Submission to Floods Commission of Inquiry – 6th March 2011.

[redacted]

Background:

Engineer with some experience in water industry, and interested amateur dam watcher. I have been personally affected by this flood. Our company's Bundamba project office was fully submerged despite being located above the 1 in 100 ARI flood line. The flood exceeded the 1 in 100 yr level by around 2.7m, verified by licensed surveyors.

My main concern is the operation of Wivenhoe and Somerset Dams and the impact of the January 12th flood on:

- my employer's operations at Bundamba and Goodna,
- suburbs near my home: St Lucia, Indooroopilly and Toowong.

I have spent time researching and reading extensively on the flood, and present below in summary my key findings. I am making this submission as an interested private citizen, not in my capacity as an engineer, as it is not my area of professional practice.

KEY FINDINGS:

FINDING 1: The dual purposes of the dam should not be viewed as two static compartments

The people of south east Qld require two things of this dam: water supply and flood mitigation. At present these competing demands are divided into two compartments. There is no reason these two objectives, rather than being viewed as "fixed compartments", could not be viewed as separated in time. The volume of the two compartments could differ between years, depending on the SOI or other seasonal predictors.

FINDING 2: The Dam Operations Manual makes no mention of the SOI, or other rainfall seasonal predictors.

The Dam operating manual should be completely re-done to vary the required operating level in two ways:

- According to the SOI and time of year a strategic level should be set such that it is reasonable to expect it to be 100% FSL at the end of the wet season
- According to short term weather warnings such as those released on 5th January by the Bureau of Meteorology, to lower below 100% FSL as rain approaches, to provide additional flood mitigation.

Therefore

- During the wet season, in years with high SOI, the dam operations for Wivenhoe should adopt a lower target level for full water supply, at least until near the end of the wet season. This target could vary depending on the calendar. The target could be say 70% on 1 January, 75% on 1 February, and then increase linearly on a daily basis until it reaches 100% by mid-April. Statistical maths techniques should be applied to develop some science around this approach, considering the dates of the largest rain events.
- At any time it goes above 100%, this should be reduced with the maximum speed possible / practical, rather than allowing it to go up to 148% over the weekend as occurred.
- When there is a reasonable certainty (or reasonable prospect) that the dam will refill, **it should be pro-actively lowered as rain event approaches**, to be conservative, rather than relying on releases after the flood event. **Why not return to 100% from below, rather than above?**

As the science of SOI and other climate factors develop, the operations should be adjusted accordingly. Section 7.5 of the operations manual requires a five-yearly review:

> *Prior to the expiry of the approval period, Seqwater must review the Manual pursuant to provisions of the Act. The review is to take into account the continued suitability of the communication network and the flood monitoring and forecasting system, as well as hydrological and hydraulic engineering assessments of the operational procedures.*

So why not make this five-yearly review of the operations manual subject to debate and reviewed at a public conference, with papers called prior? The science behind SOI and other climate indicators will undoubtedly develop to the point where it needs a major review at least every five years, maybe three years in the short term.

FINDING 3: Inadequate Response from Dam Operators

The Dam operators did not respond adequately to warnings circulated by the Bureau of Meteorology and Emergency Management Qld as early as Wednesday prior to the flood. The Chief Executive of Seqwater has been reported widely as saying "nobody had foreseen the extreme rainfall that ensued[i]". This statement seems to be at variance with internal email circulated from Emergency Management Qld which had been forwarded to me prior to the flood to alert me to risks on our construction project. This email identifies the expectation of 300 mm of rain in the next 7 days.

This email was only a repeat of publically available information from the Bureau of Meteorology[ii]. However it shows the emergency management and related agencies within the government were aware of the impending rain and presumably undertaking contingency planning. Everyone knew there was a major rain event coming. Over a 7000 km2 saturated catchment, approx 166mm will fill it from zero to 100% FSL, so why not significantly lower the dam prior to 300mm of rain arriving?

FINDING 4: Inadequate Warnings issued on morning of Tuesday 11th January

Warning of at least localised flooding should have been issued by the authorities at latest by 7am on Tuesday 11th January. When I arrived at work at 7.30am that morning I was aware the dam was at least 150% full from Monday, and likely to be rapidly rising. I calculated very simply how much more rainfall was coming into the system using the Bureau of Meteorology website. I googled graphs of the how the dam storage would increase[iii], and quickly determined that either the fuse plugs would be breached or (as actually happened) the operators would be forced to release water to prevent this. As I said to a meeting we called at 9.30 am to send our staff team home, "the dam operators will shortly run out of options and have to release water".

Hydrology is not my area. I learned most of what I knew about Wivenhoe's storage level behaviour on the morning of 11th January because I was worried. I did not fully realise the impact of what was about to happen, and suspected only minor/local flooding, having no knowledge of Brisbane River flows. Our office was above the 1 in 100 ARI, so it felt safe, yet it was fully inundated. Why did no expert predict this?

I emailed my manager with the graphs I had downloaded at 8.35am on 11th January. I forwarded this email to my wife at 9.17am, saying *"The numbers here are scary and I think the media is not telling us the whole truth. Wivenhoe will be out of flood mitigation capacity by lunch time"*. The fact that no warnings were issued until later that day is unacceptable.

FINDING 5: Operation "in accordance with manual" can be debated.

The widely reported assertion that the dams were "operated in accordance with the manual" is a point I feel can be debated.

The Operations manual defines a flood event as:

> *"**Flood Event**" is a situation where the Duty Flood Operations Engineer expects the water level in either of the Dams to exceed the Full Supply Level;*

On this definition then, the "Flood Event" commenced as early as the Wednesday prior to the flood.

Page 23 of the manual contains a flowchart. This requires the adoption of at least strategy W2 if the level is likely to exceed 68.5m. It is reasonable to conclude that strategy W2 or W3 should have been adopted as early as Friday or at the latest, Saturday morning. There is a gap in the dam level data on the weekend, but it is reasonable to assume 68.5m would have been forecast based on predicted rainfall by at latest Saturday night, triggering at least W2. Clearly this didn't happen.

The BOM rainfall radar for 24 hrs up to 9am on Monday 10th[iv] shows the inflows which were causing the dam to rise. Simply measuring area "medium red" (scaling from range circles at 50km and 100km suggests around 4000 km^2) and depth 200mm shows there is *at least* 800GL to enter the dam, which was already at 148%. That would bring the dam level to 217% (2530GL) or approx RL 76.5 – 77. Therefore by 9am Monday morning at the very latest, W4 should have been initiated. The reported release at this point is only 2600m3/sec (224GL/d) which would:

1. Still leave the dam at a level where fuse plugs would overtop.
2. Leave no spare capacity for the predicted rain which was to arrive on Tuesday.

Whichever strategy was adopted, it is clear the dam operators had no plan which would result in the dam levels return to 100% within 7 days of the flood event commencing (Wednesday 5th).

The leaked emails from the "Michael O'Brien" article[v] show the operators expected releases to continue until Sunday 16th, some 12 days after the start of the "flood event" as defined by the manual. So this would appear to not comply with the legislated requirement to return to 100% within 7 days.

Section 8.3 states:

> ***8.3 Initial Flood Control Action***
> *Once a Flood Event is declared, an assessment is to be made of the magnitude of the Flood Event, including:*
> *• A prediction of the maximum storage levels in Wivenhoe and Somerset Dams.*
> *• A prediction of the peak flow rate at the Lowood Gauge excluding Wivenhoe Dam releases.*
> *• A prediction of the peak flow rate at the Moggill Gauge excluding Wivenhoe Dam releases.*
> *The spillway gates are not to be opened for flood control purposes prior to the reservoir level exceeding EL 67.25.*

Noting also that the manual section 2.2 requires:

> *A Duty Flood Operations Engineer is on call at all times. The Duty Flood Operations Engineer must constantly review weather forecasts and catchment rainfall and must declare a Flood Event if the water level of either Wivenhoe or Somerset Dam is expected to exceed Full Supply Level as a result of prevailing or predicted weather conditions.*

I think the commission of inquiry should uncover at what time the Flood Event was declared and how it was progressively updated. What levels were forecast? Can the widely reported assertion that the dam was operated in accordance with the manual be sustained under thorough analysis of the documents created under clause 8.3 and others between 6th-15th January?

The manual also contains:

2.9 Report

Seqwater must prepare a report after each Flood Event. The report must contain details of the procedures used, the reasons therefore and other pertinent information. Seqwater must forward the report to the Chief Executive within six weeks of the completion of the Flood Event.

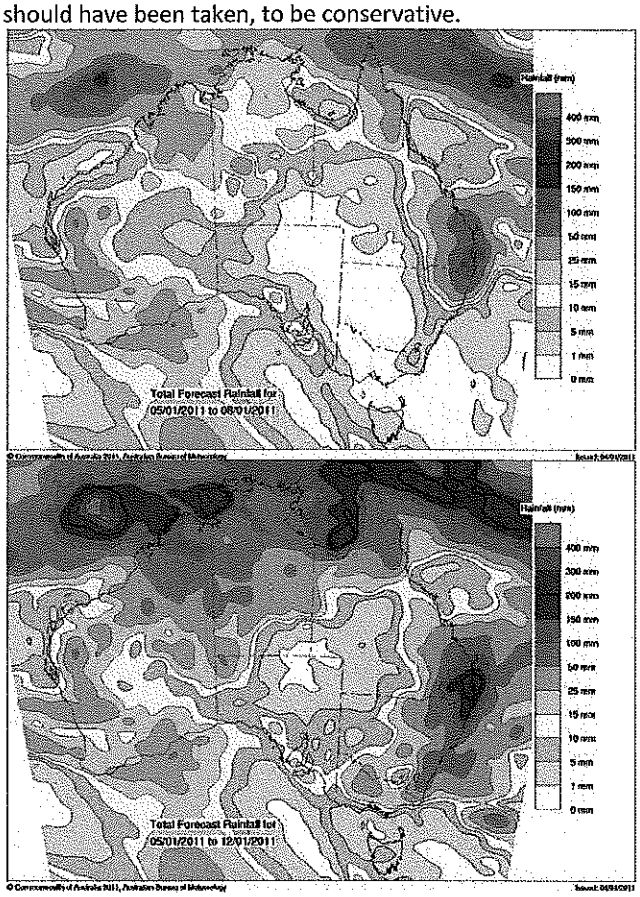
Where is this report, now due? Can it be released under Freedom of Information legislation?

CONCLUSION

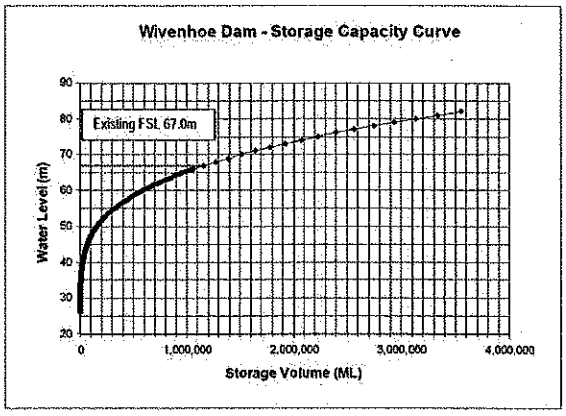
I have set out above as concisely and simply as I can my personal concerns and what I am hoping for out of the inquiry. I understand there are many people with greater understanding of these matters, and know there are many fine water engineers and hydrologists in Queensland. I am making this submission due to the impact on me personally and on the team I lead at work, some of whom have lost possessions and all of whom suffered many extra hours of work and stress. I think the people of Brisbane and Ipswich deserve dam management and operations practices of the highest quality, something I personally believe we have not had. I await the Inquiry's outcome with great interest.

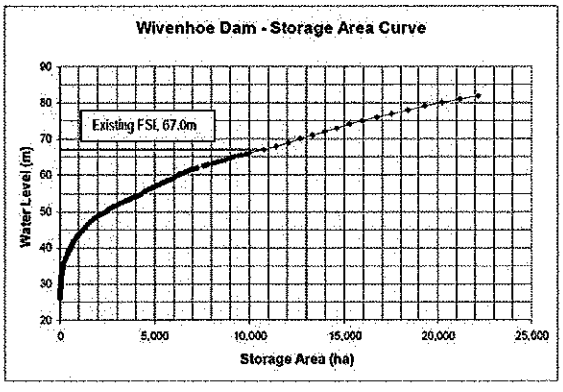
[i] http://www.theaustralian.com.au/national-affairs/water-releases-before-deluge-too-low-dam-expert/story-fn59niix-1225989066171

[ii] The emergency services email contained the following graphics. Note the volume of rain experienced over the weekend is higher than predicted by these two charts but in general it is clear what was coming, and proactive measures could have and should have been taken, to be conservative.

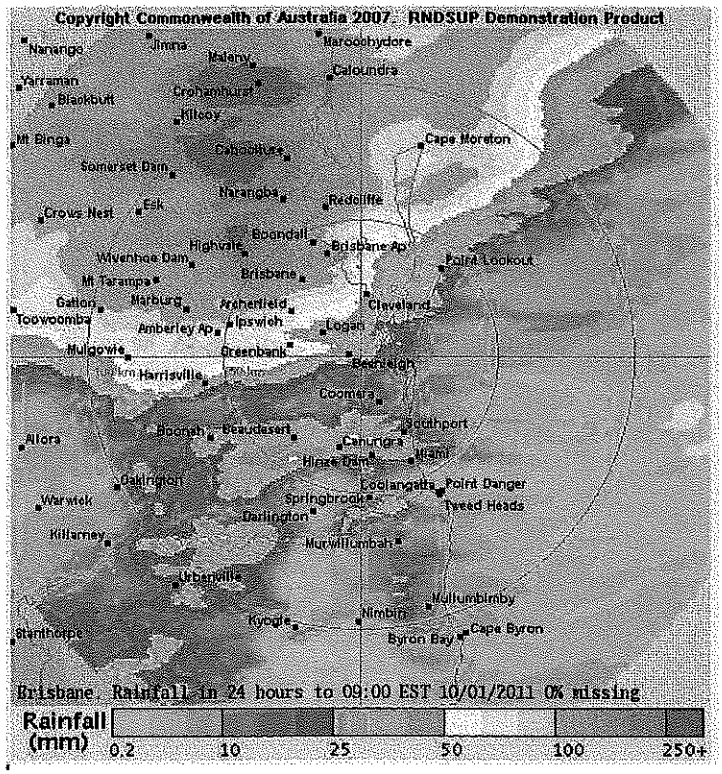


[iii]





[iv]



[v] http://www.theaustralian.com.au/in-depth/queensland-floods/engineers-emails-reveal-wivenhoe-dam-releases-too-little-too-late/story-fn7iwx3v-1225991990957 includes the following:
By 3.25am on Monday, the email alert advises: "We have experienced a rapid increase in river levels and inflow rates in the upper-Brisbane River . . . Increases in Wivenhoe Dam release rates began at 0200hrs this morning. Initial target is 2600 cumecs, and potential peak rate is 3500 cumecs. The release is now expected to continue until at least Sunday 16 (Jan)."