Brooke Foxover

From: DutyEngineer [dutyseq[redacted]
Sent: Thursday, 3 February 2011 10:12 AM
To: John Tibaldi
Subject: Flood Event Summary - 07.doc
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Flood Event Summary - 07.doc (354 KB)

SUMMARY OF JANUARY 2011 FLOOD EVENT

The following summary must be read in conjunction with the Manual of Operational Procedures for Flood Mitigation at Wivenhoe Dam and Somerset Dam. The summary contains a series of tables provides a detailed summary of the operation of Wivenhoe and Somerset Dams during the January 2011 Flood Event that impacted on Brisbane. Each table covers a period of the event during which one of the following occurred:

- There was a transition or change to the flood operation strategy used as defined by the Manual.
- There was a period of stability during which no gate operations from either Wivenhoe Dam or Somerset Dam were directed.
- There was a period of sustained gate operations (either opening or closing) at either Wivenhoe Dam or Somerset Dam.

Each table also provides a summary of both relevant background information and a summary of the information that was used in decision making during the period covered by the table. This information includes:

- Details of the time period.
- Relevant background information from the period leading up to and during the period.
- Changes in dam conditions during the period.
- Rainfall information (including forecast rainfall) and model results available during the period.
- The Strategy used and/or adopted during the period.

Further reports and appendices are available to explain in detail the derivation of the technical information presented in the tables. Much of the background detail in the reports is taken from the event log.

In summary, the event was extremely large and rare, with some relevant statistics that demonstrate this fact as follows:

- Catchment average rainfalls recorded for the catchment area above Wivenhoe Dam indicate rainfall intensities for the 72 hour and 120 hour periods to Tuesday 11 January 2011 at 19:00 had an annual recurrence interval of between 1 in 500 years and 1 in 1000 years.

- Point rainfalls experienced in the Wivenhoe Dam storage area experienced between 05:00 and 13:00 on Tuesday 11 January 2011 have been estimated to have an annual recurrence interval of between 1 in 500 years and 1 in 1000 years. Although this rainfall was not recorded at a single station, it is estimated to have occurred in order to reproduce the rapid storage level rises experienced at Wivenhoe Dam during this period.

- The volume of total inflow into Wivenhoe Dam experienced during this event has been calculated to be in the order of 88% more that the comparable volume of inflow calculated from the January 1974 event.

- The inflow into Wivenhoe Dam experienced during this event is represented by a dual peaked hydrograph with the two peaks separated by 30 hours and both peaks estimated

to be in the order of 50% greater that the comparable peak inflow calculated from the January 1974 event.

Full details of the modeling results that are shown in the tables are contained in Appendix A. Other decision support tools that were used in conjunction with the modeling results included:

- The 24 hour Quantitative Precipitation Forecasts (QPF) for the dam catchments provided by BoM.
- The BoM weather radar available through the BoM website.
- BoM SILO Meteograms Forecast Rainfall.
- BoM Interactive Weather and Wave Forecast Rainfall Maps.
- BoM Water and the Land Forecast Rainfall.

Of these tools the QPF is considered the primary forecast tool as it is provided by BoM to give specific forecast information in relation to the dam catchment areas.

JANUARY 2011 FLOOD EVENT - PERIOD 1 OF 20				
DATE/TIME	**BACKGROUND**	**DAM CONDITIONS**	**RAINFALL AND MODEL RESULTS**	**STRATEGY**
	Strategy W1A and Strategy W1B; and Strategy S2			**Strategy W1A and Strategy W1B; and Strategy S2 (Lake Level greater than 67.25, maximum release 110 m^3/s)**
Commenced Thursday 06 Jan 2011 07:42 Completed Friday 07 Jan 2011 02:00	• No significant rainfall occurred in the 24 hours to 0900 on 5 January 2011. • Catchment average rainfalls in the 24 hours to 0800 on 6 January 2011 were: o Wivenhoe 25mm; o Somerset 21mm; o Lockyer 23mm; o Bremer 23mm. • Event Mobilisation occurred at 7:42 on Thursday 6 January 2011, using Strategies W1A and S2. • Once mobilisation occurs, 24/7 staffing of the Flood Operations Centre and dams continues until official de-mobilisation is announced. For this event, this occurred at 12:00 on Wednesday 19 January 2011. • Duty Engineer called back early from annual Christmas holidays to assist with the management of the event. • Transition from Strategy W1A to W1B once the Wivenhoe Lake Level exceeded 67.50.	Total rainfall since commencement: Wivenhoe 53mm; Somerset 44mm; Lockyer 53mm; Bremer 54mm. Wivenhoe Dam level rises from 67.31 to 67.52 over the 18 hour period. Somerset Dam level rises from 99.34 to 99.55 over the 18 hour period.	• Catchment average rainfalls over this period were: o Wivenhoe 28mm; o Somerset 23mm; o Lockyer 30mm; o Bremer 31mm. • Forecast rainfall in the next 24 hours is 25mm. • Estimated peak Wivenhoe level is: 68.2 (excluding forecast); 68.7 (including forecast). • Estimated peak Somerset level is: 99.7 (excluding forecast); 100.1 (including forecast). • Estimated total dam inflow is: 204,000ML (excluding forecast); 343,000ML (including forecast). • Estimated peak flow at Lowood excluding Wivenhoe releases is: 470 m^3/s (excluding forecast); 720 m^3/s (including forecast). • Estimated peak flow at Moggill excluding Wivenhoe releases is: 550 m^3/s (excluding forecast); 960 m^3/s (including forecast).	• Peak inflows into the Brisbane River from Lockyer are estimated to be in the order of 400 m^3/s, but these flows will not inundate Colleges Crossing until the morning of Friday 07 January 2011. • Lake level not expected to reach 67.50 (Strategy W1B) until Friday 7 January 2011. Lake level may not exceed 68.5. • Endeavour to maintain College's Crossing trafficable by limiting combined flows from Wivenhoe Dam and Lockyer Creek to a maximum of 175 m^3/s. • Water held in Wivenhoe in an attempt to maintain College's Crossing trafficable in accordance with Strategy W1A. Low level releases continued from the Mini-Hydro at this time and at various stages during the event. However these releases (in the order of 13 m^3/s) have low relative significance and are not referred to specifically in the remainder of this summary document. • In accordance with Strategy S2, the crest gates at Somerset Dam were raised to enable uncontrolled discharge and the low level sluices were kept closed. Some regulator releases continued from December as part of previous event drain down, (in the order of 30 m^3/s) but these were shut down at 18:00.

JANUARY 2011 FLOOD EVENT - PERIOD 2 OF 20				
DATE/TIME	**BACKGROUND**	**DAM CONDITIONS**	**RAINFALL AND MODEL RESULTS**	**STRATEGY**
	Strategy W1B and Strategy S2			**Strategy W1B and Strategy S2 (Lake Level greater than 67.50, maximum release 110 m^3/s)**
Commenced Friday 07 Jan 2011 02:00 Completed Friday 07 Jan 2011 09:00	• Transition from Strategy W1A to W1B due to the Wivenhoe Lake Level exceeding 67.50. • Transition from Strategy W1B to W1C once the Wivenhoe Lake Level exceeds 67.75.	Total rainfall since commencement: Wivenhoe 64mm; Somerset 60mm; Lockyer 57mm; Bremer 60mm. Wivenhoe Dam level rises from 67.52 to 67.75 over the 7 hour period. Somerset Dam level rises from 99.55 to 99.65 over the 7 hour period.	• Catchment average rainfalls over this period were: o Wivenhoe 11mm; o Somerset 15mm; o Lockyer 4mm; o Bremer 5mm. • Forecast rainfall in the next 24 hours is 25mm. • Estimated peak Wivenhoe level is: 68.2 (excluding forecast); 68.5 (including forecast). • Estimated peak Somerset level is: 99.7 (excluding forecast); 100.2 (including forecast). • Estimated total dam inflow is: 242,000ML (excluding forecast); 380,000ML (including forecast). • Estimated peak flow at Lowood excluding Wivenhoe releases is: 470 m^3/s (excluding forecast); 670 m^3/s (including forecast). • Estimated peak flow at Moggill excluding Wivenhoe releases is: 570 m^3/s (excluding forecast); 970 m^3/s (including forecast).	• Peak inflows into the Brisbane River from Lockyer are estimated to be in the order of 500 m^3/s, but these flows may not be sufficient to inundate Burtons Bridge. • Lake level not expected to reach 67.75 (Strategy W1C) for at least 6 hours. Lake level may not exceed 68.5. • Endeavour to maintain Burtons Bridge trafficable by limiting combined flows from Wivenhoe Dam and Lockyer Creek to a maximum of 430 m^3/s. • Water held in Wivenhoe in an attempt to maintain Burtons Bridge trafficable in accordance with Strategy W1B. • In accordance with Strategy S2, the crest gates at Somerset Dam were raised to enable uncontrolled discharge and the low level regulators and sluices at Somerset Dam were kept closed.

JANUARY 2011 FLOOD EVENT - PERIOD 3 OF 20				
DATE/TIME	**BACKGROUND**	**DAM CONDITIONS**	**RAINFALL AND MODEL RESULTS**	**STRATEGY**
	Strategy W1C and Strategy S2			**Strategy W1C (Lake Level greater than 68.00, maximum release 1900 m^3/s)**
Commenced Friday 07 Jan 2011 09:00 Completed Friday 07 Jan 2011 15:00	• At around 9:00 it becomes apparent that flows from Lockyer Creek into the Brisbane River combined with local Brisbane River inflows downstream of Wivenhoe will be sufficient to inundate all bridges downstream of the dam with the exception of the Mt Crosby Weir Bridge and Fernvale Bridge. • All impacted Councils are notified of situation and that releases are to be commenced from Wivenhoe Dam. Release commencement was delayed until 15:00 to allow bridges to be closed and arrangements to be made to cater for rural community isolation. The impacted rural communities had been isolated over the Christmas period and time was needed for suitable arrangements to be made to allow these communities to be prepared for another potentially extended period of isolation. The delay in releases was also in accordance with the Manual requirements of maintaining Burtons Bridge and Kholo Bridge trafficable when operating under Strategy W1C. • Transition from Strategy W1C to Strategy W1D once the Wivenhoe Dam lake level exceeds 68.0	Total rainfall since commencement: Wivenhoe 89mm; Somerset 90mm; Lockyer 71mm; Bremer 71mm. Wivenhoe Dam level rises from 67.75 to 68.03 over the 6 hour period. Somerset Dam level rises from 99.65 to 99.94 over the 6 hour period.	• Catchment average rainfalls over this period were: o Wivenhoe 24mm; o Somerset 30mm; o Lockyer 14mm; o Bremer 12mm. • Forecast rainfall in the next 24 hours is 25mm. • Estimated peak Wivenhoe level is: 68.4 (excluding forecast); 68.9 (including forecast). • Estimated peak Somerset level is: 100.3 (excluding forecast); 100.6 (including forecast). • Estimated total dam inflow is: 346,000ML (excluding forecast); 483,000ML (including forecast). • Estimated peak flow at Lowood excluding Wivenhoe releases is: 530 m^3/s (excluding forecast); 710 m^3/s (including forecast). • Estimated peak flow at Moggill excluding Wivenhoe releases is: 660 m^3/s (excluding forecast); 1040 m^3/s (including forecast).	• Due to the further rain and observed stream rises, it has become apparent that flows from Lockyer Creek into the Brisbane River combined with local Brisbane River inflows downstream of Wivenhoe will be sufficient to inundate all bridges downstream of the dam with the exception of the Mt Crosby Weir Bridge and Fernvale Bridge. • Releases from Wivenhoe Dam managed in an attempt to maintain Mt Crosby Weir Bridge and Fernvale Bridge trafficable in accordance with Strategies W1D and W1E. • In accordance with Strategy S2, the crest gates at Somerset Dam were raised to enable uncontrolled discharge and the low level regulators and sluices at Somerset Dam were kept closed.

JANUARY 2011 FLOOD EVENT - PERIOD 4 OF 20				
DATE/TIME	**BACKGROUND**	**DAM CONDITIONS**	**RAINFALL AND MODEL RESULTS**	**STRATEGY**
	Transition from Strategy W1D to W1E to W3; and Strategy S2 Wivenhoe Directives #1 to #4. Somerset Directives #1 to #3.			**Strategy W3 and Strategy S2 (Lake Level greater than 68.50, maximum release 4000 m^3/s)**
Commenced Friday 07 Jan 2011 15:00 Completed Saturday 08 Jan 2011 14:00	• Gates opened continuously at Wivenhoe Dam for 23 hours in accordance with the standard gate opening sequence at a rate or 0.5 metres of opening per hour. • Transition from Strategy W1D to W1E once the Wivenhoe Dam level exceeds 68.25 (22:00 on 7 Jan 2011). • Transition from Strategy W1E to W2 once it becomes apparent that the Wivenhoe Dam level will exceed 68.50 (08:00 on 8 Jan 2011). However it was not possible to meet the intent of Strategy W2 by limiting the flow in the Brisbane River to less than the naturally occurring peaks at Lowood and Moggill. This is because the calculated naturally occurring peaks at Lowood and Moggill were 530 m^3/s and 800 m^3/s respectively, whereas the release rate from the dam was already 940 m^3/s. Accordingly Strategy W2 was bypassed and Strategy W3 was adopted for use at 08:00 on Saturday 8 January 2011. • At 14:00 on 08 January 2011, Wivenhoe discharge is 1239 m^3/s. All rural bridges below the dam with the exception of the Mt Crosby Weir Bridge and Fernvale Bridge are flooded.	Total rainfall since commencement: Wivenhoe 92mm; Somerset 95mm; Lockyer 72mm; Bremer 72mm. Wivenhoe Dam level rises from 68.03 to 68.61 over the 23 hour period. Somerset Dam level rises from 99.94 to 100.44 over the 23 hour period.	• Catchment average rainfalls over this period were: o Wivenhoe 3mm; o Somerset 5mm; o Lockyer 1mm; o Bremer 1mm. • Forecast rainfall in the next 24 hours is 40mm. • Estimated peak Wivenhoe level is: 68.7 (excluding forecast); 69.1 (including forecast). • Estimated peak Somerset level is: 100.5 (excluding forecast); 100.6 (including forecast). • Estimated total dam inflow is: 420,000ML (excluding forecast); 662,000ML (including forecast). • Estimated peak flow at Lowood excluding Wivenhoe releases is: 530 m^3/s (excluding forecast); 530 m^3/s (including forecast). • Estimated peak flow at Moggill excluding Wivenhoe releases is: 550 m^3/s (excluding forecast); 960 m^3/s (including forecast). This peak was estimated to have occurred at 05:00 on 8 January 2011. • Estimated peak Wivenhoe outflow is: 1480 m^3/s (excluding forecast); 1540 m^3/s (including forecast). This flow is significantly greater than the calculated natural peak that excluded Wivenhoe releases.	• Inflows from Lockyer Creek into the Brisbane River have inundated all bridges downstream of the dam with the exception of the Mt Crosby Weir Bridge and Fernvale Bridge. • The Strategy transitions from W1 to W3 once it becomes apparent that the Wivenhoe Dam level is likely to exceed 68.5 and Strategy W2 cannot be applied. • Strategy W3 requires the flow at Moggill to be lowered to 4000 m^3/s as soon as possible after the naturally occurring peak at Moggill (excluding Wivenhoe releases). This was already achieved. • Strategy W3 also requires consideration of lower level Manual objectives. Therefore consideration during this period was given to minimizing disruption to downstream rural life and endeavoring to maintain Mt Crosby Weir Bridge and Fernvale Bridge trafficable. • Due to rainfall on the ground, it was apparent that the Somerset Dam level would exceed 100.45. Accordingly two sluice gates were opened during this period to allow dam levels to move towards the Wivenhoe/Somerset Operating Target Line in accordance with Strategy S2.

JANUARY 2011 FLOOD EVENT - PERIOD 5 OF 20				
DATE/TIME	**BACKGROUND**	**DAM CONDITIONS**	**RAINFALL AND MODEL RESULTS**	**STRATEGY**
	Strategy W3 and Strategy S2			**Strategy W3 and Strategy S2 (Lake Level greater than 68.50, maximum release 4000 m^3/s)**
Commenced Saturday 08 Jan 2011 14:00 Completed Sunday 09 Jan 2011 01:00	• Releases maintained from both dams to ensure Mt Crosby Weir Bridge and Fernvale Bridge remain trafficable. • No change to gate settings over this period. Wivenhoe discharge is 1240 m^3/s. All rural bridges below the dam with the exception of the Mt Crosby Weir Bridge and Fernvale Bridge are flooded.	Total rainfall since commencement: Wivenhoe 100mm; Somerset 111mm; Lockyer 75mm; Bremer 75mm. Wivenhoe Dam level rises very slightly from 68.61 to 68.63 over the 13 hour period. Somerset Dam level falls from 100.44 to 100.32 over the 13 hour period.	• Catchment average rainfalls over this period were: o Wivenhoe 8mm; o Somerset 16mm; o Lockyer 3mm; o Bremer 2mm. • Forecast rainfall in the next 24 hours is 40mm. • Estimated peak Wivenhoe level is: 68.7 (excluding forecast); 69.9 (including forecast). • Estimated peak Somerset level is: 100.5 (excluding forecast); 100.6 (including forecast). • Estimated total dam inflow is: 457,000ML (excluding forecast); 697,000ML (including forecast). • Estimated peak flow at Lowood excluding Wivenhoe releases is: 530 m^3/s (excluding forecast); 530 m^3/s (including forecast). • Estimated peak flow at Moggill excluding Wivenhoe releases is: 770 m^3/s (excluding forecast); 840 m^3/s (including forecast). This peak was estimated to have occurred at 05:00 on 8 January 2011. • Estimated peak Wivenhoe outflow is: 1480 m^3/s (excluding forecast); 1520 m^3/s (including forecast). This flow is significantly greater than the calculated natural peak that excluded Wivenhoe releases.	• Strategy W3 requires the flow at Moggill to be lowered to 4000 m^3/s as soon as possible after the naturally occurring peak at Moggill (excluding Wivenhoe releases). This was already achieved. • Strategy W3 also requires consideration of lower level Manual objectives. Therefore with lake levels rising slightly (Wivenhoe) and falling (Somerset) consideration during this period remained on minimizing disruption to downstream rural life and endeavoring to maintain Mt Crosby Weir Bridge and Fernvale Bridge trafficable. • With the Somerset Lake Dam Level still expected to exceed 100.45 and the level in Wivenhoe remaining relatively static, releases from Somerset Dam continued. In any event, closing of the sluices would have resulted in dam levels quickly moving under the Wivenhoe/Somerset Operating Target Line requiring sluice re-opening within a short period.

JANUARY 2011 FLOOD EVENT - PERIOD 6 OF 20				
DATE/TIME	**BACKGROUND**	**DAM CONDITIONS**	**RAINFALL AND MODEL RESULTS**	**STRATEGY**
	Strategy W3 and Strategy S2 Wivenhoe Directives #5 to #7.			**Strategy W3 and Strategy S2 (Lake Level greater than 68.50, maximum release 4000 m^3/s)**
Commenced Sunday 09 Jan 2011 01:00 Completed Sunday 09 Jan 2011 08:00	• Releases increased marginally from Wivenhoe Dam to account for the passing of the Lockyer peak while maintaining Mt Crosby Weir Bridge and Fernvale Bridge trafficable. • Wivenhoe discharge increased from 1240 m^3/s to 1334 m^3/s. • No change to Somerset Dam gate settings over this period. • All rural bridges below the dam with the exception of the Mt Crosby Weir Bridge and Fernvale Bridge are flooded.	Total rainfall since commencement: Wivenhoe 112mm; Somerset 146mm; Lockyer 76mm; Bremer 75mm. Wivenhoe Dam level falls from 68.63 to 68.56 over the 7 hour period. Somerset Dam level falls from 100.32 to 100.28 over the 7 hour period.	• Catchment average rainfalls over this period were: o Wivenhoe 12mm; o Somerset 36mm; o Lockyer 1mm; o Bremer 0mm. • Forecast rainfall in the next 24 hours is 40mm. • Estimated peak Wivenhoe level is: 68.7 (excluding forecast); 69.3 (including forecast). • Estimated peak Somerset level is: 100.5 (excluding forecast); 101.0 (including forecast). • Estimated total dam inflow is: 569,000ML (excluding forecast); 814,000ML (including forecast). • Estimated peak flow at Lowood excluding Wivenhoe releases is: 530 m^3/s (excluding forecast); 530 m^3/s (including forecast). • Estimated peak flow at Moggill excluding Wivenhoe releases is: 770 m^3/s (excluding forecast); 780 m^3/s (including forecast). This peak was estimated to have occurred at 05:00 on 8 January 2011. • Estimated peak Wivenhoe outflow is: 1500 m^3/s (excluding forecast); 1550 m^3/s (including forecast). This flow is significantly greater than the calculated natural peak that excluded Wivenhoe releases.	• Strategy W3 requires the flow at Moggill to be lowered to 4000 m^3/s as soon as possible after the naturally occurring peak at Moggill (excluding Wivenhoe releases). This was already achieved. • Strategy W3 also requires consideration of lower level Manual objectives. Therefore with lake levels falling at both dams, consideration during this period remained on minimizing disruption to downstream rural life and endeavoring to maintain Mt Crosby Weir Bridge and Fernvale Bridge trafficable. • With the Somerset Lake Dam Level still expected to exceed 100.45 and the level in Wivenhoe Dam falling, releases from Somerset Dam continued. In any event, closing of the sluices would have resulted in dam levels quickly moving under the Wivenhoe/Somerset Operating Target Line requiring sluice re-opening within a short period, particularly given the rainfall that occurred in the Somerset Dam catchment during this period.

JANUARY 2011 FLOOD EVENT - PERIOD 7 OF 20				
DATE/TIME	**BACKGROUND**	**DAM CONDITIONS**	**RAINFALL AND MODEL RESULTS**	**STRATEGY**
Commenced Sunday 09 Jan 2011 08:00 Completed Sunday 09 Jan 2011 14:00	**Strategy W3 and Strategy S2** **Wivenhoe Directives #7.** **Somerset Directives #4 to #5.** • Releases increased marginally from Wivenhoe Dam to account for the passing of the Lockyer peak while maintaining Mt Crosby Weir Bridge and Fernvale Bridge trafficable. • Wivenhoe discharge increased from 1334 m^3/s to 1386 m^3/s. • Somerset Dam sluice gates opened progressively over this period to allow dam levels to move towards the Wivenhoe/Somerset Operating Target Line in accordance with Strategy S2. • All rural bridges below the dam with the exception of the Mt Crosby Weir Bridge and Fernvale Bridge are flooded.	Total rainfall since commencement: Wivenhoe 146mm; Somerset 199mm; Lockyer 94mm; Bremer 90mm. Wivenhoe Dam level rises very slightly from 68.56 to 68.58 over the 6 hour period. Somerset Dam level rises from 100.28 to 100.47 over the 6 hour period.	• Catchment average rainfalls over this period were: o Wivenhoe 34mm; o Somerset 53mm; o Lockyer 18mm; o Bremer 15mm. • Forecast rainfall in the next 24 hours is 50mm. • Estimated peak Wivenhoe level is: 70.0 (excluding forecast); 71.3 (including forecast). • Estimated peak Somerset level is: 100.7 (excluding forecast); 101.1 (including forecast). • Estimated total dam inflow is: 804,000ML (excluding forecast); 1,108,000ML (including forecast). • Estimated peak flow at Lowood excluding Wivenhoe releases is: 530 m^3/s (excluding forecast); 690 m^3/s (including forecast). • Estimated peak flow at Moggill excluding Wivenhoe releases is: 770 m^3/s (excluding forecast); 1210 m^3/s (including forecast). This peak was estimated to have occurred at 05:00 on 8 January 2011. • Estimated peak Wivenhoe outflow is: 1490 m^3/s (excluding forecast); 1560 m^3/s (including forecast). This flow is significantly greater than the calculated natural peak that excluded Wivenhoe releases.	**Strategy W3 and Strategy S2** **(Lake Level greater than 68.50, maximum release 4000 m^3/s)** • With lake levels rising at both dams and heavy rain being experienced in the dam catchments, consideration is given to transitioning the consideration from minimizing disruption to downstream rural life to protecting urban areas from inundation. • Model results also showing likely rises in water levels in the dams provides further justification to consider transitioning to Strategy W3 within the next 6 hours. • Using the BOM rainfall forecasts, a three day assessment showed the lower limit of three day forecast inflow to be similar to the October 2010 event, with the upper limit similar to the February 1999 event. Therefore, during this period consideration remained on minimizing disruption to downstream rural life and endeavoring to maintain Mt Crosby Weir Bridge and Fernvale Bridge trafficable. • With dam levels under the Wivenhoe/Somerset Operating Target Line at the end of this period, releases continued from Somerset Dam.

JANUARY 2011 FLOOD EVENT - PERIOD 8 OF 20				
DATE/TIME	**BACKGROUND**	**DAM CONDITIONS**	**RAINFALL AND MODEL RESULTS**	**STRATEGY**
	Strategy W3 and Strategy S2			**Strategy W3 and Strategy S2 (Lake Level greater than 68.50, maximum release 4000 m^3/s)**
Commenced Sunday 09 Jan 2011 14:00 Completed Sunday 09 Jan 2011 19:00	• During this period releases continued from both dams at a level that maintained Mt Crosby Weir Bridge and Fernvale Bridge trafficable. Gate settings were unchanged and the Wivenhoe discharge was 1411 m^3/s. • Due to rainfall on the ground and the modeled rapid lake level rises, a decision is made to transition to focus on protecting urban areas from inundation at 19:00. • Councils and the Seqwater CEO were notified of the decision soon after 19:00. The ramifications of the decision were that the new estimated peak flow at Moggill of 3300 m^3/s would impact properties and commence to cause damage to urban areas below Moggill. Damage tables supplied by the Brisbane City Council indicated that at flows of 3000 m^3/s, damage costs would exceed $5M and 2600 properties would be impacted in some way. These impacts rise steeply as flows increase, so the focus was on minimizing the flow at Moggill. • A decision is also made at 19:00, that because of the serious nature of the event, the Flood Operations Centre will be staffed with at least two Duty Engineers at all times until at least the peak of the event has occurred.	Total rainfall since commencement: Wivenhoe 208mm; Somerset 305mm; Lockyer 116mm; Bremer 96mm. Wivenhoe Dam level rises from 68.58 to 68.97 over the 5 hour period. Somerset Dam level rises from 100.47 to 101.43 over the 5 hour period.	• Catchment average rainfalls over this period were: o Wivenhoe 62mm; o Somerset 106mm; o Lockyer 22mm; o Bremer 6mm. • Forecast rainfall in the next 24 hours is 65mm. • Estimated peak Wivenhoe level is: 72.1 (excluding forecast); 73.9 (including forecast). • Estimated peak Somerset level is: 102.3 (excluding forecast); 103.0 (including forecast). • Estimated total dam inflow is: 1,272,000ML (excluding forecast); 1,712,000ML (including forecast). • Estimated peak flow at Moggill excluding Wivenhoe releases is: 770 m^3/s (excluding forecast); 1940 m^3/s (including forecast). This peak was estimated to have occurred at 05:00 on 8 January 2011. • Estimated peak flow at Moggill including Wivenhoe releases is: 3300 m^3/s (excluding forecast); 4400 m^3/s (including forecast).	• With lake levels continuing to rise at both dams combined with heavy rain in the dam catchments during this period, the decision was made at the end of this period no longer consider minimizing disruption to downstream rural life and to focus on protecting urban areas from inundation. • Towards the end of this period, it was becoming apparent that Moggill was likely to experience a second naturally occurring peak on 10 January 2011 or later and that the Manual required the flow at Moggill to be minimized prior to this peak occurring. This requirement was competing with the need to protect urban areas by not allowing the Wivenhoe Dam level to reach a level that invoked Strategy W4. After considering these issues it was decided that the best course of action would be to increase releases as quickly as possible to the limit of non-damaging flows at Moggill. However before this could occur, Councils needed to be advised, bridges needed to be closed and actions needed to be taken to prepare for rural communities for isolation and urban areas below Moggill for river flows approaching 3500 m^3/s. • With dam levels under the Wivenhoe/Somerset Operating Target Line during this period, releases continued from Somerset Dam.

JANUARY 2011 FLOOD EVENT - PERIOD 9 OF 20				
DATE/TIME	**BACKGROUND**	**DAM CONDITIONS**	**RAINFALL AND MODEL RESULTS**	**STRATEGY**
	Strategy W3 and Strategy S2			**Strategy W3 and Strategy S2 (Lake Level greater than 68.50, maximum release 4000 m^3/s)**
Commenced Sunday 09 Jan 2011 19:00 Completed Monday 10 Jan 2011 01:00	• Council and Agency notifications commenced at 7:00pm. The likely peak flow at Moggill of over 3000 m^3/s was communicated to the Brisbane City Council and the Seqwater CEO. • Damage tables supplied by the Brisbane City Council indicated that at flows of 3000 m^3/s, damage costs would exceed $5M and 2600 properties would be impacted in some way. These impacts rise steeply as flows increase, so the focus was on minimizing the flow at Moggill. • Fernvale Bridge closed by police at around 01:00 on 10 January 2011 and once this was confirmed a directive was issued to increases releases from Wivenhoe Dam. • No change to gate settings over this period due to the potential danger to the public associated with inundating Fernvale Bridge from Wivenhoe Dam outflows prior to the bridge being closed to traffic. Councils also required time to prepare for the isolation of rural communities, the onset of urban damage below Moggill and to undertake any necessary evacuations. Wivenhoe discharge is 1473 m^3/s. All rural bridges below the dam with the exception of the Mt Crosby Weir Bridge and Fernvale Bridge are flooded.	Total rainfall since commencement: Wivenhoe 232mm; Somerset 343mm; Lockyer 131mm; Bremer 102mm. Wivenhoe Dam level rises from 68.97 to 69.97 over the 6 hour period. Somerset Dam level rises from 101.43 to 102.54 over the 6 hour period.	• Catchment average rainfalls over this period were: o Wivenhoe 24mm; o Somerset 38mm; o Lockyer 14mm; o Bremer 6mm. • Forecast rainfall in the next 24 hours is 65mm. • Estimated peak Wivenhoe level is: 72.9 (excluding forecast); 74.7 (including forecast). • Estimated peak Somerset level is: 102.9 (excluding forecast); 103.4 (including forecast). • Estimated total dam inflow is: 1,468,000ML (excluding forecast); 1,922,000ML (including forecast). • Estimated peak flow at Moggill excluding Wivenhoe releases is: 820 m^3/s (excluding forecast); 2000 m^3/s (including forecast). This peak was estimated to occur at 16:00 on 10 January 2011. • Estimated peak flow at Moggill including Wivenhoe releases is: 3240 m^3/s (excluding forecast); 4480 m^3/s (including forecast).	• Consideration was on protecting urban areas from inundation. However before releases are increased to and above the limit of non-damaging floods at Moggill, Councils and other impacted agencies are notified so that appropriate actions can be taken including any necessary evacuations and the closure of both the Mt Crosby Weir Bridge and Fernvale Bridge. • The Manual requires the flow at Moggill to be minimized prior to its naturally occurring peak and this requirement was balanced against the need to protect urban areas by releasing water from the dams in an attempt to keep the Wivenhoe Dam lake level below a level that will invoke Strategy W4. However the onset of increased releases did roughly coincide with the calculated naturally occurring peak at Moggill (based on a 16 hour travel time between the dam and Moggill). • With dam levels under the Wivenhoe/Somerset Operating Target Line during this period, releases continued from Somerset Dam. • Although there is a full awareness of the rainfall forecasts and associated potential flood impacts, the strategy is not to release flows that will cause high level urban inundation until it is certain that this cannot be avoided. Model results continue to indicate that this may be possible.

JANUARY 2011 FLOOD EVENT - PERIOD 10 OF 20				
DATE/TIME	**BACKGROUND**	**DAM CONDITIONS**	**RAINFALL AND MODEL RESULTS**	**STRATEGY**
	Strategy W3 and Strategy S2 Wivenhoe Directives #8 to #10.			**Strategy W3 and Strategy S2 (Lake Level greater than 68.50, maximum release 4000 m^3/s)**
Commenced Monday 10 Jan 2011 01:00 Completed Monday 10 Jan 2011 09:00	• Gates opened continuously at Wivenhoe Dam for 8 hours in accordance with the standard gate opening sequence at a rate of 0.5 metres of opening per hour. • Wivenhoe discharge is increased from 1473 m^3/s to 2015 m^3/s. All rural bridges below the dam are flooded. • Further gate openings at Wivenhoe Dam were paused at 09:00 in an attempt to allow the Lockyer and Bremer peaks to pass Moggill and to restrict Brisbane River flows at Moggill to 3500 m^3/s. This was done following discussions with the Brisbane City Council that advised a flow of 3500 m^3/s at Moggill will fully submerge 322 properties and impact on 7000 properties. • No gate movements occurred at Somerset Dam during this period, with dam levels plotting under the Wivenhoe/Somerset Operating Target Line. This meant that the only gate movements allowable at Somerset under Strategy S2 would be openings and this was not done to limit further rises in Wivenhoe.	Total rainfall since commencement: Wivenhoe 244mm; Somerset 373mm; Lockyer 143mm; Bremer 120mm. Wivenhoe Dam level rises from 69.97 to 71.56 over the 8 hour period. Somerset Dam level rises from 102.54 to 103.08 over the 8 hour period.	• Catchment average rainfalls over this period were: o Wivenhoe 12mm; o Somerset 30mm; o Lockyer 12mm; o Bremer 18mm. • Forecast rainfall in the next 24 hours is 65mm. • Estimated peak Wivenhoe level is: 72.9 (excluding forecast); 74.5 (including forecast). • Estimated peak Somerset level is: 103.1 (excluding forecast); 103.5 (including forecast). • Estimated total dam inflow is: 1,531,000ML (excluding forecast); 1,985,000ML (including forecast). • Estimated peak flow at Moggill excluding Wivenhoe releases is: 1090 m^3/s (excluding forecast); 2090 m^3/s (including forecast). This peak was estimated to occur at 16:00 on 10 January 2011. • Estimated peak flow at Moggill including Wivenhoe releases is: 3420 m^3/s (excluding forecast); 4680 m^3/s (including forecast).	• Consideration was on protecting urban areas from inundation and minimizing urban damage. • Due to advice received from the Brisbane City Council that a flow of 3500 m^3/s at Moggill will fully submerge 322 properties and impact on 7000 properties, an attempt was made to remain below this flow • The Manual states that the intent of Strategy W3 is to limit the flow in the Brisbane River at Moggill to less than 4000 m^3/s and this approach was adopted. Advice received during the event from the Brisbane City Council that the upper limit of non-damaging floods was below the 4000 m^3/s stated in the manual was noted and taken into account in the decision making processes. • With dam levels under the Wivenhoe/Somerset Operating Target Line during this period, releases continued from Somerset Dam. • Although there is a full awareness of the rainfall forecasts and associated potential flood impacts, the strategy is not to release flows that will cause high level urban inundation until it is certain that this cannot be avoided. Model results continue to indicate that this may be possible.

JANUARY 2011 FLOOD EVENT - PERIOD 11 OF 20				
DATE/TIME	**BACKGROUND**	**DAM CONDITIONS**	**RAINFALL AND MODEL RESULTS**	**STRATEGY**
Commenced Monday 10 Jan 2011 09:00 Completed Monday 10 Jan 2011 15:00	**Strategy W3 and Strategy S2** • No change to gate settings occurred at Wivenhoe Dam over this period. Wivenhoe discharge is 2087 m^3/s. All rural bridges below the dam are flooded. • At 15:00 the attempt to restrict Brisbane River flows at Moggill to 3500 m^3/s was abandoned due to the rainfall being experienced in the dam catchments. A new target of 4000 m^3/s was set in accordance with the Manual, on the basis that the intent of Strategy W3 is to limit the flow in the Brisbane River at Moggill to less than 4000 m^3/s and minimize urban damage. • No gate movements occurred at Somerset Dam during this period, with dam levels plotting under the Wivenhoe/Somerset Operating Target Line. This meant that the only gate movements allowable at Somerset under Strategy S2 would be openings and this was not done to limit further rises in Wivenhoe.	Total rainfall since commencement: Wivenhoe 274mm; Somerset 407mm; Lockyer 169mm; Bremer 149mm. Wivenhoe Dam level rises from 71.56 to 72.54 over the 6 hour period. Somerset Dam level rises from 103.08 to 103.43 over the 6 hour period.	• Catchment average rainfalls over this period were: o Wivenhoe 34mm; o Somerset 31mm; o Lockyer 27mm; o Bremer 30mm. • Forecast rainfall in the next 24 hours is 75mm. • Estimated peak Wivenhoe level is: 73.6 (excluding forecast); 75.2 (including forecast). • Estimated peak Somerset level is: 103.4 (excluding forecast); 103.7 (including forecast). • Estimated total dam inflow is: 1,708,000ML (excluding forecast); 2,162,000ML (including forecast). • Estimated peak flow at Moggill excluding Wivenhoe releases is: 1500 m^3/s (excluding forecast); 2570 m^3/s (including forecast). This peak was estimated to occur at 20:00 on 10 January 2011. • Estimated peak flow at Moggill including Wivenhoe releases is: 3910 m^3/s (excluding forecast); 5180 m^3/s (including forecast).	**Strategy W3 and Strategy S2 (Lake Level greater than 68.50, maximum release 4000 m^3/s)** • Consideration was on protecting urban areas from inundation and minimizing urban damage. • A decision was made at 15:00 to attempt to remain below a target flow of around 4000 m^3/s at Moggill. • The Manual states that the intent of Strategy W3 is to limit the flow in the Brisbane River at Moggill to less than 4000 m^3/s and this approach continued to be followed. • With dam levels under the Wivenhoe/Somerset Operating Target Line during this period, releases continued from Somerset Dam. • Although there is a full awareness of the rainfall forecasts and associated potential flood impacts, the strategy is not to release flows that will cause high level urban inundation until it is certain that this cannot be avoided. Model results continue to indicate that this may be possible.

JANUARY 2011 FLOOD EVENT - PERIOD 12 OF 20				
DATE/TIME	**BACKGROUND**	**DAM CONDITIONS**	**RAINFALL AND MODEL RESULTS**	**STRATEGY**
	Strategy W3 and Strategy S2 Wivenhoe Directive #11.			**Strategy W3 and Strategy S2 (Lake Level greater than 68.50, maximum release 4000 m^3/s)**
Commenced Monday 10 Jan 2011 15:00 Completed Monday 10 Jan 2011 20:00	• Gates opened continuously at Wivenhoe Dam for 5 hours in accordance with the standard gate opening sequence at a rate or 1.0 metres of opening per hour. • A target of 4000 m^3/s at Moggill was set in accordance with the Manual, on the basis that the intent of Strategy W3 is to limit the flow in the Brisbane River at Moggill to less than 4000 m^3/s and minimize urban damage. • Wivenhoe discharge is increased from 2087 m^3/s to 2695 m^3/s. • Further gate openings at Wivenhoe Dam were paused at 20:00 in an attempt to allow the Lockyer and Bremer peaks to pass Moggill and to restrict Brisbane River flows at Moggill to 4000 m^3/s. • No gate movements occurred at Somerset Dam during this period, with dam levels plotting under the Wivenhoe/Somerset Operating Target Line. This meant that the only gate movements allowable at Somerset under Strategy S2 would be openings and this was not done to limit further rises in Wivenhoe.	Total rainfall since commencement: Wivenhoe 279mm; Somerset 415mm; Lockyer 174mm; Bremer 153mm. Wivenhoe Dam level rises from 72.53 to 73.06 over the 5 hour period. Somerset Dam level rises from 103.43 to 103.45 over the 5 hour period.	• Catchment average rainfalls over this period were: o Wivenhoe 4mm; o Somerset 8mm; o Lockyer 5mm; o Bremer 3mm. • Forecast rainfall in the next 24 hours is 38mm, with isolated falls to 100mm. • Estimated peak Wivenhoe level is: 73.6 (excluding forecast); 74.3 (including forecast). • Estimated peak Somerset level is: 103.5 (excluding forecast); 103.5 (including forecast). • Estimated total dam inflow is: 1,731,000ML (excluding forecast); 1,982,000ML (including forecast). • Estimated peak flow at Moggill excluding Wivenhoe releases is: 1500 m^3/s (excluding forecast); 1840 m^3/s (including forecast). This peak was estimated to occur at 20:00 on 10 January 2011. • Estimated peak flow at Moggill including Wivenhoe releases is: 3980 m^3/s (excluding forecast); 4470 m^3/s (including forecast).	• Consideration was on protecting urban areas from inundation and minimizing urban damage. • The target maximum flow at Moggill was now 4000 m^3/s. The Manual states that the intent of Strategy W3 is to limit the flow in the Brisbane River at Moggill to less than 4000 m^3/s and this approach continued to be followed. • With dam levels under the Wivenhoe/Somerset Operating Target Line during this period, releases continued from Somerset Dam. • The reduced rainfall forecast provides justification to retain the target of 4000 m^3/s at Moggill, with the Wivenhoe peak of 74.3 (including forecast) indicating that it may be possible to keep urban damage within tolerable limits. A discussion is held with the Dam Safety Regulator requesting permission to exceed a level of 74.0 in Wivenhoe for a short period (maximum 12 hours) without invoking Strategy W4 if the safety of the dam can be guaranteed and urban damage reduced. The Regulator agreed with this approach. • The strategy continues to be not to release flows that will cause high level urban inundation until it is certain that this cannot be avoided. Model results continue to indicate that this may be possible.

JANUARY 2011 FLOOD EVENT - PERIOD 13 OF 20				
DATE/TIME	**BACKGROUND**	**DAM CONDITIONS**	**RAINFALL AND MODEL RESULTS**	**STRATEGY**
Commenced Monday 10 Jan 2011 20:00 Completed Tuesday 11 Jan 2011 04:00	**Strategy W3 and Strategy S2** • Gate openings at Wivenhoe Dam were paused at 20:00 in an attempt to restrict flows at Moggill to close to 4000 m^3/s. No change to gate settings occurred at Wivenhoe Dam over this period. Wivenhoe discharge is 2726 m^3/s. • A target flow of 4000 m^3/s is set at Moggill in accordance with the Manual (the intent of Strategy W3 is to limit the flow in the Brisbane River at Moggill to less than 4000 m^3/s). However BCC damage tables indicate this would still impact 5325 properties and cause damage in excess of $47M. • Initial advice on a significant flash flood originating in Lockyer headwaters received at 17:32, with details received at 20:00. Considerations were undertaken during this period to develop strategies to manage these potential flows, but because any strategy would involve significantly reducing outflows from Wivenhoe, the strategies were not adopted. • During this period the plotted dam levels drifted just above the Wivenhoe/Somerset Operating Target Line. This lead to a decision at 04:00 to commence closing down releases from Somerset Dam to limit further rises in Wivenhoe.	Total rainfall since commencement: Wivenhoe 323mm; Somerset 437mm; Lockyer 186mm; Bremer 167mm. Wivenhoe Dam level rises from 73.06 to 73.40 over the 8 hour period. Somerset Dam level fell from 103.45 to 103.23 over the 8 hour period.	• Catchment average rainfalls over this period were: o Wivenhoe 44mm; o Somerset 22mm; o Lockyer 12mm; o Bremer 14mm. • Forecast rainfall in the next 24 hours is 38mm, with isolated falls to 100mm. • Estimated peak Wivenhoe level is: 74.1 (excluding forecast); 74.9 (including forecast). • Estimated peak Somerset level is: 103.5 (excluding forecast); 103.7 (including forecast). • Estimated total dam inflow is: 2,016,000ML (excluding forecast); 2,267,000ML (including forecast). • Estimated peak flow at Moggill excluding Wivenhoe releases is: 1500 m^3/s (excluding forecast); 1810 m^3/s (including forecast). This peak was estimated to have occurred at 20:00 on 10 January 2011. • Estimated peak flow at Moggill including Wivenhoe releases is: 4040 m^3/s (excluding forecast); 4540 m^3/s (including forecast).	**Strategy W3 and Strategy S2 (Lake Level greater than 68.50, maximum release 4000 m^3/s)** • Consideration on protecting urban areas from inundation and minimizing urban damage. The target maximum flow at Moggill remains at 4000 m^3/s. The Manual states that the intent of Strategy W3 is to limit the flow in the Brisbane River at Moggill to less than 4000 m^3/s and this approach continues to be followed. • Model results show that a peak level in the dam close to 74.0 remains possible, but is appearing increasing unlikely. • With dam levels moving above the Wivenhoe/Somerset Operating Target Line during this period, a decision is made commence closing down releases from Somerset Dam to limit further rises in Wivenhoe. • Although there is a full awareness of the rainfall forecasts and associated potential flood impacts, the strategy is not to release flows that will cause high level urban inundation until it is certain that this cannot be avoided. Model results continue to indicate that this may be possible, although with continued rainfall, the strategy is now being reviewed on an hour by hour basis. The discussion at 21:00 with the Dam Safety Regulator requesting permission to exceed a level of 74.0 in Wivenhoe for a short period without invoking Strategy W4 (provided the safety of the dam can be guaranteed) is also being considered carefully in view of the continued rainfall.

JANUARY 2011 FLOOD EVENT - PERIOD 14 OF 20				
DATE/TIME	**BACKGROUND**	**DAM CONDITIONS**	**RAINFALL AND MODEL RESULTS**	**STRATEGY**
	Transition from Strategy W3 to Strategy W4; and Strategy S2 Wivenhoe Directive #12. Somerset Directive #6.			**Strategy W4 and Strategy S2 (Lake Level predicted to exceed 74.00, no maximum release rate)**
Commenced Tuesday 11 Jan 2011 04:00 Completed Tuesday 11 Jan 2011 08:00	• Extreme intense rainfall (estimated to exceed **1 in 500 year intensities**) commenced on and close to the Wivenhoe Dam lake area during this period. If the centroid of this rainfall was located east or south, it may have been possible to avoid transition to Strategy W4. • Because the extreme intense rainfall was occurring on and close to the dam rather than in the northern areas of the dam catchment, response time is minimized and actions must be taken quickly to prevent a situation arising during which the safety of the dam is put at risk. Accordingly at 08:00 a decision is made to transition to Strategy W4. Significant urban damage can now not be avoided. The Dam Safety Regulator, Seqwater CEO and the Councils are advised of this development. • No change to gate settings occurred at Wivenhoe Dam over this period. Wivenhoe discharge is 2832 m^3/s. • During this period sluice gate openings at Somerset Dam are reduced from 5 to 2 as the plotted dam levels had drifted just above the Wivenhoe/Somerset Operating Target Line. This decision is consistent with Strategy S2.	Total rainfall since commencement: Wivenhoe 356mm; Somerset 483mm; Lockyer 240mm; Bremer 183mm. Wivenhoe Dam level rises from 73.40 to 73.70 over the 4 hour period. Somerset Dam level rises from 103.23 to 103.46 over the 4 hour period.	• Catchment average rainfalls over this period were: o Wivenhoe 33mm; o Wivenhoe Local 78mm; o Somerset 46mm; o Lockyer 54mm; o Bremer 16mm. • Forecast rainfall in the next 24 hours is 38mm, with isolated falls to 100mm. • Estimated peak Wivenhoe level is: 74.5 (excluding forecast); 75.1 (including forecast). • Estimated peak Somerset level is: 103.9 (excluding forecast); 104.2 (including forecast). • Estimated total dam inflow is: 2,210,000ML (excluding forecast); 2,460,000ML (including forecast). • Estimated peak flow at Moggill including Wivenhoe releases is: 5870 m^3/s (excluding forecast).	• At 08:00, model results show that restricting the peak level in the dam close to 74.0 is no longer possible due to the high intensity rainfall experienced over this period. • At 08:00 a decision is made to transition to Strategy W4 and the Dam Safety Regulator, Seqwater CEO and the Councils are advised of this decision. It was now apparent that significant urban damage resulting from releases from Wivenhoe Dam could not be avoided due to the extreme intense rainfall (estimated to exceed **1 in 500 year intensities**) that commenced on and close to the Wivenhoe Dam lake area during this period • With dam levels moving above the Wivenhoe/Somerset Operating Target Line during this period releases from Somerset Dam were progressively closed down to limit further rises in Wivenhoe (sluices closed down at hourly intervals in accordance with the Manual).

JANUARY 2011 FLOOD EVENT - PERIOD 15 OF 20				
DATE/TIME	**BACKGROUND**	**DAM CONDITIONS**	**RAINFALL AND MODEL RESULTS**	**STRATEGY**
Commenced Tuesday 11 Jan 2011 08:00 Completed Tuesday 11 Jan 2011 13:00	**Strategy W4 and Strategy S2 Wivenhoe Directive #12 to #14. Somerset Directive #7.** • Extreme intense rainfall (estimated to exceed **1 in 500 year intensities**) continued on and close to the Wivenhoe Dam lake area during this period. If the centroid of this rainfall was located east or south, it may have been possible to avoid transition to Strategy W4. • Because the extreme rainfall is occurring on and close to the dam rather than in the northern areas of the dam catchment, response time is minimized and actions must be taken quickly to protect the safety of the dam. Once Strategy W4 is invoked, the Manual requires the opening of gates in accordance with standard sequences until the storage level of Wivenhoe Dam begins to fall. Accordingly gates are opened continuously at Wivenhoe Dam for 5 hours in accordance with the standard gate opening sequence at an average rate of 2.0 metres of opening per hour. This increases the dam discharge from 2753 m^3/s to 4250 m^3/s. The threshold limit for urban damage has been exceeded and the lake level continues to rise. • During this period sluice gate openings at Somerset Dam are closed off to limit rises in Wivenhoe in accordance with Strategy S2.	Total rainfall since commencement: Wivenhoe 382mm; Somerset 570mm; Lockyer 287mm; Bremer 237mm. Wivenhoe Dam level rises from 73.70 to 74.39 over the 5 hour period. Somerset Dam level rises from 103.46 to 103.83 over the 5 hour period.	• Catchment average rainfalls over this period were: o Wivenhoe 27mm; o Wivenhoe Local 85mm; o Somerset 86mm; o Lockyer 47mm; o Bremer 55mm. • Forecast rainfall in the next 24 hours is 100mm. • A portion of the extreme intense rainfall in the dam catchment was falling in an un-gauged area (e.g. on the dam lake area) and this resulted in difficulties in the model being able to accurately predict lake level rises. Accordingly, during this period dam operations at Wivenhoe commenced taking gauge board readings every 30 minutes during this period and relaying this information to the Flood Operations Centre by telephone. • Estimated peak Wivenhoe level is: 75.0 (excluding forecast); 76.2 (including forecast). • Estimated peak Somerset level is: 104.8 (excluding forecast); 105.7 (including forecast). • Estimated total dam inflow is: 2,506,000ML (excluding forecast); 3,123,000ML (including forecast). • Estimated peak flow at Moggill including Wivenhoe releases is: 9180 m^3/s (excluding forecast).	**Strategy W4 and Strategy S2 (Lake Level predicted to exceed 74.00, no maximum release rate)** • The strategy was to protect the structural safety of the dam. • The Manual requires actions under Strategy 4 to be that Wivenhoe gate openings are to occur in accordance with standard sequences until the storage level of Wivenhoe Dam begins to fall. • The dam level continued to rise at 13:00. During this period, a Dam Operator was relaying Wivenhoe Dam gauge board readings to the Flood Operations Centre every 30 minutes. All four duty engineers were present in the Flood Operations Centre and flood operations decisions were commenced to be made on a half hourly basis once the gauge board readings from Wivenhoe Dam were received. • With dam levels above the Wivenhoe/Somerset Operating Target Line during this period releases from Somerset Dam are closed down (all sluices closed at 10:00) to limit further rises in Wivenhoe.

JANUARY 2011 FLOOD EVENT - PERIOD 16 OF 20				
DATE/TIME	**BACKGROUND**	**DAM CONDITIONS**	**RAINFALL AND MODEL RESULTS**	**STRATEGY**
	Strategy W4 and Strategy S2 Wivenhoe Directive #12 to #14.			**Strategy W4 and Strategy S2 (Lake Level predicted to exceed 74.00, no maximum release rate)**
Commenced Tuesday 11 Jan 2011 13:00 Completed Tuesday 11 Jan 2011 19:00	• Extreme lake level rises in Wivenhoe Dam continue during this period. The QPF issued at 16:00 is for a catchment average rainfall of 75mm over the next 24 hours. • Gates opened continuously at Wivenhoe Dam for 6 hours in accordance with Strategy W4 and the standard gate opening sequence at an average rate of 4.5 metres of opening per hour. • Wivenhoe discharge is increased from 4250 m^3/s to 7464 m^3/s. Significant damage to urban areas below Moggill cannot be avoided. • No releases are made from Somerset Dam to limit increases in Wivenhoe Dam in accordance with Strategy S2.	Total rainfall since commencement: Wivenhoe 397mm; Somerset 610mm; Lockyer 325mm; Bremer 278mm. Wivenhoe Dam level rises from 74.39 to 74.97 over the 6 hour period. Somerset Dam level rises from 103.83 to 104.60 over the 6 hour period.	• Catchment average rainfalls over this period were: o Wivenhoe 15mm; o Wivenhoe Local 35mm; o Somerset 40mm; o Lockyer 38mm; o Bremer 40mm. • Forecast rainfall in the next 24 hours is 75mm (issued at 16:00). However, catchment average rainfalls for the 24 hour period commencing at 16:00 were: o Wivenhoe 8mm; o Wivenhoe Local 13mm; o Somerset 19mm; o Lockyer 9mm; o Bremer 8mm. • A portion of the extreme intense rainfall in the dam catchment had fallen in an un-gauged area (e.g. on the dam lake area) and this resulted in difficulties in the model being able to accurately predict lake level rises. • Estimated peak Wivenhoe level is: 75.0 (excluding forecast); 75.2 (including forecast). • Estimated peak Somerset level is: 105.2 (excluding forecast); 105.9 (including forecast). • Estimated total dam inflow is: 2,659,000ML (excluding forecast); 3,289,000ML (including forecast).	• The strategy was to protect the structural safety of the dam. • The Manual requires actions under Strategy 4 to be that Wivenhoe gate openings are to occur in accordance with standard sequences until the storage level of Wivenhoe Dam begins to fall. • The lake level in both dams continued to rise during this period. A dam operator was relaying Wivenhoe Dam gauge board readings to the Flood Operations Centre every 30 minutes. All four duty engineers were present in the Flood Operations Centre and decisions were being made on a half hourly basis once the gauge board readings were received. • With dam levels above the Wivenhoe/Somerset Operating Target Line during this period no releases from Somerset Dam are made to limit further rises in Wivenhoe. • The water level in Wivenhoe Dam peaked at 19:00 on 11 January 2011 at 74.97m AHD.

JANUARY 2011 FLOOD EVENT - PERIOD 17 OF 20				
DATE/TIME	**BACKGROUND**	**DAM CONDITIONS**	**RAINFALL AND MODEL RESULTS**	**STRATEGY**
	Strategy W4 and Strategy S2 Wivenhoe Directive #15 to #24.			**Strategy W4 and Strategy S2 (Lake Level predicted to exceed 74.00, no maximum release rate)**
Commenced Tuesday 11 Jan 2011 19:00 Completed Tuesday 11 Jan 2011 21:00	• No change to gate settings occurred at Wivenhoe Dam over this period. Wivenhoe discharge is 7458 m^3/s. • The lake level in Wivenhoe dam stabilizes and then falls slightly at 21:00. A decision to commence closing down the gates as quickly as possible to reduce urban flood impacts is taken at 21:00. This decision is potentially in contravention of the minimum gate opening settings required under Strategy W4; however it is made in an attempt to minimize urban damage below Moggill which is an objective that must be considered under Strategy W4. Gates would have been re-opened if further lake level rises were experienced. • No releases are made from Somerset Dam in accordance with Strategy S2.	Total rainfall since commencement: Wivenhoe 398mm; Somerset 610mm; Lockyer 326mm; Bremer 278mm. During this 2 hour period, the lake level in Wivenhoe Dam stabilizes at 74.97 and then falls slightly to 74.95 at 21:00. Somerset Dam level rises from 104.60 to 104.78 over the 2 hour period.	• Catchment average rainfalls over this period were: o Wivenhoe 1mm; o Somerset 1mm; o Lockyer 1mm; o Bremer 1mm. • Forecast rainfall in the next 24 hours is 75mm. • A portion of the extreme intense rainfall in the dam catchment had fallen in an un-gauged area (e.g. on the dam lake area) and this continued to result in difficulties in the model being able to accurately predict lake level behaviour. • Estimated peak Wivenhoe level is: 75.0 (excluding forecast); 75.2 (including forecast). • Estimated peak Somerset level is: 105.2 (excluding forecast); 105.9 (including forecast). • Estimated total dam inflow is: 2,659,000ML (excluding forecast); 3,289,000ML (including forecast).	• The target was to protect the structural safety of the dam. • The Manual requires actions under Strategy 4 to be that Wivenhoe gate openings are to occur at the minimum intervals and sequences until the storage level of Wivenhoe Dam begins to fall. • The dam level stabilized during this period and then fell slightly at 21:00. A dam operator was relaying Wivenhoe Dam gauge board readings to the Flood Operations Centre every 30 minutes. All four duty engineers were present in the Flood Operations Centre and decisions were being made on a half hourly basis once the gauge board readings were received. • With dam levels above the Wivenhoe/Somerset Operating Target Line during this period no releases from Somerset Dam are made to limit further rises in Wivenhoe. • The water level in Wivenhoe Dam peaked at 19:00 on 11 January 2011 at 74.97m AHD.

JANUARY 2011 FLOOD EVENT - PERIOD 18 OF 20				
DATE/TIME	**BACKGROUND**	**DAM CONDITIONS**	**RAINFALL AND MODEL RESULTS**	**STRATEGY**
	Strategy W4 and Strategy S2 Wivenhoe Directive #25 to #34.			**Strategy W4 and Strategy S2 (Lake Level predicted to exceed 74.00, no maximum release rate)**
Commenced Tuesday 11 Jan 2011 21:00 Completed Wednesday 12 Jan 2011 08:00	• During this period Wivenhoe Dam gates are closed off as quickly as possible without causing rises in lake level. These actions are taken to reduce urban flood impacts downstream. The decision to close off the release in this way is potentially in contravention of the minimum gate opening settings required under Strategy W4; however it is made in an attempt to minimize urban damage below Moggill which is an objective that must be considered under this Strategy. • Gates closed continuously at Wivenhoe Dam for 11 hours in accordance with the standard gate closing sequence at an average rate of just over 3.6 metres of opening per hour. • Wivenhoe discharge is decreased from 7464 m^3/s to 2547 m^3/s. All rural bridges below the dam remain flooded and significant damage to urban areas below Moggill has not been avoided. • No releases are made from Somerset Dam in accordance with Strategy S2.	Total rainfall since commencement: Wivenhoe 399mm; Somerset 613mm; Lockyer 328mm; Bremer 279mm. Wivenhoe Dam level falls from 74.97 to 74.78 over the 11 hour period. Somerset Dam level rises from 104.78 to 105.11 over the 11 hour period.	• Catchment average rainfalls over this period were: o Wivenhoe 1mm o Somerset 3mm; o Lockyer 3m; o Bremer 1m. • Forecast rainfall in the next 24 hours is 10mm (issued Wednesday morning). • Estimated peak Wivenhoe level is: 75.0 (excluding forecast); 75.0 (including forecast). • Estimated peak Somerset level is: 105.1 (excluding forecast); 105.1 (including forecast). • Estimated total dam inflow is: 2,650,000ML (excluding forecast); 2,650,000ML (including forecast).	• The target was to protect the structural safety of the dam. • The Manual requires actions under Strategy 4 to be that Wivenhoe gate openings are to occur at the minimum intervals and sequences until the storage level of Wivenhoe Dam begins to fall. Because the lake level was falling slightly, a decision was made to reduce releases from Wivenhoe Dam as quickly and to as low a level as possible, to minimize urban damage below Moggill. • It was calculated that reducing to a discharge of 2547 m^3/s from Wivenhoe Dam would: o Not increase the downstream flood peak; o Not cause the water level in Wivenhoe Dam to rise and; o Allow the dam to be drained back to FSL in 7 days in accordance with the Manual. • With dam levels above the Wivenhoe/Somerset Operating Target Line during this period no releases from Somerset Dam are made to limit further rises in Wivenhoe.

JANUARY 2011 FLOOD EVENT - PERIOD 19 OF 20				
DATE/TIME	**BACKGROUND**	**DAM CONDITIONS**	**RAINFALL AND MODEL RESULTS**	**STRATEGY**
Commenced Wednesday 12 Jan 2011 08:00 Completed Thursday 13 Jan 2011 12:00	**Transition from Strategy W4 to the Drain Down Phase Somerset Directives #8 to #9.** • No change to gate settings occurred at Wivenhoe Dam over this period. Wivenhoe discharge is 2534 m^3/s. All rural bridges below the dam remain flooded. • Releases commenced from Somerset Dam during this period as the plotted dam levels fell below the Wivenhoe/Somerset Operating Target Line. These actions were undertaken in accordance with Strategy S2 and to allow the D'Aguilar Highway to be opened as soon as possible. Even though plotted dam levels later rose above the Wivenhoe/Somerset Operating Target Line during this period, releases from Somerset dam continued to allow the dam to be drained back to FSL in 7 days in accordance with the Manual.	Total rainfall since commencement: Wivenhoe 401mm; Somerset 619mm; Lockyer 330mm; Bremer 280mm. Wivenhoe Dam level falls from 74.78 to 74.61 over the 28 hour period. Somerset Dam level falls from 105.11 to 103.96 over the 28 hour period.	• Catchment average rainfalls over this period were: o Wivenhoe 2mm; o Somerset 6mm; o Lockyer 6mm; o Bremer 6mm. • Forecast rainfall in the next 24 hours is 10mm.	**Drain Down Phase (Stored floodwaters emptied from the dam in seven days)** • During this period the strategy transitioned from Strategy W4, during which the target is to protect the structural safety of the dam, to the Drain Down Phase of the event. • Once the Drain Down Phase commenced, the target was to release stored floodwaters from the dam within 7 days of the flood peak passing through the dams, while controlling downstream impacts. Considerations impacting on the duration and timing of the Drain Down Phase in this instance included: o Causing no renewed increases in river levels below the dam (except where they were unavoidable due to tidal influences. o Maintaining an adequate release rate to ensure that the temporary pumps providing water supplies to the Lowood area could continue to operate; o Minimizing bank slumping impacts along the river, particularly in key areas such as Coronation Drive (as requested from the Brisbane City Council); o Re-opening the Brisbane Valley highway and key rural bridges as quickly as possible; o Achieving full supply levels in the dams at the conclusion of the event.

JANUARY 2011 FLOOD EVENT - PERIOD 20 OF 20				
DATE/TIME	**BACKGROUND**	**DAM CONDITIONS**	**RAINFALL AND MODEL RESULTS**	**STRATEGY**
Commenced Thursday 13 Jan 2011 12:00 Completed Wednesday 19 Jan 2011 12:00	**Drain Down Phase** **Wivenhoe Directives #35 to #62** **Somerset Directives #10 to #13.** • During this period releases from Wivenhoe Dam are increased to as the peaks from the Lockyer and Bremer subside. Downstream impacts are controlled to ensure that at no time during this phase do downstream water levels rise except if impacted by tidal influences. • During this period, stored flood water in Somerset Dam is drained into Wivenhoe Dam in accordance with the drain down target of seven days. Importance is placed on opening the D'Aguilar Highway as soon as possible.	Total rainfall since commencement: Wivenhoe 415mm; Somerset 626mm; Lockyer 337mm; Bremer 288mm. Wivenhoe Dam level falls from 74.61 to 66.89 over the 6 day period. Somerset Dam level falls from 103.96 to 99.00 over the 6 day period.	• Catchment average rainfalls over this six day period were: o Wivenhoe 14mm; o Somerset 7mm; o Lockyer 7mm; o Bremer 8mm.	**Drain Down Phase** • During this period the target was to release stored floodwaters from the dam within 7 days of the flood peak passing through the dams, while controlling downstream impacts. Considerations impacting on the duration and timing of the Drain Down Phase in this instance included: o Causing no renewed increases in river levels below the dam (except where they were unavoidable due to tidal influences. o Maintaining an adequate release rate to ensure that the temporary pumps providing water supplies to the Lowood area could continue to operate; o Minimizing bank slumping impacts along the river, particularly in key areas such as Coronation Drive (as requested from the Brisbane City Council); o Re-opening the Brisbane Valley highway and key rural bridges as quickly as possible; o Achieving full supply levels in the dams at the conclusion of the event.

Brooke Foxover

From: DutyEngineer [dutyseq[redacted]
Sent: Saturday, 5 February 2011 1:02 PM
To: John Tibaldi
Attachments: @

This message has been archived. View the original item

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Your Anti-virus Service scanned this email. It is safe from known viruses.
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Attachments:

02 - Flood Event Summary.doc (405 KB)

2 SUMMARY OF JANUARY 2011 FLOOD EVENT

The following summary must be read in conjunction with the Manual of Operational Procedures for Flood Mitigation at Wivenhoe Dam and Somerset Dam. The summary contains a series of tables provides a detailed summary of the operation of Wivenhoe and Somerset Dams during the January 2011 Flood Event that impacted on Brisbane. Each table covers a period of the event during which one of the following occurred:

- There was a transition or change to the flood operation strategy used as defined by the Manual.
- There was a period of stability during which no gate operations from either Wivenhoe Dam or Somerset Dam were directed.
- There was a period of sustained gate operations (either opening or closing) at either Wivenhoe Dam or Somerset Dam.

Each table also provides a summary of both relevant background information and a summary of the information that was used in decision making during the period covered by the table. This information includes:

- Details of the time period.
- Relevant background information from the period leading up to and during the period.
- Changes in dam conditions during the period.
- Rainfall information (including forecast rainfall) and model results available during the period.
- The Strategy used and/or adopted during the period.

Full details of the modeling results that are shown in the tables are contained in Appendix A. Other decision support tools that were used in conjunction with the modeling results included:

- The 24 hour Quantitative Precipitation Forecasts (QPF) for the dam catchments provided by BoM.
- The BoM weather radar available through the BoM website.
- BoM SILO Meteograms Forecast Rainfall.
- BoM Interactive Weather and Wave Forecast Rainfall Maps.
- BoM Water and the Land Forecast Rainfall.

Of these tools the QPF is considered the primary forecast tool as it is provided by BoM to give specific forecast information in relation to the dam catchment areas.

Further reports and appendices are available to explain in detail the derivation of the technical information presented in the tables. Much of the background detail in the reports is taken from the event log.

In summary, the event was extremely large and rare, with some relevant statistics that demonstrate this fact as follows:

- Catchment average rainfalls recorded for the catchment area above Wivenhoe Dam indicate rainfall intensities for the 72 hour and 120 hour periods to Tuesday 11 January 2011 at 19:00 had an annual recurrence interval of between 1 in 500 years and 1 in 1000 years.

- Point rainfalls experienced in the Wivenhoe Dam storage area experienced between 05:00 and 13:00 on Tuesday 11 January 2011 have been estimated to have an annual

recurrence interval of between 1 in 500 years and 1 in 1000 years. Although this rainfall was not recorded at a single station, it is estimated to have occurred in order to reproduce the rapid storage level rises experienced at Wivenhoe Dam during this period.

- The volume of total inflow into Wivenhoe Dam experienced during this event has been calculated to be in the order of 88% more that the comparable volume of inflow calculated from the January 1974 event.

- The water flow into Wivenhoe Dam experienced during this event is represented by a dual peaked hydrograph with the two peaks separated by 30 hours and the maximum flow rate at both peaks estimated to be in the order of 50% greater that the comparable flow rate calculated from the January 1974 event.

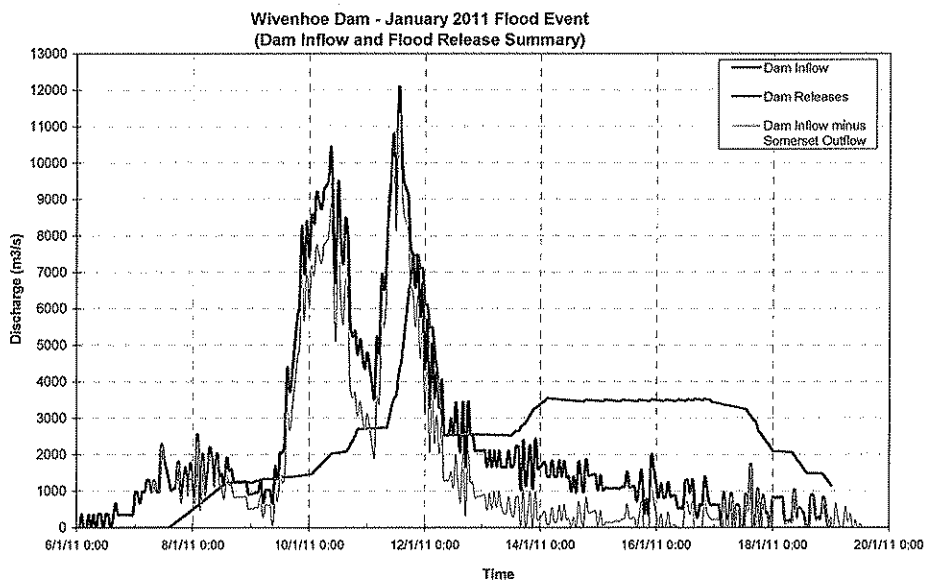
Certainly Wivenhoe Dam provided clear and greatly significant flood mitigation benefits during the event, with some relevant statistics being:

- The following graph demonstrates the significant benefits of Wivenhoe Dam in mitigating the current flood event. Just below the dam, the maximum hourly flow rate in the Brisbane River was reduced by 38% and the maximum three hourly flow rate was reduced by 30%.

- If the above reductions are translated to reductions in flood peak height downstream of Wivenhoe Dam, flood peak height reductions of up to 2.5 metres in the City area, up to 4.0 metres in the Jindalee area and up to 5.5 metres in the Moggill area can be estimated.

- The projected reductions in the flood peak height equates to significant reductions 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 (Source: Flood Damage Tables provided to Seqwater by the Brisbane City Council).

- Additionally, based on the above figures, up to 13,000 more properties would have been impacted by the event without Wivenhoe Dam. (Source: Flood Damage Tables provided to Seqwater by the Brisbane City Council).



JANUARY 2011 FLOOD EVENT - PERIOD 1 OF 20				
DATE/TIME	**BACKGROUND**	**DAM CONDITIONS**	**RAINFALL AND MODEL RESULTS**	**STRATEGY**
	Strategy W1A and Strategy W1B; and Strategy S2			**Strategy W1A and Strategy W1B; and Strategy S2 (Lake Level greater than 67.25, maximum release 110 m^3/s)**
Commenced Thursday 06 Jan 2011 07:42 Completed Friday 07 Jan 2011 02:00	• No significant rainfall occurred in the 24 hours to 0900 on 5 January 2011. • Catchment average rainfalls in the 24 hours to 0800 on 6 January 2011 were: o Wivenhoe 25mm; o Somerset 21mm; o Lockyer 23mm; o Bremer 23mm. • Event Mobilisation occurred at 7:42 on Thursday 6 January 2011, using Strategies W1A and S2. • Once mobilisation occurs, 24/7 staffing of the Flood Operations Centre and dams continues until official de-mobilisation is announced. For this event, this occurred at 12:00 on Wednesday 19 January 2011. • Duty Engineer called back early from annual Christmas holidays to assist with the management of the event. • Transition from Strategy W1A to W1B once the Wivenhoe Lake Level exceeded 67.50.	Total rainfall since commencement: Wivenhoe 53mm; Somerset 44mm; Lockyer 53mm; Bremer 54mm. Wivenhoe Dam level rises from 67.31 to 67.52 over the 18 hour period. Somerset Dam level rises from 99.34 to 99.55 over the 18 hour period.	• Catchment average rainfalls over this period were: o Wivenhoe 28mm; o Somerset 23mm; o Lockyer 30mm; o Bremer 31mm. • Forecast rainfall in the next 24 hours is 25mm. • Estimated peak Wivenhoe level is: 68.2 (excluding forecast); 68.7 (including forecast). • Estimated peak Somerset level is: 99.7 (excluding forecast); 100.1 (including forecast). • Estimated total dam inflow is: 204,000ML (excluding forecast); 343,000ML (including forecast). • Estimated peak flow at Lowood excluding Wivenhoe releases is: 470 m^3/s (excluding forecast); 720 m^3/s (including forecast). • Estimated peak flow at Moggill excluding Wivenhoe releases is: 550 m^3/s (excluding forecast); 960 m^3/s (including forecast).	• Peak inflows into the Brisbane River from Lockyer are estimated to be in the order of 400 m^3/s, but these flows will not inundate Colleges Crossing until the morning of Friday 07 January 2011. • Lake level not expected to reach 67.50 (Strategy W1B) until Friday 7 January 2011. Lake level may not exceed 68.5. • Endeavour to maintain College's Crossing trafficable by limiting combined flows from Wivenhoe Dam and Lockyer Creek to a maximum of 175 m^3/s. • Water held in Wivenhoe in an attempt to maintain College's Crossing trafficable in accordance with Strategy W1A. Low level releases continued from the Mini-Hydro at this time and at various stages during the event. However these releases (in the order of 13 m^3/s) have low relative significance and are not referred to specifically in the remainder of this summary document. • In accordance with Strategy S2, the crest gates at Somerset Dam were raised to enable uncontrolled discharge and the low level sluices were kept closed. Some regulator releases continued from December as part of previous event drain down, (in the order of 30 m^3/s) but these were shut down at 18:00.

JANUARY 2011 FLOOD EVENT - PERIOD 2 OF 20				
DATE/TIME	**BACKGROUND**	**DAM CONDITIONS**	**RAINFALL AND MODEL RESULTS**	**STRATEGY**
Commenced Friday 07 Jan 2011 02:00 Completed Friday 07 Jan 2011 09:00	**Strategy W1B and Strategy S2** • Transition from Strategy W1A to W1B due to the Wivenhoe Lake Level exceeding 67.50. • Transition from Strategy W1B to W1C once the Wivenhoe Lake Level exceeds 67.75.	Total rainfall since commencement: Wivenhoe 64mm; Somerset 60mm; Lockyer 57mm; Bremer 60mm. Wivenhoe Dam level rises from 67.52 to 67.75 over the 7 hour period. Somerset Dam level rises from 99.55 to 99.65 over the 7 hour period.	• Catchment average rainfalls over this period were: o Wivenhoe 11mm; o Somerset 15mm; o Lockyer 4mm; o Bremer 5mm. • Forecast rainfall in the next 24 hours is 25mm. • Estimated peak Wivenhoe level is: 68.2 (excluding forecast); 68.5 (including forecast). • Estimated peak Somerset level is: 99.7 (excluding forecast); 100.2 (including forecast). • Estimated total dam inflow is: 242,000ML (excluding forecast); 380,000ML (including forecast). • Estimated peak flow at Lowood excluding Wivenhoe releases is: 470 m^3/s (excluding forecast); 670 m^3/s (including forecast). • Estimated peak flow at Moggill excluding Wivenhoe releases is: 570 m^3/s (excluding forecast); 970 m^3/s (including forecast).	**Strategy W1B and Strategy S2 (Lake Level greater than 67.50, maximum release 110 m^3/s)** • Peak inflows into the Brisbane River from Lockyer are estimated to be in the order of 500 m^3/s, but these flows may not be sufficient to inundate Burtons Bridge. • Lake level not expected to reach 67.75 (Strategy W1C) for at least 6 hours. Lake level may not exceed 68.5. • Endeavour to maintain Burtons Bridge trafficable by limiting combined flows from Wivenhoe Dam and Lockyer Creek to a maximum of 430 m^3/s. • Water held in Wivenhoe in an attempt to maintain Burtons Bridge trafficable in accordance with Strategy W1B. • In accordance with Strategy S2, the crest gates at Somerset Dam were raised to enable uncontrolled discharge and the low level regulators and sluices at Somerset Dam were kept closed.

JANUARY 2011 FLOOD EVENT - PERIOD 3 OF 20				
DATE/TIME	**BACKGROUND**	**DAM CONDITIONS**	**RAINFALL AND MODEL RESULTS**	**STRATEGY**
	Strategy W1C and Strategy S2			**Strategy W1C (Lake Level greater than 68.00, maximum release 1900 m^3/s)**
Commenced Friday 07 Jan 2011 09:00 Completed Friday 07 Jan 2011 15:00	• At around 9:00 it becomes apparent that flows from Lockyer Creek into the Brisbane River combined with local Brisbane River inflows downstream of Wivenhoe will be sufficient to inundate all bridges downstream of the dam with the exception of the Mt Crosby Weir Bridge and Fernvale Bridge. • All impacted Councils are notified of situation and that releases are to be commenced from Wivenhoe Dam. Release commencement was delayed until 15:00 to allow bridges to be closed and arrangements to be made to cater for rural community isolation. The impacted rural communities had been isolated over the Christmas period and time was needed for suitable arrangements to be made to allow these communities to be prepared for another potentially extended period of isolation. The delay in releases was also in accordance with the Manual requirements of maintaining Burtons Bridge and Kholo Bridge trafficable when operating under Strategy W1C. • Transition from Strategy W1C to Strategy W1D once the Wivenhoe Dam lake level exceeds 68.0	Total rainfall since commencement: Wivenhoe 89mm; Somerset 90mm; Lockyer 71mm; Bremer 71mm. Wivenhoe Dam level rises from 67.75 to 68.03 over the 6 hour period. Somerset Dam level rises from 99.65 to 99.94 over the 6 hour period.	• Catchment average rainfalls over this period were: o Wivenhoe 24mm; o Somerset 30mm; o Lockyer 14mm; o Bremer 12mm. • Forecast rainfall in the next 24 hours is 25mm. • Estimated peak Wivenhoe level is: 68.4 (excluding forecast); 68.9 (including forecast). • Estimated peak Somerset level is: 100.3 (excluding forecast); 100.6 (including forecast). • Estimated total dam inflow is: 346,000ML (excluding forecast); 483,000ML (including forecast). • Estimated peak flow at Lowood excluding Wivenhoe releases is: 530 m^3/s (excluding forecast); 710 m^3/s (including forecast). • Estimated peak flow at Moggill excluding Wivenhoe releases is: 660 m^3/s (excluding forecast); 1040 m^3/s (including forecast).	• Due to the further rain and observed stream rises, it has become apparent that flows from Lockyer Creek into the Brisbane River combined with local Brisbane River inflows downstream of Wivenhoe will be sufficient to inundate all bridges downstream of the dam with the exception of the Mt Crosby Weir Bridge and Fernvale Bridge. • Releases from Wivenhoe Dam managed in an attempt to maintain Mt Crosby Weir Bridge and Fernvale Bridge trafficable in accordance with Strategies W1D and W1E. • In accordance with Strategy S2, the crest gates at Somerset Dam were raised to enable uncontrolled discharge and the low level regulators and sluices at Somerset Dam were kept closed.

JANUARY 2011 FLOOD EVENT - PERIOD 4 OF 20				
DATE/TIME	**BACKGROUND**	**DAM CONDITIONS**	**RAINFALL AND MODEL RESULTS**	**STRATEGY**
	Transition from Strategy W1D to W1E to W3; and Strategy S2 Wivenhoe Directives #1 to #4. Somerset Directives #1 to #3.			**Strategy W3 and Strategy S2 (Lake Level greater than 68.50, maximum release 4000 m^3/s)**
Commenced Friday 07 Jan 2011 15:00 Completed Saturday 08 Jan 2011 14:00	• Gates opened continuously at Wivenhoe Dam for 23 hours in accordance with the standard gate opening sequence at a rate or 0.5 metres of opening per hour. • Transition from Strategy W1D to W1E once the Wivenhoe Dam level exceeds 68.25 (22:00 on 7 Jan 2011). • Transition from Strategy W1E to W2 once it becomes apparent that the Wivenhoe Dam level will exceed 68.50 (08:00 on 8 Jan 2011). However it was not possible to meet the intent of Strategy W2 by limiting the flow in the Brisbane River to less than the naturally occurring peaks at Lowood and Moggill. This is because the calculated naturally occurring peaks at Lowood and Moggill were 530 m^3/s and 800 m^3/s respectively, whereas the release rate from the dam was already 940 m^3/s. Accordingly Strategy W2 was bypassed and Strategy W3 was adopted for use at 08:00 on Saturday 8 January 2011. • At 14:00 on 08 January 2011, Wivenhoe discharge is 1239 m^3/s. All rural bridges below the dam with the exception of the Mt Crosby Weir Bridge and Fernvale Bridge are flooded.	Total rainfall since commencement: Wivenhoe 92mm; Somerset 95mm; Lockyer 72mm; Bremer 72mm. Wivenhoe Dam level rises from 68.03 to 68.61 over the 23 hour period. Somerset Dam level rises from 99.94 to 100.44 over the 23 hour period.	• Catchment average rainfalls over this period were: o Wivenhoe 3mm; o Somerset 5mm; o Lockyer 1mm; o Bremer 1mm. • Forecast rainfall in the next 24 hours is 40mm. • Estimated peak Wivenhoe level is: 68.7 (excluding forecast); 69.1 (including forecast). • Estimated peak Somerset level is: 100.5 (excluding forecast); 100.6 (including forecast). • Estimated total dam inflow is: 420,000ML (excluding forecast); 662,000ML (including forecast). • Estimated peak flow at Lowood excluding Wivenhoe releases is: 530 m^3/s (excluding forecast); 530 m^3/s (including forecast). • Estimated peak flow at Moggill excluding Wivenhoe releases is: 550 m^3/s (excluding forecast); 960 m^3/s (including forecast). This peak was estimated to have occurred at 05:00 on 8 January 2011. • Estimated peak Wivenhoe outflow is: 1480 m^3/s (excluding forecast); 1540 m^3/s (including forecast). This flow is significantly greater than the calculated natural peak that excluded Wivenhoe releases.	• Inflows from Lockyer Creek into the Brisbane River have inundated all bridges downstream of the dam with the exception of the Mt Crosby Weir Bridge and Fernvale Bridge. • The Strategy transitions from W1 to W3 once it becomes apparent that the Wivenhoe Dam level is likely to exceed 68.5 and Strategy W2 cannot be applied. • Strategy W3 requires the flow at Moggill to be lowered to 4000 m^3/s as soon as possible after the naturally occurring peak at Moggill (excluding Wivenhoe releases). This was already achieved. • Strategy W3 also requires consideration of lower level Manual objectives. Therefore consideration during this period was given to minimizing disruption to downstream rural life and endeavoring to maintain Mt Crosby Weir Bridge and Fernvale Bridge trafficable. • Due to rainfall on the ground, it was apparent that the Somerset Dam level would exceed 100.45. Accordingly two sluice gates were opened during this period to allow dam levels to move towards the Wivenhoe/Somerset Operating Target Line in accordance with Strategy S2.

JANUARY 2011 FLOOD EVENT - PERIOD 5 OF 20				
DATE/TIME	**BACKGROUND**	**DAM CONDITIONS**	**RAINFALL AND MODEL RESULTS**	**STRATEGY**
	Strategy W3 and Strategy S2			**Strategy W3 and Strategy S2 (Lake Level greater than 68.50, maximum release 4000 m^3/s)**
Commenced Saturday 08 Jan 2011 14:00 Completed Sunday 09 Jan 2011 01:00	• Releases maintained from both dams to ensure Mt Crosby Weir Bridge and Fernvale Bridge remain trafficable. • No change to gate settings over this period. Wivenhoe discharge is 1240 m^3/s. All rural bridges below the dam with the exception of the Mt Crosby Weir Bridge and Fernvale Bridge are flooded.	Total rainfall since commencement: Wivenhoe 100mm; Somerset 111mm; Lockyer 75mm; Bremer 75mm. Wivenhoe Dam level rises very slightly from 68.61 to 68.63 over the 13 hour period. Somerset Dam level falls from 100.44 to 100.32 over the 13 hour period.	• Catchment average rainfalls over this period were: o Wivenhoe 8mm; o Somerset 16mm; o Lockyer 3mm; o Bremer 2mm. • Forecast rainfall in the next 24 hours is 40mm. • Estimated peak Wivenhoe level is: 68.7 (excluding forecast); 69.9 (including forecast). • Estimated peak Somerset level is: 100.5 (excluding forecast); 100.6 (including forecast). • Estimated total dam inflow is: 457,000ML (excluding forecast); 697,000ML (including forecast). • Estimated peak flow at Lowood excluding Wivenhoe releases is: 530 m^3/s (excluding forecast); 530 m^3/s (including forecast). • Estimated peak flow at Moggill excluding Wivenhoe releases is: 770 m^3/s (excluding forecast); 840 m^3/s (including forecast). This peak was estimated to have occurred at 05:00 on 8 January 2011. • Estimated peak Wivenhoe outflow is: 1480 m^3/s (excluding forecast); 1520 m^3/s (including forecast). This flow is significantly greater than the calculated natural peak that excluded Wivenhoe releases.	• Strategy W3 requires the flow at Moggill to be lowered to 4000 m^3/s as soon as possible after the naturally occurring peak at Moggill (excluding Wivenhoe releases). This was already achieved. • Strategy W3 also requires consideration of lower level Manual objectives. Therefore with lake levels rising slightly (Wivenhoe) and falling (Somerset) consideration during this period remained on minimizing disruption to downstream rural life and endeavoring to maintain Mt Crosby Weir Bridge and Fernvale Bridge trafficable. • With the Somerset Lake Dam Level still expected to exceed 100.45 and the level in Wivenhoe remaining relatively static, releases from Somerset Dam continued. In any event, closing of the sluices would have resulted in dam levels quickly moving under the Wivenhoe/Somerset Operating Target Line requiring sluice re-opening within a short period.

JANUARY 2011 FLOOD EVENT - PERIOD 6 OF 20				
DATE/TIME	**BACKGROUND**	**DAM CONDITIONS**	**RAINFALL AND MODEL RESULTS**	**STRATEGY**
	Strategy W3 and Strategy S2 Wivenhoe Directives #5 to #7.			**Strategy W3 and Strategy S2 (Lake Level greater than 68.50, maximum release 4000 m^3/s)**
Commenced Sunday 09 Jan 2011 01:00 Completed Sunday 09 Jan 2011 08:00	• Releases increased marginally from Wivenhoe Dam to account for the passing of the Lockyer peak while maintaining Mt Crosby Weir Bridge and Fernvale Bridge trafficable. • Wivenhoe discharge increased from 1240 m^3/s to 1334 m^3/s. • No change to Somerset Dam gate settings over this period. • All rural bridges below the dam with the exception of the Mt Crosby Weir Bridge and Fernvale Bridge are flooded.	Total rainfall since commencement: Wivenhoe 112mm; Somerset 146mm; Lockyer 76mm; Bremer 75mm. Wivenhoe Dam level falls from 68.63 to 68.56 over the 7 hour period. Somerset Dam level falls from 100.32 to 100.28 over the 7 hour period.	• Catchment average rainfalls over this period were: o Wivenhoe 12mm; o Somerset 36mm; o Lockyer 1mm; o Bremer 0mm. • Forecast rainfall in the next 24 hours is 40mm. • Estimated peak Wivenhoe level is: 68.7 (excluding forecast); 69.3 (including forecast). • Estimated peak Somerset level is: 100.5 (excluding forecast); 101.0 (including forecast). • Estimated total dam inflow is: 569,000ML (excluding forecast); 814,000ML (including forecast). • Estimated peak flow at Lowood excluding Wivenhoe releases is: 530 m^3/s (excluding forecast); 530 m^3/s (including forecast). • Estimated peak flow at Moggill excluding Wivenhoe releases is: 770 m^3/s (excluding forecast); 780 m^3/s (including forecast). This peak was estimated to have occurred at 05:00 on 8 January 2011. • Estimated peak Wivenhoe outflow is: 1500 m^3/s (excluding forecast); 1550 m^3/s (including forecast). This flow is significantly greater than the calculated natural peak that excluded Wivenhoe releases.	• Strategy W3 requires the flow at Moggill to be lowered to 4000 m^3/s as soon as possible after the naturally occurring peak at Moggill (excluding Wivenhoe releases). This was already achieved. • Strategy W3 also requires consideration of lower level Manual objectives. Therefore with lake levels falling at both dams, consideration during this period remained on minimizing disruption to downstream rural life and endeavoring to maintain Mt Crosby Weir Bridge and Fernvale Bridge trafficable. • With the Somerset Lake Dam Level still expected to exceed 100.45 and the level in Wivenhoe Dam falling, releases from Somerset Dam continued. In any event, closing of the sluices would have resulted in dam levels quickly moving under the Wivenhoe/Somerset Operating Target Line requiring sluice re-opening within a short period, particularly given the rainfall that occurred in the Somerset Dam catchment during this period.

JANUARY 2011 FLOOD EVENT - PERIOD 7 OF 20				
DATE/TIME	**BACKGROUND**	**DAM CONDITIONS**	**RAINFALL AND MODEL RESULTS**	**STRATEGY**
Commenced Sunday 09 Jan 2011 08:00 Completed Sunday 09 Jan 2011 14:00	**Strategy W3 and Strategy S2 Wivenhoe Directives #7. Somerset Directives #4 to #5.** • Releases increased marginally from Wivenhoe Dam to account for the passing of the Lockyer peak while maintaining Mt Crosby Weir Bridge and Fernvale Bridge trafficable. • Wivenhoe discharge increased from 1334 m^3/s to 1386 m^3/s. • Somerset Dam sluice gates opened progressively over this period to allow dam levels to move towards the Wivenhoe/Somerset Operating Target Line in accordance with Strategy S2. • All rural bridges below the dam with the exception of the Mt Crosby Weir Bridge and Fernvale Bridge are flooded.	Total rainfall since commencement: Wivenhoe 146mm; Somerset 199mm; Lockyer 94mm; Bremer 90mm. Wivenhoe Dam level rises very slightly from 68.56 to 68.58 over the 6 hour period. Somerset Dam level rises from 100.28 to 100.47 over the 6 hour period.	• Catchment average rainfalls over this period were: o Wivenhoe 34mm; o Somerset 53mm; o Lockyer 18mm; o Bremer 15mm. • Forecast rainfall in the next 24 hours is 50mm. • Estimated peak Wivenhoe level is: 70.0 (excluding forecast); 71.3 (including forecast). • Estimated peak Somerset level is: 100.7 (excluding forecast); 101.1 (including forecast). • Estimated total dam inflow is: 804,000ML (excluding forecast); 1,108,000ML (including forecast). • Estimated peak flow at Lowood excluding Wivenhoe releases is: 530 m^3/s (excluding forecast); 690 m^3/s (including forecast). • Estimated peak flow at Moggill excluding Wivenhoe releases is: 770 m^3/s (excluding forecast); 1210 m^3/s (including forecast). This peak was estimated to have occurred at 05:00 on 8 January 2011. • Estimated peak Wivenhoe outflow is: 1490 m^3/s (excluding forecast); 1560 m^3/s (including forecast). This flow is significantly greater than the calculated natural peak that excluded Wivenhoe releases.	**Strategy W3 and Strategy S2 (Lake Level greater than 68.50, maximum release 4000 m^3/s)** • With lake levels rising at both dams and heavy rain being experienced in the dam catchments, consideration is given to transitioning the consideration from minimizing disruption to downstream rural life to protecting urban areas from inundation. • Model results also showing likely rises in water levels in the dams provides further justification to consider transitioning to Strategy W3 within the next 6 hours. • Using the BOM rainfall forecasts, a three day assessment showed the lower limit of three day forecast inflow to be similar to the October 2010 event, with the upper limit similar to the February 1999 event. Therefore, during this period consideration remained on minimizing disruption to downstream rural life and endeavoring to maintain Mt Crosby Weir Bridge and Fernvale Bridge trafficable. • With dam levels under the Wivenhoe/Somerset Operating Target Line at the end of this period, releases continued from Somerset Dam.

JANUARY 2011 FLOOD EVENT - PERIOD 8 OF 20				
DATE/TIME	**BACKGROUND**	**DAM CONDITIONS**	**RAINFALL AND MODEL RESULTS**	**STRATEGY**
	Strategy W3 and Strategy S2			**Strategy W3 and Strategy S2 (Lake Level greater than 68.50, maximum release 4000 m^3/s)**
Commenced Sunday 09 Jan 2011 14:00 Completed Sunday 09 Jan 2011 19:00	• During this period releases continued from both dams at a level that maintained Mt Crosby Weir Bridge and Fernvale Bridge trafficable. Gate settings were unchanged and the Wivenhoe discharge was 1411 m^3/s. • Due to rainfall on the ground and the modeled rapid lake level rises, a decision is made to transition to focus on protecting urban areas from inundation at 19:00. • Councils and the Seqwater CEO were notified of the decision soon after 19:00. The ramifications of the decision were that the new estimated peak flow at Moggill of 3300 m^3/s would impact properties and commence to cause damage to urban areas below Moggill. Damage tables supplied by the Brisbane City Council indicated that at flows of 3000 m^3/s, damage costs would exceed $5M and 2600 properties would be impacted in some way. These impacts rise steeply as flows increase, so the focus was on minimizing the flow at Moggill. • A decision is also made at 19:00, that because of the serious nature of the event, the Flood Operations Centre will be staffed with at least two Duty Engineers at all times until at least the peak of the event has occurred.	Total rainfall since commencement: Wivenhoe 208mm; Somerset 305mm; Lockyer 116mm; Bremer 96mm. Wivenhoe Dam level rises from 68.58 to 68.97 over the 5 hour period. Somerset Dam level rises from 100.47 to 101.43 over the 5 hour period.	• Catchment average rainfalls over this period were: o Wivenhoe 62mm; o Somerset 106mm; o Lockyer 22mm; o Bremer 6mm. • Forecast rainfall in the next 24 hours is 65mm. • Estimated peak Wivenhoe level is: 72.1 (excluding forecast); 73.9 (including forecast). • Estimated peak Somerset level is: 102.3 (excluding forecast); 103.0 (including forecast). • Estimated total dam inflow is: 1,272,000ML (excluding forecast); 1,712,000ML (including forecast). • Estimated peak flow at Moggill excluding Wivenhoe releases is: 770 m^3/s (excluding forecast); 1940 m^3/s (including forecast). This peak was estimated to have occurred at 05:00 on 8 January 2011. • Estimated peak flow at Moggill including Wivenhoe releases is: 3300 m^3/s (excluding forecast); 4400 m^3/s (including forecast).	• With lake levels continuing to rise at both dams combined with heavy rain in the dam catchments during this period, the decision was made at the end of this period no longer consider minimizing disruption to downstream rural life and to focus on protecting urban areas from inundation. • Towards the end of this period, it was becoming apparent that Moggill was likely to experience a second naturally occurring peak on 10 January 2011 or later and that the Manual required the flow at Moggill to be minimized prior to this peak occurring. This requirement was competing with the need to protect urban areas by not allowing the Wivenhoe Dam level to reach a level that invoked Strategy W4. After considering these issues it was decided that the best course of action would be to increase releases as quickly as possible to the limit of non-damaging flows at Moggill. However before this could occur, Councils needed to be advised, bridges needed to be closed and actions needed to be taken to prepare for rural communities for isolation and urban areas below Moggill for river flows approaching 3500 m^3/s. • With dam levels under the Wivenhoe/Somerset Operating Target Line during this period, releases continued from Somerset Dam.

JANUARY 2011 FLOOD EVENT - PERIOD 9 OF 20				
DATE/TIME	**BACKGROUND**	**DAM CONDITIONS**	**RAINFALL AND MODEL RESULTS**	**STRATEGY**
	Strategy W3 and Strategy S2			**Strategy W3 and Strategy S2 (Lake Level greater than 68.50, maximum release 4000 m^3/s)**
Commenced Sunday 09 Jan 2011 19:00 Completed Monday 10 Jan 2011 01:00	• Council and Agency notifications commenced at 7:00pm. The likely peak flow at Moggill of over 3000 m^3/s was communicated to the Brisbane City Council and the Seqwater CEO. • Damage tables supplied by the Brisbane City Council indicated that at flows of 3000 m^3/s, damage costs would exceed $5M and 2600 properties would be impacted in some way. These impacts rise steeply as flows increase, so the focus was on minimizing the flow at Moggill. • Fernvale Bridge closed by police at around 01:00 on 10 January 2011 and once this was confirmed a directive was issued to increases releases from Wivenhoe Dam. • No change to gate settings over this period due to the potential danger to the public associated with inundating Fernvale Bridge from Wivenhoe Dam outflows prior to the bridge being closed to traffic. Councils also required time to prepare for the isolation of rural communities, the onset of urban damage below Moggill and to undertake any necessary evacuations. Wivenhoe discharge is 1473 m^3/s. All rural bridges below the dam with the exception of the Mt Crosby Weir Bridge and Fernvale Bridge are flooded.	Total rainfall since commencement: Wivenhoe 232mm; Somerset 343mm; Lockyer 131mm; Bremer 102mm. Wivenhoe Dam level rises from 68.97 to 69.97 over the 6 hour period. Somerset Dam level rises from 101.43 to 102.54 over the 6 hour period.	• Catchment average rainfalls over this period were: o Wivenhoe 24mm; o Somerset 38mm; o Lockyer 14mm; o Bremer 6mm. • Forecast rainfall in the next 24 hours is 65mm. • Estimated peak Wivenhoe level is: 72.9 (excluding forecast); 74.7 (including forecast). • Estimated peak Somerset level is: 102.9 (excluding forecast); 103.4 (including forecast). • Estimated total dam inflow is: 1,468,000ML (excluding forecast); 1,922,000ML (including forecast). • Estimated peak flow at Moggill excluding Wivenhoe releases is: 820 m^3/s (excluding forecast); 2000 m^3/s (including forecast). This peak was estimated to occur at 16:00 on 10 January 2011. • Estimated peak flow at Moggill including Wivenhoe releases is: 3240 m^3/s (excluding forecast); 4480 m^3/s (including forecast).	• Consideration was on protecting urban areas from inundation. However before releases are increased to and above the limit of non-damaging floods at Moggill, Councils and other impacted agencies are notified so that appropriate actions can be taken including any necessary evacuations and the closure of both the Mt Crosby Weir Bridge and Fernvale Bridge. • The Manual requires the flow at Moggill to be minimized prior to its naturally occurring peak and this requirement was balanced against the need to protect urban areas by releasing water from the dams in an attempt to keep the Wivenhoe Dam lake level below a level that will invoke Strategy W4. However the onset of increased releases did roughly coincide with the calculated naturally occurring peak at Moggill (based on a 16 hour travel time between the dam and Moggill). • With dam levels under the Wivenhoe/Somerset Operating Target Line during this period, releases continued from Somerset Dam. • Although there is a full awareness of the rainfall forecasts and associated potential flood impacts, the strategy is not to release flows that will cause high level urban inundation until it is certain that this cannot be avoided. Model results continue to indicate that this may be possible.

JANUARY 2011 FLOOD EVENT - PERIOD 10 OF 20				
DATE/TIME	**BACKGROUND**	**DAM CONDITIONS**	**RAINFALL AND MODEL RESULTS**	**STRATEGY**
	Strategy W3 and Strategy S2 Wivenhoe Directives #8 to #10.			**Strategy W3 and Strategy S2 (Lake Level greater than 68.50, maximum release 4000 m^3/s)**
Commenced Monday 10 Jan 2011 01:00 Completed Monday 10 Jan 2011 09:00	• Gates opened continuously at Wivenhoe Dam for 8 hours in accordance with the standard gate opening sequence at a rate of 0.5 metres of opening per hour. • Wivenhoe discharge is increased from 1473 m^3/s to 2015 m^3/s. All rural bridges below the dam are flooded. • Further gate openings at Wivenhoe Dam were paused at 09:00 in an attempt to allow the Lockyer and Bremer peaks to pass Moggill and to restrict Brisbane River flows at Moggill to 3500 m^3/s. This was done following discussions with the Brisbane City Council that advised a flow of 3500 m^3/s at Moggill will fully submerge 322 properties and impact on 7000 properties. • No gate movements occurred at Somerset Dam during this period, with dam levels plotting under the Wivenhoe/Somerset Operating Target Line. This meant that the only gate movements allowable at Somerset under Strategy S2 would be openings and this was not done to limit further rises in Wivenhoe.	Total rainfall since commencement: Wivenhoe 244mm; Somerset 373mm; Lockyer 143mm; Bremer 120mm. Wivenhoe Dam level rises from 69.97 to 71.56 over the 8 hour period. Somerset Dam level rises from 102.54 to 103.08 over the 8 hour period.	• Catchment average rainfalls over this period were: o Wivenhoe 12mm; o Somerset 30mm; o Lockyer 12mm; o Bremer 18mm. • Forecast rainfall in the next 24 hours is 65mm. • Estimated peak Wivenhoe level is: 72.9 (excluding forecast); 74.5 (including forecast). • Estimated peak Somerset level is: 103.1 (excluding forecast); 103.5 (including forecast). • Estimated total dam inflow is: 1,531,000ML (excluding forecast); 1,985,000ML (including forecast). • Estimated peak flow at Moggill excluding Wivenhoe releases is: 1090 m^3/s (excluding forecast); 2090 m^3/s (including forecast). This peak was estimated to occur at 16:00 on 10 January 2011. • Estimated peak flow at Moggill including Wivenhoe releases is: 3420 m^3/s (excluding forecast); 4680 m^3/s (including forecast).	• Consideration was on protecting urban areas from inundation and minimizing urban damage. • Due to advice received from the Brisbane City Council that a flow of 3500 m^3/s at Moggill will fully submerge 322 properties and impact on 7000 properties, an attempt was made to remain below this flow • The Manual states that the intent of Strategy W3 is to limit the flow in the Brisbane River at Moggill to less than 4000 m^3/s and this approach was adopted. Advice received during the event from the Brisbane City Council that the upper limit of non-damaging floods was below the 4000 m^3/s stated in the manual was noted and taken into account in the decision making processes. • With dam levels under the Wivenhoe/Somerset Operating Target Line during this period, releases continued from Somerset Dam. • Although there is a full awareness of the rainfall forecasts and associated potential flood impacts, the strategy is not to release flows that will cause high level urban inundation until it is certain that this cannot be avoided. Model results continue to indicate that this may be possible.

JANUARY 2011 FLOOD EVENT - PERIOD 11 OF 20				
DATE/TIME	**BACKGROUND**	**DAM CONDITIONS**	**RAINFALL AND MODEL RESULTS**	**STRATEGY**
	Strategy W3 and Strategy S2			**Strategy W3 and Strategy S2 (Lake Level greater than 68.50, maximum release 4000 m^3/s)**
Commenced Monday 10 Jan 2011 09:00 Completed Monday 10 Jan 2011 15:00	• No change to gate settings occurred at Wivenhoe Dam over this period. Wivenhoe discharge is 2087 m^3/s. All rural bridges below the dam are flooded. • At 15:00 the attempt to restrict Brisbane River flows at Moggill to 3500 m^3/s was abandoned due to the rainfall being experienced in the dam catchments. A new target of 4000 m^3/s was set in accordance with the Manual, on the basis that the intent of Strategy W3 is to limit the flow in the Brisbane River at Moggill to less than 4000 m^3/s and minimize urban damage. • No gate movements occurred at Somerset Dam during this period, with dam levels plotting under the Wivenhoe/Somerset Operating Target Line. This meant that the only gate movements allowable at Somerset under Strategy S2 would be openings and this was not done to limit further rises in Wivenhoe.	Total rainfall since commencement: Wivenhoe 274mm; Somerset 407mm; Lockyer 169mm; Bremer 149mm. Wivenhoe Dam level rises from 71.56 to 72.54 over the 6 hour period. Somerset Dam level rises from 103.08 to 103.43 over the 6 hour period.	• Catchment average rainfalls over this period were: o Wivenhoe 34mm; o Somerset 31mm; o Lockyer 27mm; o Bremer 30mm. • Forecast rainfall in the next 24 hours is 75mm. • Estimated peak Wivenhoe level is: 73.6 (excluding forecast); 75.2 (including forecast). • Estimated peak Somerset level is: 103.4 (excluding forecast); 103.7 (including forecast). • Estimated total dam inflow is: 1,708,000ML (excluding forecast); 2,162,000ML (including forecast). • Estimated peak flow at Moggill excluding Wivenhoe releases is: 1500 m^3/s (excluding forecast); 2570 m^3/s (including forecast). This peak was estimated to occur at 20:00 on 10 January 2011. • Estimated peak flow at Moggill including Wivenhoe releases is: 3910 m^3/s (excluding forecast); 5180 m^3/s (including forecast).	• Consideration was on protecting urban areas from inundation and minimizing urban damage. • A decision was made at 15:00 to attempt to remain below a target flow of around 4000 m^3/s at Moggill. • The Manual states that the intent of Strategy W3 is to limit the flow in the Brisbane River at Moggill to less than 4000 m^3/s and this approach continued to be followed. • With dam levels under the Wivenhoe/Somerset Operating Target Line during this period, releases continued from Somerset Dam. • Although there is a full awareness of the rainfall forecasts and associated potential flood impacts, the strategy is not to release flows that will cause high level urban inundation until it is certain that this cannot be avoided. Model results continue to indicate that this may be possible.

JANUARY 2011 FLOOD EVENT - PERIOD 12 OF 20				
DATE/TIME	**BACKGROUND**	**DAM CONDITIONS**	**RAINFALL AND MODEL RESULTS**	**STRATEGY**
	Strategy W3 and Strategy S2 Wivenhoe Directive #11.			**Strategy W3 and Strategy S2 (Lake Level greater than 68.50, maximum release 4000 m^3/s)**
Commenced Monday 10 Jan 2011 15:00 Completed Monday 10 Jan 2011 20:00	• Gates opened continuously at Wivenhoe Dam for 5 hours in accordance with the standard gate opening sequence at a rate or 1.0 metres of opening per hour. • A target of 4000 m^3/s at Moggill was set in accordance with the Manual, on the basis that the intent of Strategy W3 is to limit the flow in the Brisbane River at Moggill to less than 4000 m^3/s and minimize urban damage. • Wivenhoe discharge is increased from 2087 m^3/s to 2695 m^3/s. • Further gate openings at Wivenhoe Dam were paused at 20:00 in an attempt to allow the Lockyer and Bremer peaks to pass Moggill and to restrict Brisbane River flows at Moggill to 4000 m^3/s. • No gate movements occurred at Somerset Dam during this period, with dam levels plotting under the Wivenhoe/Somerset Operating Target Line. This meant that the only gate movements allowable at Somerset under Strategy S2 would be openings and this was not done to limit further rises in Wivenhoe.	Total rainfall since commencement: Wivenhoe 279mm; Somerset 415mm; Lockyer 174mm; Bremer 153mm. Wivenhoe Dam level rises from 72.53 to 73.06 over the 5 hour period. Somerset Dam level rises from 103.43 to 103.45 over the 5 hour period.	• Catchment average rainfalls over this period were: o Wivenhoe 4mm; o Somerset 8mm; o Lockyer 5mm; o Bremer 3mm. • Forecast rainfall in the next 24 hours is 38mm, with isolated falls to 100mm. • Estimated peak Wivenhoe level is: 73.6 (excluding forecast); 74.3 (including forecast). • Estimated peak Somerset level is: 103.5 (excluding forecast); 103.5 (including forecast). • Estimated total dam inflow is: 1,731,000ML (excluding forecast); 1,982,000ML (including forecast). • Estimated peak flow at Moggill excluding Wivenhoe releases is: 1500 m^3/s (excluding forecast); 1840 m^3/s (including forecast). This peak was estimated to occur at 20:00 on 10 January 2011. • Estimated peak flow at Moggill including Wivenhoe releases is: 3980 m^3/s (excluding forecast); 4470 m^3/s (including forecast).	• Consideration was on protecting urban areas from inundation and minimizing urban damage. • The target maximum flow at Moggill was now 4000 m^3/s. The Manual states that the intent of Strategy W3 is to limit the flow in the Brisbane River at Moggill to less than 4000 m^3/s and this approach continued to be followed. • With dam levels under the Wivenhoe/Somerset Operating Target Line during this period, releases continued from Somerset Dam. • The reduced rainfall forecast provides justification to retain the target of 4000 m^3/s at Moggill, with the Wivenhoe peak of 74.3 (including forecast) indicating that it may be possible to keep urban damage within tolerable limits. A discussion is held with the Dam Safety Regulator requesting permission to exceed a level of 74.0 in Wivenhoe for a short period (maximum 12 hours) without invoking Strategy W4 if the safety of the dam can be guaranteed and urban damage reduced. The Regulator agreed with this approach. • The strategy continues to be not to release flows that will cause high level urban inundation until it is certain that this cannot be avoided. Model results continue to indicate that this may be possible.

JANUARY 2011 FLOOD EVENT - PERIOD 13 OF 20				
DATE/TIME	**BACKGROUND**	**DAM CONDITIONS**	**RAINFALL AND MODEL RESULTS**	**STRATEGY**
	Strategy W3 and Strategy S2			**Strategy W3 and Strategy S2 (Lake Level greater than 68.50, maximum release 4000 m^3/s)**
Commenced Monday 10 Jan 2011 20:00 Completed Tuesday 11 Jan 2011 04:00	• Gate openings at Wivenhoe Dam were paused at 20:00 in an attempt to restrict flows at Moggill to close to 4000 m^3/s. No change to gate settings occurred at Wivenhoe Dam over this period. Wivenhoe discharge is 2726 m^3/s. • A target flow of 4000 m^3/s is set at Moggill in accordance with the Manual (the intent of Strategy W3 is to limit the flow in the Brisbane River at Moggill to less than 4000 m^3/s). However BCC damage tables indicate this would still impact 5325 properties and cause damage in excess of $47M. • Initial advice on a significant flash flood originating in Lockyer headwaters received at 17:32, with details received at 20:00. Considerations were undertaken during this period to develop strategies to manage these potential flows, but because any strategy would involve significantly reducing outflows from Wivenhoe, the strategies were not adopted. • During this period the plotted dam levels drifted just above the Wivenhoe/Somerset Operating Target Line. This lead to a decision at 04:00 to commence closing down releases from Somerset Dam to limit further rises in Wivenhoe.	Total rainfall since commencement: Wivenhoe 323mm; Somerset 437mm; Lockyer 186mm; Bremer 167mm. Wivenhoe Dam level rises from 73.06 to 73.40 over the 8 hour period. Somerset Dam level fell from 103.45 to 103.23 over the 8 hour period.	• Catchment average rainfalls over this period were: o Wivenhoe 44mm; o Somerset 22mm; o Lockyer 12mm; o Bremer 14mm. • Forecast rainfall in the next 24 hours is 38mm, with isolated falls to 100mm. • Estimated peak Wivenhoe level is: 74.1 (excluding forecast); 74.9 (including forecast). • Estimated peak Somerset level is: 103.5 (excluding forecast); 103.7 (including forecast). • Estimated total dam inflow is: 2,016,000ML (excluding forecast); 2,267,000ML (including forecast). • Estimated peak flow at Moggill excluding Wivenhoe releases is: 1500 m^3/s (excluding forecast); 1810 m^3/s (including forecast). This peak was estimated to have occurred at 20:00 on 10 January 2011. • Estimated peak flow at Moggill including Wivenhoe releases is: 4040 m^3/s (excluding forecast); 4540 m^3/s (including forecast).	• Consideration on protecting urban areas from inundation and minimizing urban damage. The target maximum flow at Moggill remains at 4000 m^3/s. The Manual states that the intent of Strategy W3 is to limit the flow in the Brisbane River at Moggill to less than 4000 m^3/s and this approach continues to be followed. • Model results show that a peak level in the dam close to 74.0 remains possible, but is appearing increasing unlikely. • With dam levels moving above the Wivenhoe/Somerset Operating Target Line during this period, a decision is made commence closing down releases from Somerset Dam to limit further rises in Wivenhoe. • Although there is a full awareness of the rainfall forecasts and associated potential flood impacts, the strategy is not to release flows that will cause high level urban inundation until it is certain that this cannot be avoided. Model results continue to indicate that this may be possible, although with continued rainfall, the strategy is now being reviewed on an hour by hour basis. The discussion at 21:00 with the Dam Safety Regulator requesting permission to exceed a level of 74.0 in Wivenhoe for a short period without invoking Strategy W4 (provided the safety of the dam can be guaranteed) is also being considered carefully in view of the continued rainfall.

JANUARY 2011 FLOOD EVENT - PERIOD 14 OF 20				
DATE/TIME	**BACKGROUND**	**DAM CONDITIONS**	**RAINFALL AND MODEL RESULTS**	**STRATEGY**
	Transition from Strategy W3 to Strategy W4; and Strategy S2 Wivenhoe Directive #12. Somerset Directive #6.			**Strategy W4 and Strategy S2 (Lake Level predicted to exceed 74.00, no maximum release rate)**
Commenced Tuesday 11 Jan 2011 04:00 Completed Tuesday 11 Jan 2011 08:00	• Extreme intense rainfall (estimated to exceed **1 in 500 year intensities**) commenced on and close to the Wivenhoe Dam lake area during this period. If the centroid of this rainfall was located east or south, it may have been possible to avoid transition to Strategy W4. • Because the extreme intense rainfall was occurring on and close to the dam rather than in the northern areas of the dam catchment, response time is minimized and actions must be taken quickly to prevent a situation arising during which the safety of the dam is put at risk. Accordingly at 08:00 a decision is made to transition to Strategy W4. Significant urban damage can now not be avoided. The Dam Safety Regulator, Seqwater CEO and the Councils are advised of this development. • No change to gate settings occurred at Wivenhoe Dam over this period. Wivenhoe discharge is 2832 m^3/s. • During this period sluice gate openings at Somerset Dam are reduced from 5 to 2 as the plotted dam levels had drifted just above the Wivenhoe/Somerset Operating Target Line. This decision is consistent with Strategy S2.	Total rainfall since commencement: Wivenhoe 356mm; Somerset 483mm; Lockyer 240mm; Bremer 183mm. Wivenhoe Dam level rises from 73.40 to 73.70 over the 4 hour period. Somerset Dam level rises from 103.23 to 103.46 over the 4 hour period.	• Catchment average rainfalls over this period were: o Wivenhoe 33mm; o Wivenhoe Local 78mm; o Somerset 46mm; o Lockyer 54mm; o Bremer 16mm. • Forecast rainfall in the next 24 hours is 38mm, with isolated falls to 100mm. • Estimated peak Wivenhoe level is: 74.5 (excluding forecast); 75.1 (including forecast). • Estimated peak Somerset level is: 103.9 (excluding forecast); 104.2 (including forecast). • Estimated total dam inflow is: 2,210,000ML (excluding forecast); 2,460,000ML (including forecast). • Estimated peak flow at Moggill including Wivenhoe releases is: 5870 m^3/s (excluding forecast).	• At 08:00, model results show that restricting the peak level in the dam close to 74.0 is no longer possible due to the high intensity rainfall experienced over this period. • At 08:00 a decision is made to transition to Strategy W4 and the Dam Safety Regulator, Seqwater CEO and the Councils are advised of this decision. It was now apparent that significant urban damage resulting from releases from Wivenhoe Dam could not be avoided due to the extreme intense rainfall (estimated to exceed **1 in 500 year intensities**) that commenced on and close to the Wivenhoe Dam lake area during this period • With dam levels moving above the Wivenhoe/Somerset Operating Target Line during this period releases from Somerset Dam were progressively closed down to limit further rises in Wivenhoe (sluices closed down at hourly intervals in accordance with the Manual).

JANUARY 2011 FLOOD EVENT - PERIOD 15 OF 20				
DATE/TIME	**BACKGROUND**	**DAM CONDITIONS**	**RAINFALL AND MODEL RESULTS**	**STRATEGY**
	Strategy W4 and Strategy S2 Wivenhoe Directive #12 to #14. Somerset Directive #7.			**Strategy W4 and Strategy S2 (Lake Level predicted to exceed 74.00, no maximum release rate)**
Commenced Tuesday 11 Jan 2011 08:00 Completed Tuesday 11 Jan 2011 13:00	• Extreme intense rainfall (estimated to exceed **1 in 500 year intensities**) continued on and close to the Wivenhoe Dam lake area during this period. If the centroid of this rainfall was located east or south, it may have been possible to avoid transition to Strategy W4. • Because the extreme rainfall is occurring on and close to the dam rather than in the northern areas of the dam catchment, response time is minimized and actions must be taken quickly to protect the safety of the dam. Once Strategy W4 is invoked, the Manual requires the opening of gates in accordance with standard sequences until the storage level of Wivenhoe Dam begins to fall. Accordingly gates are opened continuously at Wivenhoe Dam for 5 hours in accordance with the standard gate opening sequence at an average rate of 2.0 metres of opening per hour. This increases the dam discharge from 2753 m^3/s to 4250 m^3/s. The threshold limit for urban damage has been exceeded and the lake level continues to rise. • During this period sluice gate openings at Somerset Dam are closed off to limit rises in Wivenhoe in accordance with Strategy S2.	Total rainfall since commencement: Wivenhoe 382mm; Somerset 570mm; Lockyer 287mm; Bremer 237mm. Wivenhoe Dam level rises from 73.70 to 74.39 over the 5 hour period. Somerset Dam level rises from 103.46 to 103.83 over the 5 hour period.	• Catchment average rainfalls over this period were: o Wivenhoe 27mm; o Wivenhoe Local 85mm; o Somerset 86mm; o Lockyer 47mm; o Bremer 55mm. • Forecast rainfall in the next 24 hours is 100mm. • A portion of the extreme intense rainfall to the dam catchment was falling in an un-gauged area (e.g. on the dam lake area) and this resulted in difficulties in the model being able to accurately predict lake level rises. Accordingly, during this period dam operations at Wivenhoe commenced taking gauge board readings every 30 minutes during this period and relaying this information to the Flood Operations Centre by telephone. • Estimated peak Wivenhoe level is: 75.0 (excluding forecast); 76.2 (including forecast). • Estimated peak Somerset level is: 104.8 (excluding forecast); 105.7 (including forecast). • Estimated total dam inflow is: 2,506,000ML (excluding forecast); 3,123,000ML (including forecast). • Estimated peak flow at Moggill including Wivenhoe releases is: 9180 m^3/s (excluding forecast).	• The strategy was to protect the structural safety of the dam. • The Manual requires actions under Strategy 4 to be that Wivenhoe gate openings are to occur in accordance with standard sequences until the storage level of Wivenhoe Dam begins to fall. • The dam level continued to rise at 13:00. During this period, a Dam Operator was relaying Wivenhoe Dam gauge board readings to the Flood Operations Centre every 30 minutes. All four duty engineers were present in the Flood Operations Centre and flood operations decisions were commenced to be made on a half hourly basis once the gauge board readings from Wivenhoe Dam were received. • With dam levels above the Wivenhoe/Somerset Operating Target Line during this period releases from Somerset Dam are closed down (all sluices closed at 10:00) to limit further rises in Wivenhoe.

JANUARY 2011 FLOOD EVENT - PERIOD 16 OF 20				
DATE/TIME	**BACKGROUND**	**DAM CONDITIONS**	**RAINFALL AND MODEL RESULTS**	**STRATEGY**
	Strategy W4 and Strategy S2 Wivenhoe Directive #12 to #14.			**Strategy W4 and Strategy S2 (Lake Level predicted to exceed 74.00, no maximum release rate)**
Commenced Tuesday 11 Jan 2011 13:00 Completed Tuesday 11 Jan 2011 19:00	• Extreme lake level rises in Wivenhoe Dam continue during this period. The QPF issued at 16:00 is for a catchment average rainfall of 75mm over the next 24 hours. • Gates opened continuously at Wivenhoe Dam for 6 hours in accordance with Strategy W4 and the standard gate opening sequence at an average rate of 4.5 metres of opening per hour. • Wivenhoe discharge is increased from 4250 m^3/s to 7464 m^3/s. Significant damage to urban areas below Moggill cannot be avoided. • No releases are made from Somerset Dam to limit increases in Wivenhoe Dam in accordance with Strategy S2.	Total rainfall since commencement: Wivenhoe 397mm; Somerset 610mm; Lockyer 325mm; Bremer 278mm. Wivenhoe Dam level rises from 74.39 to 74.97 over the 6 hour period. Somerset Dam level rises from 103.83 to 104.60 over the 6 hour period.	• Catchment average rainfalls over this period were: o Wivenhoe 15mm; o Wivenhoe Local 35mm; o Somerset 40mm; o Lockyer 38mm; o Bremer 40mm. • Forecast rainfall in the next 24 hours is 75mm (issued at 16:00). However, catchment average rainfalls for the 24 hour period commencing at 16:00 were: o Wivenhoe 8mm; o Wivenhoe Local 13mm; o Somerset 19mm; o Lockyer 9mm; o Bremer 8mm. • A portion of the extreme intense rainfall in the dam catchment had fallen in an un-gauged area (e.g. on the dam lake area) and this resulted in difficulties in the model being able to accurately predict lake level rises. • Estimated peak Wivenhoe level is: 75.0 (excluding forecast); 75.2 (including forecast). • Estimated peak Somerset level is: 105.2 (excluding forecast); 105.9 (including forecast). • Estimated total dam inflow is: 2,659,000ML (excluding forecast); 3,289,000ML (including forecast).	• The strategy was to protect the structural safety of the dam. • The Manual requires actions under Strategy 4 to be that Wivenhoe gate openings are to occur in accordance with standard sequences until the storage level of Wivenhoe Dam begins to fall. • The lake level in both dams continued to rise during this period. A dam operator was relaying Wivenhoe Dam gauge board readings to the Flood Operations Centre every 30 minutes. All four duty engineers were present in the Flood Operations Centre and decisions were being made on a half hourly basis once the gauge board readings were received. • With dam levels above the Wivenhoe/Somerset Operating Target Line during this period no releases from Somerset Dam are made to limit further rises in Wivenhoe. • The water level in Wivenhoe Dam peaked at 19:00 on 11 January 2011 at 74.97m AHD.

JANUARY 2011 FLOOD EVENT - PERIOD 17 OF 20				
DATE/TIME	**BACKGROUND**	**DAM CONDITIONS**	**RAINFALL AND MODEL RESULTS**	**STRATEGY**
	Strategy W4 and Strategy S2 Wivenhoe Directive #15 to #24.			**Strategy W4 and Strategy S2 (Lake Level predicted to exceed 74.00, no maximum release rate)**
Commenced Tuesday 11 Jan 2011 19:00 Completed Tuesday 11 Jan 2011 21:00	• No change to gate settings occurred at Wivenhoe Dam over this period. Wivenhoe discharge is 7458 m^3/s. • The lake level in Wivenhoe dam stabilizes and then falls slightly at 21:00. A decision to commence closing down the gates as quickly as possible to reduce urban flood impacts is taken at 21:00. This decision is potentially in contravention of the minimum gate opening settings required under Strategy W4; however it is made in an attempt to minimize urban damage below Moggill which is an objective that must be considered under Strategy W4. Gates would have been re-opened if further lake level rises were experienced. • No releases are made from Somerset Dam in accordance with Strategy S2.	Total rainfall since commencement: Wivenhoe 398mm; Somerset 610mm; Lockyer 326mm; Bremer 278mm. During this 2 hour period, the lake level in Wivenhoe Dam stabilizes at 74.97 and then falls slightly to 74.95 at 21:00. Somerset Dam level rises from 104.60 to 104.78 over the 2 hour period.	• Catchment average rainfalls over this period were: o Wivenhoe 1mm; o Somerset 1mm; o Lockyer 1mm; o Bremer 1mm. • Forecast rainfall in the next 24 hours is 75mm. • A portion of the extreme intense rainfall in the dam catchment had fallen in an un-gauged area (e.g. on the dam lake area) and this continued to result in difficulties in the model being able to accurately predict lake level behaviour. • Estimated peak Wivenhoe level is: 75.0 (excluding forecast); 75.2 (including forecast). • Estimated peak Somerset level is: 105.2 (excluding forecast); 105.9 (including forecast). • Estimated total dam inflow is: 2,659,000ML (excluding forecast); 3,289,000ML (including forecast).	• The target was to protect the structural safety of the dam. • The Manual requires actions under Strategy 4 to be that Wivenhoe gate openings are to occur at the minimum intervals and sequences until the storage level of Wivenhoe Dam begins to fall. • The dam level stabilized during this period and then fell slightly at 21:00. A dam operator was relaying Wivenhoe Dam gauge board readings to the Flood Operations Centre every 30 minutes. All four duty engineers were present in the Flood Operations Centre and decisions were being made on a half hourly basis once the gauge board readings were received. • With dam levels above the Wivenhoe/Somerset Operating Target Line during this period no releases from Somerset Dam are made to limit further rises in Wivenhoe. • The water level in Wivenhoe Dam peaked at 19:00 on 11 January 2011 at 74.97m AHD.

JANUARY 2011 FLOOD EVENT - PERIOD 18 OF 20				
DATE/TIME	**BACKGROUND**	**DAM CONDITIONS**	**RAINFALL AND MODEL RESULTS**	**STRATEGY**
	Strategy W4 and Strategy S2 Wivenhoe Directive #25 to #34.			**Strategy W4 and Strategy S2 (Lake Level predicted to exceed 74.00, no maximum release rate)**
Commenced Tuesday 11 Jan 2011 21:00 Completed Wednesday 12 Jan 2011 08:00	• During this period Wivenhoe Dam gates are closed off as quickly as possible without causing rises in lake level. These actions are taken to reduce urban flood impacts downstream. The decision to close off the release in this way is potentially in contravention of the minimum gate opening settings required under Strategy W4; however it is made in an attempt to minimize urban damage below Moggill which is an objective that must be considered under this Strategy. • Gates closed continuously at Wivenhoe Dam for 11 hours in accordance with the standard gate closing sequence at an average rate of just over 3.6 metres of opening per hour. • Wivenhoe discharge is decreased from 7464 m^3/s to 2547 m^3/s. All rural bridges below the dam remain flooded and significant damage to urban areas below Moggill has not been avoided. • No releases are made from Somerset Dam in accordance with Strategy S2.	Total rainfall since commencement: Wivenhoe 399mm; Somerset 613mm; Lockyer 328mm; Bremer 279mm. Wivenhoe Dam level falls from 74.97 to 74.78 over the 11 hour period. Somerset Dam level rises from 104.78 to 105.11 over the 11 hour period.	• Catchment average rainfalls over this period were: o Wivenhoe 1mm o Somerset 3mm; o Lockyer 3m; o Bremer 1m. • Forecast rainfall in the next 24 hours is 10mm (issued Wednesday morning). • Estimated peak Wivenhoe level is: 75.0 (excluding forecast); 75.0 (including forecast). • Estimated peak Somerset level is: 105.1 (excluding forecast); 105.1 (including forecast). • Estimated total dam inflow is: 2,650,000ML (excluding forecast); 2,650,000ML (including forecast).	• The target was to protect the structural safety of the dam. • The Manual requires actions under Strategy 4 to be that Wivenhoe gate openings are to occur at the minimum intervals and sequences until the storage level of Wivenhoe Dam begins to fall. Because the lake level was falling slightly, a decision was made to reduce releases from Wivenhoe Dam as quickly and to as low a level as possible, to minimize urban damage below Moggill. • It was calculated that reducing to a discharge of 2547 m^3/s from Wivenhoe Dam would: o Not increase the downstream flood peak; o Not cause the water level in Wivenhoe Dam to rise and; o Allow the dam to be drained back to FSL in 7 days in accordance with the Manual. • With dam levels above the Wivenhoe/Somerset Operating Target Line during this period no releases from Somerset Dam are made to limit further rises in Wivenhoe.

JANUARY 2011 FLOOD EVENT - PERIOD 19 OF 20				
DATE/TIME	**BACKGROUND**	**DAM CONDITIONS**	**RAINFALL AND MODEL RESULTS**	**STRATEGY**
Commenced Wednesday 12 Jan 2011 08:00 Completed Thursday 13 Jan 2011 12:00	**Transition from Strategy W4 to the Drain Down Phase** **Somerset Directives #8 to #9.** • No change to gate settings occurred at Wivenhoe Dam over this period. Wivenhoe discharge is 2534 m^3/s. All rural bridges below the dam remain flooded. • Releases commenced from Somerset Dam during this period as the plotted dam levels fell below the Wivenhoe/Somerset Operating Target Line. These actions were undertaken in accordance with Strategy S2 and to allow the D'Aguilar Highway to be opened as soon as possible. Even though plotted dam levels later rose above the Wivenhoe/Somerset Operating Target Line during this period, releases from Somerset dam continued to allow the dam to be drained back to FSL in 7 days in accordance with the Manual.	Total rainfall since commencement: Wivenhoe 401mm; Somerset 619mm; Lockyer 330mm; Bremer 280mm. Wivenhoe Dam level falls from 74.78 to 74.61 over the 28 hour period. Somerset Dam level falls from 105.11 to 103.96 over the 28 hour period.	• Catchment average rainfalls over this period were: o Wivenhoe 2mm; o Somerset 6mm; o Lockyer 6mm; o Bremer 6mm. • Forecast rainfall in the next 24 hours is 10mm.	**Drain Down Phase** **(Stored floodwaters emptied from the dam in seven days)** • During this period the strategy transitioned from Strategy W4, during which the target is to protect the structural safety of the dam, to the Drain Down Phase of the event. • Once the Drain Down Phase commenced, the target was to release stored floodwaters from the dam within 7 days of the flood peak passing through the dams, while controlling downstream impacts. Considerations impacting on the duration and timing of the Drain Down Phase in this instance included: o Causing no renewed increases in river levels below the dam (except where they were unavoidable due to tidal influences. o Maintaining an adequate release rate to ensure that the temporary pumps providing water supplies to the Lowood area could continue to operate; o Minimizing bank slumping impacts along the river, particularly in key areas such as Coronation Drive (as requested from the Brisbane City Council); o Re-opening the Brisbane Valley highway and key rural bridges as quickly as possible; o Achieving full supply levels in the dams at the conclusion of the event.

JANUARY 2011 FLOOD EVENT - PERIOD 20 OF 20				
DATE/TIME	**BACKGROUND**	**DAM CONDITIONS**	**RAINFALL AND MODEL RESULTS**	**STRATEGY**
Commenced Thursday 13 Jan 2011 12:00 Completed Wednesday 19 Jan 2011 12:00	**Drain Down Phase** **Wivenhoe Directives #35 to #62** **Somerset Directives #10 to #13.** • During this period releases from Wivenhoe Dam are increased to as the peaks from the Lockyer and Bremer subside. Downstream impacts are controlled to ensure that at no time during this phase do downstream water levels rise except if impacted by tidal influences. • During this period, stored flood water in Somerset Dam is drained into Wivenhoe Dam in accordance with the drain down target of seven days. Importance is placed on opening the D'Aguilar Highway as soon as possible.	Total rainfall since commencement: Wivenhoe 415mm; Somerset 626mm; Lockyer 337mm; Bremer 288mm. Wivenhoe Dam level falls from 74.61 to 66.89 over the 6 day period. Somerset Dam level falls from 103.96 to 99.00 over the 6 day period.	• Catchment average rainfalls over this six day period were: o Wivenhoe 14mm; o Somerset 7mm; o Lockyer 7mm; o Bremer 8mm.	**Drain Down Phase** • During this period the target was to release stored floodwaters from the dam within 7 days of the flood peak passing through the dams, while controlling downstream impacts. Considerations impacting on the duration and timing of the Drain Down Phase in this instance included: o Causing no renewed increases in river levels below the dam (except where they were unavoidable due to tidal influences. o Maintaining an adequate release rate to ensure that the temporary pumps providing water supplies to the Lowood area could continue to operate; o Minimizing bank slumping impacts along the river, particularly in key areas such as Coronation Drive (as requested from the Brisbane City Council); o Re-opening the Brisbane Valley highway and key rural bridges as quickly as possible; o Achieving full supply levels in the dams at the conclusion of the event.