

**J. V. HODGKINSON** F.C.A.  
Chartered Accountant

Correspondence to:

[REDACTED]  
[REDACTED]  
29<sup>th</sup> January 2011

DI

[REDACTED]  
Acting General Manager, Regional Planning and Policy  
Queensland Water Commission  
PO Box 15087  
CITY EAST 402

Copy to Commissioner Mary Boydell, Commissioner Queensland Water Commission

[REDACTED]  
Commissioner Mary Boydell was good enough to give me your name as acting General Manager, regional Planning and Policy, should I require any further information. As we have met at the meeting of DERM and QWC officers on the 2<sup>nd</sup> February 2010 we have a reasonable understanding of each other's views.

The recent flood event reinforces the need to resolve the "Millennium drought" issue as flood proofing Brisbane City is very much a product of the resolution of this issue.

The linking of low dam levels in the Wivenhoe/Somerset to "drought" severely damages the credibility of the Water Strategy as outlined by the following evidence.

I have two issues with the Water Strategy.

CI

**The calculation by the Technical Advisory Panel (TAP)** to include the major floods in the "mean annual flow" against their own advice that they would "skew" the result. The application of this permanent method to the 113 years 1894 to 2006 proves that a further 9% above the required 66% has been diverted to the Brisbane River. This is an additional annual volume of 130,568ML is the equivalent of the entire Traveston project or the output equivalent of the three desalination plants the Water Strategy has on the drawing board.

I had requested pre-development flows before the meeting. I received them after the meeting and provided a copy of my calculations to all present without response.

At our meeting you were forthright in letting both Trevor Herse and myself know that you and one other present were unhappy with the 66% allocated to the ecology of the River by the TAP and had taken steps to improve it. That you had the authority or authorization was not questioned by us.

You were also adamant "that you cannot take water out of the Wivenhoe/Somerset system". Well the Act provides that one can for later return. The block to extraction of the water for later return had its roots in the redirection to the ecology of 130,568ML than was intended by the 66%.

In view of these circumstances and to return to a proper balance, the facts have been put to Minister

Robertson and [REDACTED] of DERM for consideration.

**Establishing the Water Strategy based on coping with a drought** the size of the “Millennium Drought”.

The “Millennium Drought” appears in Commissioner Mary Boydell’s “Foreword” and on page 54 of the QWC Water Strategy.

**Page 54 “The Federation and Millennium drought”**

The source relies solely on the QCCCE “Accumulated rainfall deficit for the Federation and Millennium droughts”. The information is contained on page 54. D2

It had previously been issued as the “The South East Queensland drought to 2007”. D3

The Water Strategy deals with a **hydrological** drought. It does not, and should not, deal with “social” droughts which can be anything that suits your particular situation. We are talking about inflow into our dams for distribution to the ecology and our own needs.

**Qualifications previous attached not shown**

It does not show the qualifications made in their issue of the same material in their in “The South East Queensland drought to 2007”.

**Extension of the “drought”**

It extends the “drought” a further 2 years and 4 months to May 2009.

**Drought to May 2009**

Taking the last point first the QCCCE has extended the drought from January 2007 to May 2009.

The readily available 24 month 01/05/07 to 30/04/09 Bureau of Meteorology rainfall maps show

- (a) The 24 month “rainfall deficiency” map records **no deficit** over the catchments D4
- (b) The confirming “rainfall percentages” map shows **rainfall percentages** in the range of **100% to 125% of the long term average.** D5

There was no drought in the catchments for the period 01/05/07 to 30/04/09.

**The credibility of the QCCCE information is seriously jeopardized and as a consequence the QWC Water Strategy is jeopardized as well.**

**Qualifications attached to the QCCCE “accumulated rainfall deficits” is missing**

The second point is that the qualifications attached to the 2007 publication were omitted from the current publication. (*attached*) D6

In the 2007 publication it clearly states “*However, rainfall is not necessarily the best indicator of a hydrological drought.*”

It confirms that it is a **hydrological** drought that we are examining and not a “social drought”. For example our current Premier Bligh used a Hydrological “decile” map extensively to convince us that that our low dam levels were drought induced. In May 2009 she declared “her brand of drought” over. I point to the evidence above that there had been no drought in the catchment for at least 2 years prior as detailed by Bureau statistics. D7

The hydrological aspect that we need to examine is the inflow into the dams. This is the only true comparison of both periods. The obfuscation of the QCCCE in setting out unnecessary requirements of the comparison is evident.

There is no mention that the inflow into the dams was available yet not included. D8

The Water Resource (Moreton) Plan of 2007 was enacted in March of that year. Its essential ingredient was the “mean annual flow” as calculated by the IQQM model and enshrined in the Act. It requires the pre-development flows.

The pre-development flows commenced in 1890 some 8 years prior to the QCCCE “Federation Drought” period.

Supporting this evidential truth is the QWC “Water for SEQ a long term solution” on Page 36. The performance of the Wivenhoe with pre-development flows and utilizing a yield of 373,000ML also starts at 1888. This basis has been confirmed in writing to me by the QWC.

So there is ample evidence that the QCCCE was not diligent, to the point of being careless, in the preparation of the information that appears on page 54 of the Water Strategy. As a consequence your reliance on the QCCCE, without interrogation, reflects badly on the QWC.

Adding to this is the QWC attempt to shore up support in its second paragraph on page 54. It expands well outside of SEQ into Western Queensland where a drought existed. We are dealing specifically with the catchments of which the Stanley River in particular is a coastal River. The Wivenhoe catchment, being the Upper Brisbane River, adjoins it. D2

The failure to restate that the 70 month period recorded rainfall at 76.2% of the long term average was also conspicuous by its absence. The Bureau of Meteorology had confirmed by email that the percentage was close to 80% of the long term average. Their “percentage” map corresponding with the “decile” map used by Premier Beattie and current Premier Bligh also showed 80%. D3

The “decile” map was a statistical aberration as the rainfall for the period of six years had never been lower than 80% of the long term average since records were kept. D9

Most people would not regard 80% of the long term average as a drought let alone “the worst drought in 100 years”. It was the statistical aberration of the “decile” map that was used to mislead people of SEQ to believe that it was a “drought” causing our depleted dam levels.

### The substance of the “Federation “ and the “Millennium” periods

Having examined the attempt to rely heavily on rainfall we now examine this aspect.

SEQWater Courier Mail 10<sup>th</sup> February 2007. Mr Rob Drury spokesman

Mr Drury made it clear that it required large “uncommon events” to fill large dams. They are low pressure systems that generally cover all of SEQ. The important points for this heading is D10

- It is the mix and concentration of rainfall that counts in providing inflow into the dams. This should be no revelation to the QWC. It is very obvious when examining the Wivenhoe dam level graph from its commissioning in 1986.
- There were no such events in both the “Federation and “Millennium” periods. This is confirmed by Bureau of Meteorology flood and catchment rainfall records
- Although of minor inflow consequence, the rainfall in the “Federation” period was evenly spread creating little opportunity for inflow. (*attached*)
- On the other hand the “Millennium” period had several opportunities to create flow. For example the rainfall (*attached*) for the period December 2003 to March 2004 created a fill of 15.4 per cent of the joint Wivenhoe/Somerset capacities. Reference is the excellent Seqwater dam level chart.

An examination of rainfall and its concentration for both the Federation and the Millennium periods is *attached*. D11 D12

Further examination of “uncommon events” using Bureau flood levels, flood information and heights coupled with rainfall shows that they occur on average of 3.7 years with most below that average. It is a mathematical consequence that those above the average will have a lengthy absence.

The Federation and the Millennium periods experienced the larger gaps being 5.2 years for the Federation and 7.0 for the Millennium, both well above the average of 3.7 years. D13

That the QWC has failed to recognize that effect on dam levels that these “uncommon events” have is evident in its change from HYNF to a stochastic approach. “Stochastic” is defined by the Macquarie dictionary as “conjectural” and the cynics in Wikipedia define it as “best guess under the circumstance”.

After the cancellation of the Wolfdene dam it was obvious as early as 1992 that summer rainfall December to March was inadequate to provide for our needs. The Hydrologists of the nineteen seventies and eighties were aware of this with that dam design and preparation commenced after the commissioning of the Wivenhoe in 1986. It was cancelled for political reasons. D14

The continued drain to levels as low as 44.7% and then refill by “uncommon events”, evidenced by the Wivenhoe Dam level chart, showed our heavy reliance on these large scale rainfall events. That we would run into an extended period was also obvious. It shows a lack of diligence that is, and will be, costing SEQ residents dearly well into the future. D15

### **Conclusive proof that our low dam levels was not caused by a drought**

Comparison of the first 45 months of the February 1992 to November 1995 period with the first 45 months of the February 2001 period to November 2004 period of the “Millennium” period is revealing.

Both of those periods started with full dams. The period 1992/95 was ended with a refill by “uncommon events” after 45 months and was right on the average for “uncommon events” of 3.7 years. The 2001/07 period ended a further 31 months later.

Convenient Bureau information shows that rainfall was similar with the 1992/95 period recording 80% to 90% of the long term average and no drought. The 2001/04 period was 80% of the long term average.

The Dam levels at month 45 was 44.3% in the 1992/95 period with the 2001/2007 period recording 53.4% at the 45 month mark.

**Our dams held 9.1% more in the “worst drought on record” period (2001/2007) than in the 1992/95 period at the 45 month mark when it was refilled by “uncommon events”.**

The 2001/2007 period had to wait a further 31 months with a fill over 148% of the capacity of the Wivenhoe taking that level to 164% with 64% released from the flood compartment. (early January 2011 figures). Later January figures 243%.

Timely warnings were issued to Premier Bligh in January 2008 and Minister Hinchcliffe in March 2009 that the return of “uncommon events” was a mathematical certainty.

### **Summary and implications for the Water Strategy**

The major source of our water is, and has been, large scale high rainfall low depressions that generally cover all of SEQ. SEQWater labelled them “uncommon events for good reason.

The average occurrence is 3.7 years with most below that average. Those above can be quite lengthy. The time of year is “any time of the year”.

These lengthy periods of absence can be misinterpreted as a drought. They can last much longer than a real drought. The 2001 to 2007 period was prime example.

The major artillery that the water Strategy has is the Tugun Desalination Plant producing 124ML a day when not under repair. The recycled water available has been quoted by Premier Bligh at 115ML a day. They are the major items with a few others contributing additional water. On that basis, both of these producers of manufactured water will take 17 years to fill Wivenhoe/Somerset 17 years to fill if we do not take water out.

The QWC has in its possession our Borumba Dam proposal and its addendum. In brief it proposes the Borumba Dam being raised to 2,000,000ML. This provides space for its own catchment to around 500,000ML with the remaining 1,500,000ML space as storage space for the Wivenhoe/Somerset.

The Borumba Dam addendum is in your possession. Your previous Water Strategy produced a dam level chart for the Wivenhoe based on pre-development flows and an extraction of a yield for consumption of 373,000ML a year. Currently only 286,000ML is allocated.

This chart shows that the return transfer back to Wivenhoe would be no more than 500,000ML at any one time to bridge large gaps in “uncommon events”. This is to maintain the 40% level. Using that chart that volume of 500,000ML would be required for around 3 years or 1095 days. The “Borumba” option could supply it in 125 days

The Tugun desalination and the recycling plants produce 239ML a day (124 + 115). It would take 2092 days to produce the required 500,000ML. As the requirement is 1095 days, there would be a deficiency imposed on residents of SEQ.

It should not be overlooked that there is quite a body of objection amongst residents to the use of recycled water for domestic consumption.

By comparison the Borumba proposal clearly gives the QWC room for expansion of the population and at much lower costs.

The pumps, with electricity provided by the Hydro Plant, would transfer water at up to 4,000ML a day when water levels in the dams were high. This creates space to increase the capture of water from "uncommon events".

The cost of the Dam wall, Hydro and pipes less the QWC planned 350,000ML dam is less than the cost of the Tugun Desalination plant.

I look forward to your critical and detailed analysis of the foregoing

Sincerely

.....  
John V Hodgkinson F.C.A.

### The Federation and Millennium droughts

From 2001 to 2009, SEQ experienced the worst drought in the region's recorded history in terms of both length and rainfall deficit – the Millennium Drought. On 20 May 2009, Wivenhoe, Somerset and North Pine Dams reached 60% of their combined capacity, signalling an end to the water security crisis for SEQ.

Until the Millennium Drought, the Federation Drought was the worst drought in Australia's recorded history. The Federation Drought had significant impacts in Queensland. Rivers in Western Queensland dried up, including the Darling River, with devastating impacts to stock across drought afflicted areas. Sheep numbers fell from 91 million to 54 million, and cattle from 11.8 million to 7 million, with some far western properties dropping from tens of thousands to only a few hundred head of cattle<sup>3</sup>.

Figure 2.8 illustrates the difference between the accumulated rainfall deficits across the catchment area to the west of Brisbane during the Millennium and Federation droughts. Accumulated rainfall deficit is the difference between rainfall over the drought period and average rainfall.

SEQ suffered the Federation Drought for five years from 1898 to 1903. At its worst, the accumulated rainfall deficit reached 1278mm.

In comparison, the SEQ Millennium Drought ran for nearly eight years from 2001 to 2009 ending in May 2009 when the Wivenhoe, Somerset and North Pine Dams reached a combined total of 60% capacity. The maximum accumulated deficit during the period was 1530mm.

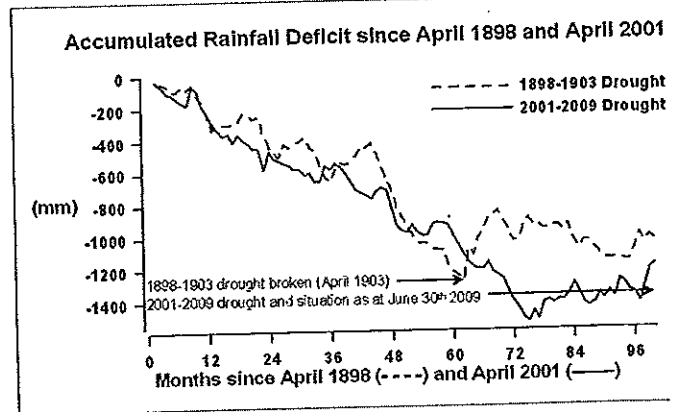


Figure 2.8 Accumulated rainfall deficit for the Federation and Millennium droughts

Source: Prepared by the Queensland Climate Change Centre for Excellence, July 2009

<sup>3</sup> Australian Bureau of Meteorology, Australian Climate Extremes – Drought: <http://www.bom.gov.au/lam/climate/levelthree/c20thc/drought1.htm>



**D 3**

# The South East Queensland Drought to 2007



#28188





**Is this the worst drought on record in the Brisbane dam catchments?**

The Wivenhoe, Somerset and North Pine dams are the main storages that service the Brisbane region. These storages last filled in the summer of 2000-01. Since that time, rainfall over the dam catchments to the west of Brisbane has been extremely low.

The severity of the current drought can be measured in a number of ways. The easiest way is to compare rainfall across the catchment region during the current drought with rainfall during previous droughts. Rainfall during the current drought can then be ranked against historical rainfall records or, to further quantify the severity of the drought, expressed as a deficit relative to average or median rainfall over the same time period. However, rainfall is not necessarily the best indicator of hydrological drought. A more sophisticated analysis of the current drought in the catchments to the west of Brisbane would involve hydrological modelling of storage levels based on modelled historical inflows into the current dams and evaporation of surface water from the dams coupled with assumed releases. Such a comparison is more

difficult due to the assumptions involved and lack of climate data during the Federation Drought—a drought occurring in the late 1890s to early 1900s that showed similar duration and severity to the current drought.

**Catchment rainfall**

If rainfall during the current drought is ranked against historical rainfall on a timescale of 70 months (the amount of time since the dam was last full), rainfall averaged over the dam catchment at the end of January 2007 is the worst on record. The accumulated rainfall deficit since March 2001 (that is, the difference between rainfall over the last 70 months and average rainfall over equivalent 70-month periods since 1903) is currently minus 1356 mm, which is 23.8% below the historical average over equivalent 70-month periods. A rainfall deficit of this magnitude, over such a long time period (70 months), has only been recorded during the Federation Drought. In the catchment area, as the detailed analysis in Figure 1 shows, the current rainfall deficit at the end of January 2007 is more extreme than that during the Federation Drought.

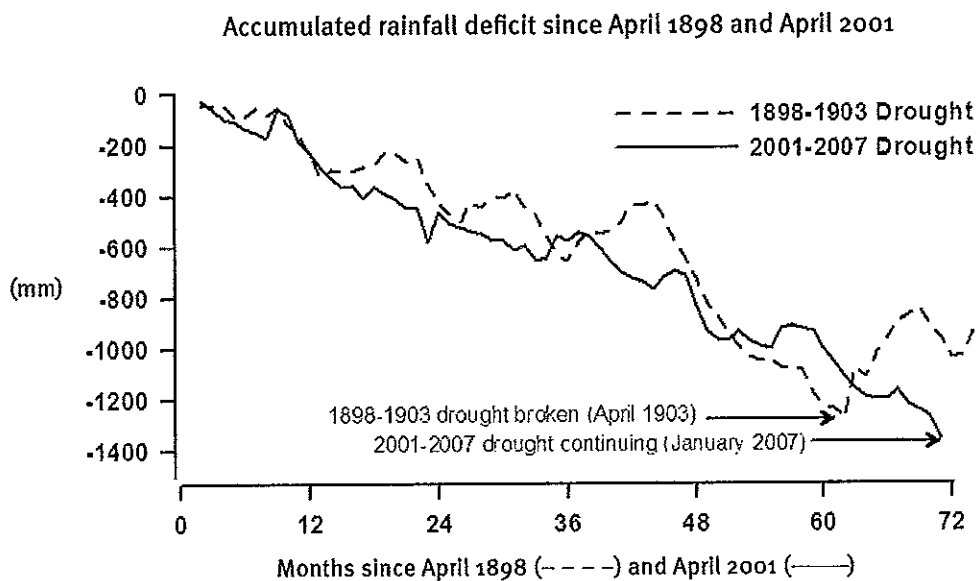


Figure 1: Comparison of the accumulated rainfall deficit in the catchment area to the west of Brisbane during the current drought (from April 2001 to January 2007) with the previous worst drought (from April 1898 to April 1903).



SEARCH



### Archive - Twenty-four-monthly rainfall deciles for Queensland

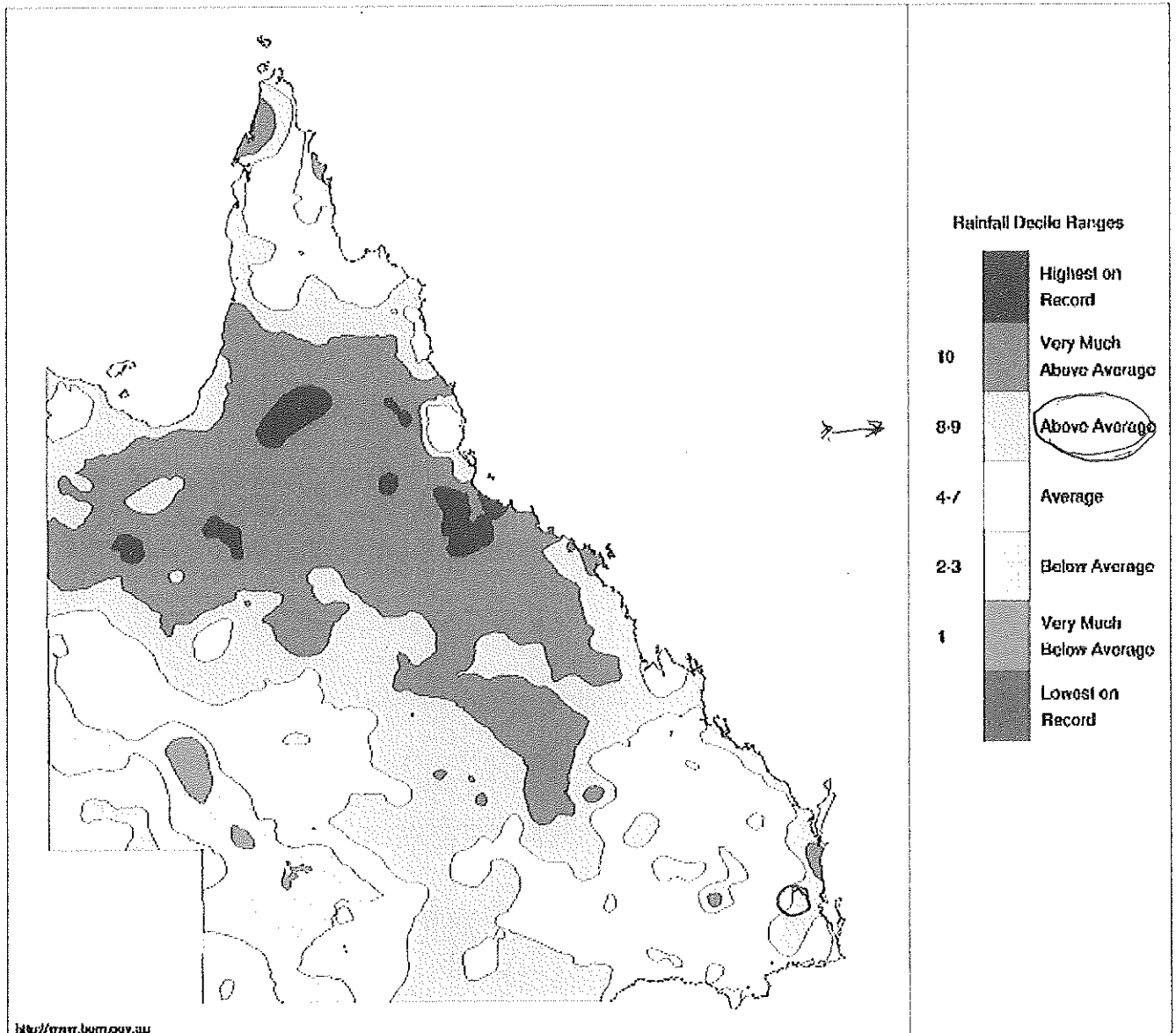
Map Rainfall Deciles  
Period 24 months  
Area Queensland

Year 2009  
Month Apr  
Day 01  
EARLIER LATER  
EARLIER LATER



Queensland Rainfall Deciles 1 May 2007 to 30 April 2009

Distribution Based on Gridded Data  
Product of the National Climate Centre



<http://www.bom.gov.au>

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Issued: 24/12/2009

Product Code: IDCKAR74Q0



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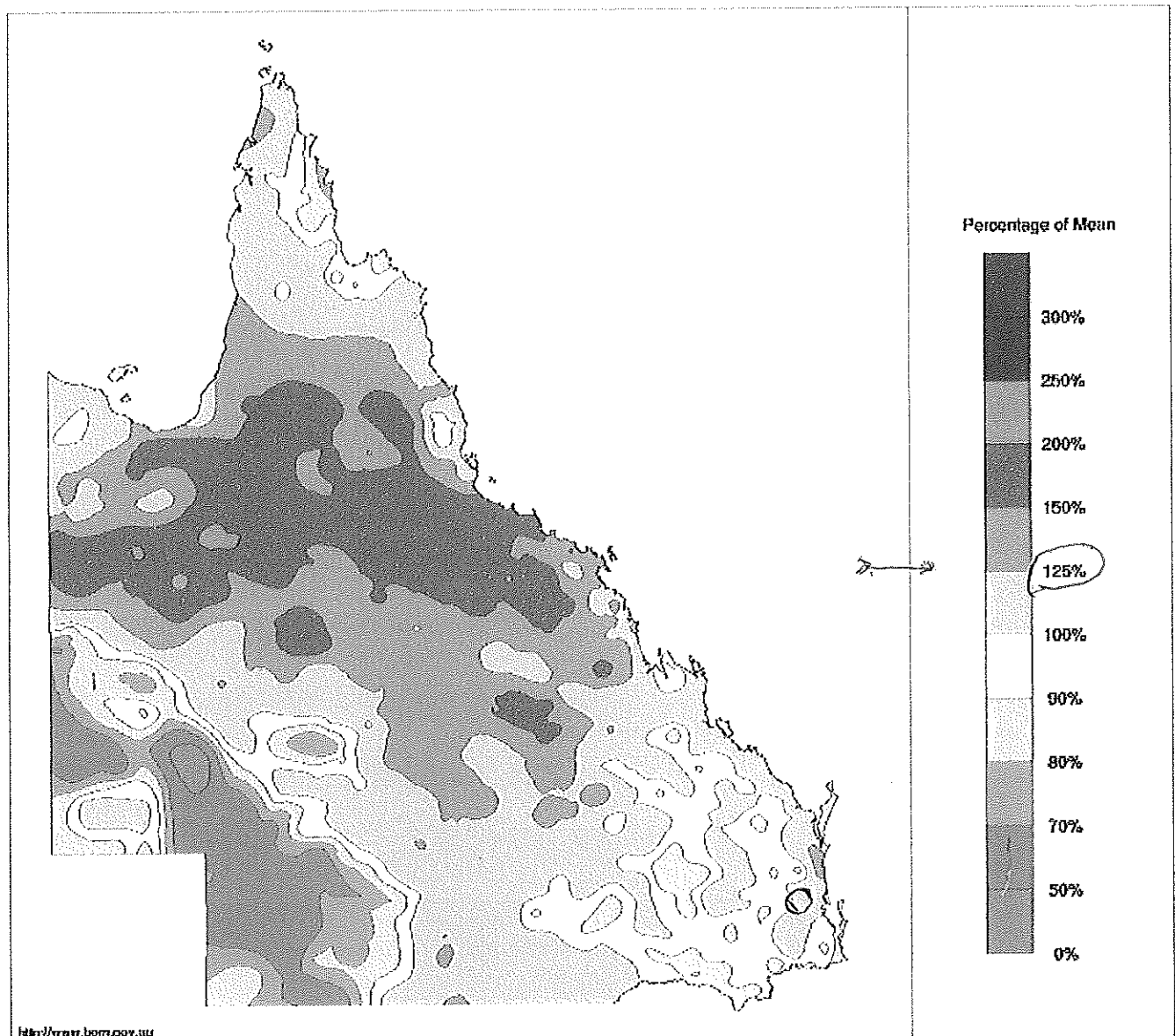
### Archive - Twenty-four-monthly rainfall percentages for Queensland

Map Rainfall Percentages  
Period 24 months  
Area Queensland

Year 2009  
Month Apr  
Day 30  
EARLIER LATER  
EARLIER LATER



Queensland Rainfall Percentages 1 May 2007 to 30 April 2009  
Product of the National Climate Centre



http://www.bom.gov.au  
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Issued: 24/12/2009

Product Code: IDCKAR74P0

**Is this the worst drought on record in the Brisbane dam catchments?**

The Wivenhoe, Somerset and North Pine dams are the main storages that service the Brisbane region. These storages last filled in the summer of 2000-01. Since that time, rainfall over the dam catchments to the west of Brisbane has been extremely low.

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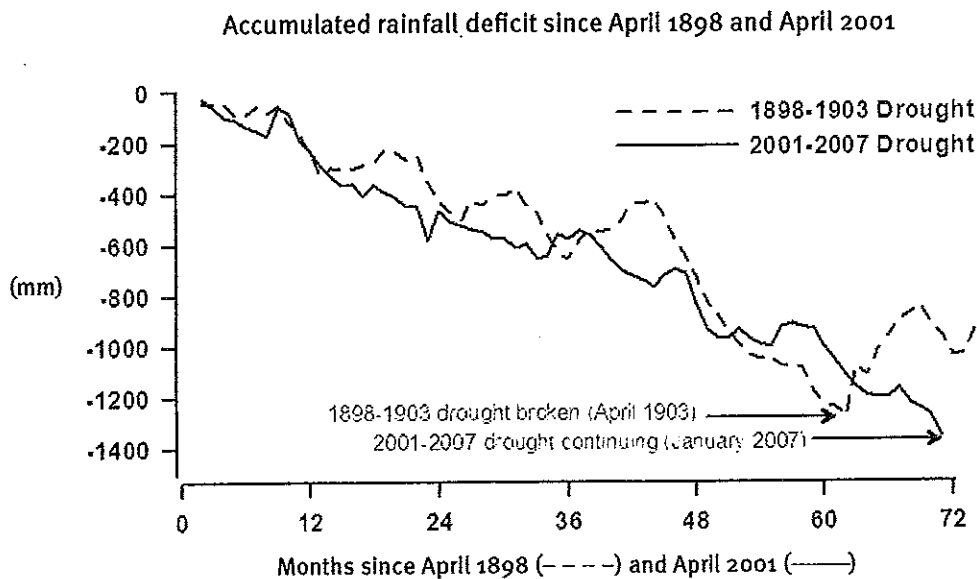
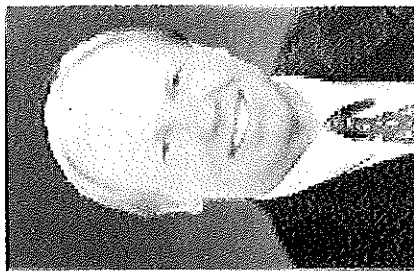


Figure 1: Comparison of the accumulated rainfall deficit in the catchment area to the west of Brisbane during the current drought (from April 2001 to January 2007) with the previous worst drought (from April 1898 to April 1903).

# Building the foundations

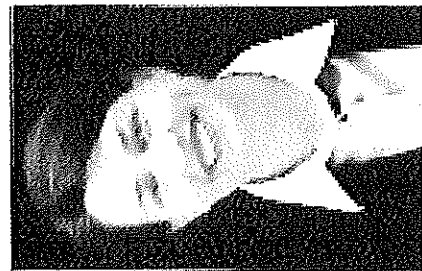


The Smart State is growing at a record rate. Our economy is booming, we are gaining 1500 new Queenslanders each week and global demand for our exports has surged.

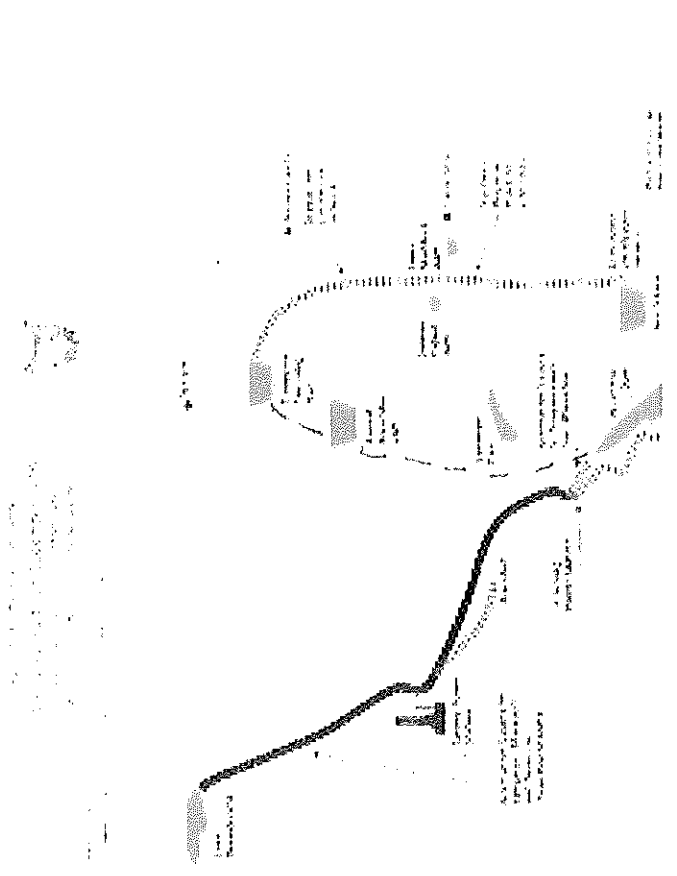
To sustain this growth and maintain our enviable lifestyle, we need to build more hospitals and schools, and improve roads and public transport for Queenslanders.

We are also encoring the worst drought on record and that means an absolute commitment to securing our water supply for the future is vital. Our plans for water infrastructure will therefore remain at the forefront.

We need to build now and plan for the future, so we have the infrastructure necessary to ensure prosperity, jobs, health, education and training in the Smart State.

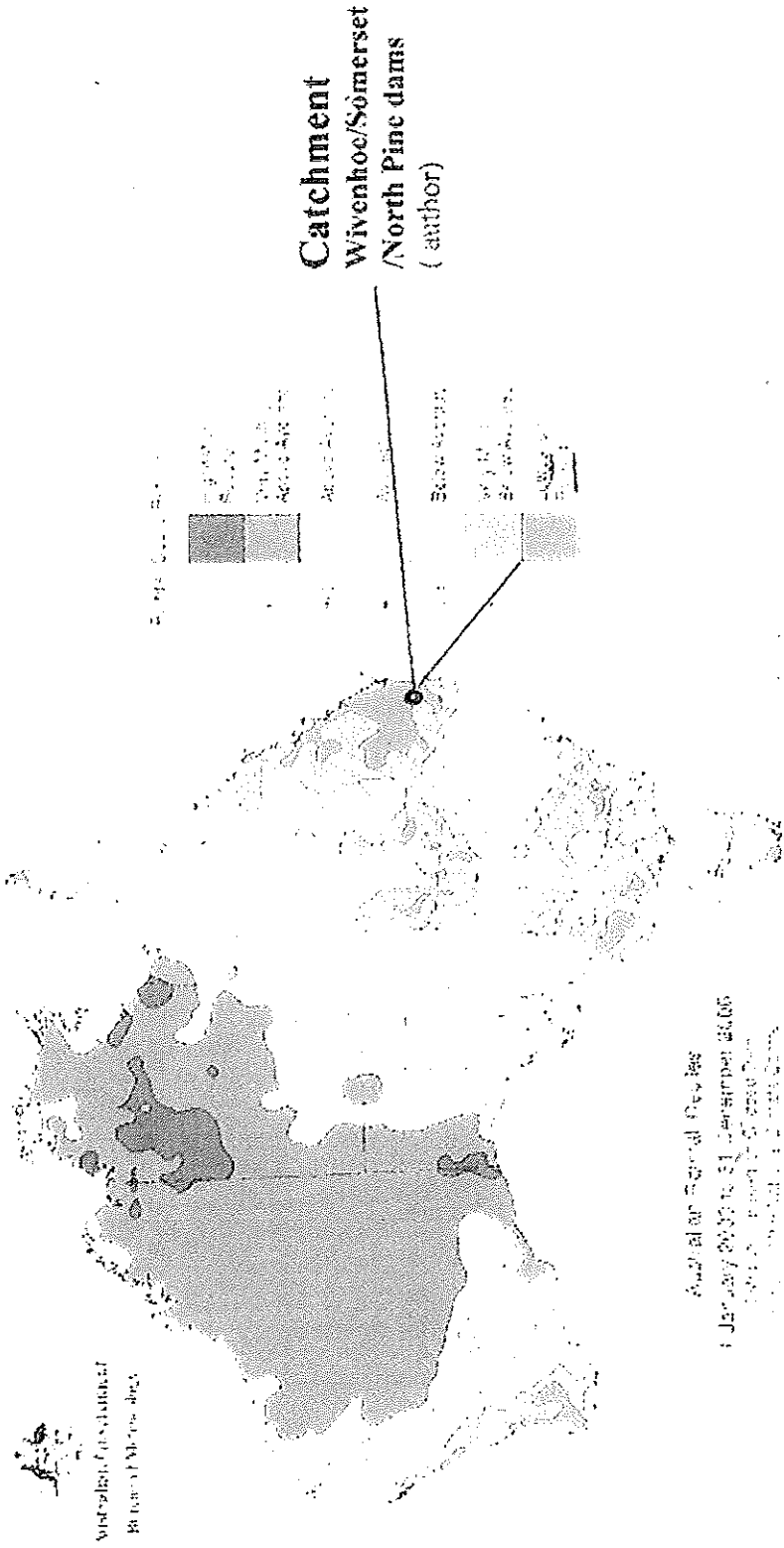


The Queensland Government is due to spend a record \$1.6 billion across the state this year to meet our current



### Bureau of Metrology map expanded for clarity (author)

Unprecedented demands on South-East Queensland's water supply.



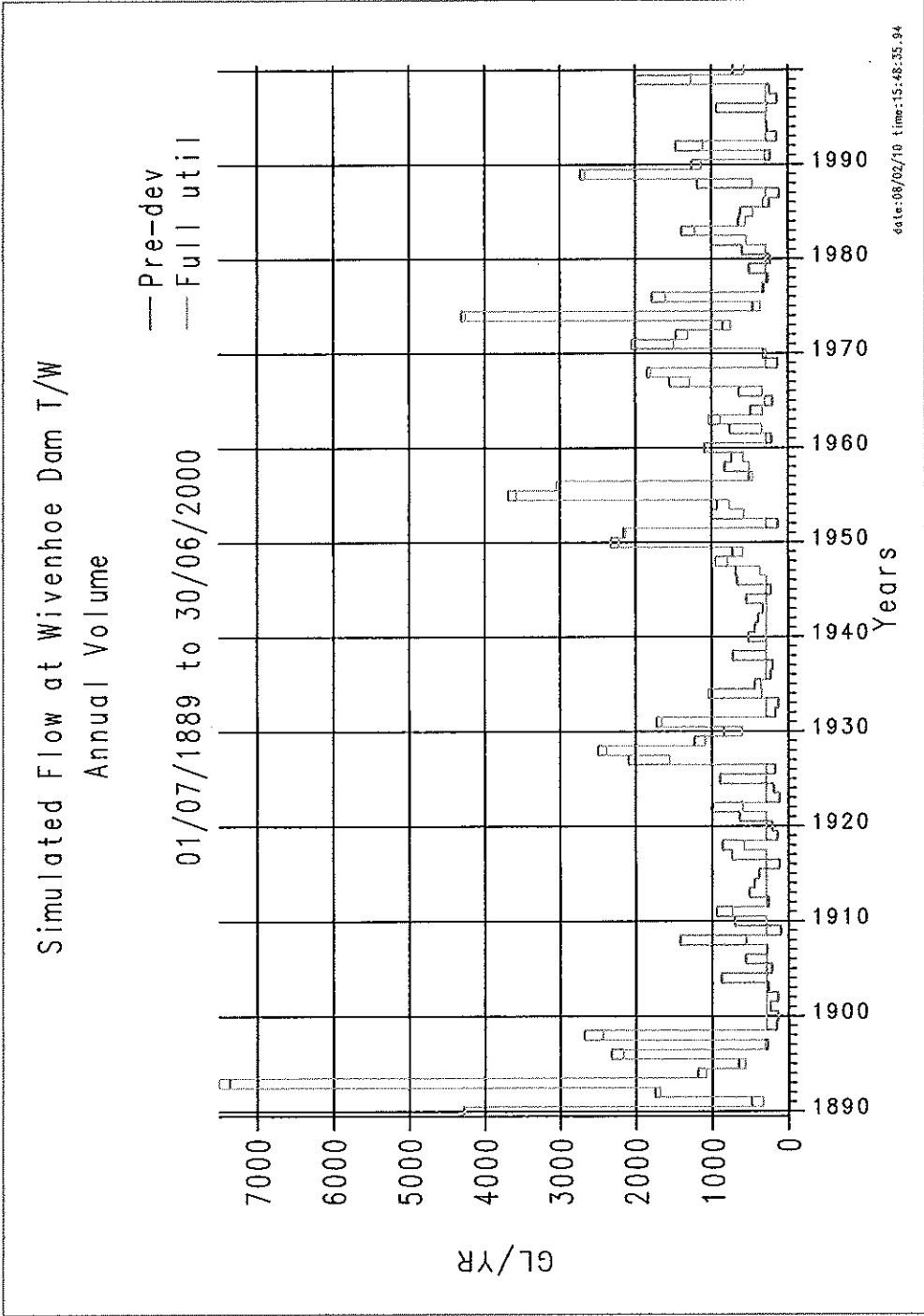


Figure 1: Annual flow volume simulated at Wivenhoe Dam TW for pre-development and full utilisation of existing entitlements scenario

**John Hodgkinson**

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**From:** [REDACTED]  
**To:** "John Hodgkinson" [REDACTED]  
**Sent:** Friday, 25 August 2006 11:21 AM  
**Subject:** RE: Deciles/drought deficiencies vs percentage of mean

Hi John,

Yes you are on the right track there. The percentages show that the catchment area received close to 80% of the (1961-1990) mean for the period, this is compatible with the drought decile information as the actual totals would place it in the lowest decile (or lowest 10% of totals) of the whole dataset.

Regards,  
 Lyn

**From:** John Hodgkinson [REDACTED]  
**Sent:** Friday, 25 August 2006 10:29 AM  
**To:** [REDACTED]  
**Subject:** Re: Deciles/drought deficiencies vs percentage of mean

Many thanks for your information

If I have understood it, the dam catchment area received 80% of rain for the 36 month period as measured against the period 1961 to 1990.

This is compatible with the drought column because 80% of the rainfall as measured for the period 1961 to 1990 is the lowest, or close to the lowest percentage on record.

Have I got it right ?

I appreciate your time

John Hodgkinson

----- Original Message -----

**From:** [REDACTED]  
**To:** [REDACTED]  
**Sent:** Friday, August 25, 2006 10:00 AM  
**Subject:** Deciles/drought deficiencies vs percentage of mean

Hi John

I am writing to follow up your enquiry. Sorry I couldn't answer this over the phone. The differences are to do with the way the different indices are calculated:

With the drought statement and deciles the values are lined up in order and then put into ten categories: for example if we had 100 data points, the ten lowest would be in decile 1. If there were 200 data points the 20 lowest would be in decile 1.

With percentiles (percentage of the mean) we calculate the mean (or the average) and see what values fall in that category. For example if the mean was 50mm - 70 % of the mean would be  $0.7 * 50 = 35$ , and 80% of the mean would be  $.8 * 50 = 40$ .

so if we had a dataset of 20 points:

4 32 34 35 62 65 43 22 71 76 22 14 57 89 45 32 21 12 19 20

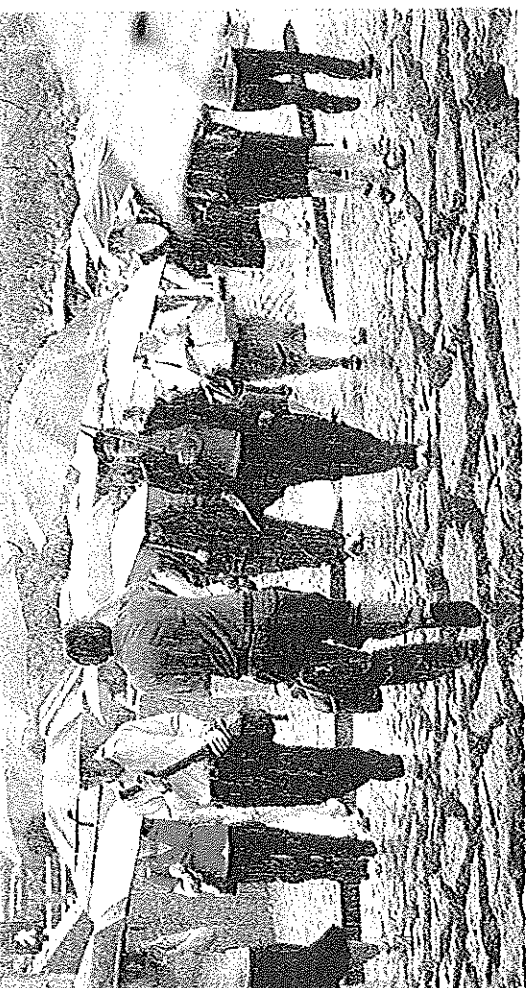
to get the decile we put them in order:



# Bring us a monsoon

Let it rain

Summer rainfalls in Wivenhoe, Somerset and North Pine Dam catchments	
DECEMBER 1991 - MARCH 1992	922.8mm registered at Kilcoy
DECEMBER 1993 - MARCH 1994	414.7mm registered at Esk
DECEMBER 1992 - MARCH 1995	384.2mm registered at Kilcoy
DECEMBER 1995 - MARCH 1996	572.4mm registered at Blackbutt
DECEMBER 1998 - MARCH 1999	838.7mm registered at Esk
DECEMBER 1999 - MARCH 2001	426.2mm registered at Esk
DECEMBER 2003 - MARCH 2004	571.7mm registered at Esk
DECEMBER 2005 - MARCH 2006	392.3mm registered at Kilcoy



## Near-tropical storms needed to fill storages

Amanda Gearing

CYCLONES in the Gulf of Carpentaria that have dropped half a metre of rain in tropical Queensland in the past week may have filled dams in the area to overflowing.

But similar amounts of rain would be needed to break the drought gripping southeast Queensland and replenish dwindling water supplies.

The combined storage volume of the region's three main dams is down to 22.7 per cent, well below the previous record low of 44.7 per cent set in November 1995.

SEQWater operations manager for Wivenhoe, Somerset and North Pine dams Rob Drury said a low or a major depression would be needed to cover the whole catchment area of the dams.

Wivenhoe would need 300mm-350mm of rain falling at 120mm a day over three days to fill, he said.

Wivenhoe has the capacity to store 1,165,000 megalitres of water as well as an additional capacity of 1,450,000ML to miti-

gate flooding. Brisbane's second largest dam, Somerset Dam, upstream of Wivenhoe, would need 350mm-400mm of intense rain to fill because it has a smaller catchment area, Mr Drury said.

North Pine Dam, which has an even smaller catchment area would need 600mm-650mm of intense rain to fill.

"You do need large, uncommon events to fill large dams. You don't fill them every year," Mr Drury said.

"There have been only four main rainfall events in the past 15-16 years. It has been seven years since we had a major rainfall event that has given us a refill of 50 per cent of the dam."

The only two rainfall periods that generated major inflows that filled the dams since 1990 were 922.8mm registered at Kilcoy in the four months to March 1992 and 838.7mm registered at Esk in the four months to March 1999.

"The dam levels were dropping 15-18 per cent a year (before water restrictions began) but last year it was only 10 per cent," Mr Drury said.

WIVENHOE																
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Total				
3	1898	336	107	127	11	47	39	16	29	40	28	63	36	Summer	172	480
3	1899	81	44	11	96	43	49	51	43	75	59	63	109	29	268	413
4	1900	21	30	37	118	38	68	68	41	56	1	54	29	303	527	
4	1901	84	55	196	117	29	88	72	100	43	83	14	35	211	193	
4	1902	117	42	17	19	1	0	3	26	29	36	79	183	307	735	
4	1903	40	66	67	31	163	25	125	79	110	84	119	56	302	473	
4	1904	73	86	87	98	100	7	53	4	54	66	92	89	1564	2821	

WIVENHOE													
	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Total
8	2000	178	96	45	44	26	47	37	15	5	77	92	425
8	2001	87	52	212	55	405	8	39	8	25	64	193	246
8	2002	101	27	82	87	296	13	59	1	9	40	41	273
8	2003	126	2	173	63	363	52	47	21	7	87	11	254
8	2004	131	222	109	116	573	29	3	6	18	38	126	375
8	2005	138	121	14	24	297	17	26	5	21	148	75	228
7	2006	85	98	47	29	258	16	13	35	53	11	64	1800

SOMERSET													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1898	1	505	186	256	26	83	43	6	43	79	52	174	45
1899	1	102	67	35	94	62	47	76	56	85	43	24	128
1900	1	22	60	57	49	136	58	85	34	82	22	84	249
1901	1	34	131	189	110	47	60	87	75	30	99	18	267
1902	1	47	66	14	22	5	0	5	16	51	32	108	356
1903	1	41	98	90	28	260	17	134	75	106	84	107	134
1904	1	93	42	140	163	106	16	45	7	29	92	98	239

SOMERSET DAM													
	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Total
2001	5	111	46	250	104	512	37	34	23	12	17	52	213
2002	5	94	53	89	52	289	33	19	50	60	9	48	259
2003	5	96	41	314	83	466	73	53	43	35	4	83	352
2004	5	225	135	183	173	60	22	8	7	23	23	49	318
2005	5	163	131	16	19	330	60	58	12	39	147	95	523
2006	5	165	140	68	92	466	17	17	35	35	86	24	293

Summary	Year	Year	Summer (4 mths)	Non/Sum (8 mths)	Total	Variance
Wivenhoe	1899	1903	1564	2821	4385	
Wivenhoe	2001	2006	2198	1800	3998	(387)
Somerset	1899	1903	1657	3116	4773	
Somerset	2001	2006	2766	1958	4724	(49)

## Federation drought

Examination of individual months that are high impact and create inflow into the Dams.

**Colour key :**

Non - Summer months April to November  
 Summer months December to March

Somerset			
Total	Federation drought	2001-06	Total
	260	314	
	174	250	
	169	215	&
	140	183	
	136	165	&
	134	163	
	131	147	
	128	140	
	110	135	
	108	131	
	107	130	&
	106	126	
	102	123	&
	99	104	
<b>1904</b>			<b>2326</b>

Wivenhoe			
Total	Federation drought	2001-06	Total
	163	222	*
	136	212	
	133	193	
	125	173	
	119	148	
	118	138	
	117	131	*
	117	126	
	110	126	
	109	121	
	100	116	*
	100	109	*
<b>1545</b>	<b>98</b>	<b>101</b>	<b>1916</b>

**Comment :**

As we have seen of recent date, rainfall under 100mm creates little inflow into the Dams. For those who wish to examine the number and rainfall, full details of all monthly rainfall are supplied in the associated chart.

The Federation drought shows a major departure from the normal summer rainfall.

While the associated chart shows similar rainfall in total, the Federation drought does not have the normal high impact rainfall that creates inflow into the Dams.

The Federation drought high impact rainfall fell in the low impact non-summer rainfall months. Refer to extensive information elsewhere in the web-site.

**Known inflows :**

- \* Wivenhoe. The months marked with an ( \* ) were 4 months in succession December 2003 and January to March 2004. They created a dam level rise of 10 percent in the Wivenhoe.
- & Somerset. The months marked with an ( & ) were 4 months in succession December 2003 and January to March 2004. They created a dam level rise of 27 percent in the Somerset.

**FREQUENCY OF "LARGE SCALE RAIN EVENTS "**

( Known by SEQWater as "uncommon events")  
 Flood gauge BOM is at Brisbane City. Localised In catchments are marked "no reading"  
 but appear in written BOM flood information affecting the catchments.

Year	Catchment Somerset MM	Catchment Wivenhoe MM	Flood Gauge BOM Metres	Years Since	Average																
					1	2	3	4	5	6	7	8	9	10	11	12	13	14			
1841	n/a	n/a	8.5	n/a																	
1843	n/a	n/a	2.8	2																	
1844	n/a	n/a	7.0	1																	
1852	n/a	n/a	3.0	8																	
1857	n/a	n/a	5.0	5																	
1863	n/a	n/a	3.4	6																	
1864	n/a	n/a	3.8	1																	
1867	n/a	n/a	2.4	3																	
1870	n/a	n/a	3.0	3																	
1873	n/a	n/a	2.8	3																	
1875	No bureau records		2.8	2																	
1879	kept to here		2.8	4																	
1887	n/a	454	3.8	8																	
1888	n/a	324	3.8	1																	
1890	n/a	385	5.3	2																	
1892	394	302	n/a	2																	
1892	395	287	n/a	0																	
1893	1422	1036	8.5	1																	
1893	4 floods in 1893		1.9	0																	
1893			8.3	0																	
1893			2.4	0																	
1898	505	336	2.5	5																	
1908	394	309	3.3	10																	
1911	436	225	No reading	3																	
1915	322	152	No reading	4																	
1918	352	168	No reading	3																	
1927	564	260	1.8	9																	
1928	413	252	2.1	1																	
1929	257	129	1.9	1																	
1931	216	250	3.4	2																	
1934	292	201	No reading	3																	
1939	294	140	No reading	5																	
1950	479	286	No reading	11																	
1955	532	289	2.4	5																	
1956	429	250	1.8	1																	
1967	310	251	2.0	11																	
1968	526	292	2.0	1																	
1971	468	296	1.8	3																	
1972	304	318	No reading	1																	
1973	474	257	No reading	1																	
1974	790	517	5.4	1																	
1976	671 3mths	534 3mths	No reading	2																	
1983	529 3mths	697 3mths	No reading	7																	
	Wivenhoe dam in place																				
1988	440	294	Dam filling	5																	
1989	564	262	1.9	1																	
1992	1062 4 mths		1.9	3																	
1996	308	205	-	4																	
1999	544	296	1.9	3																	
2001	251	204	n/a	2																	
2007	Near miss		n/a	6																"Worst drought ?"	
<b>OVERALL TOTALS / AVERAGE</b>				<b>50</b>																	

SUMMARY

Years Since	No. of Events	Total Events
Below the average		
0	4	
1	12	
2	7	
3	10	72%
4	3	36
Above the average		
5	5	
6	2	
7	1	
8	2	
9	1	
10	1	
11	2	
12		
13		28%
14		14
<b>Total</b>		<b>50</b>

Notes :

11 years is the largest gap

72% of events occur within 4 years

Average gap is 3.7 yrs

SEQWater rainfall requirements to fill dams

Required in a few days

Wivenhoe 300-350mm

Somerset 360-400mm

Bureau flood gauge

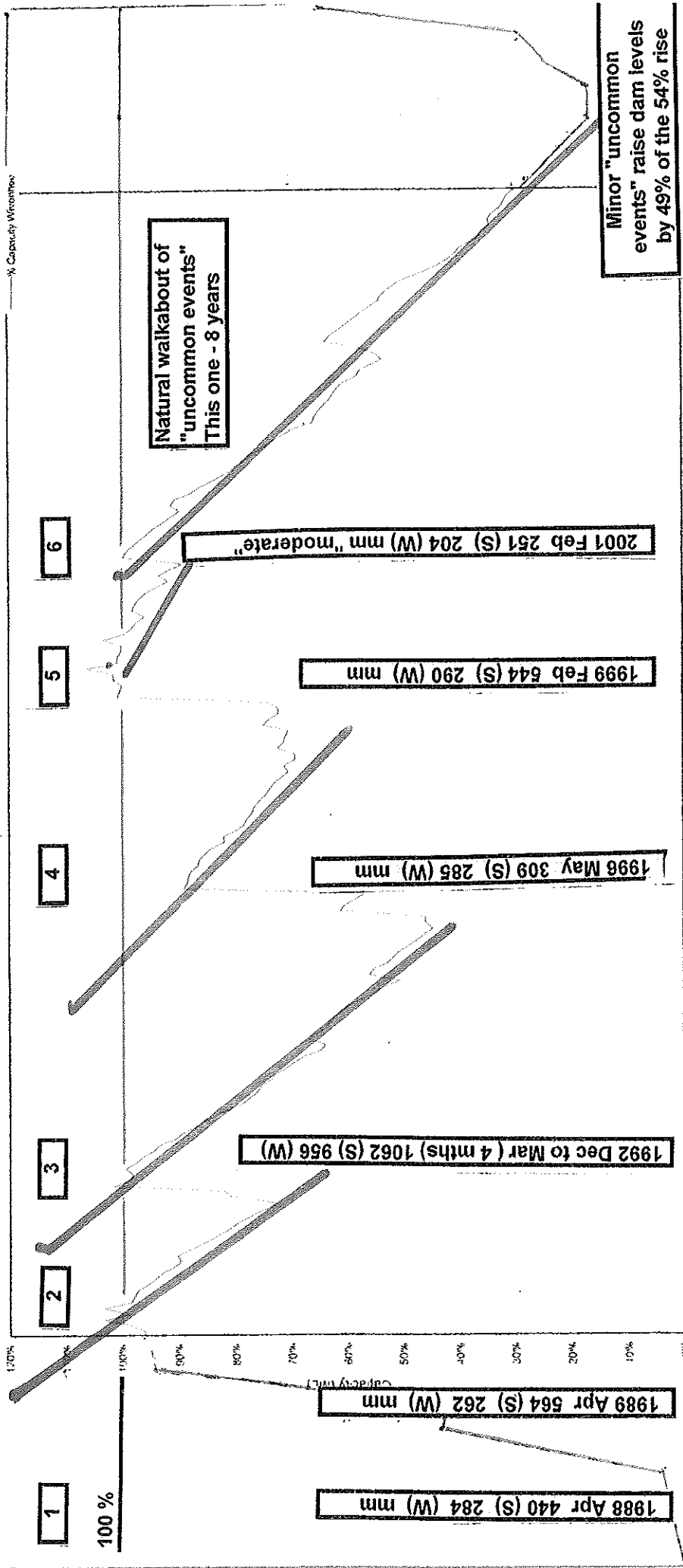
Major 3.5 metres

Moderate 2.6 metres

Revision date January 2011

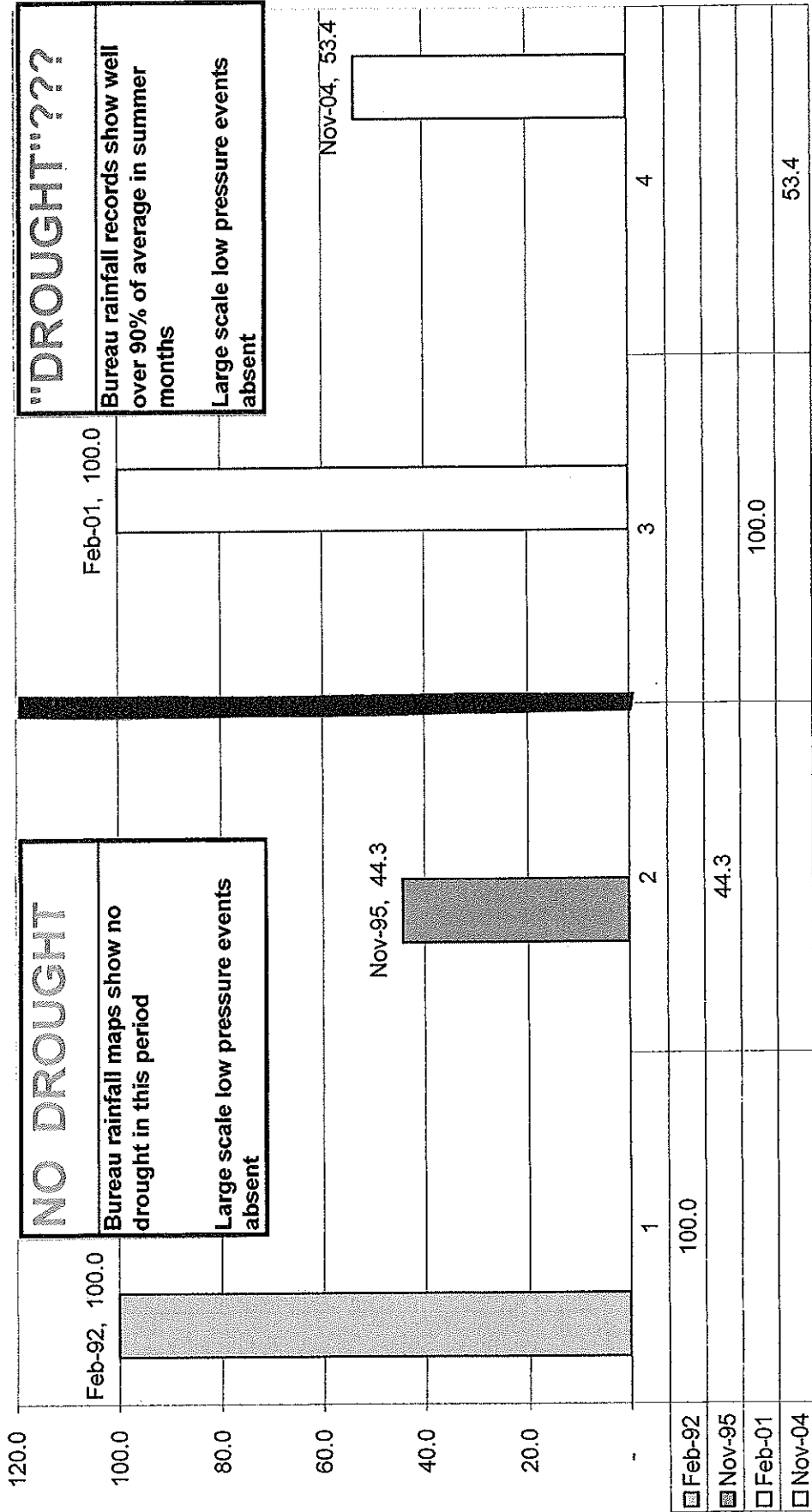
**Wivenhoe dam levels supplied by SEQWater matched with "Uncommon events"  
Wivenhoe Dam completed in 1986**

Historical Wivenhoe Storage Capacity  
Jan 1990 to May 2006



Year	Mth	%
1986	Start	
1987	Jan	n/a
1987	Jul	n/a
1988	Jan	n/a
1988	Jul	n/a
1989	Jan	n/a
1989	Jul	n/a
1990	Jan	97
1990	Jul	98
1991	Jan	93
1991	Jul	85
1992	Jan	73
1992	Jul	100
1993	Jan	92
1993	Jul	80
1994	Jan	70
1994	Jul	84
1995	Jan	50
1995	Jul	50
1996	Jan	47
1996	Jul	60
1997	Jan	89
1997	Jul	80
1998	Jan	76
1998	Jul	70
1999	Jan	71
1999	Jul	100
2000	Jan	100
2000	Jul	100
2001	Jan	97
2001	Jul	100
2002	Jan	90
2002	Jul	80
2003	Jan	70
2003	Jul	80
2004	Jan	53
2004	Jul	64
2005	Jan	50
2005	Jul	40
2006	Jan	32
2006	Jul	29
2007	Jan	24
2007	Jul	18
2008	Jan	18
2008	Jul	26
2009	Jan	30
2009	Jul	64

Comparison of Wivenhoe Dam levels for 3 years and 9 months periods after the dam was full to overflowing on both occasions. Proof that our depleted Dams were not affected by drought conditions. Low pressure systems absent from both for normal 3.7 years



Feb-92 
  Nov-95 
  Feb-01 
  Nov-04