"JP-1"

Queensland Government

Ref CTS 19311/10

25 OCT 2010

Office of the
Minister for Natural Resources, Mines and Energy and Minister for Trade

Mr Gary Humphrys
Chair
SEQ Water Grid Manager
PO Box 16205
CITY EAST QLD 4002

Dear Mr Humphrys

I write in relation to seeking advice regarding options to and benefits of releasing water from key storages in anticipation of major inflows over the coming summer.

I understand that the key Water Grid storages are at 100 per cent of storage capacity going into the traditional wet season, with forecasts of higher than median rainfall and the prospect of multiple flood events.

I am also advised that our water supply is more secure than ever before, due to storages being full, key Water Grid projects completed and ongoing water efficiency.

I seek your urgent advice about whether this water security provides an opportunity to reduce the volume stored in key dams as a means of reducing the severity, frequency and duration of flooding in downstream areas.

In doing so, I note that recent releases from Wivenhoe Dam have resulted in significant inconvenience and isolation for residents in some downstream areas. With the catchments saturated, I understand that even quite minor rainfall events will result in further water releases and further inconvenience for these residents.

By end November 2010, I would appreciate your advice as to the available options and the likely benefits. At a minimum, you should review the operation of Wivenhoe, North Pine and Leslie Harrison dams. At least for Leslie Harrison Dam, this would be a return to standard operating procedures prior to the drought, when the dam was routinely drawn down to 95 per cent of capacity to minimise the impacts of storms on downstream residents.

I also seek your confirmation that these options would not significantly impact upon our current water security, measured as the probability of needing to reintroduce Medium Level Restrictions over the next five to ten years.

Level 17
61 Mary Street Brisbane 4000
PO Box 15216 City East
Queensland 4002 Australia
Telephone +61 7 3225 1861
Facsimile +61 7 3225 1828
Email nrmet@ministerial.qld.gov.au
ABN 65 959 415 158

Queensland Government

Office of the
Minister for Natural Resources, Mines and Energy and Minister for Trade

I emphasise that this is only a temporary measure, reflecting that dams are full prior to the commencement of the traditional wet season. I expect that your advice will include a clear date or trigger beyond which dams will be allowed to fill to their full supply level.

Thank you in advance for your assistance.

Should you have any further enquiries, please feel welcome to contact Mr John Bradley, Director General, Department of Environment and Resource Management on [redacted]

Yours sincerely

STEPHEN ROBERTSON MP

Level 17
61 Mary Street Brisbane 4000
PO Box 15216 City East
Queensland 4002 Australia
Telephone +61 7 3225 1861
Facsimile +61 7 3225 1828
Email nrmet@ministerial.qld.gov.au
ABN 65 959 415 158

"JP-2"

Completed For file.

SEQ Water Grid manager

Secure and efficient water through partnership and innovation

TRIM ref: D/10/7049

2 November 2010

Mr Peter Borrows
Chief Executive Officer
Seqwater
PO Box 16146
City East QLD 4002

Dear Peter

I write to seek your advice about options to, and benefits of, releasing water from key storages in anticipation of major inflows over the coming summer.

The Minister has sought our urgent advice about whether current water security provides an opportunity to reduce the volume stored in key dams as a means of reducing the severity, frequency and duration of flooding in downstream areas. I have attached a copy of his request for your information. You will note that he has highlighted that this is a temporary measure only.

To meet this deadline, I would appreciate your advice about options by 19 November 2010. We can then undertake an assessment of the impact of these options on water security, before jointly preparing advice to the Minister with you.

I understand that Mr Daniel Spiller, Director Operations, has already advised your officers of this request and that investigations have commenced. However, please advise if you have concerns about your ability to meet the above timeframes.

Please do not hesitate to call Dan on [redacted] if you have any queries or require any further information.

Yours sincerely

[redacted]

Barry Dennien
Chief Executive Officer

Enclosed: Letter from Stephen Robertson MP regarding release of water from key storages

PO Box 16205, City East QLD 4002 Tel: +[redacted] Fax: +[redacted] www.seqwgm.qld.gov.au
ABN: 14 783 917 630

"JP-3"

From: John Tibaldi
Sent: Tuesday, 9 November 2010 2:12 PM
To: Jim Pruss
Cc: Brooke Foxover
Subject: RE: Letter from minister/Grid Manager re lowering of dam levels (letter attached)

Jim

With input from Terry I have prepared a draft discussion paper for submission to the WGM. I suggest we submit the paper along with an invitation for a discussion with relevant WGM staff (draft covering letter also attached).

At this stage I will await your advice before proceeding further. I can add further technical data to the paper if needed.

John Tibaldi
Dam Safety Manager
Queensland Bulk Water Supply Authority *trading as* Seqwater

cid:image001.png@01C8F22C.8A

Ph [redacted]
Unit 1/ 68 Junction Road, Karalee QLD 4306
PO Box 2437, North Ipswich QLD 4305
Website | www.seqwater.com.au

From: Brooke Foxover
Sent: Monday, 8 November 2010 9:15 AM
To: John Tibaldi
Subject: FW: Letter from minister/Grid Manager re lowering of dam levels (letter attached)

Hi John,

As requested, letter is attached.

thanks

Brooke Foxover
Group Support Officer

Water Delivery
QLD Bulk Water Supply Authority *trading as* Seqwater

Ph [redacted]
Level 3, 240 Margaret Street, Brisbane City QLD 4000 Australia
PO Box 16146, City East QLD 4002
Website | www.seqwater.com.au

From: Jim Pruss
Sent: Thursday, 4 November 2010 6:28 AM
To: Rob Drury; John Tibaldi; Terry Malone
Cc: Barton Maher
Subject: Letter from minister/Grid Manager re lowering of dam levels

Guys
We have now received the letter i discussed with rob the week before last . They are after our advice about options by 19 November. It is a temporary measure only with the intent being we come up with an arbitrary FSL for the coming months, slowly release water to hit that target if the storages are already above this and manage to that new level for future rainfall events. Obviously after a certain date we would revert back to a normal FSL with an objective of being an near to FSL as possible by the end of the wet season. I think the advice from us will be a recommended FSL that will prevent gate opening in a limited range of rainfall conditions, at lease to stop the cycle of openings from relatively small rain events.

We will need to have justification for the numbers and they wont need to be the same level.

Could someone please advise who is working on this and when we might have a consolidated picture to brief me on

Hope you boys are enjoying ANCOLD

cheers

Jim Pruss
Executive General Manager, Water Delivery
QLD Bulk Water Supply Authority *trading as* Seqwater

Ph [redacted]
Level 4 240 Margaret Street, Brisbane City QLD 4000 Australia
PO Box 16146, City East QLD 4002
Website | www.seqwater.com.au

Seqwater_No-Lifeguards-Here_email_strap

seqwater
WATER FOR LIFE

When contacting Seqwater please ask for John Tibaldi
Telephone: [redacted]
Reference: 09-000053

9 November 2010

Mr Barry Dennien
Chief Executive Officer
SEQ Water Grid Manager
PO Box 16205
CITY EAST BRISBANE QLD 4002

Dear Mr Dennien

DAM FULL SUPPLY LEVEL (FSL) INVESTIGATIONS

I refer to your letter to me dated 2 November 2010 concerning the above.

Attached is a short discussion paper on the issues raised in your letter for your consideration. To progress the issues in the paper, I suggest a meeting involving the relevant technical staff from our organisations, with the aim of developing and finalising an appropriate response to the Minister. Seqwater staff will make themselves available for such a meeting and I request that you contact Seqwater's Executive General Manager Mr Jim Pruss to arrange the meeting details.

Please don't hesitate to contact me should you wish to discuss this matter further.

Yours faithfully

Peter Borrows
Chief Executive Officer
QLD Bulk Water Supply Authority *trading as* Seqwater

DAM FULL SUPPLY LEVEL (FSL) INVESTIGATIONS
SEQWATER GATED STORAGES

INTRODUCTION

The following short paper examines the issues associated with temporary lowering the full supply levels of Seqwater's gated dams to improve short term flood mitigation benefits. The paper considers Wivenhoe Dam, Somerset Dam, North Pine Dam and Leslie Harrison Dam.

WIVENHOE DAM AND SOMERSET DAM

Wivenhoe Dam and Somerset dam control only 50% of the Brisbane River catchment (Bremer River and Lockyer Creek catchments are not controlled), therefore the Flood Mitigation benefits provided by the dam will depend on the rainfall distribution experienced during a flood event. This makes it difficult to quantify exactly the benefits of lowering the storage in anticipation of possible flood rains.

There are primarily two types of flood events that may occur in the Brisbane River Catchment. There are the smaller events that impact primarily on the rural bridges upstream of Moggill and the larger events that impact on urban areas in Brisbane. The threshold that separates these two events is a river flow of around 3500 cubic metres per second at Moggill. To understand the possible benefits of lowering the storage to reduce flooding impacts, it makes sense to discuss these two types of events separately.

Events Impacting on Bridges (Moggill Flow < 3500m^3/s) – Limited Urban Impacts

In recent history, flood events of this nature occurred in April 1989, February 1999 and October 2010. The flow characteristics of events of this type are shown in the following table.

Event	Wivenhoe Dam					
	Starting Level		Volume Of Inflow	Volume Of Outflow	Peak Outflow	Peak Water Level
	m AHD	%	ML	ML	m3/s	m AHD
Early April 1989	67.06	>100	690,000	690,000	1,620	69.78
Late April 1989	67.00	100	870,000	820,000	1,490	71.45
February 1999	63.92	<100	1,220,000	900,600	1,800	70.45
October 2010	67.03	>100	640,000	640,000	1,300	69.65

The October 2010 event was examined to determine the benefits of lowering the storage level. This event commenced with the dam at FSL. The event was examined with the dam at 95% capacity, 90% capacity, 80% capacity, 50% capacity and empty at the commencement of the event. The results are shown in the following table. When reading the table it is important to understand that the bridges are impacted not just by outflows from Wivenhoe, but also by flows from the uncontrolled areas of the river catchment. Accordingly, the location of a bridge within the system will dictate the size of catchment area that will impact on the bridge. All inundation times shown in the table are approximations only, made for the purposes of this investigation.

Dam Percentage Full at Event Commencement	Approximate Duration of Wivenhoe Radial Gate Releases/ Twin Bridges Inundation (hours)	Approximate Duration of Savages Crossing and Colleges Crossing Inundation (hours)	Approximate Duration of Burtons Bridge and Kholo Bridge Inundation (hours)	Peak Flow at Moggill (m^3/s)
100%	230	247	183	1848
95%	187	214	183	1848
90%	185	214	183	1841
80%	172	214	183	1786
50%	130	214	153	1722
0%	0	189	38	940

The table shows that the reduction in FSL won't have a large impact on Bridge inundation times. A reduction in the order or 36 hours or 15% of the total inundation time may be possible for the low level bridges only. The reductions are generally caused by the delay in release commencement associated with the lower starting FSL. However, the bridges can often already inundated at this time anyway due to flood inflows into the Brisbane River from the 50% of the catchment not controlled by Wivenhoe Dam. Lowering the FSL of the dam has no impact on such inundations as shown in the table.

For events smaller than those considered above, it should be noted that the Manual of Flood Mitigation allows a trigger level buffer of 27500 megalitres above FSL and this has the effect of protecting Twin Bridges and the lower level bridges from inundation as a result of minor events. Twin Bridges is essentially a low level causeway that is inundated following any radial gate release. This inundation could possibly be prevented by raising the bridge deck level. Regardless, the areas accessed using this bridge can also be accessed using the Fernvale Bridge. It is acknowledged however that the closing of Twin Bridges causes inconvenience to local residents, as it adds approximately another five kilometres to the journeys to and from their residences. Approximately 40 residences and several businesses (primarily turf farms) are impacted.

Events Impacting on Urban Areas (Moggill Flow > 3500m^3/s) – All rural bridges inundated

Events of this nature have not been experienced since the construction of Wivenhoe Dam was completed in 1984, with the last event of this nature being experienced in 1974. The inflow volume into Wivenhoe Dam associated with the 1974 event has been estimated to be in the order of 1.5 million megalitres. However during the 1974 event, an additional 1.5 million megalitres of flood flow impacting of the urban areas of Brisbane originated from catchment areas that are not controlled by Wivenhoe Dam.

For events of this nature, it is unlikely that peak water levels in Brisbane would be significantly impacted by minor reductions in the level of Wivenhoe Dam. Certainly reductions in dam volume in the order of at least 250000 megalitres would be needed to provide any significant reduction in water level peaks experienced in urban areas. Additionally, reductions in the FSL of this order would not necessarily guarantee reductions

in urban flood levels, as the effectiveness of Wivenhoe Dam in reducing urban flood levels is directly dependant on the distribution of rainfall in the Brisbane River catchment during a flood event (Wivenhoe Dam controls only 50% of the total Brisbane River catchment) and the spacing between individual flood events.

NORTH PINE DAM

North Pine Dam has no flood mitigation potential. Unlike Wivenhoe Dam, once the dam has reached FSL, all water flows into the dam must be released to protect the structural safety of the dam.

Any radial gate operation at North Pine Dam to release flood water, results in inundation of Youngs Crossing Road, so lowering the FSL is problematic and may best be achieved by increasing the daily water diversion to the North Pine Dam Water Treatment Plant. There are river release valves that allow some water to be drained from North Pine Dam without inundating Youngs Crossing. These valves have been operated continuously since the recent gate releases to manage residual inflows into the dam. However outflows from these valves are restricted to flows in the order of several hundred megalitres per day as larger flows will adversely impact on Youngs Crossing. Certainly a small reduction in the level of North Pine Dam is potentially beneficial in preventing closures of Youngs Crossing Road associated with small storm events.

It should be noted however that Youngs Crossing Road is also impacted by uncontrolled flood flows from Lake Kurwongbah and local storm run-off. In recent times Youngs Crossing Road has been closed by flood water during times when no water releases were being made from North Pine Dam, but when storm rains resulted in flood flows from uncontrolled areas of the catchment.

The table below gives an indication of the rainfall required to operate for NPD:

Level	Capacity			Rainfall Required to Operate	
				Wet Conditions	Dry Conditions
	m AHD	%	ML	mm	mm
FSL	39.60	100.0%	214,302	5	60
Reduced FSL	39.10	95.0%	203,618	35	100

Recent changes to the Manual of Flood Mitigation for North Pine Dam allows for some ability to retain up to 2500 megalitres of water to reduce impacts on Youngs Crossing Road, provided favourable weather forecasts are experienced. However the preferred option to reduce public inconvenience associated with storm events would be to raise the flood immunity of the river crossing on Youngs Crossing Road. This crossing is primarily a low level causeway that is potentially unsuitable given the volume of traffic that now uses this crossing on a daily basis.

LESLIE HARRISON DAM

Similar to North Pine Dam, Leslie Harrison Dam has no flood mitigation potential. Once the dam has reached FSL, all water flows into the dam must be released to protect the structural safety of the dam.

The dam is relatively small with a total full supply storage volume of only 24800 megalitres, against an inflow volume during a 72 hour 1 in 50 year storm event of over 30000 megalitres. Flood gate operations at Leslie Harrison Dam do not impact on public roads and generally only inconvenience the general public during large flood events. Reductions in this inconvenience cannot be achieved by small reductions in dam storage level.

Peter Borrows

From: Jim Pruss
Sent: Tuesday, 9 November 2010 4:01 PM
To: Peter Borrows
Subject: FW: Letter from minister/Grid Manager re lowering of dam levels (letter attached)
Attachments: Let - WGM-01.doc; WIVENHOE DAM - Storage Lowering.Investigation.docx

Peter

Draft response to Minister's letter included. Effectively the strategy is to send the draft of the investigation to date WGM and lets kick around implications with them. What do you think. I believe it is pretty smart to get them involved before final advice, gives everyone some room to breathe. Dont know if we need to formalise such an invitation but would need to formally sign off final report

Any comments?

Jim

From: John Tibaldi .
Sent: Tuesday, 9 November 2010 2:12 PM
To: Jim Pruss
Cc: Brooke Foxover
Subject: RE: Letter from minister/Grid Manager re lowering of dam levels (letter attached)

Jim

With input from Terry I have prepared a draft discussion paper for submission to the WGM. I suggest we submit the paper along with an invitation for a discussion with relevant WGM staff (draft covering letter also attached).

At this stage I will await your advice before proceeding further. I can add further technical data to the paper if needed..

John Tibaldi
Dam Safety Manager
Queensland Bulk Water Supply Authority *trading as* Seqwater

Ph [redacted]
Unit 1/ 68 Junction Road, Karalee QLD 4306
PO Box 2437, North Ipswich QLD 4305
Website | www.seqwater.com.au

From: Brooke Foxover
Sent: Monday, 8 November 2010 9:15 AM
To: John Tibaldi
Subject: FW: Letter from minister/Grid Manager re lowering of dam levels (letter attached)

HI John,

Message: Dam full supply level (FSL) investigations (Draft document)

Case Information:

Message Type:	Exchange
Message Direction:	External, Outbound
Folder:	AAR Urgent Request
Capture Date:	28/03/2011 1:11:29 PM
Item ID:	1718041
Policy Action:	Not Specified

Mark History:

No reviewing has been done

Policies:

No Policies attached

Dam full supply level (FSL) investigations (Draft document)

From Brooke Foxover **Date** Wednesday, 10 November 2010 3:57 PM

To Daniel Spiller [redacted]

Cc Jim Pruss

WIVENHOE DAM - Storage Lowering Investigation.docx (29 Kb HTML) **image001.png** (7 Kb HTML) **image002.jpg** (13 Kb HTML)

Hi Dan,

This is the draft advice received from Dam safety guys to date.

Suggest we discuss expectations/ other required details over the phone when convenient.

Once discussed, Seqwater can provide a formal response to meet Grid Manager expectations and Minister deadlines.

Jim

Jim Pruss
Executive General Manager, Water Delivery
QLD Bulk Water Supply Authority *trading as* Seqwater

cid:image001.png@01CB7FE7.B0

Ph [redacted]
Level 4 240 Margaret Street, Brisbane City QLD 4000 Australia
PO Box 16146, City East QLD 4002
Website | www.seqwater.com.au

Seqwater_No-Lifeguards-Here_email_strap

DAM FULL SUPPLY LEVEL (FSL) INVESTIGATIONS

SEQWATER GATED STORAGES

INTRODUCTION

The following short paper examines the issues associated with temporary lowering the full supply levels of Seqwater's gated dams to improve short term flood mitigation benefits. The paper considers Wivenhoe Dam, Somerset Dam, North Pine Dam and Leslie Harrison Dam.

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Brooke Foxover

From: Rob Drury
Sent: Thursday, 2 December 2010 3:11 PM
To: 'Barry Dennien'; Jim Pruss
Cc: Peter Borrows
Subject: RE: Dam levels - Investigation

Barry,
Attached is our DRAFT reply on possibility and impact of lowering dam levels on floods for your review and any comments.

Rob

Robert Drury
Dam Operations Manager
Water Delivery
Queensland Bulk Water Supply Authority *trading as* Seqwater

seqwater
WATER FOR LIFE

Ph [redacted]
Wivenhoe Dam, Brisbane Valley Highway, via Fernvale Q4306 Australia
PO Box 37, Fernvale QLD 4306
Website | www.seqwater.com.au

From: Barry Dennien [redacted]
Sent: Wednesday, 1 December 2010 11:56 AM
To: Jim Pruss; Rob Drury
Subject: Dam levels - Investigation

Jim Rob

Hope all is well.

Just following up on our discussions with regards dam levels and flood impacts. Anything I can do to help?

We are due to get back to the Minister by the end of November.

Regards

Barry Dennien
Chief Executive Officer
SEQ Water Grid Manager
Phone: [redacted]
Email: [redacted]
Visit: Level 15, 53 Albert Street, Brisbane
Post: PO Box 16205, City East Qld 4002
ABN: 14783 317 630

Please consider the environment before printing this email. It takes 10 litres of water to make one sheet of A4 paper.

Summary of comments

The attached paper summarises an analysis that changing the initial storage level of dams has on downstream flood impacts.

Wivenhoe/Somerset System

The analysis shows that for some minor floods similar to October 2010, reducing the starting volume of Wivenhoe Dam by 5% or 10% has minimal impacts on impacts downstream. The main benefit being that inundation times for downstream bridges will be reduced but only by around15%. However peak water levels are not affected. There are minimal potential benefits to downstream bridge until dam levels are reduced down to about 50% of capacity.

These results are not unexpected as Wivenhoe has such a large flood storage. Adding say 100,000ML to the flood storage (equates to reducing the storage volume by 10%) does not appreciably increase this available flood storage.

It should also be noted that in many cases, Wivenhoe flood releases will be made following the peaks of inflows into the Brisbane River from the Lockyer and Bremer Catchments. Certainly during many events, Lockyer Creek could already have inundated most or all of the road crossings downstream of Wivenhoe Dam. In these instances, a small amount of additional flood storage in the dam provides minimal benefit.

Another option considered was pre-releasing Wivenhoe water in anticipation of a flood event. This is not considered a viable option for the following reasons:

- Regardless of forecast, there is never any certainty on the amount of rain that will fall within a dam catchment. For example, on 29 November 2010, the quantitative forecast from BOM for the Wivenhoe Catchment was 25 to 50 millimetres. Actual rainfall received was in the order of 10 millimetres. On a saturated catchment this could equate to a runoff discrepancy of hundreds of thousands of megalitres. A pre-release of anticipated flood water based on forecast could result in major embarrassment.
- Any significant pre-release of water would result in bridge inundation below Wivenhoe Dam.
- Any pre-release of water from Wivenhoe Dam will take at least 24 hours to reach the lower end of the Brisbane River system. Rains occurring in the catchments below the dam over this period could potentially worsen downstream flood impacts.

The Bureau of Meteorology has been contacted and they have confirmed the above forecast reliability assessment. They advised that, whilst weather prediction models are steadily improving, the forecast of rainfall amounts over catchment time/space scales is recognised as one of the most challenging/difficult tasks. Detailed rainfall forecasting is not deterministic - the uncertainties involved are often expressed in probabilistic forecasts and whilst there is often the ability to forecast the potential for a significant rain event to occur in the southeast Qld-northern NSW region, it is difficult (if not impossible) to predict the actual location of the heaviest rain, even with only a few hours notice.

The Queensland Director of Dam Safety (Mr Peter Allen) was contacted and he confirmed the assessment that minor reductions in the stored volume of Wivenhoe Dam would have

minimal impacts on floods downstream and concurred with the risks involved in any pre release of significant volumes of water from dams prior to an event.

North Pine and Leslie Harrison Dams

Lowering the normal FSL for North Pine and Leslie Harrison Dams will have minimal impact on major floods and may not decrease releases depending on the size of even minor events. However lowering the level of North Pine Dam after a flood release to between 95% and 100% may reduce the frequency of operations in some rain events although the main benefit is in operational efficiency as it provides more time for response and may reduce making releases in a minor storm event.

Similarly reducing Leslie Harrison level to around 95% after or before an event could assist in reducing call out of staff and manning the storage for minor releases and even the timing of releases.

Normally both dams are returned to just under 100% after an event based on base inflows still occurring and possible further rain. Allowing the dams to reduce to around 95% improves the operational leeway. However this could best be provided by an operational arrangement where the WGM simply agrees Seqwater has the operational latitude to reduce both storages to between 95% and 100% after an event or when there is some inflow and Seqwater can decide the exact level based on ongoing inflows and possible predicted rainfall, but not going below 95%.

DAM FULL SUPPLY LEVEL (FSL) INVESTIGATIONS
SEQWATER GATED STORAGES

INTRODUCTION

The following short paper examines the issues associated with temporary lowering the full supply levels of Seqwater's gated dams to improve short term flood mitigation benefits. The paper considers Wivenhoe Dam, Somerset Dam, North Pine Dam and Leslie Harrison Dam.

WIVENHOE DAM AND SOMERSET DAM

Wivenhoe Dam and Somerset dam control only 50% of the Brisbane River catchment (Bremer River and Lockyer Creek catchments are not controlled), therefore the Flood Mitigation benefits provided by the dam will depend on the rainfall distribution experienced during a flood event. This makes it difficult to quantify exactly the benefits of lowering the storage in anticipation of possible flood rains.

There are primarily two types of flood events that may occur in the Brisbane River Catchment. There are the smaller events that impact primarily on the rural bridges upstream of Moggill and the larger events that impact on urban areas in Brisbane. The threshold that separates these two events is a river flow of around 3500 cubic metres per second at Moggill. To understand the possible benefits of lowering the storage to reduce flooding impacts, it makes sense to discuss these two types of events separately.

Events Impacting on Bridges (Moggill Flow < 3500m^3/s) – Limited Urban Impacts

In recent history, flood events of this nature occurred in April 1989, February 1999 and October 2010. The flow characteristics of events of this type are shown in the following table.

Event	Wivenhoe Dam					
	Starting Level		Volume Of Inflow	Volume Of Outflow	Peak Outflow	Peak Water Level
	m AHD	%	ML	ML	m3/s	m AHD
Early April 1989	67.06	>100	690,000	690,000	1,620	69.78
Late April 1989	67.00	100	870,000	820,000	1,490	71.45
February 1999	63.92	<100	1,220,000	900,600	1,800	70.45
October 2010	67.03	>100	640,000	640,000	1,300	69.65

The October 2010 event was examined to determine the benefits of lowering the storage level. This event commenced with the dam at FSL. The event was examined with the dam at 95% capacity, 90% capacity, 80% capacity, 50% capacity and empty at the commencement of the event. The results are shown in the following table. When reading the table it is important to understand that the bridges are impacted not just by outflows from Wivenhoe, but also by flows from the uncontrolled areas of the river catchment. Accordingly, the location of a bridge within the system will dictate the size of catchment area that will impact on the bridge. All inundation times shown in the table are approximations only, made for the purposes of this investigation.

Dam Percentage Full at Event Commencement	Approximate Duration of Wivenhoe Radial Gate Releases/ Twin Bridges Inundation (hours)	Approximate Duration of Savages Crossing and Colleges Crossing Inundation (hours)	Approximate Duration of Burtons Bridge and Kholo Bridge Inundation (hours)	Peak Flow at Moggill (m^3/s)
100%	230	247	183	1848
95%	187	214	183	1848
90%	185	214	183	1841
80%	172	214	183	1786
50%	130	214	153	1722
0%	0	189	38	940

The table shows that the reduction in FSL won't have a large impact on Bridge inundation times. A reduction in the order or 36 hours or 15% of the total inundation time may be possible for the low level bridges only. The reductions are generally caused by the delay in release commencement associated with the lower starting FSL. However, the bridges can often already inundated at this time anyway due to flood inflows into the Brisbane River from the 50% of the catchment not controlled by Wivenhoe Dam. Lowering the FSL of the dam has no impact on such inundations as shown in the table.

For events smaller than those considered above, it should be noted that the Manual of Flood Mitigation allows a trigger level buffer of 27500 megalitres above FSL and this has the effect of protecting Twin Bridges and the lower level bridges from inundation as a result of minor events. Twin Bridges is essentially a low level causeway that is inundated following any radial gate release. This inundation could possibly be prevented by raising the bridge deck level. Regardless, the areas accessed using this bridge can also be accessed using the Fernvale Bridge. It is acknowledged however that the closing of Twin Bridges causes inconvenience to local residents, as it adds approximately another five kilometres to the journeys to and from their residences. Approximately 40 residences and several businesses (primarily turf farms) are impacted.

Events Impacting on Urban Areas (Moggill Flow > 3500m^3/s) – All rural bridges inundated

Events of this nature have not been experienced since the construction of Wivenhoe Dam was completed in 1984, with the last event of this nature being experienced in 1974. The inflow volume into Wivenhoe Dam associated with the 1974 event has been estimated to be in the order of 1.5 million megalitres. However during the 1974 event, an additional 1.5 million megalitres of flood flow impacting of the urban areas of Brisbane originated from catchment areas that are not controlled by Wivenhoe Dam.

For events of this nature, it is unlikely that peak water levels in Brisbane would be significantly impacted by minor reductions in the level of Wivenhoe Dam. Certainly reductions in dam volume in the order of at least 250000 megalitres would be needed to provide any significant reduction in water level peaks experienced in urban areas. Additionally, reductions in the FSL of this order would not necessarily guarantee reductions in urban flood levels, as the effectiveness of Wivenhoe Dam in reducing urban flood levels is

directly dependant on the distribution of rainfall in the Brisbane River catchment during a flood event (Wivenhoe Dam controls only 50% of the total Brisbane River catchment) and the spacing between individual flood events.

NORTH PINE DAM

North Pine Dam has no flood mitigation potential. Unlike Wivenhoe Dam, once the dam has reached FSL, all water flows into the dam must be released to protect the structural safety of the dam.

Any radial gate operation at North Pine Dam to release flood water, results in inundation of Youngs Crossing Road, so lowering the FSL is problematic and may best be achieved by increasing the daily water diversion to the North Pine Dam Water Treatment Plant. There are river release valves that allow some water to be drained from North Pine Dam without inundating Youngs Crossing. These valves have been operated continuously since the recent gate releases to manage residual inflows into the dam. However outflows from these valves are restricted to flows in the order of several hundred megalitres per day as larger flows will adversely impact on Youngs Crossing. Certainly a small reduction in the level of North Pine Dam is potentially beneficial in preventing closures of Youngs Crossing Road associated with small storm events.

It should be noted however that Youngs Crossing Road is also impacted by uncontrolled flood flows from Lake Kurwongbah and local storm run-off. In recent times Youngs Crossing Road has been closed by flood water during times when no water releases were being made from North Pine Dam, but when storm rains resulted in flood flows from uncontrolled areas of the catchment.

The table below gives an indication of the rainfall required to operate for NPD:

Level	Capacity			Rainfall Required to Operate	
				Wet Conditions	Dry Conditions
	m AHD	%	ML	mm	mm
FSL	39.60	100.0%	214,302	5	60
Reduced FSL	39.10	95.0%	203,618	35	100

Recent changes to the Manual of Flood Mitigation for North Pine Dam allows for some ability to retain up to 2500 megalitres of water to reduce impacts on Youngs Crossing Road, provided favourable weather forecasts are experienced. However the preferred option to reduce public inconvenience associated with storm events would be to raise the flood immunity of the river crossing on Youngs Crossing Road. This crossing is primarily a low level causeway that is potentially unsuitable given the volume of traffic that now uses this crossing on a daily basis.

LESLIE HARRISON DAM

Similar to North Pine Dam, Leslie Harrison Dam has no flood mitigation potential. Once the dam has reached FSL, all water flows into the dam must be released to protect the structural safety of the dam.

The dam is relatively small with a total full supply storage volume of only 24800 megalitres, against an inflow volume during a 72 hour 1 in 50 year storm event of over 30000 megalitres. Flood gate operations at Leslie Harrison Dam do not impact on public roads and generally only inconvenience the general public during large flood events. Reductions in this inconvenience cannot be achieved by small reductions in dam storage level.

From: Barry Dennien [redacted]
Sent: Wednesday, 8 December 2010 8:23 AM
To: Jim Pruss; Rob Drury
Cc: Dan Spiller; Peter Borrows
Subject:

Hi Jim Rob

The Minister is attending our Board meeting this Monday and given the public debate on Wivenhoe levels is very much front of mind (attached) he will ask on the status of the modelling work. I received your update the other day thankyou, I had a few extra questions, is there any chance on your thoughts before Monday, not necessarily any new model runs before then.

Regards

Barry

Rob

Thanks for the report. Thanks for the additional BOM advice.

I note the good work on modelled sensitivities for flows below 1900m3/sec – W1 strategy (flood manual)

The report then jumps to greater than 3500m3/sec (W4 strategy) and comments how peak water levels would unlikely be impacted and it comments that dam volume reductions of 250,000 megalitres (reduction 20% dam level) would be needed for any significant reduction in water level peaks.

Q1. Was the >3500m3/sec modelled like the October event < 1900M3/sec to draw the above conclusions.

Q2. Was the flow between 1900 and 3500 m3/sec modelled (Strategy W2 W3) with various dam levels to ascertain benefits to peak levels or bridge outage durations

Q3. If no to 1 and 2 is it worth doing considering we make the comments above about maybe a benefit if we have 250,000 ML extra storage.

Regards

Barry

Message: RE:

Case Information:

Message Type:	Exchange
Message Direction:	External, Outbound
Folder:	AAR Urgent Request
Capture Date:	28/03/2011 1:11:25 PM
Item ID:	1717505
Policy Action:	Not Specified

Mark History:
No reviewing has been done

Policies:
No Policies attached

RE:

From Rob Drury **Date** Thursday, 9 December 2010 12:11 PM
To Barry Dennien; Jim Pruss
Cc Dan Spiller; Peter Borrows

Image001.jpg (69 Kb HTML) Image002.png (7 Kb HTML)

Barry,

To question 1, no it wasn't modelled mainly because the bigger the event, the much less impact of the reduced FSL. But yes to Question 2 in that this was considered. However the following may help summarise and also offer a way to give the proposal a more detailed analysis in the future.

Basically, there are an unlimited number of scenarios containing an infinite number of rainfall patterns and distributions producing flood events in the Brisbane River for flows both above and below 3500 cumecs. Seqwater has not attempted to model each scenario in the discussion paper or even a variety of scenarios. A major study would be required to undertake this exercise and the study that Seqwater has been commissioned to undertake for the Water Commission relating to raising the Wivenhoe Dam Full Supply Level will consider these issues. This study is scheduled to commence in the new year and take in the order of six months.

The main point to be noted from the discussion paper is that having a relatively small volume of water to fill below the dam FSL provides only limited benefits and the larger the flood, the smaller these benefits will potentially be (although unusual rainfall patterns could produce exceptions). The reason for the reducing potential benefit as flood size increases is due to the reducing proportion of the available volume below FSL to the total flood volume. The other factor is that the available storage volume below FSL is generally only a very small proportion of the total flood storage unless the dam is below around 50% capacity.

Generally although the lower Wivenhoe Dam is at the commencement of the event, the smaller the downstream impacts, as the events get bigger the impact reduction will generally decrease and may be insignificant. And during smaller events, the impact is less significant anyway. Quantifying the exact size of the potential benefit for a range of scenarios will take a major study and as previously discussed, this work will commence in the new year.

Hence to gain any significant benefit, Wivenhoe would have to be considerably lower at the start of an event and assuming the dam would not be kept at 50% or 75% continually, the point to really consider is how does Seqwater lower the storage below FSL before an event. Once rain commences it will generally be too late, as a release strategy may already be optimised to control downstream flood impacts, so increasing releases to lower the storage level will likely worsen those downstream flood impacts. That is, if there are significant flows downstream, it is already too late to pre-release.

The other option is to pre-release based on forecast and before the rain event is underway. However, as seen in recent events, lowering storage levels based on forecast and before the event initiates, is a strategy containing many risks including:

- Causing unnecessary downstream impacts when rainfall below forecast levels is experienced.
- Standing accused of wasting precious water resources when rainfall below forecast levels is experienced.
- Unnecessarily extending bridge inundation times and disrupting irrigation activities downstream of Wivenhoe Dam.
- Unnecessarily increasing river turbidity downstream of Wivenhoe Dam.

In summary, much thought and investigation by many people has gone into developing the current Manual of Flood

Mitigation for Wivenhoe and Somerset dams. The Manual should not be modified lightly and certainly not without suitable engineering investigations being undertaken. Seqwater will undertake extensive investigations for the Water Commission in the new year to examine the possibility of raising the full supply level of Wivenhoe Dam. At this stage it is suggested that the scope of this work be widened to consider not just raising the water level in the dam, but also examining in detail the costs and benefits of modifying the manual of Flood Mitigation to allow "pre-lowering" of storage levels based on forecast rainfall at the onset of potential flood events.

Rob

Robert Drury
Dam Operations Manager
Water Delivery
Queensland Bulk Water Supply Authority *trading as* Seqwater

Seqwater_No-Lifeguards-Here_email_strap

cid:image001.png@01CA24E1.BD

Ph [redacted]
Wivenhoe Dam, Brisbane Valley Highway, via Fernvale Q4306 Australia
PO Box 37, Fernvale QLD 4306
Website | www.seqwater.com.au

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Barry

"JP-4"

/S No. xxxxx/10

Advisor .....€Ok Dated / / €Approved €Not Approved €Noted €Further Information required Minister..... Dated / /

SEQ Water Grid Manager and Seqwater
MINISTERIAL BRIEFING NOTE

TO: **Minister for Natural Resources, Mines and Energy and Minister for Trade**

SUBJECT: **January 2011 flood event and Wivenhoe Dam operations**

REQUESTED BY

- The Ministers Office requested this brief by 16 January 2011.

TIMEFRAME

- Noting of this brief is required prior to the Emergency Cabinet meeting to be held on 17 January 2011.

RECOMMENDATION

It is recommended that the Minister:

- **note** Seqwater's Ministerial briefing note setting out background information on Wivenhoe Dam, the January 2011 flood event and Seqwater's Flood Mitigation Manual.
- **note** the advice on the benefits of pre-emptive releases from Wivenhoe Dam in response to the Minister's request.
- **note** Mr Brian Cooper's independent compliance review of the operation of Wivenhoe Dam against the Flood Mitigation Manual for the January 2011 flood event.
- **approve** key media responses on the flood event and Wivenhoe Dam.
- **approve** that Mr Barry Dennien, Chief Executive Officer, SEQ Water Grid Manager, speak to the media in accordance with the key media responses.

BACKGROUND

- From 13 December 2010 to 11 January 2011, South East Queensland experienced unprecedented rainfall, which resulted in the January 2011 flood event. Wivenhoe Dam played a significant role in mitigating the downstream flood peak.
- **Attachment A** contains Seqwater's Ministerial briefing note setting out background information on Wivenhoe Dam, Wivenhoe Dam's flood mitigation and operations, Seqwater's Flood Mitigation Manual, the regulatory context of the Flood Mitigation Manual and Seqwater's proposed procedure for the preparation of its comprehensive Flood Mitigation Manual report to the Chief Executive, Department of Environment and Resource Management, on Wivenhoe Dam operations for the January 2011 flood event.
- After the Wivenhoe Dam release in October 2010, by way of a letter dated 25 October 2010 at **Attachment B,** the Minister requested the SEQ Water Grid Manager to procure urgent advice as to whether South East Queensland's water security situation would provide "*an opportunity to reduce the volume stored in key dams as a means of reducing the severity, frequency and duration of flooding in downstream areas.*"
- The Minister also sought the SEQ Water Grid Manager's "*confirmation that these options would not significantly impact upon our current water security, measured as the probability of needing to reintroduce Medium Level Restrictions over the next five to ten years.*"
- As a result, the SEQ Water Grid Manager requested that Seqwater provide a report assessing the options requested by the Minister.

Author	Cleared by	Cleared by	Recommended:
Name: Barry Dennien Position: Chief Executive Officer, SEQ Water Grid Manager Tel No: [redacted] Date: 16 January 2011	Name: Position: Tel No: Name: Position: Tel No:	Name: Position: Tel No: Name: Position: Tel No:	Name: John Bradley Director-General, DERM Tel No: [redacted] Date:

File Ref:

- **Attachment C** contains the SEQ Water Grid Manager's letter to the Minister dated 24 December 2010, in response to the pre-emptive Wivenhoe Dam release advice sought, based on Seqwater's advice. This letter stated that "*Seqwater has advised that releasing water to below Full Supply Level may provide some benefits in terms of reduced community and operational impacts during minor inflow events, such as has occurred over the past month. For medium and major flood events, it considers that pre-emptive releases will provide negligible benefits...Informed by this advice, the SEQ Water Grid Manager has advised Seqwater that, from a water security perspective, it has no in-principle objection to minor releases from Wivenhoe, Somerset and North Pine dams to minimise the operational and community impacts of gate releases.*"
- It should be noted that while seeking advice from Seqwater on pre-emptive dam releases, the SEQ Water Grid Manager continued to provide the Department of Environment and Resource Management with progress reports.
- On 11 January 2011, the Minister requested the SEQ Water Grid Manager to procure an urgent independent review of Seqwater's operation of Somerset and Wivenhoe Dams in accordance with the Flood Mitigation Manual, for the period 13 December 2010 to 11 January 2011.
- Mr Brian Cooper was engaged to conduct the independent review and his report and curriculum vitae are contained in **Attachment D.**
- Mr Brian Cooper concludes that the "*strategies as set out in the Flood Mitigation Manual have been followed, allowing for the discretion given to making variations in order to maximise flood mitigation effects. The actions taken and decisions made during the Flood Event appear to have been prudent and appropriate in the context of the available knowledge available to those responsible for flood operations and the way events unfolded.*"

CURRENT ISSUES

- The purpose of this Ministerial brief is to provide the Minister with background information on the January 2011 flood event and the operation of Wivenhoe Dam, in preparation for an Emergency Cabinet meeting scheduled on 17 January 2011.
- This Ministerial brief provides information that may assist in responding to questions raised, or anticipated to be raised, by the public and media.
- **Attachment E** contains key media responses based on factual information from Seqwater's Ministerial briefing note.

RESOURCE/IMPLEMENTATION IMPLICATIONS

- Any recommendations regarding the Flood Mitigation Manual, improvements to the structure or operation of Wivenhoe Dam, resourcing etc. will arise after any relevant flood event debriefs and Seqwater's Flood Mitigation Manual report to the Chief Executive, Department of Environment and Resource Management.

PROPOSED ACTION

- In accordance with the Flood Mitigation Manual, Seqwater will submit a comprehensive report to the Chief Executive, Department of Environment and Resource Management, containing details of the procedures used, the reasons for such and other pertinent information for the operation of Wivenhoe Dam during the January 2011 flood event.
- This report is required to be submitted within six weeks of completion of the flood event.

Author	Cleared by	Cleared by	Recommended:
Name: Barry Dennien Position: Chief Executive Officer, SEQ Water Grid Manager Tel No: [redacted] Date: 16 January 2011	Name: Position: Tel No: Name: Position: Tel No:	Name: Position: Tel No: Name: Position: Tel No:	Name: John Bradley Director-General, DERM Tel No: [redacted] Date:

OTHER INFORMATION

- *Consultation:* In preparing the Ministerial briefing note at **Attachment A**, Seqwater consulted with Mr Peter Allen and Mr Bob Reilly from the Office of the Water Supply Regulator, Department of Environment and Resource Management. The SEQ Water Grid Manager provided information on the Minister's request for advice on pre-emptive releases from Wivenhoe Dam and the independent compliance review from Mr Brian Cooper.
- *Legislation:* The Flood Mitigation Manual is a requirement of, and approved by the Chief Executive, Department of Environment and Resource Management, under the *Water Supply (Safety and Reliability) Act 2008.*
- *Key Communication Messages:* The information contained in this Ministerial brief may be used to formulate public messaging regarding the flood event and the operation of Wivenhoe Dam. Communicating the benefits of Wivenhoe Dam for flood mitigation may present positive communication opportunities.

MINISTER'S COMMENTS

PLEASE LEAVE THIS SPACE BLANK SO THE MINISTER CAN ADD COMMENTS

ATTACHMENTS

- **Attachment A: Seqwater Ministerial briefing note**
- **Attachment B: Letter from Minister Robertson to the SEQ Water Grid Manager dated 25 October 2010**
- **Attachment C: Letter from the SEQ Water Grid Manager to Minister Robertson dated 24 December 2010**
- **Attachment D: Flood Mitigation Manual compliance review report by Mr Brian Cooper and curriculum vitae of Mr Brian Cooper**
- **Attachment E: Key media responses**

Author	Cleared by	Cleared by	Recommended:
Name: Barry Dennien Position: Chief Executive Officer, SEQ Water Grid Manager Tel No: [redacted] Date: 16 January 2011	Name: Position: Tel No: Name: Position: Tel No:	Name: Position: Tel No: Name: Position: Tel No:	Name: John Bradley Director-General, DERM Tel No: [redacted] Date:

Ministerial Briefing Note

17 January 2010

Flood Event January 2011

1. BACKGROUND INFORMATION ON WIVENHOE DAM

2. WIVENHOE DAM FLOOD MITIGATION AND FLOOD OPERATIONS

2.1 What were the benefits provided by Wivenhoe Dam during the current event?

2.2 Why was Wivenhoe Dam only allowed to rise up to 191% and not 230%?

2.3 What is the role of the erodible fuse plug embankments?

2.4 Why weren't pre-emptive releases undertaken prior to the start of the flood event?

2.5 Is there a detailed record of the events associated with the current flood?

3. THE MANUAL OF OPERATIONAL PROCEDURES FOR FLOOD MITIGATION AT WIVENHOE DAM AND SOMERSET DAM

3.1 What is the Manual of Flood Mitigation and how was it developed?

3.2 What is contained in the Manual?

4. REGULATORY CONTEXT

5. SEQWATER REPORT

1 BACKGROUND INFORMATION ON WIVENHOE DAM

Wivenhoe Dam was completed in 1984 and has two main functions;

- A 1,165,000 ML storage providing an urban water supply for Brisbane;
- Flood mitigation in the Brisbane River by providing a dedicated flood storage volume of 1,450,000 ML (this flood storage was increased in 2005 to 1,966,000 ML with the dam at the point of failure).

In accordance with the Queensland Regulatory program for dam spillway upgrades, a further upgrade of Wivenhoe Dam is scheduled to occur prior to 2035 but only for dam safety reasons in the event of a probable maximum flood and has no impact on the current event.

Wivenhoe Dam is in excellent condition with four Comprehensive Dam Safety reviews undertaken in the last 14 years, the latest in 2010.

2 WIVENHOE DAM FLOOD MITIGATION AND FLOOD OPERATIONS

2.1 What were the benefits provided by Wivenhoe Dam during the current event?

The following graphs demonstrate the significant benefits of Wivenhoe Dam in mitigating the current flood event, with reductions in flood peak from Wivenhoe Dam not existing of up to 2.5 metres in the City area and up to 5.5 metres in the Moggill area further upstream.

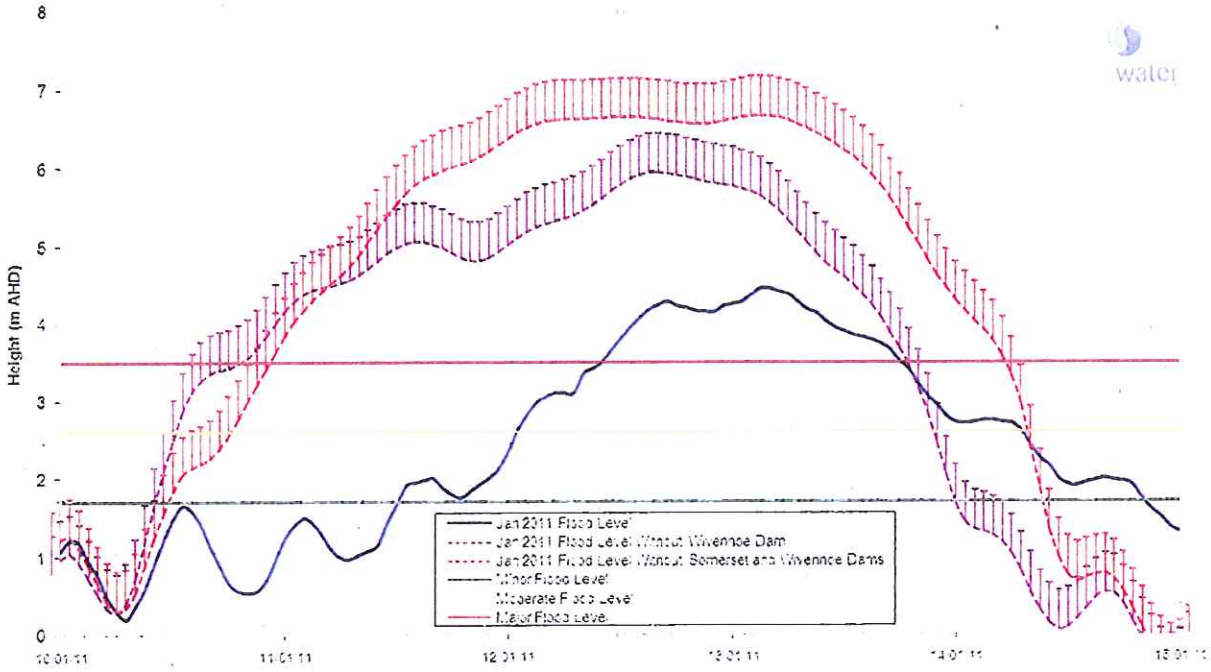
This equates to significant reduction in the potential for loss of life as well as saving in damages in the order of up to $1.6 billion based on current damage curves. Up to 13,000 more properties would have been impacted by the event without the Dam. (Source: Flood Damage Tables provided to Seqwater by the Brisbane City Council).

The time at which flood levels remained elevated above major levels has also been reduced by up to 3 days by the dam. This has significant benefits to impact on the population of the city, property damage and the recovery operation.

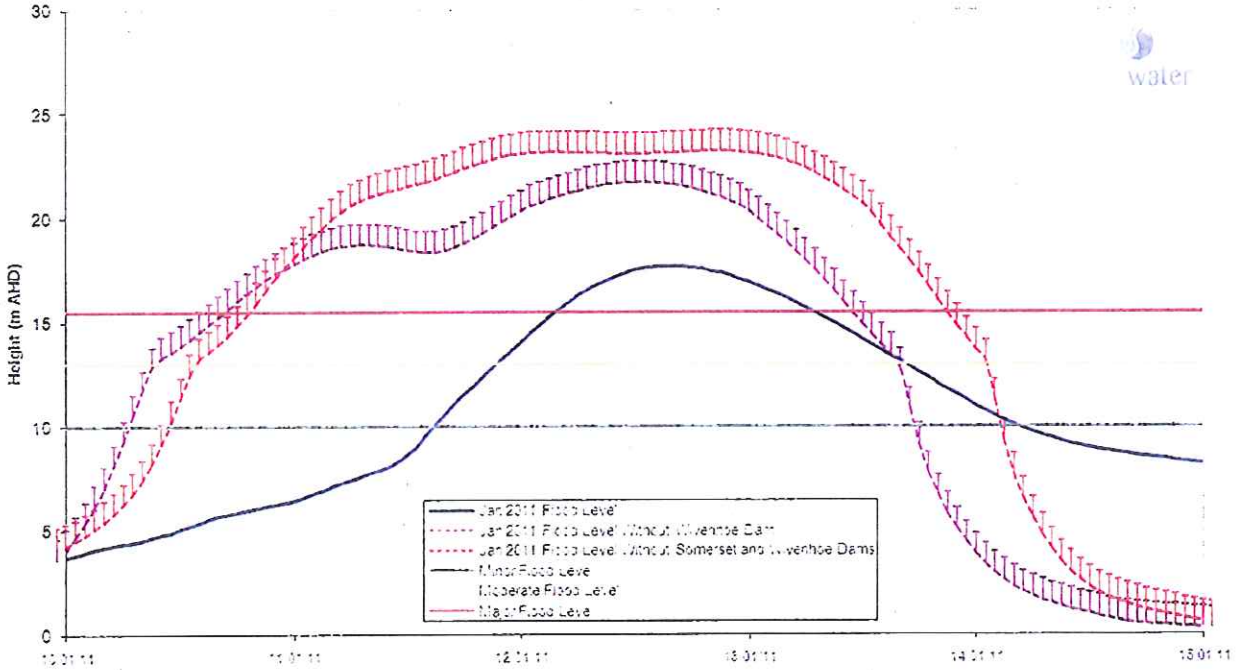
Depending on the nature of the event, the presence of Wivenhoe Dam could also potentially increase flood warning times to impacted areas. How these times may have been increased during the current event is presently difficult to quantify, but discussions will be held with BOM on this issue at a later date.

In addition, the strategy adopted to quickly close off releases once the peak in the dam had been reached and rain stopped falling certainly reduced the predicted flood peak by at least one metre in the lower Brisbane River area. This was carried out because the releases had stopped the dam from rising and careful monitoring allowed rapid reduction of releases while ensuring fuse plug initiation did not occur.

JANUARY 2011 BRISBANE FLOOD
Assessment of Flood Levels at Brisbane City



JANUARY 2011 BRISBANE FLOOD
Assessment of Flood Levels at Moggill



2.2 Why was Wivenhoe Dam only allowed to rise up to 191% and not 230%?

Wivenhoe Dam mitigates downstream flooding by storing incoming flood water during a rainfall event and releasing these waters at a reduced flow rate downstream to reduce flood impacts. The timing of the releases is also manipulated so that the aim is for outflows from the dams to impact on downstream areas only after the peak inflows from the downstream major tributaries have passed. However this aim cannot always be achieved in practice. This is because some large floods, such as the one currently being experienced, have the potential to overflow the dam's flood storage compartment. **Should this occur, the dam would fail and the resulting damage and loss of life would be at least 100 to 1000 times greater than that currently being experienced.**

Therefore the basis of all flood operation decision making is to ensure the dam never fails. This is the reason that the dam's flood storage compartment would never be intentionally fully filled as any additional inflows after this point would result in a dam failure. At any one time, there will always be uncertainty about what rain is going to occur. Hence, we cannot use all of the flood capacity as we would not be able to release sufficient water to cater for large inflows.

2.3 What is the role of the erodible fuse plug embankments?

Another factor that impacts on flood release decision making in large events are the levels at which the erodible fuse plugs are triggered. The fuse plugs act as a safety valve to rapidly increase dam outflows if the structural safety of the dam is in danger. Loss of one or more fuse plugs severely limits the ability of the dam to mitigate the effects of future flood events that may occur prior to the fuse plug or plugs being reinstated. Reinstatement of a fuse plug following an event would take a minimum of 4 to 6 months and would require an extended period of relatively dry weather.

2.4 Why weren't pre-emptive releases undertaken prior to the start of the flood event?

In the 25 days leading up to the current event, three flood events impacting on Wivenhoe Dam were experienced, with gate releases being made on all but five of those days. The total outflow from these events was around 700,000ML.

During these events, requests were received from Councils and residents impacted by bridge closures downstream of the dam to curtail releases as soon and as quickly as possible. Additionally the 2 January end date of the flood event prior to the current event meant that significant drain down of the dam prior to the onset of the current event that commenced on 6 January 2011, was not possible without major bridge inundation downstream of the dam and without exceeding minor flood levels in the lower Brisbane River.

Additionally, a flood event was also experienced in October 2010 that resulted in a release of 750,000ML from the dam. Accordingly drain down below the dam full supply level prior to the start of the first December event would not have been possible without significant bridge inundation and without exceeding minor flood levels (as defined by BOM and BCC) in the lower Brisbane River.

Regardless, significant drain down prior to the current event would have had little impact on the peak level in Wivenhoe Dam as shown in the table below. The reason for this is that this total event inflow volume of 2,600,000 ML is well in excess of the useable flood storage combined with the available water supply storages shown in the table.

The specific impact on the Lower Brisbane River of these reduced dam levels requires the use of a complex hydraulic model. The results of this modelling would still contain a degree of uncertainty as illustrated by the difficulties in estimating the final flood peak in Brisbane during the event. This is because the rapid closure of the gates after peak inflow was achieved resulted in significant water level reductions downstream and this is difficult to model accurately.

JANUARY 2011 FLOOD			
Starting Level		Peak Height	Capacity
%	m AHD	m AHD	%
100	67.0	74.97	191
95	66.5	74.93	191
90	65.8	74.88	190
75	64.0	74.63	187
50	60.0	74.11	180

It should be noted that the possible reductions shown above are based up a unique dual peaked flood hydrograph with a volume of about 2,600,000 ML which occurred during this event. A hydrograph with the same volume but a different distribution could result in a significantly lower reduction in peak water levels.
Flood operations at the dam are also highly dependent upon the flood inflow volume and a slight variation in the flood volume could significantly reduce the benefits associated with draining down the dam prior to a flood event.

2.5 Is there a detailed record of the events associated with the current flood?

A preliminary report has been prepared and is attached to this briefing.

1.
2.

3 THE MANUAL OF FLOOD MITIGATION AT WIVENHOE DAM AND SOMERSET DAM

3.1 What is the Manual of Flood Mitigation and how was it developed?

The Manual of Flood Mitigation for Wivenhoe and Somerset dams in its current form was developed in 1992 during an extensive hydrological study of the Brisbane and Pine Rivers catchments by DPI, Water Resources. The final reports were subject to extensive internal review by the Water Resources Group before being reviewed by an independent review panel comprising Professor Colin Apelt, Head of Department, Department of Civil Engineering, University of Queensland and Mr Eric Lesleighter, Principal Hydraulic Engineer and Chief Engineer Water Resources, Snowy Mountains Engineering Corporation. Subsequently, the Manual was extensively reviewed during the Brisbane Valley Flood Damages Minimisation Study in 2006, with the latest comprehensive review of the Manual undertaken in 2009. Both of these reviews have included expert review panels comprising key stakeholders, with the most recent review involving representatives from DERM, BOM, BCC and SunWater.

The Manual of Flood Mitigation is prepared by Seqwater as the owner of the dam and approved and gazetted by the Chief Executive of DERM in accordance with the Water Supply Act 2008. The manual defines flood objectives procedures; roles and responsibilities; and staffing and operational requirements for flood events impacting on Wivenhoe and Somerset dams.

3.2 What is contained in the Manual?

The primary objectives of the procedures contained in the Manual are, in order of importance:

- Ensure the structural safety of the dams;
- Provide optimum protection of urbanised areas from inundation;
- Minimise disruption to rural life in the valleys of the Brisbane and Stanley Rivers primarily, this involves minimising inundation of the seven bridges below the dam upstream of Moggill);
- Retain the storage at Full Supply Level at the conclusion of the Flood Event.

- Minimise impacts to riparian flora and fauna during the drain down phase of the Flood Event.

During an event, the operation of the dam transitions between the following four operating strategies depending of the circumstances at the time. These procedures associated with these strategies are explained in detail in the Manual.

- **Strategy W1** – Primary consideration is given to Minimising Disruption to Downstream Rural Life.
- **Strategy W2** – Transition Phase moving from Minimising Disruption to Protecting Downstream Urban Areas.
- **Strategy W3** – Primary consideration is to Protect of Urban Areas from Inundation.
- **Strategy W4** – Primary consideration is to protecting the structural safety of the Dam.

In addition to these strategies, historical records show that there is a significant probability of two or more flood producing storms occurring in the Brisbane River system within a short time of each other. Accordingly for each flood event, the aim is always to empty stored floodwaters within seven days after the flood peak has passed through the dams.

4 REGULATORY CONTEXT

Operational procedures for flood mitigation for a dam are contained in the Flood Mitigation Manual approved under sections 370 to 374 of the *Water Supply (Safety and Reliability) Act 2008* (Water Supply Act). Under section 370 of the Water Supply Act, Seqwater as the owner and operator of Wivenhoe and Somerset Dams is required to prepare a Flood Mitigation Manual. The Chief Executive (CE) of DERM (or his delegate) approves the Flood Mitigation Manual, and the approval is notified in the Queensland Government Gazette. Approval can be for a period of up to five years, after which the approval needs to be renewed. There are no decision-making criteria specified in the Water Supply Act for the CE to take into account when approving the Flood Mitigation Manual.

The Flood Mitigation Manual requires, amongst other matters:

1. Flood operations to be conducted in accordance with manual's provisions, unless Seqwater considers that it is necessary to depart from the procedures of the Flood Mitigation Manual to meet the flood mitigation objectives of the Flood Mitigation Manual. The Flood Mitigation Manual sets out a consultation and approval process through Seqwater's Chair and the CE for departures from the Flood Mitigation Manual. This discretion was not exercised in the January 2011 flood event.
2. Flood operations to be under the control of CE-approved engineers (who are highly qualified and experienced)
3. Annual reporting on the preparedness and status of the flood control system for flood operations, and the training of the personnel who manage the flood event
4. Reporting on the flood operations during flood events.
5. Reviews after flood events such as the January 2011 event, and a Seqwater report containing details of the procedures used, the reasons for such and other pertinent information. Seqwater must forward this report to the CE within six weeks of the completion of a flood event.

Section 374 of the Water Supply Act protects the CE and Seqwater from liability for complying with the Flood Mitigation Manual. It states:

> *(1) The chief executive or a member of the council does not incur civil liability for an act done, or omission made, honestly and without negligence under this part.*
>
> *(2) An owner of a dam who observes the operational procedures in a flood mitigation manual, approved by the chief executive, for the dam does not incur civil liability for an act done, or omission made, honestly and without negligence in observing the procedures.*

During November 2010, Commonwealth, State and local government agencies developed a *Protocol for Communication of Flooding Information for the Brisbane River Catchment – including Floodwater Releases from Wivenhoe and Somerset Dams* to "*ensure the provision of consistent and robust information to the community*". This is separate from the Flood Mitigation Manual, is not legally binding and is not subject to regulatory approval/review.

Some DERM staff, because of their specialist skills, work in the Flood Operations Centre that Seqwater activates to manage such events in accordance with the Flood Mitigation Manual. The Flood Operations Centre is not involved in any of the regulatory decisions concerning the dams or are members of the Office of the Water Supply Regulator,

Department of Environment and Resource Management, which undertakes the CE's regulatory functions.

5 SEQWATER REPORT

It is recommended that the process and content for reports required for this event be:

- In the short term, utilise this report attached to this briefing note as the basis for communications and discussion.
- Prepare any Interim Reports as agreed to provide information and input as required.
- Seqwater prepare a Comprehensive Report as per the existing regulatory requirements of the Act and the gazetted manual and any requirements of the Dam Safety Regulator. This would be done within 6 weeks of the closure of the current event as per the manual. This timeframe is subject to any new mobilisation of the Flood Operations Centre. The Table of Contents would include:
    - Introduction
    - Flood Event Summary
    - Mobilisation and Staffing
    - Event Rainfall
    - Inflow and Release Details
    - Data Collection System Performance
    - Data Analysis Performance
    - Communication
    - Flood Management Strategies and Manual Compliance
    - Improvements in data collection systems, practices and processes.
    - improvements by interacting agencies
    - Review of factors impacting on the protection of urban areas
    - Recommendations & Conclusions
- The report would then be reviewed by the Dam Safety Regulator in conjunction with any peer review they require. The review should cover:
    - Were the provisions of the manual complied with?
    - What improvements to either facilities e.g. stream gauges, or work practices, are desirable to improve Sewater's ability to predict inflows into the dams.
    - Are improvements to either Seqwater's facilities or work practices desirable to improve Seqwater's ability to manage events? For example, investigations to raise the dam to improve its flood storage capacity, If so, what are they and their implications

- Are changes to the facilities or work practices of other organisations desirable to improve Seqwater's abilities to manage these events?
- whether it is worth investigating increasing the flood capacity of Wivenhoe
- whether the Brisbane River crossings which act, under some situations as a constraint on the releases from Wivenhoe, should be replaced by bridges. For example if the smallest could pass , for example, 2,500 cumecs, then this could enable higher releases under some circumstances.
- Whether the policy of draining the flood compartment within 7 days should be modified.
- Given the manual's order of priorities i.e. protection of the dam etc, are any changes in the flood release strategies for either dam desirable? If so, what are they, and their implications

- Based on this review, a review of the Manual of Operational Procedures for Flood Mitigation at Wivenhoe Dam and Somerset Dam would occur utilising an expert panel of review including representatives of DERM, Seqwater, BoM, affected Local Governments and other stakeholders as necessary.