Brooke Foxover

From: DutyEngineer [dutyseq[redacted]
Sent: Monday, 31 January 2011 4:21 PM
To: John Tibaldi
Subject: Flood MGt Strategies and Manual Compliance - 01.doc
Attachments: @

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Flood MGt Strategies and Manual Compliance - 01.doc (200 KB)

7. FLOOD MANAGEMENT STRATEGIES AND MANUAL COMPLIANCE

7.1 Wivenhoe Dam Flood Mitigation Strategies

Wivenhoe Dam is capable of being operated in a number of ways to reduce flooding in the Brisbane River downstream of the dam, depending on the origin, magnitude and spatial extent of the flood. Maximum overall flood mitigation effect will be achieved by operating Wivenhoe Dam in conjunction with Somerset Dam.

There are four strategies (W1 to W4) used when operating Wivenhoe Dam during a flood event. These strategies are based on the Flood Objectives of the Manual. These objectives, listed in descending order of importance, are as follows:

- Ensure the structural safety of the dams;
- Provide optimum protection of urbanised areas from inundation;
- Minimise disruption to rural life in the valleys of the Brisbane and Stanley Rivers;
- Retain the storage at Full Supply Level at the conclusion of the Flood Event.
- Minimise impacts to riparian flora and fauna during the drain down phase of the Flood Event.

Within any strategy, consideration is always given to these objectives in this order, when making decisions on dam releases.

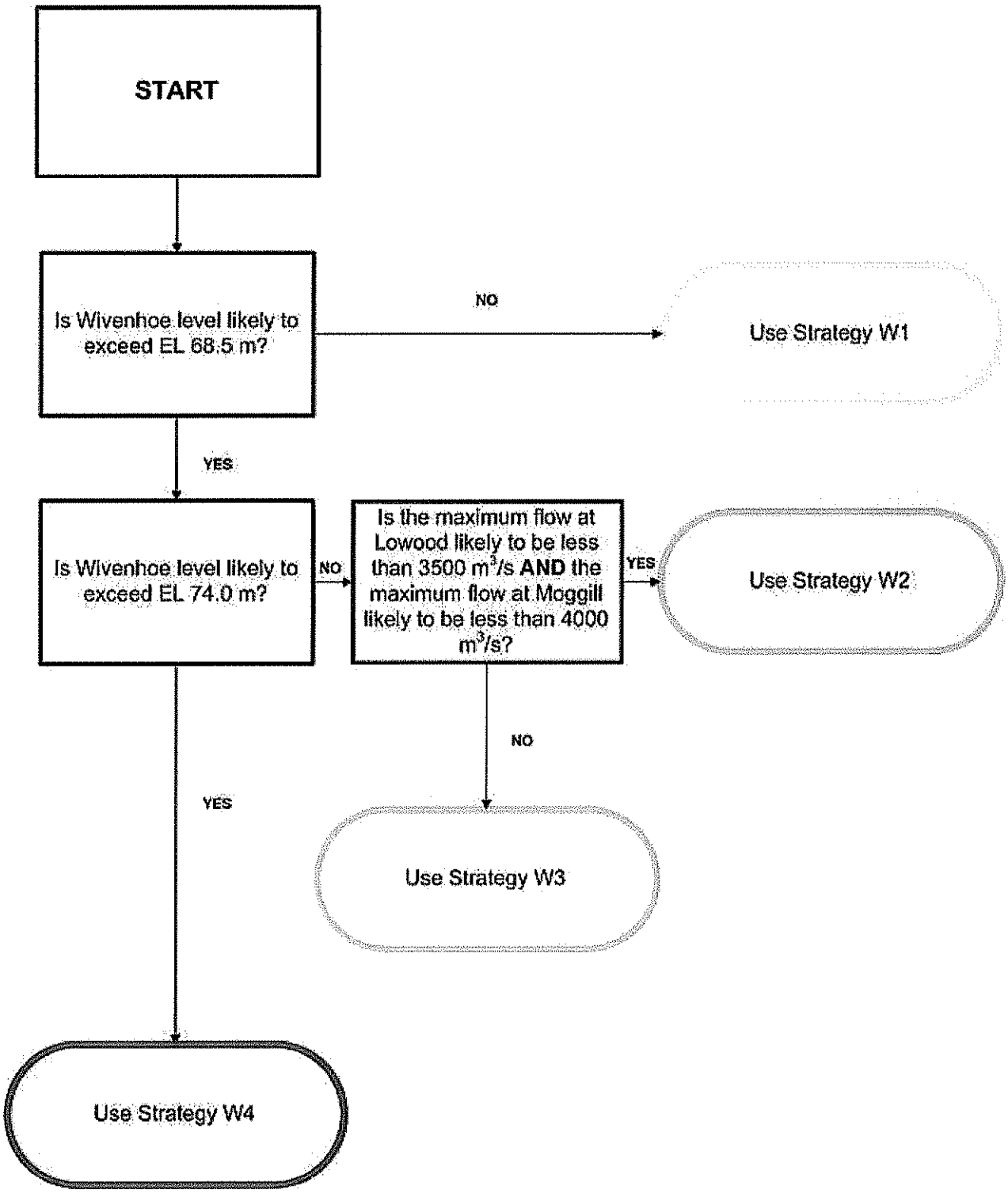
The strategy chosen at any point in time will depend on the actual levels in the dams and the following predictions, which are to be made using the best forecast rainfall and stream flow information available at the time:

- Maximum storage levels in Wivenhoe and Somerset Dams.
- Peak flow rate at the Lowood Gauge (excluding Wivenhoe Dam releases).
- Peak flow rate at the Moggill Gauge (excluding Wivenhoe Dam releases).

Strategies change during a flood event as forecasts change and rain is received in the catchments. It is not possible to predict the range of strategies that will be used during the course of a flood event at the commencement of the event. Strategies are changed in response to changing rainfall forecasts and stream flow conditions to maximise the flood mitigation benefits of the dams.

When determining dam outflows within all strategies, peak outflow should generally not exceed peak inflow. A flowchart showing how best to select the appropriate strategy to use at any point in time is shown below:

WIVENHOE FLOOD STRATEGY FLOW CHART



Summary details of the four strategies (W1 to W4) used when operating Wivenhoe Dam during a flood event are contained below:

Strategy W1 - The Primary Consideration is Minimising Disruption to Downstream Rural Life

Conditions	• **Wivenhoe Storage Level predicted to be less than 68.50 m AHD** • **Maximum release predicted to be less than 1,900 m^3/s** • **The primary consideration is minimising disruption to downstream rural life**

The intent of Strategy W1 is to not to submerge the seven bridges between the dam and Moggill prematurely (see Appendix ??). The limiting condition for Strategy W1 is the submergence of Mt Crosby Weir Bridge that occurs at approximately 1,900 m^3/s.

This strategy require a great deal of control over releases and knowledge of discharges from Lockyer Creek. In general, the releases from Wivenhoe Dam are controlled such that the combined flow from Lockyer Creek and Wivenhoe Dam is less than the limiting values to delay the submergence of a particular bridge.

Strategy W2 - Strategy W2 is a Transition Strategy where the primary consideration changes from Minimising Impact to Downstream Rural Life to Protecting Urban Areas from Inundation.

Conditions	• **Wivenhoe Storage Level predicted to be between 68.50 and 74.00 m AHD** • **Maximum Release predicted to be less than 3,500 m^3/s** • **This is a transition strategy in which the primary consideration changes from minimising disruption to downstream rural life to protecting urban areas from inundation** • **Lower level objectives are still considered when making decisions on water releases. Objectives are always considered in order of importance**

The intent of Strategy W2 is limit the flow in the Brisbane River to less than the naturally occurring peaks at Lowood and Moggill, while remaining within the upper limit of non-damaging floods at Lowood (3,500 m^3/s).

Strategy W3 – The primary consideration is Protecting Urban Areas from Inundation

Conditions	• **Wivenhoe Storage Level predicted to be between 68.50 and 74.00 m AHD** • **Maximum Release should not exceed 4,000 m^3/s** • **The primary consideration is protecting urban areas from inundation** • **Lower level objectives are still considered when making decisions on water releases. Objectives are always considered in order of importance**

The intent of Strategy W3 is to limit the flow in the Brisbane River at Moggill to less than 4000 m^3/s, noting that 4000 m^3/s at Moggill is the upper limit of non-damaging floods downstream. The combined peak river flow targets for Strategy W3 are shown in the following table. In relation to these targets, it should be noted that depending on natural flows from the Lockyer and Bremer catchments, it may not be possible to limit the flow at Moggill to below 4000 m^3/s. In these instances, the flow at Moggill is to be kept as low as possible.

TIMING	TARGET MAXIMUM FLOW IN THE BRISBANE RIVER
Prior to the naturally occurring peak at Moggill (excluding Wivenhoe Dam releases).	The flow at Moggill is to be minimised.
After the naturally occurring peak at Moggill (excluding Wivenhoe Dam releases).	The flow at Moggill is to be lowered to 4,000m^3/s as soon as possible.

Strategy W4 – The primary consideration is Protecting the Structural Safety of the Dam

Conditions	• **Wivenhoe Storage Level predicted to exceed 74.00m AHD.**

	• **No limit on Maximum Release rate** • **The primary consideration is protecting the structural safety of the dam** • **Lower level objectives are still considered when making decisions on water releases. Objectives are always considered in order of importance**

The intent of Strategy W4 is to ensure the safety of the dam while limiting downstream impacts as much as possible. This strategy normally comes into effect when the water level in Wivenhoe Dam reaches 74.0 m AHD. However the Senior Flood Operations Engineer may seek to invoke the discretionary powers of Section 2.8 if earlier commencement is able to prevent triggering of a fuse plug.

Under Strategy W4 the release rate is increased as the safety of the dam becomes the priority. Opening of the gates is to occur generally, until the storage level of Wivenhoe Dam begins to fall.

There are no restrictions on gate opening increments or gate operating frequency once the storage level exceeds 74.0 AHD, as the safety of the dam is of primary concern at these storage levels.

7.2 Somerset Dam Flood Mitigation Strategies

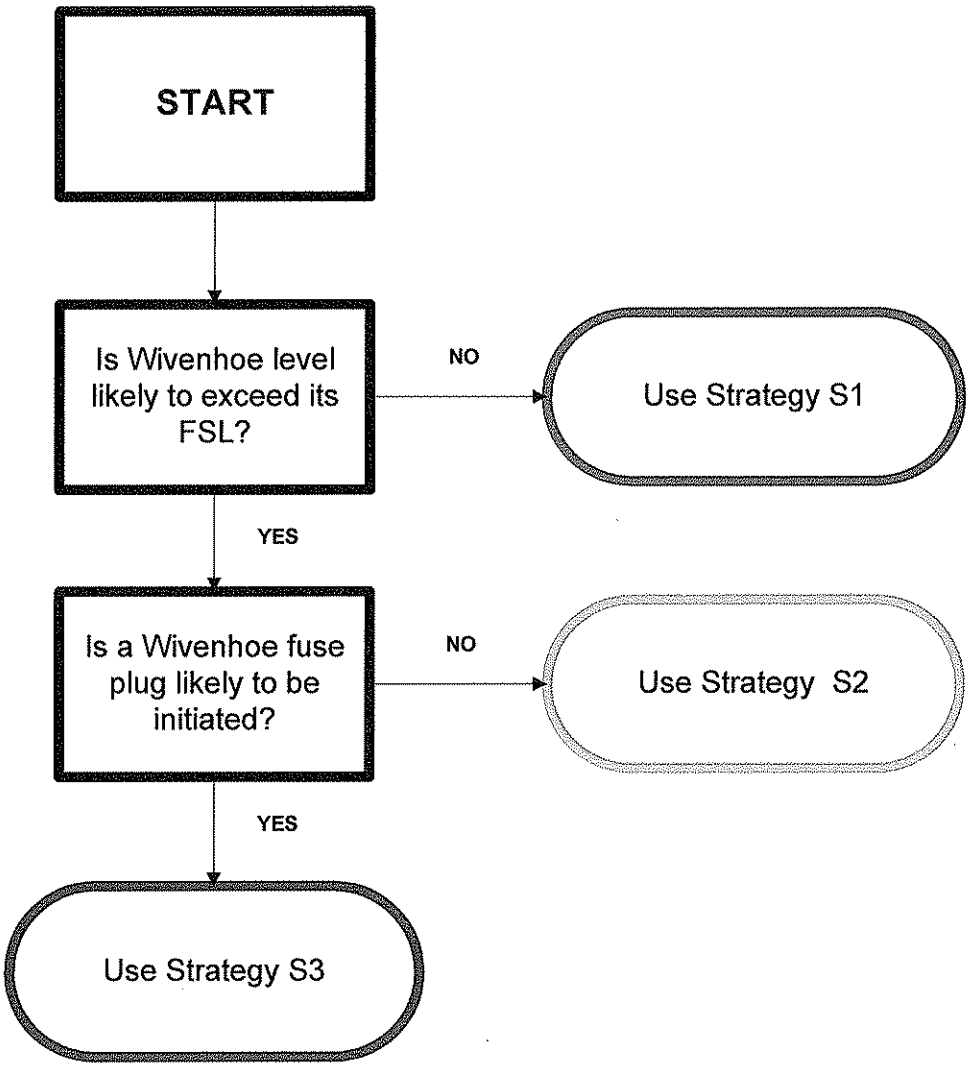
Somerset Dam is capable of being operated in a number of ways to regulate Stanley River floods. Somerset Dam and Wivenhoe Dam are to be operated in conjunction to optimise the flood mitigation benefits downstream of Wivenhoe Dam. Once a Flood Event is declared, all radial gates are to be fully opened and all sluice gates and regulator valves are to be fully closed. An assessment is to be made of the magnitude of the Flood Event, including a prediction of the maximum storage levels in Wivenhoe and Somerset Dams.

There are three strategies used when operating Somerset Dam during a flood event. These strategies are based on the objectives of the Manual. The strategy chosen at any point in time will depend on predictions of the maximum storage levels in Wivenhoe and Somerset Dams which are to be made using the best forecast rainfall and stream flow information available at the time.

Strategies are likely to change during a flood event as forecasts change and rain is received in the catchments. It is not possible to predict the range of strategies that will be used during the course of a flood event at the commencement of the event. Strategies are changed in response to changing rainfall forecasts and stream flow conditions to maximise the flood mitigation benefits of the dams.

A flowchart showing how best to select the appropriate strategy to use at any point in time is shown below:

SOMERSET FLOOD STRATEGY FLOW CHART



Summary details of the three strategies (S1 to S3) used when operating Somerset Dam during a flood event are contained below:

Strategy S1 – Minimising Impact on Rural Life Upstream

Conditions	• **Somerset Dam Level expected to exceed EL 99.0 and Wivenhoe Dam not expected to reach EL 67.0 (FSL) during the course of the Flood Event**

The intent of this strategy is to return the dam to full supply level while minimising the impact on rural life upstream of the dam. Consideration is also given to minimising the downstream environmental impacts from the release.

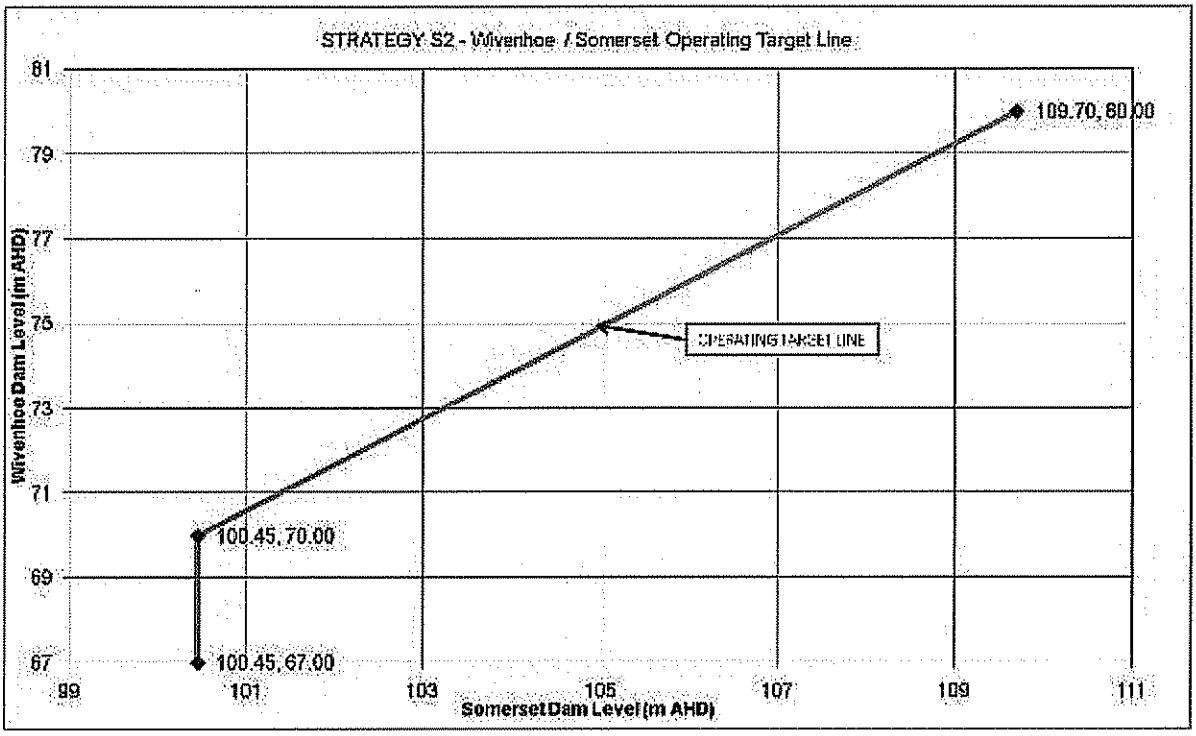
The crest gates at Somerset Dam are raised to enable uncontrolled discharge. The Regulator Valves and Sluice gates are to be used to maintain the level in Somerset dam below EL 102.0 (deck level of Mary Smokes Bridge). The release rate from Somerset dam is not to exceed the peak inflow into the dam.

Strategy S2 – Minimise Impacts below Wivenhoe Dam

Conditions	• **Somerset Dam Level expected to exceed EL 99.0 and Wivenhoe Dam level expected to exceed EL 67.0 (FSL) but not exceed EL 75.5 (fuse plug initiation) during the course of the Flood Event.**

The intent of this strategy is to maximise the benefits of the flood storage capabilities of the dam while protecting the structural safety of both dams. The table below contains the operating conditions and actions for Strategy S2.

CONDITION	ACTION
Wivenhoe rising and Somerset level below EL 100.45.	The crest gates are raised to enable uncontrolled discharge. The low level regulators and sluices are generally kept closed.
Wivenhoe rising and Somerset level above EL 100.45.	The crest gates are raised to enable uncontrolled discharge. Operations are to target a correlation of water levels in Somerset Dam and Wivenhoe Dam as set out in the graph below. The operations target line shown on this graph is to generally be followed as the flood event progresses. The release rate from Somerset Dam is generally not to exceed the peak inflow into the dam.
Wivenhoe falling and Somerset level above EL 100.45.	The opening of the regulators and sluices generally should not cause Wivenhoe Dam to rise significantly. The release rate from Somerset Dam is generally not to exceed the peak inflow into the dam.
The Flood Event has emanated mainly from the Stanley River catchment without significant runoff in the Upper Brisbane River catchment	The crest gates at Somerset Dam are raised to enable uncontrolled discharge. The Regulator Valves and Sluice gates are to be used to maintain the level in Somerset dam below EL 102.0 (deck level of Mary Smokes Bridge). The release rate from Somerset Dam is generally not to exceed the peak inflow into the dam.



Notes:

- The Operating Target Line was selected following an optimisation study. The Target Line was selected based on the following factors:
    - Equal minimisation of flood level peaks in both dams in relation to their associated dam failure levels.
    - Minimisation of flows in the Brisbane River downstream of Wivenhoe Dam.
    - Consideration of the time needed at the onset of a Flood Event to properly assess the magnitude of the event and the likely impacts, so that the likely optimal strategy to maximise the Flood Mitigation benefits of the storages can be selected.
- The target point on the operating target line at any point in time is based on the maximum storage levels in Wivenhoe and Somerset Dams using the best forecast rainfall and stream flow information available at the time.
- Gate operations will enable the movement of the duty point towards the target line in a progressive manner. It will not necessarily be possible to adjust the duty point directly towards the target line in a single gate operation.

Strategy S3 - Protect the Structural Safety of the Dam

Conditions	• **Somerset Dam Level expected to exceed EL 99.0**

	and Wivenhoe Dam level expected to exceed EL 75.5 (fuse plug initiation) during the course of the Flood Event.

The intent of this strategy is to maximise the benefits of the flood storage capabilities of the dam while protecting the structural safety of both dams.

In addition to the operating protocols used in Strategy S2, to prevent fuse plug initiation, consideration can be given to temporary departure from the operating protocols contained in this strategy under the following conditions:

- The safety of Somerset Dam is the primary consideration and cannot be compromised.
- The peak level in Somerset dam cannot exceed EL 109.7.

7.3 Wivenhoe Dam – Manual Compliance

The following table summarises the Strategies that were used in the operation of Wivenhoe Dam during the January 2011 Flood Event and provides explanations of how the use of these strategies complies with the Manual.

PERIOD	STRATEGY	WIVENHOE LEVEL AND OUTFLOW CONDITIONS	MANUAL REQUIREMENTS
Commenced Thursday 06 Jan 2011 07:42 Completed Friday 07 Jan 2011 02:00	W1A	Lake Level between 67.25 m AHD and 67.50 m AHD. [Maximum Release 0 m^3/s] The strategy during this period was to maintain College's Crossing trafficable by limiting the combined flows from Wivenhoe Dam and Lockyer Creek to a maximum of 175 m^3/s. Because of the inflows into the Brisbane River from Lockyer Creek, no releases from the dam were made during this period. College's Crossing remained trafficable during this period.	Lake Level between 67.25 m AHD and 67.50 m AHD. [Maximum Release 110 m^3/s] The Manual requirement is to endeavour to maintain College's Crossing trafficable by limiting the combined flows from Wivenhoe Dam and Lockyer Creek to a maximum of 175 m^3/s.

Commenced Friday 07 Jan 2011 02:00 Completed Friday 07 Jan 2011 09:00	W1B	Lake Level between 67.50 m AHD and 67.75 m AHD. [Maximum Release 0 m^3/s] College's Crossing was inundated during this period. The strategy during this period was to maintain Burtons Bridge trafficable by limiting the combined flows from Wivenhoe Dam and Lockyer Creek to a maximum of 430 m^3/s. Because of the inflows into the Brisbane River from Lockyer Creek, no releases from the dam were made during this period.	Lake Level between 67.50 m AHD and 67.75 m AHD. [Maximum Release 380 m^3/s] The Manual requirement is that once College's Crossing is closed to traffic, endeavour to maintain Burtons Bridge trafficable by limiting the combined flows from Wivenhoe Dam and Lockyer Creek to a maximum of 430 m^3/s.
Commenced Friday 07 Jan 2011 09:00 Completed Friday 07 Jan 2011 15:00	W1C	Lake Level between 67.75 m AHD and 68.00 m AHD. [Maximum Release 0 m^3/s] The strategy during this period was to maintain Burtons Bridge trafficable by limiting the combined flows from Wivenhoe Dam and Lockyer Creek to a maximum of 430 m^3/s and then once Burtons Bridge is closed to traffic, endeavour to maintain Kholo Bridge trafficable by limiting the combined flows from Wivenhoe Dam and Lockyer Creek to a maximum of 550 m^3/s.. Because of the inflows into the Brisbane River from Lockyer Creek, no releases from the dam were made during this period. Burtons Bridge was inundated near the end of this period. Kholo Bridge remained trafficable during this period. As well as being in accordance with the Manual, delaying the commencement of releases until 15:00 allowed bridges to be closed by the relevant authorities 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.	Lake Level between 67.50 m AHD and 67.75 m AHD. [Maximum Release 500 m^3/s] The Manual requirement is to endeavour to maintain Burtons Bridge trafficable by limiting the combined flows from Wivenhoe Dam and Lockyer Creek to a maximum of 430 m^3/s. The Manual also requires that once Burtons Bridge is closed to traffic (occurred around 13:00 during this period) endeavour to maintain Kholo Bridge trafficable by limiting the combined flows from Wivenhoe Dam and Lockyer Creek to a maximum of 550 m^3/s.

Commenced Friday 07 Jan 2011 15:00 Completed Friday 07 Jan 2011 22:00	W1D	Lake Level between 68.00 m AHD and 68.25 m AHD. [Maximum Release 421 m^3/s] At the commencement of this period, it became apparent that Kholo Bridge would be inundated by natural Brisbane River flows (excluding Wivenhoe Dam releases) and this occurred at near the end of this period (middle of the night). Therefore the strategy was to close Kholo Bridge in daylight hours and then assume for the purposes of Strategy W1D that Kholo Bridge was closed to traffic. Accordingly, the strategy during this period was to maintain Mt Crosby Weir Bridge trafficable by limiting the combined flows from Wivenhoe Dam and Lockyer Creek to a maximum of 1900 m^3/s. During this period, releases were increased to 421 cumecs, with radial gates opened continuously at Wivenhoe Dam during this period in accordance with the standard gate opening sequence at a rate or 0.5 metres of opening per hour.	Lake Level between 68.00 m AHD and 68.25 m AHD. [Maximum Release 1900 m^3/s] The Manual requires that once Kholo Bridge is closed to traffic, endeavour to maintain Mt Crosby Weir Bridge trafficable by limiting the combined flows from Wivenhoe Dam and Lockyer Creek to a maximum of 1900 m^3/s.
Commenced Friday 07 Jan 2011 22:00 Completed Saturday 08 Jan 2011 08:00	W1E	Lake Level between 68.25 m AHD and 68.50 m AHD. [Maximum Release 953 m^3/s] The strategy during this period was to maintain Mt Crosby Weir Bridge trafficable by limiting the combined flows from Wivenhoe Dam and Lockyer Creek to a maximum of 1900 m^3/s. During this period, releases were increased to 953 cumecs, with radial gates opened continuously at Wivenhoe Dam during this period in accordance with the standard gate opening sequence at a rate or 0.5 metres of opening per hour.	Lake Level between 68.25 m AHD and 68.50 m AHD. [Maximum Release 1900 m^3/s] The Manual requirement is to endeavour to maintain Mt Crosby Weir Bridge trafficable by limiting the combined flows from Wivenhoe Dam and Lockyer Creek to a maximum of 1900 m^3/s.

Saturday 08 Jan 2011 08:00	W2	The lake level at this time was 68.52 and the release rate from the dam at this time was 940 cumecs. At this time 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. At this time the calculated naturally occurring peaks at Lowood and Moggill were 530 cumecs and 800 cumecs respectively, whereas the release rate from the dam at this time was 940 cumecs. Accordingly Strategy W3 was adopted for use at 08:00 on Saturday 8 January 2011.	Lake Level predicted to be between 68.50 and 74.00 m AHD [Maximum Release 3,500 m^3/s] This is a transition strategy in which the primary consideration changes from minimising disruption to downstream rural life to protecting urban areas from inundation. Lower level objectives are still considered when making decisions on water releases. Objectives are always considered in order of importance. The intent of Strategy W2 is limit the flow in the Brisbane River to less than the naturally occurring peaks at Lowood and Moggill, while remaining within the upper limit of non-damaging floods at Lowood (3,500 m^3/s).
Commenced Friday 08 Jan 2011 08:00 Completed Tuesday 11 Jan 2011 08:00	W3	The lake level at the commencement of this period was 68.52 and the release rate from the dam at this time was 940 cumecs. The naturally occurring peak at Moggill was calculated to occur at	Lake Level predicted to be between 68.50 and 74.00 m AHD [Maximum Release 4,000 m^3/s] The primary consideration is protecting urban areas from inundation. Lower level objectives are still considered when making decisions on water releases. Objectives are always considered in order of importance.

Brooke Foxover

From: DutyEngineer [dutyseq[redacted]
Sent: Monday, 31 January 2011 4:22 PM
To: John Tibaldi
Subject: Flood Event Summary - 05.doc
Attachments: @

Attachments:

Flood Event Summary - 05.doc (318 KB)

SUMMARY OF JANUARY 2011 FLOOD EVENT

The following 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 of 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 covered by the table.
- Relevant background information from the period leading up to and during the time period covered by the table.
- Changes in dam levels 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 extreme, 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 exceedance probability 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 calculated to have an annual exceedance probability of between 1 in 500 years and 1 in 1000 years. Although this rainfall was not recorded at a single station, it is calculated to have occurred based on the extreme 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 peak inflow into Wivenhoe Dam experienced during this event has been calculated to be in the order of 50% more that the comparable peak inflow calculated from the January 1974 event.

JANUARY 2011 FLOOD EVENT - PERIOD 1 OF 20				
DATE/TIME	**BACKGROUND**	**DAM LEVELS**	**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 cumecs)**
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 2011were: 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.	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. Total rainfall since event commencement (including the current period): Wivenhoe 53mm; Somerset 44mm; Lockyer 53mm; Bremer 54mm.	• Catchment average rainfalls over this period were: o Wivenhoe 28mm; o Somerset 23mm; o Lockyer 30mm; o Bremer 31mm. • Forecast rainfall is 25mm in the next 24 hours. • Wivenhoe Lake level forecast to peak at 68.2 (excluding forecast) 68.4 (including forecast). • Somerset Lake level forecast to peak at 99.7 (excluding forecast) 99.9 (including forecast). • Total dam inflow volume forecast is 224,000ML (excluding forecast) 287,000ML (including forecast). • Peak flow at Lowood (excluding Wivenhoe releases) estimated at 470 cumecs (excluding forecast) 560 cumecs (including forecast). • Peak flow at Moggill (excluding Wivenhoe releases) estimated at 590 cumecs (excluding forecast) 750 cumecs (including forecast).	• Peak inflows into the Brisbane River from Lockyer are estimated to be in the order of 400 cumecs, 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 unlikely to 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 cumecs. • Water held in Wivenhoe in an attempt to maintain College's Crossing trafficable in accordance with Strategy W1A. • 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 2 OF 20				
DATE/TIME	**BACKGROUND**	**DAM LEVELS**	**RAINFALL AND MODEL RESULTS**	**STRATEGY**
	Strategy W1B and Strategy S2			**Strategy W1B and Strategy S2 (Lake Level greater than 67.50, maximum release 110 cumecs)**
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.	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. Total rainfall since event commencement (including the current period): Wivenhoe 64mm; Somerset 60mm; Lockyer 57mm; Bremer 60mm.	• Catchment average rainfalls over this period were: o Wivenhoe 11mm; o Somerset 15mm; o Lockyer 4mm; o Bremer 5mm. • Forecast rainfall is 25mm in the next 24 hours. • Wivenhoe Lake level forecast to peak at 68.3 (excluding forecast) 68.7 (including forecast). • Somerset Lake level forecast to peak at 99.8 (excluding forecast) 100.2 (including forecast). • Total dam inflow volume forecast is 236,000ML (excluding forecast) 370,000ML (including forecast). • Peak flow at Lowood (excluding Wivenhoe releases) estimated at 480 cumecs (excluding forecast) 680 cumecs (including forecast). • Peak flow at Moggill (excluding Wivenhoe releases) estimated at 600 cumecs (excluding forecast) 1040 cumecs (including forecast).	• Peak inflows into the Brisbane River from Lockyer are estimated to be in the order of 500 cumecs, 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 cumecs. • 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 LEVELS**	**RAINFALL AND MODEL RESULTS**	**STRATEGY**
Commenced Friday 07 Jan 2011 09:00 Completed Friday 07 Jan 2011 15:00	**Strategy W1C and Strategy S2** • 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	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. Total rainfall since event commencement (including the current period): Wivenhoe 89mm; Somerset 90mm; Lockyer 71mm; Bremer 71mm.	• Catchment average rainfalls over this period were: o Wivenhoe 24mm; o Somerset 30mm; o Lockyer 14mm; o Bremer 12mm. • Forecast rainfall is 25mm in the next 24 hours. • Wivenhoe Lake level forecast to peak at 68.4 (excluding forecast) 68.9 (including forecast). • Somerset Lake level forecast to peak at 100.3 (excluding forecast) 100.6 (including forecast). • Total dam inflow volume forecast is 346,000ML (excluding forecast) 484,000ML (including forecast). • Peak flow at Lowood (excluding Wivenhoe releases) estimated at 530 cumecs (excluding forecast) 710 cumecs (including forecast). • Peak flow at Moggill (excluding Wivenhoe releases) estimated at 670 cumecs (excluding forecast) 1060 cumecs (including forecast).	**Strategy W1C** **(Lake Level greater than 68.00, maximum release 1900 cumecs)** • 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 LEVELS**	**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 3500 cumecs)**
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 exceesd 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 cumecs and 800 cumecs respectively, whereas the release rate from the dam was already 940 cumecs. 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 1271 cumecs. All rural bridges below the dam with the exception of the Mt Crosby Weir Bridge and Fernvale Bridge are flooded.	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. Total rainfall since event commencement (including the current period): Wivenhoe 92mm; Somerset 95mm; Lockyer 72mm; Bremer 72mm.	• Catchment average rainfalls over this period were: o Wivenhoe 3mm; o Somerset 5mm; o Lockyer 1mm; o Bremer 1mm. • Forecast rainfall is 40mm in the next 24 hours. • Wivenhoe Lake level forecast to peak at 68.7 (excluding forecast) 69.1 (including forecast). • Somerset Lake level forecast to peak at 100.5 (excluding forecast) 100.6 (including forecast). • Total dam inflow volume forecast is 420,000ML (excluding forecast) 662,000ML (including forecast). • Peak flow at Lowood (excluding Wivenhoe releases) estimated at 530 cumecs (excluding forecast) 530 cumecs (including forecast). • Peak flow at Moggill (excluding Wivenhoe releases) estimated at 800 cumecs (excluding forecast) 950 cumecs (including forecast).	• Inflows from Lockyer Creek into the Brisbane River have been sufficient to inundate all bridges downstream of the dam with the exception of the Mt Crosby Weir Bridge and Fernvale Bridge. • Transition from Strategy W1 to Strategy W3 once it becomes apparent that the Wivenhoe Dam level is likely to exceed 68.5 and Strategy W2 cannot be applied. • Initial consideration for Strategy W3 on minimizing disruption to downstream rural life and endeavoring to maintain Mt Crosby Weir Bridge and Fernvale Bridge trafficable. This emphasis would be changed if further significant rainfall is experienced. • Strategy W3 requires the flow at Moggill to be minimized prior to the naturally occurring peak at Moggill. However this requirement was ignored as it would has resulted in a reduction in Wivenhoe Dam outflows. • Due to rainfall on the ground, it was apparent that the Somerset Dam level would significantly exceed 100.45. Accordingly two sluice gates were opened during this period to allow dam levels to move towards the Wivenhoe/Somerset Operations Target Line in accordance with Strategy S2.

JANUARY 2011 FLOOD EVENT - PERIOD 5 OF 20				
DATE/TIME	**BACKGROUND**	**DAM LEVELS**	**RAINFALL AND MODEL RESULTS**	**STRATEGY**
	Strategy W3 and Strategy S2			**Strategy W3 and Strategy S2 (Lake Level greater than 68.50, maximum release 3500 cumecs)**
Commenced Saturday 08 Jan 2011 14:00 Completed Sunday 09 Jan 2011 01:00	• Releases maintained from both dams to maintain Mt Crosby Weir Bridge and Fernvale Bridge trafficable. • No change to gate settings over this period. Wivenhoe discharge is 1271 cumecs. All rural bridges below the dam with the exception of the Mt Crosby Weir Bridge and Fernvale Bridge are flooded.	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. Total rainfall since event commencement (including the current period): Wivenhoe 100mm; Somerset 111mm; Lockyer 75mm; Bremer 75mm.	• Catchment average rainfalls over this period were: o Wivenhoe 8mm; o Somerset 16mm; o Lockyer 3mm; o Bremer 2mm. • Forecast rainfall is 40mm in the next 24 hours. • Wivenhoe Lake level forecast to peak at 68.8 (excluding forecast) 68.9 (including forecast). • Somerset Lake level forecast to peak at 100.5 (excluding forecast) 100.6 (including forecast). • Total dam inflow volume forecast is 457,000ML (excluding forecast) 697,000ML (including forecast). • Peak flow at Lowood (excluding Wivenhoe releases) estimated at 530 cumecs (excluding forecast) 530 cumecs (including forecast). • Peak flow at Moggill (excluding Wivenhoe releases) estimated at 800 cumecs (excluding forecast) 850 cumecs (including forecast).	• With lake levels rising slightly (Wivenhoe) and falling (Somerset) consideration remains on minimizing disruption to downstream rural life and endeavoring to maintain Mt Crosby Weir Bridge and Fernvale Bridge trafficable. This emphasis would be changed if further significant rainfall is experienced. • Strategy W3 requires the flow at Moggill to be minimized prior to the naturally occurring peak at Moggill. However this requirement was ignored as it would has resulted in a reduction in Wivenhoe Dam outflows. • 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 Operations Target Line requiring sluice re-opening within a short period.

JANUARY 2011 FLOOD EVENT - PERIOD 6 OF 20				
DATE/TIME	**BACKGROUND**	**DAM LEVELS**	**RAINFALL AND MODEL RESULTS**	**STRATEGY**
Commenced Sunday 09 Jan 2011 01:00 Completed Sunday 09 Jan 2011 08:00	**Strategy W2 and Strategy S2 Wivenhoe Directives #5 to #7.** • 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 is increased from 1271 cumecs to 1367 cumecs. • 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.	Wivenhoe Dam level falls from 68.63 to 68.57 over the 7 hour period. Somerset Dam level falls from 100.32 to 100.28 over the 7 hour period. Total rainfall since event commencement (including the current period): Wivenhoe 112mm; Somerset 146mm; Lockyer 76mm; Bremer 75mm.	• Catchment average rainfalls over this period were: o Wivenhoe 12mm; o Somerset 36mm; o Lockyer 1mm; o Bremer 0mm. • Forecast rainfall is 40mm in the next 24 hours. • Wivenhoe Lake level forecast to peak at 68.7 (excluding forecast) 69.3 (including forecast). • Somerset Lake level forecast to peak at 100.5 (excluding forecast) 101.0 (including forecast). • Total dam inflow volume forecast is 569,000ML (excluding forecast) 813,000ML (including forecast). • Peak flow at Lowood (excluding Wivenhoe releases) estimated at 530 cumecs (excluding forecast) 530 cumecs (including forecast). • Peak flow at Moggill (excluding Wivenhoe releases) estimated at 800 cumecs (excluding forecast) 800 cumecs (including forecast).	**Strategy W2 and Strategy S2 (Lake Level greater than 68.50, maximum release 3500 cumecs)** • With lake levels falling at both dams consideration remains on minimizing disruption to downstream rural life and endeavoring to maintain Mt Crosby Weir Bridge and Fernvale Bridge trafficable by limiting combined flows from Wivenhoe Dam and Lockyer Creek to a maximum of 1900 cumecs. This emphasis will change if further significant rainfall is experienced. • 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 Operations Target Line requiring sluice re-opening within a short period, particularly given the rainfall that occurred in the Somerset Dam catchment during this period. • Write about sit rep at 11:00am see Terry's note based on three day outlook.

JANUARY 2011 FLOOD EVENT - PERIOD 7 OF 20				
DATE/TIME	**BACKGROUND**	**DAM LEVELS**	**RAINFALL AND MODEL RESULTS**	**STRATEGY**
Commenced Sunday 09 Jan 2011 08:00 Completed Sunday 09 Jan 2011 14:00	**Strategy W2 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 is increased from 1367 cumecs to 1420 cumecs. • Somerset Dam sluice gates opened progressively over this period to allow dam levels to move towards the Wivenhoe/Somerset Operations 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.	Wivenhoe Dam level rises very slightly from 68.57 to 68.58 over the 6 hour period. Somerset Dam level rises from 100.28 to 100.47 over the 4 hour period. Total rainfall since event commencement (including the current period): Wivenhoe 146mm; Somerset 199mm; Lockyer 94mm; Bremer 90mm.	• Catchment average rainfalls over this period were: o Wivenhoe 34mm; o Somerset 53mm; o Lockyer 18mm; o Bremer 15mm. • Forecast rainfall is 50mm in the next 24 hours. • Wivenhoe Lake level forecast to peak at 70.0 (excluding forecast) 71.3 (including forecast). • Somerset Lake level forecast to peak at 100.7 (excluding forecast) 101.1 (including forecast). • Total dam inflow volume forecast is 804,000ML (excluding forecast) 1,109,000ML (including forecast). • Peak flow at Lowood (excluding Wivenhoe releases) estimated at 530 cumecs (excluding forecast) 690 cumecs (including forecast). • Peak flow at Moggill (excluding Wivenhoe releases) estimated at 800 cumecs (excluding forecast) 1230 cumecs (including forecast).	**Strategy W2 and Strategy S2 (Lake Level greater than 68.50, maximum release 3500 cumecs)** • With lake levels rising at both dams and heavy rain being experienced in the dam catchments, consideration was given to transitioning the primary consideration from minimizing disruption to downstream rural life to protecting urban areas from inundation. However during this period, consideration remained on minimizing disruption to downstream rural life and endeavoring to maintain Mt Crosby Weir Bridge and Fernvale Bridge trafficable by limiting combined flows from Wivenhoe Dam and Lockyer Creek to a maximum of 1900 cumecs. • With dam levels under the Wivenhoe/Somerset Operations Target Line at the end of this period, releases continued from Somerset Dam. • Model results showing rapid rises in water level in the Dams provide justification to consider transitioning to Strategy W3 within the next 6 hours.

JANUARY 2011 FLOOD EVENT - PERIOD 8 OF 20				
DATE/TIME	**BACKGROUND**	**DAM LEVELS**	**RAINFALL AND MODEL RESULTS**	**STRATEGY**
	Transition from Strategy W2 to Strategy W3; and Strategy S2			**Strategy W2 and Strategy S2 (Lake Level greater than 68.50, maximum release 3500 cumecs)**
Commenced Sunday 09 Jan 2011 14:00 Completed Sunday 09 Jan 2011 19:00	• Releases maintained from both dams to maintain Mt Crosby Weir Bridge and Fernvale Bridge trafficable. • No change to gate settings over this period. Wivenhoe discharge is 1436 cumecs. All rural bridges below the dam with the exception of the Mt Crosby Weir Bridge and Fernvale Bridge are flooded. • Due to rainfall on the ground and the rapid lake level rises, a decision is made to transition to Strategy W3 at 19:00.	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. Total rainfall since event commencement (including the current period): Wivenhoe 208mm; Somerset 305mm; Lockyer 116mm; Bremer 96mm.	• Catchment average rainfalls over this period were: o Wivenhoe 62mm; o Somerset 106mm; o Lockyer 22mm; o Bremer 6mm. • Forecast rainfall is 65mm in the next 24 hours. • Wivenhoe Lake level forecast to peak at 72.1 (excluding forecast) 73.9 (including forecast). • Somerset Lake level forecast to peak at 102.3 (excluding forecast) 103.0 (including forecast). • Total dam inflow volume forecast is 1,273,000ML (excluding forecast) 1,712,000ML (including forecast). • Peak flow at Lowood (excluding Wivenhoe releases) estimated at 530 cumecs (excluding forecast) 1250 cumecs (including forecast). • Peak flow at Moggill (excluding Wivenhoe releases) estimated at 800 cumecs (excluding forecast) 1970 cumecs (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 to transition the primary consideration from minimizing disruption to downstream rural life to protecting urban areas from inundation. However during this period, consideration remained on minimizing disruption to downstream rural life and endeavoring to maintain Mt Crosby Weir Bridge and Fernvale Bridge trafficable by limiting combined flows from Wivenhoe Dam and Lockyer Creek to a maximum of 1900 cumecs. • With dam levels under the Wivenhoe/Somerset Operations Target Line during this period, releases continued from Somerset Dam. • Decision is made to transition to Strategy W3 at 19:00.

JANUARY 2011 FLOOD EVENT - PERIOD 9 OF 20				
DATE/TIME	**BACKGROUND**	**DAM LEVELS**	**RAINFALL AND MODEL RESULTS**	**STRATEGY**
	Strategy W3 and Strategy S2			**Strategy W3 and Strategy S2 (Lake Level greater than 68.50, maximum release 4000 cumecs)**
Commenced Sunday 09 Jan 2011 19:00 Completed Monday 10 Jan 2011 01:00	• Council and Agency notifications commenced at 7:00pm. • 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 some time to prepare for the isolation of rural communities and to undertake evacuations. Wivenhoe discharge is 1436 cumecs. All rural bridges below the dam with the exception of the Mt Crosby Weir Bridge and Fernvale Bridge are flooded.	Wivenhoe Dam level rises from 68.97 to 69.97 over the 6 hour period. Somerset Dam level rises from 101.43 to 102.51 over the 6 hour period. Total rainfall since event commencement (including the current period): Wivenhoe 232mm; Somerset 343mm; Lockyer 131mm; Bremer 102mm.	• Catchment average rainfalls over this period were: o Wivenhoe 24mm; o Somerset 38mm; o Lockyer 14mm; o Bremer 6mm. • Forecast rainfall is 65mm in the next 24 hours. • Wivenhoe Lake level forecast to peak at 72.9 (excluding forecast) 74.7 (including forecast). • Somerset Lake level forecast to peak at 102.9 (excluding forecast) 103.4 (including forecast). • Total dam inflow volume forecast is 1,468,000ML (excluding forecast) 1,922,000ML (including forecast). • Peak flow at Lowood (excluding Wivenhoe releases) estimated at 620 cumecs (excluding forecast) 1290 cumecs (including forecast). • Peak flow at Moggill (excluding Wivenhoe releases) estimated at 840 cumecs (excluding forecast) 2030 cumecs (including forecast).	• Consideration on protecting urban areas from inundation. • Before releases are increased towards 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 increased releases will result in the isolation of significant rural communities and result in the closure of both the Brisbane Valley Highway and the D'Aguilar Highway. • With dam levels under the Wivenhoe/Somerset Operations 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 serious 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 LEVELS**	**RAINFALL AND MODEL RESULTS**	**STRATEGY**
Commenced Monday 10 Jan 2011 01:00 Completed Monday 10 Jan 2011 09:00	**Strategy W3 and Strategy S2 Wivenhoe Directives #8 to #10.** • Gates opened continuously at Wivenhoe Dam for 8 hours in accordance with the standard gate opening sequence at a rate or 0.5 metres of opening per hour. • Wivenhoe discharge is increased from 1484 cumecs to 2030 cumecs. 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 Brisbane and to restrict Brisbane River flows at Moggill to 3500 cumecs. This was done following advice from the Brisbane City Council that 3500 cumecs at Moggill will 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 Operations 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.	Wivenhoe Dam level rises from 69.97 to 71.56 over the 8 hour period. Somerset Dam level rises from 102.51 to 103.08 over the 8 hour period. Total rainfall since event commencement (including the current period): Wivenhoe 244mm; Somerset 373mm; Lockyer 143mm; Bremer 120mm.	• Catchment average rainfalls over this period were: o Wivenhoe 12mm; o Somerset 30mm; o Lockyer 12mm; o Bremer 18mm. • Forecast rainfall is 65mm in the next 24 hours. • Wivenhoe Lake level forecast to peak at 72.9 (excluding forecast) 74.5 (including forecast). • Somerset Lake level forecast to peak at 103.1 (excluding forecast) 103.5 (including forecast). • Total dam inflow volume forecast is 1,531,000ML (excluding forecast) 2,064,000ML (including forecast). • Peak flow at Lowood (excluding Wivenhoe releases) estimated at 630 cumecs (excluding forecast) 1220 cumecs (including forecast). • Peak flow at Moggill (excluding Wivenhoe releases) estimated at 1100 cumecs (excluding forecast) 2140 cumecs (including forecast).	**Strategy W3 and Strategy S2 (Lake Level greater than 68.50, maximum release 4000 cumecs)** • Consideration on protecting urban areas from inundation. • Due to advice received from the Brisbane City Council that the limit of non-damaging floods is a flow of 3500 cumecs at Moggill, an attempt is made to remain within this flow (see spreadsheet associated with Model Run 41). • This strategy is consistent with the Manual directive that requires the flow at Moggill to be minimized prior to the naturally occurring peak at Moggill (excluding Wivenhoe Dam releases) being experienced. • With dam levels under the Wivenhoe/Somerset Operations 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 serious 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 LEVELS**	**RAINFALL AND MODEL RESULTS**	**STRATEGY**
	Strategy W3 and Strategy S2			**Strategy W3 and Strategy S2 (Lake Level greater than 68.50, maximum release 4000 cumecs)**
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 2099 cumecs. All rural bridges below the dam are flooded. • At 15:00 the attempt to restrict Brisbane River flows at Moggill to 3500 cumecs was abandoned due to the rainfall being experienced in the dam catchments. A new target of 4000 cumecs was set in accordance with the Manual. • No gate movements occurred at Somerset Dam during this period, with dam levels plotting under the Wivenhoe/Somerset Operations 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.	Wivenhoe Dam level rises from 71.56 to 72.53 over the 6 hour period. Somerset Dam level rises from 103.08 to 103.43 over the 6 hour period. Total rainfall since event commencement (including the current period): Wivenhoe 274mm; Somerset 407mm; Lockyer 169mm; Bremer 149mm.	• Catchment average rainfalls over this period were: o Wivenhoe 34mm; o Somerset 31mm; o Lockyer 27mm; o Bremer 30mm. • Forecast rainfall is 75mm in the next 24 hours. • Wivenhoe Lake level forecast to peak at 73.6 (excluding forecast) 75.2 (including forecast). • Somerset Lake level forecast to peak at 103.4 (excluding forecast) 103.7 (including forecast). • Total dam inflow volume forecast is 1,708,000ML (excluding forecast) 2,161,000ML (including forecast). • Peak flow at Lowood (excluding Wivenhoe releases) estimated at 780 cumecs (excluding forecast) 1590 cumecs (including forecast). • Peak flow at Moggill (excluding Wivenhoe releases) estimated at 1480 cumecs (excluding forecast) 2630 cumecs (including forecast).	• Consideration on protecting urban areas from inundation. • A decision is made at 15:00 to attempt to remain within a target flow of around 4000 cumecs at Moggill (see spreadsheet associated with Model Run 43). • This strategy is consistent with the Manual directive that requires the flow at Moggill to be minimized prior to the naturally occurring peak at Moggill (excluding Wivenhoe Dam releases) being experienced. • With dam levels under the Wivenhoe/Somerset Operations 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 serious 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 LEVELS**	**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 cumecs)**
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. • Wivenhoe discharge is increased from 2099 cumecs to 2707 cumecs. All rural bridges below the dam are flooded. • Further gate openings at Wivenhoe Dam were paused at 20:00 in an attempt to allow the Lockyer and Bremer peaks to pass Brisbane and to restrict Brisbane River flows at Moggill to 4000 cumecs. • No gate movements occurred at Somerset Dam during this period, with dam levels plotting under the Wivenhoe/Somerset Operations 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.	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. Total rainfall since event commencement (including the current period): Wivenhoe 279mm; Somerset 415mm; Lockyer 174mm; Bremer 153mm.	• Catchment average rainfalls over this period were: o Wivenhoe 4mm; o Somerset 8mm; o Lockyer 5mm; o Bremer 3mm. • Forecast rainfall is 38mm in the next 24 hours, with isolated falls to 100mm. • Wivenhoe Lake level forecast to peak at 73.6 (excluding forecast) 74.3 (including forecast). • Somerset Lake level forecast to peak at 103.5 (excluding forecast) 103.5 (including forecast). • Total dam inflow volume forecast is 1,731,000ML (excluding forecast) 1,982,000ML (including forecast). • Peak flow at Lowood (excluding Wivenhoe releases) estimated at 780 cumecs (excluding forecast) 1070 cumecs (including forecast). • Peak flow at Moggill (excluding Wivenhoe releases) estimated at 1480 cumecs (excluding forecast) 1930 cumecs (including forecast).	• Consideration on protecting urban areas from inundation. • A decision is made at 15:00 to attempt to remain within a target maximum flow of around 4000 cumecs at Moggill (see spreadsheet associated with Model Run 24). • This strategy is consistent with the Manual directive that requires the flow at Moggill to be minimized prior to the naturally occurring peak at Moggill (excluding Wivenhoe Dam releases) being experienced. • With dam levels under the Wivenhoe/Somerset Operations 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 serious 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 LEVELS**	**RAINFALL AND MODEL RESULTS**	**STRATEGY**
	Strategy W3 and Strategy S2			**Strategy W3 and Strategy S2 (Lake Level greater than 68.50, maximum release 4000 cumecs)**
Commenced Monday 10 Jan 2011 20:00 Completed Tuesday 11 Jan 2011 04:00	• No change to gate settings occurred at Wivenhoe Dam over this period. Wivenhoe discharge is 2752 cumecs. All rural bridges below the dam are flooded. • Gate openings at Wivenhoe Dam were paused at 20:00 in an attempt to allow the initial Lockyer and Bremer peaks to pass Brisbane and to restrict Brisbane River flows at Moggill to close to 4000 cumecs. • Initial advice on a flash flood originating in Lockyer headwaters received at 20:00 and considerations undertaken during this period to develop a strategy to manage these potential flows. Strategies would involve reducing outflows from Wivenhoe until the peak of this flash flood passed. • During this period the plotted dam levels drifted just above the Wivenhoe/Somerset Operations Target Line. This lead to a decision at 04:00 to commence closing down releases from Somerset Dam to limit further rises in Wivenhoe. This decision is consistent with Strategy S2.	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. Total rainfall since event commencement (including the current period): Wivenhoe 323mm; Somerset 437mm; Lockyer 186mm; Bremer 167mm.	• Catchment average rainfalls over this period were: o Wivenhoe 44mm; o Somerset 22mm; o Lockyer 12mm; o Bremer 14mm. • Forecast rainfall is 38mm in the next 24 hours, with isolated falls to 100mm. • Wivenhoe Lake level forecast to peak at 74.00 (excluding forecast) ??.?? (including forecast). • Somerset Lake level forecast to peak at 103.5 (excluding forecast) ??.?? (including forecast). • Total dam inflow volume forecast is 181000ML (excluding forecast) 226000ML (including forecast). • Peak flow at Lowood (excluding Wivenhoe releases) estimated at ??.?? (excluding forecast) ??.?? (including forecast). • Peak flow at Moggill (excluding Wivenhoe releases) estimated at??.?? (excluding forecast) ??.?? (including forecast).	• Consideration on protecting urban areas from inundation, with the target being a maximum flow of around 4000 cumecs at Moggill (see spreadsheet associated with Model Run 28). • This strategy is consistent with the Manual directive that requires the flow at Moggill to be minimized prior to the naturally occurring peak at Moggill (excluding Wivenhoe Dam releases) being experienced. • Model results show that a peak level in the dam close to 74.0 remains possible, but is appearing increasing unlikely. Reference note to P Allen at 21 on 10/1. • With dam levels moving above the Wivenhoe/Somerset Operations 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 serious 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 14 OF 20				
DATE/TIME	**BACKGROUND**	**DAM LEVELS**	**RAINFALL AND MODEL RESULTS**	**STRATEGY**
	Transition from Strategy W3 to Strategy W4; and Strategy S2 Wivenhoe Directive #12. Somerset Directive #6.			**Strategy W3 and Strategy S2 (Lake Level greater than 68.50, maximum release 4000 cumecs)**
Commenced Tuesday 11 Jan 2011 04:00 Completed Tuesday 11 Jan 2011 08:00	◦ Extreme intense rainfall (IFD curves indicate that this rainfall could have exceeded 1 in 500 year intensities) are experienced on and close to the Wivenhoe Dam lake area during this period. If the centroid of this rainfall was located 50 kms east or south, it is likely that there would not have been a need to 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. • No change to gate settings occurred at Wivenhoe Dam over this period. Wivenhoe discharge is 2832 cumecs. All rural bridges below the dam are flooded. • 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 Operations Target Line. This decision is consistent with Strategy S2.	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. Total rainfall since event commencement (including the current period): Wivenhoe 356mm; Somerset 483mm; Lockyer 240mm; Bremer 183mm.	• 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 is 38mm in the next 24 hours, with isolated falls to 100mm. • Wivenhoe Lake level forecast to peak at 74.5 (excluding forecast) 75.1 (including forecast). • Somerset Lake level forecast to peak at 103.9 (excluding forecast) 104.2 (including forecast). • Total dam inflow volume forecast is 2,210,000ML (excluding forecast) 2,246,000ML (including forecast). • Peak flow at Lowood (excluding Wivenhoe releases) estimated at 1750 cumecs (excluding forecast) 2130 cumecs (including forecast). • Peak flow at Moggill (excluding Wivenhoe releases) estimated at 2360 cumecs (excluding forecast) 3060 cumecs (including forecast).	• Consideration on protecting urban areas from inundation, with the target being a maximum flow of 4000 cumecs at Moggill. • This strategy is consistent with the Manual directive that requires the flow at Moggill to be minimized prior to the naturally occurring peak at Moggill (excluding Wivenhoe Dam releases) being experienced. ◦ 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. • With dam levels moving above the Wivenhoe/Somerset Operations Target Line during this period releases from Somerset Dam are closed down to limit further rises in Wivenhoe. ◦ At 08:00 a decision is made to transition to Strategy W4 and the Dam Safety Regulator (DERM) is advised of this decision. It is now apparent that significant urban damage resulting from releases from Wivenhoe Dam cannot be avoided. • Note here about minimized response time because where the rainfall is falling, normally 24 hours, now only a few hours.

JANUARY 2011 FLOOD EVENT - PERIOD 15 OF 20				
DATE/TIME	**BACKGROUND**	**DAM LEVELS**	**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 (IFD curves indicate greater than 1 in 500 year intensities) continues on and close to the Wivenhoe Dam lake area during this period. If the centroid of this rainfall was located 50 kms east or south, it is likely that there would not have been a need to 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. • The 10:00am situation report warns of the rapidly deteriorating situation. • Gates 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 2832 cumecs to 3992 cumecs. The threshold limit for urban damage has been exceeded. • During this period sluice gate openings at Somerset Dam are closed off to limit rises in Wivenhoe in accordance with Strategy S2.	Wivenhoe Dam level rises from 73.70 to 74.39 over the 5 hour period. Somerset Dam level rises from 103.46 to 103.91 over the 5 hour period. Total rainfall since event commencement (including the current period): Wivenhoe 382mm; Somerset 570mm; Lockyer 287mm; Bremer 237mm.	• 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 is 100mm in the next 24 hours. • Wivenhoe Lake level forecast to peak at 74.9 (excluding forecast) ??.?? (including forecast). • Somerset Lake level forecast to peak at 105.0 (excluding forecast) ??.?? (including forecast). • Total dam inflow volume forecast is 181000ML (excluding forecast) 226000ML (including forecast). • Once Strategy W4 is activated, the peak flows at Lowood and Moggill are no longer relevant to flood release considerations.	• 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 continued to rise at 01:00. 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 Operations Target Line during this period releases from Somerset Dam are stopped to limit further rises in Wivenhoe. • Explain rain stopped, but model results a bit low.

JANUARY 2011 FLOOD EVENT - PERIOD 16 OF 20				
DATE/TIME	**BACKGROUND**	**DAM LEVELS**	**RAINFALL AND MODEL RESULTS**	**STRATEGY**
Commenced Tuesday 11 Jan 2011 13:00 Completed Tuesday 11 Jan 2011 19:00	**Strategy W4 and Strategy S2 Wivenhoe Directive #12 to #14.** • Extreme lake level rises in Wivenhoe Dam continue during this period and a severe weather warning for intense rainfall remains current (issued at 17:00). • Gates opened continuously at Wivenhoe Dam for 6 hours in accordance with the standard gate opening sequence at an average rate of 4.5 metres of opening per hour. • Wivenhoe discharge is increased from 3992 cumecs to 7464 cumecs. Significant damage to urban areas in Brisbane cannot be avoided. • No releases are made from Somerset Dam to limit increases in Wivenhoe Dam in accordance with Strategy S2.	Wivenhoe Dam level rises from 74.39 to 74.97 over the 6 hour period. Somerset Dam level rises from 103.91 to 104.57 over the 6 hour period. Total rainfall since event commencement (including the current period): Wivenhoe 397mm; Somerset 610mm; Lockyer 325mm; Bremer 278mm.	• 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 is 75mm in the next 24 hours (issued at 16:00; actual rain recorded after this time was minimal as shown below) and a severe weather warning for potential intense rainfall in the dam catchments remains current. Catchment average rainfalls for the 24 hour period commencing at 16:00 during this period were: o Wivenhoe 8mm; o Wivenhoe Local 13mm; o Somerset 19mm; o Lockyer 9mm; o Bremer 8mm. • Wivenhoe Lake level forecast to peak at ??.?? (excluding forecast) ??.?? (including forecast). • Somerset Lake level forecast to peak at ??.?? (excluding forecast) ??.?? (including forecast). • Total dam inflow volume forecast is 181000ML (excluding forecast) 226000ML (including forecast). • Once Strategy W4 is activated, the peak flows at Lowood and Moggill are no longer relevant to flood release considerations.	**Strategy W4 and Strategy S2 (Lake Level predicted to exceed 74.00, no maximum release rate)** • 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 continued to rise at 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 Operations 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 18:00 on 11 January 2011. • Explain inflows low but model tweaked to match levels.

JANUARY 2011 FLOOD EVENT - PERIOD 17 OF 20				
DATE/TIME	**BACKGROUND**	**DAM LEVELS**	**RAINFALL AND MODEL RESULTS**	**STRATEGY**
Commenced Tuesday 11 Jan 2011 19:00 Completed Tuesday 11 Jan 2011 21:00	**Strategy W4 and Strategy S2 Wivenhoe Directive #15 to #24.** • The lake level in Wivenhoe dam stabilizes and then falls slightly at 21:00. A severe weather warning for intense rainfall remains current (issued at 17:00), but it appears from the BOM radar that the rainfall may have dissipated. On this basis a decision to commence closing down the gates to reduce urban flood impacts is taken at 21:00. This decision is potentially in contravention with the minimum gate opening settings required under Strategy W4. • No change to gate settings occurred at Wivenhoe Dam over this period. Wivenhoe discharge is 7464 cumecs. All rural bridges below the dam are flooded. Damage to urban areas in Brisbane cannot be avoided. • No releases are made from Somerset Dam in accordance with Strategy S2.	During this 2 hours 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 104.45 to 104.78 over the 2 hour period. Total rainfall since event commencement (including the current period): Wivenhoe 398mm; Somerset 610mm; Lockyer 326mm; Bremer 278mm.	• Catchment average rainfalls over this period were: o Wivenhoe 1mm; o Somerset 1mm; o Lockyer 1mm; o Bremer 1mm. • Forecast rainfall is 75mm in the next 24 hours and a severe weather warning for possible intense rainfall in the catchments remains current. • Wivenhoe Lake level forecast to peak at 74.9 (excluding forecast) 74.9 (including forecast). • Somerset Lake level forecast to peak at 105.1 (excluding forecast) 105.1 (including forecast). • Total dam inflow volume forecast is 181000ML (excluding forecast) 226000ML (including forecast). • Once Strategy W4 is activated, the peak flows at Lowood and Moggill are no longer relevant to flood release considerations.	**Strategy W4 and Strategy S2 (Lake Level predicted to exceed 74.00, no maximum release rate)** • 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 Operations 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 18:00 on 11 January 2011.

JANUARY 2011 FLOOD EVENT - PERIOD 18 OF 20				
DATE/TIME	**BACKGROUND**	**DAM LEVELS**	**RAINFALL AND MODEL RESULTS**	**STRATEGY**
Commenced Tuesday 11 Jan 2011 21:00 Completed Wednesday 12 Jan 2011 08:00	**Strategy W4 and Strategy S2 Wivenhoe Directive #25 to #34.** • 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 severe weather warning for intense rainfall is cancelled at 22:00 and it appears from the BOM radar that the rainfall may have dissipated. The decision to close off the release in this way is potentially in contravention with the minimum gate opening settings required under Strategy W4. • 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 cumecs to 2547 cumecs. All rural bridges below the dam are flooded. Damage to urban areas in Brisbane cannot be avoided. • No releases are made from Somerset Dam in accordance with Strategy S2.	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. Total rainfall since event commencement (including the current period): Wivenhoe 399mm; Somerset 613mm; Lockyer 328mm; Bremer 279mm.	• Catchment average rainfalls over this period were: o Wivenhoe 1mm o Somerset 3mm; o Lockyer 3m; o Bremer 1m. • Forecast rainfall is 10mm in the next 24 hours. • Wivenhoe Lake level forecast to peak at 75.0 (excluding forecast) 75.0 (including forecast). • Somerset Lake level forecast to peak at 105.1 (excluding forecast) 105.1 (including forecast). • Total dam inflow volume forecast is 2,650,000ML (excluding forecast) 2,650,000ML (including forecast). • Once Strategy W4 is activated, the peak flows at Lowood and Moggill are no longer relevant to flood release considerations.	**Strategy W4 and Strategy S2 (Lake Level predicted to exceed 74.00, no maximum release rate)** • 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. • During this period Wivenhoe Dam gates are closed off as quickly as possible without causing rises in lake level. • It was calculated that reducing to a discharge of 2547 cumecs from Wivenhoe Dam will: 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 Operations 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 LEVELS**	**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.** • During this period releases from Wivenhoe Dam are kept constant. These actions are taken to reduce urban flood impacts downstream. The decision to maintain the release in this way is potentially in contravention with the minimum gate opening settings required under Strategy W4. • No change to gate settings occurred at Wivenhoe Dam over this period. Wivenhoe discharge is 2546 cumecs. All rural bridges below the dam are flooded. Damage to urban areas in Brisbane has not been avoided. • Releases commenced from Somerset Dam during this period as the plotted dam levels fell below the Wivenhoe/Somerset Operations 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 Operations 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.	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. Total rainfall since event commencement (including the current period): Wivenhoe 401mm; Somerset 619mm; Lockyer 330mm; Bremer 280mm.	• Catchment average rainfalls over this period were: o Wivenhoe 2mm; o Somerset 6mm; o Lockyer 6mm; o Bremer 6mm. • Forecast rainfall is 10mm in the next 24 hours.	**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 seven 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 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 LEVELS**	**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 and and 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.	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. Total rainfall since event commencement (including the current period): Wivenhoe 415mm; Somerset 626mm; Lockyer 337mm; Bremer 288mm.	• 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 seven 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 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: Tuesday, 1 February 2011 4:31 PM
To: John Tibaldi
Subject: Flood Event Summary - 05.doc
Attachments: @

Attachments:

Flood Event Summary - 05.doc (325 KB)

SUMMARY OF JANUARY 2011 FLOOD EVENT

The following 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 of 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 covered by the table.
- Relevant background information from the period leading up to and during the time period covered by the table.
- Changes in dam levels 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 extreme, 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 exceedance probability 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 calculated to have an annual exceedance probability of between 1 in 500 years and 1 in 1000 years. Although this rainfall was not recorded at a single station, it is calculated to have occurred based on the extreme 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 peak inflow into Wivenhoe Dam experienced during this event has been calculated to be in the order of 50% more that the comparable peak inflow calculated from the January 1974 event.

JANUARY 2011 FLOOD EVENT - PERIOD 1 OF 20				
DATE/TIME	**BACKGROUND**	**DAM LEVELS**	**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 cumecs)**
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 2011were: 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.	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. Total rainfall since event commencement (including the current period): Wivenhoe 53mm; Somerset 44mm; Lockyer 53mm; Bremer 54mm.	• Catchment average rainfalls over this period were: o Wivenhoe 28mm; o Somerset 23mm; o Lockyer 30mm; o Bremer 31mm. • Forecast rainfall is 25mm in the next 24 hours. • Wivenhoe Lake level forecast to peak at 68.2 (excluding forecast) 68.7 (including forecast). • Somerset Lake level forecast to peak at 99.7 (excluding forecast) 100.1 (including forecast). • Total dam inflow volume forecast is 204,000ML (excluding forecast) 425,000ML (including forecast). • Peak flow at Lowood (excluding Wivenhoe releases) estimated at 470 cumecs (excluding forecast) 720 cumecs (including forecast). • Peak flow at Moggill (excluding Wivenhoe releases) estimated at 550 cumecs (excluding forecast) 960 cumecs (including forecast).	• Peak inflows into the Brisbane River from Lockyer are estimated to be in the order of 400 cumecs, 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 cumecs. • Water held in Wivenhoe in an attempt to maintain College's Crossing trafficable in accordance with Strategy W1A. • 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 2 OF 20				
DATE/TIME	**BACKGROUND**	**DAM LEVELS**	**RAINFALL AND MODEL RESULTS**	**STRATEGY**
	Strategy W1B and Strategy S2			**Strategy W1B and Strategy S2 (Lake Level greater than 67.50, maximum release 110 cumecs)**
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.	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. Total rainfall since event commencement (including the current period): Wivenhoe 64mm; Somerset 60mm; Lockyer 57mm; Bremer 60mm.	• Catchment average rainfalls over this period were: o Wivenhoe 11mm; o Somerset 15mm; o Lockyer 4mm; o Bremer 5mm. • Forecast rainfall is 25mm in the next 24 hours. • Wivenhoe Lake level forecast to peak at 68.2 (excluding forecast) 68.5 (including forecast). • Somerset Lake level forecast to peak at 99.7 (excluding forecast) 100.2 (including forecast). • Total dam inflow volume forecast is 242,000ML (excluding forecast) 453,000ML (including forecast). • Peak flow at Lowood (excluding Wivenhoe releases) estimated at 470 cumecs (excluding forecast) 670 cumecs (including forecast). • Peak flow at Moggill (excluding Wivenhoe releases) estimated at 570 cumecs (excluding forecast) 970 cumecs (including forecast).	• Peak inflows into the Brisbane River from Lockyer are estimated to be in the order of 500 cumecs, 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 cumecs. • 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 LEVELS**	**RAINFALL AND MODEL RESULTS**	**STRATEGY**
Commenced Friday 07 Jan 2011 09:00 Completed Friday 07 Jan 2011 15:00	**Strategy W1C and Strategy S2** • 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	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. Total rainfall since event commencement (including the current period): Wivenhoe 89mm; Somerset 90mm; Lockyer 71mm; Bremer 71mm.	• Catchment average rainfalls over this period were: o Wivenhoe 24mm; o Somerset 30mm; o Lockyer 14mm; o Bremer 12mm. • Forecast rainfall is 25mm in the next 24 hours. • Wivenhoe Lake level forecast to peak at 68.4 (excluding forecast) 68.9 (including forecast). • Somerset Lake level forecast to peak at 100.3 (excluding forecast) 100.6 (including forecast). • Total dam inflow volume forecast is 346,000ML (excluding forecast) 542,000ML (including forecast). • Peak flow at Lowood (excluding Wivenhoe releases) estimated at 530 cumecs (excluding forecast) 710 cumecs (including forecast). • Peak flow at Moggill (excluding Wivenhoe releases) estimated at 660 cumecs (excluding forecast) 1040 cumecs (including forecast).	**Strategy W1C** **(Lake Level greater than 68.00, maximum release 1900 cumecs)** • 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 LEVELS**	**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 3500 cumecs)**
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 exceesd 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 cumecs and 800 cumecs respectively, whereas the release rate from the dam was already 940 cumecs. 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 cumecs. All rural bridges below the dam with the exception of the Mt Crosby Weir Bridge and Fernvale Bridge are flooded.	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. Total rainfall since event commencement (including the current period): Wivenhoe 92mm; Somerset 95mm; Lockyer 72mm; Bremer 72mm.	• Catchment average rainfalls over this period were: o Wivenhoe 3mm; o Somerset 5mm; o Lockyer 1mm; o Bremer 1mm. • Forecast rainfall is 40mm in the next 24 hours. • Wivenhoe Lake level forecast to peak at 68.7 (excluding forecast) 69.1 (including forecast). • Somerset Lake level forecast to peak at 100.5 (excluding forecast) 100.6 (including forecast). • Total dam inflow volume forecast is 420,000ML (excluding forecast) 675,000ML (including forecast). • Peak flow at Lowood (excluding Wivenhoe releases) estimated at 530 cumecs (excluding forecast) 530 cumecs (including forecast). • Peak flow at Moggill (excluding Wivenhoe releases) estimated at 770 cumecs (excluding forecast) 940 cumecs (including forecast). This peak was calculated to already have occurred at 05:00 on 8 January 2011. • Predicted peak Wivenhoe Dam outflow was 1480 cumecs (excluding forecast) 1540 cumecs (including forecast). This 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 cumecs 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 Operations Target Line in accordance with Strategy S2.

JANUARY 2011 FLOOD EVENT - PERIOD 5 OF 20				
DATE/TIME	**BACKGROUND**	**DAM LEVELS**	**RAINFALL AND MODEL RESULTS**	**STRATEGY**
	Strategy W3 and Strategy S2			**Strategy W3 and Strategy S2 (Lake Level greater than 68.50, maximum release 3500 cumecs)**
Commenced Saturday 08 Jan 2011 14:00 Completed Sunday 09 Jan 2011 01:00	• Releases maintained from both dams to maintain Mt Crosby Weir Bridge and Fernvale Bridge trafficable. • No change to gate settings over this period. Wivenhoe discharge is 1240 cumecs. All rural bridges below the dam with the exception of the Mt Crosby Weir Bridge and Fernvale Bridge are flooded.	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. Total rainfall since event commencement (including the current period): Wivenhoe 100mm; Somerset 111mm; Lockyer 75mm; Bremer 75mm.	• Catchment average rainfalls over this period were: o Wivenhoe 8mm; o Somerset 16mm; o Lockyer 3mm; o Bremer 2mm. • Forecast rainfall is 40mm in the next 24 hours. • Wivenhoe Lake level forecast to peak at 68.7 (excluding forecast) 68.9 (including forecast). • Somerset Lake level forecast to peak at 100.5 (excluding forecast) 100.6 (including forecast). • Total dam inflow volume forecast is 457,000ML (excluding forecast) 693,000ML (including forecast). • Peak flow at Lowood (excluding Wivenhoe releases) estimated at 530 cumecs (excluding forecast) 530 cumecs (including forecast). • Peak flow at Moggill (excluding Wivenhoe releases) estimated at 770 cumecs (excluding forecast) 840 cumecs (including forecast). This peak was calculated to already have occurred at 05:00 on 8 January 2011. • Predicted peak Wivenhoe Dam outflow was 1480 cumecs (excluding forecast) 1520 cumecs (including forecast). This is significantly greater than the calculated natural peak that excluded Wivenhoe releases.	• Strategy W3 requires the flow at Moggill to be lowered to 4000 cumecs 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 Operations Target Line requiring sluice re-opening within a short period.

JANUARY 2011 FLOOD EVENT - PERIOD 6 OF 20				
DATE/TIME	**BACKGROUND**	**DAM LEVELS**	**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 3500 cumecs)**
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 cumecs to 1334 cumecs. • 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.	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. Total rainfall since event commencement (including the current period): Wivenhoe 112mm; Somerset 146mm; Lockyer 76mm; Bremer 75mm.	• Catchment average rainfalls over this period were: o Wivenhoe 12mm; o Somerset 36mm; o Lockyer 1mm; o Bremer 0mm. • Forecast rainfall is 40mm in the next 24 hours. • Wivenhoe Lake level forecast to peak at 68.7 (excluding forecast) 69.3 (including forecast). • Somerset Lake level forecast to peak at 100.5 (excluding forecast) 101.0 (including forecast). • Total dam inflow volume forecast is 569,000ML (excluding forecast) 765,000ML (including forecast). • Peak flow at Lowood (excluding Wivenhoe releases) estimated at 530 cumecs (excluding forecast) 530 cumecs (including forecast). • Peak flow at Moggill (excluding Wivenhoe releases) estimated at 770 cumecs (excluding forecast) 780 cumecs (including forecast). This peak was calculated to already have occurred at 05:00 on 8 January 2011. • Predicted peak Wivenhoe Dam outflow was 1500 cumecs (excluding forecast) 1550 cumecs (including forecast). This is significantly greater than the calculated natural peak that excluded Wivenhoe releases.	• Strategy W3 requires the flow at Moggill to be lowered to 4000 cumecs 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 Operations 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 LEVELS**	**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 cumecs to 1386 cumecs. • Somerset Dam sluice gates opened progressively over this period to allow dam levels to move towards the Wivenhoe/Somerset Operations 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.	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. Total rainfall since event commencement (including the current period): Wivenhoe 146mm; Somerset 199mm; Lockyer 94mm; Bremer 90mm.	• Catchment average rainfalls over this period were: o Wivenhoe 34mm; o Somerset 53mm; o Lockyer 18mm; o Bremer 15mm. • Forecast rainfall is 50mm in the next 24 hours. • Wivenhoe Lake level forecast to peak at 70.0 (excluding forecast) 71.3 (including forecast). • Somerset Lake level forecast to peak at 100.7 (excluding forecast) 101.1 (including forecast). • Total dam inflow volume forecast is 804,000ML (excluding forecast) 1,035,000ML (including forecast). • Peak flow at Lowood (excluding Wivenhoe releases) estimated at 530 cumecs (excluding forecast) 690 cumecs (including forecast). • Peak flow at Moggill (excluding Wivenhoe releases) estimated at 770 cumecs (excluding forecast) 1210 cumecs (including forecast). This peak was calculated to already have occurred at 05:00 on 8 January 2011. • Predicted peak Wivenhoe Dam outflow was 1490 cumecs (excluding forecast) 1560 cumecs (including forecast). This 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 3500 cumecs)** • 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 interactive Model, a three day assessment shows 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 Operations 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 LEVELS**	**RAINFALL AND MODEL RESULTS**	**STRATEGY**
	Strategy W3 and Strategy S2			**Strategy W3 and Strategy S2 (Lake Level greater than 68.50, maximum release 3500 cumecs)**
Commenced Sunday 09 Jan 2011 14:00 Completed Sunday 09 Jan 2011 19:00	• Releases continued from both dams at a level that maintained Mt Crosby Weir Bridge and Fernvale Bridge trafficable. • No change to gate settings over this period. Wivenhoe discharge is 1411 cumecs. All rural bridges below the dam with the exception of the Mt Crosby Weir Bridge and Fernvale Bridge are flooded. • Due to rainfall on the ground and the rapid lake level rises, a decision is made to transition to focus on protecting urban areas from inundation at 19:00.	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. Total rainfall since event commencement (including the current period): Wivenhoe 208mm; Somerset 305mm; Lockyer 116mm; Bremer 96mm.	• Catchment average rainfalls over this period were: o Wivenhoe 62mm; o Somerset 106mm; o Lockyer 22mm; o Bremer 6mm. • Forecast rainfall is 65mm in the next 24 hours. • Wivenhoe Lake level forecast to peak at 72.1 (excluding forecast) 73.9 (including forecast). • Somerset Lake level forecast to peak at 102.3 (excluding forecast) 103.0 (including forecast). • Total dam inflow volume forecast is 1,272,000ML (excluding forecast) 1,564,000ML (including forecast). • Peak flow at Moggill (excluding Wivenhoe releases) estimated at 770 cumecs (excluding forecast) 1940 cumecs (including forecast). This peak was calculated to already have occurred at 05:00 on 8 January 2011. • Peak flow at Moggill (including Wivenhoe releases) estimated at 3300 cumecs (excluding forecast) 4400 cumecs (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 also starting to become 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 near 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 Brisbane for river flows approaching 3500 cumecs. • With dam levels under the Wivenhoe/Somerset Operations Target Line during this period, releases continued from Somerset Dam.

JANUARY 2011 FLOOD EVENT - PERIOD 9 OF 20				
DATE/TIME	**BACKGROUND**	**DAM LEVELS**	**RAINFALL AND MODEL RESULTS**	**STRATEGY**
	Strategy W3 and Strategy S2			**Strategy W3 and Strategy S2 (Lake Level greater than 68.50, maximum release 4000 cumecs)**
Commenced Sunday 09 Jan 2011 19:00 Completed Monday 10 Jan 2011 01:00	• Council and Agency notifications commenced at 7:00pm. • 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 some time to prepare for the isolation of rural communities and to undertake any necessary evacuations. Wivenhoe discharge is 1436 cumecs. All rural bridges below the dam with the exception of the Mt Crosby Weir Bridge and Fernvale Bridge are flooded.	Wivenhoe Dam level rises from 68.97 to 69.97 over the 6 hour period. Somerset Dam level rises from 101.43 to 102.51 over the 6 hour period. Total rainfall since event commencement (including the current period): Wivenhoe 232mm; Somerset 343mm; Lockyer 131mm; Bremer 102mm.	• Catchment average rainfalls over this period were: o Wivenhoe 24mm; o Somerset 38mm; o Lockyer 14mm; o Bremer 6mm. • Forecast rainfall is 65mm in the next 24 hours. • Wivenhoe Lake level forecast to peak at 72.9 (excluding forecast) 74.7 (including forecast). • Somerset Lake level forecast to peak at 102.9 (excluding forecast) 103.4 (including forecast). • Total dam inflow volume forecast is 1,468,000ML (excluding forecast) 1,922,000ML (including forecast). • Peak flow at Lowood (excluding Wivenhoe releases) estimated at 620 cumecs (excluding forecast) 1290 cumecs (including forecast). • Peak flow at Moggill (excluding Wivenhoe releases) estimated at 840 cumecs (excluding forecast) 2030 cumecs (including forecast).	• Consideration on protecting urban areas from inundation. • Before releases are increased towards 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 increased releases will result in the isolation of significant rural communities and result in the closure of both the Brisbane Valley Highway and the D'Aguilar Highway. • With dam levels under the Wivenhoe/Somerset Operations 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 serious 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 LEVELS**	**RAINFALL AND MODEL RESULTS**	**STRATEGY**
Commenced Monday 10 Jan 2011 01:00 Completed Monday 10 Jan 2011 09:00	**Strategy W3 and Strategy S2 Wivenhoe Directives #8 to #10.** • Gates opened continuously at Wivenhoe Dam for 8 hours in accordance with the standard gate opening sequence at a rate or 0.5 metres of opening per hour. • Wivenhoe discharge is increased from 1484 cumecs to 2030 cumecs. 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 Brisbane and to restrict Brisbane River flows at Moggill to 3500 cumecs. This was done following advice from the Brisbane City Council that 3500 cumecs at Moggill will 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 Operations 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.	Wivenhoe Dam level rises from 69.97 to 71.56 over the 8 hour period. Somerset Dam level rises from 102.51 to 103.08 over the 8 hour period. Total rainfall since event commencement (including the current period): Wivenhoe 244mm; Somerset 373mm; Lockyer 143mm; Bremer 120mm.	• Catchment average rainfalls over this period were: o Wivenhoe 12mm; o Somerset 30mm; o Lockyer 12mm; o Bremer 18mm. • Forecast rainfall is 65mm in the next 24 hours. • Wivenhoe Lake level forecast to peak at 72.9 (excluding forecast) 74.5 (including forecast). • Somerset Lake level forecast to peak at 103.1 (excluding forecast) 103.5 (including forecast). • Total dam inflow volume forecast is 1,531,000ML (excluding forecast) 2,064,000ML (including forecast). • Peak flow at Lowood (excluding Wivenhoe releases) estimated at 630 cumecs (excluding forecast) 1220 cumecs (including forecast). • Peak flow at Moggill (excluding Wivenhoe releases) estimated at 1100 cumecs (excluding forecast) 2140 cumecs (including forecast).	**Strategy W3 and Strategy S2 (Lake Level greater than 68.50, maximum release 4000 cumecs)** • Consideration on protecting urban areas from inundation. • Due to advice received from the Brisbane City Council that the limit of non-damaging floods is a flow of 3500 cumecs at Moggill, an attempt is made to remain within this flow (see spreadsheet associated with Model Run 41). • This strategy is consistent with the Manual directive that requires the flow at Moggill to be minimized prior to the naturally occurring peak at Moggill (excluding Wivenhoe Dam releases) being experienced. • With dam levels under the Wivenhoe/Somerset Operations 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 serious 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 LEVELS**	**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 2099 cumecs. All rural bridges below the dam are flooded. • At 15:00 the attempt to restrict Brisbane River flows at Moggill to 3500 cumecs was abandoned due to the rainfall being experienced in the dam catchments. A new target of 4000 cumecs was set in accordance with the Manual. • No gate movements occurred at Somerset Dam during this period, with dam levels plotting under the Wivenhoe/Somerset Operations 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.	Wivenhoe Dam level rises from 71.56 to 72.53 over the 6 hour period. Somerset Dam level rises from 103.08 to 103.43 over the 6 hour period. Total rainfall since event commencement (including the current period): Wivenhoe 274mm; Somerset 407mm; Lockyer 169mm; Bremer 149mm.	• Catchment average rainfalls over this period were: o Wivenhoe 34mm; o Somerset 31mm; o Lockyer 27mm; o Bremer 30mm. • Forecast rainfall is 75mm in the next 24 hours. • Wivenhoe Lake level forecast to peak at 73.6 (excluding forecast) 75.2 (including forecast). • Somerset Lake level forecast to peak at 103.4 (excluding forecast) 103.7 (including forecast). • Total dam inflow volume forecast is 1,708,000ML (excluding forecast) 2,161,000ML (including forecast). • Peak flow at Lowood (excluding Wivenhoe releases) estimated at 780 cumecs (excluding forecast) 1590 cumecs (including forecast). • Peak flow at Moggill (excluding Wivenhoe releases) estimated at 1480 cumecs (excluding forecast) 2630 cumecs (including forecast).	**Strategy W3 and Strategy S2 (Lake Level greater than 68.50, maximum release 4000 cumecs)** • Consideration on protecting urban areas from inundation. • A decision is made at 15:00 to attempt to remain within a target flow of around 4000 cumecs at Moggill (see spreadsheet associated with Model Run 43). • This strategy is consistent with the Manual directive that requires the flow at Moggill to be minimized prior to the naturally occurring peak at Moggill (excluding Wivenhoe Dam releases) being experienced. • With dam levels under the Wivenhoe/Somerset Operations 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 serious 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 LEVELS**	**RAINFALL AND MODEL RESULTS**	**STRATEGY**
Commenced Monday 10 Jan 2011 15:00 Completed Monday 10 Jan 2011 20:00	**Strategy W3 and Strategy S2 Wivenhoe Directive #11.** • 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. • Wivenhoe discharge is increased from 2099 cumecs to 2707 cumecs. All rural bridges below the dam are flooded. • Further gate openings at Wivenhoe Dam were paused at 20:00 in an attempt to allow the Lockyer and Bremer peaks to pass Brisbane and to restrict Brisbane River flows at Moggill to 4000 cumecs. • No gate movements occurred at Somerset Dam during this period, with dam levels plotting under the Wivenhoe/Somerset Operations 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.	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. Total rainfall since event commencement (including the current period): Wivenhoe 279mm; Somerset 415mm; Lockyer 174mm; Bremer 153mm.	• Catchment average rainfalls over this period were: o Wivenhoe 4mm; o Somerset 8mm; o Lockyer 5mm; o Bremer 3mm. • Forecast rainfall is 38mm in the next 24 hours, with isolated falls to 100mm. • Wivenhoe Lake level forecast to peak at 73.6 (excluding forecast) 74.3 (including forecast). • Somerset Lake level forecast to peak at 103.5 (excluding forecast) 103.5 (including forecast). • Total dam inflow volume forecast is 1,731,000ML (excluding forecast) 1,982,000ML (including forecast). • Peak flow at Lowood (excluding Wivenhoe releases) estimated at 780 cumecs (excluding forecast) 1070 cumecs (including forecast). • Peak flow at Moggill (excluding Wivenhoe releases) estimated at 1480 cumecs (excluding forecast) 1930 cumecs (including forecast).	**Strategy W3 and Strategy S2 (Lake Level greater than 68.50, maximum release 4000 cumecs)** • Consideration on protecting urban areas from inundation. • A decision is made at 15:00 to attempt to remain within a target maximum flow of around 4000 cumecs at Moggill (see spreadsheet associated with Model Run 24). • This strategy is consistent with the Manual directive that requires the flow at Moggill to be minimized prior to the naturally occurring peak at Moggill (excluding Wivenhoe Dam releases) being experienced. • With dam levels under the Wivenhoe/Somerset Operations 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 serious 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 LEVELS**	**RAINFALL AND MODEL RESULTS**	**STRATEGY**
Commenced Monday 10 Jan 2011 20:00 Completed Tuesday 11 Jan 2011 04:00	**Strategy W3 and Strategy S2** • No change to gate settings occurred at Wivenhoe Dam over this period. Wivenhoe discharge is 2752 cumecs. All rural bridges below the dam are flooded. • Gate openings at Wivenhoe Dam were paused at 20:00 in an attempt to allow the initial Lockyer and Bremer peaks to pass Brisbane and to restrict Brisbane River flows at Moggill to close to 4000 cumecs. • Initial advice on a flash flood originating in Lockyer headwaters received at 20:00 and considerations undertaken during this period to develop a strategy to manage these potential flows. Strategies would involve reducing outflows from Wivenhoe until the peak of this flash flood passed. • During this period the plotted dam levels drifted just above the Wivenhoe/Somerset Operations Target Line. This lead to a decision at 04:00 to commence closing down releases from Somerset Dam to limit further rises in Wivenhoe. This decision is consistent with Strategy S2.	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. Total rainfall since event commencement (including the current period): Wivenhoe 323mm; Somerset 437mm; Lockyer 186mm; Bremer 167mm.	• Catchment average rainfalls over this period were: o Wivenhoe 44mm; o Somerset 22mm; o Lockyer 12mm; o Bremer 14mm. • Forecast rainfall is 38mm in the next 24 hours, with isolated falls to 100mm. • Wivenhoe Lake level forecast to peak at 74.00 (excluding forecast) ??.?? (including forecast). • Somerset Lake level forecast to peak at 103.5 (excluding forecast) ??.?? (including forecast). • Total dam inflow volume forecast is 181000ML (excluding forecast) 226000ML (including forecast). • Peak flow at Lowood (excluding Wivenhoe releases) estimated at ??.?? (excluding forecast) ??.?? (including forecast). • Peak flow at Moggill (excluding Wivenhoe releases) estimated at??.?? (excluding forecast) ??.?? (including forecast).	**Strategy W3 and Strategy S2 (Lake Level greater than 68.50, maximum release 4000 cumecs)** • Consideration on protecting urban areas from inundation, with the target being a maximum flow of around 4000 cumecs at Moggill (see spreadsheet associated with Model Run 28). • This strategy is consistent with the Manual directive that requires the flow at Moggill to be minimized prior to the naturally occurring peak at Moggill (excluding Wivenhoe Dam releases) being experienced. • Model results show that a peak level in the dam close to 74.0 remains possible, but is appearing increasing unlikely. Reference note to P Allen at 21 on 10/1. • With dam levels moving above the Wivenhoe/Somerset Operations 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 serious 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 14 OF 20				
DATE/TIME	**BACKGROUND**	**DAM LEVELS**	**RAINFALL AND MODEL RESULTS**	**STRATEGY**
Commenced Tuesday 11 Jan 2011 04:00 Completed Tuesday 11 Jan 2011 08:00	**Transition from Strategy W3 to Strategy W4; and Strategy S2 Wivenhoe Directive #12. Somerset Directive #6.** • Extreme intense rainfall (IFD curves indicate that this rainfall could have exceeded 1 in 500 year intensities) are experienced on and close to the Wivenhoe Dam lake area during this period. If the centroid of this rainfall was located 50 kms east or south, it is likely that there would not have been a need to 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. • No change to gate settings occurred at Wivenhoe Dam over this period. Wivenhoe discharge is 2832 cumecs. All rural bridges below the dam are flooded. • 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 Operations Target Line. This decision is consistent with Strategy S2.	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. Total rainfall since event commencement (including the current period): Wivenhoe 356mm; Somerset 483mm; Lockyer 240mm; Bremer 183mm.	• 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 is 38mm in the next 24 hours, with isolated falls to 100mm. • Wivenhoe Lake level forecast to peak at 74.5 (excluding forecast) 75.1 (including forecast). • Somerset Lake level forecast to peak at 103.9 (excluding forecast) 104.2 (including forecast). • Total dam inflow volume forecast is 2,210,000ML (excluding forecast) 2,246,000ML (including forecast). • Peak flow at Lowood (excluding Wivenhoe releases) estimated at 1750 cumecs (excluding forecast) 2130 cumecs (including forecast). • Peak flow at Moggill (excluding Wivenhoe releases) estimated at 2360 cumecs (excluding forecast) 3060 cumecs (including forecast).	**Strategy W3 and Strategy S2 (Lake Level greater than 68.50, maximum release 4000 cumecs)** • Consideration on protecting urban areas from inundation, with the target being a maximum flow of 4000 cumecs at Moggill. • This strategy is consistent with the Manual directive that requires the flow at Moggill to be minimized prior to the naturally occurring peak at Moggill (excluding Wivenhoe Dam releases) being experienced. • 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. • With dam levels moving above the Wivenhoe/Somerset Operations Target Line during this period releases from Somerset Dam are closed down to limit further rises in Wivenhoe. • At 08:00 a decision is made to transition to Strategy W4 and the Dam Safety Regulator (DERM) is advised of this decision. It is now apparent that significant urban damage resulting from releases from Wivenhoe Dam cannot be avoided. • Note here about minimized response time because where the rainfall is falling, normally 24 hours, now only a few hours.

JANUARY 2011 FLOOD EVENT - PERIOD 15 OF 20				
DATE/TIME	**BACKGROUND**	**DAM LEVELS**	**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 (IFD curves indicate greater than 1 in 500 year intensities) continues on and close to the Wivenhoe Dam lake area during this period. If the centroid of this rainfall was located 50 kms east or south, it is likely that there would not have been a need to 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. • The 10:00am situation report warns of the rapidly deteriorating situation. • Gates 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 2832 cumecs to 3992 cumecs. The threshold limit for urban damage has been exceeded. • During this period sluice gate openings at Somerset Dam are closed off to limit rises in Wivenhoe in accordance with Strategy S2.	Wivenhoe Dam level rises from 73.70 to 74.39 over the 5 hour period. Somerset Dam level rises from 103.46 to 103.91 over the 5 hour period. Total rainfall since event commencement (including the current period): Wivenhoe 382mm; Somerset 570mm; Lockyer 287mm; Bremer 237mm.	• 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 is 100mm in the next 24 hours. • Wivenhoe Lake level forecast to peak at 74.9 (excluding forecast) ??.?? (including forecast). • Somerset Lake level forecast to peak at 105.0 (excluding forecast) ??.?? (including forecast). • Total dam inflow volume forecast is 181000ML (excluding forecast) 226000ML (including forecast). • Once Strategy W4 is activated, the peak flows at Lowood and Moggill are no longer relevant to flood release considerations.	• 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 continued to rise at 01:00. 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 Operations Target Line during this period releases from Somerset Dam are stopped to limit further rises in Wivenhoe. • Explain rain stopped, but model results a bit low.

JANUARY 2011 FLOOD EVENT - PERIOD 16 OF 20				
DATE/TIME	**BACKGROUND**	**DAM LEVELS**	**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 and a severe weather warning for intense rainfall remains current (issued at 17:00). • Gates opened continuously at Wivenhoe Dam for 6 hours in accordance with the standard gate opening sequence at an average rate of 4.5 metres of opening per hour. • Wivenhoe discharge is increased from 3992 cumecs to 7464 cumecs. Significant damage to urban areas in Brisbane cannot be avoided. • No releases are made from Somerset Dam to limit increases in Wivenhoe Dam in accordance with Strategy S2.	Wivenhoe Dam level rises from 74.39 to 74.97 over the 6 hour period. Somerset Dam level rises from 103.91 to 104.57 over the 6 hour period. Total rainfall since event commencement (including the current period): Wivenhoe 397mm; Somerset 610mm; Lockyer 325mm; Bremer 278mm.	• 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 is 75mm in the next 24 hours (issued at 16:00; actual rain recorded after this time was minimal as shown below) and a severe weather warning for potential intense rainfall in the dam catchments remains current. Catchment average rainfalls for the 24 hour period commencing at 16:00 during this period were: o Wivenhoe 8mm; o Wivenhoe Local 13mm; o Somerset 19mm; o Lockyer 9mm; o Bremer 8mm. • Wivenhoe Lake level forecast to peak at ??.?? (excluding forecast) ??.?? (including forecast). • Somerset Lake level forecast to peak at ??.?? (excluding forecast) ??.?? (including forecast). • Total dam inflow volume forecast is 181000ML (excluding forecast) 226000ML (including forecast). • Once Strategy W4 is activated, the peak flows at Lowood and Moggill are no longer relevant to flood release considerations.	• 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 continued to rise at 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 Operations 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 18:00 on 11 January 2011. • Explain inflows low but model tweaked to match levels.

JANUARY 2011 FLOOD EVENT - PERIOD 17 OF 20				
DATE/TIME	**BACKGROUND**	**DAM LEVELS**	**RAINFALL AND MODEL RESULTS**	**STRATEGY**
Commenced Tuesday 11 Jan 2011 19:00 Completed Tuesday 11 Jan 2011 21:00	**Strategy W4 and Strategy S2 Wivenhoe Directive #15 to #24.** • The lake level in Wivenhoe dam stabilizes and then falls slightly at 21:00. A severe weather warning for intense rainfall remains current (issued at 17:00), but it appears from the BOM radar that the rainfall may have dissipated. On this basis a decision to commence closing down the gates to reduce urban flood impacts is taken at 21:00. This decision is potentially in contravention with the minimum gate opening settings required under Strategy W4. • No change to gate settings occurred at Wivenhoe Dam over this period. Wivenhoe discharge is 7464 cumecs. All rural bridges below the dam are flooded. Damage to urban areas in Brisbane cannot be avoided. • No releases are made from Somerset Dam in accordance with Strategy S2.	During this 2 hours 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 104.45 to 104.78 over the 2 hour period. Total rainfall since event commencement (including the current period): Wivenhoe 398mm; Somerset 610mm; Lockyer 326mm; Bremer 278mm.	• Catchment average rainfalls over this period were: o Wivenhoe 1mm; o Somerset 1mm; o Lockyer 1mm; o Bremer 1mm. • Forecast rainfall is 75mm in the next 24 hours and a severe weather warning for possible intense rainfall in the catchments remains current. • Wivenhoe Lake level forecast to peak at 74.9 (excluding forecast) 74.9 (including forecast). • Somerset Lake level forecast to peak at 105.1 (excluding forecast) 105.1 (including forecast). • Total dam inflow volume forecast is 181000ML (excluding forecast) 226000ML (including forecast). • Once Strategy W4 is activated, the peak flows at Lowood and Moggill are no longer relevant to flood release considerations.	**Strategy W4 and Strategy S2 (Lake Level predicted to exceed 74.00, no maximum release rate)** • 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 Operations 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 18:00 on 11 January 2011.

JANUARY 2011 FLOOD EVENT - PERIOD 18 OF 20				
DATE/TIME	**BACKGROUND**	**DAM LEVELS**	**RAINFALL AND MODEL RESULTS**	**STRATEGY**
Commenced Tuesday 11 Jan 2011 21:00 Completed Wednesday 12 Jan 2011 08:00	**Strategy W4 and Strategy S2 Wivenhoe Directive #25 to #34.** • 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 severe weather warning for intense rainfall is cancelled at 22:00 and it appears from the BOM radar that the rainfall may have dissipated. The decision to close off the release in this way is potentially in contravention with the minimum gate opening settings required under Strategy W4. • 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 cumecs to 2547 cumecs. All rural bridges below the dam are flooded. Damage to urban areas in Brisbane cannot be avoided. • No releases are made from Somerset Dam in accordance with Strategy S2.	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. Total rainfall since event commencement (including the current period): Wivenhoe 399mm; Somerset 613mm; Lockyer 328mm; Bremer 279mm.	• Catchment average rainfalls over this period were: o Wivenhoe 1mm o Somerset 3mm; o Lockyer 3m; o Bremer 1m. • Forecast rainfall is 10mm in the next 24 hours. • Wivenhoe Lake level forecast to peak at 75.0 (excluding forecast) 75.0 (including forecast). • Somerset Lake level forecast to peak at 105.1 (excluding forecast) 105.1 (including forecast). • Total dam inflow volume forecast is 2,650,000ML (excluding forecast) 2,650,000ML (including forecast). • Once Strategy W4 is activated, the peak flows at Lowood and Moggill are no longer relevant to flood release considerations.	**Strategy W4 and Strategy S2 (Lake Level predicted to exceed 74.00, no maximum release rate)** • 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. • During this period Wivenhoe Dam gates are closed off as quickly as possible without causing rises in lake level. • It was calculated that reducing to a discharge of 2547 cumecs from Wivenhoe Dam will: 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 Operations 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 LEVELS**	**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.** • During this period releases from Wivenhoe Dam are kept constant. These actions are taken to reduce urban flood impacts downstream. The decision to maintain the release in this way is potentially in contravention with the minimum gate opening settings required under Strategy W4. • No change to gate settings occurred at Wivenhoe Dam over this period. Wivenhoe discharge is 2546 cumecs. All rural bridges below the dam are flooded. Damage to urban areas in Brisbane has not been avoided. • Releases commenced from Somerset Dam during this period as the plotted dam levels fell below the Wivenhoe/Somerset Operations 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 Operations 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.	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. Total rainfall since event commencement (including the current period): Wivenhoe 401mm; Somerset 619mm; Lockyer 330mm; Bremer 280mm.	• Catchment average rainfalls over this period were: o Wivenhoe 2mm; o Somerset 6mm; o Lockyer 6mm; o Bremer 6mm. • Forecast rainfall is 10mm in the next 24 hours.	**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 seven 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 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 LEVELS**	**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 and and 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.	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. Total rainfall since event commencement (including the current period): Wivenhoe 415mm; Somerset 626mm; Lockyer 337mm; Bremer 288mm.	• 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 seven 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 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 [dutyse[redacted]
Sent: Wednesday, 2 February 2011 12:47 PM
To: John Tibaldi
Subject: Flood Event Summary - 06.doc
Attachments: @

Attachments:

Flood Event Summary - 06.doc (332 KB)

SUMMARY OF JANUARY 2011 FLOOD EVENT

The following 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 of 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 covered by the table.
- Relevant background information from the period leading up to and during the time period covered by the table.
- Changes in dam levels 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 extreme, 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 exceedance probability 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 calculated to have an annual exceedance probability of between 1 in 500 years and 1 in 1000 years. Although this rainfall was not recorded at a single station, it is calculated to have occurred based on the extreme 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 peak inflow into Wivenhoe Dam experienced during this event has been calculated to be in the order of 50% more that the comparable peak inflow calculated from the January 1974 event.

JANUARY 2011 FLOOD EVENT - PERIOD 1 OF 20				
DATE/TIME	**BACKGROUND**	**DAM LEVELS**	**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 cumecs)**
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 2011were: 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.	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. Total rainfall since event commencement (including the current period): Wivenhoe 53mm; Somerset 44mm; Lockyer 53mm; Bremer 54mm.	• Catchment average rainfalls over this period were: o Wivenhoe 28mm; o Somerset 23mm; o Lockyer 30mm; o Bremer 31mm. • Forecast rainfall is 25mm in the next 24 hours. • Wivenhoe Lake level forecast to peak at 68.2 (excluding forecast) 68.7 (including forecast). • Somerset Lake level forecast to peak at 99.7 (excluding forecast) 100.1 (including forecast). • Total dam inflow volume forecast is 204,000ML (excluding forecast) 425,000ML (including forecast). • Peak flow at Lowood (excluding Wivenhoe releases) estimated at 470 cumecs (excluding forecast) 720 cumecs (including forecast). • Peak flow at Moggill (excluding Wivenhoe releases) estimated at 550 cumecs (excluding forecast) 960 cumecs (including forecast).	• Peak inflows into the Brisbane River from Lockyer are estimated to be in the order of 400 cumecs, 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 cumecs. • Water held in Wivenhoe in an attempt to maintain College's Crossing trafficable in accordance with Strategy W1A. • 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 2 OF 20				
DATE/TIME	**BACKGROUND**	**DAM LEVELS**	**RAINFALL AND MODEL RESULTS**	**STRATEGY**
	Strategy W1B and Strategy S2			**Strategy W1B and Strategy S2 (Lake Level greater than 67.50, maximum release 110 cumecs)**
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.	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. Total rainfall since event commencement (including the current period): Wivenhoe 64mm; Somerset 60mm; Lockyer 57mm; Bremer 60mm.	• Catchment average rainfalls over this period were: o Wivenhoe 11mm; o Somerset 15mm; o Lockyer 4mm; o Bremer 5mm. • Forecast rainfall is 25mm in the next 24 hours. • Wivenhoe Lake level forecast to peak at 68.2 (excluding forecast) 68.5 (including forecast). • Somerset Lake level forecast to peak at 99.7 (excluding forecast) 100.2 (including forecast). • Total dam inflow volume forecast is 242,000ML (excluding forecast) 453,000ML (including forecast). • Peak flow at Lowood (excluding Wivenhoe releases) estimated at 470 cumecs (excluding forecast) 670 cumecs (including forecast). • Peak flow at Moggill (excluding Wivenhoe releases) estimated at 570 cumecs (excluding forecast) 970 cumecs (including forecast).	• Peak inflows into the Brisbane River from Lockyer are estimated to be in the order of 500 cumecs, 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 cumecs. • 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 LEVELS**	**RAINFALL AND MODEL RESULTS**	**STRATEGY**
Commenced Friday 07 Jan 2011 09:00 Completed Friday 07 Jan 2011 15:00	**Strategy W1C and Strategy S2** • 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	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. Total rainfall since event commencement (including the current period): Wivenhoe 89mm; Somerset 90mm; Lockyer 71mm; Bremer 71mm.	• Catchment average rainfalls over this period were: o Wivenhoe 24mm; o Somerset 30mm; o Lockyer 14mm; o Bremer 12mm. • Forecast rainfall is 25mm in the next 24 hours. • Wivenhoe Lake level forecast to peak at 68.4 (excluding forecast) 68.9 (including forecast). • Somerset Lake level forecast to peak at 100.3 (excluding forecast) 100.6 (including forecast). • Total dam inflow volume forecast is 346,000ML (excluding forecast) 542,000ML (including forecast). • Peak flow at Lowood (excluding Wivenhoe releases) estimated at 530 cumecs (excluding forecast) 710 cumecs (including forecast). • Peak flow at Moggill (excluding Wivenhoe releases) estimated at 660 cumecs (excluding forecast) 1040 cumecs (including forecast).	**Strategy W1C** **(Lake Level greater than 68.00, maximum release 1900 cumecs)** • 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 LEVELS**	**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 cumecs)**
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 exceesd 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 cumecs and 800 cumecs respectively, whereas the release rate from the dam was already 940 cumecs. 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 cumecs. All rural bridges below the dam with the exception of the Mt Crosby Weir Bridge and Fernvale Bridge are flooded.	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. Total rainfall since event commencement (including the current period): Wivenhoe 92mm; Somerset 95mm; Lockyer 72mm; Bremer 72mm.	• Catchment average rainfalls over this period were: o Wivenhoe 3mm; o Somerset 5mm; o Lockyer 1mm; o Bremer 1mm. • Forecast rainfall is 40mm in the next 24 hours. • Wivenhoe Lake level forecast to peak at 68.7 (excluding forecast) 69.1 (including forecast). • Somerset Lake level forecast to peak at 100.5 (excluding forecast) 100.6 (including forecast). • Total dam inflow volume forecast is 420,000ML (excluding forecast) 675,000ML (including forecast). • Peak flow at Lowood (excluding Wivenhoe releases) estimated at 530 cumecs (excluding forecast) 530 cumecs (including forecast). • Peak flow at Moggill (excluding Wivenhoe releases) estimated at 770 cumecs (excluding forecast) 940 cumecs (including forecast). This peak was calculated to already have occurred at 05:00 on 8 January 2011. • Predicted peak Wivenhoe Dam outflow was 1480 cumecs (excluding forecast) 1540 cumecs (including forecast). This 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 cumecs 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 Operations Target Line in accordance with Strategy S2.

JANUARY 2011 FLOOD EVENT - PERIOD 5 OF 20				
DATE/TIME	**BACKGROUND**	**DAM LEVELS**	**RAINFALL AND MODEL RESULTS**	**STRATEGY**
	Strategy W3 and Strategy S2			**Strategy W3 and Strategy S2 (Lake Level greater than 68.50, maximum release 4000 cumecs)**
Commenced Saturday 08 Jan 2011 14:00 Completed Sunday 09 Jan 2011 01:00	• Releases maintained from both dams to maintain Mt Crosby Weir Bridge and Fernvale Bridge trafficable. • No change to gate settings over this period. Wivenhoe discharge is 1240 cumecs. All rural bridges below the dam with the exception of the Mt Crosby Weir Bridge and Fernvale Bridge are flooded.	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. Total rainfall since event commencement (including the current period): Wivenhoe 100mm; Somerset 111mm; Lockyer 75mm; Bremer 75mm.	• Catchment average rainfalls over this period were: o Wivenhoe 8mm; o Somerset 16mm; o Lockyer 3mm; o Bremer 2mm. • Forecast rainfall is 40mm in the next 24 hours. • Wivenhoe Lake level forecast to peak at 68.7 (excluding forecast) 68.9 (including forecast). • Somerset Lake level forecast to peak at 100.5 (excluding forecast) 100.6 (including forecast). • Total dam inflow volume forecast is 457,000ML (excluding forecast) 693,000ML (including forecast). • Peak flow at Lowood (excluding Wivenhoe releases) estimated at 530 cumecs (excluding forecast) 530 cumecs (including forecast). • Peak flow at Moggill (excluding Wivenhoe releases) estimated at 770 cumecs (excluding forecast) 840 cumecs (including forecast). This peak was calculated to already have occurred at 05:00 on 8 January 2011. • Predicted peak Wivenhoe Dam outflow was 1480 cumecs (excluding forecast) 1520 cumecs (including forecast). This is significantly greater than the calculated natural peak that excluded Wivenhoe releases.	• Strategy W3 requires the flow at Moggill to be lowered to 4000 cumecs 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 Operations Target Line requiring sluice re-opening within a short period.

JANUARY 2011 FLOOD EVENT - PERIOD 6 OF 20				
DATE/TIME	**BACKGROUND**	**DAM LEVELS**	**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 cumecs)**
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 cumecs to 1334 cumecs. • 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.	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. Total rainfall since event commencement (including the current period): Wivenhoe 112mm; Somerset 146mm; Lockyer 76mm; Bremer 75mm.	• Catchment average rainfalls over this period were: o Wivenhoe 12mm; o Somerset 36mm; o Lockyer 1mm; o Bremer 0mm. • Forecast rainfall is 40mm in the next 24 hours. • Wivenhoe Lake level forecast to peak at 68.7 (excluding forecast) 69.3 (including forecast). • Somerset Lake level forecast to peak at 100.5 (excluding forecast) 101.0 (including forecast). • Total dam inflow volume forecast is 569,000ML (excluding forecast) 765,000ML (including forecast). • Peak flow at Lowood (excluding Wivenhoe releases) estimated at 530 cumecs (excluding forecast) 530 cumecs (including forecast). • Peak flow at Moggill (excluding Wivenhoe releases) estimated at 770 cumecs (excluding forecast) 780 cumecs (including forecast). This peak was calculated to already have occurred at 05:00 on 8 January 2011. • Predicted peak Wivenhoe Dam outflow was 1500 cumecs (excluding forecast) 1550 cumecs (including forecast). This is significantly greater than the calculated natural peak that excluded Wivenhoe releases.	• Strategy W3 requires the flow at Moggill to be lowered to 4000 cumecs 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 Operations 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 LEVELS**	**RAINFALL AND MODEL RESULTS**	**STRATEGY**
	Strategy W3 and Strategy S2 Wivenhoe Directives #7. Somerset Directives #4 to #5.			**Strategy W3 and Strategy S2 (Lake Level greater than 68.50, maximum release 4000 cumecs)**
Commenced Sunday 09 Jan 2011 08:00 Completed Sunday 09 Jan 2011 14:00	• 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 1334 cumecs to 1386 cumecs. • Somerset Dam sluice gates opened progressively over this period to allow dam levels to move towards the Wivenhoe/Somerset Operations 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.	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. Total rainfall since event commencement (including the current period): Wivenhoe 146mm; Somerset 199mm; Lockyer 94mm; Bremer 90mm.	• Catchment average rainfalls over this period were: o Wivenhoe 34mm; o Somerset 53mm; o Lockyer 18mm; o Bremer 15mm. • Forecast rainfall is 50mm in the next 24 hours. • Wivenhoe Lake level forecast to peak at 70.0 (excluding forecast) 71.3 (including forecast). • Somerset Lake level forecast to peak at 100.7 (excluding forecast) 101.1 (including forecast). • Total dam inflow volume forecast is 804,000ML (excluding forecast) 1,035,000ML (including forecast). • Peak flow at Lowood (excluding Wivenhoe releases) estimated at 530 cumecs (excluding forecast) 690 cumecs (including forecast). • Peak flow at Moggill (excluding Wivenhoe releases) estimated at 770 cumecs (excluding forecast) 1210 cumecs (including forecast). This peak was calculated to already have occurred at 05:00 on 8 January 2011. • Predicted peak Wivenhoe Dam outflow was 1490 cumecs (excluding forecast) 1560 cumecs (including forecast). This is significantly greater than the calculated natural peak that excluded Wivenhoe releases.	• 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 interactive Model, a three day assessment shows 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 Operations 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 LEVELS**	**RAINFALL AND MODEL RESULTS**	**STRATEGY**
	Strategy W3 and Strategy S2			**Strategy W3 and Strategy S2 (Lake Level greater than 68.50, maximum release 4000 cumecs)**
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 cumecs. • 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 cumecs would impact properties and commence to cause damage in the urban areas of Brisbane. Damage tables supplied by the Brisbane City Council indicated that at flows of 3000 cumecs, 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.	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. Total rainfall since event commencement (including the current period): Wivenhoe 208mm; Somerset 305mm; Lockyer 116mm; Bremer 96mm.	• Catchment average rainfalls over this period were: o Wivenhoe 62mm; o Somerset 106mm; o Lockyer 22mm; o Bremer 6mm. • Forecast rainfall is 65mm in the next 24 hours. • Wivenhoe Lake level forecast to peak at 72.1 (excluding forecast) 73.9 (including forecast). • Somerset Lake level forecast to peak at 102.3 (excluding forecast) 103.0 (including forecast). • Total dam inflow volume forecast is 1,272,000ML (excluding forecast) 1,564,000ML (including forecast). • Peak flow at Moggill (excluding Wivenhoe releases) estimated at 770 cumecs (excluding forecast) 1940 cumecs (including forecast). This peak was calculated to already have occurred at 05:00 on 8 January 2011. • Peak flow at Moggill (including Wivenhoe releases) estimated at 3300 cumecs (excluding forecast) 4400 cumecs (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 also starting to become 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 Brisbane for river flows approaching 3500 cumecs. • With dam levels under the Wivenhoe/Somerset Operations Target Line during this period, releases continued from Somerset Dam.

JANUARY 2011 FLOOD EVENT - PERIOD 9 OF 20				
DATE/TIME	**BACKGROUND**	**DAM LEVELS**	**RAINFALL AND MODEL RESULTS**	**STRATEGY**
	Strategy W3 and Strategy S2			**Strategy W3 and Strategy S2 (Lake Level greater than 68.50, maximum release 4000 cumecs)**
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 cumecs 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 cumecs, 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 in Brisbane and to undertake any necessary evacuations. Wivenhoe discharge is 1473 cumecs. All rural bridges below the dam with the exception of the Mt Crosby Weir Bridge and Fernvale Bridge are flooded.	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. Total rainfall since event commencement (including the current period): Wivenhoe 232mm; Somerset 343mm; Lockyer 131mm; Bremer 102mm.	• Catchment average rainfalls over this period were: o Wivenhoe 24mm; o Somerset 38mm; o Lockyer 14mm; o Bremer 6mm. • Forecast rainfall is 65mm in the next 24 hours. • Wivenhoe Lake level forecast to peak at 72.9 (excluding forecast) 74.7 (including forecast). • Somerset Lake level forecast to peak at 102.9 (excluding forecast) 103.4 (including forecast). • Total dam inflow volume forecast is 1,468,000ML (excluding forecast) 1,731,000ML (including forecast). • Peak flow at Moggill (excluding Wivenhoe releases) estimated at 820 cumecs (excluding forecast) 2000 cumecs (including forecast). This peak was calculated to occur at 16:00 on 10 January 2011. • Peak flow at Moggill (including Wivenhoe releases) estimated at 3240 cumecs (excluding forecast) 4480 cumecs (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 Operations 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 LEVELS**	**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 cumecs)**
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 or 0.5 metres of opening per hour. • Wivenhoe discharge is increased from 1473 cumecs to 2015 cumecs. 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 Brisbane and to restrict Brisbane River flows at Moggill to 3500 cumecs. This was done following discussions with the Brisbane City Council that advised a flow of 3500 cumecs 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 Operations 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.	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. Total rainfall since event commencement (including the current period): Wivenhoe 244mm; Somerset 373mm; Lockyer 143mm; Bremer 120mm.	• Catchment average rainfalls over this period were: o Wivenhoe 12mm; o Somerset 30mm; o Lockyer 12mm; o Bremer 18mm. • Forecast rainfall is 65mm in the next 24 hours. • Wivenhoe Lake level forecast to peak at 72.9 (excluding forecast) 74.5 (including forecast). • Somerset Lake level forecast to peak at 103.1 (excluding forecast) 103.5 (including forecast). • Total dam inflow volume forecast is 1,531,000ML (excluding forecast) 1,768,000ML (including forecast). • Peak flow at Moggill (excluding Wivenhoe releases) estimated at 1090 cumecs (excluding forecast) 2090 cumecs (including forecast). This peak was calculated to occur at 16:00 on 10 January 2011. • Peak flow at Moggill (including Wivenhoe releases) estimated at 3420 cumecs (excluding forecast) 4680 cumecs (including forecast).	• Consideration on protecting urban areas from inundation and minimizing urban damage. • Due to advice received from the Brisbane City Council that a flow of 3500 cumecs at Moggill will fully submerge 322 properties and impact on 7000 properties, an attempt is made to remain within 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 cumecs 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 cumecs stated in the manual was noted and taken into account in the decision making processes. • With dam levels under the Wivenhoe/Somerset Operations 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 LEVELS**	**RAINFALL AND MODEL RESULTS**	**STRATEGY**
	Strategy W3 and Strategy S2			**Strategy W3 and Strategy S2 (Lake Level greater than 68.50, maximum release 4000 cumecs)**
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 cumecs. All rural bridges below the dam are flooded. • At 15:00 the attempt to restrict Brisbane River flows at Moggill to 3500 cumecs was abandoned due to the rainfall being experienced in the dam catchments. A new target of 4000 cumecs 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 cumecs and minimize urban damage. • No gate movements occurred at Somerset Dam during this period, with dam levels plotting under the Wivenhoe/Somerset Operations 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.	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. Total rainfall since event commencement (including the current period): Wivenhoe 274mm; Somerset 407mm; Lockyer 169mm; Bremer 149mm.	• Catchment average rainfalls over this period were: o Wivenhoe 34mm; o Somerset 31mm; o Lockyer 27mm; o Bremer 30mm. • Forecast rainfall is 75mm in the next 24 hours. • Wivenhoe Lake level forecast to peak at 73.6 (excluding forecast) 75.2 (including forecast). • Somerset Lake level forecast to peak at 103.4 (excluding forecast) 103.7 (including forecast). • Total dam inflow volume forecast is 1,708,000ML (excluding forecast) 1,959,000ML (including forecast). • Peak flow at Moggill (excluding Wivenhoe releases) estimated at 1500 cumecs (excluding forecast) 2570 cumecs (including forecast). This peak was calculated to occur at 20:00 on 10 January 2011. • Peak flow at Moggill (including Wivenhoe releases) estimated at 3910 cumecs (excluding forecast) 5180 cumecs (including forecast).	• Consideration on protecting urban areas from inundation and minimizing urban damage. • A decision is made at 15:00 to attempt to remain within a target flow of around 4000 cumecs 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 cumecs and this approach continues to be followed. • With dam levels under the Wivenhoe/Somerset Operations 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 LEVELS**	**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 cumecs)**
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 cumecs 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 cumecs and minimize urban damage. • Wivenhoe discharge is increased from 2087 cumecs to 2695 cumecs. • Further gate openings at Wivenhoe Dam were paused at 20:00 in an attempt to allow the Lockyer and Bremer peaks to pass Brisbane and to restrict Brisbane River flows at Moggill to 4000 cumecs. • No gate movements occurred at Somerset Dam during this period, with dam levels plotting under the Wivenhoe/Somerset Operations 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.	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. Total rainfall since event commencement (including the current period): Wivenhoe 279mm; Somerset 415mm; Lockyer 174mm; Bremer 153mm.	• Catchment average rainfalls over this period were: o Wivenhoe 4mm; o Somerset 8mm; o Lockyer 5mm; o Bremer 3mm. • Forecast rainfall is 38mm in the next 24 hours, with isolated falls to 100mm. • Wivenhoe Lake level forecast to peak at 73.6 (excluding forecast) 74.3 (including forecast). • Somerset Lake level forecast to peak at 103.5 (excluding forecast) 103.5 (including forecast). • Total dam inflow volume forecast is 1,731,000ML (excluding forecast) 1,734,000ML (including forecast). • Peak flow at Moggill (excluding Wivenhoe releases) estimated at 1500 cumecs (excluding forecast) 1840 cumecs (including forecast). This peak was calculated to occur at 20:00 on 10 January 2011. • Peak flow at Moggill (including Wivenhoe releases) estimated at 3980 cumecs (excluding forecast) 4470 cumecs (including forecast).	• Consideration on protecting urban areas from inundation and minimizing urban damage. • The target maximum flow at Moggill is now 4000 cumecs. The Manual states that the intent of Strategy W3 is to limit the flow in the Brisbane River at Moggill to less than 4000 cumecs and this approach continues to be followed. • With dam levels under the Wivenhoe/Somerset Operations Target Line during this period, releases continued from Somerset Dam. • The reduced QPF provides justification to retain the target of 4000 cumecs 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 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 LEVELS**	**RAINFALL AND MODEL RESULTS**	**STRATEGY**
	Strategy W3 and Strategy S2			**Strategy W3 and Strategy S2 (Lake Level greater than 68.50, maximum release 4000 cumecs)**
Commenced Monday 10 Jan 2011 20:00 Completed Tuesday 11 Jan 2011 04:00	• No change to gate settings occurred at Wivenhoe Dam over this period. Wivenhoe discharge is 2752 cumecs. All rural bridges below the dam are flooded. • Gate openings at Wivenhoe Dam were paused at 20:00 in an attempt to allow the initial Lockyer and Bremer peaks to pass Brisbane and to restrict Brisbane River flows at Moggill to close to 4000 cumecs. • Initial advice on a flash flood originating in Lockyer headwaters received at 20:00 and considerations undertaken during this period to develop a strategy to manage these potential flows. Strategies would involve reducing outflows from Wivenhoe until the peak of this flash flood passed. • During this period the plotted dam levels drifted just above the Wivenhoe/Somerset Operations Target Line. This lead to a decision at 04:00 to commence closing down releases from Somerset Dam to limit further rises in Wivenhoe. This decision is consistent with Strategy S2.	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. Total rainfall since event commencement (including the current period): Wivenhoe 323mm; Somerset 437mm; Lockyer 186mm; Bremer 167mm.	• Catchment average rainfalls over this period were: o Wivenhoe 44mm; o Somerset 22mm; o Lockyer 12mm; o Bremer 14mm. • Forecast rainfall is 38mm in the next 24 hours, with isolated falls to 100mm. • Wivenhoe Lake level forecast to peak at 74.00 (excluding forecast) ??.?? (including forecast). • Somerset Lake level forecast to peak at 103.5 (excluding forecast) ??.?? (including forecast). • Total dam inflow volume forecast is 181000ML (excluding forecast) 226000ML (including forecast). • Peak flow at Lowood (excluding Wivenhoe releases) estimated at ??.?? (excluding forecast) ??.?? (including forecast). • Peak flow at Moggill (excluding Wivenhoe releases) estimated at??.?? (excluding forecast) ??.?? (including forecast).	• Consideration on protecting urban areas from inundation, with the target being a maximum flow of around 4000 cumecs at Moggill (see spreadsheet associated with Model Run 28). • This strategy is consistent with the Manual directive that requires the flow at Moggill to be minimized prior to the naturally occurring peak at Moggill (excluding Wivenhoe Dam releases) being experienced. • Model results show that a peak level in the dam close to 74.0 remains possible, but is appearing increasing unlikely. Reference note to P Allen at 21 on 10/1. • With dam levels moving above the Wivenhoe/Somerset Operations 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 serious 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 14 OF 20				
DATE/TIME	**BACKGROUND**	**DAM LEVELS**	**RAINFALL AND MODEL RESULTS**	**STRATEGY**
	Transition from Strategy W3 to Strategy W4; and Strategy S2 Wivenhoe Directive #12. Somerset Directive #6.			**Strategy W3 and Strategy S2 (Lake Level greater than 68.50, maximum release 4000 cumecs)**
Commenced Tuesday 11 Jan 2011 04:00 Completed Tuesday 11 Jan 2011 08:00	• Extreme intense rainfall (IFD curves indicate that this rainfall could have exceeded 1 in 500 year intensities) are experienced on and close to the Wivenhoe Dam lake area during this period. If the centroid of this rainfall was located 50 kms east or south, it is likely that there would not have been a need to 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. • No change to gate settings occurred at Wivenhoe Dam over this period. Wivenhoe discharge is 2832 cumecs. All rural bridges below the dam are flooded. • 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 Operations Target Line. This decision is consistent with Strategy S2.	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. Total rainfall since event commencement (including the current period): Wivenhoe 356mm; Somerset 483mm; Lockyer 240mm; Bremer 183mm.	• 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 is 38mm in the next 24 hours, with isolated falls to 100mm. • Wivenhoe Lake level forecast to peak at 74.5 (excluding forecast) 75.1 (including forecast). • Somerset Lake level forecast to peak at 103.9 (excluding forecast) 104.2 (including forecast). • Total dam inflow volume forecast is 2,210,000ML (excluding forecast) 2,246,000ML (including forecast). • Peak flow at Lowood (excluding Wivenhoe releases) estimated at 1750 cumecs (excluding forecast) 2130 cumecs (including forecast). • Peak flow at Moggill (excluding Wivenhoe releases) estimated at 2360 cumecs (excluding forecast) 3060 cumecs (including forecast).	• Consideration on protecting urban areas from inundation, with the target being a maximum flow of 4000 cumecs at Moggill. • This strategy is consistent with the Manual directive that requires the flow at Moggill to be minimized prior to the naturally occurring peak at Moggill (excluding Wivenhoe Dam releases) being experienced. • 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. • With dam levels moving above the Wivenhoe/Somerset Operations Target Line during this period releases from Somerset Dam are closed down to limit further rises in Wivenhoe. • At 08:00 a decision is made to transition to Strategy W4 and the Dam Safety Regulator (DERM) is advised of this decision. It is now apparent that significant urban damage resulting from releases from Wivenhoe Dam cannot be avoided. • Note here about minimized response time because where the rainfall is falling, normally 24 hours, now only a few hours.

JANUARY 2011 FLOOD EVENT - PERIOD 15 OF 20				
DATE/TIME	**BACKGROUND**	**DAM LEVELS**	**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 (IFD curves indicate greater than 1 in 500 year intensities) continues on and close to the Wivenhoe Dam lake area during this period. If the centroid of this rainfall was located 50 kms east or south, it is likely that there would not have been a need to 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. • The 10:00am situation report warns of the rapidly deteriorating situation. • Gates 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 2832 cumecs to 3992 cumecs. The threshold limit for urban damage has been exceeded. • During this period sluice gate openings at Somerset Dam are closed off to limit rises in Wivenhoe in accordance with Strategy S2.	Wivenhoe Dam level rises from 73.70 to 74.39 over the 5 hour period. Somerset Dam level rises from 103.46 to 103.91 over the 5 hour period. Total rainfall since event commencement (including the current period): Wivenhoe 382mm; Somerset 570mm; Lockyer 287mm; Bremer 237mm.	• 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 is 100mm in the next 24 hours. • Wivenhoe Lake level forecast to peak at 74.9 (excluding forecast) ??.?? (including forecast). • Somerset Lake level forecast to peak at 105.0 (excluding forecast) ??.?? (including forecast). • Total dam inflow volume forecast is 181000ML (excluding forecast) 226000ML (including forecast). • Once Strategy W4 is activated, the peak flows at Lowood and Moggill are no longer relevant to flood release considerations.	**Strategy W4 and Strategy S2 (Lake Level predicted to exceed 74.00, no maximum release rate)** • 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 continued to rise at 01:00. 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 Operations Target Line during this period releases from Somerset Dam are stopped to limit further rises in Wivenhoe. • Explain rain stopped, but model results a bit low.

JANUARY 2011 FLOOD EVENT - PERIOD 16 OF 20				
DATE/TIME	**BACKGROUND**	**DAM LEVELS**	**RAINFALL AND MODEL RESULTS**	**STRATEGY**
Commenced Tuesday 11 Jan 2011 13:00 Completed Tuesday 11 Jan 2011 19:00	**Strategy W4 and Strategy S2 Wivenhoe Directive #12 to #14.** • Extreme lake level rises in Wivenhoe Dam continue during this period and a severe weather warning for intense rainfall remains current (issued at 17:00). • Gates opened continuously at Wivenhoe Dam for 6 hours in accordance with the standard gate opening sequence at an average rate of 4.5 metres of opening per hour. • Wivenhoe discharge is increased from 3992 cumecs to 7464 cumecs. Significant damage to urban areas in Brisbane cannot be avoided. • No releases are made from Somerset Dam to limit increases in Wivenhoe Dam in accordance with Strategy S2.	Wivenhoe Dam level rises from 74.39 to 74.97 over the 6 hour period. Somerset Dam level rises from 103.91 to 104.57 over the 6 hour period. Total rainfall since event commencement (including the current period): Wivenhoe 397mm; Somerset 610mm; Lockyer 325mm; Bremer 278mm.	• 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 is 75mm in the next 24 hours (issued at 16:00; actual rain recorded after this time was minimal as shown below) and a severe weather warning for potential intense rainfall in the dam catchments remains current. Catchment average rainfalls for the 24 hour period commencing at 16:00 during this period were: o Wivenhoe 8mm; o Wivenhoe Local 13mm; o Somerset 19mm; o Lockyer 9mm; o Bremer 8mm. • Wivenhoe Lake level forecast to peak at ??.?? (excluding forecast) ??.?? (including forecast). • Somerset Lake level forecast to peak at ??.?? (excluding forecast) ??.?? (including forecast). • Total dam inflow volume forecast is 181000ML (excluding forecast) 226000ML (including forecast). • Once Strategy W4 is activated, the peak flows at Lowood and Moggill are no longer relevant to flood release considerations.	**Strategy W4 and Strategy S2 (Lake Level predicted to exceed 74.00, no maximum release rate)** • 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 continued to rise at 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 Operations 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 18:00 on 11 January 2011. • Explain inflows low but model tweaked to match levels.

JANUARY 2011 FLOOD EVENT - PERIOD 17 OF 20				
DATE/TIME	**BACKGROUND**	**DAM LEVELS**	**RAINFALL AND MODEL RESULTS**	**STRATEGY**
Commenced Tuesday 11 Jan 2011 19:00 Completed Tuesday 11 Jan 2011 21:00	**Strategy W4 and Strategy S2 Wivenhoe Directive #15 to #24.** • The lake level in Wivenhoe dam stabilizes and then falls slightly at 21:00. A severe weather warning for intense rainfall remains current (issued at 17:00), but it appears from the BOM radar that the rainfall may have dissipated. On this basis a decision to commence closing down the gates to reduce urban flood impacts is taken at 21:00. This decision is potentially in contravention with the minimum gate opening settings required under Strategy W4. • No change to gate settings occurred at Wivenhoe Dam over this period. Wivenhoe discharge is 7464 cumecs. All rural bridges below the dam are flooded. Damage to urban areas in Brisbane cannot be avoided. • No releases are made from Somerset Dam in accordance with Strategy S2.	During this 2 hours 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 104.45 to 104.78 over the 2 hour period. Total rainfall since event commencement (including the current period): Wivenhoe 398mm; Somerset 610mm; Lockyer 326mm; Bremer 278mm.	• Catchment average rainfalls over this period were: o Wivenhoe 1mm; o Somerset 1mm; o Lockyer 1mm; o Bremer 1mm. • Forecast rainfall is 75mm in the next 24 hours and a severe weather warning for possible intense rainfall in the catchments remains current. • Wivenhoe Lake level forecast to peak at 74.9 (excluding forecast) 74.9 (including forecast). • Somerset Lake level forecast to peak at 105.1 (excluding forecast) 105.1 (including forecast). • Total dam inflow volume forecast is 181000ML (excluding forecast) 226000ML (including forecast). • Once Strategy W4 is activated, the peak flows at Lowood and Moggill are no longer relevant to flood release considerations.	**Strategy W4 and Strategy S2 (Lake Level predicted to exceed 74.00, no maximum release rate)** • 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 Operations 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 18:00 on 11 January 2011.

JANUARY 2011 FLOOD EVENT - PERIOD 18 OF 20				
DATE/TIME	**BACKGROUND**	**DAM LEVELS**	**RAINFALL AND MODEL RESULTS**	**STRATEGY**
Commenced Tuesday 11 Jan 2011 21:00 Completed Wednesday 12 Jan 2011 08:00	**Strategy W4 and Strategy S2 Wivenhoe Directive #25 to #34.** • 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 severe weather warning for intense rainfall is cancelled at 22:00 and it appears from the BOM radar that the rainfall may have dissipated. The decision to close off the release in this way is potentially in contravention with the minimum gate opening settings required under Strategy W4. • 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 cumecs to 2547 cumecs. All rural bridges below the dam are flooded. Damage to urban areas in Brisbane cannot be avoided. • No releases are made from Somerset Dam in accordance with Strategy S2.	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. Total rainfall since event commencement (including the current period): Wivenhoe 399mm; Somerset 613mm; Lockyer 328mm; Bremer 279mm.	• Catchment average rainfalls over this period were: o Wivenhoe 1mm o Somerset 3mm; o Lockyer 3m; o Bremer 1m. • Forecast rainfall is 10mm in the next 24 hours. • Wivenhoe Lake level forecast to peak at 75.0 (excluding forecast) 75.0 (including forecast). • Somerset Lake level forecast to peak at 105.1 (excluding forecast) 105.1 (including forecast). • Total dam inflow volume forecast is 2,650,000ML (excluding forecast) 2,650,000ML (including forecast). • Once Strategy W4 is activated, the peak flows at Lowood and Moggill are no longer relevant to flood release considerations.	**Strategy W4 and Strategy S2 (Lake Level predicted to exceed 74.00, no maximum release rate)** • 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. • During this period Wivenhoe Dam gates are closed off as quickly as possible without causing rises in lake level. • It was calculated that reducing to a discharge of 2547 cumecs from Wivenhoe Dam will: 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 Operations 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 LEVELS**	**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.** • During this period releases from Wivenhoe Dam are kept constant. These actions are taken to reduce urban flood impacts downstream. The decision to maintain the release in this way is potentially in contravention with the minimum gate opening settings required under Strategy W4. • No change to gate settings occurred at Wivenhoe Dam over this period. Wivenhoe discharge is 2546 cumecs. All rural bridges below the dam are flooded. Damage to urban areas in Brisbane has not been avoided. • Releases commenced from Somerset Dam during this period as the plotted dam levels fell below the Wivenhoe/Somerset Operations 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 Operations 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.	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. Total rainfall since event commencement (including the current period): Wivenhoe 401mm; Somerset 619mm; Lockyer 330mm; Bremer 280mm.	• Catchment average rainfalls over this period were: o Wivenhoe 2mm; o Somerset 6mm; o Lockyer 6mm; o Bremer 6mm. • Forecast rainfall is 10mm in the next 24 hours.	**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 seven 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 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 LEVELS**	**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 and and 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.	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. Total rainfall since event commencement (including the current period): Wivenhoe 415mm; Somerset 626mm; Lockyer 337mm; Bremer 288mm.	• 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 seven 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 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: Wednesday, 2 February 2011 4:05 PM
To: John Tibaldi
Subject: Flood Event Summary - 07.doc
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.
For more information regarding this service, please contact your service provider.

Attachments:

Flood Event Summary - 07.doc (339 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 large to 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 LEVELS**	**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 cumecs)**
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 2011were: 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.	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. Total rainfall since event commencement (including the current period): Wivenhoe 53mm; Somerset 44mm; Lockyer 53mm; Bremer 54mm.	• Catchment average rainfalls over this period were: o Wivenhoe 28mm; o Somerset 23mm; o Lockyer 30mm; o Bremer 31mm. • Forecast rainfall is 25mm in the next 24 hours. • Wivenhoe Lake level forecast to peak at 68.2 (excluding forecast) 68.7 (including forecast). • Somerset Lake level forecast to peak at 99.7 (excluding forecast) 100.1 (including forecast). • Total dam inflow volume forecast is 204,000ML (excluding forecast) 343,000ML (including forecast). • Peak flow at Lowood (excluding Wivenhoe releases) estimated at 470 cumecs (excluding forecast) 720 cumecs (including forecast). • Peak flow at Moggill (excluding Wivenhoe releases) estimated at 550 cumecs (excluding forecast) 960 cumecs (including forecast).	• Peak inflows into the Brisbane River from Lockyer are estimated to be in the order of 400 cumecs, 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 cumecs. • Water held in Wivenhoe in an attempt to maintain College's Crossing trafficable in accordance with Strategy W1A. • 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 2 OF 20				
DATE/TIME	**BACKGROUND**	**DAM LEVELS**	**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.	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. Total rainfall since event commencement (including the current period): Wivenhoe 64mm; Somerset 60mm; Lockyer 57mm; Bremer 60mm.	• Catchment average rainfalls over this period were: o Wivenhoe 11mm; o Somerset 15mm; o Lockyer 4mm; o Bremer 5mm. • Forecast rainfall is 25mm in the next 24 hours. • Wivenhoe Lake level forecast to peak at 68.2 (excluding forecast) 68.5 (including forecast). • Somerset Lake level forecast to peak at 99.7 (excluding forecast) 100.2 (including forecast). • Total dam inflow volume forecast is 242,000ML (excluding forecast) 380,000ML (including forecast). • Peak flow at Lowood (excluding Wivenhoe releases) estimated at 470 cumecs (excluding forecast) 670 cumecs (including forecast). • Peak flow at Moggill (excluding Wivenhoe releases) estimated at 570 cumecs (excluding forecast) 970 cumecs (including forecast).	**Strategy W1B and Strategy S2 (Lake Level greater than 67.50, maximum release 110 cumecs)** • Peak inflows into the Brisbane River from Lockyer are estimated to be in the order of 500 cumecs, 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 cumecs. • 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 LEVELS**	**RAINFALL AND MODEL RESULTS**	**STRATEGY**
	Strategy W1C and Strategy S2			**Strategy W1C (Lake Level greater than 68.00, maximum release 1900 cumecs)**
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	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. Total rainfall since event commencement (including the current period): Wivenhoe 89mm; Somerset 90mm; Lockyer 71mm; Bremer 74mm.	• Catchment average rainfalls over this period were: o Wivenhoe 24mm; o Somerset 30mm; o Lockyer 14mm; o Bremer 12mm. • Forecast rainfall is 25mm in the next 24 hours. • Wivenhoe Lake level forecast to peak at 68.4 (excluding forecast) 68.9 (including forecast). • Somerset Lake level forecast to peak at 100.3 (excluding forecast) 100.6 (including forecast). • Total dam inflow volume forecast is 346,000ML (excluding forecast) 483,000ML (including forecast). • Peak flow at Lowood (excluding Wivenhoe releases) estimated at 530 cumecs (excluding forecast) 710 cumecs (including forecast). • Peak flow at Moggill (excluding Wivenhoe releases) estimated at 660 cumecs (excluding forecast) 1040 cumecs (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 LEVELS**	**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 cumecs)**
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 exceesd 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 cumecs and 800 cumecs respectively, whereas the release rate from the dam was already 940 cumecs. 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 cumecs. All rural bridges below the dam with the exception of the Mt Crosby Weir Bridge and Fernvale Bridge are flooded.	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. Total rainfall since event commencement (including the current period): Wivenhoe 92mm; Somerset 95mm; Lockyer 72mm; Bremer 72mm.	• Catchment average rainfalls over this period were: o Wivenhoe 3mm; o Somerset 5mm; o Lockyer 1mm; o Bremer 1mm. • Forecast rainfall is 40mm in the next 24 hours. • Wivenhoe Lake level forecast to peak at 68.7 (excluding forecast) 69.1 (including forecast). • Somerset Lake level forecast to peak at 100.5 (excluding forecast) 100.6 (including forecast). • Total dam inflow volume forecast is 420,000ML (excluding forecast) 662,000ML (including forecast). • Peak flow at Lowood (excluding Wivenhoe releases) estimated at 530 cumecs (excluding forecast) 530 cumecs (including forecast). • Peak flow at Moggill (excluding Wivenhoe releases) estimated at 770 cumecs (excluding forecast) 940 cumecs (including forecast). This peak was calculated to already have occurred at 05:00 on 8 January 2011. • Predicted peak Wivenhoe Dam outflow was 1480 cumecs (excluding forecast) 1540 cumecs (including forecast). This 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 cumecs 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 Operations Target Line in accordance with Strategy S2.

JANUARY 2011 FLOOD EVENT - PERIOD 5 OF 20				
DATE/TIME	**BACKGROUND**	**DAM LEVELS**	**RAINFALL AND MODEL RESULTS**	**STRATEGY**
	Strategy W3 and Strategy S2			**Strategy W3 and Strategy S2 (Lake Level greater than 68.50, maximum release 4000 cumecs)**
Commenced Saturday 08 Jan 2011 14:00 Completed Sunday 09 Jan 2011 01:00	• Releases maintained from both dams to maintain Mt Crosby Weir Bridge and Fernvale Bridge trafficable. • No change to gate settings over this period. Wivenhoe discharge is 1240 cumecs. All rural bridges below the dam with the exception of the Mt Crosby Weir Bridge and Fernvale Bridge are flooded.	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. Total rainfall since event commencement (including the current period): Wivenhoe 100mm; Somerset 111mm; Lockyer 75mm; Bremer 75mm.	• Catchment average rainfalls over this period were: o Wivenhoe 8mm; o Somerset 16mm; o Lockyer 3mm; o Bremer 2mm. • Forecast rainfall is 40mm in the next 24 hours. • Wivenhoe Lake level forecast to peak at 68.7 (excluding forecast) 68.9 (including forecast). • Somerset Lake level forecast to peak at 100.5 (excluding forecast) 100.6 (including forecast). • Total dam inflow volume forecast is 457,000ML (excluding forecast) 697,000ML (including forecast). • Peak flow at Lowood (excluding Wivenhoe releases) estimated at 530 cumecs (excluding forecast) 530 cumecs (including forecast). • Peak flow at Moggill (excluding Wivenhoe releases) estimated at 770 cumecs (excluding forecast) 840 cumecs (including forecast). This peak was calculated to already have occurred at 05:00 on 8 January 2011. • Predicted peak Wivenhoe Dam outflow was 1480 cumecs (excluding forecast) 1520 cumecs (including forecast). This is significantly greater than the calculated natural peak that excluded Wivenhoe releases.	• Strategy W3 requires the flow at Moggill to be lowered to 4000 cumecs 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 Operations Target Line requiring sluice re-opening within a short period.

JANUARY 2011 FLOOD EVENT - PERIOD 6 OF 20				
DATE/TIME	**BACKGROUND**	**DAM LEVELS**	**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 cumecs)**
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 cumecs to 1334 cumecs. • 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.	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. Total rainfall since event commencement (including the current period): Wivenhoe 112mm; Somerset 146mm; Lockyer 76mm; Bremer 75mm.	• Catchment average rainfalls over this period were: o Wivenhoe 12mm; o Somerset 36mm; o Lockyer 1mm; o Bremer 0mm. • Forecast rainfall is 40mm in the next 24 hours. • Wivenhoe Lake level forecast to peak at 68.7 (excluding forecast) 69.3 (including forecast). • Somerset Lake level forecast to peak at 100.5 (excluding forecast) 101.0 (including forecast). • Total dam inflow volume forecast is 569,000ML (excluding forecast) 814,000ML (including forecast). • Peak flow at Lowood (excluding Wivenhoe releases) estimated at 530 cumecs (excluding forecast) 530 cumecs (including forecast). • Peak flow at Moggill (excluding Wivenhoe releases) estimated at 770 cumecs (excluding forecast) 780 cumecs (including forecast). This peak was calculated to already have occurred at 05:00 on 8 January 2011. • Predicted peak Wivenhoe Dam outflow was 1500 cumecs (excluding forecast) 1550 cumecs (including forecast). This is significantly greater than the calculated natural peak that excluded Wivenhoe releases.	• Strategy W3 requires the flow at Moggill to be lowered to 4000 cumecs 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 Operations 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 LEVELS**	**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 cumecs to 1386 cumecs. • Somerset Dam sluice gates opened progressively over this period to allow dam levels to move towards the Wivenhoe/Somerset Operations 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.	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. Total rainfall since event commencement (including the current period): Wivenhoe 146mm; Somerset 199mm; Lockyer 94mm; Bremer 90mm.	• Catchment average rainfalls over this period were: o Wivenhoe 34mm; o Somerset 53mm; o Lockyer 18mm; o Bremer 15mm. • Forecast rainfall is 50mm in the next 24 hours. • Wivenhoe Lake level forecast to peak at 70.0 (excluding forecast) 71.3 (including forecast). • Somerset Lake level forecast to peak at 100.7 (excluding forecast) 101.1 (including forecast). • Total dam inflow volume forecast is 804,000ML (excluding forecast) 1,108,000ML (including forecast). • Peak flow at Lowood (excluding Wivenhoe releases) estimated at 530 cumecs (excluding forecast) 690 cumecs (including forecast). • Peak flow at Moggill (excluding Wivenhoe releases) estimated at 770 cumecs (excluding forecast) 1210 cumecs (including forecast). This peak was calculated to already have occurred at 05:00 on 8 January 2011. • Predicted peak Wivenhoe Dam outflow was 1490 cumecs (excluding forecast) 1560 cumecs (including forecast). This 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 cumecs)** • 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 interactive Model, a three day assessment shows 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 Operations 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 LEVELS**	**RAINFALL AND MODEL RESULTS**	**STRATEGY**
	Strategy W3 and Strategy S2			**Strategy W3 and Strategy S2 (Lake Level greater than 68.50, maximum release 4000 cumecs)**
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 cumecs. • 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 cumecs would impact properties and commence to cause damage in the urban areas of Brisbane. Damage tables supplied by the Brisbane City Council indicated that at flows of 3000 cumecs, 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.	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. Total rainfall since event commencement (including the current period): Wivenhoe 208mm; Somerset 305mm; Lockyer 116mm; Bremer 96mm.	• Catchment average rainfalls over this period were: o Wivenhoe 62mm; o Somerset 106mm; o Lockyer 22mm; o Bremer 6mm. • Forecast rainfall is 65mm in the next 24 hours. • Wivenhoe Lake level forecast to peak at 72.1 (excluding forecast) 73.9 (including forecast). • Somerset Lake level forecast to peak at 102.3 (excluding forecast) 103.0 (including forecast). • Total dam inflow volume forecast is 1,272,000ML (excluding forecast) 1,712,000ML (including forecast). • Peak flow at Moggill (excluding Wivenhoe releases) estimated at 770 cumecs (excluding forecast) 1940 cumecs (including forecast). This peak was calculated to already have occurred at 05:00 on 8 January 2011. • Peak flow at Moggill (including Wivenhoe releases) estimated at 3300 cumecs (excluding forecast) 4400 cumecs (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 also starting to become 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 Brisbane for river flows approaching 3500 cumecs. • With dam levels under the Wivenhoe/Somerset Operations Target Line during this period, releases continued from Somerset Dam.

JANUARY 2011 FLOOD EVENT - PERIOD 9 OF 20				
DATE/TIME	**BACKGROUND**	**DAM LEVELS**	**RAINFALL AND MODEL RESULTS**	**STRATEGY**
	Strategy W3 and Strategy S2			**Strategy W3 and Strategy S2 (Lake Level greater than 68.50, maximum release 4000 cumecs)**
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 cumecs 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 cumecs, 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 in Brisbane and to undertake any necessary evacuations. Wivenhoe discharge is 1473 cumecs. All rural bridges below the dam with the exception of the Mt Crosby Weir Bridge and Fernvale Bridge are flooded.	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. Total rainfall since event commencement (including the current period): Wivenhoe 232mm; Somerset 343mm; Lockyer 131mm; Bremer 102mm.	• Catchment average rainfalls over this period were: o Wivenhoe 24mm; o Somerset 38mm; o Lockyer 14mm; o Bremer 6mm. • Forecast rainfall is 65mm in the next 24 hours. • Wivenhoe Lake level forecast to peak at 72.9 (excluding forecast) 74.7 (including forecast). • Somerset Lake level forecast to peak at 102.9 (excluding forecast) 103.4 (including forecast). • Total dam inflow volume forecast is 1,468,000ML (excluding forecast) 1,922,000ML (including forecast). • Peak flow at Moggill (excluding Wivenhoe releases) estimated at 820 cumecs (excluding forecast) 2000 cumecs (including forecast). This peak was calculated to occur at 16:00 on 10 January 2011. • Peak flow at Moggill (including Wivenhoe releases) estimated at 3240 cumecs (excluding forecast) 4480 cumecs (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 Operations 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 LEVELS**	**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 cumecs)**
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 or 0.5 metres of opening per hour. • Wivenhoe discharge is increased from 1473 cumecs to 2015 cumecs. 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 Brisbane and to restrict Brisbane River flows at Moggill to 3500 cumecs. This was done following discussions with the Brisbane City Council that advised a flow of 3500 cumecs 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 Operations 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.	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. Total rainfall since event commencement (including the current period): Wivenhoe 244mm; Somerset 373mm; Lockyer 143mm; Bremer 120mm.	• Catchment average rainfalls over this period were: o Wivenhoe 12mm; o Somerset 30mm; o Lockyer 12mm; o Bremer 18mm. • Forecast rainfall is 65mm in the next 24 hours. • Wivenhoe Lake level forecast to peak at 72.9 (excluding forecast) 74.5 (including forecast). • Somerset Lake level forecast to peak at 103.1 (excluding forecast) 103.5 (including forecast). • Total dam inflow volume forecast is 1,531,000ML (excluding forecast) 1,985,000ML (including forecast). • Peak flow at Moggill (excluding Wivenhoe releases) estimated at 1090 cumecs (excluding forecast) 2090 cumecs (including forecast). This peak was calculated to occur at 16:00 on 10 January 2011. • Peak flow at Moggill (including Wivenhoe releases) estimated at 3420 cumecs (excluding forecast) 4680 cumecs (including forecast).	• Consideration on protecting urban areas from inundation and minimizing urban damage. • Due to advice received from the Brisbane City Council that a flow of 3500 cumecs at Moggill will fully submerge 322 properties and impact on 7000 properties, an attempt is made to remain within 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 cumecs 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 cumecs stated in the manual was noted and taken into account in the decision making processes. • With dam levels under the Wivenhoe/Somerset Operations 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 LEVELS**	**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 cumecs. All rural bridges below the dam are flooded. • At 15:00 the attempt to restrict Brisbane River flows at Moggill to 3500 cumecs was abandoned due to the rainfall being experienced in the dam catchments. A new target of 4000 cumecs 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 cumecs and minimize urban damage. • No gate movements occurred at Somerset Dam during this period, with dam levels plotting under the Wivenhoe/Somerset Operations 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.	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. Total rainfall since event commencement (including the current period): Wivenhoe 274mm; Somerset 407mm; Lockyer 169mm; Bremer 149mm.	• Catchment average rainfalls over this period were: o Wivenhoe 34mm; o Somerset 31mm; o Lockyer 27mm; o Bremer 30mm. • Forecast rainfall is 75mm in the next 24 hours. • Wivenhoe Lake level forecast to peak at 73.6 (excluding forecast) 75.2 (including forecast). • Somerset Lake level forecast to peak at 103.4 (excluding forecast) 103.7 (including forecast). • Total dam inflow volume forecast is 1,708,000ML (excluding forecast) 2,162,000ML (including forecast). • Peak flow at Moggill (excluding Wivenhoe releases) estimated at 1500 cumecs (excluding forecast) 2570 cumecs (including forecast). This peak was calculated to occur at 20:00 on 10 January 2011. • Peak flow at Moggill (including Wivenhoe releases) estimated at 3910 cumecs (excluding forecast) 5180 cumecs (including forecast).	**Strategy W3 and Strategy S2 (Lake Level greater than 68.50, maximum release 4000 cumecs)** • Consideration on protecting urban areas from inundation and minimizing urban damage. • A decision is made at 15:00 to attempt to remain within a target flow of around 4000 cumecs 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 cumecs and this approach continues to be followed. • With dam levels under the Wivenhoe/Somerset Operations 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 LEVELS**	**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 cumecs)**
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 cumecs 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 cumecs and minimize urban damage. • Wivenhoe discharge is increased from 2087 cumecs to 2695 cumecs. • Further gate openings at Wivenhoe Dam were paused at 20:00 in an attempt to allow the Lockyer and Bremer peaks to pass Brisbane and to restrict Brisbane River flows at Moggill to 4000 cumecs. • No gate movements occurred at Somerset Dam during this period, with dam levels plotting under the Wivenhoe/Somerset Operations 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.	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. Total rainfall since event commencement (including the current period): Wivenhoe 279mm; Somerset 415mm; Lockyer 174mm; Bremer 153mm.	• Catchment average rainfalls over this period were: o Wivenhoe 4mm; o Somerset 8mm; o Lockyer 5mm; o Bremer 3mm. • Forecast rainfall is 38mm in the next 24 hours, with isolated falls to 100mm. • Wivenhoe Lake level forecast to peak at 73.6 (excluding forecast) 74.3 (including forecast). • Somerset Lake level forecast to peak at 103.5 (excluding forecast) 103.5 (including forecast). • Total dam inflow volume forecast is 1,731,000ML (excluding forecast) 1,982,000ML (including forecast). • Peak flow at Moggill (excluding Wivenhoe releases) estimated at 1500 cumecs (excluding forecast) 1840 cumecs (including forecast). This peak was calculated to occur at 20:00 on 10 January 2011. • Peak flow at Moggill (including Wivenhoe releases) estimated at 3980 cumecs (excluding forecast) 4470 cumecs (including forecast).	• Consideration on protecting urban areas from inundation and minimizing urban damage. • The target maximum flow at Moggill is now 4000 cumecs. The Manual states that the intent of Strategy W3 is to limit the flow in the Brisbane River at Moggill to less than 4000 cumecs and this approach continues to be followed. • With dam levels under the Wivenhoe/Somerset Operations Target Line during this period, releases continued from Somerset Dam. • The reduced QPF provides justification to retain the target of 4000 cumecs 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 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 LEVELS**	**RAINFALL AND MODEL RESULTS**	**STRATEGY**
	Strategy W3 and Strategy S2			**Strategy W3 and Strategy S2 (Lake Level greater than 68.50, maximum release 4000 cumecs)**
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 restrict Brisbane River flows at Moggill to close to 4000 cumecs. No change to gate settings occurred at Wivenhoe Dam over this period. Wivenhoe discharge is 2726 cumecs. • A target of 4000 cumecs is set at Moggill in accordance with the Manual. According to the Manual, the intent of Strategy W3 is to limit the flow in the Brisbane River at Moggill to less than 4000 cumecs. However BCC damage tables indicated this would still impact 5325 properties and cause damage in excess of $47M. • Initial advice on a flash flood originating in Lockyer headwaters received at 20:00 and considerations undertaken during this period to develop a strategy to manage these potential flows. Strategies would involve reducing outflows from Wivenhoe until the peak of this flash flood passed and these strategies were not adopted. • During this period the plotted dam levels drifted just above the Wivenhoe/Somerset Operations Target Line. This lead to a decision at 04:00 to commence closing down releases from Somerset Dam to limit further rises in Wivenhoe.	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. Total rainfall since event commencement (including the current period): Wivenhoe 323mm; Somerset 437mm; Lockyer 186mm; Bremer 167mm.	• Catchment average rainfalls over this period were: o Wivenhoe 44mm; o Somerset 22mm; o Lockyer 12mm; o Bremer 14mm. • Forecast rainfall is 38mm in the next 24 hours, with isolated falls to 100mm. • Wivenhoe Lake level forecast to peak at 74.1 (excluding forecast) 74.9 (including forecast). • Somerset Lake level forecast to peak at 103.5 (excluding forecast) 103.7 (including forecast). • Total dam inflow volume forecast is 2,016,000ML (excluding forecast) 2,267,000ML (including forecast). • Peak flow at Moggill (excluding Wivenhoe releases) estimated at 1500 cumecs (excluding forecast) 1810 cumecs (including forecast). This peak was calculated to occur at 20:00 on 10 January 2011. • Peak flow at Moggill (including Wivenhoe releases) estimated at 4040 cumecs (excluding forecast) 4540 cumecs (including forecast).	• Consideration on protecting urban areas from inundation and minimizing urban damage. The target maximum flow at Moggill remains at 4000 cumecs. The Manual states that the intent of Strategy W3 is to limit the flow in the Brisbane River at Moggill to less than 4000 cumecs 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 Operations 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 LEVELS**	**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 (IFD curves indicate that this rainfall **exceeded 1 in 500 year intensities**) is experienced 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 this extreme intense 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. 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 cumecs. • 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 Operations Target Line. This decision is consistent with Strategy S2.	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. Total rainfall since event commencement (including the current period): Wivenhoe 356mm; Somerset 483mm; Lockyer 240mm; Bremer 183mm.	• 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 is 38mm in the next 24 hours, with isolated falls to 100mm. • Wivenhoe Lake level forecast to peak at 74.5 (excluding forecast) 75.1 (including forecast). • Somerset Lake level forecast to peak at 103.9 (excluding forecast) 104.2 (including forecast). • Total dam inflow volume forecast is 2,210,000ML (excluding forecast) 2,460,000ML (including forecast). • Peak flow at Moggill (including Wivenhoe releases) estimated at 5870 cumecs (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 is now apparent that significant urban damage resulting from releases from Wivenhoe Dam cannot be avoided due to the extreme intense rainfall (IFD curves indicate that this rainfall **exceeded 1 in 500 year intensities**) that is experienced on and close to the Wivenhoe Dam lake area during this period • With dam levels moving above the Wivenhoe/Somerset Operations Target Line during this period releases from Somerset Dam are closed down to limit further rises in Wivenhoe.

JANUARY 2011 FLOOD EVENT - PERIOD 15 OF 20				
DATE/TIME	**BACKGROUND**	**DAM LEVELS**	**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 (IFD curves indicate **greater than 1 in 500 year intensities**) continues 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 cumecs to 4250 cumecs. 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.	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. Total rainfall since event commencement (including the current period): Wivenhoe 382mm; Somerset 570mm; Lockyer 287mm; Bremer 287mm.	• 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 is 100mm in the next 24 hours. • A portion of the extreme intense rainfall in the dam catchment was falling outside of rain gauges (e.g. on the dam lake area) and this resulted in difficulties in the model being able to accurately predict lake level rises. Accordingly gauge board readings were obtained every 30 minutes during this period. • Wivenhoe Lake level forecast to peak at 75.0 (excluding forecast) 76.2 (including forecast). • Somerset Lake level forecast to peak at 104.8 (excluding forecast) 105.7 (including forecast). • Total dam inflow volume forecast is 2,506,000ML (excluding forecast) 3,123,000ML (including forecast). • Peak flow at Moggill (including Wivenhoe releases) estimated at 9180 cumecs (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 decisions were being made on a half hourly basis once the gauge board readings were received. • With dam levels above the Wivenhoe/Somerset Operations Target Line during this period releases from Somerset Dam are closed down to limit further rises in Wivenhoe.

JANUARY 2011 FLOOD EVENT - PERIOD 16 OF 20				
DATE/TIME	**BACKGROUND**	**DAM LEVELS**	**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 and a severe weather warning for intense rainfall remains current (issued at 17:00). 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 cumecs to 7464 cumecs. Significant damage to urban areas in Brisbane cannot be avoided. • No releases are made from Somerset Dam to limit increases in Wivenhoe Dam in accordance with Strategy S2.	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. Total rainfall since event commencement (including the current period): Wivenhoe 397mm; Somerset 610mm; Lockyer 325mm; Bremer 278mm.	• 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 is 75mm in the next 24 hours (issued at 16:00) and a severe weather warning for potential intense rainfall in the dam catchments remains current. However, catchment average rainfalls for the 24 hour period commencing at 16:00 during this period 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 has fallen outside of rain gauges (e.g. on the dam lake area) and this resulted in difficulties in the model being able to accurately predict lake level rises. • Wivenhoe Lake level forecast to peak at 75.0 (excluding forecast) 75.2 (including forecast). • Somerset Lake level forecast to peak at 105.2 (excluding forecast) 105.9 (including forecast). • Total dam inflow volume forecast 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 Operations 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.

JANUARY 2011 FLOOD EVENT - PERIOD 17 OF 20				
DATE/TIME	**BACKGROUND**	**DAM LEVELS**	**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 cumecs. • The lake level in Wivenhoe dam stabilizes and then falls slightly at 21:00. A severe weather warning for intense rainfall remains current (issued at 17:00), but it appears from the BOM radar that the rainfall may have dissipated. On this basis a decision to commence closing down the gates 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 in Brisbane which is an objective that must be considered under Strategy S4. • No releases are made from Somerset Dam in accordance with Strategy S2.	During this 2 hours 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. Total rainfall since event commencement (including the current period): Wivenhoe 398mm; Somerset 610mm; Lockyer 326mm; Bremer 278mm.	• Catchment average rainfalls over this period were: o Wivenhoe 1mm; o Somerset 1mm; o Lockyer 1mm; o Bremer 1mm. • Forecast rainfall is 75mm in the next 24 hours and a severe weather warning for possible intense rainfall in the catchments remains current. • A portion of the extreme intense rainfall in the dam catchment has fallen outside of rain gauges (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. • Wivenhoe Lake level forecast to peak at 75.0 (excluding forecast) 75.2 (including forecast). • Somerset Lake level forecast to peak at 105.2 (excluding forecast) 105.9 (including forecast). • Total dam inflow volume forecast is 2,659,000ML (excluding forecast) 3,282,000ML (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 Operations 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 around 20:00 on 11 January 2011.

JANUARY 2011 FLOOD EVENT - PERIOD 18 OF 20				
DATE/TIME	**BACKGROUND**	**DAM LEVELS**	**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 severe weather warning for intense rainfall is cancelled at 22:00 and it appears from the BOM radar that the rainfall may have dissipated. 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 in Brisbane 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 cumecs to 2547 cumecs. All rural bridges below the dam remain flooded and significant damage to urban areas in Brisbane has not been avoided. • No releases are made from Somerset Dam in accordance with Strategy S2.	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. Total rainfall since event commencement (including the current period): Wivenhoe 399mm; Somerset 613mm; Lockyer 328mm; Bremer 279mm.	• Catchment average rainfalls over this period were: o Wivenhoe 1mm o Somerset 3mm; o Lockyer 3m; o Bremer 1m. • Forecast rainfall is 10mm in the next 24 hours (issued Wednesday morning). • Wivenhoe Lake level forecast to peak at 75.0 (excluding forecast) 75.0 (including forecast). • Somerset Lake level forecast to peak at 105.1 (excluding forecast) 105.1 (including forecast). • Total dam inflow volume forecast 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 in Brisbane. • It was calculated that reducing to a discharge of 2547 cumecs 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 Operations 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 LEVELS**	**RAINFALL AND MODEL RESULTS**	**STRATEGY**
	Transition from Strategy W4 to the Drain Down Phase **Somerset Directives #8 to #9.**			**Drain Down Phase** **(Stored floodwaters emptied from the dam in seven days)**
Commenced Wednesday 12 Jan 2011 08:00 Completed Thursday 13 Jan 2011 12:00	• No change to gate settings occurred at Wivenhoe Dam over this period. Wivenhoe discharge is 2534 cumecs. 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 Operations 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 Operations 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.	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. Total rainfall since event commencement (including the current period): Wivenhoe 401mm; Somerset 619mm; Lockyer 330mm; Bremer 280mm.	• Catchment average rainfalls over this period were: o Wivenhoe 2mm; o Somerset 6mm; o Lockyer 6mm; o Bremer 6mm. • Forecast rainfall is 10mm in the next 24 hours.	• 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 seven 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 increases in river levels below the dam (except where they were unavoidable die 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 LEVELS**	**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.	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. Total rainfall since event commencement (including the current period): Wivenhoe 415mm; Somerset 626mm; Lockyer 337mm; Bremer 288mm.	• 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 seven 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 increases in river levels below the dam (except where they were unavoidable die 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.