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SA statewide power outage 28th September 2016

BOM Climatologist Darren Ray and Power Supply Engineer Mike Leane

Late September 2016 saw the development of severe storms that impacted South Australian power infrastructure, contributing to widespread blackout conditions across South Australia.

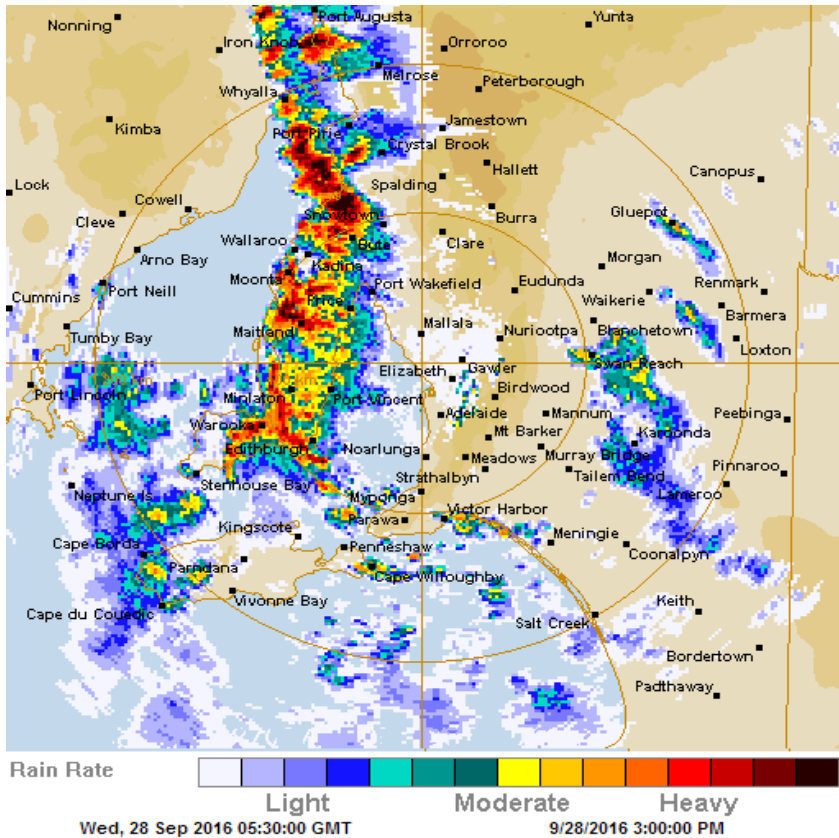
The well attended AMETA February 2017 meeting featured Bureau of Meteorology Senior Climatologist Darren Ray looking at the meteorological conditions contributing to the outage, and Power Supply Engineer Mike Leane examined the subsequent impacts on South Australian power supply networks.

The 27th and early on the 28th September 2016 saw the development of an intense low pressure system in the Great Australian Bight, to the west of Adelaide. A trough of low pressure moved across southern South Australia during the afternoon of the 28th September ahead of the cold front. Central and eastern areas of the state had wet soils after a very wet September, and balloon soundings on the day indicated cooler air in the middle of the atmosphere conducive to thunderstorm development. For the meteorologists, measures of CAPE (Convective Available Potential Energy) were around 1800 joules/kg, with Lifted Indices as an indicator of atmospheric instability, at -8 °C – clear indications of the potential for severe thunderstorm activity.

The progression of the trough across Eyre Peninsula and surface heating in this environment, provided the combination of ingredients for severe thunderstorm activity to develop. A line of severe thunderstorms developed across northern Eyre Peninsula during the afternoon, and moved into the Mid-North districts of the state by mid-afternoon. Radar imagery from this time shows characteristic bow- echoes indicating severe thunderstorm activity. Reports were received of tornadoes developing along this line of severe activity. Post event analysis by the South Australian Bureau of Meteorology severe weather team visited the area and found damage tracks indicative of tornadoes in at least 5, and possibly 7 locations.

Tornadoes in South Australia are a feature seen several times a year, but tend to be lower end F0 or F1 tornadoes according to the Fujita rating scale. They leave narrow damage tracks 100-200m wide that touch down for 3-5 km or more before dissipating.

The thunderstorm activity north of Adelaide on the 28th September produced several tornadoes. A tornado that started near Wilmington damaged 4 power towers, and further south, another near Blyth also damaged 4 towers on a separate power line, and right at the end of the tornado damage path. While no direct wind observations are available of a tornado passing over a weather station in this event, assessment of damage along the tracks indicated wind speeds could have been up to or in excess of 260 km/h along the tornado tracks, with the tornadoes rated at F2 or low end F3 category in severity.



Radar imagery from the afternoon of the 28th September 2016

The intense low pressure system then went on to pass over the Adelaide region overnight on the 28th September and produced record September rainfall totals at many locations in the Adelaide and Mount Lofty and Flinders Ranges.

Mike Leane related that the event, while widely portrayed as a state-wide blackout, really impacted the lower 1/3 of South Australia, with the remainder of the state supplied with

islanded mini-grids which stayed operational through the blackout. Wind was producing about 40% of the 1825 MW demand, with 600MW being imported via inter-connectors.

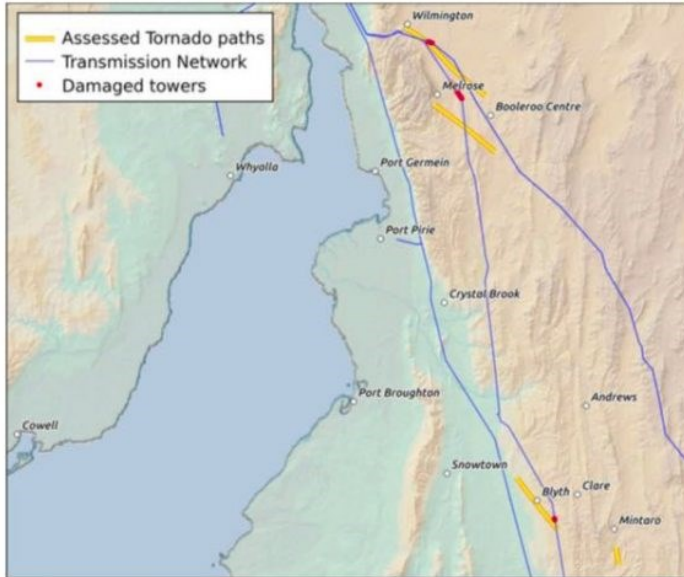


Figure 15: The locations of the four assessed tornado paths overlaid with transmission network and damaged towers.

There were minor faults from 3:21pm, but the major outage from the power tower damage occurred at 3:48pm, but with power lines going down in response to the two tornadoes , protection settings on wind farms switched into operation to protect the wind turbines. This meant the inter-connector had to pick up the slack to meet demand to levels too high to sustain, so the two inter-connectors dropped out in succession, leaving the bulk of South Australia’s supply out. Return to power started 2 hours and 40 minutes later, with 80-90% power restored by midnight.

With the narrow path of the tornadoes, and the damage from one right at the end of the damage track- that this damage occurred was incredibly bad luck. Subsequent investigations have established that settings on wind turbines had been changed from factory settings, increasing the vulnerability of the wind turbines to dropping out in this kind of situation.

For further reading see:

http://www.bom.gov.au/announcements/sevwx/sa/Severe_Thunderstorm_and_Tornado_Outbreak_28_September_2016.pdf

https://www.aemo.com.au/-media/Files/Electricity/NEM/Market_Notices_and_Events/Power_System_Incident_Reports/2017/Integrated-Final-Report-SA-Black-System-28-September-2016.pdf

PLEASE NOTE THAT THE APRIL MEETING WILL BE ON THURSDAY 27th April 2017

Adelaide in January 2017: Heavy rain and above average temperatures

It was a wet start to 2017 for Adelaide with most locations across the metropolitan and Hills regions recording above average rainfall for January. Both day and night temperatures were above average.

Heavy rainfall

- On the 19th and 20th a broad area of low pressure combined with tropical moisture brought very humid conditions to the Adelaide region with very heavy rainfall and thunderstorm activity
- The system saw both Edinburgh RAAF (44.8 mm) and Mount Crawford AWS (34 mm) report their wettest January day on record
- Most locations reported more than double the long-term average for January with several locations reporting their wettest January since at least 1996

A warmer than average start to the year

- Both maximum and minimum temperatures were above average for most locations, with particularly warm periods during the first and third weeks of the month
- For Adelaide (Kent Town), daytime maximum temperatures were 1.3 °C warmer than the long term average and overnight minimum temperatures were 1.0 °C warmer
- Adelaide (Kent Town) recorded 8 days with a maximum temperature greater than 35 °C this January, surpassing the average of 6 days

Damaging winds, high humidity and heavy rainfall

- On the 19th, a vigorous line of thunderstorms associated with a deep low pressure trough passed across the region bringing very high humidity, strong wind gusts and heavy showers
- Adelaide Airport recorded a wind gust of 111 km/h on the 19th, the highest wind speed to be recorded in January for this locations since observations began in 1955, with the previous highest being 104 km/h on 26 January 1995

Extremes in January 2017

Hottest day	41.5 °C at Edinburgh RAAF on the 7th
Warmest days on average	30.7 °C at Adelaide (Kent Town) 30.7 °C at Parafield Airport
Coollest days on average	25.1 °C at Mount Lofty
Coldest day	18.0 °C at Mount Lofty on the 20th
Coldest night	8.4 °C at Mount Lofty on the 25th
Coollest nights on average	13.4 °C at Mount Lofty
Warmest nights on average	18.2 °C at Adelaide (Kent Town)
Warmest night	31.6 °C at Parafield Airport on the 7th
Warmest on average overall	24.4 °C at Adelaide (Kent Town)
Coollest on average overall	19.2 °C at Mount Lofty
Wettest overall	84.0 mm at Kangarilla (Saddlebags)
Wettest day	44.8 mm at Edinburgh RAAF on the 20th
Strongest wind gust	111 km/h at Adelaide Airport on the 19 th

Record January daily rainfalls were recorded at Edinburgh RAAF and Mt. Crawford.
Record January rainfalls were recorded at McLaren Vale and Sellicks beach.

South Australia in January 2017: Wet, warm and windy

It was a wet start to 2017 for South Australia with much of the State recording very much above average rainfall for January. Both day and night temperatures were above average, with particularly warm nights across the Northeast.

Heavy rainfall results in ninth-wettest January for the State

- On the 19th and 20th a broad area of low pressure over the West Coast and Pastoral districts combined with tropical moisture resulted in very humid conditions with heavy shower and thunderstorm activity over northern, western and central districts
- The line of thunderstorms also saw several locations record more than 50 mm of rainfall in the 24 hours to 9am on the 20th, including a record high of 106.2 mm at Wilpena Pound in the Upper North, and several other locations reporting record high daily rainfall for January
- Much of the State reported more than double the January average rainfall, and many sites had their wettest January on record or their wettest January for several decades
- With up to four times the long-term January average rainfall being observed across the western agricultural district, many locations there reported their wettest January on record
- For the State as whole, it was the ninth-wettest January on record

Warmer than average nights across much of the State; mild days in the west

- Minimum temperatures were more than one degree above average across most districts, and more than three degrees above average in the northeast of the State
- The statewide January mean minimum temperature was more than 2 °C warmer than average, coming in eighth-warmest on record
- Maximum temperatures were generally above average across the eastern half of the state, but tended cooler across the far west
- The statewide mean maximum temperature was more than 1 °C above average

Damaging winds and high humidity

- On the 19th and 20th, a vigorous line of thunderstorms associated with a deep low pressure trough passed over the State, bringing very high humidity, strong wind gusts and heavy showers to most areas
- Several locations recorded wind gusts in excess of 100 km/h, including a wind gust of 111 km/h at Adelaide Airport, the highest wind speed to be recorded there since observations began in 1955

Some notable statistics for South Australia for January were:

Many other rainfall records were also set in January. For more information plus a summary of statistics please see:

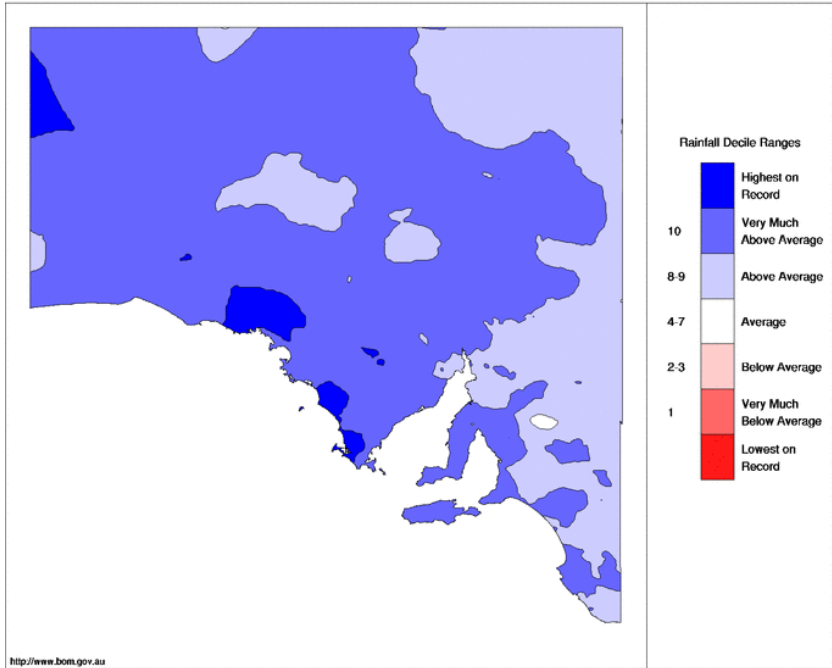
<http://www.bom.gov.au/climate/current/month/sa/archive/201701.summary.shtml>

Adelaide, South Australia January 2017 Daily Weather Observations

Observations are from Kent Town, about 2 km east of the city centre.

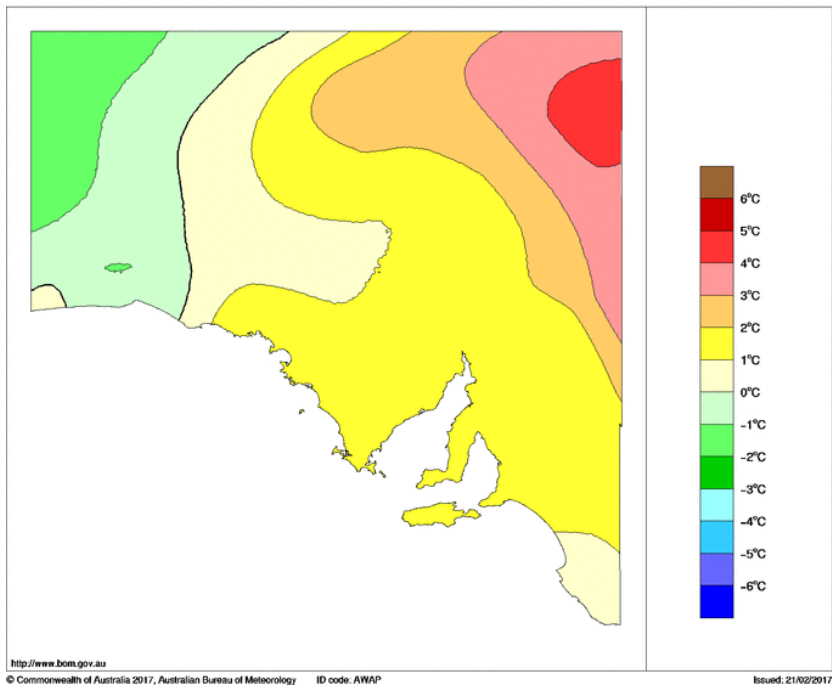
Date	Day	Temps		Rain	Evap	Sun	Max wind gust			9am					3pm										
		Min	Max				Dir	Spd	Time	Temp	RH	Cld	Dir	Spd	MSLP	Temp	RH	Cld	Dir	Spd	MSLP				
		°C	°C	mm	mm	hours	km/h	km/h	local	°C	%	eghtns	km/h	km/h	hPa	°C	%	eghtns	km/h	km/h	hPa				
1	Su	16.3	23.7	0			WSW	39	15:38	18.3	72		SW	17	1011.9	22.6	57		SW	17	1012.8				
2	Mo	15.7	24.6	0.2			SSE	33	16:44	18.2	59		SE	15	1019.7	23.6	42		ESE	17	1018.4				
3	Tu	13.6	27.8	0			SE	26	14:42	18.5	58		WSW	9	1019.9	27.3	28		ENE	7	1016.3				
4	We	18.5	33.3	0			SE	39	20:17	25.7	43		WSW	6	1015.0	32.8	27		ESE	15	1012.8				
5	Th	23.5	35.8	0			ESE	50	00:35	28.7	35		NE	6	1012.2	34.9	33		E	9	1008.5				
6	Fr	24.0	39.5	0			NNE	30	11:24	31.4	34		NE	9	1011.1	38.3	18		ENE	9	1008.2				
7	Sa	31.4	40.7	0			SW	44	18:16	34.5	26		NE	11	1006.7	39.2	17		WNW	19	1003.2				
8	Su	20.9	28.0	0			SW	28	00:30	22.6	57		SW	7	1009.8	25.6	49		SW	13	1010.4				
9	Mo	20.2	30.4	0			SW	24	15:46	20.9	70		ESE	6	1012.7	28.9	38		WNW	9	1011.3				
10	Tu	19.5	29.3	0			WSW	35	15:38	23.6	60		NW	4	1012.9	26.7	50		SW	15	1011.5				
11	We	15.8	28.0	0			WSW	33	14:29	20.3	59		S	9	1015.3	25.5	50		WSW	19	1013.4				
12	Th	15.7	37.2	0			WNW	39	21:00	22.0	45		NNE	2	1011.2	34.2	22		NE	13	1005.8				
13	Fr	21.7	23.4	11.8			W	44	03:36	21.9	95		NNE	6	1002.5	22.4	66		SW	19	1005.5				
14	Sa	17.0	23.3	7.8			WSW	37	06:56	18.0	55		SW	15	1015.2	22.5	46		WSW	19	1017.0				
15	Su	13.8	26.1	0			WSW	28	14:17	17.8	62		SSE	7	1020.7	24.9	48		SW	13	1017.3				
16	Mo	15.1	36.1	0			W	26	15:27	23.8	46		ESE	2	1014.0	34.2	17		W	11	1010.8				
17	Tu	18.7	41.1	0			SSE	41	21:21	29.1	30		NE	2	1008.6	39.9	7		NW	17	1006.3				
18	We	18.4	27.2	0			ESE	30	23:21	19.0	63		S	6	1016.1	25.8	34		ENE	9	1013.8				
19	Th	18.8	38.2	0			NW	74	18:33	23.9	39		ENE	6	1009.1	36.5	24		NNE	11	1002.8				
20	Fr	18.2	24.3	21.0			SSW	44	04:25	18.4	74		S	17	1005.2	23.3	48		S	13	1008.4				
21	Sa	13.2	26.5	0			WSW	28	15:18	18.3	61		W	4	1016.0	25.5	42		SW	15	1013.8				
22	Su	17.3	34.2	0			N	30	08:57	25.7	32		NNE	9	1013.3	32.7	24		W	13	1009.3				
23	Mo	24.5	33.0	0			WSW	37	22:06	30.8	25		NE	7	1004.9	25.6	79		W	6	1006.2				
24	Tu	16.2	25.2	6.4			SSW	35	23:24	19.1	67		SSW	11	1017.4	24.1	41		S	17	1018.0				
25	We	12.4	27.4	0			WSW	31	15:33	18.8	51		SW	2	1021.4	25.6	38		WSW	17	1019.3				
26	Th	13.7	28.0	0			SE	26	15:49	19.5	56		SW	4	1020.8	26.7	37		SE	7	1018.3				
27	Fr	15.1	32.2	0			WNW	22	14:30	20.3	62		SW	4	1018.8	30.9	28		W	9	1014.0				
28	Sa	16.2	32.3	0			WSW	26	17:15	24.5	46		N	2	1014.8	31.0	24		SW	13	1014.9				
29	Su	16.3	39.0	0			WSW	20	15:56	25.3	42		Cal	2	1016.4	28.9	17		SW	9	1012.9				
30	Mo	24.6	28.7	0			SW	59	05:30	28.1	47		SW	4	1010.2	28.6	66		SW	9	1009.6				
31	Tu	17.1	26.0	0			WSW	39	14:04	18.9	100		SSE	11	1016.7	23.5	47		WSW	20	1016.2				
Statistics for January 2017																									
Mean		18.2		30.7						22.8		53		7		1013.5		29.0		37		13		1011.9	
Lowest		12.4		23.3						17.8		25		Cal		1002.5		22.4		7		6		1002.8	
Highest		31.4		41.1		21.0		NW		74		100		#		1021.4		39.9		79		20		1019.3	
Total										47.2															

Observations were drawn from Adelaide (Kent Town) (station 023395)



Maximum Temperature Anomaly (°C) January 2017

Australian Bureau of Meteorology



Adelaide in February 2017: generally cooler than average with one very wet day

February 2017 in Adelaide was generally wetter and cooler than average. Adelaide city received more than double its February average rainfall. Mean daytime temperatures were more than one degree cooler than the February average in some areas.

Wetter than average

- Most areas throughout Adelaide were wetter than average during February
- Most rain fell on 6 February, with daily rainfall totals typically over 20 mm throughout the Adelaide hills and suburbs
- There were only four raindays in the city during the month
- Noarlunga was the only part of Adelaide to receive below average rainfall during the month—72% of average

Temperatures generally cooler than average

- Most sites around Adelaide were slightly cooler than average during February
- A run of very hot days from 8–10 February as heatwave conditions extended across much of southeast Australia
- Adelaide (Kent Town) recorded 42.4 °C on the 8th, the city site's hottest day since December 2015, and hottest February day since 2014
- On the 6th, Mount Crawford had its coldest February day on record
- Other sites around Adelaide had their coldest February day since 2012 on 6 February

Strong winds

- The strongest gust during February was 76 km/h at Mt Crawford on the 22nd

Extremes in February 2017

Hottest day	42.4 °C at Adelaide (Kent Town) on the 8th
Warmest days on average	29.1 °C at Parafield Airport
Coollest days on average	22.6 °C at Mount Lofty
Coldest day	12.7 °C at Mount Lofty on the 6th
Coldest night	6.6 °C at Mount Barker on the 26th
Coollest nights on average	11.9 °C at Mount Lofty
Warmest nights on average	17.0 °C at Adelaide (Kent Town)
Warmest night	27.3 °C at Noarlunga on the 9th
Warmest on average overall	22.8 °C at Adelaide (Kent Town)
Coollest on average overall	17.1 °C at Mount Lofty
Wettest overall	62.4 mm at Owen
Driest overall	14.2 mm at Noarlunga
Wettest day	52.0 mm at Owen on the 6th
Strongest wind gust	76 km/h at Mount Crawford AWS on the 22nd

Record lowest February daily maximum temperature

	New (°C)	Old	Years held	February Average
Mount Crawford	14.6 on the 6th	14.7 on 3/2/2005	23	27.1

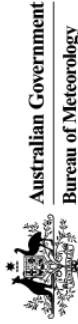
For more information on Adelaide's February temperatures and rainfall plus a summary of statistics please see:

<http://www.bom.gov.au/climate/current/month/sa/archive/201702.adelaide.shtml>

Adelaide, South Australia

February 2017 Daily Weather Observations

Observations are from Kent Town, about 2 km east of the city centre.



Date	Day	Temps		Rain	Evap	Sun	Max wind gust			9am					3pm								
		°C	°F				mm	mm	hours	Dirn	Spd	Time	Temp	RH	Cld	Dirn	Spd	MSLP	Temp	RH	Cld	Dirn	Spd
1	We	17.0	25.6	0			WSW	30	14:24	18.7	55			Calm	1016.4	24.8	38			WSW	9	1014.8	
2	Th	14.9	25.8	0						18.6	65	SW		7	1019.6	24.4	43			SW	15	1017.3	
3	Fr	13.4	29.7	0			WSW	22	13:47	19.9	57			Calm	1017.3	28.2	37			SW	13	1014.0	
4	Sa	17.5	30.2	0			WNW	28	10:43	24.5	44	NNE		6	1009.9	27.5	46			NW	11	1009.9	
5	Su	20.8	24.9	1.2			N	35	11:28	23.5	81	NNW		11	1009.5	24.7	82			N	9	1008.4	
6	Mo	16.8	19.3	29.0			E	33	08:53	17.3	65	ESE		13	1013.2	18.6	71			SE	7	1014.8	
7	Tu	14.1	31.7	0						18.9	62	N		7	1018.5	27.9	45			E	11	1014.7	
8	We	18.6	42.4	0			NNE	35	10:47	31.7	44	NE		13	1011.8	41.2	24			NNE	13	1008.2	
9	Th	25.8	41.0	0			N	20	10:42	33.1	43	SSW		4	1008.0	38.5	30			W	7	1007.2	
10	Fr	24.2	40.0	0			WSW	24	11:39	29.0	61	SSW		6	1009.7	38.0	36			SW	9	1007.8	
11	Sa	25.0	34.0	0			SSW	33	19:34	26.7	75	N		6	1009.1	32.2	44			S	15	1008.5	
12	Su	17.2	23.4	0			S	41	10:43	17.7	59	S		13	1015.7	21.9	36			WSW	19	1015.7	
13	Mo	16.0	24.3	0			WSW	31	14:09	17.4	60	SSW		15	1019.2	23.3	47			SSW	11	1018.2	
14	Tu	15.1	28.1	0			WSW	24	13:10	18.2	68	ESE		9	1020.3	25.1	50			SW	11	1017.4	
15	We	18.1	33.4	0			NNW	37	11:29	25.3	29	N		11	1011.9	31.6	28			WSW	15	1010.0	
16	Th	18.1	26.9	0			WSW	30	16:12	22.3	67	N		4	1012.2	26.0	50			WSW	13	1010.9	
17	Fr	15.6	23.4	0			WSW	41	16:52	19.1	58	WSW		13	1013.9	22.3	54			WSW	15	1013.6	
18	Sa	15.9	20.6	0			SSW	39	08:26	16.9	51	SW		17	1015.9	19.3	44			SW	20	1016.4	
19	Su	12.1	20.3	2.4			SW	37	14:53	14.3	85	NW		2	1017.7	18.7	60			SSW	17	1016.6	
20	Mo	13.2	23.1	0.8			WSW	31	13:26	17.1	55	S		4	1018.9	21.9	37			WSW	17	1017.7	
21	Tu	11.7	31.1	0			N	26	12:43	19.2	40	NE		7	1019.2	28.8	24			NW	7	1015.0	
22	We	19.2	30.3	0			WSW	48	09:43	28.1	18	NNE		17	1009.2	26.2	33			W	22	1011.7	
23	Th	17.9	24.9	0			WSW	31	23:47	19.6	62	S		13	1020.3	24.0	47			WSW	13	1021.1	
24	Fr	14.5	24.5	0			SSW	37	16:04	17.7	55	SSE		11	1027.0	23.4	38			SSE	13	1025.1	
25	Sa	14.5	24.8	0			SE	35	00:51	17.8	52	ESE		6	1025.6	23.6	35			SSE	13	1022.8	
26	Su	12.2	27.0	0			SW	26	13:48	17.2	52	WSW		2	1021.2	26.0	35			WSW	13	1018.1	
27	Mo	14.1	35.0	0			ESE	35	21:16	21.7	58	WSW		4	1018.4	33.2	28			WSW	15	1015.9	
28	Tu	21.7	38.4	0			ESE	35	23:21	30.0	22	NE		9	1017.7	36.8	18			S	6	1015.7	
Statistics for February 2017																							
Mean		17.0	28.7							21.5	55			8	1016.0	27.1	41				12	1014.6	
Lowest		11.7	19.3							14.3	18			Calm	1008.0	18.6	18			S	6	1007.2	
Highest		25.8	42.4	29.0			WSW	48		33.1	85		#	17	1027.0	41.2	82			W	22	1025.1	
Total				33.4																			

Observations were drawn from Adelaide (Kent Town) (station 023090)

IDC:DW5002.201702. Prepared at 16:05 GMT on 2 Apr 2017
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 accepted the conditions described in the notes at
<http://www.bom.gov.au/climate/dwo/IDC-DW0000.pdf>

South Australia in February 2017

February in South Australia saw warmer and drier than average conditions in northeast pastoral districts, but was wet with temperatures slightly cooler than average across agricultural areas and the southeast.

Drier than average northeast and wetter than average west and south

- Overall, South Australia was slightly drier than average for February
- Rainfall was confined to the western and southern parts of the State
- Below average to very much below average rainfall across the northern and northeast pastoral districts
- Northeastern South Australia had less than 1 mm of rain for the month
- Many sites in the northeast pastoral district recorded no rainfall for the month
- Above average to very much above average rainfall across agricultural districts
- Large parts of the Western Agricultural district had more than 300% of their February average rainfall
- Nullarbor recorded 67.6 mm in the month—more than 400% of the site's February average—making it the State's wettest site this month

Warmer than average overall

- South Australia as a whole was warmer than average in February
- Warmer than average in northeast pastoral districts
- Average to cooler than average mean temperatures in the west and southeast
- Tarcoola recorded 48.2 °C on 9 February, which was a late-season record for South Australia and equalled the February South Australian record of 48.2 °C set at Renmark on Black Saturday, 7 February 2009
- At least 16 sites recorded 45 °C or above on 9 February, covering an area from Coober Pedy and Tarcoola in the west to Renmark and Loxton in the east
- Prolonged heat across pastoral areas of South Australia in the first half of the month saw runs of extreme heat
- Woomera had a record run of four consecutive days of 45 °C or above during the month, breaking the site's previous February record of two consecutive days in 2009
- From 8–10 February, nine sites across central and northern South Australia had their highest February temperature on record
- Later in the month, some of those same sites had their lowest February temperature on record
- On the 6th, Mount Crawford and Nuriootpa had their coldest February day (lowest maximum temperature) for more than 21 years
- Moomba had its highest February mean daily maximum temperature on record

Strong winds at times

- A cold front crossed southern parts of South Australia on the morning of the 22nd, bringing a northwest gust of 96 km/h to Hindmarsh Island, the strongest wind gust recorded in the State during February

Record highest February mean daily maximum temperature

	New record (°C)	Old record	Years of record	February Average
Moomba	39.8	39.3 in 2015	21	37.0

Extremes in February 2017

Hottest day	48.2 °C at Tarcoola Aero on the 9th
Warmest days on average	39.8 °C at Moomba Airport
Coollest days on average	21.8 °C at Neptune Island
Coldest day	12.7 °C at Mount Lofty on the 6th
Coldest night	2.0 °C at Keith (Munkora) on the 26th
Coollest nights on average	10.9 °C at Coonawarra
Warmest nights on average	24.6 °C at Moomba Airport
Warmest night	31.3 °C at Moomba Airport on the 7th
Warmest on average overall	32.2 °C at Moomba Airport
Coollest on average overall	17.1 °C at Mount Lofty
Wettest overall	67.6 mm at Nullarbor
Driest overall	0 mm at Arkaroola
	0 mm at Coober Pedy Airport
	0 mm at Leigh Creek Airport
	0 mm at Marree Aero
	0 mm at Moomba Airport
	0 mm at Woomera Aerodrome

Record lowest February daily maximum temperature				
	New record	Old record	Years held	February Average
Mount Crawford	14.6 on the 6th	14.7 on 3/2/2005	23	27.1
Nuriootpa Pirsia	16.6 on the 6th	16.8 on 29/2/2005	21	29.6

Record lowest February temperature				
	New record (°C)	Old record	Years held	February Average
Yongala	3.7 on the 20th	3.8 on the 28th in 1984	61	13.4
Hawker	9.0 on the 20th	9.4 on the 2nd in 2005	45	18.0
Coonawarra	2.2 on the 21st	= 2.2 on the 7th in 2011	32	11.8
Kingscote	4.8 on the 21st	5.3 on the 17th in 1998	23	13.6
Ernabella	9.6 on the 20th	9.9 on the 2nd in 2005	20	20.4
Tarcoola	9.1 on the 19th	10.0 on the 2nd in 2005	20	19.3

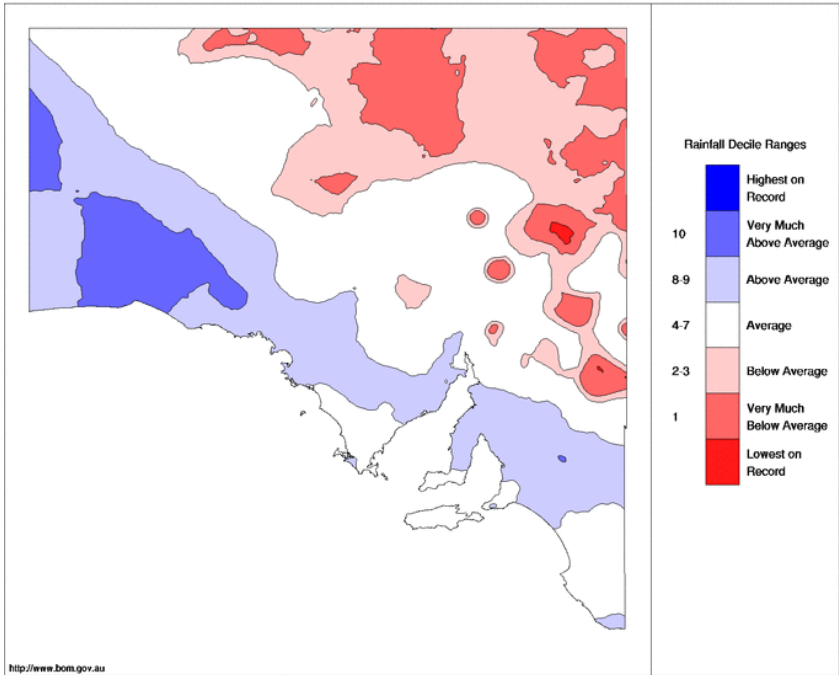
Wettest day	52.0 mm at Owen on the 6th
Strongest wind gust	96 km/h at Hindmarsh Island AWS on the 22 nd

For more information on South Australia's February temperatures and rainfall plus a summary of statistics please see:

<http://www.bom.gov.au/climate/current/month/sa/archive/201702.summary.shtml>

South Australian Rainfall Deciles February 2017

Distribution Based on Gridded Data
Australian Bureau of Meteorology

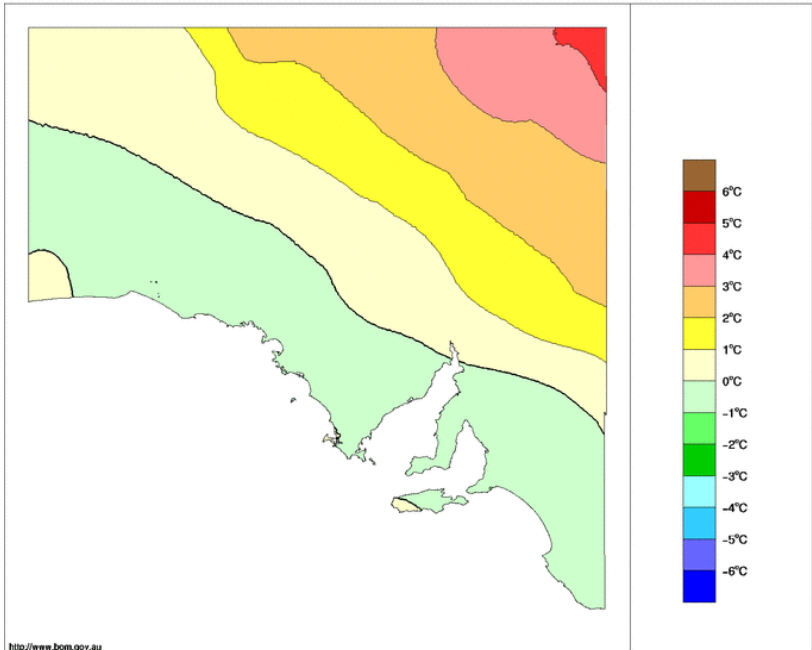


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Issued: 21/03/2017

Maximum Temperature Anomaly (°C) February 2017

Australian Bureau of Meteorology



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Issued: 21/03/2017

Adelaide in March 2017: very warm and generally drier than average

Most of the Adelaide region was drier and much warmer than average during March. Despite a cool end to the month, daytime temperatures in particular were very much above average. All locations in the Adelaide hills and suburbs had mean maximum temperatures that were more than two degrees warmer than average.

Generally drier than average

- Most sites around the Adelaide hills and suburbs had below average rainfall during March
- Adelaide (Kent Town) was one of only a few sites in the Adelaide region that recorded above average rainfall for the month
- North of the city, Edinburgh and Williamstown had their lowest total March rainfall since 1997

Much warmer than average

- March was warmer than average throughout the Adelaide region
- Maximum temperatures during March were very much warmer than average
- Mean maximum temperatures were almost five degrees warmer than average at Mount Lofty
- Mean minimum temperatures were also warmer than average throughout Adelaide
- March began with several hot days, with most sites recording their hottest day of the month on the 1st, but ended with several cold days
- Adelaide city had 25 nights of 15 °C or above during March, which was the most warm nights for March since 1974 (when there were 28 such warm nights at West Terrace)
- Mount Crawford had its warmest March on record after both its mean daily maximum temperatures and mean daily minimum temperatures were highest on record for March

Extremes in March 2017

Hottest day	38.6 °C at Kent Town on the 1st 38.6 °C at Parafield Airport on the 1st
Warmest days on average	30.2 °C at Parafield Airport
Coollest days on average	23.8 °C at Mount Lofty
Coldest day	14.1 °C at Mount Lofty on the 30th
Coldest night	6.5 °C at Mount Lofty on the 30th 6.5 °C Edinburgh RAAF on the 31st
Coollest nights on average	13.3 °C at Mount Barker
Warmest nights on average	17.5 °C at Noarlunga
Warmest night	23.3 °C at Noarlunga on the 20th
Warmest on average overall	23.3 °C at Adelaide (Kent Town)
Coollest on average overall 1	8.8 °C at Mount Lofty
Wettest overall	46.4 mm at North Adelaide
Wettest day	29.0 mm at North Adelaide on the 21st

Some notable statistics for Adelaide for March were:

Lowest March total rainfall for at least 20 years

	Observed (mm)	Most recent lower	Average for March
Hope Valley	4.6	0.0 in 1994	29.3
Sellicks Beach	3.4	0.0 in 1994	18.5
McLaren Vale	6.4	4.8 in 1995*	22.8
Edinburgh RAAF	6.4	4.8 in 1997	25.3
South Para Reservoir	7.6	5.8 in 1997	29.7

** note: there are gaps in the historical record at this site, so it is possible a lower value has gone unreported*

Record highest March mean daily maximum temperature

	New record (°C)	Old record	Years of record	Average for March
Mount Crawford	26.3	26.2 in 2008	22	23.3

Record highest March mean daily minimum temperature

	New record (°C)	Old record	Years of record	Average for March
Mount Crawford	14.6	14.5 in 2013	22	12.1

Record highest March mean temperature

	New record (°C)	Old record	Years of record	Average for March
Mount Crawford	20.5	20.3 in 2008	22	17.7

For more information on Adelaide's March temperatures and rainfall plus a summary of statistics please see:

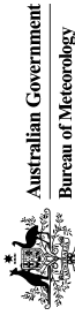
All the detail you could possibly want and more is available on the BoM website.

Visit <http://www.bom.gov.au/climate> and wander through the various archived

<http://www.bom.gov.au/climate/current/month/sa/archive/201703.adelaide.shtml>

Adelaide, South Australia March 2017 Daily Weather Observations

Observations are from Kent Town, about 2 km east of the city centre.



Date	Day	Temps		Rain	Evap	Sun	Max wind gust			9am					3pm						
		Min	Max				Dirn	Spd	Time	Temp	RH	Cld	Dirn	Spd	MSLP	Temp	RH	Cld	Dirn	Spd	MSLP
		°C	°C	mm	mm	hours	km/h	local	°C	%	eighths	°C	%	eighths	km/h	hPa	°C	%	eighths	km/h	hPa
1	We	23.0	38.6	0			W	26	15:03	30.9	23	23	NE	7	1017.7	38.1	14	WSW	15	1016.4	
2	Th	21.1	36.2	0			SE	33	16:49	26.0	46	NNE	NNE	4	1018.3	35.9	21	SSW	11	1017.0	
3	Fr	18.9	34.0	0			ESE	30	15:21	25.1	47				1019.9	32.6	24	E	9	1017.4	
4	Sa	19.0	32.5	0			WSW	35	16:21	24.8	50				1016.3	31.7	26	WSW	20	1014.8	
5	Su	15.0	26.9	0			S	39	17:24	19.4	61	SSE	SSE	13	1017.5	26.1	41	SSE	13	1015.4	
6	Mo	16.7	28.8	0			SSE	30	15:13	18.6	69	ESE	ESE	6	1017.6	27.5	41	SW	7	1014.6	
7	Tu	18.3	32.2	0			SW	30	14:43	23.3	54				1015.6	30.4	39	SW	17	1013.3	
8	We	19.1	33.0	0			SW	31	16:25	23.3	45	NNE	NNE	6	1014.3	31.3	29	WSW	15	1012.8	
9	Th	17.3	32.9	0			WSW	26	15:32	22.6	48				1016.4	31.7	22	SW	13	1015.3	
10	Fr	15.1	31.5	0					20.1	20.1	42				1017.1	30.8	19	WSW	11	1015.3	
11	Sa	19.2	30.7	0			WSW	37	20:14	23.9	40	ENE	ENE	7	1017.0	28.6	35	SSE	2	1007.0	
12	Su	16.9	21.7	1.4			WSW	43	09:38	18.7	78	NW	NW	13	1004.8	20.0	69	WSW	20	1005.5	
13	Mo	16.4	23.4	7.2			SSE	26	13:21	18.0	74	SSW	SSW	9	1015.1	21.1	63	SE	15	1015.4	
14	Tu	15.2	30.2	0			WSW	26	12:38	21.5	72				1016.6	28.8	41	WSW	15	1014.2	
15	We	19.0	35.4	0					26.2	26.2	40	NNE	NNE	7	1011.5	33.5	22	WNW	15	1008.0	
16	Th	18.2	23.3	0			WSW	44	14:12	19.7	49				1015.3	22.9	41	SW	22	1016.4	
17	Fr	12.5	27.3	0			ESE	26	16:30	16.5	53	NNW	NNW	6	1023.5	26.3	22	NE	9	1021.2	
18	Sa	12.7	33.5	0			NNE	24	09:22	19.2	54				1022.2	33.3	12	NW	6	1019.2	
19	Su	16.3	34.6	0			ESE	30	22:02	23.3	48				1017.1	34.2	19	WSW	15	1013.4	
20	Mo	23.2	34.4	0			SE	41	12:46	26.6	42				1011.5	23.6	83	N	11	1010.8	
21	Tu	21.5	29.9	26.8			E	37	23:39	24.6	65	SE	SE	7	1010.3	28.5	52	E	7	1009.6	
22	We	19.2	22.6	0			SE	33	14:36	19.8	73	SSE	SSE	9	1017.0	21.9	64	SSE	17	1016.8	
23	Th	17.7	29.0	0			WSW	26	14:14	18.6	75	SSW	SSW	2	1019.0	28.0	50	ESE	9	1015.1	
24	Fr	18.5	32.5	0			E	30	01:13	24.2	59	ENE	ENE	9	1014.8	32.0	49	SSE	6	1011.9	
25	Sa	20.5	27.7	0			WSW	19	13:34	21.6	76	NE	NE	6	1013.7	27.0	63	WSW	9	1013.0	
26	Su	20.7	33.3	0			ENE	24	20:38	22.9	72				1012.4	32.9	56	SW	6	1009.3	
27	Mo	20.8	23.9	0			WSW	50	02:37	21.6	62	WSW	WSW	17	1013.2	22.9	41	WSW	19	1014.9	
28	Tu	13.8	24.6	0			NNW	24	11:27	16.4	69	N	N	9	1016.9	24.0	44	W	9	1014.3	
29	We	14.3	22.7	0			SW	46	13:38	16.6	79	NNE	NNE	7	1012.1	16.2	93	SW	24	1011.6	
30	Th	10.9	19.7	4.0			WSW	37	14:29	13.8	66	SSW	SSW	11	1022.6	17.7	46	S	11	1023.1	
31	Fr	8.8	20.1	0			SW	28	16:18	13.0	71	NNW	NNW	6	1025.2	18.4	47	SW	13	1023.0	
Statistics for March 2017																					
Mean		17.4	29.3							21.3	58			5	1016.0	27.7	41		12	1014.4	
Lowest		8.8	19.7						13.0	23					1004.8	16.2	12	SSE	2	1005.5	
Highest		23.2	38.6	26.8			WSW	50	30.9	79		#		17	1025.2	38.1	93	SW	24	1023.1	
Total				39.4																	

Observations were drawn from Adelaide (Kent Town) (station 023090)

ICDJWS002.201703 Prepared at 13:05 GMT on 2 Apr 2017

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South Australia in March 2017: drier than average with warm temperatures

March 2017 was drier than average across most of South Australia. Daytime and night time temperatures were very much warmer than average across large areas of the State.

Drier than average

- Driest March for South Australia as a whole since 2005
- Most of South Australia had below average rainfall during March
- Large parts of the pastoral districts and western agricultural areas received little or no rain during the month
- Above average to very much above average rainfall in the far southeast and parts of Kangaroo Island
- Lucindale, Frances and Avenue in the southeast, and Kingscote on Kangaroo Island, had their highest total March rainfall since 1983
- Several other sites around the State had their driest March since 1994
- The southeast received heavy rain on the 21st

Much warmer than average

- March 2017 was South Australia's third-warmest March on record overall
- Mean maximum temperatures were also third-warmest on record
- Very much above average maximum temperatures across most of South Australia for the month
- March daytime temperatures in southern South Australia were warmer than they were during February
- Mean minimum temperatures were warmer than average throughout the State
- Daytime temperatures at Woomera reached 25 °C or above for 135 consecutive days from from 15 November 2016 to 29 March 2017, which is a record for the site (previous record was 128 consecutive days ending in March 2001)
- Loxton and Arkaroola each had their highest count of March days of 30 °C or above during the month
- Ceduna recorded 44.5 °C on Sunday, 26 March, which was a South Australian late-season heat record (hottest day so late in the season); it was seven days later in the year than the previous latest date for temperatures this hot in South Australia
- On the 26th, sites in western and central districts had their highest March temperature on record
- Many sites throughout the State had their highest March mean daily maximum temperature on record
- Some sites had their highest March mean daily maximum temperature since at least 1986 (at Yongala it was the highest since 1940)
- Several sites in eastern and southeastern South Australia observed their highest March mean daily minimum temperature on record
- Many sites across the State had their highest March mean temperature on record, or their highest since 1986

Extremes in March 2017

Hottest day	44.5 °C at Ceduna AMO on the 26th
Warmest days on average	37.2 °C at Moomba Airport
Coollest days on average	21.6 °C at Neptune Island
Coldest day	14.1 °C at Mount Lofty on the 30th
Coldest night	1.0 °C at Keith (Munkora) on the 31st
Coollest nights on average	12.4 °C at Keith (Munkora)
Warmest nights on average	22.6 °C at Moomba Airport
Warmest night	30.2 °C at Oodnadatta Airport on the 27th
Warmest on average overall	29.8 °C at Moomba Airport
Coollest on average overall	18.8 °C at Mount Lofty
Wettest overall	113.8 mm at Lucindale Post Office
Wettest day	98.8 mm at Lucindale Post Office on the 21st
Strongest wind gust	87 km/h at Neptune Island on the 29 th

Some notable statistics for South Australia for March were:

Record highest March daily rainfall

Record highest March temperature				
	New record (°C)	Old record	Years of	Average for March
Woomera	43.0 on the 26th	= 43.0 on the 6th in 1986	68	30.4
Nullarbor	43.4 on the 26th	43.0 on the 31st in 2005	30	26.6
Coulta	40.6 on the 26th	39.9 on the 11th in 2006	26	25.1
Minnipa	42.4 on the 26th	41.8 on the 2nd in 2007	21	28.7
Tarcoola	44.0 on the 26th	43.0 on the 17th in 2000	20	31.5

Record lowest March temperature

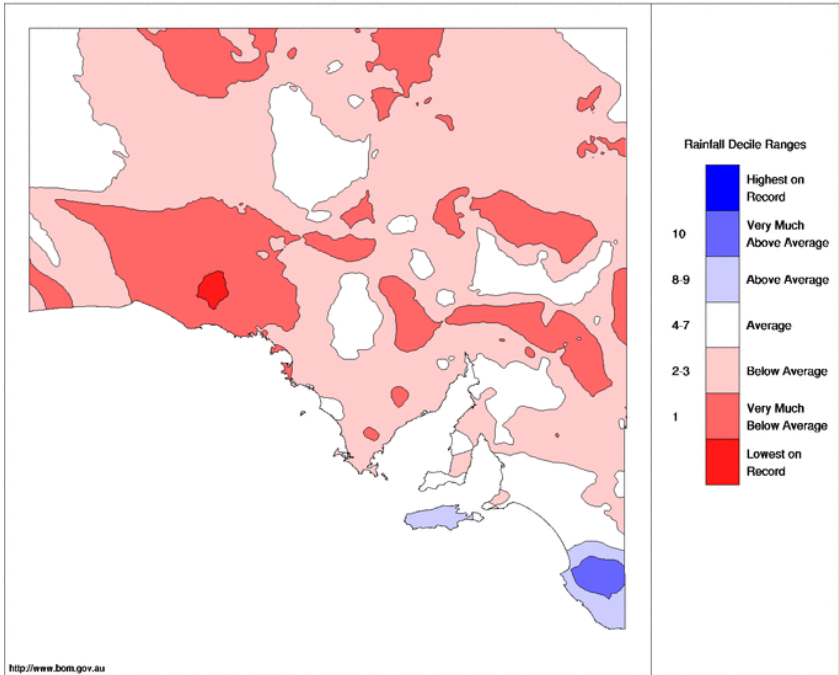
	New record	Old record	Years held	March Average
Yongala	1.1 on the 31st	= 1.1 on the 30th in 1970	61	10.8
Minnipa	5.9 on the 30th	6.3 on the 24th in 2015	21	14.1

Record highest March mean daily minimum temperature

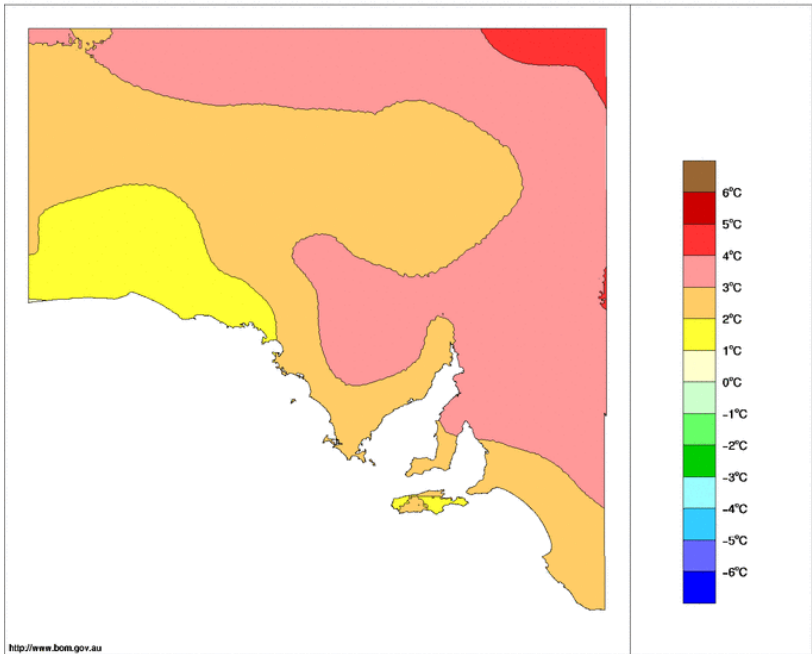
	New (°C)	Old	Years held	March Average
Loxton	14.8	= 14.8 in 2016	32	12.1
Coonawarra	13.2	12.9 in 1989	31	10.1
Kingscote	13.7	13.6 in 2013	22	11.2
Mount Crawford	14.6	14.5 in 2013	22	12.1
Renmark	15.2	15.1 in 2016	21	12.9

	New record (mm)	Old record	Years of record
Avenue	55.0 on the 21st	36.2 on the 20th in 2003	43

Many other rainfall and temperature records for March in South Australia were also set. For more information plus a summary of statistics please see:



Maximum Temperature Anomaly (°C) March 2017
Australian Bureau of Meteorology



Adelaide in summer 2016-17: very wet with temperatures close to average

Adelaide hills and suburbs generally recorded more than double their summer average rainfall. Summer mean temperatures in and around Adelaide were generally close to the long-term average.

Very much wetter than average

- Over summer, all areas of Adelaide recorded very much above average rainfall
- Most sites recorded more than 200% of their summer average rainfall
- Adelaide city (combining old and current sites) recorded its wettest summer since 1936–37 and third-wettest summer on record—wettest was 172.8 mm at West Terrace in 1924–25
- On 28 December 2016, several sites around Adelaide had their highest summer daily rainfall on record
- Sites around the city and to the south had their wettest summer on record

Temperatures generally close to the summer average

- Most areas of Adelaide recorded mean maximum and mean minimum temperatures that were within one degree of their summer average
- Mount Lofty was the only site with mean maximum temperatures that were significantly warmer than average—2.5 °C warmer than average
- Nights were generally close to average or slightly warmer than average
- Many suburbs recorded temperatures over 40 °C on 8 February, the hottest day of the summer for the Adelaide region
- Strong winds and humid at times
- Mount Crawford recorded the strongest wind gust in the Adelaide region over summer, 120 km/h on 28 December 2016
- On 19 January, several sites around the city recorded near or above 100 km/h gusts, including at Adelaide Airport, Edinburgh and Parafield Airport

Adelaide had many days of high humidity during summer

- On 20 January, Adelaide Airport recorded its highest precipitable water value for January in at least 26 years—61.3 mm (precipitable water is a measure of the amount of water in the atmosphere)

Extremes in summer 2016-17

Hottest day	42.4 °C at Adelaide (Kent Town) on 8 Feb 2017
Warmest days on average	29.6 °C at Parafield Airport
Coollest days on average	23.5 °C at Mount Lofty
Coldest day	12.7 °C at Mount Lofty on 6 Feb 2017
Coldest night	5.2 °C at Mount Lofty on 18 Dec 2016
Coollest nights on average	12.1 °C at Mount Lofty
Warmest nights on average	16.8 °C at Adelaide (Kent Town)
Warmest night	31.6 °C at Parafield Airport on 7 Jan 2017
Warmest on average overall	23.1 °C at Adelaide (Kent Town)
Coollest on average overall	7.7 °C at Mount Lofty
Wettest overall	265.0 mm at Uraidla
Driest overall	117.2 mm at Morphettville
Wettest day	110.0 mm at Uraidla on 28 Dec 2016

South Australia in summer 2016-17: wet with warm temperatures

South Australia had its sixth-wettest summer on record. Temperatures were warmer than average across most of South Australia. Nights were particularly warm, with South Australia having its fifth-warmest summer mean minimum temperatures on record.

Above average rainfall

- Summer 2016–17 was South Australia's sixth-wettest summer on record (the record wettest was in 1973–74)
- Wettest summer for the State since 2010–11
- Very much above average rainfall across western districts and eastern agricultural areas
- Wettest summer on record for isolated patches around Nullarbor and in the north-west
- Above average summer rainfall through most of the rest of South Australia
- With several strong bursts of tropical activity, warmer than average ocean temperatures around northern Australia contributed to the wetter than average summer
- Many sites had their wettest summer day on record
- Numerous sites across agricultural areas and around Adelaide had their highest total summer rainfall on record

Warmer than average

- Night time temperatures were particularly warm across most of South Australia
- Fifth-warmest summer mean minimum temperatures on record—warmest summer nights for South Australia as a whole since 2005–06
- Very much above average daytime and night time mean temperatures for eastern pastoral districts
- Mean temperatures were near average in the southeast and far west of the State
- Warmer than average temperatures throughout most of the rest of South Australia
- Summer mean maximum temperatures for the State were more than one degree warmer than average
- The State experienced heatwave conditions several times during the summer
- From 27 January to 12 February, Moomba experienced 17 consecutive days of temperatures reaching 40 °C or above—Moomba's record is a run of 19 days in January–February 2014)
- Whyalla equalled its coldest summer day on record
- Ernabella had its coldest summer night on record
- Moomba Airport equalled its highest summer mean temperature on record

Strong winds at times and high humidity

- Moonta on Yorke Peninsula recorded the State's strongest wind gust over the summer, 141 km/h on 7 December 2016, as thunderstorms crossed the State
- Many areas of South Australia recorded extended periods of high humidity during summer
- On 28 December 2016, and then again on 13 January 2017, Mount Gambier recorded its highest daily precipitable water value for any month—52.0 mm and 53.6 mm respectively.
- On 20 January, Woomera and Adelaide recorded their highest precipitable water values for January for at least 26 years—67.0 mm and 61.3 mm respectively

Some notable statistics for Adelaide for Summer were:

Record highest summer daily rainfall			
	New record (mm)	Old record	Years of record
Edinburgh RAAF	70.0 on 28 Dec 2016	62.4 on 1 Feb 1974	46
Kuitpo Forest	58.6 on 28 Dec 2016	53.0 on 21 Feb 2000	20
Uraidla	110.0 on 28 Dec 2016	84.5 on 14 Feb 2014	128

Record highest summer total rainfall				
	New record	Old record	Years held	Summer Average
Lenswood	260.6	249.0 in 1992	50	105.3
Kent Town	167.4	147.6 in 2010	40	65.9
Hope Valley	175.8	153.0 in 1986	38	72.0
Burnside	169.2	164.6 in 2010	38	70.4
Blackwood	171.0	163.0 in 1992	37	78.6
McLaren Vale	136.0	115.6 in 2010	21	63.9

Highest summer total rainfall for at least 20 years			
	Observed (mm)	Most recent higher	Summer Average
North Adelaide	163.0	182.0 in 1936*	70.5
Uraidla	265.0	293.3 in 1945*	113.5
Mallala	158.6	167.5 in 1945*	60.3
Cudlee Creek	196.2	213.7 in 1968*	94.8
Morphett Vale	161.6	173.4 in 1968*	69.1
Adelaide Airport	144.8	163.9 in 1973	61.2
Salisbury	157.4	182.7 in 1973*	61.6
Parafield Airport	167.4	176.0 in 1973*	65.7
Willunga	154.0	160.8 in 1973*	68.3
Owen	165.2	167.3 in 1973*	66.8
Happy Valley	170.2	172.6 in 1992	74.1
Seaton	145.0	183.4 in 1992*	64.3
Lobethal	228.9	237.2 in 1992*	90.7

note: There are gaps in the historical record at this site, so it is possible a higher value has gone unreported

For more information on Adelaide's Summer temperatures and rainfall plus a summary of statistics please see:

<http://www.bom.gov.au/climate/current/season/sa/archive/201702.adelaide.shtml>

Extremes in summer 2016-17

Hottest day	48.2 °C at Tarcoola Aero on 9 Feb 2017
Warmest days on average	39.5 °C at Moomba Airport
Coollest days on average	21.7 °C at Neptune Island
Coldest day	12.7 °C at Mount Lofty on 6 Feb 2017
Coldest night	1.1 °C at Keith (Munkora) on 18 Dec 2016
Coollest nights on average	11.1 °C at Keith (Munkora)
Warmest nights on average	25.3 °C at Moomba Airport
Warmest night	32.7 °C at Oodnadatta Airport on 13 Jan 2017
Warmest on average overall	32.4 °C at Moomba Airport
Coollest on average overall	17.7 °C at Mount Lofty
Wettest overall	305.0 mm at Ernabella (Pukatja)
Driest overall	75.4 mm at Moomba Airport

Record highest summer total rainfall

	New record (mm)	Old record	Years held	Summer Average
Glen Osmond	155.6	152.3 in 1945	128	72.2
Coonalpyn	191.2	178.0 in 1937	127	65.1
Coomandook	156.8	155.9 in 1945	102	61.5
Nullarbor	203.2	200.0 in 2005	101	42.3
Lenswood	260.6	249.0 in 1992	50	105.3
Aldgate	254.9	249.4 in 1993	45	111.0
Hope Valley	175.8	153.0 in 1986	38	72.0
Burnside	169.2	164.6 in 2010	38	70.4
Blackwood	171.0	163.0 in 1992	37	78.6
Coffin Bay	124.6	118.3 in 2015	24	47.4
Clare	172.6	155.2 in 2013	23	87.1
McLaren Vale	136.0	115.6 in 2010	21	63.9
Minnipa	131.4	73.4 in 2007	20	45.4

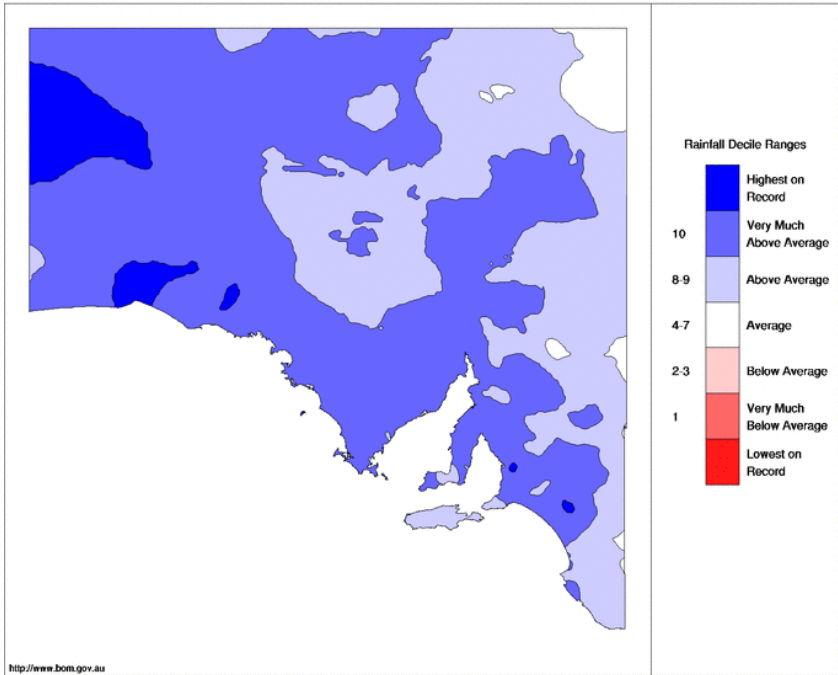
Wettest day	117.2 mm at Ernabella (Pukatja) on 27 Dec 2016
Strongest wind gust	141 km/h at Moonta (Warburto Point) on 7 Dec 2016

Record lowest summer temperature

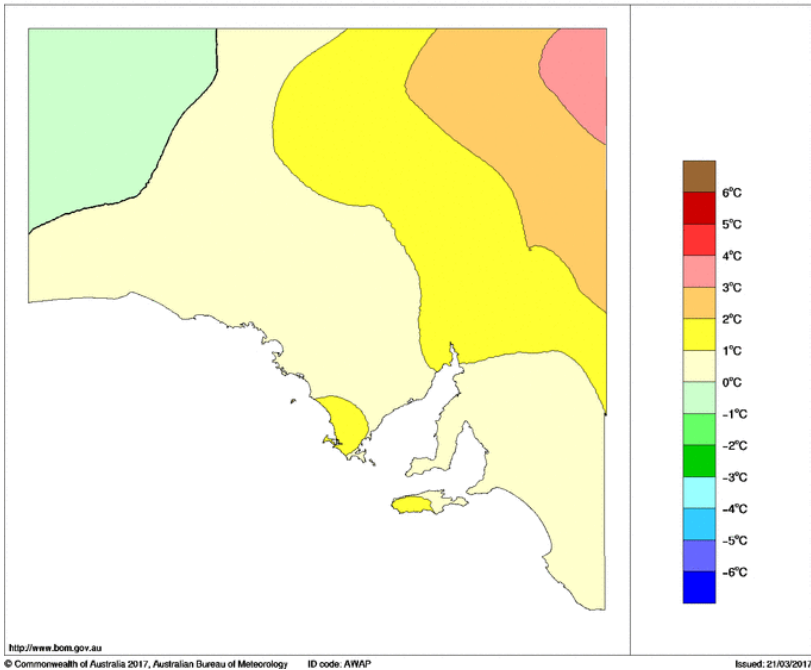
	New record (°C)	Old record	Years held	Summer Average
Ernabella	9.6 on 20 Feb 2017	9.9 on 12 Dec 2013	20	20.2

Many other rainfall and temperature records for Summer in South Australia were also set. For more information plus a summary of statistics please see:
<http://www.bom.gov.au/climate/current/season/sa/archive/201702.summary.shtml>

South Australian Rainfall Deciles 1 December 2016 to 28 February 2017
 Distribution Based on Gridded Data
 Australian Bureau of Meteorology



Maximum Temperature Anomaly (°C) 1 December 2016 to 28 February 2017
 Australian Bureau of Meteorology





Australian Meteorological Association Inc (AMetA)
www.ameta.org.au

NEXT MEETING

6.00 PM THURSDAY 27th APRIL 2017

*Bureau of Meteorology offices, Level 4, Optus Building, NW corner of
South Terrace & King William Street, Adelaide*

Please note that subscriptions for 2016/2017 (\$15) are now due

Subject: Forecasting the November 2015 Pinery fires

**Speaker: Matt Collopy—Supervising Meteorologist—South
Australian Forecasting Centre—Bureau of Meteorology**

***PLEASE NOTE CHANGED DATE FOR THIS MEETING**

Convenient free street parking is usually available nearby (e.g. South Tce.)

We look forward to seeing you.

For further information contact

Secretary:	Darren Ray
Phone:	8366 2664
Fax:	8366 2693

Inquiries or suggestions, please contact the Secretary on the phone number listed above.