Queensland Floods Commission of Inquiry
Level 30 400 George Street
BRISBANE QLD 4000

L111128_111024

28 November 2011

Attention: Mr Julian Ensbey

Dear Sir,

Re: Response to Seqwater submission "Further response to Mr Babister's hydrodynamic modelling report," dated 21 November 2011

1 We refer to the Commission's request that WMAwater provide a written response to the Seqwater submission above, which relates to WMAwater's *Review of Hydraulic Modelling Final Report* (the WMAwater report, Reference 1).

2 Specifically, the Commission requested that WMAwater address questions or issues arising from the submission, and additionally undertake independent modelling of the scenarios assessed by Mr Terry Malone in his "Preliminary Investigation of the Flood Mitigation Benefits of Operating Wivenhoe Dam at 75% of FSL," dated November 2011.

Issues Arising from Seqwater Response

3 The discussion presented in the Seqwater submission relates generally to the "Option B" hypothetical scenario assessed in WMAwater's report (Reference 1). The Option B scenario estimated the impact on flood behaviour during the January 2011 flood event, had the storage level in Wivenhoe Dam been at 75% of FSL prior to the commencement of the flood-producing rainfall, rather than close to 100% as actually occurred. The Option B scenario did not consider any changes to the dam operational procedures for flood mitigation.

4 Seqwater (via Allens Arthur Robinson) raise the following objection relating to the Option B scenario in their submission:

> *We are instructed that Mr Babister's conclusion of a 0.3 metre reduction at the Brisbane Port Office is based on an assumption that Strategy W1 is effectively bypassed. This assumption is evident from paragraph 77.*
>
> *Our client does not agree that this would occur in real time flood operations. Nor is it permitted under the Manual.*

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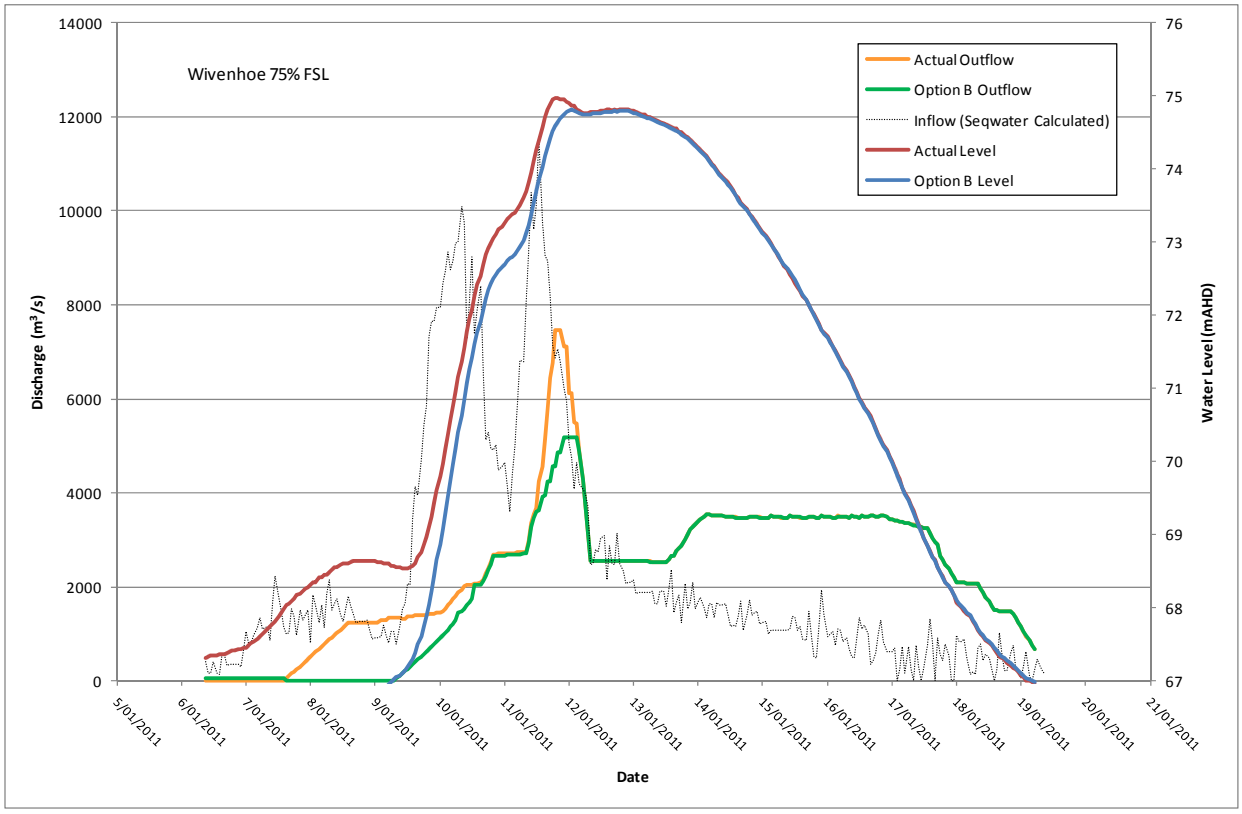
The effect of this assumption is to overstate the potential reduction in flood levels downstream of Wivenhoe Dam for Option B which are [sic] *reported in Mr Babister's report.*

5 Bypassing Strategy W1 is permitted under the Manual (Reference 8), as clearly indicated by the flow chart on page 23 of that document, described on page 22 as "showing how best to select the appropriate strategy to use at any point in time." The flow chart requires that Strategy W1 be bypassed if the Wivenhoe Dam level is "likely to exceed EL 68.5 m" [68.5 mAHD], once a Flood Event has been declared, presumably as a result of the Wivenhoe Dam level exceeding 67.0 mAHD. The criteria for "declaring a Flood Event" are not explicitly stated in the Manual, but there is an implication that this occurs once the dam level enters the flood storage compartment above 67.0 mAHD.

Figure 1: Option B scenario from Reference 1



6 In the hypothetical Option B scenario modelled by WMAwater, the early part of the flood is contained by the additional 25% of FSL available from the 75% FSL starting condition. The Wivenhoe Dam level rises above 67.0 mAHD at 7:00am on 9 January, at which time the inflow to the dam exceeds 1,000 m^3/s and is rising quickly to over 7,000 m^3/s within 12 hours (refer Figure 1).

7 At that time when the dam level exceeds 74.0 mAHD, even in the extreme case where the gates are opened according to the minimum intervals specified in the Manual, the level in Wivenhoe Dam could not have been kept below 68.5 mAHD. With the maximum outflows specified by Strategy W1, it would have been impossible to keep the Wivenhoe Dam level

below 68.5 mAHD. The operator would therefore have been required to bypass Strategy W1 according to the flow chart on page 23 of the Manual.

8 Presumably under these circumstances, prior to the dam level reaching 67.0 mAHD the dam operator would have been aware from modelling that Strategy W1 would either be bypassed or only implemented for a very short duration (perhaps a few hours), and would have had time to provide some warning to downstream communities about impending road and bridge closures.

9 WMAwater therefore reaffirm that under the hypothetical Option B scenario, it is appropriate to assume that "Strategy W2 would have been engaged almost immediately," as per Paragraph 77 of Reference 1. WMAwater consider that the estimated impacts reported for the Option B scenario are not overstated as suggested by Seqwater.

10 Additionally, WMAwater consider that regardless of whether Strategy W1 was hypothetically implemented or not, the decision would have had a negligible effect on the overall release sequence estimated for Option B, and this estimated impacts reported are therefore not influenced by the assumptions relating to Strategy W1.

Flood mitigation releases from Wivenhoe Dam below 100% FSL.

11 The Seqwater submission includes modelling by Mr Terry Malone estimating the potential impact on flood levels for the January 2011 flood event, if:

a. the Wivenhoe Dam level had been 75% of FSL prior to the flood commencing; and

b. The Manual permitted dam releases to be made with the Wivenhoe Dam level between 75% and 100% of FSL.

12 The Seqwater submission includes the following findings based on this modelling:

> *In summary, the modelling suggests that if a flood event similar to January 2011 was experienced in the future, a reduction in water storage to 75% of FSL prior to the commencement of the event with a commencement of flood releases at that level, could reduce the flood level at the Brisbane Port Office by between 0.2 metres and 0.4 metres.*
>
> *The reduction in flood level of 0.4 metres assumes an aggressive approach to maximising river flows within the allowable limits of the Manual. We are instructed that it is unlikely such an approach would be adopted by a responsible flood engineer in real time. The reduction of 0.2 meters assumes a less aggressive approach that is more likely to be adopted in real time.*

13 The Commission requested that WMAwater undertake independent modelling of the scenarios presented by Mr Malone in the Seqwater submission. WMAwater do not have access to the working of Mr Malone, and have endeavoured to reproduce the outflow sequences shown in Figure 1 and Figure 2 of the submission, although inevitably there are some minor differences. The outflow sequences from Seqwater and reproduced by WMAwater are shown in Figure 2 and Figure 3 respectively, below.

Figure 2: Seqwater outflow scenarios for 75% of FSL, using Revision 9 of the Manual

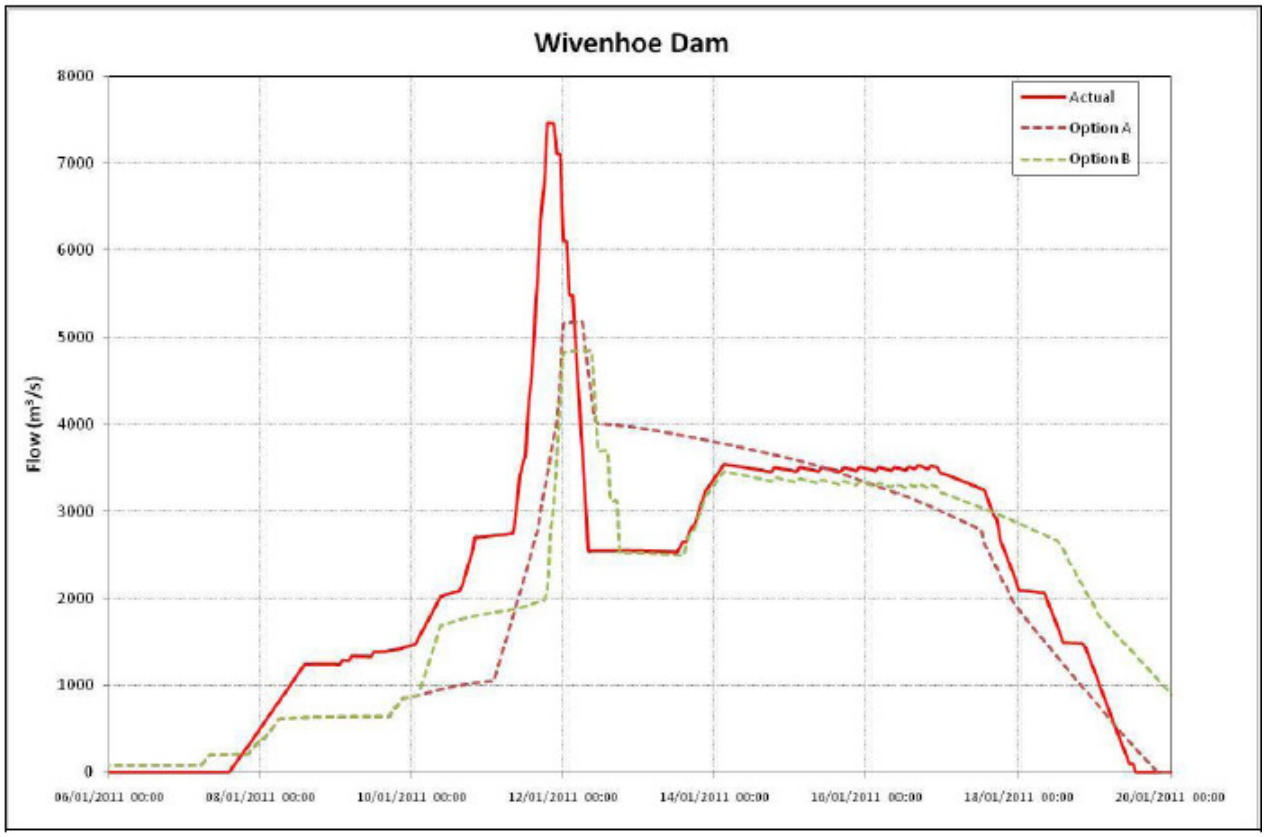
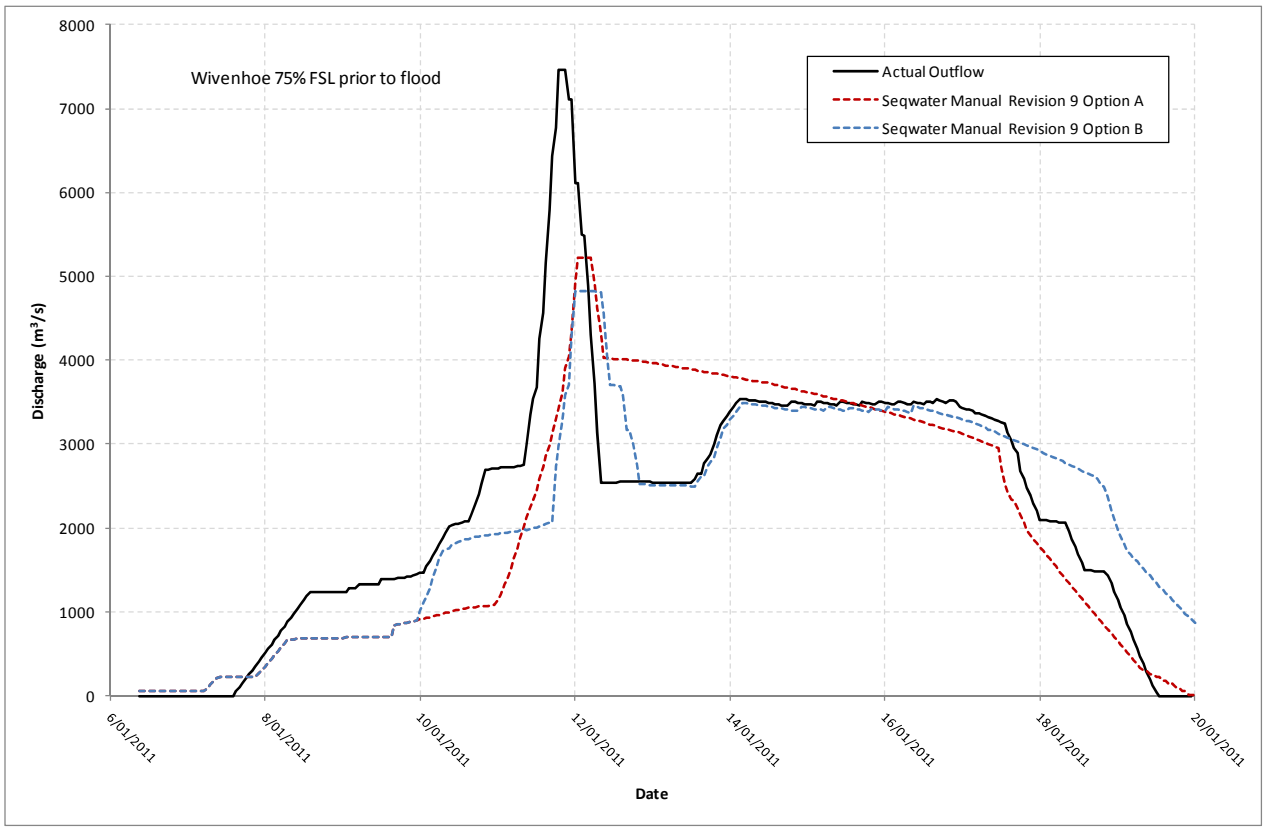


Figure 3: WMAwater replica outflow scenarios



14 Please note that the Seqwater submission refers to "Option A" and "Option B," which are not to be confused with the "Option A" and "Option B" referred to in previous WMAwater reports, and in paragraphs 3 to 10 above. In an attempt to avoid confusion, this document refers to the Seqwater scenarios as "Seqwater Manual Revision 9 Option A" and "Seqwater Manual Revision 9 Option B."

15 WMAwater used the two dam outflow scenarios above as inputs to the SKM/Seqwater MIKE11 model (Version 2) as per the previous modelling assessments (References 1 and 10). The results were compared to "Case 1," which is a calibrated model scenario corresponding to the actual dam releases and recorded flows from the January 2011 event. The peak flows and levels at various locations were compared to assess the potential impact of the alternative release scenarios.

16 Peak flood levels at key locations from the modelling of the above scenarios are presented in Table 1 below. A negative value of "Peak Flood Level Difference" for a given scenario indicates a benefit (i.e. a reduction in flood levels compared to what actually occurred). The impacts assessed by Seqwater in their submission are provided for comparison.

Table 1: Alternative Dam Operation Scenario Results

		Manual Revision 9 Option A		**Manual Revision 9 Option B**	
Location	**Case 1**	**Seqwater Submission**	**WMAwater Modelling**	**Seqwater Submission**	**WMAwater Modelling**
	Peak Flood Level (mAHD)	Peak Flood Level difference relative to Case 1 (m)			
Moggill	17.6	-0.59	-0.63	-0.89	-0.83
Jindalee	13.1	-0.54	-0.55	-0.79	-0.74
Oxley	8.3		-0.43		-0.60
Brisbane	4.6	-0.20	-0.21	-0.35	-0.32

17 The results obtained by WMAwater are very similar to those obtained by Seqwater. The minor differences can most likely be attributed to differences in the Wivenhoe Dam outflow hydrographs, which were derived independently by WMAwater based on visual inspection of the chart in the Seqwater submission (refer to Figure 2 and Figure 3). WMAwater consider that these results are essentially equivalent to those provided in the Seqwater submission, as the differences in estimated flood level impacts are within the likely bounds of modelling error associated with those estimates.

Further Comments

18 The impacts on flood levels resulting from these scenarios are similar to those estimated by WMAwater for the scenario where the initial Wivenhoe Dam level was at 75% of FSL, but the gate operations were left unchanged (Option B, Reference 1). The statement from Paragraph 99 of Reference 1, that the benefits for flooding would be expected to improve if gate

operations were modified to take advantage of the additional flood storage available, is not necessarily supported by these results. WMAwater provide some discussion below in relation to this outcome.

19 The main reason for the similarity of results between Option B (initially 75% of FSL with releases only above 100% of FSL) and the options above (initially 75% of FSL with releases commencing above 75% FSL), is that in either case, the January 2011 flood event produced enough inflow to Wivenhoe Dam that Strategy W4 would eventually be required during the second larger inflow peak. As a result, the peak outflow from Wivenhoe Dam in either scenario is similar (5,200 m^3/s for Option B, versus 5,200/4,800 m^3/s for Seqwater Manual Revision 9 Option A/B respectively). Additionally, in the first of the Seqwater scenarios, the dam releases remain elevated near 4,000 m^3/s immediately after the peak, rather than being reduced below about 2,500 m^3/s for about 24 hours as actually occurred, and as modelled in Option B of Reference 1.

20 This outcome (a similar benefit to flooding from initial storage 75% of FSL under both Revision 7 and Revision 9 of the Manual) is therefore reasonable for the January 2011 flood. However WMAwater still expect that allowing releases below 100% of FSL as per Revision 9 of the Manual, would generally be expected to produce better flood mitigation for floods where the majority of inflow volume occurs early in the flood, or where there is a single peak.

Comments on Revision 9 of the Manual

21 For the purposes of this assessment, the Commission provided WMAwater with a preliminary copy of Revision 9 of the Manual (Reference 12) under conditions of confidentiality. WMAwater were not asked to comment on the revised Manual, but insofar as the revisions affect this assessment WMAwater make the following observations.

22 It is not particularly clear under what circumstances releases can be made below 100% of FSL, and whether there is a lower limit below which releases for flood mitigation should not be made (although the spillway crest is at 57.0 mAHD preventing radial gate releases below this level).

23 WMAwater have not made a detailed assessment as to whether the Seqwater dam outflow scenarios (Figure 2) for compliance with Revision 9 of the Manual. However it is observed that the scenarios in the Seqwater submission do not retain the Wivenhoe Dam level at near FSL (67.0 mAHD) at the conclusion of the flood event, as per Section 3.5 of Revision 9 of the Manual. This factor is not considered to significantly impact the outcomes of the modelling undertaken for these scenarios, which have been focused on peak flows and flood levels.

Clarification Regarding the Port Office Gauge

24 Paragraphs 36 to 38 of Reference 11 address the issue of different flood level readings between the Brisbane River City Gauge (operated by Seqwater) and the Brisbane Port Office Gauge (operated by Maritime Safety Queensland (MSQ)) during the January 2011 flood. The Commission have indicated that the discussion from Reference 11 could be construed as

inconsistent with evidence provided by Mr Babister during Commission hearings (transcript for Day 51, pages 4421 to 4423), and have requested clarification.

25 WMAwater maintain (as per Mr Babister's evidence before the Commission) that the higher level recorded at the Seqwater gauge (peak level of 4.46 mAHD) was the appropriate level to use for modelling analysis at that location. The main reason for adopting this level was that it was verified by manual inspection of the gauge boards during the flood, whereas WMAwater understand that readings from the MSQ gauge was not verified during the event, but that the gauge was tested after the event and found by MSQ to be providing accurate readings.

26 The additional discussion provided in Reference 11, in response to a submission by Mr Michael O'Brien, was intended to highlight that some uncertainty remains as to the cause of the different readings between the gauges, as the operators of each gauge maintain that their gauge was functioning correctly. This uncertainty would be best addressed jointly by the agencies responsible for the gauge operation.

27 For the purposes of the modelling assessment however (and therefore for addressing issues raised by Mr O'Brien), WMAwater remain of the view that the levels from the Seqwater gauge are appropriate for use, as they were manually verified during the flood.

Yours sincerely,
WMAwater

Mark Babister
Director

Rhys Hardwick Jones
Associate

References

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Review of Hydraulic Modelling – Queensland Floods Commission of Inquiry
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4. SKM
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Seqwater, August 2011.

5. WMAwater
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Queensland Floods Commission of Inquiry, May 2011

6. WMAwater
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Queensland Floods Commission of Inquiry, September 2011

7. WMAwater
Supplementary Report – Ipswich Flood Frequency Analysis
Queensland Floods Commission of Inquiry, October 2011

8. Seqwater
Manual of Operational Procedures for Flood Mitigation at Wivenhoe and Somerset Dam – Revision 7
November 2009

9. Seqwater
January 2011 Flood Event – Report on the operation of Somerset Dam and Wivenhoe Dam
March 2011

10. WMAwater
Modelling of Additional Dam Release Scenarios – Addendum to "Review of Hydraulic Modelling" Report
Queensland Floods Commission of Inquiry, November 2011

11. WMAwater
Response to Submissions Relating to WMAwater Report: "Review of Hydraulic Modelling" for the Queensland Floods Commission of Inquiry
Queensland Floods Commission of Inquiry, November 2011

12. Seqwater
Manual of Operational Procedures for Flood Mitigation at Wivenhoe Dam and Somerset Dam – Revision 9
November 2011