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SPECIAL CLIMATE STATEMENT 35

Very heavy summer rainfall in southern Western Australia

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This statement is based on preliminary data available as of 15 December 2011, which may be subject to change as a result of standard quality control procedures.

Very heavy summer rainfall in southern Western Australia

Two major rain events have affected large parts of southern Western Australia during the first half of December 2011, normally one of the region's driest months of the year, with numerous daily and monthly rainfall records broken.

Both events were caused by deep mid-level troughs lying off the west coast of WA which triggered widespread and long-lived thunderstorm activity through large parts of the Southwest Land Division (SWLD) and adjacent districts. The first event, on the afternoon and evening of 6 December, was most significant in the eastern Central Wheat Belt and northeastern Great Southern, whilst the second event, on the evening of 12 December, primarily affected a region extending from southern parts of the Lower West (including Perth) into the western half of the Great Southern region.

A point of interest with the current heavy December rainfall, and recent good falls in spring, is the effect on prolonged dry conditions in the region. Since around 1970, the Lower Southwest region (southwest of a line from Jurien Bay to Bremer Bay) has experienced a well documented decline in winter season rainfall of around 10-20% in comparison to earlier parts of the rainfall record. Over the same period, the region has also experienced an absence of very wet years, with the sequence of high rainfall from 1963-1965 being the most significant in the last 50 years. The current record breaking rainfall has fallen during December, well outside the winter season that has experienced long term declines. The total annual rainfall for the Lower Southwest in 2011 is likely to be near average, whilst areas in eastern parts of the SWLD are likely to see above average annual rainfall.

<u>Daily rainfall totals and their historical context</u>

Daily rainfall totals for the 24 hours to 0900 WST on 7 December exceeded 25 millimetres over two major regions (Figure 1a). The larger area covered most of the eastern Central Wheat Belt, northeastern Great Southern, adjacent Goldfields, and Southeast Coastal with the heaviest falls in the region between Merredin and Hyden. Numerous sites in this area received falls in excess of 50 millimetres, and two – Hyden and Amrista Park (35 kilometres southwest of Hyden) – exceeded 100 millimetres, with Amrista Park recording the highest daily total for the event of 109.0 millimetres. Both Amrista Park and Hyden registered their wettest day on record for any month, while a number of other sites set December records (Table 1). A second area with daily rainfall totals in the 25-50 millimetre range covered metropolitan Perth and areas to its north.

In the second event nearly a week later, daily rainfall totals for the 24 hours to 0900 WST on 13 December exceeded 25 millimetres over a broad band extending from the Perth area over much of the Great Southern and as far east as Ravensthorpe in the Southeast Coastal (Figure 1b). A second area of falls in excess of 25 millimetres was observed near Mount Magnet in the Gascoyne. The heaviest falls were in the westernmost part of the Great Southern, with an area of totals in excess of 50 millimetres centred around Wagin and Narrogin. The highest daily total was 125.6 millimetres at Williams. Again, numerous December daily records were set, although no long-term sites set all-time records. Perth's 43.6 millimetres in this event (which included 36.4 millimetres in the 30 minutes from 2200 WST to 2230 WST on 12 December) was its third-highest December daily total on record[1].

The 125.6 millimetre fall at Williams on 13 December is the heaviest daily rainfall on record in December in the southwest of Western Australia[2], breaking the previous record of 117.6 millimetres, at Corrigin on 3 December 1940. The 109.0 millimetre total at Amrista Park on 7 December ranks fifth.

In total, daily rainfall records have been set over 3.8% of Western Australia so far in December 2011 (Figure 2), 2.4% on 7 December and 1.4% on 13-14 December.

The daily rainfall totals observed during these events are all far in excess of December monthly averages. Monthly mean rainfall in December is below 20 millimetres almost everywhere in the southwest of Western Australia, except on the southern coast around Albany (which largely missed the two recent events), and is below 10 millimetres in coastal and near-coastal areas from Perth northwards.

There have been a total of 10 events in December in the historical record in which at least one station in the southwest of Western Australia has received a daily rainfall of 100 millimetres or more (Table 2). Six of these events have occurred since 1999.

Such heavy rainfall events are more common later in the summer, with 20 such events in January and 17 in February. The heaviest and most extensive summer rainfall events historically in southern Western Australia have occurred in the second half of summer, most notably the events of 16-17 February 1955, 20-23 January 1982 and 28-29 January 1990. All three of these events produced daily totals exceeding 100 millimetres at 100 or more stations in the southwest of Western Australia, and the first two had peak daily totals of 200 millimetres or more. All three events were associated with the remnants of tropical cyclones.

Monthly rainfall totals for December

Most of the southwest of Western Australia, except for the far southwest corner and some near-coastal areas north of Perth, has received at least 50 millimetres of rainfall so far in December[3] (Figure 3a). In most of the region this ranges between four and ten times the long-term December monthly average (Figure 3b). The heaviest falls have been in the Great Southern where a number of stations have had 100 millimetres or more for the month. The heaviest monthly fall (to 14 December) has been 147.4 millimetres at Karlgarin (near Hyden), followed by 145.0 millimetres at Akoonah (near Lake King) and 141.4 millimetres at Williams. December 2011 is already the wettest December on record over areas extending south from Merredin over the eastern Central Wheat Belt and into the eastern Great Southern, and between Wagin and Williams. At Perth it currently ranks third with 75.8 millimetres, behind the record of 80.7 millimetres set in 1951.

[1] This includes data from the post-1993 Perth Metro site (9225) and the pre-1992 Perth Regional Office site (9034).
[2] In this statement the southwest of Western Australia is defined as the Bureau of Meteorology rainfall districts 8, 9 and 10.
[3] All month-to-date figures in this section are as of 14 December.

Over the Lower Southwest (southwest of a line from Jurien Bay to Bremer Bay), December 2011 is currently the fourth-wettest December on record, with an area average of 50.8 millimetres. The record of 68.1 millimetres was set in December 1913. The wet December follows wetter-than-normal months in October and November, resulting in an October-December total of 167.7 millimetres, which currently ranks second behind the 205.7 millimetres set in 1965. Much wetter individual months in the Lower Southwest have occurred later in the summer, including February 1955 (172.2 millimetres) and January 1982 (131.5 millimetres).

Over the cropping region of the SWLD, it is already the wettest October-December on record, with a total of 122.23 millimetres surpassing the 1983 record of 112.86 millimetres. December 2011 currently ranks fourth in this region with a total of 39.72 millimetres.

Contacts for further information

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This statement will be updated in early January with final December monthly figures.

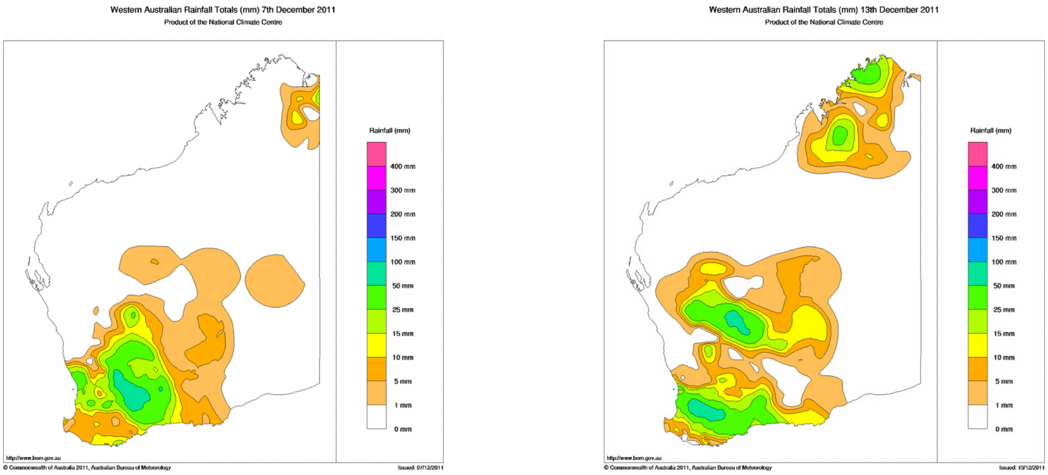

Figure 1. Daily rainfall for Western Australia for the 24 hours to 0900 on (a) 7 December 2011 (left) and (b) 13 December 2011 (right).

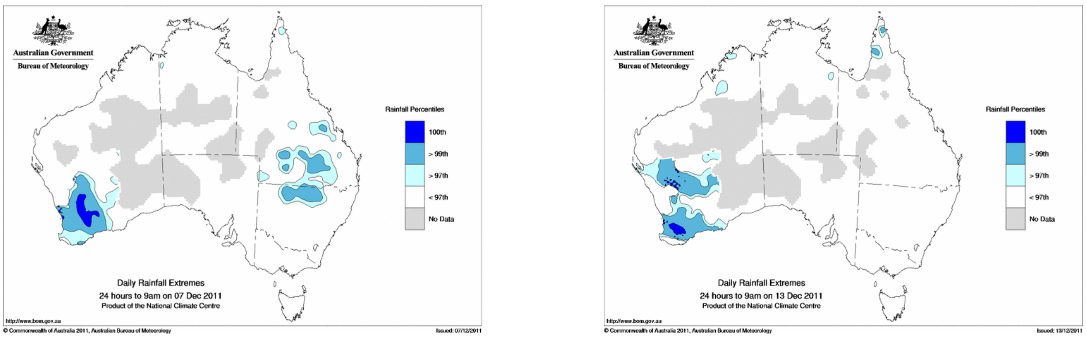

Figure 2. Extreme rainfalls on 7 December (left) and 13 December (right). Dark blue shows the area where December daily rainfall records were set.

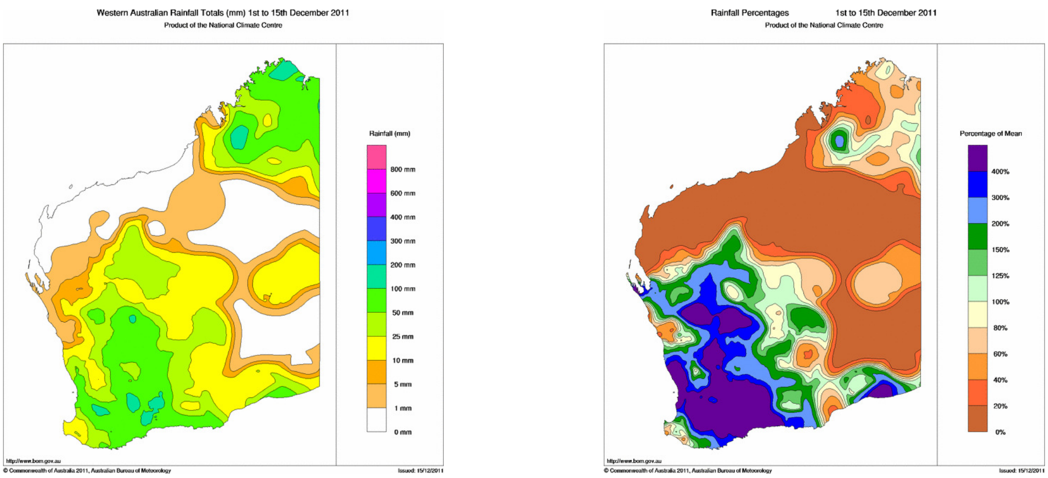

Figure 3. (a) Rainfall in Western Australia for the period 1-15 December (left). (b) Percentage of the long-term December monthly average received in the period 1-15 December (right).

Station number	Name	Rainfall (mm)	Date	Previous record	Date	Years of data
9018	Gingin	76.0	7 December	66.0	16/12/1923	89
9021	Perth Airport	35.2	13 December	27.2	3/12/1951	63
9053	Pearce	48.8	7 December	34.5	18/12/1952	45
9507	Bannister	105.4	13 December	57.6	31/12/1980	82
10126	Trayning	70.4	7 December	35.8	3/12/1940	86
10149	Codg Codgen	76.6	7 December	53.0	25/12/1991	88
10505	Arthur River	71.0	13 December	53.4	23/12/1987	85
10542	Darkan	64.8	13 December	53.3	29/12/1912	83
10546	Dumbleyung	71.0	13 December	51.0	31/12/1983	86
10568	**Hyden**	**105.0**	**7 December**	**47.2** **100.3 (all)**	**3/12/1940** **2/1/1966**	**75**
10579	Katanning	63.0	13 December	54.9	3/12/1940	102
10614	Narrogin	84.4	13 December	57.8	31/12/1980	87
10626	Pingelly	72.2	7 December	61.0	30/12/1999	87
10647	Wagin	87.0	13 December	66.0	24/12/1987	94
10655	Williams	125.6	13 December	74.2	22/12/1958	87
10696	**Amrista Park**	**109.0**	**7 December**	**58.0** **101.6 (all)**	**25/12/1987** **17/2/1970**	50

Table 1. Selected stations where December daily rainfall records have been set. Stations where records have been set for any month are shown in bold.

Date	Number of stations with daily totals of 100 mm or more	Highest daily total (mm)
20/12/1913	2	105.7
3/12/1940	1	117.6
7/12/1943	1	101.6
24/12/1987	1	112.0
29/12/1999	1	117.2
5/12/2001	3	111.4
17/12/2007	1	102.6
21/12/2008	1	124.2
7/12/2011	2*	109.0
13/12/2011	2*	125.6

Table 2. Previous events in which a daily rainfall total of 100 millimetres or more has occurred in the southwest of Western Australia during the month of December. (* - these numbers may increase as late reports are received).