



Australian Government
Bureau of Meteorology

TAF Verification for Major Airports

March to June 2014



Australian Bureau of Meteorology

Manager

Major Airport Weather Services

Weather and Ocean Services Branch

PO BOX 211 Mascot NSW 1460



www.bom.gov.au

TAF Verification Report for June 2014

These statistics are compiled using the Bureau's AVS(1) verification system. They are compared with statistics for the 10 year average 2002-2012 for the airport. Positive results are highlighted in green in the tables. Anomalies are highlighted in orange and some comments have been made for each aerodrome. The graphs and parameters on each page are calculated from all TAFs as follows:

Forecast Prediction Accuracy Index

This index is designed to represent the actual risk the aircraft has of encountering un-forecast weather, which they are unable to land in (Conditions below the landing minima or thunderstorms observed). This figure is calculated for the first 4 hours of the TAF. The lower the percentage, the less the risk there was for pilots using the TAF for flight planning that month. Figures near or above 1% require some scrutiny though a high index does not necessarily correlate with a decline in forecast performance. The detail is revealed through the fog and thunderstorm figures.

Thunderstorms

POD is the probability of detection % of a TS by the TAF in the first 6 hours of the forecast.

FAR is the false alarm ratio% and is the number of TS hourly misses divided by the total forecast TS hours in the first 6 hours of every TAF for the month. A FAR of 80% means 5 hours of forecast TS for every hour of TS reported. 80% is a very good result. A result of 95% means 20 hours of forecast TS for every reported TS within the TAF range (5nm). High values often occur if there are very low numbers of TS in a month. This figure does not include missed TS by the first 6 hours of the TAF. These results do not include thunderstorms that passed between 5-10nm (VCTS) or TS in the Terminal Area (TMA) beyond. Given the nature of TS it is quite possible to have numerous near misses and score a high FAR even though it was prudent to have TS on the TAF.

TS Hours is the total number of observed TS hours in the month.

Forecast TS Hours is the number of TS hours forecast in the first 6 hours of the TAF over the month.

Fog

These fog statistics are based on a reported visibility of <1000m as extracted from AVS(1). They could be distorted by observations of heavy precipitation and smoke. Heavy precipitation that reduces visibility below 1000m in fog seasons across Australia is extremely unlikely. These metrics should be treated with caution October to March.

POD is the probability of detection % of fog by the TAF in the first 6 hours of the forecast.

FAR is the false alarm ratio% and is the number of Fog hourly misses divided by the total forecast Fog hours. A FAR of 80% means 5 hours of forecast Fog for every hour of hit. 80% is a very good result. A result of 95% means 20 hours of forecast Fog for every hour of hit. This figure does not include outright misses by the TAF.

Fog Hours is the total number of observed Fog hours in the month.

Forecast FG Hours is the number of FG hours forecast in the first 6 hours of the TAF over the month.

Alternate Minima

Operationally Correct is the % of time for the month that the first 6 hours of every TAF were forecast above minima and observed above minima plus forecast below minima and observed below minima.

Failed detections are the % of time below the alternate minimum when the TAF forecast above minimum in the first 6 hours of every TAF.

False Alarms are the % of time that the TAF forecast below the alternate minimum in the first 6 hours when the observed conditions were above.

Hours Below are the number of hours observed below the alternate minimum.

Summary of Results

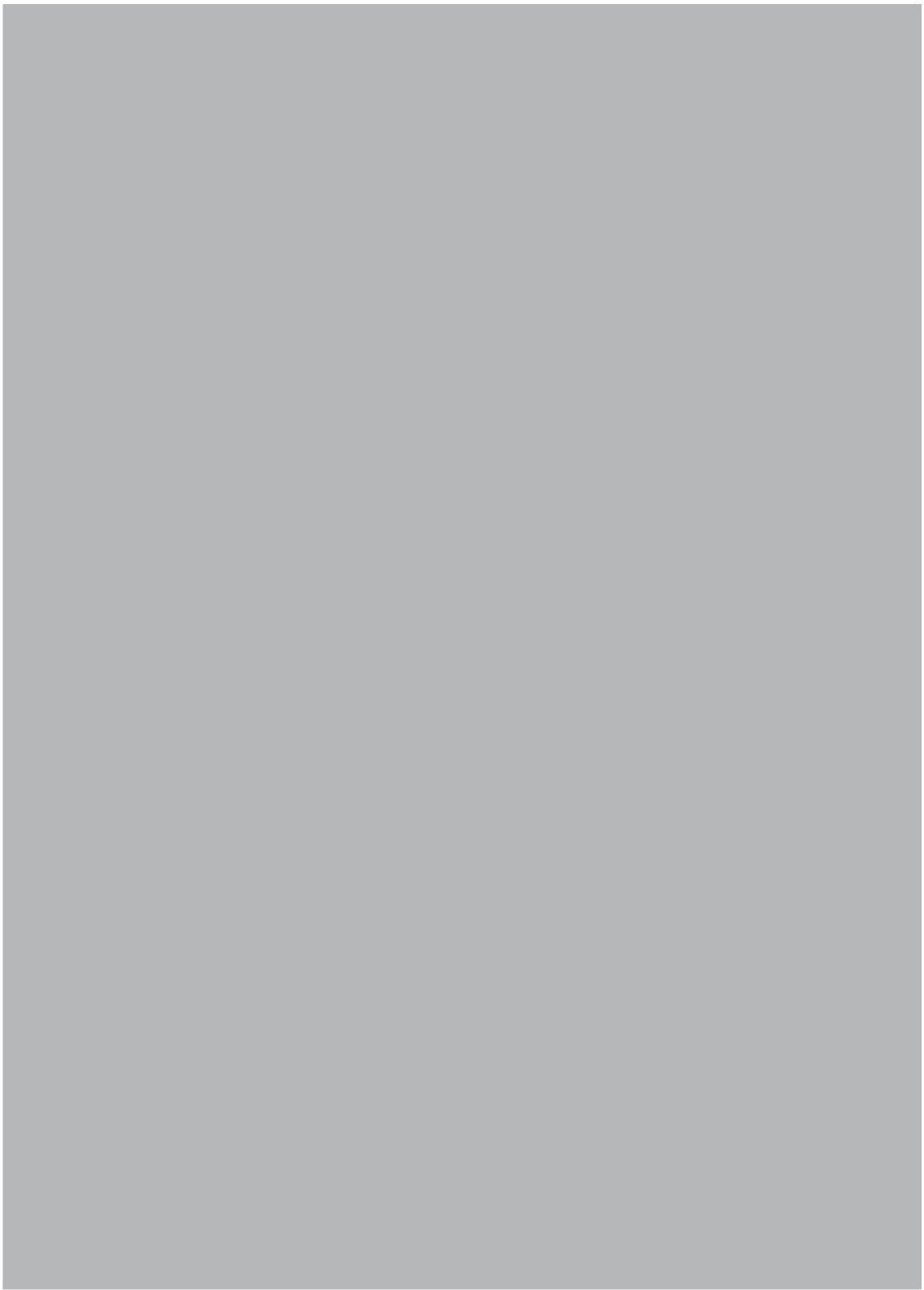
Forecast Prediction Accuracy Index

% of forecasts not meeting this strict criterion

	March	April	May	June
Melbourne	0	0.19	0.05	0.65
Perth	0.32	0	0.09	0.04



12



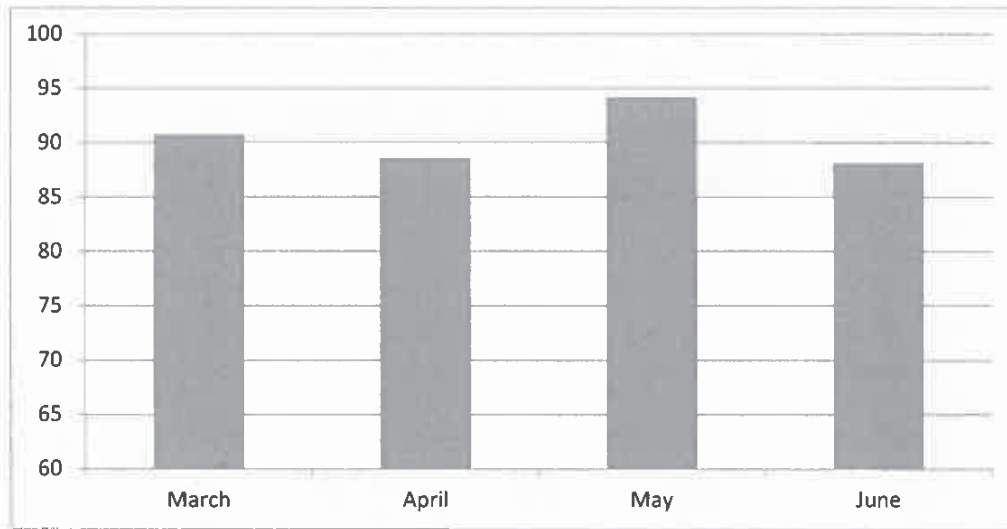
Melbourne

Alternate Minimum	2500m	700ft
Landing Minimum	800m	210ft

Month	March	April	May	June	10 Year Avg
FPAI (1-4hrs)%	0	0.19	0.05	0.65	
Vis <1000 POD (1-6hrs) %	0	0	68.2	0	78.1
Vis <1000 FAR (1-6hrs) %	100	100	66.5	100	88.1
Vis <1000 HRS (1-6hrs)	0	0	15.7	2.93	300.6
Forecast FG Hours (1-6hrs)	9	39	32	12	1966
TS POD (1-6hrs) %	100	0	0	0	77.04
TS FAR (1-6hrs) %	97	0	100	100	95.9
TS HRS (1-6hrs)	0.97	0	0	0	205.9
Forecast TS Hours (1-6hrs)	32	0	18	10	3868
Operationally correct (1-6hrs only) %	90.77	88.55	94.18	88.13	90.05
Failed detections (1-6hrs) %	0.22	1.75	0.28	1.61	0.49
False Alarms (1-6hrs) %	9.02	9.7	5.54	10.26	9.46
Hours Below (1-6hrs)	15.5	52.3	18	22.3	2636.2

Comment: High number of hours below alternate minimum in April. POD for fog was slightly low in May.

Operationally Correct%



12



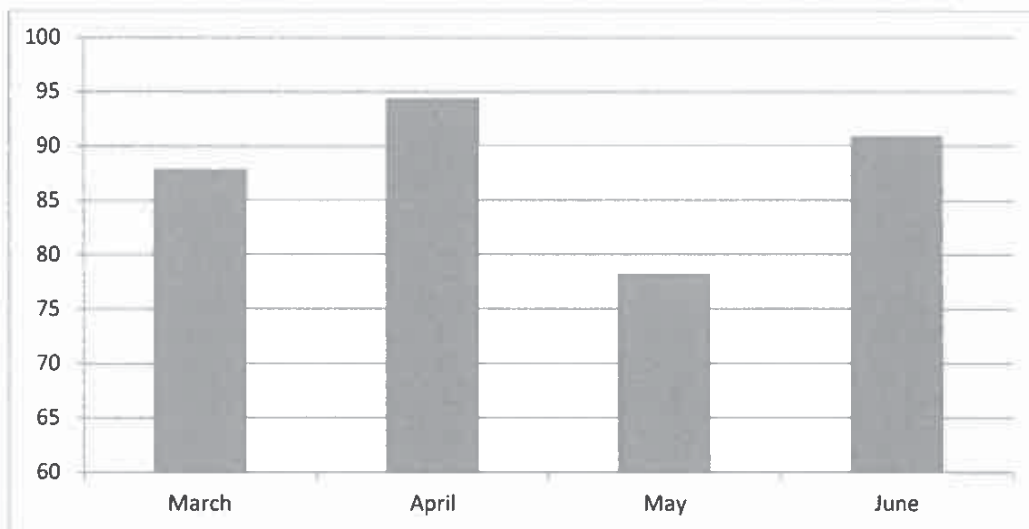
Perth

Alternate Minimum	2500m	700ft
Landing Minimum	1500m	250ft

Month	March	April	May	June	10 Year Avg
FPAI (1-4hrs)%	0.32	0	0.09	0.04	
Vis <1000 POD (1-6hrs)%	0	0	79	97.6	82.3
Vis <1000 FAR (1-6hrs)%	100	100	99	75.9	95.3
Vis <1000 HRS (1-6hrs)	0	0	2.07	17	216.7
Forecast FG Hours (1-6hrs)	25	31	161	69	3760
TS POD (1-6hrs)%	0	0	0	100	79.8
TS FAR (1-6hrs)%	100	100	100	94.6	96.4
TS HRS (1-6hrs)	2	0	0	2.12	255.4
Forecast TS Hours (1-6hrs)	82	8	62	39	5658
Operationally correct (1-6hrs only)%	87.88	94.4	78.23	90.9	89.34
Failed detections (1-6hrs)%	0.25	0.41	0.63	0.25	0.26
False Alarms (1-6hrs)%	11.87	5.19	21.14	8.86	10.4
Hours Below (1-6hrs)	2.33	7.33	11.9	44.8	1051.9

Comment: A very good result for fog forecasting in June maintaining a high POD, low false alarms and covering a number of fog events. High false alarms for both fog and thunderstorms in May.

Operationally Correct%



SUMMARY



Melbourne:

- Above or near operationally correct long term average in March to June.
- POD for fog slightly low in May.
- High number of hours below alternate minimum in April.



Perth:

- Above operationally correct in June.
- A very good result for fog forecasting in June maintaining a high POD, low false alarms and covering a number of fog events.
- Below Operationally correct long term average in May.
- High false alarm rates for both fog and thunderstorms in May.



IRRELEVANT INFORMATION HAS BEEN REMOVED
FROM THIS DOCUMENT - s22.

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Major Airport Weather Services

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Major Airport Services

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This index is designed to represent the actual risk the aircraft has of encountering un-forecast weather, which they are unable to land in (Conditions below the landing minima or thunderstorms observed). This figure is calculated for the first 4 hours of the TAF. The lower the percentage, the less the potential risk to pilots using the TAF for flight planning that month. Figures near or above 1% require some scrutiny.

Thunderstorms

POD is the probability of detection % of a TS by the TAF in the first 6 hours of the forecast.

FAR is the false alarm ratio% and is the number of TS hourly misses divided by the total forecast TS hours in the first 6 hours of every TAF for the month. A FAR of 80% means 5 hours of forecast TS for every hour of TS reported. 80% is a very good result. A result of 95% means 20 hours of forecast TS for every reported TS within the TAF. High values often occur if there are very low numbers of TS in a month. This figure does not include missed TS by the first 6 hours of the TAF.

TS Hours is the total number of observed TS hours in the month.

Forecast TS Hours is the number of TS hours forecast in the first 6 hours of the TAF over the month.

Fog

These fog statistics are based on a reported visibility of <1000m as extracted from AVS(1). They could be distorted by observations of heavy precipitation and smoke. Heavy precipitation that reduces visibility below 1000m in fog seasons across Australia is extremely unlikely. These metrics should be treated with caution October to March.

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Forecast FG Hours is the number of FG hours forecast in the first 6 hours of the TAF over the month.

Alternate Minima

Operationally Correct is the % of time for the month that the first 6 hours of every TAF were forecast above minima and observed above minima plus forecast below minima and observed below minima.

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False Alarms are the % of time that the TAF forecast below the alternate minimum in the first 6 hours when the observed conditions were above.

Hours Below are the number of hours observed below the alternate minimum.

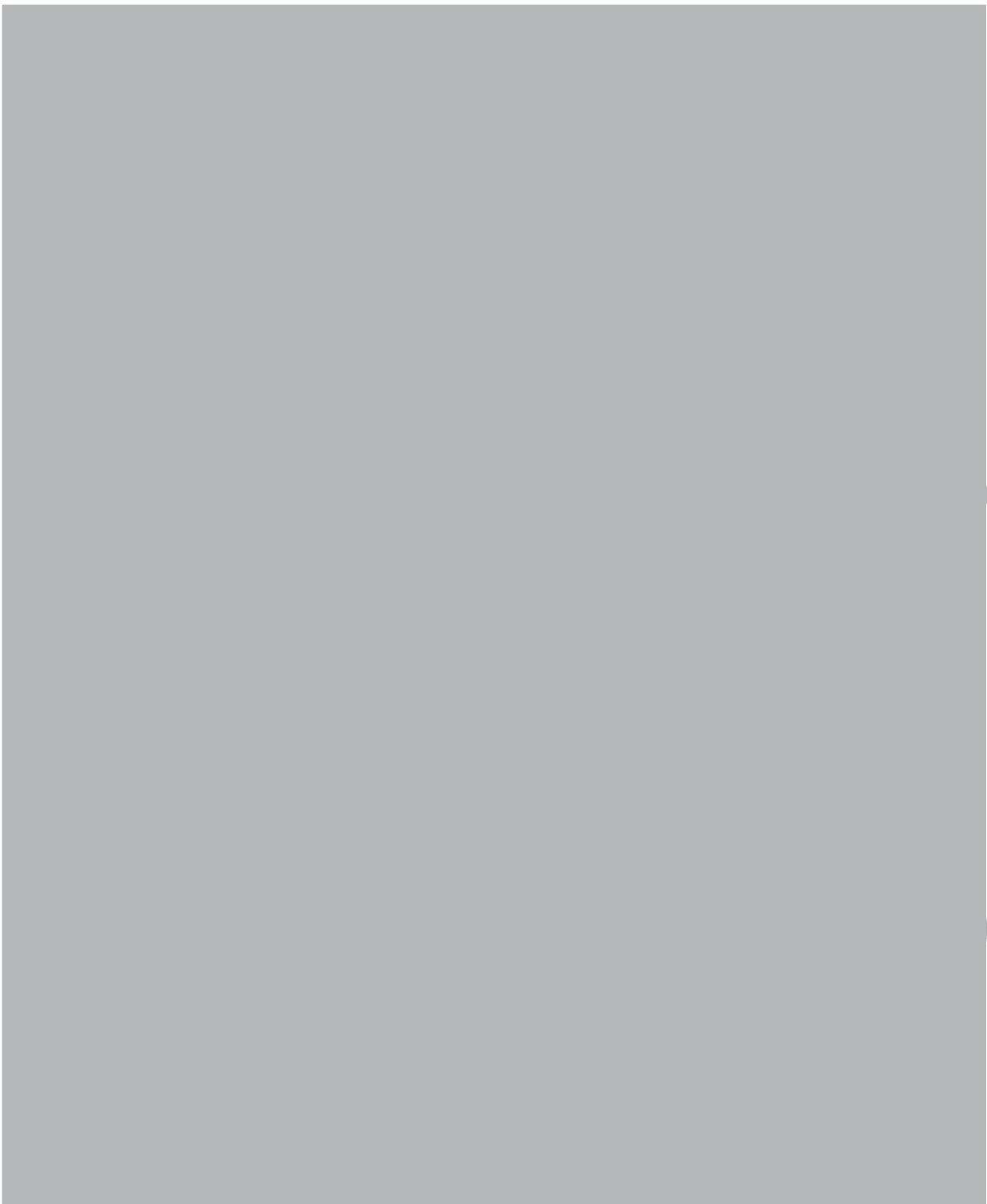
Summary of Results

Forecast Prediction Accuracy Index

% of forecasts above alternate minima when actual below landing minima

	January	February	March	April	May	June
Melbourne	0	0	0	0.19	0.05	0.65
Perth	0	0	0.32	0	0.09	0.04





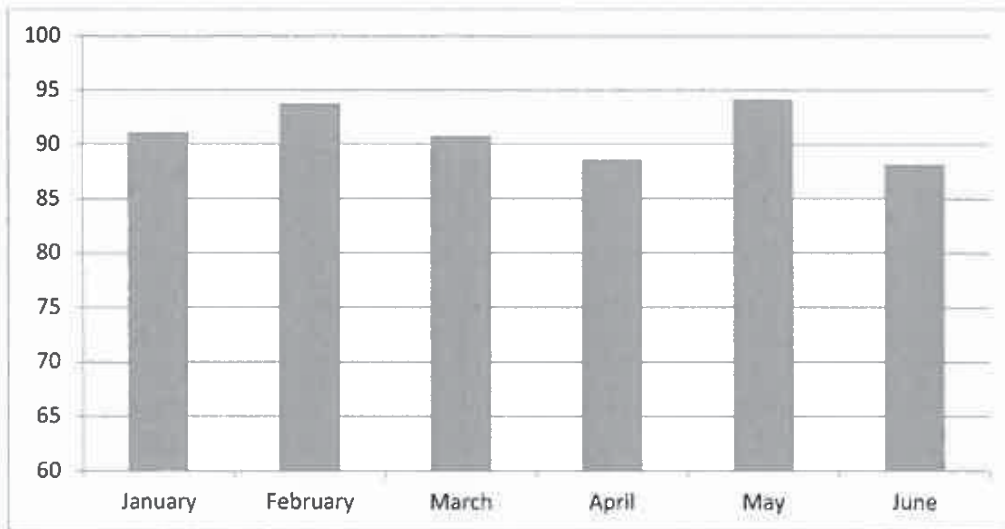
Melbourne

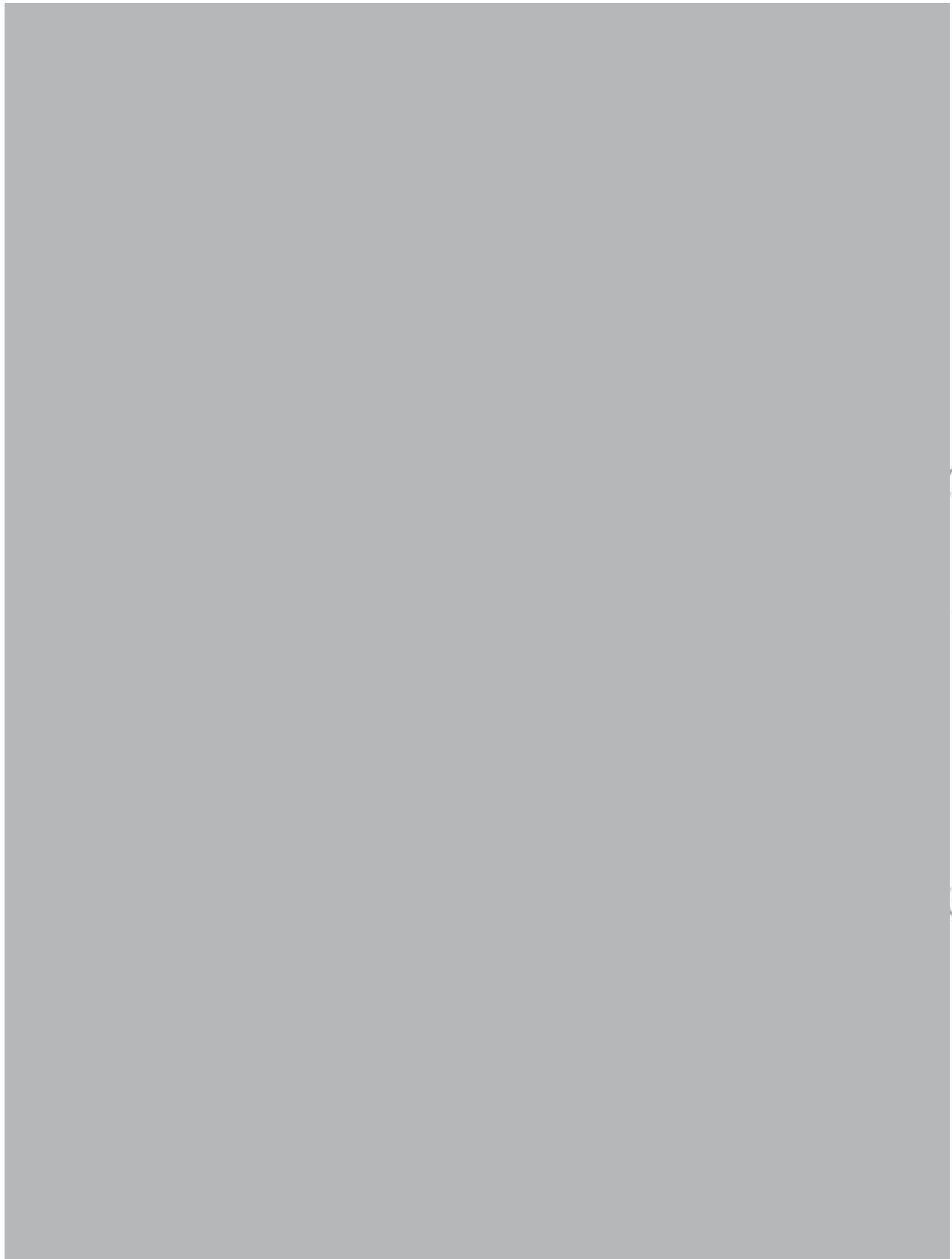
Alternate Minimum 2500m 700ft
Landing Minimum 800m 210ft

Month	January	February	March	April	May	June	10 Year Avg
FPAI (1-4hrs)%	0	0	0	0.19	0.05	0.65	
Vis <1000 POD (1-6hrs) %	100	0	0	0	68.2	0	78.1
Vis <1000 FAR (1-6hrs) %	98.2	100	100	100	66.5	100	88.1
Vis <1000 HRS (1-6hrs)	0.25	0	0	0	15.7	2.93	300.6
Forecast FG Hours (1-6hrs)	14	4	9	39	32	12	1966
TS POD (1-6hrs) %	100	100	100	0	0	0	77.04
TS FAR (1-6hrs) %	99.1	97.3	97	0	100	100	95.9
TS HRS (1-6hrs)	0.38	0.32	0.97	0	0	0	205.9
Forecast TS Hours (1-6hrs)	46	12	32	0	18	10	3868
Operationally correct (1-6hrs only) %	91.11	93.77	90.77	88.55	94.18	88.13	90.05
Failed detections (1-6hrs) %	0	0.08	0.22	1.75	0.28	1.61	0.49
False Alarms (1-6hrs) %	8.89	6.15	9.02	9.7	5.54	10.26	9.46
Hours Below (1-6hrs)	5.38	3.73	15.5	52.3	18	22.3	2636.2

Comment: Near or above long term operationally correct throughout. Slightly high false alarms in April and June.

Operationally Correct% - Long term average 90.05%





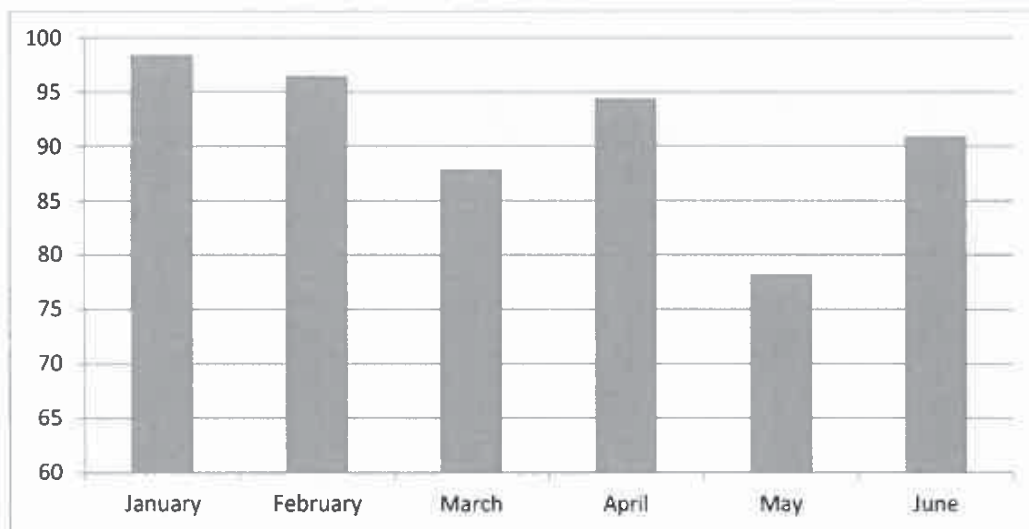
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Alternate Minimum	2500m	700ft
Landing Minimum	1500m	250ft

Month	January	February	March	April	May	June	10 Year Avg
FPAI (1-4hrs)%	0	0	0.32	0	0.09	0.04	
Vis <1000 POD (1-6hrs)%	0	0	0	0	79	97.6	82.3
Vis <1000 FAR (1-6hrs)%	0	0	100	100	99	75.9	95.3
Vis <1000 HRS (1-6hrs)	0	0	0	0	2.07	17	216.7
Forecast FG Hours (1-6hrs)	0	0	25	31	161	69	3760
TS POD (1-6hrs)%	0	0	0	0	0	100	79.8
TS FAR (1-6hrs)%	100	100	100	100	100	94.6	96.4
TS HRS (1-6hrs)	0	0	2	0	0	2.12	255.4
Forecast TS Hours (1-6hrs)	14	27	82	8	62	39	5658
Operationally correct (1-6hrs only)%	98.43	96.48	87.88	94.4	78.23	90.9	89.34
Failed detections (1-6hrs)%	0	0	0.25	0.41	0.63	0.25	0.26
False Alarms (1-6hrs)%	1.57	3.52	11.87	5.19	21.14	8.86	10.4
Hours Below (1-6hrs)	0	0	2.33	7.33	11.9	44.8	1051.9

Comment: A very good result for fog forecasting in June maintaining a high POD, low false alarms and covering a number of fog events. High false alarms for both fog and thunderstorms in May.

Operationally Correct% - Long term average 89.34%



THIS DOCUMENT HAS BEEN EDITED UNDER s.22 OF THE FOI ACT TO REMOVE THE FOLLOWING 5 PAGES OF IRRELEVANT INFORMATION

SUMMARY

Melbourne:

- Above or near operationally correct long term average in March to June.
- POD for fog slightly low in May.
- High number of hours below alternate minimum in April.

Perth:

- Above or near operationally correct for 5 of 6 months.
- A very good result for fog forecasting in June maintaining a high POD, low false alarms and covering a number of fog events.
- Below Operationally correct long term average in May.
- High false alarm rates for both fog and thunderstorms in May.

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TS Hours is the total number of observed TS hours in the month.

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False Alarms are the % of time that the TAF forecast below the alternate minimum in the first 6 hours when the observed conditions were above.

Hours Below are the number of hours observed below the alternate minimum.

Summary of Results

Forecast Prediction Accuracy Index

% of forecasts not meeting this strict criterion

	April	May	June	July
Melbourne	0.19	0.05	0.65	0.51
Perth	0	0.09	0.04	0.04





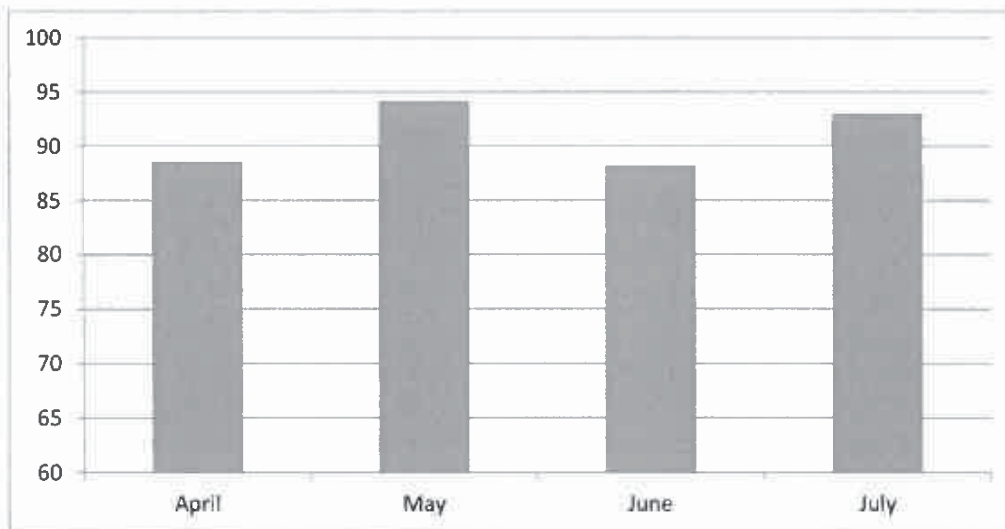
Melbourne

Alternate Minimum	2500m	700ft
Landing Minimum	800m	210ft

Month	April	May	June	July	10 Year Avg
FPAI (1-4hrs)%	0.19	0.05	0.65	0.51	
Vis <1000 POD (1-6hrs) %	0	68.2	0	75.8	78.1
Vis <1000 FAR (1-6hrs) %	100	66.5	100	79.7	88.1
Vis <1000 HRS (1-6hrs)	0	15.7	2.93	16.1	300.6
Forecast FG Hours (1-6hrs)	39	32	12	60	1966
TS POD (1-6hrs) %	0	0	0	0	77.04
TS FAR (1-6hrs) %	0	100	100	100	95.9
TS HRS (1-6hrs)	0	0	0	0	205.9
Forecast TS Hours (1-6hrs)	0	18	10	6	3868
Operationally correct (1-6hrs only) %	88.55	94.18	88.13	92.97	90.05
Failed detections (1-6hrs) %	1.75	0.28	1.61	1.97	0.49
False Alarms (1-6hrs) %	9.7	5.54	10.26	5.06	9.46
Hours Below (1-6hrs)	52.3	18	22.3	52.9	2636.2

Comment: High number of hours below alternate minimum in April. POD for fog was slightly low in May.

Operationally Correct%





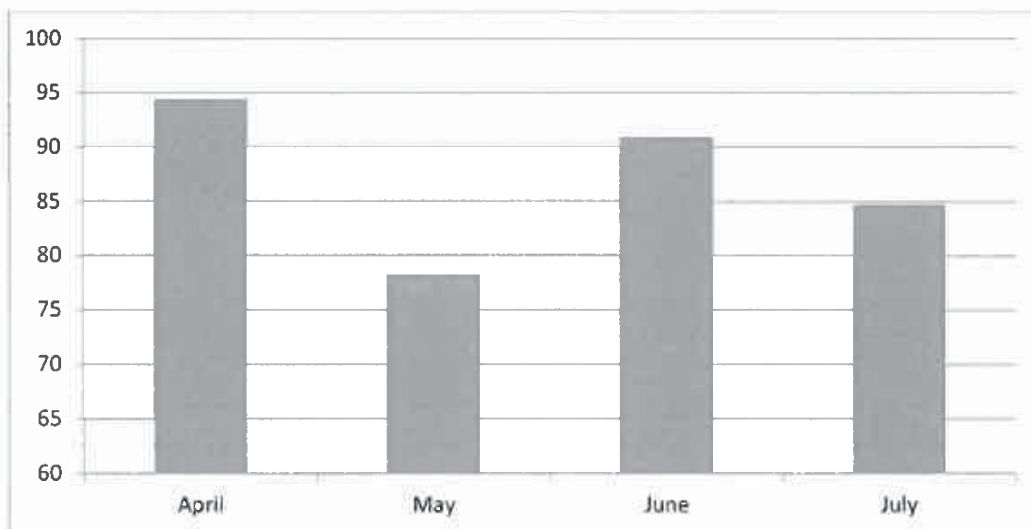
Perth

Alternate Minimum	2500m	700ft
Landing Minimum	1500m	250ft

Month	April	May	June	July	10 Year Avg
FPAI (1-4hrs)%	0	0.09	0.04	0.04	
Vis <1000 POD (1-6hrs)%	0	79	97.6	0	82.3
Vis <1000 FAR (1-6hrs)%	100	99	75.9	100	95.3
Vis <1000 HRS (1-6hrs)	0	2.07	17	0	216.7
Forecast FG Hours (1-6hrs)	31	161	69	105	3760
TS POD (1-6hrs)%	0	0	100	77.3	79.8
TS FAR (1-6hrs)%	100	100	94.6	98.4	96.4
TS HRS (1-6hrs)	0	0	2.12	1.25	255.4
Forecast TS Hours (1-6hrs)	8	62	39	60	5658
Operationally correct (1-6hrs only)%	94.4	78.23	90.9	84.72	89.34
Failed detections (1-6hrs)%	0.41	0.63	0.25	0.3	0.26
False Alarms (1-6hrs)%	5.19	21.14	8.86	14.97	10.4
Hours Below (1-6hrs)	7.33	11.9	44.8	10.6	1051.9

Comment: A very good result for fog forecasting in June maintaining a high POD, low false alarms and covering a number of fog events. High false alarm rate for both fog and thunderstorms in May and July.

Operationally Correct%



SUMMARY



Melbourne:

- Above or near operationally correct long term average in April to July.
- POD for fog slightly low in May.
- High number of hours below alternate minimum in April and July.



Perth:

- Above operationally correct in April and June.
- A very good result for fog forecasting in June maintaining a high POD, low false alarms and covering a number of fog events.
- Below Operationally correct long term average in May and July.
- High false alarm rates for both fog and thunderstorms in May and July.



Spot Fire Weather Forecast Verification Report for the Department of Parks and Wildlife

Introduction

This report documents verification statistics for the routine spot fire weather forecasts issued for the Department of Parks and Wildlife (DPaW). 18 hour spot fire weather forecasts (commencing at 0900 WST) are issued daily during the southern fire season for the following locations: Pearce, Bickley, Dwellingup, Bridgetown, Witchcliffe, Pemberton, Walpole and Rocky Gully. A key concern raised by DPaW was the perceived over-forecasting of winds, particularly at Walpole and Pemberton. This has implications for their prescribed burning program.

Data

Spot fire weather forecasts and observational data were extracted for the 8 sites for the period 13 October 2013 to 14 February 2014. Pearce, Bickley, Dwellingup, Bridgetown, Witchcliffe, Walpole (North) and Rocky Gully are all Bureau standard automatic weather stations (AWS). Pemberton AWS is a Department of Agriculture and Food Western Australia (DAFWA) AWS where wind observations are made at 3 metres above ground (compared with the Bureau standard of 10 metres). These winds have been upscaled using a power rule equation¹.

Analysis

Bias values for wind speed were calculated for all sites to assess whether wind speeds are being "over-forecast". The mean absolute error (MAE) and root mean square error (RMSE) for temperature, dew point, relative humidity, wind speed and wind gust were also calculated. Data was analysed for three periods: 13/10/2013-14/11/2013, 15/11/2013-14/02/2014 and the entire period, 13/10/2013-14/02/2014. A brief explanation of MAE and RMSE is included in Appendix A.

Discussion

Over the initial data period (13/10/2013-14/11/2013), 6 of the 8 sites had a forecast wind speed bias of less than 5 km/h. Four of the sites had a bias of less than 2 km/h. Pemberton had the largest forecast bias (6.2 km/h), Bridgetown had a bias of 5 km/h and North Walpole was near that value with 4.9 km/h negative (over-forecast) bias. Rocky Gully had a bias of 3.9 km/h and the other sites had very low bias. Because the sample size is small these figures are not reliable but they do agree with the subjective impressions of DPaW staff that winds at Pemberton and North Walpole were being over-forecast. This was brought to the attention of the forecasters and they were asked to consider this bias when forecasting for those sites.

Over the second period (15/11/2013-14/02/2014) and after notifying forecasters of this issue, the biases at the four sites with initial bias > 2 km/h were all reduced though only marginally in some cases. Wind speed bias at Rocky Gully was reduced to just less than 2 km/h. Walpole also saw a marked reduction in bias from 4.9 to 3.1 km/h. Bias at Bridgetown was reduced from 5 to 3.9 km/h. However, at Pemberton the bias was only marginally reduced from 6.2 to 5.9 km/h. Further work will be done to reduce the bias at Pemberton to below 5 km/h.

During the analysis it was noted that the wind speed forecasts for Pearce showed a time-dependent bias. The overall bias for Pearce is small but positive (indicating wind speeds were generally under-forecast), however, an examination of the biases by time period for Pearce (not shown) shows that the bias was negligible for most time periods but marked at 1500 WST. This is likely to be due to under-forecasting the strength of the sea breeze at Pearce. This will be further investigated and brought to the attention of forecasters in order to improve the afternoon wind speed forecasts for Pearce.

The mean absolute errors for temperatures were below 2°C at most sites with the exception of Rocky Gully. At Rocky Gully the error was 2°C over the entire period with a slight increase over the 2 periods. The peak biases

¹ 1/8 power rule equation: $V_{10m} = V_H * (10/H)^{1/8}$ where H = sensor height and V = wind velocity.

for temperature at Rocky Gully were recorded at 1500 and 1800 WST, where temperatures were over forecast (on average) ~ 2.3°C (not shown).

The mean absolute errors for dew point temperatures were below 2°C at all sites over the entire period. The highest value was 1.9°C at Pearce and is likely to be linked to the under-forecasting of the sea breeze.

The mean absolute errors for relative humidity were less than 10% at most sites with the exception of Pemberton and Walpole. At Walpole, there was a consistent under-forecasting of relative humidity across most time steps, peaking at 1200 WST (average bias ~11%). An investigation into the components of relative humidity showed that the peak biases for temperature (slight over-forecasting ~ 1.7°C) and dew point (slight under-forecasting ~ 1.5°C) occurred at 1200 WST and may be attributed to the sea breeze.

Conclusion and outcomes

While the verification demonstrates that forecasts meet a high standard of accuracy for most sites, it has also confirmed the subjective impressions of DPaW staff that there has been a high wind speed bias in forecasts for several sites. A routine verification process is being implemented for these 8 sites. This will enable routine reporting to forecasters to facilitate improvements in forecast accuracy. Results of the verification analyses will be regularly reported to DPaW.

BoM would like to recognise the efforts of DPaW staff in collating much of the data required to perform this initial analysis.

Wind Bias (km/h)

Location/ Date Period	Pearce	Bickley	Dwellingup	Bridgetown	Witchcliffe	Pemberton	Walpole	Rocky Gully
13/10/2013- 14/11/2013	0.6	-0.5	-1.7	-5.0	-0.9	-6.2	-4.9	-3.9
15/11/2013- 14/02/2014	1.6	-0.9	-1.0	-3.9	0.5	-5.9	-3.1	-1.9
13/10/2013- 14/02/2014	1.4	-0.8	-1.1	-4.1	0.3	-5.9	-3.5	-2.3

Note: A negative bias here indicates over-forecasting and a positive bias indicates under-forecasting.

Wind Speed (km/h) – Mean Absolute Error, Root Mean Square Error in brackets

Location/ Date Period	Pearce	Bickley	Dwellingup	Bridgetown	Witchcliffe	Pemberton	Walpole	Rocky Gully
13/10/2013- 14/11/2013	4.5 (5.5)	3.6 (4.4)	4.7 (4.1)	5.3 (5.9)	4.1 (5.1)	6.6 (7.7)	5.7 (6.7)	4.4 (5.3)
15/11/2013- 14/02/2014	5.1 (6.4)	3.8 (5.2)	3.6 (4.6)	5.0 (6.2)	3.9 (5.1)	6.1 (7.2)	4.7 (5.9)	4.3 (5.3)
13/10/2013- 14/02/2014	4.9 (6.2)	3.7 (5.0)	3.7 (4.5)	5.1 (6.1)	3.9 (5.0)	6.2 (7.3)	4.8 (6.0)	4.3 (5.2)

Temperature (°C) – Mean Absolute Error, Root Mean Square Error in brackets

Location/ Date Period	Pearce	Bickley	Dwellingup	Bridgetown	Witchcliffe	Pemberton	Walpole	Rocky Gully
13/10/2013- 14/11/2013	1.6 (1.8)	1.6 (1.9)	1.3 (1.5)	1.4 (1.7)	1.1 (1.3)	1.5 (1.9)	1.3 (1.5)	1.6 (2.0)
15/11/2013- 14/02/2014	1.7 (2.1)	1.5 (2.1)	1.4 (1.8)	1.4 (2.0)	1.5 (1.9)	1.7 (2.3)	1.6 (2.1)	2.0 (2.7)
13/10/2013- 14/02/2014	1.7 (2.0)	1.5 (2.1)	1.4 (1.8)	1.4 (1.9)	1.4 (1.8)	1.7 (2.2)	1.5 (2.0)	2.0 (2.5)

Dew Point Temperature (°C) – Mean Absolute Error, Root Mean Square Error in brackets

Location/ Date Period	Pearce	Bickley	Dwellingup	Bridgetown	Witchcliffe	Pemberton	Walpole	Rocky Gully
13/10/2013- 14/11/2013	1.7 (2.1)	1.5 (2.1)	1.9 (2.2)	1.7 (2.0)	1.2 (1.6)		1.3 (1.5)	1.3 (1.5)
15/11/2013- 14/02/2014	2.0 (5.8)	1.7 (2.3)	1.6 (2.1)	1.6 (2.3)	1.0 (1.4)	1.7 (2.1)	1.5 (1.9)	1.3 (1.8)
13/10/2013- 14/02/2014	1.9 (5.2)	1.7 (2.2)	1.7 (2.1)	1.6 (2.2)	1.1 (1.4)	1.7 (1.8)	1.5 (1.8)	1.3 (1.8)

Relative Humidity (%) – Mean Absolute Error, Root Mean Square Error in brackets

Location/ Date Period	Pearce	Bickley	Dwellingup	Bridgetown	Witchcliffe	Pemberton	Walpole	Rocky Gully
13/10/2013- 14/11/2013	4.8 (6.1)	6.4 (8.2)	5.2 (6.3)	9.7 (12.5)	5.3 (6.6)		9.6 (11.3)	8.4 (10.1)
15/11/2013- 14/02/2014	5.4 (7.4)	6.5 (8.7)	5.4 (7.4)	6.5 (9.6)	6.0 (7.8)	10.5 (16.7)	10.6 (13.2)	8.1 (11.2)
13/10/2013- 14/02/2014	5.3 (7.2)	6.5 (8.6)	5.4 (7.2)	7.2 (10.4)	5.8 (7.5)	10.5 (14.6)	10.4 (12.7)	8.2 (11.0)

Appendix A: Statistics

Mean absolute error (MAE)

The MAE measures the average magnitude of the errors in a set of forecasts, without considering their bias. It measures accuracy for continuous variables. Expressed in words, the MAE is the average over the verification sample of the absolute values of the differences between forecast and the corresponding observation. The MAE is a linear score which means that all the individual differences are weighted equally in the average.

Root mean squared error (RMSE)

The RMSE is a quadratic scoring rule which measures the average magnitude of the error. Expressing the formula in words, the difference between forecast and corresponding observed values are each squared and then averaged over the sample. Finally, the square root of the average is taken. Since the errors are squared before they are averaged, the RMSE gives a relatively high weight to large errors. This means the RMSE is most useful when large errors are particularly undesirable.

The MAE and the RMSE can be used together to diagnose the variation in the errors in a set of forecasts. The RMSE will always be larger or equal to the MAE; the greater difference between them, the greater the variance in the individual errors in the sample. If the $RMSE=MAE$, then all the errors are of the same magnitude.

IRRELEVANT INFORMATION HAS BEEN REMOVED FROM THIS DOCUMENT - s22.

FIRE WEATHER WARNINGS - performance statistics 93/94 to 13/14 (where available)

A Fire Danger Rating (low, moderate, high, very high, extreme) is forecast every day during the fire season, and a Fire Weather Warning is issued above a critical threshold (generally "extreme" fire danger, but other factors may be taken into account)

Performance is monitored using the following statistics:

contingency table entries:

		warn-able event occurred:	
		YES	NO
warning issued:	YES	Y	Z
	NO	X	

Probability Of Detection:

$$POD = Y / (Y + X)$$

False Alarm Ratio:

$$FAR = Z / (Z + Y)$$

VICTORIA

	93/94	94/95	95/96	96/97	97/98	98/99	99/00	00/01	01/02	02/03	03/04	04/05	05/06	06/07	07/08	08/09	09/10	10/11	11/12	12/13	13/14
X			2	3			16	20	11	33	22	24	20	51	20	16	28	4	10	16	31
Y	3	11	3	5	15	9	31	30	24	85	64	41	63	119	74	120	50	6	17	15	48
Z	2	4	0	6	2	1	22	18	6	55	25	13	29	43	27	58	24	1	4	1	14
0.68 POD			0.60	0.63			0.66	0.60	0.69	0.72	0.74	0.63	0.76	0.70	0.79	0.88	0.64	0.60	0.63	0.48	0.61
0.27 FAR	0.40	0.27	0.00	0.55	0.12	0.10	0.42	0.38	0.20	0.39	0.28	0.24	0.32	0.27	0.27	0.33	0.32	0.14	0.19	0.06	0.23

WESTERN AUSTRALIA

	90/91	91/92	92/93	93/94	94/95	95/96	96/97	97/98	98/99	99/00	00/01	01/02	02/03	03/04	04/05	06/07	07/08	08/09	09/10	10/11	11/12	12/13	13/14
X				14	35	24	26	46					67	34	87	64	65	74	45	43	58	100	26
Y				10	4	15	16	26					82	34	58	64	46	44	73	47	59	95	62
Z				19	19	56	67	75					92	36	63	98	64	125	228	176	122	234	122
0.43	POD	0.74	0.60	0.53	0.42	0.10	0.38	0.38			0.47	0.33	0.55	0.50	0.40	0.50	0.41	0.37	0.62	0.52	0.50	0.49	0.70
0.68	FAR	0.83	0.77	0.80	0.66	0.83	0.79	0.81	0.74		0.60	0.69	0.53	0.51	0.52	0.60	0.58	0.74	0.76	0.79	0.67	0.71	0.66

Percentage of the time that gale force wind forecasts for Western Port were hits (aka the success ratio):

21.2%

There were 0 days where a gale force wind warning SHOULD have been issued (misses) and a further 0 where a warning COULD have been issued (possible misses).

There were 26 false alarms across the verification period.

This provides an overall forecast accuracy (aka critical success index) of between

20.6%

(possible misses counted)

and

21.2%

(possible misses discounted)

Verification period: 1/1/2012 to 1/1/2014

Percentage of the time that gale force wind forecasts for Port Phillip Local Waters were hits (aka the success ratio):

96%

There were 7 days where a gale force wind warning SHOULD have been issued (misses) and a further 8 where a warning COULD have been issued (possible misses).

There were 2 false alarms across the verification period.

This provides an overall forecast accuracy (aka critical success index) of between

75%

(possible misses counted)

and

85%

(possible misses discounted)

Verification period: 01/01/2012 to 01/01/2014