

## Mary River Flood Warnings

Note: The standard action statement and weather forecast information have been removed from each warning

Warning sequence:

Issue number	Date & Time	Next issue date & time	Severity
1	5:03pm Thur 27 Mar	9pm Thur 27 Mar	Minor
2	9:00pm Thur 27 Mar	00:00am Fri 28 Mar	Minor
3	00:12am Fri 28 Mar	6am Fri 28 Mar	Moderate
4	5:28am Fri 28 Mar	9am Fri 28 Mar	Moderate
5	9:02am Fri 28 Mar	3pm Fri 28 Mar	Moderate
6	8:02pm Fri 28 Mar	9pm Fri 28 Mar	Moderate
7	9:01pm Fri 28 Mar	8:30am Sat 29 Mar	Minor
8	8:12am Sat 29 Mar	12:30pm Sat 29 Mar	Minor
9	12:13pm Sat 29 Mar	6pm Sat 29 Mar	Minor
10	5:30pm Sat 29 Mar	9:30am Sun 30 Mar	Minor
11	9:34am Sun 30 Mar	5pm Sun 30 Mar	Minor
12	5:12pm Sun 30 Mar	9:30am Mon 31 Mar	Minor
13	9:28am Mon 31 Mar	9:30am Tues 01 Apr	Minor
14	8am Tues 01 Apr	n/a	Final

Comment [ 1]: Slightly late

Comment [ 2]: Slightly late

Comment [ 3]: Slightly late

Comment [ 4]: Slightly late

Comment [ 5]: Slightly late

Comment [ 6]: Slightly late

Forecast location	Qualitative or quantitative	Target height	Target lead time	Date & time of exceedance of minor flood level	Date & time of exceedance of target height	Recorded peak	Predictions	
							Made	Detail
Moy Pocket	Qual	12.0m (Mod)	6hrs	00:57am Fri 28 Mar	n/a	9.30m (Minor) 7:04am Fri 28 Mar	(1) 5:03pm, 9pm Thur 27 Mar (2) 00:12am Fri 28 Mar (3) 5:28am Fri 28 Mar (4) 9:02am Fri 28 Mar	(1) Remain below minor (2) Exceed minor in next few hours (3) Minor flood peak during Friday (4) Minor flood peak in next hour or two
Dagun Pocket	Qual	13.0m (Mod)	12hrs	11:46pm Thur 27 Mar	n/a	10.52m (Minor) 3pm Fri 28 Mar	(1) 5:03pm Thur 27 Mar (2) 9pm Thur 27 Mar & 00:12am Fri 28 Mar (3) 5:28am, 9:02am Fri 28 Mar (4) 3:02pm Fri 28 Mar	(1) Reach near minor (2) Exceed minor during early hours of Friday (3) Minor flood levels continue during Friday (4) Flood levels peaking, easing thereafter
Gympie	Quan	12.0m (Mod)	24hrs	00:42am Fri 28 Mar	n/a	10.64m (Minor) 00:23am Sat 29 Mar	(1) 5:03pm Thur 27 Mar (2) 9pm Thur 27 Mar (3) 00:12am Fri 28 Mar (4) 5:28am Fri 28 Mar (5) 9:02am, 3:02pm Fri 28 Mar (6) 9:01pm Fri 28 Mar	(1) Reach up to minor Friday afternoon, further rises possible (2) Exceed minor around 5am Friday, further small rises (3) Exceed minor in next few hours* (4) Moderate possible late Friday afternoon* (5) Rise to around 12m late Friday afternoon / evening (6) Rise to around 11m overnight Friday
Miva	Qual	9.5m (Mod)	24hrs	6pm Fri 28 Mar	n/a	9.22m (Minor) 4pm Sat 29 Mar	(1) 5:03pm, 9pm Thur 27 Mar (2) 00:12am, 5:28am, 9:02am, Fri 28 Mar (3) 3:02pm Fri 28 Mar (4) 9:01pm Fri 28 Mar (5) 8:12am Sat 29 Mar (6) 12:13pm Sat 29 Mar (7) 5:30pm Sat 29 Mar	(1) Remain below minor (2) Exceed minor during Friday (3) Exceed minor during Friday afternoon (4) Minor flood levels to peak Fri evening (5) Minor flood peak around midday Sat (6) Minor flood peak around mid-ervo Sat (7) Minor flood peak on Sat evening
Tiaro	Qual	8.0m (Mod)	24hrs	6am Sat 29 Mar	n/a	6.7m 3:30am Sun 30 Mar	(1) 5:03pm, 9pm Thur 27 Mar (2) 00:12am, 5:28am, 9:02am, 3:02pm, 9:01pm Fri 28 Mar (3) 8:12am Sat 29 Mar (4) 12:13pm Sat 29 Mar (5) 5:30pm Sat 29 Mar (6) 9:34am Sun 30 Mar	(1) Remain below minor (2) Exceed minor during weekend (3) Minor peak expected overnight Sat (4) Minor peak expected early Sunday (5) Minor peak expected early afternoon Sunday (6) Minor peak expected early afternoon Sunday
Maryborough	Quan	5.0m (Min)	24hrs	n/a	n/a	n/a	All warnings	Remain below minor

Comment [ 7]: 45mins notice ahead of exceedance of minor

Comment [ 8]: Station had already peaked about 2hrs prior to warning issue

Comment [ 9]: Classic case of chasing a peak

Comment [ 10]: See comment above

\* Prediction stated that a forecast height / peak will be provided once upstream locations peak

Note 1: Target height was not exceeded at any of the forecast locations so assessment of the target lead time is not relevant

Note 2: Flood warnings were issued ahead of the first forecast location exceeding the minor flood level

Note 3: Quantitative locations: -Since neither of the quantitative forecast locations (Gympie and Maryborough) exceeded the target height, quantitative predictions were strictly not required for this event

## Lower Brisbane and Bremer Flood Warnings

Note: The standard action statement and weather forecast information have been removed from each warning

Warning sequence:

Issue number	Date & Time	Next issue date & time	Severity	Catchments
1	5:25am Fri 28 March	8am Fri 28 March	Major	BREMER RIVER AND WESTERN, LAIDLEY, WARRILL AND LOCKYER CREEKS
1	8:11am Fri 28 March	8am Fri 28 March	Major	BREMER RIVER AND WESTERN, LAIDLEY, WARRILL AND LOCKYER CREEKS
2	11:57am Fri 28 March	4pm Fri 28 March	Major	BREMER RIVER AND WESTERN, LAIDLEY, WARRILL AND LOCKYER CREEKS
3	4:04pm Fri 28 March	10pm Fri 28 March	Moderate	BREMER RIVER AND WARRILL AND LOCKYER CREEKS
4	10:01pm Fri 28 March	8:30am Sat 29 March	Major	BREMER RIVER AND WARRILL AND LOCKYER CREEKS
5	8:24am Sat 29 March	4pm Sat 29 March	Moderate	WARRILL CREEK
6	8:52am Sat 29 March	4pm Sat 29 March	Minor	WARRILL CREEK
7	3:44pm Sat 29 March	8pm Sat 29 March	Minor	WARRILL CREEK
8	8:22pm Sat 29 March	n/a	Final	WARRILL CREEK

Comment [1]: Kalbar Weir (forecast location on Warrill Creek) went through minor around 11pm Thur 27 March. Technically, warning should have been out at or before this. Target height and lead time is 7m (moderate) and 6hrs; 7m was exceeded around midnight Thur 27 March

Comment [2]: Issue number not updated

Comment [3]: Warning issued slightly late

Comment [4]: Next issue date and time not updated

Comment [6]: Downgraded to moderate, then upgraded again to major

Comment [5]: Warning issued slightly late

Comment [7]: Warning issued slightly late

Comment [8]: Warning reissued within 30mins to reflect change in severity

Comment [9]: Warning issued slightly late



Forecast location	Qualitative or quantitative	Target height	Target lead time*	Date & time of exceedance of minor flood level	Date & time of exceedance of target height	Recorded peak	Predictions	
							Made	Detail
Gatton (Lockyer Creek)	Qualitative	10.0m (Mod)	6hrs	n/a	n/a	3.32m 11:40am Fri 28 Mar	05:25, 08:11, 11:57 Fri 28 Mar	8.5m during Friday morning
Laidley (Laidley Creek)	Qualitative	6.0m (Mod)	6hrs	No data	No data	No data	05:25 Fri 28 Mar	7.0m during Friday morning
Kalbar Weir** (Warrill Creek)	Qualitative	7.0m (Mod)	6hrs	10:50pm Thurs 27 Mar	11:40pm Thurs 27 Mar	9.27m (Major) 4:40am Fri 28 Mar	05:25 Fri 28 Mar	Moderate levels to continue easing Friday morning
Harrisville (Warrill Creek)	Quantitative	4.0m (Mod)	6hrs	2:34am Fri 28 Mar	3:25am Fri 28 Mar	5.42m (Major) 8:32am Fri 28 Mar	05:25, 08:11 Fri 28 Mar	Rises to 5.5m Friday morning, then ease
Amberley (Warrill Creek)	Quantitative	5.5m (Mod)	9hrs	7:48am Fri 28 Mar	10:27am Fri 28 Mar	6.49m (Mod) 9:57pm Fri 28 Mar	05:25, 08:11 Fri 28 Mar	Rises to 7.0m Friday morning
Rosewood (Bremer River)	Quantitative	5.0m (Mod)	6hrs	5:00am Fri 28 Mar	6:40am Fri 28 Mar	5.65m (Mod) 9:28am Fri 28 Mar	05:25, 08:11 Fri 28 Mar	Rises to 5.8m Friday morning
Walloon (Bremer River)	Quantitative	5.5m (Mod)	9hrs	9:10am Fri 28 Mar	11:34am Fri 28 Mar	6.08m (Mod) 2:26pm Fri 28 Mar	(1) 05:25, 08:11 (2) 11:57 (3) 16:04 Fri 28 Mar	(1) Rises to 8.0m Friday morning (2) Rises to 6.8m Friday afternoon (3) Peak around 6.2m next few hours
Ipswich (Bremer River)	Quantitative	7.0m (Minor)	12hrs	n/a	n/a	5.15m (<Minor) 10:45pm Fri 28 Mar	(1) 05:25, 08:11 (2) 11:57 (3) 16:04 (4) 22:01 Fri 28 Mar	(1) Rises to 8m midday Friday (2) Rises to 8m around Friday afternoon (3) Peak up to 8m Friday evening (4) Peak below minor (7m) overnight Friday

Comment [ 10]: Significant over-prediction (>5m)

Comment [ 11]: Minor & moderate exceeded Thurs evening, first warning and predictions should have been made then

Comment [ 12]: Good prediction, though using peak stage from Kalbar on Thursday evening would have allowed earlier predictions to be made

Comment [ 13]: Good prediction, though using peak stage from Kalbar to Harrisville to Amberley on Thursday evening would have allowed earlier predictions to be made

Comment [ 14]: Good prediction

Comment [ 15]: Over-predicted by close to 2m initially

Comment [ 16]: Big over-prediction, even within an hour of the peak

\* Target lead time was not met at any of the forecast locations that exceeded the target height

\*\* Recorded data taken from Kalbar Weir TW in absence of data at manual station

[REDACTED]

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**From:** [REDACTED]  
**Sent:** Thursday, 17 April 2014 5:04 PM  
**To:** [REDACTED]  
**Subject:** Lessons from Ita [SEC=UNCLASSIFIED]  
**Attachments:** [REDACTED] Ita\_performance\_notes.pptx

- s22.

Hi all

Some other random comments:

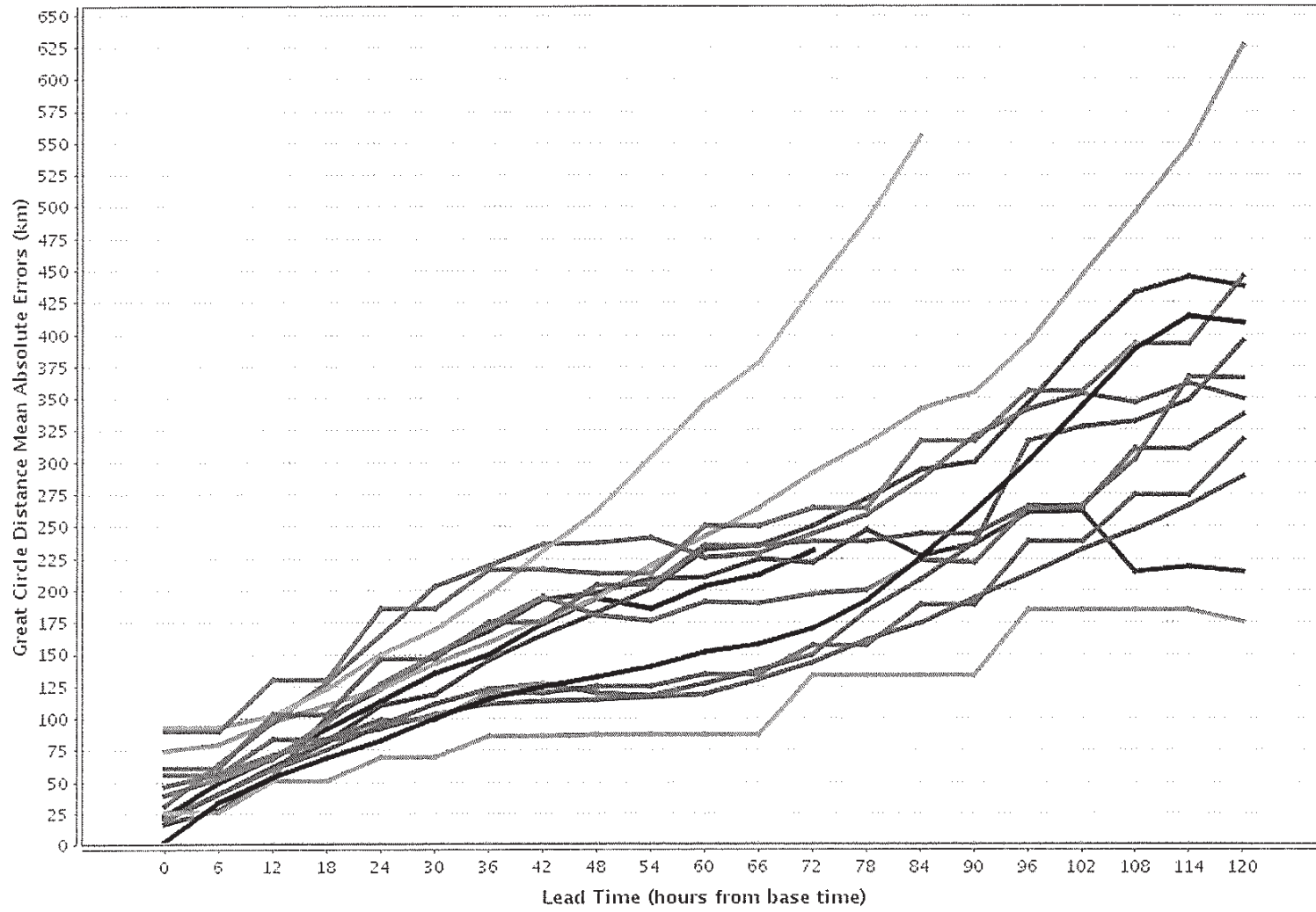
Verification shows GFS performed exceptionally well. HWRF did as well : [REDACTED]

( ecause EC lagged GFS in picking recurvature, BoM forecasts were not as good as JTWCs. See attached.

# Ita – verification

## Beaten by JTWC - GFS superior to EC

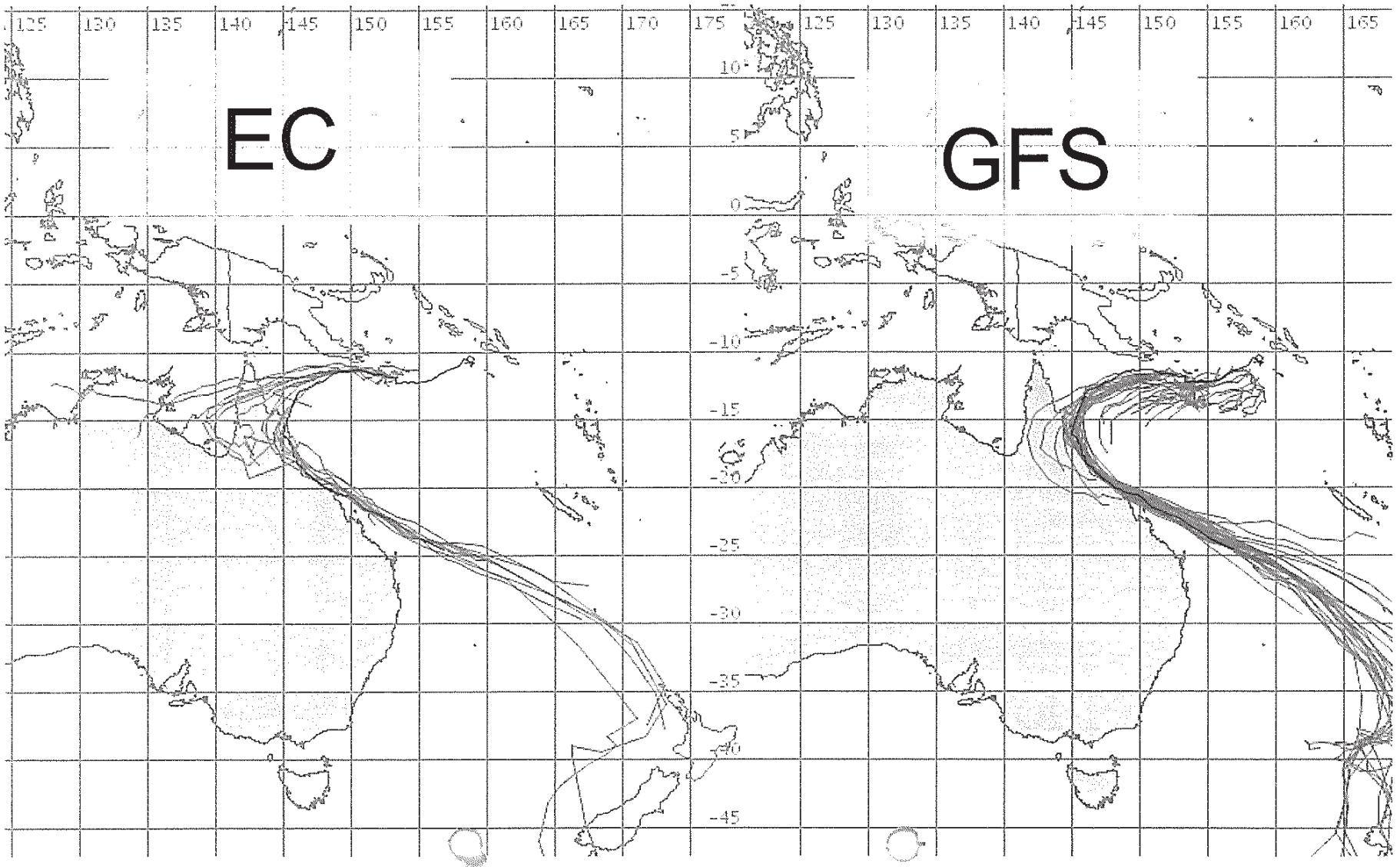
Great Circle Distance: Mean Absolute Error



ACCESS-TC ACCESS\_TC\_PROD COAMPS-COTC COAMPS-CTCX ECHWF GFDL-GFDN GFS-AVNO GFS-JAVN HWRF JMA JTWC NAVGEM  
NOGAPS-JNCP OFT UKMO No Error

# Ita – verification

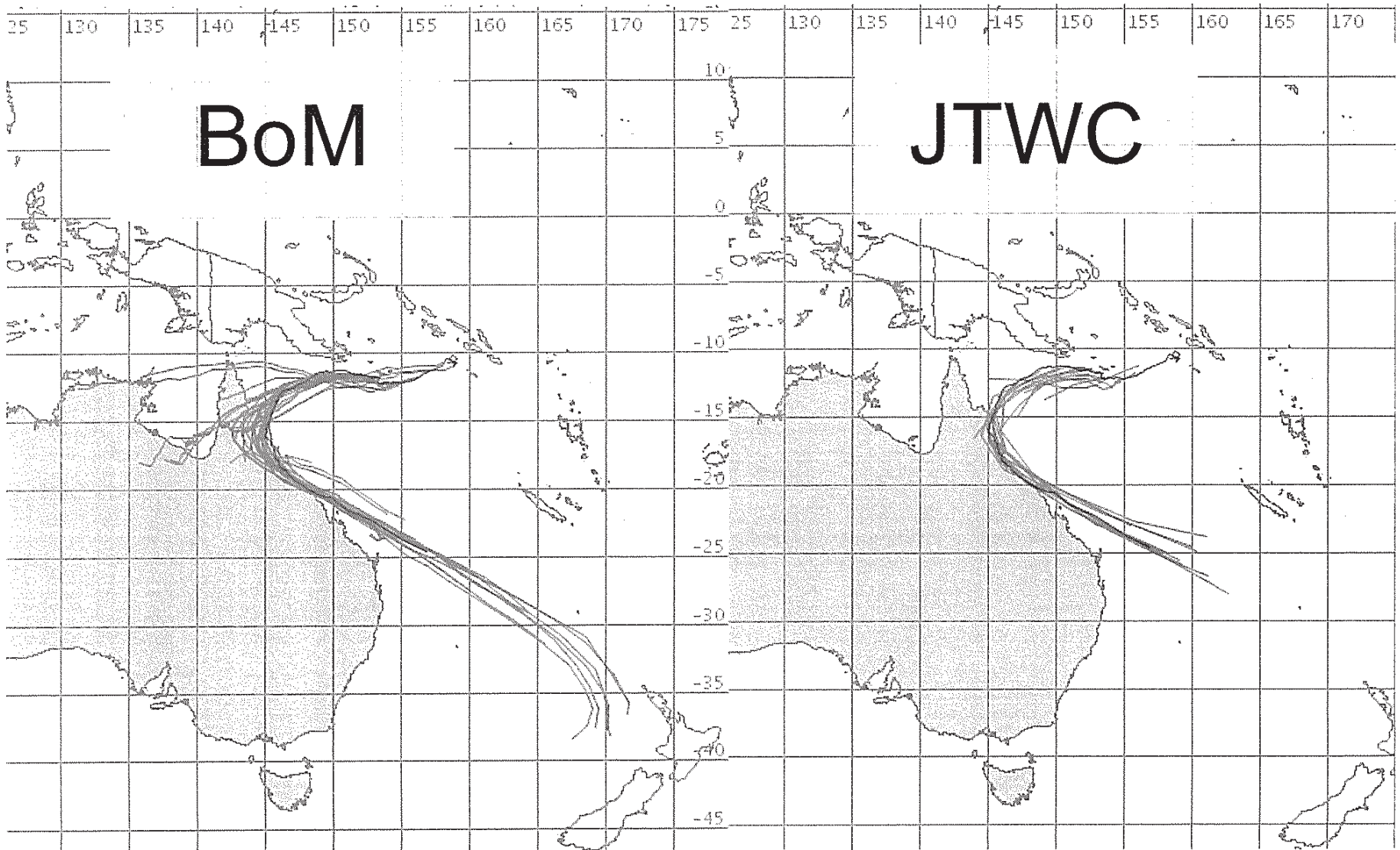
## GFS superior to EC





# Ita – verification

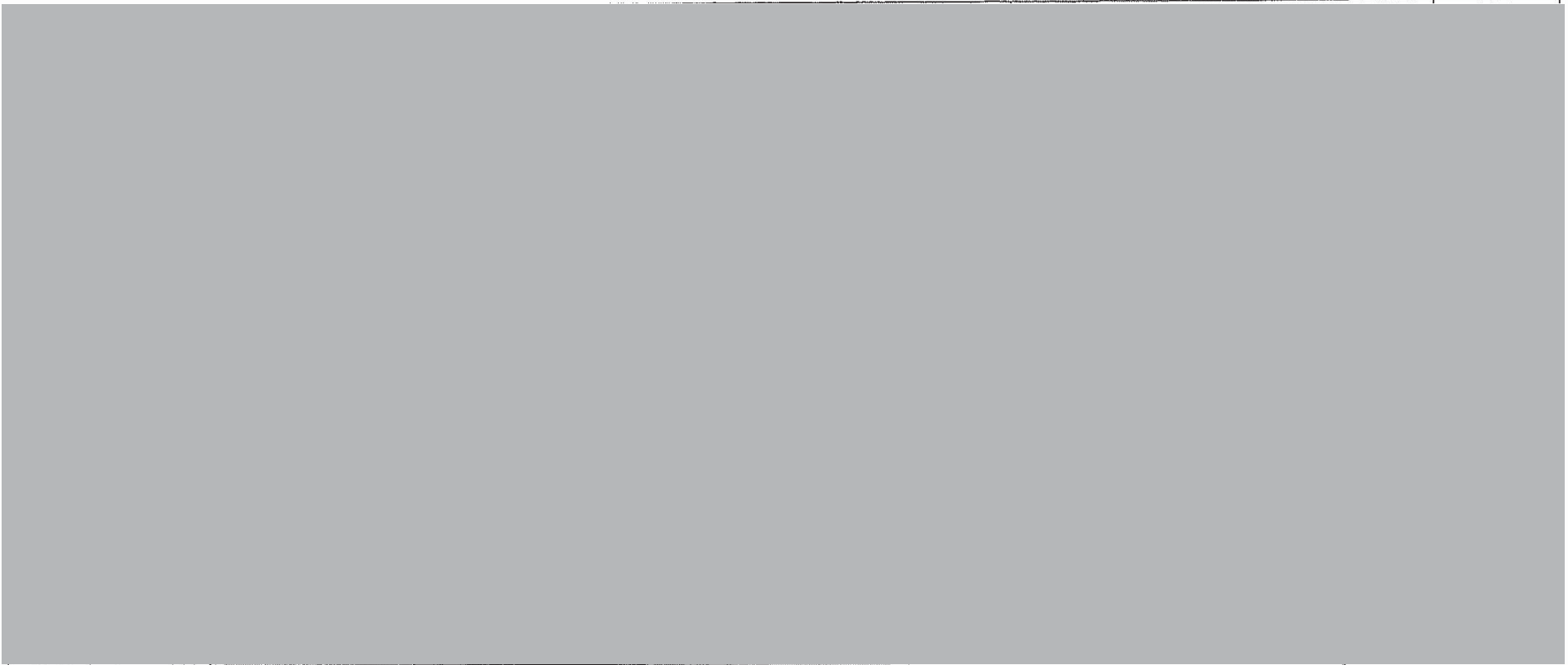
## BoM beaten by JTWC



Catchment	Forecast Location	Number Issued	Predictions	Within Range (time)	Within Range (height)
Daintree River	Daintree Village	12	8	3	3
Barron River	Kamerunga Bridge	6	4	3	4
	Cairns Airport	6	5	5	5
Mulgrave & Russell R	Peets Bridge	10	5	3	5
	Gordonvale	10	6	4	6
Johnstone River	Mourilyan	4	0	0	0
	McAvoy Bridge	4	2	2	2
	Innisfail Wharf	4	0	0	0
Tully River	Euramo	16	10	9	10
	Murray Flats	16	8	5	8
Herbert River	Gleneagle	19	-	-	-
	Abergowrie Bridge	19	7	4	7
	Ingham Pump Station	19	7	7	7
	Gairloch	19	7	5	7
	Halifax	19	8	5	8
Haughton River	Giru	10	7	7	7
Don River	Bowen Pump Station	7	3	3	3

## Feedback from TC Ita flood event debrief held 24/04/14

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Topic area	Issue	
	The flood warnings are generally a lot more consistent in terms of their structure and content compared to the previous wet season	
Rainfall forecast information	QPF information was provided during the event which was good but it was not always timely or to the required level of detail 24hr QPF totals were generally pretty good for the event	



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2



Barron River Flood Warnings

Note: The standard action statement and weather forecast information have been removed from each warning

Warning sequence:

Issue number	Date & Time	Next issue date & time	Severity
1	10:28 Sat 12 April	15:00 Sat 12 April	Minor
2	15:06 Sat 12 April	19:00 Sat 12 April	Moderate
3	19:05 Sat 12 April	23:00 Sat 12 April	Moderate
4	23:19 Sat 12 April	05:00 Sun 13 April	Moderate
5	04:36 Sun 13 April	11:00 Sun 13 April	Minor
6	10:51 Sun 13 April	n/a	Final

Comment [ 1]: Catchment Directive advises that warnings should be issued roughly every 3hrs during the developing stages. Frequency here was less frequent

Comment [ 2]: 6mins late

Comment [ 3]: 5mins late

Comment [ 4]: 19mins late

Forecast location	Qualitative or quantitative	Target height	Target lead time	Date & time of exceedance of minor flood level	Date & time of exceedance of target height	Recorded peak	Predictions (rising limb and peak only)	
							Made	Detail
Kamerunga Bridge	Quan	6.5m (Mod)	6hrs	14:18 Sat 12 April	20:19 Sat 12 April	6.64m 21:31 12 April	(1) 10:28 Sat 12 April (2) 15:06 Sat 12 April (3) 19:05 Sat 12 April (4) 23:19 Sat 12 April	(1) Exceed minor late Sat evening (2) Exceed moderate during Sat evening, with further rises expected (3) Rises to around moderate during Saturday evening (4) Nearing a peak at the moderate flood level
Cairns Airport	Quan	3.0m (Mod)	6hrs	21:33 Sat 12 April	n/a	2.58m 22:18 12 April	(1) 10:28 Sat 12 April (2) 15:06 Sat 12 April, 19:05 Sat 12 April (3) 23:19 Sat 12 April	(1) Approach minor during Sunday (2) Rises above minor late Sat (3) Nearing a peak at the minor flood level

Comment [ 5]: Good – first warning issued approximately 4hrs before minor was exceeded at the first forecast location

Comment [ 6]: Quantitative predictions should have been made – within 6hrs of exceedance of target height (Mod)

Comment [ 7]: Qualitative predictions fine as the target height (Mod) was not reached

Don River Flood Warnings

Note: The standard action statement and weather forecast information have been removed from each warning

Warning sequence:

Issue number	Date & Time	Next issue date & time	Severity
1	14:26 Sun 13 April	18:00 Sun 13 April	Minor
2	15:32 Sun 13 April	17:00 Sun 13 April	Moderate
3	17:02 Sun 13 April	20:00 Sun 13 April	Major
4	19:43 Sun 13 April	23:00 Sun 13 April	Moderate
5	22:42 Sun 13 April	05:00 Mon 14 April	Minor
6	04:55 Mon 14 April	11:00 Mon 14 April	Minor
7	11:00 Mon 14 April	n/a	Final

**Comment [ 1 ]:** Heavy rain began about noon. Could warning have been put out earlier?  
 Hourly totals at Bowen PS:  
 - 12pm to 1pm approx. 60mm  
 - 1pm to 2pm approx. 90mm  
 - 2pm to 3pm approx. 15mm

**Comment [ 2 ]:** Good – Directive states that "Rapid updates may be required for increasing major floods at Bowen Pump Station.", i.e. more frequently than every 3 hours

**Comment [ 3 ]:** Slightly late

**Comment [ 5 ]:** According to the SLS, quantitative predictions should have been made

**Comment [ 4 ]:** 2hrs lead time given... Target is 6hrs

Forecast location	Qualitative or quantitative	Target height	Target lead time	Date & time of exceedance of minor flood level	Date & time of exceedance of target height	Recorded peak	Predictions (rising limb and peak only)	
							Made	Detail
Bowen PS	Quan	2.5m (Min)	6hrs	16:25 Sun 13 April	16:25 Sun 13 April	5.30m 18:40 Sun -13 April	(1) 14:26 Sun 13 April (2) 15:32 Sun 13 April (3) 17:02 Sun 13 April	(1) Rises above minor late afternoon Sun (2) Rises above moderate late afternoon Sun (3) Peak near major 9pm Sun

## Haughton River Flood Warnings

Note: The standard action statement and weather forecast information have been removed from each warning

Warning sequence:

Issue number	Date & Time	Next issue date & time	Severity	Comments
1	08:59 Sun 13 April	13:00 Sun 13 April	Minor	
2	12:47 Sun 13 April	16:00 Sun 13 April	Minor	
3	16:10 Sun 13 April	19:00 Sun 13 April	Moderate	
4	17:55 Sun 13 April	21:00 Sun 13 April	Major	Not sent out via email. Check with Graham Buis if it went out via other means
5	21:05 Sun 13 April	00:00 Mon 14 April	Major	
6	22:17 Sun 13 April	01:00 Mon 14 April	Major	
7	00:58 Mon 14 April	04:00 Mon 14 April	Major	
8	04:01 Mon 14 April	08:00 Mon 14 April	Major	
9	07:40 Mon 14 April	12:00 Mon 4 April	Moderate	
10	11:40 Mon 14 April	n/a	Final	

Comment 1]: Issued 10mins late

Comment 2]: Issued 5mins late

Comment 3]: Issued 1min late

Forecast location	Qual or quan	Target height	Target lead time	Date & time of exceedance of minor flood level	Date & time of exceedance of target height	Recorded peak	Predictions (rising limb and peak only)	
							Made	Detail

Forecast location	Qual or quan	Target height	Target lead time	Date & time of exceedance of minor flood level	Date & time of exceedance of target height	Recorded peak	Predictions (rising limb and peak only)	
							Made	Detail
Giru	Quan	2.1m (Mod)	12hrs	19:02 Sun 13 April *	20:44 Sun 13 April *	2.68m** 02:40 Mon 14 April	(1) 08:59 Sun 13 April (2) 12:47 Sun 13 April (3) 16:10 Sun 13 April (4) 17:55 Sun 13 April (5) 21:05 Sun 13 April (6) 22:17 Sun 13 April (7) 00:58 Mon 14 April	(1) Rises above minor during Sunday (2) Rises above minor during Sunday (3) Exceed minor in next few hours. Further rises to moderate are possible during Sunday evening (4) Exceed moderate in next few hours. Major flooding expected late Sunday evening (5) Exceed moderate late Sunday evening, with rises to around major by early Monday morning. (6) Exceed major late Sunday evening, with rises to around 2.7m early hours of Monday. (7) Peak close to 2.7m early hours of Monday

**Comment 4]:** Good - first warning was issued about 10hrs earlier

**Comment 5]:** Target is to provide 12hrs lead time - we provided just over 4.5hrs

**Comment 6]:** Prediction for major jumped around: initially late Sun, then early Mon, then back to late Sun

\* Based on observations from automatic station

\*\* Based on manual observation

## Herbert River Flood Warnings

Note: The standard action statement and weather forecast information have been removed from each warning

Warning sequence:

Issue number	Date & Time	Next issue date & time	Severity
1	12/04/14 21:24	13/04/14 00:00	MINOR
2	13/04/14 00:40	13/04/14 05:00	MODERATE
3	13/04/14 02:41	13/04/14 05:00	MAJOR
4	13/04/14 05:06	13/04/14 08:00	MAJOR
5	13/04/14 08:19	13/04/14 11:00	MAJOR
6	13/04/14 10:59	13/04/14 14:00	MAJOR
7	13/04/14 14:03	13/04/14 17:00	MAJOR
8	13/04/14 16:52	13/04/14 20:00	MAJOR
9	13/04/14 20:14	14/04/14 00:00	MAJOR
10	13/04/14 23:59	14/04/14 06:00	MAJOR
11	14/04/14 05:41	14/04/14 10:00	MAJOR
12	14/04/14 09:53	14/04/14 14:00	MAJOR
13	14/04/14 13:55	14/04/14 18:00	MAJOR
14	14/04/14 17:50	14/04/14 22:00	MAJOR
15	14/04/14 21:44	15/04/14 10:00	MAJOR
16	15/04/14 08:49	15/04/14 13:00	MODERATE
17	15/04/14 13:01	15/04/14 18:00	MODERATE
18	15/04/14 17:56	16/04/14 09:00	MINOR
19	16/04/14 08:41		FINAL

Comment [ 1]: Described as 12am Sunday

Comment [ 2]: Described as midnight Sunday. Confusing compared to 1<sup>st</sup> comment.

Comment [ 3]: Grey depicts the recession of the flood.



Forecast locations	Qualitative or quantitative	Target height	Target lead time	Date & time of exceedance of minor flood level	Date & time of exceedance of target height	Recorded peak	Predictions (rising limb and peak only)	
							Made	Detail
Gleneagle	Qual	7.5m	12hrs	Not available	Not available	Not available	(1) 00:40 Sun 13 April (2) 02:41 Sun 13 April (3) 05:06 Sun 13 April (4) 08:19 Sun 13 April	(1) Minor flood levels Sun morning (2) Minor flood levels to continue Sun (3) Moderate flood level Sun morning (4) Peaking at major flood level currently
Abergowrie Bridge*	Qual	10.0m	6hrs	Not available	Not available	16.25m	(1) 09:24 Sat 12 April (2) 00:40 Sun 13 April (3) 02:41 Sun 13 April (4) 05:06 Sun 13 April (5) 08:19 Sun 13 April (6) 10:59 Sun 13 April (7) 14:03 Sun 13 April	(1) Minor flood levels expected Saturday night (2) Minor flood levels expected to rise further (3) Moderate flood levels during Sunday morning (4) Moderate flood levels during Sunday morning (5) Major flood levels reach 15m Sun afternoon (6) Major flood levels reach 15.5m in next hour (7) Major flood levels peak at 16.2m at 3pm Sun
Ingham Pump Station	Quan	10.0m	6hrs	13/04/14 04:53	13/04/14 04:53	14.54m	(1) 00:40 Sun 13 April (2) 02:41 Sun 13 April (3) 05:06 Sun 13 April (4) 08:19 Sun 13 April (5) 10:59 Sun 13 April (6) 14:03 Sun 13 April (7) 16:52 Sun 13 April (8) 20:14 Sun 13 April	(1) Rises to moderate late morning Sun (2) Rises to major possible during Sun (3) Rises to 13.0m expected morning Sun (4) Rises to 14.0m expected afternoon Sun (5) Rises to 14.3m expected 2pm Sun (6) Rises to 14.3m expected 3pm Sun (7) Remain high near peak of 14.3m (8) Steady around peak of 14.4m
Gairloch	Quan	9.5m	6hrs	13/04/14 05:19	13/04/14 05:19	12.45m	(1) 00:40 Sun 13 April (2) 02:41 Sun 13 April (3) 05:06 Sun 13 April (4) 08:19 Sun 13 April (5) 10:59 Sun 13 April (6) 14:03 Sun 13 April (7) 16:52 Sun 13 April (8) 20:14 Sun 13 April	(1) Rises to moderate late morning Sun (2) Rises to major flood level during Sun (3) Rises to major flood level during Sun (4) Rises to 12m during afternoon Sun (5) Peak of 12.25m 3pm Sun (6) Peak of 12.4m 4pm Sun (7) Peak of 12.4m in the next few hours (8) Remain high near peak of 12.4m evening Sun
Halifax	Quan	5.0m	9hrs	13/04/14 03:59	13/04/14 06:10	5.62m	(1) 09:24 Sat 12 April (2) 00:40 Sun 13 April (3) 02:41 Sun 13 April (4) 05:06 Sun 13 April (5) 08:19 Sun 13 April (6) 10:59 Sun 13 April	(1) Minor flood levels expected Sunday morning (2) Moderate flood level Sunday morning (3) Major flood level Sunday morning (4) 5.3m expected during Sunday morning (5) 5.5m in the next few hours (6) 5.6m within the next hour

Comment 4]: All predictions inferred from auto station

Comment 5]: Started forecasting quantitatively here. Qualitative location only.

\* The manual gauge started reporting at 13.6m due to the observer being unavailable.

Mulgrave – Russell Rivers Flood Warning

Note: The standard action statement and weather forecast information have been removed from each warning

Warning sequence:

Issue number	Date & Time	Next issue date & time	Severity
1	04:35 Sat 12 April	08:00 Sat 12 April	Minor
2	07:44 Sat 12 April	12:00 Sat 12 April	Minor
3	11:46 Sat 12 April	16:00 Sat 12 April	Moderate
4	14:20 Sat 12 April	18:00 Sat 12 April	Major
5	16:28 Sat 12 April	21:00 Sat 12 April	Major
6	19:06 Sat 12 April	23:00 Sat 12 April	Major
7	23:02 Sat 12 April	05:00 Sun 13 April	Major
8	04:33 Sun 13 April	11:00 Sun 13 April	Major
9	08:42 Sun 13 April	16:00 Sun 13 April	Moderate
10	15:09 Sun 13 April	Na	Final

Comment [1]: Use of Priority – For Immediate Broadcast. Warning updated much earlier.

Comment [2]: Use of Priority – For Immediate Broadcast. Warning updated much earlier.

Comment [3]: Use of Priority – For Immediate Broadcast. Warning updated much earlier.

Comment [4]: Warning issued 2 mins late.

Forecast location	Qualitative or quantitative	Target height	Target lead time	Date & time of exceedance of minor flood level	Date & time of exceedance of target height	Recorded peak	Predictions (rising limb and peak only)	
							Made	Detail
Peets Bridge	Quan	5.0	6.0	09:27 Sat 12 April	09:27 Sat 12 April	9.66m 17:36 Sat 12 April	(1) 04:45 Sat 12 April (2) 07:44 Sat 12 April (3) 11:46 Sat 12 April (4) 14:20 Sat 12 April (5) 16:28 Sat 12 April (6) 19:06 Sat 12 April	(1) May exceed minor Sat afternoon (2) May exceed minor Sat morning (3) Reach moderate Sat evening (4) Exceed major late Sat afternoon, peaking near 8.3m Sat evening (5) Major levels rising Sat evening, reach up to 10m as rain continues (6) Major peaked at 9.66m at 1730

Comment [6]: Should have been issued a couple of hours earlier to meet lead time objective.

Comment [5]: First warning inside target lead time required

Comment [7]: Revised timing, with less than two hours lead time.

Comment [8]: Poor advice, mod exceeded at 13:30, so just over two hrs lead time

Comment [9]: First quantitative forecast, issued within target lead time.

Comment [10]: Rain info superfluous.