Queensland Floods Commission of Enquiry

'2011 Brisbane Floods – A Geography Lesson'

Introduction

This is a private submission. Its scope is limited to the January 2011 floods that affected Brisbane, Ipswich, Toowoomba, and the Lockyer Valley.

I have no qualifications in weather science or hydrology. While I do not have the status of a professional or an expert in that field, I also have no preconceived notions about it. That is in fact why I decided to write to you. I believe that input from ordinary citizens such as I can give a dynamic balance to your process.

You will have access to many professional opinions from experts in the disciplines relevant to your enquiry's Terms of Reference, and quite rightly their professional opinions will have considerable weight and influence. However, there is an increasing tendency to rely on computer 'modelling' to back up professional opinions. These models are designed to test scenarios involving multiple variables and they are useful. However, they are only as good as the facts and assumptions that underpin them. Their disadvantage, and hidden danger, is that they are abstract, and they can create blind spots whereby simple facts fail to be considered.

I was also motivated to write this submission by some reports that appeared in the print and electronic media after the floods in Brisbane. The floods had barely receded before they started the 'blame game', with some turning their sights on the operators of Wivenhoe Dam. These reports generally lacked objectivity and balance and the result is that many ordinary people to whom I talk actually believe that the Brisbane floods were caused by water released from Wivenhoe Dam. Various 'experts' were quoted and while I accept that these people may have been quoted out of context, I doubt if many of those journalists and others making public comments would know even the basic geography of our region, or even know that half of the major catchments feeding into the Brisbane River are downstream from the Wivenhoe Dam.

I carried out my own research into the facts of what happened and I feel that it is my duty as a citizen to share the results of this research with you. Hopefully there will be others with more resources at their disposal than I have who will have done a more comprehensive fact-finding and analytical exercise. However, if no one else provides you with these basic facts, then at least I will have.

Research sources

Rainfall details produced by the Bureau of Meteorology are published on its website, www.bom.gov.au, under 'Climate Information/Climate Data Online'. I extracted relevant information from the Bureau's online archive and this is collated in Tables 1 and 2 at the end of this submission.

I used 1:100,000 scale topographic maps produced by the Australian Surveying and Land Information Group (AUSLIG), Department of Industry, Science, and Resources, to cross-check weather station locations and identify the major and minor tributaries in the catchments. The reference maps are:

- 9243 Oakey
- 9242 Toowoomba
- 9241 Allora
- 9341 Warwick
- 9342 Helidon
- 9343 Esk
- 9344 Nanango
- 9444 Nambour
- 9443 Caboolture
- 9442 Ipswich
- 9441 Mount Lindesay
- 9544 Caloundra
- 9543 Brisbane
- 9542 Beenleigh
- 9541 Gold Coast/Murwillumbah

Information from the Bureau of Meteorology

The Bureau of Meteorology has published a number of brochures that describe its flood warning systems in periods of heavy rainfall. In the brochure titled *'Flood Warning System For The Brisbane River Below Wivenhoe Dam To Brisbane City'*, it is stated that:

> '**Flood Risk**
>
> The Brisbane River catchment covers an area of approximately 15,000 square kilometres ***of which about half is below Wivenhoe Dam***. The Lockyer-Laidley Valley drains into the Brisbane River just downstream of Wivenhoe Dam near Lowood. The second major tributary, the Bremer River, flows into the Brisbane River at Moggill. ***Heavy rains in these areas can cause severe flooding of rural districts in the Lockyer and Bremer Valleys and along the Brisbane River.*** Severe flooding of the Cities of Ipswich (refer to brochure for the Bremer River) and Brisbane has occurred on several occasions. ***Although Wivenhoe Dam significantly reduces the frequency of flooding in Brisbane City, major flooding can still occur***. (Emphasis added)
>
> Flooding in the Brisbane City area can also be caused by local creeks including Oxley and Bulimba Creeks on the southside, and Kedron Brook, Moggill and Enoggera Creeks in the northern and western suburbs. During intense rainfalls, the suburban creeks rise very quickly and can cause significant flooding of streets and houses.'
>
> …..
>
> '**BRISBANE RIVER CATCHMENT - ASSESSMENT OF THE FLOOD POTENTIAL**
>
> Major flooding requires a large scale rainfall situation over the Brisbane River catchment. The following can be used as a rough guide to the likelihood of flooding in the catchment:
>
> **Brisbane River:**
>
> **Average catchment rainfalls in excess of 200-300mm in 48 hours, may result in stream rises and the possibility of moderate to major flooding and local traffic disabilities throughout the Brisbane River catchment**. (Emphasis added)
>
> **Brisbane Metropolitan Creeks:**

> Average catchment rainfalls in excess of 35mm in 3 hours, may result in stream rises and the possibility of minor flooding and local traffic disabilities in the Enoggera, Breakfast, Moggill and Bulimba Creeks and Kedron Brook. Whilst average catchment rainfalls in excess of 100mm in 3 hours may result in stream rises and the possibility of major flooding and local traffic disabilities.
>
> However, in the Oxley Creek catchment average catchment rainfalls in excess of 100mm in 6-12 hours may result in stream rises and the possibility of major flooding and local traffic disabilities.' [1]

From the Bureau information above it follows that even if there were no rainfalls in the upper Brisbane catchment above Wivenhoe, it is possible to have major floods in the lower Brisbane River if enough heavy rain falls in the Bremer, Lockyer, and metropolitan creek catchments alone. Even though this was not the case in January 2011, it demonstrates that the significance of these catchments below Wivenhoe cannot be underestimated in any analysis of the cause of the floods during that month.

Geography of the Brisbane River catchment below Wivenhoe

In this paper I have not attempted to discuss the effects of every metropolitan creek that feeds into the lower reaches of the Brisbane River. I have confined the scope to its two major tributaries below Wivenhoe, namely Lockyer Creek and the Bremer River, and three creeks – England, Banks and Cabbage Tree Creeks – that enter the Brisbane River at points between the entry of the Lockyer and Bremer systems.

Lockyer Creek

Lockyer Creek flows into the Brisbane River just below the Wivenhoe Dam spillway at a location known as Wivenhoe Pocket, not far from the town of Lowood.

Lockyer Creek itself starts at the foot of the Toowoomba escarpment on the Great Dividing Range. From the 1:100,000 maps it is difficult to conclusively determine where it officially begins, that is, whether it has minor branches that rise in the range, or whether its source consists of other creeks that rise in the range and join it at the bottom of the range. These creeks are: **Murphy's Creek** that has its source near Highfields and Spring Bluff; **Little Oaky Creek** that rises in the Dividing Range directly east of Toowoomba and eventually joins **Rocky Creek** that rises near Harlaxton and which in turn eventually joins **Six Mile Creek.** The latter rises on the range further north and flows down through Postman's Ridge. In any case, Six Mile Creek and Murphy's Creek eventually join at a point a few kilometres west of Helidon, from which point the creek is called Lockyer Creek.

In addition to these source streams, Lockyer Creek has several major tributaries and many smaller ones sourced in the Great Dividing Range and foothills. It has a massive catchment before it reaches the Brisbane River. These tributary streams are described briefly below:

- **Flagstone Creek** joins Lockyer Creek about one third of the way between Helidon and Grantham. It rises near the top of the Dividing Range at Glen

[1] This brochure was last updated in November 2010 before the January 2011 Brisbane flood.

Lomond, a few kilometres south of Toowoomba city. It is joined at the foot of the range by Glen Lomond Creek which also rises near the top of the range. It is then joined by another creek called Stockyard Creek that also rises in the range further south and flows through Deverton, Stockyard and the district that bears its name, Flagstone Creek;

- **Ma Ma Creek** rises in the range south of Mt Ridgley (27º42' South; 152º7' East) and **Heifer Creek** rises in the range near West Haldon (27º 48' South, 152º6' East). Heifer Creek joins Ma Ma Creek at the foot of the range and this creek flows through Fordsdale, Mt Whitestone, and the little hamlet of Ma Ma Creek and eventually joins Lockyer Creek about two kilometres east of Grantham;

- **Tenthill Creek** rises in the Main Range National Park near Mt Haldon (27º49' South; 152º49' East). At Mount Sylvia it is joined by Blackfellow Creek which runs through a long parallel valley to the west and rises almost as far south as the western slopes of the Mistake Mountains north of the Goomburra State Forest. Tenthill Creek joins Lockyer Creek just outside of Gatton;

- **Laidley Creek** officially starts at Townson at the end of the Laidley Valley at the foot of the Dividing Range. Its sources are several subsidiary streams that rise in the Main Range National Park and the western watershed of a spur of the Great Dividing Range known as the Little Liverpool Range. As it flows north it is joined by several other major creek systems, the most notable of which is **Sandy Creek** that flows along a parallel valley to the west past Mount Berryman (27º42' South; 152º19' East). Sandy Creek joins Laidley Creek just north of Forest Hill. Laidley Creek then joins the Lockyer system about ten kilometres north of Forest Hill and about 2 kilometres west of Glenore Grove. Another creek system (not named on the map) rises in the hills behind Plainland and Hatton Vale and joins the Lockyer system just east of Mount Tarampa;

- **Buaraba Creek** rises in the Ravensbourne National Park and adjacent Ravensbourne State Forest, approximately 27º20' South and 152º12' East. This creek runs east roughly parallel to Lockyer Creek, with many branches and smaller streams flowing into it from foothills such as Mt Mulgowie and Mt Hallen. Its waters are diverted into Atkinson's Lagoon near Mt Tarampa, and then flow out of that lagoon to finally join Lockyer Creek at a location called Clarendon, about 8 kilometres north-east of Lowood;

- **Plain Creek** rises at the northern end of the Little Liverpool Range near Minden and flows north past Tarampa and joins Lockyer Creek about 5 kilometres west of Lowood (that is 'as the crow flies', not the distance upstream from Lowood).

The above list is not exhaustive but it describes major steams that feed into the Lockyer system. The catchments range from latitude between 27º20' and 28º00' South, and longitude of between 152º00' and 152º30' East. With the scale of the 1:100,000 maps taken as a guide, this area is at least 2,500 square kilometres.

Bremer River

The Bremer River rises in the Main Range National Park near Mount Castle (27º58' South: 152º24' East) and in the eastern watershed of the Little Liverpool Range. Several subsidiary creeks, namely Stewart, Boyd, and Thomas Creeks, are also part of the Bremer Catchment and feed into the river at Rosevale.

From its source it flows north through Mount Walker, Rosewood, Amberley and Ipswich, until it joins with the Brisbane River at Riverview and Moggill. Along its length, the Bremer River has three major tributaries with large catchments. These are described below:

- **Western Creek**, into which also flows **Franklin Vale Creek**, joins the Bremer River just south of Rosewood. Both of these creek systems rise on the eastern watershed of the Little Liverpool Range;

- **Warrill Creek** rises in the Main Range National Park near the district of Tarome, almost as far back as the source of the Bremer River. It runs roughly parallel to the Bremer River in a northerly direction through Fassifern and Harrisville and is joined by many subsidiary streams too numerous to mention. Just south of the Amberley Defence Area, it is joined by **Purga Creek**, which comes from the direction of Peak Crossing and is sourced by numerous streams from the Flinders Peak Conservation Park and adjacent range. After it is joined by Purga Creek, Warrill Creek finally joins the Bremer River at One Mile near the boundary of the Amberley Defence Area;

- **Bundamba Creek** rises near the Mount Perry Conservation Park (27º45' South; 152º49' East). It flows north through Swanbank and Bundamba, joining the Bremer River at the Ipswich suburb of Tivoli.

A rough estimate of the total area covering the Bremer River and its tributaries, using the 1:100,000 topographic maps of the region as a guide, is about 1700 square kilometres.

England Creek, Banks Creek, and Cabbage Tree Creek

England Creek rises in the western slopes of the Brisbane Forest Park below Mount Glorious. It enters the Brisbane River below Wivenhoe near Fernvale.

Banks Creek has three branches that rise in the Cabbage Tree Range in the D'Aguilar National Park approximately half way between Mount Glorious and Mount Nebo. It joins the Brisbane River below Wivenhoe at Savage's Crossing.

Cabbage Tree also has three branches that rise in the Cabbage Tree Range in D'Aguilar National Park, but closer to Mount Nebo. With another creek called Branch Creek, Cabbage Tree Creek flows into Lake Manchester. Overflows from Lake Manchester enter the Brisbane River north of Cameron's Scrub.

The catchment areas for these three creek systems is not as extensive as the Lockyer and Bremer systems, but they are sourced in an area that has notably larger average annual rainfalls, namely Mount Glorious and Mount Nebo. The catchments are steep range slopes so flood waters flow faster and enter the Brisbane River system rapidly.

I have not attempted to discuss the impacts of the other Brisbane metropolitan creeks that enter the Brisbane River further downstream. However, as pointed out in the Bureau of Meteorology brochure *'Flood Warning System For The Brisbane River Below Wivenhoe Dam To Brisbane City'*, under the heading *Brisbane River Catchment - Assessment Of The Flood Potential*, heavy rainfalls over those catchments significantly increase the likelihood of major flooding (refer to passage quoted earlier).

The rainfall data

There are two tables at the end of this submission.

Table 1 provides rainfall measurements recorded over three days in January 2010 and, for comparison purposes, three days in January 1974 at weather stations registered with the Bureau of Meteorology. The first group of weather stations is spread widely over the Lockyer Creek, Bremer River, and Brisbane River below Wivenhoe catchment areas. The second group of weather stations are in the catchments of nearby river systems. The purpose of including the data from these other stations is to illustrate the geographical spread of where the rain fell over south-east Queensland.

Table 2 is a comparative table of total monthly rainfall for the two months of December and January in the 2010/2011 season and the 1973/74 season. The two-month view highlights both differences and similarities between the two events. How this data is significant will be discussed later.

Analysing the data in Table 1

Assumptions

1. The rainfall registrations recorded by the Bureau represent the rain that fell in the 24-hour period prior to the date of the record. Thus rain that was recorded on the 10th, 11th and 12th of January 2010 represents the rain that fell in the previous 24 hours on the 9th, 10th, and 11th of that month. A similar case applies to the January 1974 statistics.

2. Due to the deadline for this submission, time didn't enable me to collate all rain statistics for the weeks leading up to the floods and drill down into that data for more detailed analysis, so it was necessary to limit myself to what I identified as the 'tipping points' of the respective flood events.

3. The tipping points were taken to be the periods of sustained heavy rain immediately before the floods and which could be said to have triggered them. In January 2011, the tipping point was the heavy widespread rain that fell between the night of Sunday 9 January and the night of Tuesday 11 January.

In January 1974, the tipping point was the rain on the three days ending on Australia Day, that is, the 24th, 25th, and 26th January 1974.

4. In January 1974 there was a fourth day of rain on the 27th January but in general the rain was not as heavy as that on the previous day and which had actually triggered the major flood, and in many locations these falls were less than 50mm for the 24-hour period. I therefore ignored the fourth day rainfalls in the January 1974 event as it enabled a more even comparison with the 3-day event in January 2011.

5. The locations of the weather stations on the Bureau of Meteorology website are expressed in decimal fractions of a degree of latitude or longitude, whereas topographic maps show conventional degrees and minutes. In Table 1 the Bureau's decimal degrees have been converted to degrees and minutes, rounded up or down to the nearest whole minute of a degree.

What the data demonstrates

The heavy rain that fell from the 9th to 11th of January came from a stationary system of storm cells that formed in a line from the Sunshine Coast to Warwick on the Darling Downs.

In the first section of Table 1, there are records of the rain that fell over the Bremer, Lockyer Creek, and England/Banks/Cabbage Tree Creek catchments, covering 42 localities. The second section of Table 1 shows falls in catchments other than the Brisbane and Bremer systems.

The first thing that stands out is the widespread and consistent nature of the rain across all catchments. In the Bremer River system, the 3-day 2011 totals are generally lower than the 3-day 1974 totals. However there are locations in the Lockyer Creek system where the 2011 falls match or even exceed the 1974 figures, Helidon, Hatton Vale, Coominya and Lowood being examples of this. The falls in the England/Banks/Cabbage Tree Creek systems, though less than in 1974, were still very heavy (over 500mm at Mt Glorious) and would have added significantly to the water volume in the Brisbane River below Wivenhoe, particularly with Lockyer Creek in flood.

The second thing to stand out is that most locations in these catchments received more than 200mm over 48 hours, with a significant number recording over 300mm. These are the figures cited by the Bureau of Meteorology as the potential trigger for major flooding in the lower Brisbane River (see earlier).

Table 1 also shows that that heavier falls were received in the Toowoomba region and upper Lockyer Creek on the 9th and 10th, and on the 11th these falls were more concentrated to the east in the Bremer River, lower Lockyer Valley, and lower Brisbane River reaches. This likely explains the massive flash floods that hit Toowoomba and the Lockyer Valley towns on the 10th January. Those flood waters then made their way down the Lockyer valley towards the Brisbane River. Their effects were exacerbated by the heavy rains that continued to fall over the Lockyer Creek catchments on 11 January.

I also included in Table 1 rainfall data of some weather stations in the catchments of Gold Coast rivers and creeks. This data is included because it demonstrates how the flooding rains of January 2011 were concentrated in a fixed line of storm cells between the Sunshine Coast and Warwick, but were patchier over the Gold Coast catchments. This is the likely explanation why in January 1974 the Gold Coast experienced floods as major as those that hit Brisbane and Ipswich, but came through January 2011 unscathed.

Analysing the data in Table 2

The data in Table 2 is restricted to the Lockyer, Bremer, and Brisbane-below-Wivenhoe catchments, and includes data only from those weather stations for which information on both the 1974 and 2011 seasons are available.

The purpose of Table 2 is to demonstrate the degree of saturation of the relevant catchments prior to the January 2011 floods, and also to compare the weather events of January 2011 with those of January 1974.

A significant factor determining the incidence and severity of floods is the extent of saturation of the catchment area prior to the rain event. If heavy rain falls in a catchment where there have been no lead-in rainfalls, streams are either empty or their levels are very low, and dry ground in the catchment readily absorbs the first rains to fall. Thus heavy rainfall in a dry catchment might produce a minor flash flood, whereas if the catchment had been saturated by recent rains, the same rain event is more likely to result in a major flood.

The floods of 2011 occurred earlier in the month of January than they did in 1974. However, in both cases, there had been significant rains prior to the respective ‘tipping point’ events, ensuring that catchments were soaked and rivers and streams were full and at capacity.

In January 1974, there had been only moderate falls in the preceding month of December 1973 (see Table 2). However, prior to the rain events of Australia Day in 1974, and this is not reflected in the Table, there had been three weeks of consistently heavy falls across all catchments. The catchments were saturated by the time the Australia Day rain arrived.

The situation in January 2011 was different. December 2010 had been a very wet month (see Table 2). Catchments were at saturation point even before January but then more widespread and significant rains fell in the first week of January, with particularly heavy falls on the 7th. When the stationary line of storms formed on 9 January and stayed until the evening of the 11th, the catchments were saturated and the massive volumes of rain water had no place to go but downstream.

In a retrospective view, the 1974 and 2011 were, despite timing differences, very similar. Columns 4 and 7 of Table 2 compare the total rain received over the two months of December and January for each event. With few exceptions, the totals for both months across the board are strikingly close.

The Brisbane River above Wivenhoe and the role of Wivenhoe Dam

I did not collect any rainfall data for catchments above Wivenhoe because it can be taken as given that the rainfalls above Wivenhoe were consistently similar to those in Brisbane catchments below its spillway.

Following heavy spring rainfalls, Wivenhoe has been consistently opening its flood gates since October 2010 to keep its level at the 100% water supply level.

The terminology '100% water supply level' needs to be explained in relation to the dam's role in flood mitigation. The following extracts are taken from the SEQ Water website:

> **About Wivenhoe Dam**
> Wivenhoe Dam (Lake Wivenhoe) is built on the Brisbane River, approximately 80 kilometres from Brisbane. It was designed by the Water Resources Commission and built in 1984. Its primary function is to provide a safe and reliable water supply to the south-east Queensland region.
>
> …….
>
> **Flood Mitigation**
> During a flood situation, Wivenhoe Dam is designed to hold back a further 1.45 million megalitres as well as its normal storage capacity of 1.15 million megalitres. Floods may still occur in the Ipswich and Brisbane areas but they will be rarer in occurrence. Wivenhoe's flood control facility, together with the existing flood mitigation effect of Somerset Dam, will substantially reduce the heights of relatively small floods.
>
> It is anticipated that during a large flood similar in magnitude to that experienced in 1974, by using mitigation facility within Wivenhoe Dam, flood levels will be reduced downstream by an estimated 2 metres.
>
> Full supply level or 100 percent capacity (in the water level analysis) is indicative of the optimum level intended for town water supply, and does not take flood mitigation levels into account[2].

The above information means in effect that when Wivenhoe Dam is said to be at 100% water supply level, then it has a further 126% of excess capacity available as a flood buffer.

SEQ Water has also published a Fact Sheet titled *Wivenhoe and Somerset Dams: Providing water supply and flood control for South East Queensland*[3]. Relevant extracts from that Fact Sheet are quoted below:

> As soon as Wivenhoe Dam's flood storage compartment begins to fill, it has to be carefully emptied in order to make room for additional heavy rainfall events that may occur. Wivenhoe Dam's flood storage compartment can fill in less than three days following heavy rainfall. This highlights the need for strategic management of dam levels. Controlled releases consider the following flood factors: catchment runoff below the dam wall, urban runoff and river levels. …
>
> Wivenhoe Dam controls 50 per cent of the Brisbane catchment. It is therefore possible for Brisbane to flood from other sources such as rainfall in the catchment below the dam wall.

[2] http://www.seqwater.com.au/public/catch-store-treat/dams/wivenhoe-dam
[3] http://www.seqwater.com.au/news and publications/fact sheets

> A fundamental principle in the management of Wivenhoe Dam is that all floodwater should be released within seven days. This means the greater the volume received in the flood storage compartment, the greater the discharge required.

In the Appendix to this submission, there is a chart produced by the Bureau of Meteorology headed '*Water storage levels at Wivenhoe Dam'*. The chart shows that since it exceeded 100% water supply back in October 2010 after a record wet spring, excess flood waters that have entered the dam's flood compartment have been consistently released from the dam and its storage level maintained at 100% water supply.

The chart further indicates that the flood compartment of the dam was emptied in early January and that the dam was at 100% water supply level around the first week of January. It also indicates how the flood compartment filled rapidly during the week of the floods, and the graph clearly shows how the excess waters were held back during the flood period until the total capacity was at 197%.

As I recall the events reported at the time, it was a calculated judgement to allow the dam's flood storage to reach that level until the flood waters from the Lockyer and Bremer catchments which had inundated Ipswich and Brisbane had subsided. Those flood waters coincided with 2 metre high tides on 13 January and that was the primary cause of the floods in Brisbane and its suburbs. The chart indicates how, after the floods had subsided, Wivenhoe's flood compartment was reduced to 100% water supply during the second half of the month and that level was consistently maintained until late February when a decision was taken to empty the dam further to 75% supply in anticipation of more seasonal rains.

As a commoner with no qualifications in hydrology, common sense tells me that during the 2011 floods, Wivenhoe Dam did exactly the job for which it was designed. It *mitigated* the effects of the floods in Brisbane. It could not have prevented the flood because flooding rains fell in the other half of the Brisbane River catchments downstream from the dam. Nevertheless, the flood levels at the Brisbane Port Office had been initially predicted to exceed the 1974 levels but they peaked nearly two metres below those levels. That would not have been the case if the flood waters from the catchments above Wivenhoe Dam had not been held back for as long as they were.

Conclusions and thoughts on future management of floods

1. ***People need to know the plain truth***. Until the floods of 2011, there was a common but mistaken belief that a flood of 1974 proportions could never happen in Brisbane again because Wivenhoe Dam would prevent it. One outcome for the future should be that people fully understand that half of the Brisbane River catchment is not protected by Wivenhoe Dam, and flooding rains falling in that half of the catchment can and will result in future floods, particularly where the floodwaters coincide with high tides downstream.

2. ***More effective management of suburbs at risk of flooding is needed.*** People living in these areas need education in an effective evacuation plan in the event of a future flood. Memories of these events tend to fade over time, so an

education strategy every summer season about timely and effective evacuation in the event of a flood may be an idea worth considering. This is particularly important in years when a La Nina summer weather pattern is forecast.

3. ***Where possible new buildings erected in known flood areas should be designed with future floods in mind***. For all I know this may already be happening. Admittedly, it will not be feasible in areas where the depth of inundation is excessive. Owning property or living in such areas is a calculated risk that many people are prepared to take, but they need to be left in no doubt of those risks. That comes back to the education program mentioned earlier. However, there would be many places where living areas could be raised above major flood levels which could minimise the damage and personal losses suffered in the future.

4. ***Caution should be exercised in the management of Wivenhoe Dam***. As SEQ Water states, 'Its (Wivenhoe Dam's) primary function is to provide a safe and reliable water supply to the south-east Queensland region[4].' Decisions to reduce the level of the dam below full water supply capacity should therefore be taken with great caution. These decisions are based on computer forecasts of weather events. While the models used in such forecasts are good at predicting events such as La Nina weather cycles, they cannot pinpoint exactly where and when rain will fall during such cycles. If we release water from Wivenhoe to below 100% water supply level and subsequent rains don't fall in the dam catchment to replenish that supply, and the La Nina cycle is then followed by a long and sustained El Nino cycle, we could end up with a future water shortage crisis as bad as the one we experienced in the middle of the 2000 decade. Toowoomba city was recently connected to Wivenhoe, and the population of wider south-east Queensland continues to grow rapidly. It follows that water supplies will be used up faster even with restrictions in place. El Nino weather cycles have become more common and sustained in recent decades (whether due to climate change I am not qualified to say), but the possibility of a region the size of south-east Queensland and a city the size of Brisbane running out of water during one of these sustained dry cycles is not beyond possibility. The consequences of that happening are potentially as drastic as the consequences of any floods. When water supply in Wivenhoe is at 100%, it needs to be conserved while we have it.

Further recommended reference

The Bureau of Meteorology has a very useful document that provides a history of floods in Brisbane and Ipswich since the time of John Oxley in 1824 to the present day. The document also has useful time charts of all major, moderate and minor flood events in the Brisbane River.

The document can be found at the following address:

www.bom.gov.au/hydro/flood/qld/fld_history/brisbane_history.shtml

[4] http://www.seqwater.com.au/news and publications/fact sheets

If that fails, it can be accessed by entering *'Known Floods In The Brisbane & Bremer River Basin'* into the Google search line on your Home Page.

Conclusion

I submit this paper because I am passionate about facts as the rock foundation of any investigative methodology with the objective of the truth. I realise that my personal opinions as someone with no formal expertise in the relevant disciplines will not carry much weight. However, facts are a different matter; they are objective; they carry their own weight. If the factual information that I have provided assists your commission of enquiry even to a slight extent or gives you just one idea or line of enquiry, then I will have achieved my objective.

[redacted]

Table 1

Comparative 3-day January rainfalls

Weather Station and Number	Latitude Deg/Min	Longitude Deg/Min	Elevation (Metres)	January 2011 10	January 2011 11	January 2011 12	January 1974 25	January 1974 26	January 1974 27	Destination Catchments
Catchments below Wivenhoe Dam										
40183 Rosevale	27-51	152-29	101	14.2	83.8	135.6	30	88	86.8	Bremer River
40184 Rosewood Walloon	27-38	152-35	63	55	83	227	67.8	153.6	278.8	Western Ck/Bremer
40816 Amberley	27-40	152-42	18	45	37	94	NA	NA	NA	Warrill Ck/Bremer
40004 Amberley AMO	27-38	152-43	24	70.4	39.4	110	63.4	140.1	240	Warrill Ck/Bremer
40447 Rhonda	27-59	152-28	185	29	89.8	104	22.6	154	254.6	Warrill Ck/Bremer
40992 Deebing Heights	47-41	152-45	91	⇨	102.8	72.2	NA	NA	NA	Warrill Ck/Bremer
40198 Tarome	27-59	152-30	137	26	86.6	90.4	24	142	247	Warrill Ck/Bremer
40317 Range View	27-45	152-40	53	50.6	38.6	59.6	41	126	195	Warrill Ck/Bremer
40374 Franklyn Vale	27-46	152-28	105	40	168	133	42.2	134.6	364.7	Bremer
40493 Homeleigh	27-47	152-32	96	45	NA	202.5	45.6	146	327	Bremer
40135 L Moogerah	28-02	152-33	183	14.4	73.4	102	31.4	145.1	217	Warrill Ck/Bremer
40104 Engelsberg V	27-57	152-37	101	25	63.8	53	31.2	120.4	208	Warrill Ck/Bremer
40091 Grandchester	27-40	152-28	95	77.1	185	174	160.5	248.5	50.4	Bremer
40094 Harrisville PO	27-49	152-40	39	⇨	⇨	130.8	39.2	128	238	Warrill Ck/Bremer
40836 One Mile Bridge	27-38	152-45	0	64	29	74	NA	NA	NA	Bremer
40400 Moorang	27-54	152-28	163	41.8	98.4	102.8	33.8	144.4	243	Bremer
40675 Townson	27-55	152-28	268	68	193	104.6	NA	NA	NA	Lockyer Ck/Bris.R.
40716 Laidley	27-39	152-23	123	58	55	100	NA	NA	NA	Lockyer Ck/Bris.R.
40503 Tallegalla Alert	27-37	152-35	60	76	177	197	NA	NA	NA	Plain Ck/Lockyer Ck
40310 Mount Berryman	27-43	152-19	451	53.4	98.8	67.4	83.2	176	216	Sandy /Laidley/Lock.
40449 Placid Hills	29-34	152-14	125	96.1	57.1	78.7	22.2	48	NA	Lockyer Ck/Bris.R.
40096 Helidon PO	27-33	152-7	155	94	⇨	162	30	70	127	Lockyer Ck/Bris.R.
40083 Gatton	27-32	152-17	114	67.2	77.6	108.2	26.6	70.4	179.2	Lockyer Ck/Bris.R.
40388 Upper TentHill	27-39	152-13	139	60.6	73	63.4	21.6	57.4	122	Lockyer Ck/Bris.R.
40436 Gatton DPI	27-33	152-20	98	88	79.4	126	30.4	73.8	199.4	Lockyer Ck/Bris.R
40397 Mt Whitestone	27-40	152-10	180	49.6	67	85.6	16.4	51.8	139.8	Lockyer Ck/Bris.R
40672 Withcott	27-33	152-1	261	61.8	180.8	15.6	NA	NA	NA	Lockyer Ck/Bris.R.
40079 Forest Hill	27-35	152-23	112	63.6	84.1	75.9	50.6	115.6	238.2	Lockyer Ck/Bris.R.
40395 Fordsdale	27-43	152-7	252	⇨	140.1	11	18.8	44.6	115	Lockyer Ck/Bris.R.
40883 Deverton Saw.	27-41	152-3	343	42.2	122.4	36.8	NA	NA	NA	Lockyer Ck/Bris.R.
41096 Mt Kynock	27-31	151-57	739	104.2	143.2	36.4	NA	NA	NA	Lockyer Ck/Bris.R.
41510 Tamba	27-28	151-57	642	104.6	⇨	178.8	NA	NA	NA	Lockyer Ck/Bris.R.
40095 Hatton Vale	27-34	152-28	124	66	⇨	277.2	54.6	108.6	0	Lockyer Ck/Bris.R.

Table 1

Comparative 3-day January rainfalls

Weather Station and Number	Latitude Deg/Min	Longitude Deg/Min	Elevation (Metres)	January 2011 10	January 2011 11	January 2011 12	January 1974 25	January 1974 26	January 1974 27	Destination Catchments
40914 Mount Tarampa	27-29	152-30	74	102	134	250	NA	NA	NA	Buaraba Ck/Lockyer
40329 Atkinson Dam	27-25	152-27	75	107.2	108	NA	NA	NA	NA	Lockyer Ck/Bris.R.
40763 Wivenhoe D.	27-24	152-37	73	68.4	248.8	133.4	NA	NA	NA	Brisbane R.
40056 Coominya	27-23	152-30	81	99.4	101.2	161	44	106	194	Lockyer Ck/Bris.R.
40120 Lowood	27-28	152-34	51	102	180.6	203.2	53	105	194	Lockyer Ck/Bris.R.
40308 Mt Glorious	27-20	152-46	618	188	252	208.4	279.4	376.4	496	England Ck/Bris.R
40147 Mt Nebo	27-24	152-47	449	162.8	108.8	145	187.8	408.3	400	Banks Ck/Bris. R.
40115 L. Manchester	27-29	152-45	43	⇨	⇨	355	110.1	202.1	183.4	Cabbage Tree Ck
40990 Kholo Plateau	27-31	152-46	65	⇨	⇨	308.8	NA	NA	NA	Bremer/Brisbane
Other Catchments										
41529 T'wba Airport	27-32	151-55	641	83.6	123.4	26.6	NA	NA	NA	Western Downs
40480 Perseverance	27-17	152-7	470	136.6	150.2	25	48	47.4	142.6	Above Wivenhoe
40170 Pechey Forest	27-18	152-3	667	⇨	253	26	53	52.2	139.4	Western Downs
40808 Cooby Ck	27-23	151-55	497	96	127	25	NA	NA	NA	Western Downs
41037 Goombungee	27-19	151-51	497	96	100.4	31.6	13.4	22.8	152.8	Western Downs
40142 Haden PO	27-13	151-53	640	94	126	NA	17.4	⇨	172.2	Western Downs
40301 Glenaven	27-11	151-58	612	129.8	150.2	13.4	24.2	54	137.6	Western Downs
40517 McKenzie Ck	27-12	152-45	104	141.8	163	222	174	203.6	233	Laceys Ck/Pine R.
40189 Somerset Dam	27-7	152-34	113	192	156	66	68.2	11.6	186.2	Above Wivenhoe
40186 Samsonvale	27-17	152-49	98	123	164.6	131.4	204	214.4	215.4	North Pine Dam
40693 Highvale	27-23	152-49	98	162	77.4	120.6	123.2	448	299.2	South Pine River
40607 Springbrook R.	28-12	153-16	681	85	29	26	NA	NA	NA	Nerang River
40848 Lower S'brook	28-13	153-16	705	129	145	42	NA	NA	NA	Nerang River
40524 Little NerangD	28-8	153-17	177	47.2	92.2	18.6	129.6	240	441.2	Nerang River
40882 Numinbah A	28-10	153-13	152	43	63	30	NA	NA	NA	Nerang River
40162 N'bah Farm	28-10	152-13	162	60	86.1	36.5	400	270	61.4	Nerang River
40550 Numinbah	28-15	153-14	355	135	161	42	326.8	380.8	280.8	Nerang River
40845 Binna Burra	28-12	153-11	780	91	112	40	NA	NA	NA	Coomera River
58197 Mt Numinbah	28-16	153-14	320	37	24	17.2	NA	NA	NA	Nerang River
40844 Beechmont	28-8	153-11	520	40	98	32	NA	NA	NA	Coomera River
40899 Tomewin	28-14	153-23	354	51.2	66.6	10.2	NA	NA	NA	Currumbin Creek
40182 Green Mtns	28-14	153-8	916	105.7	109.9	24	146	354	309	Coomera River
40931 O'Reilly's	28-14	153-8	913	106	109	24	NA	NA	NA	Coomera River

Table 2

Comparative December and January rainfalls 1974 and 2011

Weather Station and Number	Total Rainfall December 1973	Total Rainfall January 1974	2-monthly total Dec 73 & Jan 74	Total Rainfall December 2010	Total Rainfall January 2011	2-monthly total Dec 10 & Jan 11
40183 Rosevale	80.4	397.6	478	516	371.8	887.8
40198 Tarome	95.5	687.2	782.7	523.4	347.2	870.6
40184 Rosewood Walloon	139	757	896	353.2	481.3	834.5
40374 Franklyn Vale	109.2	791.8	901	448.5	482	930.5
40493 Homeleigh	101.6	729.3	830.9	424.5	421.9	846.4
40135 L Moogerah	133.2	567.3	700.5	462	361.2	823.2
40104 Engelsberg V	104	557.4	661.4	369.4	272.5	641.9
40004 Amberley AMO	115.2	635.2	750.4	365	319	684
40091 Grandchester	68.4	679.4	747.8	271.4	584.1	855.5
40094 Harrisville PO	130.7	543.6	674.3	369	220.8	589.8
40317 Range View	111.8	536.1	647.9	349.4	279.4	628.8
40400 Moorang	81	655.2	736.2	489.8	378.6	868.4
40449 Placid Hills	90.4	239.4	329.8	340.8	352.7	639.5
40096 Helidon PO	105.2	448.5	553.7	326	395.9	721.9
40083 Gatton	81.6	464.2	545.8	120.8	379.4	500.2
40310 Mount Berryman	45	766	811	354.4	389.2	743.6
40388 Upper TentHill	75.5	356.4	431.9	351.6	387.4	739
40436 Gatton DPI	90.7	482.1	572.8	323.7	410.6	734.3
40397 Mt Whitestone	53.7	381.7	435.4	348.2	414	762.2
40079 Forest Hill	63.2	521.3	584.5	296.3	353.8	650.1
40095 Hatton Vale	54.6	337.9	392.5	329.6	447.6	777.2
40056 Coominya	101.1	528	629.1	278.8	494.6	773.4
40120 Lowood	69.6	588.4	658	246.6	642.6	889.2
40308 Mt Glorious	169.7	1895.6	2065.3	575.6	921.8	1497.4
40147 Mt Nebo	136.7	1513.6	1650.3	435.2	579	1014.2
40115 L. Manchester	104.2	689.2	793.4	243	361	604

Appendix

Water storage levels at Wivenhoe Dam
Source: www.bom.gov.au / Water