

WIVENHOE POWER STATION

January 2011 Exceptional Rainfall Event

Review of Event and Actions

Operation of Power Station

and

Splityard Creek Dam



WPS - Main Access Road – 11 January 2011

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1. Water Licence for Splityard Creek Dam Reference Number 104049 Expiry 30 November 2011
2. Emergency Action Plan Wivenhoe Power Station Splityard Creek Dam T-MISC-149
3. Wivenhoe Power Station Business Procedure for Wivenhoe – High Rainfall, High Dam Water Levels WIV-OPS-15
4. Emergency Response and Business Continuity Plan for Wivenhoe Power Station WIV-MAN-13
5. Wivenhoe Dam and Wivenhoe Power Station – Deed of Amendment and Consolidation and covering letter dated 20 August 2003
6. Internal email from Peter Berthelsen to David Evans dated Tuesday, 1 February 2011 @ 9.22am detailing the chronology of notifications made to DERM and Sunwater in regard to Splityard Creek Dam during the event
7. Internal emails from Trevor Lush to David Evans dated Wednesday, 2 February 2011 @ 9.04am attaching a pdf graph of all water movements over the flood period and @ 9.40am setting out details of the water volumes and level change effects resulting from the power station operation including an attached table.
8. Internal email from Peter Berthelsen to David Evans dated Friday, 21 January 2011 @ 2.06pm
9. Wivenhoe Power Station Memorandum to GMGO from Wivenhoe Lead Engineers titled, Response to TE Board Request following High Rainfall Event January 2011
10. Internal email from Trevor Lush to David Evans dated Monday, 31 January 2011 @ 1.00pm setting out details of Splityard Levels and Unit Operation 6 January to 16 January 2011 including attached graphs.
11. Wivenhoe Power Station – Official Opening Brochure

EXECUTIVE SUMMARY

This Report has been prepared voluntarily by Tarong Energy to address (where relevant) terms of reference 2(f) published by the Commission of Inquiry: Implementation of the systems operation plans for dams across the state and in particular the Wivenhoe and Somerset release strategy and an assessment of compliance with, and the suitability of the operational procedures relating to flood mitigation and dam safety.

On Tuesday 11 January 2011 an exceptional rainfall event occurred in the region surrounding Wivenhoe Power Station and Wivenhoe Dam. The photo below is included to demonstrate the high level approximately (RL 75), to which Wivenhoe Dam rose during this event and this report's cover photo shows the severity of rainfall runoff and slope failure that occurred on the main access road to the power station.



This review has determined that there were appropriate procedures, policies and manuals in place to which station staff could refer to guide them through most of the issues that arose during the crisis. In particular:

1. Sufficient staff were available to adequately operate and manage the WPS and the SYCD;
2. Contact details for all relevant staff were current and accessible;
3. Copies of relevant documents and manuals were available;
4. Sufficient facilities were available to allow the staff to perform their roles.

Summarised below are the outcomes relating to the particular infrastructure items and issues managed during the crisis.

Splityard Creek Dam

During exceptional rainfall events, issues including extreme runoff, uncertainty regarding dam levels and the inability to access the dam for inspection resulted in staff needing to make a number of urgent decisions. During these events appropriate contact was made and maintained with the dam regulator.

The lowering of the dam level was prudent and appropriate in the circumstances and although the outcome of the generation and pumping events that occurred on 10 and 11 January did, in a net sense, add water to Wivenhoe Dam (8,647ML), this small volume of water is minor in comparison to the hundreds of thousands of mega litres that SEQwater were managing over that period. In the 24 hours between midnight on 10 January 2011 and midnight on 11 January 2011, the SEQWater Report (pp 158/159) estimates that the total WD inflow (including forecast) was 253,021 ML. The release from SYCD during that period (5,262 ML) contributed approximately 2% of that inflow.

Further to above, lowering the level of water in Splityard Creek Dam and ensuring its safety in such exceptional circumstances was appropriate because had any failure in Splityard Creek Dam developed, then it could have resulted in uncontrolled release of the full storage of up to 28,700 ML of water.

This could have threatened the lives of the immediate downstream residents as well as added a significant volume of water to the already heavily flooded Brisbane River downstream of Wivenhoe Dam.

Although current and available for use, the Emergency Action Plan prepared for Tarong Energy by SunWater was not triggered by the events of December 2010 and January 2011.

Power Station Operation

The operation and integrity of the power station was threatened by both the rising Wivenhoe Dam level as well as surrounding slope runoff and debris resulting from the exceptional rainfall received.

All normal operating protocols were adhered to during the crisis with the exception that SEQwater were not advised by Tarong Energy of the commencement of generation on 11 January 2011. The failure to notify SEQWater of the release of 5,262 ML on 11 January was occasioned by the urgent need to release that water in order to ensure the structural integrity of the Split Yard Creek Dam and the difficulties faced by Tarong Energy staff on site, brought about by failures in their telecommunications systems occasioned by the severe weather conditions. It is understood however that SEQWater staff, acting independently of Tarong Energy staff at the Wivenhoe Power Station, had the ability to monitor inflows into the Wivenhoe Dam from the Split-Yard Creek Dam.

When requested by SEQwater to stop releases from Splityard Creek Dam on the evening of 11 January 2011, Tarong Energy promptly ceased releasing.

Procedures

The existing procedures proved useful although both the High Rainfall and Business Continuity Procedures need review and improvement to cover exceptional rainfall, flooding, access and power station operation. It is acknowledged that whenever exceptional circumstances occur there will always be unanticipated circumstances that will need urgent action and these will often not be covered in the existing procedures.

Communications

The most significant issue faced by the Wivenhoe Power Station event response staff was the loss of communications including mobile phone coverage, internet, email, computer access and VOIP phones. Other issues included the uncertainty associated with dam level readings at Splyard Creek Dam and the potential discrepancy between Wivenhoe Dam levels recorded at the station, versus those recorded by SEQwater at the dam wall. Access restrictions, due to flooded roads as well as slope failure on the main access road, compounded communications and access issues.

Staffing

Although limited in number, the Wivenhoe Power Station staff should be commended for the professional and dedicated manner in which they followed procedures and managed the exceptional circumstances they were experiencing. They maintained the integrity of both the dam and power station without impacting the flooding crisis occurring at that time.

BACKGROUND

Wivenhoe Power Station – General Details

The two unit 500MW Wivenhoe Power Station is located on the eastern side of Wivenhoe Dam about 90 kilometres by road northwest of Brisbane. Access to the station from Brisbane is normally through Fernvale and then over the Fernvale Bridge that crosses the Brisbane River. This bridge and surrounding flood plain is subject to flooding when higher flood volumes are released from Wivenhoe Dam.

Water can be pumped out of Wivenhoe Dam (water extraction) up to the higher storage namely Splityard Creek Dam and then released back down into Wivenhoe Dam (water release) when power generation is required.

Wivenhoe Power Station - History

Construction of the power station commenced in 1978 and the units commenced commercial operation in June and August 1984.

There have been a number of occasions during the station life where the water levels in Wivenhoe Dam have been low (droughts) as well as above FSL 67 (floods). Although these times have required some checks and adjustments to occur, the power station has operated normally throughout these periods.

Wivenhoe Power Station – Statistics

The power station is connected to Wivenhoe Dam by an open intake channel and to Splityard Creek Dam by two underground steel and concrete lined tunnels, 420 meters long and varying diameters from 8.5 to 6.8 meters. The station has an operating head range of 64m-117.5m and a minimum operating level of EL 49. The combined capability of the two pumps 420 m³/s.

Splityard Creek Dam – General Details

Splityard Creek Dam consists of an earth and rockfill embankment 76m in height and 1,120 m long. A small saddle dam closes off a low saddle on the northern side of the reservoir rim.

The spillway discharges surplus inflows in a northerly direction into Wivenhoe Dam. The rainfall catchment area for the dam is very limited and is only 3.6 km². The original design Probable Maximum Flood (PMF) for the spillway design was 229m³/s while the combined station pumping capability is 420m³/s. The spillway design was dictated by the pumping capacity requirement.

The dam has a total storage volume of 28,700 ML with storage of 23,500 ML available to the station for generation. The dam's full supply level is EL 166.5m with the embankment crest level being EL 168m.

Splityard Creek Dam - Licensing

Splityard Creek Dam is a licensed dam in accordance with the Water Act and a copy of the licence is attached. There is a set of dam safety documentation in

place at Wivenhoe Power Station as required by the Splityard Creek Dam Water Licence including:

- Emergency Action Plan (copy attached)
- Data Books
- Operations and Maintenance Manual
- Operating Procedures

Splityard Creek Dam - History

Construction of Splityard Creek Dam commenced in 1976 and the power station units commenced commercial operation in June and August 1984.

The dam is one of Queensland's highest earth and rock fill and has been operated and maintained without incident since its construction.

One issue that has required some amended procedures throughout the dam life relates to the very high water levels and the period of time water should be held at those levels. Dam design reviews have not identified any shortcomings in the design, however, TE has maintained a conservative approach to minimising the duration for which it holds the dam at or near FSL.

The design of the spillway has been reviewed during dam safety inspection reviews and the design criterion for the spillway has remained as the station pumping capacity of 420m³/s.

CONTEXT – EXCEPTIONAL RAIN EVENT OPERATIONS

Operation of Wivenhoe Power Station

Wivenhoe Power Station has in place procedures, policies and guidelines associated with its operation.

During the exceptional rainfall event two particular procedures became relevant.

- Wivenhoe Power Station Business Procedure for Wivenhoe – High Rainfall, High Dam Water Levels – WIV-OPS-15 (copy attached)
- Emergency Response and Business Continuity Plan for Wivenhoe Power Station WIV-MAN-13 (copy attached)

The first procedure was used extensively during the crisis, however, it is noted that this procedure contained no details of actual power station operation (generation or pumping) during such circumstances. The procedure also refers to high rainfall events, but does not address exceptional rainfall events of the nature that were received on 11 January 2011.

The second procedure was also referred to by staff however, it does not contain any reference to high or exceptional rainfall / flooding events and therefore was of limited use during this crisis

Tarong Energy also has a Deed of Practice Agreement with SEQwater (copy attached). Section 3.2 of this Deed makes reference to TE being required to “as far as practicable” assist SEQwater in achieving its prime objectives. Tarong Energy did, as far as practicable, do everything it could to assist SEQwater during this crisis.

Operation of Splityard Creek Dam

As a result of the exceptional rainfall event there were three documents to which Wivenhoe staff referred. These were:

- Wivenhoe power station Business Procedure for Wivenhoe – High Rainfall, High Dam Water Levels – WIV-OPS-15
- Emergency Action Plan Wivenhoe Power Station Splityard Creek Dam T-MISC-149
- Operations and Maintenance Manual for Splityard Creek Dam

As a result of landslides and exceptional rainfall WPS hydro personnel were not able to physically monitor the integrity of dam as required by the procedures. The protocol for the operation of Splityard Creek Dam when this situation occurs depends on the type of emergency. For example a high rainfall event response is vastly different to that of an earthquake.

During the 11 January 2011 exceptional rainfall event the calculated inflow to Splityard Creek Dam was approximately 30m³/s over a 4 hour period which triggered consecutive high water level alarms. While exceptional, the inflow of 30m³/s is far less than the spillway capacity of 420m³/s.

Despite the fact that the dam was at a low risk of overtopping and its integrity via that failure mechanism was low there were concerns regarding potential reservoir rim slips, rock movements and dam wall erosion/scour caused by exceptional rainfall runoff as was being experienced at the station.

The decision was made to reduce the forces on the dam by lowering the dam water level to EL 157. This decision was made taking into account the Crisis Management Team directions, consultation with DERM (refer to attached email) and in accordance with WIV-OPS-15 High Rainfall, High Dam Water Level as well as the Splityard Creek Dam O&M Manual.

Attached are emails from Trevor Lush setting out the dam volume versus height curve on which is marked a number of notable levels as well as details of the volumes and times of water movements. In particular the minimum level for Black Start capability is shown and Tarong Energy is contracted with the Australian Electricity Market Operator (AEMO) to maintain water in the dam above this level.

In accordance with good dam safety practice and the respective procedures Wivenhoe hydro staff maintained contact with the dam regulator and the history of these communications is set out in an email from Peter Berthelsen dated 1 February at 9.22 am. A copy of this email is attached.

On Wednesday 19 January 2011, a complete physical inspection of Splityard Creek Dam was carried out by SunWater dam safety engineers. Verbal feedback immediately after the inspection indicated that the dam was in good condition and there were no issues requiring attention. This detail is summarised in an email from Peter Berthelsen dated 21 January and attached.

Normal operation and maintenance of the dam has resumed following this exceptional event.