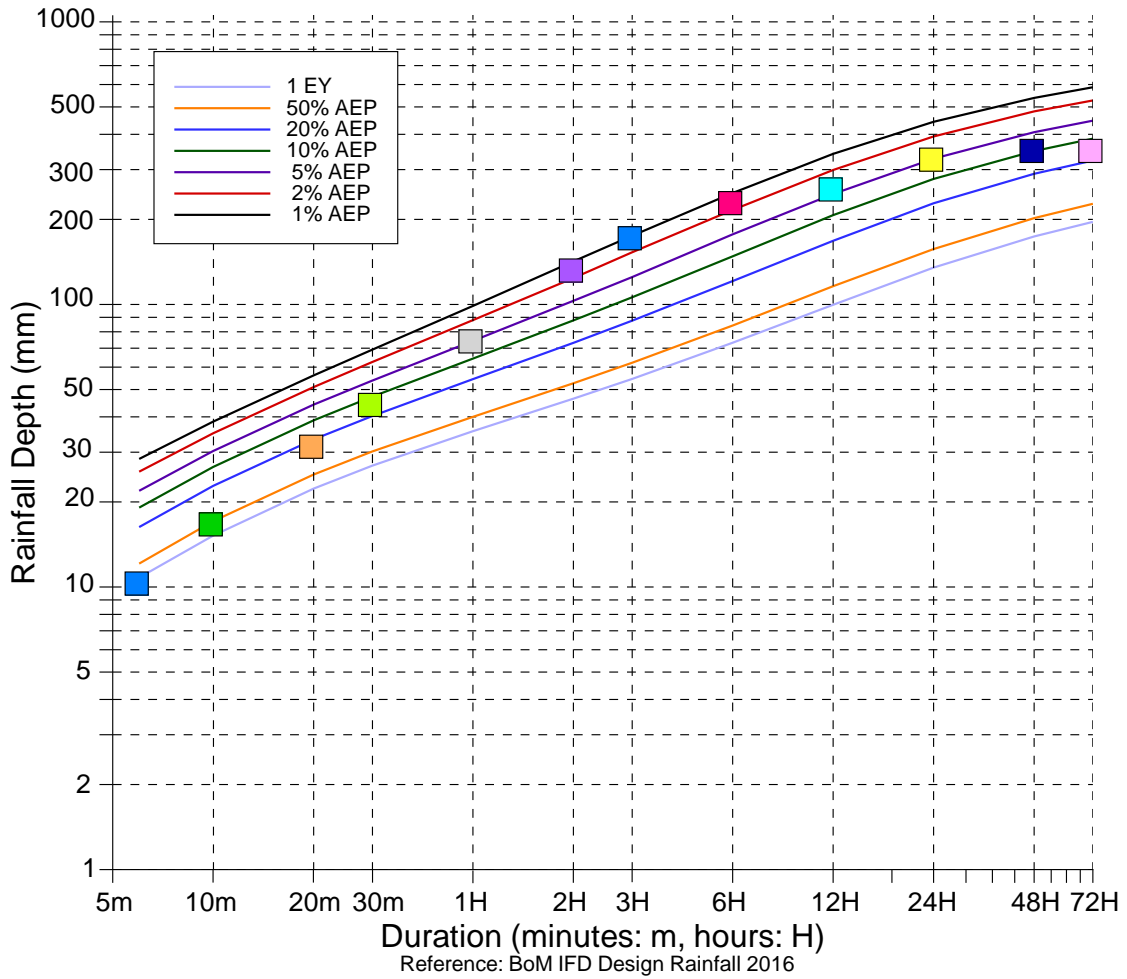


Duration (minutes:m) (Hours: H)	Rainfall Depth (mm)	Time/Date
6m	7.8	19:54_30/03/2017
10m	12.2	19:50_30/03/2017
20m	19.8	19:44_30/03/2017
30m	26.6	19:50_30/03/2017
1H	45.2	19:32_30/03/2017
2H	70.8	18:54_30/03/2017
3H	95.8	19:04_30/03/2017
6H	139.0	16:14_30/03/2017
12H	197.6	13:24_30/03/2017
24H	219.0	12:06_30/03/2017
48H	219.0	12:06_30/03/2017
72H	219.0	12:06_30/03/2017

The probability terminology used for the 2016 design rainfalls is consistent with the probability terminology for the new edition of Australian Rainfall and Runoff (ARR2016). Further details on the new probability terminology can be found in Book 1; Chapter 2; Section 2.2 Terminology of ARR2016 <http://arr.ga.gov.au/arr-guideline>. The main terms used to describe design rainfalls are:

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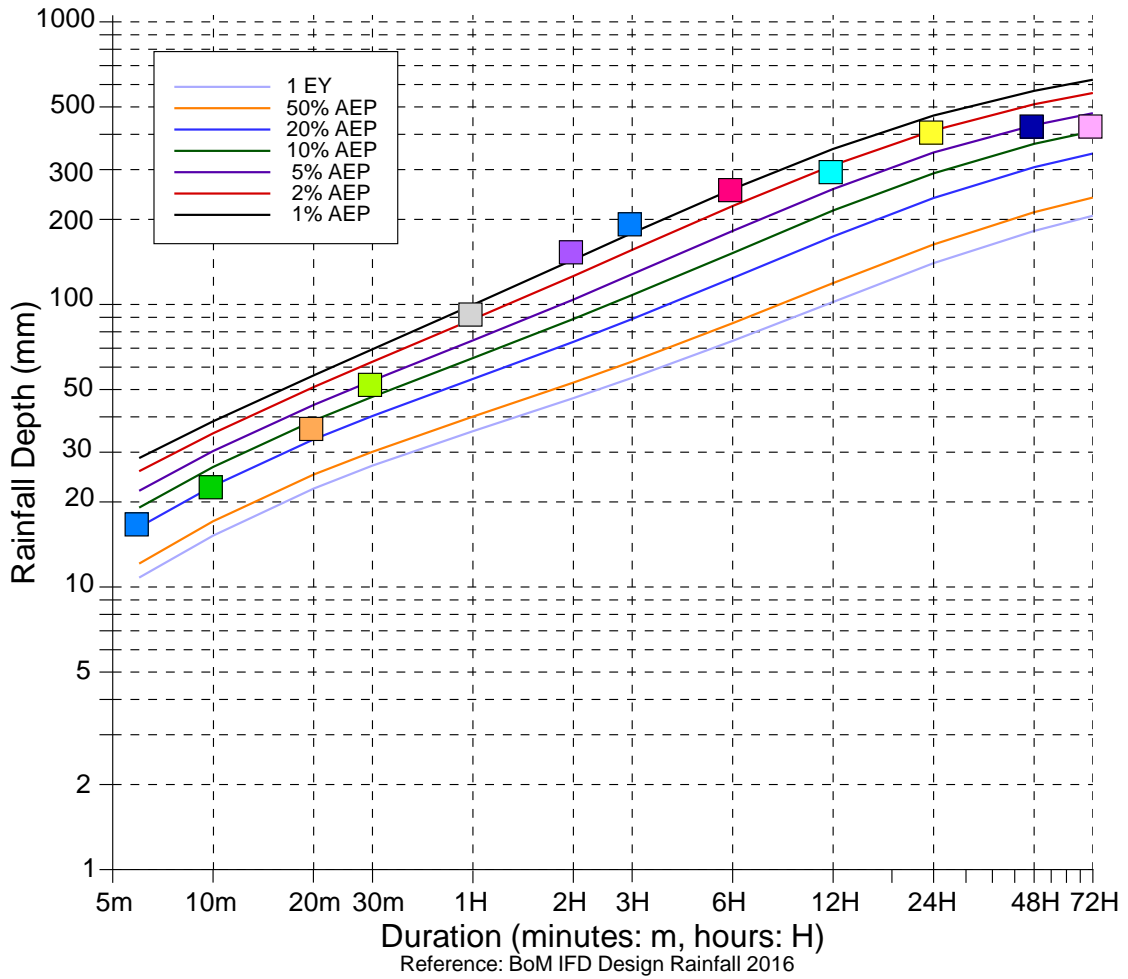


Duration (minutes:m) (Hours: H)	Rainfall Depth (mm)	Time/Date
6m	10.5	22:52_30/03/2017
10m	17.0	22:54_30/03/2017
20m	32.0	22:52_30/03/2017
30m	45.0	22:46_30/03/2017
1H	75.5	22:18_30/03/2017
2H	134.5	22:02_30/03/2017
3H	175.0	22:02_30/03/2017
6H	233.0	19:24_30/03/2017
12H	260.5	16:24_30/03/2017
24H	332.0	02:32_30/03/2017
48H	356.5	22:56_29/03/2017
72H	356.5	22:56_29/03/2017

The probability terminology used for the 2016 design rainfalls is consistent with the probability terminology for the new edition of Australian Rainfall and Runoff (ARR2016). Further details on the new probability terminology can be found in Book 1; Chapter 2; Section 2.2 Terminology of ARR2016 <http://arr.ga.gov.au/arr-guideline>. The main terms used to describe design rainfalls are:

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For further information refer to BoM frequently asked questions: <http://www.bom.gov.au/water/designRainfalls/ifd/ifd-faq.shtml>

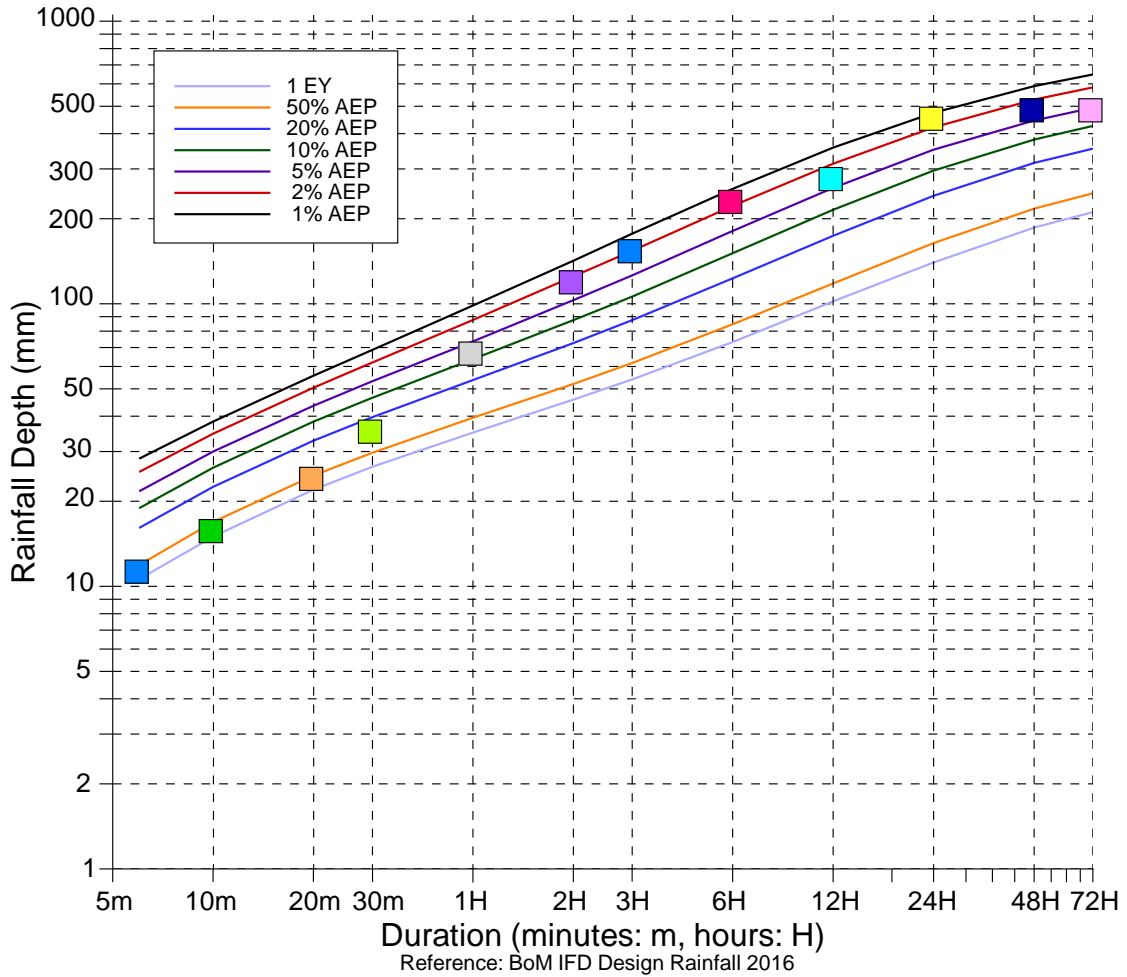


Duration (minutes:m) (Hours: H)	Rainfall Depth (mm)	Time/Date
6m	17.0	23:22_30/03/2017
10m	23.0	00:14_31/03/2017
20m	37.0	00:04_31/03/2017
30m	53.0	00:14_31/03/2017
1H	94.0	23:58_30/03/2017
2H	156.0	23:08_30/03/2017
3H	196.0	22:38_30/03/2017
6H	259.0	19:52_30/03/2017
12H	300.0	16:04_30/03/2017
24H	414.0	03:32_30/03/2017
48H	435.0	23:24_29/03/2017
72H	435.0	23:24_29/03/2017

The probability terminology used for the 2016 design rainfalls is consistent with the probability terminology for the new edition of Australian Rainfall and Runoff (ARR2016). Further details on the new probability terminology can be found in Book 1; Chapter 2; Section 2.2 Terminology of ARR2016 <http://arr.ga.gov.au/arr-guideline>. The main terms used to describe design rainfalls are:

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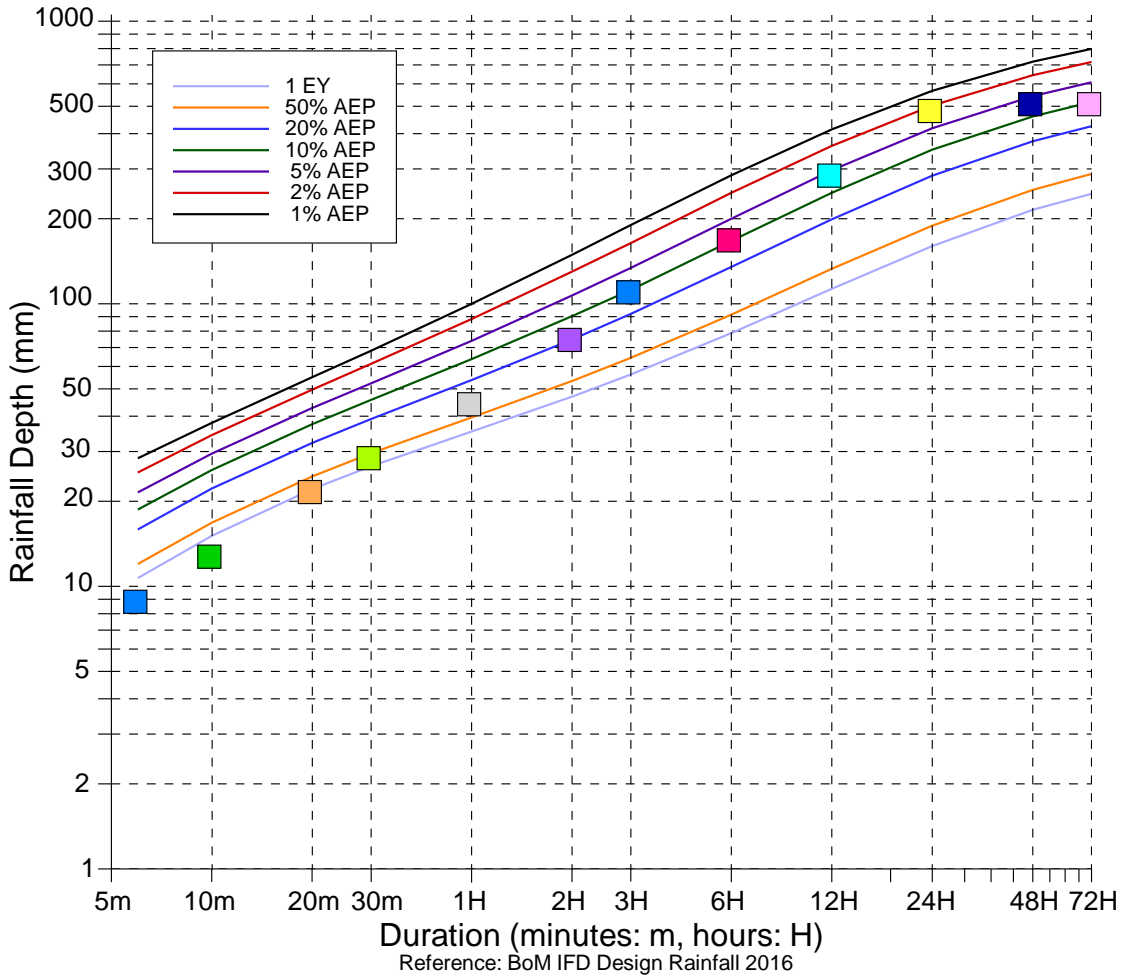


Duration (minutes:m (Hours: H)	Rainfall Depth (mm)	Time/Date
6m	11.5	05:06_15/03/2017
10m	16.0	05:04_15/03/2017
20m	24.5	23:08_30/03/2017
30m	36.0	22:58_30/03/2017
1H	68.0	23:00_30/03/2017
2H	121.5	22:14_30/03/2017
3H	156.5	21:26_30/03/2017
6H	234.0	18:56_30/03/2017
12H	282.0	14:50_30/03/2017
24H	461.0	01:24_30/03/2017
48H	493.5	17:36_29/03/2017
72H	493.5	17:36_29/03/2017

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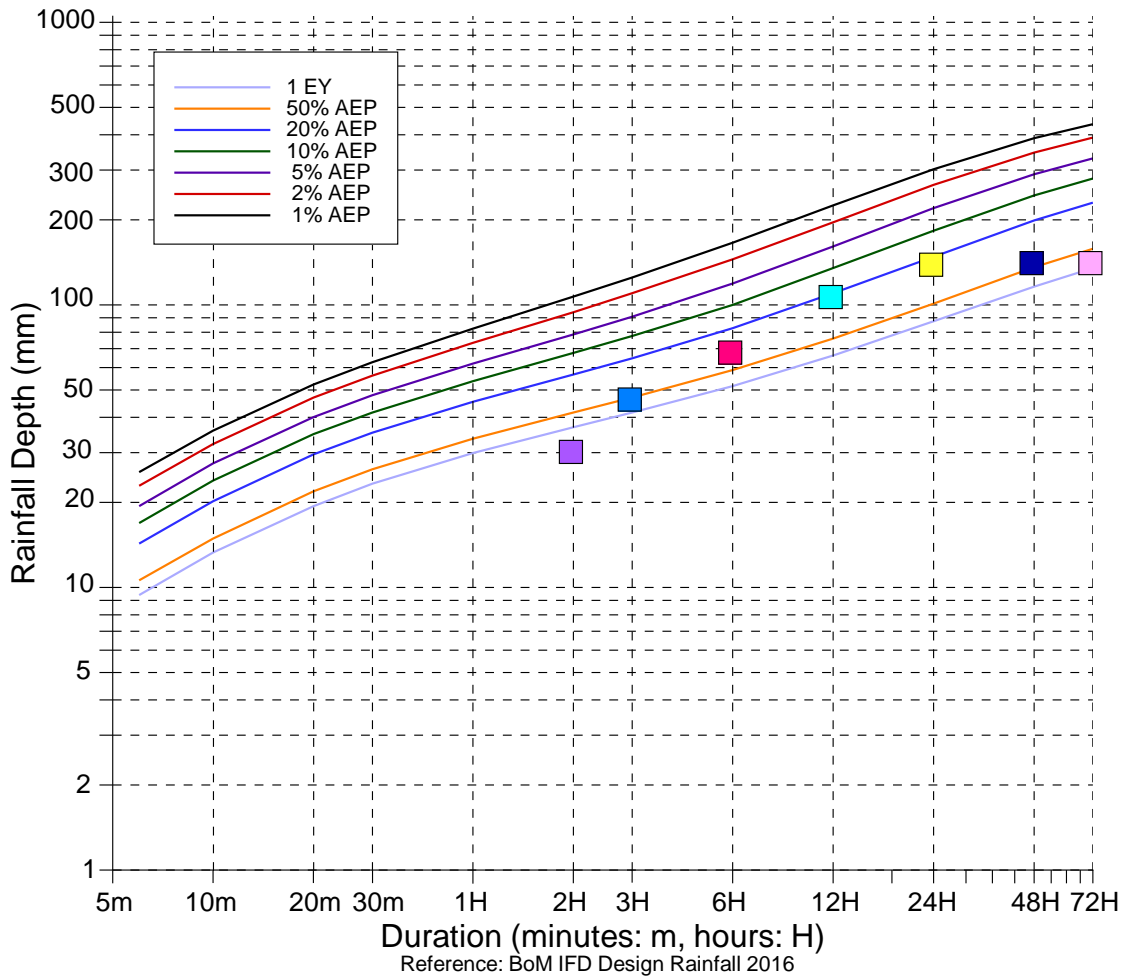


Duration (minutes:m Hours: H)	Rainfall Depth (mm)	Time/Date
6m	9.0	13:26_30/03/2017
10m	13.0	13:26_30/03/2017
20m	22.0	02:46_30/03/2017
30m	29.0	02:36_30/03/2017
1H	45.0	02:14_30/03/2017
2H	76.0	02:36_30/03/2017
3H	112.0	02:14_30/03/2017
6H	171.0	02:14_30/03/2017
12H	290.0	02:12_30/03/2017
24H	491.0	02:12_30/03/2017
48H	519.0	16:28_29/03/2017
72H	519.0	16:28_29/03/2017

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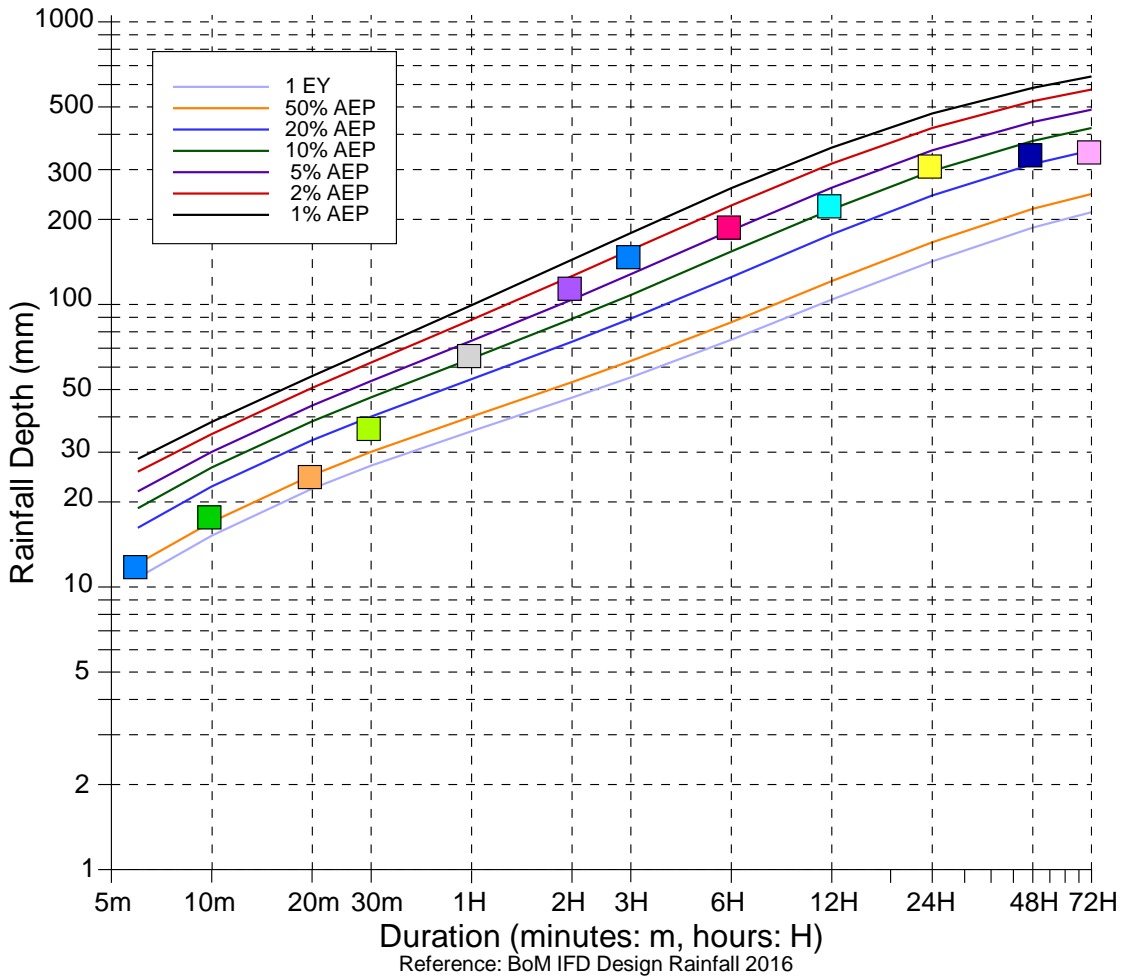
Short duration rainfall data impacted by possible radio transfer interruptions. Suspect short duration IFD results removed by observation.

Duration (minutes:m) (Hours: H)	Rainfall Depth (mm)	Time/Date
6m		
10m		
20m		
30m		
1H		
2H	30.8	22:58_29/03/2017
3H	47.2	21:58_29/03/2017
6H	69.2	21:58_29/03/2017
12H	108.8	21:58_29/03/2017
24H	141.6	17:58_29/03/2017
48H	143.4	13:58_29/03/2017
72H	143.4	13:58_29/03/2017

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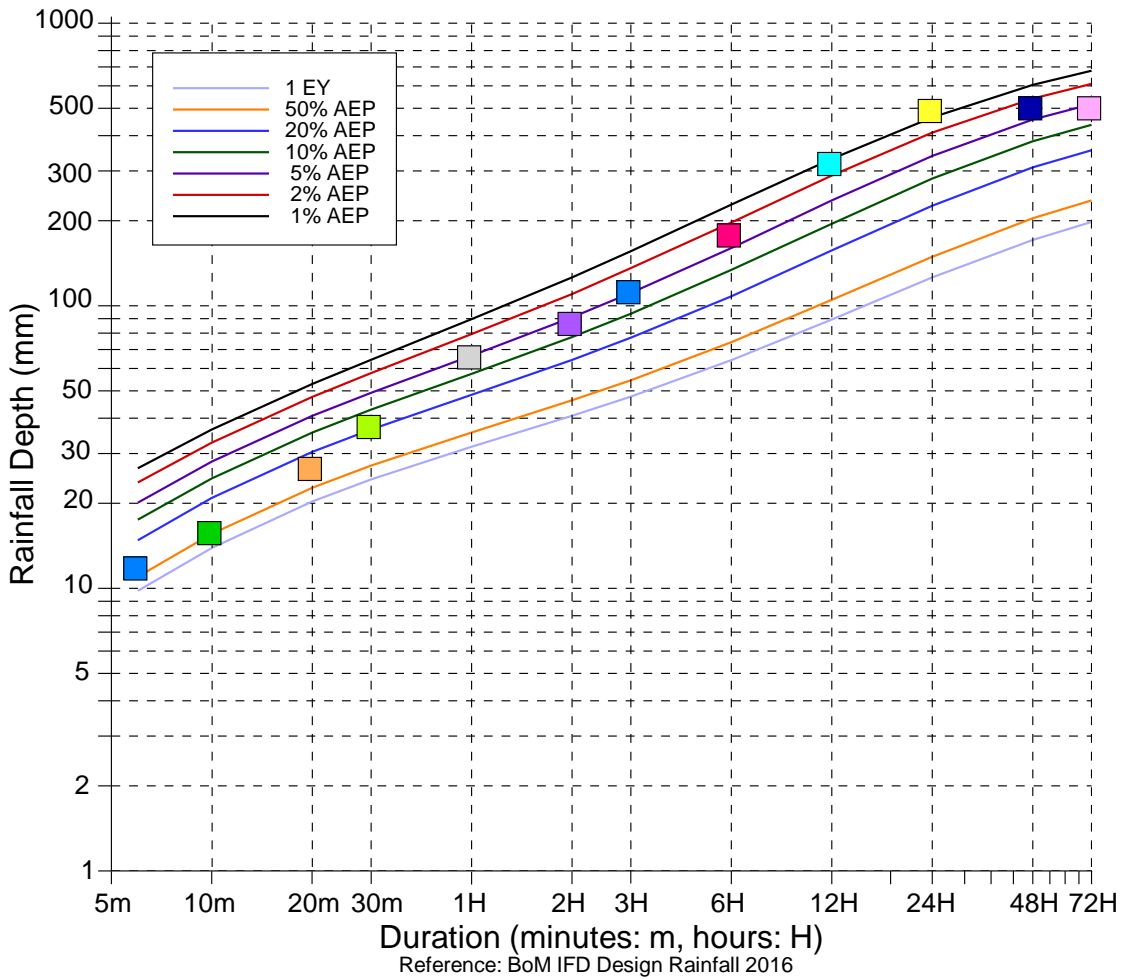


Duration (minutes:m) (Hours: H)	Rainfall Depth (mm)	Time/Date
6m	12.0	06:02_15/03/2017
10m	18.0	05:58_15/03/2017
20m	25.0	00:30_31/03/2017
30m	37.0	00:26_31/03/2017
1H	67.0	00:02_31/03/2017
2H	116.0	23:18_30/03/2017
3H	150.0	22:28_30/03/2017
6H	191.0	21:24_30/03/2017
12H	227.0	17:18_30/03/2017
24H	314.0	03:38_30/03/2017
48H	344.0	22:26_29/03/2017
72H	352.0	22:26_28/03/2017

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For further information refer to BoM frequently asked questions: <http://www.bom.gov.au/water/designRainfalls/ifd/ifd-faq.shtml>

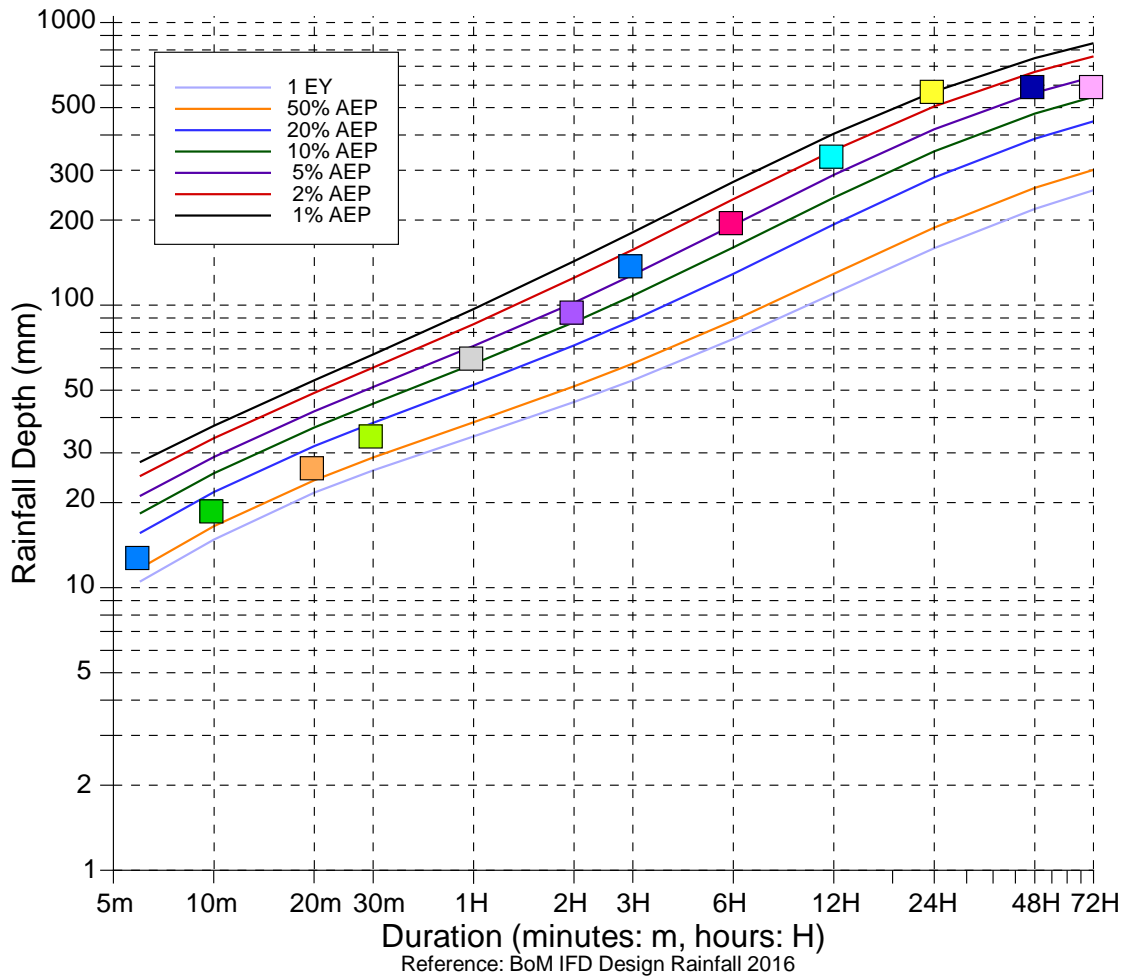


Duration (minutes:m) (Hours: H)	Rainfall Depth (mm)	Time/Date
6m	12.0	14:44_23/03/2017
10m	16.0	11:34_30/03/2017
20m	27.0	11:38_30/03/2017
30m	38.0	11:28_30/03/2017
1H	67.0	11:16_30/03/2017
2H	88.0	19:26_30/03/2017
3H	114.0	19:26_30/03/2017
6H	181.0	16:12_30/03/2017
12H	324.0	10:48_30/03/2017
24H	499.0	04:14_30/03/2017
48H	510.0	19:54_29/03/2017
72H	510.0	19:54_29/03/2017

The probability terminology used for the 2016 design rainfalls is consistent with the probability terminology for the new edition of Australian Rainfall and Runoff (ARR2016). Further details on the new probability terminology can be found in Book 1; Chapter 2; Section 2.2 Terminology of ARR2016 <http://arr.ga.gov.au/arr-guideline>. The main terms used to describe design rainfalls are:

- *Exceedances per year (EY)*: the number of times an event is likely to occur or be exceeded within any given year.
- *Annual exceedance probability (AEP)*: the probability or likelihood of an event occurring or being exceeded within any given year, usually expressed as a percentage.

For further information refer to BoM frequently asked questions: <http://www.bom.gov.au/water/designRainfalls/ifd/ifd-faq.shtml>

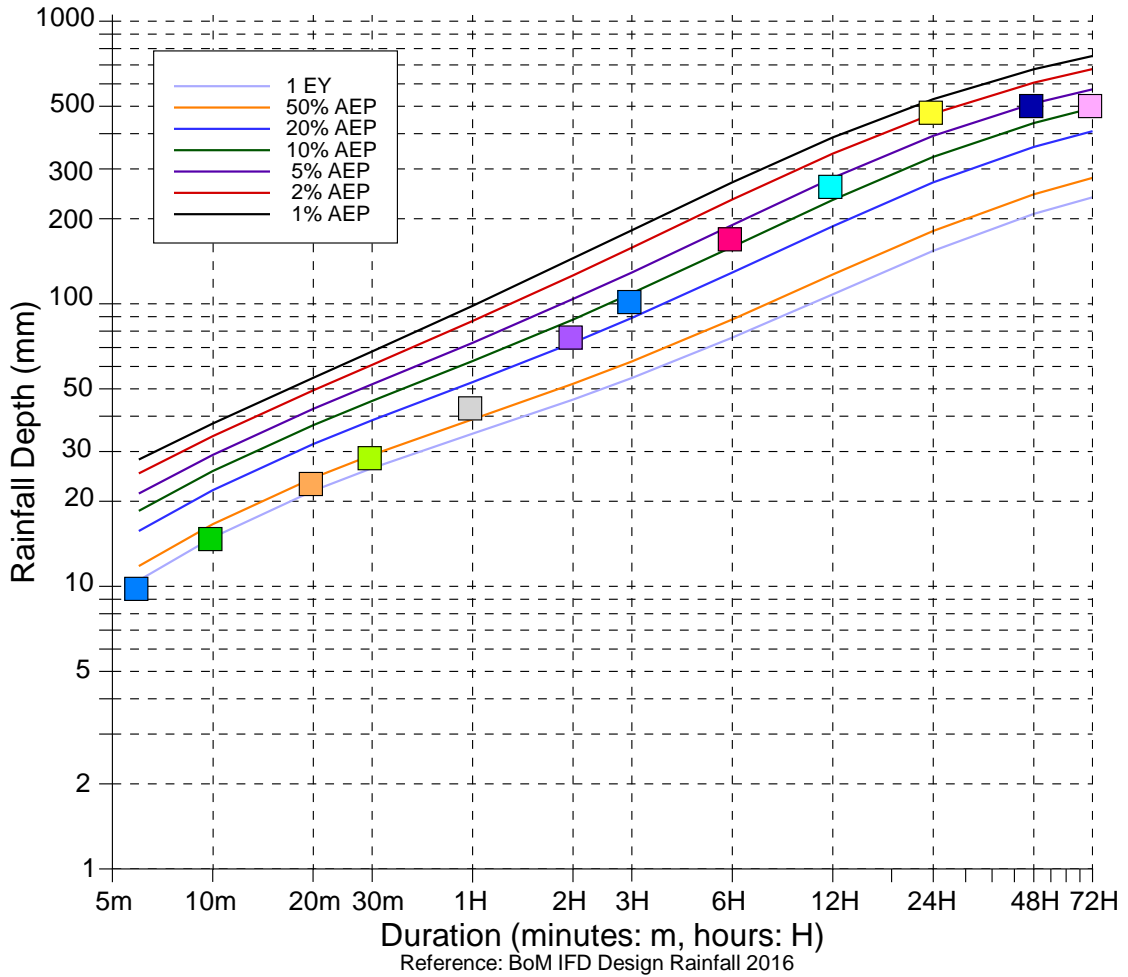


Duration (minutes:m) (Hours: H)	Rainfall Depth (mm)	Time/Date
6m	13.0	16:26_17/03/2017
10m	19.0	16:22_17/03/2017
20m	27.0	03:14_30/03/2017
30m	35.0	02:24_30/03/2017
1H	66.0	02:36_30/03/2017
2H	96.0	02:22_30/03/2017
3H	140.0	02:24_30/03/2017
6H	199.0	02:24_30/03/2017
12H	342.0	02:22_30/03/2017
24H	580.0	02:22_30/03/2017
48H	603.0	22:52_29/03/2017
72H	603.0	22:52_29/03/2017

The probability terminology used for the 2016 design rainfalls is consistent with the probability terminology for the new edition of Australian Rainfall and Runoff (ARR2016). Further details on the new probability terminology can be found in Book 1; Chapter 2; Section 2.2 Terminology of ARR2016 <http://arr.ga.gov.au/arr-guideline>. The main terms used to describe design rainfalls are:

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- *Annual exceedance probability (AEP)*: the probability or likelihood of an event occurring or being exceeded within any given year, usually expressed as a percentage.

For further information refer to BoM frequently asked questions: <http://www.bom.gov.au/water/designRainfalls/ifd/ifd-faq.shtml>

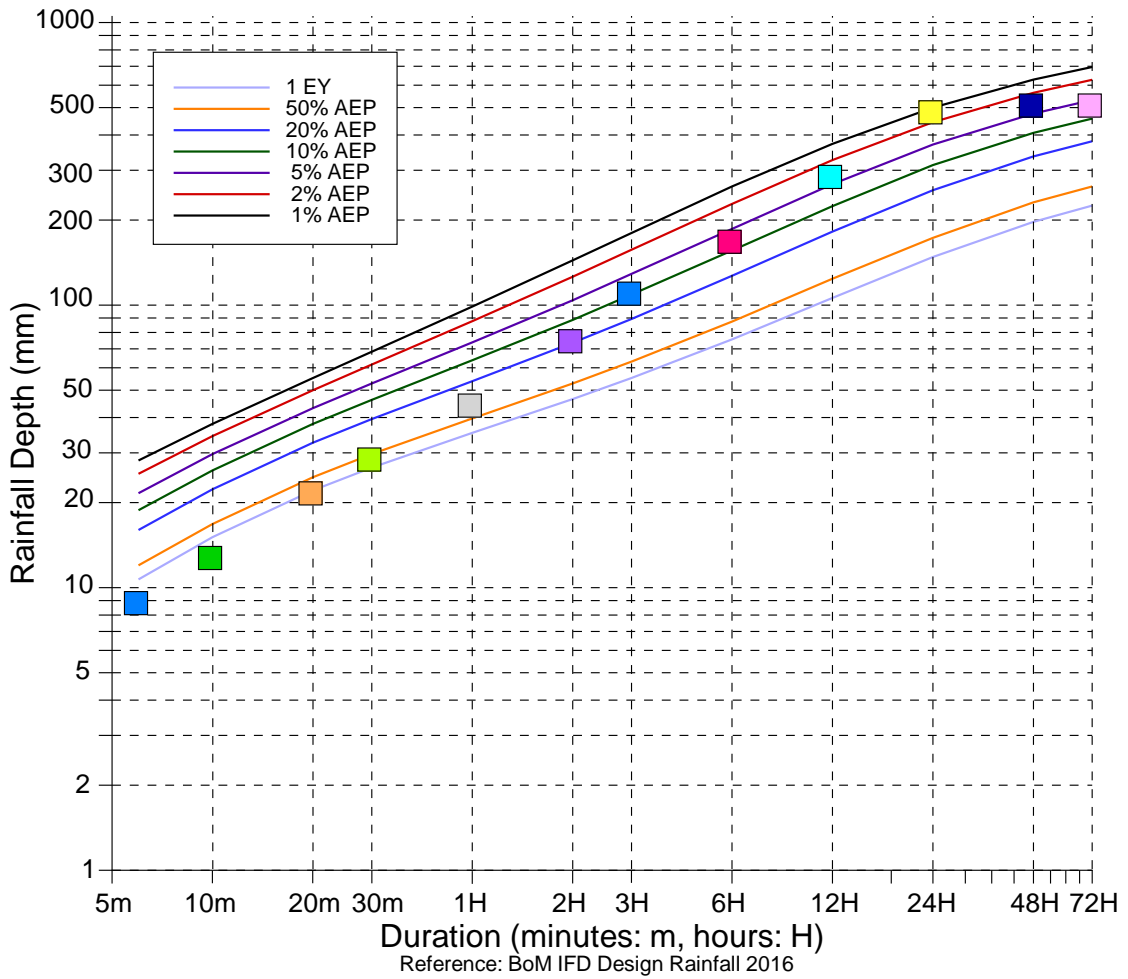


Duration (minutes:m) (Hours: H)	Rainfall Depth (mm)	Time/Date
6m	10.0	05:12_15/03/2017
10m	15.0	05:12_15/03/2017
20m	23.5	05:10_15/03/2017
30m	29.0	03:14_30/03/2017
1H	43.5	23:04_30/03/2017
2H	77.5	22:32_30/03/2017
3H	103.5	21:32_30/03/2017
6H	172.5	18:50_30/03/2017
12H	264.5	01:22_30/03/2017
24H	484.0	01:18_30/03/2017
48H	511.0	18:00_29/03/2017
72H	511.0	18:00_29/03/2017

The probability terminology used for the 2016 design rainfalls is consistent with the probability terminology for the new edition of Australian Rainfall and Runoff (ARR2016). Further details on the new probability terminology can be found in Book 1; Chapter 2; Section 2.2 Terminology of ARR2016 <http://arr.ga.gov.au/arr-guideline>. The main terms used to describe design rainfalls are:

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For further information refer to BoM frequently asked questions: <http://www.bom.gov.au/water/designRainfalls/ifd/ifd-faq.shtml>

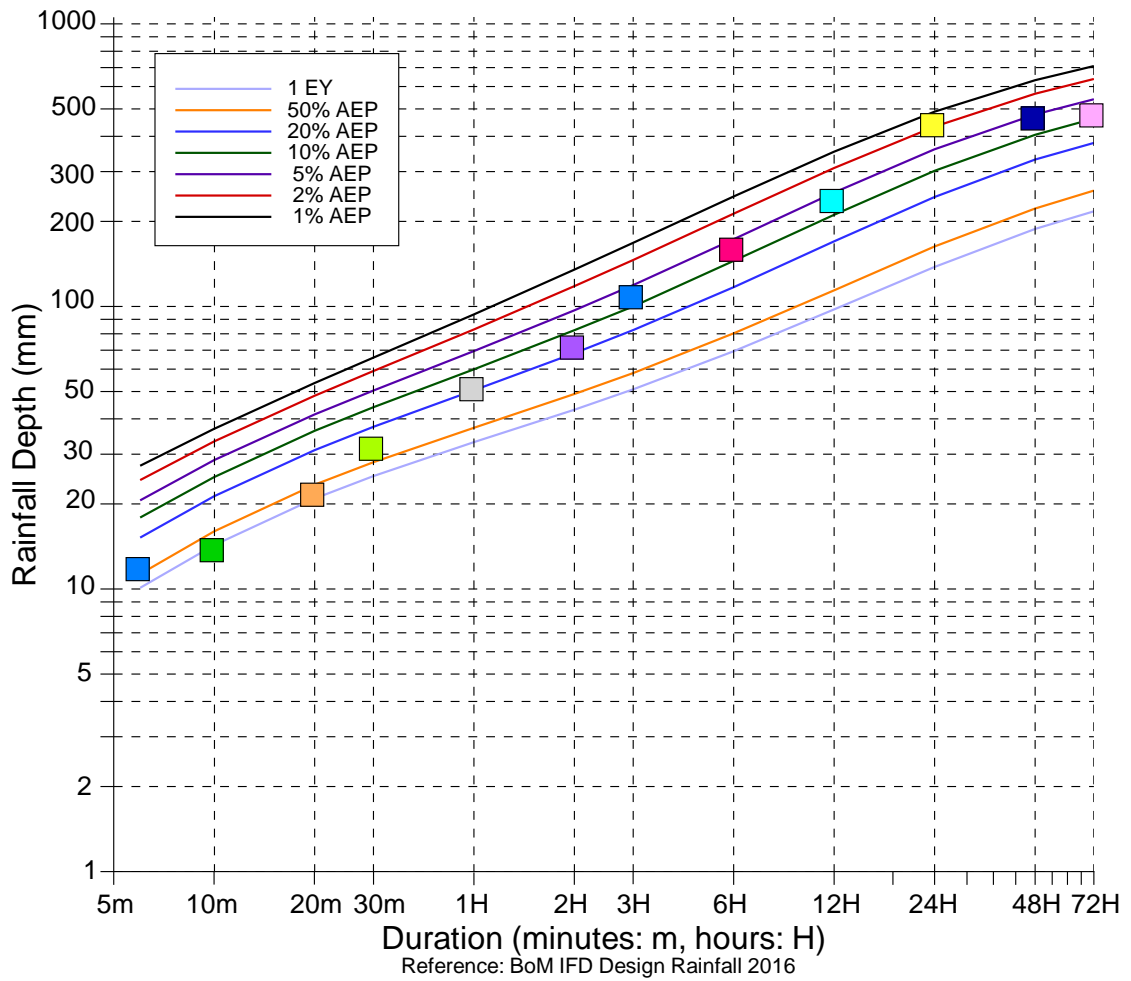


	Duration (minutes:m Hours: H)	Rainfall Depth (mm)	Time/Date
	6m	9.0	13:26_30/03/2017
	10m	13.0	13:26_30/03/2017
	20m	22.0	02:46_30/03/2017
	30m	29.0	02:36_30/03/2017
	1H	45.0	02:14_30/03/2017
	2H	76.0	02:36_30/03/2017
	3H	112.0	02:14_30/03/2017
	6H	171.0	02:14_30/03/2017
	12H	290.0	02:12_30/03/2017
	24H	491.0	02:12_30/03/2017
	48H	519.0	16:28_29/03/2017
	72H	519.0	16:28_29/03/2017

The probability terminology used for the 2016 design rainfalls is consistent with the probability terminology for the new edition of Australian Rainfall and Runoff (ARR2016). Further details on the new probability terminology can be found in Book 1; Chapter 2; Section 2.2 Terminology of ARR2016 <http://arr.ga.gov.au/arr-guideline>. The main terms used to describe design rainfalls are:

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- *Annual exceedance probability (AEP)*: the probability or likelihood of an event occurring or being exceeded within any given year, usually expressed as a percentage.

For further information refer to BoM frequently asked questions: <http://www.bom.gov.au/water/designRainfalls/ifd/ifd-faq.shtml>

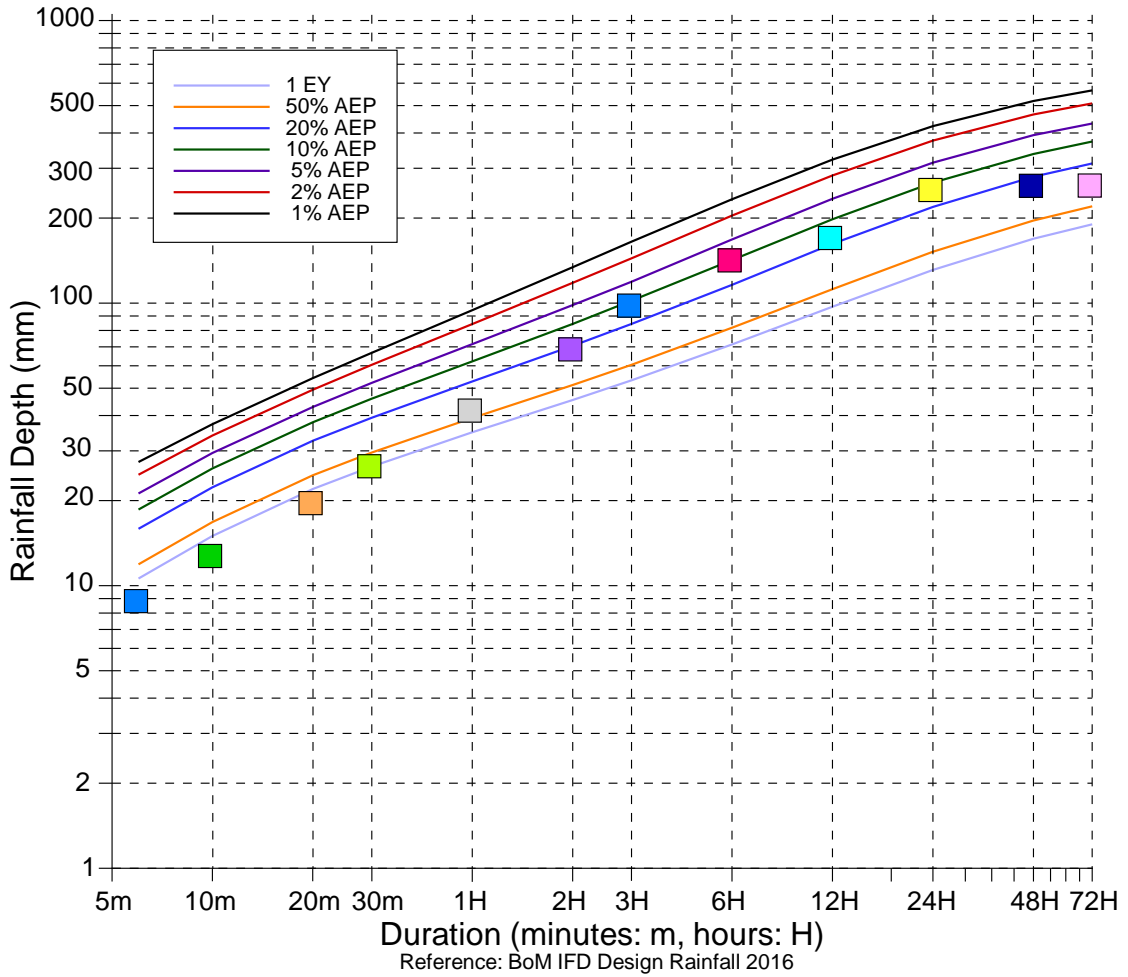


Duration (minutes:m) (Hours: H)	Rainfall Depth (mm)	Time/Date
6m	12.0	15:44_23/03/2017
10m	14.0	15:44_23/03/2017
20m	22.0	02:36_30/03/2017
30m	32.0	02:44_30/03/2017
1H	52.0	02:36_30/03/2017
2H	73.0	02:28_30/03/2017
3H	110.0	02:36_30/03/2017
6H	162.0	02:36_30/03/2017
12H	241.0	02:36_30/03/2017
24H	447.0	02:28_30/03/2017
48H	472.0	20:32_29/03/2017
72H	484.0	01:48_30/03/2017

The probability terminology used for the 2016 design rainfalls is consistent with the probability terminology for the new edition of Australian Rainfall and Runoff (ARR2016). Further details on the new probability terminology can be found in Book 1; Chapter 2; Section 2.2 Terminology of ARR2016 <http://arr.ga.gov.au/arr-guideline>. The main terms used to describe design rainfalls are:

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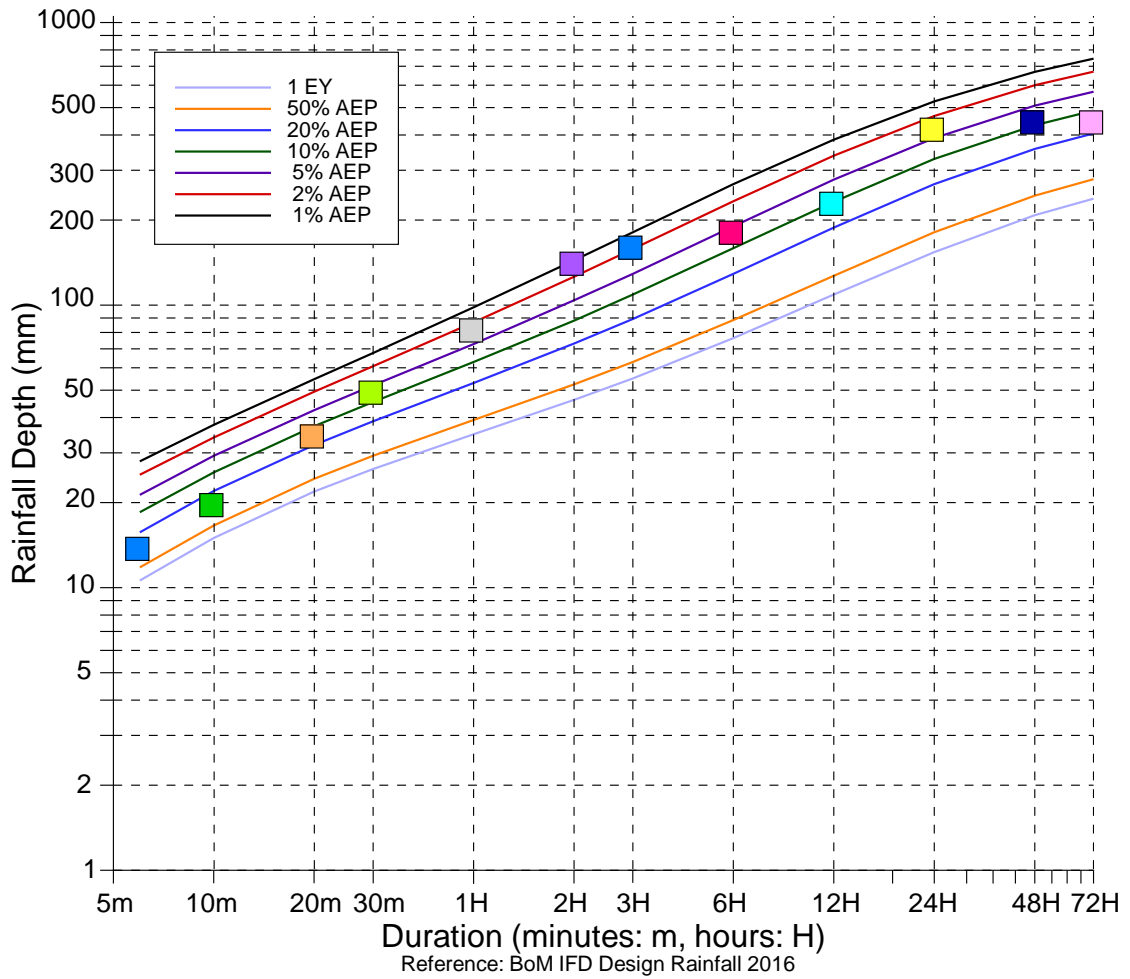


Duration (minutes:m) (Hours: H)	Rainfall Depth (mm)	Time/Date
6m	9.0	22:22_18/03/2017
10m	13.0	22:20_18/03/2017
20m	20.0	22:16_18/03/2017
30m	27.0	22:12_18/03/2017
1H	42.5	21:42_18/03/2017
2H	70.0	22:02_30/03/2017
3H	100.0	21:10_30/03/2017
6H	144.5	20:20_30/03/2017
12H	173.5	15:38_30/03/2017
24H	256.5	02:24_30/03/2017
48H	265.5	23:30_29/03/2017
72H	266.0	23:30_29/03/2017

The probability terminology used for the 2016 design rainfalls is consistent with the probability terminology for the new edition of Australian Rainfall and Runoff (ARR2016). Further details on the new probability terminology can be found in Book 1; Chapter 2; Section 2.2 Terminology of ARR2016 <http://arr.ga.gov.au/arr-guideline>. The main terms used to describe design rainfalls are:

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For further information refer to BoM frequently asked questions: <http://www.bom.gov.au/water/designRainfalls/ifd/ifd-faq.shtml>

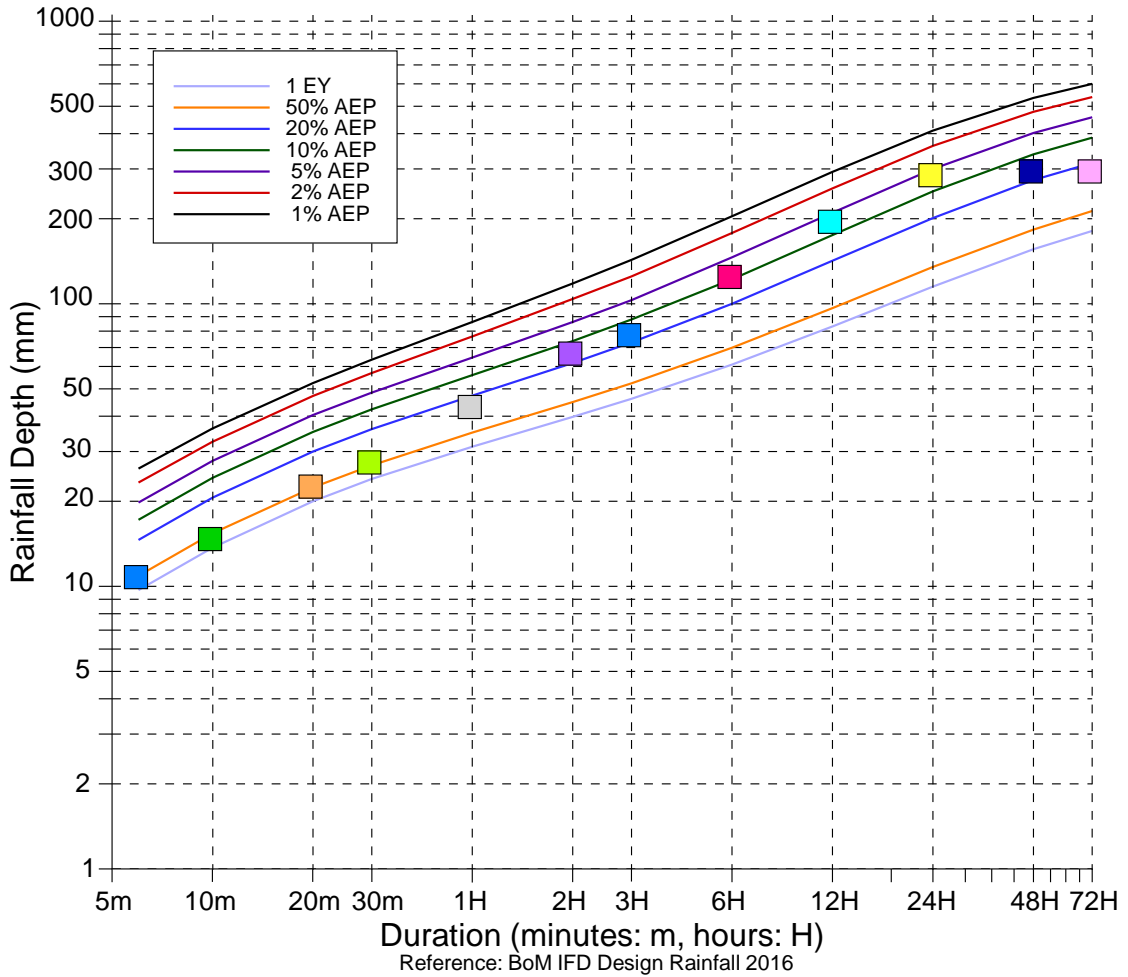


Duration (minutes:m) (Hours: H)	Rainfall Depth (mm)	Time/Date
6m	14.0	08:24_15/03/2017
10m	20.0	08:24_15/03/2017
20m	35.0	08:14_15/03/2017
30m	50.0	08:20_15/03/2017
1H	83.0	08:06_15/03/2017
2H	143.0	07:26_15/03/2017
3H	163.0	06:26_15/03/2017
6H	184.0	06:22_15/03/2017
12H	233.0	06:22_15/03/2017
24H	426.0	03:06_30/03/2017
48H	452.0	20:04_29/03/2017
72H	452.0	20:04_29/03/2017

The probability terminology used for the 2016 design rainfalls is consistent with the probability terminology for the new edition of Australian Rainfall and Runoff (ARR2016). Further details on the new probability terminology can be found in Book 1; Chapter 2; Section 2.2 Terminology of ARR2016 <http://arr.ga.gov.au/arr-guideline>. The main terms used to describe design rainfalls are:

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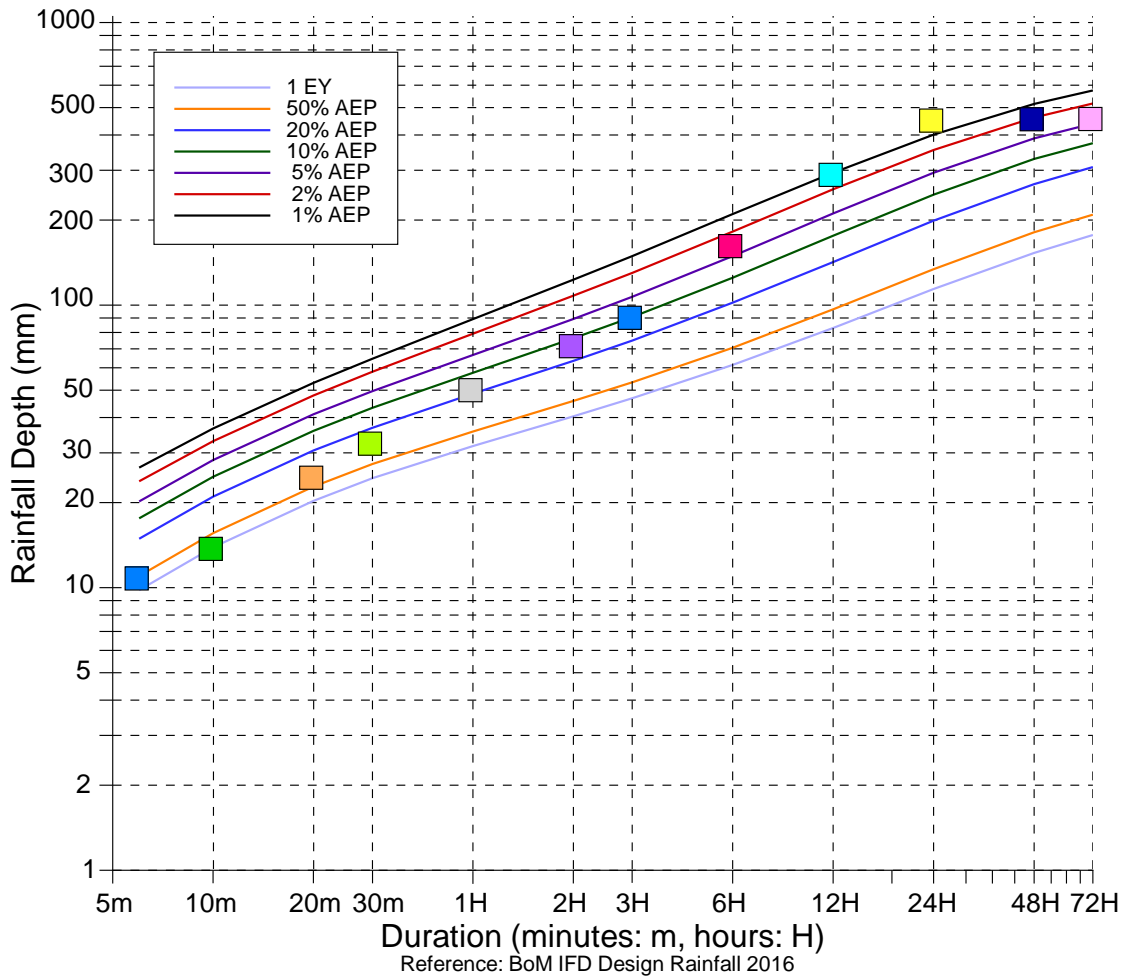


Duration (minutes:m (Hours: H))	Rainfall Depth (mm)	Time/Date
6m	11.0	06:24_30/03/2017
10m	15.0	06:24_30/03/2017
20m	23.0	06:12_30/03/2017
30m	28.0	05:06_23/03/2017
1H	44.0	05:40_30/03/2017
2H	68.0	05:00_23/03/2017
3H	79.0	04:18_23/03/2017
6H	127.0	05:22_30/03/2017
12H	199.0	00:18_30/03/2017
24H	291.0	17:46_29/03/2017
48H	300.0	11:26_29/03/2017
72H	300.0	11:26_29/03/2017

The probability terminology used for the 2016 design rainfalls is consistent with the probability terminology for the new edition of Australian Rainfall and Runoff (ARR2016). Further details on the new probability terminology can be found in Book 1; Chapter 2; Section 2.2 Terminology of ARR2016 <http://arr.ga.gov.au/arr-guideline>. The main terms used to describe design rainfalls are:

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For further information refer to BoM frequently asked questions: <http://www.bom.gov.au/water/designRainfalls/ifd/ifd-faq.shtml>

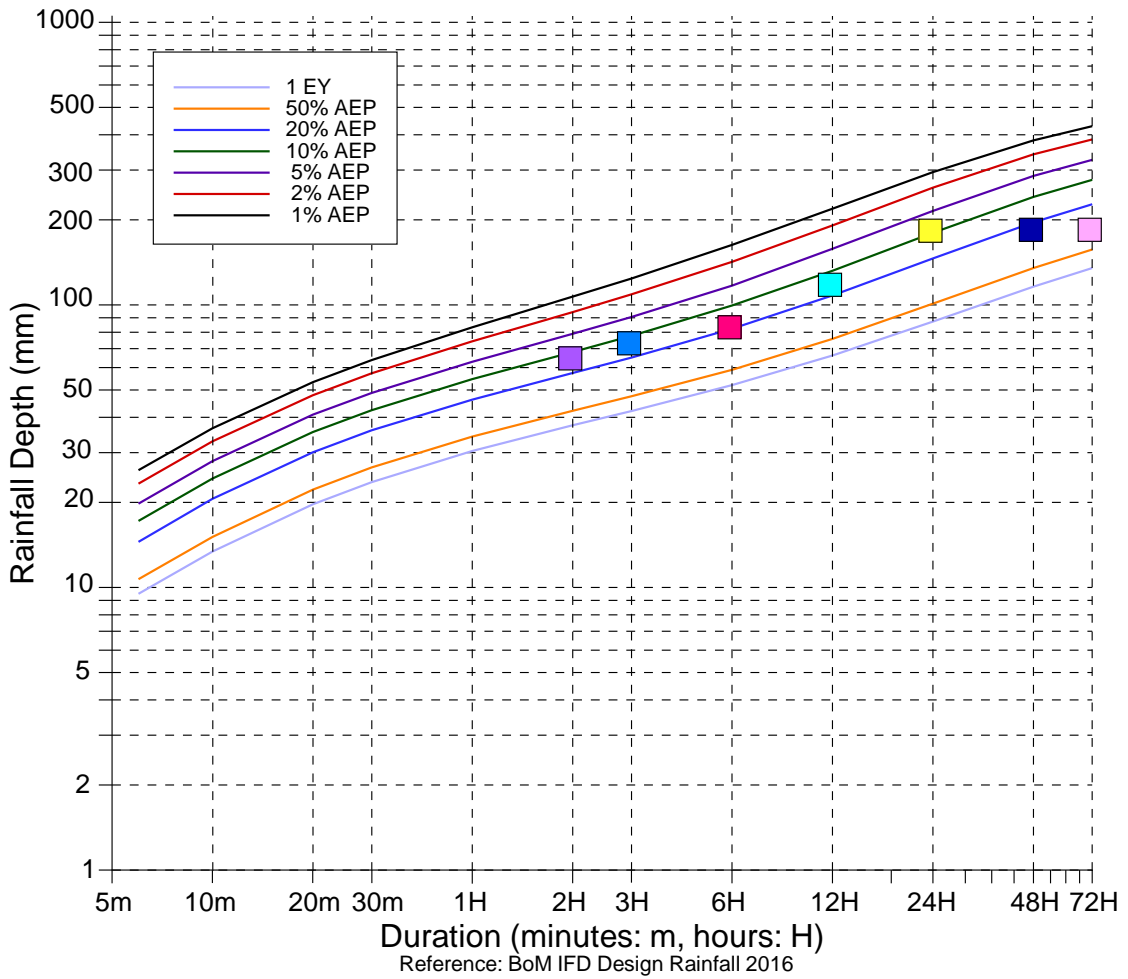


	Duration (minutes:m (Hours: H))	Rainfall Depth (mm)	Time/Date
■	6m	11.0	13:40_19/03/2017
■	10m	14.0	17:46_30/03/2017
■	20m	25.0	17:46_30/03/2017
■	30m	33.0	17:36_30/03/2017
■	1H	51.0	17:20_30/03/2017
■	2H	73.0	17:00_30/03/2017
■	3H	92.0	11:34_30/03/2017
■	6H	165.0	12:04_30/03/2017
■	12H	295.0	10:40_30/03/2017
■	24H	459.0	02:52_30/03/2017
■	48H	464.0	00:08_30/03/2017
■	72H	465.0	06:08_28/03/2017

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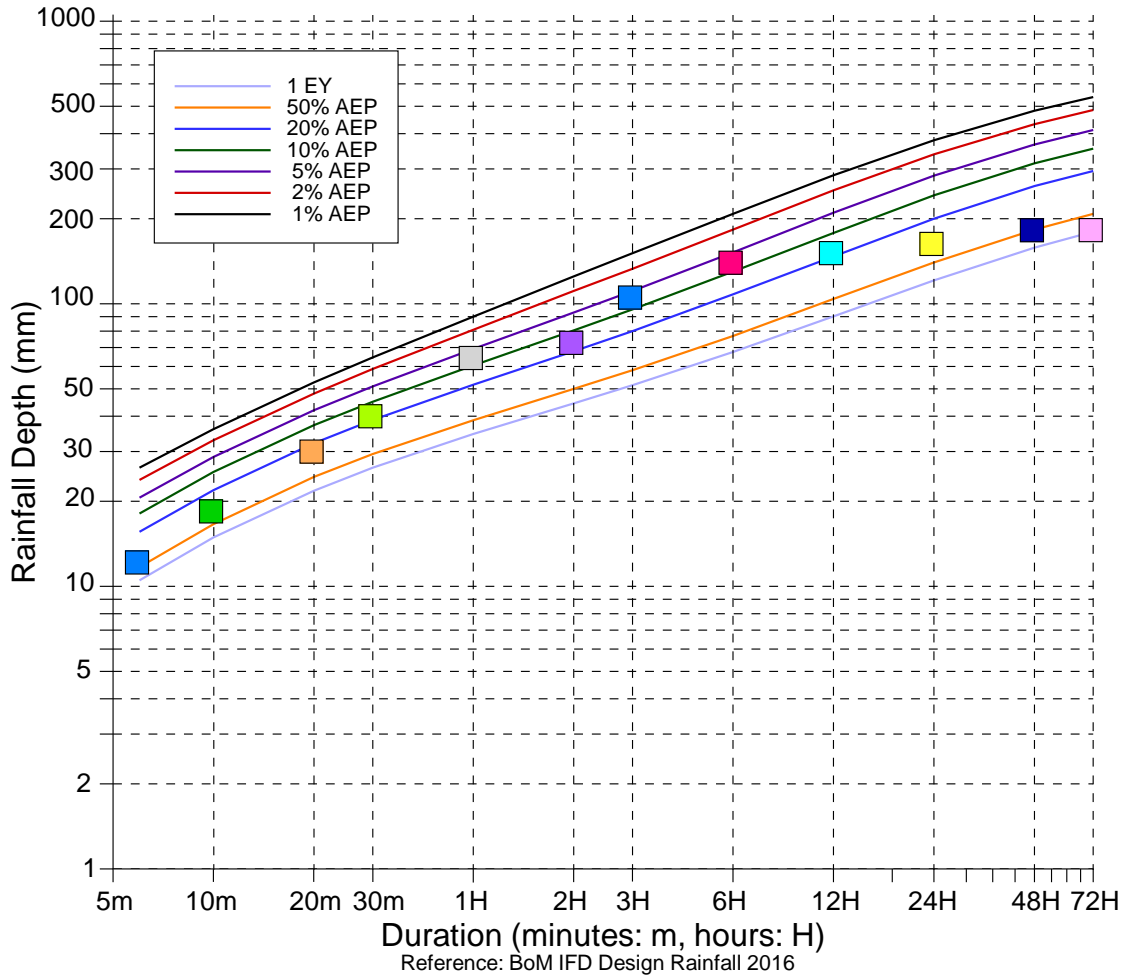
Short duration rainfall data impacted by possible radio transfer interruptions. Suspect short duration IFD results removed by observation.

Duration (minutes:m) (Hours: H)	Rainfall Depth (mm)	Time/Date
6m		
10m		
20m		
30m		
1H		
2H	66.0	04:58_23/03/2017
3H	74.6	04:58_23/03/2017
6H	85.0	04:58_23/03/2017
12H	120.2	00:58_30/03/2017
24H	186.8	15:58_29/03/2017
48H	188.2	12:58_29/03/2017
72H	188.2	12:58_29/03/2017

The probability terminology used for the 2016 design rainfalls is consistent with the probability terminology for the new edition of Australian Rainfall and Runoff (ARR2016). Further details on the new probability terminology can be found in Book 1; Chapter 2; Section 2.2 Terminology of ARR2016 <http://arr.ga.gov.au/arr-guideline>. The main terms used to describe design rainfalls are:

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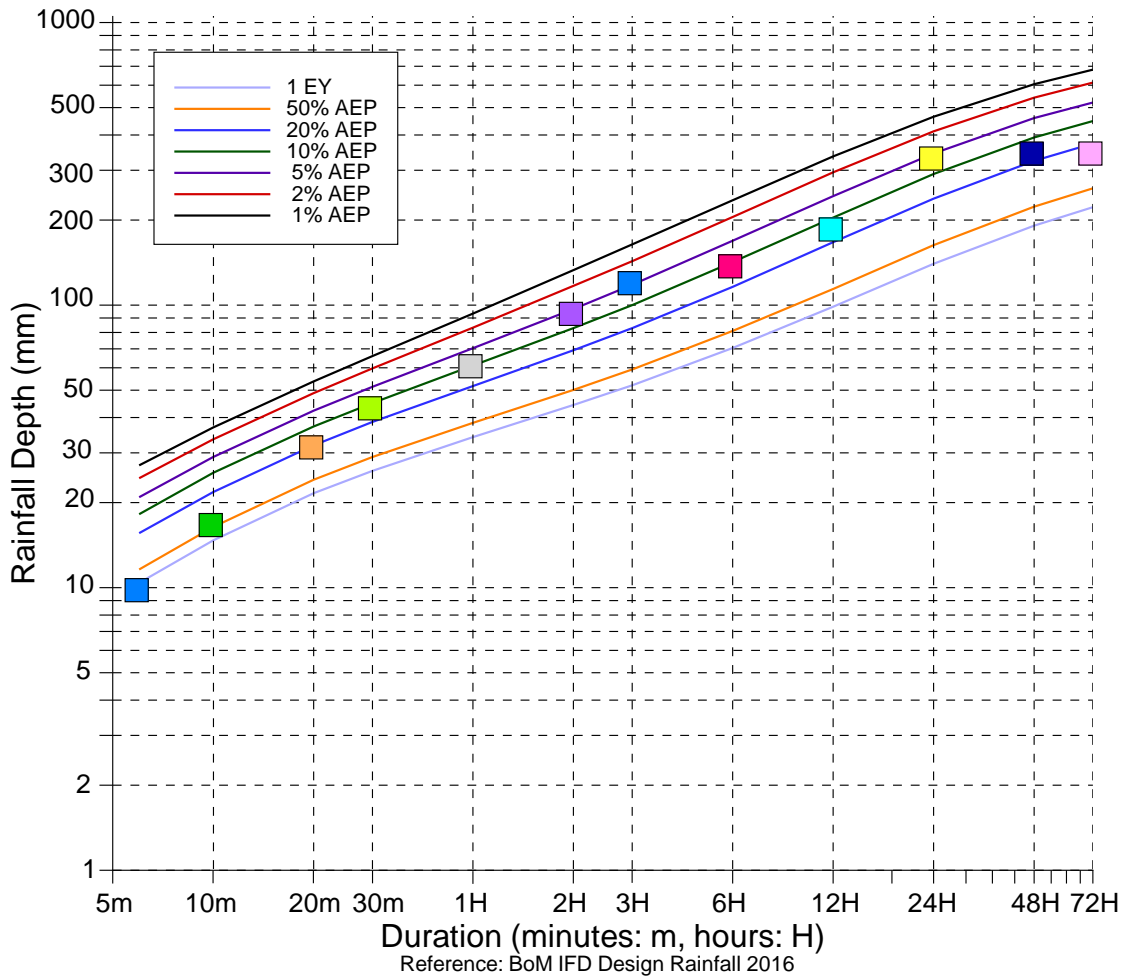


Duration (minutes:m Hours: H)	Rainfall Depth (mm)	Time/Date
6m	12.4	17:14_15/03/2017
10m	18.8	17:10_15/03/2017
20m	30.6	17:00_15/03/2017
30m	40.8	17:08_15/03/2017
1H	65.6	16:50_15/03/2017
2H	74.2	16:56_15/03/2017
3H	107.4	16:56_15/03/2017
6H	142.6	16:08_15/03/2017
12H	154.2	10:06_15/03/2017
24H	166.2	02:50_15/03/2017
48H	185.8	06:28_14/03/2017
72H	186.0	06:28_14/03/2017

The probability terminology used for the 2016 design rainfalls is consistent with the probability terminology for the new edition of Australian Rainfall and Runoff (ARR2016). Further details on the new probability terminology can be found in Book 1; Chapter 2; Section 2.2 Terminology of ARR2016 <http://arr.ga.gov.au/arr-guideline>. The main terms used to describe design rainfalls are:

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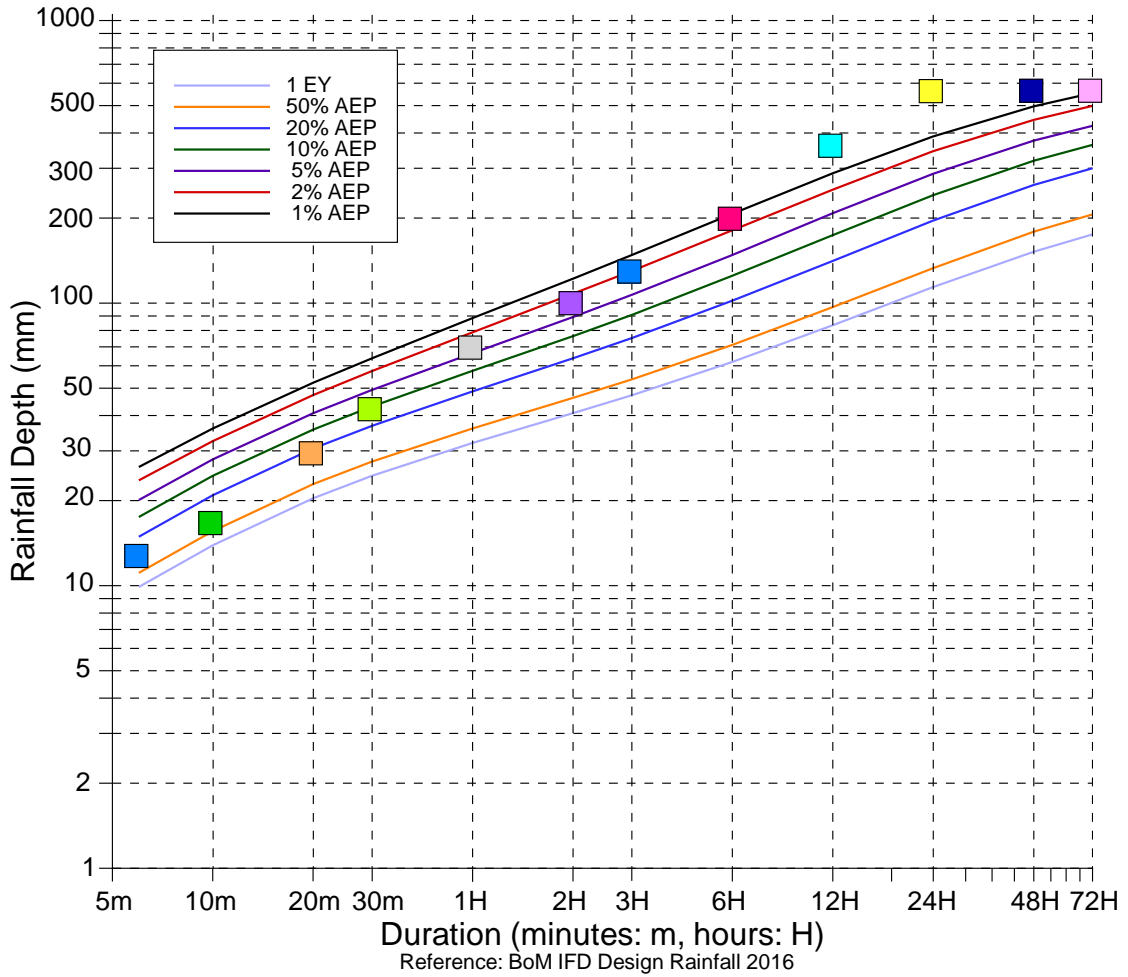


Duration (minutes:m) (Hours: H)	Rainfall Depth (mm)	Time/Date
6m	10.0	08:38_15/03/2017
10m	17.0	08:30_15/03/2017
20m	32.0	08:30_15/03/2017
30m	44.0	08:26_15/03/2017
1H	62.0	08:14_15/03/2017
2H	95.0	07:20_15/03/2017
3H	122.0	07:16_15/03/2017
6H	140.0	07:32_15/03/2017
12H	189.0	06:36_15/03/2017
24H	337.0	03:12_30/03/2017
48H	351.0	20:44_29/03/2017
72H	351.0	20:44_29/03/2017

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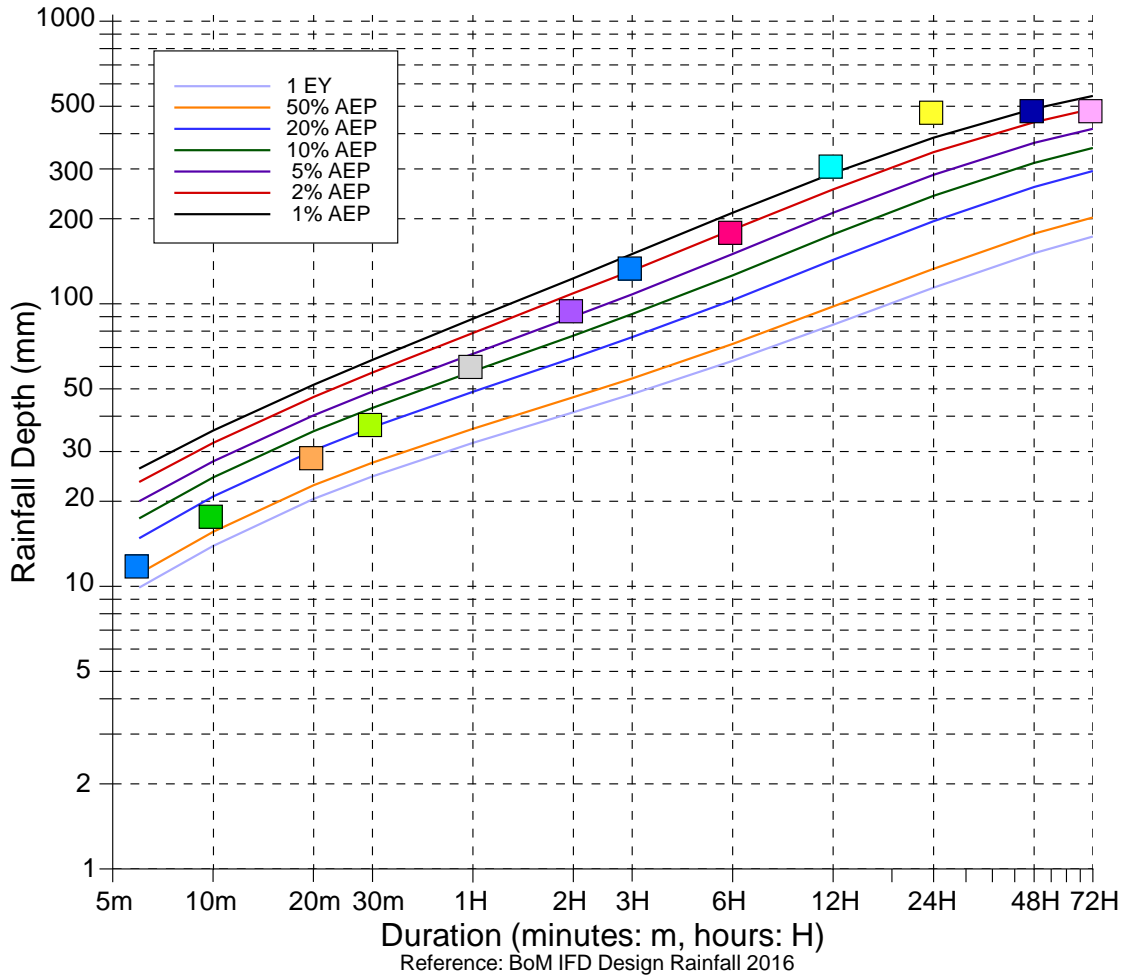


Duration (minutes:m) (Hours: H)	Rainfall Depth (mm)	Time/Date
6m	13.0	03:30_30/03/2017
10m	17.0	09:54_30/03/2017
20m	30.0	09:46_30/03/2017
30m	43.0	09:48_30/03/2017
1H	71.0	09:36_30/03/2017
2H	102.0	09:00_30/03/2017
3H	132.0	01:30_30/03/2017
6H	203.0	01:30_30/03/2017
12H	368.0	22:58_29/03/2017
24H	574.0	15:40_29/03/2017
48H	576.0	15:40_29/03/2017
72H	576.0	15:40_29/03/2017

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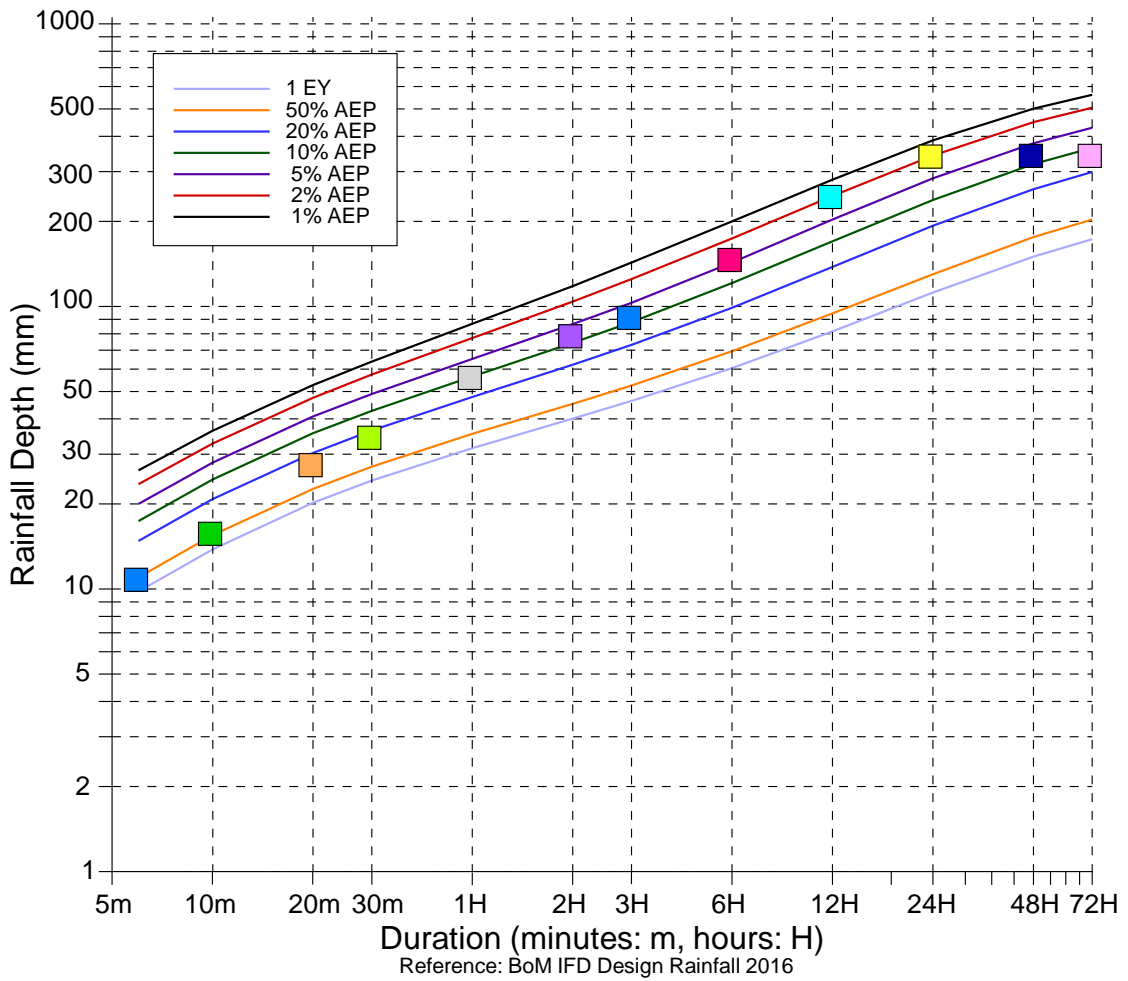


Duration (minutes:m (Hours: H))	Rainfall Depth (mm)	Time/Date
6m	12.0	15:34_30/03/2017
10m	18.0	15:34_30/03/2017
20m	29.0	15:24_30/03/2017
30m	38.0	07:48_15/03/2017
1H	61.0	14:42_30/03/2017
2H	96.0	13:52_30/03/2017
3H	136.0	12:52_30/03/2017
6H	182.0	09:52_30/03/2017
12H	312.0	04:16_30/03/2017
24H	484.0	02:44_30/03/2017
48H	490.0	20:28_29/03/2017
72H	490.0	20:28_29/03/2017

The probability terminology used for the 2016 design rainfalls is consistent with the probability terminology for the new edition of Australian Rainfall and Runoff (ARR2016). Further details on the new probability terminology can be found in Book 1; Chapter 2; Section 2.2 Terminology of ARR2016 <http://arr.ga.gov.au/arr-guideline>. The main terms used to describe design rainfalls are:

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For further information refer to BoM frequently asked questions: <http://www.bom.gov.au/water/designRainfalls/ifd/ifd-faq.shtml>

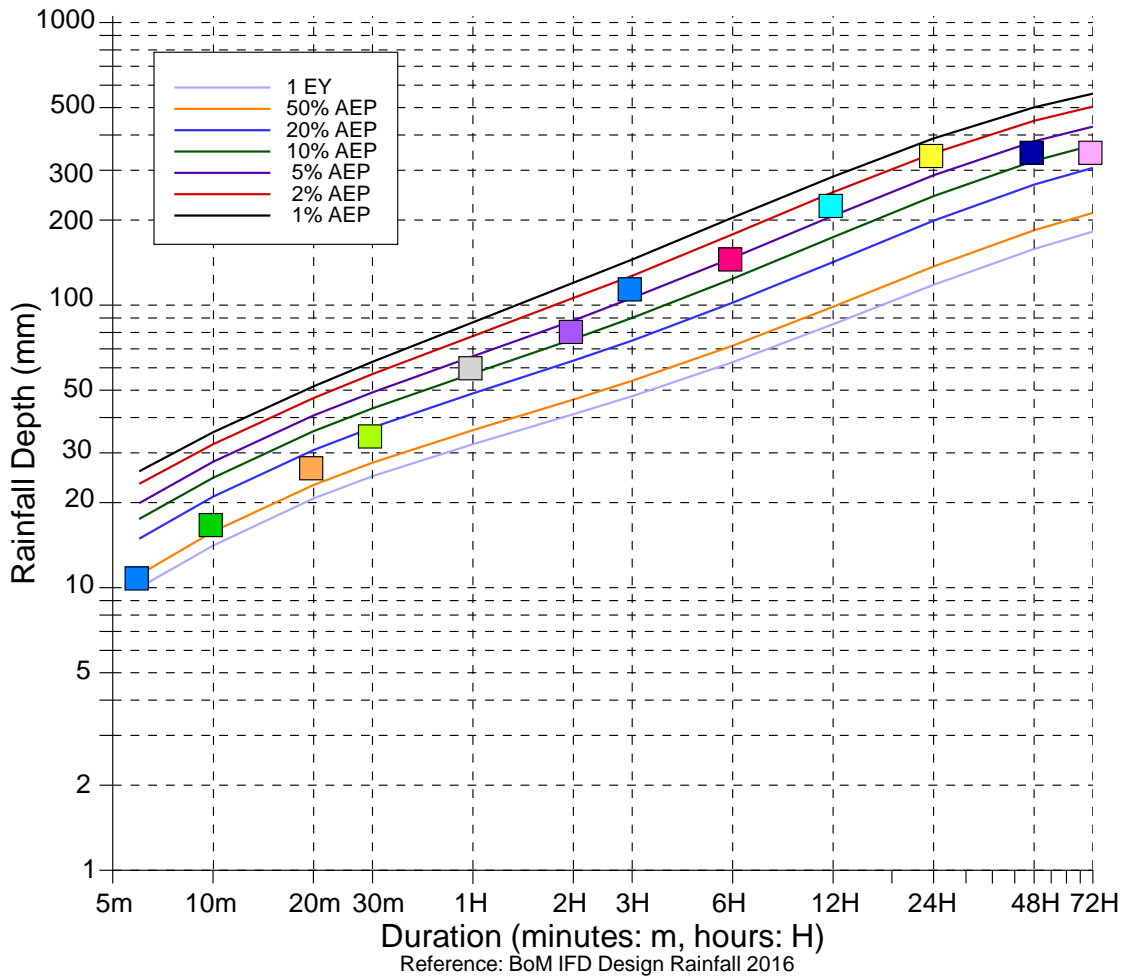


Duration (minutes:m, Hours: H)	Rainfall Depth (mm)	Time/Date
6m	11.0	17:36_30/03/2017
10m	16.0	17:38_30/03/2017
20m	28.0	17:28_30/03/2017
30m	35.0	17:28_30/03/2017
1H	57.0	17:08_30/03/2017
2H	80.0	16:30_30/03/2017
3H	93.0	16:44_30/03/2017
6H	149.0	16:44_30/03/2017
12H	249.0	10:56_30/03/2017
24H	346.0	02:00_30/03/2017
48H	348.0	01:32_30/03/2017
72H	348.0	01:32_30/03/2017

The probability terminology used for the 2016 design rainfalls is consistent with the probability terminology for the new edition of Australian Rainfall and Runoff (ARR2016). Further details on the new probability terminology can be found in Book 1; Chapter 2; Section 2.2 Terminology of ARR2016 <http://arr.ga.gov.au/arr-guideline>. The main terms used to describe design rainfalls are:

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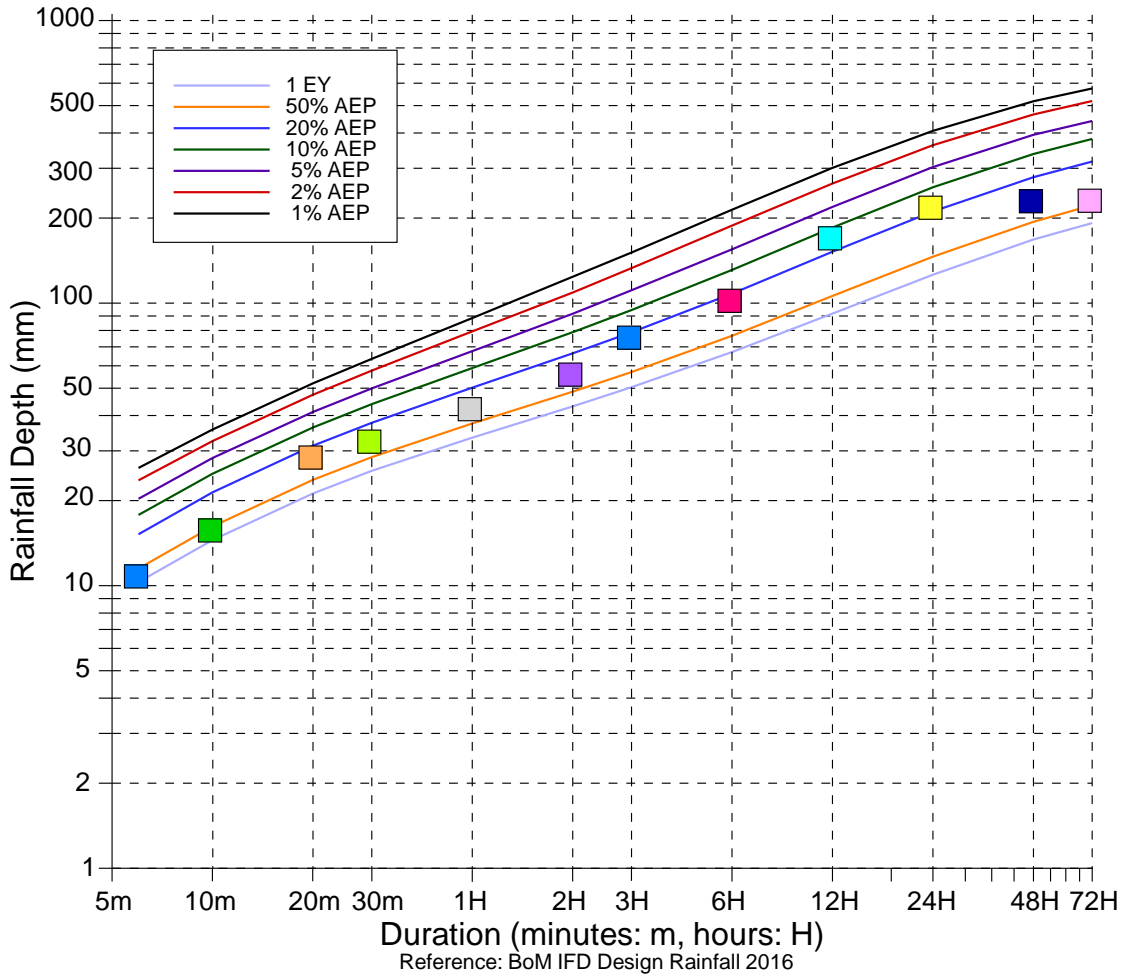


Duration (minutes:m) (Hours: H)	Rainfall Depth (mm)	Time/Date
6m	11.0	09:18_15/03/2017
10m	17.0	09:14_15/03/2017
20m	27.0	15:32_30/03/2017
30m	35.0	15:22_30/03/2017
1H	61.0	14:58_30/03/2017
2H	82.0	13:52_30/03/2017
3H	116.0	13:00_30/03/2017
6H	148.0	10:04_30/03/2017
12H	229.0	04:30_30/03/2017
24H	344.0	02:48_30/03/2017
48H	353.0	22:34_29/03/2017
72H	353.0	22:34_29/03/2017

The probability terminology used for the 2016 design rainfalls is consistent with the probability terminology for the new edition of Australian Rainfall and Runoff (ARR2016). Further details on the new probability terminology can be found in Book 1; Chapter 2; Section 2.2 Terminology of ARR2016 <http://arr.ga.gov.au/arr-guideline>. The main terms used to describe design rainfalls are:

- Exceedances per year (EY): the number of times an event is likely to occur or be exceeded within any given year.
- Annual exceedance probability (AEP): the probability or likelihood of an event occurring or being exceeded within any given year, usually expressed as a percentage.

For further information refer to BoM frequently asked questions: <http://www.bom.gov.au/water/designRainfalls/ifd/ifd-faq.shtml>

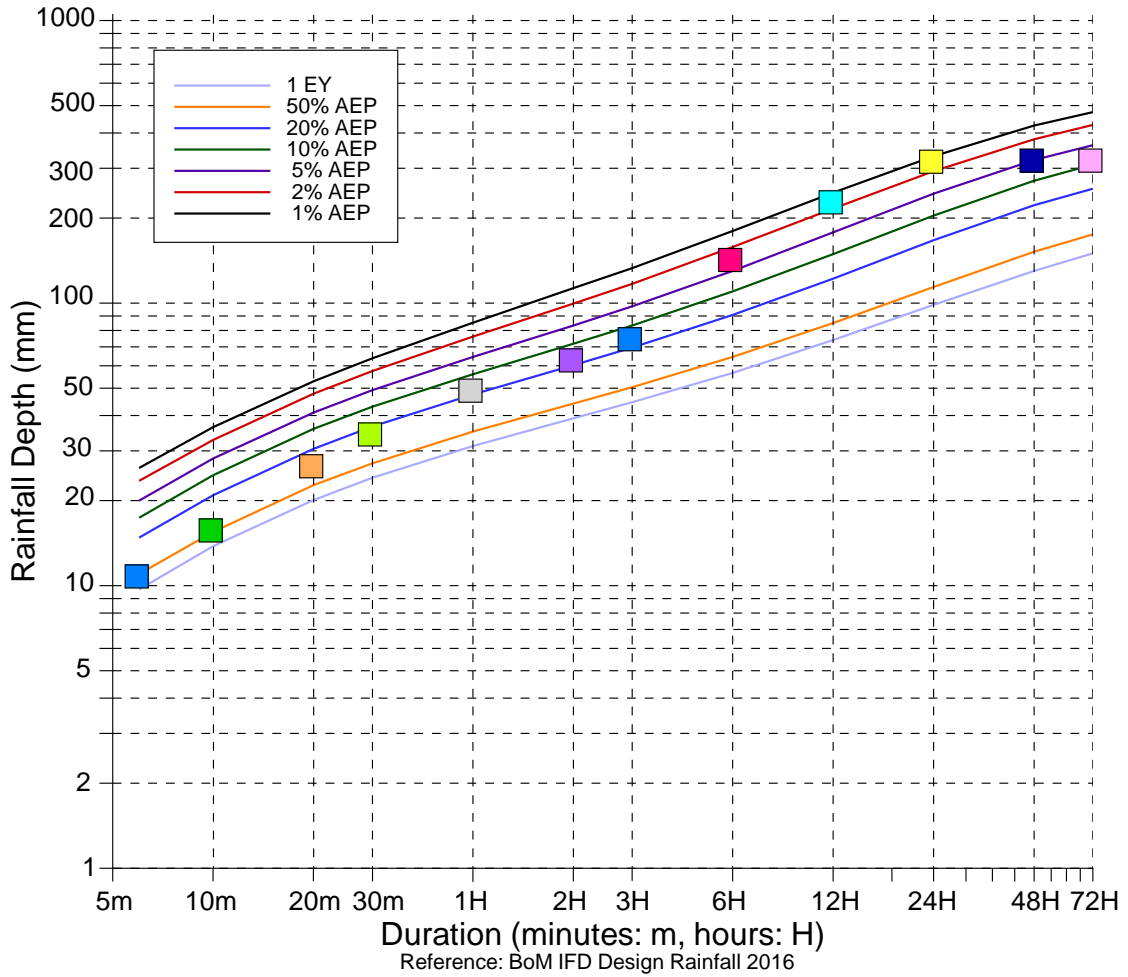


Duration (minutes:m) (Hours: H)	Rainfall Depth (mm)	Time/Date
6m	11.0	21:30_14/03/2017
10m	16.0	21:30_14/03/2017
20m	29.0	21:24_14/03/2017
30m	33.0	21:24_14/03/2017
1H	43.0	21:24_14/03/2017
2H	57.0	21:04_14/03/2017
3H	77.0	19:20_14/03/2017
6H	104.0	19:20_14/03/2017
12H	173.0	17:34_14/03/2017
24H	222.0	16:24_29/03/2017
48H	234.0	13:48_29/03/2017
72H	235.0	17:44_27/03/2017

The probability terminology used for the 2016 design rainfalls is consistent with the probability terminology for the new edition of Australian Rainfall and Runoff (ARR2016). Further details on the new probability terminology can be found in Book 1; Chapter 2; Section 2.2 Terminology of ARR2016 <http://arr.ga.gov.au/arr-guideline>. The main terms used to describe design rainfalls are:

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For further information refer to BoM frequently asked questions: <http://www.bom.gov.au/water/designRainfalls/ifd/ifd-faq.shtml>

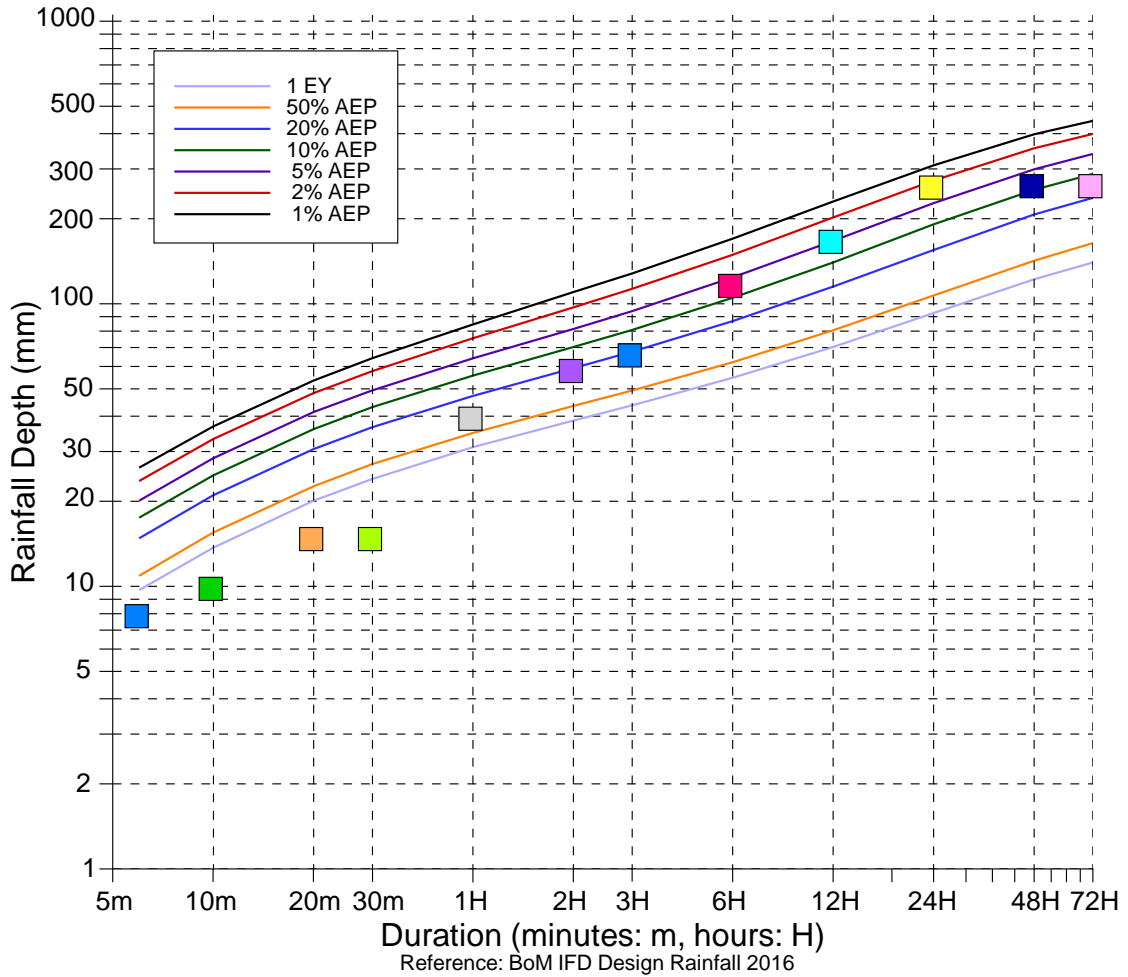


Duration (minutes:m) (Hours: H)	Rainfall Depth (mm)	Time/Date
6m	11.0	17:50_30/03/2017
10m	16.0	17:46_30/03/2017
20m	27.0	17:40_30/03/2017
30m	35.0	17:40_30/03/2017
1H	50.0	17:16_30/03/2017
2H	64.0	16:44_30/03/2017
3H	76.0	16:50_30/03/2017
6H	145.0	16:36_30/03/2017
12H	232.0	11:38_30/03/2017
24H	323.0	02:28_30/03/2017
48H	326.0	23:06_29/03/2017
72H	326.0	23:06_29/03/2017

The probability terminology used for the 2016 design rainfalls is consistent with the probability terminology for the new edition of Australian Rainfall and Runoff (ARR2016). Further details on the new probability terminology can be found in Book 1; Chapter 2; Section 2.2 Terminology of ARR2016 <http://arr.ga.gov.au/arr-guideline>. The main terms used to describe design rainfalls are:

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For further information refer to BoM frequently asked questions: <http://www.bom.gov.au/water/designRainfalls/ifd/ifd-faq.shtml>

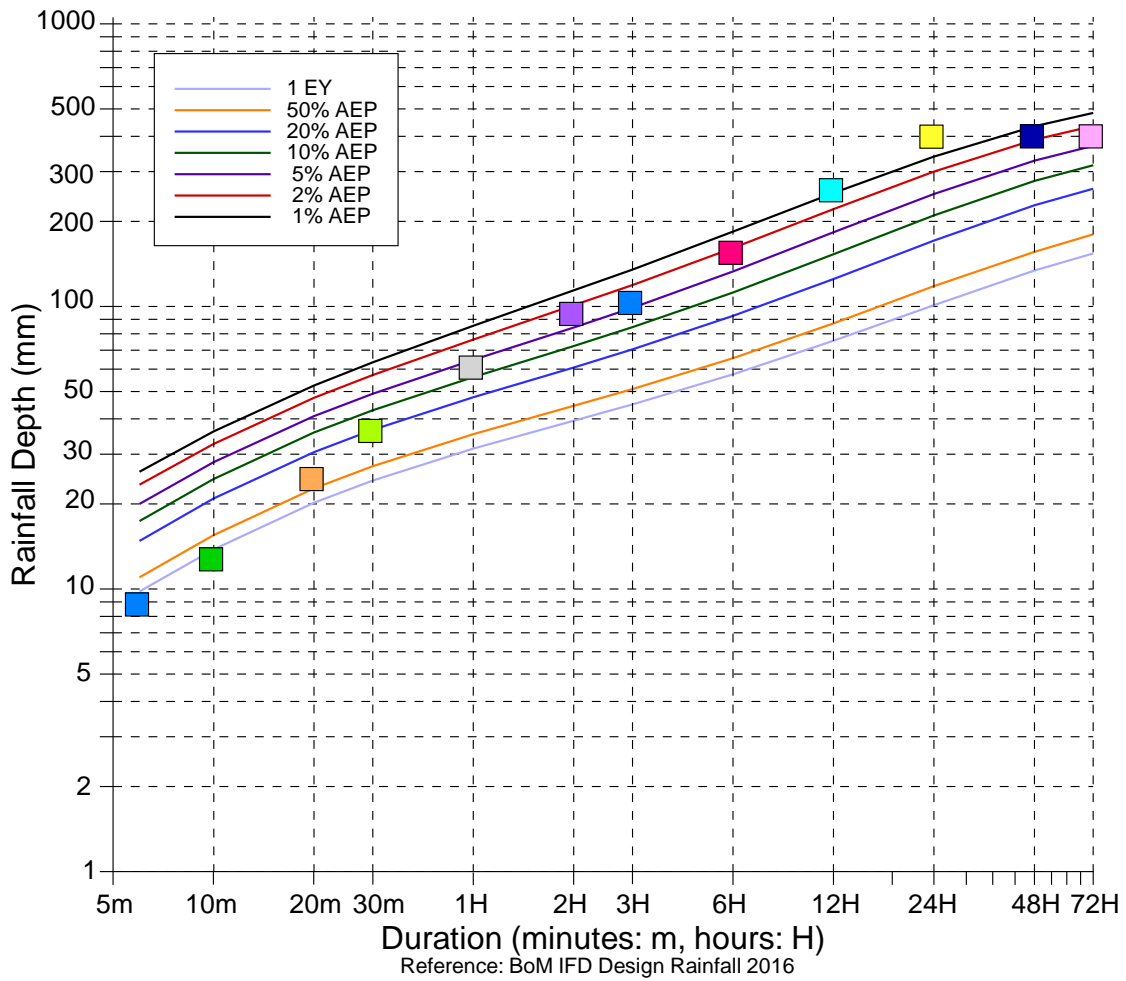


Duration (minutes:m) (Hours: H)	Rainfall Depth (mm)	Time/Date
6m	8.0	05:56_30/03/2017
10m	10.0	05:56_30/03/2017
20m	15.0	05:56_30/03/2017
30m	15.0	05:56_30/03/0000
1H	40.0	05:56_30/03/2017
2H	59.0	05:42_30/03/2017
3H	67.0	05:22_30/03/2017
6H	118.0	05:42_30/03/2017
12H	169.0	00:46_30/03/2017
24H	263.0	18:00_29/03/2017
48H	266.0	15:30_29/03/2017
72H	266.0	15:30_29/03/2017

The probability terminology used for the 2016 design rainfalls is consistent with the probability terminology for the new edition of Australian Rainfall and Runoff (ARR2016). Further details on the new probability terminology can be found in Book 1; Chapter 2; Section 2.2 Terminology of ARR2016 <http://arr.ga.gov.au/arr-guideline>. The main terms used to describe design rainfalls are:

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For further information refer to BoM frequently asked questions: <http://www.bom.gov.au/water/designRainfalls/ifd/ifd-faq.shtml>

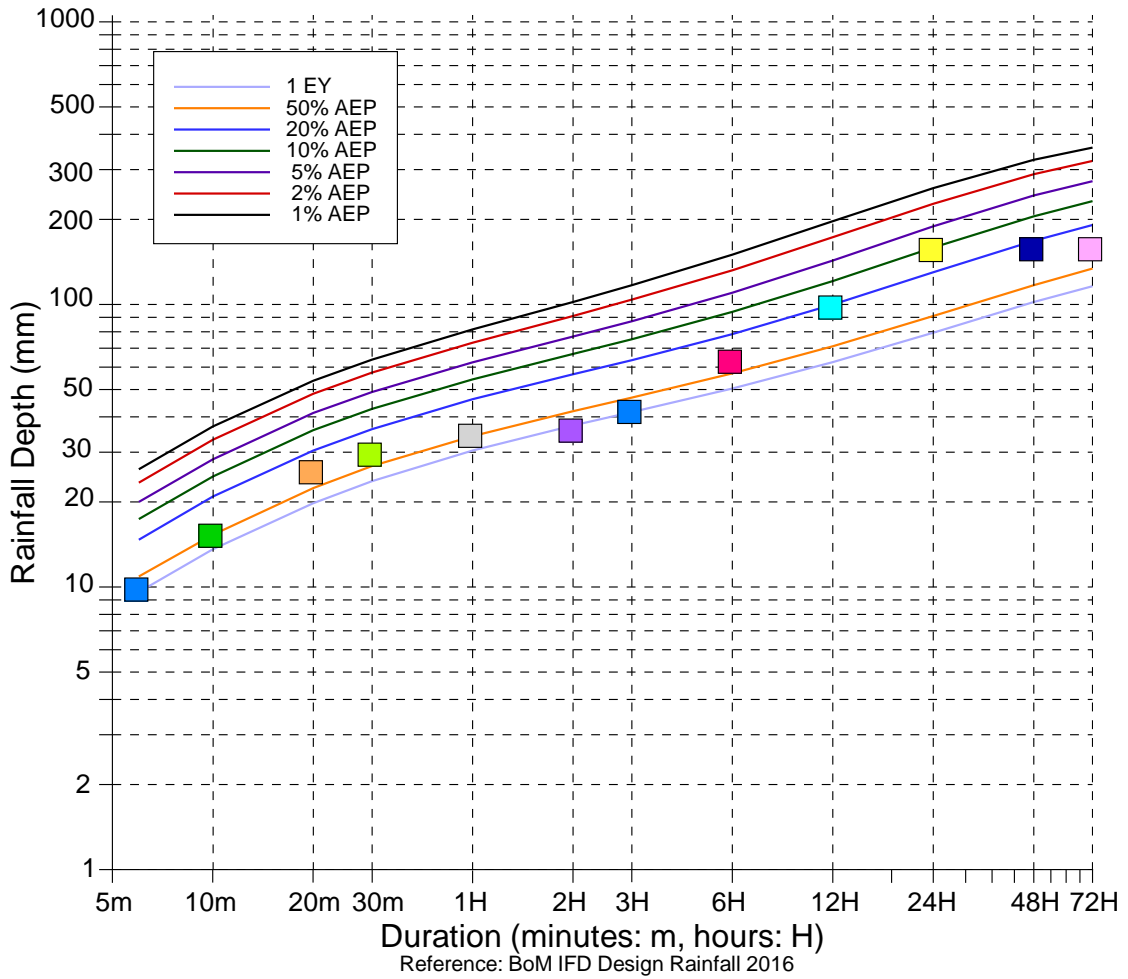


Duration (minutes:m Hours: H)	Rainfall Depth (mm)	Time/Date
6m	9.0	21:28_30/03/2017
10m	13.0	21:48_30/03/2017
20m	25.0	21:38_30/03/2017
30m	37.0	21:28_30/03/2017
1H	62.0	21:00_30/03/2017
2H	96.0	20:12_30/03/2017
3H	105.0	20:06_30/03/2017
6H	158.0	17:10_30/03/2017
12H	263.0	10:52_30/03/2017
24H	407.0	02:14_30/03/2017
48H	408.0	22:30_29/03/2017
72H	408.0	22:30_29/03/2017

The probability terminology used for the 2016 design rainfalls is consistent with the probability terminology for the new edition of Australian Rainfall and Runoff (ARR2016). Further details on the new probability terminology can be found in Book 1; Chapter 2; Section 2.2 Terminology of ARR2016 <http://arr.ga.gov.au/arr-guideline>. The main terms used to describe design rainfalls are:

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For further information refer to BoM frequently asked questions: <http://www.bom.gov.au/water/designRainfalls/ifd/ifd-faq.shtml>

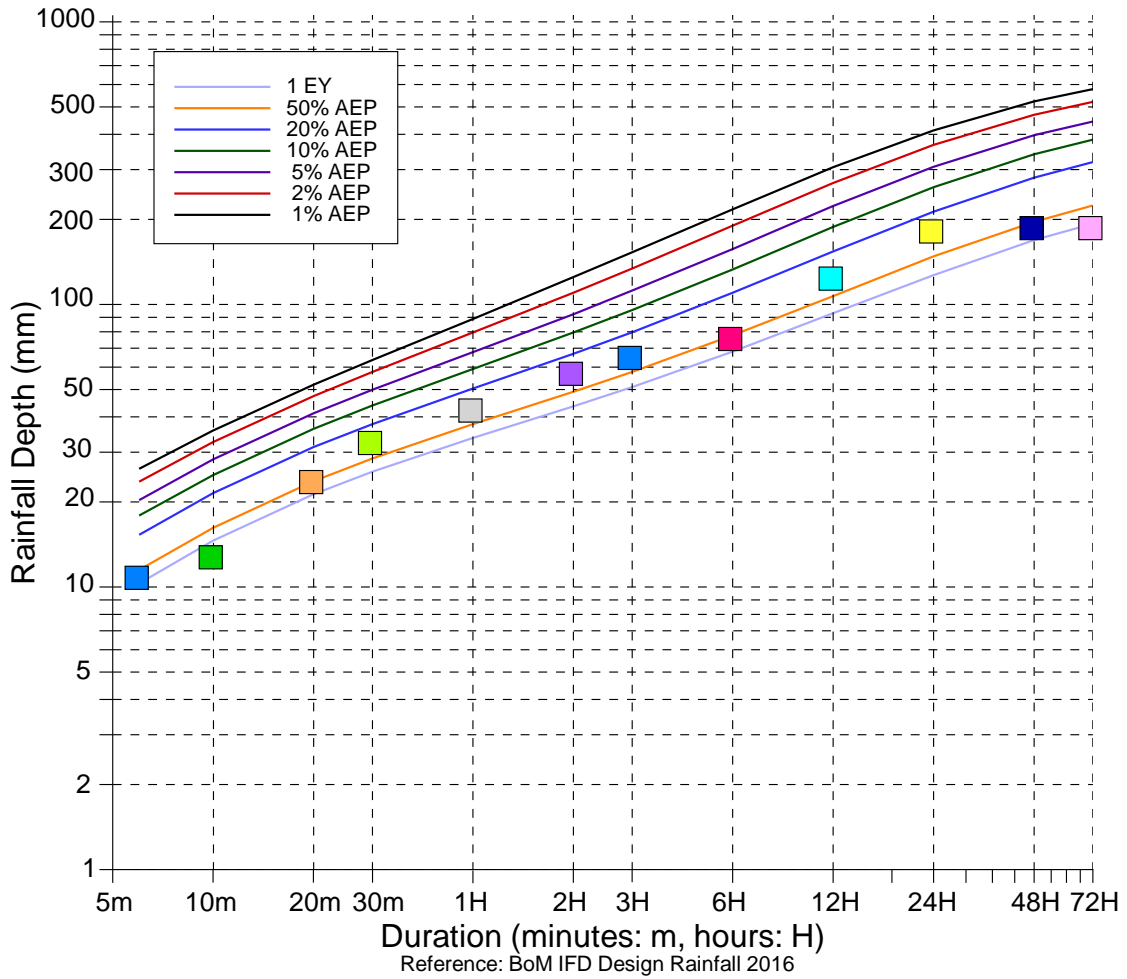


Duration (minutes:m) (Hours: H)	Rainfall Depth (mm)	Time/Date
6m	10.0	04:24_17/03/2017
10m	15.5	04:22_17/03/2017
20m	26.0	04:22_17/03/2017
30m	30.0	04:22_17/03/2017
1H	35.0	04:20_17/03/2017
2H	36.5	04:20_17/03/2017
3H	42.5	20:00_29/03/2017
6H	64.0	19:46_29/03/2017
12H	99.5	20:02_29/03/2017
24H	159.0	17:20_29/03/2017
48H	160.0	13:26_29/03/2017
72H	160.0	13:26_29/03/2017

The probability terminology used for the 2016 design rainfalls is consistent with the probability terminology for the new edition of Australian Rainfall and Runoff (ARR2016). Further details on the new probability terminology can be found in Book 1; Chapter 2; Section 2.2 Terminology of ARR2016 <http://arr.ga.gov.au/arr-guideline>. The main terms used to describe design rainfalls are:

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For further information refer to BoM frequently asked questions: <http://www.bom.gov.au/water/designRainfalls/ifd/ifd-faq.shtml>

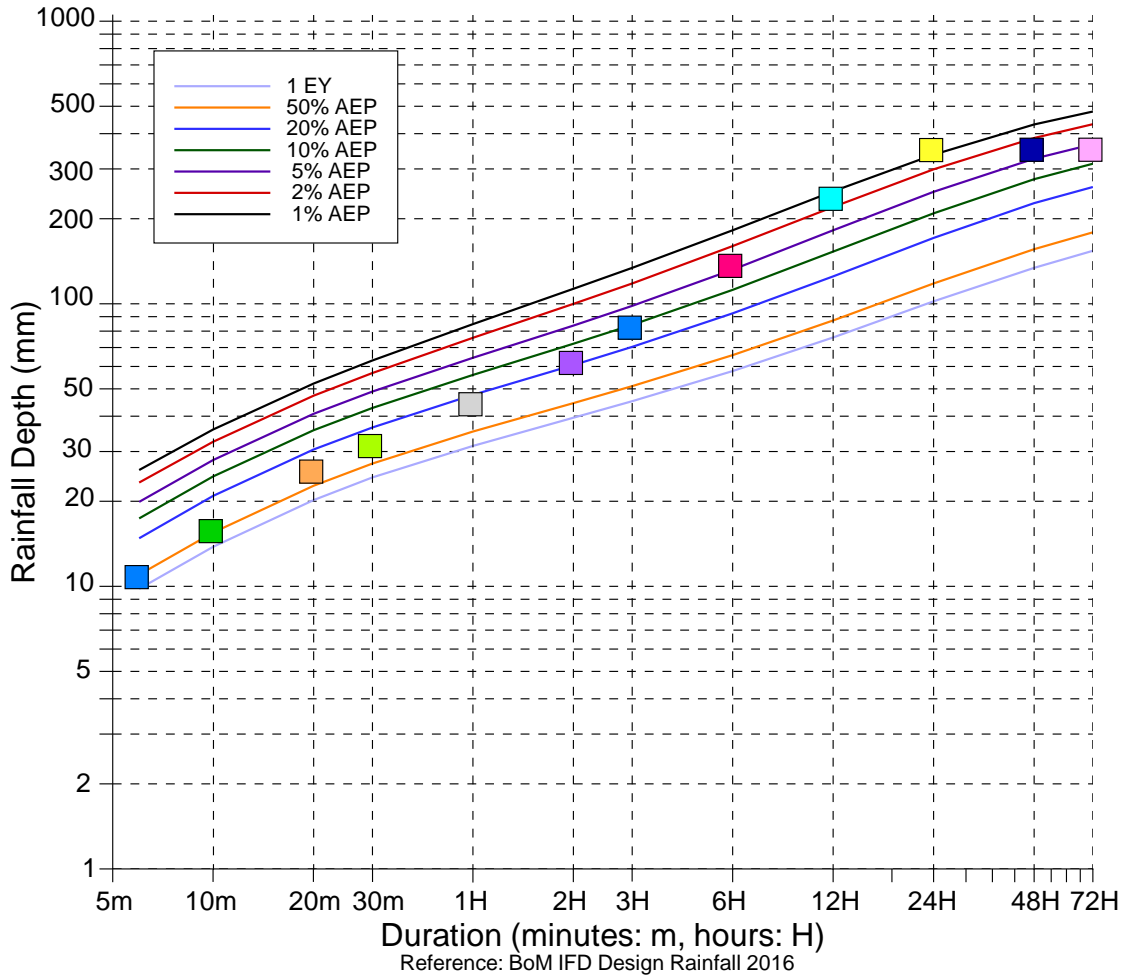


Duration (minutes:m) (Hours: H)	Rainfall Depth (mm)	Time/Date
6m	11.0	06:28_15/03/2017
10m	13.0	06:26_15/03/2017
20m	24.0	06:18_20/03/2017
30m	33.0	06:12_20/03/2017
1H	43.0	05:50_20/03/2017
2H	58.0	05:50_20/03/2017
3H	66.0	05:50_20/03/2017
6H	77.0	21:02_30/03/2017
12H	126.0	05:14_15/03/2017
24H	185.0	03:54_30/03/2017
48H	190.0	22:28_29/03/2017
72H	190.0	22:28_29/03/2017

The probability terminology used for the 2016 design rainfalls is consistent with the probability terminology for the new edition of Australian Rainfall and Runoff (ARR2016). Further details on the new probability terminology can be found in Book 1; Chapter 2; Section 2.2 Terminology of ARR2016 <http://arr.ga.gov.au/arr-guideline>. The main terms used to describe design rainfalls are:

- *Exceedances per year (EY)*: the number of times an event is likely to occur or be exceeded within any given year.
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For further information refer to BoM frequently asked questions: <http://www.bom.gov.au/water/designRainfalls/ifd/ifd-faq.shtml>

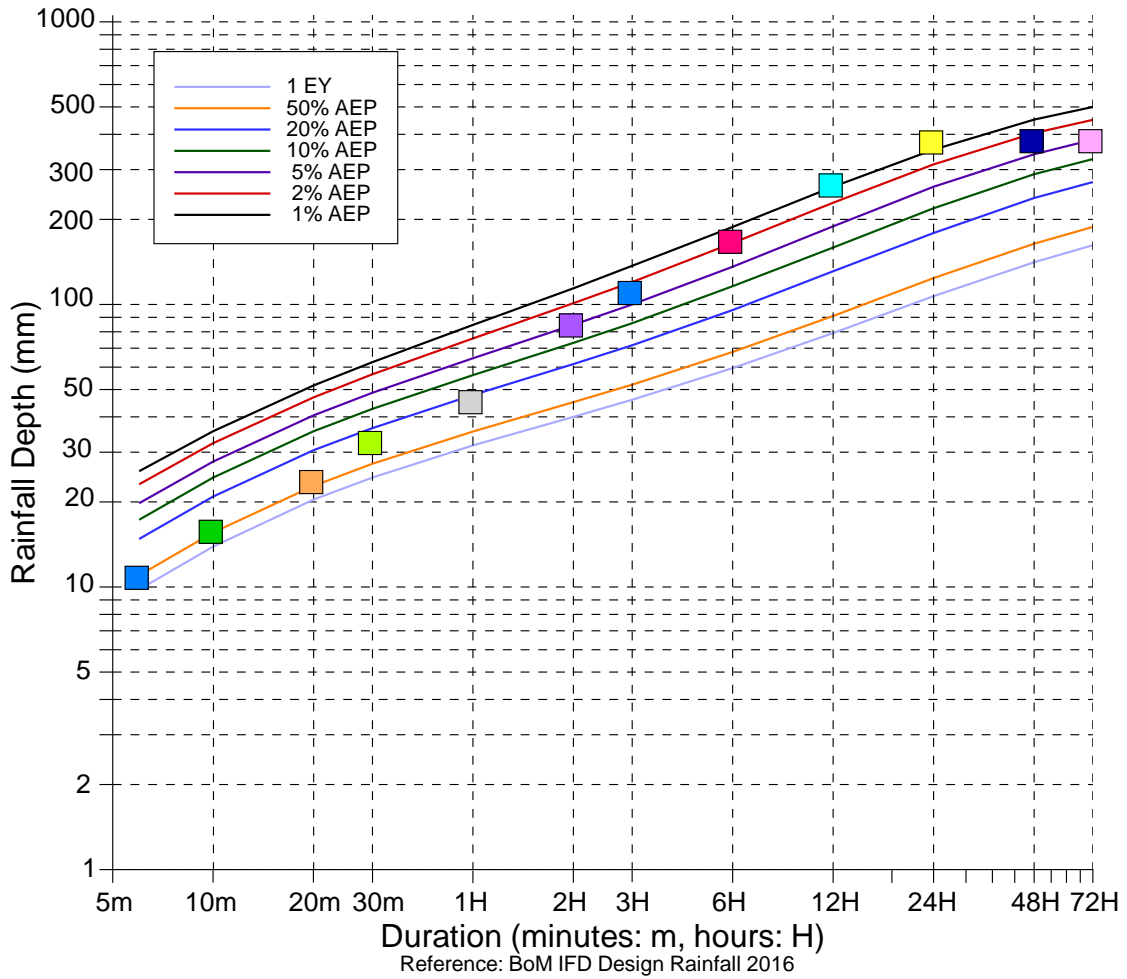


Duration (minutes:m) (Hours: H)	Rainfall Depth (mm)	Time/Date
6m	11.0	18:08_30/03/2017
10m	16.0	18:08_30/03/2017
20m	26.0	18:00_30/03/2017
30m	32.0	17:56_30/03/2017
1H	45.0	17:52_30/03/2017
2H	63.0	17:28_30/03/2017
3H	84.0	12:18_30/03/2017
6H	139.0	12:26_30/03/2017
12H	240.0	09:20_30/03/2017
24H	357.0	01:52_30/03/2017
48H	358.0	19:52_29/03/2017
72H	358.0	19:52_29/03/2017

The probability terminology used for the 2016 design rainfalls is consistent with the probability terminology for the new edition of Australian Rainfall and Runoff (ARR2016). Further details on the new probability terminology can be found in Book 1; Chapter 2; Section 2.2 Terminology of ARR2016 <http://arr.ga.gov.au/arr-guideline>. The main terms used to describe design rainfalls are:

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- *Annual exceedance probability (AEP)*: the probability or likelihood of an event occurring or being exceeded within any given year, usually expressed as a percentage.

For further information refer to BoM frequently asked questions: <http://www.bom.gov.au/water/designRainfalls/ifd/ifd-faq.shtml>



Duration (minutes:m) (Hours: H)	Rainfall Depth (mm)	Time/Date
6m	11.0	08:44_15/03/2017
10m	16.0	08:40_15/03/2017
20m	24.0	08:40_15/03/2017
30m	33.0	08:40_15/03/2017
1H	46.0	14:08_30/03/2017
2H	86.0	13:08_30/03/2017
3H	112.0	12:54_30/03/2017
6H	170.0	09:54_30/03/2017
12H	269.0	09:54_30/03/2017
24H	382.0	02:12_30/03/2017
48H	386.0	22:22_29/03/2017
72H	386.0	22:22_29/03/2017

The probability terminology used for the 2016 design rainfalls is consistent with the probability terminology for the new edition of Australian Rainfall and Runoff (ARR2016). Further details on the new probability terminology can be found in Book 1; Chapter 2; Section 2.2 Terminology of ARR2016 <http://arr.ga.gov.au/arr-guideline>. The main terms used to describe design rainfalls are:

- Exceedances per year (EY): the number of times an event is likely to occur or be exceeded within any given year.
- Annual exceedance probability (AEP): the probability or likelihood of an event occurring or being exceeded within any given year, usually expressed as a percentage.

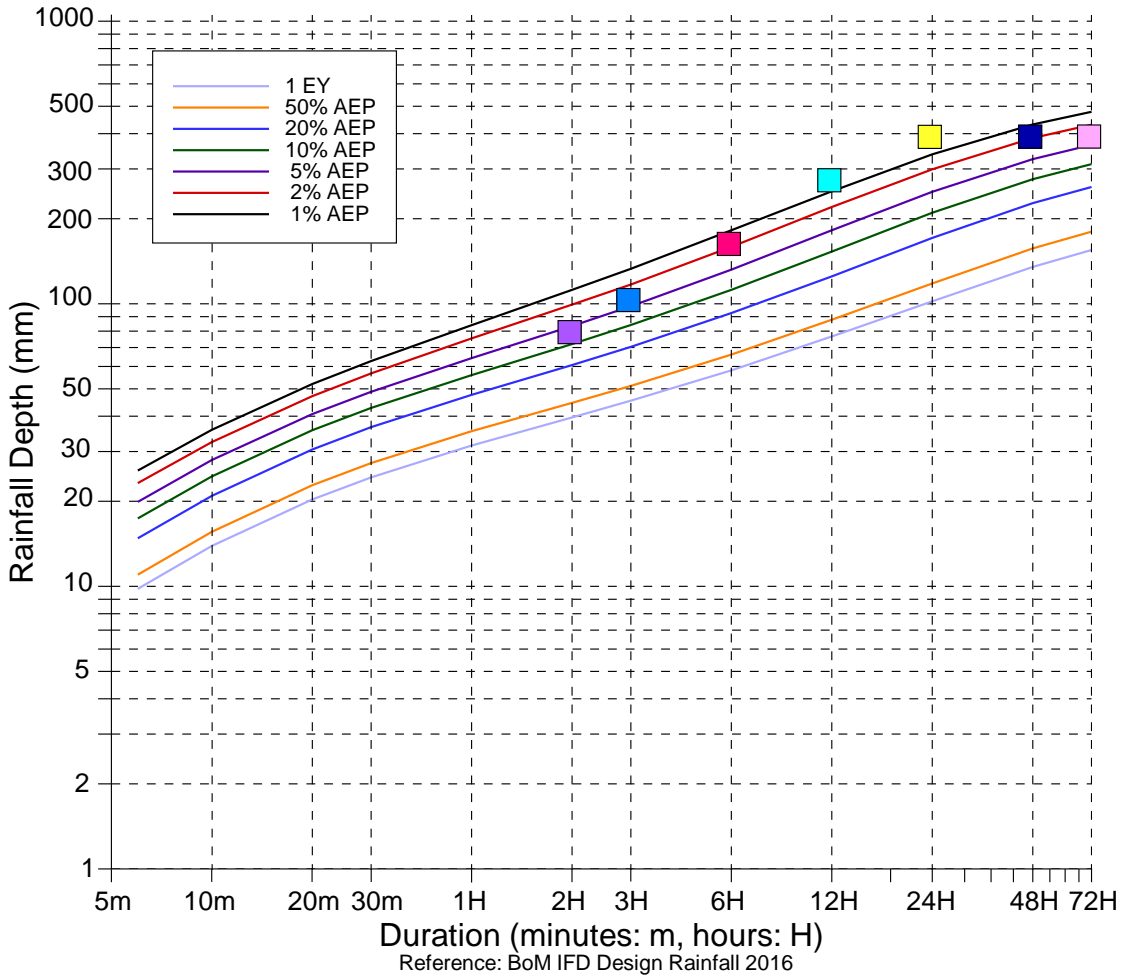
For further information refer to BoM frequently asked questions: <http://www.bom.gov.au/water/designRainfalls/ifd/ifd-faq.shtml>

\* Station failed during event. IFD analysis has not been undertaken.

The probability terminology used for the 2016 design rainfalls is consistent with the probability terminology for the new edition of Australian Rainfall and Runoff (ARR2016). Further details on the new probability terminology can be found in Book 1; Chapter 2; Section 2.2 Terminology of ARR2016 <http://arr.ga.gov.au/arr-guideline>. The main terms used to describe design rainfalls are:

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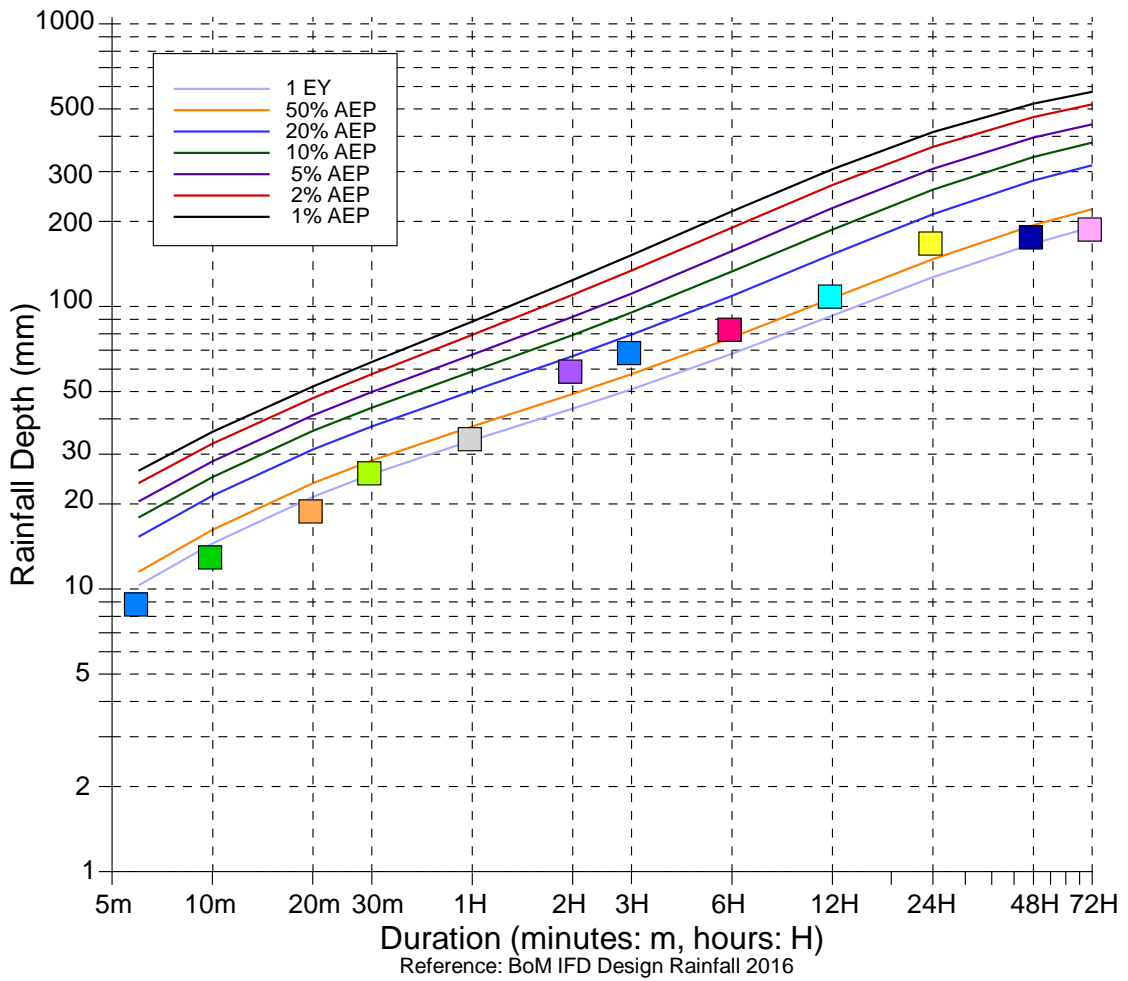
Short duration rainfall data impacted by possible radio transfer interruptions. Suspect short duration IFD results removed by observation.

Duration (minutes:m Hours: H)	Rainfall Depth (mm)	Time/Date
6m		
10m		
20m		
30m		
1H		
2H	81.0	02:58_30/03/2017
3H	105.2	01:58_30/03/2017
6H	166.2	02:58_30/03/2017
12H	279.2	22:58_29/03/2017
24H	397.6	15:58_29/03/2017
48H	398.8	16:00_28/03/2017
72H	398.8	16:00_27/03/2017

The probability terminology used for the 2016 design rainfalls is consistent with the probability terminology for the new edition of Australian Rainfall and Runoff (ARR2016). Further details on the new probability terminology can be found in Book 1; Chapter 2; Section 2.2 Terminology of ARR2016 <http://arr.ga.gov.au/arr-guideline>. The main terms used to describe design rainfalls are:

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For further information refer to BoM frequently asked questions: <http://www.bom.gov.au/water/designRainfalls/ifd/ifd-faq.shtml>

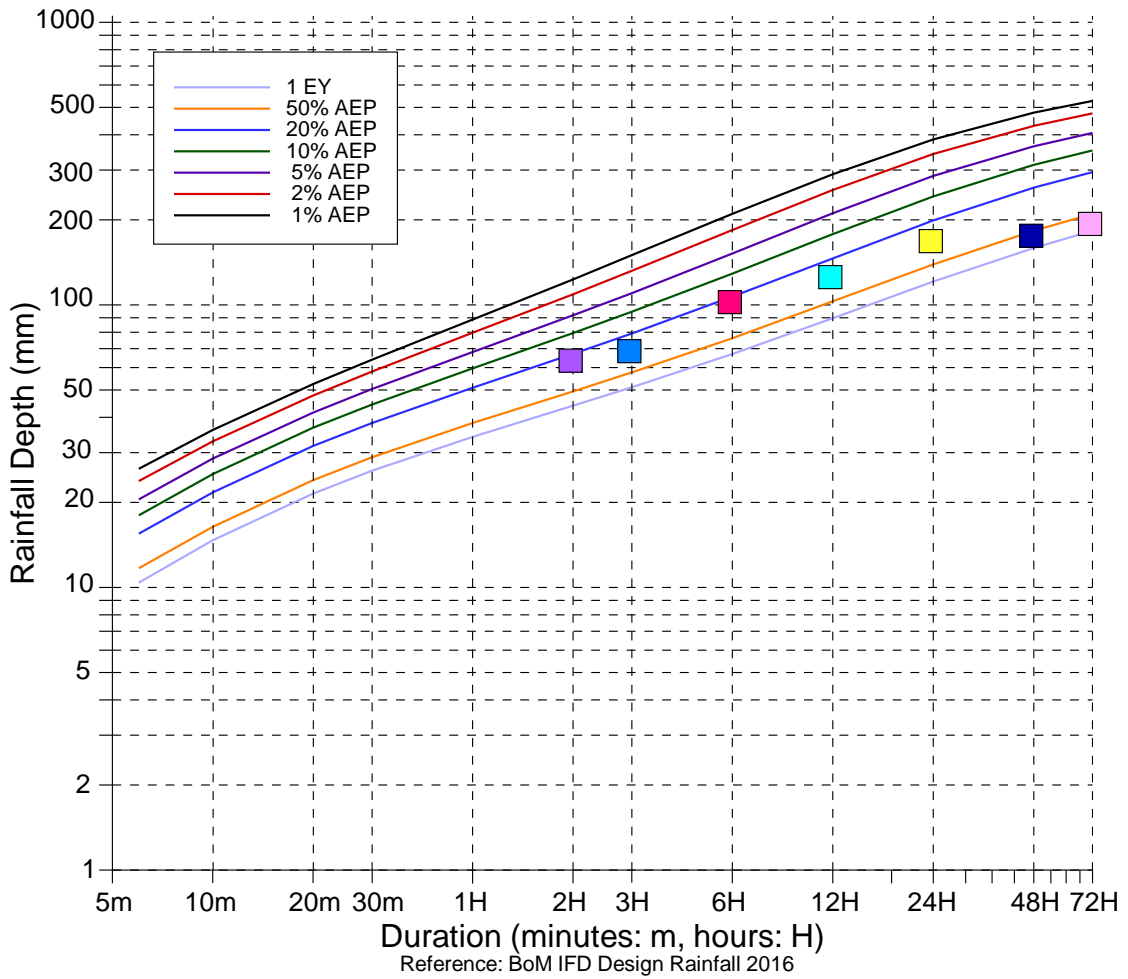


Duration (minutes:m (Hours: H))	Rainfall Depth (mm)	Time/Date
6m	9.0	07:40_20/03/2017
10m	13.2	07:36_20/03/2017
20m	19.2	07:28_20/03/2017
30m	26.2	06:26_20/03/2017
1H	34.6	06:00_20/03/2017
2H	60.0	06:00_20/03/2017
3H	69.8	04:52_20/03/2017
6H	84.4	04:50_20/03/2017
12H	110.6	23:04_19/03/2017
24H	170.4	03:08_30/03/2017
48H	179.0	16:38_29/03/2017
72H	191.0	02:02_18/03/2017

The probability terminology used for the 2016 design rainfalls is consistent with the probability terminology for the new edition of Australian Rainfall and Runoff (ARR2016). Further details on the new probability terminology can be found in Book 1; Chapter 2; Section 2.2 Terminology of ARR2016 <http://arr.ga.gov.au/arr-guideline>. The main terms used to describe design rainfalls are:

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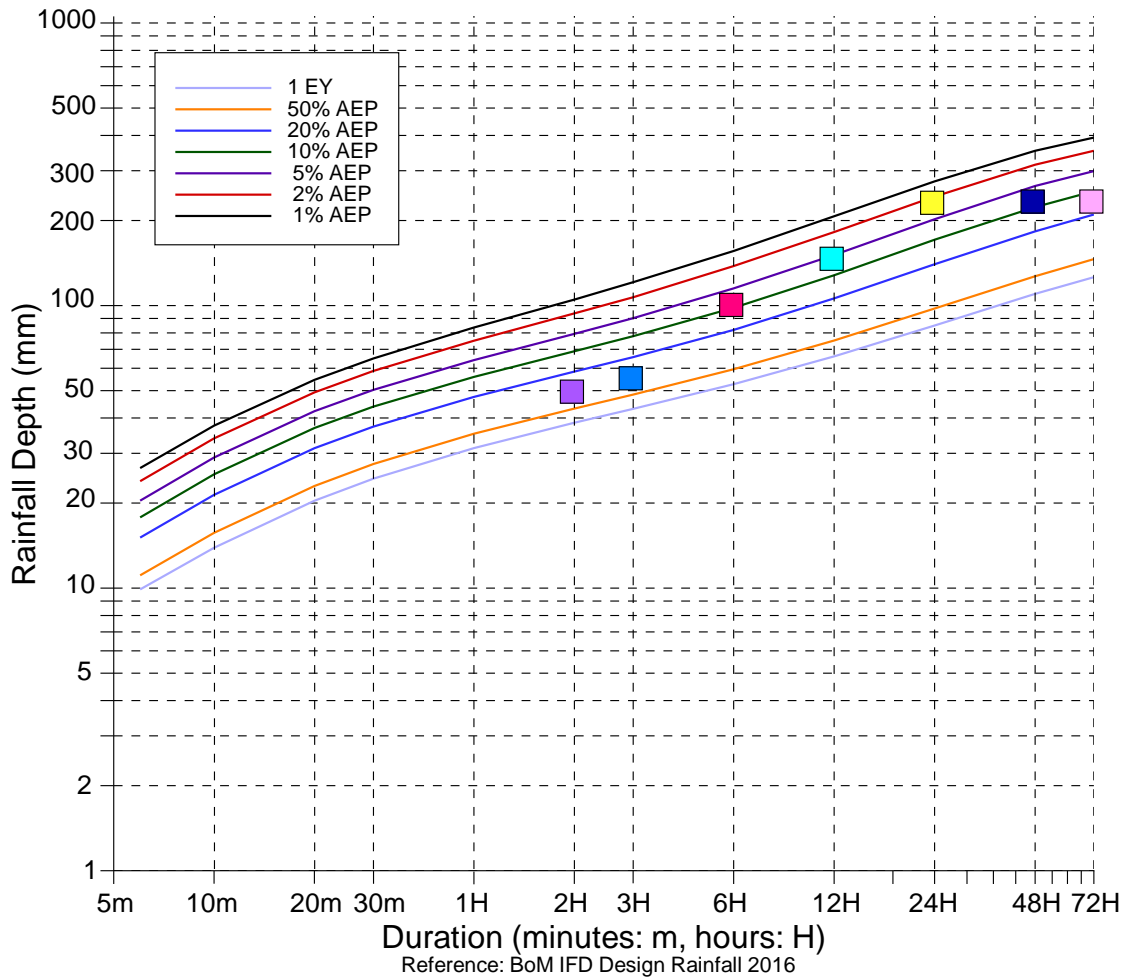
Short duration rainfall data impacted by possible radio transfer interruptions. Suspect short duration IFD results removed by observation.

Duration (minutes:m) (Hours: H)	Rainfall Depth (mm)	Time/Date
6m		
10m		
20m		
30m		
1H		
2H	64.8	05:58_15/03/2017
3H	70.0	05:58_15/03/2017
6H	104.4	05:58_15/03/2017
12H	128.0	23:58_14/03/2017
24H	171.6	13:58_14/03/2017
48H	179.2	00:58_14/03/2017
72H	197.4	19:58_14/03/2017

The probability terminology used for the 2016 design rainfalls is consistent with the probability terminology for the new edition of Australian Rainfall and Runoff (ARR2016). Further details on the new probability terminology can be found in Book 1; Chapter 2; Section 2.2 Terminology of ARR2016 <http://arr.ga.gov.au/arr-guideline>. The main terms used to describe design rainfalls are:

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For further information refer to BoM frequently asked questions: <http://www.bom.gov.au/water/designRainfalls/ifd/ifd-faq.shtml>



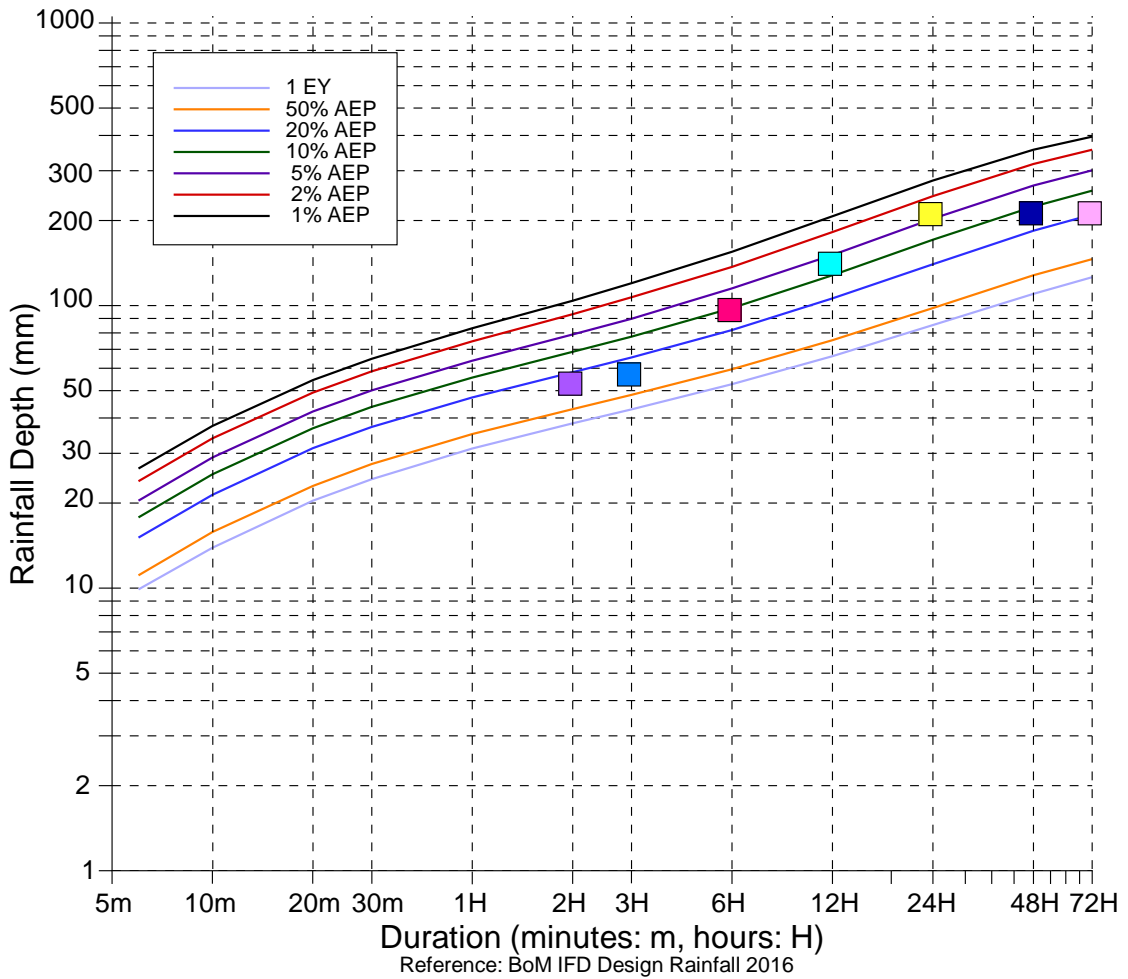
Short duration rainfall data impacted by possible radio transfer interruptions. Suspect short duration IFD results removed by observation.

Duration (minutes:m) (Hours: H)	Rainfall Depth (mm)	Time/Date
6m		
10m		
20m		
30m		
1H		
2H	50.6	06:58_30/03/2017
3H	56.4	05:58_30/03/2017
6H	102.6	06:58_30/03/2017
12H	149.4	01:58_30/03/2017
24H	235.8	16:58_29/03/2017
48H	238.2	15:58_29/03/2017
72H	238.2	15:58_29/03/2017

The probability terminology used for the 2016 design rainfalls is consistent with the probability terminology for the new edition of Australian Rainfall and Runoff (ARR2016). Further details on the new probability terminology can be found in Book 1; Chapter 2; Section 2.2 Terminology of ARR2016 <http://arr.ga.gov.au/arr-guideline>. The main terms used to describe design rainfalls are:

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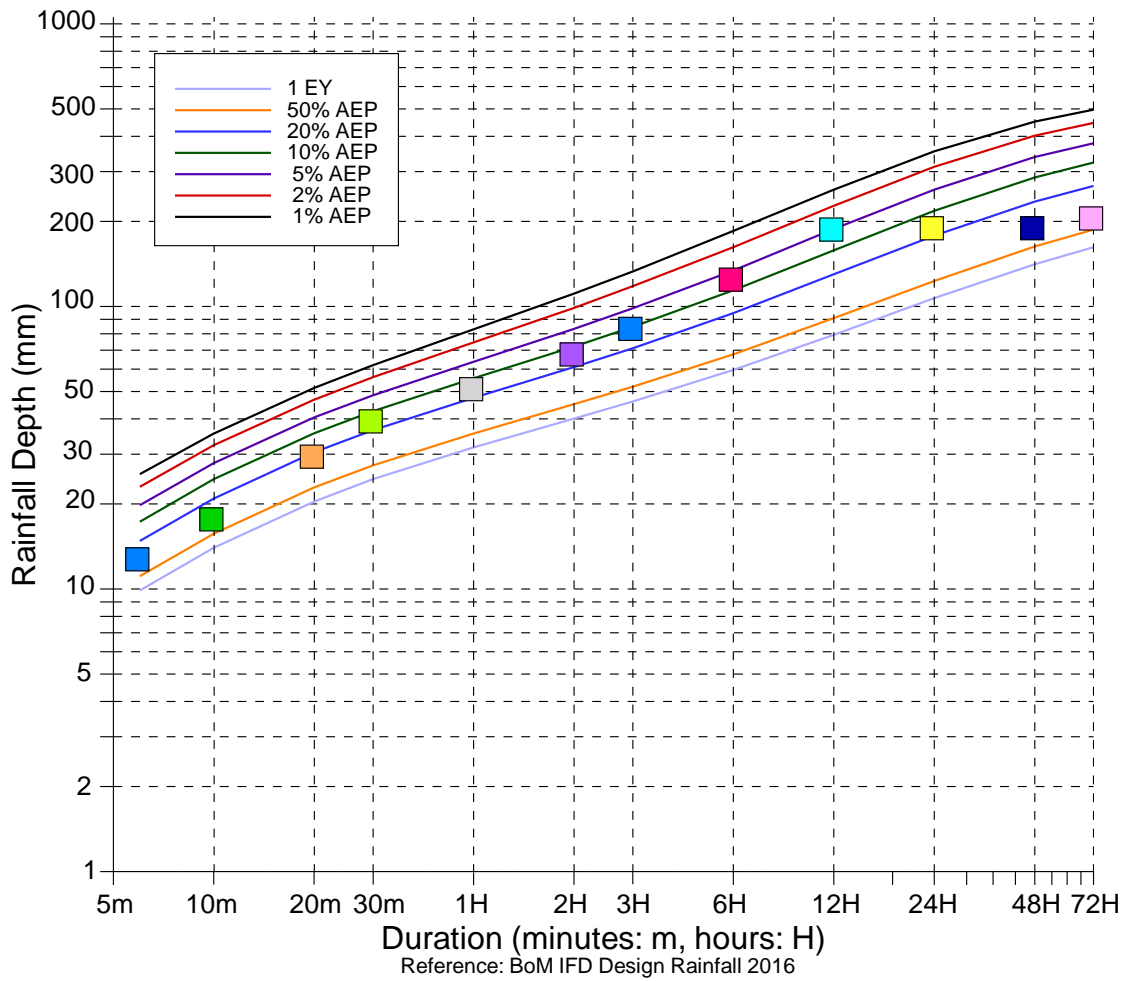
Short duration rainfall data impacted by possible radio transfer interruptions. Suspect short duration IFD results removed by observation.

Duration (minutes:m Hours: H)	Rainfall Depth (mm)	Time/Date
6m		
10m		
20m		
30m		
1H		
2H	54.0	06:58_30/03/2017
3H	58.2	06:58_30/03/2017
6H	98.4	06:58_30/03/2017
12H	143.4	20:58_29/03/2017
24H	215.0	17:58_29/03/2017
48H	216.4	16:58_29/03/2017
72H	216.4	16:58_29/03/2017

The probability terminology used for the 2016 design rainfalls is consistent with the probability terminology for the new edition of Australian Rainfall and Runoff (ARR2016). Further details on the new probability terminology can be found in Book 1; Chapter 2; Section 2.2 Terminology of ARR2016 <http://arr.ga.gov.au/arr-guideline>. The main terms used to describe design rainfalls are:

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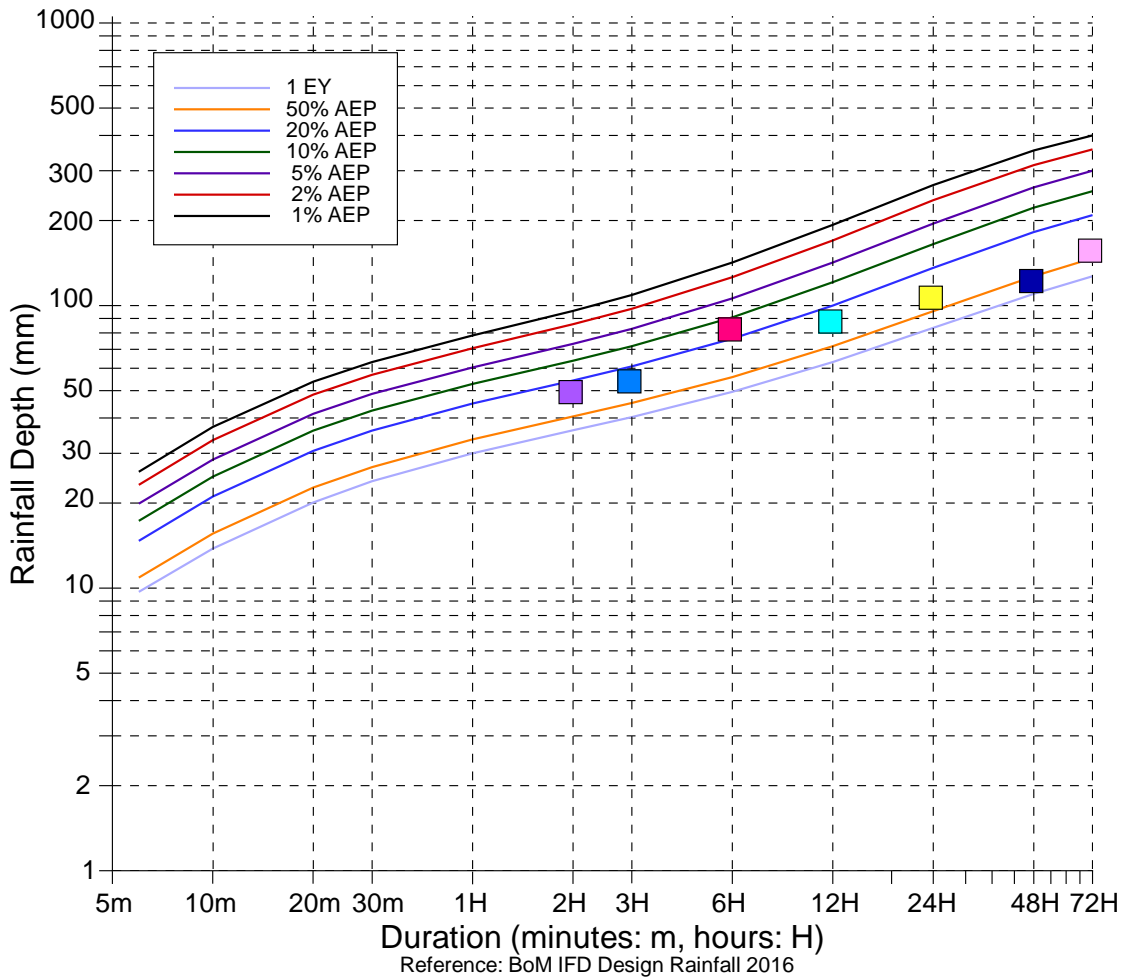


Duration (minutes:m (Hours: H))	Rainfall Depth (mm)	Time/Date
6m	13.0	15:12_30/03/2017
10m	18.0	15:18_19/03/2017
20m	30.0	15:18_19/03/2017
30m	40.0	15:10_19/03/2017
1H	52.0	14:42_19/03/2017
2H	69.0	13:56_30/03/2017
3H	85.0	13:56_30/03/2017
6H	127.0	14:30_30/03/2017
12H	191.0	13:58_30/03/2017
24H	193.0	13:56_30/03/2017
48H	193.0	13:56_30/03/2017
72H	209.0	01:14_18/03/2017

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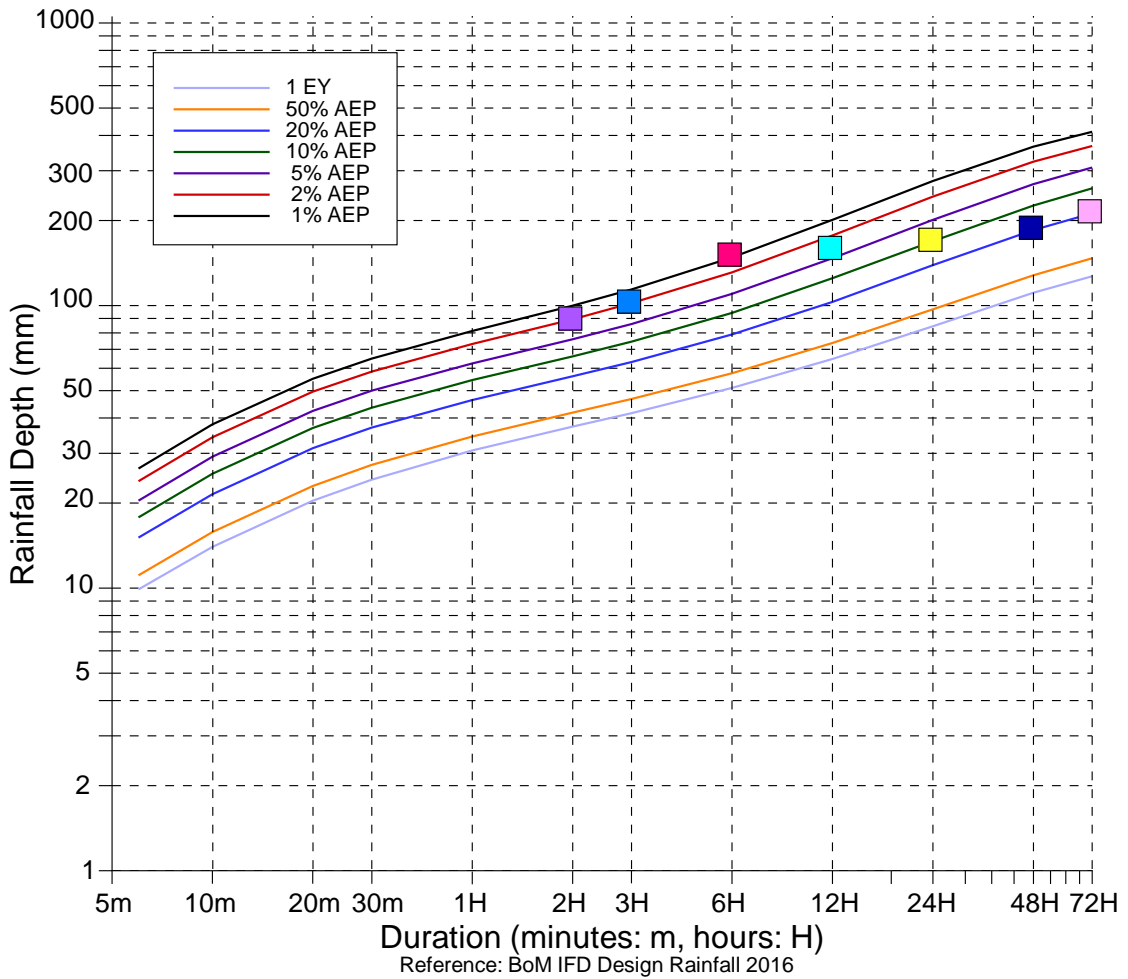
Short duration rainfall data impacted by possible radio transfer interruptions. Suspect short duration IFD results removed by observation.

Duration (minutes:m, Hours: H)	Rainfall Depth (mm)	Time/Date
6m		
10m		
20m		
30m		
1H		
2H	50.4	00:58_18/03/2017
3H	55.0	23:58_17/03/2017
6H	84.0	20:58_17/03/2017
12H	89.6	18:58_17/03/2017
24H	108.8	17:58_29/03/2017
48H	124.6	19:58_17/03/2017
72H	159.6	17:58_17/03/2017

The probability terminology used for the 2016 design rainfalls is consistent with the probability terminology for the new edition of Australian Rainfall and Runoff (ARR2016). Further details on the new probability terminology can be found in Book 1; Chapter 2; Section 2.2 Terminology of ARR2016 <http://arr.ga.gov.au/arr-guideline>. The main terms used to describe design rainfalls are:

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- Annual exceedance probability (AEP): the probability or likelihood of an event occurring or being exceeded within any given year, usually expressed as a percentage.

For further information refer to BoM frequently asked questions: <http://www.bom.gov.au/water/designRainfalls/ifd/ifd-faq.shtml>



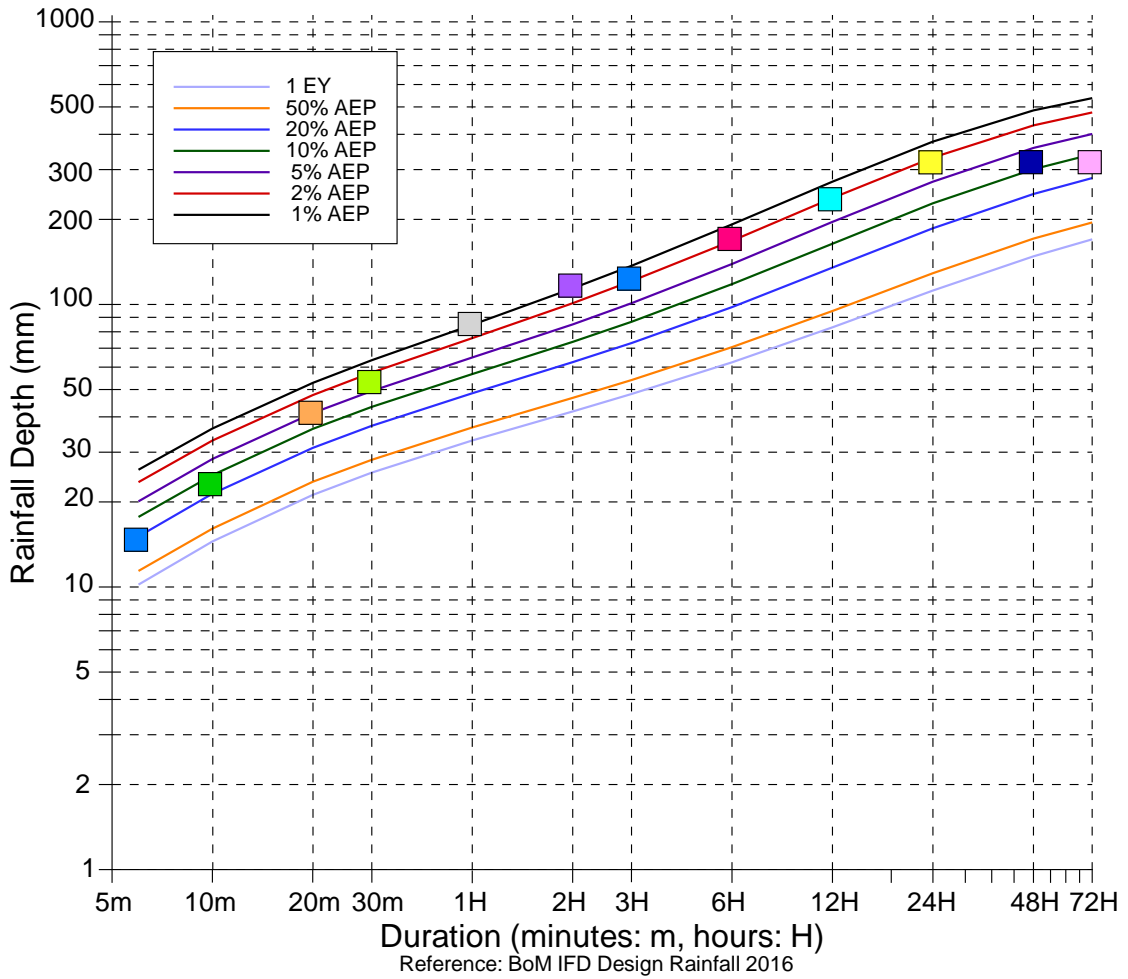
Short duration rainfall data impacted by possible radio transfer interruptions. Suspect short duration IFD results removed by observation.

Duration (minutes:m Hours: H)	Rainfall Depth (mm)	Time/Date
6m		
10m		
20m		
30m		
1H		
2H	91.8	23:58_17/03/2017
3H	105.4	23:58_17/03/2017
6H	154.6	20:58_17/03/2017
12H	163.2	15:58_17/03/2017
24H	174.4	03:58_17/03/2017
48H	192.4	17:58_17/03/2017
72H	220.0	03:58_15/03/2017

The probability terminology used for the 2016 design rainfalls is consistent with the probability terminology for the new edition of Australian Rainfall and Runoff (ARR2016). Further details on the new probability terminology can be found in Book 1; Chapter 2; Section 2.2 Terminology of ARR2016 <http://arr.ga.gov.au/arr-guideline>. The main terms used to describe design rainfalls are:

- Exceedances per year (EY): the number of times an event is likely to occur or be exceeded within any given year.
- Annual exceedance probability (AEP): the probability or likelihood of an event occurring or being exceeded within any given year, usually expressed as a percentage.

For further information refer to BoM frequently asked questions: <http://www.bom.gov.au/water/designRainfalls/ifd/ifd-faq.shtml>

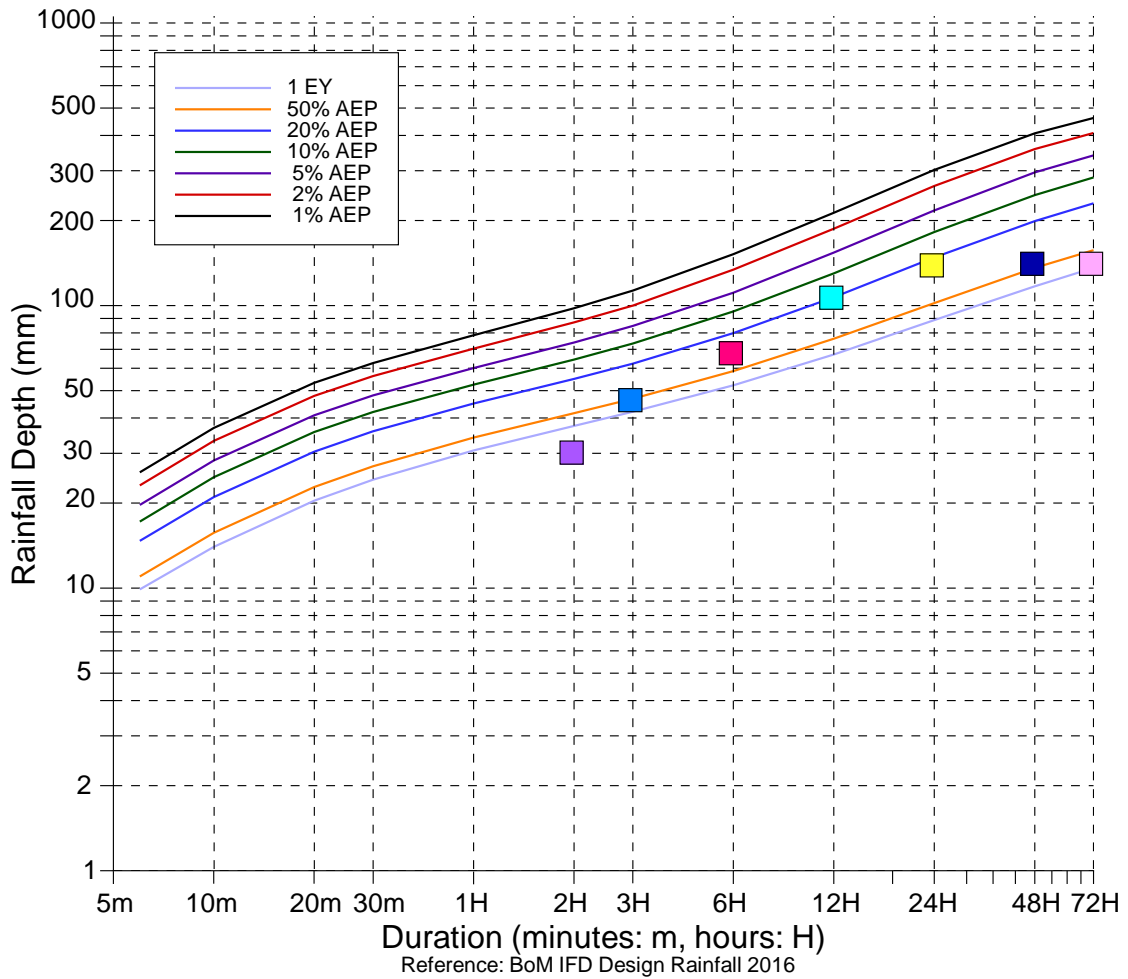


Duration (minutes:m Hours: H)	Rainfall Depth (mm)	Time/Date
6m	15.0	09:56_18/03/2017
10m	23.6	09:52_18/03/2017
20m	42.2	09:44_18/03/2017
30m	54.2	09:38_18/03/2017
1H	87.0	09:06_18/03/2017
2H	119.0	08:16_18/03/2017
3H	126.0	07:10_18/03/2017
6H	174.0	14:44_30/03/2017
12H	240.4	08:44_30/03/2017
24H	324.8	03:40_30/03/2017
48H	325.2	02:30_30/03/2017
72H	325.2	02:30_30/03/2017

The probability terminology used for the 2016 design rainfalls is consistent with the probability terminology for the new edition of Australian Rainfall and Runoff (ARR2016). Further details on the new probability terminology can be found in Book 1; Chapter 2; Section 2.2 Terminology of ARR2016 <http://arr.ga.gov.au/arr-guideline>. The main terms used to describe design rainfalls are:

- *Exceedances per year (EY)*: the number of times an event is likely to occur or be exceeded within any given year.
- *Annual exceedance probability (AEP)*: the probability or likelihood of an event occurring or being exceeded within any given year, usually expressed as a percentage.

For further information refer to BoM frequently asked questions: <http://www.bom.gov.au/water/designRainfalls/ifd/ifd-faq.shtml>



Short duration rainfall data impacted by possible radio transfer interruptions. Suspect short duration IFD results removed by observation.

Duration (minutes:m) (Hours: H)	Rainfall Depth (mm)	Time/Date
6m		
10m		
20m		
30m		
1H		
2H	30.8	22:58_29/03/2017
3H	47.2	21:58_29/03/2017
6H	69.2	21:58_29/03/2017
12H	108.8	21:58_29/03/2017
24H	141.6	17:58_29/03/2017
48H	143.4	13:58_29/03/2017
72H	143.4	13:58_29/03/2017

The probability terminology used for the 2016 design rainfalls is consistent with the probability terminology for the new edition of Australian Rainfall and Runoff (ARR2016). Further details on the new probability terminology can be found in Book 1; Chapter 2; Section 2.2 Terminology of ARR2016 <http://arr.ga.gov.au/arr-guideline>. The main terms used to describe design rainfalls are:

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For further information refer to BoM frequently asked questions: <http://www.bom.gov.au/water/designRainfalls/ifd/ifd-faq.shtml>

## Appendix D – WaterNSW water level station local datum to AHD conversion

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Table D-1 provides the conversion from local gauge datum to Australian Height Datum for stations managed by WaterNSW.

**Table D-1 WaterNSW station conversion to AHD**

Station name	Station name	Datum	Conversion to AHD (m)
Rous River at Boat Harbour No 3	201005	AHD	2.757
Oxley River at Eungella	201001	AHD	13.275
Tweed River at Uki	201900	AHD	9.04
Tweed River at Palmers Road	201015	Assumed datum	-
Richmond River at Wiangaree	203005	AHD	61.44
Brunswick River at Sherrys Bridge	202001	AHD	13.056
Richmond River at Kyogle	203900	AHD	40.251
Toonunbar Dam D/S	203023	AHD	96.194
Coopers Creek at Repentance	203002	AHD	42.938
Coopers at Ewing Bridge (Corndale)	203024	AHD	9.588
Leycester Creek at Rock Valley	203010	AHD	13.196
Wilson's River at Eltham	203014	Assumed datum	-
Eden Creek at Doubtful	203034	AHD	27.037
Richmond River at Casino	203004	AHD	5.02
Shannon Brook at Yorklea	203041	Assumed datum	-
Richmond River at Oakland Road	203470	Assumed datum	-
Myrtle Creek at Rappville	203030	Assumed datum	-