

**In the matter of the *Commissions of Inquiry Act 1950*
Commissions of Inquiry Order (No.1) 2011
Queensland Floods Commission of Inquiry**

Witness Statement of James Thomas Davidson

I, James Thomas Davidson, of Level 21, 69 Ann Street, Brisbane, in the State of Queensland, say as follows:

1. I am the Regional Director for Queensland in the Bureau of Meteorology (the **Bureau**). The Bureau is Australia's national weather, climate and water agency. I was performing the role of Regional Director during the recent Queensland flood events, including the major flood episode in southeast Queensland in December 2010 and January 2011. I have been the Regional Director since 2002 and have worked at the Bureau since 1969.
2. This statement is provided in response to a series of questions received by the Bureau from the Queensland Floods Commission of Inquiry (the **Commission**) on 4 March 2011 and in a letter from the Commission dated 22 March 2011. Except where otherwise stated, I make this statement from my own knowledge and on information and belief after making enquiries within the Bureau.

Qualifications and Professional Experience

3. I hold a Bachelor of Science (Hons Physics) from the University of Queensland and have a Diploma in Meteorology from the Bureau Training Centre and Graduate Diploma in Management from the University of Central Queensland. I am also a Justice of the Peace (qualified).
4. I commenced work in the Queensland Regional Office of the Bureau in 1969. The following is a summary of the positions I have held within the Bureau:
 - a. Weather forecaster in the Queensland Regional Office (1969);
 - b. Weather forecaster in Port Moresby PNG (1970-72) with the Bureau;

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- c. Weather forecaster in the Brisbane Regional Forecast Centre (1972-87);
 - d. Queensland Severe Weather Services Manager (1987-1990);
 - e. Queensland Weather Services Manager (1990-2002) – with supervisory responsibility for both the Brisbane Regional Forecast Centre and the Queensland Tropical Cyclone Warning Centre; and
 - f. Queensland Regional Director (2002-present) – with leadership and management responsibility for the Bureau's staff, resources and operations in the Queensland Region.
5. For 25 years I have held a senior role in the Queensland Tropical Cyclone Warning Centre (TCWC). At various times, I have served in the TCWC as a senior forecaster, as the shift supervisor and as the lead warning strategist. I am also the current Chair of the Queensland Flood Warning Consultative Committee, Co-Chair of the Queensland Tropical Cyclone Consultative Committee, and a member of the Queensland Flood Consultative Committee.
6. For the past 9 years, I have been a meteorological adviser to a range of Queensland disaster management groups including the State Disaster Management Group, the State Disaster Coordination Group, Disaster District Management Groups and Local Disaster Management Groups. I have participated in the pre-season disaster awareness and education campaign since 1987. Each year during the Spring months senior Bureau meteorologists and hydrologists participate in seminars held in storm, cyclone and flood prone centres with the objective of preparing disaster management officials and the wider community for the wet season ahead.
7. I was the project manager of the "The Queensland Climate Change and Community Vulnerability to Tropical Cyclones Project" which in 2004 received both a Queensland and Australian Safer Communities Award. I am also the Chair of the World Meteorological Organisation (WMO) Expert Team on "Disaster Prevention and Mitigation" and was co-author of the WMO publication "Guidelines on Integrating Severe Weather Warnings into Disaster Risk Management".

Bureau of Meteorology Report to the Queensland Floods Commission of Inquiry

8. I have overseen the preparation of and contributed to a detailed report to the Commission titled "Report to Queensland Floods Commission of Inquiry: provided in response to a request for information from the Queensland Floods Commission of Inquiry received by the Bureau of Meteorology on 4 March 2011", which was prepared in response to a request for information

from the Commission received by the Bureau on 4 March 2011. Attached hereto and marked "JD-1" is a copy of the report and its appendices (the Report). I also contributed to the "Provision of Preliminary Meteorological and Hydrological Information: Background Briefing for the Queensland Floods Commission of Inquiry" (the Background Briefing) which was provided to the Commission on 17 March 2011.

9. Since the initial request for information from the Commission was received by the Bureau on 4 March 2011, the Commission has made additional requests for information to the Bureau. Although the Report was prepared as a response to the request for information received by the Bureau on 4 March 2011, it also covers much of the additional information which was sought by the Commission in its letter dated 22 March 2011.
10. I have been informed that the Bureau's Hydrology Manager for Queensland, Mr Peter Baddiley, will also be providing a witness statement to the Commission regarding issues which the Commission has sought clarification on and which fall more within his area of knowledge and expertise. In particular, Mr Baddiley will be responding to issues outlined under the heading 'Interrelationship with government agencies and dam operations' in the request for information from the Commission dated 22 March 2011. The following is my response to the remaining issues posed by the Commission.

A Bureau overview

- 1 **The lead up to the major flood episode in south east Queensland in December 2010 and January 2011.**
11. Subsections 2.1.1 and 8.2.1 of the Report cover this topic. In summary, the longer time-scale influences (or 'climate drivers') were:
 - a. Heavy rainfall in the prior months;
 - b. The monsoonal wet season;
 - c. The La Niña event; and
 - d. The Madden Julian Oscillation.
12. A series of major rainfall events across Queensland throughout late 2010 and January 2011 then resulted in widespread flooding across numerous river systems. This topic will also be covered in a presentation I will make on the Bureau's behalf at the public hearings of the Commission.

2 Flooding as it happened across the State of Queensland.

13. The Queensland floods of December 2010 and January 2011 consisted of four main rain events:
 - a. Between 28 November 2010 and 22 December 2010, there was a continuous sequence of large-scale rainfall events that occurred across Queensland.
 - b. Between 23 and 28 December 2010, there was a six-day sequence of heavy rainfall that involved the landfall of Tropical Cyclone Tasha. After landfall, Cyclone Tasha transformed into a monsoon low or rain depression, which accentuated the structure of the monsoon trough in which it was embedded. An upper level westerly trough interacted with the depression and brought about a large scale ascent of tropical air, which rose ahead of the trough as it moved to higher latitude. Figure 2.1.3 of the Report shows the rainfall across Queensland during these six days.
 - c. Between 10 and 12 January 2011, there was an unusual rainfall event that occurred over southeast Queensland. The onshore moist easterly trade wind flow interacted with an upper level cut-off low, to produce a major rain system with the unusual scale of only several hundred kilometres. The rainfall from this system fell into the catchments that feed the Brisbane River. On 12 January, the upper level low weakened and moved further west stabilising conditions and clearing the rainfall from southeast Queensland.
 - d. On 10 January 2011, the easterly flow and upper level cut-off low described in c. above brought about a sequence of thunderstorms forming within the easterlies and moving slowly inland towards the coastal mountain range. The thunderstorm cells moved southward and westward, slowed and intensified due to the enhanced uplift across the escarpment, a complex interaction between neighbouring storms and low level changes in wind. The lifetime of the thunderstorms was several hours, with intense rainfalls over a one to two hour period over Toowoomba and the Lockyer Valley catchment.
14. Further information about the rainfall that caused the flash flooding event in Toowoomba and the Lockyer Valley is detailed in Sections 5 and 6 of the Report.
15. Subsections 2.1.1-2.1.5 and Appendices F-I of the Report give a more fulsome description of the flooding in December 2010 and January 2011. This topic will also be covered in the presentation mentioned above.

3 The Bureau's role, in general, for providing information and warning services.

16. Section 1.2 of the Report covers this topic. In summary, the Bureau provides:

a. Weather forecasting.

i. The Bureau's Regional Forecasting Centre (RFC), under the direction of the Regional Director, provides weather forecasting services in Queensland.

ii. The RFC provides the following publicly available forecast services for Queensland:

1. A forecast that describes the expected evolution of the weather pattern in Queensland over the next four days;
2. The weather forecast suite, which is a collection of forecasts for 17 Districts and 38 locations around Queensland;
3. Marine forecasts for six areas; and
4. Tropical cyclone outlooks.

iii. The RFC provides the following publicly available warning services for Queensland:

1. Tropical Cyclone Warning Services;
2. Fire Weather Warning Services;
3. Severe Thunderstorm Warning Services;
4. Severe Weather Warning Services;
5. Coastal Waters and High Seas marine weather warning services; and
6. Other warnings.

iv. The RFC provides to emergency management authorities and organisations:

1. pre-season briefing that aims to assist with the development of appropriate emergency management strategies;

2. climatological advice; and
3. detailed routine and operational forecasts.

b. Flood forecasting and warning service:

i. The Bureau's Flood Warning Centre (FWC) provides flood warning services in Queensland. The FWC is:

1. managed by the Bureau's Regional Hydrology Manager;
2. permanently established, but staffed only during flood periods;
3. staffed by hydrologists, meteorologists and technical officers who work closely with meteorologists in the RFC.

ii. The FWC:

1. prepares and issues flood warnings on a river basin scale; and
2. makes predictions of future flood levels at a limited number of specific locations.

iii. The FWC provides flood forecasting and warning services in cooperation with agencies from State and Local Governments. Under the disaster management arrangements that the Bureau has with State and Local agencies, the FWC does not:

1. issue flash flood warnings for specific locations or individual creeks;
2. predict the extent to which increased river height levels will cause an inundation of flood plains;
3. interpret the impact of any predicted flood levels or expected flooding on people and infrastructure;
4. disseminate targeted information to individuals or communities who are likely to be affected by any expected flooding.

c. Flood warning network:

- i. The FWC has access to about 2,200 stations that provide rainfall and water level information.

17. The Bureau has no direct role in flood estimation.

18. The Bureau also conducts community awareness campaigns, and develops awareness material and brochures to help communities and individuals understand weather phenomena and the services provided by the Bureau, in partnership with emergency managers and local governments.

4 The types of warnings which are provided by the Bureau.

19. Section 1.2 of the Report covers this topic. Section 5.1 covers the warnings which were specifically available for the Lockyer Valley and section 6.7 for Toowoomba.

5 The Bureau's role in the provision of flash flood warnings.

20. The provision of flood forecasting and warning services in Australia is a cooperative arrangement between all three levels of government, which describe the responsibilities of agencies for the establishment and operation of flood warning and forecasting systems. Under this arrangement, a distinction is made between flash flood warnings (described as situations where the rain-to-flood time is less than 6 hours) and other (non-flash flood or riverine) warnings. While the Bureau is responsible for forecasting floods, predicting river height levels, and forecasting heavy rain that is conducive to flash flooding, the Bureau is not responsible for forecasting flash flooding in specific locations or individual creeks. Flash flood warning services for individual locations require full end-to-end systems. Subsections 1.2.2 to 1.2.4 of the Report cover this topic.

6 Dissemination of information to Queensland State and Local Governments, emergency services and the Queensland Police Service.

21. Sections 3.1-3.8 of the Report cover this topic.

B Weather events in the Wivenhoe and Somerset catchments during the January 2011 flood episode

22. The weather events relating to the Wivenhoe and Somerset catchments are the same as described in Section C below.

C Toowoomba and Lockyer Valley

1 Weather, rainfall and hydrological issues particular to the region in the lead up to and including 10 and 11 January 2011.

23. During the period 9 to 12 January 2011, an active monsoon trough extended across northern Queensland and over the Coral Sea linking a series of low pressure systems. A high pressure system over the southern Tasman Sea directed moist easterly winds into the southeast corner of the state.

24. The southwestward movement of an upper level low pressure system across the southern Queensland coast on 9-10 January directed moist tropical air into the Sunshine Coast and southeast Queensland. This caused intense rainfall to move from the Mary and Burnett River catchments into the Sunshine Coast and the Upper and Lower Brisbane, Bremer and Upper Condamine River catchments including the Lockyer Valley region. Daily falls in excess of 200 millimetres were recorded across these parts to 9am on both 10 and 11 January.

25. On 10 January 2011, thunderstorm cells embedded in a rain band affected areas between the Sunshine Coast hinterland to Esk and moved southwest over Toowoomba (including across the catchments of Wivenhoe and Somerset Dams) between 10am and 3pm EST. Subsequent to the rainfall on the 10 January 2011, the following events occurred:

- a. fast creek rises and flash flooding in the Toowoomba City area;
- b. fast rises in Gowrie and Oakey Creek draining from the Toowoomba area westwards towards the Condamine River;
- c. flash flooding in the upper parts of Lockyer Creek and its tributaries; and
- d. major river flooding in the Brisbane, Stanley and Bremer rivers including Brisbane and Ipswich Cities.

26. Appendix E and section 2.1 (*event four*) of the Report outlines the weather and rainfall issues more fully. Appendix I-12 (Lockyer Valley including Forest Hill) and Appendix I-22 (Toowoomba) of the Report outlines the hydrological issues in more detail.

2 Weather events in Toowoomba, the Lockyer Valley and Forest Hill.

27. Rainfall over Toowoomba drains into the Gowrie Creek and its tributaries East and West Creek and Black Gully. Very intense localised rainfall in the Toowoomba area caused severe flash flooding through the Toowoomba CBD during the afternoon of 10 January 2011. The most

significant rainfall intensity was recorded at the two Toowoomba gauges in the hour up to 1:50 pm on 10 January 2011.

28. The towns in the Lockyer Valley affected by flooding were:

- a. Withcott, on the Gatton Creek. There is no water level observation available for this town.
- b. Helidon, on the Lockyer Creek. The Lockyer Creek at the Helidon AL peaked at 13.88 metres on 10 January 2010. A 'major' flood at this station is 8.0 metres.
- c. Grantham, affected by both the Lockyer and Sandy Creeks. The Sandy Creek at the Sandy Creek Rd AL peaked at 4.9 metres on 11 January 2011. A 'major' flood at this station is 4.0 metres. Note that the flash flood at Grantham on Monday 10 January was caused by flooding in Lockyer Creek, not Sandy Creek. There is no water level observation available from Lockyer Creek at Grantham.
- d. Gatton, on the Lockyer Creek. The Lockyer Creek at Gatton peaked at 15.38 metres on 11 January 2011. A 'major' flood at this station is 15.0 metres.
- e. Laidley, on the Laidley Creek. The Laidley Creek at Laidley peaked at 8.85 metres. A 'major' flood at this station is 7.0 metres.
- f. Forest Hill, near the junction of Laidley and Sandy Creeks. The Bureau does not currently collect data for this site.

29. Appendix I-12 (Lockyer Valley including Forest Hill) and Appendix I-22 (Toowoomba) provide location specific information of the weather events.

3 The Bureau's observations and warnings issued relevant to Toowoomba, Lockyer Valley and Forest Hill.

30. Appendix L of the Report provides copies of all warnings issued for Toowoomba and the Lockyer Valley (including Forest Hill) for the period 9 to 11 January 2011 inclusive.

31. Observations for the Lockyer Valley (including Forest Hill) are contained in section 5 and Appendix I-12 of the report. Observations for Toowoomba are contained in section 6 and Appendix I-22 of the report.

4 Communications and information given to Queensland State and Local Governments, emergency services and the Queensland Police Service.

32. On 4 January 2011, I briefed the State Disaster Management Group and on the next day gave a similar briefing to Premier and Cabinet. At both briefings, I referred to the large and intense upper level low over southeast Queensland and the impact that it was likely to have on rainfall during the following week. With moist tropical air circulating around the upper level low, the

probability of heavy rainfalls developing was considered to be quite high. A map of the cumulative rainfall forecast was shown at the briefings with totals of several hundred millimetres expected over the next 4-8 days.

33. In addition to the above, the Bureau also provided a number of briefings to various agencies (details are provided in subsection 3.1.2 and Appendix J of the Report). Sections 4 (Lockyer Valley – Disaster Management) and 6.8 (Warnings Given in Relation to Toowoomba) of the Report are also relevant to this topic. It should also be noted that the Queensland Police Service receives by email all warnings issued by the Bureau for Queensland.

D Other issues

34. I will now cover some specific issues on which the Commission has requested information more recently.

a. Amateur Bloggers.

35. The Bureau has a range of warnings that are described in Section 5.1 and Table 5.1.1 of the Report and an established range of distribution channels (Section 5.3 refers). The Bureau also provides access to its data and services to private meteorologists and members of the public through special data feeds and its web site. In recent years general discussion of meteorological events on various internet forums, based on the information provided by the Bureau, has significantly increased.

36. The Bureau does not have the capacity to monitor chat rooms and blogs. Nor does the Bureau have the capacity to check and calibrate (e.g. by ground truthing) the data that is listed in or relied upon by the blogs. However, the Bureau does encourage its own official Storm Spotter network that members of the public, including bloggers, may register with to provide information of severe weather events directly to the Bureau (Section 6.12 of the Report refers). This official network has dedicated access to the RFC through a special phone number and web-based submissions can be made by Spotters to a special Bureau email address that triggers an alert that is continually monitored by forecasters.

37. As well as its updated Severe Weather Warning issued at 11.05am on 10 January 2011 (which alerted of heavy rain leading to localised flash flooding in the district), the Bureau did recognise the possibility of flash flooding in the Toowoomba area and alerted the State Disaster Coordination Centre at 1.00pm. Other actions taken are outlined in Section 5.3.

b. Warning relevant authorities of events leading to flash flooding in the Lockyer River region.

38. This is covered in section 5.3 of the Report.

c. Telephone call to the Queensland State Disaster Coordination Centre at 1 pm on 10 January 2011.

39. This telephone call is referred to in sections 5.3 and 6.8 of the Report. In the telephone call to the State Disaster Coordination Centre, attention was drawn to the exceptionally heavy rainfall to the west of Wivenhoe Dam and the recording of 75mm in the previous hour at Redbank Creek. The Bureau noted that the really heavy rainfall had moved over the Toowoomba town area with expected flash flooding over the next hour or two. The Bureau expressed the view that the expected flash flooding could soon result in calls for assistance. There was also mention made of a recent storm spotter report from Cressbrook Dam advising of multiple landslides. In relation to the specific question raised by the Commission, the 1pm phone call did not mention the Lockyer Valley *per se* because the phone call focused on the heavy rainfall west of the Wivenhoe Dam and flash flooding in the general Toowoomba area.

d. Monitoring of river and rain gauges at Helidon.

Sections 5.4-5.5 of the Report cover this topic.

e. Liaison person for private meteorological companies.

Private meteorologists, including private meteorological companies, are able to register through the Storm Spotter network (Section 6.12 of the Report refers). Each Bureau office has a staff member that manages this network. In addition, the Bureau holds meetings on a six monthly basis with representatives from the private meteorological sector to discuss a range of issues including access to the Bureau's data and provision of forecasts and warnings to their clients.

Date: 4 April 2011

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James Thomas Davidson