

SIXTH STATEMENT
OF
ROBERT ARNOLD AYRE

30 JANUARY 2012

QFCI

Date:

2/2/12 *jm*

Exhibit Number:

1048

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QUEENSLAND FLOODS COMMISSION OF INQUIRY

SIXTH STATEMENT OF ROBERT ARNOLD AYRE

30 January 2012

QUEENSLAND TO WIT

I, **ROBERT ARNOLD AYRE**, care of Holding Redlich, Level 1, 300 Queen Street, Brisbane in the State of Queensland do solemnly and sincerely declare as follows:

INTRODUCTION

- 1 This statement is a further supplementary statement to statements previously provided to the Commission of Inquiry on 23 March 2011 (**my first statement**), 29 March 2011 (**my supplementary statement**), 8 April 2011 (**my third statement**) and 11 April 2011 (**my response to Michael O'Brien's submission**) and my statement of 30 April 2011 (**my fifth statement**).
- 2 I will provide any further information or explanation required by the Commission of Inquiry.

The Requirement Dated 25 January 2012

- 3 I have been provided with a Requirement to provide an account of my involvement in the creation of the following parts of the January 2011 Flood Report on the Operation of Somerset Dam and Wivenhoe Dam, 2 March 2011 (Exhibit 24 in the Commission of Inquiry):
 - (a) Executive Summary;
 - (b) Part 2 – Flood Event Summary
 - (c) Part 10 Flood Management Strategies and Manual Compliance
 - (d) Part 19 Report Conclusions.
- 4 **Exhibit 1 to this statement** is a copy of the Requirement dated 25 January 2011.

The Drafting and Review Process Generally

- 5 The process for drafting and reviewing the Flood Report was generally that the principal author of various Parts of the Flood Report would be responsible for the drafting of that Part. Discussion would sometimes occur at an early stage of the drafting of a Part to consider the contents in a broad sense (such as the column headings in a table, or the subsections to be dealt with). The principal author would then produce a largely complete draft of that Part of the Flood Report, and distribute it to the other Flood Engineers, generally in hard copy. The other engineers would then review that Part, and provide feedback to the principal author. Whilst at times this occurred in writing, most of the time this would occur in a meeting with the principal author. Sometimes this would include the other engineers and sometimes it would not. I have not kept a record of the dates or times of these meetings. My recollection is that during that meeting, we would often do a page turn on the Part raising any comments or suggestions that each of us had, rather than simply providing the draft that we had made our corrections or notes on to the principal author of that Part.
- 6 As best as I can now recall, I did not make electronic comments / corrections to the drafts of the Flood Report. It was my usual practice to make notes on my own hard copy, and then provide verbal feedback to the principal author of that Part. I have found in the past that electronic amendments by several people to documents is often more hassle than it is worth because of difficulties in reconciling various changes to different versions of the same document.
- 7 I have exhibited to this statement all previous drafts of the Flood Report or Parts of the Flood Report that I have been able to locate in my possession. Once I had made my notes and provided feedback, I did not generally retain my version of that draft.
- 8 The Flood Report was largely prepared in the FOC on the computers that were present. The document was saved on the FOC local area network in a dedicated series of folders entitled "draft", "final draft" and then "final", or something like that. Our general practice was not to email the document, but rather to work on the copy on the computer. This was to avoid confusion as to what the latest version of the draft was.

- 9 **Exhibit 2 to this statement** is a compact disc containing 7 Folders containing various electronic documents relevant to the Flood Report that I have in my possession. These are the only electronic documents relevant to the Requirement that I have been able to locate in my possession.
- 10 The “Draft” folder was essentially the initial working draft folder for the live documents that were still being worked on and reviewed primarily by the author for that relevant Part and the document formatters. This folder is saved in “Folder 1” on the compact disc at exhibit 2 to this statement.
- 11 As each Part of the Flood Report would near completion, it would be transferred to the “Final Draft” folder for final review, proof reading and preparation for printing. I believe that the final draft was also forwarded to the Seqwater Board. This folder is saved in Folder 2 on the compact disc in exhibit 2.
- 12 I believe that Parts of the Flood Report contained in the “Final” folder were provided to external technical reviewers (Dr Rory Nathan and Peter Hill from SKM, and Emeritus Professor Colin Apelt (University of Queensland), and Greg Roads (WRM Water and Environment) and Brian Shannon (retired SunWater) and Len McDonald (retired former NSW Dam Safety). The Reports from these technical reviewers are exhibits before the Commission of Inquiry. The “Final” folder is saved in Folder 3 on the compact disc in exhibit 2.
- 13 Folder 4 contains a copy of a draft of Part 2 Flood Event Summary in electronic form. I don’t believe that the corrections / annotations down the side of that document were created by me.
- 14 Folder 5 contains a document entitled “Performance of RTFM” and a document entitled “Copy of Performance of RTFM.” These documents appear to be identical. This document is an early draft of Part 7 of the Flood Report, which is the only substantive Part of the Flood Report for which I was the principal author.
- 15 Folder 6 contains a document entitled “final sunset” which is an excel version of the model results. I believe that Terry Malone created this document, which ultimately made its way into appendix A.
- 16 Folder 7 contains a copy of an excel document that I compiled as my own aide. The document started as one of the gate operation spreadsheets, and I added to it. I have dated this document as 19 January 2011 at 7.00am in the file name. I don’t

believe that I gave this document to any of the other engineers. I cannot now recall if I referred to this document in reviewing any parts of the Flood Report or any of the data contained therein.

17 I do not believe that I have any other electronic versions of documents relevant to the Flood Report specified in the Requirement issued to me.

The First Step in the Process – The Table of Contents

18 Before the drafting of the Flood Report commenced, the Flood Engineers held a series of meetings to determine the content and structure of the Flood Report and the Parts to be included.

19 One of the very first tasks that was undertaken was to decide upon an overall structure to the Flood Report and a table of contents.

20 Various tasks were then assigned to people to complete.

21 Terry Malone, John Ruffini and I are all hydrologists, and so we were tasked with the Modelling and Event Data Parts, and because of the huge amount of modelling and data involved in the Flood Event, the three of us were to take the lead in collating, recording and summarising that data in a digestible form.

22 John Tibaldi was left to take the lead on the Parts such as the Introduction, Flood Event Summary, and the Flood Management Strategies.

23 John Ruffini was initially tasked with completing Part 5 Data Collection, however, Terry Malone and I ultimately drafted that Part as John Ruffini had other work commitments that he had to meet with DERM.

24 **Exhibit 3 to this statement** is a copy of a very early draft of the table of contents. I believe that John Tibaldi prepared this draft table of contents.

25 I believe that the handwriting on the second page of exhibit 3 is John Ruffini's.

26 I can recall a particular meeting that all four Flood Engineers attended in the FOC before the drafting of the Flood Report commenced where we discussed this proposed table of contents.

27 I do recall that we had a lot of discussion about Part 17 in the Table of Contents in exhibit 3, namely, the Review of the Wivenhoe Dam Full Supply Level. As the Full Supply Level is set by the ROP, it was my view that was outside the scope of the flood operations manual, which operates separately to the ROP. Ultimately, a Part about the impacts on the procedures in the manual of any proposed review of FSL was included in the Flood Report (see Part 17 of the Flood Report of 22 March 2011.)

The Ultimate Ownership of the Flood Report

28 Under section 2.9 of the W&S Manual, Seqwater are required to prepare a report after each Flood Event and forward the report to the Chief Executive within six weeks of the completion of the Flood Event. Whilst all Flood Engineers were involved in the preparation and drafting or review of the Flood Report, it is ultimately Seqwater's Flood Report. Because John Tibaldi and Terry Malone were both Seqwater employees, and neither I nor John Ruffini were, John Tibaldi and Terry Malone took a more active role in drafting and reviewing the Flood Report.

29 As is stated at paragraph 154 of my first statement, I considered that the Flood Report was an accurate record of the January 2011 Flood Event.

30 The Requirement issued to me by the Commission of Inquiry requires information on 4 specific Parts of the Flood Report, namely:

- (a) Part 1 Executive Summary;
- (b) Part 2 Flood Event Summary;
- (c) Part 10 Flood Management Strategies and Manual Compliance;
- (d) Part 19 Report Conclusions.

Part 1 Executive Summary

31 From my recollection, the principal author of the Executive Summary was John Tibaldi.

32 I reviewed a draft of the Executive Summary. I made handwritten comments on the draft that I reviewed. The notation that I have made indicates that I reviewed the document at 14:00 hours on 7 February 2011. **Exhibit 4 to this statement** is a copy of my handwritten comments on the Executive Summary.

33 **Exhibit 5 to this statement** is a copy of what I believe is an earlier version of the Executive Summary. I have not made any notations on that draft and I cannot recall making any comments on it.

34 I don't believe I drafted any of the paragraphs in the Executive Summary.

35 I did participate in various reviews of the Executive Summary. The process that would generally be adopted was that John Tibaldi would issue a draft which we would all review and then pass our comments back to John Tibaldi to consider. After searching my documents, I don't believe that I have a copy of any other drafts of the Executive Summary.

36 I don't recall precisely the comments or corrections that I suggested in detail.

37 The particular issues that I remember discussing with John Tibaldi was to ensure that the Executive Summary gave a good account of the magnitude of the Flood Event and its relativity, provided a brief but sufficient description of the flood at each of the dams, and adequately explained complicated matters in a way that could be understood by people without experience in the operation of a flood mitigation dam.

38 One particular issue that I do recall discussing with John Tibaldi was the use of the phrase "extremely large" in describing the magnitude of the Flood Event in the draft of the Executive Summary as appears in exhibit 4 to this statement. In the final version of the Flood Report, the description is given as a "large (Annual Exceedance Probability AEP of 1 in 100) to rare (AEP of 1 in 2,000 years) event". I had a concern with the use of the words "extremely large" as in hydrologic terminology, "extreme" has a technical meaning, namely the PMF (probable maximum flood). John Tibaldi and I discussed that in layman's terms, the Flood Event could be characterised as "extremely large", but we decided to adopt the industry practice. I recall that we discussed this on a number of occasions. I also recall discussing this with Terry Malone and John Ruffini.

39 I recall we also discussed the order of paragraphs, but I cannot now recall what those changes were.

40 I also made typographical corrections to various drafts, although I no longer have any of these other than those exhibited to this statement.

Part 2 Flood Event Summary

41 The principal author of Part 2 Flood Event Summary was John Tibaldi.

42 I recall receiving a copy of a very early version of the table in Part 2. **Exhibit 6 to this statement** is a copy of that document. I made some handwritten notes on the document referencing model runs and the results out of those model runs. The purpose of being provided with this document by John Tibaldi was to have an early version of the table to workshop how it would be set out and the sort of information that should be included. The notes that I made on the table were for my own benefit so that I could provide feedback to John Tibaldi on the sort of information that should be included in the table.

43 I also reviewed a subsequent draft Part 2. **Exhibit 7 to this statement** is a copy of that document. I have made a handwritten notation of 13:45 on 2/2/11, and I believe this refers to the date and time that I received the document. In that document I made some handwritten amendments. In reviewing this draft, I recall that I had paid particular attention to the data and I spent a lot of time cross checking the data in the draft against our models and captured data. Transposing such a large amount of data and presenting it in a way that can be easily digested is a very difficult task.

44 I also have in my possession another draft of Part 2. **Exhibit 8 to this statement is a copy of that document.** I believe that this draft came from the technical writer (a formatter) with notes down the side with suggested formatting or typographical changes for review. I do recall looking at this document, but I don't recall having any comments to make regarding the formatting changes that were being suggested. I believe that some of the information that was contained in this draft dealing with forecasts was moved to Part 6.2 of the Flood Report.

45 **Exhibit 9 to this statement** is a copy of a draft of the text in Part 2 of the Flood Report. I note that the text in this draft provides a little more information than what is contained in the final Flood Report. I don't recall making those changes, and I am not sure who did.

46 I have also exhibited the electronic version of a draft of this Part in Folder 4 contained in the compact disc at exhibit 2 to this statement.

47 I do not recall or have in my possession any other drafts of Part 2 of the Flood Report, and I do not believe that I was involved in any other reviews of this Part.

Part 10 – Flood Management Strategies and Manual Compliance

48 I think that John Tibaldi was the person who drafted this Part of the Flood Report, but I cannot be sure. I know that it was not me, and I am sure that it was not John Ruffini.

49 I do recall making comments on this Part, although I do not have any drafts of Part 10 in my possession. The first sections of this document are largely extracts from the Manual.

50 In regards to the table at 10.4.1, I do recall reviewing at least one draft of this table. I may have reviewed more than one draft but I cannot now recall. I recall making spelling corrections, and making suggestions about the order of bullet points to place them in a sequence that was easier to understand, but I cannot now recall what those were. I cannot now recall the specific content of my corrections or amendments to the drafts of this document.

51 I do recall a meeting where all four duty engineers discussed the table in Part 10. I do recall going through each period with the other Flood Engineers and checking that the data, such as release rates, lake levels, forecasts, and projected flows etc was accurately recorded. My recollection of what was discussed in this meeting centred on ensuring the accuracy of the data captured in the Part.

52 I also recall that at a very early stage in the Flood Report process, when I and the other Flood Engineers on duty were in the FOC working on the Flood Report, John Tibaldi said to me words to the effect that he realised from looking at the data that the criteria of W2 could not technically have been achieved at any stage of the Flood Event because the rates of release from Wivenhoe Dam exceeded the peak of the naturally occurring flows at Lowood and Moggill. I recall saying to John that I agreed with him about that. I cannot recall if the other Flood Engineers were involved in that discussion.

53 I have recently been shown an excel spreadsheet attached to an email from me to John Tibaldi on 15 January 2011. I believe this email was sent in preparing the ministerial briefing. A copy of the email and the excel spreadsheet is **Exhibit 10 to this statement**. I do not now recall this document. I note that the times attributed to strategies W1 to W4 coming into effect are incorrect. I can recall a meeting involving all of the engineers where we discussed those errors in attributing times in a document like the attached spreadsheet, but I can't now recall if this is the actual spreadsheet I looked at as at the time we discussed this I was looking at it on my computer screen. That information had been produced in a very short amount of time, and when the Flood Event was still ongoing. Realising those errors, they were not repeated in the Flood Report at table 10.4.1.

Part 19 – Report Conclusions

54 To the best of my recollection, John Tibaldi was the principal author of this Part.

55 I don't have any drafts of this Part of the Flood Report in my possession to the best of my knowledge.

56 I do recall reviewing the conclusions in Part 19, but I don't recall making any particular comments or suggestions. I do recall discussing with all of the other Flood Engineers when we were all together in the FOC the order of the conclusions.

My Involvement regarding the Remaining Parts of the Flood Report

57 I assisted in drafting and / or reviewing various parts of the Flood Report.

Part 3 Event Mobilisation and Staffing

58 As best as I can now recall, John Tibaldi was the principal author of Part 3.

59 I was not involved in drafting any sections of this Part, however, I did review a draft of this Part. I recall checking for accuracy table 3.4.1.

60 I cannot recall any particular comments that I made on this Part.

Part 4 Flood Event Procedures

- 61 I believe that John Tibaldi was the principal author of Part 4.
- 62 I was not involved in drafting any sections of this Part, however, I did review a draft of this Part.
- 63 I cannot recall any particular comments that I made on this Part.

Part 5 Data Collection System Performance

- 64 Terry Malone and I were the principal authors of Part 5. To the best of my recollection, I populated Tables 5.2.3, 5.2.4, 5.2.5, and 5.2.6, and I authored some of the paragraphs, although I couldn't say which ones.
- 65 I was also involved in reviewing this Part.
- 66 I cannot recall any particular comments or reviews that I undertook on this Part.

Part 6 Event Data

- 67 I believe that Terry Malone was the principal author of Part 6 Event Data,
- 68 Although I was not the principal author, I was involved in drafting various sections of this Part. From memory, I produced the images in Figures 6.3.2 to 6.3.11 and 6.3.13 and the associated text for those Figures.
- 69 I was also involved in reviewing this Part.
- 70 I cannot recall any particular comments or reviews that I undertook on this Part.

Part 7 Flood Model Validity and Performance

- 71 I was the principal author of Part 7 of the Flood Report, namely Flood Model Validity and Performance.

72 **Exhibit 11 to this statement** is a copy of a draft that I issued to each of the engineers for review with a handwritten notation of 8/2/11 at 11.00am in my handwriting. This document includes only one correction, namely a spelling mistake on the first page that I believe is my notation.

73 **Exhibit 12 to this statement** is a copy of that same draft that I received back with comments from John Ruffini.

74 I cannot now recall if John Tibaldi or Terry Malone provided me with any written comments on this draft of this Part of the Flood Report.

75 I do recall John Tibaldi providing me with verbal feedback on this Part. I don't have a precise recollection of what those comments were but I think they related to a suggestion that I expand on the discussion of how we were able to compare the model performance with the actual performance at various key locations. I note that under the heading "cases" in this Part of the Flood Report of 22 March 2011 further explanation is provided (when compared to exhibit 9 to this statement) in accordance with the suggestion I believe was made by John Tibaldi.

76 I have not been able to locate a copy of any written draft reviewed by John Tibaldi or Terry Malone.

77 Folder 5 on Exhibit 2 contains two copies of electronic versions of drafts for this Part.

Part 8 Preliminary Assessment of Event Magnitude

78 I believe that Terry Malone was the principal author of this Part.

79 Although I was not the principal author, I did contribute to drafting various sections of this Part. I believe I drafted Part 8.5 by populating some of the figures in table 8.5.1.

80 I recall reviewing Parts 8.10 and 8.11 but I cannot recall any particular corrections or comments I may have had.

Part 9 Dam Inflow and Flood Release Details

81 I believe that Terry Malone was the principal author of this Part.

82 I was involved in reviewing this Part but I cannot recall any particular corrections or comments I had.

Part 11 Event Communications

83 I believe that John Tibaldi was the principal author of this Part.

84 I was also involved in reviewing this Part. I cannot recall anything in particular about any corrections or comments I may have made.

Part 12 Review of Data Collection Systems

85 I believe that Terry Malone was the principal author of this Part.

86 I was also involved in reviewing this Part.

87 I cannot recall any particular comments or reviews that I undertook on this Part.

Part 13 Review of Flood Operations Centre Personnel and Staffing

88 I cannot recall whether Terry Malone or John Tibaldi was the principal author of this Part. I think it was John Tibaldi but I can't be sure.

89 I was not an author of any of this Part, but I did review it. I can recall a discussion between all four Flood Engineers where we discussed staffing strategies during the Flood Event and facilities in the FOC. I made some comments on this topic at paragraphs 138 to 140 of my first statement.

Part 14 Review of Dam Site Personnel and Staffing

90 I believe that John Tibaldi was the principal author of this Part.

91 I was involved in reviewing this Part, but I cannot recall any particular comments or corrections I may have suggested.

Part 15 Review of Flood Modelling Systems

92 Terry Malone was the principal author of this Part.

93 I was involved in reviewing this Part. I recall discussing with Terry Malone the level of detail required in this Part, namely whether we should review each and every minor aspect of the RTFM system, or provide an overall assessment, which is the approach that we decided upon.

Part 16 Review of the Manual Objectives and Strategies

94 I believe that John Tibaldi was the principal author of this Part.

95 I was involved in reviewing this Part. John Tibaldi asked me for suggestions on areas of the Manual that could be examined, and I recall that all of the Flood Engineers workshopped the topic and came up with the points reflected in the bullet points listed on page 218 of the Flood Report.

Part 17 Review of Wivenhoe Dam Full Supply Level

96 I do not know who drafted Part 17.

97 I was not involved in drafting or reviewing this Part.

Part 18 Review of Agency Interaction

98 I believe that John Tibaldi was the principal author of this Part.

99 I was not involved in drafting this Part.

100 I cannot recall if I reviewed this Part at any stage.

Part 20 Report Recommendations

- 101 I believe that John Tibaldi was the principal author of this Part.
- 102 I did not draft any aspects of this Part.
- 103 I was involved in reviewing this Part. I recall agreeing with all of the recommendations listed.

Appendix A

- 104 I believe that John Tibaldi drafted the text in Appendix A. The tables and graphs were compiled by Terry Malone. I recall discussing with Terry and John Tibaldi which models to include and there was a post event numbering of the model runs. As described in the text, some of the model runs were re-created. We discussed trying to select specific model runs that were representative of key moments in the Flood Event.

Appendix B Flood Volume Summary

- 105 Terry Malone prepared the table and the graph in Appendix B. I recall reviewing the table, but cannot recollect anything in particular about my review.

Appendix C Quantitative Precipitation Forecasts

- 106 Terry Malone prepared the summary table in this Appendix. I don't know who copied or formatted the forecast information into this Appendix.

Appendix D Catchment Rainfall

- 107 I produced figure 1 in this Appendix.
- 108 Terry Malone produced Table 1 and the remaining figures.

Appendix E Situation Reports

- 109 The situation reports were collated and assigned a chronological number for reference use for inclusion in the Flood Report. I cannot recall who collated the situation reports, but I believe it may have been a data collector or technical assistant.
- 110 In that process, it appears some of the situation reports were left out of the Flood Report inadvertently by the person who collated them for inclusion. I note that one of these situation reports is the 5.53pm report from Saturday 8 January 2011. By way of comment I note that I had included the complete text of this situation report in my supplementary statement dated 29 March 2011 (exhibit 18 before the Commission of Inquiry at paragraph 49).
- 111 I believe some of the other situation reports were not chronologically included in the Flood Report by the person who collated them for inclusion.
- 112 I can't recall ever checking to ensure that each situation report had been included in the Flood Report.

Appendix F Communication Protocol Technical Situation Reports

- 113 I am unsure who collated this Appendix of the Flood Report. The technical situation reports were collated from emails sent by Mr Rob Drury during the Flood Event.

Appendix G Severe Weather Warnings

- 114 I am unsure who collated this Appendix of the Flood Report from the information received from the BoM during the Flood Event.

Appendix H Flood Event Notification Email

- 115 I am unsure who collated this Appendix of the Flood Report.

Appendix I Flood Readiness Checklists

116 I am unsure who collated this Appendix of the Flood Report.

Appendix J Forecast Rainfall Comparison

117 Terry Malone was the principal author of this Appendix. I can recall reviewing the data in this Appendix.

Appendix K Three Day Assessments and Model Results

118 I was the principal author of this Appendix, and I produced the tables and graphs. Terry Malone produced the copy of the email for inclusion in this Appendix.

Appendix L Flood Operations Directives

119 I am unsure who collated this Appendix to the Flood Report.

Appendix M Flood Event Log

120 I believe that Chloe Cross (an administrative assistant at Seqwater) removed individual names and gate operation directives (as explained in Appendix M).

121 By way of additional comment I note the entry for 3.30pm Sunday 9 January 2011 and see that "Engineer 1" is referred to in the far right column of Appendix M. I note that this is an error and in this instance refer to Exhibit 23 before the Commission of Inquiry where for the same entry the cipher NGA is attributed to this event.

Appendix N Flood Operation Engineers Resumes

122 I drafted the section of this Appendix for Engineer 1.

Appendix O Daily and Hourly Rainfall Tables

123 Terry Malone compiled this Appendix. I reviewed the data contained in this Appendix and I cannot recall making any comment.

Appendix P Rainfall Intensity Frequency Duration

124 Terry Malone and John Ruffini prepared this Appendix. I reviewed the data contained in this Appendix and I cannot recall making any comment.

Appendix Q Recorded Height Hydrographs

125 Terry Malone produced the plots. I reviewed the data contained in this Appendix and I cannot recall making any comment.

Appendix R Ratings

126 I was the principal author of this Appendix. I extracted the information from the RTFM and plotted the information into graph form.

Appendix S Model Calibration Runs

127 I produced the tables and graphs in this Appendix from information extracted from the RTFM.

Appendix T Rainfall Station Temporal Patterns

128 Terry Malone was the principal author of this Appendix. I recall reviewing the data but cannot recall making any comment.

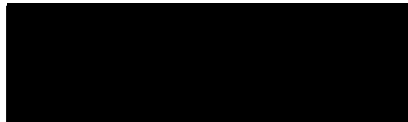
Appendix U Wivenhoe Dam Hydrology Reports

129 I produced the list of Wivenhoe Dam hydrology reports noted in this Appendix.

AND I MAKE this solemn declaration conscientiously believing the same to be true and by virtue of the provisions of the *Oaths Act 1867*.

Affirmed and Declared at Brisbane)

this 30th day of January 2012 in the)
presence of:)



.....

Signature of the declarant



Solicitor

Tulani Love