Statement of Barry Dennien

Dated 3 February 2012

To Tender

QFCI
Date: 8/2/12 JM
Exhibit Number: 1098

400 George Street Brisbane
GPO Box 1738 Brisbane
Queensland 4001 Australia
Telephone **1300 309 634**

Statement by Barry Kevin Dennien, sworn on 3 February 2012

I, Barry Kevin Dennien of Level 15, 53 Albert Street, Brisbane, Queensland, the Chief Executive Officer of the South East Queensland Water Grid Manager (**Water Grid Manager**) state the following on oath.

1 In this statement to the Queensland Floods Commission of Inquiry (**Commission**), as required in the letter to me dated 2 February 2012 (**Letter**), I have:

(a) provided all the information in my possession and identified the source or sources of that information; and

(b) made commentary and provided opinions I am qualified to give as to the appropriateness of particular actions or decisions on the basis of that commentary or opinion,

in relation to the matters outlined in topics 1 to 5 in the Letter.

2 I provide this statement only in respect of the topics listed in the Letter. I address each of those topics separately below.

3 As is apparent from this statement and the documents annexed to it, I was assisted in the tasks of retaining and instructing Mr Brian Cooper by the Water Grid Manager's Director of Governance and Regulatory Compliance, Ms Elaina Smouha.

4 For the purposes of preparing this statement, I have consulted with Ms Smouha as to discussions which she had concerning these matters, and set out her account of those matters. I also annex to this statement copies of emails sent and received by Ms Smouha relating to this matter.

5 I have previously given two statements to the Commission, which were sworn on 5 April 2011 (**First Statement**) and on 1 February 2012 (**Second Statement**). Those statements

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Barry Kevin Dennien

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annexed large volumes of material. In accordance with the direction given in the Letter, if any records relating to topics 1 to 5 in the Letter are already before the Commission, whether as an exhibit or otherwise, I have identified (as far as possible, having regard to the time available) where the record is contained by reference to an exhibit, page and/or annexure number.

Topic 1: The circumstances which led to the engagement of Mr Brian Cooper to conduct an independent review of the operation of Wivenhoe Dam (including controlled releases) for compliance against The Manual of Operational Procedures for Flood Mitigation at Wivenhoe and Somerset Dam (Revision 7)

6 The following is my recollection of the circumstances which led to the engagement of Mr Cooper.

7 I was scheduled to attend a meeting of the State Disaster Management Group **(SDMG)** at Kedron at 8.00am on Tuesday, 11 January 2011. Prior to that meeting, at 7.17am on 11 January, I received from Mr Dan Spiller, the Director of Operations of the Water Grid Manager, a copy of Technical Situation Report **(TSR)** W38, which had been issued at 6.30am that morning by Mr Robert Drury, the Dam Operations Manager of Seqwater. A copy of that TSR is annexed at page 199 of my Second Statement. That TSR was significant, in that it noted that the level of Wivenhoe Dam was 73.51 AHD and rising at about 25mm per hour. Releases from the dam had been held at a rate of 2,750m3/s since 7.30pm the previous evening. The TSR noted that radial gates of the dam were open at the time and still releasing about 2,750m3/s and that at that stage, the dam would reach just over 74.0 AHD that evening. At above that level, the objective for the dam operations would be to maintain the security of the dam and to minimise downstream flows if possible.

8 I subsequently attended the meeting of the SDMG. Among the attendees were the Premier and the then Director General of the Department of Premier and Cabinet, Mr Ken Smith. During the meeting, I briefed the attendees on TSR38.

Signed [redacted]....
Barry Kevin Dennien

Taken by: [redacted].....
[Justice of the Peace/Solicitor]

9 Following the SDMG meeting, I had a separate meeting with the Premier and Mr Smith. I told them (reiterating comments made by Mr Borrows, the Chief Executive Officer of Seqwater, at a meeting the previous day) that Wivenhoe Dam had never experienced an event as big as the current event. While I commented that I had no personal reason to suspect that the dam operations were not appropriate, our discussion concerned the importance of ensuring public confidence in the operation of the dam. That was especially so following the releases from the dam which had been occurring at different times since October 2010 and which had been the topic of significant public discussion. With that imperative in mind, it was agreed between the Premier, Mr Smith and me that an expert should be urgently retained to undertake an independent review of the operation of Wivenhoe Dam. I was instructed by the Premier and Mr Smith to immediately arrange the commissioning of an expert to assess how the dam operation was being performed against the requirements of the Flood Mitigation Manual (that is, the Manual of Operational Procedures for Flood Mitigation at Wivenhoe and Somerset Dams). I indicated that I would seek to identify a suitable expert after consultation with the Dam Regulator and Seqwater and then proceed accordingly.

10 Following my meeting with the Premier and Mr Smith, I spoke with Mr Borrows who agreed to initiate urgent enquiries to identify a number of possible independent experts who could undertake the review.

11 I recall that on returning to my office from the meeting, I spoke with Ms Smouha and told her of the instructions which I had received from the Premier and Mr Smith to engage an independent expert. I did so because Ms Smouha was normally responsible for the documenting of the Water Grid Manager's consultancy arrangements. I instructed Ms Smouha that once the prospective experts were identified, she was to contact them, ascertain their availability and then, after consultation with me, retain the expert agreed upon.

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Barry Kevin Dennien

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[Justice of the Peace/Solicitor]

12 I recall that at about that time, Mr Borrows had been attempting to forward to me an email that he had received from Mr Peter Allen, the Director, Dam Safety (Water Supply), in the office of Water Supply Regulator within the Department of Environment and Resource Management. The email identified four possible experts, together with their contact details. I finally received that email at 10.54am.

13 I am informed by Ms Smouha and believe:

(a) that at about the same time as I received Mr Borrows' email, he had had a separate discussion with her, in which he read to her the list of prospective experts and gave her their contact details;

(b) she then telephoned, or attempted to speak with, each of the nominated experts; and

(c) she identified Mr Cooper as the expert who was best placed to undertake the engagement as a matter of urgency.

14 After undertaking her enquiries, Ms Smouha discussed Mr Cooper's proposed appointment with me. I agreed to his appointment.

15 Following our discussion, at 11.42am Ms Smouha sent an email to Mr Smith, attaching Mr Cooper's CV and notifying him that the Water Grid Manager intended to engage Mr Cooper to undertake the independent review.

Topic 2: The engagement of Mr Cooper

16 Mr Cooper was engaged by email on the afternoon on 11 January 2011.

17 At 4.08pm on 11 January 2011, Ms Smouha sent an email to Mr Cooper providing him with a draft Consultancy Agreement for his consideration. He subsequently accepted that agreement.

Signed [redacted].....
Barry Kevin Dennien

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[Justice of the Peace/Solicitor]

18 Mr Cooper was asked to provide a written preliminary advice by 9.00am on 12 January 2011 and a formal written report by 4.00pm on the same day.

Topic 3: All instructions given to Mr Cooper

19 The scope of work set out in the Consultancy Agreement stated that Mr Cooper was engaged by the Water Grid Manager to:

(a) review the operation of Wivenhoe Dam, including controlled releases, for compliance against the Flood Mitigation Manual for the period commencing on or about 13 December 2010 to 11 January 2011 (**Flood Event**); and

(b) advise on whether the decisions and actions taken during the Flood Event regarding the operation of Wivenhoe Dam were prudent and appropriate in light of the Flood Mitigation Manual's requirements and the circumstances of the Flood Event.

20 The scope of work expressly excluded a review of the sufficiency or adequacy of the Flood Mitigation Manual itself.

21 Mr Cooper's advice was requested to be given in the context of:

(a) the Flood Mitigation Manual's requirements; and

(b) the facts, matters and circumstances of the Flood Event.

Topic 4: The material provided to Mr Cooper

22 Material provided to Mr Cooper for the purpose of his review included:

(a) a link to Seqwater's website containing historical dam storage data;

(b) a copy of the Flood Mitigation Manual;

(c) a copy of the TSRs for December 2010;

(d) a copy of the TSRs to date for January 2011;

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(e) a link to the Bureau of Meteorology's website which contained summary tables rainfall information for 2010 and 2011;

(f) a copy of the draft Protocol for the Communication of Flooding Information for the Brisbane River Catchment – including Floodwater Releases from Wivenhoe and Somerset Dams; and

(g) a document titled *Seqwater Dam Operations January 2011* containing information in respect of flood peaks volumes and hydrographs.

23 Copies of all documentation referred to in topic 4 are either contained as part of **Annexure A** to this statement or cross-referenced in the index to that annexure.

24 In addition, I participated in an initial teleconference with Mr Cooper and Ms Smouha at 12.30pm on 11 January 2011, during which a general overview of the engagement was provided. Mr Allen also participated in that teleconference. During the teleconference, the invitation was made to Mr Cooper to make any additional enquiries of Mr Allen. I have no direct knowledge as to whether Mr Cooper made further enquiries of Mr Allen, although it appears from the face of his report that he may have.

Topic 5: All communications involving Mr Dennien or any other employee of the South East Queensland Water Grid Manager – whether with Mr Cooper or any other person – about:

5.1 The engagement of Mr Brian Cooper

25 Copies of all emails and documentation relevant to the engagement of Mr Cooper are either contained as part of **Annexure A** to this statement or cross-referenced in the index to that annexure.

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Barry Kevin Dennien

Taken by: [redacted].....
[Justice of the Peace/Solicitor]

5.2 Mr Cooper's report/s, including the use to be made of his reports

12 January 2011

26 At 9.12am on 12 January 2011, I received an email from Mr Cooper providing his initial report regarding the operations of Wivenhoe and Somerset Dams (**Preliminary Report**).

27 At 9.24am, I requested, via email, that the Water Grid Manager's Director of Operations, Mr Dan Spiller, and Mr Borrows proof check the Preliminary Report.

28 At 9.36pm I received a response email from Mr Borrows confirming that the Preliminary Report *'OK'* by him.

29 At 9.47am, I sent an email to Honourable Stephen Robertson (the then Minister for Natural Resources, Mines and Energy and Minister for Trade) providing him with a copy of the Preliminary Report.

30 At 11.03am Ms Smouha forwarded a copy of the Preliminary Report to Mr Allen and Mr Borrows.

31 At 2.15pm, Ms Smouha forwarded a copy of the Preliminary Report to Mr Bradley, Mr Timothy Watts, a Ministerial advisor and others informing them that the final report was due by close of business that day.

32 At 3.31pm, Mr Cooper emailed Ms Smouha providing his final report (**Final Report**), as requested.

13 January 2011

33 At 9.27am on 13 January 2011, I sent an email to Mr John Bradley, the then Director General of the Department of Environment and Resource Management, providing him with a copy of the Preliminary Report.

Signed [redacted].
Barry Kevin Dennien

Taken by: [redacted].....
[Justice of the Peace/Solicitor]

34 At 4.45pm on 13 January 2011, Ms Smouha sent the Final Report, via email, to Mr Watts at Minister Robertson's office, copied to Mr Smith and Mr Bradley. The email also attached my covering letter to Minister Robertson of the same date, together with a briefing note from Seqwater on the development of the Flood Mitigation Manual.

35 At 5.25pm on 14 January 2011, Ms Smouha re-sent to Mr Smith, the email referred to in the preceding paragraph.

36 At 1.42pm on 15 January 2011, Ms Smouha sent an email to Mr Bradley regarding a 2.00pm teleconference in respect of the following Monday's Emergency Cabinet meeting. The talking points attached to Ms Smouha's email mentioned a review requirement under the Flood Mitigation Manual as well as the prospect of obtaining a more comprehensive report from Mr Cooper.

37 At approximately 2.00pm that day I took part in a teleconference in relation to the Ministerial Briefing Note dated 16 January 2011.

38 Information concerning the preparation of the Ministerial Briefing Note and my involvement with it is set out in paragraphs 35 to 37 in my Second Statement.

39 On 17 January 2011 at 8.53am, I received an email from Ms Smouha informing me that she had received a telephone call from Toni Lake, Legal Counsel, Seqwater, requesting that Mr Ken Sedgwick, Assistant Under Treasurer, Queensland Treasury, be provided with a similar update as that provided to Minister Robertson.

40 At 11.54am on 17 January 2011, I was copied into an email that one of my staff members sent to Ms Smouha informing her that this was done.

Signed: [redacted]..
Barry Kevin Dennien

Taken by: [redacted]...
[~~Justice of the Peace~~/Solicitor]

41 All the facts and circumstances deposed to herein are within my own knowledge, save such as are deposed to from information only, and my means of knowledge and sources of knowledge appear in this my statement to the Commission.

[redacted]

Sworn by Barry Kevin Dennien on 3 February 2012
in the presence of:

[redacted]

Signature of witness

Cindy Jane Hulsey

Name of witness (print)

Signature of Barry Kevin Dennien

Suzie Emery

From: Brian Cooper Consulting [brian.cooper.consult[redacted]
Sent: Tuesday, 11 January 2011 11:32 AM
To: Elaina Smouha
Subject: Brian Cooper - CV
Attachments: BrianCooperCV09122010.pdf

Dear Elaina,

Please find my CV attached.

Regards,

Brian Cooper

brian cooper consulting

Brian Cooper

Dams Engineer

Qualifications & Affiliations

Short courses on finite element analysis, embankment dam engineering, earthquake engineering. Published technical papers – ICOLD. ANCOLD and I.E. Aust. Attended dam safety course at USBR (Denver, USA) in 2002

Bachelor of Engineering (B.E. Hons), 1968 and Master of Engineering Science (M.Eng.Sc.), 1971

University of New South Wales

Graduate Diploma of Engineering Management, 1994 Deakin University

F.I.E. Aust.,C.P.Eng. RPEQ

Expertise

Brian has approximately 40 years experience in investigation and design of major dams, weirs and hydraulic structures, having started his career designing farm dams and small irrigation schemes. He retired from NSW Department of Commerce in 2005. Brian now works as a private consultant specialising in dams engineering and fish passage at dams and weirs. He has a special interest in risk assessment and computer modelling in general and the seismic analysis of dams in particular. Engineering software (concrete dam stability analysis and flood routing) written by Brian is still used extensively in the Dams & Civil Group of the Department of Commerce. He also has particular experience with concrete dams and the use of post tensioned ground anchors for strengthening those dams. He was a member of the Australian National Committee on Large Dams (ANCOLD) Working Group that developed guidelines for 'Design of Dams for Earthquakes' and a member of the Working Group that revised the guidelines for 'Risk Assessment for Dams'. He has been a guest lecturer for a number of years (most recently in 2009) on concrete dam engineering for the University of NSW post graduate Embankment Dam Engineering Course, and on the history of dams in NSW at Sydney University.

He has been the project director and project manager for a number of feasibility studies, design reviews, site investigations and detail design consultancies for major dams and weirs including the direction and co-ordination of all specialist services including dambreak studies, preparation of dam safety emergency plans and risk assessments. He is currently an expert reviewer for a number of Australian water authorities and consultants (State Water Corporation (NSW), Hydro Tasmania, SunWater (Queensland), Brisbane City Council, Goulburn-Murray Water, Goulburn Valley Water, WA Water Corporation, Southern Rural Water (Victoria), URS, GHD, Hobart Water, NT PowerWater, and TrustPower (NZ)). He has also worked as a sub-consultant for a number of consulting firms (URS, MWH, GHD).

Brian is the Engineers Australia representative for the NSW Dams Safety Committee (the dam safety regulator in NSW) and is currently the Chairman of that organisation. He has been a member of the Murray Darling Basin Authority's Fish Passage Task Force which advises inter alia on the installation of fishways on the Murray River as part of the Living Murray Program.

Brian is a registered engineer in Queensland (RPEQ No. 6819). He started his own consulting business in 2008, advising on dam safety, dam design and analysis, dam risk assessments and dam upgrades as well as fish passage for dams. He is providing specialist advice through *Brian Cooper Consulting* as a sole trader.

Professional Experience

2008 to Present: Principal of Brian Cooper Consulting

2010
Five yearly comprehensive dam safety inspection of Carcoar Dam (double curvature arch dam).
Internal reviewer to URS (Melbourne) on concept design of regulator structures and associated fishways for the Hipwell Road project for watering the Gunbower Forest
Specialist adviser to Melbourne Water – valve behaviour on Sugarloaf Dam pipeline, structural behaviour of pumping station floor slab and pump bases at Cardinia Dam Pumping Station
Commenced work as member of ANCOLD working group re-writing the Earthquake Guidelines – responsible for re-writing sections relating to concrete dams.
Continuing involvement with Alluvium in the design of the weir upgrade and the new fishway for Booligal Weir.
Continuing external peer review services to State Water Corporation for the detail design of new auxiliary fuse plug spillways for Copeton and Chaffey Dams, detail design of raising and post tensioned strengthening of Keepit Dam, detail design of upgrade works for Wyangala Dam, finite element analysis of Carcoar Dam (double curvature arch dam).
Further work with GHD (Perth) on risk assessment for Serpentine Dam.
Continuing involvement with Hydro Tasmania, as Chair of external review panel for Catagunya Dam.

2009
Part of URS' comprehensive inspection team for Melbourne Water's Maroondah Dam.
Part of URS' business risk assessment team for Southern Rural Water's Cowwarr and Maffra Weirs.
Part of Alluvium's design team upgrading Booligal Weir and providing a fishway at the weir, for State Water Corporation.
Part of GHD's design team for Lower Fitzroy River Infrastructure Project designing fishways for Rookwood and Eden Bann Weirs near Rockhampton in Queensland.
Project Manager on behalf of SA Water and reviewer for study into vibration of a crane rail beam at Lock 5 on the River Murray.
Expert reviewer for State Water Corporation for 3D finite element analysis of Carcoar Dam (double curvature arch dam).
Internal reviewer for URS on Laanecoorie Dam Upgrade.
Expert reviewer for State Water Corporation for risk assessments for Oberon and Rydal Dams.
Member of GHD's Serpentine Dam risk assessment team for WA WaterCorp.
Expert reviewer for SunWater in Queensland for the comprehensive risk assessment undertaken for Fairbairn Dam and Coolmunda Dam.
Expert reviewer for State Water Corporation for major upgrade works at Keepit, Copeton, Chaffey and Wyangala Dams.
Appointed as Chairman of the NSW Dams Safety Committee (the dam safety regulator in NSW).
Provided external peer review for Goulburn Valley Water, on Nine Mile Creek Dam Upgrade.
Internal reviewer for URS (Adelaide) for Lake Victoria Outlet Regulator options studies.
Provided advice to URS (Melbourne) on the Mildura Weir Fishway design.
Member of expert panel advising State Water Corporation on revised dam surveillance regime.
Part of Ecosmart bid team - prepared concept designs for fish passage facility at proposed Wyaralong Dam in Queensland.
Continuing expert review role for Catagunya Dam upgrade.

2008
Started as a private specialist dams consultant - *Brian Cooper Consulting.*
Worked through the URS Corporation for the USBR and the USACE in developing a risk toolbox for lined spillways.
Advised TrustPower in New Zealand on replacement of post tensioned anchors at Mahinerangi No. 1 Dam.
Adviser to State Water Corporation and to URS on further upgrade works for Hume Dam.
Provided specialist advice to WA Water Corporation on Wellington Dam post tensioning.
Peer reviewer on behalf of URS for Warren Dam in South Australia.
Part of URS team carrying out portfolio risk assessment of Melbourne Water's dams.
Member of Expert Review Panel for Darwin River and Manton Dams for NT PowerWater.

1987 to 2008: Dams & Civil Section of NSW Department of Public Works and Services/NSW Department of Commerce.

2008
Carried out detailed 3D finite element analysis of radial gate at Wyangala Dam spillway for State Water Corporation.
Continuing review role for Tillegra Dam.
Continuing review role for Hinze and Lake Manchester Dams in Queensland and Catagunya Dam in Tasmania.
Prepared options report on Burrendong Dam spillway modifications for State Water Corporation.

2007
Continuing roles on Lake Manchester, Hinze, Catagunya and Redbank Ck. Dams.
Internal peer reviewer for NSW Dept. of Commerce regarding design of Tillegra Dam.
Advised State Water on feasibility of fish passage facilities at a number of their major irrigation dams.
Expert reviewer for GHD on a flood retarding basin in south west Sydney.
Part of expert panel for River Murray Water risk assessments for Hume and Dartmouth Dams, Torrumbarry and Yarrowonga Weirs and Lake Victoria.
Re-elected as Deputy Chairman of the Dams Safety Committee

2006
Project director for 3D finite element analysis of Bendora Dam (double curvature arch dam)
Chair of external peer review panel for upgrading of Lake Manchester Dam (concrete gravity dam) in Queensland
Internal peer reviewer and senior consultant for the raising of Hinze Dam (earth and rockfill embankment) in Queensland
Project director for preliminary and detailed design of Redbank Creek Dam (single curvature arch dam) upgrading
Project director for Keepit Dam fish passage investigations
Part of expert panel for URS undertaking portfolio risk assessment for dams owned by River Murray Water
External peer reviewer for Hydro Tasmania for Catagunya Dam (concrete gravity dam) upgrading;
Project director for 3D finite element analysis of Upper Cordeaux No. 2 Dam (single curvature arch dam owned by SCA) for BHP Billiton

2005
Project design engineer for dam related aspects of Nepean Dam Deepwater Access Project: Pipeline crossing end of spillway; outlet works for end of pipeline
Project design engineer for Avon Dam Deepwater Access Project: tunnel design through rockfill buttressing; new low level outlet works

2004
Internal reviewer to URS Australia for Pykes Ck Dam Investigations (Southern Rural Water, Victoria)
Internal reviewer to URS Australia for Lower Reservoir Dam (Hobart Water, Tasmania)
Member of expert review panel for the Melton Dam upgrade design (Southern Rural Water, Victoria)

2003/04
Designer for retrofitting multi-level offtake for Tallowa Dam (Sydney Catchment Authority).
Member of the Independent Technical Expert Panel for the Eildon Dam Upgrading in Victoria for Goulburn-Murray Water.
Currently the design director for the Wivenhoe Dam Alliance carrying out the flood capacity upgrading for Wivenhoe Dam in Queensland – included directing major computational fluid dynamics modelling investigations of existing spillway

2003
Carried out options study for environmental upgrading works at Keepit Dam (selective withdrawal facility, additional outlet works and fish passage)
Carried out assessment of spillway capacity for Hume Dam using computational fluid dynamics modelling (by a sub-consultant)
Carried out detail design for anchoring Bellfield Dam (Victoria) Intake Tower
Carried out detailed finite element analysis of Keepit Dam radial gates

2002
Carried out review of large farm dam with seepage problems. Directed computational fluid dynamics modelling of drum gate and radial gates at Warragamba Dam together with structural analysis of gates (modelling carried out by sub-consultant) to ensure gates can handle more

rigorous operating conditions
Adviser to the Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) on civil engineering matters related to the replacement reactor project at Lucas Heights
Expert reviewer for Goulburn-Murray Water for remedial works at Cairn Curran Dam in Victoria
Project Director for Lerderderg Weir safety review and risk assessment for Southern Rural Water (Victoria). Carried out finite element analysis of radial gate

2001

Project Director for design of further remedial works at Hume Dam.
Technical director on behalf of NPWS for quantitative risk assessment for Snowy Mountains roads
Chairman of the committee producing a geotechnical response plan for the Alpine Way in the Snowy Region for NPWS
Carried out non-linear finite element analysis (earthquake loading) for outlet tower at Bellfield Dam for Wimmera-Mallee Water (Victoria)
Joined the MDBC's Fish Passage Reference Group and reviewed fishway designs
Consultant to DLWC for their portfolio risk assessment of thirty dams
Provided advice on the post tensioning system at Waitakere Dam in New Zealand.

Director of Dam Surveillance Group responsible for the surveillance of DLWC dams and participant of a number of 5 yearly surveillance inspections
Project Director of review of DLWC Intake Towers Earthquake Stability Review
Directed DPWS input into the Earthquake Stability of the structural elements of Yarrawonga Weir as sub-consultant to URS Australia – included detail design of anchoring system for the weir.
Also provided design advice on design of stone columns to provide protection against liquefaction of alluvial foundations.
Member of the expert panel for the risk assessment studies being undertaken for Goulburn-Murray Water
Project Director for safety review and preliminary design of remedial options for Blowering Dam (DLWC)
Acted as reviewer for a number of projects carried out by URS (incl. Cardinia Dam outlet tower, Bellfield Dam embankment/spillway)
Directed functionality study (including business risk assessment) for Yalloum Weir for Southern Rural Water (Victoria)

2000

Project Director for design of further investigations and remedial works at Hume Dam.
Safety reviews for Bamarang and Flat Rock Dams
Director of Dam Surveillance Group responsible for the surveillance of DLWC dams and participant of a number of 5 yearly surveillance inspections
Project Director for earthquake studies on intake towers and appurtenant works at DLWC dams
Consultant to DLWC to manage their portfolio risk assessment
Project Director for a number of dambreak studies and preparation of dam safety emergency plans
Member of the consulting team carrying out risk assessments for Goulburn-Murray Water (Victoria) for Eppalock Dam
Carried out review of Earthquake Stability Review of the Outlet Tower at Eppalock Dam in Victoria for G-MW.
Reviewed URS Australia designs for Alpine Way remedial works

1999

Project Director of earthquake studies on Wyangala Dam
Project Director for design of further remedial works at Hume Dam. Included design of ground improvement works (stone columns) for protecting alluvial foundations against liquefaction
Peer reviewer of Leslie Dam (Queensland) Safety Report.
Peer reviewer of DLWC's Screening Level Risk Assessment

1998

Project Director for portfolio risk assessment for six dams owned by a Southern Rural Water in Victoria.
Directed structural analysis of spillway gates on Narracan Dam for Southern Rural Water
Project Director for concept design and DD&C contract documentation for Warragamba Dam auxiliary spillway. Dam to be upgraded the dam to cater for increased inflow flood estimates. Upgrading works estimated to cost $135M. An auxiliary spillway is to be constructed adjacent to the existing dam - involves excavating some 2,000,000m³ of rock and constructing concrete lining, training walls, fuse plug embankments, large scale cement stabilised sandstone fill, a multi

span bridge across the spillway, post tensioned ground anchors for dissipator/training walls, modifications of existing spillway gates. Design involved extensive physical hydraulic model testing.

1997 Feasibility options study for remediation of Redbank Ck. Dam near Mudgee (NSW) Karapiro Dam, New Zealand - Part of international consulting team reviewing this concrete arch dam's security and determining appropriate remedial options (mass concrete buttressing). Director of risk assessment studies for Tenterfield Dam

1993-1997 Hume Dam Investigations - Project Manager of Investigation and Design Studies for the embankments at the dam. Work involves:

- review of the stability of the embankments under static and earthquake loadings
- investigation of liquefaction
- potential of embankments' foundations
- development of stabilising options
- development of options to provide increased flood security including provision of new auxiliary spillways and modifications to existing works

- detail design and documentation of stabilising works for the embankments including a key trench into the dam's foundations, stabilising berms, slurry wall cut-offs, drainage/filter curtains and strengthening of critical gravity training walls with both horizontal and vertical post tensioning.

- part of advisory and review team for the risk assessment of the dam and its components.

1990-1996 Warragamba Dam Upgrading for Sydney Water Corporation - Project Manager of Investigation Concept Design Studies for upgrading the dam to cater for increased inflow flood estimates and provide substantial flood mitigation. Upgrading works estimated to cost $280M. The existing dam was to be strengthened with mass concrete buttressing – some 600,000m³.

1996 Project Director for Safety Review (including Finite Element Analysis) of Wellington Dam

1993-1996 Hume Dam Gates for Department of Water Resources - Project Manager for the design of new maintenance baulks and emergency closure gates. Involves development of proposals for underwater installation.

1995 Redbank Creek Dam and Lithgow No. 2 Dam for NSW Public Works Dams Surveillance - Project Manager for safety reviews and finite element analysis of two 15m high arch dams. Clarrie Hall Dam for NSW Public Works Dams Surveillance - Project Manager for dambreak studies.

1994 Burrinjuck Dam Gates for NSW Department of Water Resources - Project Manager for the design of new control and emergency closure gates. Involves underwater installation. Karangi Dam for Coffs Harbour City Water Project - Project Manager for dambreak studies.

1993 Mardi Dam for Wyong Council - Project Manager for safety review of earth embankment.

1988-1990 Nepean Dam Remedial Works for Sydney Water Corporation - Project Manager for investigation studies, design development and detail design. Work involved:

- initial flood security studies and development of options
- co-ordination of hydraulic model studies
- detail design and contract documentation for modified spillway, large size post-tensioned ground anchors and rockfill buttressing.

1987-1989 Boggabilla Weir for NSW Department of Water Resources - Project Manager for detail design and contract documentation of a large gated re-regulation weir with fishway. Involved liaison with fisheries expert in developing optimum geometry for fish ladder.

Chaffey Dam for NSW Department of Water Resources - Project Manager for upgrading of dam. Work involved:

- development of options and preliminary design
- finite element analyses for raised morning glory spillway
- stability analyses for raised earth/rockfill embankment
- co-ordination of hydraulic model studies for raised spillway.

1969-1987: ***Water Resources Commission of NSW (WRC) (now Department of Land and Water Conservation).***

1986-1987 Flood Security studies for WRC - Project Design Engineer for investigation into flood security of Chaffey and Glennies Creek Dams. Involved co-ordinating dambreak studies, development of remedial options, economic risk studies.

1985-1987 Hume Dam Strengthening for WRC - Project Design Engineer for detail design and contract documentation. Work included:

- design of large size post-tensioned ground anchors including development of appropriate grouting procedures
- design of structural modifications to the concrete gravity dam
- design of a new road bridge over the dam.
- establishing the rationale for replacing the existing post tensioning system

Contact

Tel: [redacted]
Mobile
Email: [redacted]

Gina O'Driscoll

From: Elaina Smouha
Sent: Tuesday, 11 January 2011 11:33 AM
To: Barry Dennien
Subject: FW: Brian Cooper - CV
Attachments: BrianCooperCV09122010.pdf

Elaina Smouha
Director, Governance and Regulatory Compliance
SEQ Water Grid Manager
[redacted]
Visit: Level 15, 53 Albert Street Brisbane
Post: PO Box 16205, City East QLD 4002
ABN: 14783 317 630

om: Brian Cooper Consulting [mailto:brian.cooper.consult[redacted]
Sent: Tuesday, 11 January 2011 11:32 AM
To: Elaina Smouha
Subject: Brian Cooper - CV

Dear Elaina,

Please find my CV attached.

Regards,

Brian Cooper

brian cooper consulting

Brian Cooper

Dams Engineer



Qualifications & Affiliations

Short courses on finite element analysis, embankment dam engineering, earthquake engineering. Published technical papers – ICOLD. ANCOLD and I.E. Aust. Attended dam safety course at USBR (Denver, USA) in 2002

Bachelor of Engineering (B.E. Hons), 1968 and Master of Engineering Science (M.Eng.Sc.), 1971

University of New South Wales

Graduate Diploma of Engineering Management, 1994 Deakin University

F.I.E. Aust.,C.P.Eng. RPEQ

Expertise

Brian has approximately 40 years experience in investigation and design of major dams, weirs and hydraulic structures, having started his career designing farm dams and small irrigation schemes. He retired from NSW Department of Commerce in 2005. Brian now works as a private consultant specialising in dams engineering and fish passage at dams and weirs. He has a special interest in risk assessment and computer modelling in general and the seismic analysis of dams in particular. Engineering software (concrete dam stability analysis and flood routing) written by Brian is still used extensively in the Dams & Civil Group of the Department of Commerce. He also has particular experience with concrete dams and the use of post tensioned ground anchors for strengthening those dams. He was a member of the Australian National Committee on Large Dams (ANCOLD) Working Group that developed guidelines for 'Design of Dams for Earthquakes' and a member of the Working Group that revised the guidelines for 'Risk Assessment for Dams'. He has been a guest lecturer for a number of years (most recently in 2009) on concrete dam engineering for the University of NSW post graduate Embankment Dam Engineering Course, and on the history of dams in NSW at Sydney University.

He has been the project director and project manager for a number of feasibility studies, design reviews, site investigations and detail design consultancies for major dams and weirs including the direction and co-ordination of all specialist services including dambreak studies; preparation of dam safety emergency plans and risk assessments. He is currently an expert reviewer for a number of Australian water authorities and consultants (State Water Corporation (NSW), Hydro Tasmania, SunWater (Queensland), Brisbane City Council, Goulburn-Murray Water, Goulburn Valley Water, WA Water Corporation, Southern Rural Water (Victoria), URS, GHD, Hobart Water, NT PowerWater, and TrustPower (NZ)). He has also worked as a sub-consultant for a number of consulting firms (URS, MWH, GHD).

Brian is the Engineers Australia representative for the NSW Dams Safety Committee (the dam safety regulator in NSW) and is currently the Chairman of that organisation. He has been a member of the Murray Darling Basin Authority's Fish Passage Task Force which advises inter alia on the installation of fishways on the Murray River as part of the Living Murray Program.

Brian is a registered engineer in Queensland (RPEQ No. 6819). He started his own consulting business in 2008, advising on dam safety, dam design and analysis, dam risk assessments and dam upgrades as well as fish passage for dams. He is providing specialist advice through *Brian Cooper Consulting* as a sole trader.

Professional Experience

2008 to Present: Principal of Brian Cooper Consulting

2010
Five yearly comprehensive dam safety inspection of Carcoar Dam (double curvature arch dam).
Internal reviewer to URS (Melbourne) on concept design of regulator structures and associated fishways for the Hipwell Road project for watering the Gunbower Forest
Specialist adviser to Melbourne Water – valve behaviour on Sugarloaf Dam pipeline, structural behaviour of pumping station floor slab and pump bases at Cardinia Dam Pumping Station
Commenced work as member of ANCOLD working group re-writing the Earthquake Guidelines – responsible for re-writing sections relating to concrete dams.
Continuing involvement with Alluvium in the design of the weir upgrade and the new fishway for Booligal Weir.
Continuing external peer review services to State Water Corporation for the detail design of new auxiliary fuse plug spillways for Copeton and Chaffey Dams, detail design of raising and post tensioned strengthening of Keepit Dam, detail design of upgrade works for Wyangala Dam, finite element analysis of Carcoar Dam (double curvature arch dam).
Further work with GHD (Perth) on risk assessment for Serpentine Dam.
Continuing involvement with Hydro Tasmania, as Chair of external review panel for Catagunya Dam.

2009
Part of URS' comprehensive inspection team for Melbourne Water's Maroondah Dam.
Part of URS' business risk assessment team for Southern Rural Water's Cowwarr and Maffra Weirs.
Part of Alluvium's design team upgrading Booligal Weir and providing a fishway at the weir, for State Water Corporation.
Part of GHD's design team for Lower Fitzroy River Infrastructure Project designing fishways for Rookwood and Eden Bann Weirs near Rockhampton in Queensland.
Project Manager on behalf of SA Water and reviewer for study into vibration of a crane rail beam at Lock 5 on the River Murray.
Expert reviewer for State Water Corporation for 3D finite element analysis of Carcoar Dam (double curvature arch dam).
Internal reviewer for URS on Laanecoorie Dam Upgrade.
Expert reviewer for State Water Corporation for risk assessments for Oberon and Rydal Dams.
Member of GHD's Serpentine Dam risk assessment team for WA WaterCorp.
Expert reviewer for SunWater in Queensland for the comprehensive risk assessment undertaken for Fairbairn Dam and Coolmunda Dam.
Expert reviewer for State Water Corporation for major upgrade works at Keepit, Copeton, Chaffey and Wyangala Dams.
Appointed as Chairman of the NSW Dams Safety Committee (the dam safety regulator in NSW).
Provided external peer review for Goulburn Valley Water, on Nine Mile Creek Dam Upgrade.
Internal reviewer for URS (Adelaide) for Lake Victoria Outlet Regulator options studies.
Provided advice to URS (Melbourne) on the Mildura Weir Fishway design.
Member of expert panel advising State Water Corporation on revised dam surveillance regime.
Part of Ecosmart bid team - prepared concept designs for fish passage facility at proposed Wyaralong Dam in Queensland.
Continuing expert review role for Catagunya Dam upgrade.

2008
Started as a private specialist dams consultant - *Brian Cooper Consulting.*
Worked through the URS Corporation for the USBR and the USACE in developing a risk toolbox for lined spillways.
Advised TrustPower in New Zealand on replacement of post tensioned anchors at Mahinerangi No. 1 Dam.
Adviser to State Water Corporation and to URS on further upgrade works for Hume Dam.
Provided specialist advice to WA Water Corporation on Wellington Dam post tensioning.
Peer reviewer on behalf of URS for Warren Dam in South Australia.
Part of URS team carrying out portfolio risk assessment of Melbourne Water's dams.
Member of Expert Review Panel for Darwin River and Manton Dams for NT PowerWater.

1987 to 2008: Dams & Civil Section of NSW Department of Public Works and Services/NSW Department of Commerce.

2008	Carried out detailed 3D finite element analysis of radial gate at Wyangala Dam spillway for State Water Corporation. Continuing review role for Tillegra Dam. Continuing review role for Hinze and Lake Manchester Dams in Queensland and Catagunya Dam in Tasmania. Prepared options report on Burrendong Dam spillway modifications for State Water Corporation.
2007	Continuing roles on Lake Manchester, Hinze, Catagunya and Redbank Ck. Dams. Internal peer reviewer for NSW Dept. of Commerce regarding design of Tillegra Dam. Advised State Water on feasibility of fish passage facilities at a number of their major irrigation dams. Expert reviewer for GHD on a flood retarding basin in south west Sydney. Part of expert panel for River Murray Water risk assessments for Hume and Dartmouth Dams, Torrumbarry and Yarrowonga Weirs and Lake Victoria. Re-elected as Deputy Chairman of the Dams Safety Committee
2006	Project director for 3D finite element analysis of Bendora Dam (double curvature arch dam) Chair of external peer review panel for upgrading of Lake Manchester Dam (concrete gravity dam) in Queensland Internal peer reviewer and senior consultant for the raising of Hinze Dam (earth and rockfill embankment) in Queensland Project director for preliminary and detailed design of Redbank Creek Dam (single curvature arch dam) upgrading Project director for Keepit Dam fish passage investigations Part of expert panel for URS undertaking portfolio risk assessment for dams owned by River Murray Water External peer reviewer for Hydro Tasmania for Catagunya Dam (concrete gravity dam) upgrading; Project director for 3D finite element analysis of Upper Cordeaux No. 2 Dam (single curvature arch dam owned by SCA) for BHP Billiton
2005	Project design engineer for dam related aspects of Nepean Dam Deepwater Access Project: Pipeline crossing end of spillway; outlet works for end of pipeline Project design engineer for Avon Dam Deepwater Access Project: tunnel design through rockfill buttressing; new low level outlet works
2004	Internal reviewer to URS Australia for Pykes Ck Dam Investigations (Southern Rural Water, Victoria) Internal reviewer to URS Australia for Lower Reservoir Dam (Hobart Water, Tasmania) Member of expert review panel for the Melton Dam upgrade design (Southern Rural Water, Victoria)
2003/04	Designer for retrofitting multi-level offtake for Tallowa Dam (Sydney Catchment Authority). Member of the Independent Technical Expert Panel for the Eildon Dam Upgrading in Victoria for Goulburn-Murray Water. Currently the design director for the Wivenhoe Dam Alliance carrying out the flood capacity upgrading for Wivenhoe Dam in Queensland – included directing major computational fluid dynamics modelling investigations of existing spillway
2003	Carried out options study for environmental upgrading works at Keepit Dam (selective withdrawal facility, additional outlet works and fish passage) Carried out assessment of spillway capacity for Hume Dam using computational fluid dynamics modelling (by a sub-consultant) Carried out detail design for anchoring Bellfield Dam (Victoria) Intake Tower Carried out detailed finite element analysis of Keepit Dam radial gates
2002	Carried out review of large farm dam with seepage problems. Directed computational fluid dynamics modelling of drum gate and radial gates at Warragamba Dam together with structural analysis of gates (modelling carried out by sub-consultant) to ensure gates can handle more

rigorous operating conditions
Adviser to the Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) on civil engineering matters related to the replacement reactor project at Lucas Heights
Expert reviewer for Goulburn-Murray Water for remedial works at Cairn Curran Dam in Victoria
Project Director for Lerderderg Weir safety review and risk assessment for Southern Rural Water (Victoria). Carried out finite element analysis of radial gate

2001

Project Director for design of further remedial works at Hume Dam.
Technical director on behalf of NPWS for quantitative risk assessment for Snowy Mountains roads
Chairman of the committee producing a geotechnical response plan for the Alpine Way in the Snowy Region for NPWS
Carried out non-linear finite element analysis (earthquake loading) for outlet tower at Bellfield Dam for Wimmera-Mallee Water (Victoria)
Joined the MDBC's Fish Passage Reference Group and reviewed fishway designs
Consultant to DLWC for their portfolio risk assessment of thirty dams
Provided advice on the post tensioning system at Waitakere Dam in New Zealand.

Director of Dam Surveillance Group responsible for the surveillance of DLWC dams and participant of a number of 5 yearly surveillance inspections
Project Director of review of DLWC Intake Towers Earthquake Stability Review
Directed DPWS input into the Earthquake Stability of the structural elements of Yarrawonga Weir as sub-consultant to URS Australia – included detail design of anchoring system for the weir.
Also provided design advice on design of stone columns to provide protection against liquefaction of alluvial foundations.
Member of the expert panel for the risk assessment studies being undertaken for Goulburn-Murray Water
Project Director for safety review and preliminary design of remedial options for Blowering Dam (DLWC)
Acted as reviewer for a number of projects carried out by URS (incl. Cardinia Dam outlet tower, Bellfield Dam embankment/spillway)
Directed functionality study (including business risk assessment) for Yallourn Weir for Southern Rural Water (Victoria)

2000

Project Director for design of further investigations and remedial works at Hume Dam.
Safety reviews for Bamarang and Flat Rock Dams
Director of Dam Surveillance Group responsible for the surveillance of DLWC dams and participant of a number of 5 yearly surveillance inspections
Project Director for earthquake studies on intake towers and appurtenant works at DLWC dams
Consultant to DLWC to manage their portfolio risk assessment
Project Director for a number of dambreak studies and preparation of dam safety emergency plans
Member of the consulting team carrying out risk assessments for Goulburn-Murray Water (Victoria) for Eppalock Dam
Carried out review of Earthquake Stability Review of the Outlet Tower at Eppalock Dam in Victoria for G-MW.
Reviewed URS Australia designs for Alpine Way remedial works

1999

Project Director of earthquake studies on Wyangala Dam
Project Director for design of further remedial works at Hume Dam. Included design of ground improvement works (stone columns) for protecting alluvial foundations against liquefaction
Peer reviewer of Leslie Dam (Queensland) Safety Report.
Peer reviewer of DLWC's Screening Level Risk Assessment

1998

Project Director for portfolio risk assessment for six dams owned by a Southern Rural Water in Victoria.
Directed structural analysis of spillway gates on Narracan Dam for Southern Rural Water
Project Director for concept design and DD&C contract documentation for Warragamba Dam auxiliary spillway. Dam to be upgraded the dam to cater for increased inflow flood estimates. Upgrading works estimated to cost $135M. An auxiliary spillway is to be constructed adjacent to the existing dam - involves excavating some 2,000,000m³ of rock and constructing concrete lining, training walls, fuse plug embankments, large scale cement stabilised sandstone fill, a multi

span bridge across the spillway, post tensioned ground anchors for dissipator/training walls, modifications of existing spillway gates. Design involved extensive physical hydraulic model testing.

1997 Feasibility options study for remediation of Redbank Ck. Dam near Mudgee (NSW) Karapiro Dam, New Zealand - Part of international consulting team reviewing this concrete arch dam's security and determining appropriate remedial options (mass concrete buttressing). Director of risk assessment studies for Tenterfield Dam

1993-1997 Hume Dam Investigations - Project Manager of Investigation and Design Studies for the embankments at the dam. Work involves:

- review of the stability of the embankments under static and earthquake loadings
- investigation of liquefaction
- potential of embankments' foundations
- development of stabilising options
- development of options to provide increased flood security including provision of new auxiliary spillways and modifications to existing works

- detail design and documentation of stabilising works for the embankments including a key trench into the dam's foundations, stabilising berms, slurry wall cut-offs, drainage/filter curtains and strengthening of critical gravity training walls with both horizontal and vertical post tensioning.

- part of advisory and review team for the risk assessment of the dam and its components.

1990-1996 Warragamba Dam Upgrading for Sydney Water Corporation - Project Manager of Investigation Concept Design Studies for upgrading the dam to cater for increased inflow flood estimates and provide substantial flood mitigation. Upgrading works estimated to cost $280M. The existing dam was to be strengthened with mass concrete buttressing – some 600,000m³.

1996 Project Director for Safety Review (including Finite Element Analysis) of Wellington Dam

1993-1996 Hume Dam Gates for Department of Water Resources - Project Manager for the design of new maintenance baulks and emergency closure gates. Involves development of proposals for underwater installation.

1995 Redbank Creek Dam and Lithgow No. 2 Dam for NSW Public Works Dams Surveillance - Project Manager for safety reviews and finite element analysis of two 15m high arch dams. Clarrie Hall Dam for NSW Public Works Dams Surveillance - Project Manager for dambreak studies.

1994 Burrinjuck Dam Gates for NSW Department of Water Resources - Project Manager for the design of new control and emergency closure gates. Involves underwater installation. Karangi Dam for Coffs Harbour City Water Project - Project Manager for dambreak studies.

1993 Mardi Dam for Wyong Council - Project Manager for safety review of earth embankment.

1988-1990 Nepean Dam Remedial Works for Sydney Water Corporation - Project Manager for investigation studies, design development and detail design. Work involved:

- initial flood security studies and development of options
- co-ordination of hydraulic model studies
- detail design and contract documentation for modified spillway, large size post-tensioned ground anchors and rockfill buttressing.

1987-1989 Boggabilla Weir for NSW Department of Water Resources - Project Manager for detail design and contract documentation of a large gated re-regulation weir with fishway. Involved liaison with fisheries expert in developing optimum geometry for fish ladder.

Chaffey Dam for NSW Department of Water Resources - Project Manager for upgrading of dam. Work involved:

- development of options and preliminary design.
- finite element analyses for raised morning glory spillway
- stability analyses for raised earth/rockfill embankment
- co-ordination of hydraulic model studies for raised spillway.

1969-1987: ***Water Resources Commission of NSW (WRC) (now Department of Land and Water Conservation).***

1986-1987 Flood Security studies for WRC - Project Design Engineer for investigation into flood security of Chaffey and Glennies Creek Dams. Involved co-ordinating dambreak studies, development of remedial options, economic risk studies.

1985-1987 Hume Dam Strengthening for WRC - Project Design Engineer for detail design and contract documentation. Work included:

- design of large size post-tensioned ground anchors including development of appropriate grouting procedures
- design of structural modifications to the concrete gravity dam
- design of a new road bridge over the dam.
- establishing the rationale for replacing the existing post tensioning system

Contact

Tel: [redacted]
Mobile
Email: [redacted]

Suzie Emery

From: Elaina Smouha [Elaina.Smouha[redacted]]
Sent: Tuesday, 11 January 2011 11:33 AM
To: Brian Cooper Consulting
Subject: RE: Brian Cooper - CV

Thanks Brian.

Elaina Smouha
Director, Governance and Regulatory Compliance
SEQ Water Grid Manager
[redacted]
Visit: Level 15, 53 Albert Street Brisbane
Post: PO Box 16205, City East QLD 4002
ABN: 14783 317 630

From: Brian Cooper Consulting [mailto:brian.cooper.consult[redacted]]
Sent: Tuesday, 11 January 2011 11:32 AM
To: Elaina Smouha
Subject: Brian Cooper - CV

Dear Elaina,

Please find my CV attached.

Regards,

Brian Cooper

This email has been scanned by the Symantec Email Security.cloud service.
For more information please visit http://www.symanteccloud.com

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Gina O'Driscoll

From: Elaina Smouha
Sent: Tuesday, 11 January 2011 11:42 AM
To: Ken Smith (ken.smith[redacted])
Cc: Barry Dennien
Subject: FW: Brian Cooper - CV
Attachments: BrianCooperCV09122010.pdf

Ken

Attached is a copy of the consultant's CV, Brian Cooper, who we intended to engage for the independent Flood Manual review.

Please let Barry or I know if you have any queries.

Regards

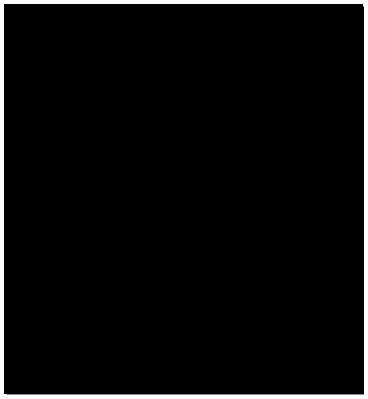
Elaina

Elaina Smouha
Director, Governance and Regulatory Compliance
SEQ Water Grid Manager
[redacted]
Visit: Level 15, 53 Albert Street Brisbane
Post: PO Box 16205, City East QLD 4002
ABN: 14783 317 630

brian cooper consulting

Brian Cooper

Dams Engineer



Qualifications & Affiliations

Short courses on finite element analysis, embankment dam engineering, earthquake engineering. Published technical papers – ICOLD. ANCOLD and I.E. Aust. Attended dam safety course at USBR (Denver, USA) in 2002

Bachelor of Engineering (B.E. Hons), 1968 and Master of Engineering Science (M.Eng.Sc.), 1971

University of New South Wales

Graduate Diploma of Engineering Management, 1994 Deakin University

F.I.E. Aust.,C.P.Eng. RPEQ

Expertise

Brian has approximately 40 years experience in investigation and design of major dams, weirs and hydraulic structures, having started his career designing farm dams and small irrigation schemes. He retired from NSW Department of Commerce in 2005. Brian now works as a private consultant specialising in dams engineering and fish passage at dams and weirs. He has a special interest in risk assessment and computer modelling in general and the seismic analysis of dams in particular. Engineering software (concrete dam stability analysis and flood routing) written by Brian is still used extensively in the Dams & Civil Group of the Department of Commerce. He also has particular experience with concrete dams and the use of post tensioned ground anchors for strengthening those dams. He was a member of the Australian National Committee on Large Dams (ANCOLD) Working Group that developed guidelines for 'Design of Dams for Earthquakes' and a member of the Working Group that revised the guidelines for 'Risk Assessment for Dams'. He has been a guest lecturer for a number of years (most recently in 2009) on concrete dam engineering for the University of NSW post graduate Embankment Dam Engineering Course, and on the history of dams in NSW at Sydney University.

He has been the project director and project manager for a number of feasibility studies, design reviews, site investigations and detail design consultancies for major dams and weirs including the direction and co-ordination of all specialist services including dambreak studies, preparation of dam safety emergency plans and risk assessments. He is currently an expert reviewer for a number of Australian water authorities and consultants (State Water Corporation (NSW), Hydro Tasmania, SunWater (Queensland), Brisbane City Council, Goulburn-Murray Water, Goulburn Valley Water, WA Water Corporation, Southern Rural Water (Victoria), URS, GHD, Hobart Water, NT PowerWater, and TrustPower (NZ)). He has also worked as a sub-consultant for a number of consulting firms (URS, MWH, GHD).

Brian is the Engineers Australia representative for the NSW Dams Safety Committee (the dam safety regulator in NSW) and is currently the Chairman of that organisation. He has been a member of the Murray Darling Basin Authority's Fish Passage Task Force which advises inter alia on the installation of fishways on the Murray River as part of the Living Murray Program.

Brian is a registered engineer in Queensland (RPEQ No. 6819). He started his own consulting business in 2008, advising on dam safety, dam design and analysis, dam risk assessments and dam upgrades as well as fish passage for dams. He is providing specialist advice through *Brian Cooper Consulting* as a sole trader.

Professional Experience

2008 to Present: Principal of Brian Cooper Consulting

2010
Five yearly comprehensive dam safety inspection of Carcoar Dam (double curvature arch dam).
Internal reviewer to URS (Melbourne) on concept design of regulator structures and associated fishways for the Hipwell Road project for watering the Gunbower Forest
Specialist adviser to Melbourne Water – valve behaviour on Sugarloaf Dam pipeline, structural behaviour of pumping station floor slab and pump bases at Cardinia Dam Pumping Station
Commenced work as member of ANCOLD working group re-writing the Earthquake Guidelines – responsible for re-writing sections relating to concrete dams.
Continuing involvement with Alluvium in the design of the weir upgrade and the new fishway for Booligal Weir.
Continuing external peer review services to State Water Corporation for the detail design of new auxiliary fuse plug spillways for Copeton and Chaffey Dams, detail design of raising and post tensioned strengthening of Keepit Dam, detail design of upgrade works for Wyangala Dam, finite element analysis of Carcoar Dam (double curvature arch dam).
Further work with GHD (Perth) on risk assessment for Serpentine Dam.
Continuing involvement with Hydro Tasmania, as Chair of external review panel for Catagunya Dam.

2009
Part of URS' comprehensive inspection team for Melbourne Water's Maroondah Dam.
Part of URS' business risk assessment team for Southern Rural Water's Cowwarr and Maffra Weirs.
Part of Alluvium's design team upgrading Booligal Weir and providing a fishway at the weir, for State Water Corporation.
Part of GHD's design team for Lower Fitzroy River Infrastructure Project designing fishways for Rookwood and Eden Bann Weirs near Rockhampton in Queensland.
Project Manager on behalf of SA Water and reviewer for study into vibration of a crane rail beam at Lock 5 on the River Murray.
Expert reviewer for State Water Corporation for 3D finite element analysis of Carcoar Dam (double curvature arch dam).
Internal reviewer for URS on Laanecoorie Dam Upgrade.
Expert reviewer for State Water Corporation for risk assessments for Oberon and Rydal Dams.
Member of GHD's Serpentine Dam risk assessment team for WA WaterCorp.
Expert reviewer for SunWater in Queensland for the comprehensive risk assessment undertaken for Fairbairn Dam and Coolmunda Dam.
Expert reviewer for State Water Corporation for major upgrade works at Keepit, Copeton, Chaffey and Wyangala Dams.
Appointed as Chairman of the NSW Dams Safety Committee (the dam safety regulator in NSW).
Provided external peer review for Goulburn Valley Water, on Nine Mile Creek Dam Upgrade.
Internal reviewer for URS (Adelaide) for Lake Victoria Outlet Regulator options studies.
Provided advice to URS (Melbourne) on the Mildura Weir Fishway design.
Member of expert panel advising State Water Corporation on revised dam surveillance regime.
Part of Ecosmart bid team - prepared concept designs for fish passage facility at proposed Wyaralong Dam in Queensland.
Continuing expert review role for Catagunya Dam upgrade.

2008
Started as a private specialist dams consultant - *Brian Cooper Consulting.*
Worked through the URS Corporation for the USBR and the USACE in developing a risk toolbox for lined spillways.
Advised TrustPower in New Zealand on replacement of post tensioned anchors at Mahinerangi No. 1 Dam.
Adviser to State Water Corporation and to URS on further upgrade works for Hume Dam.
Provided specialist advice to WA Water Corporation on Wellington Dam post tensioning.
Peer reviewer on behalf of URS for Warren Dam in South Australia.
Part of URS team carrying out portfolio risk assessment of Melbourne Water's dams.
Member of Expert Review Panel for Darwin River and Manton Dams for NT PowerWater.

1987 to 2008: Dams & Civil Section of NSW Department of Public Works and Services/NSW Department of Commerce.

2008
Carried out detailed 3D finite element analysis of radial gate at Wyangala Dam spillway for State Water Corporation.
Continuing review role for Tillegra Dam.
Continuing review role for Hinze and Lake Manchester Dams in Queensland and Catagunya Dam in Tasmania.
Prepared options report on Burrendong Dam spillway modifications for State Water Corporation.

2007
Continuing roles on Lake Manchester, Hinze, Catagunya and Redbank Ck. Dams.
Internal peer reviewer for NSW Dept. of Commerce regarding design of Tillegra Dam.
Advised State Water on feasibility of fish passage facilities at a number of their major irrigation dams.
Expert reviewer for GHD on a flood retarding basin in south west Sydney.
Part of expert panel for River Murray Water risk assessments for Hume and Dartmouth Dams, Torrumbarry and Yarrowonga Weirs and Lake Victoria.
Re-elected as Deputy Chairman of the Dams Safety Committee

2006
Project director for 3D finite element analysis of Bendora Dam (double curvature arch dam)
Chair of external peer review panel for upgrading of Lake Manchester Dam (concrete gravity dam) in Queensland
Internal peer reviewer and senior consultant for the raising of Hinze Dam (earth and rockfill embankment) in Queensland
Project director for preliminary and detailed design of Redbank Creek Dam (single curvature arch dam) upgrading
Project director for Keepit Dam fish passage investigations
Part of expert panel for URS undertaking portfolio risk assessment for dams owned by River Murray Water
External peer reviewer for Hydro Tasmania for Catagunya Dam (concrete gravity dam) upgrading;
Project director for 3D finite element analysis of Upper Cordeaux No. 2 Dam (single curvature arch dam owned by SCA) for BHP Billiton

2005
Project design engineer for dam related aspects of Nepean Dam Deepwater Access Project: Pipeline crossing end of spillway; outlet works for end of pipeline
Project design engineer for Avon Dam Deepwater Access Project: tunnel design through rockfill buttressing; new low level outlet works

2004
Internal reviewer to URS Australia for Pykes Ck Dam Investigations (Southern Rural Water, Victoria)
Internal reviewer to URS Australia for Lower Reservoir Dam (Hobart Water, Tasmania)
Member of expert review panel for the Melton Dam upgrade design (Southern Rural Water, Victoria)

2003/04
Designer for retrofitting multi-level offtake for Tallowa Dam (Sydney Catchment Authority).
Member of the Independent Technical Expert Panel for the Eildon Dam Upgrading in Victoria for Goulburn-Murray Water.
Currently the design director for the Wivenhoe Dam Alliance carrying out the flood capacity upgrading for Wivenhoe Dam in Queensland – included directing major computational fluid dynamics modelling investigations of existing spillway

2003
Carried out options study for environmental upgrading works at Keepit Dam (selective withdrawal facility, additional outlet works and fish passage)
Carried out assessment of spillway capacity for Hume Dam using computational fluid dynamics modelling (by a sub-consultant)
Carried out detail design for anchoring Bellfield Dam (Victoria) Intake Tower
Carried out detailed finite element analysis of Keepit Dam radial gates

2002
Carried out review of large farm dam with seepage problems. Directed computational fluid dynamics modelling of drum gate and radial gates at Warragamba Dam together with structural analysis of gates (modelling carried out by sub-consultant) to ensure gates can handle more

rigorous operating conditions
Adviser to the Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) on civil engineering matters related to the replacement reactor project at Lucas Heights
Expert reviewer for Goulburn-Murray Water for remedial works at Cairn Curran Dam in Victoria
Project Director for Lerderderg Weir safety review and risk assessment for Southern Rural Water (Victoria). Carried out finite element analysis of radial gate

2001

Project Director for design of further remedial works at Hume Dam.
Technical director on behalf of NPWS for quantitative risk assessment for Snowy Mountains roads
Chairman of the committee producing a geotechnical response plan for the Alpine Way in the Snowy Region for NPWS
Carried out non-linear finite element analysis (earthquake loading) for outlet tower at Bellfield Dam for Wimmera-Mallee Water (Victoria)
Joined the MDBC's Fish Passage Reference Group and reviewed fishway designs
Consultant to DLWC for their portfolio risk assessment of thirty dams
Provided advice on the post tensioning system at Waitakere Dam in New Zealand.

Director of Dam Surveillance Group responsible for the surveillance of DLWC dams and participant of a number of 5 yearly surveillance inspections
Project Director of review of DLWC Intake Towers Earthquake Stability Review
Directed DPWS input into the Earthquake Stability of the structural elements of Yarrawonga Weir as sub-consultant to URS Australia – included detail design of anchoring system for the weir.
Also provided design advice on design of stone columns to provide protection against liquefaction of alluvial foundations.
Member of the expert panel for the risk assessment studies being undertaken for Goulburn-Murray Water
Project Director for safety review and preliminary design of remedial options for Blowering Dam (DLWC)
Acted as reviewer for a number of projects carried out by URS (incl. Cardinia Dam outlet tower, Bellfield Dam embankment/spillway)
Directed functionality study (including business risk assessment) for Yallourn Weir for Southern Rural Water (Victoria)

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Project Director for design of further investigations and remedial works at Hume Dam.
Safety reviews for Bamarang and Flat Rock Dams
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Project Director for earthquake studies on intake towers and appurtenant works at DLWC dams
Consultant to DLWC to manage their portfolio risk assessment
Project Director for a number of dambreak studies and preparation of dam safety emergency plans
Member of the consulting team carrying out risk assessments for Goulburn-Murray Water (Victoria) for Eppalock Dam
Carried out review of Earthquake Stability Review of the Outlet Tower at Eppalock Dam in Victoria for G-MW.
Reviewed URS Australia designs for Alpine Way remedial works

1999

Project Director of earthquake studies on Wyangala Dam
Project Director for design of further remedial works at Hume Dam. Included design of ground improvement works (stone columns) for protecting alluvial foundations against liquefaction
Peer reviewer of Leslie Dam (Queensland) Safety Report.
Peer reviewer of DLWC's Screening Level Risk Assessment

1998

Project Director for portfolio risk assessment for six dams owned by a Southern Rural Water in Victoria.
Directed structural analysis of spillway gates on Narracan Dam for Southern Rural Water
Project Director for concept design and DD&C contract documentation for Warragamba Dam auxiliary spillway. Dam to be upgraded the dam to cater for increased inflow flood estimates. Upgrading works estimated to cost $135M. An auxiliary spillway is to be constructed adjacent to the existing dam - involves excavating some 2,000,000m³ of rock and constructing concrete lining, training walls, fuse plug embankments, large scale cement stabilised sandstone fill, a multi

span bridge across the spillway, post tensioned ground anchors for dissipator/training walls, modifications of existing spillway gates. Design involved extensive physical hydraulic model testing.

1997 Feasibility options study for remediation of Redbank Ck. Dam near Mudgee (NSW) Karapiro Dam, New Zealand - Part of international consulting team reviewing this concrete arch dam's security and determining appropriate remedial options (mass concrete buttressing). Director of risk assessment studies for Tenterfield Dam

1993-1997 Hume Dam Investigations - Project Manager of Investigation and Design Studies for the embankments at the dam. Work involves:

- review of the stability of the embankments under static and earthquake loadings
- investigation of liquefaction
- potential of embankments' foundations
- development of stabilising options
- development of options to provide increased flood security including provision of new auxiliary spillways and modifications to existing works

- detail design and documentation of stabilising works for the embankments including a key trench into the dam's foundations, stabilising berms, slurry wall cut-offs, drainage/filter curtains and strengthening of critical gravity training walls with both horizontal and vertical post tensioning.

- part of advisory and review team for the risk assessment of the dam and its components.

1990-1996 Warragamba Dam Upgrading for Sydney Water Corporation - Project Manager of Investigation Concept Design Studies for upgrading the dam to cater for increased inflow flood estimates and provide substantial flood mitigation. Upgrading works estimated to cost $280M. The existing dam was to be strengthened with mass concrete buttressing – some 600,000m³.

1996 Project Director for Safety Review (including Finite Element Analysis) of Wellington Dam

1993-1996 Hume Dam Gates for Department of Water Resources - Project Manager for the design of new maintenance baulks and emergency closure gates. Involves development of proposals for underwater installation.

1995 Redbank Creek Dam and Lithgow No. 2 Dam for NSW Public Works Dams Surveillance - Project Manager for safety reviews and finite element analysis of two 15m high arch dams. Clarrie Hall Dam for NSW Public Works Dams Surveillance - Project Manager for dambreak studies.

1994 Burrinjuck Dam Gates for NSW Department of Water Resources - Project Manager for the design of new control and emergency closure gates. Involves underwater installation. Karangi Dam for Coffs Harbour City Water Project - Project Manager for dambreak studies.

1993 Mardi Dam for Wyong Council - Project Manager for safety review of earth embankment.

1988-1990 Nepean Dam Remedial Works for Sydney Water Corporation - Project Manager for investigation studies, design development and detail design. Work involved:

- initial flood security studies and development of options
- co-ordination of hydraulic model studies
- detail design and contract documentation for modified spillway, large size post-tensioned ground anchors and rockfill buttressing.

1987-1989 Boggabilla Weir for NSW Department of Water Resources - Project Manager for detail design and contract documentation of a large gated re-regulation weir with fishway. Involved liaison with fisheries expert in developing optimum geometry for fish ladder.

Chaffey Dam for NSW Department of Water Resources - Project Manager for upgrading of dam. Work involved:

- development of options and preliminary design
- finite element analyses for raised morning glory spillway
- stability analyses for raised earth/rockfill embankment
- co-ordination of hydraulic model studies for raised spillway.

1969-1987: ***Water Resources Commission of NSW (WRC) (now Department of Land and Water Conservation).***

1986-1987 Flood Security studies for WRC - Project Design Engineer for investigation into flood security of Chaffey and Glennies Creek Dams. Involved co-ordinating dambreak studies, development of remedial options, economic risk studies.

1985-1987 Hume Dam Strengthening for WRC - Project Design Engineer for detail design and contract documentation. Work included:

- design of large size post-tensioned ground anchors including development of appropriate grouting procedures
- design of structural modifications to the concrete gravity dam
- design of a new road bridge over the dam.
- establishing the rationale for replacing the existing post tensioning system

Contact

Tel: [redacted]
Mobile [redacted]
Email: [redacted]

Suzie Emery

From: Elaina Smouha [elainamir[redacted]]
Sent: Thursday, 2 February 2012 2:56 PM
To: Elaina Smouha
Subject: Fwd: Flood Manual Pt 1
Attachments: Flood Manual Pt 1.pdf

---------- Forwarded message ----------
From: **Elaina Smouha** <elainamir[redacted]>
Date: Tue, Jan 11, 2011 at 12:24 PM
Subject: Flood Manual Pt 1
To: brian.cooper.consult[redacted]

Brian

Attached is Part 1 of 3 of Seqwater's Flood Mitigation Manual.

Apologies but due to the size of the file I have had to split it and send it from my personal email.

I will send you the other parts shortly.

Regards

Elaina

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seqwater
WATER FOR LIFE

MANUAL

OF

OPERATIONAL PROCEDURES

FOR

FLOOD MITIGATION

AT

WIVENHOE DAM

AND

SOMERSET DAM

Revision 7
November 2009

Revision No.	Date	Amendment Details
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1	6 October 1992	Complete revision and re-issue
2	13 November 1997	Complete revision and re-issue
3	24 August 1998	Change to page 23
4	6 September 2002	Complete revision and re-issue
5	4 October 2004	Complete revision
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7	November 2009	Complete Revision

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1 INTRODUCTION

1.1 Preface

Given their potential significant impact on downstream populations, it is imperative that Wivenhoe and Somerset Dams be operated during flood events in accordance with clearly defined procedures to minimise impacts to life and property. This manual outlines these procedures and is an approved Flood Mitigation Manual under Water Supply Act 2008.

The Manual in its current form was developed in 1992 and the basis of this document was a manual written in 1968 covering flood operations at Somerset Dam (Wivenhoe Dam was completed in 1984). Six revisions of the Manual have occurred since 1992 to account for updates to the Flood Alert Network and the Real Time Flood Models, the construction of an Auxiliary Spillway at Wivenhoe Dam in 2005 and to account for institutional and legislative changes.

The primary objectives of the procedures contained in this Manual are essentially the same as those contained in previous Manual versions. These objectives in order of importance are:

- 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.

In meeting these objectives, the dams must be operated to account for the potential effects of closely spaced Flood Events. Accordingly, normal procedures require stored floodwaters to be emptied from the dams within seven days of the flood event peak passing through the dams.

Wivenhoe Dam and Somerset Dam are operated in conjunction so as to maximise the overall flood mitigation capabilities of the two dams. The procedures outlined in this Manual are based on the operation of the dams in tandem.

1.2 Meaning of Terms

In this Manual, save where a contrary definition appears –

"Act" means the *Water Supply (Safety and Reliability) Act 2008*;

"AEP" means annual exceedance probability, the probability of a specified event being exceeded in any year;

"Agency" includes a person, a local government and a department of state government within the meaning of the Acts Interpretation Act 1954;

"AHD" means Australian Height Datum;

"Chairperson" means the Chairperson of Seqwater;

"Chief Executive" means the Director General of the Department of Environment and Resource Management or nominated delegate;

"Controlled Document" means a document subject to managerial control over its contents, distribution and storage. It may have legal and contractual implications;

"Dams" means dams to which this Manual applies, that is Wivenhoe Dam and Somerset Dam;

"Dam Supervisor" means the senior on-site officer at Wivenhoe or Somerset Dam as the case may be;

"Duty Flood Operations Engineer" means the Senior Flood Operations Engineer or Flood Operations Engineer rostered on duty to be in charge of Flood Operations at the dams;

"EL" means elevation in metres Australian Height Datum;

"Flood Event" is a situation where the Duty Flood Operations Engineer expects the water level in either of the Dams to exceed the Full Supply Level;

"Flood Operations Centre" means the Centre used during by Flood Operations Engineers to manage Flood Events;

"Flood Operations Engineer" means a person designated to direct flood operations at the dams in accordance with Section 2.4 of this Manual;

"FSL" or "Full Supply Level" means the level of the water surface when the reservoir is at maximum operating level, excluding periods of flood discharge;

"Gauge" when referred to in (m) means river level referenced to AHD, and when referred to in (m^3/s) means flow rate in cubic metres per second;

"Manual" or "Manual of Operational Procedures for Flood Events at Wivenhoe Dam and Somerset Dam" means the current version of this Manual;

"Power Station" means the Wivenhoe pumped storage hydro-electric power station associated with Wivenhoe Dam and Split-Yard Creek Dam;

"Senior Flood Operations Engineer" means a person designated in accordance with Section 2.3 of this Manual under whose general direction the procedures in this Manual must be carried out;

"Seqwater" means the Queensland Bulk Water Supply Authority trading as Seqwater;

1.3 Purpose of Manual

The purpose of this Manual is to define procedures for the operation of Wivenhoe Dam and Somerset Dam to reduce, so far as practicable, the effects of flooding associated with the dams. This is achieved by the proper control and regulation in time of the flood release infrastructure at the dams, with due regard to the safety of the dam structures.

The procedures in this Manual have been developed on the basis that the community is to be protected to the maximum extent practical against flood hazards recognising the limitations on being able to:

- Obtain accurate forecasts of rainfall during flood events;
- Accurately estimate flood run-off within the dam catchments;
- Identify all potential flood hazards and their likelihood;
- Remove or reduce community vulnerability to flood hazards;
- Effectively respond to flooding;
- Provide resources in a cost effective manner.

1.4 Legal Authority

This manual has been prepared as a Flood Mitigation Manual in accordance with Chapter 4 Part 2 of the Act.

1.5 Application and Effect

The procedures in this Manual apply to the operation of Wivenhoe Dam and Somerset Dam for the purpose of flood mitigation, and operation in accordance with the manual shall give the protection from liability provided by Section 374 of the Act.

1.6 Date of Effect

The procedures in this Manual shall have effect on and from the date on which this version of the Manual is approved by gazette notice.

The Manual shall remain in force for the period of approval as determined by the Chief Executive. This approval may be for a period of up to five years.

Before the approval of the Manual expires, Seqwater must review and if necessary update the Manual and submit a copy to the chief executive for approval.

1.7 Observance of Manual

This Manual contains the operational procedures for Wivenhoe Dam and Somerset Dam for the purposes of flood mitigation and must be used for the operation of the dams during flood events.

1.8 Provision for Variations to Manual

If Seqwater is of the opinion that this Manual should be amended, altered or varied, it must submit for approval as soon as practical, an appropriate request to the Chief Executive, setting out the circumstances and the exact nature of the amendment, alteration or variation sought. The Chief Executive may accept, reject or modify the request prior to approval.

1.9 Distribution of Manual

Seqwater must regard the manual as a Controlled Document and ensure that only controlled manuals are used in the direction of flood mitigation activities. Agencies having copies of controlled hardcopies of the Manual are listed in Appendix A. Seqwater must maintain a Register of Contact Persons for issued controlled hardcopies of the Manual and must ensure that each issued document is updated whenever amendments or changes are approved.

2 DIRECTION OF OPERATIONS

2.1 Statutory Operation

Pursuant to the provisions of the Act, Seqwater is responsible for operating and maintaining the dams in accordance with this Manual in order to retain the protection from liability afforded by the Act. Operators, employees, agents, and contractors working for Seqwater must also comply with this Manual to obtain the protection of the Act.

2.2 Operational Arrangements

For the purposes of operation of the dams during Flood Events, Seqwater must ensure that:

- Sufficient numbers of suitably qualified personnel are available to operate the dams if a Flood Event occurs.
- Sufficient numbers of suitably qualified personnel are available to operate the Flood Operations Centre if a Flood Event occurs
- A Duty Flood Operations Engineer is on call at all times. The Duty Flood Operations Engineer must constantly review weather forecasts and catchment rainfall and must declare a Flood Event if the water level of either Wivenhoe or Somerset Dam is expected to exceed Full Supply Level as a result of prevailing or predicted weather conditions.
- A Senior Flood Operations Engineer is designated to be in the charge of Flood Operations at all times during a Flood Event.
- Release of water at the dams during Flood Events is carried out under the direction of the Duty Flood Operations Engineer.
- All practical attempts are made to liaise with the Chairperson and the Chief Executive if the release of water from the Dams during a Flood Event is likely to endanger life or property.

2.3 Designation and Responsibilities of Senior Flood Operations Engineer

Seqwater must nominate one or more suitably qualified and experienced persons to undertake the role of Senior Flood Operations Engineer. If approved by the Chief Executive, these persons can be authorised in the Schedule of Authorities (see Section 2.6). When rostered on duty during a Flood Event, the responsibilities of the Senior Flood Engineer are as follows:

- Set the overall strategy for management of the Flood Event in accordance with the objectives of this Manual.
- Provide instructions to site staff to make releases of water from the Dams during Flood Events that are in accordance with this Manual.
- Apply reasonable discretion in managing a Flood Event as described in Section 2.8.

Seqwater must ensure that an adequate number of Senior Flood Operations Engineers are available to manage all Flood Events.

2.4 Designation and Responsibilities of Flood Operations Engineer

Seqwater must nominate one or more suitably qualified and experienced persons to undertake the role of Flood Operations Engineer. If approved by the Chief Executive, these persons can be authorised in the Schedule of Authorities (see Section 2.6). When rostered on duty during a Flood Event, the responsibilities of the Flood Engineer are as follows:

- Direct the operation of the dams during a flood event in accordance with the general strategy determined by the Senior Flood Operations Engineer.
- Follow any direction from the Senior Flood Operations Engineer in relation to applying reasonable discretion in managing a Flood Event as described in Section 2.8. Unless otherwise directed, a Flood Operations Engineer is to follow this Manual in managing Flood Events and is not to apply reasonable discretion unless directed by the Senior Flood Operations Engineer or the Chief Executive.
- Provide instructions to site staff to make releases of water from the Dams during Flood Events that are in accordance with this Manual.

Seqwater must ensure that an adequate number of Flood Operations Engineers are available to manage all Flood Events. Seqwater must also ensure that an adequate number of suitably qualified and experienced persons are available to assist the Flood Operations Engineers during all Floods Events.

2.5 Qualifications and Experience of Engineers

Qualifications

All engineers referred to in Sections 2.3 and 2.4 must hold a Certificate of Registration as a Registered Professional Engineer of Queensland and must hold appropriate engineering qualifications to the satisfaction of the Chief Executive.

Experience

All engineers referred to in Sections 2.3 and 2.4 must, to the satisfaction of the Chief Executive, have:

(1) Knowledge of design principles related to the structural, geotechnical and hydraulic design of large dams, and

(2) At least a total of five years of suitable experience and demonstrated expertise in at least two of the following areas:

- Investigation, design or construction of major dams;
- Operation and maintenance of major dams;
- Hydrology with particular reference to flooding, estimation of extreme storms, water management or meteorology;
- Applied hydrology with particular reference to flood forecasting and/or flood forecasting systems.

2.6 Schedule of Authorities

Seqwater must maintain a Schedule of Authorities containing a list of the Senior Flood Operations Engineers and Flood Operations Engineers approved by the Chief Executive to direct flood operations at the dams during floods. A copy of the Schedule of Authority must be provided to the Chief Executive by 30 September of each year.

Seqwater shall nominate suitably qualified and experienced engineers for registration in the Schedule of Authorities as the need arises. Each new nomination must include a validated statement of qualifications and experience as required by the Chief Executive. Seqwater must obtain the approval for all nominations from the Chief Executive prior to their inclusion in the Schedule of Authorities.

If, in the event of unforseen and emergency situations, no Senior Flood Operations Engineer or no Flood Operations Engineer is available from the Schedule of Authorities to manage a Flood Event, Seqwater must temporarily appoint a suitable person or persons and immediately seek ratification from the Chief Executive.

2.7 Training

Seqwater must ensure that operational personnel required for flood operations activities receive adequate training in the various activities involved in flood control operation as required by the Chief Executive.

2.8 Reasonable Discretion

If in the opinion of the Senior Flood Operations Engineer, it is necessary to depart from the procedures set out in this Manual to meet the flood mitigation objectives set out in Section 3, the Senior Flood Operations Engineer is authorised to adopt such other procedures as considered necessary subject to the following:

- Before exercising discretion under this Section of the Manual with respect to flood mitigation operations, the Senior Flood Operations Engineer must make a reasonable attempt to consult with both the Chairperson and Chief Executive.
- The Chief Executive would normally authorise any departures from the Manual. However if the Chief Executive cannot be contacted within a reasonable time, departures from the Manual can be authorised by the Chairperson.
- If both the Chairperson and the Chief Executive cannot be contacted within a reasonable time, the Senior Flood Operations Engineer may proceed with the procedures considered

necessary and report such action at the earliest opportunity to the Chairperson and Chief Executive.

2.9 Report

Seqwater must prepare a report after each Flood Event. The report must contain details of the procedures used, the reasons therefore and other pertinent information. Seqwater must forward the report to the Chief Executive within six weeks of the completion of the Flood Event.

3 FLOOD MITIGATION OBJECTIVES

3.1 General

To meet the purpose of the flood operational procedures in this Manual, the following 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.

In meeting these objectives, the dams must be operated to account for the potential effects of closely spaced Flood Events. Accordingly, normal procedures require stored floodwaters to be emptied from the dams within seven days of the flood event peak passing through the dams.

Additionally, the auxiliary spillway constructed at Wivenhoe Dam in 2005 incorporates fuse plugs. Triggering of a fuse plug will increase floods levels downstream. Where possible, gate operations at both Wivenhoe and Somerset dams should be formulated to prevent operation of the fuse plug. This potential scenario is possible only when the forecast peak water level for Wivenhoe Dam just exceeds the trigger level for the fuse plug and sufficient time is available to alter releases.

3.2 Structural Safety of Dams

The structural safety of the dams must be the first consideration in the operation of the dams for the purpose of flood mitigation.

Wivenhoe Dam

The structural safety of Wivenhoe Dam is of paramount importance. Structural failure of Wivenhoe Dam would have catastrophic consequences. Wivenhoe Dam is predominantly a central core rockfill dam. Such dams are not resistant to overtopping and are susceptible to breaching should such an event occur. Overtopping is considered a major threat to the security of Wivenhoe Dam. Wivenhoe Dam is overtopped by an event with a 1 in 100,000 AEP.

Somerset Dam

The structural safety of Somerset Dam also is of paramount importance. Failure of Somerset Dam could have catastrophic consequences. Whilst Wivenhoe Dam has the capacity to mitigate the flood effects of such a failure in the absence of any other flooding, if the failure were to occur during major flooding, Wivenhoe Dam could be overtopped and destroyed also.

Somerset Dam is a mass concrete dam. Such dams can withstand limited overtopping without damage. Failure of such structures is rare but when they do occur, they occur suddenly without warning, creating very severe and destructive flood waves. Although Somerset Dam is overtopped by an event with a 1 in 5,000 AEP, it is expected that the dam could withstand at least 2.2 metres of overtopping without failure, provided all radial gates are fully open. This equates to an event centred on the Somerset Dam catchment with a 1 in 20,000 AEP.

Extreme Floods and Closely Spaced Large Floods

As indicated in the previous section, techniques for estimating extreme floods show that floods are possible which would overtop both dams. In the case of Wivenhoe Dam such an overtopping would most likely result in the destruction of the dam. Such events however require several days of intense rainfall to produce the necessary runoff.

Historical records show that there is a significant probability of two or more flood producing storms occurring in the Brisbane River system within a short time of each other. Therefore, unless determined otherwise by the Senior Flood Operations Engineer in accordance with Section 2.8, the aim during a Flood Event should be to empty stored floodwaters within seven days after the flood peak has passed through the dams. In a very large flood, this time frame may not be achievable because of downstream flood conditions and it may be necessary to extend the emptying period by several days.

The discharges from the dams should be regulated so as to have little impact on the urban reaches of the Brisbane River, taking into account inflows into the river downstream of the dams. However the seven day drainage requirement may result in submergence of some bridges. Regardless, the level of flooding as a result of emptying stored floodwaters after the peak has passed is to be less than the flood peak unless accelerated release is necessary to reduce the risk of overtopping.

3.3 Inundation of Urban Areas

The prime purpose of incorporating flood mitigation measures into Wivenhoe Dam and Somerset Dam is to reduce flooding in the urban areas of the flood plains below Wivenhoe Dam. The peak flows of floods emanating from the upper catchments of Brisbane and Stanley Rivers can be reduced by controlling flood releases from the dams, while taking into account flooding derived from the lower Brisbane River catchments.

3.4 Disruption to Rural Areas

While the dams are being used for flood mitigation purposes, bridges and areas upstream of the dams may be temporarily inundated. Downstream of the dam, bridges and lower river terraces will be submerged. The operation of the dams should not prolong this inundation unnecessarily.

Disruption to navigation in the Brisbane River can also be taken into account when considering disruption to rural areas downstream of the dam. Generally, this consideration is secondary to considerations associated with reducing bridge inundation.

3.5 Retain the storage at Full Supply Level at the Conclusion of the Flood Event

As the dams are the primary urban water supply for South East Queensland, it is important that all opportunities to fill the dams are taken. There should be no reason why the dams should not be full following a Flood Event.

3.6 Minimising Impacts to Riparian Flora and Fauna

During the drain down phase, consideration is to be given to minimising the impacts on riparian flora and fauna. In particular, strategies aimed at reducing fish deaths in the vicinity of the dam walls are to be instigated, provided such procedures do not adversely impact on other flood mitigation objectives.

Additionally, when determining the time interval between successive gate closures consideration should also be given to reducing potential bank slumping. Rapid draw down of stream levels where banks are saturated should be avoided if this can be managed within the other flood mitigation objectives.

4. FLOOD CLASSIFICATION

For the reference purposes of this Manual, four magnitudes of flooding are classified as follows:

Minor Flooding

Causes inconvenience. Low-lying areas next to watercourses are inundated which may require the removal of stock and equipment. Minor roads may be closed and low-level bridges submerged.

Moderate Flooding

In addition to the impacts experienced during Minor Flooding, the evacuation of some houses may be required. Main traffic routes may be impacted. The area of inundation is substantial in rural areas requiring the removal of stock.

Major Flooding

In addition to the impacts experienced during Moderate Flooding, extensive rural areas and/or urban areas are inundated. Properties and towns are likely to be isolated and major traffic routes likely to be closed. Evacuation of people from flood affected areas may be required. The 1974 flood that impacted on the Ipswich and Brisbane areas is classified as a major flood.

Extreme Flooding

This causes flooding impacts equal to or in excess of levels previously experienced. In addition to the impacts experienced during Major Floods, the general evacuation of people from significant populated areas is likely to be required.

It should be noted that a flood may not cause the same category of flooding along its entire length and the relevant agencies shall have regard to this when flooding is predicted. The classifications of minor, moderate and major flooding are based on the Bureau of Meteorology Standard Flood Classifications for Australia.

The current classifications for key reference gauges in the Brisbane River are given in Appendix B.

5 FLOOD MONITORING AND FORECASTING SYSTEM

5.1 General

A real time flood monitoring and forecasting system has been established in the dam catchments. This system employs radio telemetry to collect, transmit and receive rainfall and stream flow information. The system consists of more than 100 field stations that automatically record rainfall and/or river heights at selected locations in the dam catchments. Some of the field stations are owned by Seqwater with the remainder belonging to other agencies.

The rainfall and river height data is transmitted to Seqwater's Flood Operations Centre in real time. Once received in the Flood Operations Centre, the data is processed using a Real Time Flood Model (RTFM) to estimate likely dam inflows and evaluate a range of possible inflow scenarios based on forecast and potential rainfall in the dam catchments. The RTFM is a suite of hydrologic and hydraulic computer programs that utilise the real time data to assist in the operation of the dams during flood events. Seqwater is responsible for providing and maintaining the RTFM and for ensuring that sufficient data is available to allow proper operation of the RTFM during a Flood Event.

5.2 Operation

The Senior Flood Operations and Flood Operations Engineers use the RTFM for flood monitoring and forecasting during flood events to operate the dams in accordance with this Manual. This is done by optimising releases of water from the dams to minimise the impacts of flooding in accordance with the objectives and procedures contained in this Manual.

Seqwater is responsible for improving the operation of the RTFM over time by using the following processes:

- Implementing improvements based on Flood Event audits and reviews.
- Improving RTFM calibration as further data becomes available.
- Updating software in line with modern day standards.
- Improving the coverage and reliability of the data collection network to optimise data availability during Flood Events.
- Recommendations by Senior Flood Operations Engineers.

A regular process of internal audit and management review must be maintained by Seqwater to achieve these improvements.

Seqwater must also maintain a log of the performance of the data collection network. The log must include all revised field calibrations and changes to the number, type and locations of gauges. Senior Flood Operations and Flood Operations Engineers are to be notified of all significant changes to the Log.

Seqwater must also maintain a log of the performance of the RTFM. Any faults to the computer hardware or software are to be noted and promptly and appropriately attend to.

5.3 Storage of Documentation

The performance of any flood monitoring and forecasting system is reliant on accurate historical data over a long period of time. Seqwater must ensure that all available data and other documentation is appropriately collected and catalogued for future use.

5.4 Key Reference Gauges

Key field station locations have been identified for reference purposes when flood information is exchanged between authorities or given to the public. Should it be deemed desirable to relocate field stations from these locations or vary flood classification levels, agreement must first be obtained between Seqwater, Bureau of Meteorology and the Local Government within whose boundaries the locations are situated.

Gauge boards that can be read manually must be maintained by Seqwater as part of the equipment of each key field station. Where possible and practical during Flood events, Seqwater is to have procedures in place for manual reading of these gauge boards in the event of failure of field stations.

5.5 Reference Gauge Values

Other agencies such as the Bureau of Meteorology, Brisbane City Council and Ipswich City Council have direct access to the information from field stations for flood assessment purposes. The consultation between agencies is a very important part of the assessment and prediction of flood flows and heights.

Seqwater must ensure that information relevant to the calibration of its field stations is shared with these agencies.

6 COMMUNICATIONS

6.1 Communications between Staff

Seqwater is responsible for providing and maintaining equipment to allow adequate channels of communication to exist at all times between the Seqwater Flood Operations Centre and site staff at Wivenhoe and Somerset Dams.

6.2 Dissemination of Information

Agencies other than Seqwater have responsibilities for formal flood predictions, the interpretation of flood information and advice to the public associated with Flood Events. Adequate and timely information is to be supplied to agencies responsible for the operation of facilities affected by flooding and for providing warnings and information to the public. Agency information requirements are generally as shown in the table below.

The Senior Flood Operations and Flood Operations Engineers must supply information to each of these agencies during Flood Events. The contact information for these Agencies and communication procedures is contained in the Emergency Action Plans for the dams and each agency is to receive updated controlled copies of these documents.

Seqwater must liaise and consult with these agencies with a view to ensuring all information relative to the flood event is consistent and used in accordance with agreed responsibilities.

AGENCY INFORMATION REQUIREMENTS

Agency	Activity	Information Required from Flood Operations Centre	Trigger
Bureau of Meteorology	Issue of flood warnings for Brisbane River basin	Actual and projected discharges from Wivenhoe Dam Actual and projected discharges from Somerset Dam	Initial gate operations and thereafter at intervals to suit forecasting requirements
Department of Environment and Resource Management	Review of flood operations and discretionary powers	Actual and predicted lake levels and discharges	
Somerset Regional Council	Flood level information upstream of Somerset Dam and upstream and downstream of Wivenhoe Dam	Actual and predicted lake levels, Somerset Dam and actual and predicted lake levels and discharges, Wivenhoe Dam	Somerset Dam water level predicted to exceed EL 102 m AHD and initial Wivenhoe Dam gate operation
Ipswich City Council	Flood level information for Ipswich City area	Nil (information obtained from BOM)	
Brisbane City Council	Flood level information for Brisbane City area	Nil (information obtained from BOM)	

Comms with Comment
Manage Time Response

6.3 Release of Information to the Public

Seqwater is responsible for the issue of information regarding storage conditions and current and proposed releases from the dams to the public and the media.

The Bureau of Meteorology has responsibility for issuing flood warnings.

The Emergency Services Response Authorities, under the Disaster Management Act 2003, have responsibility for the preparation of a local counter disaster plan and the interpretation of flood forecast information for inclusion in their local flood warnings prepared under the flood sub plan of the counter disaster plan.

Councils responsibility for community response

7 REVIEW

7.1 Introduction

With the passage of time neither the technical assumptions nor the physical conditions on which this Manual is based may remain unchanged. It is also recognised that the relevance of the Manual may change with changing circumstances. It is important therefore, that the Manual contain operational procedures which cause the assumptions and conditions upon which they are based, to be checked and reviewed regularly.

This process must involve all personnel involved in the management of Flood Events, to ensure that changes of personnel do not result in a diminished understanding of the basic principles upon which the operational procedures are based. Variations to the Manual may be made in accordance with provisions in Section 1.8.

7.2 Personnel Training

Seqwater must report to the Chief Executive by 30 September each year on the training and state of preparedness of operations personnel.

7.3 Monitoring and Forecasting System and Communication Networks

Seqwater must provide a report to the Chief Executive by 30 September each year on the state of the Flood Monitoring and Forecasting System and Communication Networks. The report must assess following in terms of hardware, software and personnel:

- Adequacy of the communication and data gathering facilities.
- Reliability of the system over the previous period.
- Reliability of the system under prolonged flood conditions.
- Accuracy of forecasting flood flows and heights.
- The overall state of preparedness of the system.

Seqwater must take any action considered necessary for the proper functioning and improvement of this system.

7.4 Operational Review

After each significant flood event, Seqwater must report to the Chief Executive on the effectiveness of the operational procedures contained in this manual. This report must be submitted within six weeks of any flood event that requires mobilisation of the Flood Operations Centre.

7.5 Five Yearly Review

Prior to the expiry of the approval period, Seqwater must review the Manual pursuant to provisions of the Act. The review is to take into account the continued suitability of the communication network and the flood monitoring and forecasting system, as well as hydrological and hydraulic engineering assessments of the operational procedures.

Suzie Emery

From: Elaina Smouha [elainamir[redacted]
Sent: Thursday, 2 February 2012 2:57 PM
To: Elaina Smouha
Subject: Fwd: Flood Manual Pt 2
Attachments: Flood Manual Pt 2.pdf

---------- Forwarded message ----------
From: **Elaina Smouha** <elainamir[redacted]>
Date: Tue, Jan 11, 2011 at 12:25 PM
Subject: Flood Manual Pt 2
To: brian.cooper.consult[redacted]

Brian

Part 2 of the Manual

On Tue, Jan 11, 2011 at 12:24 PM, Elaina Smouha <elainamir[redacted]> wrote:
Brian

Attached is Part 1 of 3 of Seqwater's Flood Mitigation Manual.

Apologies but due to the size of the file I have had to split it and send it from my personal email.

I will send you the other parts shortly.

Regards

Elaina

Elaina Smouha
Director, Governance and Regulatory Compliance
SEQ Water Grid Manager
[redacted]
Visit: Level 15, 53 Albert Street Brisbane
Post: PO Box 16205, City East QLD 4002
ABN: 14783 317 630

8 WIVENHOE DAM FLOOD OPERATIONS

8.1 Introduction

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.

The reservoir volume above FSL of EL 67.0 is available as temporary flood storage. How much of the available flood storage compartment is utilised, will depend on the initial reservoir level below FSL, the magnitude of the flood being regulated and the procedures adopted.

Splityard Creek Dam is part of the overall Wivenhoe Area Project and it forms the upper pumped storage for hydro power generation. Splityard Creek Dam impounds a volume of 28,700 ML at FSL (EL 166.5). This volume can be emptied into Lake Wivenhoe within 12 hours and this water can affect the level in Wivenhoe Dam by up to 300mm when Wivenhoe Dam is close to FSL. Operation of the power station and release of water from Splityard Creek Dam to Lake Wivenhoe is outside the control of Seqwater, but should be considered when assessing the various trigger levels of Wivenhoe Dam.

8.2 Flood Release Infrastructure

Radial Gates and an Auxiliary Spillway are the primary infrastructure used to release water during flood events at Wivenhoe Dam. The arrangement of the Radial Gates is shown in the diagram below:



In addition to the five radial gates, the auxiliary spillway was constructed in 2005 as part of an upgrade to improve flood adequacy of this storage. The auxiliary spillway consists of a three bay fuse plug spillway at the right abutment. In association with other works constructed at the dam, this gives the dam crest flood an AEP of approximately 1 in 100,000. Another one bay fuse plug spillway may be constructed at Saddle Dam Two in the future.

Pertinent information about the auxiliary spillway, including the initiation level for the specific bays is given in the following table.

AUXILIARY SPILLWAY - FUSE PLUG DETAILS



The arrangement of the Auxiliary Spillway is shown in the diagram below.



8.3 Initial Flood Control Action

Once a Flood Event is declared, 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.
- A prediction of the peak flow rate at the Lowood Gauge excluding Wivenhoe Dam releases.
- A prediction of the peak flow rate at the Moggill Gauge excluding Wivenhoe Dam releases.

The spillway gates are not to be opened for flood control purposes prior to the reservoir level exceeding EL 67.25.

8.4 Flood Operations Strategies

There are four strategies (W1 to W4) used when operating Wivenhoe Dam during a flood event as outlined below. These strategies are based on the Flood Objectives of this manual. As outlined in Section 3, the 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.

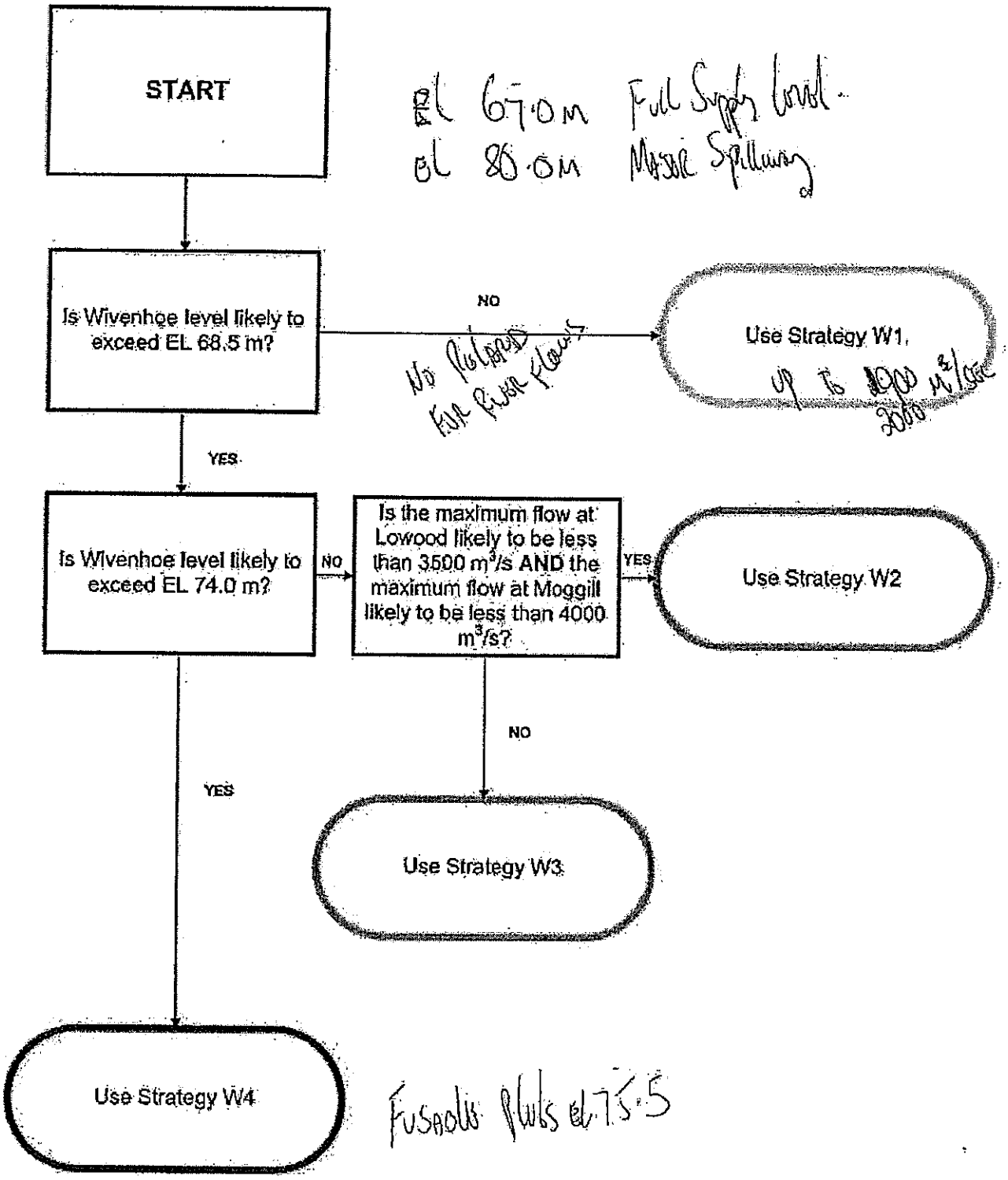
The strategy chosen at any point in time will depend on the actual levels in the dams and the following predictions, which are to be made using the best forecast rainfall and stream flow information available at the time:

- 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 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.

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



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 bridges downstream of the dam prematurely (see Appendix I). The limiting condition for Strategy W1 is the submergence of Mt Crosby Weir Bridge that occurs at approximately 1,900 m^3/s.

* Note: Colleges Crossing is affected by tides.

For situations where flood rains are occurring on the catchment upstream of Wivenhoe Dam and only minor rainfall is occurring downstream of the dam, releases are to be regulated to limit, as much as appropriate in the circumstances, downstream flooding.

The following strategies 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 particular bridges. The diagram above shows the location of the impacted bridges and the approximate river flow rate at which they are closed to traffic.

Strategy W1A Twin Bridges, Savages Crossing and Colleges Crossing

Lake Level greater than 67.25 m AHD
[Maximum Release 110 m^3/s]

Firstly, endeavour to maintain Twin Bridges trafficable by limiting the combined flows from Wivenhoe Dam and Lockyer Creek to a maximum of 50 m^3/s.

Once Twin Bridges is closed to traffic, endeavour to maintain Savages Crossing trafficable by limiting the combined flows from Wivenhoe Dam and Lockyer Creek to a maximum of 110 m^3/s.

Once Savages Crossing is closed to traffic, 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. Note that College's Crossing can be impacted by tidal influences.

When the flood event subsides, all gates are to be closed when the dam achieves FSL in accordance with Section 8.5.

Strategy W1B College's Crossing and Burtons Bridge

Lake Level greater than 67.50 m AHD
[Maximum Release 380 m^3/s]

No consideration is given to maintaining Twin Bridges or Savages Crossing open.

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.

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.

Strategy W1C Burtons Bridge and Kholo Bridge

Lake Level greater than 67.75 m AHD
[Maximum Release 500 m^3/s]

No consideration is given to maintaining College's Crossing open.

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.

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.

Strategy W1D Kholo Bridge and Mt Crosby Weir Bridge

Lake Level greater than 68.00 m AHD
[Maximum Release 1900 m^3/s]

No consideration is given to maintaining Burtons Bridge open.

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.

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.

Strategy W1E Mt Crosby Weir Bridge and Fernvale Bridge

Lake Level greater than 68.25 m AHD
[Maximum Release 1900 m^3/s]

No consideration is given to maintaining Kholo Bridge open.

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.

Once Mt Crosby Weir Bridge is closed to traffic, endeavour to maintain Fernvale Bridge trafficable by limiting the combined flows from Wivenhoe Dam and Lockyer Creek to a maximum of 2000 m^3/s.

If the level reaches EL 68.5 m AHD in Wivenhoe Dam, switch to Strategy W2 or W3 as appropriate.

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). In these instances, the combined peak river flows should not exceed those shown in the following table:

LOCATION	TARGET MAXIMUM FLOW IN THE BRISBANE RIVER
Lowood	The lesser of: • the natural peak flow at Lowood excluding Wivenhoe Dam releases, and; • 3,500m^3/s.
Moggill	The lesser of: • the natural peak flow at Moggill excluding Wivenhoe Dam releases, and; • 4,000m^3/s.

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.

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 in accordance with the requirements of Section 8.6, 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. However the impact of rapidly increasing discharge from Wivenhoe Dam on downstream reaches should be considered when determining gate opening sequences.

Strategy W4A – No Fuse Plug Initiation Expected

Lake Level between 74.0 and 75.5 m AHD
[No Maximum Release]

Strategy 4A applies while all indications of the peak flood level in Wivenhoe Dam are that it will be insufficient to trigger operation of the first bay of the fuse plug by reaching 75.5 m AHD.

Gate openings are generally to occur at the minimum intervals and sequences as specified in Section 8.6 until the storage level of Wivenhoe Dam begins to fall. However, to protect the safety of the dam, minimum opening intervals can be reduced and gate opening sequences can be modified.

Strategy W4B – Fuse Plug Initiation Possible

Lake Level greater than 75.5 m AHD
[No Maximum Release]

Strategy W4B applies once indications are the peak flood level in Wivenhoe Dam may exceed EL75.5 and trigger the fuse plug under normal operations. Two scenarios are possible under this strategy. The first scenario is where it may be possible to prevent fuse plug initiation by early opening of the gates. The second scenario is where fuse plug initiation cannot be avoided. The actions associated with these scenarios are contained in the following table:



8.5 Gate Closing Strategies

In general, gate closing commences when the level in Wivenhoe Dam begins to fall and is generally to occur in the reverse order to opening. The final gate closure should occur when the lake level has returned to Full Supply Level. The following requirements must be considered when determining gate closure sequences:

- Where possible, total releases during closure should not produce greater flood levels downstream than occurred during the flood event.
- The maximum discharge from the dam during closure should generally be less than the peak inflow into Wivenhoe Dam experienced during the event. The discharge from Wivenhoe Dam includes discharge from triggered fuse plugs, gates, regulator cone dispersion valve and hydro release.
- If, at the time the lake level in Wivenhoe Dam begins to fall, the combined flow at Lowood is in excess of 3,500 m^3/s then the combined flow at Lowood is to be reduced to 3,500 m^3/s as quickly as practicable.
- The aim should always be to empty stored floodwaters stored above EL 67.0m within seven days after the flood peak has passed through the dams. However, provided a favourable weather outlook is available, this requirement can be relaxed for the volume between EL 67.0m and EL 67.5m, to obtain positive environmental outcomes.
- If the flood storage compartments of Wivenhoe Dam and Somerset Dam can be emptied within seven days, the maximum flow in the Brisbane River at Lowood should not exceed 3,500 m^3/s.
- To minimise the stranding of fish downstream of the dam, final closure sequences should consider Seqwater policies relating to fish protection at the dam.

There may be a need to take into account base flow when determining final gate closure. This may mean that the lake level temporarily falls below Full Supply Level to provide for a full dam at the end of the Flood Event.

8.6 Gate Operation Sequences

Radial Gate Opening Operations

When dam outflows are less than 4,000 m^3/s, rapid opening of the radial gates can cause undesirable rapid rises in downstream river levels. Accordingly, when dam outflows are less than 4,000 m^3/s, the aim in opening radial gates is to operate the gates one at a time at intervals that will minimise adverse impacts on the river system. The table below shows the target minimum interval for gate operations in these circumstances. This target interval can be reduced if the gates are at risk of being overtopped or the safety of the dam is at risk.

TARGET MINIMUM INTERVAL FOR RADIAL GATE OPENING (DOWNSTREAM RIVER FLOWS < 4000 m^3/s)

OPERATION	TIME INTERVAL BETWEEN SUCCESSIVE OPENING OF INDIVIDUAL GATES (mins)
Radial Gate opening of 500 mm	10

When dam outflows exceed 4,000 m^3/s, the impact of rapid gate openings on downstream water levels is reduced due to the already elevated river levels. Under these circumstances, the safety of the dam will generally be of primary concern and therefore there are no minimum gate opening intervals in these circumstances.

Under extreme circumstances, the mechanical capability of the radial gate operating system provides the facility to open each radial gate more than five metres within a one hour period. Accordingly, unless a mechanical breakdown is experienced, physical gate opening capability is unlikely to be a constraint in meeting projected outflow targets.

Radial Gate Closing Operations

When dam outflows are less than 4,000 m^3/s, rapid closure of the radial gates can cause adverse impacts to the river system. Accordingly, when dam outflows are less than 4,000 m^3/s, the aim in closing radial gates is to operate the gates one at a time at an interval that will minimise adverse impacts on the river system as outlined in the table below.

TARGET MINIMUM INTERVAL FOR RADIAL GATE CLOSURE

OPERATION	TIME INTERVAL BETWEEN SUCCESSIVE CLOSING OF INDIVIDUAL GATES (mins)
Radial Gate closure of 500 mm	20

When dam outflows exceed 4,000 m^3/s, the impact of rapid gate closings is reduced due to the already elevated river levels. However, given that the safety of the dam is unlikely to be at risk if decisions are made to close radial gates, the target of operating the gates one at a time in accordance with the time interval shown in the above table remains.

Rapid closure of radial gates is permissible however, when there is a requirement to preserve storage or to reduce downstream flooding. When determining gate closure sequences, consideration should also be given to following the calculated natural recession of the flood in the river to aim to ensure that the recession impacts are not greater than those that would have been experienced had the dam not been constructed.

Protection of the Spillway Walls

The flip bucket spillway is designed to control the discharge from the reservoir and to dissipate the energy of the discharge. The flip throws the discharge clear of the concrete spillway structures and into a plunge pool where the energy is dissipated by turbulence. Under non-symmetric flow conditions or when Gates 1 and 5 are not operating, the discharge jet may impinge on the walls of the plunge pool. As these walls have been excavated into erodible sandstone rock, this impingement may cause non-predictable erosion. Upstream migration of this erosion is to be avoided. This can be achieved by operating Gates 1 and 5 to deflect the discharge away from the walls of the plunge pool.

Therefore in operating the spillway, the principles to be observed in order of priority are:

(i) The discharge jet into the plunge pool is not to impinge on the right or left walls of the plunge pool.

(ii) The flow in the spillway is to be symmetrical.

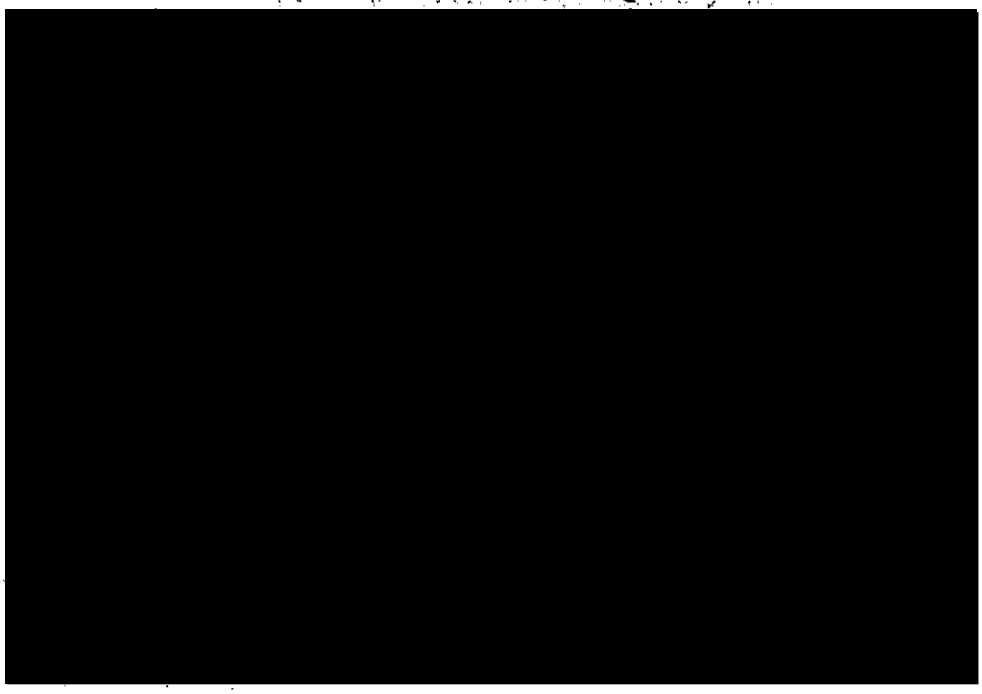
Normal Gate Operation Sequences

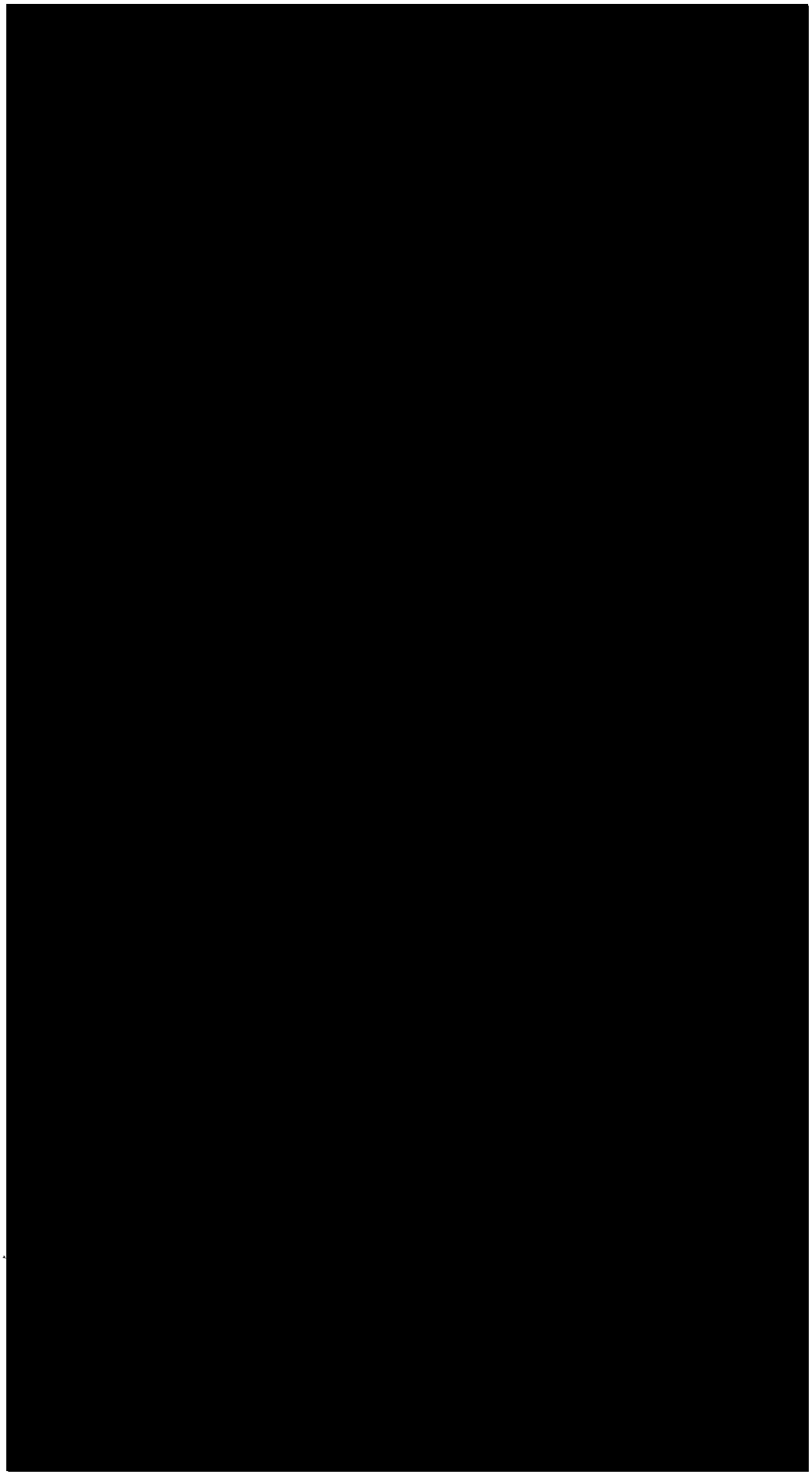
Under normal operation, only one gate is to be opened at any one time and the sequences shown in the table below are to be adopted. Generally gates are operated in the order of 3,2,4,1,5. Variations are allowed at any time to protect the structural safety of the dam.

It should also be noted that:

- Gates are numbered 1 to 5 from the left bank looking downstream
- Flow in spillway to be as symmetrical as possible.

RADIAL GATE OPENING SEQUENCES







During the initial opening or final closure sequences of gate operations it is permissible to replace the discharge through a gate by the immediate opening of a regulator valve (or the reverse operation). This allows for greater control of low flows.

Gate Failure or Malfunction Procedures

Gate operating procedures in the event of equipment failure are contained in Appendix G. If one or more gates are inoperable during the course of the flood event, the gate openings of the remaining gates are to be adjusted to provide the required discharge from the dam. These adjustments should ensure that:

- The impact of the flow on the sidewalls of the plunge pool should be minimised, and
- The flow in the spillway is as symmetrical as practicable.

Radial Gate Turbulence Considerations

Unless in the process of lifting the gates clear of the flow, the bottom edge of the radial gates must always be at least 500 millimetres below the release flow surface. Having the bottom edge of the gates closer to the release flow surface than 500 millimetres may cause unusual turbulence that could adversely impact on the gates. This procedure has never been undertaken in practice and should be observed closely when being undertaken. Variations to the procedure are allowed to protect the structural safety of the dam.

Lowering Radial Gates that have been lifted Clear of the Release Flow

When lowering radial gates that have been lifted clear of the release flow, the bottom edge of the gates must be lowered at least 500 millimetres into the flow. Lowering gates into the release flow less than this amount may cause unusual turbulence that could adversely impact on the gates. This procedure has never been undertaken in practice and should be observed closely

when being undertaken. Variations to the procedure are allowed to protect the structural safety of the dam.

8.7 Modification to Flood Operating Procedures if a Fuse Plug Triggers

Where the operation of a fuse plug spillway bay has been triggered, the flood operation procedures are to be modified such that:

- The discharge from the triggered fuse plug is to be taken into account when determining total flood releases from the dam;
- The gates are to be operated, to the extent possible, so that the same discharge restrictions apply as would have if the fuse plug embankment was intact.

8.8 Modification to Flood Operating Procedures if a subsequent flood event occurs prior to the reconstruction of Triggered Fuse Plugs

Where the operation of any or all of the fuse plug spillway bays has been triggered and a flood event occurs before the fuse plug can be reinstated, the flood operation procedures are to be modified such that:

- The discharge from the triggered fuse plug is to be taken into account when determining total flood releases from the dam;
- The gates are to be operated, to the extent possible, so that the same discharge restrictions apply as would have if the fuse plug embankment was intact.
- Discharge from the Auxiliary Spillway will occur before the Gate Trigger Level of EL 67.25 m AHD. This flow should be taken into account when applying the flood operation strategies relevant to the low level bridge crossings.

9 SOMERSET DAM FLOOD OPERATIONS

9.1 Introduction

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. The arrangement of the Somerset Dam Radial Gates, Sluice Gates and Regulator Valves is shown in the diagram below. At EL 107.45, flood waters commence to flow over the dam crest. To account for this discharge, the dam crest is assumed to operate as a broad crested weir with a spillway width of 135.33 m.



9.2 Initial Flood Control Action

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.

9.3 Flood Operations Strategies

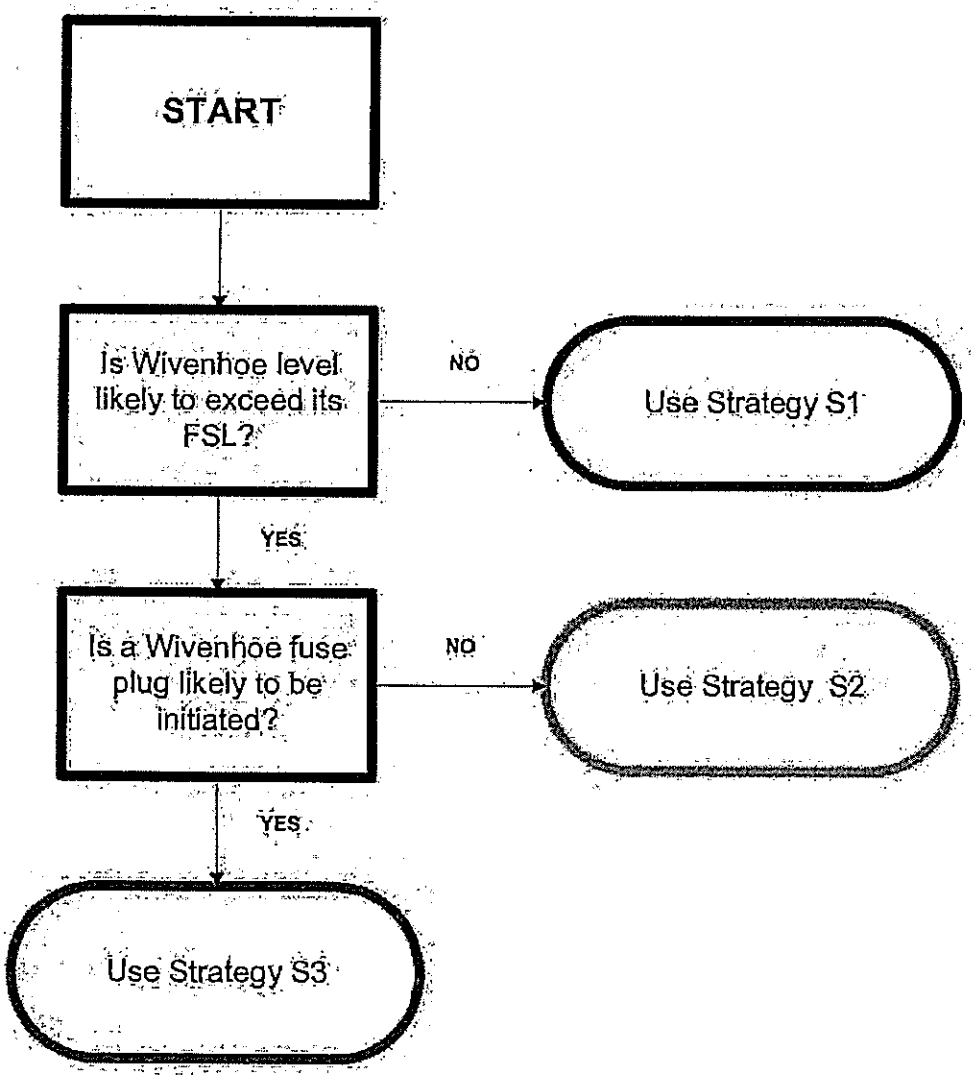
There are three strategies used when operating Somerset Dam during a flood event as outlined below. These strategies are based on the Flood Objectives of this manual. The strategy chosen at any point in time will depend on predictions of the maximum storage levels in Wivenhoe and Somerset Dams which 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.

When calculating the impacts of flood releases from Somerset Dam, the gate opening sequences outlined in Section 9.5 should be used to determine likely outflow rates from the dam.

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



The order of operation for opening the sluices under each strategy is LMKNJOIP. Sluices are to be closed in reverse order of opening. Any inoperable sluices are to be dropped from the opening or closing sequences.

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**

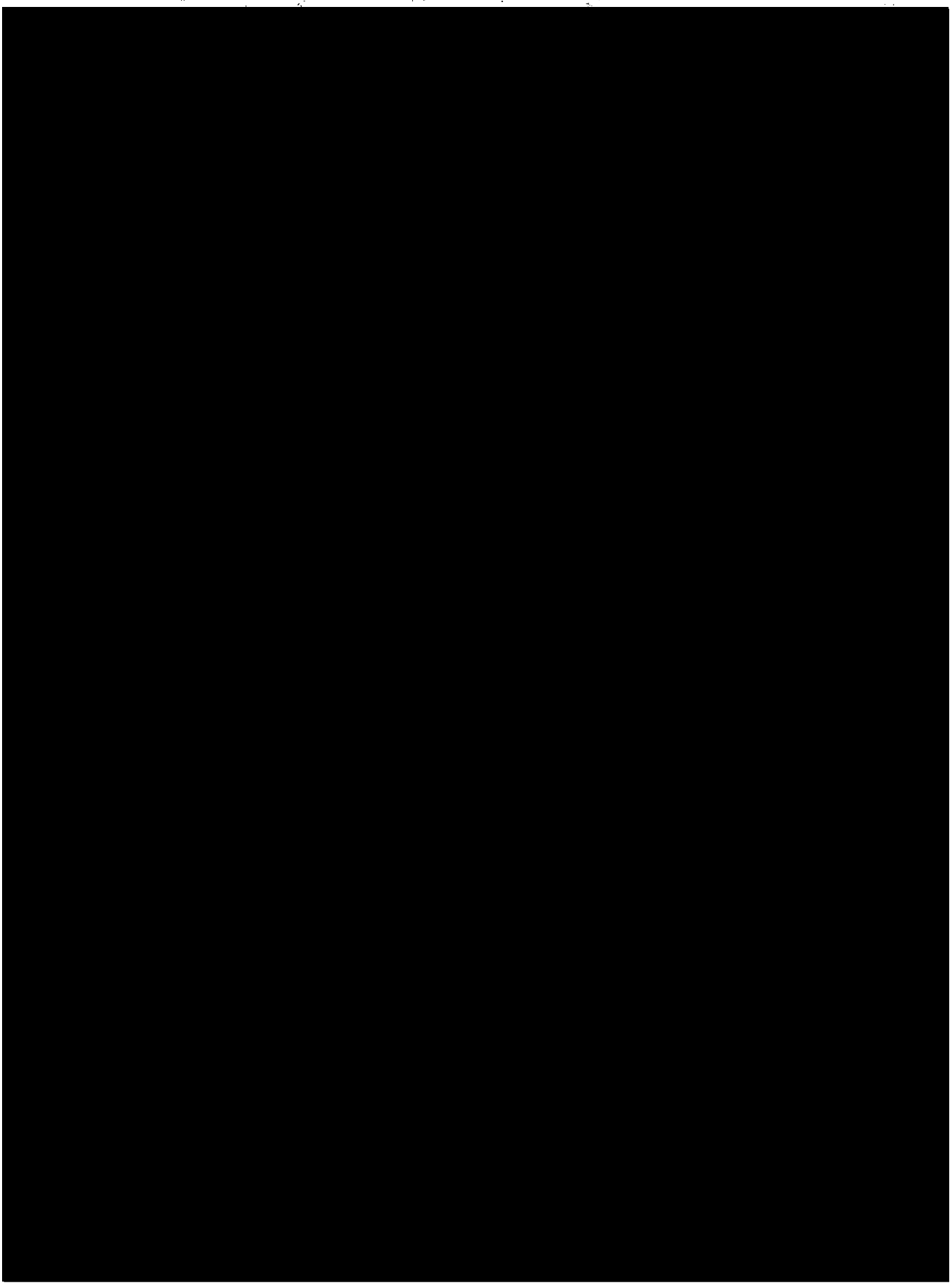
The intent of this strategy is to return the dam to full supply level while minimising the impact on rural life upstream of the dam. Consideration is also given to minimising the downstream environmental impacts from the release.

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.

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.

[redacted]



[redacted]

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.

9.4 Gate Closing Strategies

In general, gate closing commences when the level in Somerset Dam begins to fall and is generally to occur in the reverse order to opening. The final gate closure should occur when the lake level has returned to Full Supply Level. The following requirements must be considered when determining gate closure sequences:

- Unless determined otherwise by the Senior Flood Operations Engineer in accordance with Section 2.8, the aim should be to empty stored floodwaters within seven days after the flood peak has passed through the dams.
- To minimise the stranding of fish downstream of the dam, final closure sequences should consider Seqwater policies relating to fish protection at the dam.

There may be a need to take into account base flow when determining final gate closure. This may mean that the lake level temporarily falls below Full Supply Level to provide for a full dam at the end of the Flood Event.

9.5 Gate Operation Sequences

Intervals between Operations

Releases from Somerset Dam flow directly into Wivenhoe Dam and therefore the downstream river impact considerations associated with radial gate operations at Wivenhoe Dam, do not directly apply to Somerset Dam. However, the following minimum intervals should generally be observed whilst opening and closing regulators, sluices and crest gates at Somerset Dam for flood mitigation purposes. These intervals have been chosen to minimise any adverse impacts caused by lake level rises above the junction of the Stanley and Brisbane Rivers.

MINIMUM INTERVALS FOR NORMAL GATE OPERATIONS

ITEM	OPENING	CLOSING
Regulator Valves	30 mins	60 mins
Sluice Gates (Dam level < EL 100.45)	120 mins	180 mins
Sluice Gates (Dam level > EL 100.45)	60 mins	60 mins
Crest Gates	Gates are normally open	-

Sluice Gate Operations

The order of operation for opening the sluices under each strategy is LMKNJOIP. Sluices are to be closed in reverse order of opening. Any inoperable sluices are to be dropped from the opening or closing sequences.

Regulator Valve Considerations

During the initial opening or final closure sequences of gate operations it is permissible to replace the discharge through a sluice gate by the immediate opening of one or more regulator valves (or the reverse operation). This allows for greater control of low flows and enables a smooth transition on opening and closing sequences.

It must also be noted that the Regulator Valves are not to be operated when the tail water level below Somerset Dam is above the invert of the valves (68.60 m AHD). Operating the valves under these circumstances can damage the valves. This requirement can be ignored if the structural safety of the dam is at risk.

10 EMERGENCY FLOOD OPERATIONS

10.1 Introduction

While every care has been exercised in the design and construction of the dams, there still remains a low risk that the dams may develop an emergency condition either through flood events or other causes. Vigilance is required to recognise emergency flood conditions such as:

- Occurrence of a much larger flood than the discharge capacity of the dam;
- Occurrence of a series of large storms in a short period;
- Failure of one or more gates during a flood.
- Development of a piping failure through the embankment of Wivenhoe Dam;
- Damage to the dams by earthquake;
- Damage to the dams as an act of war or terrorism;

Responses to these conditions are included in Emergency Action Plans for the dams.

10.2 Overtopping of Dams

Whatever the circumstances, every endeavour must be made to prevent overtopping of Wivenhoe Dam by the progressive opening of operative spillway gates. The Auxiliary Spillway constructed at the dam in 2005 gives the dam crest flood an AEP of approximately 1 in 100,000. Another one bay fuse plug spillway may be constructed at Saddle Dam Two in the future, thereby increasing this immunity.

Somerset Dam should not be overtopped by flood water, but if Wivenhoe Dam is threatened by overtopping, the release of water from Somerset Dam is to be reduced at the risk of overtopping Somerset Dam in order to prevent the overtopping of Wivenhoe Dam.

10.3 Communications Failure

If communications are lost between the Flood Operations Centre and either dam, the officers in charge at each dam are to adopt the procedures set out below.

Wivenhoe Dam Emergency Procedure

In the event of communications loss with the Flood Operations Centre, the Dam Supervisor at Wivenhoe Dam is to assume responsibility for flood releases from the Dam. Once it has been established that communications have been lost, the Dam Supervisor at Wivenhoe Dam is to:-

- Take all practicable measures to restore communications and periodically check the lines of communication for any change;

- Follow the procedures set out below to determine the relevant magnitude and duration of releases from Wivenhoe Dam;
- Log all actions in the Event Log;
- Ensure the dam is at full supply level at the end of the event;
- Remain in the general vicinity of the dam while on duty.

The radial gate opening sequence is as set out in Table 10.2. Individual sequence steps are shown against a target storage level. The minimum time intervals between each step in the radial gate opening sequence are shown in Table 10.1. Falling behind or being in front of the target gate openings is permissible when the storage level is less than 74.0 m AHD, but not allowed when the storage level is greater than 74.0 m AHD. When the storage level is below 74.0 m AHD, the operating intervals shown in Table 10.1 must generally be followed and can be ignored only to protect the structural safety of the dam.

Where the operation of a fuse plug spillway bay has been triggered, the relevant table contained in Appendix J is to be substituted for Table 10.2.

TABLE 10.1
MINIMUM INTERVALS BETWEEN OPERATING SEQUENCE STEPS

ITEM	MINIMUM OPENING INTERVAL	MINIMUM CLOSING INTERVAL
Radial Gates (Dam Level < EL 74.0)	10 mins	20 mins
Radial Gates (Dam Level > EL 74.0)	No Minimum	No Minimum

TABLE 10.2
RADIAL GATE OPENING SEQUENCE STEPS AND TARGET GATE OPENINGS AGAINST STORAGE LEVEL

[redacted]

TABLE 10.2 (CONTINUED)

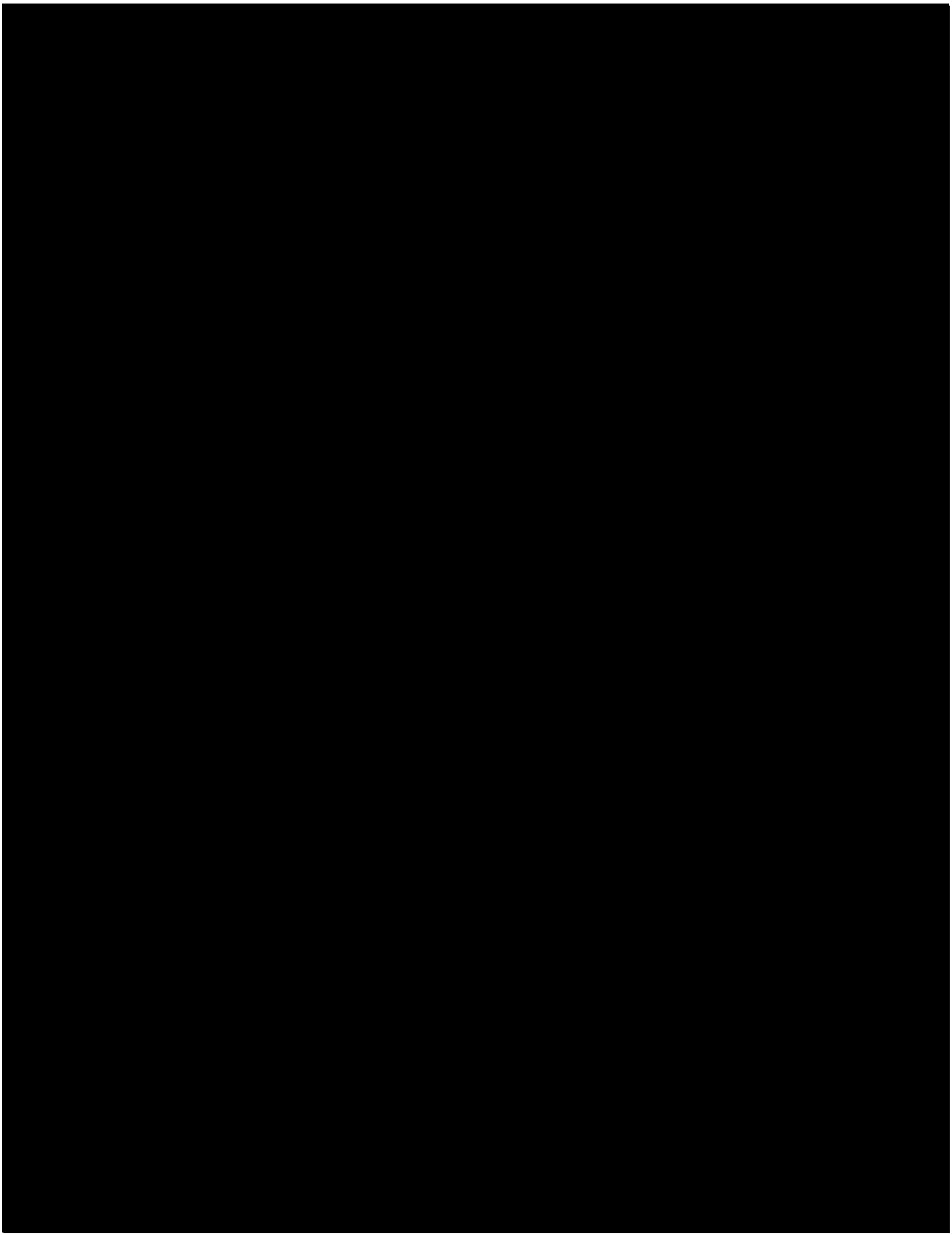


TABLE 10.2 (CONTINUED)



Under extreme circumstances, the mechanical capability of the gate operating system allows the facility to open each radial gate more than five metres within a one hour period. Accordingly, unless a mechanical breakdown is experienced, physical gate opening capability in unlikely to be a constraint in meeting projected gate opening targets. However in a loss of communications scenario, when extreme rises in lake level are being experienced, dam operators will have difficulty in continually matching minimum gate settings to lake level. Accordingly, in these circumstances when the dam level exceeds 74.0 AHD, it is permissible to estimate target dam levels one hour in advance, based on lake level rises in the previous hour and undertake gate operations on this basis.

In the event of one or more radial gates becoming jammed, the remaining gates are to be operated to provide the same total opening for a particular storage level, as shown in the Table 10.2. In these circumstances, gates are generally operated in the order of 3,2,4,1,5, moving through the sequence shown in the table.

In a loss of communication scenario, the bulkhead gate is only to be used to prevent a situation occurring which could endanger the safety of the dam. At the end of the event, the full supply level of the storage is to be achieved.

Somerset Dam Emergency Procedure

In the event of communications loss with the Flood Operations Centre, the Dam Supervisor at Somerset Dam is to assume responsibility for flood releases from the Dam. Once it has been established that communications have been lost, the Dam Supervisor at Somerset Dam is to:

- Take all practicable measures to restore communications and periodically check the lines of communication for any change;
- Undertake the actions set out below to release flood water from Somerset Dam;
- Log all actions in the Event Log;
- Ensure the dam is at full supply level at the end of the event;
- Remain in the general vicinity of the dam while on duty.

The actions to be undertaken to release flood water are:

- If communications with Wivenhoe Dam are lost, the level in Wivenhoe Dam is to be assumed as the level shown on gauge boards located downstream of Somerset Dam.
- The radial gates are to be kept raised to allow uncontrolled discharge.
- The regulators are to be closed if the tail water level exceeds EL 68.60 and are generally kept closed. The only exception to this is if the regulators are used to prevent overtopping of the dam.
- Sluice gates are operated as either fully opened or fully closed. The order of operation for opening the sluice gates is LMKNJOIP. Sluices are to be closed in reverse order of opening. Any inoperable sluices are to be dropped from the opening or closing sequences. The sluice gates are to be operated in accordance with the following procedures:
    - Case 1 - the level in Somerset Dam is below EL 100.45; or
    - Case 2 - the level in Somerset Dam is above EL 100.45.

  These procedures are described below.

Case 1 Procedure (Level in Somerset Dam is below EL 100.45)

The sluice gates are to be operated in accordance with the following table:

SOMERSET DAM LOSS OF COMMUNICATIONS CASE 1 PROCEDURE	
CONDITIONS AT SOMERSET AND WIVENHOE DAMS	**ACTIONS**
Level in Somerset Dam is below EL 100.45, Level in Wivenhoe Dam is below EL 70.0 and falling.	Sluice gates are to be opened at intervals of not less than 120 minutes, provided the number of open sluice gates does not exceed that shown in the "**SOMERSET DAM - MAXIMUM SLUICE GATE OPENING**" table. Once a sluice gate is opened, no further sluice gate operations are to be undertaken for 120 minutes.
Level in Somerset Dam is below EL 100.45, Level in Wivenhoe Dam is below EL 70.0 and rising.	Sluice gates are to be closed at intervals of not less than 180 minutes. Once a sluice gate is closed, no further sluice gate operations are to be undertaken for 180 minutes.
Level in Somerset Dam is below EL 100.45, Level in Wivenhoe Dam is above EL 70.0.	Sluice gates are to be closed at intervals of not less than 60 minutes. Once a sluice gate is closed, no further sluice gate operations are to be undertaken for 60 minutes.

SOMERSET DAM MAXIMUM SLUICE GATE OPENING	
SOMERSET DAM LEVEL	**MAXIMUM NUMBER OF SLUICE GATES ALLOWED TO BE OPEN**
[redacted]	

Case 2 Procedure (Level in Somerset Dam is above EL 100.45)

The sluices gates are to be operated in accordance with the following graph:

Sluices are progressively closed at one hour intervals if operating above the Operating Target Line and progressively opened at one hour intervals if operating below the Operating Target Line. The aim is always to follow the Operating Target Line as closely as possible.

10.4 Equipment Failure

In the event of equipment failure the action to be taken is indicated in Appendix E for Wivenhoe Dam and Appendix F for Somerset Dam.

Suzie Emery

From: Elaina Smouha [elainamir[redacted]]
Sent: Thursday, 2 February 2012 2:57 PM
To: Elaina Smouha
Subject: Fwd: Flood Manual Pt 3
Attachments: Flood Manual Pt 3.pdf

---------- Forwarded message ----------
From: **Elaina Smouha** <elainamir[redacted]>
Date: Tue, Jan 11, 2011 at 12:26 PM
Subject: Flood Manual Pt 3
To: brian.cooper.consult[redacted]

Brian

Part 3 of the Manual

On Tue, Jan 11, 2011 at 12:24 PM, Elaina Smouha <elainamir[redacted]> wrote:
Brian

Attached is Part 1 of 3 of Seqwater's Flood Mitigation Manual.

Apologies but due to the size of the file I have had to split it and send it from my personal email.

I will send you the other parts shortly.

Regards

Elaina

Elaina Smouha
Director, Governance and Regulatory Compliance
SEQ Water Grid Manager
Phone:[redacted] | Mobile:[redacted] | Fax:[redacted]
Email: elaina.smouha[redacted]
Visit: Level 15, 53 Albert Street Brisbane
Post: PO Box 16205, City East QLD 4002
ABN: 14783 317 630

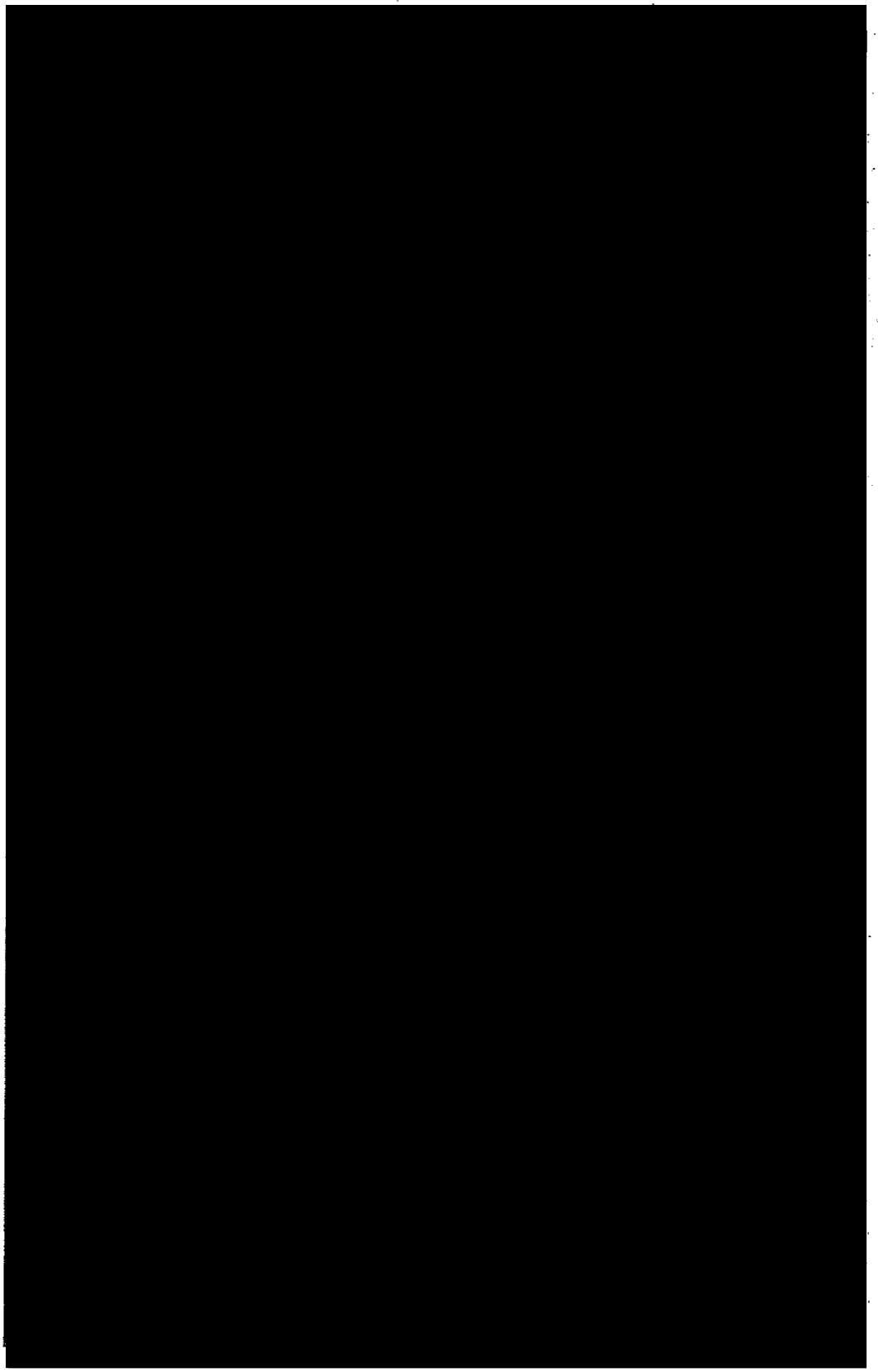
APPENDIX A
AGENCIES HOLDING CONTROLLED COPIES OF THIS MANUAL

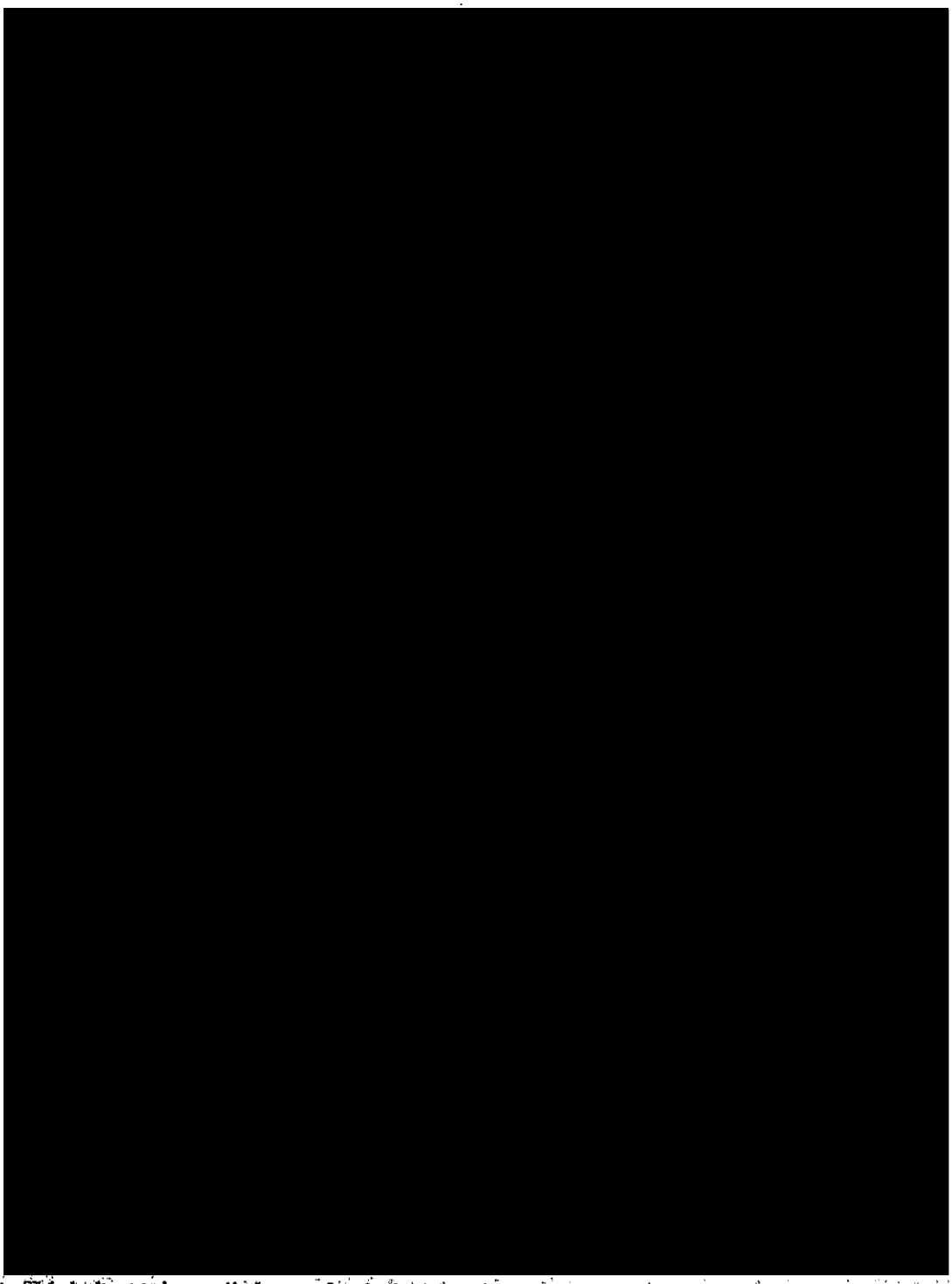


APPENDIX B
KEY REFERENCE GAUGES

Location	Gauge Zero	1974 Gauge Height	Minor Flood		Moderate Flood		Major Flood	
			Gauge Height	Flow	Gauge Height	Flow	Gauge Height	Flow
	m AHD	m	m	m^3/s	m	m^3/s	m	m^3/s
[redacted]								

APPENDIX C
WIVENHOE DAM TECHNICAL DATA



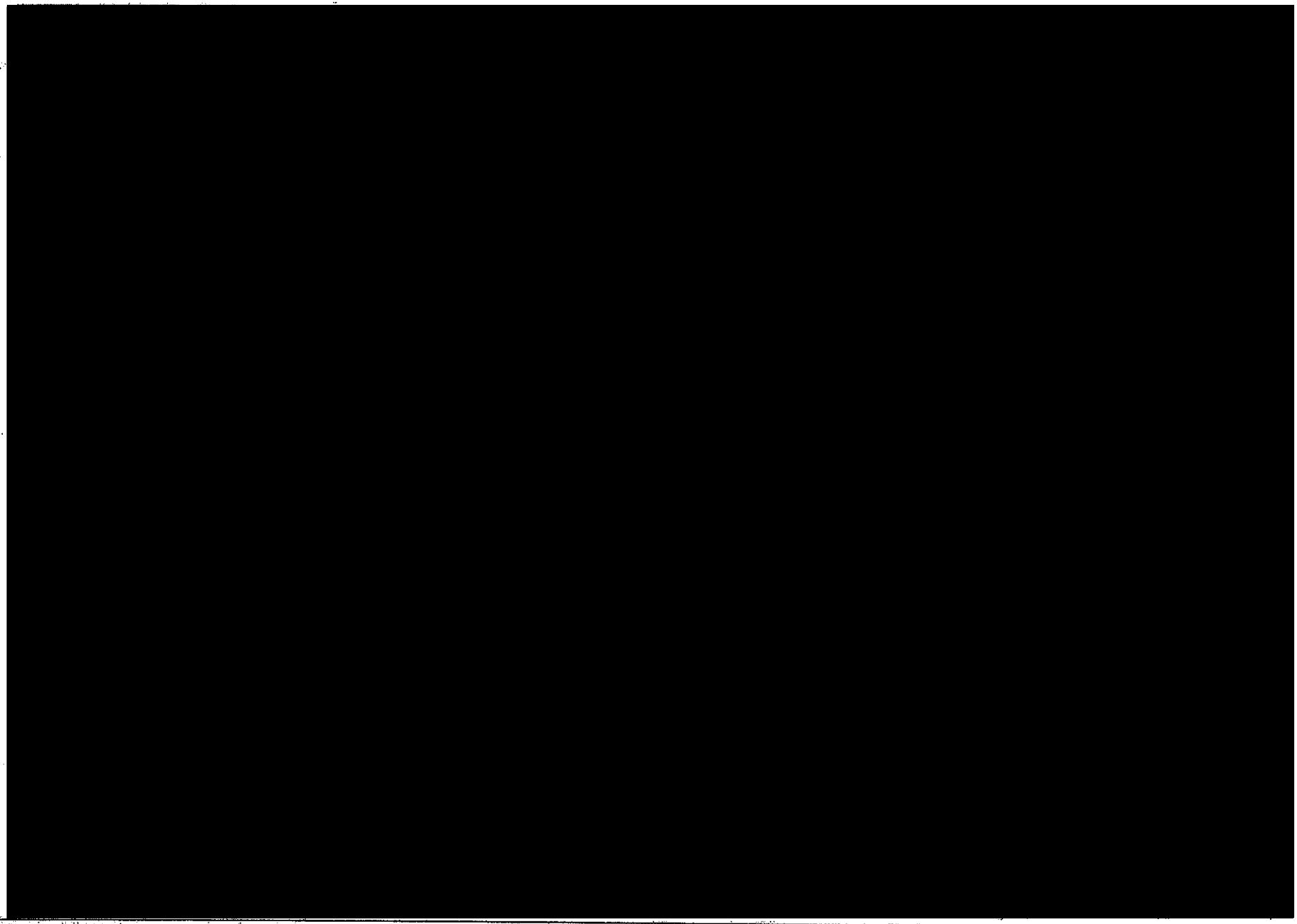


(1) This is the maximum discharge of an individual spillway bay or regulator. Total discharge is calculated by adding the contributions of each gate or regulator. There are two (2) regulators to five (5) spillway bays.

(2) This assumes that all gates and sluices are closed. Discharges through the spillway have to be added to the above figures to calculate the actual inflow into the reservoir.

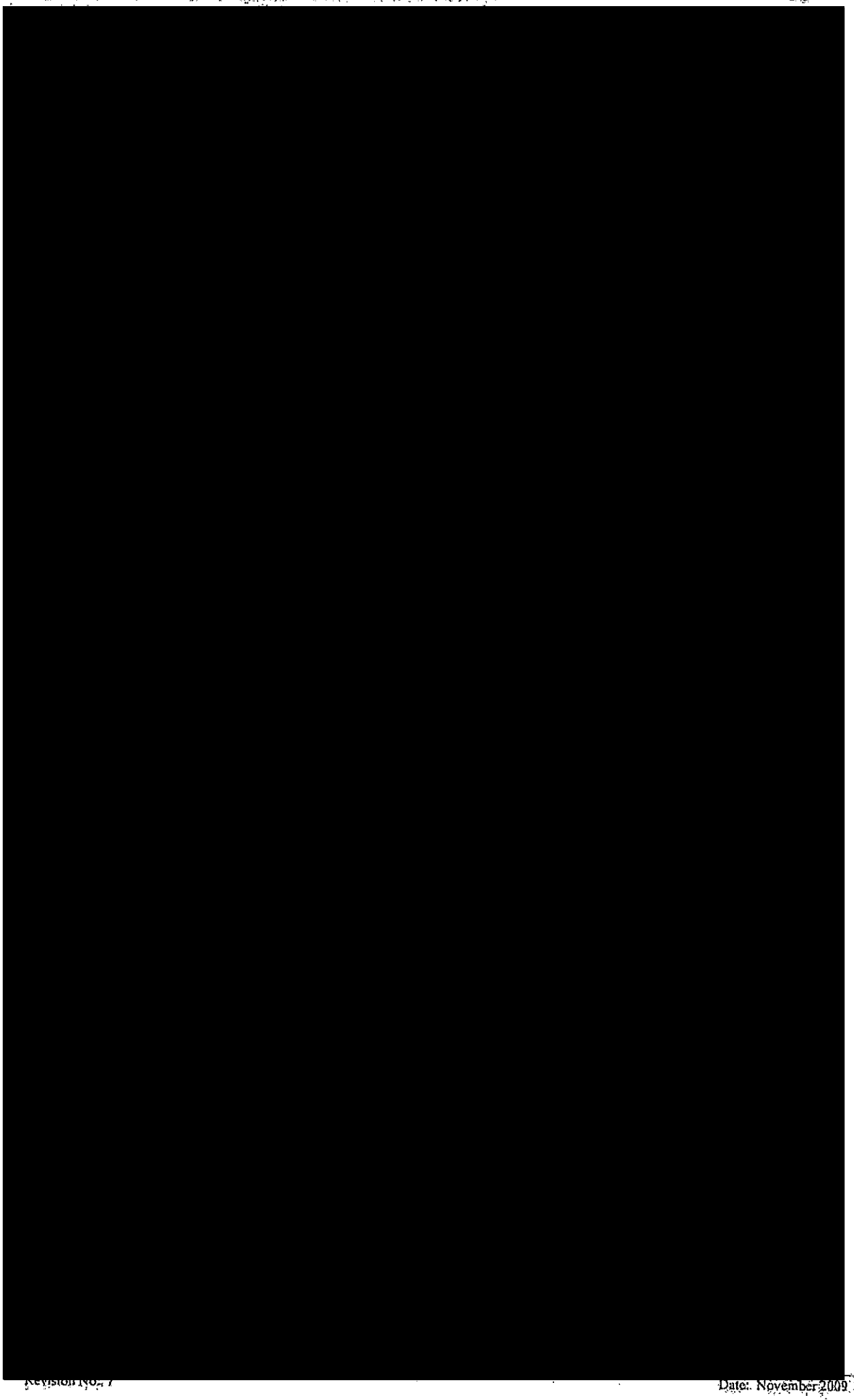
(3) The temporary storage above normal Full Supply Level of EL 67.0.

(4) The first fuse plug is designed to trigger at EL 75.7. Above this level, fuse plug flows from Table E.3 need to be added to give the full outflow.

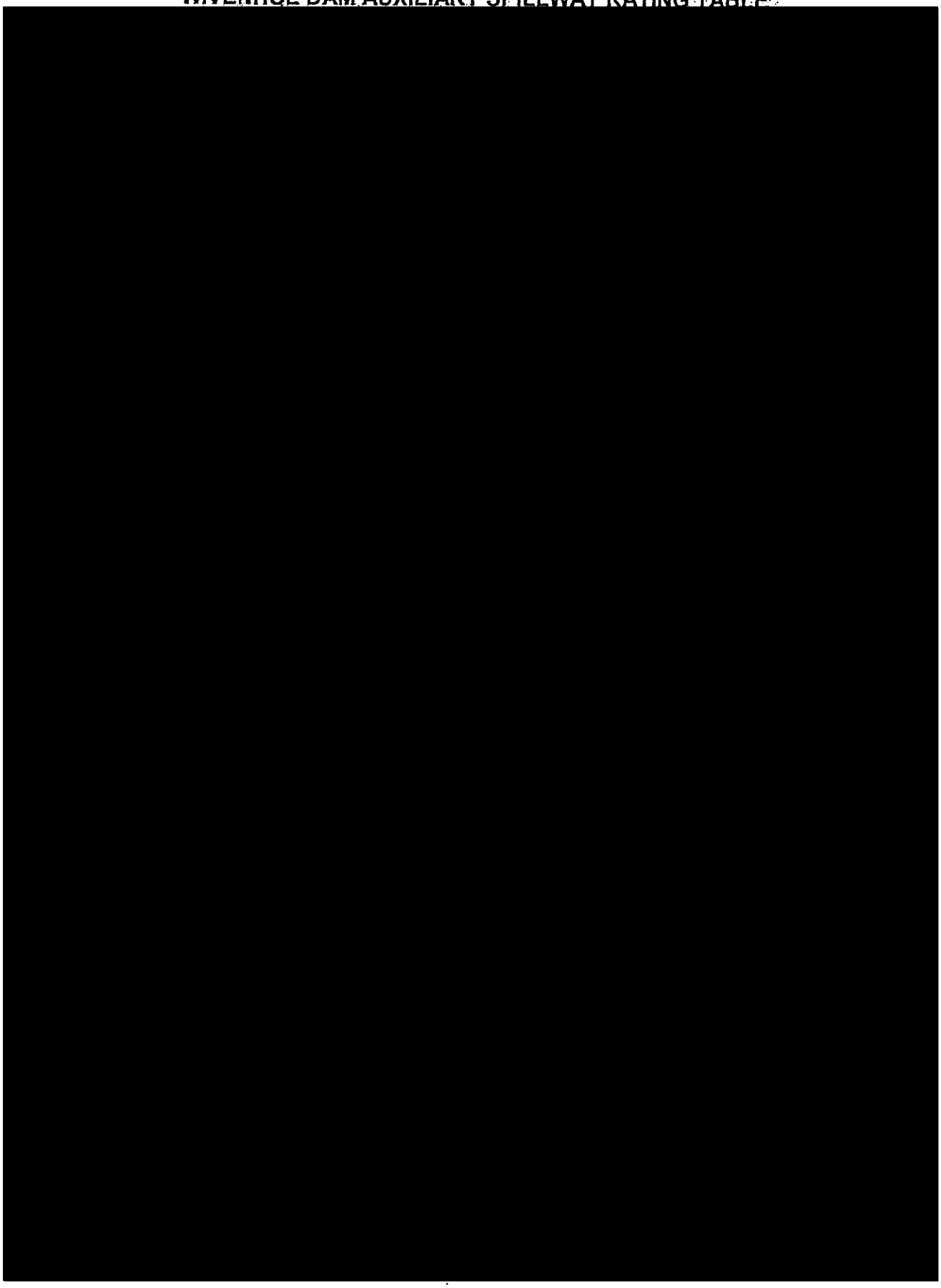




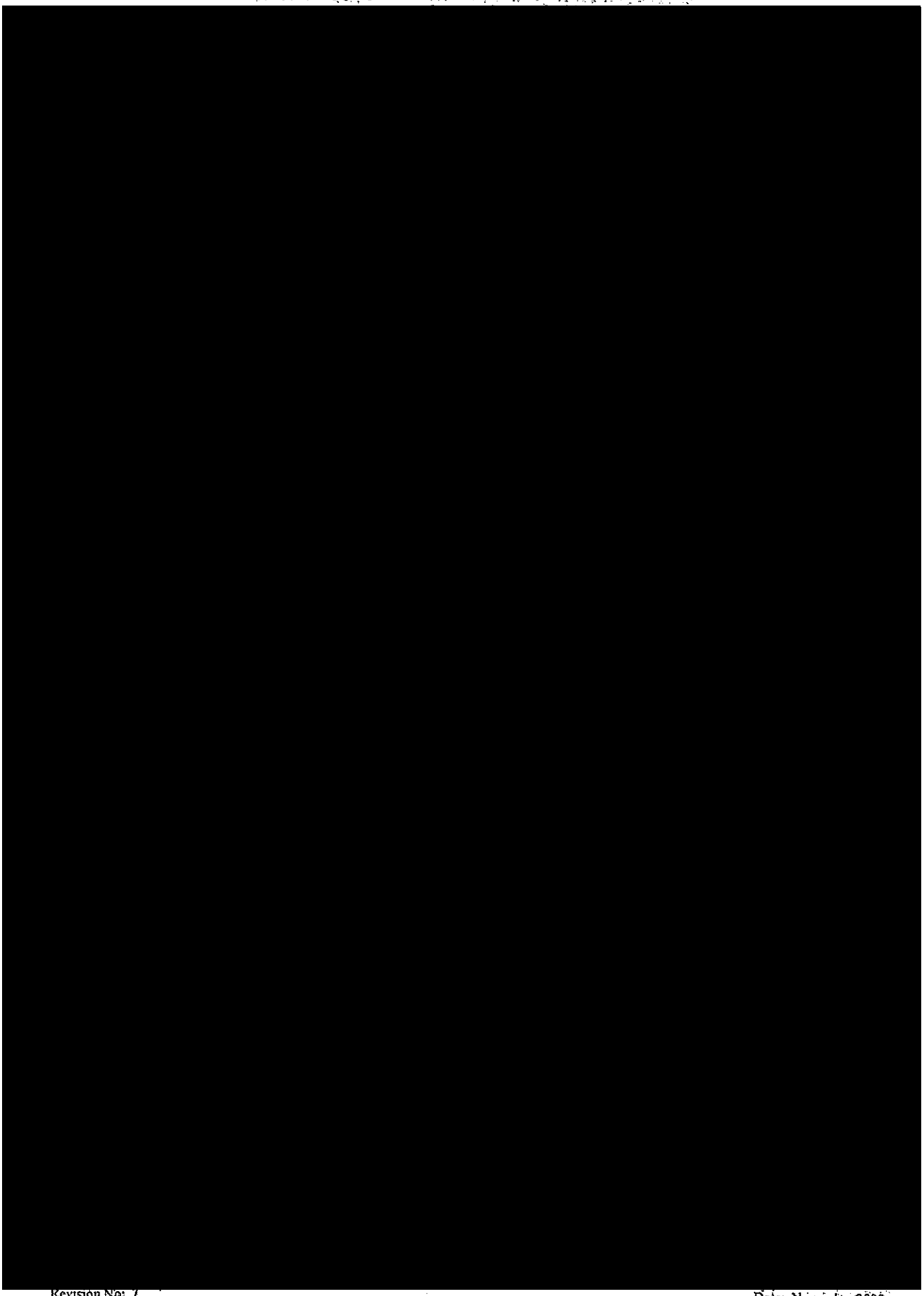
* Flow impacted by bridge deck



WIVENHOE DAM AUXILIARY SPILLWAY RATING TABLE

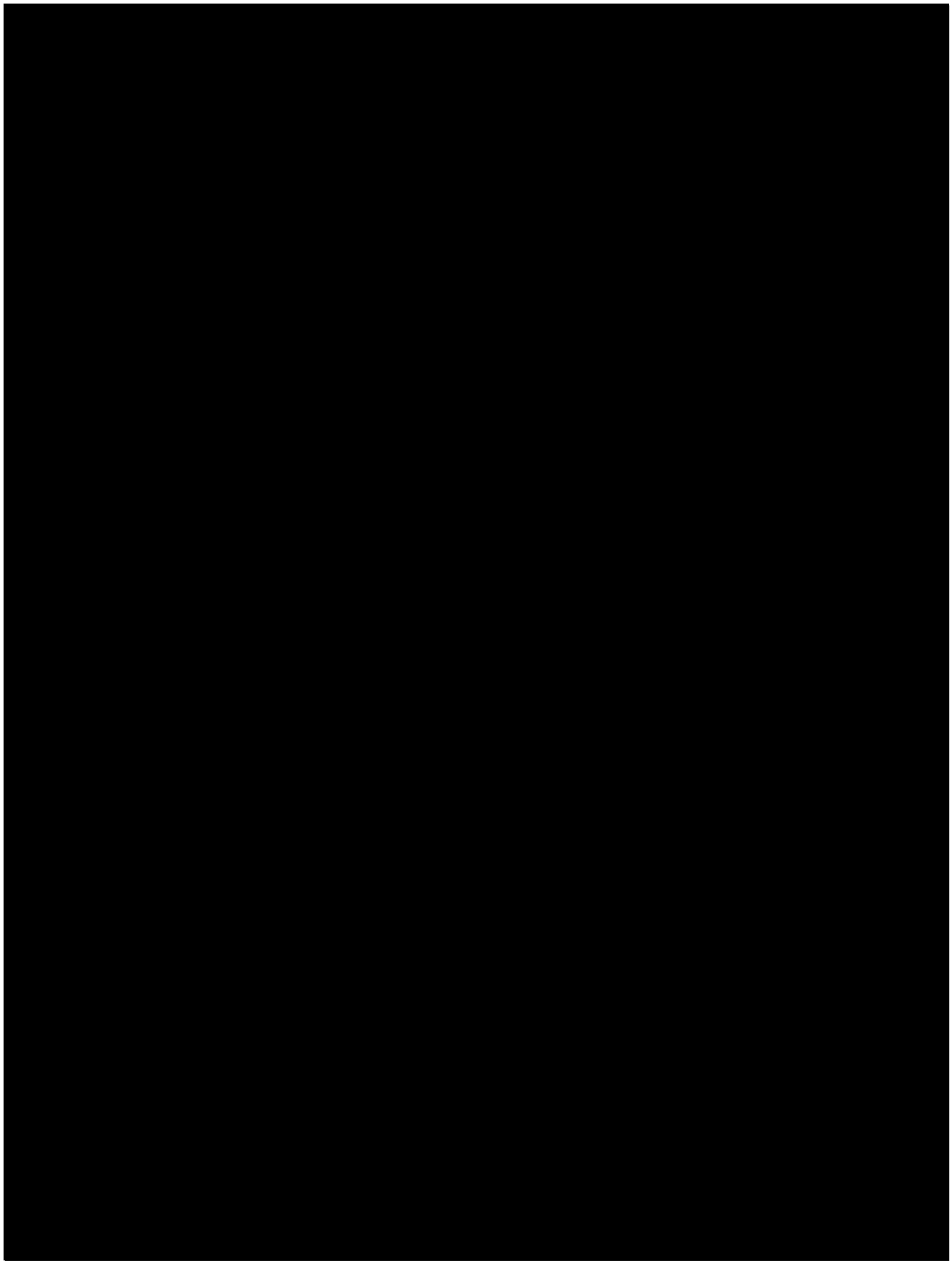


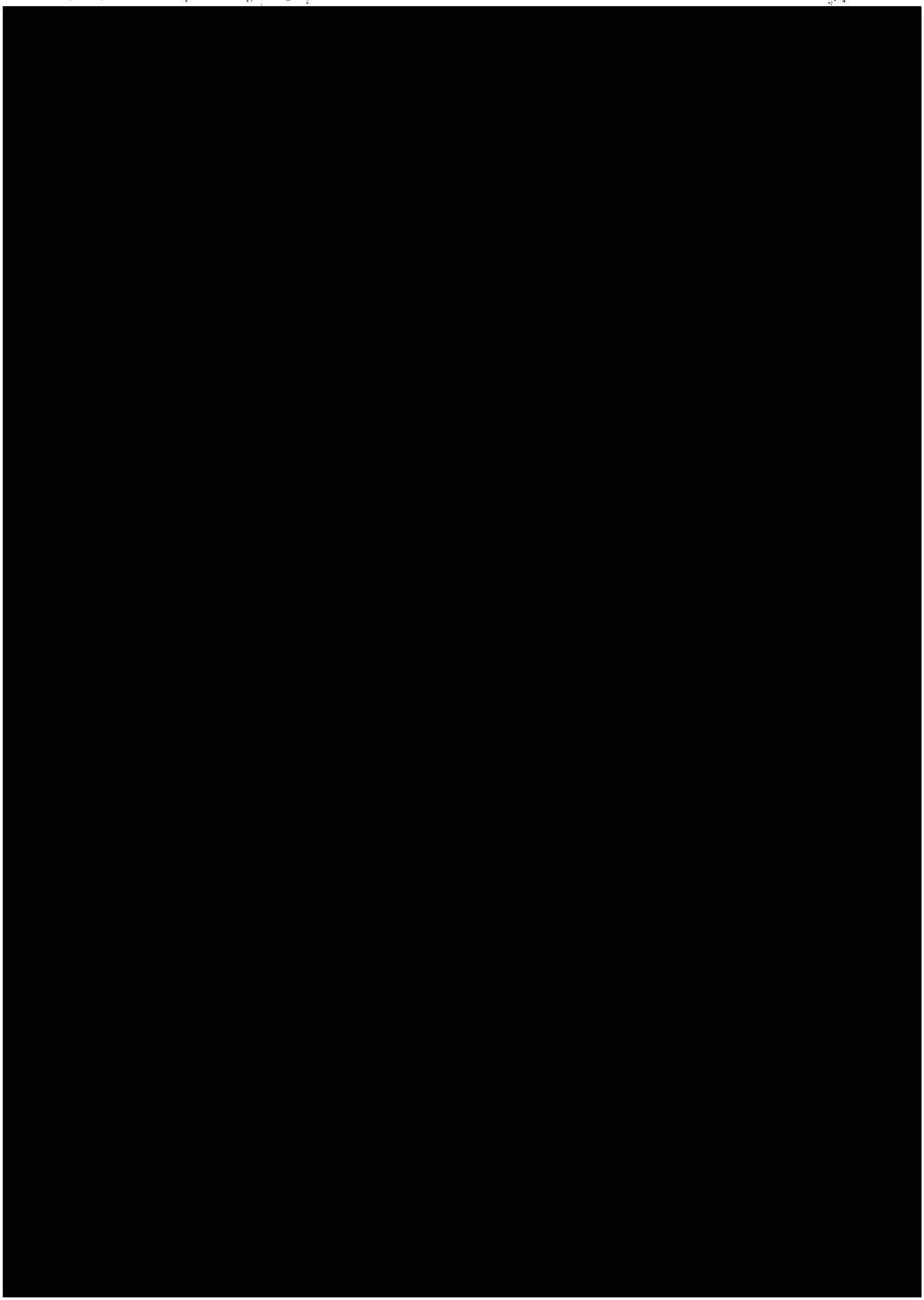
APPENDIX D
SOMERSET DAM TECHNICAL DATA

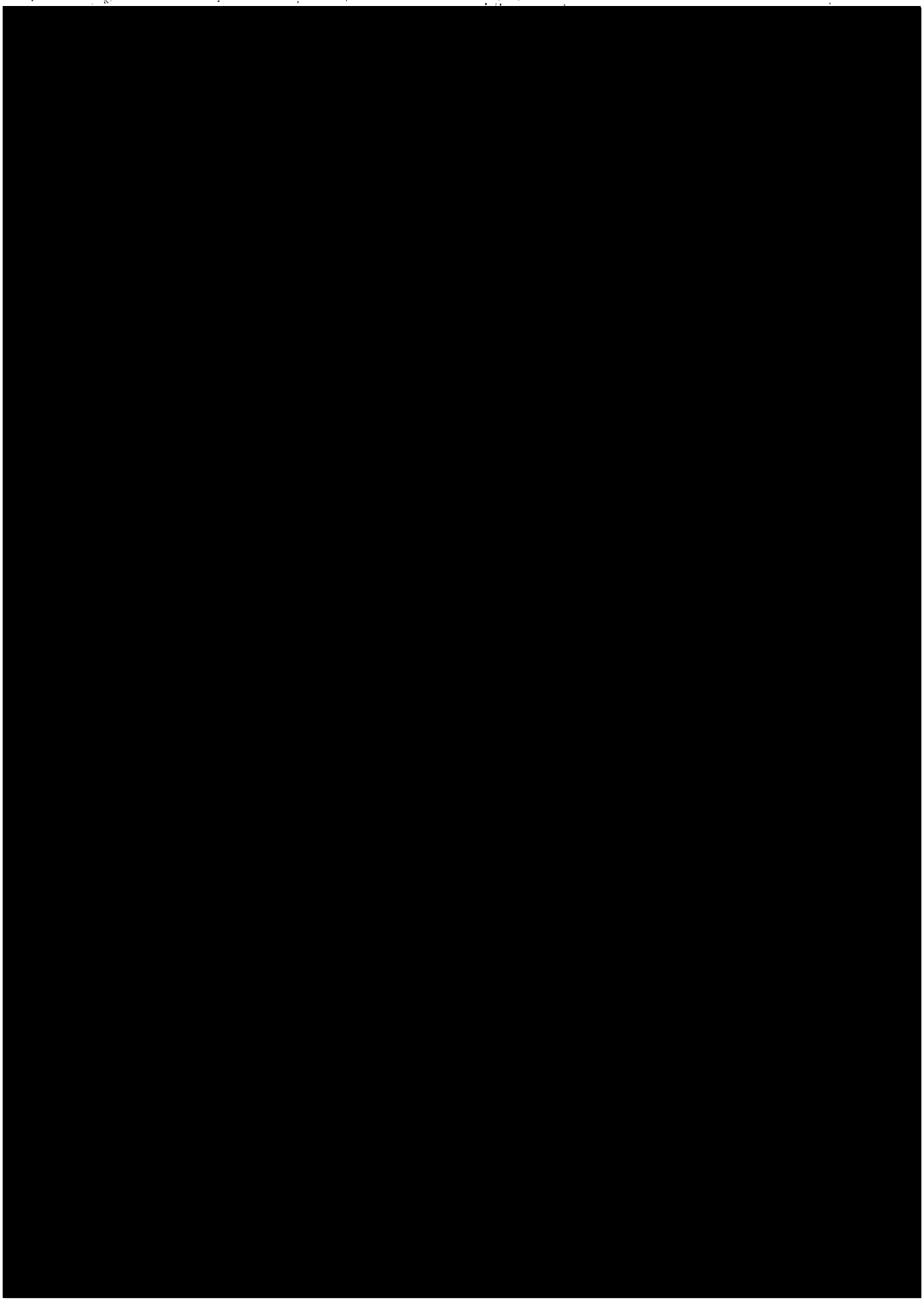


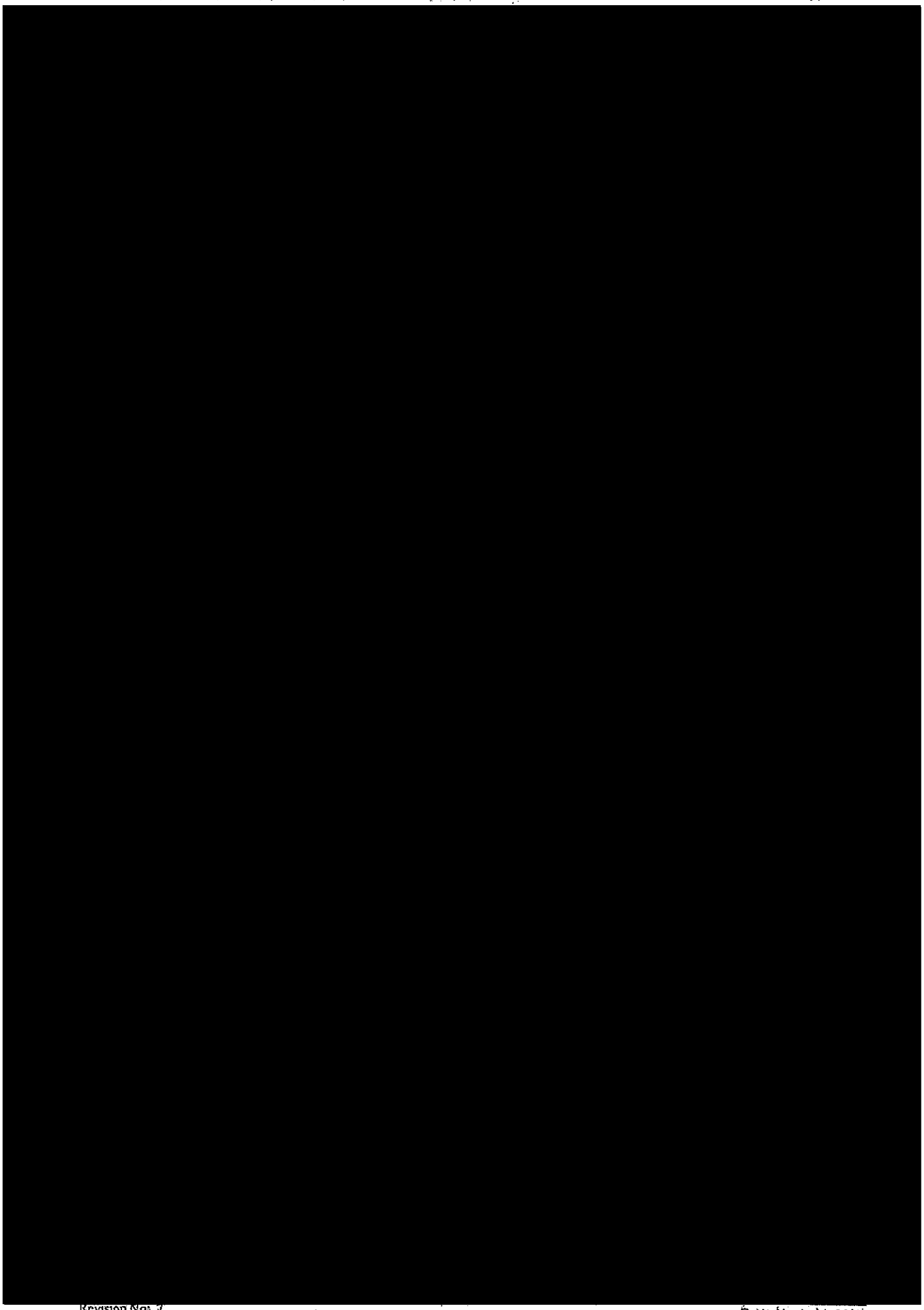
[redacted]

APPENDIX E
WIVENHOE DAM GATE OPERATION CONSIDERATIONS







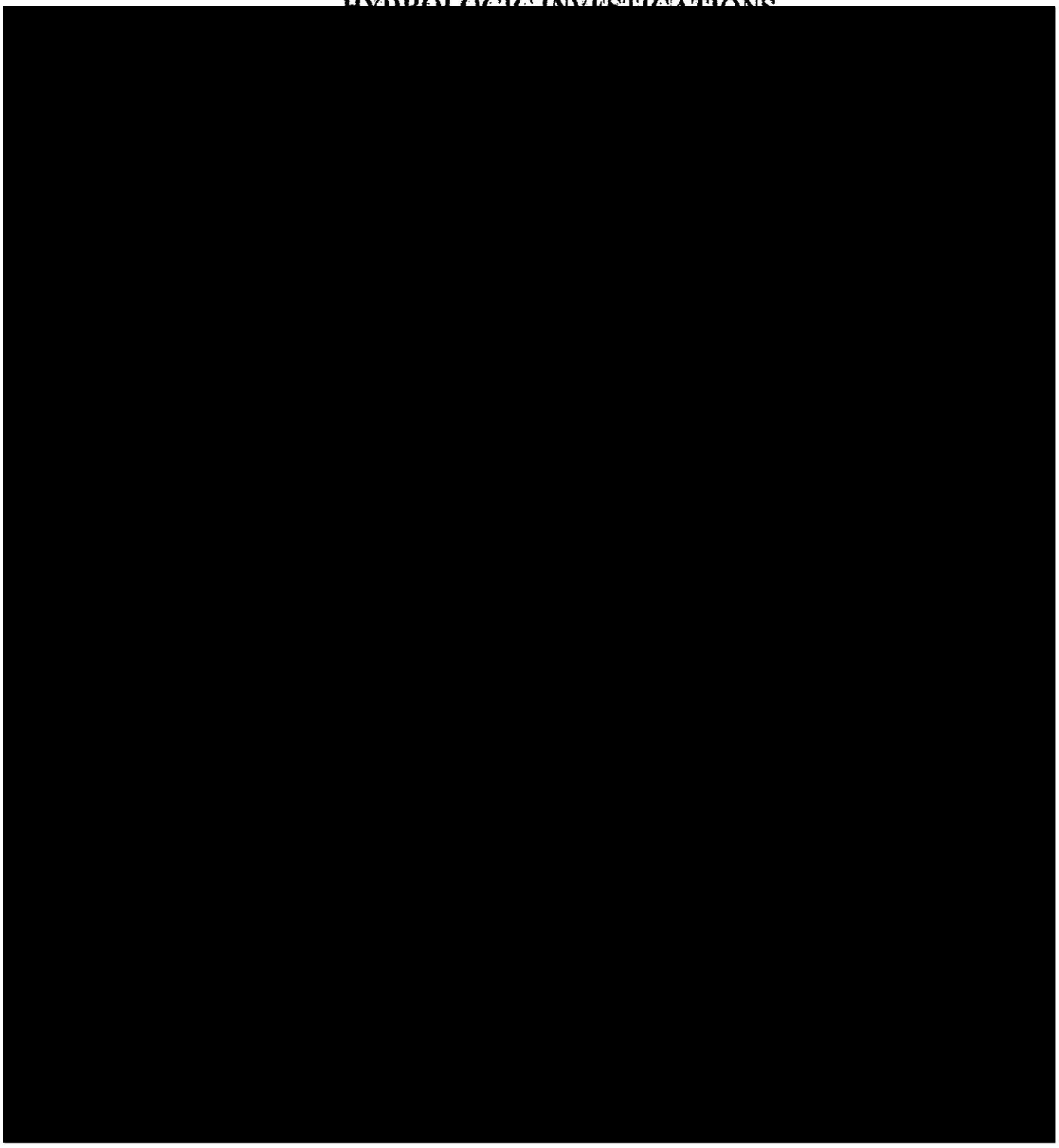




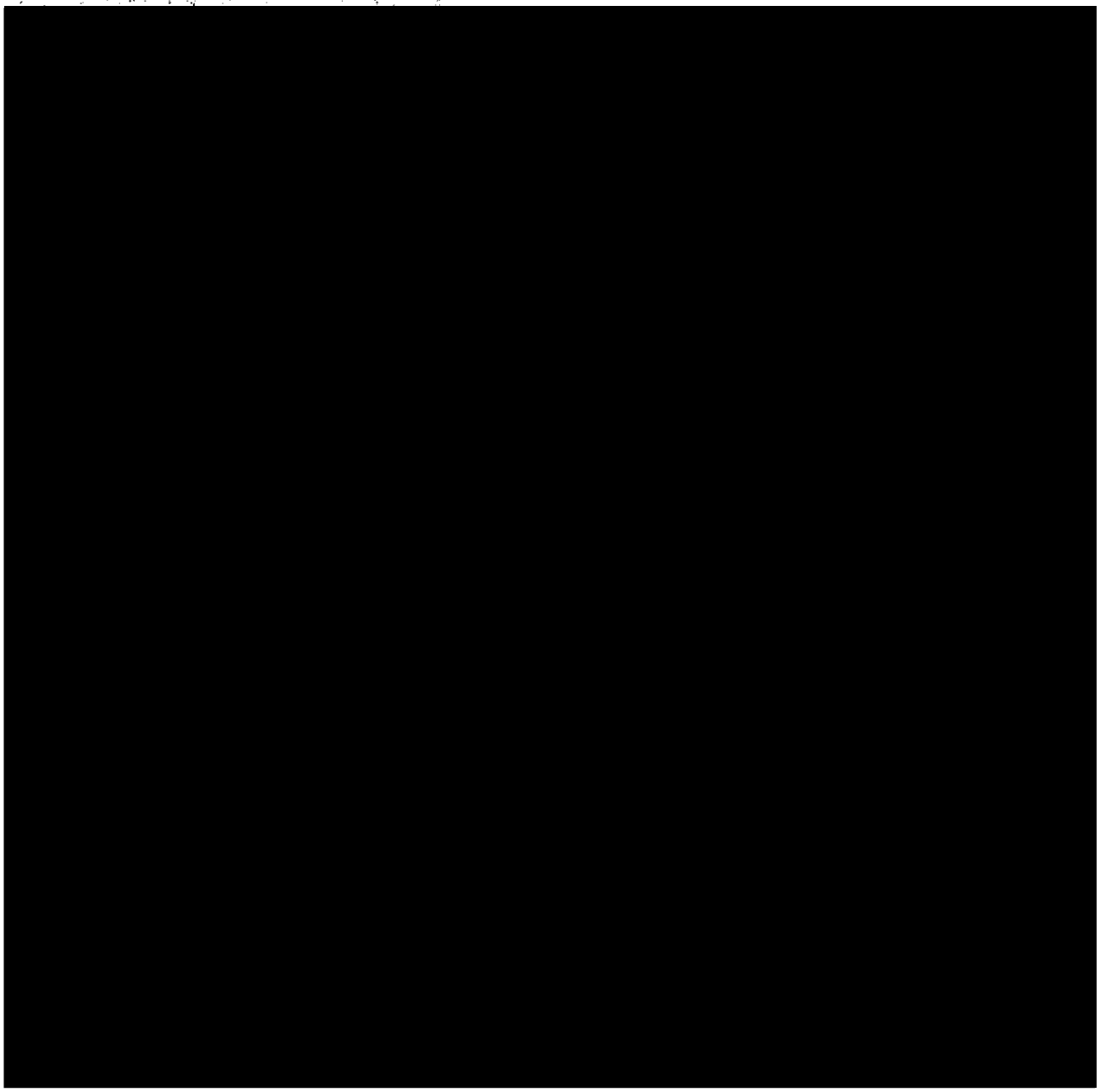
APPENDIX F
SOMERSET DAM AUXILIARY EQUIPMENT

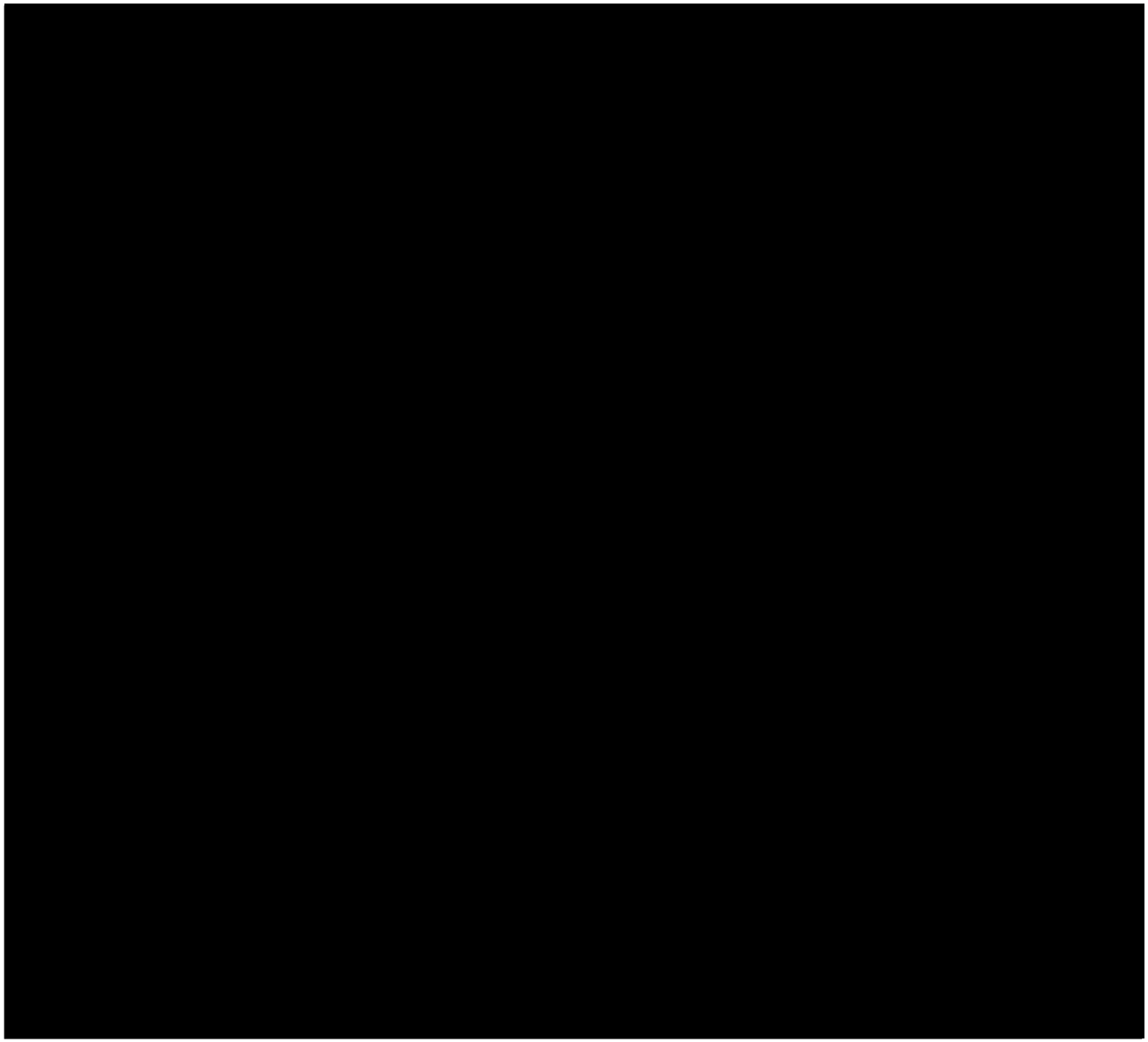


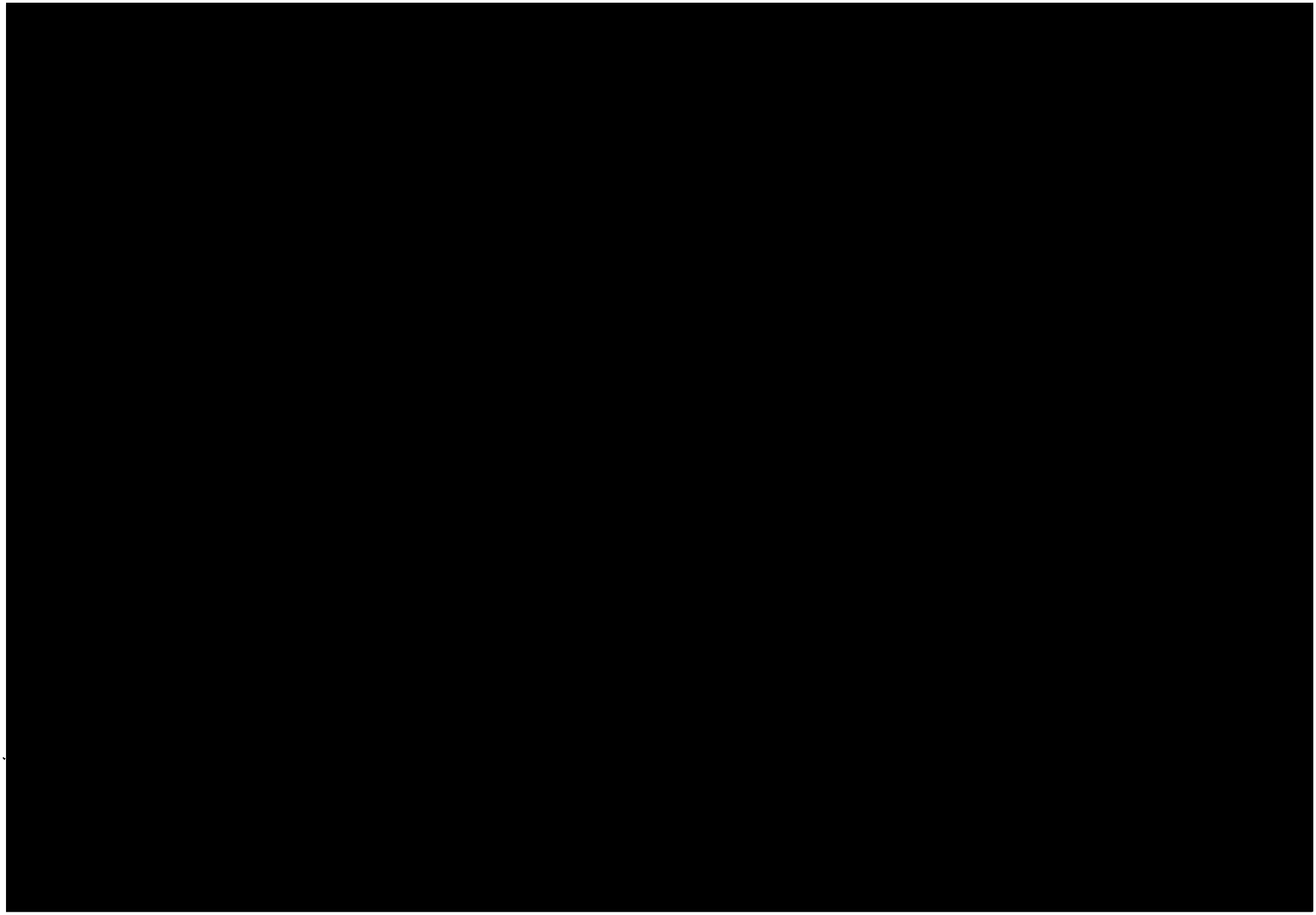
APPENDIX G
HYDROLOGIC INVESTIGATIONS



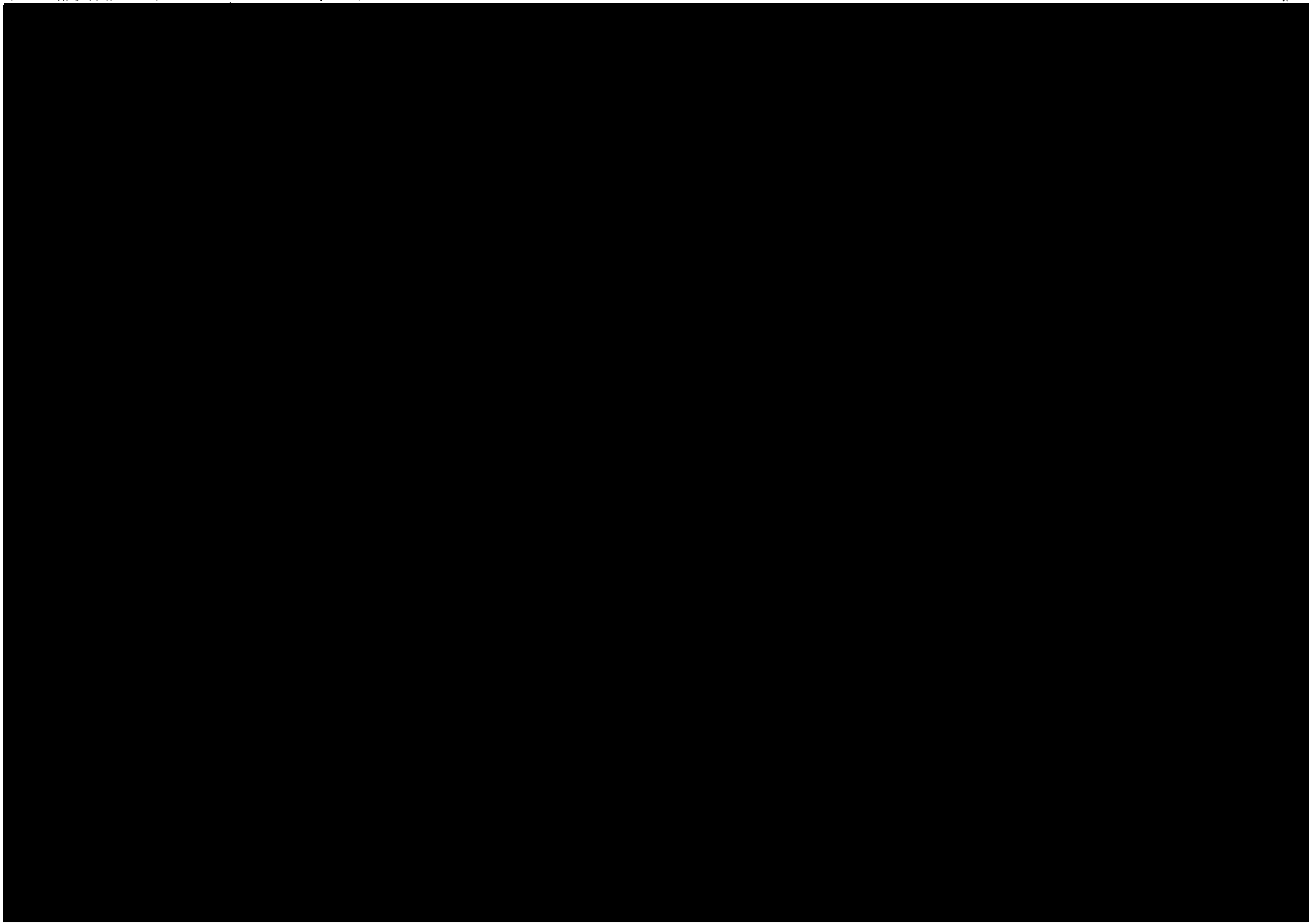
APPENDIX H
WIVENHOE DAM
PLANS, MAPS AND PHOTOGRAPHS

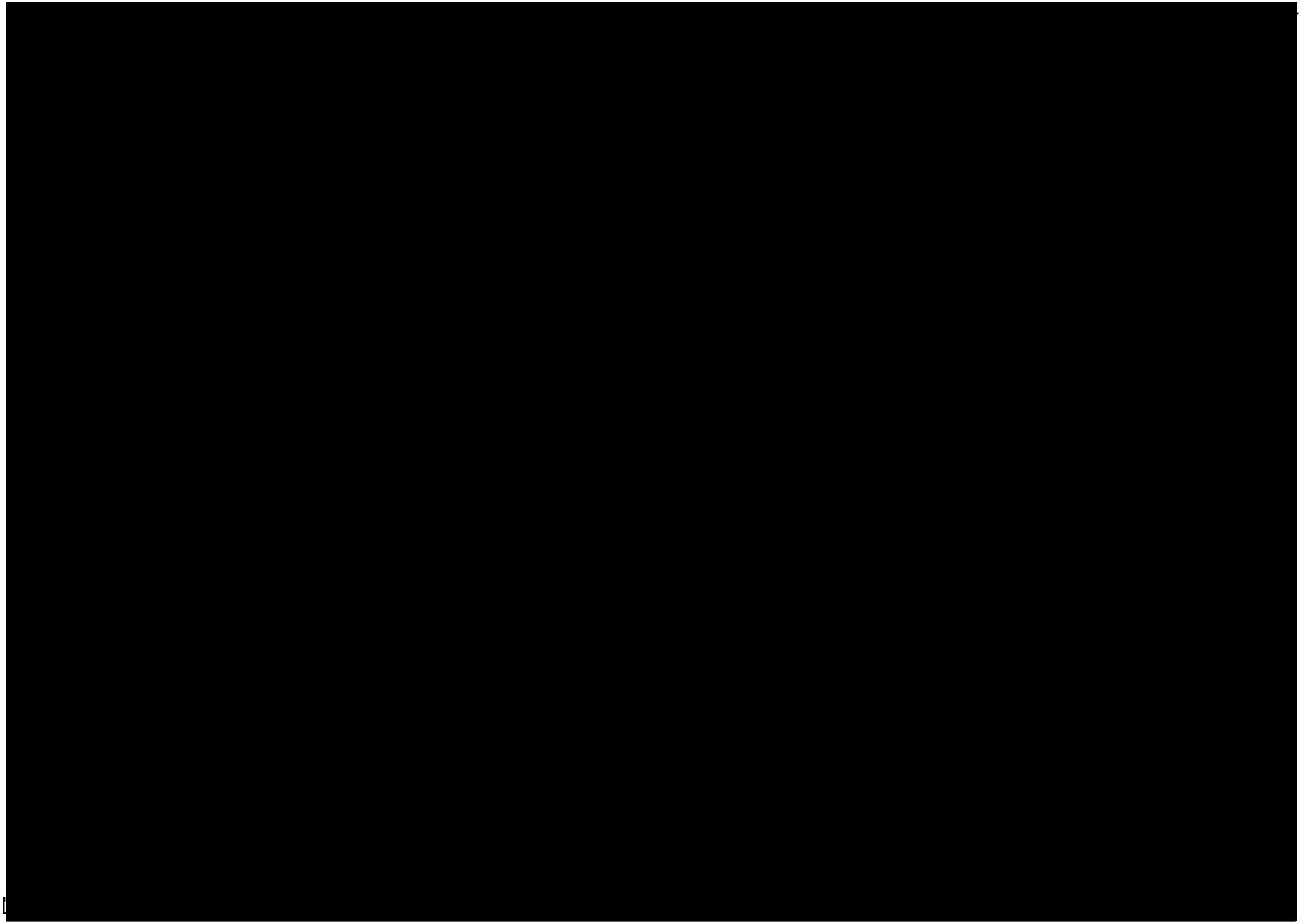




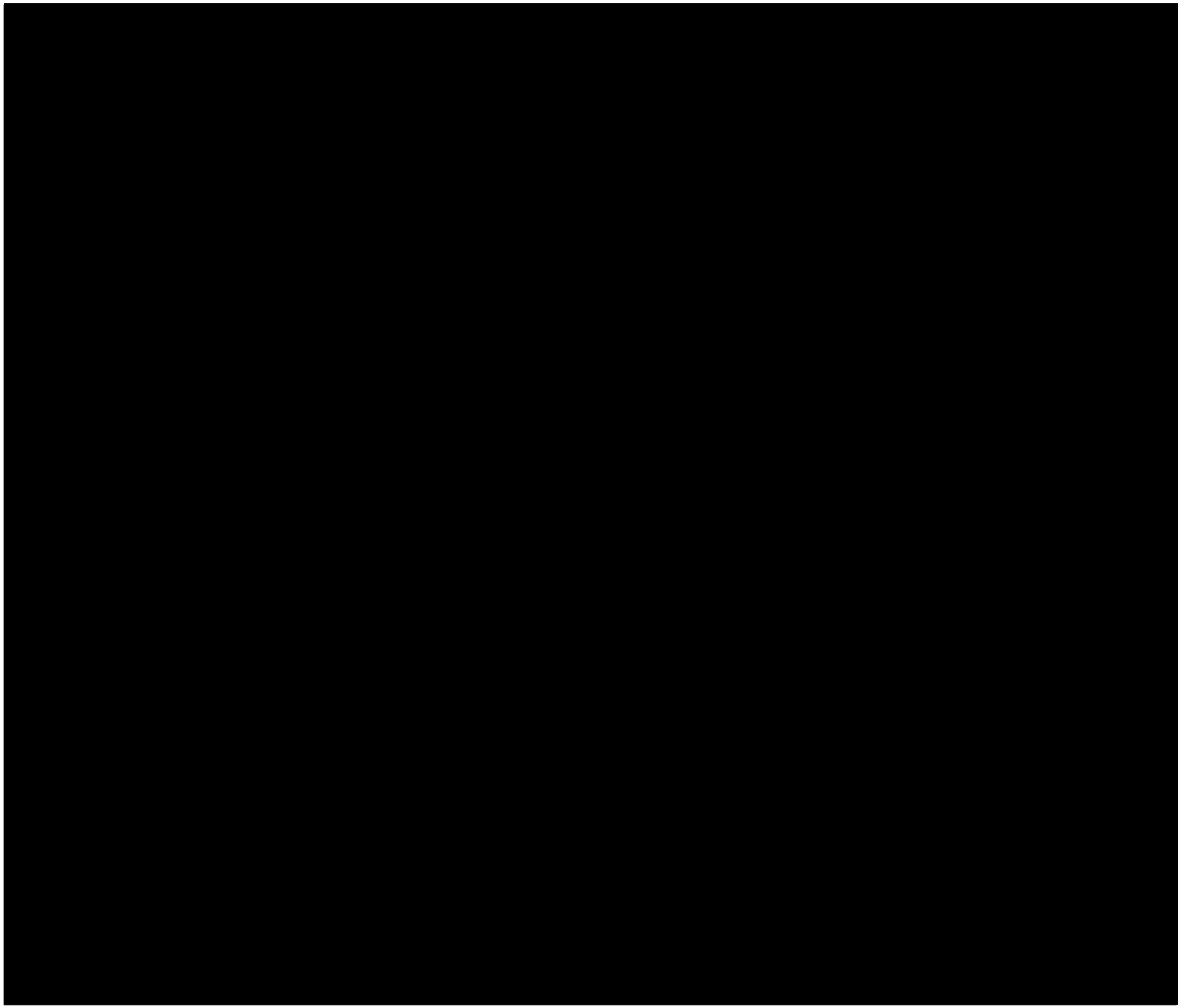




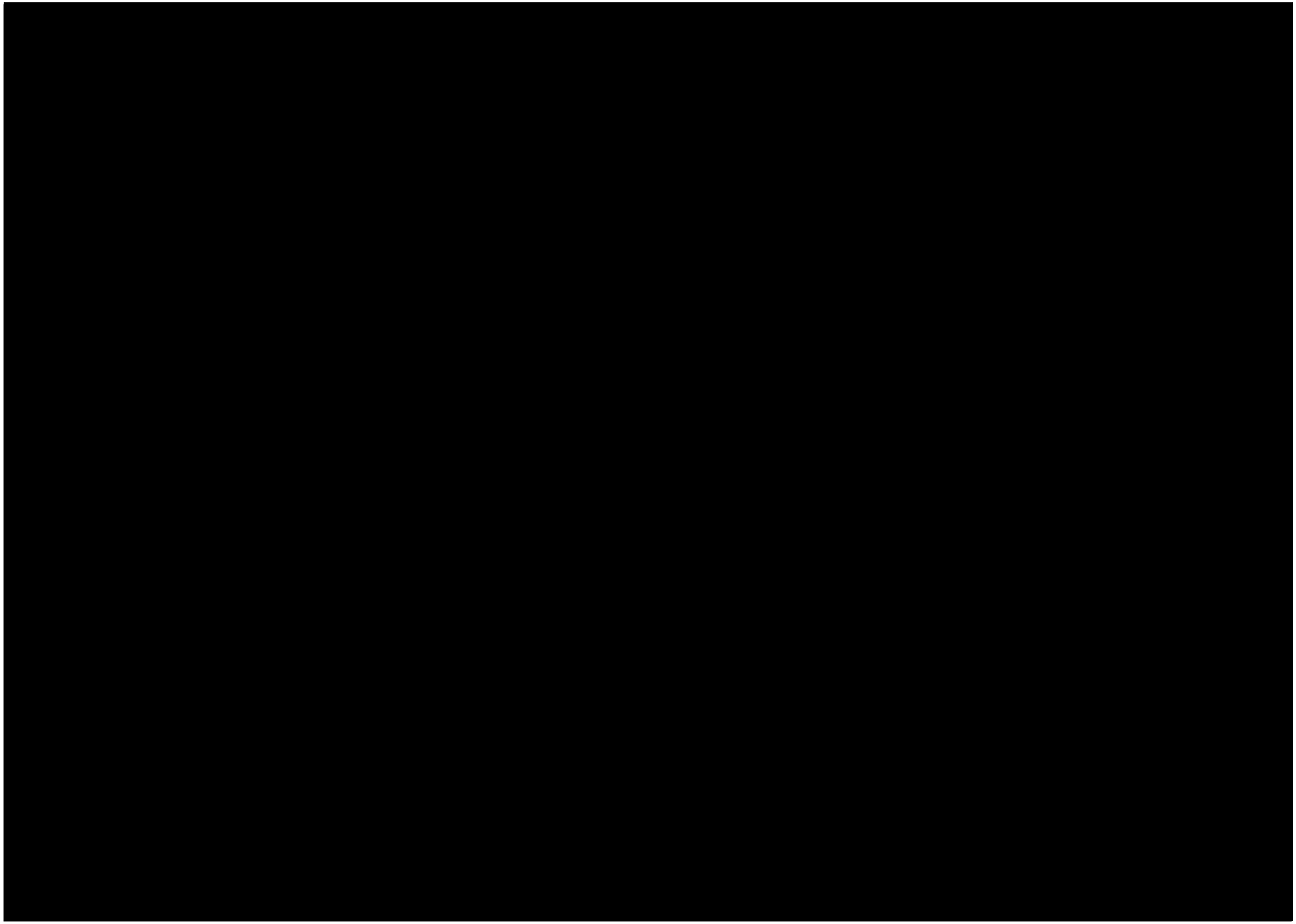


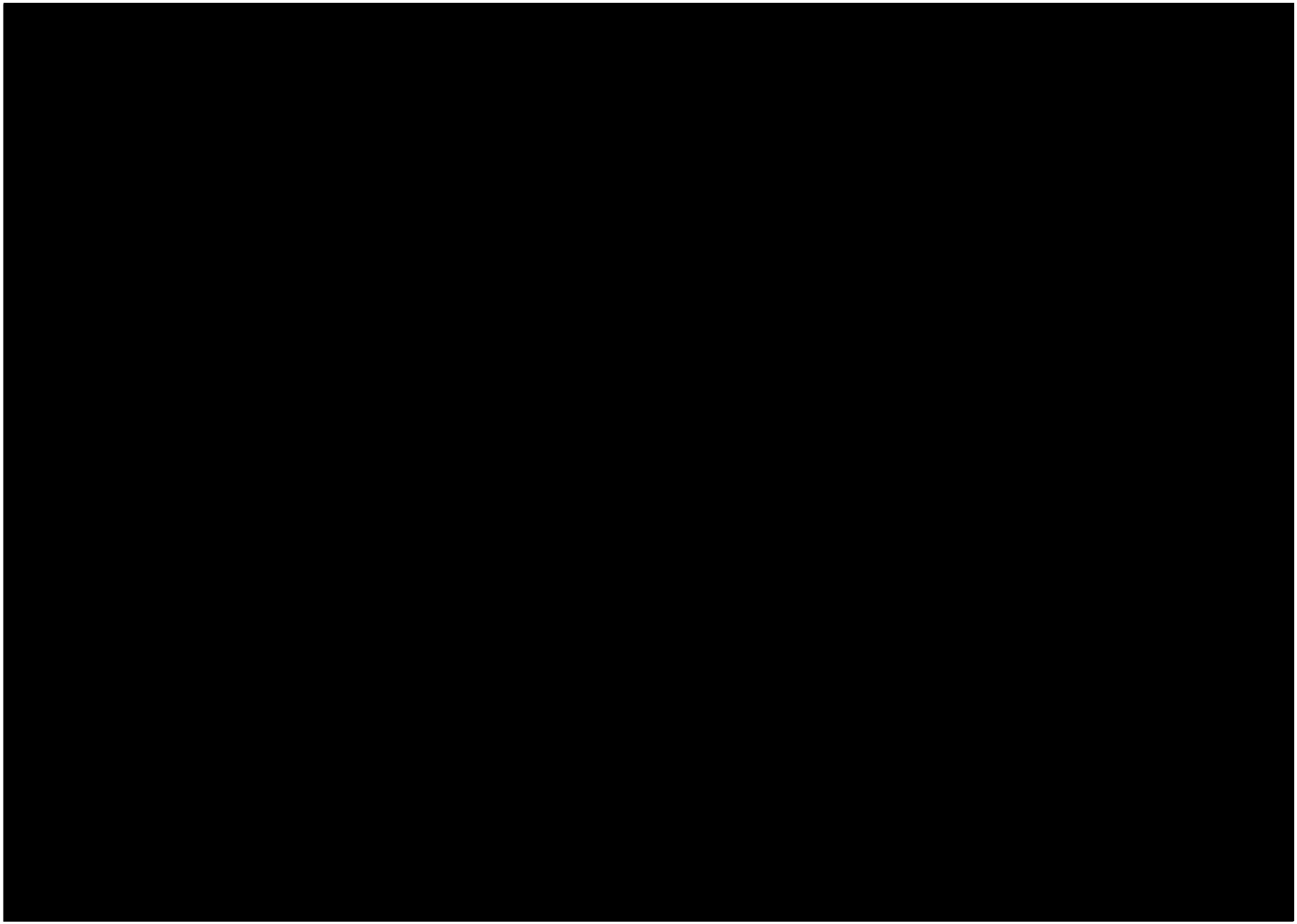


APPENDIX I
SOMERSET DAM
PLANS, MAPS AND PHOTOGRAPHS



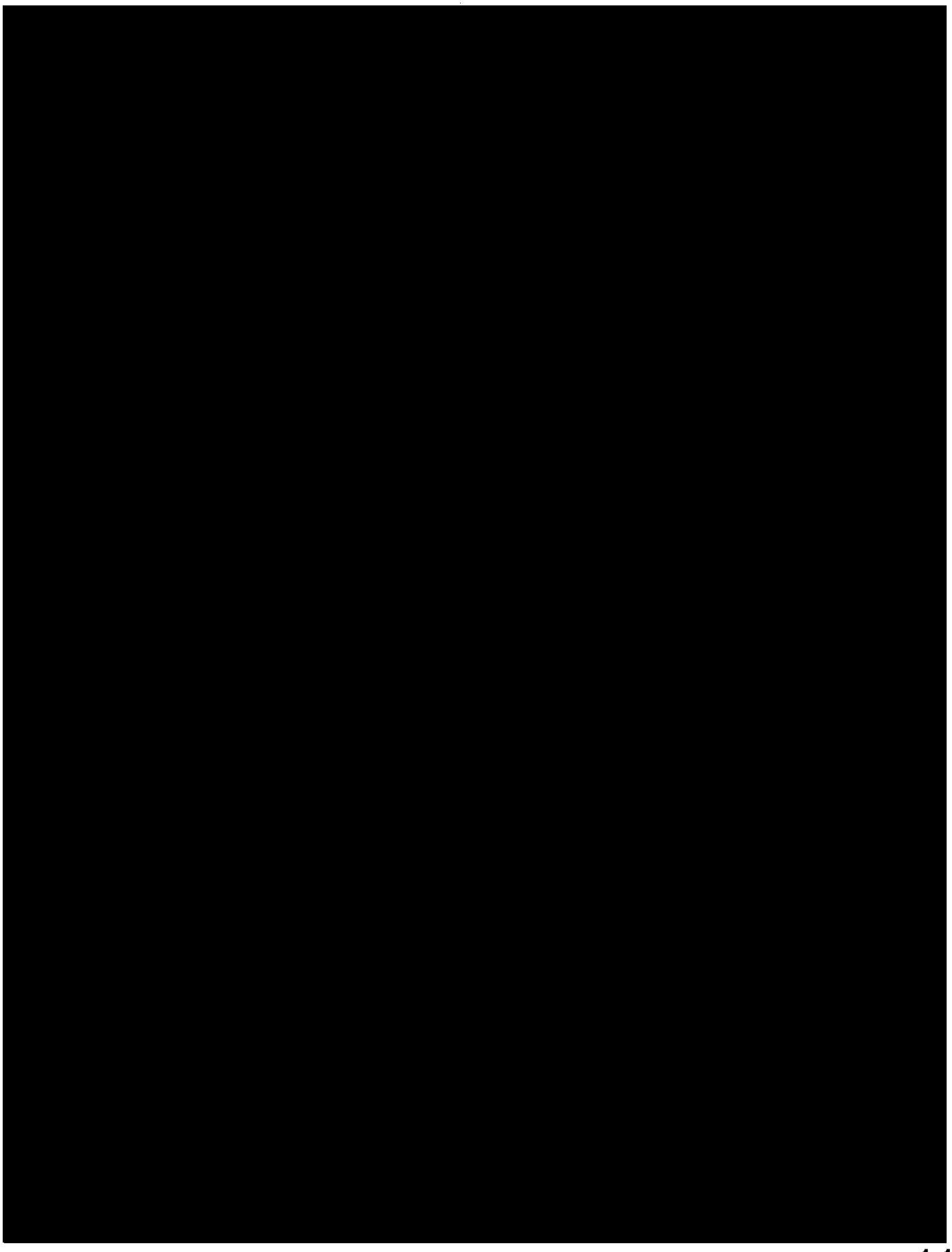


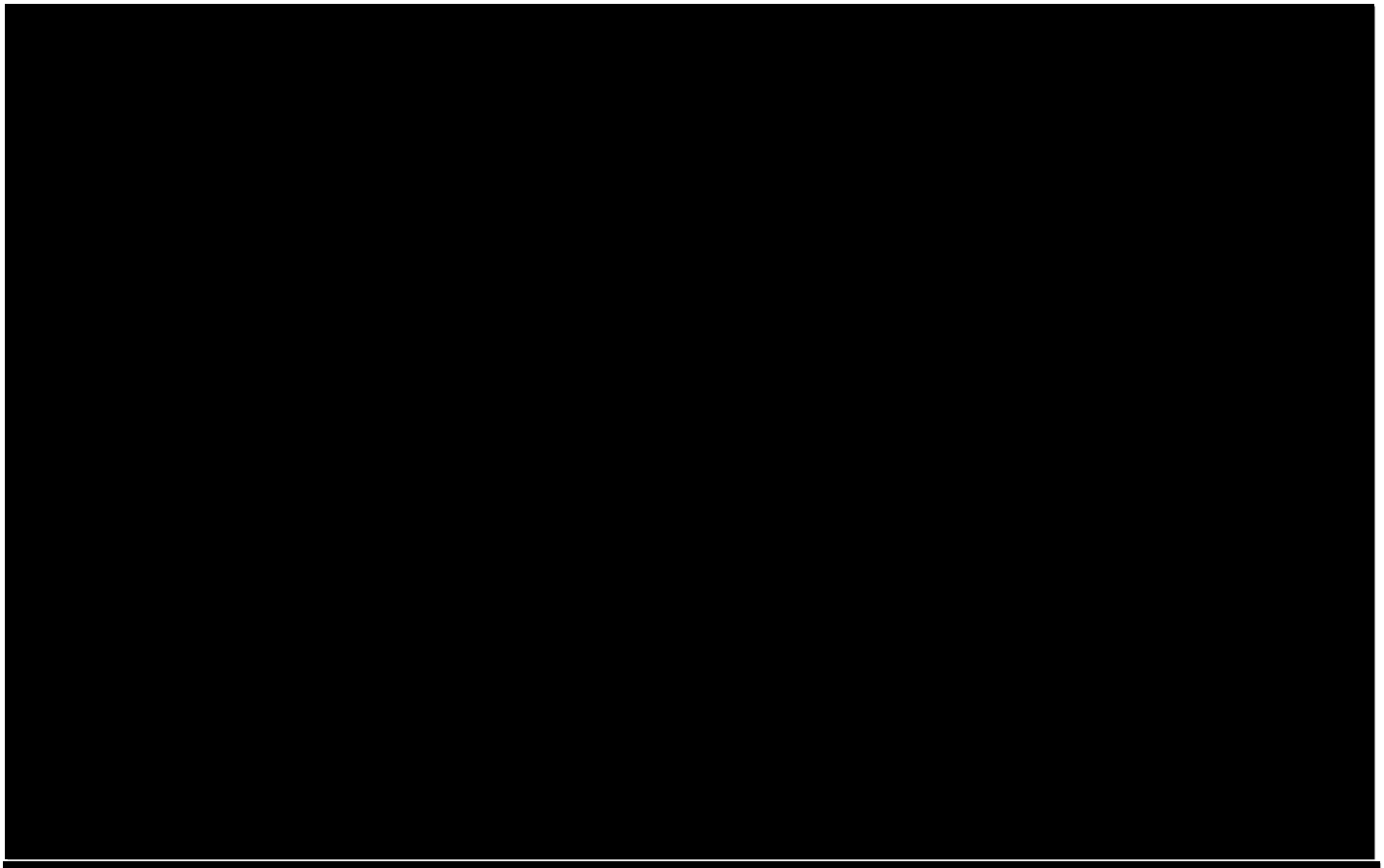






APPENDIX J
WIVENHOE DAM – FUSE PLUG BREACH SCENARIOS

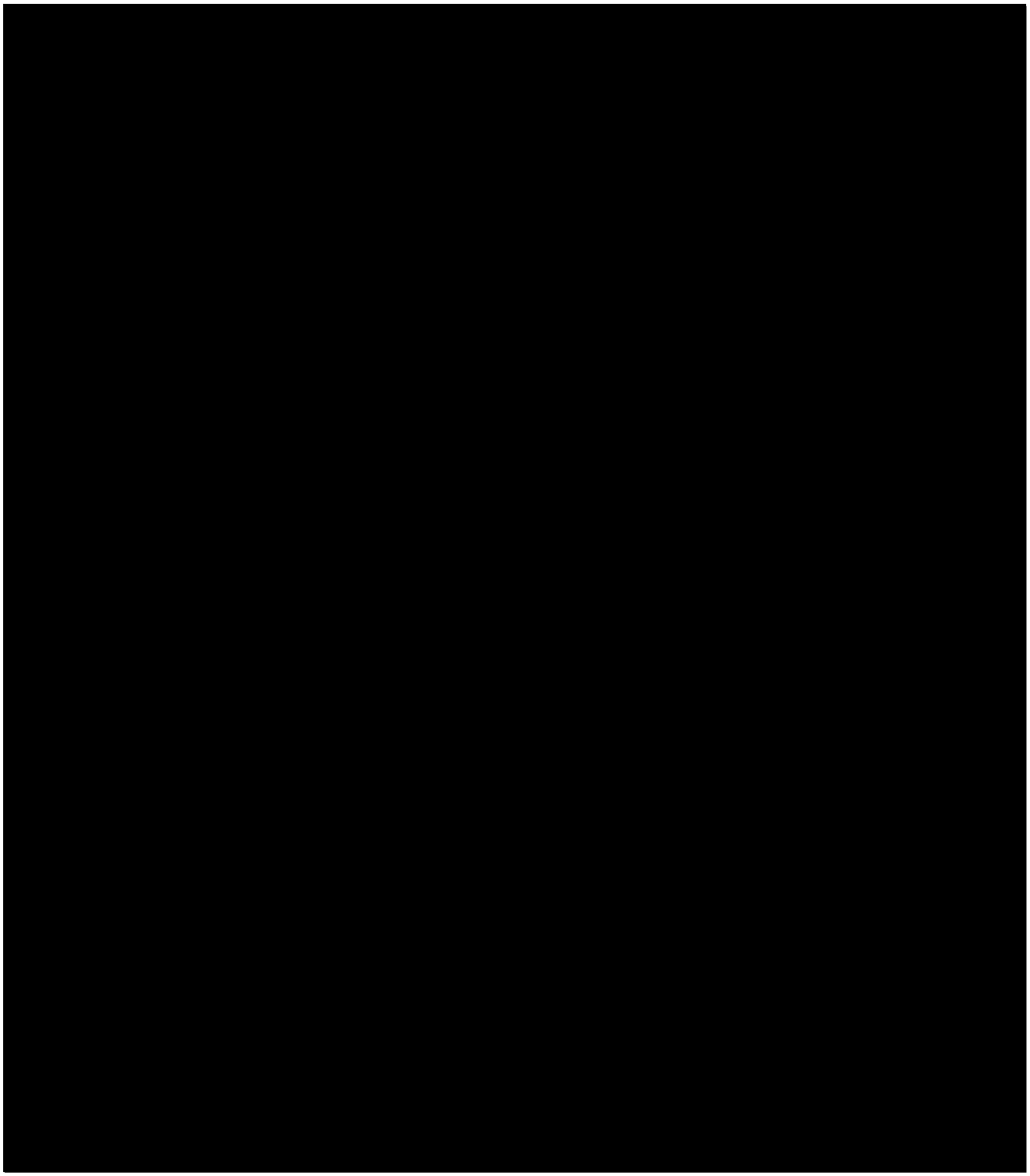














From: Elaina Smouha [Elaina.Smouha[redacted]
Sent: Tuesday, 11 January 2011 12:28 PM
To: Brian Cooper Consulting; peter.allen[redacted]
Subject: Teleconf

Importance: High

Brian, Peter

Dial in details for 12:30pm teleconference (Brian – 1:30pm your time).

Phone: [redacted]
Enter Account Number: [redacted]
Enter PIN: [redacted]

Regards

Elaina

Elaina Smouha
Director, Governance and Regulatory Compliance
SEQ Water Grid Manager
Phone: [redacted] | Mobile: [redacted] | Fax: [redacted]
Email: elaina.smouha[redacted]
Visit: Level 15, 53 Albert Street Brisbane
Post: PO Box 16205, City East QLD 4002
ABN: 14783 317 630

This email has been scanned by the Symantec Email Security.cloud service.
For more information please visit http://www.symanteccloud.com

Gina O'Driscoll

From: Elaina Smouha
Sent: Tuesday, 11 January 2011 1:49 PM
To: Brian Cooper Consulting
Cc: peter.allen[redacted]; Barry Dennien
Subject: Other Technical Reports

Brian

There seem to be some Technical Reports missing from the sequential numbering. I am following these up from our Seqwater contact.

Please let me know if I can assist with any further information.

Regards

Elaina

ina Smouha
irector, Governance and Regulatory Compliance
SEQ Water Grid Manager
Phone:[redacted] | Mobile:[redacted] | Fax:[redacted]
Email: elaina.smouha[redacted]
Visit: Level 15, 53 Albert Street Brisbane
Post: PO Box 16205, City East QLD 4002
ABN: 14783 317 630

Suzie Emery

From: Elaina Smouha [Elaina.Smouha[redacted]]
Sent: Tuesday, 11 January 2011 4:08 PM
To: Brian Cooper Consulting
Cc: Barry Dennien
Subject: Draft agreement and terms of reference - Commercial in Confidence
Attachments: LEGAL SERVICES - CONTRACTING_OUT - Consultants - Consultancy Agreement - Brian Cooper - Flood Mitigation Manual.DOCX

Importance: High

Brian

Attached is a draft agreement for your consideration.

May I draw your attention to The Schedule, Annexure 1 – Terms of Reference and Annexure 2 – the Offer.

We appreciate you accommodating our tight timeframes. We have proposed the following deliverables and milestones. Please let me know if this will be an issue.

Deliverables and milestones

a) *Provision of a written preliminary advice by **9am, on 12 January 2011**.*
b) *Formal written report of final advice delivered to the Principal by **4pm, 12 January 2011**.*

Feel free to contact me with any questions or comments. If you are fine with the attached I will organise for Barry to sign.

Regards

Elaina

Elaina Smouha
Director, Governance and Regulatory Compliance
SEQ Water Grid Manager
Phone: [redacted] | Mobile: [redacted] | Fax: [redacted]
Email: elaina.smouha[redacted]
Visit: Level 15, 53 Albert Street Brisbane
Post: PO Box 16205, City East QLD 4002
ABN: 14783 317 630

L/11/06



CONSULTANCY AGREEMENT

CONSULTANCY AGREEMENT

THIS AGREEMENT is made this _____day of _____2011.

BETWEEN: The **SOUTH EAST QUEENSLAND WATER GRID MANAGER, ABN 14 783 317 630**, of Level 15, 53 Albert Street, Brisbane, Queensland 4000 ("the Principal")

AND: **THE ENTITY SHOWN IN Item 1 OF THE SCHEDULE** ("the Consultant")

RECITALS

A. The Consultant has agreed to perform the Consultancy Services for the Principal.

B. The parties wish to record the terms and conditions of their agreement.

IT IS AGREED:

1. INTERPRETATION

1.1 Where commencing with a capital letter and unless the context otherwise requires:

Agency	has the meaning given to it in the IP Act;
Agreement	means the clauses contained in this document and the attached Schedule and Annexures;
Business Day	means a day that is not a Saturday, Sunday or public holiday in the State;
Completion Date	means the date or dates specified in Item 4A of the Schedule or the Terms of Reference for completion of the Consultancy Services;
Consequential Loss	means: (a) any loss of anticipated or actual revenue or profits; (b) loss of use of equipment; (c) business interruption or a failure to realise anticipated savings; (d) loss of data; (e) downtime costs or wasted overheads; (f) loss of goodwill or business opportunity; (g) punitive or exemplary damages; or (h) any special or indirect loss or damage of any nature whatsoever;

Consultancy Fee	means the monies payable to the Consultant for the Consultancy Services under this Agreement and specified in Item 6 of the Schedule;
Consultancy Services	means the services described in the Terms of Reference including all Deliverables;
Contract Material	means: (a) any material forming part of or constituting a deliverable that is created, written or otherwise brought into existence by or on behalf of the Consultant in the course of performing the Consultancy Services (called "new Contract Material"); and (b) any material that exists at the Date of Commencement and is incorporated into a Deliverable (called "existing Contract Material");
Date of Commencement	means the date specified in Item 4 of the Schedule;
Deliverable	means any document, piece of equipment, data listing or other creation required to be delivered to the Principal in order to complete the performance of the Consultancy Services including those deliverables specified in the Terms of Reference;
Force Majeure	means the following events that are not within the reasonable control of a party: (a) acts of God, including earthquakes, floods landslides and natural disasters; (b) national or statewide strikes, lockouts, bans or other industrial disturbances excluding those that are specific to a party; (c) acts of public enemies, terrorism, sabotage, wars, blockades, insurrections, riots and civil disturbances, arrests and restraints of rulers and people; (d) fire or explosions; epidemic; or (e) a State Direction, any change in law or regulation or regulatory practice.
GST	means any tax imposed under any GST Law and includes GST within the meaning of the GST Act;
GST Act	means the *A New Tax System (Goods and Services Tax) Act 1999* (Commonwealth) as amended;
GST Law	means the GST Law as defined in the GST Act and includes any Act of the Parliament of Australia that imposes or deals with GST;

Industry Best Practice	means the standards (including any relevant Australian Standard), practices, methods and procedures generally followed or approved by relevant industries and consultants in Australia with respect to the Consultancy Services and that degree of skill, diligence, prudence and foresight which would reasonably and ordinarily be expected from a skilled and experienced consultant engaged in similar work or services;
Information	means all information or data however held, stored or recorded including this Agreement drawings, plans, specifications, correspondence, calculations, reports, models, concepts, source codes, files, computerised data, photographic recordings, audio or audio visual recordings;
Intellectual Property	means all proprietary rights in relation to Information including copyright and neighbouring rights, and all proprietary rights in relation to inventions (including patents) registered and unregistered trademarks (including service marks), registered designs, confidential information (including trade secrets and know how) and circuit layouts, and all other proprietary rights resulting from intellectual activity in the industrial, scientific, literary or artistic fields;
IP Act	means the *Information Privacy Act 2009* (Qld);
Key Personnel	means the Consultant's Personnel specified in Item 2 of the Schedule who are approved by the Principal to perform the Consultancy Services;
Legislative Requirements	includes: (a) Acts, ordinances, regulations, by-laws, orders, awards and proclamations of the Commonwealth and the State or Territory applicable to the Services; (b) certificates, licences, consents, permits, approvals, codes, standards and requirements of organisations having jurisdiction in connection with or recognised generally as authorities in respect of the carrying out of the Consultancy Services, including the requirements of any local government or other authority, and the requirements of any development consent issued in relation to any project to which the Consultancy Services relate; (c) Australian Standards and any other relevant standards; and (d) the Codes of Practice of the State or Territory applicable to the Consultancy Services and other appropriate codes;

Milestones	means the milestones specified in the Schedule and Terms of Reference;
Moral Rights	mean the moral rights of attribution of authorship, right not to have authorship falsely attributed and right of integrity of authorship specified in Part IX of the *Copyright Act 1968* (Cth);
Offer	means the offer submitted to the Principal by the Consultant to provide the Consultancy Services a copy of which is contained in Annexure 2;
Personal Information	has the meaning given to it in the IP Act;
Personnel	means any officer, employee, agent or sub-contractor of a party;
Principal's Consent	means prior written consent (which will not be unreasonably withheld) of the Principal which may be given subject to such terms and conditions as the Principal may see fit to impose;
Project Coordinator	means the person appointed by the Consultant specified in Item 3A of the Schedule, or any other person substituted by the Consultant by notice to the Principal.
Project Officer	means the person specified in Item 3 of the Schedule or any other person substituted by the Principal by notice to the Consultant;
Quality Assurance System	means the Consultant's system which establishes the qualities and performance of the Consultancy Services including, all quality manuals, plans, management structures and responsibility statements, techniques for identification and management of non-conforming or disputed Consultancy Services and audit and other critical issues relating to quality assurance;
Records	means all material including but not limited to books, documents, information, computer software, equipment, and data stored by any means disclosed, or made available, by the Principal to the Consultant in connection with the performance of this Agreement;
State	means the State of Queensland;
Tax Invoice	has the same meaning as in the GST Act;
Terms of Reference	means the document issued by the Principal to the Consultant for the purpose of obtaining an Offer, a copy of which is contained in Annexure 1.

1.2 In this Agreement unless a contrary intention appears, words importing a gender include any other gender and words in the singular include the plural and vice versa.

1.3 In this Agreement, unless a contrary intention appears, a reference to:

1.3.1 "dollars" or "$" is a reference to the currency of Australia;

1.3.2 any legislation shall include any Act of Parliament and any subordinate legislation, rule, regulation, order or instrument made under it and shall include any statutory modification, substitution or re-enactment of such legislation;

1.3.3 an individual or person includes a corporation, partnership, joint venture, trust, association, government, local government authorities and agencies;

1.3.4 a recital, clause, schedule or annexure is a reference to a recital, clause, schedule or annexure to this Agreement; and

1.3.5 a party to this Agreement includes the executors, administrators, successors and permitted assigns of that party.

1.4 Clause headings in this Agreement are for convenience of reference only and have no effect in limiting or extending the language of the provisions to which they refer.

1.5 In this Agreement if a word is defined, cognate words and phrases have corresponding definitions.

1.6 If a party to this Agreement consists of more than one person those persons shall be jointly and severally bound under this Agreement.

1.7 Subject to clause 1.8, where any inconsistency exists between the provisions of the Terms of Reference, this Agreement and the Offer and the inconsistency is not the result of a variation agreed to under clause 23 the provisions of the documents will take precedence in the following order:

1.7.1 Agreement
1.7.2 Terms of Reference
1.7.3 Offer.

1.8 Where a higher standard to that specified in the Agreement is stated in the Terms of Reference or Offer, the Consultant shall be bound by the higher standard.

2. TERM

2.1 This Agreement will start on the Date of Commencement and, unless earlier terminated in accordance with its terms, continue until the Completion Date.

3. PROVISION OF SERVICES

3.1 Time must be of the essence in the provision of the Consultancy Services.

4. CONSULTANCY SERVICES

4.1 The Consultant will provide and complete the Consultancy Services:

4.1.1 through its Key Personnel;

4.1.2 with due care and skill and to the best of its knowledge and expertise;

4.1.3 in a thorough and professional manner in accordance with relevant professional principles and standards;

4.1.4 by any Milestones and time frames informed by the Principal to the Consultant; and

4.1.5 in accordance with:

4.1.5.1 the requirements of this Agreement;

4.1.5.2 all Legislative Requirements including all applicable safety, health and environmental laws and regulations;

4.1.5.3 all operations, safety, health and environment guidelines, rules and procedures provided to the Consultant by the Principal;

4.1.5.4 Industry Best Practice; and

4.1.5.5 all reasonable directions and orders given by the Principal.

4.2 The Consultant agrees that the scope of the Consultancy Services includes all incidental and related work which may arise from the matters referred to, identified in, or to be reasonably inferred from or contemplated by the Terms of Reference.

4.3 The Consultant will -

4.3.1 inform itself of the Principal's stated requirements in respect of the Consultancy Services;

4.3.2 make its own investigations and assessments of the work and risks involved in providing the Consultancy Services and it will review and satisfy itself about the Information that the Principal has made available to the Consultant about the Consultancy Services and this Agreement;

4.3.3 consult regularly with the Principal throughout the performance of the Consultancy Services; and

4.3.4 provide such further Information in relation to the provision of the Consultancy Services as reasonably required by the Principal.

4.4 The Consultant warrants (and the Principal relies upon this warranty) that:

4.4.1 the Consultancy Services will match the description as set out in this Agreement;

4.4.2 it and its Key Personnel have the qualifications, admissions and memberships (if any) necessary for the performance of the Consultancy Services and it is a condition of this Agreement that the Consultant and its Key Personnel must retain memberships, at the Consultant's own cost, whilst performing the Consultancy Services;

4.4.3 the Consultancy Services must be carried out with all due care and skill and in accordance with the highest applicable professional standards, principles and practices;

4.4.4 the Information contained in the Offer as to the structure, viability, reliability, insurance cover, capacity, experience and expertise of the Consultant or its Key Personnel is correct;

4.4.5 it will not infringe the Intellectual Property rights of any third party or otherwise breach any law or obligation to any third party in the

performance of its obligations pursuant to this document or in completing the Consultancy Services;

4.4.6 as at the date of this document no conflict of interest exists or is likely to arise in the performance of its obligations pursuant to this Agreement; and

4.4.7 the Consultancy Services will be fit for the purpose or purposes:

4.4.7.1 described in this Agreement;

4.4.7.2 informed to the Consultant by the Principal; and

4.4.7.3 for which these types of Consultancy Services are commonly provided.

4.5 Where specified in Item 5 of the Schedule, the Principal will provide the specified assistance to the Consultant.

4.6 The Consultant must maintain solely at the Consultant's own expense any licences, accreditations, certificates or registrations that the Consultant or its Personnel are required to possess by any relevant Legislative Requirements in order to complete the Consultancy Services.

5. COMPLIANCE WITH DEMONSTRATED SERVICES

5.1 Without limiting clause 4, if the Consultant:

5.1.1 provides or provided the Principal with a demonstration of the Consultancy Services before the Principal entered into this Agreement, the Consultancy Services must correspond in nature and quality with the Consultancy Services demonstrated; or

5.1.2 showed the Principal a result achieved by the Consultancy Services or similar services before the Principal entered into this Agreement, the Consultancy Services must correspond in quality with the services that achieved that result.

6. SUPPLY OF ITEMS

6.1 Any items which the Consultant uses or supplies in conjunction with the Consultancy Services must:

6.1.1 be of merchantable quality;

6.1.2 comply with any applicable Australian Standards and any other standards specified in this Agreement; and

6.1.3 be fit for the purpose or purposes described in clause 4.4.7.

7. KEY PERSONNEL

7.1 Unless the Principal has given its written consent to the contrary, the Consultancy Services must be performed by the Key Personnel of the Consultant.

7.2 The Consultant will ensure that Key Personnel are competent and have the necessary skills to perform the Consultancy Services on which they will be engaged.

7.3 The Consultant will not, without the Principal's Consent:

7.3.1 allow Key Personnel to delegate any part of the Consultancy Services; or

7.3.2 allocate tasks not connected with the Consultancy Services to any of the Key Personnel engaged on the Consultancy Services on a full time basis until completion of the Consultancy Services allocated to that person.

If any of the Key Personnel are not available to perform any of the Consultancy Services allocated to them, or leave the employ of the Consultant, the Consultant will immediately:

7.3.3 give notice to the Principal of the circumstances; and

7.3.4 if so requested by the Principal, arrange for replacement of that person with a person of comparable skill, experience and qualification and obtain the Principal's Consent to such replacement Key Personnel at no cost to the Principal.

7.4 The Principal may, on reasonable grounds, give written notice requiring the Consultant to remove Key Personnel from working on the Consultancy Services. Upon receipt of a notice pursuant to this clause 7.4, the Consultant will, at no cost to the Principal, promptly remove and replace the Key Personnel referred to in the notice with a person satisfactory to the Principal.

7.5 If any of the events mentioned in clauses 7.3 and 7.4 occur, the Consultant must do all that is necessary to minimise any delay to the performance of the Consultancy Services.

8. QUALITY ASSURANCE SYSTEM

8.1 The Consultant will be a third party accredited to the relevant Australian Standard. The Consultant will carry out the Services under the Quality Assurance System in accordance with the relevant Australian Standard and the requirements of this Agreement.

9. INSPECTION AND INFORMATION

9.1 The Consultant must keep the Principal fully informed on all aspects of the Consultancy Services.

9.2 Without limiting the scope of clause 9.1, the Consultant will provide to the Principal, as requested from time to time by the Principal, copies of all plans, designs, drawings, specifications, reports, data and other information relating to the Consultancy Services to a standard which at all times meets the satisfaction of the Principal and accords with Industry Best Practice.

9.3 At all reasonable times, the Principal will have the right to inspect and review performance of the Consultancy Services at:

9.3.1 the site or premises at which the Consultancy Services are to be performed;

9.3.2 the Consultant's premises; and

9.3.3 the premises of any of the Consultant's subcontractors.

10. MEETINGS AND REPORTING

10.1 The Consultant must appoint a Project Coordinator who is to be responsible for liaising with the Principal regarding the Consultancy Services.

10.2 The Principal and the Consultant must meet monthly or as required by the Principal to discuss:

10.2.1 the progress of the Consultancy Services; and

10.2.2 any other matters which the Principal may wish to raise at a meeting concerning the Consultancy Services and this Agreement.

10.3 The Consultant must provide the Principal with progress reports as to the provision of the Consultancy Services in such detail as allows the Principal to ascertain whether the Consultancy Services are being performed in accordance with this Agreement. Such progress reports to be provided prior to any meeting requested under clause 10.1, at the intervals stated in Item 5A of the Schedule and at other intervals reasonably requested by the Principal.

11. LABOUR, PLANT AND EQUIPMENT

11.1 The Consultant will supply at its own cost all labour, plant, equipment, tools, appliances or other property and items the Consultant requires to fulfil its obligations under this document, unless otherwise provided in Item 5 of the Schedule.

11.2 Any plant, equipment, tools, appliances or other property and items that the Principal provides to the Consultant to enable it to complete its obligations under this document remain the Principal's property and must only be used for the purposes of fulfilling the Consultant's obligations under this Agreement.

11.3 The Consultant must keep the Principal's property in good order and condition, subject to fair wear and tear.

12. FEES AND REIMBURSABLE EXPENSES

12.1 The Consultant will provide the Consultancy Services for the Consultancy Fee. This Consultancy Fee is inclusive of all costs and expenses of the Consultant whether foreseen or unforeseen, including without limitation, insurance, duties, imposts and taxes and the GST (if any) that must be paid by the Consultant.

12.2 The Principal will only be liable to the Consultant for the Consultancy Fee and expenses in relation to the Consultancy Services that meet the requirements of this Agreement.

12.3 Notwithstanding clause 12.1 above the Consultant may include in an invoice under clause 13.2 a claim, and be paid, for expenses described in Item 7 of the Schedule provided that the Consultant has incurred these expenses.

12.4 The Consultant will not be reimbursed by the Principal for any other expenses unless the Consultant has the Principal's Consent.

13. PAYMENT

13.1 The Principal will not have any obligation to pay the Consultant for any part of the Consultancy Services until the Principal has been given a correctly rendered invoice.

13.2 The Consultant shall issue a correctly rendered invoice at the intervals specified in Item 8 of the Schedule.

13.3 Invoices must be in sufficient detail to allow the Principal to assess progress against Milestones. For work carried out on a time basis, invoices must be supported by records of times spent by individuals on the Consultancy Services, certified by the Consultant and the Project Officer.

13.4 Upon receipt of an invoice the Principal may require the Consultant to provide additional information to assist the Principal to determine whether or not an amount is payable.

13.5 The Principal will make payment of a correctly rendered invoice within the time limit set out in Item 8 of the Schedule after receipt of the invoice or, if additional information is required by the Principal pursuant to clause 13.4, then upon receipt of the additional information payment will be made within the time limit set out in Item 8 of the Schedule.

13.6 For the purposes of this clause 13, a correctly rendered invoice is an invoice that has been submitted to the Principal in accordance with clause 13.2 and the Consultant must ensure that:

13.6.1 the amount claimed in the invoice is due for payment pursuant to this Agreement;

13.6.2 the amount claimed in the invoice is correctly calculated in accordance with this Agreement; and

13.6.3 correctly identifies the Consultancy Services performed.

13.7 In addition, the invoice must comply with the requirements of the GST Law (as a Tax Invoice) and must, unless inconsistent with the GST Law, specify:

13.7.1 the Consultant's Australian Business Number;

13.7.2 the Consultancy Fee due to the Consultant and the basis for its calculation;

13.7.3 the amount of any GST paid or payable by the Consultant with respect to the Consultancy Fee;

13.7.4 the date of delivery of the Consultancy Services to which the invoice relates;

13.7.5 a description of the Consultancy Services delivered;

13.7.6 the Consultant's address for payment; and

13.7.7 the Principal's reference number.

13.8 The Principal will notify the Consultant within 14 days after receipt of an invoice found not to be correctly rendered.

13.9 Where the Principal disputes the Consultancy Fee or expenses claimed in the Consultant's invoice, the Principal will:

13.9.1 give written notice to the Consultant of the amount that the Principal disputes;

13.9.2 pay the undisputed amount;

13.9.3 attempt to resolve the disputed amount with the Consultant within 20 Business Days of the dated of the Principal's notice under clause 13.9.1;

13.9.4 if the disputed amount still remains unresolved after 20 Business Days, the matter is to be resolved accordance with the dispute resolution process under clause 30; and

13.9.5 pay the resolved disputed amount within the time frame under clause 13.5.

13.10 Where the Principal has paid an invoice to the Consultant, and the Principal subsequently determines that such invoice was not a correctly rendered invoice, the Principal will:

13.10.1 pay any underpaid amount owed to the Consultant within 30 days of receipt of a correctly rendered invoice or, if additional information is required by the Principal pursuant to clause 13.4, then upon receipt of the additional information payment will be made within the time limit set out in Item 8 of the Schedule;

13.10.2 deduct any overpaid amount owed to the Principal from the next invoiced payment or, if no other payment is due to the Consultant pursuant to this Agreement, recover the amount from the Consultant as a debt due to the Principal.

13.11 Notwithstanding any other provisions in this Agreement, payment of an invoice is not:

13.11.1 evidence or an admission that the Consultancy Services have been provided in accordance with the Agreement;

13.11.2 evidence of the value of the Consultancy Services provided;

13.11.3 an admission that the Consultancy Fee or expenses invoiced were properly incurred in accordance with this Agreement;

13.11.4 an admission of the Principal's liability; or

13.11.5 acceptance or approval of the Consultant's performance;

but must be taken only as payment on account.

13.12 The Principal may set off against any sum owing to the Consultant any amount owing by the Consultant to the Principal.

14. NO AGENCY

14.1 The Consultant is engaged as an independent contractor and nothing in this Agreement shall be deemed to constitute the Consultant as an agent or employee of the Principal or the State and the Consultant shall not have any authority to incur and shall not incur any obligation or make or purport to make any representation on behalf of the Principal except with the Principal's Consent.

14.2 The Consultant acknowledges that it is the employer of all or has otherwise engaged all Personnel who will provide the Consultancy Services, including the Key Personnel, and the Consultant must meet all payment obligations to such Personnel and must pay all statutory taxes, fees, levies or charges applicable with respect to the engagement of or payments made to such personnel. The Consultant must comply with all reasonable requests for verification of such payment obligations received from the Principal.

14.3 The Consultant indemnifies and must keep the Principal indemnified against:

14.3.1 any obligation to make payments to Key Personnel and other Personnel engaged in the provision of the Consultancy Services, and

14.3.2 any obligation to pay any related statutory taxes, fees, levies or charges.

15. CONFLICT OF INTEREST

15.1 The Consultant will at all times act in the best interests of the Principal.

15.2 If a conflict or risk of conflict of interest arises (without limitation, because of work undertaken for any person other than the Principal) the Consultant will immediately give notice of the conflict of interest, or the risk of it, to the Principal.

15.3 The Consultant will do all that is necessary to ensure that its Personnel do not engage in any activity or obtain any interest that is in conflict with providing the Consultancy Services to the Principal fairly and independently. The Consultant will immediately give notice of any conflict of interest relating to the activities or interests of any of its Personnel to the Principal.

15.4 If the Principal is given notice of a conflict of interest pursuant to clause 15.1 or 15.3, the Principal may proceed in accordance with clause 25 to terminate this Agreement.

16. CONTRACT MATERIAL

16.1 Title to and Intellectual Property rights in all new Contract Material will vest in the Principal unless otherwise specified in Item 12 of the Schedule.

16.2 If title to and Intellectual Property rights in new Contract Material will vest in the Principal:

16.2.1 this Agreement does not affect Intellectual Property rights in existing Contract Material but the Consultant grants, and will ensure that relevant third parties grant, to the Principal a paid up non-exclusive, non-transferable, perpetual and irrevocable licence to:

16.2.1.1 use, reproduce and adapt for its own use; and

16.2.1.2 perform any other act with respect to copyright; and

16.2.1.3 manufacture, sell, hire or otherwise exploit a product or process or to provide a service or to licence a third party to do these things in respect of,

any existing Contract Material, but only as incorporated in new Contract Material (and any further development of the Contract Material);

16.2.2 if requested to do so before or after the expiration or sooner termination of this Agreement, the Consultant must deliver to the Principal, in a format specified by the Principal, all new Contract Material;

16.2.3 the Consultant must ensure that new Contract Material and Records are used, copied, supplied or reproduced only for the purposes of this Agreement;

16.2.4 if any Contract Material is produced or reproduced in an electronic format or stored electronically, the Consultant must not:

16.2.4.1 store it on a foreign computer (meaning a hard disk or other similar device affixed to a computer that is not the property of the Principal) without keeping the current version of the Contract Material on separate media and delivering it to the Principal at the intervals (if any) specified in the Terms of Reference; or

16.2.4.2 produce, reproduce or store Contract Material in such a way this it is mixed with, attached to or indistinguishable, with the use of a computer, from material that is not the subject of this Agreement.

16.3 If the Consultant is an individual, the Consultant consents to any act or omission done by the Principal in the exercise of the Intellectual Property rights granted under this Agreement that might otherwise constitute an infringement of the Consultant's Moral Rights and without limiting this, the Consultant consents to:

16.3.1 being attributed as author of Contract Material comprised in a Deliverable or any new Contract Material, in a manner acceptable to the Principal;

16.3.2 any amendments, deletion/destruction, alteration, relocation or selection of the Contract Material (or any part thereof);

16.3.3 the publication or communication of the Contract Material or any part thereof; and

16.3.4 the specific acts or omissions (if any) specified in Item 12 of the Schedule.

16.4 If the Consultant is an entity other than an individual, the Consultant must, prior to commencing work in respect of a Deliverable, obtain from every person who is to create new Contract Material:

16.4.1 all consents, permissions and assignments necessary to enable the Principal to exercise the Intellectual Property rights granted under this Agreement in full, without impediment or cost to the Principal; and

16.4.2 without limiting clause 16.4.1, consent from the person to any act or omission by the Principal in their exercise of the Intellectual Property rights granted under this Agreement that might otherwise constitute an infringement of the person's Moral Rights, including a consent to the acts or omissions specified in clause 16.3.1 to 16.3.4, and if requested by the Principal, such consent must be in a form specified by the Principal.

16.5 If Item 12 of the Schedule specifies that title to and Intellectual Property rights in new Contract Material will, upon their creation, vest in the Consultant:

16.5.1 the Consultant grants, and will ensure that relevant third parties grant, to the Principal a paid up non-exclusive, non-transferable, perpetual and irrevocable licence to:

16.5.1.1 use, reproduce and adapt for its own use; and

16.5.1.2 perform any other act with respect to copyright; and

16.5.1.3 manufacture, sell, hire or otherwise exploit a product or process or to provide a service or to licence a third party to do these things in respect of,

any new and existing Contract Material, but only as incorporated in the Contract Material (and any further development of the Contract Material); and

16.5.2 if requested to do so before or after the expiration or sooner termination of this Agreement, the Consultant must deliver to the Principal, in a format specified by the Principal, all new and existing Contract Material.

16.6 Intellectual Property rights in Records and Information supplied to the Consultant by the Principal for reproduction or guidance remain vested in the Principal.

16.7 The Consultant warrants that it is entitled to use any Intellectual Property that may be used by it in connection with the provision of Consultancy Services and grants to the Principal the rights granted pursuant to this clause 16.

16.8 The Consultant must, at its own expense, execute all documents and do all other things reasonably necessary to:

16.8.1 enable the Principal or its nominee to obtain letters patent, design registration or other official protection for the Principal's interest in the Intellectual Property rights of the Contract Material; and

16.8.2 assign and transfer to the Principal or its nominee the full ownership of the Consultant's Intellectual Property rights in the Contract Material.

16.9 The Consultant indemnifies and will at all times keep the Principal and the State indemnified against any action, claim, suit or demand, including a claim, suit or demand for or liability to pay compensation or damages and costs or expenses arising out of or in respect of any breach of any third party's Intellectual Property rights or Moral Rights relating to the provision of Consultancy Services under this Agreement and the Principal's use of the Contract Material.

17. NON-COMPLIANT CONSULTANCY SERVICES

17.1 If the Principal is not satisfied that the Consultancy Services comply in all respects with the requirements of this Agreement, the Principal may, at its option:

17.1.1 require the Consultant to, within a reasonable time, take such steps as are necessary to ensure that the Consultancy Services comply with this Agreement and the Consultant agrees that no Consultancy Fee will be payable to the Consultant by the Principal for any work done to rectify the non-compliance;

17.1.2 notify the Consultant that the Principal rejects the Consultancy Services which do not comply with this Agreement and the Consultant agrees to refund to the Principal any payments made by the Principal in respect of the Consultancy Services which do not comply with this Agreement; or

17.1.3 subject to clause 17.1.1 rectify, either itself or by others, the Consultancy Services which do not comply with this Agreement and the Consultant agrees to reimburse the Principal for any costs, losses, expenses or damages the Principal incurs in rectifying any Consultancy Services which do not comply with this Agreement, which costs, losses, expenses or damages are deemed a debt due by the Consultant to the Principal.

17.2 The Principal's rights under clause 17.1 do not in any way change or affect the Consultant's obligations under this Agreement or affect the Principal's rights to claim for any damage or loss the Principal may suffer because of the Consultant's failure to fulfil its obligations under this Agreement or to exercise other rights under this Agreement, including under clause 25.

18. PROJECT MANAGEMENT

18.1 The Principal appoints the Project Officer as its agent for the purposes of this Agreement.

18.2 The Consultant will:

18.2.1 liaise with and report to the Project Officer; and

18.2.2 attend meetings and briefings with the staff of the Principal as reasonably required by the Project Officer.

18.3 Reports by the Consultant to the Project Officer must be in writing and in a form satisfactory to the Principal, unless otherwise permitted by the Project Officer.

19. DISCLOSURE OF INFORMATION

19.1 All Information provided to, produced or dealt with (including any deliverables of the Consultancy Services) by the Consultant under this Agreement and during the course of providing the Consultancy Services, must be treated as confidential by the Consultant. In this clause 19, this Information is referred to as "Confidential Information".

19.2 The Consultant agrees that the Consultant or its employees, agents, directors, partners, shareholders or consultants must not disclose to any person, any Confidential Information relating to the Principal or the affairs of others which may have come to its or their knowledge as a result of this Agreement or performance of the Consultancy Services and must take all necessary precautions to prevent unauthorised access to such Information.

19.3 All Confidential Information, and any copies of Confidential Information, must remain the property of the Principal and must be returned to the Principal at the completion of the Consultancy Services or upon the expiration or termination of this Agreement.

19.4 The Confidential Information supplied to the Consultant under this Agreement must be used only for the provision of the Consultancy Services or as directed by the Project Officer and must not be used for any other purpose.

19.5 The Consultant must not divulge any Information regarding the nature or progress of the Consultancy Services or give any publicity concerning the Consultancy Services except with the Principal's Consent.

19.6 The Consultant acknowledges that the Principal is entitled (in addition to any entitlement to damages) to an injunction or other equitable relief with respect to any actual or threatened breach by the Consultant of this clause 19 and without the need on the part of the Principal to prove any special damage.

19.7 The Consultant's and the Principal's obligations under this clause 19 do not extend to:

19.7.1 information already in the public domain other than due to a breach of this Agreement; or

19.7.2 any disclosure required by law.

20. MEDIA RELEASES

20.1 The Consultant must not make any statement or issue any Information, publication, document or article for publication concerning this Agreement and the Consultancy Services in any media without the Principal's Consent.

21. SECURITY AND ACCESS

21.1 The Consultant will, when using the Principal's premises or facilities, comply with all rules, directions and procedures including those relating to security and workplace health and safety in effect at the premises or in regard to the facilities notified to the Consultant by the Principal.

21.2 The Consultant will give the Project Officer, and any other persons authorised in writing by the Principal, reasonable access to premises occupied by the Consultant where the Consultancy Services are being undertaken and will permit them to inspect any Contract Material or Information related to the Consultancy Services.

21.3 The Project Officer and any other person authorised by the Principal, when at the Consultant's premises will comply with all rules, directions and procedures including those relating to security and to workplace health and safety in effect at the premises or in regard to the facilities as notified by the Consultant to the Principal.

22. SUSPENSION OF SERVICES

22.1 The Principal may issue a notice to the Consultant, at any time and for any reason, to suspend all or any part of the Consultancy Services and the Consultant must immediately comply with such notice.

22.2 The Principal may by notice require the Consultant to recommence work on all or any part of the suspended Consultancy Services and the Consultant must promptly comply with such notice at its own cost.

22.3 For the avoidance of doubt, when the Consultancy Services are suspended in accordance with clause 22.1, the Consultant has no claim except where the:

22.3.1 rights have otherwise accrued under this Agreement prior to the date of the suspension; or

22.3.2 Consultant is able to seek an extension of time pursuant to clause 29.

23. VARIATION

23.1 The Principal may by written notice, vary the Consultancy Services.

23.2 The Consultant may seek approval from the Principal to vary the Consultancy Services if the Consultant deems it to be necessary for the performance of the Consultancy Services. When seeking a variation, the Consultant must give written notice to the Principal setting out the:

23.2.1 variation to the Agreement that the Consultant deems necessary;

23.2.2 reasons why the variation is necessary; and

23.2.3 effect of the variation on the Consultancy Fee, expenses and any Milestones and time frames.

23.3 Where the Principal requires a variation to the Consultancy Services pursuant to clause 23.1, or approves a variation sought by the Consultant under clause 23.2:

23.3.1 the Consultant must do everything possible to mitigate its losses arising as a consequence of the variation of the Consultancy Services; and

23.3.2 the parties will negotiate in good faith how much the Consultant is entitled to charge the Principal for the provision of any new services or, alternatively, the basis on which the Consultant must calculate the amounts it may charge the Principal for the provison of any new services.

23.4 In the event that the parties fail to reach agreement under clause 23.3.2, the Principal will reimburse the Consultant for those fees and expenses, which the Principal believes in its sole and absolute discretion, are reasonably and properly incurred by the Consultant as a result of variation of the Consultancy Services under clause 23.1.

24. TERMINATION OF CONSULTANCY SERVICES

24.1 Notwithstanding clause 25, the Principal may at any time, in its sole and absolute discretion, by giving written notice to the Consultant, terminate the provision of the Consultancy Services and the Consultant must on receipt of such notice immediately cease all work under the Agreement and take all appropriate action to mitigate any loss and prevent further costs being incurred with respect to the provision of the relevant Consultancy Services.

24.2 If the Principal elects to terminate under this clause 24.1 it must pay the reasonable fees and expenses of the Consultant (based on the rate of the Consultancy Fees specified in this Agreement or if no such rate is specified, the reasonable rates usually charged by the Consultant in its ordinary course of business) for all work performed by the Consultant in accordance with the Agreement prior to its termination.

24.3 In the event that the parties fail to reach agreement on reasonable fees and expenses under clause 24.2, the Principal will reimburse the Consultant for those fees and expenses, which it believes in its sole and absolute discretion are reasonably and properly incurred by the Consultant as a result of termination of the Consultancy Services under clause 24.1.

24.4 In no circumstances must the fees payable for terminated Consultancy Services exceed the fees that would have been paid had the relevant Consultancy Services been completed.

25. DEFAULT OF THE CONSULTANT AND TERMINATION

25.1 If the Consultant:

25.1.1 fails to comply with any of the terms and conditions of this Agreement; or

25.1.2 fails to comply with a direction of the Project Officer given in accordance with this Agreement;

the Principal may, subject to clause 25.2, terminate this Agreement in whole or in part without prejudice to any other rights.

25.2 Where a breach under clause 25.1 is capable of being remedied (except for those breaches set out in clause 25.3), the Principal must not exercise its rights of termination unless it gives to the Consultant notice requiring the

Consultant to remedy the breach within 14 days of the notice and the matter is not remedied by the Consultant within this time.

25.3 Notwithstanding clauses 25.1 and 25.2, if the Consultant:

25.3.1 abandons or refuses to proceed with the Consultancy Services;

25.3.2 fails to comply with clause 4 (Consultancy Services);

25.3.3 fails to comply with clause 15 (Conflict of Interest);

25.3.4 fails to comply with clause 27 (Insurance); or

25.3.5 enters into any arrangement or proceedings for the purpose of insolvency administration or is placed under official management,

the Principal may immediately terminate this Agreement by notice to the Consultant.

25.4 In the event of termination under clause 25.1 or clause 25.3, but without prejudice to any right of action or remedy which has accrued or which may accrue in favour of the Principal, the Principal:

25.4.1 may procure from any other source services that are reasonably similar to the Consultancy Services and the Consultant must be liable to the Principal for any extra expense incurred which must be recoverable from the Consultant as a liquidated debt payable on demand;

25.4.2 must be liable under the Agreement to pay only for the Consultancy Services performed to the satisfaction of the Project Officer, in accordance with this Agreement; and

25.4.3 may recover from the Consultant the amount of any loss or damage suffered by the Principal as a result of the termination.

25.5 Upon termination of this Agreement under clauses 24.1, 25.1 or clause 25.3, all money which has been paid and all money to be paid for Consultancy Services performed to the date of the termination will be in full and final satisfaction of all claims by the Consultant under this Agreement.

26. INDEMNITIES

26.1 Subject to clause 26.2, the Consultant indemnifies the Principal and its Personnel (**Indemnified Parties**) against any and all damages, costs, expenses or loss which any of them may incur or sustain, and any and all actions, proceedings, claims and demands whatsoever which may be brought or made against the Indemnified Parties by any person, in respect of, by reason of or arising out of:

26.1.1 the performance of the Consultancy Services; or

26.1.2 any act or omission of the Consultant or the Consultant's Personnel.

26.2 The Consultant's liability under this Agreement will be reduced to the extent to which any action, proceeding, claim or demand was directly caused by a negligent act or omission of the Principal.

26.3 In no circumstances will the Principal be liable to the Consultant or any other person for Consequential Loss.

26.4 If the Consultant fails to comply with this clause 26, the Principal may make good the damage and if the cost of so doing would, if the Consultant had performed it, have been borne by the Consultant under this clause, then the cost to the Principal of performing such services or carrying out such repairs will be a debt due and owing from the Consultant to the Principal.

27. INSURANCE

27.1 The Consultant must take out and maintain for the duration of this Agreement:

27.1.1 insurance for the Consultant's relevant Personnel in accordance with applicable workers' compensation legislation;

27.1.2 public liability insurance specified in Item 9 of the Schedule for the amount specified;

27.1.3 professional indemnity insurance specified in Item 9 of the Schedule for the amount and for the term specified; and

27.1.4 any other insurance specified in Item 9 of the Schedule.

27.2 The insurances must be effected with an insurer that is authorised and licensed to operate in Australia.

27.3 The Consultant must properly provide evidence to the Principal of the existence and currency of any of the insurances required by this clause:

27.3.1 before providing any of the Consultancy Services; and

27.3.2 upon request in writing at any time by the Principal.

27.4 The Consultant must immediately notify the Principal of any cancellation of any insurance policy required by clause 27.1.

27.5 The Consultant will immediately notify the Principal and keep the Principal informed of any claims which fall for consideration under any insurance policy required by clause 27.1.

28. FORCE MAJEURE

28.1 A party will not be entitled to exercise its rights and remedies upon the default of the other party (whether at common law or pursuant to this Agreement) if that default is caused by Force Majeure.

28.2 A party that is unable to perform its obligations under this Agreement due to Force Majeure shall:

28.2.1 notify the other party as soon as possible of the Force Majeure event including details of the nature of the event, the date of commencement of the event and an estimate of the period of time required to enable that party to resume full performance of its obligations under this Agreement;

28.2.2 use all reasonable diligence and employ all reasonable means to remedy or abate the Force Majeure as quickly as possible;

28.2.3 resume performance as soon as possible after termination of the Force Majeure or after the Force Majeure has abated to an extent which permits resumption of performance; and

28.2.4 notify the other party when the Force Majeure has terminated or abated to an extent which permits resumption of performance to occur.

28.3 If an event of Force Majeure prevents the performance of any obligation under this Agreement for a period of 30 days, the parties must meet to agree, in good faith, any actions to be taken in relation to this Agreement.

28.4 The Principal shall be relieved from its obligation to pay the Consultant any sum of money during any period that the Consultant is unable to perform its obligations under the Agreement due to Force Majeure.

29. DELAY

29.1 The Consultant must take all possible steps to avoid, or if it cannot be avoided to minimise, any delay.

29.2 The Consultant must give written notice to the Principal advising:

29.2.1 all relevant details of the matters causing the delay;

29.2.2 the duration of the delay;

29.2.3 the impact of the delay on the Milestones and time frames (if any) for completion of the Consultancy Services;

29.2.4 the Consultant's recommendation as to how to minimise the impact of the delay on the Milestones and other time frames; and

29.2.5 any other information reasonably requested by the Principal,

within 5 Business Days after becoming aware or within 5 Business Days from the first time that the Consultant ought to have become aware, whichever is the earlier, of anything which is likely to cause, or has caused, delay to the Consultant in providing the Consultancy Services by the Milestones and other timeframes or which will or may affect the Milestones or timeframes.

29.3 The Principal will not be liable for any claim, including for an extension of time to the Milestones and timeframes which has not been made strictly in accordance with clause 29.2.

29.4 On receipt of a notice from the Consultant in accordance with clause 29.2, the Principal will review the claim and may grant a reasonable extension of time to the Consultant and adjust the Milestones and time frames accordingly, provided:

29.4.1 the delay:

29.4.1.1 has been directly caused by an act, omission or default of the Principal;

29.4.1.2 is critical in that its occurrence will affect the Completion Date;

29.4.1.3 is not concurrent with a delay for which the Consultant is responsible; and

29.4.1.4 has not been caused or contributed to, directly or indirectly, by the Consultant; and

29.4.2 the Consultant has complied with clauses 29.1 and 29.2.

29.5 Except to the extent that this Agreement otherwise expressly provides, the Consultant will not be entitled to any additional payment or to any claim as a result of the granting of an extension of time.

29.6 The Principal may at any time, in its absolute discretion, grant the Consultant an extension of time. This clause is for the Principal's benefit and the Principal will not be required to exercise its discretion under this clause 29.6 for the benefit of the Consultant.

29.7 If the Consultant disputes the Principal's determination, it may refer the matter to be resolved under clause 30 within 10 Business Days after the Principal notifies the Consultant of its decision under clause 29.4. Otherwise, the Principal will have no further liability with respect to the claim.

29.8 The Principal may direct the Consultant to complete the Consultancy Services on a date earlier than the Completion Date or the Milestones, and the Consultant must comply with that direction at no extra cost to the Principal, unless the Consultant can demonstrate that it will unavoidably incur extra costs.

30. DISPUTE RESOLUTION BY MEDIATION

30.1 Any dispute or difference whatsoever arising out of or in connection with this Agreement must be submitted to mediation in accordance with, and subject to, The Institute of Arbitrators & Mediators Australia Mediation and Conciliation Rules.

30.2 The parties must continue to perform their obligations under this Agreement despite a dispute.

31. WAIVER

31.1 No right or obligation under this Agreement must be deemed to be waived except upon written acknowledgment signed by each party.

31.2 A waiver by the Principal will not prejudice any of its rights in respect of any subsequent breach of this Agreement by the Consultant.

31.3 Subject to clause 31.1, any failure by the Principal to enforce any clause of this Agreement, or any forbearance, delay or indulgence granted by the Principal to the Consultant, is not to be construed as a waiver of its rights under this Agreement.

32. GOVERNING LAW

32.1 This Agreement will be governed by and construed in accordance with the laws of the State of Queensland and the parties submit to the jurisdiction of the courts of that State.

33. ENTIRE AGREEMENT

33.1 This Agreement constitutes the entire agreement between the parties and supersedes all communications, negotiations, arrangements and agreements either oral or written between the parties with respect to the subject matter referred to in this Agreement.

33.2 No agreement or understanding that varies or amends this Agreement binds either party unless and until agreed to in writing by both parties.

34. NO SUBCONTRACTING

34.1 The Consultant will not subcontract any part of the Consultancy Services without the Principal's Consent.

34.2 Any consent given by the Principal for the Consultant to subcontract:

34.2.1 will not operate as an authority to transfer responsibility to the subcontractor; and

34.2.2 will not relieve the Consultant from any of its liabilities or obligations under this Agreement.

34.3 The Consultant will not assign this Agreement or any of the benefits under this Agreement without the Principal's Consent.

35. FURTHER ASSISTANCE

35.1 The Consultant will do all things reasonably required by the Principal to give effect to this Agreement or to perfect or protect the rights of the Principal including, without limitation, giving or obtaining confidentiality undertakings acceptable to the Principal in relation to records and the Consultancy Services.

36. CLAUSES TO SURVIVE TERMINATION

36.1 The following clauses will survive termination or expiration of this Agreement:

36.1.1 clause 4.4 (Consultant's warranties);

36.1.2 clause 16 (Contract Material);

36.1.3 clause 19 (Disclosure of Information);

36.1.4 clause 26 (Indemnities);

36.1.5 clause 27.1 (Insurance);

36.1.6 clause 35 (Further Assistance); and

36.1.7 clause 40 (Personal Information).

37. NOTICES

37.1 Notices under this Agreement must be in writing and may be delivered by prepaid postage or certified mail, by hand, by e-mail, or by facsimile transmission to the parties at the address specified in Item 10 of the Schedule or other address subsequently notified by a party to the other.

37.2 Notices will be deemed to be given -

37.2.1 two (2) days after deposit in the mail with postage prepaid; or

37.2.2 immediately upon delivery by hand; or

37.2.3 if sent by e-mail or facsimile transmission, upon completion of transmission.

37.3 The parties agree that where notice is given by either e-mail or facsimile the original document must be sent by post on the same day as the transmission is sent.

38. SEVERABILITY

38.1 Any provision in this Agreement, which is invalid or unenforceable, is to be read down if possible, so as to be valid and enforceable, and if that is not possible the provisions must, to the extent that it is capable, be severed to the extent of the invalidity or unenforceability, without affecting the remaining provisions.

39. PAY AS YOU GO

39.1 In the event that:

39.1.1 the parties are bound by a Voluntary Agreement pursuant to the *A New Tax System (Pay as You Go) Act 1999* ("the Act"), or

39.1.2 the Principal is otherwise obliged to withhold payments from the Consultant pursuant to the Act,

the Principal shall be entitled to withhold from any payment otherwise due to the Consultant under or in connection with the Agreement tax calculated and to be held in accordance with the Act.

40. PERSONAL INFORMATION

40.1 This clause 40 applies if the:

40.1.1 Consultant deals with Personal Information (including the receipt and collection of Personal Information) under this Agreement; or

40.1.2 Consultancy Services involves the:

40.1.2.1 transfer of Personal Information to the Principal; or

40.1.2.2 provision of services to a third party for the Principal.

40.2 Without limiting clause 19, the Consultant must comply with and is bound by Parts 1 to 3, Chapter 2, of the IP Act as if the Consultant was an Agency under that Act.

40.3 In addition to clause 40.2, the Consultant will, in performing its obligations under this Agreement:

40.3.1 protect Personal Information against loss, unauthorised access, use, modification, or disclosure and against other misuse;

40.3.2 not use Personal Information other than for the purpose of performing this Agreement;

40.3.3 not disclose Personal Information without the written consent of the Principal;

40.3.4 immediately notify the Principal if it becomes aware that an unauthorised disclosure of Personal Information has occurred;

40.3.5 ensure that only the Consultant's authorised Personnel have access to Personal Information;

40.3.6 ensure that its Personnel are aware of the Consultant's obligations under this clause, including, when requested by the Principal, requiring any of them to sign an undertaking in relation to Personal Information as defined by this clause;

40.3.7 comply with the Principal's directions regarding the collection, storage, handling, accessing, amendment, management, transfer, use or disclosure of Personal Information by the Consultant. Any direction given by the Principal will not relieve the Consultant of its obligations under clause 40.2; and

40.3.8 comply with any specific restrictions outlined in Item 11 of the Schedule for Records and Confidential Information. The Consultant acknowledges having read and understood these restrictions before executing this Agreement.

40.4 Upon completion of the Consultancy Services, or expiration or termination of this Agreement, the Consultant must return to the Principal all Personal Information including any copies.

The parties have executed this Agreement as follows -

SIGNED on behalf of the **South East Queensland Water Grid Manager**, ABN 14 783 317 630, by the Chief Executive Officer:

Barry K Dennien

_____
(signature)

a delegated officer of the South East Queensland Water Grid Manager

this _____ day of_____2011

In the presence of:

_____ _____
(name of witness) *(signature)*

*** If a company**

Executed for and on behalf of:

Brian Cooper Consulting
ABN 56 154 707 619

_____
(company name and ACN)

by:

Brian Cooper

_____ _____
(name) *(signature)*

_____
(title)

this _____ day of_____2011

in the presence of:

_____ _____
(name of witness) *(signature)*

THE SCHEDULE

Item 1 Consultant
Brian Cooper Consulting
ABN 56 154 707 619

Item 2 Key Personnel (Clause 1.1)

Brian Cooper

Item 3 Project Officer (Clauses 1.1 and 18.1)

The Principal appoints: Barry Dennien
Contact: Telephone: [redacted]
Facsimile:
E-mail: barry.dennien[redacted]

Item 3A Project Coordinator (Clauses 1.1 and 10.1)

Brian Cooper

Item 4 Date of Commencement (Clause 1.1)

The Date of Commencement is 11 January 2011.

Item 4A Completion Date (Clause 1.1)

a) Provision of written preliminary view of compliance and level of response against the Flood Mitigation Manual – by **9am, on 12 January 2011**.
b) Formal written report of final advice delivered to the Principal by **4pm, 12 January 2011**.

Item 5 Assistance to be provided by the Principal (Clause 4.5 and 11.1)

Access to relevant information, personnel and stakeholders, including Seqwater, Department of Environment and Resource Management etc.

Item 5A Progress Reports (Clause 10.3)

As required by the Principal.

Item 6 Fees to be paid for the Consultancy Services (Clause 12.1)

$260 per hour, excluding GST.

Item 7 Expenses for which Consultant may be reimbursed (Clause 12.3)

All reasonable expenses as necessary for the Consultant's performance of the Consultancy Services.

Item 8 Issuance of Invoices and Payment of fees (Clauses 13.2, 13.5 and 13.10)

Invoices to be issued by the Consultant to the Principal after each calendar month

Payment of a correctly rendered invoice will be due within 30 days of the Principal's receipt of the correctly rendered invoice.

Item 9 Insurance (Clause 27)

Workers' compensation insurance

Held in accordance with clause 27.1.1

Public Liability Insurance (Clause 27.1.2)

Ten million dollars ($10,000,000).

Professional Indemnity Insurance (Clause 27.1.3)

Amount: Five million dollars ($5,000,000)

Period: 6 years

Any other insurance (Clause 27.1.4)

Not required.

Item 10 Addresses for notices (Clause 37)

Principal

All notices for the Principal are to be addressed as follows -

Mr Barry Dennien
Chief Executive Officer
SEQ Water Grid Manager
PO Box 16205
City East QLD 4002
Telephone: [redacted]
Facsimile:
E-mail: admin[redacted]

Consultant

All notices for the Consultant are to be addressed as follows -

Mr Brian Cooper
Brian Cooper Consulting
Telephone: [redacted]
Mobile:
E-mail: brian.cooper.consult[redacted]

Item 11 Privacy (Clause 40)

NIL

Item 12 Intellectual Property (Clause 16)

N/A

ANNEXURE 1

Terms of Reference

This page and the following pages comprise the Terms of Reference referred to in the Agreement.

Background

The Queensland Bulk Water Supply Authority, trading as Seqwater, provides storage and treatment of bulk water and manages South East Queensland's dams, weirs and water treatment plants. Seqwater is also responsible for catchment management, the quality of water from these assets and the production of drinking water.

The SEQ Water Grid Manager (Water Grid Manager) is a statutory body responsible for managing the strategic operation of the SEQ Water Grid (Water Grid). The Water Grid Manager's role is to manage the Water Grid to ensure water security and quality for South East Queensland in a cost effective way.

The Water Grid Manager buys the following water services from its Grid Service Providers:

- storage and water treatment of bulk water from Seqwater
- transport of bulk water from LinkWater
- production and treatment of desalinated and purified recycled water from WaterSecure.

The Water Grid Manager sells treated bulk water, purified recycled water and raw water to Grid Customers — Distributor-Retailers, power stations, Toowoomba Regional Council - and a small group of commercial and irrigator customers. The Water Grid Manager does not own infrastructure assets but owns the urban water entitlements for South East Queensland. Because it does not own infrastructure assets, we can make operational decisions on water security that are based on ensuring water is moved to where it's needed most, rather than to generate a return on capital.

Under Chapter 4, Part 2 of the *Water Supply (Safety and Reliability) Act 2008,* Seqwater manages controlled releases from Somerset and Wivenhoe Dams in accordance with a *Flood Mitigation Manual, Revision 7, November 2009*, as approved by the Department of Environment and Resource Management (**Flood Mitigation Manual**). Seqwater is responsible for developing the Flood Mitigation Manual and for obtaining approval under the Act.

Purpose

Since October 2010, South East Queensland has experienced unprecedented rainfall which has resulted in controlled releases from Wivenhoe Dam into the Brisbane River under the Flood Mitigation Manual.

The purpose of the Consultancy Services is to obtain independent assurance over the operation of Wivenhoe Dam, including controlled releases, as against the Flood Mitigation Manual, for the period concerning the current South East Queensland flood event (commencing on or about 13 December 2010 to date).

Scope of works

The Consultancy Services requires the Consultant to:

a) review the operation of Wivenhoe Dam, including controlled releases, for compliance against the Flood Mitigation Manual for the period commencing on or about 13 December 2010 to date (**Flood Event**); and
b) advise on whether the decisions and actions taken during the Flood Event regarding the operation of Wivenhoe Dam were prudent and appropriate in light of the Flood Mitigation Manual's requirements and the circumstances of the Flood Event.

At this stage, the Consultancy Services excludes a review of the sufficiency or adequacy of the Flood Mitigation Manual itself.

The Consultant's advice is to be given in the context of the:

a) Flood Mitigation Manual's requirements; and
b) facts matters and circumstances of the Flood Event.

Deliverables and milestones

a) Provision of a written preliminary advice by **9am, on 12 January 2011**.
b) Formal written report of final advice delivered to the Principal by **4pm, 12 January 2011**.

Deliverables are to be provided to:

Mr Barry Dennien
Chief Executive Officer
SEQ Water Grid Manager
Email: barry.dennien[redacted]

Confidentiality

The Consultant acknowledges that the Information (including this Agreement) provided to, dealt with and produced by the Consultant as a result of the Consultancy Services is confidential and the Consultant will strictly comply with the confidentiality requirements set out in clause 19 of this Agreement.

ANNEXURE 2

Offer

This page comprises the Offer referred to in the Agreement and contains the curriculum vitae of the Consultant.

The Consultant has offered to provide the Consultancy Services in accordance with the Terms of Reference at the hourly rate of [redacted] per hour, excluding GST.

Suzie Emery

From: Elaina Smouha [Elaina.Smouha[redacted]
Sent: Tuesday, 11 January 2011 4:09 PM
To: Brian Cooper Consulting
Cc: peter.allen[redacted]
Subject: FW: Technical Situation Reports
Attachments: Technical Situation Report W27.docx

Brian

Last outstanding report attached. You should now have a complete set.

Regards

Elaina

Elaina Smouha
Director, Governance and Regulatory Compliance
SEQ Water Grid Manager
Phone: [redacted] | Mobile: [redacted] | Fax: [redacted]
Email: elaina.smouha[redacted]
Visit: Level 15, 53 Albert Street Brisbane
Post: PO Box 16205, City East QLD 4002
ABN: 14783 317 630
76 (Trading as Seqwater).

TECHNICAL SITUATION REPORT

TSR Number	W27	Date of TSR release	2.1.2011	Time of TSR release	9.00am

Seqwater status of inflows and dam operations

Current status but could change based on inflows or rainfall.

Current objectives	• .	
Strategy	• Closed gates at 9am • Maintain levels through low level releases • All bridges should be out of water during Sunday, Colleges may be late Sunday.	
Key considerations	Storage levels:	Slightly above FSL
	Inflows:	Ongoing minor inflows
	Rainfall:	
	Lockyer/Bremer:	
	Brisbane River:	Initial reduction of releases will have started being observed in Brisbane River downstream by late Saturday night. By Sunday afternoon impact would be equivalent to around 50% of maximum release. By later Monday there should be no impact of releases as flows will have all passed.

Rainfall

There has been light falls of up to 30mm in the North Pine and Somerset Dam catchments in the 24 hours to 06:00 Sunday 2 January 2011 which has resulted in some runoff in the Stanley and Pine Rivers. The current BOM forecast for SE Qld over the next week is for light showers, although there is a chance of storms on Wednesday and Thursday next week.

The catchments remain wet and are likely to generate additional runoff in the event of rain.

Somerset Dam

The rain in the Stanley River catchment has produced minor inflows and one regulator is partially open, managing the small inflows.

At 07:30 on Sunday 2 January 2010, the lake level was EL 99.10m AHD and rising slowly. The peak of the event occurred around noon on Tuesday 28 December 2010 with a level of EL 100.0 m. The total volume of water released since the event commenced on 26 December 2010 is 135,000 ML.

Wivenhoe Dam

At 09:00 on Sunday 2 January 2011, Wivenhoe Dam level was EL 67.10 m and gates are fully closed

and fish recovery has commenced. Upon completion of this operation, a regulator will be fully opened to manage continuing low inflows to the dam.

The total volume of water released from Wivenhoe dam since the event commenced on 26 December 2010 is 480,000ML (includes inflows from Somerset Dam).

Impacts of Wivenhoe Dam Releases

Somerset Regional, Ipswich City and Brisbane City Councils have been advised of the closure.

It is expected that the flow in the mid Brisbane R will fall below Burtons Bridge on Sunday morning and below Colleges Crossing by Monday morning. Twin Bridges will continue to be impact by the continuing low releases for several days.

Wivenhoe releases should have minimal impact on tides based on planned releases. BoM advice confirmed this earlier in the week. Impacts from Bremer and other inflows have mostly passed by this time. By later Monday virtually all releases will have passed through the system.

Seqwater Technical Officer name	Robert Drury
Seqwater Technical Officer position title	Dam Operations Manager
[redacted]	

BoM assessment

(consisting of references to latest Flood Warning for the Brisbane River and other relevant Bureau forecasts and warnings (e.g. weather/rain forecasts, Tropicol Cyclone Warning etc) and other updates/comments if needed)

BoM has been advised.

BoM Technical Officer name	Peter Baddiley
BoM Technical Officer position title	
BoM Technical Officer contact details	flood.qld[redacted]

Brisbane City Council (BCC) assessment

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised and do not have a problem with the new strategy.

BCC Technical Officer name	Chris Lavin
BCC Technical Officer position title	Disaster Operations Manager
BCC Technical Officer contact details	[redacted]

Ipswich City Council (ICC) assessment (if required)

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised and do not have a problem with the new strategy.

ICC Technical Officer name	Tony Trace
ICC Technical Officer position title	Local Disaster Response Coordinator
ICC Technical Officer contact details	[redacted]

Somerset Regional Council (SRC) assessment (if required)

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised and do not have a problem with the new strategy.

SRC Technical Officer name	Tony Jacobs
SRC Technical Officer position title	Local Disaster Response Coordinator
SRC Technical Officer contact details	[redacted]

Collated and distributed by (Agency)

Contact Officer signature	
Contact Officer name	Rob Drury
Contact Officer position title	Dam Operations Manager

Next TSR due	**Date**		**Time**		**or Event**

Suzie Emery

From: Elaina Smouha [Elaina.Smouha[redacted]
Sent: Tuesday, 11 January 2011 4:26 PM
To: Brian Cooper Consulting
Subject: RE: Draft agreement and terms of reference - Commercial in Confidence

Brian

I should clarify that below is Queensland time.

Thanks

Elaina

Elaina Smouha
Director, Governance and Regulatory Compliance
SEQ Water Grid Manager
Phone:[redacted] | Mobile:[redacted] | Fax:[redacted]
Email: elaina.smouha[redacted]
Visit: Level 15, 53 Albert Street Brisbane
Post: PO Box 16205, City East QLD 4002
ABN: 14783 317 630

From: Elaina Smouha
Sent: Tuesday, 11 January 2011 4:08 PM
To: 'Brian Cooper Consulting'
Cc: Barry Dennien
Subject: Draft agreement and terms of reference - Commercial in Confidence
Importance: High

Brian

Attached is a draft agreement for your consideration.

May I draw your attention to The Schedule, Annexure 1 – Terms of Reference and Annexure 2 – the Offer.

We appreciate you accommodating our tight timeframes. We have proposed the following deliverables and milestones. Please let me know if this will be an issue.

Deliverables and milestones

a) *Provision of a written preliminary advice by **9am, on 12 January 2011**.*
b) *Formal written report of final advice delivered to the Principal by **4pm, 12 January 2011**.*

Feel free to contact me with any questions or comments. If you are fine with the attached I will organise for Barry to sign.

Regards

Elaina

Elaina Smouha
Director, Governance and Regulatory Compliance
SEQ Water Grid Manager
Phone:[redacted] | Mobile:[redacted] | Fax:[redacted]

Email: elaina.smouha[redacted]
Visit: Level 15, 53 Albert Street Brisbane
Post: PO Box 16205, City East QLD 4002
ABN: 14783 317 630

This email has been scanned by the Symantec Email Security.cloud service.
For more information please visit http://www.symanteccloud.com

Suzie Emery

From: Elaina Smouha [elainamir[redacted]]
Sent: Thursday, 2 February 2012 3:38 PM
To: Elaina Smouha
Subject: Fwd: Wivenhoe Dam Flood Ops
Attachments: SEQ WGM PrelimRep 12012011.docx

---------- Forwarded message ----------
From: **Brian Cooper Consulting** <brian.cooper.consult[redacted]>
Date: Wed, Jan 12, 2011 at 10:53 AM
Subject: Wivenhoe Dam Flood Ops
To: elainamir[redacted]

Dear Elaina,

Report attached as requested.

Regards,

Brian Cooper

P.O. Box 205, BELROSE WEST NSW 2085
phone: [redacted]
mobile [redacted]
email: brian.cooper.consult [redacted]
ABN: 56154707619

brian cooper consulting

12 January 2011

Mr. Barry Dennien
CEO, SEQ Water Grid Manager
PO Box 16205
City East QLD 4002

Dear Barry,

This letter report:

- presents my preliminary findings on a review of the operation of Wivenhoe Dam (including controlled releases) for compliance against the Flood Mitigation Manual for the period 12 December 2010 to date (Flood Event), and;
- provides initial advice on the prudence and appropriateness of the decisions and actions taken during the Flood Event regarding the operation of Wivenhoe Dam in light of the Flood Mitigation Manual's requirements and the circumstances of the Flood Event.

The findings and advice are provided on the basis of information provided by SEQ Water Grid Manager which comprised the Flood Mitigation Manual and Technical Situation Reports. The latter were daily (sometimes twice daily) reports for the subject period. They gave a log of rainfall over the dam catchments and the downstream river (Lockyer Ck. And Bremer R.) catchments; inflows to Somerset and Wivenhoe Dams; storage levels; releases from the dams; details of the operation of gates and other outlets (gate openings/discharges); proposed changes in operating strategies and impacts on the various access crossings downstream of Wivenhoe Dam. In reviewing the Technical Situation Reports, I prepared a spreadsheet summarising the reports so that a timeline of the Flood Event could be seen at a glance. This provided a good overview of the Flood Event as it unfolded.

The main aspects of the Flood Mitigation Manual are the various strategies for operating Wivenhoe Dam and Somerset Dam as well as a number of requirements relating to flood operations personnel, flood preparedness and flood training.
At Wivenhoe Dam there are four main strategies for operating the dam (W1 to W4) and at Dam there are three (S1 to S3). These strategies are hierarchical and are based on a number of flood objectives. These in descending order of importance, are:

- Ensure the structural safety of the dams;
- 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 (FSL) at the conclusion of the Flood Event, and;

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

Normal procedures require a return to FSL within 7 days of the flood event peak passing through the dams so that the potential effects of closely spaced Flood Events can be allowed for.

It is apparent from the Technical Situation Reports that emphasis has been given to communicating changes in flood operations strategies with local authorities and the Bureau of Meteorology (BOM).

Until the last day or so, Wivenhoe Dam has been below EL74.0 and accordingly, would be operating under Strategy W1 i.e. make releases such that bridges downstream of the dam do not have to be closed prematurely. At various times during the Flood Event some of the downstream bridges have been closed. However, it is evident that action has been taken to vary dam releases such that various bridges could be re-opened as soon as possible. This appears to have been done in accordance with the flood operating strategies.

Over the last couple of days, the storage level in Wivenhoe Dam has increased to above EL 74.0 and the storage level in Somerset Dam is at EL 103.3 and is rising. This situation would demand strategy W3 for Wivenhoe Dam (*limit flow in the Brisbane River at Moggill to less than 4,000m^3/s*) and strategy S2 for Somerset Dam (*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 a graph. 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*). These strategies have been followed, although there appears to have been some discretion used in varying the releases from Somerset Dam (water has been held back in that dam). The last Technical Situation Report (W39 on 11/1/2011) however, indicated that there may need to be a move to Strategy W4 for Wivenhoe Dam (fuse plug triggering likely).

I conclude then, that the strategies as set out in the Flood Mitigation Manual have been followed, allowing for the discretion given to making variations in order to maximise flood mitigation effects. As a means of reviewing processes followed during a flood, it would be useful to present a timeline of the flood event showing graphs of storage levels, rainfall events, storage inflows, releases made and critical levels and discharges together with strategies adopted and projected strategies. The actions taken and decisions made during the Flood Event appear to have been prudent and appropriate in the context of the available knowledge available to those responsible for flood operations and the way events unfolded. I am informed by the Queensland Dam Safety Regulator (Peter Allen) that the various requirements of the Flood Mitigation Manual relating to requirements for flood operations personnel, flood preparedness and flood training have been adhered to.

Regards,

[redacted]

Brian Cooper

Suzie Emery

From: Elaina Smouha [elainamir[redacted]]
Sent: Thursday, 2 February 2012 2:57 PM
To: Elaina Smouha
Subject: Fwd: Dam storage data

---------- Forwarded message ----------
From: **Elaina Smouha** <elainamir[redacted]>
Date: Wed, Jan 12, 2011 at 10:56 AM
Subject: Dam storage data
To: brian.cooper.consult[redacted]

Hi Brian

Below is a link to Seqwater's website containing historical dam storage data.

Just scroll down to the bottom and you can get graphical representations of storage for each dam.

http://www.seqwater.com.au/public/dam-levels

Regards

Elaina

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For more information please visit http://www.symanteccloud.com

Suzie Emery

From: Elaina Smouha [elainamir[redacted]]
Sent: Thursday, 2 February 2012 3:38 PM
To: Elaina Smouha
Subject: Fwd: Wivenhoe Dam Flood Ops
Attachments: SEQ WGM PrelimRep 12012011.docx

---------- Forwarded message ----------
From: **Elaina Smouha** <elainamir[redacted]>
Date: Wed, Jan 12, 2011 at 11:03 AM
Subject: Fwd: Wivenhoe Dam Flood Ops
To: peter.allen[redacted]
Cc: bob.reilly[redacted]

Peter, Bob

Attached is a copy of Brian Cooper's preliminary advice which Barry requested that I forward to you.

Regards

Elaina

Elaina Smouha
Director, Governance and Regulatory Compliance
SEQ Water Grid Manager
Phone:[redacted] | Mobile:[redacted] | Fax:[redacted]
Email: elaina.smouha[redacted]
Visit: Level 15, 53 Albert Street Brisbane
Post: PO Box 16205, City East QLD 4002
ABN: 14783 317 630

---------- Forwarded message ----------
From: **Brian Cooper Consulting** <brian.cooper.consult[redacted]>
Date: Wed, Jan 12, 2011 at 10:53 AM
Subject: Wivenhoe Dam Flood Ops
To: elainamir[redacted]

Dear Elaina,

Report attached as requested.

Regards,

P.O. Box 205, BELROSE WEST NSW 2085
phone: [redacted]
mobile [redacted]
email: brian.cooper.consult [redacted]
ABN: 56154707619

brian cooper consulting

12 January 2011

Mr. Barry Dennien
CEO, SEQ Water Grid Manager
PO Box 16205
City East QLD 4002

Dear Barry,

This letter report:

- presents my preliminary findings on a review of the operation of Wivenhoe Dam (including controlled releases) for compliance against the Flood Mitigation Manual for the period 12 December 2010 to date (Flood Event), and;
- provides initial advice on the prudence and appropriateness of the decisions and actions taken during the Flood Event regarding the operation of Wivenhoe Dam in light of the Flood Mitigation Manual's requirements and the circumstances of the Flood Event.

The findings and advice are provided on the basis of information provided by SEQ Water Grid Manager which comprised the Flood Mitigation Manual and Technical Situation Reports. The latter were daily (sometimes twice daily) reports for the subject period. They gave a log of rainfall over the dam catchments and the downstream river (Lockyer Ck. And Bremer R.) catchments; inflows to Somerset and Wivenhoe Dams; storage levels; releases from the dams; details of the operation of gates and other outlets (gate openings/discharges); proposed changes in operating strategies and impacts on the various access crossings downstream of Wivenhoe Dam. In reviewing the Technical Situation Reports, I prepared a spreadsheet summarising the reports so that a timeline of the Flood Event could be seen at a glance. This provided a good overview of the Flood Event as it unfolded.

The main aspects of the Flood Mitigation Manual are the various strategies for operating Wivenhoe Dam and Somerset Dam as well as a number of requirements relating to flood operations personnel, flood preparedness and flood training.
At Wivenhoe Dam there are four main strategies for operating the dam (W1 to W4) and at Dam there are three (S1 to S3). These strategies are hierarchical and are based on a number of flood objectives. These in descending order of importance, are:

- Ensure the structural safety of the dams;
- 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 (FSL) at the conclusion of the Flood Event, and;

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

Normal procedures require a return to FSL within 7 days of the flood event peak passing through the dams so that the potential effects of closely spaced Flood Events can be allowed for.

It is apparent from the Technical Situation Reports that emphasis has been given to communicating changes in flood operations strategies with local authorities and the Bureau of Meteorology (BOM).

Until the last day or so, Wivenhoe Dam has been below EL74.0 and accordingly, would be operating under Strategy W1 i.e. make releases such that bridges downstream of the dam do not have to be closed prematurely. At various times during the Flood Event some of the downstream bridges have been closed. However, it is evident that action has been taken to vary dam releases such that various bridges could be re-opened as soon as possible. This appears to have been done in accordance with the flood operating strategies.

Over the last couple of days, the storage level in Wivenhoe Dam has increased to above EL 74.0 and the storage level in Somerset Dam is at EL 103.3 and is rising. This situation would demand strategy W3 for Wivenhoe Dam (*limit flow in the Brisbane River at Moggill to less than 4,000m^3/s*) and strategy S2 for Somerset Dam (*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 a graph. 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*). These strategies have been followed, although there appears to have been some discretion used in varying the releases from Somerset Dam (water has been held back in that dam). The last Technical Situation Report (W39 on 11/1/2011) however, indicated that there may need to be a move to Strategy W4 for Wivenhoe Dam (fuse plug triggering likely).

I conclude then, that the strategies as set out in the Flood Mitigation Manual have been followed, allowing for the discretion given to making variations in order to maximise flood mitigation effects. As a means of reviewing processes followed during a flood, it would be useful to present a timeline of the flood event showing graphs of storage levels, rainfall events, storage inflows, releases made and critical levels and discharges together with strategies adopted and projected strategies. The actions taken and decisions made during the Flood Event appear to have been prudent and appropriate in the context of the available knowledge available to those responsible for flood operations and the way events unfolded. I am informed by the Queensland Dam Safety Regulator (Peter Allen) that the various requirements of the Flood Mitigation Manual relating to requirements for flood operations personnel, flood preparedness and flood training have been adhered to.

Regards,

[redacted]

Brian Cooper

Suzie Emery

From: Elaina Smouha [elainamir[redacted]]
Sent: Thursday, 2 February 2012 3:36 PM
To: Elaina Smouha
Subject: Fwd: Rainfall data
Attachments: Wivenhoe Dam - 2011.pdf; Somerset Dam - 2010.pdf; Somerset Dam - 2011.pdf; Wivenhoe Dam - 2010.pdf

---------- Forwarded message ----------
From: **Elaina Smouha** <elainamir[redacted]>
Date: Wed, Jan 12, 2011 at 11:28 AM
Subject: Rainfall data
To: brian.cooper.consult[redacted]
Cc: peter.allen[redacted]

Brian

If it helps, rainfall information can be found on the following BOM website:
http://www.bom.gov.au/climate/data/index.shtml

Search by map or station no:
Somerset Dam: Station No. 040189
Wivenhoe Dam: Station No. 040763

Can access both 2010 and 2011 data. I have attached summary tables for these two sites for all of 2010 and Jan 2011 from the BOM website. You can access graphs for both of them on the website.

Regards

Elaina

Daily Rainfall (millimetres)

WIVENHOE DAM

Station Number: 040763 · State: QLD · Opened: 1986 · Status: Open · Latitude: 27.40°S · Longitude: 152.61°E · Elevation: 73 m

2011	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1st	*0*											
2nd												
3rd												
4th												
5th												
6th												
7th	*31.0*											
8th	*7.0*											
9th	*15.2*											
10th	*68.4*											
11th	*248.8*											
12th												
13th												
14th												
15th												
16th												
17th												
18th												
19th												
20th												
21st												
22nd												
23rd												
24th												
25th												
26th												
27th												
28th												
29th												
30th												
31st												
Highest daily	*248.8*											

↓ This day is part of an accumulated total
Quality control: 12.3 Done & acceptable, *12.3* Not completed or unknown

Product code: IDCJAC0009 reference: 03695651

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Daily Rainfall (millimetres)

WIVENHOE DAM

Station Number: 040763 · State: QLD · Opened: 1986 · Status: Open · Latitude: 27.40°S · Longitude: 152.61°E · Elevation: 73 m

Statistics for this station calculated over all years of data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Highest daily	*248.8*	119.0	124.0	57.8	101.4	47.8	32.2	*38.8*	33.0	*71.4*	76.6	69.8
Date of highest daily	11th 2011	15th 1997	6th 2004	14th 2009	2nd 1996	3rd 2008	27th 2001	11th 2010	25th 1998	12th 2010	8th 2004	24th 1997

1) Calculation of statistics

Summary statistics, other than the Highest and Lowest values, are only calculated if there are at least 20 years of data available.

2) Gaps and missing data

Gaps may be caused by a damaged instrument, a temporary change to the site operation, or due to the absence or illness of an observer.

3) Further information

http://www.bom.gov.au/climate/cdo/about/about-rain-data.shtml.

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Daily Rainfall (millimetres)

SOMERSET DAM

Station Number: 040189 · State: QLD · Opened: 1936 · Status: Open · Latitude: 27.11°S · Longitude: 152.56°E · Elevation: 113 m

2010	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1st	5.6	10.2	14.0	14.2								2.0
2nd	1.2	5.8	77.0							2.8		
3rd		1.8	66.0							1.2		0.4
4th	13.2	1.2	12.0		2.0						2.0	0.2
5th		0	1.0								1.6	47.0
6th		0	5.4	0.6					44.5			4.0
7th	1.0	26.0	44.0									8.8
8th		14.0	5.0				1.0			7.0		9.0
9th		2.0	0.5									1.0
10th		2.8								5.6		
11th		1.2						65.0		55.0		
12th		0	1.0		1.2					152.0		
13th		0	0.4	3.0								
14th		0	0.3									
15th		0	1.0						0.2			2.1
16th		9.0										
17th		30.6										32.0
18th		1.2	0.6		6.0							4.0
19th		0		4.0							29.0	
20th		0.8					2.8	13.0	9.0			58.4
21st		0		0.8				9.8	9.0			
22nd		5.6	0.4	19.6					2.0			
23rd		0										16.6
24th		0	1.2			11.0						3.2
25th		0			4.6				14.0	28.4		15.2
26th		0.6	1.0				2.8		2.0			7.0
27th		2.0							0.4	2.0		40.6
28th		11.8	0.8									35.6
29th	10.0						17.0		46.4	2.0		5.8
30th	3.4		2.6			3.0					6.0	
31st	2.4		2.0									
Highest daily	13.2	30.6	77.0	19.6	6.0	11.0	17.0	65.0	46.4	152.0	29.0	58.4
Monthly Total	36.8	126.6	236.2	42.2	13.8	14.0	23.6	87.8	127.5	256.0	38.6	292.9

Annual total for 2010 = 1296.0mm

↓ This day is part of an accumulated total
Quality control: 12.3 Done & acceptable, *12.3* Not completed or unknown

Product code: IDCJAC0009 reference: 03695603

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Daily Rainfall (millimetres)

SOMERSET DAM

Station Number: 040189 · State: QLD · Opened: 1936 · Status: Open · Latitude: 27.11°S · Longitude: 152.56°E · Elevation: 113 m

Statistics for this station calculated over all years of data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Mean	127.4	143.0	111.6	70.3	65.9	50.0	46.8	33.7	39.9	85.8	85.4	130.6
Median	119.0	111.8	90.0	46.9	51.9	34.7	31.9	22.5	32.8	67.9	76.8	114.2
Highest daily	186.2	276.2	156.5	130.0	147.6	99.1	191.3	*65.0*	53.6	*152.0*	114.0	165.1
Date of highest daily	27th 1974	9th 1999	25th 1946	12th 1988	20th 2009	23rd 1950	20th 1965	11th 2010	11th 1998	12th 2010	1st 1976	7th 1970

1) Calculation of statistics

Summary statistics, other than the Highest and Lowest values, are only calculated if there are at least 20 years of data available.

2) Gaps and missing data

Gaps may be caused by a damaged instrument, a temporary change to the site operation, or due to the absence or illness of an observer.

3) Further information

http://www.bom.gov.au/climate/cdo/about/about-rain-data.shtml.

Product code: IDCJAC0009 reference: 03695603 Created on Wed 12 Jan 2011 10:39:53 AM EST

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Daily Rainfall (millimetres)

SOMERSET DAM

Station Number: 040189 · State: QLD · Opened: 1936 · Status: Open · Latitude: 27.11°S · Longitude: 152.56°E · Elevation: 113 m

2011	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1st	*1.4*											
2nd	*8.6*											
3rd												
4th	*0.2*											
5th												
6th	*30.0*											
7th	*24.0*											
8th	*55.0*											
9th	*30.0*											
10th	*156.0*											
11th												
12th	*66.0*											
13th												
14th												
15th												
16th												
17th												
18th												
19th												
20th												
21st												
22nd												
23rd												
24th												
25th												
26th												
27th												
28th												
29th												
30th												
31st												
Highest daily	*156.0*											

↓ This day is part of an accumulated total
Quality control: 12.3 Done & acceptable, *12.3* Not completed or unknown

Product code: IDCJAC0009 reference: 03695608

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Daily Rainfall (millimetres)

SOMERSET DAM

Station Number: 040189 · State: QLD · Opened: 1936 · Status: Open · Latitude: 27.11°S · Longitude: 152.56°E · Elevation: 113 m

Statistics for this station calculated over all years of data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Mean	127.4	143.0	111.6	70.3	65.9	50.0	46.8	33.7	39.9	85.8	85.4	130.6
Median	119.0	111.8	90.0	46.9	51.9	34.7	31.9	22.5	32.8	67.9	76.8	114.2
Highest daily	186.2	276.2	156.5	130.0	147.6	99.1	191.3	*65.0*	53.6	*152.0*	114.0	165.1
Date of highest daily	27th 1974	9th 1999	25th 1946	12th 1988	20th 2009	23rd 1950	20th 1965	11th 2010	11th 1998	12th 2010	1st 1976	7th 1970

1) Calculation of statistics

Summary statistics, other than the Highest and Lowest values, are only calculated if there are at least 20 years of data available.

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3) Further information

http://www.bom.gov.au/climate/cdo/about/about-rain-data.shtml.

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Daily Rainfall (millimetres)

WIVENHOE DAM

Station Number: 040763 · State: QLD · Opened: 1986 · Status: Open · Latitude: 27.40°S · Longitude: 152.61°E · Elevation: 73 m

2010	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1st	0	15.6	8.4	23.0	0	0	0.4	0	0	0	0	3.8
2nd	1.6	0.8	58.0	10.6	0	1.2	0	0	0	0.8	0	21.0
3rd	1.2	0.4	16.4	0	0	0.2	9.4	0	0	6.8	0	0.4
4th	9.0	0	4.4	0	2.4	0.4	0	0	0	0	1.6	2.2
5th	0	0	1.4	0	1.4	0	0	0	2.6	3.0	1.4	18.0
6th	0	0	4.8	0	0	0	0	0	30.8	0	0	2.4
7th	0	18.0	3.6	0	0	0	0	0	0	0	0	2.6
8th	4.4	5.4	1.8	0	0	0	1.0	0	0	0	0	4.6
9th	2.8	0	3.4	0	0	0	0	0	0	26.2	0	0
10th	0	13.0	0	0	0	0	0	1.2	0	1.4	0	0
11th	0	0.6	0	0	0	0	0	38.8	5.6	57.6	0	0
12th	0	0	0	0	1.6	0	0	0	0	71.4	0	5.4
13th	0	0	0	2.2	0	0	0	0	0	0.8	0	0.4
14th	0	0	2.2	0	0	0	0	0	0	0	0	0
15th	0	0	1.4	0	0	0	0	0	0.8	0	0	0
16th	0	30.6	0	0	0	0	0	0	0	17.2	0	0
17th	0	11.4	0	0	0	0	0	0	0	0	0	27.6
18th	11.6	0.6	0	0	0	0.6	0	0	0	0	0.8	0
19th	0	0	0	1.4	0	0	0	0	0.2	0	7.6	0
20th	0	0.4	0	0	0	0	1.8	8.8	10.2	0	0	46.8
21st	0	0	0	2.0	0.4	0	0	4.2	12.2	0.8	0	0
22nd	0	0	0	7.8	2.4	0	0	0	0.8	0	0.6	0
23rd	0	0	0	0	0	0	0	0	0.2	0	0	19.4
24th	0	0	0	0	0	2.8	0	16.6	0	0	2.8	0.4
25th	0	0	0	1.0	2.0	0	0	0	8.8	26.0	1.6	8.0
26th	0	0	5.6	0	0	0	2.0	0	0	0	1.0	8.6
27th	0	0.4	0	0	0	0	0	0	0	8.0	0.4	40.4
28th	0	2.0	0.2	0	0	0	1.4	0	0.2	0	0	18.4
29th	14.0		0	0	9.2	0	17.4	0	9.8	0	0	0
30th	1.8		0.4	0	1.8	4.6	0.6	0	2.4	0	2.8	0
31st	1.2		1.6		0		0	0		0		0
Highest daily	14.0	30.6	58.0	23.0	9.2	4.6	17.4	38.8	30.8	71.4	7.6	46.8
Monthly Total	47.6	99.2	113.6	48.0	21.2	9.8	34.0	69.6	84.6	220.0	20.6	230.4

Annual total for 2010 = 998.6mm

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180

Daily Rainfall (millimetres)

WIVENHOE DAM

Station Number: 040763 · State: QLD · Opened: 1986 · Status: Open · Latitude: 27.40°S · Longitude: 152.61°E · Elevation: 73 m

Statistics for this station calculated over all years of data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Highest daily	*248.8*	119.0	124.0	57.8	101.4	47.8	32.2	*38.8*	33.0	*71.4*	76.6	69.8
Date of highest daily	11th 2011	15th 1997	6th 2004	14th 2009	2nd 1996	3rd 2008	27th 2001	11th 2010	25th 1998	12th 2010	8th 2004	24th 1997

1) Calculation of statistics

Summary statistics, other than the Highest and Lowest values, are only calculated if there are at least 20 years of data available.

2) Gaps and missing data

Gaps may be caused by a damaged instrument, a temporary change to the site operation, or due to the absence or illness of an observer.

3) Further information

http://www.bom.gov.au/climate/cdo/about/about-rain-data.shtml.

Product code: IDCJAC0009 reference: 03695655 Created on Wed 12 Jan 2011 10:44:00 AM EST

Australian Government
Bureau of Meteorology

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We have taken all due care but cannot provide any warranty nor accept any liability for this information.
http://www.bom.gov.au/other/copyright.shtml

Suzie Emery

From: Elaina Smouha [elainamir[redacted]]
Sent: Thursday, 2 February 2012 3:36 PM
To: Elaina Smouha
Subject: Fwd: Communication Protocol for Flood Information
Attachments: Draft_Protocol_for_Communication_of_Flooding_Information_-_releases_from_Wivenhoe_Dam[1].docx

---------- Forwarded message ----------
From: **Elaina Smouha** <elainamir[redacted]>
Date: Wed, Jan 12, 2011 at 11:51 AM
Subject: Communication Protocol for Flood Information
To: brian.cooper.consult[redacted]
Cc: peter.allen[redacted]

Brian

Attached is a copy of the draft Protocol for the Communication of Flooding Information for the Brisbane River Catchment - including Floodwater Releases from Wivenhoe and Somerset Dams. This was developed in October/November last year.

While it is in draft, it is being followed by all relevant parties.

Regards

Elaina

Protocol for the Communication of Flooding Information for the Brisbane River Catchment - including Floodwater Releases from Wivenhoe and Somerset Dams

OBJECTIVE

The purpose of this protocol is to outline the arrangements for the Brisbane, Ipswich and Somerset Councils, relevant Queensland Government agencies and the Bureau of Meteorology, which will ensure the provision of consistent and robust information to the community, concerning potential flooding impacts for the Brisbane River catchment, including release of floodwater from Wivenhoe and Somerset Dams.

The intent is to ensure that consistent, harmonised information, based on an agreed single technical report, is communicated to the public in a way that contributes to resilient communities.

BACKGROUND

Queensland's disaster management arrangements, based on disaster management groups at local, district and state level, ensure the collaborative and effective coordination of information for all hazards.

Existing local, district and state disaster management and hazard-specific plans outline arrangements and structures for disaster management, or the hazard, and amongst other things, identify the need for coordination of public communications.

This protocol adds to such plans by outlining specific arrangements necessary when advice to the community needs to be based on technical assessments from hazard-specific primary agencies and other complementary stakeholders across federal, state and local governments.

Factors such as storm surges, tides, creek flooding, flooding from the lower Brisbane River, including Lockyer Creek and the Bremer River, will influence inundation levels in Brisbane.

Wivenhoe Dam controls approximately half of the Brisbane River catchment above Brisbane City. The operational strategy for water release from Wivenhoe and Somerset Dams is governed by the *Manual of Operational Procedures for Flood Mitigation at Wivenhoe Dam and Somerset Dam*, henceforth referred to as the Flood Mitigation Manual.

This protocol also covers the possibility that, during an above-average wet season, the water supply level of the dams may be marginally reduced, on a temporary basis, by small water releases. The water supply level would be returned to normal prior to the conclusion of the wet season, to avoid affecting water supply security. These changes, if they proceed, will ultimately be incorporated into the Flood Mitigation Manual.

GENERAL DECISION MAKING - GUIDING PRINCIPLES

- Protection of public safety is paramount throughout both this Protocol and the Flood Mitigation Manual;

- Impact on the community upstream or downstream is a legitimate consideration of any risk assessment;
- Regular and consistent communications within government and to the public, in relation to flooding impacts, are essential;
- Decision-making chains regarding the communications strategy and disaster management should remain flexible and highly responsive;
- The Flood Mitigation Manual is used to determine how Wivenhoe and Somerset Dams will be operated during flood events.
- This Protocol does not infringe the right of any party to issue information in line with their responsibilities.

PROCESS OF COMMUNICATION

There are three stages in the process of communication:

- Monitoring and Assessment
- Briefing and Activation
- Public Communications

Monitoring and Assessment

Communications with the public on flooding information, including floodwater releases, are based on a continuous process of monitoring and technical assessment. The process is dynamic and evolves according to the event, but will normally contain the following steps:

- Routine monitoring of weather events and dam levels by relevant agencies via established systems and procedures;

- The Bureau of Meteorology (BoM) provides weather forecasts and warnings (e.g. Tropical Cyclone, Severe Weather, Severe Thunderstorm, Flood). In the event of heavy rain and runoff in the Wivenhoe and/or Somerset Dam catchments, BoM and the Queensland Bulk Water Supply Authority (Seqwater) discuss modelled inflows to Wivenhoe and/or Somerset Dam, and downstream flood levels.

- Councils monitor, to the extent that they are able, creek levels, local runoff and flash flooding, consult with BoM and Seqwater on other potential events upstream that may contribute to and aggravate the situation.

- Seqwater discusses and models implications of the inflows on the necessary floodwater release from Wivenhoe Dam and/or Somerset Dam. The floodwater release strategy is a balance between releasing the water quickly enough so that the flood storage capacity is available if another major rain event occurs, versus minimising downstream flooding impacts (human safety and property damage) from the releases.

- Seqwater calculates the floodwater releases according to dam levels and predicted weather events in accordance with the Flood Mitigation Manual. A fundamental principle is that all floodwater should be released from the dams within seven days of the flood event peaking in Wivenhoe or Somerset Dam. This ensures the dams can cope with closely spaced major rain events.

- Seqwater shares predicted floodwater releases with BoM and with the Councils.

- Councils with the ability to monitor flooding share information on the status of

the Brisbane River catchment and its river systems with each other, BoM, Seqwater.

- BoM undertakes modelling of the Brisbane River catchment and its river systems using Seqwater advice of actual and projected Wivenhoe Dam and/or Somerset Dam releases when these are occurring, or are expected to occur.

- BoM participates in technical discussions with Seqwater, Brisbane City Council, Ipswich City Council and Somerset Regional Council as necessary, to share modelling results. The discussions aim to establish a technical agreement on the flood situation, on which public communications should be based.

- Councils with the necessary resources and expertise undertake modelling, form predictions, identify flood inundation areas and assess impacts for their communities, and regularly share this information with all relevant parties. Councils without the necessary resources and expertise will rely on information from other agencies to complete the impact assessment for their communities.

During this continuous process, it may become apparent to either BoM, local governments or Seqwater that the situation is likely to result in public safety issues.

These public safety issues may arise from a decision to release floodwater, a significant change in the severity and scope of the event, or a pre-agreed trigger-point being reached.

Any of the agencies may initiate the public communications process and engage with the disaster management arrangements as appropriate.

The trigger points for commencing public communication of flooding information are defined according to an agency's responsibilities.

The initiating agency will instigate a technical staff teleconference. Decisions from the teleconference will be distributed to senior management and media representatives of each agency.

In these circumstances all agencies agree that technical advice will form the basis of public communications messages.

- In every case of floodwater release from Wivenhoe or Somerset Dam, Seqwater coordinates the completion of the Technical Situation Report - TSR (Appendix C) and provides the Report to the SEQ Water Grid Manager (according to their Emergency Response Plan), and to relevant local governments.

- In other circumstances where a formal technical statement would enhance clarity, the local or state agency initiating the public communication of flooding information will pull together relevant information from other agencies in the form of a TSR. If initiated, the TSR should be circulated to all parties.

Briefing and Activation

If public safety is considered to be at risk, consideration will be given to the activation of the disaster management arrangements, if not already activated.

1. Councils will consider activating their Local Disaster Management Groups (LDMGs);

2. LDMGs will inform the relevant District Disaster Coordinators (DDCs);

3. The Queensland Police Service (QPS) will consider initiating disaster management actions as provided for under the *Disaster Management Act 2003*;

4. In the case of floodwater release:

   (a) the SEQ Water Grid Manager will alert the Director-General (DG) of the Department of Community Safety (DCS), DG Department of Environment and Resource Management (DERM), and the local governments

   (b) DG DCS will inform the DG of the Department of Premier and Cabinet (DPC) - the Chair of the State Disaster Management Group (SDMG) and will activate the State Disaster Coordination Centre (SDCC). DG DCS will also inform the Minister for Police, Corrective Services and Emergency Services

   (c) DG DERM will inform the Minister for Natural Resources, Mines and Energy

   (d) DG DPC will inform the Premier;

5. In the case of an extreme event, the Crisis Communications Network, chaired by DPC, may be activated at the direction of the SDMG Chair to coordinate public messaging from BoM, Seqwater, SEQ Water Grid Manager, QPS, relevant Councils and DCS as per this protocol;

6. In the case of a non-disaster, public communications will be in accordance with existing arrangements, supported, where appropriate, by this protocol.

Public Communications Issues

Each agency has its own responsibilities to issue information commensurate with their role without prior approvals. The obligation under this protocol is to share that information with other agencies and operate in a fully consultative process to ensure consistent public information.

The BoM, Local Governments and relevant State Government agencies agree to maintain continual discussions, to ensure that conflicting information is not released to the public at any time. Genuine efforts should be made to ensure consistency by basing public communications on technical reports. Inter-agency consultation should not cause delays in the issuance of public warnings. All agencies agree to exchange public communications at time of release. No power of veto to any organisation is implied under this protocol.

Harmonised public communications messages will be released from the following agencies:

- **Bureau of Meteorology -** concentrating on Flood Warnings which are widely disseminated to the BoM website, agencies and the media. BoM also participates in media (radio, television, newspaper) interviews to provide factual information regarding observed and forecast weather conditions, rainfalls and water levels;

- **Local Governments / Local Disaster Management Groups -** concentrating on the effects of weather related events and safety for their local communities and residents, and the impacts on councils' assets. Local governments have primacy of public communications within their community. Community service

announcements from local governments will be shared with the relevant agencies, prior to public release if time allows;

- **SEQ Water Grid Manager** - if floodwater releases from Wivenhoe and Somerset dams are involved, the SEQ Water Grid Manager concentrates on the communication aspects of release timings and duration of effects as the State's lead communication agency on floodwater release. Seqwater operational staff are to ensure that technical information is communicated to the SEQ Water Grid Emergency Response Team (if activated), the SEQ Water Grid Communications Unit and relevant local governments.

If necessary these will be augmented by:

- **Queensland Police Service** - concentrating on specific community safety messaging during operations;
- **Department of Community Safety** - concentrating on general safety matters regarding flooding;
- **Department of Premier and Cabinet (extreme events only)** - concentrating on consistent messages to media and agencies concerned.

Event-specific information will be released to the public as frequently as required by the severity and scope of the event. Timings of media releases will be dependent on the event, guided by the frequency of technical reports and may range from once a day to once an hour.

In the case of floodwater release from Wivenhoe and/or Somerset Dam, SEQ Water Grid Communications Unit will centrally track all communications and ensure they are shared. The unit will liaise with the following or their representatives over pubic safety messages:

- BoM;
- Seqwater;
- Councils' Media Directors;
- QPS Media Director; and
- DCS Media Director.

Questions from the Public

All questions from the public should be directed to the relevant local government in the first instance. Questions expressly relating to the event should be directed to the hazard-specific primary agency. Any questions relating to the release of floodwater should be directed to the SEQ Water Grid Communications Unit. Any queries about disaster management should be addressed by the relevant local and district disaster management groups.

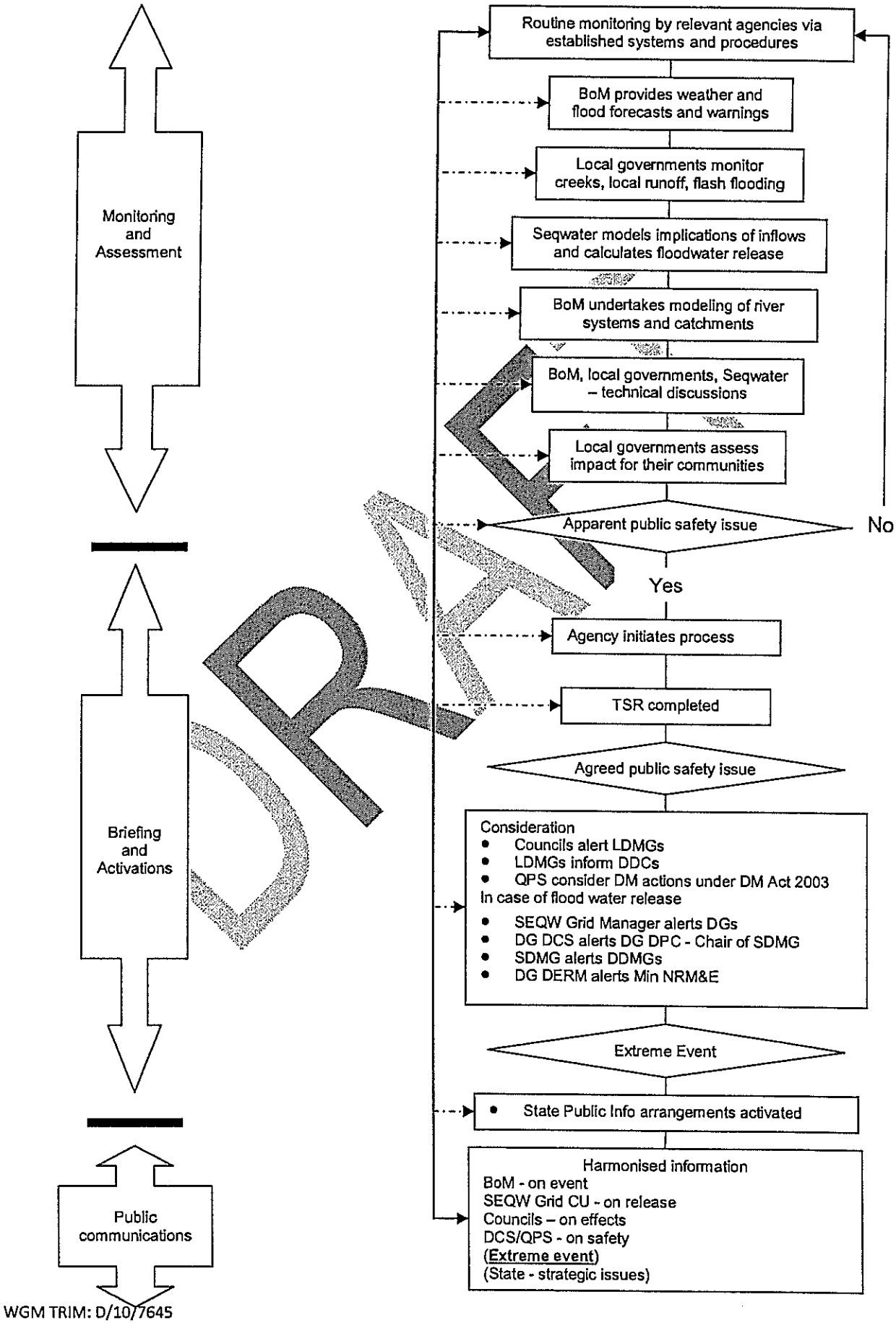
Protocol Maintenance

This protocol will be reviewed annually by agencies involved and exercised, during non-operational season, under DDMG arrangements.

The protocol should provide for a review after each event of what worked and could be improved for management of future events, to be led by DCS.

DRAFT

Communications process for the release of floodwater from Wivenhoe and Somerset Dams



DRAFT

WGM TRIM: D/10/7645

Appendix B

ROLES AND RESPONSIBILITIES

- The Bureau of Meteorology (BoM) is the agency responsible for issuing flood warnings for the Brisbane River and its major tributaries. These, when required, include rainfall forecasts for the Brisbane catchment and predicted river heights for Brisbane City, Ipswich, Jindalee and Moggill according to established procedures.

  River height predictions are agreed in consultation with Seqwater, Brisbane City Council (BCC), Ipswich City Council (ICC) and Somerset Regional Council (SRC), as required.

- Queensland Bulk Water Supply Authority (Seqwater) operates Wivenhoe and Somerset Dams in accordance with the Flood Mitigation Manual. It provides dam outflow information to BoM, to allow the development of Flood Warnings and to local authorities, to assist them in quantifying likely impacts within their areas.

  It informs BoM and other agencies on the status of dams, and actual and projected releases from Wivenhoe and Somerset dams. It consults BoM regarding inflows to Wivenhoe and Somerset dams and expected flood heights along the Brisbane River downstream of Wivenhoe Dam.

  Seqwater initiates proposed reviews or updates to the Flood Mitigation Manual, undertaking consultation with Councils and other stakeholders. Seqwater coordinates the production of the TSRs relating to floodwater releases from the Wivenhoe and Somerset dams.

- Brisbane City Council (BCC), Ipswich City Council (ICC) and Somerset Regional Council (SRC) distribute consistent, detailed local flood level information, both to their respective operational units, their senior management and their broader communities. This should include the interpretation of BoM flood warnings and river height forecasts into expected areas and depths of inundation. Councils are responsible for activating their respective Local Disaster Management Groups (LDMGs), which then undertake the disaster management responsibility for response in the community.

- Department of Environment and Resource Management (DERM) consults with the stakeholders prior to the approval of any updates to the Flood Mitigation Manual. DERM also approves any necessary variations to the strategies in the manual if required during the course of a flood event.

- Queensland Police Service (QPS) assumes a legislative role, as per the disaster management system, to provide disaster management at a district level during an event, including provision of necessary community advice for public safety.

- Emergency Management Queensland (EMQ) provides support and general community safety advice on flooding issues, during non-operational times.

- SEQ Water Grid Manager in the case of floodwater release alerts the Director-General (DG) of the Department of Community Safety (DCS), DG Department of Environment and Resource Management (DERM), and the local governments.

- SEQ Water Grid Communications Unit tracks the general harmonisation, but not specific detail of public messaging relating to floodwater releases, with BoM, SEQ Water Grid, Councils and DCS, as required. It does this by ensuring that each agency understands the extent of the release and that there is a general consensus as to the level of potential impacts.

Appendix C

TECHNICAL SITUATION REPORT

TSR Number		Date of TSR release		Time of TSR release	

This report is as at the time of assessment, and may quickly become out of date, depending on the current events. It relies on timely information provided by Seqwater, BoM and Councils. A reply will be required by a specified time and if not received by that time no information will be included. If any information is not provided, the section will remain blank. There will be no follow up requests.

Each authority will provide an email and telephone contact for all communications. If an event escalates, there may be less time to respond or it may not be possible to respond to requests.

In floodwater releases Seqwater will email advices on releases to the organisations email address provided. Once a flood event is initiated, at any time a Council or agency can contact Seqwater to discuss if they have a serious concern regarding the information on releases provided. This would normally be by phone and followed by email. However, the ability to respond to any queries depends on the event. The frequency of advices will depend on the severity of the event and the needs of each agency.

Seqwater will also request at that time, a situation assessment from each agency as per details outlined in this document. Each agency will then email in return the requested information if possible or advice that it has not changed. If it is not received within the specified timeframe, it is assumed it is not being provided.

DRAFT

Seqwater status of inflows and dam operations

(to include information on the current and/or predicted levels of Somerset and Wivenhoe Dams and the probable or planned release strategy with assessment as governed under the Manual of Operational Procedures for Flood Mitigation at Wivenhae Dam and Somerset Dam)

This is Seqwater's status report on the dam levels, probable inflows and planned releases.

.....

This has been supplied to
BCC on .....
ICC on .....
SRC on .....

Issues raised by Councils were .....

Actions taken were .....

Seqwater Technical Officer name	
Seqwater Technical Officer position title	
Seqwater Technical Officer contact details	

DRAFT

BoM assessment

(consisting of references to latest Flood Warning for the Brisbane River and other relevant Bureau forecasts and warnings (e.g. weather/rain forecasts, Tropical Cyclone Warning etc) and other updates/comments if needed)

BoM is to provide either a copy of, or links to, their current information and other updates or comments if needed. This will be their current set of warnings and may be updated or changed at any time.

BoM Technical Officer name	
BoM Technical Officer position title	
BoM Technical Officer contact details	

Brisbane City Council (BCC) assessment

(to include predicted local inundation areas and depths of inundation based on the information)

This is an assessment as provided by BCC. A request for this information will be sent to the email address provided by BCC.

BCC Technical Officer name	
BCC Technical Officer position title	
BCC Technical Officer contact details	

Ipswich City Council (ICC) assessment (if required)

(to include predicted local inundation areas and depths of inundation based on the information)

This is an assessment as provided by ICC. A request for this information will be sent to the email address provided by ICC.

ICC Technical Officer name	
ICC Technical Officer position title	
ICC Technical Officer contact details	

Somerset Regional Council (SRC) assessment (if required)

(to include predicted local inundation areas and depths of inundation based on the information)

This is an assessment as provided by SRC. A request for this information will be sent to the email address provided by SRC.

SRC Technical Officer name	
SRC Technical Officer position title	
SRC Technical Officer contact details	

Collated and distributed by (Agency)

Contact Officer signature	
Contact Officer name	
Contact Officer position title	

Next TSR due	**Date**		**Time**		**or Event**

Suzie Emery

From: Elaina Smouha [elainamir[redacted]]
Sent: Thursday, 2 February 2012 3:38 PM
To: Elaina Smouha
Subject: Fwd: Wivenhoe Dam Flood Ops
Attachments: SEQ WGM PrelimRep 12012011.docx

---------- Forwarded message ----------
From: **Elaina Smouha** <elainamir[redacted]>
Date: Wed, Jan 12, 2011 at 2:15 PM
Subject: Fwd: Wivenhoe Dam Flood Ops
To: john.bradley[redacted], tim.watts[redacted], WGMExec[redacted]

John, Tim

Preliminary report as promised by Barry. Final report due COB today.

Regards

Elaina Smouha
Elaina Smouha
Director, Governance and Regulatory Compliance
SEQ Water Grid Manager
Phone:[redacted] | Mobile:[redacted] | Fax:[redacted]
Email: elaina.smouha[redacted]
Visit: Level 15, 53 Albert **Street** Brisbane
Post: PO Box 16205, City East QLD 4002
ABN: 14783 317 630

---------- Forwarded message ----------
From: **Elaina Smouha** <elainamir[redacted]>
Date: Wed, Jan 12, 2011 at 11:03 AM
Subject: Fwd: Wivenhoe Dam Flood Ops
To: peter.allen[redacted]
Cc: bob.reilly([redacted]

Peter, Bob

Attached is a copy of Brian Cooper's preliminary advice which Barry requested that I forward to you.

Regards

Elaina

Elaina Smouha
Director, Governance and Regulatory Compliance
SEQ Water Grid Manager
Phone:[redacted] | Mobile:[redacted] | Fax:[redacted]
Email: elaina.smouha[redacted]

Visit: Level 15, 53 Albert Street Brisbane
Post: PO Box 16205, City East QLD 4002
ABN: 14783 317 630

---------- Forwarded message ----------
From: **Brian Cooper Consulting** <brian.cooper.consult[redacted]>
Date: Wed, Jan 12, 2011 at 10:53 AM
Subject: Wivenhoe Dam Flood Ops
To: elainamir[redacted]

Dear Elaina,

Report attached as requested.

Regards,

Brian Cooper

P.O. Box 205, BELROSE WEST NSW 2085
phone: [redacted]
mobile: [redacted]
email: brian.cooper.consult[redacted]
ABN: 56154707619

brian cooper consulting

12 January 2011

Mr. Barry Dennien
CEO, SEQ Water Grid Manager
PO Box 16205
City East QLD 4002

Dear Barry,

This letter report:

- presents my preliminary findings on a review of the operation of Wivenhoe Dam (including controlled releases) for compliance against the Flood Mitigation Manual for the period 12 December 2010 to date (Flood Event), and;
- provides initial advice on the prudence and appropriateness of the decisions and actions taken during the Flood Event regarding the operation of Wivenhoe Dam in light of the Flood Mitigation Manual's requirements and the circumstances of the Flood Event.

The findings and advice are provided on the basis of information provided by SEQ Water Grid Manager which comprised the Flood Mitigation Manual and Technical Situation Reports. The latter were daily (sometimes twice daily) reports for the subject period. They gave a log of rainfall over the dam catchments and the downstream river (Lockyer Ck. And Bremer R.) catchments; inflows to Somerset and Wivenhoe Dams; storage levels; releases from the dams; details of the operation of gates and other outlets (gate openings/discharges); proposed changes in operating strategies and impacts on the various access crossings downstream of Wivenhoe Dam. In reviewing the Technical Situation Reports, I prepared a spreadsheet summarising the reports so that a timeline of the Flood Event could be seen at a glance. This provided a good overview of the Flood Event as it unfolded.

The main aspects of the Flood Mitigation Manual are the various strategies for operating Wivenhoe Dam and Somerset Dam as well as a number of requirements relating to flood operations personnel, flood preparedness and flood training.
At Wivenhoe Dam there are four main strategies for operating the dam (W1 to W4) and at Dam there are three (S1 to S3). These strategies are hierarchical and are based on a number of flood objectives. These in descending order of importance, are:

- Ensure the structural safety of the dams;
- 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 (FSL) at the conclusion of the Flood Event, and;

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

Normal procedures require a return to FSL within 7 days of the flood event peak passing through the dams so that the potential effects of closely spaced Flood Events can be allowed for.

It is apparent from the Technical Situation Reports that emphasis has been given to communicating changes in flood operations strategies with local authorities and the Bureau of Meteorology (BOM).

Until the last day or so, Wivenhoe Dam has been below EL74.0 and accordingly, would be operating under Strategy W1 i.e. make releases such that bridges downstream of the dam do not have to be closed prematurely. At various times during the Flood Event some of the downstream bridges have been closed. However, it is evident that action has been taken to vary dam releases such that various bridges could be re-opened as soon as possible. This appears to have been done in accordance with the flood operating strategies.

Over the last couple of days, the storage level in Wivenhoe Dam has increased to above EL 74.0 and the storage level in Somerset Dam is at EL 103.3 and is rising. This situation would demand strategy W3 for Wivenhoe Dam (*limit flow in the Brisbane River at Moggill to less than 4,000m^3/s*) and strategy S2 for Somerset Dam (*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 a graph. 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*). These strategies have been followed, although there appears to have been some discretion used in varying the releases from Somerset Dam (water has been held back in that dam). The last Technical Situation Report (W39 on 11/1/2011) however, indicated that there may need to be a move to Strategy W4 for Wivenhoe Dam (fuse plug triggering likely).

I conclude then, that the strategies as set out in the Flood Mitigation Manual have been followed, allowing for the discretion given to making variations in order to maximise flood mitigation effects. As a means of reviewing processes followed during a flood, it would be useful to present a timeline of the flood event showing graphs of storage levels, rainfall events, storage inflows, releases made and critical levels and discharges together with strategies adopted and projected strategies. The actions taken and decisions made during the Flood Event appear to have been prudent and appropriate in the context of the available knowledge available to those responsible for flood operations and the way events unfolded. I am informed by the Queensland Dam Safety Regulator (Peter Allen) that the various requirements of the Flood Mitigation Manual relating to requirements for flood operations personnel, flood preparedness and flood training have been adhered to.

Regards,

[redacted]

Brian Cooper

Suzie Emery

From: Elaina Smouha [elainamir[redacted]]
Sent: Thursday, 2 February 2012 3:38 PM
To: Elaina Smouha
Subject: Fwd: Wivenhoe Dam Flood Ops

---------- Forwarded message ----------
From: **Elaina Smouha** <elainamir[redacted]>
Date: Wed, Jan 12, 2011 at 2:24 PM
Subject: Re: Wivenhoe Dam Flood Ops
To: Brian Cooper Consulting <brian.cooper.consult[redacted]>

Brian,

Our work email system is still down, so could you please email through your final report to this email address?

Thanks

Elaina

On Wed, Jan 12, 2011 at 10:53 AM, Brian Cooper Consulting <brian.cooper.consult[redacted]> wrote:

Dear Elaina,

Report attached as requested.

Regards,

Brian Cooper

This email has been scanned by the Symantec Email Security.cloud service.
For more information please visit http://www.symanteccloud.com

Suzie Emery

From: Elaina Smouha [elainamir[redacted]]
Sent: Thursday, 2 February 2012 3:39 PM
To: Elaina Smouha
Subject: Fwd: Wivenhoe Dam Flood Ops
Attachments: SEQ WGM FinalRep 12012011.docx; TechReports - Summary.xlsx

---------- Forwarded message ----------
From: **Brian Cooper Consulting** <brian.cooper.consult[redacted]>
Date: Wed, Jan 12, 2011 at 3:31 PM
Subject: RE: Wivenhoe Dam Flood Ops
To: Elaina Smouha <elainamir[redacted]>

Dear Elaina,

Please find attached my final report. The attached spreadsheet is part of the report. Again, if you or Barry have any questions, please do not hesitate to call me.

Regards,

Brian Cooper

From: Elaina Smouha [mailto:elainamir[redacted]]
Sent: Wednesday, 12 January 2011 3:25 PM
To: Brian Cooper Consulting
Subject: Re: Wivenhoe Dam Flood Ops

Brian,

Our work email system is still down, so could you please email through your final report to this email address?

Thanks

Elaina

On Wed, Jan 12, 2011 at 10:53 AM, Brian Cooper Consulting <brian.cooper.consult[redacted]> wrote:

Dear Elaina,

Report attached as requested.

Regards,

Brian Cooper

P.O. Box 205, BELROSE WEST NSW 2085
phone: [redacted]
mobile: [redacted]
email: brian.cooper.consult[redacted]
ABN: 56154707619

brian cooper consulting

12 January 2011

Mr. Barry Dennien
CEO, SEQ Water Grid Manager
PO Box 16205
City East QLD 4002

Dear Barry,

This letter report:

- presents my final findings on a review of the operation of Wivenhoe Dam (including controlled releases) for compliance against the Flood Mitigation Manual for the period 12 December 2010 to date (Flood Event), and;
- provides advice on the prudence and appropriateness of the decisions and actions taken during the Flood Event regarding the operation of Wivenhoe Dam in light of the Flood Mitigation Manual's requirements and the circumstances of the Flood Event.

The report follows on from my preliminary report sent to you earlier today. The findings and advice are provided on the basis of information provided by SEQ Water Grid Manager which comprised the Flood Mitigation Manual and Technical Situation Reports. The latter were daily (sometimes twice daily) reports for the subject period. They gave a log of rainfall over the dam catchments and the downstream river (Lockyer Ck. and Bremer R.) catchments; inflows to Somerset and Wivenhoe Dams; storage levels; releases from the dams; details of the operation of gates and other outlets (gate openings/discharges); proposed changes in operating strategies and impacts on the various access crossings downstream of Wivenhoe Dam. In reviewing the Technical Situation Reports, I prepared a spreadsheet (see separate attachment of Excel spreadsheet *Tech Reports – Summary*, summarising the reports so that a timeline of the Flood Event could be seen at a glance. This provided a good overview of the Flood Event as it unfolded and showed what information may or may not have been included in a particular report. The Queensland Director Dam Safety (Water Supply) informed me that the Flood Operation Logs contain much more detailed information including details of the communications that were carried out and some of the more detailed information that is not necessarily included in the Technical Situation Reports. I have been provided with a draft of the "*Protocol for the Communication of Flooding Information for the Brisbane River Catchment – Including Floodwater Releases from Wivenhoe and Somerset Dams*" developed in October/November last year and currently being used. The Technical Situation Reports appear to have been an outcome of that Protocol.

The various requirements and required actions detailed in the Flood Mitigation Manual are summarised in the Table given in Attachment A. The Table also gives my comments (where appropriate) on whether there is evidence from the information presented to me, that there is satisfactory compliance with these requirements and actions.

The main aspects of the Flood Mitigation Manual are the various strategies for operating Wivenhoe Dam and Somerset Dam as well as a number of requirements relating to flood operations personnel, flood preparedness and flood training.

At Wivenhoe Dam there are four main strategies for operating the dam (W1 to W4) and at Dam there are three (S1 to S3). These strategies are hierarchical and are based on a number of flood objectives. These in descending order of importance, are:

- Ensure the structural safety of the dams;
- 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 (FSL) at the conclusion of the Flood Event, and;
- Minimise impacts to riparian flora and fauna during the drain down phase of the Flood Event.

Normal procedures require a return to FSL within 7 days of the flood event peak passing through the dams so that the potential effects of closely spaced Flood Events can be allowed for.

It is apparent from the Technical Situation Reports that emphasis has been given to communicating changes in flood operations strategies with local authorities and the Bureau of Meteorology (BOM).

Until the last day or so, Wivenhoe Dam has been below EL74.0 and accordingly, would be operating under Strategy W1 i.e. make releases such that bridges downstream of the dam do not have to be closed prematurely. For a few days at the end of December and for the last day or so before yesterday's big rise, Strategy W2 would be in place (restrain releases from Wivenhoe Dam such that Brisbane River flows are maintained within the upper limit of non-damaging floods at Lowood (3,500 m3/s)). At various times during the Flood Event some of the downstream bridges have been closed. However, it is evident that action has been taken to vary dam releases such that various bridges could be re-opened as soon as possible. This appears to have been done in accordance with the flood operating strategies. The operations then moved onto Strategy W4 when the storage in Wivenhoe Dam reached about EL 73.5 (before the W4 trigger level of EL 74) when yesterday's heavy rain came on and it was assessed that there was a chance that the first (central) fuse plug could be triggered. It was then a matter of juggling the radial gate openings in an attempt to circumvent any fuse plug triggering. A graph of storage levels for Wivenhoe and Somerset Dams (from information taken from the Technical Situation Reports) showing the limits for the various Wivenhoe Dam flood strategies is given in Attachment A. It is apparent from this graph, that the appropriate flood operation strategies were adopted. The Technical Situation Reports indicate that proposed changes in strategy were appropriately communicated with appropriate authorities in accordance with the new Communication Protocol.

Summary:

The Technical Situation Reports comply with the requirements of the new Communication Protocol. However, I feel that there could be more consistency in the information presented. There seem to be gaps in information presented such as storage levels (see spreadsheet and graph in Attachment A). It would be useful to specify the minimum information required to be presented in the Technical Situation Reports (storage levels, inflows, recent/current rainfall, forecast rainfall, releases from dams, estimated flows from downstream tributaries, current flood operating strategy for each dam and proposed change in strategy, gate and regulator operations, state of downstream road crossings etc). Most of the minimum information is already given, but not in a consistent manner. As a means of reviewing processes followed during a flood, it would be useful to present a timeline of the flood event showing graphs of storage levels and other data that can be easily presented in a graphical manner.

I am informed by the Queensland Director Dam Safety (Water Supply) that the various requirements of the Flood Mitigation Manual relating to requirements for flood operations personnel, flood preparedness and flood training have been adhered to. There are a number of other requirements however, that I am not able to say whether they were satisfied as I had insufficient information. These requirements (see Table in Attachment A) should be subject to a separate audit.

It appears to me that the decision to implement Strategy W4 was a prudent one. While it would cause some damage in the Brisbane River downstream, its implementation, considering forecast rainfalls

and projected flows in Lockyer Ck. And the Bremer River, would allow reduction of the storage level in Wivenhoe Dam. This reduction in storage level would hopefully provide a sufficient buffer that would minimise the chance of a fuse plug triggering in the auxiliary spillway. Triggering of the first (central) fuse plug would cause a sudden increase of flow of some 2,000m^3/s from Wivenhoe Dam. This increase in flow would cause significantly more flooding in the lower Brisbane River than that caused by early implementation of Strategy W4.

Conclusions:

The strategies as set out in the Flood Mitigation Manual have been followed, allowing for the discretion given to making variations in order to maximise flood mitigation effects. The actions taken and decisions made during the Flood Event appear to have been prudent and appropriate in the context of the available knowledge available to those responsible for flood operations and the way events unfolded.

There are a number of requirements where there was insufficient information for me to demonstrate compliance. However, satisfaction or otherwise of these requirements would have had little impact on the operation of the two dams during this particular Flood Event. They should be audited separately.

There are aspects of the Technical Situation Reports that could be improved and these have been discussed above.

Regards,

[redacted]

Brian Cooper

ATTACHMENT A

Action Requirements extracted from the Flood Mitigation Manual:

Action	Comment
The Flood Mitigation Manual contains the operational procedures for Wivenhoe Dam and Somerset Dam for the purposes of flood mitigation and must be used for the operation of the dams during flood events.	Appears to have been done
Sufficient numbers of suitably qualified personnel are available to operate the dams if a Flood Event occurs.	Director of Dam Safety is satisfied
The level of flooding as a result of emptying stored floodwaters after the peak has passed is to be less than the flood peak unless accelerated release is necessary to reduce the risk of overtopping.	Not sufficient information for me to say
A regular process of internal audit and management review must be maintained by Seqwater to achieve improvements in the operation of the RTFM.	Not sufficient information for me to say
Seqwater must maintain a log of the performance of the data collection network. The log must include all revised field calibrations and changes to the number, type and locations of gauges. Senior Flood Operations and Flood Operations Engineers are to be notified of all significant changes to the Log.	Not sufficient information for me to say
Seqwater must maintain a log of the performance of the RTFM. Any faults to the computer hardware or software are to be noted and promptly and appropriately attend to.	Not sufficient information for me to say
Seqwater must ensure that all available data and other documentation is appropriately collected and catalogued for future use.	Not sufficient information for me to say
Seqwater must ensure that information relevant to the calibration of its field stations is shared with appropriate agencies.	Not sufficient information for me to say
Seqwater must liaise and consult with these agencies with a view to ensuring all information relative to the flood event is consistent and used in accordance with agreed responsibilities: • Bureau of Meteorology (issue of flood warnings for Brisbane River basin); • Department of Environment and Resource Management (review of flood and discretionary powers); • Somerset Regional Council (flood level information for upstream of Somerset Dam and upstream and downstream of Wivenhoe Dam); • Ipswich City Council (flood level information for Ipswich), and; • Brisbane City Council (flood level information for Brisbane City).	Required also by draft of Communications Protocol. Technical Situation Reports infer compliance
Seqwater must report to the Chief Executive by 30 September each year on the training and state of preparedness of operations personnel.	Not sufficient information for me to say
Seqwater must provide a report to the Chief Executive by 30 September each year on the state of the Flood Monitoring and Forecasting System and Communication Networks.	Not sufficient information for me to say
After each significant flood event, Seqwater must report to the Chief Executive on the effectiveness of the operational procedures contained in this manual.	Pending?

Action	Comment
Prior to the expiry of the approval period, Seqwater must review the Manual pursuant to provisions of the Act.	Not sufficient information for me to say
Strategies are changed in response to changing rainfall forecasts and stream flow conditions to maximise the flood mitigation benefits of the dams.	Technical Situation Reports indicate that this is done
When determining dam outflows within all strategies, peak outflow should generally not exceed peak inflow.	Not sufficient information for me to say
Protocol for use of discretionary powers (i.e. who gets told)	Director of Dam Safety is satisfied – I don't know whether appropriate CEO's have approved

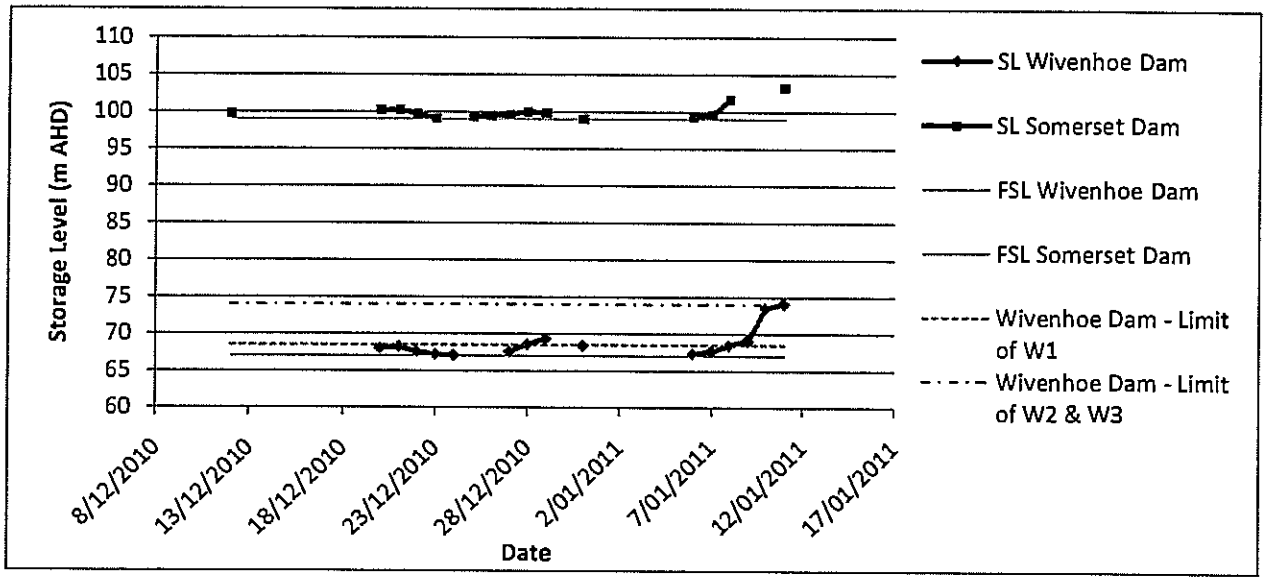
For a number of the above actions, there was not sufficient information for me to comment. These actions should be audited separately.

Action	Comment
Flood Strategies for Wivenhoe Dam:	
The intent of Strategy W1 is to not to submerge the bridges downstream of the dam prematurely (see Appendix I). The limiting condition for Strategy W1 is the submergence of Mt Crosby Weir Bridge that occurs at approximately 1,900 m^3/s . For situations where flood rains are occurring on the catchment upstream of Wivenhoe Dam and only minor rainfall is occurring downstream of the dam, releases are to be regulated to limit, as much as appropriate in the circumstances, downstream flooding.	Technical Situation Reports indicate that every attempt was made to keep the specified road crossings open
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 nondamaging floods at Lowood (3,500 m^3/s). In these instances, the combined peak river flows should not exceed those shown in the following table:	Technical Situation Reports indicate that Wivenhoe Dam releases were made considering concurrent
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	

Action	Comment
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.	flows in the Bremer River & Lockyer Ck. To delay damaging floods as long as possible
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 EL74.0 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. There are no restrictions on gate opening increments or gate operating frequency once the storage level exceeds EL74.0 AHD, as the safety of the dam is of primary concern at these storage levels.	Technical Situation Reports indicate that Wivenhoe Dam releases were such as to delay adopting this strategy as long as possible
Where possible, total releases during closure should not produce greater flood levels downstream than occurred during the flood event.	Technical Situation Reports indicate that this requirement was satisfied
The aim should always be to empty stored floodwaters stored above EL 67.0m within seven days after the flood peak has passed through the dams.	Technical Situation Reports indicate that emphasis was given to satisfying this requirement
Flow in the spillway to be as symmetrical as possible with the centre gates opened first.	Technical Situation Reports indicate that this was done
The bottom edge of the radial gates must always be at least 500mm below the release flow surface.	Not sufficient information for me to say

Action	Comment
Flood Strategies for Somerset Dam:	
The intent of Strategy S1 (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) 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.	Technical Situation Reports indicate that this was done
The intent of Strategy S2 (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). This to maximise the benefits of the flood storage capabilities of the dam while protecting the structural safety of both dams. The Flood Mitigation Manual contains a graph that shows the intended interaction of the Wivenhoe Dam and Somerset Dam storage levels.	Technical Situation Reports indicate that this was done – little information on the operation of the radial gates at Somerset Dam. How the graph was followed not really demonstrated
The intent of Strategy S3 (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) is to maximise the benefits of the flood storage capabilities of the dam while protecting the structural safety of both dams.	Not relevant at this stage
The safety of Somerset Dam is the primary consideration and cannot be compromised and its peak level cannot exceed EL 109.7.	Maximum level only EL103.3

Wivenhoe & Somerset Dams – Storage Level Behaviour (as presented in Technical Situation Reports)



Date	Time	TSR	Wivenhoe Dam Release (m^3/s)				Gate No.	Opening (m)	Storage Level	Rainfall (mm)
			Regulators	Hydro	Gates	Total				
12/12/2010	1400	W1								
13/12/2010	1300	W2		10	290	300				
15/12/2010	1800	W3								
16/12/2010	1600	W4			0					
17/12/2010	1200	W5								Large storms yesterday pm and night; 20-50 forecast tonight
17/12/2010	1800	W6	Closed		Opening Op. Initiated					20-50 forecast o/n
	1830			13	50	63	3	0.5		
18/12/2010	0700	W7								40-50 since 16/12/2010
19/12/2010	0700	W8			350	350	3	3.5		20-30 upper Brisbane R.
19/12/2010	1800	W9			300	300	3	3		
20/12/2010	0700	W10								
20/12/2010	0900	W11							68 expected this afternoon	
20/12/2010	0900	W12								
21/12/2010	0730	W13				peak 1,280 (0500)			peak 68.24 (0400); currently 68.22 (112% cap.) falling slowly currently @ 67.61 (107% cap.) falling slowly	
22/12/2010	0830	W14								none since 300 on 20/12/2010
22/12/2010	1600	W15			Closing sequence				to finish just>FSL	
23/12/2010	0800	W16			All gates expected to be closed by 1500				When gates closed, will be 67.2 (0.2m > FSL) & 50mm <gate opening trigger level	
23/12/2010	1430	W17			350		3	3.5	67.23	10-30 in CA over last 24 hrs.; further heavy rain expected to start on 29/12/2010
24/12/2010	0630	W18			All gates expected to be closed by 1300				67.07 expected when all gates closed	little or no rainfall
24/12/2010	1330	W19	4,200Ml/day from reg. & Hydro		Radial gate ops ceased @ 1300		3 zero			
25/12/2010	0930	W20								10-20 over last 24 hrs

26/12/2010	0800 W21					Rel. minor over last 24 hrs.
27/12/2010	0800 W22					40-50 over dam CA last 24 hrs.
28/12/2010	0700 W23	347 (initially) then back to 46				20-40 over dam CA's ;ast 24 hrs
29/12/2010	0700 W24				69.26 (@ 0600) - aim is to return to FSL by 2/1/2011 69.33 peak yesterday @ 1200	No/very little in last 24 hrs.
30/12/2010	0700 W25	Wivenhoe+Lockyer = 1,600m^3/s			(2.3m > FSL) 69.07 this am	No/very little in last 24 hrs.
31/12/2010	0700 W26 W27	Wivenhoe+Lockyer = 1,600m^3/s			68.4 @ 0500	No/very little in last 24 hrs.
06/01/2011	1200 W28	Commence opening RG @ 1800 & ramp up to 300m^3/s by 2200			67.31 @ 0700	20-30 widespread with up to 50 on dam CA's
07/01/2011	0700 W29				67.64 @ 0600	30-50 with isolated falls up to 75; signif. Rain on Lock. Ck.
07/01/2011	1500 W30	Release started 1500 to be incr. slowly to ~1,200m^3/s by 1400 tomorrow				
08/01/2011	0700 W31	~890		All (5) RG's open	68.45 @ 0600 rising steadily	Widespread rain 20-40 over dam CA's since 0900 yesterday; further high rainfall predicted for next 4 days
09/01/2011	0700 W32 W33		1,343		Currently 68.58 (falling slowly)	For last 12 hrs. av. of 40 for Somerset CA & <10 for Wivenhoe CA
09/01/2011	2100 W34		1,400		Currently @ 69.1;	Very heavy rainfall -totals for 24 hrs 100 - 300; Severe weather warning for heavy rainfall

		W35				
		W36				
		W37				
11/01/2011	0630	W38	2,750 since 1930 on 10/1/2011	All (5) gates	73.51 rising @ 25mm/hr.	20-60 last 12 hrs in Lockyer CA; 30 in Bremer R.; isol. Falls of 125 in upper Brisbane R. & widespread falls of 40 - 70 in Somerset CA
11/01/2011	1200	W39	3,970		74.1 (179.5% cap.) rising @ 25mm/hr.	

Comments	Crossing Closures
45,000Ml from Somerset; WL|Somerset to peak at 99.7 on 13/12/2010; 150m^3/s expected through Brisbane; 30,000Ml expected into Wivenhoe from upper Brisbane R.; peak WL in Wivenhoe expected to be 67.6; Releases expected from Wivenhoe on afternoon of 13/12/2010 ramping up to 300m^3/s; Reg. will be closed & Gate 3 opened to 3m to get WL back to 67.25; Incr. release will impact on 3 crossings; Dam Regulator informed	
138m^3/s from Somerset;	Gate release will impact on 3 crossings
Releases from Wivenhoe will cease on 16/12/2010; Hydro will continue during fish recovery ops.	
Gate closed 1000	
Decision to commence a release tonight was made this am by Duty Flood Engineers to provide as much notice to impacted Councils as possible; 60,000Ml needs to be released from Wivenhoe & Somerset to maintain FSL	
Need to release >60,000Ml from Wivenhoe & Somerset to achieve FSL	
Releases could increase to 300m^3/s;	Would impact Twin Bridges, Savages Crossing, Colleges Crossing
100,000Ml to be drained in next 4 days; Q|Brisbane R. to be maintained at 300-350m^3/s;Transfer from Somerset via 2 reg.; Wivenhoe Q incr. to 150m^3/s o/n; Will incr. further to 300m^3/s as Q|Lock.Ck. Subside over next 24 hrs.; Q|Lock.Ck. Currently 130m^3/s	Twin Bridges & Savages Crossing currently closed; Colleges Crossing to be impacted in afternoon
12,000Ml/day from Somerset; Release expected until 22/12/2010;	Twin Bridges, Savages Crossing, Colleges Crossing currently closed
Somerset rel. steady (Q|reg.=140m^3/s); Q|Wivenhoe to be maintained at 300m^3/s (Lock.Ck. Permitting) to allow Burtons Bridge to remain open; WL|Wivenhoe expected to incr. to 67.4 over next 2 days;	Twin Bridges, Savages Crossing and Colleges Crossing are closed; closing of Burtons Bridge and Kholo Bridge will be considered if more rain or inflows
Somerset risen to 100.2 - sluice gate releases to be made until am of 22/12/2010 when FSL expected; WL|Wivenhoe at 68 expected this pm; Q|Wivenhoe expected to be >1,200m^3/s - discuss with impacted Cncls.- strategy decision by 10000; Wivenhoe inflows excl. Q|Somerset peak tomorrow at 1800m^3/s	Both Burtons and Kholo bridges likely to be inundated
Inflow to Somerset to peak today at 700m^3/s; Somerset & Wivenhoe currently storing 140,000Ml above FSL; further inflows occurring; releases to be incr. o/n to ~1,200m^3/s; various Cncls. Given heads up; BOM advised	Wivenhoe releases reduced slightly to keep Burtons Bridge open - then incr. releases after Somerset RegnlCncl inform residents affected by Burtons Bridge
Same as W11	
410m^3/s from Somerset sluice gates; Somerset peaked @100.43 (1300 on 20/12/2010), currently @ 100.23 (114% of cap.); 110,700Ml inflow to Somerset,67,500Ml discharged into Wivenhoe; Wivenhoe inflow (excl. Somerset releases) = 157,900Ml, 103,000Ml released; Total inflow to both dams ~310,000Ml; Continued gate operations may be necessary if forecast rainfall results in subsequent river rises	Kholo Bridge is also expected to be inundated by mid-morning ; in accordance with the adopted operational strategy these bridges should be back in service by late Thursday and all bridges (with the possible exception of Twin Bridges) should be trafficable for Christmas providing no further rainfall occurs.
410m^3/s from Somerset sluice gates; Somerset currently @ 99.68 (108% cap.); 121,500Ml inflow to Somerset, 103,000Ml released to Wivenhoe; Gate Ops. @ Wivenhoe; High tides expected to coincide with peak levels in Brisbane R.	Burtons Bridge & Kholo Bridge expected to be back in service by 23-24/12/2010; All bridges expected to be trafficable by Xmas provided no further rain
BOM aware of all releases	Gate closing sequence to allow bridges to be accessible
	Projected crossing openings: Burtons Bridge – 18:00 Thursday 23 December 2010.
	Savages Crossing – 19:00 Thursday 23 December 2010
1 sluice open @ Somerset to be closed @ 0900 - WL will be 0.1m> FSL; Est. Inflow to Somerset 135,000ML, majority discharged into Wivenhoe; Gate closure ops @ Wivenhoe in progress; Wivenhoe inflow (excl. Somerset inflow) = 204,000Ml; A total of 324,000Ml has been released; Contd. gate ops may be necessary if forecast rain results in river rises; Gate closure ops sequence to be reviewed	Kholo Bridge – 21:00 Thursday 23 December 2010 Colleges Crossing – 08:00 Friday 23 December 2010
Somerset gate ops ceased @ 0900, WL @ 99.1; Gate closure sequence extended to pm of 24/12/2010; Contd. Gate ops may be necessary if forecast rainfall gives incr. river levels	Projected crossing openings: Burtons Bridge – 18:00 Thursday 23 December 2010, Kholo Bridge - 21:00 Thursday 23 December 2010; Other bridges expected to remain closed until Xmas Day
Gate ops @ Somerset ceased yesterday, reg. to be opened to bring lake to FSL; Gate ops continuing @ Wivenhoe -1 gate incr. every 5-6 hrs to ensure Brisbane R. Q not incr. due to incr. Lock. Ck. Outflows & maintain Burtons Bridge open;	Twin Bridges, Savages Crossing and Colleges Crossing are currently closed and should remain so for some time due in part to current outflows into the Brisbane River from Lockyer Creek that will peak in excess of 200 cumecs late today.
Flood Centre to monitor o/n & consider options tomorrow am based on inflows & rainfall; further gate ops may be necessary in coming days	Twin Bridges, Savages Crossing and Colleges Crossing may still be affected by flows from the Lockyer.
Somerset WL incr. from 99.18 yesterday @ 0600 to 99.33 @ 0730 today; 99.5 tomorrow if no gate ops.; Wivenhoe currently 4,200Ml through hydro & reg.; 15,00Ml expected just from upper Brisbane R. in next few days; WL cont. to fall in Lock. Ck; Small rises expected in Bremer & Warrill systems; WL in Wivenhoe incr. to 67.28 @ 600	Twin Bridges, Savages and Colleges Crossing remain impacted by Wivenhoe releases and Lockyer and local runoff. Burtons and Kholo Bridges would be currently unaffected. Kholo will no doubt still be closed by Council regarding repairs.

BOM issued severe weather warning @ 0 445; Somerset WL incr. to 99.46 (0.46m> FSL) - 2 regs. To be opened today (140m^3/s); Wivenhoe WL incr. to 67.37 (0.37m > FSL); RG to be opened later today following discussions with local authorities; further gate ops may be necessary if rainfall incr. river levels

BOM continues with severe weather warning & widespread rainfall over dam CA's; 2 regs. @ Somerset giving 139m^3/s release, lake contd. To rise to 99.6 (0.6m> FSL); RG ops @ Wivenhoe commenced yesterday @ 0900, WL contd. To rise to 67.57 (0.57m > FSL);Q|Wivenhoe reduced o/n because of incr. Q|Lockyer to ensure Burtons Bridge remains open; RG @ Wivenhoe wound back as Q|Lockyer incr. > 250m^3/s; Q|Lockyer expected to peak>500m^3/s later today/tomorrow - will innundate Burtons Bridge;When this happens, Q|Wivenhoe will be incr. to get WL back to FSL; further gate ops may be necessary in coming days

Sever weather warning no longer current; Somerset release through regs' ~ 208m^3/s;WL|Somerset incr. to 99.96 (0.96m>FSL) - inflows decreasing; RG opening dependent on Q|Lockyer; Wivenhoe WL currently @ 68.55 (1.55m > FSL); inflows to Wivenhoe decr.

Further 2 sluices opened @ Somerset; WL @ Somerset 99.83 & falling slowly, 2 sluices to be closed @ 1200; Intended to incr. Wivenhoe releases so Q|Wivenhoe+Q|Lockyer maintained @ 1,600m^3/s (similar Q to mid Oct &mid Dec 2010)

2 sluices @ Somerset remain open (405m^3/s) - FSL expected by 6/1/2011; RG closing sequence expected to start mid tomorrow- RG expected to be closed on 2/1/2011

WL @ Somerset 99.01 (falling from peak of 100.0 - 1200 28/12/2010) - currently 2 regs;

Somerset @ 99.34 (0.34m > FSL) & rising slowly; Wivenhoe 67.31 (0.31m > FSL) & rising slowly; Gates will be opened in next 24 hrs; Lockyer Ck peak of about 100m3/s Friday afternoon

100-200mm rain forecast for SE Qld next 5 days; Somerset WL @ 99.58 (0.59m > FSL) rising slowly - currently releasing 35m^3/s; Wivenhoe WL @ 67.64 (0.64m > FSL & > gate trigger level) rising slowly; u/s of dam river levels peaked @ Linville and Gregors Ck gauges; A peak of about 470 cumecs is expected from Lockyer Creek by mid-afternoon; Wivenhoe gate releases will occur after the impact of Lockyer flows on Burtons Bridge has been ascertained and flood levels in the lower Lockyer subside Q|Wivenhoe may be as high as 1,200m^3/s

Somerset releasing 35m^3/s; 50,000Ml into Somerset; Gate release @ Wivenhoe - strategy to be reviewed tomorrow (dependent on further rainfall)

Somerset WL @100.42 & rising (0500) - 1 open sluice gate; Water temp. held in Wivenhoe - strategy may need to be reviewed (depend. On confidence in estimates of Wivenhoe inflows); Intended to ramp Wivenhoe up to 1,200m^3/s by 1200 - likely to be incr. next week; since 2/1/2011, ~200,000Ml has flowed into Wivenhoe (incl. Somerset releases), further 180,000Ml expected based on recorded rainfall; ~ 50,000Ml released via reg. & hydro (@50m^3/s)

Somerset currently @ 100.27 - 60mm rain in last 2 hrs will cause significant inflow later today; 405m^3/s being released into Wivenhoe; maintain combined Q of 1,600m^3/s in mid-Brisbane R.
Not included

Somerset @ 101.68 rising quickly; 5 sluice gates open releasing ~1,100m^3/s; WL expected to reach 103.5 by am 11/1/2011; River levels u/s Wivenhoe rising fast; Q|Brisbane R. @ Gregors Ck @ 6,700m^3/s; Wivenhoe expected to reach 73.0 by 11/1/2011 - need to incr. Q|Wivenhoe am of 10/1/2011 - crank up to 2,600m^3/s by am 11/1/2011; Attempt to keep combined Q < 3,500m^3/s - < limit of urban damages in the City

Crossings downstream of the dam are currently impacted primarily by non-controlled river flows only (no RG releases from Wivenhoe). Lockyer Creek outflows into the Brisbane River are currently in the order of 60m^3/s. Twin Bridges, Savages and Colleges Crossings will be inundated but the plan is to release around 300-350m^3/s depending on flows downstream so as to not impact Burtons Bridge.

Twin Bridges, Savages Crossing and Colleges Crossing currently closed; Burtons Bridge is currently open, but will be closed later today/tomorrow; Kholo Bridge remains unserviceable due to flood damage; No current expectation that either Mt Crosby Weir Bridge or Fernvale Bridge will be impacted by the current event; An updated estimate of the time of closure of Burtons Bridge this afternoon will be provided to Council
RG discharge dropped back to 46m3/s to ensure Burtons Bridge can remain open; Twin Bridges, Savages Crossing, Colleges Crossing, Burtons Bridge and Kholo Bridge are currently closed; No current expectation that either Mt Crosby Weir Bridge or Fernvale Bridge will be impacted by the current event; Lockyer Creek outflows being closely monitored and may come close to impacting upon the Mt Crosby Weir Bridge; England Creek access is not impacted yet

Twin Bridges, Savages Crossing, Colleges Crossing, Burtons Bridge and Kholo Bridge are currently closed; no current expectation that Mt Crosby Weir Bridge or Fernvale Bridge will be impacted by current event. At this stage, estimated that the flow at Burtons Bridge will fall below the bridge deck on Sunday morning.

Twin Bridges, Savages Crossing, Colleges Crossing, Burtons Bridge and Kholo Bridge are currently closed
Twin Bridges, Savages Crossing, Colleges Crossing, Burtons Bridge and Kholo Bridge are currently closed due to inundation
Not included
Lockyer Ck peak of about 100m3/s Friday afternoon. This will take out Twin Bridges and nearly inundate Savages Crossing. Colleges Crossing could be taken out by a combined Lockyer and local runoff. Current strategy is to keep Burton Bridge free. Gate release would limit mid-Brisbane Q to 400m^3/s ((Burtons capacity 450m^3/s).
Q|Lockyer may be of sufficient magnitude to inundate Burtons Bridge; Somerset Regional Council, Ipswich City Council and Brisbane City Council have been advised of the potential for gate operations during the next 24 hours; The relatively high Lockyer flows will adversely impact upon Twin Bridges, Savages Crossing, and Colleges Crossing for several days, may also later impact upon Burtons Bridge & Kholo Bridge; not expected to be any adverse impacts upon Fernvale Bridge or Mt Crosby Weir Bridge; Councils have been advised of this strategy and are contacting residents

All of the crossings downstream of Wivenhoe with the exception of Fernvale and Mt Crosby Weir Bridge will be adversely impacted; Councils have been advised of this strategy and are contacting residents
The projected Wivenhoe release of 1,200m3/s combined with Lockyer flows and local runoff will mean that all crossings downstream of Wivenhoe (Twin Bridges, Savages Crossing, Burtons Bridge, Kholo Bridge and Colleges Crossing) will be adversely impacted for several days. At this stage Fernvale and Mt Crosby Weir Bridge are not expected to be affected but they could potentially be affected if the predicted rainfall totals eventuate.
The current Wivenhoe Dam release combined with Lockyer flows and local runoff will mean that all low level crossings downstream of Wivenhoe (Twin Bridges, Savages Crossing, Burtons Bridge, Kholo Bridge and Colleges Crossing) will be adversely impacted until at least Wednesday 12 January. At this stage Fernvale and Mt Crosby Weir Bridge are not expected to be affected, but this may be revised if the predicted rainfall totals eventuate and higher releases from Wivenhoe Dam are considered necessary. Cncls advised of Wivenhoe op. strategy

The projected Wivenhoe Dam releases combined with Lockyer flows and local runoff will mean that all crossings downstream of Wivenhoe (Twin Bridges, Fernvale, Savages Crossing, Burtons Bridge, Kholo Bridge, Mt Crosby Weir and Colleges Crossing) will be adversely impacted until at least Saturday 15 January in varying degrees; Water levels in the lower Brisbane R will be impacted by the combined flows of Lockyer Ck, Bremer River, local runoff and releases from Wivenhoe Dam

Not included
Not included
Not included

Somerset WL @ 103.27 & falling slowly ; currently 1,400m^3/s released to Wivenhoe- to be reduced to 500m^3/s later in the day - to ensure flood mitigation of Somerset & Wivenhoe are maximized; BOM provided advice on flash flooding in Lockyer Ck.; WL in Wivenhoe will reach 74 by evening; May need to increase Q further - may result inQ|lower Brisbane R. >5,000m^3/s

Somerset @ 103.3 & rising; Outflows into the Brisbane River from both Lockyer Creek and the Bremer River are also increasing; If no further rain, can hold @ 74.8 - aim is to prevent fuse plug triggering, situation assessed every 3 hrs.; Heavy rainfall continues throughout South East Queensland and the situation could deteriorate over the next 24 hours. The flood operation centre will continue to monitor the situation and provide situation reports every six hours until the situation stabilizes.

The projected Wivenhoe Dam releases combined with Lockyer Creek flows and local runoff will mean that all crossings downstream of Wivenhoe (Twin Bridges, Fernvale, Savages Crossing, Burtons Bridge, Kholo Bridge, Mt Crosby Weir and Colleges Crossing) will be adversely impacted; Water levels in the lower Brisbane River will be impacted by the combined flows of Lockyer Creek, Bremer River, local runoff and releases from Wivenhoe Dam.

Suzie Emery

From: Elaina Smouha [elainamir[redacted]]
Sent: Thursday, 2 February 2012 4:14 PM
To: Elaina Smouha
Subject: Fwd: Wivenhoe Dam Flood Ops
Attachments: January 2011 Dam Operations.pptx

---------- Forwarded message ----------
From: **Elaina Smouha** <elainamir[redacted]>
Date: Wed, Jan 12, 2011 at 4:45 PM
Subject: Re: Wivenhoe Dam Flood Ops
To: Brian Cooper Consulting <brian.cooper.consult[redacted]>

Thanks Brian.

In the process of going through the report and will call you shortly.

Attached is some information I recently received from Seqwater re flood peaks, volumes and hydrographs which might assist.

Regards

Elaina

On Wed, Jan 12, 2011 at 3:31 PM, Brian Cooper Consulting <brian.cooper.consult[redacted]> wrote:

Dear Elaina,

Please find attached my final report. The attached spreadsheet is part of the report. Again, if you or Barry have any questions, please do not hesitate to call me.

Regards,

Brian Cooper

From: Elaina Smouha [mailto:elainamir[redacted]]
Sent: Wednesday, 12 January 2011 3:25 PM
To: Brian Cooper Consulting
Subject: Re: Wivenhoe Dam Flood Ops

Brian,

Our work email system is still down, so could you please email through your final report to this email address?

Thanks

Elaina

On Wed, Jan 12, 2011 at 10:53 AM, Brian Cooper Consulting <brian.cooper.consult[redacted]> wrote:

Dear Elaina,

Report attached as requested.

Regards,

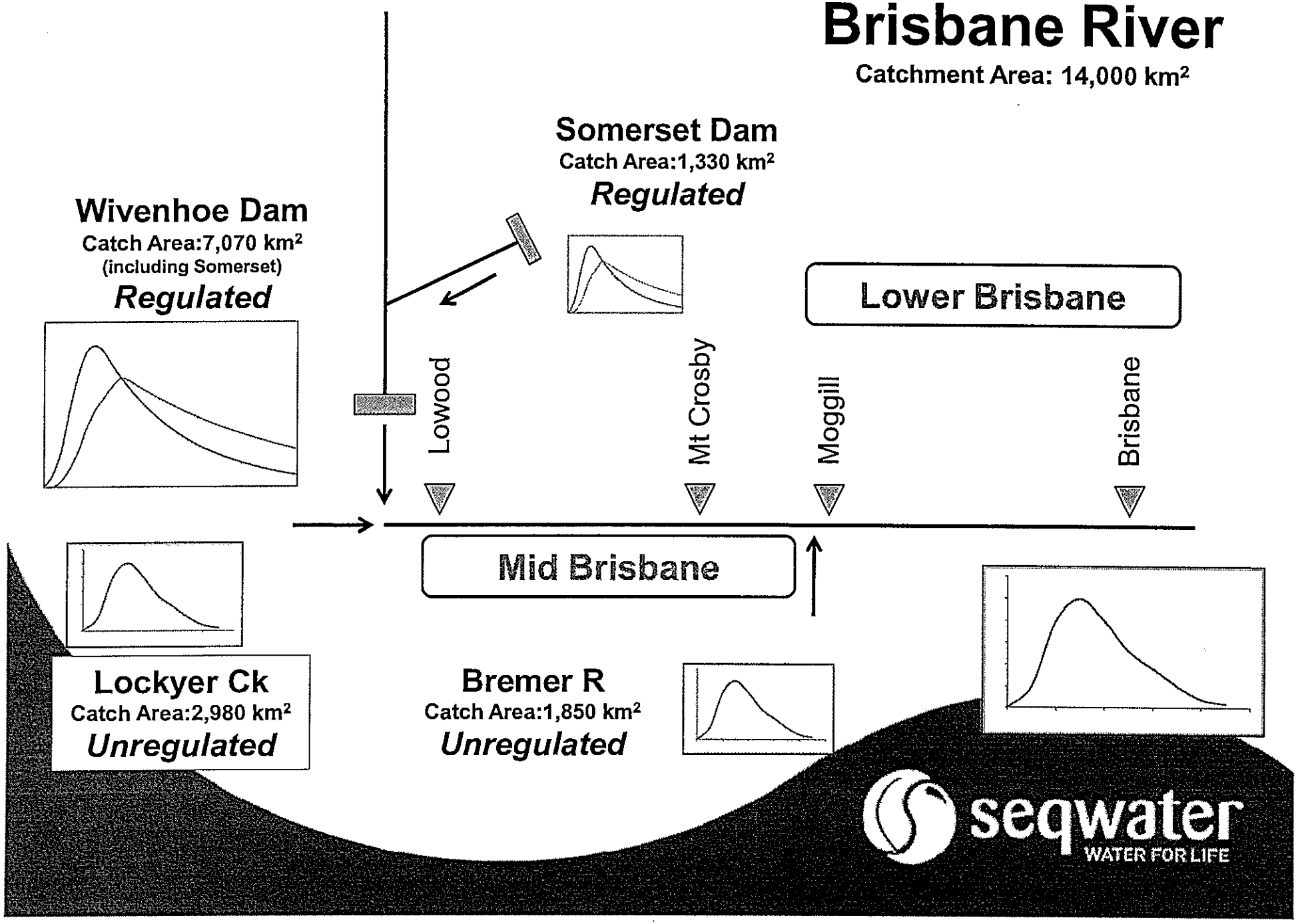
Brian Cooper

seqwater
WATER FOR LIFE

Flood Operations Centre
12 Jan 2011

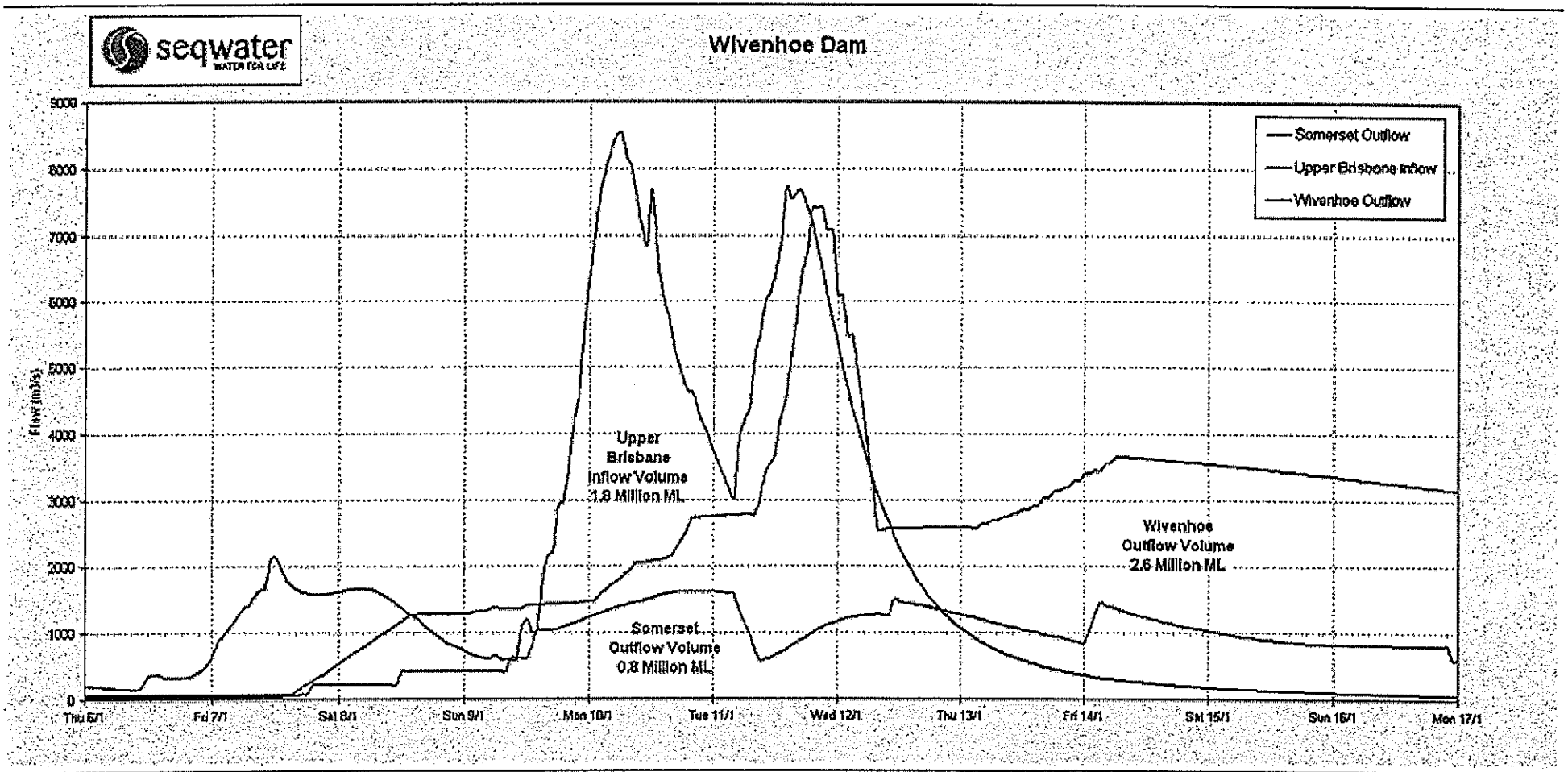
Brisbane River

Catchment Area: 14,000 km²



January 2011 Flood Event

Flood Volumes and Hydrographs



Volume of 1974 at Wivenhoe Dam Site
1.5 Million ML

seqwater
WATER FOR LIFE

January 2011 Flood Peaks

Location	Jan-74	Jan-11	
	With Somerset Dam	With Dams	Without Dams
	Peak Flow	Peak Flow	Peak Flow
	m3/s	m3/s	m3/s
Wivenhoe	5,100	7,400	13,000*
Brisbane	9,500	9,500*	13,000*

* Estimated

seqwater
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Suzie Emery

From: Elaina Smouha [elainamir[redacted]]
Sent: Thursday, 2 February 2012 3:39 PM
To: Elaina Smouha
Subject: Fwd: Wivenhoe Dam Flood Ops

---------- Forwarded message ----------
From: **Elaina Smouha** <elainamir[redacted]>
Date: Wed, Jan 12, 2011 at 5:35 PM
Subject: Re: Wivenhoe Dam Flood Ops
To: Brian Cooper Consulting <brian.cooper.consult[redacted]>

Brian

Just one minor typo, at the top of page two of the body of your report where you have the flood objectives listed, "Ensure the structural safety of the dams" appears twice.

Thanks

Elaina

On Wed, Jan 12, 2011 at 4:45 PM, Elaina Smouha <elainamir[redacted]> wrote:
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Sent: Wednesday, 12 January 2011 3:25 PM
To: Brian Cooper Consulting
Subject: Re: Wivenhoe Dam Flood Ops

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Thanks

Elaina

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Dear Elaina,

Report attached as requested.

Regards,

Brian Cooper

This email has been scanned by the Symantec Email Security.cloud service.
For more information please visit http://www.symanteccloud.com

Suzie Emery

From: Elaina Smouha [elainamir[redacted]]
Sent: Thursday, 2 February 2012 3:47 PM
To: Elaina Smouha
Subject: Fwd: Wivenhoe Dam Flood Ops
Attachments: SEQ WGM FinalRep 12012011.docx

---------- Forwarded message ----------
From: **Brian Cooper Consulting** <brian.cooper.consult[redacted]>
Date: Wed, Jan 12, 2011 at 7:04 PM
Subject: RE: Wivenhoe Dam Flood Ops
To: Elaina Smouha <elainamir[redacted]>

Dear Elaina,

Report amended as requested.

Regards,

Brian Cooper

From: Elaina Smouha [mailto:elainamir[redacted]]
Sent: Wednesday, 12 January 2011 6:36 PM

To: Brian Cooper Consulting
Subject: Re: Wivenhoe Dam Flood Ops

Brian

Just one minor typo, at the top of page two of the body of your report where you have the flood objectives listed, "Ensure the structural safety of the dams" appears twice.

Thanks

Elaina

On Wed, Jan 12, 2011 at 4:45 PM, Elaina Smouha <elainamir[redacted]> wrote:

Thanks Brian.

In the process of going through the report and will call you shortly.

Attached is some information I recently received from Seqwater re flood peaks, volumes and hydrographs which might assist.

Regards

Elaina

On Wed, Jan 12, 2011 at 3:31 PM, Brian Cooper Consulting <brian.cooper.consult[redacted]> wrote:

Dear Elaina,

Please find attached my final report. The attached spreadsheet is part of the report. Again, if you or Barry have any questions, please do not hesitate to call me.

Regards,

Brian Cooper

From: Elaina Smouha [mailto:elainamir[redacted]]
Sent: Wednesday, 12 January 2011 3:25 PM
To: Brian Cooper Consulting
Subject: Re: Wivenhoe Dam Flood Ops

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Thanks

Elaina

On Wed, Jan 12, 2011 at 10:53 AM, Brian Cooper Consulting <brian.cooper.consult[redacted]> wrote:

Dear Elaina,

Report attached as requested.

Regards,

Brian Cooper

P.O. Box 205, BELROSE WEST NSW 2085
phone: [redacted]
mobile: [redacted]
email: brian.cooper.consult[redacted]
ABN: 56154707619

brian cooper consulting

12 January 2011

Mr. Barry Dennien
CEO, SEQ Water Grid Manager
PO Box 16205
City East QLD 4002

Dear Barry,

This letter report:

- presents my final findings on a review of the operation of Wivenhoe Dam (including controlled releases) for compliance against the Flood Mitigation Manual for the period 12 December 2010 to date (Flood Event), and;
- provides advice on the prudence and appropriateness of the decisions and actions taken during the Flood Event regarding the operation of Wivenhoe Dam in light of the Flood Mitigation Manual's requirements and the circumstances of the Flood Event.

The report follows on from my preliminary report sent to you earlier today. The findings and advice are provided on the basis of information provided by SEQ Water Grid Manager which comprised the Flood Mitigation Manual and Technical Situation Reports. The latter were daily (sometimes twice daily) reports for the subject period. They gave a log of rainfall over the dam catchments and the downstream river (Lockyer Ck. and Bremer R.) catchments; inflows to Somerset and Wivenhoe Dams; storage levels; releases from the dams; details of the operation of gates and other outlets (gate openings/discharges); proposed changes in operating strategies and impacts on the various access crossings downstream of Wivenhoe Dam. In reviewing the Technical Situation Reports, I prepared a spreadsheet (see separate attachment of Excel spreadsheet *Tech Reports – Summary*, summarising the reports so that a timeline of the Flood Event could be seen at a glance. This provided a good overview of the Flood Event as it unfolded and showed what information may or may not have been included in a particular report. The Queensland Director Dam Safety (Water Supply) informed me that the Flood Operation Logs contain much more detailed information including details of the communications that were carried out and some of the more detailed information that is not necessarily included in the Technical Situation Reports. I have been provided with a draft of the "*Protocol for the Communication of Flooding Information for the Brisbane River Catchment – Including Floodwater Releases from Wivenhoe and Somerset Dams*" developed in October/November last year and currently being used. The Technical Situation Reports appear to have been an outcome of that Protocol.

The various requirements and required actions detailed in the Flood Mitigation Manual are summarised in the Table given in Attachment A. The Table also gives my comments (where appropriate) on whether there is evidence from the information presented to me, that there is satisfactory compliance with these requirements and actions.

The main aspects of the Flood Mitigation Manual are the various strategies for operating Wivenhoe Dam and Somerset Dam as well as a number of requirements relating to flood operations personnel, flood preparedness and flood training.

At Wivenhoe Dam there are four main strategies for operating the dam (W1 to W4) and at Dam there are three (S1 to S3). These strategies are hierarchical and are based on a number of flood objectives. These in descending order of importance, are:

- 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 (FSL) at the conclusion of the Flood Event, and;
- Minimise impacts to riparian flora and fauna during the drain down phase of the Flood Event.

Normal procedures require a return to FSL within 7 days of the flood event peak passing through the dams so that the potential effects of closely spaced Flood Events can be allowed for.

It is apparent from the Technical Situation Reports that emphasis has been given to communicating changes in flood operations strategies with local authorities and the Bureau of Meteorology (BOM).

Until the last day or so, Wivenhoe Dam has been below EL74.0 and accordingly, would be operating under Strategy W1 i.e. make releases such that bridges downstream of the dam do not have to be closed prematurely. For a few days at the end of December and for the last day or so before yesterday's big rise, Strategy W2 would be in place (restrain releases from Wivenhoe Dam such that Brisbane River flows are maintained within the upper limit of non-damaging floods at Lowood (3,500 m3/s)). At various times during the Flood Event some of the downstream bridges have been closed. However, it is evident that action has been taken to vary dam releases such that various bridges could be re-opened as soon as possible. This appears to have been done in accordance with the flood operating strategies. The operations then moved onto Strategy W4 when the storage in Wivenhoe Dam reached about EL 73.5 (before the W4 trigger level of EL 74) when yesterday's heavy rain came on and it was assessed that there was a chance that the first (central) fuse plug could be triggered. It was then a matter of juggling the radial gate openings in an attempt to circumvent any fuse plug triggering. A graph of storage levels for Wivenhoe and Somerset Dams (from information taken from the Technical Situation Reports) showing the limits for the various Wivenhoe Dam flood strategies is given in Attachment A. It is apparent from this graph, that the appropriate flood operation strategies were adopted. The Technical Situation Reports indicate that proposed changes in strategy were appropriately communicated with appropriate authorities in accordance with the new Communication Protocol.

Summary:

The Technical Situation Reports comply with the requirements of the new Communication Protocol. However, I feel that there could be more consistency in the information presented. There seem to be gaps in information presented such as storage levels (see spreadsheet and graph in Attachment A). It would be useful to specify the minimum information required to be presented in the Technical Situation Reports (storage levels, inflows, recent/current rainfall, forecast rainfall, releases from dams, estimated flows from downstream tributaries, current flood operating strategy for each dam and proposed change in strategy, gate and regulator operations, state of downstream road crossings etc). Most of the minimum information is already given, but not in a consistent manner. As a means of reviewing processes followed during a flood, it would be useful to present a timeline of the flood event showing graphs of storage levels and other data that can be easily presented in a graphical manner.

I am informed by the Queensland Director Dam Safety (Water Supply) that the various requirements of the Flood Mitigation Manual relating to requirements for flood operations personnel, flood preparedness and flood training have been adhered to. There are a number of other requirements however, that I am not able to say whether they were satisfied as I had insufficient information. These requirements (see Table in Attachment A) should be subject to a separate audit.

It appears to me that the decision to implement Strategy W4 was a prudent one. While it would cause some damage in the Brisbane River downstream, its implementation, considering forecast rainfalls and projected flows in Lockyer Ck. And the Bremer River, would allow reduction of the storage level in

Wivenhoe Dam. This reduction in storage level would hopefully provide a sufficient buffer that would minimise the chance of a fuse plug triggering in the auxiliary spillway. Triggering of the first (central) fuse plug would cause a sudden increase of flow of some 2,000m^3/s from Wivenhoe Dam. This increase in flow would cause significantly more flooding in the lower Brisbane River than that caused by early implementation of Strategy W4.

Conclusions:

The strategies as set out in the Flood Mitigation Manual have been followed, allowing for the discretion given to making variations in order to maximise flood mitigation effects. The actions taken and decisions made during the Flood Event appear to have been prudent and appropriate in the context of the available knowledge available to those responsible for flood operations and the way events unfolded.

There are a number of requirements where there was insufficient time given the urgency of this review, to source the necessary information for me to demonstrate compliance. However, satisfaction or otherwise of these requirements would have had little impact on the operation of the two dams during this particular Flood Event. It is intended that they be audited when time permits, after the Flood Event.

There are aspects of the Technical Situation Reports that could be improved and these have been discussed above.

Regards,

[redacted]

Brian Cooper

ATTACHMENT A

Action Requirements extracted from the Flood Mitigation Manual:

Action	Comment
The Flood Mitigation Manual contains the operational procedures for Wivenhoe Dam and Somerset Dam for the purposes of flood mitigation and must be used for the operation of the dams during flood events.	Appears to have been done
Sufficient numbers of suitably qualified personnel are available to operate the dams if a Flood Event occurs.	Director of Dam Safety is satisfied
The level of flooding as a result of emptying stored floodwaters after the peak has passed is to be less than the flood peak unless accelerated release is necessary to reduce the risk of overtopping.	See Note 1
A regular process of internal audit and management review must be maintained by Seqwater to achieve improvements in the operation of the RTFM.	See Note 1
Seqwater must maintain a log of the performance of the data collection network. The log must include all revised field calibrations and changes to the number, type and locations of gauges. Senior Flood Operations and Flood Operations Engineers are to be notified of all significant changes to the Log.	See Note 1
Seqwater must maintain a log of the performance of the RTFM. Any faults to the computer hardware or software are to be noted and promptly and appropriately attend to.	See Note 1
Seqwater must ensure that all available data and other documentation is appropriately collected and catalogued for future use.	See Note 1
Seqwater must ensure that information relevant to the calibration of its field stations is shared with appropriate agencies.	See Note 1
Seqwater must liaise and consult with these agencies with a view to ensuring all information relative to the flood event is consistent and used in accordance with agreed responsibilities: • Bureau of Meteorology (issue of flood warnings for Brisbane River basin); • Department of Environment and Resource Management (review of flood and discretionary powers); • Somerset Regional Council (flood level information for upstream of Somerset Dam and upstream and downstream of Wivenhoe Dam); • Ipswich City Council (flood level information for Ipswich), and; • Brisbane City Council (flood level information for Brisbane City).	Required also by draft of Communications Protocol. Technical Situation Reports infer compliance
Seqwater must report to the Chief Executive by 30 September each year on the training and state of preparedness of operations personnel.	See Note 1
Seqwater must provide a report to the Chief Executive by 30 September each year on the state of the Flood Monitoring and Forecasting System and Communication Networks.	See Note 1

Action	Comment
After each significant flood event, Seqwater must report to the Chief Executive on the effectiveness of the operational procedures contained in this manual.	It is too early for this action to be implemented. Will be implemented when the Flood Event is finished
Prior to the expiry of the approval period, Seqwater must review the Manual pursuant to provisions of the Act.	It is too early for this action to be implemented
Strategies are changed in response to changing rainfall forecasts and stream flow conditions to maximise the flood mitigation benefits of the dams.	Technical Situation Reports indicate that this is done
When determining dam outflows within all strategies, peak outflow should generally not exceed peak inflow.	Information from Seqwater indicates that the requirement was satisfied
Protocol for use of discretionary powers (i.e. who gets told)	Director of Dam Safety is satisfied – I don't know whether Seqwater CEO or Chairperson approved – See Note 1

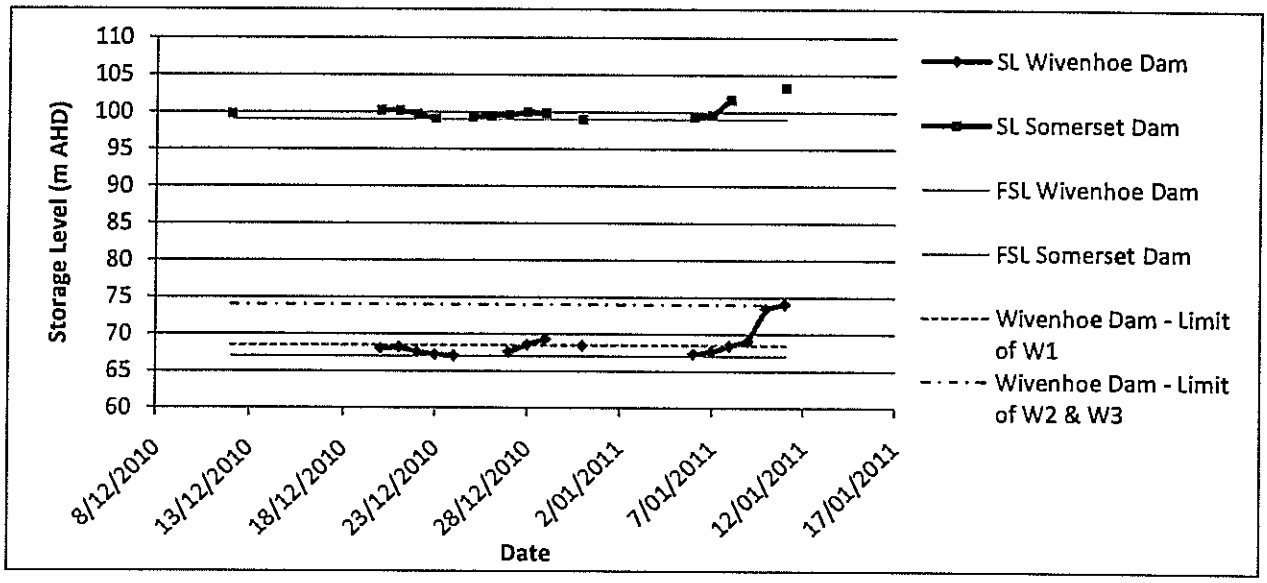
Note1: For a number of the above actions, given the short time frame for the review on compliance of actual flood operations with the Flood Mitigation Manual, it was not possible to source some of the information required to confirm that requirements had been fulfilled. These actions will be audited separately, when time permits.

Action	Comment
Flood Strategies for Wivenhoe Dam:	
The intent of Strategy W1 is to not to submerge the bridges downstream of the dam prematurely (see Appendix I). The limiting condition for Strategy W1 is the submergence of Mt Crosby Weir Bridge that occurs at approximately 1,900 m^3/s . For situations where flood rains are occurring on the catchment upstream of Wivenhoe Dam and only minor rainfall is occurring downstream of the dam, releases are to be regulated to limit, as much as appropriate in the circumstances, downstream flooding.	Technical Situation Reports indicate that every attempt was made to keep the specified road crossings open
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). In these instances, the combined peak river flows should not exceed those shown in the following table:	Technical Situation Reports indicate that Wivenhoe Dam releases were made considering concurrent flows in the Bremer River & Lockyer Ck. To delay damaging floods as long as possible
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.	
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 EL74.0 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. There are no restrictions on gate opening increments or gate operating frequency once the storage level exceeds EL74.0 AHD, as the safety of the dam is of primary concern at these storage levels.	Technical Situation Reports indicate that Wivenhoe Dam releases were such as to delay adopting this strategy as long as possible
Where possible, total releases during closure should not produce greater flood levels downstream than occurred during the flood event.	Technical Situation Reports indicate that this requirement was satisfied
The aim should always be to empty stored floodwaters stored above EL 67.0m within seven days after the flood peak has passed through the dams.	Technical Situation Reports indicate that

Action	Comment
	emphasis was given to satisfying this requirement
Flow in the spillway to be as symmetrical as possible with the centre gates opened first.	Technical Situation Reports indicate that this was done
The bottom edge of the radial gates must always be at least 500mm below the release flow surface.	See Note 1 above

Action	Comment
Flood Strategies for Somerset Dam:	
The intent of Strategy S1 (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) 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.	Technical Situation Reports indicate that this was done
The intent of Strategy S2 (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). This to maximise the benefits of the flood storage capabilities of the dam while protecting the structural safety of both dams. The Flood Mitigation Manual contains a graph that shows the intended interaction of the Wivenhoe Dam and Somerset Dam storage levels.	Technical Situation Reports indicate that this was done – little information on the operation of the radial gates at Somerset Dam. How the graph was followed not really demonstrated
The intent of Strategy S3 (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) is to maximise the benefits of the flood storage capabilities of the dam while protecting the structural safety of both dams.	Not relevant at this stage
The safety of Somerset Dam is the primary consideration and cannot be compromised and its peak level cannot exceed EL 109.7.	Maximum level only EL103.3

Wivenhoe & Somerset Dams – Storage Level Behaviour (as presented in Technical Situation Reports)



Gina O'Driscoll

From: Elaina Smouha [elainamir[redacted]]
Sent: Friday, 14 January 2011 5:25 PM
To: ken.smith[redacted]
Cc: Barry Dennien
Subject: Fwd: Flood Mitigation Manual review
Attachments: Scan 1.pdf; Brian Cooper - final report.docx; Brian Cooper - final report attachment.xlsx; Wivenhoe Dam Background_Briefing_Jan_2011[1].docx

Ken

Brian Cooper report and Seqwater brief as requested.

Regards

Elaina Smouha
SEQ Water Grid Manager

---------- Forwarded message ----------
From: **Elaina Smouha** <elainamir[redacted]>
Date: Thu, Jan 13, 2011 at 4:45 PM
Subject: Flood Mitigation Manual review
To: tim.watts[redacted]
Cc: john.bradley[redacted], ken.smith[redacted], barry.dennien[redacted]

Tim,

Attached is the independent review of Somerset and Wivenhoe Dam operations against the Flood Mitigation Manual and a briefing note from Seqwater on the development of the Manual.

Kind regards

Elaina

Elaina Smouha
Director, Governance and Regulatory Compliance
SEQ Water Grid Manager
Phone: [redacted] | Mobile: [redacted] | Fax: [redacted]
Email: elaina.smouha[redacted]
Visit: Level 15, 53 Albert Street Brisbane
Post: PO Box 16205, City East QLD 4002
ABN: 14783 317 630

SEQ Water Grid manager

Secure and efficient water through partnership and innovation

13 January 2011

The Honourable Stephen Robertson MP
Minister for Natural Resources, Mines and Energy
and Minister for Trade
PO Box 15216
Brisbane QLD 4002

Dear Minister

Independent review of Somerset and Wivenhoe Dam operations against the *Manual of Operational Procedures for Flood Mitigation at Wivenhoe Dam and Somerset Dam*

Attached is a final report from Mr Brian Cooper, Brian Cooper Consulting, on an independent review of the operation of Somerset and Wivenhoe Dams for compliance against Seqwater's *Manual of Operational Procedures for Flood Mitigation at Wivenhoe Dam and Somerset Dam* (Flood Mitigation Manual) during the current flood event.

Mr Cooper concludes that:

"The strategies as set out in the Flood Mitigation Manual have been followed, allowing for the discretion given to making variations in order to maximise flood mitigation effects. The actions taken and decisions made during the Flood Event appear to have been prudent and appropriate in the context of the available knowledge available to those responsible for flood operations and the way events unfolded."

Given the circumstances, we endeavoured to provide him with as much information as possible to enable a sufficient compliance review against the Flood Mitigation Manual. Mr Cooper identifies some Flood Mitigation Manual requirements where further information of compliance is required. In relation to these matters, Mr Cooper states:

"There are a number of requirements where there was insufficient time given the urgency of this review, to source the necessary information for me to demonstrate compliance. However, satisfaction or otherwise of these requirements would have had little impact on the operation of the two dams during this particular Flood Event. It is intended that they be audited when time permits, after the Flood Event."

PO Box 16205, City East Q 4002 Tel: [redacted] Fax: [redacted] www.seqwgm.qld.gov.au
ABN: 14 783 317 630

Also, attached is a summary from Mr Barton Maher, Seqwater, on the development history of the Flood Mitigation Manual, and in particular, the extensive peer review to which both the Flood Mitigation Manual and studies that fed the development of it were subject. For example:

- the Brisbane and Pine Rivers Flood Study underwent an internal review by the Water Resources Group and then went to an independent review panel comprising of Professor Colin Apelt, Head of Department, Department of Civil Engineering, University of Queensland; and Mr Eric Lesleighter, Principal Hydraulic Engineer and Chief Engineer Water Resources, Snowy Mountains Engineering Corporation
- the 2005/2006 Brisbane Valley Flood Damage Minimisation Study involved a Project Technical Review Group involving SEQWater Corporation, the Bureau of Meteorology, SunWater, Department of Natural Resources, Mining and Water Dam Safety Regulator and WRM Consultants
- the most recent 2009 review of the Flood Mitigation Manual was subject to an expert review panel comprising of The Bureau of Meteorology; SunWater (as operator of the Flood Control Centre); the Department of Environment and Resource Management Dam Safety Regulator and Brisbane City Council. The minor changes to the Flood Mitigation Manual were extensively tested to ensure that the flood mitigation outcomes were not compromised.

I hope this proves to be of assistance.

If you have any questions, please contact me on [redacted] or via email at barry.dennien[redacted]

Yours sincerely

[redacted]

Barry Dennien[redacted]
Chief Executive Officer

Cc: Mr John Bradley
Director-General
Department of Environment and Resource Management

P.O. Box 205, BELROSE WEST NSW 2085
phone: [redacted]
mobile [redacted]
email: brian.cooper.consult [redacted]
ABN: 56154707619

brian cooper

12 January 2011

Mr. Barry Dennien
CEO, SEQ Water Grid Manager
PO Box 16205
City East QLD 4002

Dear Barry,

This letter report:

- presents my final findings on a review of the operation of Wivenhoe Dam (including controlled releases) for compliance against the Flood Mitigation Manual for the period 12 December 2010 to date (Flood Event), and;
- provides advice on the prudence and appropriateness of the decisions and actions taken during the Flood Event regarding the operation of Wivenhoe Dam in light of the Flood Mitigation Manual's requirements and the circumstances of the Flood Event.

The report follows on from my preliminary report sent to you earlier today. The findings and advice are provided on the basis of information provided by SEQ Water Grid Manager which comprised the Flood Mitigation Manual and Technical Situation Reports. The latter were daily (sometimes twice daily) reports for the subject period. They gave a log of rainfall over the dam catchments and the downstream river (Lockyer Ck. and Bremer R.) catchments; inflows to Somerset and Wivenhoe Dams; storage levels; releases from the dams; details of the operation of gates and other outlets (gate openings/discharges); proposed changes in operating strategies and impacts on the various access crossings downstream of Wivenhoe Dam. In reviewing the Technical Situation Reports, I prepared a spreadsheet (see separate attachment of Excel spreadsheet *Tech Reports – Summary*, summarising the reports so that a timeline of the Flood Event could be seen at a glance. This provided a good overview of the Flood Event as it unfolded and showed what information may or may not have been included in a particular report. The Queensland Director Dam Safety (Water Supply) informed me that the Flood Operation Logs contain much more detailed information including details of the communications that were carried out and some of the more detailed information that is not necessarily included in the Technical Situation Reports. I have been provided with a draft of the "*Protocol for the Communication of Flooding Information for the Brisbane River Catchment – Including Floodwater Releases from Wivenhoe and Somerset Dams*" developed in October/November last year and currently being used. The Technical Situation Reports appear to have been an outcome of that Protocol.

The various requirements and required actions detailed in the Flood Mitigation Manual are summarised in the Table given in Attachment A. The Table also gives my comments (where appropriate) on whether there is evidence from the information presented to me, that there is satisfactory compliance with these requirements and actions.

The main aspects of the Flood Mitigation Manual are the various strategies for operating Wivenhoe Dam and Somerset Dam as well as a number of requirements relating to flood operations personnel, flood preparedness and flood training.

At Wivenhoe Dam there are four main strategies for operating the dam (W1 to W4) and at Dam there are three (S1 to S3). These strategies are hierarchical and are based on a number of flood objectives. These in descending order of importance, are:

- 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 (FSL) at the conclusion of the Flood Event, and;
- Minimise impacts to riparian flora and fauna during the drain down phase of the Flood Event.

Normal procedures require a return to FSL within 7 days of the flood event peak passing through the dams so that the potential effects of closely spaced Flood Events can be allowed for.

It is apparent from the Technical Situation Reports that emphasis has been given to communicating changes in flood operations strategies with local authorities and the Bureau of Meteorology (BOM).

Until the last day or so, Wivenhoe Dam has been below EL74.0 and accordingly, would be operating under Strategy W1 i.e. make releases such that bridges downstream of the dam do not have to be closed prematurely. For a few days at the end of December and for the last day or so before yesterday's big rise, Strategy W2 would be in place (restrain releases from Wivenhoe Dam such that Brisbane River flows are maintained within the upper limit of non-damaging floods at Lowood (3,500 m3/s)). At various times during the Flood Event some of the downstream bridges have been closed. However, it is evident that action has been taken to vary dam releases such that various bridges could be re-opened as soon as possible. This appears to have been done in accordance with the flood operating strategies. The operations then moved onto Strategy W4 when the storage in Wivenhoe Dam reached about EL 73.5 (before the W4 trigger level of EL 74) when yesterday's heavy rain came on and it was assessed that there was a chance that the first (central) fuse plug could be triggered. It was then a matter of juggling the radial gate openings in an attempt to circumvent any fuse plug triggering. A graph of storage levels for Wivenhoe and Somerset Dams (from information taken from the Technical Situation Reports) showing the limits for the various Wivenhoe Dam flood strategies is given in Attachment A. It is apparent from this graph, that the appropriate flood operation strategies were adopted. The Technical Situation Reports indicate that proposed changes in strategy were appropriately communicated with appropriate authorities in accordance with the new Communication Protocol.

Summary:

The Technical Situation Reports comply with the requirements of the new Communication Protocol. However, I feel that there could be more consistency in the information presented. There seem to be gaps in information presented such as storage levels (see spreadsheet and graph in Attachment A). It would be useful to specify the minimum information required to be presented in the Technical Situation Reports (storage levels, inflows, recent/current rainfall, forecast rainfall, releases from dams, estimated flows from downstream tributaries, current flood operating strategy for each dam and proposed change in strategy, gate and regulator operations, state of downstream road crossings etc). Most of the minimum information is already given, but not in a consistent manner. As a means of reviewing processes followed during a flood, it would be useful to present a timeline of the flood event showing graphs of storage levels and other data that can be easily presented in a graphical manner.

I am informed by the Queensland Director Dam Safety (Water Supply) that the various requirements of the Flood Mitigation Manual relating to requirements for flood operations personnel, flood preparedness and flood training have been adhered to. There are a number of other requirements however, that I am not able to say whether they were satisfied as I had insufficient information. These requirements (see Table in Attachment A) should be subject to a separate audit.

It appears to me that the decision to implement Strategy W4 was a prudent one. While it would cause some damage in the Brisbane River downstream, its implementation, considering forecast rainfalls and projected flows in Lockyer Ck. And the Bremer River, would allow reduction of the storage level in

Wivenhoe Dam. This reduction in storage level would hopefully provide a sufficient buffer that would minimise the chance of a fuse plug triggering in the auxiliary spillway. Triggering of the first (central) fuse plug would cause a sudden increase of flow of some 2,000m^3/s from Wivenhoe Dam. This increase in flow would cause significantly more flooding in the lower Brisbane River than that caused by early implementation of Strategy W4.

Conclusions:

The strategies as set out in the Flood Mitigation Manual have been followed, allowing for the discretion given to making variations in order to maximise flood mitigation effects. The actions taken and decisions made during the Flood Event appear to have been prudent and appropriate in the context of the available knowledge available to those responsible for flood operations and the way events unfolded.

There are a number of requirements where there was insufficient time given the urgency of this review, to source the necessary information for me to demonstrate compliance. However, satisfaction or otherwise of these requirements would have had little impact on the operation of the two dams during this particular Flood Event. It is intended that they be audited when time permits, after the Flood Event.

There are aspects of the Technical Situation Reports that could be improved and these have been discussed above.

Regards,

[redacted]

Brian Cooper

ATTACHMENT A

Action Requirements extracted from the Flood Mitigation Manual:

Action	Comment
The Flood Mitigation Manual contains the operational procedures for Wivenhoe Dam and Somerset Dam for the purposes of flood mitigation and must be used for the operation of the dams during flood events.	Appears to have been done
Sufficient numbers of suitably qualified personnel are available to operate the dams if a Flood Event occurs.	Director of Dam Safety is satisfied
The level of flooding as a result of emptying stored floodwaters after the peak has passed is to be less than the flood peak unless accelerated release is necessary to reduce the risk of overtopping.	See Note 1
A regular process of internal audit and management review must be maintained by Seqwater to achieve improvements in the operation of the RTFM.	See Note 1
Seqwater must maintain a log of the performance of the data collection network. The log must include all revised field calibrations and changes to the number, type and locations of gauges. Senior Flood Operations and Flood Operations Engineers are to be notified of all significant changes to the Log.	See Note 1
Seqwater must maintain a log of the performance of the RTFM. Any faults to the computer hardware or software are to be noted and promptly and appropriately attend to.	See Note 1
Seqwater must ensure that all available data and other documentation is appropriately collected and catalogued for future use.	See Note 1
Seqwater must ensure that information relevant to the calibration of its field stations is shared with appropriate agencies.	See Note 1
Seqwater must liaise and consult with these agencies with a view to ensuring all information relative to the flood event is consistent and used in accordance with agreed responsibilities: • Bureau of Meteorology (issue of flood warnings for Brisbane River basin); • Department of Environment and Resource Management (review of flood and discretionary powers); • Somerset Regional Council (flood level information for upstream of Somerset Dam and upstream and downstream of Wivenhoe Dam); • Ipswich City Council (flood level information for Ipswich); and; • Brisbane City Council (flood level information for Brisbane City).	Required also by draft of Communications Protocol. Technical Situation Reports infer compliance
Seqwater must report to the Chief Executive by 30 September each year on the training and state of preparedness of operations personnel.	See Note 1
Seqwater must provide a report to the Chief Executive by 30 September each year on the state of the Flood Monitoring and Forecasting System and Communication Networks.	See Note 1

Action	Comment
After each significant flood event, Seqwater must report to the Chief Executive on the effectiveness of the operational procedures contained in this manual.	It is too early for this action to be implemented. Will be implemented when the Flood Event is finished
Prior to the expiry of the approval period, Seqwater must review the Manual pursuant to provisions of the Act.	It is too early for this action to be implemented
Strategies are changed in response to changing rainfall forecasts and stream flow conditions to maximise the flood mitigation benefits of the dams.	Technical Situation Reports indicate that this is done
When determining dam outflows within all strategies, peak outflow should generally not exceed peak inflow.	Information from Seqwater indicates that the requirement was satisfied
Protocol for use of discretionary powers (i.e. who gets told)	Director of Dam Safety is satisfied – I don't know whether Seqwater CEO or Chairperson approved – See Note 1

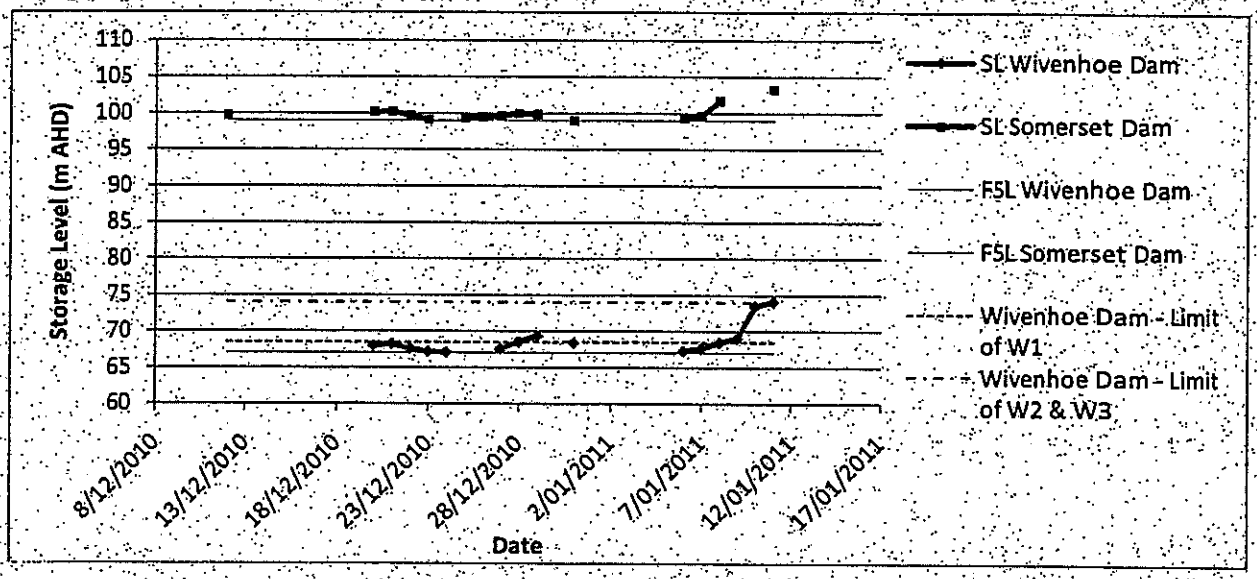
Note1: For a number of the above actions, given the short time frame for the review on compliance of actual flood operations with the Flood Mitigation Manual, it was not possible to source some of the information required to confirm that requirements had been fulfilled. These actions will be audited separately, when time permits.

Action	Comment
Flood Strategies for Wivenhoe Dam:	
The intent of Strategy W1 is to not to submerge the bridges downstream of the dam prematurely (see Appendix I). The limiting condition for Strategy W1 is the submergence of Mt Crosby Weir Bridge that occurs at approximately 1,900 m^3/s. For situations where flood rains are occurring on the catchment upstream of Wivenhoe Dam and only minor rainfall is occurring downstream of the dam, releases are to be regulated to limit, as much as appropriate in the circumstances, downstream flooding.	Technical Situation Reports indicate that every attempt was made to keep the specified road crossings open
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). In these instances, the combined peak river flows should not exceed those shown in the following table:	Technical Situation Reports indicate that Wivenhoe Dam releases were made considering concurrent flows in the Bremer River & Lockyer Ck. To delay damaging floods as long as possible
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.	
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 EL74.0 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. There are no restrictions on gate opening increments or gate operating frequency once the storage level exceeds EL74.0 AHD, as the safety of the dam is of primary concern at these storage levels.	Technical Situation Reports indicate that Wivenhoe Dam releases were such as to delay adopting this strategy as long as possible
Where possible, total releases during closure should not produce greater flood levels downstream than occurred during the flood event.	Technical Situation Reports indicate that this requirement was satisfied
The aim should always be to empty stored floodwaters stored above EL 67.0m within seven days after the flood peak has passed through the dams.	Technical Situation Reports indicate that

Action	Comment
	emphasis was given to satisfying this requirement
Flow in the spillway to be as symmetrical as possible with the centre gates opened first.	Technical Situation Reports indicate that this was done
The bottom edge of the radial gates must always be at least 500mm below the release flow surface.	See Note 1 above

Action	Comment
Flood Strategies for Somerset Dam:	
The intent of Strategy S1 (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) 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.	Technical Situation Reports indicate that this was done
The intent of Strategy S2 (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). This to maximise the benefits of the flood storage capabilities of the dam while protecting the structural safety of both dams. The Flood Mitigation Manual contains a graph that shows the intended interaction of the Wivenhoe Dam and Somerset Dam storage levels.	Technical Situation Reports indicate that this was done – little information on the operation of the radial gates at Somerset Dam. How the graph was followed not really demonstrated
The intent of Strategy S3 (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) is to maximise the benefits of the flood storage capabilities of the dam while protecting the structural safety of both dams.	Not relevant at this stage
The safety of Somerset Dam is the primary consideration and cannot be compromised and its peak level cannot exceed EL 109.7.	Maximum level only EL103.3

Wivenhoe & Somerset Dams – Storage Level Behaviour (as presented in Technical Situation Reports)



Date	Time	TSR	Wivenhoe Dam Release (m^3/s)				Gate No.	Opening (m)	Storage Level	Rainfall (mm)
			Regulators	Hydro	Gates	Total				
12/12/2010	1400 W1									
13/12/2010	1300 W2			10	290	300				
15/12/2010	1800 W3									
16/12/2010	1600 W4				0					
17/12/2010	1200 W5									Large storms yesterday pm and nig
17/12/2010	1800 W6	Closed			Opening Op. Initiated					50 forecast tonight
	1830			13		50	63	3	0.5	20-50 forecast o/n
18/12/2010	0700 W7									
19/12/2010	0700 W8					350	350	3	3.5	40-50 since 16/12/2010
										20-30 upper Brisbane R.
19/12/2010	1800 W9					300	300	3	3	
20/12/2010	0700 W10									
20/12/2010	0900 W11								68 expected this afternoon	
20/12/2010	0900 W12									
									peak 68.24 (0400); currently 68.22 (112% cap.) falling slowly	
21/12/2010	0730 W13					peak 1,280 (0500)				
									currently @ 67.61 (107% cap.) falling slowly	
22/12/2010	0830 W14									none since 300 on 20/12/2010
22/12/2010	1600 W15				Closing sequence				to finish just>FSL	
									When gates closed,	

25/12/2010	0930 W20			10-20 over last 24 hrs
26/12/2010	0800 W21			Rel. minor over last 24 hrs.
27/12/2010	0800 W22			40-50 over dam CA last 24 hrs.
28/12/2010	0700 W23	347 (initially) then back to 46		20-40 over dam CA's ;ast 24 hrs
29/12/2010	0700 W24		69.26 (@ 0600) - aim is to return to FSL by 2/1/2011	No/very little in last 24 hrs.
30/12/2010	0700 W25	Wivenhoe+Lockyer = 1,600m^3/s	69.33 peak yesterday @ 1200 (2.3m > FSL) 69.07 this am	No/very little in last 24 hrs.
31/12/2010	0700 W26 W27	Wivenhoe+Lockyer = 1,600m^3/s	68.4 @ 0500	No/very little in last 24 hrs.
6/01/2011	1200 W28	Commence opening RG @ 1800 & ramp up to 300m^3/s by 2200	67.31 @ 0700	20-30 widespread with up to 50 on CA's
				30-50 with isolated falls up to 75; si

9/01/2011	0700	W32 W33	1,343		Currently 68.58 (falling slowly)	For last 12 hrs. av. of 40 for Somers & <10 for Wivenhoe CA
9/01/2011	2100	W34 W35 W36 W37	1,400		Currently @ 69.1;	Very heavy rainfall -totals for 24 hrs 300; Severe weather warning for he rainfall
11/01/2011	0630	W38	2,750 since 1930 on 10/1/2011	All (5) gates	73.51 rising @ 25mm/hr.	20-60 last 12 hrs in Lockyer CA; 30 ir Bremer R.; Isol. Falls of 125 in upper Brisbane R. & widespread falls of 40 in Somerset CA
11/01/2011	1200	W39	3,970		74.1 (179.5% cap.) rising @ 25mm/hr.	

Comments	Cr
45,000Ml from Somerset; WL|Somerset to peak at 99.7 on 13/12/2010; 150m^3/s expected through Brisbane; 30,000Ml expected into Wivenhoe from upper Brisbane R.; peak WL in Wivenhoe expected to be 67.6; Releases expected from Wivenhoe on afternoon of 13/12/2010 ramping up to 300m^3/s; Reg. will be closed & Gate 3 opened to 3m to get WL back to 67.25; Incr. release will impact on 3 crossings; Dam Regulator informed	
138m^3/s from Somerset;	Gate release will impact on 3 crossings
Releases from Wivenhoe will cease on 16/12/2010; Hydro will continue during fish recovery ops.	
Gate closed 1000	
Decision to commence a release tonight was made this am by Duty Flood Engineers to provide as much notice to impacted Councils as possible; 60,000Ml needs to be released from Wivenhoe & Somerset to maintain FSL	
Need to release >60,000Ml from Wivenhoe & Somerset to achieve FSL	
Releases could increase to 300m^3/s;	Would impact Twin Bridges, Savages Crossing, Colleges
100,000Ml to be drained in next 4 days; Q|Brisbane R. to be maintained at 300-350m^3/s; Transfer from Somerset via 2 reg.; Wivenhoe Q incr. to 150m^3/s o/n; Will incr. further to 300m^3/s as Q|Lock Ck. Subside over next 24 hrs.; Q|Lock.Ck. Currently 130m^3/s	Twin Bridges & Savages Crossing currently closed; Colle
12,000Ml/day from Somerset; Release expected until 22/12/2010;	Twin Bridges, Savages Crossing, Colleges Crossing curre
Somerset rel. steady (Q|reg.=140m^3/s); Q|Wivenhoe to be maintained at 300m^3/s (Lock.Ck. Permitting) to allow Burtons Bridge to remain open; WL|Wivenhoe expected to incr. to 67.4 over next 2 days;	Twin Bridges, Savages Crossing and Colleges Crossing a considered if more rain or inflows
Somerset risen to 100.2 - sluice gate releases to be made until am of 22/12/2010 when FSL expected; WL|Wivenhoe at 68 expected this pm; Q|Wivenhoe expected to be >1,200m^3/s - discuss with impacted Cncls.- strategy decision by 10000; Wivenhoe inflows excl.	
Q|Somerset peak tomorrow at 1800m^3/s	Both Burtons and Kholo bridges likely to be inundated
Inflow to Somerset to peak today at 700m^3/s; Somerset & Wivenhoe currently storing 140,000Ml above FSL; further inflows occurring; releases to be incr. o/n to ~1,200m^3/s; various Cncls. Given heads up; BOM advised	Wivenhoe releases reduced slightly to keep Burtons Br residents affected by Burtons Bridge
Same as W11	
410m^3/s from Somerset sluice gates; Somerset peaked @100.43 (1300 on 20/12/2010), currently @ 100.23 (114% of cap.); 110,700Ml inflow to Somerset,67,500Ml discharged into Wivenhoe; Wivenhoe inflow (excl. Somerset releases) = 157,900Ml; 103,000Ml released; Total Inflow to both dams ~310,000Ml; Continued gate operations may be necessary if forecast rainfall results in subsequent river rises	Kholo Bridge is also expected to be inundated by mid-r these bridges should be back in service by late Thursda should be trafficable for Christmas providing no furthe
410m^3/s from Somerset sluice gates; Somerset currently @ 99.68 (108% cap.); 121,500Ml inflow to Somerset, 103,000Ml released to Wivenhoe; Gate Ops. @ Wivenhoe; High tides expected to coincide with peak levels in Brisbane R.	Burtons Bridge & Kholo Bridge expected to be bac trafficable by Xmas provided no further rain
BOM aware of all releases	Gate closing sequence to allow bridges to be accessible
	Projected crossing openings: Burtons Bridge – 18:00 Th Savages Crossing – 19:00 Thursday 23 December 2010

Somerset WL incr. from 99.18 yesterday @ 0600 to 99.33 @ 0730 today; 99.5 tomorrow if no gate ops.; Wivenhoe currently 4,200Ml through hydro & reg.; 15,00Ml expected just from upper Brisbane R. in next few days; WL cont. to fall in Lock. Ck; Small rises expected in Bremer & Warrill systems; WL in Wivenhoe incr. to 67.28 @ 600	Twin Bridges, Savages and Colleges Crossing rema runoff. Burtons and Kholo Bridges would be current regarding repairs.
BOM issued severe weather warning @ 0 445; Somerset WL incr. to 99.46 (0.46m> FSL) - 2 regs. To be opened today (140m^3/s); Wivenhoe WL incr. to 67.37 (0.37m > FSL); RG to be opened later today following discussions with local authorities; further gate ops may be necessary if rainfall incr. river levels	Crossings downstream of the dam are currently imp releases from Wivenhoe). Lockyer Creek outflows i Twin Bridges, Savages and Colleges Crossings will depending on flows downstream so as to not impact
BOM continues with severe weather warning & widespread rainfall over dam CA's; 2 regs. @ Somerset giving 139m^3/s release, lake contd. To rise to 99.6 (0.6m> FSL); RG ops @ Wivenhoe commenced yesterday @ 0900, WL contd. To rise to 67.57 (0.57m > FSL);Q|Wivenhoe reduced o/n because of incr. Q|Lockyer to ensure Burtons Bridge remains open; RG @ Wivenhoe wound back as Q|Lockyer incr. > 250m^3/s; Q|Lockyer expected to peak>500m^3/s later today/tomorrow - will innundate Burtons Bridge;When this happens, Q|Wivenhoe will be incr. to get WL back to FSL; further gate ops may be necessary in coming days	Twin Bridges, Savages Crossing and Colleges Cros will be closed later today/tomorrow; Kholo Bridge rer expectation that either Mt Crosby Weir Bridge or Fer updated estimate of the time of closure of Burtons B
Sever weather warning no longer current; Somerset release through regs' ~ 208m^3/s;WL|Somerset incr. to 99.96 (0.96m>FSL) - inflows decreasing; RG opening dependent on Q|Lockyer; Wivenhoe WL currently @ 68.55 (1.55m > FSL); Inflows to Wivenhoe decr.	RG discharge dropped back to 46m3/s to ensure Bu Crossing, Colleges Crossing, Burtons Bridge and Kh either Mt Crosby Weir Bridge or Fernvale Bridge will being closely monitored and may come close to impa access is not impacted yet
Further 2 sluices opened @ Somerset; WL @ Somerset 99.83 & falling slowly, 2 sluices to be closed @ 1200; Intended to incr. Wivenhoe releases so Q|Wivenhoe+Q|Lockyer maintained @ 1,600m^3/s (similar Q to mid Oct &mid Dec 2010)	Twin Bridges, Savages Crossing, Colleges Crossing current expectation that Mt Crosby Weir Bridge or F stage, estimated that the flow at Burtons Bridge will
2 sluices @ Somerset remain open (405m^3/s) - FSL expected by 6/1/2011; RG closing sequence expected to start mid tomorrow- RG expected to be closed on 2/1/2011	
WL @ Somerset 99.01 (falling from peak of 100.0 - 1200 28/12/2010) - currently 2 regs;	Twin Bridges, Savages Crossing, Colleges Crossing Twin Bridges, Savages Crossing, Colleges Crossing to inundation Not included
Somerset @ 99.34 (0.34m > FSL) & rising slowly; Wivenhoe 67.31 (0.31m > FSL) & rising slowly; Gates will be opened in next 24 hrs; Lockyer Ck peak of about 100m3/s Friday afternoon	Lockyer Ck peak of about 100m3/s Friday afternoor Savages Crossing. Colleges Crossing could be take strategy is to keep Burton Bridge free. Gate release 450m^3/s).
100-200mm rain forecast for SE Qld next 5 days; Somerset WL @ 99.58 (0.59m > FSL) rising slowly - currently releasing 35m^3/s; Wivenhoe WL @ 67.64 (0.64m > FSL & > gate trigger level) rising slowly; u/s of dam river levels peaked @ Linville and Gregors Ck gauges; A peak of about 470 cumecs is expected from Lockyer Creek by mid-afternoon; Wivenhoe gate releases will occur after the impact of Lockyer flows on Burtons Bridge has been ascertained and flood levels in the lower Lockyer subside Q|Wivenhoe may be as	Q|Lockyer may be of sufficient magnitude to inundat Council and Brisbane City Council have been advise hours; The relatively high Lockyer flows will adversel Colleges Crossing for several days, may also later in be any adverse impacts upon Fernvale Bridge or Mt

Somerset currently @ 100.27 - 60mm rain in last 2 hrs will cause significant inflow later today; 405m^3/s being released into Wivenhoe; maintain combined Q of 1,600m^3/s in mid-Brisbane R.

Not included

Somerset @ 101.68 rising quickly; 5 sluice gates open releasing ~1,100m^3/s; WL expected to reach 103.5 by am 11/1/2011; River levels u/s Wivenhoe rising fast; Q|Brisbane R. @ Gregors Ck @ 6,700m^3/s; Wivenhoe expected to reach 73.0 by 11/1/2011 - need to incr. Q|Wivenhoe am of 10/1/2011 - crank up to 2,600m^3/s by am 11/1/2011; Attempt to keep combined Q < 3,500m^3/s - < limit of urban damages in the City

Not included

Not included

Not included

Somerset WL @ 103.27 & falling slowly ; currently 1,400m^3/s released to Wivenhoe - to be reduced to 500m^3/s later in the day - to ensure flood mitigation of Somerset & Wivenhoe are maximized; BOM provided advice on flash flooding in Lockyer Ck.; WL in Wivenhoe will reach 74 by evening; May need to increase Q further - may result inQ|lower Brisbane R. >5,000m^3/s

Somerset @ 103.3 & rising; Outflows into the Brisbane River from both Lockyer Creek and the Bremer River are also increasing; If no further rain, can hold @ 74.8 - aim is to prevent fuse plug triggering, situation assessed every 3 hrs.; Heavy rainfall continues throughout South East Queensland and the situation could deteriorate over the next 24 hours. The flood operation centre will continue to monitor the situation and provide situation reports every six hours until the situation stabilizes.

The current Wivenhoe Dam release combined wit
crossings downstream of Wivenhoe (Twin Bridges
Colleges Crossing) will be adversely impacted unt
Mt Crosby Weir Bridge are not expected to be affe
eventuate and higher releases from Wivenhoe Da
strategy

The projected Wivenhoe Dam releases combined
downstream of Wivenhoe (Twin Bridges, Fernvale
Weir and Colleges Crossing) will be adversely imp
Water levels in the lower Brisbane R will be impac
runoff and releases from Wivenhoe Dam

The projected Wivenhoe Dam releases combined
crossings downstream of Wivenhoe (Twin Bridges
Mt Crosby Weir and Colleges Crossing) will be ad
be impacted by the combined flows of Lockyer Cr
Dam.

PCL XL error

Warning: IllegalMediaSize

Wivenhoe Dam – Development of Flood Operational Rules

1. Introduction

This briefing note has been prepared to detail the development of the flood operational rules for Wivenhoe and Somerset Dam and the extensive reviews undertaken for the studies.

The flood operational procedures were developed during an extensive hydrological study of the Brisbane and Pine Rivers catchments by the DPI, Water Resources between 1990 and 1994 which was reviewed by an external expert panel. Subsequently, the flood operational rules have been reviewed during the Brisbane Valley Flood Damages Minimisation Study in 2006 and the latest revision to the flood manual in 2009. Both reviews have included expert review panels comprising key stakeholders.

2. History

The Brisbane River Basin is the major water supply source for the City of Brisbane and many of the nearby local authorities. The major floods which are derived from the basin have a history of causing significant damage to the local communities.

Somerset Dam was constructed on the Stanley River over the period 1936 to 1954 and was the major regional water supply source up until the late 1970's

During the early 1970's it was identified that both the water supply and flood mitigation of Somerset Dam would need to be augmented. Shortly after the 1974 floods planning for the construction of Wivenhoe Dam began with construction commencing in 1979 and final completion being achieved in 1987.

The main functions of Wivenhoe Dam are to meet the water supply demands of the Moreton Region, provide the lower pool for the 500MW Wivenhoe Pumped Storage Project and provide flood mitigation for the cities of Brisbane and Ipswich.

Changes to the methods used to determine the rainfall for extreme events during the 1980's resulted in significant changes to the design flood for the newly constructed dam.

In 1990, the owners of the Dam, South East Queensland Water Board, undertook a dam safety review of the three dams owned and operated by the Board. A key component of this study was the Brisbane and Pine Rivers Flood Study.

3. Development of the Flood Operations Rules

In August 1990, the South East Queensland Water Board (SEQWB) commissioned the Department of Primary Industries, Water Resources Business Group (DPI,WR) to undertake the Brisbane and Pine Rivers Flood Study. The flood Study was initiated as part of an overall safety review of the Board's dams, Somerset Dam, Wivenhoe Dam and North Pine Dam. The need for the safety review of the dams stemmed from a number of factors including

- the emergence of new techniques for the estimation of probable maximum precipitation and subsequent flooding,
- the development of computer software capable of simulating the hydraulic behaviour of whole river basins and simulating dam failure scenarios,
- advancements in technology associated with real time weather monitoring.

The scope of the flood study was to review the hydrology for each dam and hydraulic aspects associated with the relevant flood studies and to develop real time model programmes for use in flood control operations and forecasting. Key aspects of the study were:

- hydrologic review
- flood operating procedure
- hydraulic analysis, flood studies
- dam break (failure) analysis
- flood inundation.

This study was undertaken from 1990 until 1994 and represented a thorough review of the flooding in the Brisbane and Pine Rivers and the associated role of the dams within the catchment.

i. Brisbane and Pine Rivers Flood Review

The Brisbane and Pine Rivers Flood Study comprise multiple reports, produced at the completion of each stage of the study. The reports were subject to extensive internal review by the Water Resources Group before being reviewed by an independent review panel comprising Professor Colin Apelt, Head of Department, Department of Civil Engineering, University of Queensland and Mr Eric Lesleighter, Principal Hydraulic Engineer and Chief Engineer Water Resources, Snowy Mountains Engineering Corporation.

ii. Real Time Flood Model

The outcome of the Brisbane River and Pine River Flood Studies were used to develop a real time flood model for the three dams. This real time flood model consists of alert stations within the catchment to provide real time rainfall and stream level data, a calibrated run off model to convert rainfall data into flows, a gate operating model to allow decisions on gate openings to be made and a downstream flood model to provide predictions on flood levels.

iii. Flood Operations Manual

The Flood Operation Manual is the key legislative document prepared by the owner of the dam and approved and gazetted by the Qld Dam Safety Regulator. The manual defines flood procedures, roles and responsibilities, staffing and operational requirements.

The manual in its current form was developed in 1992 using the operational procedures developed during the Brisbane and Pine Rivers Flood Study and a manual written in 1968 covering flood operations at Somerset Dam (Wivenhoe Dam was completed in 1984). Six revisions of the Manual have occurred since 1992 to account for updates to the Flood Alert Network and the Real Time Flood Models, the construction of an Auxiliary Spillway at Wivenhoe Dam in 2005 and to account for institutional and legislative changes.

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

- Ensure the structural safety of the dams;
- Provide optimum protection of urbanised areas from inundation;
- Minimise disruption to rural life in the valleys of the Brisbane and Stanley Rivers;
- 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.

To meet the objectives, there are four strategies for Wivenhoe Dam defining the gate operations as a flood event unfolds. The first three strategies are focused on delivering the optimal flood mitigation outcomes based on inflows, downstream flooding and forecast rainfall. Once the water level in Wivenhoe Dam exceeds 7m above the normal operating level, the strategies shift from flood mitigation to ensuring that the dam is not overtopped.

4. Subsequent Reviews of the Flood Operational Procedures

iv. Brisbane Valley Flood Damage Minimisation Study

In 2005 and 2006, Brisbane City Council (BCC) undertook the Brisbane Valley Flood Damage Minimisation Study (BVFDMS) in conjunction with Ipswich City Council and Esk Shire Council. The study provided a flood damage assessment for Brisbane River floods. The study aimed to estimate the potential flood damage in the Brisbane Valley and then assess the flood operation rules for the Wivenhoe Dam flood gates to determine whether the current rules could be modified to reduce flood damage in the valley.

This extensive study involved detailed survey assessment of the flood damages within the Brisbane City and Ipswich City areas. A Project Technical Review Group was formed for the project involving:

- SEQWater Corporation
- The Bureau of Meteorology
- SunWater as the operator of the SEQWater Corporation Flood Control Centre
- NRM&W Dam Safety Regulator
- WRM Consultants

Key outcomes from this study for the Flood Operational Rules were:

- Confirmation of the 4,000m3/s flood adopted in the flood manual as the start of damaging flows in the Brisbane urban areas.
- Confirmation of the effectiveness of the existing flood operating rules as the optimal method of providing flood mitigation to Brisbane.

v. 2009 Review of the Flood Manual

In 2009, after the formation of the Queensland Bulk Water Supply Authority, a comprehensive review of the flood manual was undertaken. This review was focused on re-writing the manual and

refining the operational procedures. As part of this review Seqwater assembled an expert review panel comprising the following organisations.

- The Bureau of Meteorology
- SunWater as the operator of the Flood Control Centre
- DERM Dam Safety Regulator
- Brisbane City Council

Minor changes made to the manual were extensively tested to ensure that the flood mitigation outcomes from the operation of the dam were not compromised.

5. Conclusions

The flood operational procedures for Wivenhoe and Somerset Dam were developed by a comprehensive study undertaken by the DPI Water Resources between 1990 and 1994. These operational rules have been reviewed by independent parties to identify any opportunities to improve the flood mitigation outcomes including the Brisbane City Council.

Barton Maher (RPEQ 6833)
Principal Dams & Weirs Planning
Queensland Bulk Water Supply Authority trading as Seqwater

Suzie Emery

From: Elaina Smouha [elainamir[redacted]]
Sent: Monday, 17 January 2011 8:53 AM
To: WaterGridMedia
Cc: Barry Dennien; Dan Spiller
Subject: Re: Cabinet in confidence - Ministerial brief - Flood event and Wivenhoe Dam

Barry, Dan

Toni lake called me

Ken Sedgwick was also looking for an update similar to what we provided to minister Robertson last night.

You fine for me to forward the mins brief and attachments (which includes pre emptive release advice and Brian Cooper review)?

Elaina Smouha
Director, Governance and Regulatory Compliance
SEQ Water Grid Manager
Phone: [redacted] | Mobile: [redacted] | Fax: [redacted]
Email: elaina.smouha[redacted]
Visit: Level 15, 53 Albert Street Brisbane
Post: PO Box 16205, City East QLD 4002
ABN: 14783 317 630

On 17/01/2011, at 8:08 AM, WaterGridMedia <WaterGridMedia[redacted]> wrote:

> Done - 10 copies printed, in meeting room on table.
>
> Regards
>
> **Water Grid Communications Team**
>
> [redacted]
>
> www.watergrid.com.au

From: Elaina Smouha [mailto:elainamir[redacted]]
Sent: Sunday, 16 January 2011 10:14 PM
To: john.bradley[redacted]
Cc: barry.dennien[redacted]; daniel.spiller[redacted]; WaterGridMedia; debbie.best[redacted]; pborrows
Subject: Cabinet in confidence - Ministerial brief - Flood event and Wivenhoe Dam

John

Attached is the Ministerial Brief and accompanying attachments for the Emergency Cabinet meeting scheduled on 17 January 2011.

Regards

Elaina

Elaina Smouha

Director, Governance and Regulatory Compliance

SEQ Water Grid Manager

Phone: [redacted] | Mobile: [redacted] | Fax: [redacted]

Email: elaina.smouha[redacted]

Visit: Level 15, 53 Albert Street Brisbane

Post: PO Box 16205, City East QLD 4002

ABN: 14783 317 630

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Suzie Emery

From: Elaina Smouha [elainamir[redacted]]
Sent: Monday, 17 January 2011 9:07 AM
To: Elaina Smouha
Cc: Barry Dennien; Dan Spiller
Subject: Re: Cabinet in confidence - Ministerial brief - Flood event and Wivenhoe Dam

Barry/Dan

I spoke with Patrick Wyldie at Treasury. They just want to be kept in the loop and happy if one of you could call Ken or Greg after your briefing with Minister Robertson.

They just want to prepare in case the Treasurer gets asked a question at cabinet.

Elaina

Elaina Smouha
Director, Governance and Regulatory Compliance
SEQ Water Grid Manager
Phone:[redacted] | Mobile:[redacted] | Fax: [redacted]
Email: elaina.smouha[redacted]
Visit: Level 15, 53 Albert Street Brisbane
Post: PO Box 16205, City East QLD 4002
ABN: 14783 317 630

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>
> > Done - 10 copies printed, in meeting room on table.

Regards

Water Grid Communications Team

Ph: [redacted]

www.watergrid.com.au

From: Elaina Smouha [mailto:elainamir[redacted]]
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Elaina Smouha

Director, Governance and Regulatory Compliance

SEQ Water Grid Manager

Phone: [redacted] | Mobile: [redacted] | Fax: [redacted]

Email: elaina.smouha[redacted]

Visit: Level 15, 53 Albert Street Brisbane

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Suzie Emery

From: WaterGridMedia [WaterGridMedia[redacted]]
Sent: Monday, 17 January 2011 11:54 AM
To: Elaina Smouha
Cc: Barry Dennien; Dan Spiller
Subject: RE: Cabinet in confidence - Ministerial brief - Flood event and Wivenhoe Dam

Hi Elaina

We have forwarded the talking points to Ken.

Regards
Aleisha

From: Elaina Smouha [mailto:elainamir[redacted]]
Sent: Monday, 17 January 2011 8:53 AM
To: WaterGridMedia
Cc: barry.dennien[redacted] daniel.spiller[redacted]
Subject: Re: Cabinet in confidence - Ministerial brief - Flood event and Wivenhoe Dam

Barry, Dan

Toni lake called me

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SEQ Water Grid Manager
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Subject: Cabinet in confidence - Ministerial brief - Flood event and Wivenhoe Dam

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Regards

Elaina

Elaina Smouha

Director, Governance and Regulatory Compliance

SEQ Water Grid Manager

Phone:[redacted] | Mobile:[redacted] | Fax:[redacted]

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Suzie Emery

From: Elaina Smouha [elainamir[redacted]]
Sent: Thursday, 2 February 2012 3:36 PM
To: Elaina Smouha
Subject: Fwd: Agreement (Commercial in confidence)
Attachments: LEGAL SERVICES - CONTRACTING_OUT - Consultants - Consultancy Agreement - Brian Cooper - Flood Mitigation Manual (4).docx

---------- Forwarded message ----------
From: **Elaina Smouha** <elainamir[redacted]>
Date: Fri, Jan 21, 2011 at 9:12 AM
Subject: Agreement (Commercial in confidence)
To: Brian Cooper Consulting <brian.cooper.consult[redacted]>

Hi rian

Thank you again for assisting us.

You may have already posted a signed copy of the agreement, but would you also be able to email me a scanned copy of the signed agreement. I will then provide you with a fully executed copy.

Kind regards

Elaina



CONSULTANCY AGREEMENT

CONSULTANCY AGREEMENT

THIS AGREEMENT is made this _____day of _____2011.

BETWEEN: The **SOUTH EAST QUEENSLAND WATER GRID MANAGER, ABN 14 783 317 630**, of Level 15, 53 Albert Street, Brisbane, Queensland 4000 ("the Principal")

AND: **THE ENTITY SHOWN IN Item 1 OF THE SCHEDULE** ("the Consultant")

RECITALS

A. The Consultant has agreed to perform the Consultancy Services for the Principal.

B. The parties wish to record the terms and conditions of their agreement.

IT IS AGREED:

1. INTERPRETATION

1.1 Where commencing with a capital letter and unless the context otherwise requires:

Agency	has the meaning given to it in the IP Act;
Agreement	means the clauses contained in this document and the attached Schedule and Annexures;
Business Day	means a day that is not a Saturday, Sunday or public holiday in the State;
Completion Date	means the date or dates specified in Item 4A of the Schedule or the Terms of Reference for completion of the Consultancy Services;
Consequential Loss	means: (a) any loss of anticipated or actual revenue or profits; (b) loss of use of equipment; (c) business interruption or a failure to realise anticipated savings; (d) loss of data; (e) downtime costs or wasted overheads; (f) loss of goodwill or business opportunity; (g) punitive or exemplary damages; or (h) any special or indirect loss or damage of any nature whatsoever;

Consultancy Fee	means the monies payable to the Consultant for the Consultancy Services under this Agreement and specified in Item 6 of the Schedule;
Consultancy Services	means the services described in the Terms of Reference including all Deliverables;
Contract Material	means: (a) any material forming part of or constituting a deliverable that is created, written or otherwise brought into existence by or on behalf of the Consultant in the course of performing the Consultancy Services (called "new Contract Material"); and (b) any material that exists at the Date of Commencement and is incorporated into a Deliverable (called "existing Contract Material");
Date of Commencement	means the date specified in Item 4 of the Schedule;
Deliverable	means any document, piece of equipment, data listing or other creation required to be delivered to the Principal in order to complete the performance of the Consultancy Services including those deliverables specified in the Terms of Reference;
Force Majeure	means the following events that are not within the reasonable control of a party: (a) acts of God, including earthquakes, floods landslides and natural disasters; (b) national or statewide strikes, lockouts, bans or other industrial disturbances excluding those that are specific to a party; (c) acts of public enemies, terrorism, sabotage, wars, blockades, insurrections, riots and civil disturbances, arrests and restraints of rulers and people; (d) fire or explosions; epidemic; or (e) a State Direction, any change in law or regulation or regulatory practice.
GST	means any tax imposed under any GST Law and includes GST within the meaning of the GST Act;
GST Act	means the *A New Tax System (Goods and Services Tax) Act 1999* (Commonwealth) as amended;
GST Law	means the GST Law as defined in the GST Act and includes any Act of the Parliament of Australia that imposes or deals with GST;

Industry Best Practice	means the standards (including any relevant Australian Standard), practices, methods and procedures generally followed or approved by relevant industries and consultants in Australia with respect to the Consultancy Services and that degree of skill, diligence, prudence and foresight which would reasonably and ordinarily be expected from a skilled and experienced consultant engaged in similar work or services;
Information	means all information or data however held, stored or recorded including this Agreement drawings, plans, specifications, correspondence, calculations, reports, models, concepts, source codes, files, computerised data, photographic recordings, audio or audio visual recordings;
Intellectual Property	means all proprietary rights in relation to Information including copyright and neighbouring rights, and all proprietary rights in relation to inventions (including patents) registered and unregistered trademarks (including service marks), registered designs, confidential information (including trade secrets and know how) and circuit layouts, and all other proprietary rights resulting from intellectual activity in the industrial, scientific, literary or artistic fields;
IP Act	means the *Information Privacy Act 2009* (Qld);
Key Personnel	means the Consultant's Personnel specified in Item 2 of the Schedule who are approved by the Principal to perform the Consultancy Services;
Legislative Requirements	includes: (a) Acts, ordinances, regulations, by-laws, orders, awards and proclamations of the Commonwealth and the State or Territory applicable to the Services; (b) certificates, licences, consents, permits, approvals, codes, standards and requirements of organisations having jurisdiction in connection with or recognised generally as authorities in respect of the carrying out of the Consultancy Services, including the requirements of any local government or other authority, and the requirements of any development consent issued in relation to any project to which the Consultancy Services relate; (c) Australian Standards and any other relevant standards; and (d) the Codes of Practice of the State or Territory applicable to the Consultancy Services and other appropriate codes;

Milestones	means the milestones specified in the Schedule and Terms of Reference;
Moral Rights	mean the moral rights of attribution of authorship, right not to have authorship falsely attributed and right of integrity of authorship specified in Part IX of the *Copyright Act 1968* (Cth);
Offer	means the offer submitted to the Principal by the Consultant to provide the Consultancy Services a copy of which is contained in Annexure 2;
Personal Information	has the meaning given to it in the IP Act;
Personnel	means any officer, employee, agent or sub-contractor of a party;
Principal's Consent	means prior written consent (which will not be unreasonably withheld) of the Principal which may be given subject to such terms and conditions as the Principal may see fit to impose;
Project Coordinator	means the person appointed by the Consultant specified in Item 3A of the Schedule, or any other person substituted by the Consultant by notice to the Principal.
Project Officer	means the person specified in Item 3 of the Schedule or any other person substituted by the Principal by notice to the Consultant;
Quality Assurance System	means the Consultant's system which establishes the qualities and performance of the Consultancy Services including, all quality manuals, plans, management structures and responsibility statements, techniques for identification and management of non-conforming or disputed Consultancy Services and audit and other critical issues relating to quality assurance;
Records	means all material including but not limited to books, documents, information, computer software, equipment, and data stored by any means disclosed, or made available, by the Principal to the Consultant in connection with the performance of this Agreement;
State	means the State of Queensland;
Tax Invoice	has the same meaning as in the GST Act;
Terms of Reference	means the document issued by the Principal to the Consultant for the purpose of obtaining an Offer, a copy of which is contained in Annexure 1.

1.2 In this Agreement unless a contrary intention appears, words importing a gender include any other gender and words in the singular include the plural and vice versa.

1.3 In this Agreement, unless a contrary intention appears, a reference to:

1.3.1 "dollars" or "$" is a reference to the currency of Australia;

1.3.2 any legislation shall include any Act of Parliament and any subordinate legislation, rule, regulation, order or instrument made under it and shall include any statutory modification, substitution or re-enactment of such legislation;

1.3.3 an individual or person includes a corporation, partnership, joint venture, trust, association, government, local government authorities and agencies;

1.3.4 a recital, clause, schedule or annexure is a reference to a recital, clause, schedule or annexure to this Agreement; and

1.3.5 a party to this Agreement includes the executors, administrators, successors and permitted assigns of that party.

1.4 Clause headings in this Agreement are for convenience of reference only and have no effect in limiting or extending the language of the provisions to which they refer.

1.5 In this Agreement if a word is defined, cognate words and phrases have corresponding definitions.

1.6 If a party to this Agreement consists of more than one person those persons shall be jointly and severally bound under this Agreement.

1.7 Subject to clause 1.8, where any inconsistency exists between the provisions of the Terms of Reference, this Agreement and the Offer and the inconsistency is not the result of a variation agreed to under clause 23 the provisions of the documents will take precedence in the following order:

1.7.1 Agreement
1.7.2 Terms of Reference
1.7.3 Offer.

1.8 Where a higher standard to that specified in the Agreement is stated in the Terms of Reference or Offer, the Consultant shall be bound by the higher standard.

2. TERM

2.1 This Agreement will start on the Date of Commencement and, unless earlier terminated in accordance with its terms, continue until the Completion Date.

3. PROVISION OF SERVICES

3.1 Time must be of the essence in the provision of the Consultancy Services.

4. CONSULTANCY SERVICES

4.1 The Consultant will provide and complete the Consultancy Services:

4.1.1 through its Key Personnel;

4.1.2 with due care and skill and to the best of its knowledge and expertise;

4.1.3 in a thorough and professional manner in accordance with relevant professional principles and standards;

4.1.4 by any Milestones and time frames informed by the Principal to the Consultant; and

4.1.5 in accordance with:

4.1.5.1 the requirements of this Agreement;

4.1.5.2 all Legislative Requirements including all applicable safety, health and environmental laws and regulations;

4.1.5.3 all operations, safety, health and environment guidelines, rules and procedures provided to the Consultant by the Principal;

4.1.5.4 Industry Best Practice; and

4.1.5.5 all reasonable directions and orders given by the Principal.

4.2 The Consultant agrees that the scope of the Consultancy Services includes all incidental and related work which may arise from the matters referred to, identified in, or to be reasonably inferred from or contemplated by the Terms of Reference.

4.3 The Consultant will -

4.3.1 inform itself of the Principal's stated requirements in respect of the Consultancy Services;

4.3.2 make its own investigations and assessments of the work and risks involved in providing the Consultancy Services and it will review and satisfy itself about the Information that the Principal has made available to the Consultant about the Consultancy Services and this Agreement;

4.3.3 consult regularly with the Principal throughout the performance of the Consultancy Services; and

4.3.4 provide such further Information in relation to the provision of the Consultancy Services as reasonably required by the Principal.

4.4 The Consultant warrants (and the Principal relies upon this warranty) that:

4.4.1 the Consultancy Services will match the description as set out in this Agreement;

4.4.2 it and its Key Personnel have the qualifications, admissions and memberships (if any) necessary for the performance of the Consultancy Services and it is a condition of this Agreement that the Consultant and its Key Personnel must retain memberships, at the Consultant's own cost, whilst performing the Consultancy Services;

4.4.3 the Consultancy Services must be carried out with all due care and skill and in accordance with the highest applicable professional standards, principles and practices;

4.4.4 the Information contained in the Offer as to the structure, viability, reliability, insurance cover, capacity, experience and expertise of the Consultant or its Key Personnel is correct;

4.4.5 it will not infringe the Intellectual Property rights of any third party or otherwise breach any law or obligation to any third party in the

performance of its obligations pursuant to this document or in completing the Consultancy Services;

4.4.6 as at the date of this document no conflict of interest exists or is likely to arise in the performance of its obligations pursuant to this Agreement; and

4.4.7 the Consultancy Services will be fit for the purpose or purposes:

4.4.7.1 described in this Agreement;

4.4.7.2 informed to the Consultant by the Principal; and

4.4.7.3 for which these types of Consultancy Services are commonly provided.

4.5 Where specified in Item 5 of the Schedule, the Principal will provide the specified assistance to the Consultant.

4.6 The Consultant must maintain solely at the Consultant's own expense any licences, accreditations, certificates or registrations that the Consultant or its Personnel are required to possess by any relevant Legislative Requirements in order to complete the Consultancy Services.

5. COMPLIANCE WITH DEMONSTRATED SERVICES

5.1 Without limiting clause 4, if the Consultant:

5.1.1 provides or provided the Principal with a demonstration of the Consultancy Services before the Principal entered into this Agreement, the Consultancy Services must correspond in nature and quality with the Consultancy Services demonstrated; or

5.1.2 showed the Principal a result achieved by the Consultancy Services or similar services before the Principal entered into this Agreement, the Consultancy Services must correspond in quality with the services that achieved that result.

6. SUPPLY OF ITEMS

6.1 Any items which the Consultant uses or supplies in conjunction with the Consultancy Services must:

6.1.1 be of merchantable quality;

6.1.2 comply with any applicable Australian Standards and any other standards specified in this Agreement; and

6.1.3 be fit for the purpose or purposes described in clause 4.4.7.

7. KEY PERSONNEL

7.1 Unless the Principal has given its written consent to the contrary, the Consultancy Services must be performed by the Key Personnel of the Consultant.

7.2 The Consultant will ensure that Key Personnel are competent and have the necessary skills to perform the Consultancy Services on which they will be engaged.

7.3 The Consultant will not, without the Principal's Consent:

7.3.1 allow Key Personnel to delegate any part of the Consultancy Services; or

7.3.2 allocate tasks not connected with the Consultancy Services to any of the Key Personnel engaged on the Consultancy Services on a full time basis until completion of the Consultancy Services allocated to that person.

If any of the Key Personnel are not available to perform any of the Consultancy Services allocated to them, or leave the employ of the Consultant, the Consultant will immediately:

7.3.3 give notice to the Principal of the circumstances; and

7.3.4 if so requested by the Principal, arrange for replacement of that person with a person of comparable skill, experience and qualification and obtain the Principal's Consent to such replacement Key Personnel at no cost to the Principal.

7.4 The Principal may, on reasonable grounds, give written notice requiring the Consultant to remove Key Personnel from working on the Consultancy Services. Upon receipt of a notice pursuant to this clause 7.4, the Consultant will, at no cost to the Principal, promptly remove and replace the Key Personnel referred to in the notice with a person satisfactory to the Principal.

7.5 If any of the events mentioned in clauses 7.3 and 7.4 occur, the Consultant must do all that is necessary to minimise any delay to the performance of the Consultancy Services.

8. QUALITY ASSURANCE SYSTEM

8.1 The Consultant will be a third party accredited to the relevant Australian Standard. The Consultant will carry out the Services under the Quality Assurance System in accordance with the relevant Australian Standard and the requirements of this Agreement.

9. INSPECTION AND INFORMATION

9.1 The Consultant must keep the Principal fully informed on all aspects of the Consultancy Services.

9.2 Without limiting the scope of clause 9.1, the Consultant will provide to the Principal, as requested from time to time by the Principal, copies of all plans, designs, drawings, specifications, reports, data and other information relating to the Consultancy Services to a standard which at all times meets the satisfaction of the Principal and accords with Industry Best Practice.

9.3 At all reasonable times, the Principal will have the right to inspect and review performance of the Consultancy Services at:

9.3.1 the site or premises at which the Consultancy Services are to be performed;

9.3.2 the Consultant's premises; and

9.3.3 the premises of any of the Consultant's subcontractors.

10. MEETINGS AND REPORTING

10.1 The Consultant must appoint a Project Coordinator who is to be responsible for liaising with the Principal regarding the Consultancy Services.

10.2 The Principal and the Consultant must meet monthly or as required by the Principal to discuss:

10.2.1 the progress of the Consultancy Services; and

10.2.2 any other matters which the Principal may wish to raise at a meeting concerning the Consultancy Services and this Agreement.

10.3 The Consultant must provide the Principal with progress reports as to the provision of the Consultancy Services in such detail as allows the Principal to ascertain whether the Consultancy Services are being performed in accordance with this Agreement. Such progress reports to be provided prior to any meeting requested under clause 10.1, at the intervals stated in Item 5A of the Schedule and at other intervals reasonably requested by the Principal.

11. LABOUR, PLANT AND EQUIPMENT

11.1 The Consultant will supply at its own cost all labour, plant, equipment, tools, appliances or other property and items the Consultant requires to fulfil its obligations under this document, unless otherwise provided in Item 5 of the Schedule.

11.2 Any plant, equipment, tools, appliances or other property and items that the Principal provides to the Consultant to enable it to complete its obligations under this document remain the Principal's property and must only be used for the purposes of fulfilling the Consultant's obligations under this Agreement.

11.3 The Consultant must keep the Principal's property in good order and condition, subject to fair wear and tear.

12. FEES AND REIMBURSABLE EXPENSES

12.1 The Consultant will provide the Consultancy Services for the Consultancy Fee. This Consultancy Fee is inclusive of all costs and expenses of the Consultant whether foreseen or unforeseen, including without limitation, insurance, duties, imposts and taxes and the GST (if any) that must be paid by the Consultant.

12.2 The Principal will only be liable to the Consultant for the Consultancy Fee and expenses in relation to the Consultancy Services that meet the requirements of this Agreement.

12.3 Notwithstanding clause 12.1 above the Consultant may include in an invoice under clause 13.2 a claim, and be paid, for expenses described in Item 7 of the Schedule provided that the Consultant has incurred these expenses.

12.4 The Consultant will not be reimbursed by the Principal for any other expenses unless the Consultant has the Principal's Consent.

13. PAYMENT

13.1 The Principal will not have any obligation to pay the Consultant for any part of the Consultancy Services until the Principal has been given a correctly rendered invoice.

13.2 The Consultant shall issue a correctly rendered invoice at the intervals specified in Item 8 of the Schedule.

13.3 Invoices must be in sufficient detail to allow the Principal to assess progress against Milestones. For work carried out on a time basis, invoices must be supported by records of times spent by individuals on the Consultancy Services, certified by the Consultant and the Project Officer.

13.4 Upon receipt of an invoice the Principal may require the Consultant to provide additional information to assist the Principal to determine whether or not an amount is payable.

13.5 The Principal will make payment of a correctly rendered invoice within the time limit set out in Item 8 of the Schedule after receipt of the invoice or, if additional information is required by the Principal pursuant to clause 13.4, then upon receipt of the additional information payment will be made within the time limit set out in Item 8 of the Schedule.

13.6 For the purposes of this clause 13, a correctly rendered invoice is an invoice that has been submitted to the Principal in accordance with clause 13.2 and the Consultant must ensure that:

13.6.1 the amount claimed in the invoice is due for payment pursuant to this Agreement;

13.6.2 the amount claimed in the invoice is correctly calculated in accordance with this Agreement; and

13.6.3 correctly identifies the Consultancy Services performed.

13.7 In addition, the invoice must comply with the requirements of the GST Law (as a Tax Invoice) and must, unless inconsistent with the GST Law, specify:

13.7.1 the Consultant's Australian Business Number;

13.7.2 the Consultancy Fee due to the Consultant and the basis for its calculation;

13.7.3 the amount of any GST paid or payable by the Consultant with respect to the Consultancy Fee;

13.7.4 the date of delivery of the Consultancy Services to which the invoice relates;

13.7.5 a description of the Consultancy Services delivered;

13.7.6 the Consultant's address for payment; and

13.7.7 the Principal's reference number.

13.8 The Principal will notify the Consultant within 14 days after receipt of an invoice found not to be correctly rendered.

13.9 Where the Principal disputes the Consultancy Fee or expenses claimed in the Consultant's invoice, the Principal will:

13.9.1 give written notice to the Consultant of the amount that the Principal disputes;

13.9.2 pay the undisputed amount;

13.9.3 attempt to resolve the disputed amount with the Consultant within 20 Business Days of the dated of the Principal's notice under clause 13.9.1;

13.9.4 if the disputed amount still remains unresolved after 20 Business Days, the matter is to be resolved accordance with the dispute resolution process under clause 30; and

13.9.5 pay the resolved disputed amount within the time frame under clause 13.5.

13.10 Where the Principal has paid an invoice to the Consultant, and the Principal subsequently determines that such invoice was not a correctly rendered invoice, the Principal will:

13.10.1 pay any underpaid amount owed to the Consultant within 30 days of receipt of a correctly rendered invoice or, if additional information is required by the Principal pursuant to clause 13.4, then upon receipt of the additional information payment will be made within the time limit set out in Item 8 of the Schedule;

13.10.2 deduct any overpaid amount owed to the Principal from the next invoiced payment or, if no other payment is due to the Consultant pursuant to this Agreement, recover the amount from the Consultant as a debt due to the Principal.

13.11 Notwithstanding any other provisions in this Agreement, payment of an invoice is not:

13.11.1 evidence or an admission that the Consultancy Services have been provided in accordance with the Agreement;

13.11.2 evidence of the value of the Consultancy Services provided;

13.11.3 an admission that the Consultancy Fee or expenses invoiced were properly incurred in accordance with this Agreement;

13.11.4 an admission of the Principal's liability; or

13.11.5 acceptance or approval of the Consultant's performance;

but must be taken only as payment on account.

13.12 The Principal may set off against any sum owing to the Consultant any amount owing by the Consultant to the Principal.

14. NO AGENCY

14.1 The Consultant is engaged as an independent contractor and nothing in this Agreement shall be deemed to constitute the Consultant as an agent or employee of the Principal or the State and the Consultant shall not have any authority to incur and shall not incur any obligation or make or purport to make any representation on behalf of the Principal except with the Principal's Consent.

14.2 The Consultant acknowledges that it is the employer of all or has otherwise engaged all Personnel who will provide the Consultancy Services, including the Key Personnel, and the Consultant must meet all payment obligations to such Personnel and must pay all statutory taxes, fees, levies or charges applicable with respect to the engagement of or payments made to such personnel. The Consultant must comply with all reasonable requests for verification of such payment obligations received from the Principal.

14.3 The Consultant indemnifies and must keep the Principal indemnified against:

14.3.1 any obligation to make payments to Key Personnel and other Personnel engaged in the provision of the Consultancy Services, and

14.3.2 any obligation to pay any related statutory taxes, fees, levies or charges.

15. CONFLICT OF INTEREST

15.1 The Consultant will at all times act in the best interests of the Principal.

15.2 If a conflict or risk of conflict of interest arises (without limitation, because of work undertaken for any person other than the Principal) the Consultant will immediately give notice of the conflict of interest, or the risk of it, to the Principal.

15.3 The Consultant will do all that is necessary to ensure that its Personnel do not engage in any activity or obtain any interest that is in conflict with providing the Consultancy Services to the Principal fairly and independently. The Consultant will immediately give notice of any conflict of interest relating to the activities or interests of any of its Personnel to the Principal.

15.4 If the Principal is given notice of a conflict of interest pursuant to clause 15.1 or 15.3, the Principal may proceed in accordance with clause 25 to terminate this Agreement.

16. CONTRACT MATERIAL

16.1 Title to and Intellectual Property rights in all new Contract Material will vest in the Principal unless otherwise specified in Item 12 of the Schedule.

16.2 If title to and Intellectual Property rights in new Contract Material will vest in the Principal:

16.2.1 this Agreement does not affect Intellectual Property rights in existing Contract Material but the Consultant grants, and will ensure that relevant third parties grant, to the Principal a paid up non-exclusive, non-transferable, perpetual and irrevocable licence to:

16.2.1.1 use, reproduce and adapt for its own use; and

16.2.1.2 perform any other act with respect to copyright; and

16.2.1.3 manufacture, sell, hire or otherwise exploit a product or process or to provide a service or to licence a third party to do these things in respect of,

any existing Contract Material, but only as incorporated in new Contract Material (and any further development of the Contract Material);

16.2.2 if requested to do so before or after the expiration or sooner termination of this Agreement, the Consultant must deliver to the Principal, in a format specified by the Principal, all new Contract Material;

16.2.3 the Consultant must ensure that new Contract Material and Records are used, copied, supplied or reproduced only for the purposes of this Agreement;

16.2.4 if any Contract Material is produced or reproduced in an electronic format or stored electronically, the Consultant must not:

16.2.4.1 store it on a foreign computer (meaning a hard disk or other similar device affixed to a computer that is not the property of the Principal) without keeping the current version of the Contract Material on separate media and delivering it to the Principal at the intervals (if any) specified in the Terms of Reference; or

16.2.4.2 produce, reproduce or store Contract Material in such a way this it is mixed with, attached to or indistinguishable, with the use of a computer, from material that is not the subject of this Agreement.

16.3 If the Consultant is an individual, the Consultant consents to any act or omission done by the Principal in the exercise of the Intellectual Property rights granted under this Agreement that might otherwise constitute an infringement of the Consultant's Moral Rights and without limiting this, the Consultant consents to:

16.3.1 being attributed as author of Contract Material comprised in a Deliverable or any new Contract Material, in a manner acceptable to the Principal;

16.3.2 any amendments, deletion/destruction, alteration, relocation or selection of the Contract Material (or any part thereof);

16.3.3 the publication or communication of the Contract Material or any part thereof; and

16.3.4 the specific acts or omissions (if any) specified in Item 12 of the Schedule.

16.4 If the Consultant is an entity other than an individual, the Consultant must, prior to commencing work in respect of a Deliverable, obtain from every person who is to create new Contract Material:

16.4.1 all consents, permissions and assignments necessary to enable the Principal to exercise the Intellectual Property rights granted under this Agreement in full, without impediment or cost to the Principal; and

16.4.2 without limiting clause 16.4.1, consent from the person to any act or omission by the Principal in their exercise of the Intellectual Property rights granted under this Agreement that might otherwise constitute an infringement of the person's Moral Rights, including a consent to the acts or omissions specified in clause 16.3.1 to 16.3.4, and if requested by the Principal, such consent must be in a form specified by the Principal.

16.5 If Item 12 of the Schedule specifies that title to and Intellectual Property rights in new Contract Material will, upon their creation, vest in the Consultant:

16.5.1 the Consultant grants, and will ensure that relevant third parties grant, to the Principal a paid up non-exclusive, non-transferable, perpetual and irrevocable licence to:

16.5.1.1 use, reproduce and adapt for its own use; and

16.5.1.2 perform any other act with respect to copyright; and

16.5.1.3 manufacture, sell, hire or otherwise exploit a product or process or to provide a service or to licence a third party to do these things in respect of,

any new and existing Contract Material, but only as incorporated in the Contract Material (and any further development of the Contract Material); and

16.5.2 if requested to do so before or after the expiration or sooner termination of this Agreement, the Consultant must deliver to the Principal, in a format specified by the Principal, all new and existing Contract Material.

16.6 Intellectual Property rights in Records and Information supplied to the Consultant by the Principal for reproduction or guidance remain vested in the Principal.

16.7 The Consultant warrants that it is entitled to use any Intellectual Property that may be used by it in connection with the provision of Consultancy Services and grants to the Principal the rights granted pursuant to this clause 16.

16.8 The Consultant must, at its own expense, execute all documents and do all other things reasonably necessary to:

16.8.1 enable the Principal or its nominee to obtain letters patent, design registration or other official protection for the Principal's interest in the Intellectual Property rights of the Contract Material; and

16.8.2 assign and transfer to the Principal or its nominee the full ownership of the Consultant's Intellectual Property rights in the Contract Material.

16.9 The Consultant indemnifies and will at all times keep the Principal and the State indemnified against any action, claim, suit or demand, including a claim, suit or demand for or liability to pay compensation or damages and costs or expenses arising out of or in respect of any breach of any third party's Intellectual Property rights or Moral Rights relating to the provision of Consultancy Services under this Agreement and the Principal's use of the Contract Material.

17. NON-COMPLIANT CONSULTANCY SERVICES

17.1 If the Principal is not satisfied that the Consultancy Services comply in all respects with the requirements of this Agreement, the Principal may, at its option:

17.1.1 require the Consultant to, within a reasonable time, take such steps as are necessary to ensure that the Consultancy Services comply with this Agreement and the Consultant agrees that no Consultancy Fee will be payable to the Consultant by the Principal for any work done to rectify the non-compliance;

17.1.2 notify the Consultant that the Principal rejects the Consultancy Services which do not comply with this Agreement and the Consultant agrees to refund to the Principal any payments made by the Principal in respect of the Consultancy Services which do not comply with this Agreement; or

17.1.3 subject to clause 17.1.1 rectify, either itself or by others, the Consultancy Services which do not comply with this Agreement and the Consultant agrees to reimburse the Principal for any costs, losses, expenses or damages the Principal incurs in rectifying any Consultancy Services which do not comply with this Agreement, which costs, losses, expenses or damages are deemed a debt due by the Consultant to the Principal.

17.2 The Principal's rights under clause 17.1 do not in any way change or affect the Consultant's obligations under this Agreement or affect the Principal's rights to claim for any damage or loss the Principal may suffer because of the Consultant's failure to fulfil its obligations under this Agreement or to exercise other rights under this Agreement, including under clause 25.

18. PROJECT MANAGEMENT

18.1 The Principal appoints the Project Officer as its agent for the purposes of this Agreement.

18.2 The Consultant will:

18.2.1 liaise with and report to the Project Officer; and

18.2.2 attend meetings and briefings with the staff of the Principal as reasonably required by the Project Officer.

18.3 Reports by the Consultant to the Project Officer must be in writing and in a form satisfactory to the Principal, unless otherwise permitted by the Project Officer.

19. DISCLOSURE OF INFORMATION

19.1 All Information provided to, produced or dealt with (including any deliverables of the Consultancy Services) by the Consultant under this Agreement and during the course of providing the Consultancy Services, must be treated as confidential by the Consultant. In this clause 19, this Information is referred to as "Confidential Information".

19.2 The Consultant agrees that the Consultant or its employees, agents, directors, partners, shareholders or consultants must not disclose to any person, any Confidential Information relating to the Principal or the affairs of others which may have come to its or their knowledge as a result of this Agreement or performance of the Consultancy Services and must take all necessary precautions to prevent unauthorised access to such Information.

19.3 All Confidential Information, and any copies of Confidential Information, must remain the property of the Principal and must be returned to the Principal at the completion of the Consultancy Services or upon the expiration or termination of this Agreement.

19.4 The Confidential Information supplied to the Consultant under this Agreement must be used only for the provision of the Consultancy Services or as directed by the Project Officer and must not be used for any other purpose.

19.5 The Consultant must not divulge any Information regarding the nature or progress of the Consultancy Services or give any publicity concerning the Consultancy Services except with the Principal's Consent.

19.6 The Consultant acknowledges that the Principal is entitled (in addition to any entitlement to damages) to an injunction or other equitable relief with respect to any actual or threatened breach by the Consultant of this clause 19 and without the need on the part of the Principal to prove any special damage.

19.7 The Consultant's and the Principal's obligations under this clause 19 do not extend to:

19.7.1 information already in the public domain other than due to a breach of this Agreement; or

19.7.2 any disclosure required by law.

20. MEDIA RELEASES

20.1 The Consultant must not make any statement or issue any Information, publication, document or article for publication concerning this Agreement and the Consultancy Services in any media without the Principal's Consent.

21. SECURITY AND ACCESS

21.1 The Consultant will, when using the Principal's premises or facilities, comply with all rules, directions and procedures including those relating to security and workplace health and safety in effect at the premises or in regard to the facilities notified to the Consultant by the Principal.

21.2 The Consultant will give the Project Officer, and any other persons authorised in writing by the Principal, reasonable access to premises occupied by the Consultant where the Consultancy Services are being undertaken and will permit them to inspect any Contract Material or Information related to the Consultancy Services.

21.3 The Project Officer and any other person authorised by the Principal, when at the Consultant's premises will comply with all rules, directions and procedures including those relating to security and to workplace health and safety in effect at the premises or in regard to the facilities as notified by the Consultant to the Principal.

22. SUSPENSION OF SERVICES

22.1 The Principal may issue a notice to the Consultant, at any time and for any reason, to suspend all or any part of the Consultancy Services and the Consultant must immediately comply with such notice.

22.2 The Principal may by notice require the Consultant to recommence work on all or any part of the suspended Consultancy Services and the Consultant must promptly comply with such notice at its own cost.

22.3 For the avoidance of doubt, when the Consultancy Services are suspended in accordance with clause 22.1, the Consultant has no claim except where the:

22.3.1 rights have otherwise accrued under this Agreement prior to the date of the suspension; or

22.3.2 Consultant is able to seek an extension of time pursuant to clause 29.

23. VARIATION

23.1 The Principal may by written notice, vary the Consultancy Services.

23.2 The Consultant may seek approval from the Principal to vary the Consultancy Services if the Consultant deems it to be necessary for the performance of the Consultancy Services. When seeking a variation, the Consultant must give written notice to the Principal setting out the:

23.2.1 variation to the Agreement that the Consultant deems necessary;

23.2.2 reasons why the variation is necessary; and

23.2.3 effect of the variation on the Consultancy Fee, expenses and any Milestones and time frames.

23.3 Where the Principal requires a variation to the Consultancy Services pursuant to clause 23.1, or approves a variation sought by the Consultant under clause 23.2:

23.3.1 the Consultant must do everything possible to mitigate its losses arising as a consequence of the variation of the Consultancy Services; and

23.3.2 the parties will negotiate in good faith how much the Consultant is entitled to charge the Principal for the provision of any new services or, alternatively, the basis on which the Consultant must calculate the amounts it may charge the Principal for the provison of any new services.

23.4 In the event that the parties fail to reach agreement under clause 23.3.2, the Principal will reimburse the Consultant for those fees and expenses, which the Principal believes in its sole and absolute discretion, are reasonably and properly incurred by the Consultant as a result of variation of the Consultancy Services under clause 23.1.

24. TERMINATION OF CONSULTANCY SERVICES

24.1 Notwithstanding clause 25, the Principal may at any time, in its sole and absolute discretion, by giving written notice to the Consultant, terminate the provision of the Consultancy Services and the Consultant must on receipt of such notice immediately cease all work under the Agreement and take all appropriate action to mitigate any loss and prevent further costs being incurred with respect to the provision of the relevant Consultancy Services.

24.2 If the Principal elects to terminate under this clause 24.1 it must pay the reasonable fees and expenses of the Consultant (based on the rate of the Consultancy Fees specified in this Agreement or if no such rate is specified, the reasonable rates usually charged by the Consultant in its ordinary course of business) for all work performed by the Consultant in accordance with the Agreement prior to its termination.

24.3 In the event that the parties fail to reach agreement on reasonable fees and expenses under clause 24.2, the Principal will reimburse the Consultant for those fees and expenses, which it believes in its sole and absolute discretion are reasonably and properly incurred by the Consultant as a result of termination of the Consultancy Services under clause 24.1.

24.4 In no circumstances must the fees payable for terminated Consultancy Services exceed the fees that would have been paid had the relevant Consultancy Services been completed.

25. DEFAULT OF THE CONSULTANT AND TERMINATION

25.1 If the Consultant:

25.1.1 fails to comply with any of the terms and conditions of this Agreement; or

25.1.2 fails to comply with a direction of the Project Officer given in accordance with this Agreement;

the Principal may, subject to clause 25.2, terminate this Agreement in whole or in part without prejudice to any other rights.

25.2 Where a breach under clause 25.1 is capable of being remedied (except for those breaches set out in clause 25.3), the Principal must not exercise its rights of termination unless it gives to the Consultant notice requiring the

Consultant to remedy the breach within 14 days of the notice and the matter is not remedied by the Consultant within this time.

25.3 Notwithstanding clauses 25.1 and 25.2, if the Consultant:

25.3.1 abandons or refuses to proceed with the Consultancy Services;

25.3.2 fails to comply with clause 4 (Consultancy Services);

25.3.3 fails to comply with clause 15 (Conflict of Interest);

25.3.4 fails to comply with clause 27 (Insurance); or

25.3.5 enters into any arrangement or proceedings for the purpose of insolvency administration or is placed under official management,

the Principal may immediately terminate this Agreement by notice to the Consultant.

25.4 In the event of termination under clause 25.1 or clause 25.3, but without prejudice to any right of action or remedy which has accrued or which may accrue in favour of the Principal, the Principal:

25.4.1 may procure from any other source services that are reasonably similar to the Consultancy Services and the Consultant must be liable to the Principal for any extra expense incurred which must be recoverable from the Consultant as a liquidated debt payable on demand;

25.4.2 must be liable under the Agreement to pay only for the Consultancy Services performed to the satisfaction of the Project Officer, in accordance with this Agreement; and

25.4.3 may recover from the Consultant the amount of any loss or damage suffered by the Principal as a result of the termination.

25.5 Upon termination of this Agreement under clauses 24.1, 25.1 or clause 25.3, all money which has been paid and all money to be paid for Consultancy Services performed to the date of the termination will be in full and final satisfaction of all claims by the Consultant under this Agreement.

26. INDEMNITIES

26.1 Subject to clause 26.2, the Consultant indemnifies the Principal and its Personnel (**Indemnified Parties**) against any and all damages, costs, expenses or loss which any of them may incur or sustain, and any and all actions, proceedings, claims and demands whatsoever which may be brought or made against the Indemnified Parties by any person, in respect of, by reason of or arising out of:

26.1.1 the performance of the Consultancy Services; or

26.1.2 any act or omission of the Consultant or the Consultant's Personnel.

26.2 The Consultant's liability under this Agreement will be reduced to the extent to which any action, proceeding, claim or demand was directly caused by a negligent act or omission of the Principal.

26.3 In no circumstances will the Principal be liable to the Consultant or any other person for Consequential Loss.

26.4 If the Consultant fails to comply with this clause 26, the Principal may make good the damage and if the cost of so doing would, if the Consultant had performed it, have been borne by the Consultant under this clause, then the cost to the Principal of performing such services or carrying out such repairs will be a debt due and owing from the Consultant to the Principal.

27. INSURANCE

27.1 The Consultant must take out and maintain for the duration of this Agreement:

27.1.1 insurance for the Consultant's relevant Personnel in accordance with applicable workers' compensation legislation;

27.1.2 public liability insurance specified in Item 9 of the Schedule for the amount specified;

27.1.3 professional indemnity insurance specified in Item 9 of the Schedule for the amount and for the term specified; and

27.1.4 any other insurance specified in Item 9 of the Schedule.

27.2 The insurances must be effected with an insurer that is authorised and licensed to operate in Australia.

27.3 The Consultant must properly provide evidence to the Principal of the existence and currency of any of the insurances required by this clause:

27.3.1 before providing any of the Consultancy Services; and

27.3.2 upon request in writing at any time by the Principal.

27.4 The Consultant must immediately notify the Principal of any cancellation of any insurance policy required by clause 27.1.

27.5 The Consultant will immediately notify the Principal and keep the Principal informed of any claims which fall for consideration under any insurance policy required by clause 27.1.

28. FORCE MAJEURE

28.1 A party will not be entitled to exercise its rights and remedies upon the default of the other party (whether at common law or pursuant to this Agreement) if that default is caused by Force Majeure.

28.2 A party that is unable to perform its obligations under this Agreement due to Force Majeure shall:

28.2.1 notify the other party as soon as possible of the Force Majeure event including details of the nature of the event, the date of commencement of the event and an estimate of the period of time required to enable that party to resume full performance of its obligations under this Agreement;

28.2.2 use all reasonable diligence and employ all reasonable means to remedy or abate the Force Majeure as quickly as possible;

28.2.3 resume performance as soon as possible after termination of the Force Majeure or after the Force Majeure has abated to an extent which permits resumption of performance; and

28.2.4 notify the other party when the Force Majeure has terminated or abated to an extent which permits resumption of performance to occur.

28.3 If an event of Force Majeure prevents the performance of any obligation under this Agreement for a period of 30 days, the parties must meet to agree, in good faith, any actions to be taken in relation to this Agreement.

28.4 The Principal shall be relieved from its obligation to pay the Consultant any sum of money during any period that the Consultant is unable to perform its obligations under the Agreement due to Force Majeure.

29. DELAY

29.1 The Consultant must take all possible steps to avoid, or if it cannot be avoided to minimise, any delay.

29.2 The Consultant must give written notice to the Principal advising:

29.2.1 all relevant details of the matters causing the delay;

29.2.2 the duration of the delay;

29.2.3 the impact of the delay on the Milestones and time frames (if any) for completion of the Consultancy Services;

29.2.4 the Consultant's recommendation as to how to minimise the impact of the delay on the Milestones and other time frames; and

29.2.5 any other information reasonably requested by the Principal,

within 5 Business Days after becoming aware or within 5 Business Days from the first time that the Consultant ought to have become aware, whichever is the earlier, of anything which is likely to cause, or has caused, delay to the Consultant in providing the Consultancy Services by the Milestones and other timeframes or which will or may affect the Milestones or timeframes.

29.3 The Principal will not be liable for any claim, including for an extension of time to the Milestones and timeframes which has not been made strictly in accordance with clause 29.2.

29.4 On receipt of a notice from the Consultant in accordance with clause 29.2, the Principal will review the claim and may grant a reasonable extension of time to the Consultant and adjust the Milestones and time frames accordingly, provided:

29.4.1 the delay:

29.4.1.1 has been directly caused by an act, omission or default of the Principal;

29.4.1.2 is critical in that its occurrence will affect the Completion Date;

29.4.1.3 is not concurrent with a delay for which the Consultant is responsible; and

29.4.1.4 has not been caused or contributed to, directly or indirectly, by the Consultant; and

29.4.2 the Consultant has complied with clauses 29.1 and 29.2.

29.5 Except to the extent that this Agreement otherwise expressly provides, the Consultant will not be entitled to any additional payment or to any claim as a result of the granting of an extension of time.

29.6 The Principal may at any time, in its absolute discretion, grant the Consultant an extension of time. This clause is for the Principal's benefit and the Principal will not be required to exercise its discretion under this clause 29.6 for the benefit of the Consultant.

29.7 If the Consultant disputes the Principal's determination, it may refer the matter to be resolved under clause 30 within 10 Business Days after the Principal notifies the Consultant of its decision under clause 29.4. Otherwise, the Principal will have no further liability with respect to the claim.

29.8 The Principal may direct the Consultant to complete the Consultancy Services on a date earlier than the Completion Date or the Milestones, and the Consultant must comply with that direction at no extra cost to the Principal, unless the Consultant can demonstrate that it will unavoidably incur extra costs.

30. DISPUTE RESOLUTION BY MEDIATION

30.1 Any dispute or difference whatsoever arising out of or in connection with this Agreement must be submitted to mediation in accordance with, and subject to, The Institute of Arbitrators & Mediators Australia Mediation and Conciliation Rules.

30.2 The parties must continue to perform their obligations under this Agreement despite a dispute.

31. WAIVER

31.1 No right or obligation under this Agreement must be deemed to be waived except upon written acknowledgment signed by each party.

31.2 A waiver by the Principal will not prejudice any of its rights in respect of any subsequent breach of this Agreement by the Consultant.

31.3 Subject to clause 31.1, any failure by the Principal to enforce any clause of this Agreement, or any forbearance, delay or indulgence granted by the Principal to the Consultant, is not to be construed as a waiver of its rights under this Agreement.

32. GOVERNING LAW

32.1 This Agreement will be governed by and construed in accordance with the laws of the State of Queensland and the parties submit to the jurisdiction of the courts of that State.

33. ENTIRE AGREEMENT

33.1 This Agreement constitutes the entire agreement between the parties and supersedes all communications, negotiations, arrangements and agreements either oral or written between the parties with respect to the subject matter referred to in this Agreement.

33.2 No agreement or understanding that varies or amends this Agreement binds either party unless and until agreed to in writing by both parties.

34. NO SUBCONTRACTING

34.1 The Consultant will not subcontract any part of the Consultancy Services without the Principal's Consent.

34.2 Any consent given by the Principal for the Consultant to subcontract:

34.2.1 will not operate as an authority to transfer responsibility to the subcontractor; and

34.2.2 will not relieve the Consultant from any of its liabilities or obligations under this Agreement.

34.3 The Consultant will not assign this Agreement or any of the benefits under this Agreement without the Principal's Consent.

35. FURTHER ASSISTANCE

35.1 The Consultant will do all things reasonably required by the Principal to give effect to this Agreement or to perfect or protect the rights of the Principal including, without limitation, giving or obtaining confidentiality undertakings acceptable to the Principal in relation to records and the Consultancy Services.

36. CLAUSES TO SURVIVE TERMINATION

36.1 The following clauses will survive termination or expiration of this Agreement:

36.1.1 clause 4.4 (Consultant's warranties);

36.1.2 clause 16 (Contract Material);

36.1.3 clause 19 (Disclosure of Information);

36.1.4 clause 26 (Indemnities);

36.1.5 clause 27.1 (Insurance);

36.1.6 clause 35 (Further Assistance); and

36.1.7 clause 40 (Personal Information).

37. NOTICES

37.1 Notices under this Agreement must be in writing and may be delivered by prepaid postage or certified mail, by hand, by e-mail, or by facsimile transmission to the parties at the address specified in Item 10 of the Schedule or other address subsequently notified by a party to the other.

37.2 Notices will be deemed to be given -

37.2.1 two (2) days after deposit in the mail with postage prepaid; or

37.2.2 immediately upon delivery by hand; or

37.2.3 if sent by e-mail or facsimile transmission, upon completion of transmission.

37.3 The parties agree that where notice is given by either e-mail or facsimile the original document must be sent by post on the same day as the transmission is sent.

38. SEVERABILITY

38.1 Any provision in this Agreement, which is invalid or unenforceable, is to be read down if possible, so as to be valid and enforceable, and if that is not possible the provisions must, to the extent that it is capable, be severed to the extent of the invalidity or unenforceability, without affecting the remaining provisions.

39. PAY AS YOU GO

39.1 In the event that:

39.1.1 the parties are bound by a Voluntary Agreement pursuant to the *A New Tax System (Pay as You Go) Act 1999* ("the Act"), or

39.1.2 the Principal is otherwise obliged to withhold payments from the Consultant pursuant to the Act,

the Principal shall be entitled to withhold from any payment otherwise due to the Consultant under or in connection with the Agreement tax calculated and to be held in accordance with the Act.

40. PERSONAL INFORMATION

40.1 This clause 40 applies if the:

40.1.1 Consultant deals with Personal Information (including the receipt and collection of Personal Information) under this Agreement; or

40.1.2 Consultancy Services involves the:

40.1.2.1 transfer of Personal Information to the Principal; or

40.1.2.2 provision of services to a third party for the Principal.

40.2 Without limiting clause 19, the Consultant must comply with and is bound by Parts 1 to 3, Chapter 2, of the IP Act as if the Consultant was an Agency under that Act.

40.3 In addition to clause 40.2, the Consultant will, in performing its obligations under this Agreement:

40.3.1 protect Personal Information against loss, unauthorised access, use, modification, or disclosure and against other misuse;

40.3.2 not use Personal Information other than for the purpose of performing this Agreement;

40.3.3 not disclose Personal Information without the written consent of the Principal;

40.3.4 immediately notify the Principal if it becomes aware that an unauthorised disclosure of Personal Information has occurred;

40.3.5 ensure that only the Consultant's authorised Personnel have access to Personal Information;

40.3.6 ensure that its Personnel are aware of the Consultant's obligations under this clause, including, when requested by the Principal, requiring any of them to sign an undertaking in relation to Personal Information as defined by this clause;

40.3.7 comply with the Principal's directions regarding the collection, storage, handling, accessing, amendment, management, transfer, use or disclosure of Personal Information by the Consultant. Any direction given by the Principal will not relieve the Consultant of its obligations under clause 40.2; and

40.3.8 comply with any specific restrictions outlined in Item 11 of the Schedule for Records and Confidential Information. The Consultant acknowledges having read and understood these restrictions before executing this Agreement.

40.4 Upon completion of the Consultancy Services, or expiration or termination of this Agreement, the Consultant must return to the Principal all Personal Information including any copies.

The parties have executed this Agreement as follows -

SIGNED on behalf of the **South East Queensland Water Grid Manager**, ABN 14 783 317 630, by the Chief Executive Officer:

Barry K Dennien

_____
(signature)

a delegated officer of the South East Queensland Water Grid Manager

this _____ day of_____2011

In the presence of:

_____ _____
(name of witness) *(signature)*

*** If a company**

Executed for and on behalf of:

Brian Cooper Consulting
ABN 56 154 707 619

_____
(company name and ACN)

by:

Brian Cooper

_____ _____
(name) *(signature)*

_____
(title)

this _____ day of_____2011

in the presence of:

_____ _____
(name of witness) *(signature)*

THE SCHEDULE

Item 1 Consultant
Brian Cooper Consulting
ABN 56 154 707 619

Item 2 Key Personnel (Clause 1.1)

Brian Cooper

Item 3 Project Officer (Clauses 1.1 and 18.1)

The Principal appoints: Barry Dennien
Contact: Telephone: [redacted]
Facsimile:
E-mail: barry.dennien[redacted]

Item 3A Project Coordinator (Clauses 1.1 and 10.1)

Brian Cooper

Item 4 Date of Commencement (Clause 1.1)

The Date of Commencement is 11 January 2011.

Item 4A Completion Date (Clause 1.1)

a) Provision of written preliminary view of compliance and level of response against the Flood Mitigation Manual – by **9am, on 12 January 2011**.
b) Formal written report of final advice delivered to the Principal by **4pm, 12 January 2011**.

Item 5 Assistance to be provided by the Principal (Clause 4.5 and 11.1)

Access to relevant information, personnel and stakeholders, including Seqwater, Department of Environment and Resource Management etc.

Item 5A Progress Reports (Clause 10.3)

As required by the Principal.

Item 6 Fees to be paid for the Consultancy Services (Clause 12.1)

[redacted]per hour, excluding GST.

Item 7 Expenses for which Consultant may be reimbursed (Clause 12.3)

All reasonable expenses as necessary for the Consultant's performance of the Consultancy Services.

Item 8 Issuance of Invoices and Payment of fees (Clauses 13.2, 13.5 and 13.10)

Invoices to be issued by the Consultant to the Principal after each calendar month

Payment of a correctly rendered invoice will be due within 30 days of the Principal's receipt of the correctly rendered invoice.

Item 9 Insurance (Clause 27)

Workers' compensation insurance

Held in accordance with clause 27.1.1

Public Liability Insurance (Clause 27.1.2)

Ten million dollars ($10,000,000).

Professional Indemnity Insurance (Clause 27.1.3)

Amount: Five million dollars ($5,000,000)

Period: 6 years

Any other insurance (Clause 27.1.4)

Not required.

Item 10 Addresses for notices (Clause 37)

Principal

All notices for the Principal are to be addressed as follows -

Mr Barry Dennien
Chief Executive Officer
SEQ Water Grid Manager
PO Box 16205
City East QLD 4002
Telephone: [redacted]
Facsimile:
E-mail: admin[redacted]

Consultant

All notices for the Consultant are to be addressed as follows -

Mr Brian Cooper
Brian Cooper Consulting
Telephone: [redacted]
Mobile:
E-mail: brian.cooper.consult[redacted]

Item 11 Privacy (Clause 40)

NIL

Item 12 Intellectual Property (Clause 16)

N/A

ANNEXURE 1

Terms of Reference

This page and the following pages comprise the Terms of Reference referred to in the Agreement.

Background

The Queensland Bulk Water Supply Authority, trading as Seqwater, provides storage and treatment of bulk water and manages South East Queensland's dams, weirs and water treatment plants. Seqwater is also responsible for catchment management, the quality of water from these assets and the production of drinking water.

The SEQ Water Grid Manager (Water Grid Manager) is a statutory body responsible for managing the strategic operation of the SEQ Water Grid (Water Grid). The Water Grid Manager's role is to manage the Water Grid to ensure water security and quality for South East Queensland in a cost effective way.

The Water Grid Manager buys the following water services from its Grid Service Providers:

- storage and water treatment of bulk water from Seqwater
- transport of bulk water from LinkWater
- production and treatment of desalinated and purified recycled water from WaterSecure.

The Water Grid Manager sells treated bulk water, purified recycled water and raw water to Grid Customers — Distributor-Retailers, power stations, Toowoomba Regional Council - and a small group of commercial and irrigator customers. The Water Grid Manager does not own infrastructure assets but owns the urban water entitlements for South East Queensland. Because it does not own infrastructure assets, we can make operational decisions on water security that are based on ensuring water is moved to where it's needed most, rather than to generate a return on capital.

Under Chapter 4, Part 2 of the *Water Supply (Safety and Reliability) Act 2008,* Seqwater manages controlled releases from Somerset and Wivenhoe Dams in accordance with a *Flood Mitigation Manual, Revision 7, November 2009*, as approved by the Department of Environment and Resource Management (**Flood Mitigation Manual**). Seqwater is responsible for developing the Flood Mitigation Manual and for obtaining approval under the Act.

Purpose

Since October 2010, South East Queensland has experienced unprecedented rainfall which has resulted in controlled releases from Wivenhoe Dam into the Brisbane River under the Flood Mitigation Manual.

The purpose of the Consultancy Services is to obtain independent assurance over the operation of Wivenhoe Dam, including controlled releases, as against the Flood Mitigation Manual, for the period concerning the current South East Queensland flood event (commencing on or about 13 December 2010 to date).

Scope of works

The Consultancy Services requires the Consultant to:

a) review the operation of Wivenhoe Dam, including controlled releases, for compliance against the Flood Mitigation Manual for the period commencing on or about 13 December 2010 to date (**Flood Event**); and
b) advise on whether the decisions and actions taken during the Flood Event regarding the operation of Wivenhoe Dam were prudent and appropriate in light of the Flood Mitigation Manual's requirements and the circumstances of the Flood Event.

At this stage, the Consultancy Services excludes a review of the sufficiency or adequacy of the Flood Mitigation Manual itself.

The Consultant's advice is to be given in the context of the:

a) Flood Mitigation Manual's requirements; and
b) facts matters and circumstances of the Flood Event.

Deliverables and milestones

a) Provision of a written preliminary advice by **9am, on 12 January 2011**.
b) Formal written report of final advice delivered to the Principal by **4pm, 12 January 2011**.

Deliverables are to be provided to:

Mr Barry Dennien
Chief Executive Officer
SEQ Water Grid Manager
Email: barry.dennien[redacted]

Confidentiality

The Consultant acknowledges that the Information (including this Agreement) provided to, dealt with and produced by the Consultant as a result of the Consultancy Services is confidential and the Consultant will strictly comply with the confidentiality requirements set out in clause 19 of this Agreement.

ANNEXURE 2

Offer

This page comprises the Offer referred to in the Agreement and contains the curriculum vitae of the Consultant.

The Consultant has offered to provide the Consultancy Services in accordance with the Terms of Reference at the hourly rate of $260 per hour, excluding GST.

Suzie Emery

From: Elaina Smouha [elainamir[redacted]
Sent: Thursday, 2 February 2012 3:54 PM
To: Elaina Smouha
Subject: Fwd: Agreement (Commercial in confidence)
Attachments: SEW WGM Agreement 1.pdf

---------- Forwarded message ----------
From: **Brian Cooper Consulting** <brian.cooper.consult[redacted]>
Date: Mon, Jan 24, 2011 at 8:10 AM
Subject: RE: Agreement (Commercial in confidence)
To: Elaina Smouha <elainamir[redacted]>

Dear Elaina,

Please find attached the Signature Page of the Agreement with my signature. I have posted the entire, signed Agreement.

Please advise when practicable, any pertinent information regarding the Royal Commission and the BCC Inquiry.

Regards,

Brian Cooper

From: Elaina Smouha [mailto:elainamir[redacted]
Sent: Friday, 21 January 2011 10:12 AM
To: Brian Cooper Consulting
Subject: Agreement (Commercial in confidence)

Hi rian

Thank you again for assisting us.

You may have already posted a signed copy of the agreement, but would you also be able to email me a scanned copy of the signed agreement. I will then provide you with a fully executed copy.

Kind regards

Elaina

The parties have executed this Agreement as follows -

SIGNED on behalf of the **South East Queensland Water Grid Manager**, ABN 14 783 317 630, by the Chief Executive Officer:

Barry K Dennien

_____
(signature)

a delegated officer of the South East Queensland Water Grid Manager

this _____ day of _____ 2011

In the presence of:

_____ _____

(name of witness) *(signature)*

*** If a company**

Executed for and on behalf of:

Brian Cooper Consulting
ABN 56 154 707 619

(company name and ACN)

by:

Brian Cooper

(name)

[redacted]
(signature)

Principal

(title)

this 12th day of January 2011

in the presence of:

Judith-ann Cooper

(name of witness)

[redacted]

Suzie Emery

From: Elaina Smouha [Elaina.Smouha[redacted]
Sent: Thursday, 2 February 2012 4:19 PM
To: Elaina Smouha
Subject: FW: Brian Cooper Consulting paperwork
Attachments: I 11 06.pdf

Elaina

Elaina Smouha
Director, Governance and Regulatory Compliance
SEQ Water Grid Manager
[redacted]
Visit: Level 15, 53 Albert Street Brisbane
Post: PO Box 16205, City East QLD 4002
ABN: 14783 317 630

From: Aleisha Paine
Sent: Friday, 4 February 2011 8:21 AM
To: Elaina Smouha
Subject: Brian Cooper Consulting paperwork

Scanned Consultancy Agreement for Brian Cooper Consulting.

This has not yet been saved as a rendition as I do not have the access. Can you please save.

I have renditioned and filed the Execution of Contract form.

Kind regards,

Aleisha Paine
Board Executive Officer
SEQ Water Grid Manager
[redacted]
Visit: Level 15, 53 Albert Street Brisbane
Post: PO Box 16205, City East QLD 4002
ABN: 14783 317 630

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

L/11/06



CONSULTANCY AGREEMENT

CONSULTANCY AGREEMENT

THIS AGREEMENT is made this 12th day of January 2011.

BETWEEN: The **SOUTH EAST QUEENSLAND WATER GRID MANAGER, ABN 14 783 317 630**, of Level 15, 53 Albert Street, Brisbane, Queensland 4000 ("the Principal")

AND: **THE ENTITY SHOWN IN Item 1 OF THE SCHEDULE** ("the Consultant")

RECITALS

A. The Consultant has agreed to perform the Consultancy Services for the Principal.

B. The parties wish to record the terms and conditions of their agreement.

IT IS AGREED:

1. INTERPRETATION

1.1 Where commencing with a capital letter and unless the context otherwise requires:

Agency	has the meaning given to it in the IP Act;
Agreement	means the clauses contained in this document and the attached Schedule and Annexures;
Business Day	means a day that is not a Saturday, Sunday or public holiday in the State;
Completion Date	means the date or dates specified in Item 4A of the Schedule or the Terms of Reference for completion of the Consultancy Services;
Consequential Loss	means: (a) any loss of anticipated or actual revenue or profits; (b) loss of use of equipment; (c) business interruption or a failure to realise anticipated savings; (d) loss of data; (e) downtime costs or wasted overheads; (f) loss of goodwill or business opportunity; (g) punitive or exemplary damages; or (h) any special or indirect loss or damage of any nature whatsoever;

Consultancy Fee	means the monies payable to the Consultant for the Consultancy Services under this Agreement and specified in Item 6 of the Schedule;
Consultancy Services	means the services described in the Terms of Reference including all Deliverables;
Contract Material	means: (a) any material forming part of or constituting a deliverable that is created, written or otherwise brought into existence by or on behalf of the Consultant in the course of performing the Consultancy Services (called "new Contract Material"); and (b) any material that exists at the Date of Commencement and is incorporated into a Deliverable (called "existing Contract Material");
Date of Commencement	means the date specified in Item 4 of the Schedule;
Deliverable	means any document, piece of equipment, data listing or other creation required to be delivered to the Principal in order to complete the performance of the Consultancy Services including those deliverables specified in the Terms of Reference;
Force Majeure	means the following events that are not within the reasonable control of a party: (a) acts of God, including earthquakes, floods landslides and natural disasters; (b) national or statewide strikes, lockouts, bans or other industrial disturbances excluding those that are specific to a party; (c) acts of public enemies, terrorism, sabotage, wars, blockades, insurrections, riots and civil disturbances, arrests and restraints of rulers and people; (d) fire or explosions; epidemic; or (e) a State Direction, any change in law or regulation or regulatory practice.
GST	means any tax imposed under any GST Law and includes GST within the meaning of the GST Act;
GST Act	means the *A New Tax System (Goods and Services Tax) Act 1999* (Commonwealth) as amended;
GST Law	means the GST Law as defined in the GST Act and includes any Act of the Parliament of Australia that imposes or deals with GST;

Industry Best Practice	means the standards (including any relevant Australian Standard), practices, methods and procedures generally followed or approved by relevant industries and consultants in Australia with respect to the Consultancy Services and that degree of skill, diligence, prudence and foresight which would reasonably and ordinarily be expected from a skilled and experienced consultant engaged in similar work or services;
Information	means all information or data however held, stored or recorded including this Agreement drawings, plans, specifications, correspondence, calculations, reports, models, concepts, source codes, files, computerised data, photographic recordings, audio or audio visual recordings;
Intellectual Property	means all proprietary rights in relation to Information including copyright and neighbouring rights, and all proprietary rights in relation to inventions (including patents) registered and unregistered trademarks (including service marks), registered designs, confidential information (including trade secrets and know how) and circuit layouts, and all other proprietary rights resulting from intellectual activity in the industrial, scientific, literary or artistic fields;
IP Act	means the *Information Privacy Act 2009* (Qld);
Key Personnel	means the Consultant's Personnel specified in Item 2 of the Schedule who are approved by the Principal to perform the Consultancy Services;
Legislative Requirements	includes: (a) Acts, ordinances, regulations, by-laws, orders, awards and proclamations of the Commonwealth and the State or Territory applicable to the Services; (b) certificates, licences, consents, permits, approvals, codes, standards and requirements of organisations having jurisdiction in connection with or recognised generally as authorities in respect of the carrying out of the Consultancy Services, including the requirements of any local government or other authority, and the requirements of any development consent issued in relation to any project to which the Consultancy Services relate; (c) Australian Standards and any other relevant standards; and (d) the Codes of Practice of the State or Territory applicable to the Consultancy Services and other appropriate codes;

Milestones	means the milestones specified in the Schedule and Terms of Reference;
Moral Rights	mean the moral rights of attribution of authorship, right not to have authorship falsely attributed and right of integrity of authorship specified in Part IX of the *Copyright Act 1968* (Cth);
Offer	means the offer submitted to the Principal by the Consultant to provide the Consultancy Services a copy of which is contained in Annexure 2;
Personal Information	has the meaning given to it in the IP Act;
Personnel	means any officer, employee, agent or sub-contractor of a party;
Principal's Consent	means prior written consent (which will not be unreasonably withheld) of the Principal which may be given subject to such terms and conditions as the Principal may see fit to impose;
Project Coordinator	means the person appointed by the Consultant specified in Item 3A of the Schedule, or any other person substituted by the Consultant by notice to the Principal.
Project Officer	means the person specified in Item 3 of the Schedule or any other person substituted by the Principal by notice to the Consultant;
Quality Assurance System	means the Consultant's system which establishes the qualities and performance of the Consultancy Services including, all quality manuals, plans, management structures and responsibility statements, techniques for identification and management of non-conforming or disputed Consultancy Services and audit and other critical issues relating to quality assurance;
Records	means all material including but not limited to books, documents, information, computer software, equipment, and data stored by any means disclosed, or made available, by the Principal to the Consultant in connection with the performance of this Agreement;
State	means the State of Queensland;
Tax Invoice	has the same meaning as in the GST Act;
Terms of Reference	means the document issued by the Principal to the Consultant for the purpose of obtaining an Offer, a copy of which is contained in Annexure 1.

1.2 In this Agreement unless a contrary intention appears, words importing a gender include any other gender and words in the singular include the plural and vice versa.

1.3 In this Agreement, unless a contrary intention appears, a reference to:

1.3.1 "dollars" or "$" is a reference to the currency of Australia;

1.3.2 any legislation shall include any Act of Parliament and any subordinate legislation, rule, regulation, order or instrument made under it and shall include any statutory modification, substitution or re-enactment of such legislation;

1.3.3 an individual or person includes a corporation, partnership, joint venture, trust, association, government, local government authorities and agencies;

1.3.4 a recital, clause, schedule or annexure is a reference to a recital, clause, schedule or annexure to this Agreement; and

1.3.5 a party to this Agreement includes the executors, administrators, successors and permitted assigns of that party.

1.4 Clause headings in this Agreement are for convenience of reference only and have no effect in limiting or extending the language of the provisions to which they refer.

1.5 In this Agreement if a word is defined, cognate words and phrases have corresponding definitions.

1.6 If a party to this Agreement consists of more than one person those persons shall be jointly and severally bound under this Agreement.

1.7 Subject to clause 1.8, where any inconsistency exists between the provisions of the Terms of Reference, this Agreement and the Offer and the inconsistency is not the result of a variation agreed to under clause 23 the provisions of the documents will take precedence in the following order:

1.7.1 Agreement
1.7.2 Terms of Reference
1.7.3 Offer.

1.8 Where a higher standard to that specified in the Agreement is stated in the Terms of Reference or Offer, the Consultant shall be bound by the higher standard.

2. TERM

2.1 This Agreement will start on the Date of Commencement and, unless earlier terminated in accordance with its terms, continue until the Completion Date.

3. PROVISION OF SERVICES

3.1 Time must be of the essence in the provision of the Consultancy Services.

4. CONSULTANCY SERVICES

4.1 The Consultant will provide and complete the Consultancy Services:

4.1.1 through its Key Personnel;

4.1.2 with due care and skill and to the best of its knowledge and expertise;

4.1.3 in a thorough and professional manner in accordance with relevant professional principles and standards;

4.1.4 by any Milestones and time frames informed by the Principal to the Consultant; and

4.1.5 in accordance with:

4.1.5.1 the requirements of this Agreement;

4.1.5.2 all Legislative Requirements including all applicable safety, health and environmental laws and regulations;

4.1.5.3 all operations, safety, health and environment guidelines, rules and procedures provided to the Consultant by the Principal;

4.1.5.4 Industry Best Practice; and

4.1.5.5 all reasonable directions and orders given by the Principal.

4.2 The Consultant agrees that the scope of the Consultancy Services includes all incidental and related work which may arise from the matters referred to, identified in, or to be reasonably inferred from or contemplated by the Terms of Reference.

4.3 The Consultant will -

4.3.1 inform itself of the Principal's stated requirements in respect of the Consultancy Services;

4.3.2 make its own investigations and assessments of the work and risks involved in providing the Consultancy Services and it will review and satisfy itself about the Information that the Principal has made available to the Consultant about the Consultancy Services and this Agreement;

4.3.3 consult regularly with the Principal throughout the performance of the Consultancy Services; and

4.3.4 provide such further Information in relation to the provision of the Consultancy Services as reasonably required by the Principal.

4.4 The Consultant warrants (and the Principal relies upon this warranty) that:

4.4.1 the Consultancy Services will match the description as set out in this Agreement;

4.4.2 it and its Key Personnel have the qualifications, admissions and memberships (if any) necessary for the performance of the Consultancy Services and it is a condition of this Agreement that the Consultant and its Key Personnel must retain memberships, at the Consultant's own cost, whilst performing the Consultancy Services;

4.4.3 the Consultancy Services must be carried out with all due care and skill and in accordance with the highest applicable professional standards, principles and practices;

4.4.4 the Information contained in the Offer as to the structure, viability, reliability, insurance cover, capacity, experience and expertise of the Consultant or its Key Personnel is correct;

4.4.5 it will not infringe the Intellectual Property rights of any third party or otherwise breach any law or obligation to any third party in the

performance of its obligations pursuant to this document or in completing the Consultancy Services;

4.4.6 as at the date of this document no conflict of interest exists or is likely to arise in the performance of its obligations pursuant to this Agreement; and

4.4.7 the Consultancy Services will be fit for the purpose or purposes:

4.4.7.1 described in this Agreement;

4.4.7.2 informed to the Consultant by the Principal; and

4.4.7.3 for which these types of Consultancy Services are commonly provided.

4.5 Where specified in Item 5 of the Schedule, the Principal will provide the specified assistance to the Consultant.

4.6 The Consultant must maintain solely at the Consultant's own expense any licences, accreditations, certificates or registrations that the Consultant or its Personnel are required to possess by any relevant Legislative Requirements in order to complete the Consultancy Services.

5. COMPLIANCE WITH DEMONSTRATED SERVICES

5.1 Without limiting clause 4, if the Consultant:

5.1.1 provides or provided the Principal with a demonstration of the Consultancy Services before the Principal entered into this Agreement, the Consultancy Services must correspond in nature and quality with the Consultancy Services demonstrated; or

5.1.2 showed the Principal a result achieved by the Consultancy Services or similar services before the Principal entered into this Agreement, the Consultancy Services must correspond in quality with the services that achieved that result.

6. SUPPLY OF ITEMS

6.1 Any items which the Consultant uses or supplies in conjunction with the Consultancy Services must:

6.1.1 be of merchantable quality;

6.1.2 comply with any applicable Australian Standards and any other standards specified in this Agreement; and

6.1.3 be fit for the purpose or purposes described in clause 4.4.7.

7. KEY PERSONNEL

7.1 Unless the Principal has given its written consent to the contrary, the Consultancy Services must be performed by the Key Personnel of the Consultant.

7.2 The Consultant will ensure that Key Personnel are competent and have the necessary skills to perform the Consultancy Services on which they will be engaged.

7.3 The Consultant will not, without the Principal's Consent:

7.3.1 allow Key Personnel to delegate any part of the Consultancy Services; or

7.3.2 allocate tasks not connected with the Consultancy Services to any of the Key Personnel engaged on the Consultancy Services on a full time basis until completion of the Consultancy Services allocated to that person.

If any of the Key Personnel are not available to perform any of the Consultancy Services allocated to them, or leave the employ of the Consultant, the Consultant will immediately:

7.3.3 give notice to the Principal of the circumstances; and

7.3.4 if so requested by the Principal, arrange for replacement of that person with a person of comparable skill, experience and qualification and obtain the Principal's Consent to such replacement Key Personnel at no cost to the Principal.

7.4 The Principal may, on reasonable grounds, give written notice requiring the Consultant to remove Key Personnel from working on the Consultancy Services. Upon receipt of a notice pursuant to this clause 7.4, the Consultant will, at no cost to the Principal, promptly remove and replace the Key Personnel referred to in the notice with a person satisfactory to the Principal.

7.5 If any of the events mentioned in clauses 7.3 and 7.4 occur, the Consultant must do all that is necessary to minimise any delay to the performance of the Consultancy Services.

8. QUALITY ASSURANCE SYSTEM

8.1 The Consultant will be a third party accredited to the relevant Australian Standard. The Consultant will carry out the Services under the Quality Assurance System in accordance with the relevant Australian Standard and the requirements of this Agreement.

9. INSPECTION AND INFORMATION

9.1 The Consultant must keep the Principal fully informed on all aspects of the Consultancy Services.

9.2 Without limiting the scope of clause 9.1, the Consultant will provide to the Principal, as requested from time to time by the Principal, copies of all plans, designs, drawings, specifications, reports, data and other information relating to the Consultancy Services to a standard which at all times meets the satisfaction of the Principal and accords with Industry Best Practice.

9.3 At all reasonable times, the Principal will have the right to inspect and review performance of the Consultancy Services at:

9.3.1 the site or premises at which the Consultancy Services are to be performed;

9.3.2 the Consultant's premises; and

9.3.3 the premises of any of the Consultant's subcontractors.

10. MEETINGS AND REPORTING

10.1 The Consultant must appoint a Project Coordinator who is to be responsible for liaising with the Principal regarding the Consultancy Services.

10.2 The Principal and the Consultant must meet monthly or as required by the Principal to discuss:

10.2.1 the progress of the Consultancy Services; and

10.2.2 any other matters which the Principal may wish to raise at a meeting concerning the Consultancy Services and this Agreement.

10.3 The Consultant must provide the Principal with progress reports as to the provision of the Consultancy Services in such detail as allows the Principal to ascertain whether the Consultancy Services are being performed in accordance with this Agreement. Such progress reports to be provided prior to any meeting requested under clause 10.1, at the intervals stated in Item 5A of the Schedule and at other intervals reasonably requested by the Principal.

11. LABOUR, PLANT AND EQUIPMENT

11.1 The Consultant will supply at its own cost all labour, plant, equipment, tools, appliances or other property and items the Consultant requires to fulfil its obligations under this document, unless otherwise provided in Item 5 of the Schedule.

11.2 Any plant, equipment, tools, appliances or other property and items that the Principal provides to the Consultant to enable it to complete its obligations under this document remain the Principal's property and must only be used for the purposes of fulfilling the Consultant's obligations under this Agreement.

11.3 The Consultant must keep the Principal's property in good order and condition, subject to fair wear and tear.

12. FEES AND REIMBURSABLE EXPENSES

12.1 The Consultant will provide the Consultancy Services for the Consultancy Fee. This Consultancy Fee is inclusive of all costs and expenses of the Consultant whether foreseen or unforeseen, including without limitation, insurance, duties, imposts and taxes and the GST (if any) that must be paid by the Consultant.

12.2 The Principal will only be liable to the Consultant for the Consultancy Fee and expenses in relation to the Consultancy Services that meet the requirements of this Agreement.

12.3 Notwithstanding clause 12.1 above the Consultant may include in an invoice under clause 13.2 a claim, and be paid, for expenses described in Item 7 of the Schedule provided that the Consultant has incurred these expenses.

12.4 The Consultant will not be reimbursed by the Principal for any other expenses unless the Consultant has the Principal's Consent.

13. PAYMENT

13.1 The Principal will not have any obligation to pay the Consultant for any part of the Consultancy Services until the Principal has been given a correctly rendered invoice.

13.2 The Consultant shall issue a correctly rendered invoice at the intervals specified in Item 8 of the Schedule.

13.3 Invoices must be in sufficient detail to allow the Principal to assess progress against Milestones. For work carried out on a time basis, invoices must be supported by records of times spent by individuals on the Consultancy Services, certified by the Consultant and the Project Officer.

13.4 Upon receipt of an invoice the Principal may require the Consultant to provide additional information to assist the Principal to determine whether or not an amount is payable.

13.5 The Principal will make payment of a correctly rendered invoice within the time limit set out in Item 8 of the Schedule after receipt of the invoice or, if additional information is required by the Principal pursuant to clause 13.4, then upon receipt of the additional information payment will be made within the time limit set out in Item 8 of the Schedule.

13.6 For the purposes of this clause 13, a correctly rendered invoice is an invoice that has been submitted to the Principal in accordance with clause 13.2 and the Consultant must ensure that:

13.6.1 the amount claimed in the invoice is due for payment pursuant to this Agreement;

13.6.2 the amount claimed in the invoice is correctly calculated in accordance with this Agreement; and

13.6.3 correctly identifies the Consultancy Services performed.

13.7 In addition, the invoice must comply with the requirements of the GST Law (as a Tax Invoice) and must, unless inconsistent with the GST Law, specify:

13.7.1 the Consultant's Australian Business Number;

13.7.2 the Consultancy Fee due to the Consultant and the basis for its calculation;

13.7.3 the amount of any GST paid or payable by the Consultant with respect to the Consultancy Fee;

13.7.4 the date of delivery of the Consultancy Services to which the invoice relates;

13.7.5 a description of the Consultancy Services delivered;

13.7.6 the Consultant's address for payment; and

13.7.7 the Principal's reference number.

13.8 The Principal will notify the Consultant within 14 days after receipt of an invoice found not to be correctly rendered.

13.9 Where the Principal disputes the Consultancy Fee or expenses claimed in the Consultant's invoice, the Principal will:

13.9.1 give written notice to the Consultant of the amount that the Principal disputes;

13.9.2 pay the undisputed amount;

13.9.3 attempt to resolve the disputed amount with the Consultant within 20 Business Days of the dated of the Principal's notice under clause 13.9.1;

13.9.4 if the disputed amount still remains unresolved after 20 Business Days, the matter is to be resolved accordance with the dispute resolution process under clause 30; and

13.9.5 pay the resolved disputed amount within the time frame under clause 13.5.

13.10 Where the Principal has paid an invoice to the Consultant, and the Principal subsequently determines that such invoice was not a correctly rendered invoice, the Principal will:

13.10.1 pay any underpaid amount owed to the Consultant within 30 days of receipt of a correctly rendered invoice or, if additional information is required by the Principal pursuant to clause 13.4, then upon receipt of the additional information payment will be made within the time limit set out in Item 8 of the Schedule;

13.10.2 deduct any overpaid amount owed to the Principal from the next invoiced payment or, if no other payment is due to the Consultant pursuant to this Agreement, recover the amount from the Consultant as a debt due to the Principal.

13.11 Notwithstanding any other provisions in this Agreement, payment of an invoice is not:

13.11.1 evidence or an admission that the Consultancy Services have been provided in accordance with the Agreement;

13.11.2 evidence of the value of the Consultancy Services provided;

13.11.3 an admission that the Consultancy Fee or expenses invoiced were properly incurred in accordance with this Agreement;

13.11.4 an admission of the Principal's liability; or

13.11.5 acceptance or approval of the Consultant's performance;

but must be taken only as payment on account.

13.12 The Principal may set off against any sum owing to the Consultant any amount owing by the Consultant to the Principal.

14. NO AGENCY

14.1 The Consultant is engaged as an independent contractor and nothing in this Agreement shall be deemed to constitute the Consultant as an agent or employee of the Principal or the State and the Consultant shall not have any authority to incur and shall not incur any obligation or make or purport to make any representation on behalf of the Principal except with the Principal's Consent.

14.2 The Consultant acknowledges that it is the employer of all or has otherwise engaged all Personnel who will provide the Consultancy Services, including the Key Personnel, and the Consultant must meet all payment obligations to such Personnel and must pay all statutory taxes, fees, levies or charges applicable with respect to the engagement of or payments made to such personnel. The Consultant must comply with all reasonable requests for verification of such payment obligations received from the Principal.

14.3 The Consultant indemnifies and must keep the Principal indemnified against:

14.3.1 any obligation to make payments to Key Personnel and other Personnel engaged in the provision of the Consultancy Services, and

14.3.2 any obligation to pay any related statutory taxes, fees, levies or charges.

15. CONFLICT OF INTEREST

15.1 The Consultant will at all times act in the best interests of the Principal.

15.2 If a conflict or risk of conflict of interest arises (without limitation, because of work undertaken for any person other than the Principal) the Consultant will immediately give notice of the conflict of interest, or the risk of it, to the Principal.

15.3 The Consultant will do all that is necessary to ensure that its Personnel do not engage in any activity or obtain any interest that is in conflict with providing the Consultancy Services to the Principal fairly and independently. The Consultant will immediately give notice of any conflict of interest relating to the activities or interests of any of its Personnel to the Principal.

15.4 If the Principal is given notice of a conflict of interest pursuant to clause 15.1 or 15.3, the Principal may proceed in accordance with clause 25 to terminate this Agreement.

16. CONTRACT MATERIAL

16.1 Title to and Intellectual Property rights in all new Contract Material will vest in the Principal unless otherwise specified in Item 12 of the Schedule.

16.2 If title to and Intellectual Property rights in new Contract Material will vest in the Principal:

16.2.1 this Agreement does not affect Intellectual Property rights in existing Contract Material but the Consultant grants, and will ensure that relevant third parties grant, to the Principal a paid up non-exclusive, non-transferable, perpetual and irrevocable licence to:

16.2.1.1 use, reproduce and adapt for its own use; and

16.2.1.2 perform any other act with respect to copyright; and

16.2.1.3 manufacture, sell, hire or otherwise exploit a product or process or to provide a service or to licence a third party to do these things in respect of,

any existing Contract Material, but only as incorporated in new Contract Material (and any further development of the Contract Material);

16.2.2 if requested to do so before or after the expiration or sooner termination of this Agreement, the Consultant must deliver to the Principal, in a format specified by the Principal, all new Contract Material;

16.2.3 the Consultant must ensure that new Contract Material and Records are used, copied, supplied or reproduced only for the purposes of this Agreement;

16.2.4 if any Contract Material is produced or reproduced in an electronic format or stored electronically, the Consultant must not:

16.2.4.1 store it on a foreign computer (meaning a hard disk or other similar device affixed to a computer that is not the property of the Principal) without keeping the current version of the Contract Material on separate media and delivering it to the Principal at the intervals (if any) specified in the Terms of Reference; or

16.2.4.2 produce, reproduce or store Contract Material in such a way this it is mixed with, attached to or indistinguishable, with the use of a computer, from material that is not the subject of this Agreement.

16.3 If the Consultant is an individual, the Consultant consents to any act or omission done by the Principal in the exercise of the Intellectual Property rights granted under this Agreement that might otherwise constitute an infringement of the Consultant's Moral Rights and without limiting this, the Consultant consents to:

16.3.1 being attributed as author of Contract Material comprised in a Deliverable or any new Contract Material, in a manner acceptable to the Principal;

16.3.2 any amendments, deletion/destruction, alteration, relocation or selection of the Contract Material (or any part thereof);

16.3.3 the publication or communication of the Contract Material or any part thereof; and

16.3.4 the specific acts or omissions (if any) specified in Item 12 of the Schedule.

16.4 If the Consultant is an entity other than an individual, the Consultant must, prior to commencing work in respect of a Deliverable, obtain from every person who is to create new Contract Material:

16.4.1 all consents, permissions and assignments necessary to enable the Principal to exercise the Intellectual Property rights granted under this Agreement in full, without impediment or cost to the Principal; and

16.4.2 without limiting clause 16.4.1, consent from the person to any act or omission by the Principal in their exercise of the Intellectual Property rights granted under this Agreement that might otherwise constitute an infringement of the person's Moral Rights, including a consent to the acts or omissions specified in clause 16.3.1 to 16.3.4, and if requested by the Principal, such consent must be in a form specified by the Principal.

16.5 If Item 12 of the Schedule specifies that title to and Intellectual Property rights in new Contract Material will, upon their creation, vest in the Consultant:

16.5.1 the Consultant grants, and will ensure that relevant third parties grant, to the Principal a paid up non-exclusive, non-transferable, perpetual and irrevocable licence to:

16.5.1.1 use, reproduce and adapt for its own use; and

16.5.1.2 perform any other act with respect to copyright; and

16.5.1.3 manufacture, sell, hire or otherwise exploit a product or process or to provide a service or to licence a third party to do these things in respect of,

any new and existing Contract Material, but only as incorporated in the Contract Material (and any further development of the Contract Material); and

16.5.2 if requested to do so before or after the expiration or sooner termination of this Agreement, the Consultant must deliver to the Principal, in a format specified by the Principal, all new and existing Contract Material.

16.6 Intellectual Property rights in Records and Information supplied to the Consultant by the Principal for reproduction or guidance remain vested in the Principal.

16.7 The Consultant warrants that it is entitled to use any Intellectual Property that may be used by it in connection with the provision of Consultancy Services and grants to the Principal the rights granted pursuant to this clause 16.

16.8 The Consultant must, at its own expense, execute all documents and do all other things reasonably necessary to:

16.8.1 enable the Principal or its nominee to obtain letters patent, design registration or other official protection for the Principal's interest in the Intellectual Property rights of the Contract Material; and

16.8.2 assign and transfer to the Principal or its nominee the full ownership of the Consultant's Intellectual Property rights in the Contract Material.

16.9 The Consultant indemnifies and will at all times keep the Principal and the State indemnified against any action, claim, suit or demand, including a claim, suit or demand for or liability to pay compensation or damages and costs or expenses arising out of or in respect of any breach of any third party's Intellectual Property rights or Moral Rights relating to the provision of Consultancy Services under this Agreement and the Principal's use of the Contract Material.

17. NON-COMPLIANT CONSULTANCY SERVICES

17.1 If the Principal is not satisfied that the Consultancy Services comply in all respects with the requirements of this Agreement, the Principal may, at its option:

17.1.1 require the Consultant to, within a reasonable time, take such steps as are necessary to ensure that the Consultancy Services comply with this Agreement and the Consultant agrees that no Consultancy Fee will be payable to the Consultant by the Principal for any work done to rectify the non-compliance;

17.1.2 notify the Consultant that the Principal rejects the Consultancy Services which do not comply with this Agreement and the Consultant agrees to refund to the Principal any payments made by the Principal in respect of the Consultancy Services which do not comply with this Agreement; or

17.1.3 subject to clause 17.1.1 rectify, either itself or by others, the Consultancy Services which do not comply with this Agreement and the Consultant agrees to reimburse the Principal for any costs, losses, expenses or damages the Principal incurs in rectifying any Consultancy Services which do not comply with this Agreement, which costs, losses, expenses or damages are deemed a debt due by the Consultant to the Principal.

17.2 The Principal's rights under clause 17.1 do not in any way change or affect the Consultant's obligations under this Agreement or affect the Principal's rights to claim for any damage or loss the Principal may suffer because of the Consultant's failure to fulfil its obligations under this Agreement or to exercise other rights under this Agreement, including under clause 25.

18. PROJECT MANAGEMENT

18.1 The Principal appoints the Project Officer as its agent for the purposes of this Agreement.

18.2 The Consultant will:

18.2.1 liaise with and report to the Project Officer; and

18.2.2 attend meetings and briefings with the staff of the Principal as reasonably required by the Project Officer.

18.3 Reports by the Consultant to the Project Officer must be in writing and in a form satisfactory to the Principal, unless otherwise permitted by the Project Officer.

19. DISCLOSURE OF INFORMATION

19.1 All Information provided to, produced or dealt with (including any deliverables of the Consultancy Services) by the Consultant under this Agreement and during the course of providing the Consultancy Services, must be treated as confidential by the Consultant. In this clause 19, this Information is referred to as "Confidential Information".

19.2 The Consultant agrees that the Consultant or its employees, agents, directors, partners, shareholders or consultants must not disclose to any person, any Confidential Information relating to the Principal or the affairs of others which may have come to its or their knowledge as a result of this Agreement or performance of the Consultancy Services and must take all necessary precautions to prevent unauthorised access to such information.

19.3 All Confidential Information, and any copies of Confidential Information, must remain the property of the Principal and must be returned to the Principal at the completion of the Consultancy Services or upon the expiration or termination of this Agreement.

19.4 The Confidential Information supplied to the Consultant under this Agreement must be used only for the provision of the Consultancy Services or as directed by the Project Officer and must not be used for any other purpose.

19.5 The Consultant must not divulge any Information regarding the nature or progress of the Consultancy Services or give any publicity concerning the Consultancy Services except with the Principal's Consent.

19.6 The Consultant acknowledges that the Principal is entitled (in addition to any entitlement to damages) to an injunction or other equitable relief with respect to any actual or threatened breach by the Consultant of this clause 19 and without the need on the part of the Principal to prove any special damage.

19.7 The Consultant's and the Principal's obligations under this clause 19 do not extend to:

19.7.1 information already in the public domain other than due to a breach of this Agreement; or

19.7.2 any disclosure required by law.

20. MEDIA RELEASES

20.1 The Consultant must not make any statement or issue any Information, publication, document or article for publication concerning this Agreement and the Consultancy Services in any media without the Principal's Consent.

21. SECURITY AND ACCESS

21.1 The Consultant will, when using the Principal's premises or facilities, comply with all rules, directions and procedures including those relating to security and workplace health and safety in effect at the premises or in regard to the facilities notified to the Consultant by the Principal.

21.2 The Consultant will give the Project Officer, and any other persons authorised in writing by the Principal, reasonable access to premises occupied by the Consultant where the Consultancy Services are being undertaken and will permit them to inspect any Contract Material or Information related to the Consultancy Services.

21.3 The Project Officer and any other person authorised by the Principal, when at the Consultant's premises will comply with all rules, directions and procedures including those relating to security and to workplace health and safety in effect at the premises or in regard to the facilities as notified by the Consultant to the Principal.

22. SUSPENSION OF SERVICES

22.1 The Principal may issue a notice to the Consultant, at any time and for any reason, to suspend all or any part of the Consultancy Services and the Consultant must immediately comply with such notice.

22.2 The Principal may by notice require the Consultant to recommence work on all or any part of the suspended Consultancy Services and the Consultant must promptly comply with such notice at its own cost.

22.3 For the avoidance of doubt, when the Consultancy Services are suspended in accordance with clause 22.1, the Consultant has no claim except where the:

22.3.1 rights have otherwise accrued under this Agreement prior to the date of the suspension; or

22.3.2 Consultant is able to seek an extension of time pursuant to clause 29.

23. VARIATION

23.1 The Principal may by written notice, vary the Consultancy Services.

23.2 The Consultant may seek approval from the Principal to vary the Consultancy Services if the Consultant deems it to be necessary for the performance of the Consultancy Services. When seeking a variation, the Consultant must give written notice to the Principal setting out the:

23.2.1 variation to the Agreement that the Consultant deems necessary;

23.2.2 reasons why the variation is necessary; and

23.2.3 effect of the variation on the Consultancy Fee, expenses and any Milestones and time frames.

23.3 Where the Principal requires a variation to the Consultancy Services pursuant to clause 23.1, or approves a variation sought by the Consultant under clause 23.2:

23.3.1 the Consultant must do everything possible to mitigate its losses arising as a consequence of the variation of the Consultancy Services; and

23.3.2 the parties will negotiate in good faith how much the Consultant is entitled to charge the Principal for the provision of any new services or, alternatively, the basis on which the Consultant must calculate the amounts it may charge the Principal for the provison of any new services.

23.4 In the event that the parties fail to reach agreement under clause 23.3.2, the Principal will reimburse the Consultant for those fees and expenses, which the Principal believes in its sole and absolute discretion, are reasonably and properly incurred by the Consultant as a result of variation of the Consultancy Services under clause 23.1.

24. TERMINATION OF CONSULTANCY SERVICES

24.1 Notwithstanding clause 25, the Principal may at any time, in its sole and absolute discretion, by giving written notice to the Consultant, terminate the provision of the Consultancy Services and the Consultant must on receipt of such notice immediately cease all work under the Agreement and take all appropriate action to mitigate any loss and prevent further costs being incurred with respect to the provision of the relevant Consultancy Services.

24.2 If the Principal elects to terminate under this clause 24.1 it must pay the reasonable fees and expenses of the Consultant (based on the rate of the Consultancy Fees specified in this Agreement or if no such rate is specified, the reasonable rates usually charged by the Consultant in its ordinary course of business) for all work performed by the Consultant in accordance with the Agreement prior to its termination.

24.3 In the event that the parties fail to reach agreement on reasonable fees and expenses under clause 24.2, the Principal will reimburse the Consultant for those fees and expenses, which it believes in its sole and absolute discretion are reasonably and properly incurred by the Consultant as a result of termination of the Consultancy Services under clause 24.1.

24.4 In no circumstances must the fees payable for terminated Consultancy Services exceed the fees that would have been paid had the relevant Consultancy Services been completed.

25. DEFAULT OF THE CONSULTANT AND TERMINATION

25.1 If the Consultant:

25.1.1 fails to comply with any of the terms and conditions of this Agreement; or

25.1.2 fails to comply with a direction of the Project Officer given in accordance with this Agreement;

the Principal may, subject to clause 25.2, terminate this Agreement in whole or in part without prejudice to any other rights.

25.2 Where a breach under clause 25.1 is capable of being remedied (except for those breaches set out in clause 25.3), the Principal must not exercise its rights of termination unless it gives to the Consultant notice requiring the

Consultant to remedy the breach within 14 days of the notice and the matter is not remedied by the Consultant within this time.

25.3 Notwithstanding clauses 25.1 and 25.2, if the Consultant:

25.3.1 abandons or refuses to proceed with the Consultancy Services;

25.3.2 fails to comply with clause 4 (Consultancy Services);

25.3.3 fails to comply with clause 15 (Conflict of Interest);

25.3.4 fails to comply with clause 27 (Insurance); or

25.3.5 enters into any arrangement or proceedings for the purpose of insolvency administration or is placed under official management,

the Principal may immediately terminate this Agreement by notice to the Consultant.

25.4 In the event of termination under clause 25.1 or clause 25.3, but without prejudice to any right of action or remedy which has accrued or which may accrue in favour of the Principal, the Principal:

25.4.1 may procure from any other source services that are reasonably similar to the Consultancy Services and the Consultant must be liable to the Principal for any extra expense incurred which must be recoverable from the Consultant as a liquidated debt payable on demand;

25.4.2 must be liable under the Agreement to pay only for the Consultancy Services performed to the satisfaction of the Project Officer, in accordance with this Agreement; and

25.4.3 may recover from the Consultant the amount of any loss or damage suffered by the Principal as a result of the termination.

25.5 Upon termination of this Agreement under clauses 24.1, 25.1 or clause 25.3, all money which has been paid and all money to be paid for Consultancy Services performed to the date of the termination will be in full and final satisfaction of all claims by the Consultant under this Agreement.

26. INDEMNITIES

26.1 Subject to clause 26.2, the Consultant indemnifies the Principal and its Personnel (**Indemnified Parties**) against any and all damages, costs, expenses or loss which any of them may incur or sustain, and any and all actions, proceedings, claims and demands whatsoever which may be brought or made against the Indemnified Parties by any person, in respect of, by reason of or arising out of:

26.1.1 the performance of the Consultancy Services; or

26.1.2 any act or omission of the Consultant or the Consultant's Personnel.

26.2 The Consultant's liability under this Agreement will be reduced to the extent to which any action, proceeding, claim or demand was directly caused by a negligent act or omission of the Principal.

26.3 In no circumstances will the Principal be liable to the Consultant or any other person for Consequential Loss.

26.4 If the Consultant fails to comply with this clause 26, the Principal may make good the damage and if the cost of so doing would, if the Consultant had performed it, have been borne by the Consultant under this clause, then the cost to the Principal of performing such services or carrying out such repairs will be a debt due and owing from the Consultant to the Principal.

27. INSURANCE

27.1 The Consultant must take out and maintain for the duration of this Agreement:

27.1.1 insurance for the Consultant's relevant Personnel in accordance with applicable workers' compensation legislation;

27.1.2 public liability insurance specified in Item 9 of the Schedule for the amount specified;

27.1.3 professional indemnity insurance specified in Item 9 of the Schedule for the amount and for the term specified; and

27.1.4 any other insurance specified in Item 9 of the Schedule.

27.2 The insurances must be effected with an insurer that is authorised and licensed to operate in Australia.

27.3 The Consultant must properly provide evidence to the Principal of the existence and currency of any of the insurances required by this clause:

27.3.1 before providing any of the Consultancy Services; and

27.3.2 upon request in writing at any time by the Principal.

27.4 The Consultant must immediately notify the Principal of any cancellation of any insurance policy required by clause 27.1.

27.5 The Consultant will immediately notify the Principal and keep the Principal informed of any claims which fall for consideration under any insurance policy required by clause 27.1.

28. FORCE MAJEURE

28.1 A party will not be entitled to exercise its rights and remedies upon the default of the other party (whether at common law or pursuant to this Agreement) if that default is caused by Force Majeure.

28.2 A party that is unable to perform its obligations under this Agreement due to Force Majeure shall:

28.2.1 notify the other party as soon as possible of the Force Majeure event including details of the nature of the event, the date of commencement of the event and an estimate of the period of time required to enable that party to resume full performance of its obligations under this Agreement;

28.2.2 use all reasonable diligence and employ all reasonable means to remedy or abate the Force Majeure as quickly as possible;

28.2.3 resume performance as soon as possible after termination of the Force Majeure or after the Force Majeure has abated to an extent which permits resumption of performance; and

28.2.4 notify the other party when the Force Majeure has terminated or abated to an extent which permits resumption of performance to occur.

28.3 If an event of Force Majeure prevents the performance of any obligation under this Agreement for a period of 30 days, the parties must meet to agree, in good faith, any actions to be taken in relation to this Agreement.

28.4 The Principal shall be relieved from its obligation to pay the Consultant any sum of money during any period that the Consultant is unable to perform its obligations under the Agreement due to Force Majeure.

29. DELAY

29.1 The Consultant must take all possible steps to avoid, or if it cannot be avoided to minimise, any delay.

29.2 The Consultant must give written notice to the Principal advising:

29.2.1 all relevant details of the matters causing the delay;

29.2.2 the duration of the delay;

29.2.3 the impact of the delay on the Milestones and time frames (if any) for completion of the Consultancy Services;

29.2.4 the Consultant's recommendation as to how to minimise the impact of the delay on the Milestones and other time frames; and

29.2.5 any other information reasonably requested by the Principal,

within 5 Business Days after becoming aware or within 5 Business Days from the first time that the Consultant ought to have become aware, whichever is the earlier, of anything which is likely to cause, or has caused, delay to the Consultant in providing the Consultancy Services by the Milestones and other timeframes or which will or may affect the Milestones or timeframes.

29.3 The Principal will not be liable for any claim, including for an extension of time to the Milestones and timeframes which has not been made strictly in accordance with clause 29.2.

29.4 On receipt of a notice from the Consultant in accordance with clause 29.2, the Principal will review the claim and may grant a reasonable extension of time to the Consultant and adjust the Milestones and time frames accordingly, provided:

29.4.1 the delay:

29.4.1.1 has been directly caused by an act, omission or default of the Principal;

29.4.1.2 is critical in that its occurrence will affect the Completion Date;

29.4.1.3 is not concurrent with a delay for which the Consultant is responsible; and

29.4.1.4 has not been caused or contributed to, directly or indirectly, by the Consultant; and

29.4.2 the Consultant has complied with clauses 29.1 and 29.2.

29.5 Except to the extent that this Agreement otherwise expressly provides, the Consultant will not be entitled to any additional payment or to any claim as a result of the granting of an extension of time.

29.6 The Principal may at any time, in its absolute discretion, grant the Consultant an extension of time. This clause is for the Principal's benefit and the Principal will not be required to exercise its discretion under this clause 29.6 for the benefit of the Consultant.

29.7 If the Consultant disputes the Principal's determination, it may refer the matter to be resolved under clause 30 within 10 Business Days after the Principal notifies the Consultant of its decision under clause 29.4. Otherwise, the Principal will have no further liability with respect to the claim.

29.8 The Principal may direct the Consultant to complete the Consultancy Services on a date earlier than the Completion Date or the Milestones, and the Consultant must comply with that direction at no extra cost to the Principal, unless the Consultant can demonstrate that it will unavoidably incur extra costs.

30. DISPUTE RESOLUTION BY MEDIATION

30.1 Any dispute or difference whatsoever arising out of or in connection with this Agreement must be submitted to mediation in accordance with, and subject to, The Institute of Arbitrators & Mediators Australia Mediation and Conciliation Rules.

30.2 The parties must continue to perform their obligations under this Agreement despite a dispute.

31. WAIVER

31.1 No right or obligation under this Agreement must be deemed to be waived except upon written acknowledgment signed by each party.

31.2 A waiver by the Principal will not prejudice any of its rights in respect of any subsequent breach of this Agreement by the Consultant.

31.3 Subject to clause 31.1, any failure by the Principal to enforce any clause of this Agreement, or any forbearance, delay or indulgence granted by the Principal to the Consultant, is not to be construed as a waiver of its rights under this Agreement.

32. GOVERNING LAW

32.1 This Agreement will be governed by and construed in accordance with the laws of the State of Queensland and the parties submit to the jurisdiction of the courts of that State.

33. ENTIRE AGREEMENT

33.1 This Agreement constitutes the entire agreement between the parties and supersedes all communications, negotiations, arrangements and agreements either oral or written between the parties with respect to the subject matter referred to in this Agreement.

33.2 No agreement or understanding that varies or amends this Agreement binds either party unless and until agreed to in writing by both parties.

34. NO SUBCONTRACTING

34.1 The Consultant will not subcontract any part of the Consultancy Services without the Principal's Consent.

34.2 Any consent given by the Principal for the Consultant to subcontract:

34.2.1 will not operate as an authority to transfer responsibility to the subcontractor; and

34.2.2 will not relieve the Consultant from any of its liabilities or obligations under this Agreement.

34.3 The Consultant will not assign this Agreement or any of the benefits under this Agreement without the Principal's Consent.

35. FURTHER ASSISTANCE

35.1 The Consultant will do all things reasonably required by the Principal to give effect to this Agreement or to perfect or protect the rights of the Principal including, without limitation, giving or obtaining confidentiality undertakings acceptable to the Principal in relation to records and the Consultancy Services.

36. CLAUSES TO SURVIVE TERMINATION

36.1 The following clauses will survive termination or expiration of this Agreement:

36.1.1 clause 4.4 (Consultant's warranties);

36.1.2 clause 16 (Contract Material);

36.1.3 clause 19 (Disclosure of Information);

36.1.4 clause 26 (Indemnities);

36.1.5 clause 27.1 (Insurance);

36.1.6 clause 35 (Further Assistance); and

36.1.7 clause 40 (Personal Information).

37. NOTICES

37.1 Notices under this Agreement must be in writing and may be delivered by prepaid postage or certified mail, by hand, by e-mail, or by facsimile transmission to the parties at the address specified in Item 10 of the Schedule or other address subsequently notified by a party to the other.

37.2 Notices will be deemed to be given -

37.2.1 two (2) days after deposit in the mail with postage prepaid; or

37.2.2 immediately upon delivery by hand; or

37.2.3 if sent by e-mail or facsimile transmission, upon completion of transmission.

37.3 The parties agree that where notice is given by either e-mail or facsimile the original document must be sent by post on the same day as the transmission is sent.

38. SEVERABILITY

38.1 Any provision in this Agreement, which is invalid or unenforceable, is to be read down if possible, so as to be valid and enforceable, and if that is not possible the provisions must, to the extent that it is capable, be severed to the extent of the invalidity or unenforceability, without affecting the remaining provisions.

39. PAY AS YOU GO

39.1 In the event that:

39.1.1 the parties are bound by a Voluntary Agreement pursuant to the *A New Tax System (Pay as You Go) Act 1999* ("the Act"), or

39.1.2 the Principal is otherwise obliged to withhold payments from the Consultant pursuant to the Act,

the Principal shall be entitled to withhold from any payment otherwise due to the Consultant under or in connection with the Agreement tax calculated and to be held in accordance with the Act.

40. PERSONAL INFORMATION

40.1 This clause 40 applies if the:

40.1.1 Consultant deals with Personal Information (including the receipt and collection of Personal Information) under this Agreement; or

40.1.2 Consultancy Services involves the:

40.1.2.1 transfer of Personal Information to the Principal; or

40.1.2.2 provision of services to a third party for the Principal.

40.2 Without limiting clause 19, the Consultant must comply with and is bound by Parts 1 to 3, Chapter 2, of the IP Act as if the Consultant was an Agency under that Act.

40.3 In addition to clause 40.2, the Consultant will, in performing its obligations under this Agreement:

40.3.1 protect Personal Information against loss, unauthorised access, use, modification, or disclosure and against other misuse;

40.3.2 not use Personal Information other than for the purpose of performing this Agreement;

40.3.3 not disclose Personal Information without the written consent of the Principal;

40.3.4 immediately notify the Principal if it becomes aware that an unauthorised disclosure of Personal Information has occurred;

40.3.5 ensure that only the Consultant's authorised Personnel have access to Personal Information;

40.3.6 ensure that its Personnel are aware of the Consultant's obligations under this clause, including, when requested by the Principal, requiring any of them to sign an undertaking in relation to Personal Information as defined by this clause;

40.3.7 comply with the Principal's directions regarding the collection, storage, handling, accessing, amendment, management, transfer, use or disclosure of Personal Information by the Consultant. Any direction given by the Principal will not relieve the Consultant of its obligations under clause 40.2; and

40.3.8 comply with any specific restrictions outlined in Item 11 of the Schedule for Records and Confidential Information. The Consultant acknowledges having read and understood these restrictions before executing this Agreement.

40.4 Upon completion of the Consultancy Services, or expiration or termination of this Agreement, the Consultant must return to the Principal all Personal Information including any copies.

The parties have executed this Agreement as follows -

SIGNED on behalf of the **South East Queensland Water Grid Manager,** ABN 14 783 317 630, by the Chief Executive Officer:

Barry K Dennien

[redacted]

a delegated officer of the South East Queensland Water Grid Manager

this 3rd day of February 2011

In the presence of:

MARIA ELAINA SMOUTH

(name of witness)

[redacted]

*** If a company**

Executed for and on behalf of:

Brian Cooper Consulting
ABN 56 154 707 619

(company name and ACN)

by:

Brian Cooper

(name)

[redacted]

(signature)

Principal

(title)

this 12th day of January 2011

in the presence of:

Judith-ann Cooper

(name of witness)

[redacted]

THE SCHEDULE

Item 1 Consultant
Brian Cooper Consulting
ABN 56 154 707 619

Item 2 Key Personnel (Clause 1.1)

Brian Cooper

Item 3 Project Officer (Clauses 1.1 and 18.1)

The Principal appoints: Barry Dennien
Contact: Telephone: [redacted]
Facsimile:
E-mail: barry.dennien[redacted]

Item 3A Project Coordinator (Clauses 1.1 and 10.1)

Brian Cooper

Item 4 Date of Commencement (Clause 1.1)

The Date of Commencement is 11 January 2011.

Item 4A Completion Date (Clause 1.1)

a) Provision of written preliminary view of compliance and level of response against the Flood Mitigation Manual – by **9am, on 12 January 2011**.
b) Formal written report of final advice delivered to the Principal by **4pm, 12 January 2011**.

Item 5 Assistance to be provided by the Principal (Clause 4.5 and 11.1)

Access to relevant information, personnel and stakeholders, including Seqwater, Department of Environment and Resource Management etc.

Item 5A Progress Reports (Clause 10.3)

As required by the Principal.

Item 6 Fees to be paid for the Consultancy Services (Clause 12.1)

$260 per hour, excluding GST.

Item 7 Expenses for which Consultant may be reimbursed (Clause 12.3)

All reasonable expenses as necessary for the Consultant's performance of the Consultancy Services.

Item 8 Issuance of Invoices and Payment of fees (Clauses 13.2, 13.5 and 13.10)

Invoices to be issued by the Consultant to the Principal after each calendar month

Payment of a correctly rendered invoice will be due within 30 days of the Principal's receipt of the correctly rendered invoice.

Item 9 Insurance (Clause 27)

Workers' compensation insurance

Held in accordance with clause 27.1.1

Public Liability Insurance (Clause 27.1.2)

Ten million dollars ($10,000,000).

Professional Indemnity Insurance (Clause 27.1.3)

Amount: Five million dollars ($5,000,000)

Period: 6 years

Any other insurance (Clause 27.1.4)

Not required.

Item 10 Addresses for notices (Clause 37)

Principal

All notices for the Principal are to be addressed as follows -

Mr Barry Dennien
Chief Executive Officer
SEQ Water Grid Manager
PO Box 16205
City East QLD 4002
Telephone: [redacted]
Facsimile:
E-mail: admin[redacted]

Consultant

All notices for the Consultant are to be addressed as follows -

Mr Brian Cooper
Brian Cooper Consulting
Telephone: [redacted]
Mobile:
E-mail: brian.cooper.consult[redacted]

Item 11 Privacy (Clause 40)

NIL

Item 12 Intellectual Property (Clause 16)

N/A

ANNEXURE 1

Terms of Reference

This page and the following pages comprise the Terms of Reference referred to in the Agreement.

Background

The Queensland Bulk Water Supply Authority, trading as Seqwater, provides storage and treatment of bulk water and manages South East Queensland's dams, weirs and water treatment plants. Seqwater is also responsible for catchment management, the quality of water from these assets and the production of drinking water.

The SEQ Water Grid Manager (Water Grid Manager) is a statutory body responsible for managing the strategic operation of the SEQ Water Grid (Water Grid). The Water Grid Manager's role is to manage the Water Grid to ensure water security and quality for South East Queensland in a cost effective way.

The Water Grid Manager buys the following water services from its Grid Service Providers:

- storage and water treatment of bulk water from Seqwater
- transport of bulk water from LinkWater
- production and treatment of desalinated and purified recycled water from WaterSecure.

The Water Grid Manager sells treated bulk water, purified recycled water and raw water to Grid Customers — Distributor-Retailers, power stations, Toowoomba Regional Council - and a small group of commercial and irrigator customers. The Water Grid Manager does not own infrastructure assets but owns the urban water entitlements for South East Queensland. Because it does not own infrastructure assets, we can make operational decisions on water security that are based on ensuring water is moved to where it's needed most, rather than to generate a return on capital.

Under Chapter 4, Part 2 of the *Water Supply (Safety and Reliability) Act 2008*, Seqwater manages controlled releases from Somerset and Wivenhoe Dams in accordance with a *Flood Mitigation Manual, Revision 7, November 2009*, as approved by the Department of Environment and Resource Management (**Flood Mitigation Manual**). Seqwater is responsible for developing the Flood Mitigation Manual and for obtaining approval under the Act.

Purpose

Since October 2010, South East Queensland has experienced unprecedented rainfall which has resulted in controlled releases from Wivenhoe Dam into the Brisbane River under the Flood Mitigation Manual.

The purpose of the Consultancy Services is to obtain independent assurance over the operation of Wivenhoe Dam, including controlled releases, as against the Flood Mitigation Manual, for the period concerning the current South East Queensland flood event (commencing on or about 13 December 2010 to date).

Scope of works

The Consultancy Services requires the Consultant to:

a) review the operation of Wivenhoe Dam, including controlled releases, for compliance against the Flood Mitigation Manual for the period commencing on or about 13 December 2010 to date (**Flood Event**); and
b) advise on whether the decisions and actions taken during the Flood Event regarding the operation of Wivenhoe Dam were prudent and appropriate in light of the Flood Mitigation Manual's requirements and the circumstances of the Flood Event.

At this stage, the Consultancy Services excludes a review of the sufficiency or adequacy of the Flood Mitigation Manual itself.

The Consultant's advice is to be given in the context of the:

a) Flood Mitigation Manual's requirements; and
b) facts matters and circumstances of the Flood Event.

Deliverables and milestones

a) Provision of a written preliminary advice by **9am, on 12 January 2011**.
b) Formal written report of final advice delivered to the Principal by **4pm, 12 January 2011**.

Deliverables are to be provided to:

Mr Barry Dennien
Chief Executive Officer
SEQ Water Grid Manager
Email: barry.dennien[redacted]

Confidentiality

The Consultant acknowledges that the Information (including this Agreement) provided to, dealt with and produced by the Consultant as a result of the Consultancy Services is confidential and the Consultant will strictly comply with the confidentiality requirements set out in clause 19 of this Agreement.

ANNEXURE 2

Offer

This page comprises the Offer referred to in the Agreement and contains the curriculum vitae of the Consultant.

The Consultant has offered to provide the Consultancy Services in accordance with the Terms of Reference at the hourly rate of [redacted] per hour, excluding GST.

TECHNICAL SITUATION REPORT

TSR Number	W29	Date of TSR release	7.1.2011	Time of TSR release	7.00am

Seqwater status of inflows and dam operations

Current status but could change based on inflows or rainfall.

Current objectives	• Monitor inflows and begin releases later today depending on Lockyer flows
Strategy	• Monitor and develop release strategy, possible Wivenhoe releases later today or early Saturday • Due to high inflows, may need to impact Burtons which could be impacted purely by Lockyer flows later today anyway.
Key considerations	Storage levels: Above FSL
	Inflows: Ongoing inflows
	Rainfall:
	Lockyer/Bremer: Monitoring their inflows
	Brisbane River: No impact as yet

Rainfall

There have been general totals around 30 to 50 mm with isolated heavy falls up to 75mm in the Somerset and Wivenhoe catchments since the event commenced on Wednesday 5 January 2011. There have been significant rainfalls in the Lockyer Ck catchment in the last 72 hours with widespread falls of 50mm and isolated falls up to 100mm.

Totals in the North Pine catchment have generally been about 35mm.

Falls between 20 and 30mm were recorded in the Leslie Harrison catchment.

The forecast for the next five days is for totals between 100 and 200mm in SE Qld. Given the saturated condition of the catchments further runoff will most likely be generated from this rainfall.

North Pine Dam

At 0600 Friday, North Pine Dam was at 39.48m, 0.12m below FSL. Gate operations commenced at 1915 on Thursday 6 January and are expected to continue until at least mid-day Friday 7 January when North Pine Dam is expected to be at 39.40m. These releases have impacted upon Youngs Crossing. Moreton Bay Regional Council was advised and they closed Youngs Crossing prior to gate operations commencing. Based upon the forecast rainfall, gate operations may continue into Saturday, but at this stage it is anticipated that gate operations will cease at around mid-day on Friday 7 January 2011.

Somerset Dam

At 0600 Friday, Somerset Dam was at 99.59m, 0.59m above FSL, and rising slowly. The rain in the Stanley River catchment has produced a small amount of runoff in the Upper Stanley but there have been significant rises in Kilcoy Creek, contributing to the Somerset inflows. Somerset Dam is currently releasing at a rate of 35 cumecs and further regulator/sluice operations will be required in the next 24 to 72 hours.

The estimated event inflow volume into Somerset Dam is around 50,000ML.

Wivenhoe Dam

At 0600 Friday, Wivenhoe Dam was at 67.64m and rising slowly. This is 0.64m above FSL and above the gate trigger level of 67.25m. Upstream of the dam river levels have peaked at the Linville and Gregors Ck gauges. The estimated event inflow volume into Wivenhoe Dam is 230,000ML including Somerset Dam outflow.

A peak of about 470 cumecs is expected from Lockyer Creek by mid-afternoon on Friday 7 January. At this stage there is some uncertainty associated with this estimate but it may be of sufficient magnitude to inundate Burtons Bridge.

Wivenhoe gate releases will occur after the impact of Lockyer flows on Burtons Bridge has been ascertained and flood levels in the lower Lockyer subside. It is proposed that Wivenhoe releases will commence late Friday/early Saturday and may be as high as 1,200 cumecs, (similar but slightly smaller to recent events), and the releases are expected to continue over the weekend though to Monday or Tuesday.

Impacts of Downstream of Wivenhoe

Somerset Regional Council, Ipswich City Council and Brisbane City Council have been advised of the potential for gate operations during the next 24 hours.

The relatively high Lockyer flows will adversely impact upon Twin Bridges, Savages Crossing, and Colleges Crossing for several days and may impact upon Burtons Bridge from Friday mid-day and Kholo Bridge later on Friday evening. At this stage, there are not expected to be any adverse impacts upon Fernvale Bridge or Mt Crosby Weir Bridge.

Councils have been advised of this strategy and are contacting residents.

Leslie Harrison Dam

Following the heavy rainfall Wednesday night, gate operations commenced at Leslie Harrison Dam late Wednesday night and are continuing. It is possible operations may cease later today with no further rainfall however, given the forecast rainfall, gate operations are expected to continue for some time.

Seqwater Technical Officer name	Robert Drury
Seqwater Technical Officer position title	Dam Operations Manager

BoM assessment

(consisting of references to latest Flood Warning for the Brisbane River and other relevant Bureau forecasts and warnings (e.g. weather/rain forecasts, Tropical Cyclone Warning etc) and other updates/comments if needed)

BoM has been advised.

BoM Technical Officer name	Peter Baddiley
BoM Technical Officer position title	
BoM Technical Officer contact details	flood.qld[redacted]

Brisbane City Council (BCC) assessment

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised and do not have a problem with the new strategy.

BCC Technical Officer name	Chris Lavin
BCC Technical Officer position title	Disaster Operations Manager
BCC Technical Officer contact details	[redacted]

Ipswich City Council (ICC) assessment (if required)

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised and do not have a problem with the new strategy.

ICC Technical Officer name	Tony Trace
ICC Technical Officer position title	Local Disaster Response Coordinator
ICC Technical Officer contact details	[redacted]

Somerset Regional Council (SRC) assessment (if required)

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised and do not have a problem with the new strategy.

SRC Technical Officer name	Tony Jacobs
SRC Technical Officer position title	Local Disaster Response Coordinator
SRC Technical Officer contact details	[redacted]

Collated and distributed by (Agency)

Contact Officer signature	
Contact Officer name	Rob Drury

Contact Officer position title	Dam Operations Manager

Next TSR due	Date		Time		or Event	Gate opening decision

From: Paul Bird <pbird[redacted]>
Sent: Friday, January 7, 2011 8:28 AM
To: SEQWGM Media <media[redacted]>; aroebuck[redacted]; greg.swain[redacted]; GSTUBBS[redacted]; Kathy Petrik <Kathy.Petrik[redacted]>; lisa.m.martin[redacted]; Paula Weston <paula.weston[redacted]>; tjacobs[redacted]; Barry Dennien <Barry.Dennien[redacted]>; Dan Spiller <Daniel.Spiller[redacted]>; Scott Denner <Scott.Denner[redacted]>; Arminda Roberts <aroberts[redacted]>; Bec Middlemiss <bmiddlemiss[redacted]>; Michael Fiechtner <MFiechtner[redacted]>; Mike Foster <mfoster[redacted]>; Tara King <tking[redacted]>
Cc: Mike Foster <mfoster[redacted]>; Michael Lyons <Michael.Lyons[redacted]>; Geoff Stead <Geoff.Stead[redacted]>; ELT <ELT[redacted]>
Subject: Release Update

As of 9.00 am 7 January, the following applies:

SOMERSET DAM:
Water is being released into Wivenhoe through a regulator valve and may be increased to manage rainfall and inflows. Sluice gates may be operated during the weekend.

WIVENHOE DAM:
Gate operations will commence when flood levels in the lower Lockyer Creek subside. Releases may be around 130,000 megalitres per day.

Local Councils are being advised that local flows, and the expected Wivenhoe release, may impact upon Twin Bridges, Savages Crossing, Burtons Bridge, Kholo Bridge and Colleges Crossing for several days.

At this stage, no adverse impacts are expected for Fernvale Bridge, or Mt Crosby Weir Bridge

NORTH PINE DAM:
Gate operations commenced during the evening of Thursday 6 January and may continue until next week.

The local Council was advised prior to the gate operation commencing that Youngs Crossing may be inundated.

LESLIE HARRISON DAM:
Due to rainfall, a release is underway and may continue until next week.

HINZE DAM:
No releases. There is no public access to the spillway.

For detailed information on road crossing closures and other potential impacts, always contact your local council.

RECREATION UPDATE:
Due to water levels, Wivenhoe is closed to all water based recreational activities as from this morning, and

this will most likely extend over the weekend.
At this point, Somerset is open to water based recreational activities, however this could change at short notice.
Moogerah is open to water based recreational activities, while Maroon remains open, but swimming and skiing should be avoided.
The following recreation sites are closed to the public –

- O'Sheas Crossing
- Hamon Cove
- Logan Inlet
- Captain Logan Camp
- River access at Atkinson's Crossing
- Billies Bay/Hays Landing

Lake Baroon has been closed to on-water recreation activities due to the current lake level.

The recreation areas at Lake Baroon are open for land based activities, such as picnicking and barbequing. Care should be taken at the recreation sites, as the ground may be very wet. Vehicles must be parked only in designated parking areas, and should not be driven onto grassed areas.

This information will be updated if any significant changes occur.

Paul Bird
Senior Communications Advisor
Queensland Bulk Water Supply Authority *trading as* Seqwater

seqwater
WATER FOR LIFE

[redacted] E pbird[redacted]
[redacted] Margaret St, Brisbane City QLD 4000
PO Box 16146, City East QLD 4002
Website | www.seqwater.com.au



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TECHNICAL SITUATION REPORT

TSR Number	W30	Date of TSR release	7.1.2011	Time of TSR release	3.00pm

Seqwater status of inflows and dam operations

Current status but could change based on inflows or rainfall.

Current objectives	• Begin discharging stored floodwaters
Strategy	• Start releasing at 3pm today and increase up to 1200cumecs.
Key considerations	Storage levels: Above FSL
	Inflows: Ongoing inflows
	Rainfall:
	Lockyer/Bremer: Monitoring their inflows
	Brisbane River: No impact as yet

North Pine Dam

Ongoing operations.

Somerset Dam

Somerset Dam is currently releasing at a rate of 35 cumecs and further regulator/sluice operations will be required in the next 24 to 72 hours.

The estimated event inflow volume into Somerset Dam is around 50,000ML.

Wivenhoe Dam

Wivenhoe releases commenced at 1500 Friday and will be slowly increased to about 1,200 m3/s by 1400 Saturday. It will initially be held around this level until Sunday morning at which time the release strategy will be reviewed and be dependent upon further rainfall.

Impacts of Downstream of Wivenhoe

This will mean that all of the crossings downstream of Wivenhoe with the exception of Fernvale and Mt Crosby Weir Bridge will be adversely impacted.

Councils have been advised of this strategy and are contacting residents.

Conversations have just taken place between BCC, Seqwater and BoM re impact of flows in the lower Brisbane R

Seqwater and BoM concur that a flow of a 1,500m3/s in the lower Brisbane R will only add about 50mm to the expected water levels in the City Reach on the recorded high tides. This has been demonstrated by a

comparison of the recorded water levels at Whyte Is and Brisbane City gauges during periods of no flow and periods of higher flows in the last few months.

However, it should be noted that this impact varies during the tidal cycle and is more pronounced on the low tide level that the high tide level.

It is recognized that current recorded high tide levels are 0.4 to 0.5 metres higher than predicted tides due to atmospheric conditions.

Leslie Harrison Dam

Following the heavy rainfall Wednesday night, gate operations commenced at Leslie Harrison Dam late Wednesday night and are continuing.

Seqwater Technical Officer name	Robert Drury
Seqwater Technical Officer position title	Dam Operations Manager
	[redacted]

BoM assessment

(consisting of references to latest Flood Warning for the Brisbane River and other relevant Bureau forecasts and warnings (e.g. weather/rain forecasts, Tropical Cyclone Warning etc) and other updates/comments if needed)

BoM has been advised.

BoM Technical Officer name	Peter Baddiley
BoM Technical Officer position title	
BoM Technical Officer contact details	flood.qld[redacted]

Brisbane City Council (BCC) assessment

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised and do not have a problem with the new strategy.

BCC Technical Officer name	Chris Lavin
BCC Technical Officer position title	Disaster Operations Manager
BCC Technical Officer contact details	[redacted]

Ipswich City Council (ICC) assessment (if required)

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised and do not have a problem with the new strategy.

ICC Technical Officer name	Tony Trace
ICC Technical Officer position title	Local Disaster Response Coordinator
ICC Technical Officer contact details	[redacted]

Somerset Regional Council (SRC) assessment (if required)

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised and do not have a problem with the new strategy.

SRC Technical Officer name	Tony Jacobs
SRC Technical Officer position title	Local Disaster Response Coordinator
SRC Technical Officer contact details	[redacted]

Collated and distributed by (Agency)

Contact Officer signature	
Contact Officer name	Rob Drury
Contact Officer position title	Dam Operations Manager

Next TSR due	**Date**	8.1.2011	**Time**		**or Event**	

From:	Paul Bird <pbird[redacted]>
Sent:	Friday, January 7, 2011 3:28 PM
To:	SEQWGM Media <media[redacted]>; aroebuck[redacted]; greg.swain[redacted]; GSTUBBS[redacted]; Kathy Petrik <Kathy.Petrik[redacted]>; lisa.m.martin[redacted]; Paula Weston <paula.weston[redacted]>; tjacobs[redacted]; Barry Dennien <Barry.Dennien[redacted]>; Dan Spiller <Daniel.Spiller[redacted]>; Scott Denner <Scott.Denner[redacted]>; Arminda Roberts <aroberts[redacted]>; Bec Middlemiss <bmiddlemiss[redacted]>; Michael Fiechtner <MFiechtner[redacted]>; Mike Foster <mfoster[redacted]>; Tara King <tking[redacted]>
Cc:	Mike Foster <mfoster[redacted]>; Michael Lyons <Michael.Lyons[redacted]>; ELT <ELT[redacted]>
Subject:	Release Update

As of 3.30 pm on 7 January, the following applies:

SOMERSET DAM:
Water is being released into Wivenhoe through a regulator valve and may be increased to manage rainfall and inflows. Sluice gates may be operated during the weekend.

WIVENHOE DAM:
Gate operations have commenced and releases are expected to reach around 100,000 megalitres a day by the afternoon of Saturday 8 January. Releases will be reviewed and may change according to rainfall, inflows and river flows.

Local Councils are being advised that Twin Bridges, Savages Crossing, Burtons Bridge, Kholo Bridge and Colleges Crossing may be inundated for several days.

At this stage, no adverse impacts are expected for Fernvale Bridge, or Mt Crosby Weir Bridge

NORTH PINE DAM:
Gate operations commenced during the evening of Thursday 6 January and may continue until next week.

The local Council was advised prior to the gate operation commencing that Youngs Crossing may be inundated.

LESLIE HARRISON DAM:
Due to rainfall, a release is underway and may continue until next week.

HINZE DAM:
A release through the emergency gates is expected during the weekend. There is no public access to the spillway.

For detailed information on road crossing closures and other potential impacts, always contact your local council.

RECREATION UPDATE:

Lake Wivenhoe
Lake Wivenhoe is currently closed to water based recreation activities, and is expected to remain closed for some days, due to the high water levels.
The following recreation sites at Lake Wivenhoe are currently closed due to submerged infrastructure, or dangerous conditions –

- O'Sheas Crossing
- Hamon Cove
- Logan Inlet
- Captain Logan Camp
- River access at Atkinson's Crossing
- Billies Bay/Hays Landing

Other recreation areas at Lake Wivenhoe are open for land based recreation activities.
The Spillway Lookout recreation area is open, however visitors are advised that there may be long delays due to the numbers of people on site. Security staff and traffic controllers will be on site to assist with visitor management – all visitors must comply with the reasonable directions of security staff and traffic controllers.

Lake Somerset
Lake Somerset will be temporarily closed to water based recreation activities from 6.00pm Friday 7 January due to the high water levels.
Lake Somerset is expected to remain closed over the weekend, and possibly into next week, depending upon the conditions.

Lake Borumba
Yabba Creek Road between Imbil and Borumba Dam is currently closed, meaning that access to the lake is not available. Even if there is no further rain, it is expected that access to Borumba Dam will be closed for several days.

Lake Baroon
Lake Baroon has been closed to on-water recreation activities due to the current lake level. The recreation areas at Lake Baroon are open for land based activities.

Lake Maroon
Lake Maroon remains closed to water skiing and swimming but is open to boating and fishing.

Care should be taken at the recreation sites that are open, with the ground being totally saturated. Vehicles must be parked only in designated parking areas, and should not be driven onto grassed areas.

This information will be updated if any significant changes occur.

Paul Bird
Senior Communications Advisor
Queensland Bulk Water Supply Authority *trading as* Seqwater

[redacted] E pbird[redacted]
[redacted] Margaret St, Brisbane City QLD 4000
PO Box 16146, City East QLD 4002
Website | www.seqwater.com.au



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TECHNICAL SITUATION REPORT

TSR Number	W31	Date of TSR release	8.1.2011	Time of TSR release	7.00am

Seqwater status of inflows and dam operations

Current status but could change based on inflows or rainfall.

Current objectives	• Continue increasing releases to discharge floodwater as quickly as possible	
Strategy	• Continue to increase releases from 890cumecs this morning to 1200cumecs by lunchtime • This should keep Fernvale and Mt Crosby bridges clear however further predicted rainfall may impact.	
Key considerations	Storage levels:	Above FSL
	Inflows:	Ongoing inflows
	Rainfall:	
	Lockyer/Bremer:	Monitoring their inflows
	Brisbane River:	Minimal impact as per previous discussions and releases.

Rainfall

Since 0900 Friday, there has been widespread 20 to 40mm throughout North Pine, Somerset and Wivenhoe catchments with isolated higher totals of 70mm in the upper reaches of the Brisbane R. No significant rain has fallen in the past 12 hours.

Advice from BoM indicates that SE Qld can expect further high rainfall totals over the next 4 days.

Saturday: Rain light at times 5-50mm with higher falls along the coast
Sunday: Widespread rain with totals between 50-100mm
Monday: Widespread rain again with totals between 50-100mm
Tuesday: Rain easing with totals between 25-50mm

Given the saturated conditions of the catchments, significant inflows to Seqwater dams will be generated, especially following the forecast rainfall on Sunday/Monday

North Pine (Full Supply Level 39.60 m AHD)

At 0600 Saturday, North Pine Lake Level was 39. 46 m AHD and slowly rising. Currently 3 gates are open to release runoff from rain on Wed/Thursday/Friday. Given the very high likelihood of significant runoff during the next 4 days, gates will be keep open to match inflows over the next few days, rather than opening and closing at various times with short notice. Youngs Crossing will remain adversely impacted for the duration of the gates being open. Moreton Bay Regional Council has been advised and concurs with this strategy.

Somerset (Full Supply Level 99.00 m AHD)

At 0500 Saturday, Somerset Dam level was 100.42m AHD and rising. The Dam is releasing into Wivenhoe through one open sluice gate. Water will be temporarily held in Somerset to allow the inflow from the upper Brisbane is passed through the system. However, this strategy may need to be reviewed if significant runoff occurs in the Stanley and Upper Brisbane. Under circumstances of high inflows to Somerset and Wivenhoe, it is the usual practice to hold flood water in Somerset until there is a high level of confidence in the estimated inflows to Wivenhoe.

Since the commencement of the event on 02/01/2011, approximately 85,000ML has flowed into Somerset Dam with a further 20,000ML expected based on the recorded rainfall to date. Approximately 25,000ML has been released into Wivenhoe.

Wivenhoe (Full Supply Level 67.00 m AHD)

At 0600 Saturday, Wivenhoe Dam was 68.45 m AHD and rising steadily with all five gates open and releasing about 890 m3/s. River levels upstream of Wivenhoe Dam were rising again, generating further inflow to the dam It is intended to ramp up the release from Wivenhoe to 1,200m3/s by midday Saturday 08/01/2011. Further assessments will be undertaken to determine increases above this level. However, given the high likelihood of significant inflows in the next week, this may be increased.

Since the commencement of the event on 02/01/2011, approximately 200,000ML has flowed into Wivenhoe Dam (including Somerset releases) with a further 180,000ML expected based on the recorded rainfall to date. Approximately 50,000ML has been released from Wivenhoe via the hydro and regulator at about 50m3/s.

Impacts downstream of Wivenhoe

The projected Wivenhoe release of 1,200m3/s combined with Lockyer flows and local runoff will mean that all crossings downstream of Wivenhoe (Twin Bridges, Savages Crossing, Burtons Bridge, Kholo Bridge and Colleges Crossing) will be adversely impacted for several days. At this stage Fernvale and Mt Crosby Weir Bridge are not expected to be affected but they could potentially be affected if the predicted rainfall totals eventuate.

The current available assessments indicate that the combined flow in the lower Brisbane R would only add 50mm to an upper limit of 100mm to the recorded water levels in the City Reach of the Brisbane Rive. However, it is noted that tides in the lower Brisbane R will be 0.4 to 0.5 metres higher than predicted tides

Somerset Regional, Ipswich City and Brisbane City Councils have been advised of the Wivenhoe operating strategy.

Leslie Harrison Dam

Following the heavy rainfall Wednesday night, gate operations commenced at Leslie Harrison Dam late Wednesday night and closed late last night but further operations are likely.

Seqwater Technical Officer name	Robert Drury
Seqwater Technical Officer position title	Dam Operations Manager

BoM assessment

(consisting of references to latest Flood Warning for the Brisbane River and other relevant Bureau forecasts and warnings (e.g. weather/rain forecasts, Tropical Cyclone Warning etc) and other updates/comments if needed)

BoM has been advised.

BoM Technical Officer name	Peter Baddiley
BoM Technical Officer position title	
BoM Technical Officer contact details	flood.qld[redacted]

Brisbane City Council (BCC) assessment

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised and do not have a problem with the new strategy.

BCC Technical Officer name	Chris Lavin
BCC Technical Officer position title	Disaster Operations Manager
BCC Technical Officer contact details	[redacted]

Ipswich City Council (ICC) assessment (if required)

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised and do not have a problem with the new strategy.

ICC Technical Officer name	Tony Trace
ICC Technical Officer position title	Local Disaster Response Coordinator
ICC Technical Officer contact details	[redacted]

Somerset Regional Council (SRC) assessment (if required)

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised and do not have a problem with the new strategy.

SRC Technical Officer name	Tony Jacobs
SRC Technical Officer position title	Local Disaster Response Coordinator
SRC Technical Officer contact details	[redacted]

Collated and distributed by (Agency)

Contact Officer signature	
Contact Officer name	Rob Drury
Contact Officer position title	Dam Operations Manager

Next TSR due	Date		Time		or Event	Change in strategy

John Adcock

From: Paul Bird [pbird[redacted]]
Sent: Saturday, 8 January 2011 7:54 AM
To: SEQWGM Media; Barry Dennien; Dan Spiller; Scott Denner
Cc: Geoff.Stead[redacted]; Michael Lyons; ELT
Subject: Water Release Update

As at 8.00 on Saturday 8 January, the following applies:

SOMERSET DAM:
Water is being released into Wivenhoe through a sluice gate.

WIVENHOE DAM:
Gate operations have commenced and releases are expected to reach around 100,000 megalitres a day by the afternoon of Saturday 8 January. Releases will be reviewed and may change according to rainfall, inflows and river flows.

Local Councils are being advised that Twin Bridges, Savages Crossing, Burtons Bridge, Kholo Bridge and Colleges Crossing may be inundated for several days.

At this stage, no adverse impacts are expected for Fernvale Bridge, or Mt Crosby Weir Bridge, although this may change depending on rainfall.

NORTH PINE DAM:
Gate operations commenced during the evening of Thursday 6 January and may continue until next week.

The local Council was advised prior to the gate operation commencing that Youngs Crossing may be inundated.

LESLIE HARRISON DAM:
Due to rainfall, a release is underway and may continue until next week.

HINZE DAM:
A release through the emergency gates is expected during the weekend. There is no public access to the spillway.

For detailed information on road crossing closures and other potential impacts, always contact your local council.

RECREATION UPDATE:

Lake Wivenhoe
Lake Wivenhoe is currently closed to water based recreation activities, and is expected to remain closed for some days, due to the high water levels.

Lake Somerset
Lake Somerset will be temporarily closed to water based recreation activities from 6.00pm Friday 7 January due to the high water levels and is expected to remain closed over the weekend, and possibly into next week, depending upon the conditions.

The following recreation sites are currently closed due to submerged infrastructure, or dangerous conditions –

- O'Sheas Crossing
- Hamon Cove

- Logan Inlet
- Captain Logan Camp
- River access at Atkinson's Crossing
- Billies Bay/Hays Landing
- The Spit
- Lake Somerset Holiday Park Kirkleagh [Boat ramps only]

Other recreation areas at Lake Wivenhoe are open for land based recreation activities.
The Spillway Lookout recreation area is open, however visitors are advised that there may be long delays due to the numbers of people on site. Security staff and traffic controllers will be on site to assist with visitor management – all visitors must comply with the reasonable directions of security staff and traffic controllers.

Lake Borumba
Yabba Creek Road between Imbil and Borumba Dam is currently closed, meaning that access to the lake is not available and be closed for several days.

Lake Baroon
Lake Baroon has been closed to on-water recreation activities due to the current lake level. The recreation areas at Lake Baroon are open for land based activities.

Lake Maroon
Lake Maroon remains closed to water skiing and swimming but is open to boating and fishing.

Care should be taken at the recreation sites that are open, with the ground being totally saturated. Vehicles must be parked only in designated parking areas, and should not be driven onto grassed areas.

This information will be updated if any significant changes occur.

Paul Bird
Senior Communications Advisor
Queensland Bulk Water Supply Authority *trading as* Seqwater

seqwater
WATER FOR LIFE

[redacted] E pbird[redacted]
[redacted] Margaret St, Brisbane City QLD 4000
PO Box 16146, City East QLD 4002
Website | www.seqwater.com.au



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From: Dan Spiller <Daniel.Spiller[redacted]>
Sent: Saturday, January 8, 2011 9:24 AM
To: Gary Humphrys <Gary.Humphrys[redacted]>; Gordon Jardine <Gordon.Jardine[redacted]>; Teresa Dyson <Teresa.Dyson[redacted]>; Dr David Cunliffe <David.Cuncliffe[redacted]>; Jamie Quinn <Jamie.Quinn[redacted]>
Cc: Barry Dennien <Barry.Dennien[redacted]>; Elaina Smouha <Elaina.Smouha[redacted]>; Aleisha Paine <Aleisha.Paine[redacted]>; Scott Denner <Scott.Denner[redacted]>; Joanne Collins <Joanne.Collins[redacted]>; SEQWGM Media <media[redacted]>
Subject: Update on Water Grid operations

Board,

After a couple of dry days, we are back in operational mode. Below is a summary of current status. Apologies that my updates have not been more regular.

Dam releases

Releases are being made from Somerset, Wivenhoe, North Pine and Leslie Harrison dams, with forecasts of high rainfall totals over the next four days.

For Wivenhoe Dam:

- All five gates are now open with the release rate planned to increase to 1200 cubic metres per second by midday today. This release rate is less than peak release from October 2010 (1500 cubic metres per second).
- The release strategy will continue to be reviewed based on actual rainfall. With significant inflows, it may need to be increased. Widespread rainfall of up to 200mm is forecast over four days, potentially resulting in major inflows.
- A number of local birdges have been inundated by releases and local flows. The Fernvale and Mt Crosby Weir Bridges could potentially also be affected if predicted rainfall totals eventuate.
- The BoM and Seqwater concur that current releases will increase the level of the lower Brisbane River by about 50 to 100mm. There is currently a 40 to 50mm atmospheric anomaly.

Releases from North Pine and Leslie Harrison dams are continuing. Releases from Hinze Dam are expected to be required over the weekend.

Councils have been consulted and agree with the release strategy. Somerset Regional Council now provides early advice to residents who will be isolated by the inundation of Burtons Bridge.

We are preparing a proposal to Somerset Regional Council for the Grid to pay for resupply of residents, should they be isolated for more than five days (with Council to arrange the supply). I will provide more details next week.

Water treatment

In terms of operations, Lockyer Valley flows have again caused a turbity spike in the Brisbane River. Impacts are expected to peak today at Mt Crosby today, before being diluted by dam releases. There are similar issues at some other locations.

Despite the spike, all key plants are currently operating within critical limits, with impacts being monitored. Seqwater and Linkwater have prepared for potential issues by increasing treated water storage and staffing at some treatment plants. Desalination is at one-third capacity and ready to increase production to two-thirds

within two hours of an instruction (but is unlikely to be required in this event).

There continue to be very few taste and odour complaints.

We are having daily operational teleconferences with all Grid Participants.

With forecast rainfall, these type of issues are likely to recur over the remainder of the wet season. Our key concern are towns with stand alone supplies, such as Lowood.

For interest only, Seqwater is managing a range of entity specific operational issues across the region. For example, Noosa is being operated remotely due to the causeway to the plant having been inundated. At Beaudesert, bank stabilisation is underway because the pump station was being undermined. Many of these issues are being managed by transferring staff around the region, which was not possible prior to the reforms (for example, from the Caboolture and South Maclean WTPs, which are shutdown).

Media

There has been renewed interest in gate releases and the operation of the desalination facility. I have done some television and radio interviews and we are again putting out daily updates on releases.

Going forward, Robert Macdonald from the Courier Mail has asked to do a "day in the life" article on dam operations from our Emergency Management Room. We have sought approval. There has also been a request as to whether the Premier could do media updates on the flood situation from our Emergency Management Room - which I doubt will eventuate.

Please call me on [redacted] if you require any further information.

Regards,
Dan

Gina O'Driscoll

From: Dan Spiller
Sent: Saturday, 8 January 2011 9:24 AM
To: Gary Humphrys; Gordon Jardine; Teresa Dyson; Dr David Cunliffe; Jamie Quinn
Cc: Barry Dennien; Elaina Smouha; Aleisha Paine; Scott Denner; Joanne Collins; SEQWGM Media
Subject: Update on Water Grid operations

Board,

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For Wivenhoe Dam:

- All five gates are now open with the release rate planned to increase to 1200 cubic metres per second by midday today. This release rate is less than peak release from October 2010 (1500 cubic metres per second).
- The release strategy will continue to be reviewed based on actual rainfall. With significant inflows, it may need to be increased. Widespread rainfall of up to 200mm is forecast over four days, potentially resulting in major inflows.
- A number of local birdges have been inundated by releases and local flows. The Fernvale and Mt Crosby Weir Bridges could potentially also be affected if predicted rainfall totals eventuate.
- The BoM and Seqwater concur that current releases will increase the level of the lower Brisbane River by about 50 to 100mm. There is currently a 40 to 50mm atmospheric anomaly.

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Councils have been consulted and agree with the release strategy. Somerset Regional Council now provides early advice to residents who will be isolated by the inundation of Burtons Bridge.

We are preparing a proposal to Somerset Regional Council for the Grid to pay for resupply of residents, should they be isolated for more than five days (with Council to arrange the supply). I will provide more details next week.

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Please call me on [redacted] if you require any further information.

Regards,
Dan

TECHNICAL SITUATION REPORT

TSR Number	W32	Date of TSR release	9.1.2011	Time of TSR release	7.00am

Seqwater status of inflows and dam operations

Current status but could change based on inflows or rainfall.

Current objectives	• Continue current releases to discharge floodwater as quickly as possible	
Strategy	• Continue the current releases of around 1350cumecs or 116,000ML per day, however this may change slightly depending on other flows to maintain around 1600cumecs in the mid Brisbane River • This should keep Fernvale and Mt Crosby bridges clear however if further predicted rainfall occurs there may be impacts on these bridges too	
Key considerations	Storage levels:	Above FSL
	Inflows:	Ongoing inflows
	Rainfall:	
	Lockyer/Bremer:	Monitoring their inflows
	Brisbane River:	Minimal impact as per previous discussions and releases.

Rainfall

Catchment average rainfall for the past 12 hours is; North Pine Dam (less than 10 mm); Somerset Dam (40 mm); Wivenhoe Dam (less than 10 mm). The bulk of the rain that has fallen in the Somerset Dam catchment has occurred in the last two hours, with recorded falls exceeding 60mm in some areas. The BOM forecast for the next seven days issued at 0450 this morning is:-

Sunday:	Rain periods.
Monday:	Rain periods.
Tuesday:	Rain periods.
Wednesday	A few showers.
Thursday	A shower or two.
Friday	A shower or two.
Saturday	Mostly fine.

A severe whether warning remains current for heavy rainfall in the dam catchment areas. The dam catchments are relatively saturated and significant inflows will be generated if the forecast rainfall eventuates.

North Pine Dam (Full Supply Level 39.60 m AHD)

The dam level is currently 39.47 m AHD and steady. Two radial gates remain open to release runoff generated from recent rainfall. Based on rainfall forecasts, the radial gates have been kept open in anticipation of further inflows over the next few days. However unless significant rain falls today, consideration will be given to closing the gates late this afternoon or early tomorrow morning and discussions to finalise a decision on the timing of radial gate closure will be held with the Moreton Bay Regional Council later today. Youngs crossing will remain closed while releases are in progress.

Somerset Dam (Full Supply Level 99.00 m AHD)

The dam level is currently falling slowly, with the current level being 100.27m AHD. However the rain that has fallen in the dam catchment over the last two hours (recorded falls exceed 60mm in some areas) will result in significant inflows later today. The current release rate into Wivenhoe Dam is 35,000ML/day. Since the commencement of the event on 02/01/2011approximately 56,000ML has been released from the dam, with a total of at least 150,000ML to be released based on the currently recorded rainfall. The total release for the event is likely to increase significantly over the next few days based on the current rainfall forecasts. At this stage, releases will continue until at least Tuesday.

Wivenhoe Dam (Full Supply Level 67.00 m AHD)

The dam level is currently falling slowly, with the current level being 68.58m AHD. River levels upstream of the dam are receding, however further inflows will result from any additional rainfall. The current gate operation strategy will maintain flows of around 1,600m^3/s in the mid-Brisbane River. The current release rate from Wivenhoe Dam is 116,000ML/day. Since the commencement of the event on 02/01/2011approximately 150,000ML has been released from the dam, with a total of at least 450,000ML to be released based on the currently recorded rainfall. The total release for the event is likely to increase over the next few days based on the current rainfall forecasts. At this stage, releases will continue until at least Wednesday.

Impacts downstream of Wivenhoe Dam

The current Wivenhoe Dam release combined with Lockyer flows and local runoff will mean that all low level crossings downstream of Wivenhoe (Twin Bridges, Savages Crossing, Burtons Bridge, Kholo Bridge and Colleges Crossing) will be adversely impacted until at least Wednesday 12 January. At this stage Fernvale and Mt Crosby Weir Bridge are not expected to be affected, but this may be revised if the predicted rainfall totals eventuate and higher releases from Wivenhoe Dam are considered necessary.

Somerset Regional, Ipswich City and Brisbane City Councils have been advised of the Wivenhoe operating strategy.

Leslie Harrison Dam

Following the heavy rainfall Wednesday night, gate operations commenced at Leslie Harrison Dam late Wednesday night and closed late last night. However further releases are likely.

Hinze Dam

The gate opening of 300mm continues today and may for several days depending on inflows.

Seqwater Technical Officer name	Robert Drury
Seqwater Technical Officer position title	Dam Operations Manager

BoM assessment

(consisting of references to latest Flood Warning for the Brisbane River and other relevant Bureau forecasts and warnings (e.g. weather/rain forecasts, Tropical Cyclone Warning etc) and other updates/comments if needed)

BoM has been advised.

BoM Technical Officer name	Peter Baddiley
BoM Technical Officer position title	
BoM Technical Officer contact details	flood.qld[redacted]

Brisbane City Council (BCC) assessment

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised and do not have a problem with the new strategy.

BCC Technical Officer name	Chris Lavin
BCC Technical Officer position title	Disaster Operations Manager
BCC Technical Officer contact details	[redacted]

Ipswich City Council (ICC) assessment (if required)

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised and do not have a problem with the new strategy.

ICC Technical Officer name	Tony Trace
ICC Technical Officer position title	Local Disaster Response Coordinator
ICC Technical Officer contact details	[redacted]

Somerset Regional Council (SRC) assessment (if required)

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised and do not have a problem with the new strategy.

SRC Technical Officer name	Tony Jacobs
SRC Technical Officer position title	Local Disaster Response Coordinator
SRC Technical Officer contact details	[redacted]

Collated and distributed by (Agency)

Contact Officer signature	
Contact Officer name	Rob Drury
Contact Officer position title	Dam Operations Manager

Next TSR due	**Date**		**Time**		**or Event**	Change in strategy

From: Paul Bird <pbird[redacted]>
Sent: Sunday, January 9, 2011 7:57 AM
To: SEQWGM Media <media[redacted]>; aroebuck[redacted]; greg.swain[redacted]; GSTUBBS[redacted]; Kathy Petrik <Kathy.Petrik[redacted]>; lisa.m.martin[redacted]; Paula Weston <paula.weston[redacted]>; tjacobs[redacted]; Barry Dennien <Barry.Dennien[redacted]>; Dan Spiller <Daniel.Spiller[redacted]>; Scott Denner <Scott.Denner[redacted]>; Arminda Roberts <aroberts[redacted]>; Bec Middlemiss <bmiddlemiss[redacted]>; Michael Fiechtner <MFiechtner[redacted]>; Mike Foster <mfoster[redacted]>; Tara King <tking[redacted]>
Cc: Mike Foster <mfoster[redacted]>; Michael Lyons <Michael.Lyons[redacted]>; ELT <ELT[redacted]>; Geoff.Stead[redacted]
Subject: Water Release Update

As at 8.00 on Sunday 9 January, the following applies:

SOMERSET DAM:
Water is being released into Wivenhoe through sluice gates and the release will continue until early next week.

WIVENHOE DAM:
Gate Releases of around 116,000 megalitres a day are underway and are likely to continue until mid next week.

Local Councils have been advised that Twin Bridges, Savages Crossing, Burtons Bridge, Kholo Bridge and Colleges Crossing may be inundated for several days.

At this stage, no adverse impacts are expected for Fernvale Bridge, or Mt Crosby Weir Bridge, although this may change depending on rainfall.

NORTH PINE DAM:
Gate operations are being reviewed and the gates may be closed today or tomorrow morning however any further rain may mean continued releases.

The local Council is being kept informed regarding Youngs Crossing.

LESLIE HARRISON DAM:

Releases ceased last night but may be required at short notice due to further inflows.

HINZE DAM:
A minor release through the emergency gates is underway. There is no public access to the spillway.

For detailed information on road crossing closures and other potential impacts, always contact your local council.

RECREATION UPDATE:

Lake Wivenhoe
Lake Wivenhoe is currently closed to water based recreation activities, and is expected to remain closed for some days, due to the high water levels.

Lake Somerset
Lake Somerset is closed to water based recreation activities due to the high water levels and is expected to remain closed into next week, depending upon the conditions.

The following recreation sites are currently closed due to submerged infrastructure, or dangerous conditions –

- O'Sheas Crossing
- Hamon Cove
- Logan Inlet
- Captain Logan Camp
- River access at Atkinson's Crossing
- Billies Bay/Hays Landing
- The Spit
- Lake Somerset Holiday Park Kirkleagh [Boat ramps only]

Other recreation areas at Lake Wivenhoe are open for land based recreation activities.
The Spillway Lookout recreation area is open; however visitors are advised that there may be long delays due to the numbers of people on site. Security staff and traffic controllers will be on site to assist with visitor management – all visitors must comply with the reasonable directions of security staff and traffic controllers.

Lake Borumba
Yabba Creek Road between Imbil and Borumba Dam is currently closed; meaning that access to the lake is not available and be closed for several days.

Lake Baroon
Lake Baroon has been closed to on-water recreation activities due to the current lake level. The recreation areas at Lake Baroon are open for land based activities.

Lake Maroon
Lake Maroon remains closed to water skiing and swimming but is open to boating and fishing.

Care should be taken at the recreation sites that are open, with the ground being totally saturated. Vehicles must be parked only in designated parking areas, and should not be driven onto grassed areas.

This information will be updated if any significant changes occur.

Paul Bird
Senior Communications Advisor
Queensland Bulk Water Supply Authority *trading as* Seqwater

[redacted] E pbird[redacted]
[redacted] Margaret St, Brisbane City QLD 4000
PO Box 16146, City East QLD 4002
Website | www.seqwater.com.au



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TECHNICAL SITUATION REPORT

TSR Number	W33	Date of TSR release	9.1.2011	Time of TSR release	6.00pm

Seqwater status of inflows and dam operations

Current status but could change based on inflows or rainfall.

Current objectives	• Continue current releases however event is increasing in magnitude and may require increased releases.	
Strategy	• Continue the current releases however there may be a need to increase releases above current levels and impact Mt Crosby and Fernvale Bridges.	
Key considerations	Storage levels:	Above FSL
	Inflows:	Inflows may approach 1,000,000ML which is close to outflow in 1999 and two thirds of 1974 event.
	Rainfall:	Continuing
	Lockyer/Bremer:	Monitoring their inflows
	Brisbane River:	Minimal impact as per previous discussions and releases.

Rainfall

Catchment average rainfall for the past 12 hours is; North Pine Dam (60 mm); Somerset Dam (150 mm); Wivenhoe Dam (80 mm). The bulk of the rain that has fallen in the upper reaches of the Stanley and Brisbane Rivers.

The BOM rainfall forecast for the next few days is:-

Monday:	Very heavy rain periods with totals up to 300mm centred around North Pine.
Tuesday:	Rain periods with totals up to 150mm centred around North Pine.
Wednesday	A few showers less than 10mm
Thursday	A shower or two.
Friday	A shower or two.
Saturday	Mostly fine.

A severe whether warning remains current for heavy rainfall in the dam catchment areas. The dam catchments are relatively saturated and significant inflows will be generated if the forecast rainfall eventuates.

North Pine Dam (Full Supply Level 39.60 m AHD)

The dam level is currently 39.65 m AHD and rising at 1600. Following the rain in the 9 hours, the number of open gates has been increased from 2 to 5 which are expected to remain open for the next 12 hours. Youngs Crossing will remain closed while releases are in progress.

Somerset Dam (Full Supply Level 99.00 m AHD)

The dam level is 100.75 m AHD and rising quickly. Estimated peak inflow to the dam is about 3,000m3/s. Five sluice gates are open releasing about 1,100m3/s (95,000Ml/d) into Wivenhoe Dam. At this stage the dam will reach at least 101.5 during early Tuesday morning.

Since the commencement of the event on 02/01/2011approximately 80,000ML has been released from the dam, with an event total of at least 320,000ML based on the recorded rainfall to date. The event total is expected to increase significantly due to the forecast rain in the next 24 to 48 hours. At this stage, releases will continue until at least Wednesday.

Wivenhoe Dam (Full Supply Level 67.00 m AHD)

The dam level is currently rising again, with the current level being 68.70m AHD. Estimated peak inflow to the dam just from the Upper Brisbane R is about 5,000m3/s and, at this stage, the dam will reach at least 72.5 m AHD during Wednesday morning. River levels upstream of the dam are rising quickly with significant inflow being generated from the intense heavy rainfall. The current gate operation strategy will maintain flows of around 1,600m^3/s in the mid-Brisbane River for the next 24 hours. This may mean temporarily reducing releases from Wivenhoe Dam as Lockyer flows increase. However, releases may have to be increased significantly during Monday depending on the rain in the next 12 to 24 hours. The current release rate from Wivenhoe Dam is 1,400m3/s (120,000ML/day).

Since the commencement of the event on 02/01/2011 approximately 210,000ML has been released from the dam, with an event total approaching 1,000,000ML (including Somerset outflow) based on the recorded rainfall to date. The total release for the event is likely to increase over the next few days based on the current rainfall forecasts. At this stage, releases will continue until at least Saturday 15th January 2011.

Impacts downstream of Wivenhoe Dam

The current Wivenhoe Dam release combined with Lockyer flows and local runoff will mean that all low level crossings downstream of Wivenhoe (Twin Bridges, Savages Crossing, Burtons Bridge, Kholo Bridge and Colleges Crossing) will be adversely impacted until at least Saturday 15 January.

At this stage Fernvale and Mt Crosby Weir Bridge will not be affected for the next 24 hours but there is a strong possibility that, if the predicted rainfall totals eventuate in the next 12 to 24 hours, higher releases from Wivenhoe Dam will be necessary. This may adversely impact upon Fernvale and Mt Crosby Weir Bridges as early as Tuesday morning.

Water levels in the lower Brisbane R will be impacted by the combined flows of Lockyer Ck, Bremer River, local runoff and releases from Wivenhoe Dam.

Somerset Regional, Ipswich City and Brisbane City Councils have been advised of the Wivenhoe operating strategy.

Seqwater Technical Officer name	Robert Drury
Seqwater Technical Officer position title	Dam Operations Manager

BoM assessment

(consisting of references to latest Flood Warning for the Brisbane River and other relevant Bureau forecasts and warnings (e.g. weather/rain forecasts, Tropical Cyclone Warning etc) and other updates/comments if needed)

BoM has been advised.

BoM Technical Officer name	Peter Baddiley
BoM Technical Officer position title	
BoM Technical Officer contact details	flood.qld[redacted]

Brisbane City Council (BCC) assessment

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised of the current status.

BCC Technical Officer name	Chris Lavin
BCC Technical Officer position title	Disaster Operations Manager
BCC Technical Officer contact details	[redacted]

Ipswich City Council (ICC) assessment (if required)

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised of the current status.

ICC Technical Officer name	Tony Trace
ICC Technical Officer position title	Local Disaster Response Coordinator
ICC Technical Officer contact details	[redacted]

Somerset Regional Council (SRC) assessment (if required)

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised of the current status.

SRC Technical Officer name	Tony Jacobs
SRC Technical Officer position title	Local Disaster Response Coordinator
SRC Technical Officer contact details	[redacted]

Collated and distributed by (Agency)

Contact Officer signature	
Contact Officer name	Rob Drury

Contact Officer position title		Dam Operations Manager				
Next TSR due	**Date**	9.1.2011	**Time**		**or Event**	Change in strategy

TECHNICAL SITUATION REPORT

TSR Number	W34	Date of TSR release	9.1.2011	Time of TSR release	9.00pm

Seqwater status of inflows and dam operations

Current status but could change based on inflows or rainfall.

Current objectives	• Continue current releases however event is increasing in magnitude and will require increased releases.	
Strategy	• Continue the current releases until tomorrow noon when re4leases will be increased to impact Mt Crosby and Fernvale Bridges.	
Key considerations	Storage levels:	Above FSL
	Inflows:	Inflows may approach 1,500,000ML which is close to 1974 event.
	Rainfall:	Continuing
	Lockyer/Bremer:	Monitoring their inflows
	Brisbane River:	Impact as below.

Rainfall

Very heavy rainfall has been recorded in the upper reaches of the Brisbane and Stanley in the last 6 hours with totals up 100 to 140mm. Totals for the last 24 hours range from 100 to 300mm.

Rainfall of similar magnitudes is expected in the 12 to 24 hours, especially around the Bremer/Warrill catchments as the system tracks south.

A severe weather warning remains current for heavy rainfall in the dam catchment areas.

Somerset Dam (Full Supply Level 99.00 m AHD)

The dam level is 101.68 m AHD (about 500,000ML currently in storage) and rising quickly. Peak inflow to the dam is estimated to be about 4,000 m3/s based on observed rainfall and could be as high as 5,000m3/s with additional forecast rainfall. Five sluice gates are open releasing about 1,100m3/s (95,000Ml/d) into Wivenhoe Dam. At this stage the dam will reach at least 103.5 early Tuesday morning which will adversely impact areas around Kilcoy.

Since the commencement of the event on 02/01/2011approximately 100,000ML has been released from the dam into Wivenhoe, with an event total of the order of 520,000ML expected. This may increase due to the forecast rain in the next 24 to 48 hours. At this stage, releases will continue until at least Thursday.

Wivenhoe Dam (Full Supply Level 67.00 m AHD)

River levels upstream of the dam are rising quickly with significant inflow being generated from the intense heavy rainfall. Flows in the Brisbane River at Gregor's Ck have already reached 6,700m3/s and the river is still rising.

The dam level is rising again, with the current level being 69.10m AHD (1,410,000ML with about 300,00 of flood storage). Estimated peak inflow to the dam just from the Upper Brisbane R alone may reach as high as 7,500m3/s and, at this stage, the dam will reach at least 73.0 m AHD during Tuesday morning. Given the rapid increase in inflow volumes, it will be necessary to increase the release from Wivenhoe Monday morning.

The objective for dam operations will be to minimise the impact of urban flooding in areas downstream of the dam and, at this stage, releases will be kept below 3,500m3/s and the combined flows is the lower Brisbane will be limited to 4,000m3/s. This is below the limit of urban damages in the City reaches.

The current release rate from Wivenhoe Dam is 1,400m3/s (120,000ML/day). Gate opening will start to be increased from noon Monday and the release is expected increase to at least 2,600m3/s during Tuesday morning.

Since the commencement of the event on 02/01/2011 approximately 220,000ML has been released from the dam, with an event total approaching 1,000,000ML without further rain and as much as 1,500,000ML with forecast rainfall of (both including Somerset outflow). At this stage, releases will continue until at least Sunday 16th January 2011.

Impacts downstream of Wivenhoe Dam

The projected Wivenhoe Dam releases combined with Lockyer flows and local runoff will mean that all crossings downstream of Wivenhoe (Twin Bridges, Fernvale, Savages Crossing, Burtons Bridge, Kholo Bridge, Mt Crosby Weir and Colleges Crossing) will be adversely impacted until at least Saturday 15 January in varying degrees.

Water levels in the lower Brisbane R will be impacted by the combined flows of Lockyer Ck, Bremer River, local runoff and releases from Wivenhoe Dam.

Somerset Regional, Ipswich City and Brisbane City Councils have been advised of the updated Wivenhoe operating strategy.

Seqwater Technical Officer name	Robert Drury
Seqwater Technical Officer position title	Dam Operations Manager
0410378740	[redacted]

BoM assessment

(consisting of references to latest Flood Warning for the Brisbane River and other relevant Bureau forecasts and warnings (e.g. weather/rain forecasts, Tropical Cyclone Warning etc) and other updates/comments if needed)

BoM has been advised.

BoM Technical Officer name	Peter Baddiley
BoM Technical Officer position title	
BoM Technical Officer contact details	flood.qld[redacted]

Brisbane City Council (BCC) assessment

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised of the current status.

BCC Technical Officer name	Chris Lavin
BCC Technical Officer position title	Disaster Operations Manager
BCC Technical Officer contact details	[redacted]

Ipswich City Council (ICC) assessment (if required)

(to include predicted local inundation areas and depths af inundation based on the information)

Council has been advised of the current status.

ICC Technical Officer name	Tony Trace
ICC Technical Officer position title	Local Disaster Response Coordinator
ICC Technical Officer contact details	[redacted]

Somerset Regional Council (SRC) assessment (if required)

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised of the current status.

SRC Technical Officer name	Tony Jacobs
SRC Technical Officer position title	Local Disaster Response Coordinator
SRC Technical Officer contact details	[redacted]

Collated and distributed by (Agency)

Contact Officer signature	
Contact Officer name	Rob Drury
Contact Officer position title	Dam Operations Manager

Next TSR due	**Date**	10.1.2011	**Time**		**or Event**	Change in strategy

Litsupport Brisbane

From: Dan Spiller
Sent: Sunday, 9 January 2011 9:27 PM
To: 'Rob Drury'; Barry Dennien; Michael Lyons; SEQWGM Media; Debbie Best (debbie.best[redacted]); Scott Denner; pbird[redacted]; 'sstevenson[redacted]'
Subject: FW: Technical Report W34
Attachments: Technical Situation Report W34.docx

Technical report below.

Teleconference at 9.30.

Details are:

[redacted]

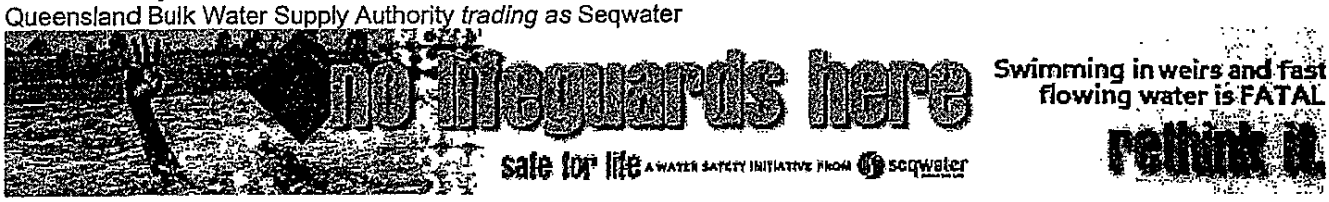
Regards,
Dan

From: Rob Drury [mailto:rdrury[redacted]]
Sent: Sunday, January 09, 2011 9:18 PM
To: Rob Drury; Dan Spiller
Cc: Peter Borrows; Stan Stevenson; Mike Foster; Paul Bird; David Roberts; Arminda Roberts
Subject: RE: Technical Report W34

See attached report W34.

Rob

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



seqwater
WATER FOR LIFE

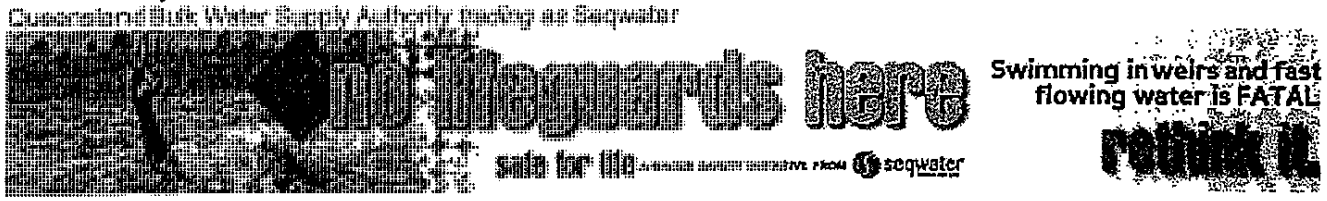
[redacted] | E rdrury[redacted]
Wivenhoe Dam, Brisbane Valley Highway, via Fernvale Q4306 Australia
PO Box 37, Fernvale QLD 4306
Website | www.seqwater.com.au

From: Rob Drury
Sent: Sunday, 9 January 2011 7:26 AM
To: Rob Drury; 'Dan Spiller'
Cc: Peter Borrows; Stan Stevenson; Mike Foster; Paul Bird; David Roberts; Arminda Roberts
Subject: RE: Technical Report W31

Please find attached Report W31.
Basically continuing releases to maintain 1600 cumecs total flow in the mid Brisbane but watching predicted rainfall as the strategy may change. Fernvale and Mt Crosby bridges still should be unaffected but does depend on what rain we get today or tomorrow.

Rob

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



seqwater
WATER FOR LIFE

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

From: Rob Drury
Sent: Saturday, 8 January 2011 7:46 AM
To: Rob Drury; 'Dan Spiller'
Cc: Peter Borrows; Stan Stevenson; Mike Foster; Paul Bird; David Roberts
Subject: RE: Technical Report W31

Attached report number W31.

Rob

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



seqwater
WATER FOR LIFE

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

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TECHNICAL SITUATION REPORT

TSR Number	W34	Date of TSR release	9.1.2011	Time of TSR release	9.00pm

Seqwater status of inflows and dam operations

Current status but could change based on inflows or rainfall.

Current objectives	• Continue current releases however event is increasing in magnitude and will require increased releases.	
Strategy	• Continue the current releases until tomorrow noon when re4leases will be increased to impact Mt Crosby and Fernvale Bridges.	
Key considerations	Storage levels:	Above FSL
	Inflows:	Inflows may approach 1,500,000ML which is close to 1974 event.
	Rainfall:	Continuing
	Lockyer/Bremer:	Monitoring their inflows
	Brisbane River:	Impact as below.

Rainfall

Very heavy rainfall has been recorded in the upper reaches of the Brisbane and Stanley in the last 6 hours with totals up 100 to 140mm. Totals for the last 24 hours range from 100 to 300mm.

Rainfall of similar magnitudes is expected in the 12 to 24 hours, especially around the Bremer/Warrill catchments as the system tracks south.

A severe weather warning remains current for heavy rainfall in the dam catchment areas.

Somerset Dam (Full Supply Level 99.00 m AHD)

The dam level is 101.68 m AHD (about 500,000ML currently in storage) and rising quickly. Peak inflow to the dam is estimated to be about 4,000 m3/s based on observed rainfall and could be as high as 5,000m3/s with additional forecast rainfall. Five sluice gates are open releasing about 1,100m3/s (95,000Ml/d) into Wivenhoe Dam. At this stage the dam will reach at least 103.5 early Tuesday morning which will adversely impact areas around Kilcoy.

Since the commencement of the event on 02/01/2011approximately 100,000ML has been released from the dam into Wivenhoe, with an event total of the order of 520,000ML expected. This may increase due to the forecast rain in the next 24 to 48 hours. At this stage, releases will continue until at least Thursday.

Wivenhoe Dam (Full Supply Level 67.00 m AHD)

River levels upstream of the dam are rising quickly with significant inflow being generated from the intense heavy rainfall. Flows in the Brisbane River at Gregor's Ck have already reached 6,700m3/s and the river is still rising.

D128

The dam level is rising again, with the current level being 69.10m AHD (1,410,000ML with about 300,00 of flood storage). Estimated peak inflow to the dam just from the Upper Brisbane R alone may reach as high as 7,500m3/s and, at this stage, the dam will reach at least 73.0 m AHD during Tuesday morning. Given the rapid increase in inflow volumes, it will be necessary to increase the release from Wivenhoe Monday morning.

The objective for dam operations will be to minimise the impact of urban flooding in areas downstream of the dam and, at this stage, releases will be kept below 3,500m3/s and the combined flows is the lower Brisbane will be limited to 4,000m3/s. This is below the limit of urban damages in the City reaches.

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Water levels in the lower Brisbane R will be impacted by the combined flows of Lockyer Ck, Bremer River, local runoff and releases from Wivenhoe Dam.

Somerset Regional, Ipswich City and Brisbane City Councils have been advised of the updated Wivenhoe operating strategy.

Seqwater Technical Officer name	Robert Drury
Seqwater Technical Officer position title	Dam Operations Manager
[redacted]	

BoM assessment

(consisting of references to latest Flood Warning for the Brisbane River and other relevant Bureau forecasts and warnings (e.g. weather/rain forecasts, Tropical Cyclone Warning etc) and other updates/comments if needed)

BoM has been advised.

BoM Technical Officer name	Peter Baddiley
BoM Technical Officer position title	
BoM Technical Officer contact details	flood.qld[redacted]

D129

Brisbane City Council (BCC) assessment

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised of the current status.

BCC Technical Officer name	Chris Lavin
BCC Technical Officer position title	Disaster Operations Manager
BCC Technical Officer contact details	[redacted]

Ipswich City Council (ICC) assessment (if required)

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised of the current status.

ICC Technical Officer name	Tony Trace
ICC Technical Officer position title	Local Disaster Response Coordinator
ICC Technical Officer contact details	[redacted]

Somerset Regional Council (SRC) assessment (if required)

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised of the current status.

SRC Technical Officer name	Tony Jacobs
SRC Technical Officer position title	Local Disaster Response Coordinator
SRC Technical Officer contact details	[redacted]

Collated and distributed by (Agency)

Contact Officer signature	
Contact Officer name	Rob Drury
Contact Officer position title	Dam Operations Manager

Next TSR due	Date	10.1.2011	Time		or Event	Change in strategy	

D130

From: Dan Spiller [Daniel.Spiller[redacted]]
Sent: Sunday, 9 January 2011 11:23 PM
To: 'ceo[redacted]
Cc: Barry Dennien; 'Debbie Best (debbie.best[redacted])'
Subject: Wivenhoe Dam operations update

Colin,

Further to our conversation, our latest advice is as follows.

There has been 100 to 300mm of rainfall in the Wivenhoe and Somerset dam catchments over the past 24 hours. Rainfall of similar magnitudes is expected over the next 12 to 24 hours. Total inflows will exceed 1,000,000 ML, based on rainfall to date.

To date, the primary objective for this event has been managing to prevent inundation of the Mt Crosby Weir and Fernvale Bridges.

With the forecast volumes, this primary objective is being changed to minimizing the risk of urban inundation. This involves larger releases now, minimizing the risk of even larger releases later (were the flood compartment to reach high levels).

Urban inundation in the City reaches generally commences at total river flows of about 3,500 cubic metres per second (dam releases plus Lockyer and Bremer). At this time, and depending upon overnight rainfall, the Flood Control Centre is proposing to increase releases from around 1,200 to 2,500 cubic metres per second from midday tomorrow. This provides an allowance for other flows.

The Mt Crosby Weir and Fernvale bridges will certainly be inundated - isolating or inconveniencing many Brisbane Valley residents. The timing will depend largely on local flows, with the river having recently increased to be about one foot below the deck. Seqwater is preparing the bridge to be inundated, and may need to close it tonight. However, other flows permitting, we will delay inundating the bridge until tomorrow night - providing notice for impacted residents.

We propose to issue a media advice about the increases and potential impact on bridges early tomorrow morning (about 7am). A draft is below. I would appreciate any comments, but understand time is limited. We will finalize it before issue, based on the status of the Weir Bridge at that time. Obviously, it is irrelevant if other flows result in closure before releases are increased.

The advice does not address urban impacts at this time. We would prefer to review the situation in the morning and consult with Councils before finalising the strategy. This includes reviewing where the rainfall occurs.

As you know, the dams are managing impacts by delaying and reducing releases. For comparison, peak flows into the dam are forecast to reach up to 7,500 cubic metres per second - excluding any downstream flows.

I will speak to you tomorrow. In the meantime, please call me on[redacted] if you require any further information.

Regards,
Daniel Spiller

Media update - 10 January 2011

Wivenhoe Dam releases

Significant rainfall received across the catchment has pushed Wivenhoe Dam's capacity to approximately _%. In order to relieve the dam's flood storage compartment, controlled releases will be increased today, utilising a strategy designed to minimise impacts downstream.

Increased releases, combined with other flows, are expected to result in the closure of the Fernvale Bridge and Mt Crosby Weir Bridge. This could occur this morning, but will be delayed until tonight if possible.

A number of other bridges have already been impacted, including Twin Bridges, Savages Crossing, Burtons Bridge, Kholo Bridge and Colleges Crossing.

Residents are urged to contact local councils for detailed information on road crossing closures and other impacts.

Telephone - [redacted] has been established for members of the public seeking information on which dams are spilling in South East Queensland.

ENDS

D140

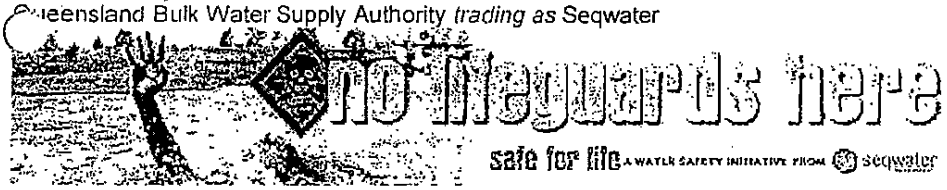
Gina O'Driscoll

From: Rob Drury [rdrury[redacted]]
Sent: Monday, 10 January 2011 6:14 AM
To: Dan Spiller; Barry Dennien
Cc: Paul Bird; Peter Borrows; David Roberts
Subject: FW: FOC Situation Report at 01:00 hrs on Monday 10 January 2011
Attachments: image001.jpg; image002.png

See below FOC report as at 1am.
Will send a technical report in hour or so when I get an update off the FOC.

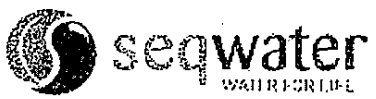
As at 6am this morning the levels are
Wivenhoe now 70.77m and 140.9% holding 1,641,685ML or 480,000Ml above FSL.
Somerset 150.9% and holding 573,067ML or 193,000ML above FSL.

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



Swimming in weirs and f
flowing water is FA1

rethink



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

m: Duty Engineer [mailto:dutyseq[redacted]]
Sent: Monday, 10 January 2011 1:14 AM
To: David Roberts; flood.qld[redacted]; Mike Foster; Paul Bird; Peter Allen; Rob Drury; Rohan Thorogood; Ken.Price[redacted]; kim.hang[redacted]; Al Navaruk; Bill Stephens; David Pokarier; John West; Louw Van Blerk; Mark Tan; Neville Ablitt; John.Ruffini[redacted]; John Tibaldi; Rob.ayre[redacted]; Terry Malone; Brett Schultz; Glenn Patterson; Malcolm Lane; Murray Dunstan; Rob Gorian; Agg Dagan; Doug Grigg; Graham Keegan; Graham Francis; Jayam Tennakoon; Matthew O'Reilly
Cc: Andy Bickerton; Deb Chandler; Mailbox; Chris Lavin; Craig Logan; Don Carroll; Evan Caswell; James Charalambous; Ken Morris; Robert McGlinn; Santina Pennisi; Tony Trace
Subject: FOC Situation Report at 01:00 hrs on Monday 10 January 2011

Rainfall

Very heavy rainfall has been recorded in the Upper Brisbane and Stanley Rivers in the last 12 hours with totals up 100 to 240mm. Totals for the last 24 hours range from 100 to 300mm.

Rainfall of similar magnitudes is expected in the 12 to 24 hours around the downstream catchments as the system tracks south.

A severe weather warning remains current for heavy rainfall in the dam catchment areas.

North Pine Dam (Full Supply Level 39.60 m AHD)

The dam level was 39.95 m and steady. Five gates are open releasing 445 m3/s. The inflow into the dam since the commencement of the event is 42,000 ML. Estimated event volume is 57,000 ML assuming no further rainfall. Gate operations will continue until at least Tuesday 11 January 2011.

Somerset Dam (Full Supply Level 99.00 m AHD)

The dam level is 102.22 m AHD and rising quickly (storing 157,000 ML above FSL). Peak inflow to the dam is estimated to be about 4,200 m3/s based on observed rainfall and could be as high as 5,000m3/s with additional forecast rainfall. Five sluice gates are open releasing about 1,100m3/s (95,000Ml/d) into Wivenhoe Dam. At this stage the dam will reach at least 103.5 on Monday afternoon which will adversely impact areas around Kilcoy.

Since the commencement of the event on 02/01/2011approximately 115,000ML has been released from the dam into Wivenhoe, with an event total of the order of 520,000ML expected. This is expected to increase due to the forecast rain in the next 24 to 48 hours. At this stage, releases will continue until at least Thursday.

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River levels upstream of the dam are rising quickly with significant inflow being generated from the intense heavy rainfall. Flows in the Brisbane River at Gregor's Ck have already reached 7,350m3/s and the river has just peaked at 13:00 on Sunday 9 January.

The dam level is rising quickly, with the current level being 69.60m AHD (storing 301,000 ML). Estimated peak inflow to the dam just from the Upper Brisbane R alone may reach as high as 8,800m3/s and, at this stage, the dam will reach at least 73.3 m AHD during Tuesday morning. Given the rapid increase in inflow volumes, it will be necessary to increase the release from Wivenhoe during Monday morning.

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Somerset Regional, Ipswich City and Brisbane City Councils have been advised of the updated Wivenhoe operating strategy.

Regards

John Ruffini

Duty Engineer
Flood Operations Centre

Phone: [redacted]
Fax:

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Gina O'Driscoll

From: Barry Dennien
Sent: Monday, 10 January 2011 6:17 AM
To: Michael Lyons
Cc: Dan Spiller
Subject: FW: FOC Situation Report at 01:00 hrs on Monday 10 January 2011

From: Paul Bird [mailto:pbird[redacted]]
Sent: Monday, 10 January 2011 6:16 AM
To: Rob Drury; Dan Spiller; Barry Dennien
Cc: Peter Borrows; David Roberts
Subject: RE: FOC Situation Report at 01:00 hrs on Monday 10 January 2011

Thanks Rob,

Woking on update now

Cheers

Paul

From: Rob Drury
Sent: Monday, 10 January 2011 06:14
To: 'Dan Spiller'; 'Barry Dennien'
Cc: Paul Bird; Peter Borrows; David Roberts
Subject: FW: FOC Situation Report at 01:00 hrs on Monday 10 January 2011

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



Swimming in weirs and flowing water is FAT

rethink

seqwater
WATER FOR LIFE

[redacted] | E rdrury[redacted]
Wivenhoe Dam, Brisbane Valley Highway, via Fernvale Q4306 Australia
PO Box 37, Fernvale QLD 4306
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From: Duty Engineer [mailto:dutyseq[redacted]]
Sent: Monday, 10 January 2011 1:14 AM
To: David Roberts; flood.qld[redacted]; Mike Foster; Paul Bird; Peter Allen; Rob Drury; Rohan Thorogood; Ken.Price[redacted]; kim.hang[redacted]; Al Navaruk; Bill Stephens; David Pokarier; John West; Louw Van Blerk; Mark Tan; Neville Ablitt; John.Ruffin[redacted]; John Tibaldi; Rob.ayre[redacted]; Terry Malone; Brett Schultz; Glenn Patterson; Malcolm Lane; Murray Dunstan; Rob Gorian; Agg Dagan; Doug Grigg; Graham Keegan; Graham Francis; Jayam Tennakoon; Matthew O'Reilly
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Somerset Regional, Ipswich City and Brisbane City Councils have been advised of the updated Wivenhoe operating strategy.

Regards

John Ruffini

Duty Engineer
Flood Operations Centre

Phone: [redacted]

Fax:

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Litsupport Brisbane

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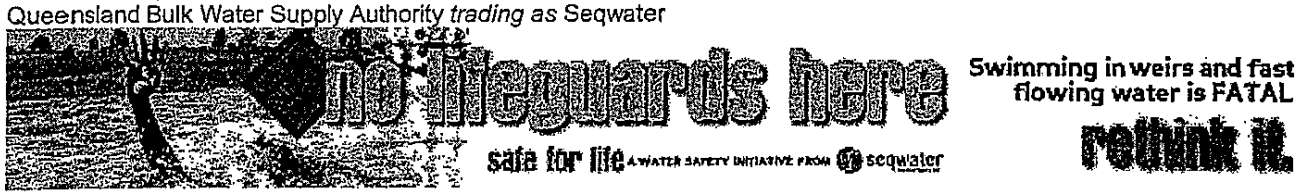



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PO Box 37, Fernvale QLD 4306
Website | www.seqwater.com.au

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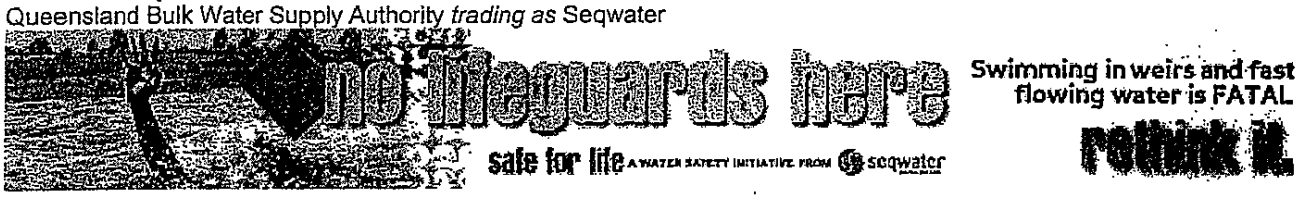

seqwater
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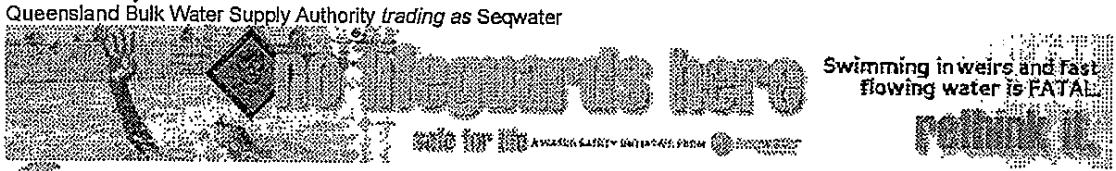



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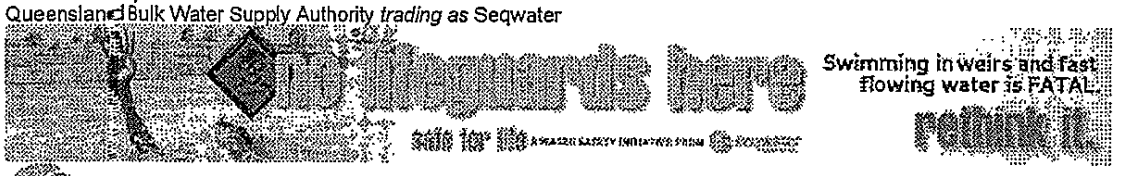



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Attach: Seqwater_No-Lifeguards-Here_email_strap.png; ATT00001.htm; cidimage001.png@01CA24E1.BDB90020; ATT00002.htm

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Begin forwarded message:

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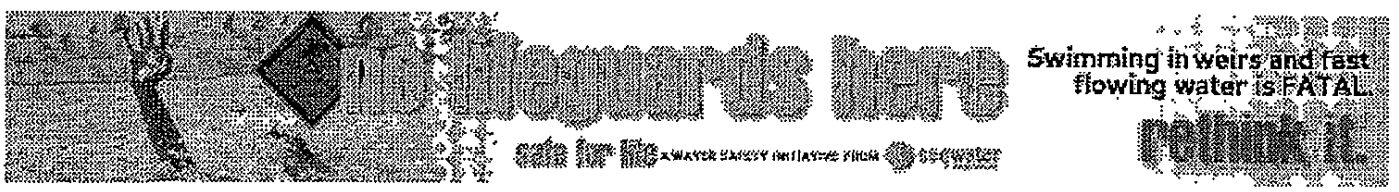
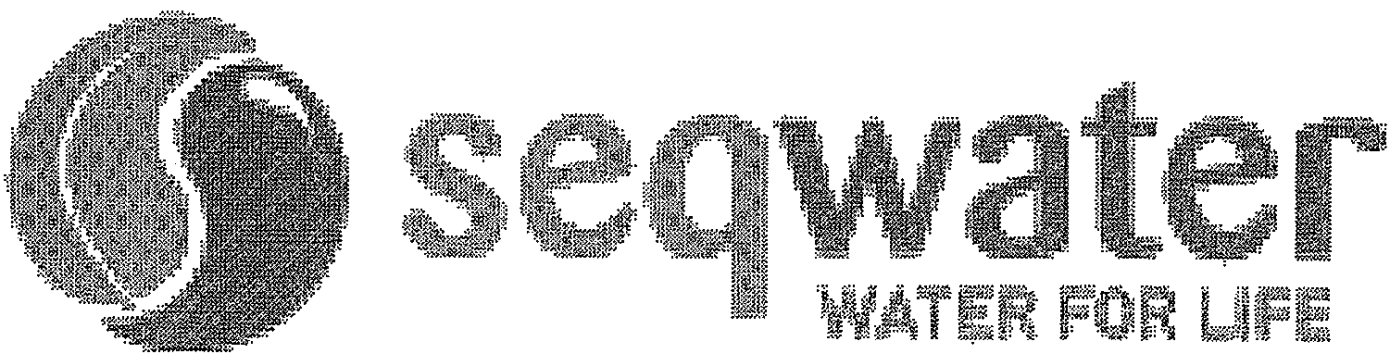

Swimming in weirs and fast flowing water is FATAL.
return it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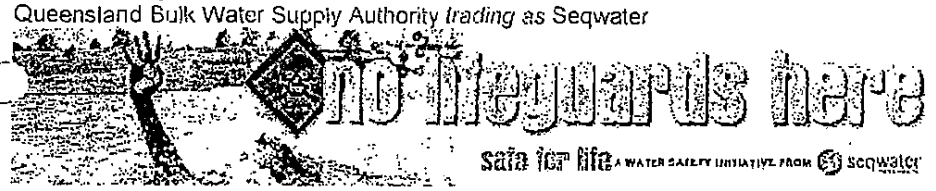
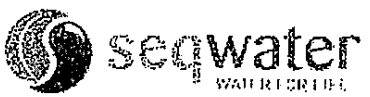
Water Delivery
Queensland Bulk Water Supply Authority *trading as* Seqwater





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

From: Duty Engineer [mailto:dutyseq[redacted]]
Sent: Monday, 10 January 2011 1:14 AM
To: David Roberts; flood.qld[redacted]; Mike Foster; Paul Bird; Peter Allen; Rob Drury; Rohan Thorogood; Ken.Price[redacted]; kim.hang[redacted]; Al Navaruk; Bill Stephens; David Pokarier; John West; Louw Van Blerk; Mark Tan; Neville Ablitt; John.Ruffini[redacted]; John Tibaldi; Rob.ayre[redacted]; Terry Malone; Brett Schultz; Glenn Patterson; Malcolm Lane; Murray Dunstan; Rob Gorian; Agg Dagan; Doug Grigg; Graham Keegan; Graham Francis; Jayam Tennakoon; Matthew O'Reilly
Cc: Andy Bickerton; Deb Chandler; Mailbox; Chris Lavin; Craig Logan; Don Carroll; Evan Caswell; James Charalambous; Ken Morris; Robert McGlinn; Santina Pennisi; Tony Trace
Subject: FOC Situation Report at 01:00 hrs on Monday 10 January 2011

Rainfall

Very heavy rainfall has been recorded in the Upper Brisbane and Stanley Rivers in the last 12 hours with totals up 100 to 240mm. Totals for the last 24 hours range from 100 to 300mm.

Rainfall of similar magnitudes is expected in the 12 to 24 hours around the downstream catchments as the system tracks south.

A severe weather warning remains current for heavy rainfall in the dam catchment areas.

North Pine Dam (Full Supply Level 39.60 m AHD)

The dam level was 39.95 m and steady. Five gates are open releasing 445 m3/s. The inflow into the dam since the commencement of the event is 42,000 ML. Estimated event volume is 57,000 ML assuming no further rainfall. Gate operations will continue until at least Tuesday 11 January 2011.

Somerset Dam (Full Supply Level 99.00 m AHD)

The dam level is 102.22 m AHD and rising quickly (storing 157,000 ML above FSL). Peak inflow to the dam is estimated to be about 4,200 m3/s based on observed rainfall and could be as high as 5,000m3/s with additional forecast rainfall. Five sluice gates are open releasing about 1,100m3/s (95,000Ml/d) into Wivenhoe Dam. At this stage the dam will reach at least 103.5 on Monday afternoon which will adversely impact areas around Kilcoy.

Since the commencement of the event on 02/01/2011approximately 115,000ML has been released from the dam into Wivenhoe, with an event total of the order of 520,000ML expected. This is expected to increase due to the forecast rain in the next 24 to 48 hours. At this stage, releases will continue until at least Thursday.

Wivenhoe Dam (Full Supply Level 67.00 m AHD)

River levels upstream of the dam are rising quickly with significant inflow being generated from the intense heavy rainfall. Flows in the Brisbane River at Gregor's Ck have already reached 7,350m3/s and the river has just peaked at 23:00 on Sunday 9 January.

The dam level is rising quickly, with the current level being 69.60m AHD (storing 301,000 ML). Estimated peak inflow the dam just from the Upper Brisbane R alone may reach as high as 8,800m3/s and, at this stage, the dam will reach at least 73.3 m AHD during Tuesday morning. Given the rapid increase in inflow volumes, it will be necessary to increase the release from Wivenhoe during Monday morning.

The objective for dam operations will be to minimise the impact of urban flooding in areas downstream of the dam and, at this stage, releases will be kept below 3,500m3/s and the combined flows in the lower Brisbane will be limited to 4,000m3/s if possible.

Fernvale Bridge approaches and Mt Crosby Weir Bridge have been inundated and both bridges are now closed or are in the process of being closed.

The current release rate from Wivenhoe Dam is 1,400m3/s (120,000ML/day). Gate opening will start to be increased during early Monday morning and the release is expected to increase to at least 2,600m3/s.

Since the commencement of the event on 02/01/2011 approximately 240,000ML has been released from the dam, with an event total approaching 1,500,000ML without further rain and as much as 2,100,000ML with forecast rainfall of (both including Somerset outflow). At this stage, releases will continue until at least Sunday 16th January 2011.

Impacts downstream of Wivenhoe Dam

The projected Wivenhoe Dam releases combined with Lockyer flows and local runoff will mean that all crossings downstream of Wivenhoe (Twin Bridges, Fernvale, Savages Crossing, Burtons Bridge, Kholo Bridge, Mt Crosby Weir and Colleges Crossing) will be adversely impacted until at least Saturday 15 January in varying degrees.

Water levels in the lower Brisbane R will be impacted by the combined flows of Lockyer Ck, Bremer River, local runoff and releases from Wivenhoe Dam. If the predicted rainfall eventuates in the downstream tributary catchments the resultant combined flows in the lower Brisbane may exceed the threshold of damaging discharge in the urban areas within the next 24 to 48 hours.

Somerset Regional, Ipswich City and Brisbane City Councils have been advised of the updated Wivenhoe operating strategy.

Regards

John Ruffini

Duty Engineer
Flood Operations Centre

Phone: [redacted]

Fax: [redacted]

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----------Safe Stamp----------
Your Anti-virus Service scanned this email. It is safe from known viruses.
For more information regarding this service, please contact your service provider.
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Cindy Hulsey

From: Rob Drury [rdrury[redacted]]
Sent: Monday, 10 January 2011 6:36 AM
To: Paul Bird; Dan Spiller

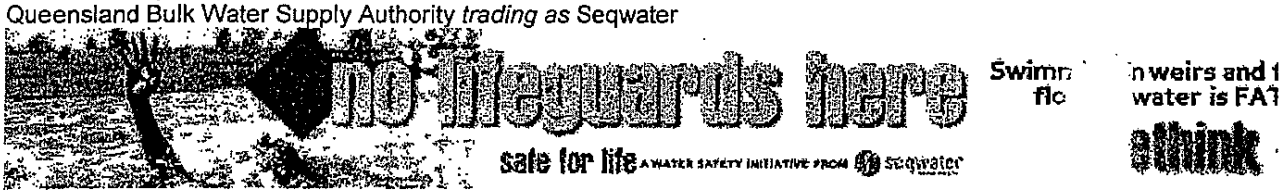
Categories: T8

Two things

- Current release rate is 1,753m3/s (150,000ML/day) but ramping up
- Our Flood Centre has been keeping BCC flood centre informed which BCC mobilised. The c . . ssue so far is that our manual has the threshold of damage to urban areas as around 4,000cumecs in th . er Brisbane River, they advised they think it is more like 3,500cumecs. We are aiming for the 4,000cu . . as per the approved manual so It would be good if we could still get a consolidated message out thro . all parties. Maybe advising flows of 3,500 to 4,000 cumecs which may cause some minor impacts down . eam, of course this also depends on further rainfall in local areas. Of course if we need to go higher . n the message would change.

Rob

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



seqwater
WATER FOR LIFE

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

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TECHNICAL SITUATION REPORT

TSR Number	W35	Date of TSR release	10.1.2011	Time of TSR release	7am

Seqwater status of inflows and dam operations

Current status but could change based on inflows or rainfall.

Current objectives	• Continue increasing releases to discharge flood waters but keep impact downstream to minimum.	
Strategy	• All bridges are now inundated . • Aiming to release 3,500cumecs to keep flow in lower Brisbane River around 4,000cumecs	
Key considerations	Storage levels:	Above FSL
	Inflows:	Inflows expected around 1,500,000ML which is close to 1974 event.
	Rainfall:	Continuing
	Lockyer/Bremer:	Monitoring their inflows
	Brisbane River:	Impact as below.

Rainfall

Moderate to heavy rainfall has been recorded in the Upper Brisbane and Stanley Rivers in the last 12 hours with totals up to 90 mm. Totals for the last 24 hours range from 100 to 325mm.

Mt Glorious recorded 100 mm in the last 12 hours.

Rainfall of similar magnitudes is expected in the 12 to 24 hours around the downstream catchments as the system tracks south.

A severe weather warning remains current for heavy rainfall in the dam catchment areas.

North Pine Dam (Full Supply Level 39.60 m AHD)

The dam level was 39.97 m and steady. Five gates are open releasing 475 m3/s. The inflow into the dam since the commencement of the event is 52,000 ML. Estimated event volume is 72,000 ML assuming no further rainfall. Gate operations will continue until at least Tuesday 11 January 2011.

Somerset Dam (Full Supply Level 99.00 m AHD)

The dam level at 05:00 was 102.84 m AHD and rising (storing 193,000 ML above FSL). Peak inflow to the dam is estimated to be about 4,200 m3/s based on observed rainfall and could be as high as 5,000m3/s with additional forecast rainfall. Five sluice gates are open releasing about 1,100m3/s (95,000Ml/d) into Wivenhoe Dam. At this stage the dam lake level will reach about 103.5 mAHD on Monday afternoon. Areas around Kilcoy will continue to be adversely affected.

Since the commencement of the event on 02/01/2011approximately 142,000ML has been released from the dam into Wivenhoe, with an event total of the order of 520,000ML expected. This is expected to increase due to the forecast rain in the next 24 to 48 hours. At this stage, releases will continue until at least Thursday.

Wivenhoe Dam (Full Supply Level 67.00 m AHD)

River levels upstream of the dam have peaked and are falling slowly with significant inflow being generated from the intense heavy rainfall. Flows in the Brisbane River at Gregor's Ck have peaked at 7,350m3/s at 23:00 on Sunday 9 January. This peak is bigger than January 1974 and February 1999 at this location.

The dam level is rising quickly, with the current level being 70.77m AHD (storing 450,000 ML). Estimated peak inflow to the dam just from the Upper Brisbane R is around 8,800m3/s and, at this stage, the dam will reach at least 73.3 m AHD during Tuesday morning. Given the rapid increase in inflow volumes, it was necessary to start to increase the release from Wivenhoe during Monday morning.

The objective for dam operations will be to minimise the impact of urban flooding in areas downstream of the dam and, at this stage, releases will be kept below 3,500m3/s and the combined flows in the lower Brisbane will be limited to 4,000m3/s if possible. This is significantly less than the current estimated combined pre-dam peak inflow of 12,000 m3/s.

Fernvale Bridge approaches and Mt Crosby Weir Bridge have been inundated and both bridges are now closed.

The current release rate from Wivenhoe Dam is 1,753m3/s (150,000ML/day). Gate opening will continue to be increased during Monday and the release is expected to increase to at least 2,600m3/s in the next 12 to 24 hours.

Since the commencement of the event on 02/01/2011 approximately 275,000ML has been released from the dam, with an event total approaching 1,600,000ML without further rain and as much as 2,100,000ML with forecast rainfall of (both including Somerset outflow). At this stage, releases will continue until at least Sunday 16th January 2011.

Impacts downstream of Wivenhoe Dam

The projected Wivenhoe Dam releases combined with Lockyer flows and local runoff will mean that all crossings downstream of Wivenhoe (Twin Bridges, Fernvale, Savages Crossing, Burtons Bridge, Kholo Bridge, Mt Crosby Weir and Colleges Crossing) will be adversely impacted until at least Saturday 15 January in varying degrees.

Water levels in the lower Brisbane R will be impacted by the combined flows of Lockyer Ck, Bremer River, local runoff and releases from Wivenhoe Dam. If the predicted rainfall eventuates in the downstream tributary catchments the resultant combined flows in the lower Brisbane may exceed the threshold of damaging discharge in the urban areas within the next 24 to 48 hours. Currently the estimate peak flow in the lower Brisbane River will be the highest since Wivenhoe Dam was completed in 1984 but still well below flows the 1974 levels.

Somerset Regional, Ipswich City and Brisbane City Councils have been advised of the updated Wivenhoe operating strategy.

Outlook

Heavy rainfall continues throughout South East Queensland and the situation could deteriorate rapidly over the next 24 hours. The flood operation centre will continue to monitor the situation and provide every six hours until the situation stabilizes.

Seqwater Technical Officer name	Robert Drury
Seqwater Technical Officer position title	Dam Operations Manager
[redacted]	

BoM assessment

(consisting of references to latest Flood Warning for the Brisbane River and other relevant Bureau forecasts and warnings (e.g. weother/rain forecasts, Tropical Cyclone Warning etc) and other updates/comments if needed)

BoM has been advised.

BoM Technical Officer name	Peter Baddiley
BoM Technical Officer position title	
BoM Technical Officer contact details	flood.qld[redacted]

Brisbane City Council (BCC) assessment

(to include predicted local inundation areas and depths of inundation based on the informotion)

Council has been advised of the current status.

BCC Technical Officer name	Chris Lavin
BCC Technical Officer position title	Disaster Operations Manager
BCC Technical Officer contact details	[redacted]

Ipswich City Council (ICC) assessment (if required)

(to include predicted local inundation areas and depths of inundation based on the informotion)

Council has been advised of the current status.

ICC Technical Officer name	Tony Trace
ICC Technical Officer position title	Local Disaster Response Coordinator
ICC Technical Officer contact details	[redacted]

Somerset Regional Council (SRC) assessment (if required)

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised of the current status.

SRC Technical Officer name	Tony Jacobs

SRC Technical Officer position title	Local Disaster Response Coordinator
SRC Technical Officer contact details	[redacted]

Collated and distributed by (Agency)

Contact Officer signature	
Contact Officer name	Rob Drury
Contact Officer position title	Dam Operations Manager

Next TSR due	Date	11.1.2011	Time		or Event	Change in strategy

1517

TECHNICAL SITUATION REPORT

TSR Number	W36	Date of TSR release	10.1.2011	Time of TSR release	8am

Seqwater status of inflows and dam operations

Current status but could change based on inflows or rainfall.

Current objectives	• Continue increasing releases to discharge flood waters but keep impact downstream to minimum.	
Strategy	• All bridges are now inundated .	
Key considerations	Storage levels:	Above FSL
	Inflows:	Inflows expected around 1,500,000ML which is close to 1974 event.
	Rainfall:	Continuing
	Lockyer/Bremer:	Monitoring their inflows
	Brisbane River:	Impact as below.

Rainfall

Moderate to heavy rainfall has been recorded in the Upper Brisbane and Stanley Rivers in the last 12 hours with totals up to 90 mm. Totals for the last 24 hours range from 100 to 325mm.

Mt Glorious recorded 100 mm in the last 12 hours.

Rainfall of similar magnitudes is expected in the 12 to 24 hours around the downstream catchments as the system tracks south.

A severe weather warning remains current for heavy rainfall in the dam catchment areas.

North Pine Dam (Full Supply Level 39.60 m AHD)

The dam level was 39.97 m and steady. Five gates are open releasing 475 m3/s. The inflow into the dam since the commencement of the event is 52,000 ML. Estimated event volume is 72,000 ML assuming no further rainfall. Gate operations will continue until at least Tuesday 11 January 2011.

Somerset Dam (Full Supply Level 99.00 m AHD)

The dam level at 05:00 was 102.84 m AHD and rising (storing 193,000 ML above FSL). Peak inflow to the dam is estimated to be about 4,200 m3/s based on observed rainfall and could be as high as 5,000m3/s with additional forecast rainfall. Five sluice gates are open releasing about 1,100m3/s (95,000Ml/d) into Wivenhoe Dam. At this stage the dam lake level will reach about 103.5 mAHD on Monday afternoon. Areas around Kilcoy will continue to be adversely affected.

Since the commencement of the event on 02/01/2011approximately 142,000ML has been released from the dam into Wivenhoe, with an event total of the order of 520,000ML expected. This is expected to increase due to the forecast rain in the next 24 to 48 hours. At this stage, releases will continue until at least Thursday.

Wivenhoe Dam (Full Supply Level 67.00 m AHD)

River levels upstream of the dam have peaked and are falling slowly with significant inflow being generated from the intense heavy rainfall. Flows in the Brisbane River at Gregor's Ck have peaked at 7,350m3/s at 23:00 on Sunday 9 January. This peak is bigger than January 1974 and February 1999 at this location.

The dam level is rising quickly, with the current level being 70.77m AHD (storing 450,000 ML). Estimated peak inflow to the dam just from the Upper Brisbane R is around 8,800m3/s and, at this stage, the dam will reach at least 73.3 m AHD during Tuesday morning. Given the rapid increase in inflow volumes, it was necessary to start to increase the release from Wivenhoe during Monday morning.

The objective for dam operations will be to minimise the impact of urban flooding in areas downstream of the dam and, at this stage, releases will be kept below 3,500m3/s and the combined flows in the lower Brisbane will be limited to 4,000m3/s if possible. This is significantly less than the current estimated combined pre-dam peak inflow of 12,000 m3/s.

Fernvale Bridge approaches and Mt Crosby Weir Bridge have been inundated and both bridges are now closed.

The current release rate from Wivenhoe Dam is 1,753m3/s (150,000ML/day). Gate opening will continue to be increased during Monday and the release is expected to increase to at least 2,600m3/s in the next 12 to 24 hours.

Since the commencement of the event on 02/01/2011 approximately 275,000ML has been released from the dam, with an event total approaching 1,600,000ML without further rain and as much as 2,100,000ML with forecast rainfall of (both including Somerset outflow). At this stage, releases will continue until at least Sunday 16th January 2011.

Impacts downstream of Wivenhoe Dam

The projected Wivenhoe Dam releases combined with Lockyer flows and local runoff will mean that all crossings downstream of Wivenhoe (Twin Bridges, Fernvale, Savages Crossing, Burtons Bridge, Kholo Bridge, Mt Crosby Weir and Colleges Crossing) will be adversely impacted until at least Saturday 15 January in varying degrees.

Water levels in the lower Brisbane R will be impacted by the combined flows of Lockyer Ck, Bremer River, local runoff and releases from Wivenhoe Dam. If the predicted rainfall eventuates in the downstream tributary catchments the resultant combined flows in the lower Brisbane may exceed the threshold of damaging discharge in the urban areas within the next 24 to 48 hours. Currently the estimate peak flow in the lower Brisbane River will be the highest since Wivenhoe Dam was completed in 1984 but still well below flows the 1974 levels.

Somerset Regional, Ipswich City and Brisbane City Councils have been advised of the updated Wivenhoe operating strategy.

Outlook

Heavy rainfall continues throughout South East Queensland and the situation could deteriorate rapidly over the next 24 hours. The flood operation centre will continue to monitor the situation and provide every six hours until the situation stabilizes.

Seqwater Technical Officer name	Robert Drury

Seqwater Technical Officer position title	Dam Operations Manager
[redacted]	

BoM assessment

(consisting of references to latest Flood Warning for the Brisbane River and other relevant Bureau forecosts and warnings (e.g. weather/rain forecasts, Tropical Cyclone Worning etc) and other updates/comments if needed)

BoM has been advised.

BoM Technical Officer name	Peter Baddiley
BoM Technical Officer position title	
BoM Technical Officer contact details	flood.qld[redacted]

Brisbane City Council (BCC) assessment

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised of the current status.

BCC Technical Officer name	Chris Lavin
BCC Technical Officer position title	Disaster Operations Manager
BCC Technical Officer contact details	[redacted]

Ipswich City Council (ICC) assessment (if required)

(to include predicted lacal inundation areas and depths of inundation based on the information)

Council has been advised of the current status.

ICC Technical Officer name	Tony Trace
ICC Technical Officer position title	Local Disaster Response Coordinator
ICC Technical Officer contact details	[redacted]

Somerset Regional Council (SRC) assessment (if required)

(to include predicted local inundation areas and depths of inundotion based on the information)

Council has been advised of the current status.

SRC Technical Officer name	Tony Jacobs
SRC Technical Officer position title	Local Disaster Response Coordinator

SRC Technical Officer' contact details	[redacted]

Collated and distributed by (Agency)

Contact Officer signature	
Contact Officer name	Rob Drury
Contact Officer position title	Dam Operations Manager

Next TSR due	Date	11.1.2011	Time		or Event	Change in strategy

1521

Litsupport Brisbane

From: Rob Drury [rdrury[redacted]]
Sent: Monday, 10 January 2011 7:53 AM
To: Rob Drury; Dan Spiller; Barry Dennien; Michael Lyons; SEQWGM Media; debbie.best[redacted]; Scott Denner; Paul Bird; Stan Stevenson; Peter Borrows; Peter.Allen[redacted]
Subject: RE: Technical Report W35
Attachments: Technical Situation Report W35.docx

Attached report W35.

Rob

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



Swimming in weirs and fast flowing water is FATAL
rethink it.

seqwater
WATER FOR LIFE

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

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TECHNICAL SITUATION REPORT

TSR Number	W35	Date of TSR release	10.1.2011	Time of TSR release	7am

Seqwater status of inflows and dam operations

Current status but could change based on inflows or rainfall.

Current objectives	• Continue increasing releases to discharge flood waters but keep impact downstream to minimum.	
Strategy	• All bridges are now inundated .	
Key considerations	Storage levels:	Above FSL
	Inflows:	Inflows expected around 1,500,000ML which is close to 1974 event.
	Rainfall:	Continuing
	Lockyer/Bremer:	Monitoring their inflows
	Brisbane River:	Impact as below.

Rainfall

Very heavy rainfall has been recorded in the upper reaches of the Brisbane and Stanley in the last 6 hours with totals up 100 to 140mm. Totals for the last 24 hours range from 100 to 300mm.

Rainfall of similar magnitudes is expected in the 12 to 24 hours, especially around the Bremer/Warrill catchments as the system tracks south.

A severe weather warning remains current for heavy rainfall in the dam catchment areas.

Somerset Dam (Full Supply Level 99.00 m AHD)

The dam level is 101.68 m AHD (about 500,000ML currently in storage) and rising quickly. Peak inflow to the dam is estimated to be about 4,000 m3/s based on observed rainfall and could be as high as 5,000m3/s with additional forecast rainfall. Five sluice gates are open releasing about 1,100m3/s (95,000Ml/d) into Wivenhoe Dam. At this stage the dam will reach at least 103.5 early Tuesday morning which will adversely impact areas around Kilcoy.

Since the commencement of the event on 02/01/2011approximately 100,000ML has been released from the dam into Wivenhoe, with an event total of the order of 520,000ML expected. This may increase due to the forecast rain in the next 24 to 48 hours. At this stage, releases will continue until at least Thursday.

Wivenhoe Dam (Full Supply Level 67.00 m AHD)

River levels upstream of the dam are rising quickly with significant inflow being generated from the intense heavy rainfall. Flows in the Brisbane River at Gregor's Ck have already reached 6,700m3/s and the river is still rising.

D184

The dam level is rising again, with the current level being 69.10m AHD (1,410,000ML with about 300,00 of flood storage). Estimated peak inflow to the dam just from the Upper Brisbane R alone may reach as high as 7,500m3/s and, at this stage, the dam will reach at least 73.0 m AHD during Tuesday morning. Given the rapid increase in inflow volumes, it will be necessary to increase the release from Wivenhoe Monday morning.

The objective for dam operations will be to minimise the impact of urban flooding in areas downstream of the dam and, at this stage, releases will be kept below 3,500m3/s and the combined flows is the lower Brisbane will be limited to 4,000m3/s. This is below the limit of urban damages in the City reaches.

The current release rate from Wivenhoe Dam is 1,400m3/s (120,000ML/day). Gate opening will start to be increased from noon Monday and the release is expected increase to at least 2,600m3/s during Tuesday morning.

Since the commencement of the event on 02/01/2011 approximately 220,000ML has been released from the dam, with an event total approaching 1,000,000ML without further rain and as much as 1,500,000ML with forecast rainfall of (both including Somerset outflow). At this stage, releases will continue until at least Sunday 16th January 2011.

Impacts downstream of Wivenhoe Dam

The projected Wivenhoe Dam releases combined with Lockyer flows and local runoff will mean that all crossings downstream of Wivenhoe (Twin Bridges, Fernvale, Savages Crossing, Burtons Bridge, Kholo Bridge, Mt Crosby Weir and Colleges Crossing) will be adversely impacted until at least Saturday 15 January in varying degrees.

Water levels in the lower Brisbane R will be impacted by the combined flows of Lockyer Ck, Bremer River, local runoff and releases from Wivenhoe Dam.

Somerset Regional, Ipswich City and Brisbane City Councils have been advised of the updated Wivenhoe operating strategy.

Seqwater Technical Officer name	Robert Drury
Seqwater Technical Officer position title	Dam Operations Manager
[redacted]	

BoM assessment

(consisting of references to latest Flood Warning for the Brisbane River and other relevant Bureau forecasts and warnings (e.g. weather/rain forecasts, Tropical Cyclone Warning etc) and other updates/camments if needed)

BoM has been advised.

BoM Technical Officer name	Peter Baddiley
BoM Technical Officer position title	
BoM Technical Officer contact details	flood.qld[redacted]

D185

Brisbane City Council (BCC) assessment

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised of the current status.

BCC Technical Officer name	Chris Lavin
BCC Technical Officer position title	Disaster Operations Manager
BCC Technical Officer contact details	[redacted]

Ipswich City Council (ICC) assessment (if required)

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised of the current status.

ICC Technical Officer name	Tony Trace
ICC Technical Officer position title	Local Disaster Response Coordinator
ICC Technical Officer contact details	[redacted]

Somerset Regional Council (SRC) assessment (if required)

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised of the current status.

SRC Technical Officer name	Tony Jacobs
SRC Technical Officer position title	Local Disaster Response Coordinator
SRC Technical Officer contact details	[redacted]

Collated and distributed by (Agency)

Contact Officer signature	
Contact Officer name	Rob Drury
Contact Officer position title	Dam Operations Manager

Next TSR due	Date	11.1.2011	Time		or Event	Change in strategy

D186

From: Dan Spiller <Daniel.Spiller[redacted]>
Sent: Monday, January 10, 2011 9:51 AM
To: Barry Dennien <Barry.Dennien[redacted]>
Subject: FW: Water Grid operations update
Attach: Technical Situation Report W36.docx

From: Dan Spiller
Sent: Monday, 10 January 2011 9:46 AM
To: 'stephen.robertson[redacted]'; 'ken.smith[redacted]'; 'lance.mccallum[redacted]'; 'Tim.Watts[redacted]'; 'Geoff.Stead[redacted]'; 'Lauren.Sims[redacted]'; 'Best Debbie'; 'Martin.PeterJ[redacted]'; 'Dunn.KerryG[redacted]
Cc: 'Rob Drury'; Paul Bird; SEQWGM Media; 'damien.brown[redacted]'; 'Reilly Bob'; Madgwick.DarrenT[redacted]; 'Stan Stevenson'
Subject: Water Grid operations update

All,

Current situation report attached. We are distributing this version of the Technical Support Report to Councils and BoM now. We are seeking their formal input and endorsement by 1pm, prior to finalising and speaking publicly to our release strategy.

For dam operations, key points are:

- There is continuing heavy rainfall in catchments. Total inflows will be at least 1,500,000 ML and probably above 2,100,000 ML.
- As a result, Wivenhoe Dam is above 140% of capacity and Somerset is above 150%, with both rising fast.
- As specified in the approved Operational Procedures, the primary objective is now to minimizing the risk of urban inundation (release strategy W2). This involves larger releases now, minimizing the risk of even larger releases later (were the flood compartment to reach high levels).
- Consistent with this release strategy, dam releases have increased to 1,750 cubic metres per second (150,000 ML/day). It is expected to increase to 2,600 cubic metres per second by midday tomorrow.
- As specified in the approved Operational Manual, we are targeting maximum flow in the Brisbane River of 3,500 cumecs at Moggill. This is the levels above which urban inundation begins.
- For comparison, flows would be up to 12,000 cumecs without the dams.

For water treatment, key points are:

- Key facilities are operating and reservoir levels are high. Mt Crosby WTP is producing at 250 ML/day and desalination at one-third of capacity.
- There are a range of smaller plants that have been impacts, due to inundation of infrastructure, connections or stranding of operators. We are working through these issues and will advise if any become critical.

Please call me on [redacted] if you require any further information.

Regards,
Dan

Daniel Spiller

Director, Operations
SEQ Water Grid Manager
[redacted]
Email: daniel.spiller[redacted]
Visit: Level 15, 53 Albert Street Brisbane
Post: PO Box 16205, City East QLD 4002
ABN: 14783 317 630

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TECHNICAL SITUATION REPORT

TSR Number	W36	Date of TSR release	10.1.2011	Time of TSR release	8am

Seqwater status of inflows and dam operations

Current status but could change based on inflows or rainfall.

Current objectives	• Continue increasing releases to discharge flood waters but keep impact downstream to minimum.	
Strategy	• All bridges are now inundated .	
Key considerations	Storage levels:	Above FSL
	Inflows:	Inflows expected around 1,500,000ML which is close to 1974 event.
	Rainfall:	Continuing
	Lockyer/Bremer:	Monitoring their inflows
	Brisbane River:	Impact as below.

Rainfall

Moderate to heavy rainfall has been recorded in the Upper Brisbane and Stanley Rivers in the last 12 hours with totals up to 90 mm. Totals for the last 24 hours range from 100 to 325mm.

Mt Glorious recorded 100 mm in the last 12 hours.

Rainfall of similar magnitudes is expected in the 12 to 24 hours around the downstream catchments as the system tracks south.

A severe weather warning remains current for heavy rainfall in the dam catchment areas.

North Pine Dam (Full Supply Level 39.60 m AHD)

The dam level was 39.97 m and steady. Five gates are open releasing 475 m3/s. The inflow into the dam since the commencement of the event is 52,000 ML. Estimated event volume is 72,000 ML assuming no further rainfall. Gate operations will continue until at least Tuesday 11 January 2011.

Somerset Dam (Full Supply Level 99.00 m AHD)

The dam level at 05:00 was 102.84 m AHD and rising (storing 193,000 ML above FSL). Peak inflow to the dam is estimated to be about 4,200 m3/s based on observed rainfall and could be as high as 5,000m3/s with additional forecast rainfall. Five sluice gates are open releasing about 1,100m3/s (95,000Ml/d) into Wivenhoe Dam. At this stage the dam lake level will reach about 103.5 mAHD on Monday afternoon. Areas around Kilcoy will continue to be adversely affected.

Since the commencement of the event on 02/01/2011approximately 142,000ML has been released from the dam into Wivenhoe, with an event total of the order of 520,000ML expected. This is expected to increase due to the forecast rain in the next 24 to 48 hours. At this stage, releases will continue until at least Thursday.

Wivenhoe Dam (Full Supply Level 67.00 m AHD)

River levels upstream of the dam have peaked and are falling slowly with significant inflow being generated from the intense heavy rainfall. Flows in the Brisbane River at Gregor's Ck have peaked at 7,350m3/s at 23:00 on Sunday 9 January. This peak is bigger than January 1974 and February 1999 at this location.

The dam level is rising quickly, with the current level being 70.77m AHD (storing 450,000 ML). Estimated peak inflow to the dam just from the Upper Brisbane R is around 8,800m3/s and, at this stage, the dam will reach at least 73.3 m AHD during Tuesday morning. Given the rapid increase in inflow volumes, it was necessary to start to increase the release from Wivenhoe during Monday morning.

The objective for dam operations will be to minimise the impact of urban flooding in areas downstream of the dam and, at this stage, releases will be kept below 3,500m3/s and the combined flows in the lower Brisbane will be limited to 4,000m3/s if possible. This is significantly less than the current estimated combined pre-dam peak inflow of 12,000 m3/s.

Fernvale Bridge approaches and Mt Crosby Weir Bridge have been inundated and both bridges are now closed.

The current release rate from Wivenhoe Dam is 1,753m3/s (150,000ML/day). Gate opening will continue to be increased during Monday and the release is expected to increase to at least 2,600m3/s in the next 12 to 24 hours.

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Impacts downstream of Wivenhoe Dam

The projected Wivenhoe Dam releases combined with Lockyer flows and local runoff will mean that all crossings downstream of Wivenhoe (Twin Bridges, Fernvale, Savages Crossing, Burtons Bridge, Kholo Bridge, Mt Crosby Weir and Colleges Crossing) will be adversely impacted until at least Saturday 15 January in varying degrees.

Water levels in the lower Brisbane R will be impacted by the combined flows of Lockyer Ck, Bremer River, local runoff and releases from Wivenhoe Dam. If the predicted rainfall eventuates in the downstream tributary catchments the resultant combined flows in the lower Brisbane may exceed the threshold of damaging discharge in the urban areas within the next 24 to 48 hours. Currently the estimate peak flow in the lower Brisbane River will be the highest since Wivenhoe Dam was completed in 1984 but still well below flows the 1974 levels.

Somerset Regional, Ipswich City and Brisbane City Councils have been advised of the updated Wivenhoe operating strategy.

Outlook

Heavy rainfall continues throughout South East Queensland and the situation could deteriorate rapidly over the next 24 hours. The flood operation centre will continue to monitor the situation and provide every six hours until the situation stabilizes.

Seqwater Technical Officer name	Robert Drury

Seqwater Technical Officer position title	Dam Operations Manager
[redacted]	

BoM assessment

(consisting of references to latest Flood Warning for the Brisbane River and other relevant Bureau forecasts and warnings (e.g. weather/rain forecasts, Tropical Cyclone Warning etc) and other updates/comments if needed)

BoM has been advised.

BoM Technical Officer name	Peter Baddiley
BoM Technical Officer position title	
BoM Technical Officer contact details	flood.qld[redacted]

Brisbane City Council (BCC) assessment

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised of the current status.

BCC Technical Officer name	Chris Lavin
BCC Technical Officer position title	Disaster Operations Manager
BCC Technical Officer contact details	[redacted]

Ipswich City Council (ICC) assessment (if required)

(to include predicted local inundation areas and depths of inundation based on the information)

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ICC Technical Officer name	Tony Trace
ICC Technical Officer position title	Local Disaster Response Coordinator
ICC Technical Officer contact details	[redacted]

Somerset Regional Council (SRC) assessment (if required)

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised of the current status.

SRC Technical Officer name	Tony Jacobs
SRC Technical Officer position title	Local Disaster Response Coordinator

SRC Technical Officer contact details	[redacted]

Collated and distributed by (Agency)

Contact Officer signature	
Contact Officer name	Rob Drury
Contact Officer position title	Dam Operations Manager

Next TSR due	Date	11.1.2011	Time		or Event	Change in strategy

Litsupport Brisbane

From: Dan Spiller
Sent: Monday, 10 January 2011 9:57 AM
To: Rob Drury; Peter Borrows
Cc: Barry Dennien
Subject: Technical Situation Report W36 (3)
Attachments: Technical Situation Report W36 (3).docx

Rob and Peter,

I am about to send the TSR to Colin Jensen for BCC input. Before doing so, I have amended it based on my understanding of our conversation. Can you please confirm that the changes reflect your strategy?

Dan

D208

TECHNICAL SITUATION REPORT

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Outlook

Heavy rainfall continues throughout South East Queensland and the situation could deteriorate rapidly over the next 24 hours. The flood operation centre will continue to monitor the situation and provide every six hours until the situation stabilizes.

D210

Seqwater Technical Officer name	Robert Drury
Seqwater Technical Officer position title	Dam Operations Manager
[redacted]	

BoM assessment

(consisting of references to latest Flood Warning for the Brisbane River and other relevant Bureau forecasts and warnings (e.g. weather/rain forecasts, Tropical Cyclone Warning etc) and other updates/comments if needed)

BoM has been advised.

BoM Technical Officer name	Peter Baddiley
BoM Technical Officer position title	
BoM Technical Officer contact details	flood.qld[redacted]

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(to include predicted local inundation areas and depths of inundation based on the information)

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BCC Technical Officer name	Chris Lavin
BCC Technical Officer position title	Disaster Operations Manager
BCC Technical Officer contact details	[redacted]

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(to include predicted local inundation areas and depths of inundation based on the information)

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ICC Technical Officer name	Tony Trace
ICC Technical Officer position title	Local Disaster Response Coordinator
ICC Technical Officer contact details	[redacted]

Somerset Regional Council (SRC) assessment (if required)

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Council has been advised of the current status.

SRC Technical Officer name	Tony Jacobs

SRC Technical Officer position title	Local Disaster Response Coordinator
SRC Technical Officer contact details	[redacted]

Collated and distributed by (Agency)

Contact Officer signature	
Contact Officer name	Rob Drury
Contact Officer position title	Dam Operations Manager

Next TSR due	Date	11.1.2011	Time		or Event	Change in strategy

D212

Gina O'Driscoll

From: Peter Borrows [pborrows[redacted]]
Sent: Monday, 10 January 2011 10:02 AM
To: Barry Dennien
Subject: FW: Answers to questions from teleconference
Attachments: image001.jpg; image002.png; image003.jpg

Regards, Peter.

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

seqwater
WATER FOR LIFE

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

no lifeguards here
A WATER SAFETY INITIATIVE FROM
Swimming in weirs and fast flowing water is FATAL.
rethink it.

From: Rob Drury
Sent: Monday, 10 January 2011 9:56 AM
To: Peter Borrows; Stan Stevenson; Paul Bird
Subject: Answers to questions from teleconference

Peter, If you want to forward to the WGM. Apologies for delay but they were in discussions with Councils.

In response to the queries raised

- The current operational strategy is to aim for a flow of no greater than 3,500cumecs in the lower Brisbane River. Accordingly, the current outflow from Wivenhoe Dam will be held at its current level of 2000 cumecs for the next 12 to 24 hours to allow for potential high flows from the Lockyer, Bremer and local area catchments to pass downstream. However this strategy may need to be revised at short notice if further significant rainfall occurs.

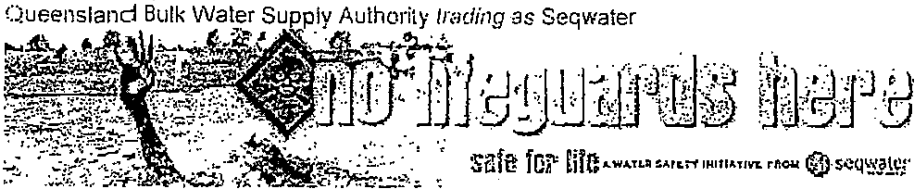
- It would require in the order of 50mm of rain across the Brisbane River Basin (this includes the Brisbane, Stanley, Lockyer and Bremer catchments) to go beyond the current operational strategy, however this depends on the spatial distribution, intensity and duration of the rainfall. This amount of rain is possible under current BOM forecasts.

- If there is a need to go beyond 3,500cumecs in the lower Brisbane around 24 hours notice should be able to be provided to BOM and BCC.

Rob

Robert Drury

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



Swimming in weirs and f
flowing water is FAT
rethink

seqwater
WATER FOR LIFE

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

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From: Barry Dennien </O=SOUTH EAST QUEENSLAND WATER GRID MANAGER/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=BARRY.DENNIEN>
Sent: Monday, January 10, 2011 10:07 AM
To: Dan Spiller <Daniel.Spiller[redacted]>
Subject: FW: Answers to questions from teleconference

Can you come in

From: Peter Borrows [mailto:pborrows[redacted]]
Sent: Monday, 10 January 2011 10:02 AM
To: Barry Dennien
Subject: FW: Answers to questions from teleconference

Regards, Peter.

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

seqwater

[redacted] | E pborrows[redacted]
Level 3, 240 Margaret St, Brisbane City QLD 4000
PO Box 16146, City East QLD 4002
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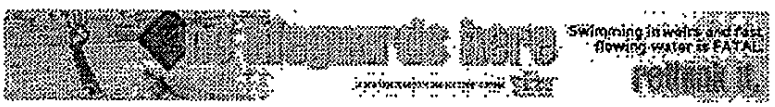

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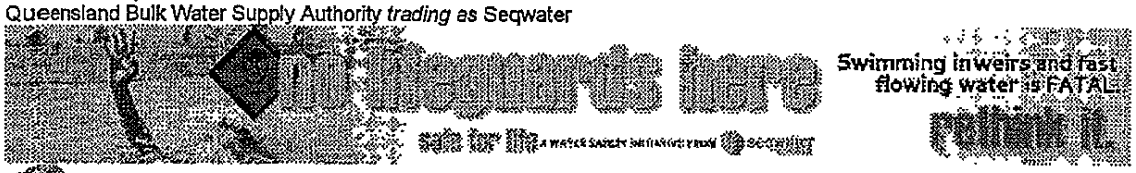



[redacted] | E rdrury[redacted]
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From:	Dan Spiller <Daniel.Spiller[redacted]>
Sent:	Monday, January 10, 2011 10:09 AM
To:	ceo[redacted]
Cc:	Barry Dennien <Barry.Dennien[redacted]>; Peter Borrows <pborrows[redacted]>
Subject:	Technical Situation Report
Attach:	Technical Situation Report W37.docx

Colin,

Further to our discussion, attached is the Technical Situation Report drafted by Seqwater following consultation with BoM and Councils.

Key points are:

- There is continuing heavy rainfall in catchments. Total inflows over the event will be at least 1,500,000 ML and probably above 2,100,000 ML.
- As a result, Wivenhoe Dam is above 140% of capacity and Somerset is above 150%, with both rising fast.
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- For comparison, flows would be up to 12,000 cumecs without the dams.

Seqwater has previously had verbal conversations with BCC staff regarding impacts. However, given the significance of this event, and consistent with the draft protocol, we are seeking formal BCC input to this version. This advice would relate to the impact of releases, based on the type of scenario analysis that you described this morning.

Our preference would be to finalise the report, including your input, before or at the 12.30 teleconference with Council CEOs and the BoM. This timing means that it can underpin all media messaging this afternoon.

I appreciate your assistance. Please call me if I can be of any assistance.

Regards,
Dan

Daniel Spiller
Director, Operations
SEQ Water Grid Manager
[redacted]
Email: daniel.spiller[redacted]
Visit: Level 15, 53 Albert Street Brisbane
Post: PO Box 16205, City East QLD 4002
ABN: 14783 317 630

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Since the commencement of the event on 02/01/2011 approximately 275,000ML has been released from the dam, with an event total approaching 1,600,000ML without further rain and as much as 2,100,000ML with forecast rainfall of (both including Somerset outflow). At this stage, releases will continue until at least Sunday 16th January 2011.

Impacts downstream of Wivenhoe Dam

The projected Wivenhoe Dam releases combined with Lockyer flows and local runoff will mean that all crossings downstream of Wivenhoe (Twin Bridges, Fernvale, Savages Crossing, Burtons Bridge, Kholo Bridge, Mt Crosby Weir and Colleges Crossing) will be adversely impacted until at least Saturday 15 January in varying degrees.

Water levels in the lower Brisbane R will be impacted by the combined flows of Lockyer Ck, Bremer River, local runoff and releases from Wivenhoe Dam. If the predicted rainfall eventuates in the downstream tributary catchments the resultant combined flows in the lower Brisbane may exceed the threshold of damaging discharge in the urban areas within the next 24 to 48 hours. Currently the estimate peak flow in the lower Brisbane River will be the highest since Wivenhoe Dam was completed in 1984 but still well below flows the 1974 levels.

Somerset Regional, Ipswich City and Brisbane City Councils have been advised of the updated Wivenhoe operating strategy.

Outlook

Heavy rainfall continues throughout South East Queensland and the situation could deteriorate rapidly over the next 24 hours. The flood operation centre will continue to monitor the situation and provide every six hours until the situation stabilizes.

Seqwater Technical Officer name	Robert Drury

Seqwater Technical Officer position title	Dam Operations Manager
[redacted]	

BoM assessment

(consisting of references to latest Flood Warning for the Brisbane River and other relevant Bureau forecasts and warnings (e.g. weather/rain forecasts, Tropical Cyclone Warning etc) and other updates/comments if needed)

BoM has been advised.

BoM Technical Officer name	Peter Baddiley
BoM Technical Officer position title	
BoM Technical Officer contact details	flood.qld[redacted]

Brisbane City Council (BCC) assessment

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised of the current status.

BCC Technical Officer name	Chris Lavin
BCC Technical Officer position title	Disaster Operations Manager
BCC Technical Officer contact details	[redacted]

Ipswich City Council (ICC) assessment (if required)

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised of the current status.

ICC Technical Officer name	Tony Trace
ICC Technical Officer position title	Local Disaster Response Coordinator
ICC Technical Officer contact details	[redacted]

Somerset Regional Council (SRC) assessment (if required)

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised of the current status.

SRC Technical Officer name	Tony Jacobs
SRC Technical Officer position title	Local Disaster Response Coordinator

SRC Technical Officer contact details	[redacted]

Collated and distributed by (Agency)

Contact Officer signature	
Contact Officer name	Rob Drury
Contact Officer position title	Dam Operations Manager

Next TSR due	Date	11.1.2011	Time		or Event	Change in strategy

Gina O'Driscoll

From: Lee Hutchison
Sent: Monday, 10 January 2011 10:21 AM
To: Dan Spiller; Barry Dennien; Scott Denner; Michael Lyons
Cc: Aleisha Coote; SEQWGM Emergency
Subject: 0830h Teleconference Notes
Attachments: Flooding 0830 10JAN11 Teleconference.docx

Colleagues,

Attached are the notes as taken during the teleconference today.

Lee Hutchison
Risk and Emergency Manager
SEQ Water Grid Manager
Phone: [redacted]
Email: lee.hutchison[redacted]
Post: PO Box 16205, BRISBANE CITY EAST, QLD 4002
Visit: Level 15, 53 Albert St, BRISBANE
ABN: 14 783 317 630

Teleconference 0830h 10 January 2011 – Dam Releases and Flooding

In attendance

Barry Dennien
Dan Spiller
Scott Denner
Michael Lyons
Lee Hutchison

Seqwater – Peter Burrows, Rob Dury, Paul Bird, Stan Stevenson

Agenda

Review the current release strategy

- 3.5 and 4
  - Seqwater – Manual – 4, 000m3/s but aiming for 3,500m3/s – 4,000m3/s in the river
  - Will adjust timings based on what is happening downstream
  - Release at 3,500m3/s – currently at 2,000m3/s
  - 2,500m3/s in next 12-24hrs
  - Objective is to minimise urban impacts
  - Barry - @ 3,500m3/s comfortable through Moggill. Point between W2 and W3 is critical. Need to engage BCC at highest level when decision is made
  - Dan – above 3.5 – flooding attributable to dam releases – Comms need to be clear
  - Peter Burrows – 8,800-9,000m3/s inflows
  - Barry - - Team talks to BCC and Bom (planned above 3.5), check concerns (not input into model), document any concerns
  - Peter – how much notice can we give that we are moving from 3,500m3/s to 4,000m3/s at Moggill – **Key question.**

Scenarios –

- W2
- BCC second scenario – river at 3,500m3/s with local rainfall causing localised/flash flooding.
- Barry – inflows in calcs?
- Dan – could it go over 4,000m3/s?

Action - Seqwater will come back with some further modelling info next hour.

How long at 3,500m3/s

Trigeer to go from 4,000m3/s and up

Grid Operations

- WTP
- Stan – Somerset – some facilities shut down.
- Site access – emerging issues
- Landslips – emerging issue

- Landers Shute – landslide issues***
- Kenilworth – 36hrs
- Mt Crosby – OK.
- More detail at 1100h
- Need to max sys storage. Linkwater comfortable
- Staff unable to return from leave or access workplace – is resourcing a risk?

Coordination –

- 1000h Min
- 1030h Min
- 1100h Grid OPs
- 12PM meeting BCC/BoM (telecon)
- TSRs - BoM and BCC – update with issues and expectiations
- W37 post 1200h teleconference as technical basis for media comms

Communications

- 1400h TV
- Short advisory am hrs earlier today

Level 3 Emergency Escalation

- Emergency Manager appointed - Dan
- Comms Manager appointed – Michael

Teleconference end at 0902h.

Tipping point discussion – how long can we hold for and what are the risks

SEQWGM Actions

- Distribute TSR to BCC and Bom for formal input and endorsement
- Communicate TSR to Gov't stakeholders

From:	Barry Dennien </O=SOUTH EAST QUEENSLAND WATER GRID MANAGER/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=BARRY.DENNIEN>
Sent:	Monday, January 10, 2011 11:46 AM
To:	Lance McCallum (lance.mccallum[redacted])
Subject:	FW: Wivenhoe Dam release strategy
Attach:	Technical Situation Report W37.docx

Lance

As discussed

Barry

Dear CEOs

This teleconference at 12.30pm today is to update you on the current Wivenhoe flood release strategy.

In preparation for this meeting we are intending to send out a Technical Report closer to 12.30pm that will detail the strategy.

Dial in details are:
Phone: [redacted]
Pin: [redacted]

If you wish to contact me regarding this teleconference, please phone my office on [redacted] or mobile [redacted].

Carl and Rob,

Attached is the Technical Situation Report drafted by Seqwater following consultation with BoM and Councils.

Key points are:

- There is continuing heavy rainfall in catchments. Total inflows over the event will be at least 1,500,000 ML and probably above 2,100,000 ML.
- As a result, Wivenhoe Dam is above 140% of capacity and Somerset is above 150%, with both rising fast.
- As specified in the approved Operational Procedures, the primary objective is now to minimizing the risk of urban inundation (release strategy W2). This involves larger releases now, minimizing the risk of even larger releases later (were the flood compartment to reach high levels).
- Consistent with this release strategy, dam releases have increased to 2,000 cubic metres per second (172,000 ML/day). It is expected to increase to 2,600 cubic metres per second by midday tomorrow.
- As specified in the approved Operational Manual, we are targeting maximum flow in the Brisbane River of 3,500 cumecs at Moggill. This is the levels above which urban inundation begins.
- For comparison, flows would be up to 12,000 cumecs without the dams.

Seqwater has previously had verbal conversations with Council staff regarding impacts. However, given the significance of this event, and consistent with the draft protocol, we are seeking formal Council input to this version. This advice would relate to the impact of releases, based on the type of scenario analysis that you

described this morning.

Our preference would be to finalise the report, including your input, before or at the 12.30 teleconference with Council CEOs and the BoM. This timing means that it can underpin all media messaging this afternoon.

I appreciate your assistance. Please call me if I can be of any assistance.

Regards,
Dan

Daniel Spiller
Director, Operations
SEQ Water Grid Manager
[redacted]
Email: daniel.spiller[redacted]
Visit: Level 15, 53 Albert Street Brisbane
Post: PO Box 16205, City East QLD 4002
ABN: 14783 317 630

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

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TECHNICAL SITUATION REPORT

TSR Number	W36	Date of TSR release	10.1.2011	Time of TSR release	8am

Seqwater status of inflows and dam operations

Current status but could change based on inflows or rainfall.

Current objectives	• Continue increasing releases to discharge flood waters but keep impact downstream to minimum.	
Strategy	• All bridges are now inundated .	
Key considerations	Storage levels:	Above FSL
	Inflows:	Inflows expected around 1,500,000ML which is close to 1974 event.
	Rainfall:	Continuing
	Lockyer/Bremer:	Monitoring their inflows
	Brisbane River:	Impact as below.

Rainfall

Moderate to heavy rainfall has been recorded in the Upper Brisbane and Stanley Rivers in the last 12 hours with totals up to 90 mm. Totals for the last 24 hours range from 100 to 325mm.

Mt Glorious recorded 100 mm in the last 12 hours.

Rainfall of similar magnitudes is expected in the 12 to 24 hours around the downstream catchments as the system tracks south.

A severe weather warning remains current for heavy rainfall in the dam catchment areas.

North Pine Dam (Full Supply Level 39.60 m AHD)

The dam level was 39.97 m and steady. Five gates are open releasing 475 m3/s. The inflow into the dam since the commencement of the event is 52,000 ML. Estimated event volume is 72,000 ML assuming no further rainfall. Gate operations will continue until at least Tuesday 11 January 2011.

Somerset Dam (Full Supply Level 99.00 m AHD)

The dam level at 05:00 was 102.84 m AHD and rising (storing 193,000 ML above FSL). Peak inflow to the dam is estimated to be about 4,200 m3/s based on observed rainfall and could be as high as 5,000m3/s with additional forecast rainfall. Five sluice gates are open releasing about 1,100m3/s (95,000Ml/d) into Wivenhoe Dam. At this stage the dam lake level will reach about 103.5 mAHD on Monday afternoon. Areas around Kilcoy will continue to be adversely affected.

Since the commencement of the event on 02/01/2011approximately 142,000ML has been released from the dam into Wivenhoe, with an event total of the order of 520,000ML expected. This is expected to increase due to the forecast rain in the next 24 to 48 hours. At this stage, releases will continue until at least Thursday.

Wivenhoe Dam (Full Supply Level 67.00 m AHD)

River levels upstream of the dam have peaked and are falling slowly with significant inflow being generated from the intense heavy rainfall. Flows in the Brisbane River at Gregor's Ck have peaked at 7,350m3/s at 23:00 on Sunday 9 January. This peak is bigger than January 1974 and February 1999 at this location.

The dam level is rising quickly, with the current level being 70.77m AHD (storing 450,000 ML). Estimated peak inflow to the dam just from the Upper Brisbane R is around 8,800m3/s and, at this stage, the dam will reach at least 73.3 m AHD during Tuesday morning. Given the rapid increase in inflow volumes, it was necessary to start to increase the release from Wivenhoe during Monday morning.

The objective for dam operations will be to minimise the impact of urban flooding in areas downstream of the dam and, at this stage, the aim is to keep combined flows in the lower Brisbane to 3,500m3/sec if possible. Consistent with the approved Operating Procedures, these target combined flows may need to be increased to 4,000m3/s, and potentially higher. In either case, this is significantly less than the current estimated combined pre-dam peak inflow of 12,000 m3/s.

Fernvale Bridge approaches and Mt Crosby Weir Bridge have been inundated and both bridges are now closed.

The current release rate from Wivenhoe Dam is around 2,000m3/s (172,000ML/day). Gate opening will continue to be increased during Monday and the release is expected to increase to at least 2,600m3/s in the next 12 to 24 hours and further depending on downstream flows..

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The projected Wivenhoe Dam releases combined with Lockyer flows and local runoff will mean that all crossings downstream of Wivenhoe (Twin Bridges, Fernvale, Savages Crossing, Burtons Bridge, Kholo Bridge, Mt Crosby Weir and Colleges Crossing) will be adversely impacted until at least Saturday 15 January in varying degrees.

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Somerset Regional, Ipswich City and Brisbane City Councils have been advised of the updated Wivenhoe operating strategy.

Outlook

Heavy rainfall continues throughout South East Queensland and the situation could deteriorate rapidly over the next 24 hours. The flood operation centre will continue to monitor the situation and provide every six hours until the situation stabilizes.

SeqWater Technical Officer name	Robert Drury

Seqwater Technical Officer position title	Dam Operations Manager
[redacted]	

BoM assessment

(consisting of references to latest Flood Warning for the Brisbane River and other relevant Bureau forecasts and warnings (e.g. weather/rain forecasts, Tropical Cyclone Warning etc) and other updates/comments if needed)

BoM has been advised.

BoM Technical Officer name	Peter Baddiley
BoM Technical Officer position title	
BoM Technical Officer contact details	flood.qld[redacted]

Brisbane City Council (BCC) assessment

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised of the current status.

BCC Technical Officer name	Chris Lavin
BCC Technical Officer position title	Disaster Operations Manager
BCC Technical Officer contact details	[redacted]

Ipswich City Council (ICC) assessment (if required)

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised of the current status.

ICC Technical Officer name	Tony Trace
ICC Technical Officer position title	Local Disaster Response Coordinator
ICC Technical Officer contact details	[redacted]

Somerset Regional Council (SRC) assessment (if required)

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised of the current status.

SRC Technical Officer name	Tony Jacobs
SRC Technical Officer position title	Local Disaster Response Coordinator

SRC Technical Officer contact details	[redacted]

Collated and distributed by (Agency)

Contact Officer signature	
Contact Officer name	Rob Drury
Contact Officer position title	Dam Operations Manager

Next TSR due	Date	11.1.2011	Time		or Event	Change in strategy

Transcript of meeting on 10 January 2011 – 12.30pm.

Attendees (in person and via teleconference):

SEQ Water Grid Manager: Barry Dennien (**BD**), Daniel Spiller (**DS**), Scott Denner, Michael Lyons, John Adcock

Seqwater: Peter Borrows (**PBor**),

Brisbane City Council: Colin Jensen (**CJ**), Shane McLeod

State: Ken Smith (**KS**), Karl Walsh

Bureau of Meteorology: Peter Baddiley (**PBad**), Jimmy Stewart (**JS**)

Office of the Water Supply Regulator, Department of Environment and Resource Management (DERM): Bob Reilly

DERM: Debbie Best

Ipswich City Council: Ipswich City Council representative (**ICC**)

Somerset Regional Council: Bob Bain (**BB**), Graeme Lehmann, Tony Jacobs

Minister Robertson's office: Minister Robertson

BD	...is being proposed around addressing those forecasts. So to kick off I'd like Peter – if you like, Peter Borrows – just to give us an update on dam levels, current release rates.
PBor	Wivenhoe Dam is currently 52% above full water supply level and Somerset Dam is 210,000 megalitres above full supply level so that would be discharging – and is discharging now into Wivenhoe. Currently the release strategy is to design the releases – and we're releasing about 2,000 mega – cubic metres a second out of Wivenhoe into the river and that's designed to have a flow rate at the Moggill gauge of about 3,500 megalitres a second. So that's the current arrangement.
BD	The – thanks, Peter. Peter, just a few additional facts. In the – in the course of the last 24 hours some of the inflows into Wivenhoe Dam peaked at around 12,000 cumecs, just to give a comparison, the release rates at that stage were about 1,300 cumecs. At the moment, Peter, they're going to about 2,800 cumecs, I believe, out of Wivenhoe.
PBor	We're increasing it to that.
BD	Yes.
PBor	But still – we're not there yet.
BD	Okay.
PBor	But the inflows, as Barry said, combining Somerset and Wivenhoe together is around the 12,000 cumecs.
BD	The – and we're trying to – strategy at the moment is to try and maintain the river, which is the combination of the dam releases, and Lockyer Creek, Bremer, et cetera, and overland flow at Moggill at 3,500 cumecs. So that's the current strategy. So is there any questions on information on where the current state of

	play is with the dams, before we talk about forecasts?
CJ	Yeah, Colin Jensen here. I understand our offices were talking this morning and actually there was a revised strategy down from 3,500. Is that not correct?
PBor	What do you mean '*down from 3,500*', Col? Lower?
CJ	As at – as at midmorning I was told that Seqwater was proposing a revised strategy which was 2,000 cumecs released from Wivenhoe plus 500 of river inflows making a total at Moggill of 2,5000 cumecs.
PBor	No, the target – the target's still 3,500, Col. But when we get onto the revised strategies, there's been a lot of rain in the catchment in the last few hours again so – but we'll wait until the BOM come in on that.
CJ	Okay. So to be clear, the 3,500 is the target?
PBor	That is the current target.
CJ	And will you give me the timetable of ramping up to that again, please?
PBor	Well...
CJ	'Cause this is different to what my flood information people are actually modelling right this moment.
KS	Yeah, Peter, it's Ken here. Can you break up that 3,500 in terms of the components? What's – what's released from Wivenhoe and what would the local – you know, the – you know, the water flow outside of Wivenhoe?
PBor	Yeah, I'm just checking something.
Voice in background	3,800 out of Wivenhoe...
Unknown	Mmm.
Voice in background	...700 out of the others.
CJ	It's Colin here. My understanding was 3,000 out of Wivenhoe, 500 out of river catchments below Wivenhoe, making a total of 3,500 at Moggill.
BD	So – so, Peter, that's not what you just said – 3,500 at Moggill was the...
PBor	3,500 at Moggill.
BD	Yeah.
PBor	That's the same number, isn't it, Col?
BD	That's the same number, isn't it, Col?
CJ	Yes.
KS	Yeah, it's the question of how much out of Wivenhoe. How does that...
PBor	Oh, yeah, okay. Righto. Well it was 2,000 ramping up as the...
BD	Yeah.
PBor	...as the projections came down. As projections out of Lockyer and Bremer came down, Wivenhoe was ramping up to try and maintain the 3,500 at Moggill.
CJ	Yeah, Colin here. So my understanding was that you're currently at about 2,000. You'll be ramping up to 3,000 as the other inflows drop to 500, maintaining 3,500 at Moggill.

PBor	That's the current release strategy, yes.
CJ	Yeah.
BD	Just of note...
CJ	My...
BD	...in the technical report, Col, that came out earlier this morning it was 2,000 ramping up to 2,600, still maintaining 3,500 at Moggill but that may have changed, as Peter's just said, as – as the inflows from Lockyer even decrease lower they'll increase Wivenhoe a bit more but still maintain 3,500 at Moggill.
PBor	But just to restate, that's the current release strategy.
BD	Yeah.
CJ	Yeah, can I just check, is there a proposed lower release strategy, because that's what I was being advised this morning.
PBor	No.
CJ	Okay. So that – for us, that's actually a confusion based on advice that officers have been told at about 10.00 this morning.
KS	Who – who advised you, Colin?
PBor	Yeah.
CJ	I haven't got names, but it's out of Seqwater to the Flood Information Centre at BCC.
BD	So...
Unknown male on phone	That's what I said.
BD	Okay. So what we'll do – we'll just – we'll – Peter Borrows is going to run that one to ground, if there was a miscommunication but what was in the technical report basically was the strategy as of his morning and – but even that we'd like to revise now and if everyone's happy with that base information, what we'd like to do is just talk about this – the change in the catchment and what's going on with the rainfall and to get the BOM to come in here, if they could, and give us two things – one is a bit of an update on what's occurred maybe in the last three or four hours and then secondly, what the forecast is in the catchment over the next coming 12/24 hour period.
PBad	Yeah, morning – good afternoon, all. Peter Baddiley – just speaking initially – I think just listening to that discussion the – the situation is changing hour by hour so a – a TSR of 8.00am – technical situation report of 8.00am is dated within hours after – within a few hours after its written, so it's old information but if I just bring an update. The last three hours there's continuing significant rainfall. There is increase in the upper Brisbane catchments and in parts of the Lockyer. Flows are increasing through the system. Currently we are operating with an expected peak of 3,700 in the Brisbane city reach but that's based on an – on a – on a, if you like, scenario of release strategy of a few hours ago and as I understand it that would be modified fairly soon. Just take account of the increasing - continuing higher rainfalls into the catchment. In terms of forecast rain, we gave on the briefing this morning to a State Disaster Coordination Centre, a further 50-100 millimetres over 24 hours with possible 150 millimetres in locations and as – as we speak now the rain is continuing with some of the three hourly totals above – above Wivenhoe being up to about 60 millimetres in three hours in some places and fairly

	significant areas of rain over the – over the catchment.
BD	Thank you, Peter. Based on that information, Peter Borrows now has had his team reference the operational manual and have a look at a revised strategy which, my understanding, Peter, will take it possibly above 3,500 at Moggill gauge. Peter, do you want to give us an overview of the new revised strategy?
PBor	Yeah, the flood operation centre's currently going through that same information that Peter Baddiley has just conveyed to the – to the group and looking at what the revised release strategy should be. The release strategy that we have has that when Wivenhoe hits 78% above full supply level then the operating mode shifts to – to basically making sure the dam – the dam's safety becomes the paramount sort of number and the effects of the dam's safety and people downstream becomes the paramount. The predicted maximum level was going to get to within 75,000 cubic metres of the full supply level prior to this upgraded rainfall that we've experienced over the last three years – three – last three hours and we are also now only – and that level would've been 3,300 – 3,300 – 3,000 – 330,000 megalitres, sorry, below the – the peak that would trigger the first – first fuse plug. So essentially what we're now doing is revising that release strategy and that will be available within the next two hours but it is extremely likely that that would increase the releases significantly above the targeted figure at Moggill at 3,500.
CJ	Colin here. So to what sort of extent – just in the ball park?
PBor	We – we're still working that through, Colin. I haven't got the answer to that yet and I'll have it within the next hour or two.
KS	So – yeah, it's Ken here. In the next hour you'll have it?
PBor	Yes, correct. Yeah.
KS	Yep. Thanks, Peter.
PBor	And – yeah.
BD	So...
CJ	Colin here. Because even – and the confusion around the – being able to drop to 2,500 total stream flow rather than 3,500 – just the difference in those two numbers to us is actually several thousand properties inundated and it's the difference between actually us managing a property damage incident which didn't impact upon residents. At 3,500 we're now actually – will have to ramp up to probably evacuations.
KS	Sorry, Colin – Ken here. At 3,500?
CJ	Yeah, we were actually – in coming out of the meeting that – when you and I spoke, that I'd just come out of, we were working on a 2,500 as – as per some maths computing advice and we were looking at next week for the king tide, as we looked further ahead, just to be...
KS	That's the 21st
CJ	21st, correct.
Male	Yes.
CJ	Our – if you like, our worst case planning on that was to work at 4,000 cumecs at Moggill and at that we're actually into the thousands of properties inundated. So now what I'm hearing is that I'm definitely at 3,500 by – and I have to check the time there, but by Wednesday high tide peak at 2.00pm and I'm possibly running up to my 4,000 number.

BD	Yes. Col, Barry Dennien here. Dan is going to shed a little bit of light on this confusion this morning around this – this lower figure that – that the officers were talking about. Dan, did you want to talk to that?
DS	Yeah, I – I just was speaking to Rob Drury. Rob advised that what he'd told the officers this morning is that because of flows in the Lockyer they were looking at that stage of holding the releases at 2,000 cumecs and doing so for a period of about ten hours to provide some time for the downstream impacts – downstream flows to peak but that – obviously that's subject to the rainfall that's occurring in the catchment now which is causing the – the review of strategy which Peter described. But at that time they were trying to hold at 2,000 rather than continue ramping up by – to 2,000...
CJ	Yep. Okay, well that explains it. And you're telling me, to be crystal clear, that strategy's definitely gone.
BD	That one's gone. And there's a...
CJ	And instead we're talking about ramping up beyond 3,500 total.
BD	What I'm hearing, Col, to be really clear, is from the BOM's forecast and from the inflows that we've just been briefed on in the last two hours, that the most likely scenario will be above 3,500 at Moggill and Peter Borrows is not willing to put a number on that at this point until that modelling's finished in the next hour and a half or so.
CJ	Okay.
KS	So in terms of – it's Ken here. Peter, in terms of Wivenhoe's history, have there been releases of amounts we've been talking about?
PBor	No. No, we haven't.
KS	It hasn't since – since – since the dam was put in place there haven't been releases of these amounts?
PBor	Well certainly not since the – the mid-80s and so – and I think the answer to your question, Ken, is no, there hasn't been any and certainly not since the mid-80s.
BB	Peter, it's Bob here from Somerset. Are you releasing from the Somerset Dam at the same rate you're releasing from Wivenhoe?
PBor	We're releasing at a lower rate from Somerset into Wivenhoe, but as you know, Bob, there's flooding from upstream of Somerset as well.
BB	That – that's right. There's going – that's backed up into the township of Kilcoy.
PBor	So we – we are releasing from Somerset. We've got the five sluice gates in Somerset open.
BB	Mmm-hmm.
CJ	Colin here. To assist, could you – 'cause I've actually had conflicting advice on this too so I might as well ask the experts, what's the maximum release rate in cumecs from Somerset and from Wivenhoe?
PBor	I can't give you that answer off the top of my head, sorry, Colin. I'll have to give you that answer.
CJ	That's okay. It's just the number keeps heading north.
PBor	Yeah.
CJ	I – I thought we'd passed the number a couple of times now so...

PBor	Yeah, well we certainly haven't passed the maximum release out of Wivenhoe.
CJ	No.
PBor	We're significantly below Wivenhoe.
BD	And just – Col, just on that, in that manual the – the flood manual, it clearly talks about releases above 4,000 and well above that in the manual, when the bigger inflows and the storages have – and the flood storage starts to fill. So I think going above 4,000 cumecs was always part of the original plan if required.
CJ	Yeah. Okay, but the...
PBad	Peter Baddiley – Peter Baddiley, if I could just make a comment at some stage.
BD	Yeah, go ahead, Peter.
CJ	Yeah, I'm willing to wait.
BD	Peter, when you're ready.
PBad	Oh okay. I was just going to comment that – with the current release strategies which was established several hours ago and it's about to be revised upwards, we were modelling about 3,700 cumecs through Brisbane anyway now because there's about a thousand cumecs of local inflow still increasing from Lockyer and Bremer so we're already up around the 3,700 level. What will now happen is that within the next hour or so Seqwater will give us their new release strategy, we will put that back into the model, we will re-crunch the numbers and we will come out with whatever the – with the current rainfalls, the increasing Lockyer and Bremer, Warril flows plus the new strategy, we'll be then looking – able to say what the new peak flow is through the Brisbane city reach. That – that will now depend on when the release strategy is given to us and then our warning is due for a re-issue at 3.30pm. We will talk then to Brisbane City Council's FIC to agree on what height – what flow and what height we'll be using in the public warning as per all of our arrangements.
BD	Col, Barry Dennien. Col, could you share with us a bit of your – you mentioned you had some scenarios modelled when we spoke this morning, that you were working up some scenarios and you mentioned then a little earlier that you had a scenario run at 4,000 cumecs at the spring tide?
CJ	Yep.
BD	Would you – would you have that information available to share on how many properties might be affected at that level?
CJ	I don't have the latter bit, in terms of how many properties are impacted at 4,000 simply because this morning inappropriately we've put that work aside and pursued a lower number than 4,000 cumecs at Moggill. So I don't have the number there but to give you some idea, at a river height of 3.1 metres which is what we're looking at the window achieving about now, in the next half hour, which is the level that we've achieved probably three or four times since late December, since just before Christmas. At that sort of level we have 6,500 properties – not houses, properties partially inundated due to the river and tidal creek.
BD	Mmm-hmm.
CJ	And some 221 of those fully inundated. So that's a 3.1 metre river height. My understanding is 3,500 cumecs at Moggill equates to a - tide height I'm talking here – of about 3.5 to 3.7 metres. And 4,000 cumecs obviously is somewhere north of that as well.

BD	Mmm-hmm.
CJ	So if I just put it into what have we dealt with recently, we've been dealing with tide heights of around 3.1 and below. Lower tides this week but higher stream flows from catchments - and including the dam releases has been keeping us at 3.1. We're now probably looking at somewhere higher than 3.7 by Wednesday, 2.00pm high tide. So we'll have to run those numbers. I have actually got some inundation maps that we've just produced at 4,000 cumecs and that's what I was referring to, saying that we were using that for our medium term planning for Friday the 21st...
BD	Right.
CJ	...in terms of the king tide effect.
BD	And...
KS	Are you able to share those maps, Colin? It's Ken.
CJ	Yeah, we can pump them out. I actually haven't got a set with me yet but they're very large obviously.
KS	Yep.
CJ	What we were planning – and I'll pause here and we'll come back to it no doubt at the end of this call, about lining our ducks up on communications – we were planning at going out mid-afternoon with the Lord Mayor to the city residents in terms of saying that as BOM and everyone's saying it is wet out there and we will be getting tides higher than we've been getting recently, we've been talking about getting – we're actually making sandbags only as fast as they're going out the door or putting it more practically, as fast as we can make them, they're leaving our depots at the moment. We're about to push staff onto sandbag marking rather than other activities and our target was to produce 30,000 bags by the time we got to Wednesday's high tide circa 2.00pm.
KS	Colin, Ken here again. The 3.1 and those figures on partially inundated and fully inundated – the fully inundated is water in the property, as opposed to water around the property?
CJ	To be clear, I'm using the word '*property*' not '*residence*'.
KS	Yep.
CJ	So in fact people should just throw those numbers away, is my recommendation. Some of the 6,000, for example, will be council parklands and the like.
BD	Okay.
KS	Okay.
BD	Yeah.
CJ	So - so we use that for our response in terms of where do we actually have to do debris cleanup and – and the like, so...
KS	So not necessarily the buildings, per se?
CJ	Correct. The – the two measures that we're actually producing – and as soon as we get off this call I'll reorientate them back to the higher river height levels, rather than waste the time down at the lower ones – firstly is which houses and business premises have water into them.
KS	Yep.

CJ	And then secondly which houses actually have water into habitable areas.
BD	Mmm-hmm.
CJ	So we get concerned at the first one because people lose their washing machines and potentially cars should be shifted from under their house.
KS	Yep.
CJ	The second one is, they've enclosed under their house or they're only a ground floor dwelling and they get water into the home proper.
KS	And – and that's the distinction, Colin, that we've had at a – at a state level, looking at basically water above the floorboards and water into the – you know, the property but not affecting the – the building itself. It – can I just ask you, do you need any additional resources around the – the sandbagging production and filling of sandbags?
CJ	My answer an hour ago was no. I might actually now change that to a yes.
KS	I think...
CJ	We'll just work out exactly what we require and I'll come back to the district coordinator.
KS	Yeah. Yeah, okay. And come straight back to me and I'll get people through the SDCC, you know...
CJ	Okay.
KS	...to ensure we get that sorted.
CJ	Yep. Can I just be clear on that home inundation again because this is one that matters and I know the Premier and the Lord Mayor have already spoken about it and it's one that the media about immediately, when you said '*floorboards*', I'm actually being a little bit finer grained in my distinction there. My first category is water into the home...
KS	Yep.
CJ	...but being heartless about it, if it's not actually affecting their ability to live in the home - that is it's actually downstairs laundries, garages and the like – they still get to live there.
KS	Yep.
CJ	So that's water downstairs. My second category is water into the living area of the home, the habitable area...
BD	Yes.
CJ	...and hence we need to evacuate.
KS	Yep, yep.
CJ	So if I took a typical two storey Queenslander home, my first category is water's downstairs, that they can live upstairs potentially without power or water supply or anything but they can live up there. The...
KS	Sure.
CJ	...second category is, they're on the kitchen table and I need to get them out.
KS	Yep.
BD	Col, Barry Dennien. Just clarifying the gauge heights you mentioned before, Col,

	what gauge was that that you were talking to - referring to?
CJ	I'm referring to Port Office.
BD	Port Office.
CJ	The gauge.
BD	Okay. And BOM – Peter, you still there?
PBad	Yes, I am. Yes.
BD	BOM – Peter, can you just clarify your process? You mentioned before you got Peter's release information, you then have your stream flow information and you calculate the river height at the Port Office as part of a process?
PBad	Definitely. We will take the new strategy in when it's released...
BD	Okay.
PBad	...rerun the model, but now I'm quite confused because – because the previous discussion was talking about three metres. In my – my rough thinking, 4,000 cumecs would give three metres AHD not three metres tide datum at the – at the gauge. So I think somehow or other – I'm not too sure. The 6,500 properties, 220 flooded at something like three metres, that sounds like AHD not tide datum.
BD	So...
CJ	No, I'm – I'm talking tide datum so yes, we have a real problem. If I add 1.24 to that we're in – we're in serious levels of inundation.
BD	So...
CJ	So, to be clear, if I looked out the window at the moment at the Brisbane River, we're kind of – haven't actually checked in the last couple of hours but with all the additional flow from the various sources, you know, the looking out the window test says we're at about three metres tide height datum. I haven't checked the gauge just at the moment.
Unknown male	No, it's at one point...
BD	The – sorry, just – I'm being...
CJ	Can I just say...
BD	Yeah.
PBad	Can I just say, to go from side datum to AHD we've got to subtract 1.24 metres.
KS	Yeah, it's Ken here. I think, Peter, once the – the estimates of the release arrangement are made, we really need the – the Bureau to give us the – you know, the estimated height at the Port Office. I mean, I – it is – this is a very difficult conversation but I think we'll need your estimate as quickly as we can after the – after the water grid manager has – and Seqwater have actually done their calcs on what needs to be released.
PBad	Yeah, thanks, Ken. And I'll just go through the process again that we've been following all day. What will happen is Seqwater will give us a new release strategy, we will run up the model which – that only takes ten minutes – and evaluate those results. We go back and discuss with Seqwater that we've got the right – we're in the same ball park with their releases, with – with what they've been modelling downstream. We – we get in the same ball park, then we make a phone call to Brisbane City Council FIC and indicate the sort of heights that we – our model is predicting and we will be using metres AHD at the Port Office. Following – following that discussion we – we update the Brisbane flood warning

	which is due for 3.30pm this afternoon with the revised height, metres AHD and that's a public – that's a public warning. So at that stage we've – we've got agreement with Seqwater on modelling upstream and downstream and we've got agreement with Brisbane City Council on the projected or predicted flood levels in AHD downstream and as – as our warnings did at 10.00 this morning or 10.30 this morning, we will give levels in metres AHD at Ipswich, Moggill, Jindalee and Brisbane city and you can see the format in the warning at 10.30 this morning. So there will be a revision this afternoon at approximately 3.30pm, if not before if the release strategy is significantly different.
BD	Just to - bit of background information, the current level as of 20 minutes ago is 1.6 metres, CoI, at the Port Office.
CJ	Yep.
BD	So that's...
CJ	AHD?
BD	AHD.
CJ	2.84 therefore tide height.
BD	Okay. So are you concurring with that, Peter?
PBad	I – yeah, that's right. I mean, 1.6 metres AHD plus – correction the tide datum would give you that number plus 1.24. I think what – what I will do is just continue to talk - as we talk with the public and in all of these technical discussions – that we will talk in AHD, which is – which is the reference for the flood warning gauge at the Port Office.
CJ	Yeah, Colin here. Just to be clear, we know you do – to be clear, we will talk in tide because actually our experience is the public don't know what we're talking about when we talk in AHD. So I accept what you're saying but just to be clear, I'll talk in tide. So I'll keep adding 1.24 whenever I name a number and you'll keep subtracting it from mine, and vice versa. Can I just – perhaps, Peter Baddiley, it would be good if actually...
PBad	Yep.
CJ	...you could run through those – the 2.84 that we just talked about – 1.6 plus the tide correction...
BD	Mmm-hmm.
CJ	...giving you 2.84 20 minutes ago.
BD	Yeah.
CJ	Could we just run through how you believe that's made up, in terms of what the contributing flows are?
PBad	Yeah, we can – we can have a look at that and I'll have Jimmy look at that now. Could I just come back to the – if we're going to give two datums, this will be a change in our procedures that we've agreed with council. Do you think then – either we're going to use these two numbers consistently – in other words, the Bureau should – should give both numbers – I'm just concerned that there's going to be confusion with two numbers floating so I'm quite happy to do what – do – to make last minute changes to this, but I think we just need to be clear, you know, that we are doing this and whether the Bureau should give both numbers, the AHD value and the tide value which would – would now be a departure from the procedures we've agreed with – with the engineers in council over the last several years.

KS	It's Ken Smith here. Peter, look there is an issue here of statewide consistency and I'm – I'm assuming your levels, that you're issuing, are – when we talk about, you know, peak heights – are in fact not the tide heights. They are the – the – the – as you're saying, the consistent way of describing this across the state, whether this is in St George or Gympie, is the way that you've described?
PBad	Generally speaking, although tidal areas vary. In some cities – for example, Mackay, they want to use the tide gauge, but for Brisbane city all of the reference information we have for Brisbane's flood is against AHD and that was established shortly after the 1974 flood – the 1974 flood was 5.5 metres AHD and has – we've been using AHD levels since shortly after the '74 flood, from my knowledge...
CJ	Yeah, it's Colin here. To be clear, every engineer in council absolutely uses AHD. Everyone that does buildings and planning approvals and - everything else uses AHD. What I'm talking about is every time we issue a statement to the public, they don't know what AHD is and we actually therefore say you have to add – so if we talk about one of our alerts, it'll actually say it is actually just triggered stream height AHD, add 1.24 metres to actually get the tide height. So if you talk foreshore flooding at Sandgate, it'll say the gauge has just tripped one point whatever metre AHD and then it'll say '*(add 1.24 metres to get your tide height)*'. The reason being is that the public don't actually get AHD.
CJ	So...
Unknown male 2	Yeah.
CJ	Boaties, fisher people, surfers – they understand tides, they don't get the – particularly when we're talking tidal flooding here. I'm not talking, like, stream flows and flash flooding...
CJ	...up the top of the creek. We're just talking the river streams. But, look, I'm happy that we pursue that with you more offline as to what it does. Ken, I'm very happy to ensure that we have statewide consistency...
KS	Yep.
CJ	...in terms of the way alerts go out, but if we go out and actually talk about, you know, the Brisbane River outside our office here – and a quick visual check says that it's now just lapping the bottom of the boardwalk outside GOMA and the art gallery, which means she's just actually probably starting to push three metres or just below three metres – so that's why I was actually interested. Because when we did this on Friday, about the same time and we were actually on a different teleconference with my FIC – Flood Information Centre – people, what we were getting from the BOM information and the modelling – just to use one example, and this isn't criticism, it's just the difficulty that we're dealing with here – is that we were dealing with a 0.3 metre oceanic sort of correction or addition and then in the end it turned out to be 0.501. So we're actually having to track it reasonably closely. On Friday actually we were slightly flat footed in terms of the number of roads that we proactively closed because we actually had an eight inch tide height difference compared to what the model was saying and actually what we went out and did. So that's why I was interested as to how the 2.84 20 minutes ago actually is made up or – in terms of, from the base tide then plus how much is Wivenhoe adding, how much is Lockyer and Bremer adding and how much is local – if you like, Brisbane – adding to it? That's the way we've been calculating it, in terms of being able to work it up as a communication.
PBad	Ken and Col, could I just please add a comment that as we get increasing flows the 1.24 does not apply - as we get increasing flows the 1.24 only applies to

	Brisbane city at low flow. As we get higher flow, the tide is progressively drowned so you don't add 1.24 to it. The – all of the levels that we give are on AHD, partly for that reason. If we go through to – now to four and five thousand cumecs, whatever the number might be, we don't use 1.24, the tides become progressively drowned.
CJ	Okay, that makes sense.
KS	And thank you, Peter. I think that's really important and, I mean, clearly this is a discussion that – that has to occur between all of the parties and, Colin, any information that – that council puts out has to have regard to, you know, that bit of information, that it's not just, you know, adding the 1.24 to the AHD levels.
CJ	Yeah, really the information that we put out basically – so for example, mid-afternoon we'll be putting out something which actually – I'm getting more concerned about what we actually need to put out, in terms of the amount of inundation that we're now expecting with this. The reality is we won't be saying a metre level in that at all. Rather we'll be saying, look this amount of water's coming downstream...
KS	This is what it will be.
CJ	Yeah.
KS	And – and going back to your point, I think what we need, Barry and Peter, is a break-up of what's the effect of the release from Wivenhoe and what's the effect of tide and – and of other water coming into the – the system from, you know, other sources – yeah.
BD	Yep.
KS	On this side of the dam wall.
BD	Can, at this point, I just bring in Ipswich. Carl, you're still there?
ICC	I'm still here.
BD	And Peter, have you got any comments on Ipswich – the impacts on Ipswich with the releases – be they increased from Wivenhoe.
PBad	Yeah, re – re Ipswich, we're indicating to reach at least 9.5 metres during the early hours of Tuesday. This will now depend on how much run-off – how much rainfall and run-off we get in the Bremer Warril systems. We'll be revising that during the day according to the rainfall that's recorded. Ultimately when the flows reduce in that system, the heights at Ipswich will ultimately be similar to the heights at Moggill. So we'll go into a – a backwater flood situation...
BD	Mmm-hmm.
PBad	...for – for Ipswich ultimately but at the moment we've got fairly high inflows coming through to Ipswich and in terms of the break up of flows from – from releases from – from – the break up of the heights between what various contributions they are, that virtually changes hour by hour but right at the moment we're using about a 0.4 metre coastal anomaly - that's from the set up of the ocean - is adding 0.4 metre to the tide, then we model the combined flow through the Brisbane city against that predicted tide to get the levels upstream. In terms of – based on a previous strategy, we were looking at a maximum of about 3,700 in Brisbane – based on previous strategy – with 2,700 of that coming out of Wivenhoe. But at the moment we've got about 700 cumecs coming out of the Lockyer system, probably of the order of 500 coming out of the Bremer system – something of that order.

BD	Okay.
Carl	Well, if we get the 9.5 at Ipswich, we know what that looks like.
BD	Thanks...
PBad	It could potentially higher if we get heavy rains in there and we'll just keep looking at making predictions for Ipswich based on what rainfalls are in the catchment and based on what level is at Moggill.
KS	What is the – the impact at 9.5?
Carl	Ken, there was a problem for us – what'll happen if the Bremer gets up to 9.5 and we have significant rains, we won't be able to get water into the river so if we have the river up, but not rain we're probably not too badly off but, yeah, the combination of a high – high river level of 9.5 plus a lot of rain, then we'll have local flooding.
KS	Flash flooding. Yeah, okay.
PBad	Can I just add that while I've been speaking, Jimmy Stewart is here and he'll just comment on the effects of the last few hours of rain for Ipswich, which is now taking it up higher. So I'll ask Jimmy just to add that information.
JS	Yeah, g'day guys. I've just been running up – crunching some more numbers of the – the additional rainfall. We're probably looking at a level of above 11 metres at Ipswich, as we speak, but that's increasing all the time. The rainfall's still coming down.
ICC	Now what time – what time frame to get to 11?
JS	Early hours of Tuesday.
ICC	Okay.
JS	And that – that could change at again, both with further rainfall and the release strategy, if that alters this afternoon.
BD	Okay. Is there any comment now for Somerset while we're here, just to close the third council? Peter?
BB	No, I think we're right at this stage. The Lockyer is still rising here. Lowood Bend is just under it'll take out the main road if it rises about another couple of feet, but most of us are dry. The Wivenhoe's backed up and broke the Brisbane Valley Highway at Paddy Gully, it's gone over there so – but we're all dry.
BD	Thanks, Bob.
KS	Sorry, Barry, it's Ken here again. Just going back to Carl, what are the impacts then at 11, if we're looking at 11 tomorrow morning? Are we looking at evacuations, for example?
ICC	I'm not sure, Ken. I'll have to get my guys – they've been working on, sort of, a nine, 9.5 which we weren't too overly concerned about but...
KS	If we're looking at 11 – can you – can you give us a call separately?
BD	Yep.
ICC	Yeah, I'll get them to have a look at what the impact of – at 11.
KS	Okay, thank you.
JS	Excuse me. It's Jimmy Stewart at the BOM again. Could I just clarify that that 11 is likely to increase. The rainfall is still coming down so that's probably a minimum

	level.
ICC	Thanks, Jimmy.
ICC	I've written down '*11 plus*'.
BD	Okay. Thanks, Carl. I'm going to have an attempt, guys, to summarise some of the actions and if there's any further information, we'll close this because there's a series of things that need to happen fairly quickly. So summary of actions is – first cab is Peter Borrows is rapidly finishing off the release strategy and Peter, an estimated time when you'd submit that to everybody including the BOM to start their assessment?
PBor	Near enough, 3.00 – quarter to 3.
BD	Peter, I'm looking at you saying is there any quicker – BOM normally do a – a release at 3.30...
PBad	Yeah.
BD	...so is there – so I'm looking at Peter here and he's given me a half a nod so...
KS	Yeah, sorry, Barry...
BD	Yep.
KS	...if we – if we're going to keep to this timetable as – as Peter Baddiley suggested that they get information out by 3.30, it's absolutely essential – even if we're looking – Peter, I would've thought - at a release strategy that then is updated if necessary. There's going to have to be another interim release strategy to inform that – that – that announcement and then informing people about what the potential impacts are.
BD	So...
KS	Sorry, I – I just think – wait till that sort of time.
BD	Okay. So Peter Baddiley, how long do you need to run your model once you've got your input from SEQ?
PBad	Oh look, that – that only takes 15 minutes and we'll go through a round of – in that 15 minutes we'll go through a round of discussions firstly with Seqwater and then with Brisbane City Council. It then takes us about 20 minutes to run up a new warning for issue to the public, which will contain the new height. The 3.30pm update is what we've indicated that we will give a next warning at about 3.30pm but clearly if – if circumstances changing rapidly we're talking now about heights for Tuesday and Wednesday, I would just like to hit the – hit the media before too late so that we've got an update in place. Probably not later than about 4ish or 4.30 so we get – capture all the news channels and so on late in the day.
BD	So, Peter...
CJ	Colin here. I'd prefer it faster than that for us to actually get media here, 4.00 is, you know, starting to run pretty late for us to be able to do anything with it, in terms of community.
BD	Sounds like consensus to run earlier at, say, 3.30. So, Peter, how – when would you need Seqwater's information – be it interim now – to still meet the 3.30 deadline?
KS	It will take about 35 minutes to get the BOM work done.
BD	Yep.
KS	So I – I think we should finish this and, Peter, you need to get an estimate of

	getting it to – to the – the BOM, like, 2.30.
BD	Yeah, that's – we're sort of nodding at that, Ken, as well.
KS	Yep.
BD	So action 1, Peter Borrows and then BOM to – as soon as they can – do that model run and start that consultation process with – with all those involved in that consultation process. I had a second item here where BCC – Col, you were to share your flood maps with – with Ken and also Ipswich were to re-run their inundation sort of impacts and get that back to Ken as well, based on 11 plus metres.
Unknown male	Yep.
BD	And BCC had a mid-afternoon press conference. Col, I take it you were going to come out mid-afternoon?
CJ	Yeah, 'cause we actually really have to come back then at a suburb by suburb level, taking the action, so...
KS	Col, can we – can we talk so that I can get the – the Premier to talk to the Lord Mayor because clearly this will be, you know, quite significant, not only for Brisbane but also through Ipswich. And the timing – if this is Tuesday morning, then we've got to give people, you know, adequate notice.
BD	Yeah.
CJ	Yeah, they actually already have spoken but you and I should speak again.
KS	I – I just think - as a result of this information, I think the Lord Mayor and Premier were working on different assumptions...
CJ	Absolutely they were. They were working on the stuff that I said before.
KS	I know, Colin, and that's why I think we need to get this material and – to both the Lord Mayor and to the Premier so that they can now discuss this situation but also the – the other issue is with Mayor Pisasale.
CJ	That's right. Now I was going to actually offer – Carl, whether – I assume that you have your own stuff but we're happy to give you our map as well that shows our 4,000 cumecs and how it backs up the Bremer and what that means for you, but I assume you have your own stuff.
ICC	Yeah, I think my guys and your people are pretty much in contact with each other on this anyway, through that Floodwise...
CJ	Yeah.
ICC	...program.
CJ	Okay.
ICC	We've got all that.
KS	Okay. And look – Ken here again – I'll talk to both you, Carl and Colin, about any deployment of additional resources that you might – you might want so that – to get onto that quickly.
CJ	Yeah.
ICC	I'll come back to you again once I've got a better picture on what 11 plus metres looks like for us.
BD	Yeah.

CJ	Yeah.
KS	I'm just wondering – Jimmy, have you got any idea of what sort of plus we're talking about?
JS	Yeah, not at the moment, guys. It's – with the rain still coming down and there is an effect of – of backwater from the Brisbane River so the release strategy will affect that so, yeah, I wouldn't like to comment until we get that.
KS	Okay. Well...
PBad	Peter here. Offline with Ipswich City Council we can – as we normally do, we can run through some forecast rain scenarios – 11.7 is the threshold of major flood level at Ipswich and if I just sort of remind the group that in terms of response, Ipswich will be the first area of – of concern during the night and Brisbane follows, you know, some – some hours and more after that.
KS	Okay.
BD	Thanks, Peter.
KS	Barry, can I suggest we go off and do this work.
BD	Yes. Yes.
KS	'Cause obviously the – the release strategy is absolutely essential to get that into the system, if we're going to achieve this, you know, 3.30...
BD	Yes.
KS	...as the – the absolute deadline.
BD	Okay. And...
CJ	Colin here. Can I just ask – given a 11 metre plus for Ipswich, do you have an AHD spot height for me in Brisbane?
PBad	Hold on a minute. What you're asking really is - what's in the current model is a – is the old release strategy.
CJ	Yeah, that's okay. I just want...
PBad	For Brisbane now that takes us through to – let's just have a look – brings it up to around about the 2.4, 2.5 metres on Wednesday high tide early, but that – I must stress that that is with the...
CJ	I understand.
PBad	...strategy of a few hours ago so really it's probably can only go north from there.
KS	Yeah, let's get the updated information through.
BD	Yeah.
CJ	Yeah, that was more so that I can just check that we are calibrated, if you like, using the same stuff. And Ken, just for your early info, we – probably the best that we can work on is our flood mapping at 4,000 cumecs.
KS	Yep.
BD	Yes.
KS	Look, that - that'd be useful.
BD	Yes. Okay. We'll call this closed and we – if we need to get together again later this afternoon or early evening based on the information that comes out, we'll reorganise that meeting and get together again.

CJ	Excellent.
BD	Thanks, gentlemen.
PBad	Thank you.
KS	Thank you.
CJ	Thanks.
BD	Thank you.

Gina O'Driscoll

From: Paul Bird [pbird[redacted]]
Sent: Monday, 10 January 2011 1:55 PM
To: SEQWGM Media; Reception; aroebuck[redacted]; greg.swain[redacted]; GSTUBBS[redacted]; Kathy Petrik; lisa.m.martin[redacted]; Paula Weston; tjacobs[redacted]; Barry Dennien; Dan Spiller; Scott Denner; Arminda Roberts; Bec Middlemiss; Michael Fiechtner; Mike Foster; Tara King
Cc: Michael Lyons; Geoff Stead
Subject: Release Update

As at 1.00 pm on Monday 10 January, the following applies:

SOMERSET DAM:
As a result of rainfall and inflows, water is being released into Wivenhoe through five sluice gates at about 95,000 megalitres per day and is likely to continue until Thursday 13 January. Areas around Kilcoy are likely to be impacted as a result of the rising dam levels.

WIVENHOE DAM:
Upstream levels are rising quickly as a result of significant heavy rainfall. The objective for dam operations will be to minimise the impact of urban flooding in areas downstream of the dam.

Gate Releases of around 170,000 megalitres a day are underway and are likely to increase due ongoing inflows and predicted rainfall and are to continue until at least Sunday 16 January.

Local Councils have been advised that as a result of Lockyer Creek flows, local runoff and Wivenhoe releases, Twin Bridges, Savages Crossing, Burtons Bridge, Kholo Bridge Colleges Crossing, Fernvale Bridge, and Mt Crosby Weir Bridge may be inundated until at least the weekend.

NORTH PINE DAM:
Five gates are open, releasing around 43,000 megalitres a day and will continue until at least Wednesday 12 January.

The local Council is being kept informed regarding Youngs Crossing.

LESLIE HARRISON DAM:

Gate releases are underway due to rainfall and inflows.

HINZE DAM:
A minor release of around 1200 megalitres a day is being made through the emergency gates. There is no public access to the spillway.

For detailed information on road crossing closures and other potential impacts, always contact your local council.

RECREATION UPDATE:

Both Wivenhoe and Somerset are closed to all recreational activities, and will remain so for some days.

The following recreation sites are closed –

- O'Sheas Crossing
- Hamon Cove
- Logan Inlet
- Captain Logan Camp

- Lumley Hill
- Spillway Common/ Atkinson's Crossing
- Cormorant Bay
- Branch Creek
- Billies Bay/Hays Landing
- The Spit
- Lake Somerset Holiday Park Kirkleagh

Numerous roads are cut including the highway at Kilcoy and Fernvale, and conditions are extremely dangerous.

This information will be updated during the afternoon of Monday 10 January.

Paul Bird
Senior Communications Advisor
Queensland Bulk Water Supply Authority *trading as* Seqwater

seqwater
WATER FOR LIFE

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



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TECHNICAL SITUATION REPORT

TSR Number	W37	Date of TSR release	10.1.2011	Time of TSR release	3pm

Seqwater status of inflows and dam operations

Current status but could chonge based on inflows or rainfall.

Current objectives	• Continue increasing releases to discharge flood waters but keep impact downstream to minimum.	
Strategy	• All bridges are now inundated . • Ramp up to 2800cumecs which will give a flow in the lower Brisbane River of around 4,000cumecs	
Key considerations	Storage levels:	Above FSL
	Inflows:	Inflows expected around 1,500,000ML which is close to 1974 event.
	Rainfall:	Continuing
	Lockyer/Bremer:	Monitoring their inflows
	Brisbane River:	Impact as below.

Rainfall

Significant rainfall has fallen in the Wivenhoe Dam catchment over the last 3 hours, with falls exceeding 100mm. This rainfall will significantly increase inflows into the dam. A severe weather warning remains current for heavy rainfall in the dam catchment areas. The QPF issued by BOM at 10:00 estimates rainfalls for the 24 hours to 10:00 Tuesday as North Pine Dam (75mm to 150mm); Wivenhoe/Somerset Dam Catchments (50mm – 100mm). Potentially significant rain moving towards the dam catchments is currently evident on the BOM radar.

Somerset Dam (Full Supply Level 99.00 m AHD)

The dam level is 103.41m AHD and rising. Peak inflow to the dam is estimated to be about 4,200 m3/s. Five sluice gates are open releasing about 1,100m3/s (95,000ML/day) into Wivenhoe Dam. At this stage the dam lake level will reach about 103.5m AHD on Monday afternoon. Areas around Kilcoy will continue to be adversely affected.

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The dam level is 72.41m AHD and rising quickly. The rainfall experienced over the last 2 to 3 hours will result in significant further inflows into the dam and releases from the dam will need to be increased in accordance with Flood Mitigation procedures and to ensure that a fuse plug is not initiated. The initiation of a fuse plug will result in a rapid uncontrolled outflow from the dam of 2,000m3/s being added to the gate release outflow. Outflows into the Brisbane River from both Lockyer Creek and the Bremer River are also increasing.

Five radial gates are currently open at the dam releasing about 2,000m3/s into the Brisbane River and

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Impacts downstream of Wivenhoe Dam

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Water levels in the lower Brisbane River will be impacted by the combined flows of Lockyer Creek, Bremer River, local runoff and releases from Wivenhoe Dam.

Outlook

Heavy rainfall continues throughout South East Queensland and the situation could deteriorate rapidly over the next 24 hours. The flood operation centre will continue to monitor the situation and provide every six hours until the situation stabilizes.

Seqwater Technical Officer name	Robert Drury
Seqwater Technical Officer position title	Dam Operations Manager
[redacted]	

BoM assessment

(consisting of references to latest Flood Warning for the Brisbane River and other relevant Bureau forecasts and warnings (e.g. weather/rain forecasts, Tropical Cyclone Warning etc) and other updates/comments if needed)

BoM has been advised.

BoM Technical Officer name	Peter Baddiley
BoM Technical Officer position title	
BoM Technical Officer contact details	flood.qld[redacted]

Brisbane City Council (BCC) assessment

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised of the current status.

1512

BCC Technical Officer name	Chris Lavin
BCC Technical Officer position title	Disaster Operations Manager
BCC Technical Officer contact details	[redacted]

Ipswich City Council (ICC) assessment (if required)

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised of the current status.

ICC Technical Officer name	Tony Trace
ICC Technical Officer position title	Local Disaster Response Coordinator
ICC Technical Officer contact details	[redacted]

Somerset Regional Council (SRC) assessment (if required)

(to include predicted local inundation areas and depths of inundation bosed on the information)

Council has been advised of the current status.

SRC Technical Officer name	Tony Jacobs
SRC Technical Officer position title	Local Disaster Response Coordinator
SRC Technical Officer contact details	[redacted]

Collated and distributed by (Agency)

Contact Officer signature	
Contact Officer name	Rob Drury
Contact Officer position title	Dam Operations Manager

Next TSR due	Date	11.1.2011	Time		or Event	Change in strategy

1513

Litsupport Brisbane

From: Jade Simmons
Sent: Monday, 10 January 2011 3:11 PM
To: Barry Dennien; Dan Spiller; Scott Denner; Michael Lyons; SEQWGM Communications Staff
Subject: FW: FOC Situation Report at 12:00 on Monday 10 January 2011

For your information, please find below the FOC Situation report sent at 3.00 pm today.

Kindest regards

Jade Simmons
Senior Correspondence Officer
SEQ Water Grid Communications Unit
SEQ Water Grid Manager
Phone: [redacted]
Email: jade.simmons[redacted]
Visit: Level 15, 53 Albert Street Brisbane
Post: PO Box 16205, City East QLD 4002

From: Paul Bird [mailto:pbird[redacted]]
Sent: Monday, 10 January 2011 3:05 PM
To: Jade Simmons
Subject: FW: FOC Situation Report at 12:00 on Monday 10 January 2011

From: Duty Engineer [mailto:dutyseq[redacted]]
Sent: Monday, 10 January 2011 14:58
To: Duty Seq; Ruffini24[redacted]; David Roberts; flood.qld[redacted]; Mike Foster; Paul Bird; Peter Allen; Rob Drury; Rohan Thorogood; Ken.Price[redacted]; kim.hang[redacted]; Al Navaruk; Bill Stephens; David Pokarier; John West; Louw Van Blerk; Mark Tan; Neville Ablitt; John.Ruffini[redacted]; John Tibaldi; Rob.ayre[redacted]; Terry Malone; Brett Schultz; Glenn Patterson; Malcolm Lane; Murray Dunstan; Rob Gorian; Agg Dagan; Doug Grigg; Graham Keegan; Graham Francis; Jayam Tennakoon; Matthew O'Reilly
Cc: Andy Bickerton; Deb Chandler; Mailbox; Tony Trace; Chris Lavin; Craig Logan; Don Carroll; Evan Caswell; James Charalambous; Ken Morris; Robert McGlinn; Santina Pennisi; Peter Borrows
Subject: RE: FOC Situation Report at 12:00 on Monday 10 January 2011

Rainfall

Significant rainfall has fallen in the Wivenhoe Dam catchment over the last 3 hours, with falls exceeding 100mm. This rainfall will significantly increase inflows into the dam. A severe weather warning remains current for heavy rainfall in the dam catchment areas. The QPF issued by BOM at 10:00 estimates rainfalls for the 24 hours to 10:00 Tuesday as North Pine Dam (75mm to 150mm); Wivenhoe/Somerset Dam Catchments (50mm – 100mm). Potentially significant rain moving towards the dam catchments is currently evident on the BOM radar.

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Water levels in the lower Brisbane River will be impacted by the combined flows of Lockyer Creek, Bremer River, local runoff and releases from Wivenhoe Dam.

Outlook

Heavy rainfall continues throughout South East Queensland and the situation could deteriorate rapidly over the next 24 hours. The flood operation centre will continue to monitor the situation and provide every six hours until the situation stabilizes.

Terry Malone
Duty Engineer
Flood Operations Centre

Phone [redacted]
Fax:

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----------Safe Stamp----------
Your Anti-virus Service scanned this email. It is safe from known viruses.
For more information regarding this service, please contact your service provider.
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Gina O'Driscoll

From: Michael Lyons
Sent: Monday, 10 January 2011 3:21 PM
To: Barry Dennien
Subject: Wivenhoe now at 153.9%

Michael Lyons
Director
SEQ Water Grid Communications Unit
Phone: [redacted]
Email: michael.lyons[redacted]
Visit: Level 15, 53 Albert Street Brisbane
Post: PO Box 16205, City East QLD 4002

From: Dan Spiller <Daniel.Spiller[redacted]>
Sent: Monday, January 10, 2011 3:29 PM
To: Barry Dennien <Barry.Dennien[redacted]>; Michael Lyons <Michael.Lyons[redacted]>; SEQWGM Media <media[redacted]>
Subject: Fwd: Technical Report W37
Attach: Seqwater_No-Lifeguards-Here_email_strap.png; ATT00001.htm; cidimage001.png@01CA24E1.BDB90020; ATT00002.htm; Seqwater_No-Lifeguards-Here_email_strap.png; ATT00003.htm; cidimage001.png@01CA24E1.BDB90020; ATT00004.htm; Seqwater_No-Lifeguards-Here_email_strap.png; ATT00005.htm; cidimage001.png@01CA24E1.BDB90020; ATT00006.htm; Technical Situation Report W37.docx; ATT00007.htm

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Begin forwarded message:

From: Rob Drury <rdrury[redacted]>
Date: 10 January 2011 3:15:37 PM GMT+10:00
To: Rob Drury <rdrury[redacted]>, Dan Spiller <Daniel.Spiller[redacted]>, Paul Bird <pbird[redacted]>, Stan Stevenson <sstevenson[redacted]>, Peter Borrows <pborrows[redacted]>, "Peter.Allen[redacted]" <Peter.Allen[redacted]>
Subject: RE: Technical Report W37

Report W37 attached.

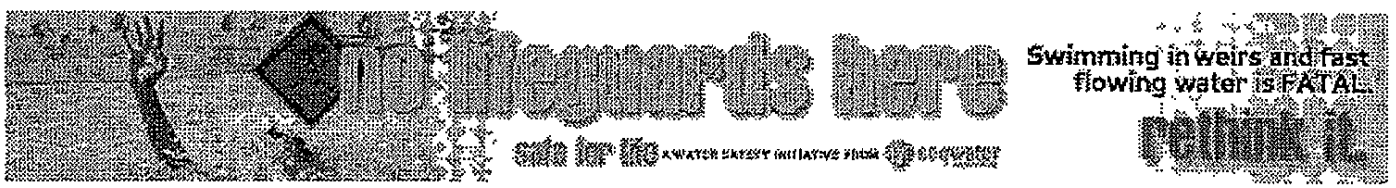
Rob

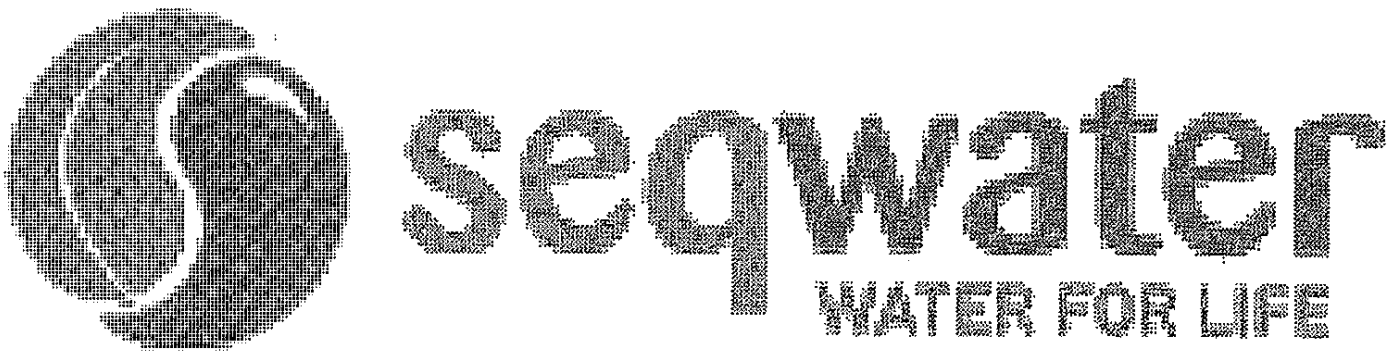
Robert Drury

Dam Operations Manager

Water Delivery

Queensland Bulk Water Supply Authority *trading as* Seqwater


Swimming in weirs and fast flowing water is FATAL.
rethink it.


seqwater
WATER FOR LIFE

[redacted] | E rdrury[redacted]

Wivenhoe Dam, Brisbane Valley Highway, via Fernvale Q4306 Australia
PO Box 37, Fernvale QLD 4306

Website | www.seqwater.com.au

From: Rob Drury
Sent: Monday, 10 January 2011 8:06 AM
To: Rob Drury; 'Daniel.Spiller[redacted]'; Paul Bird; Stan Stevenson; Peter Borrows; 'Peter.Allen[redacted]'
Subject: RE: Technical Report W36

Please disregard the previous report, it was based on older information, this is the latest update.

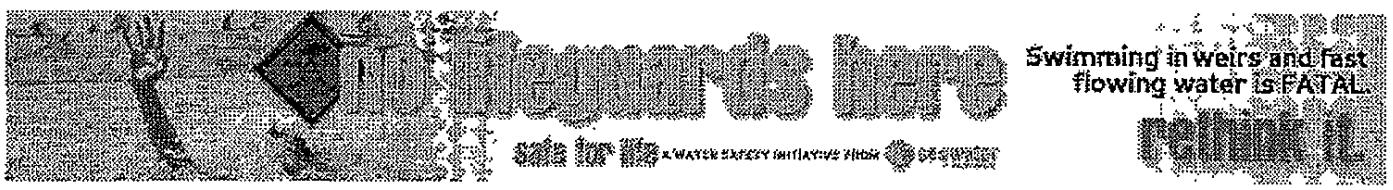
Rob

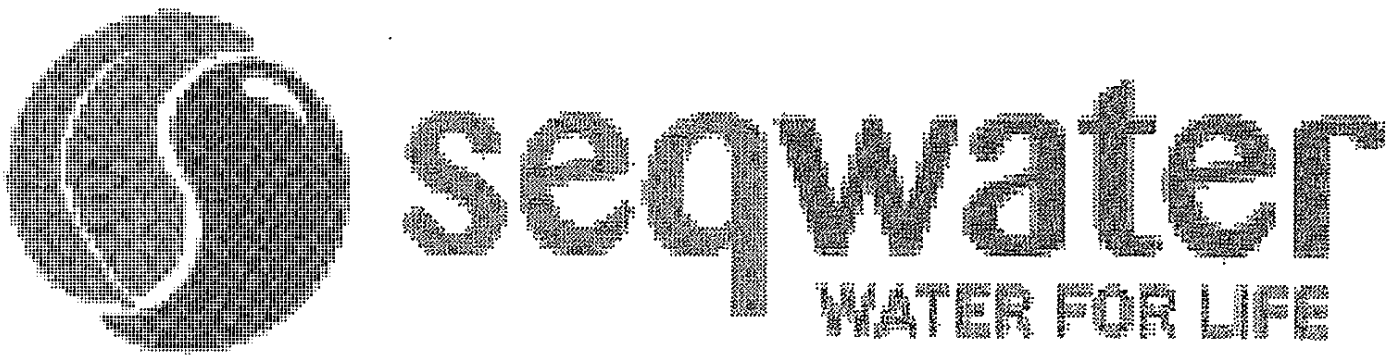
Robert Drury

Dam Operations Manager

Water Delivery

Queensland Bulk Water Supply Authority *trading as* Seqwater


Swimming in weirs and fast flowing water is FATAL.
return it.


seqwater
WATER FOR LIFE

[redacted] | E rdrury[redacted]

Wivenhoe Dam, Brisbane Valley Highway, via Fernvale Q4306 Australia
PO Box 37, Fernvale QLD 4306

Website | www.seqwater.com.au

From: Rob Drury
Sent: Monday, 10 January 2011 7:53 AM
To: Rob Drury; 'Daniel.Spiller[redacted]'; 'Barry.Dennien[redacted]';
'Michael.Lyons[redacted]'; 'media[redacted]'; 'debbie.best[redacted];
'Scott.Denner[redacted]; Paul Bird; Stan Stevenson; Peter Borrows;
'Peter.Allen[redacted]'
Subject: RE: Technical Report W35

Attached report W35.

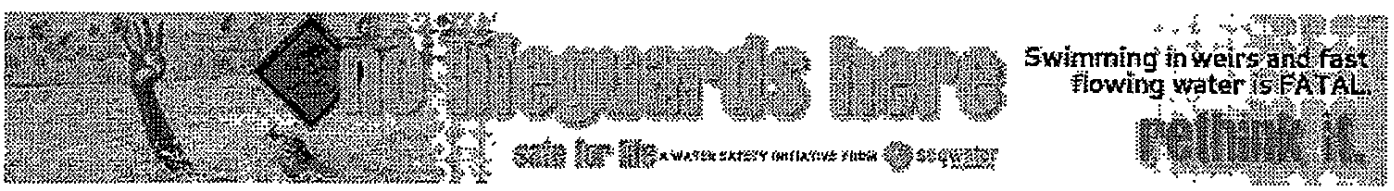
Rob

Robert Drury

Dam Operations Manager

Water Delivery

Queensland Bulk Water Supply Authority *trading as* Seqwater


Swimming in weirs and fast flowing water is FATAL.


seqwater
WATER FOR LIFE

[redacted] | E rdrury[redacted]

Wivenhoe Dam, Brisbane Valley Highway, via Fernvale Q4306 Australia
PO Box 37, Fernvale QLD 4306

Website | www.seqwater.com.au

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TECHNICAL SITUATION REPORT

TSR Number	W37	Date of TSR release	10.1.2011	Time of TSR release	3pm

Seqwater status of inflows and dam operations

Current status but could change based on inflows or rainfall.

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	Brisbane River:	Impact as below.

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Outlook

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Seqwater Technical Officer name	Robert Drury
Seqwater Technical Officer position title	Dam Operations Manager
[redacted]	

BoM assessment

(consisting of references to latest Flood Warning for the Brisbane River and other relevant Bureau forecasts and warnings (e.g. weather/rain forecasts, Tropical Cyclone Warning etc) and other updates/comments if needed)

BoM has been advised.

BoM Technical Officer name	Peter Baddiley
BoM Technical Officer position title	
BoM Technical officer contact details	flood.qld[redacted]

Brisbane City Council (BCC) assessment

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised of the current status.

BCC Technical Officer name	Chris Lavin
BCC Technical Officer position title	Disaster Operations Manager
BCC Technical Officer contact details	[redacted]

Ipswich City Council (ICC) assessment (if required)

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised of the current status.

ICC Technical Officer name	Tony Trace
ICC Technical Officer position title	Local Disaster Response Coordinator
ICC Technical Officer contact details	[redacted]

Somerset Regional Council (SRC) assessment (if required)

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised of the current status.

SRC Technical Officer name	Tony Jacobs
SRC Technical Officer position title	Local Disaster Response Coordinator
SRC Technical Officer contact details	[redacted]

Collated and distributed by (Agency)

Contact Officer signature	
Contact Officer name	Rob Drury
Contact Officer position title	Dam Operations Manager

Next TSR due	Date	11.1.2011	Time		or Event	Change in strategy

Gina O'Driscoll

From: Dan Spiller
Sent: Monday, 10 January 2011 4:09 PM
To: Barry Dennien
Subject: Technical Situation Report W37
Attachments: Technical Situation Report W37.docx

TECHNICAL SITUATION REPORT

TSR Number	W37	Date of TSR release	10.1.2011	Time of TSR release	3pm

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Outlook

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Seqwater Technical Officer name	Robert Drury
Seqwater Technical Officer position title	Dam Operations Manager
[redacted]	

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(consisting of references to latest Flood Warning for the Brisbane River and other relevant Bureau forecasts and warnings (e.g. weather/rain forecasts, Tropical Cyclone Warning etc) and other updates/comments if needed)

BoM has been advised.

BoM Technical Officer name	Peter Baddiley
BoM Technical Officer position title	
BoM Technical Officer contact details	flood.qld[redacted]

Brisbane City Council (BCC) assessment

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised of the current status.

BCC Technical Officer name	Chris Lavin
BCC Technical Officer position title	Disaster Operations Manager
BCC Technical Officer contact details	[redacted]

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(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised of the current status.

ICC Technical Officer name	Tony Trace
ICC Technical Officer position title	Local Disaster Response Coordinator
ICC Technical Officer contact details	[redacted]

Somerset Regional Council (SRC) assessment (if required)

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised of the current status.

SRC Technical Officer name	Tony Jacobs
SRC Technical Officer position title	Local Disaster Response Coordinator
SRC Technical Officer contact details	[redacted]

Collated and distributed by (Agency)

Contact Officer signature	
Contact Officer name	Rob Drury
Contact Officer position title	Dam Operations Manager

Next TSR due	**Date**	11.1.2011	**Time**		**or Event**	Change in strategy

1244

Cindy Hulsey

From: Barry Dennien
Sent: Monday, 10 January 2011 4:11 PM
To: Peter Baddiley (p.baddiley[redacted])
Cc: Dan Spiller
Subject: Tech report
Attachments: Technical Situation Report W37.docx

Categories: T8

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

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

TECHNICAL SITUATION REPORT

TSR Number	W37	Date of TSR release	10.1.2011	Time of TSR release	3pm

Seqwater status of inflows and dam operations

Current status but could change based on inflows or rainfall.

Current objectives	• Continue increasing releases to discharge flood waters but keep impact downstream to minimum.	
Strategy	• All bridges are now inundated . • Ramp up to 2800cumecs which will give a flow in the lower Brisbane River of around 4,000cumecs	
Key considerations	Storage levels:	Above FSL
	Inflows:	Inflows expected around 1,500,000ML which is close to 1974 event.
	Rainfall:	Continuing
	Lockyer/Bremer:	Monitoring their inflows
	Brisbane River:	Impact as below.

Rainfall

Significant rainfall has fallen in the Wivenhoe Dam catchment over the last 3 hours, with falls exceeding 100mm. This rainfall will significantly increase inflows into the dam. A severe weather warning remains current for heavy rainfall in the dam catchment areas. The QPF issued by BOM at 10:00 estimates rainfalls for the 24 hours to 10:00 Tuesday as North Pine Dam (75mm to 150mm); Wivenhoe/Somerset Dam Catchments (50mm – 100mm). Potentially significant rain moving towards the dam catchments is currently evident on the BOM radar.

Somerset Dam (Full Supply Level 99.00 m AHD)

The dam level is 103.41m AHD and rising. Peak inflow to the dam is estimated to be about 4,200 m3/s. Five sluice gates are open releasing about 1,100m3/s (95,000ML/day) into Wivenhoe Dam. At this stage the dam lake level will reach about 103.5m AHD on Monday afternoon. Areas around Kilcoy will continue to be adversely affected.

Wivenhoe Dam (Full Supply Level 67.00 m AHD)

The dam level is 72.41m AHD and rising quickly. The rainfall experienced over the last 2 to 3 hours will result in significant further inflows into the dam and releases from the dam will need to be increased in accordance with Flood Mitigation procedures and to ensure that a fuse plug is not initiated. The initiation of a fuse plug will result in a rapid uncontrolled outflow from the dam of 2,000m3/s being added to the gate release outflow. Outflows into the Brisbane River from both Lockyer Creek and the Bremer River are also increasing.

Five radial gates are currently open at the dam releasing about 2,000m3/s into the Brisbane River and

D343

this will need to be increased steadily to an outflow of 2,800m3/s over the next 9 hours (commencing at 1500). At this stage, the dam will reach about 73.8m AHD during Tuesday morning.

The objective for dam operations is currently to minimise the impact of urban flooding in areas downstream of the dam and to keep river flows in the lower Brisbane River below 4,000m3/s if possible. This is significantly less than the current estimated combined pre-dam peak inflow of 12,000m3/s. If further rainfall occurs, dam releases may need to be increased further and this may result in river flows in the lower Brisbane River approaching or exceeding 5,000m3/s.

Impacts downstream of Wivenhoe Dam

The projected Wivenhoe Dam releases combined with Lockyer Creek flows and local runoff will mean that all crossings downstream of Wivenhoe (Twin Bridges, Fernvale, Savages Crossing, Burtons Bridge, Kholo Bridge, Mt Crosby Weir and Colleges Crossing) will be adversely impacted until at least Sunday 16 January in varying degrees.

Water levels in the lower Brisbane River will be impacted by the combined flows of Lockyer Creek, Bremer River, local runoff and releases from Wivenhoe Dam.

Outlook

Heavy rainfall continues throughout South East Queensland and the situation could deteriorate rapidly over the next 24 hours. The flood operation centre will continue to monitor the situation and provide every six hours until the situation stabilizes.

Seqwater Technical Officer name	Robert Drury
Seqwater Technical Officer position title	Dam Operations Manager
[redacted]	

BoM assessment

(consisting of references to latest Flood Warning for the Brisbane River and other relevant Bureau forecasts and warnings (e.g. weather/rain forecasts, Tropical Cyclone Warning etc) and other updates/comments if needed)

BoM has been advised.

BoM Technical Officer name	Peter Baddiley
BoM Technical Officer position title	
BoM Technical Officer contact details	flood.qld[redacted]

Brisbane City Council (BCC) assessment

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised of the current status.

D344

BCC Technical Officer name	Chris Lavin
BCC Technical Officer position title	Disaster Operations Manager
BCC Technical Officer contact details	[redacted]

Ipswich City Council (ICC) assessment (if required)

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised of the current status.

ICC Technical Officer name	Tony Trace
ICC Technical Officer position title	Local Disaster Response Coordinator
ICC Technical Officer contact details	[redacted]

Somerset Regional Council (SRC) assessment (if required)

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised of the current status.

SRC Technical Officer name	Tony Jacobs
SRC Technical Officer position title	Local Disaster Response Coordinator
SRC Technical Officer contact details	[redacted]

Collated and distributed by (Agency)

Contact Officer signature	
Contact Officer name	Rob Drury
Contact Officer position title	Dam Operations Manager

Next TSR due	11.1.2011	[redacted]		[redacted]	Change in strategy

D345

Gina O'Driscoll

From: Rob Drury [rdrury[redacted]]
Sent: Monday, 10 January 2011 4:24 PM
To: Barry Dennien; Dan Spiller
Cc: Peter Borrows
Subject: FW: FLDWARN for Lower Brisbane and Bremer Rs [SEC=UNCLASSIFIED]

Attached is the BoM warning re levels that they develop in discussion with our FOC re releases and models and then they discuss with BCC.

This is what they then provide to everyone.

Rob

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

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

-----Original Message-----
From: weather
Sent: Monday, 10 January 2011 4:17 PM
To: DG-Ops Dam Levels; Murray Dunstan; Craig Duncan; Jayam Tennakoon; David Roberts; Jeff Lyddon; Glenn Patterson
Subject: FW: FLDWARN for Lower Brisbane and Bremer Rs [SEC=UNCLASSIFIED]

From: Aifs Operational Manager[SMTP:AIFSQLD[redacted]]
Sent: Monday, January 10, 2011 4:16:39 PM
To: weather
Subject: BOM: FLDWARN for Lower Brisbane and Bremer Rs [SEC=UNCLASSIFIED]
Auto forwarded by a Rule

TO::BOM615

IDQ20805

Australian Government Bureau of Meteorology
Queensland

PRIORITY

FLOOD WARNING FOR THE LOCKYER, BREMER, WARRILL AND BRISBANE RIVER BELOW WIVENHOE INCLUDING BRISBANE CITY
Issued at 4:16 PM on Monday the 10th of January 2011
by the Bureau of Meteorology, Brisbane.

Stream level rises causing moderate to major flooding are being recorded in Lockyer Creek, Warrill Creek and and along the Bremer River. Major flood levels are likely at Ipswich during Tuesday.

Wivenhoe dam is providing significant mitigation of upper Brisbane floods. River flows from the Bremer and Lockyer catchments combined with releases from Wivenhoe dam are expected to increase levels in Brisbane overnight and through Tuesday.

At the Brisbane City Gauge, a river levels of about 2.1 metres is expected with the afternoon high tide on Tuesday and about 3 metres is expected with the high tides on Wednesday causing moderate flooding.

(3 metres at the Brisbane City gauge is about 1.5 metres higher than the highest tide of the year at this location).

LOCKYER CREEK:
Further rainfall during Monday has led to renewed rises in the Lockyer Creek catchment. Rainfall is forecast to continue this evening and a return to moderate to major flood levels is expected overnight and during Tuesday. Major flood levels are expected to continue at Lyons Bridge with rises above 15 metres likely during Tuesday.

BREMER RIVER:
Rainfall during Monday will lead to renewed rises and a return to moderate flood levels along the Bremer River to Walloon. Levels over 5 metres are expected at Rosewood overnight.

The Bremer River at Ipswich is expected to reach about 12.7 metres on Tuesday afternoon. Higher levels are possible.

WARRILL CREEK
Further rainfall during Monday will lead to increasing river levels along Warrill Creek with levels expected to reach above 6 metres at Amberley overnight.

MIDDLE AND LOWER BRISBANE:
SEQwater advises releases from Wivenhoe Dam will increase during Monday. Moderate flooding is expected at Savages Crossing and at Mt Crosby Weir overnight tonight and during Tuesday.

The Brisbane River at the City Gauge (lower end of Edward Street and at Thornton Street) is expected to reach about 2.1 metres with the afternoon high tide on Tuesday and reach about 3 metres with the high tides on Wednesday causing moderate flooding.

(3 metres at the Brisbane City gauge is about 1.5 metres higher than the highest tide of the year at this location).

Predicted River Heights/Flows:
Ipswich: Reach about 12.7 metres (major) during Tuesday afternoon. Quicker rises and higher levels are possible depending on further rainfall tonight.

Moggill: Reach about 12 metres (minor) during Tuesday afternoon.

Jindalee: Reach about 7 metres (minor) overnight Tuesday.

Brisbane: Reach about 2.1 metres with the afternoon high tide on Tuesday. Reach about 3 metres with the high tides on Wednesday causing moderate flooding.

(3 metres at the Brisbane City gauge is about 1.5 metres higher than the highest tide of the year at this location).

Further rises are possible at all four locations depending on further rain.

Next Issue:
The next warning will be issued at about 9pm Monday.

Latest River Heights:

Lockyer Ck at Gatton #	10.36m	steady	03:04 PM MON 10/01/11
Laidley Ck at Laidley	6m	rising	02:45 PM MON 10/01/11
Laidley Ck at Showground Weir #	6.98m	rising	03:07 PM MON 10/01/11
Laidley Ck at Warrego Hwy *	5.43m	falling	01:00 PM MON 10/01/11
Lockyer Ck at Glenore Grove #	11.36m	falling	03:05 PM MON 10/01/11
Lockyer Ck at Lyons Br #	14.79m	rising	03:02 PM MON 10/01/11
Lockyer Ck at Rifle Range Rd *	13.4m	rising	08:20 AM MON 10/01/11
Brisbane R at Lowood Pump Stn #	14.13m	falling	03:07 PM MON 10/01/11
Brisbane R at Savages Crossing #	14.15m	rising	03:09 PM MON 10/01/11
Brisbane R at Burtons Br #	10.88m	rising	03:05 PM MON 10/01/11
Brisbane R at Kholo Br #	6.23m	rising	03:06 PM MON 10/01/11
Brisbane R at Mt Crosby #	14.26m	rising	03:07 PM MON 10/01/11
Brisbane R at Colleges Crossing #	11.96m	rising	03:09 PM MON 10/01/11
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Warrill Ck at Amberley DNR *	5.34m	rising	08:10 AM MON 10/01/11
Bremer R at Ipswich #	6.6m	rising	02:40 PM MON 10/01/11
Brisbane R at Moggill #	5.52m	rising	02:59 PM MON 10/01/11
Brisbane R at Jindalee Br #	3.7m	rising	02:50 PM MON 10/01/11
Brisbane R at City Gauge #	1.36m	falling	03:09 PM MON 10/01/11

*automatic station

Warnings and River Height Bulletins are available at
http://www.bom.gov.au/qld/flood/ . Flood Warnings are also available on
telephone 1300 659 219 at a low call cost of 27.5 cents, more from mobile,
public and satellite phones.

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QLD Bulk Water Supply Authority ABN754S0239876 (Trading as Seqwater).

Cindy Hulsey

From: Peter Baddiley [P.Baddiley[redacted]]
Sent: Monday, 10 January 2011 4:33 PM
To: Barry Dennien
Cc: Dan Spiller; 'flood.qld[redacted]'
Subject: RE: Tech report [SEC=UNCLASSIFIED]
Attachments: Technical Situation Report W37_BOM.docx

Categories: T8

BOM additions as at 4:30pm Monday.

Peter Baddiley
Regional Hydrology Manager
Climate & Water Division
Bureau of Meteorology
Level 21, 69 Ann Street
GPO Box 413, BRISBANE, QLD, AUSTRALIA 4001
Phone:[redacted]
EMAIL: p.baddiley[redacted]
EMAIL for flood matters: flood.qld[redacted]
WWW : www.bom.gov.au

From: Barry Dennien [mailto:Barry.Dennien[redacted]]
Sent: Monday, 10 January 2011 4:11 PM
To: Peter Baddiley
Cc: Dan Spiller
Subject: Tech report

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

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TECHNICAL SITUATION REPORT

TSR Number	W37	Date of TSR release	10.1.2011	Time of TSR release	3pm

Seqwater status of inflows and dam operations

Current status but could change based on inflows or rainfall.

Current objectives	• Continue increasing releases to discharge flood waters but keep impact downstream to minimum.	
Strategy	• All bridges are now inundated . • Ramp up to 2800cumecs which will give a flow in the lower Brisbane River of around 4,000cumecs	
Key considerations	Storage levels:	Above FSL
	Inflows:	Inflows expected around 1,500,000ML which is close to 1974 event.
	Rainfall:	Continuing
	Lockyer/Bremer:	Monitoring their inflows
	Brisbane River:	Impact as below.

Rainfall

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Somerset Dam (Full Supply Level 99.00 m AHD)

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Five radial gates are currently open at the dam releasing about 2,000m3/s into the Brisbane River and

D351

this will need to be increased steadily to an outflow of 2,800m3/s over the next 9 hours (commencing at 1500). At this stage, the dam will reach about 73.8m AHD during Tuesday morning.

The objective for dam operations is currently to minimise the impact of urban flooding in areas downstream of the dam and to keep river flows in the lower Brisbane River below 4,000m3/s if possible. This is significantly less than the current estimated combined pre-dam peak inflow of 12,000m3/s. If further rainfall occurs, dam releases may need to be increased further and this may result in river flows in the lower Brisbane River approaching or exceeding 5,000m3/s.

Impacts downstream of Wivenhoe Dam

The projected Wivenhoe Dam releases combined with Lockyer Creek flows and local runoff will mean that all crossings downstream of Wivenhoe (Twin Bridges, Fernvale, Savages Crossing, Burtons Bridge, Kholo Bridge, Mt Crosby Weir and Colleges Crossing) will be adversely impacted until at least Sunday 16 January in varying degrees.

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Outlook

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Seqwater Technical Officer name	Robert Drury
Seqwater Technical Officer position title	Dam Operations Manager
[redacted]	

BoM assessment

(consisting of references to latest Flood Warning for the Brisbane River and other relevant Bureau forecasts and warnings (e.g. weather/rain forecasts, Tropical Cyclone Warning etc) and other updates/comments if needed)

D352

Refer to details in latest Brisbane River flood warning issued at 4:16pm Monday 10 Jan. Warning is to be updated at 9pm tonight.

Ipswich: Reach about 12.7 metres (major) during Tuesday afternoon. Quicker rises and higher levels are possible depending on further rainfall tonight.

Moggill: Reach about 12 metres (minor) during Tuesday afternoon.

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Reach about 3 metres with the high tides on Wednesday causing moderate flooding.

(3 metres at the Brisbane City gauge is about 1.5 metres higher than the highest tide of the year at this location).

Further rises are possible at all four locations depending on further rain.

BoM Technical Officer name	Peter Baddiley
BoM Technical Officer position title	Supervising Hydrologist, Flood Warning Centre
BoM Technical Officer contact details	flood.qld[redacted]

Brisbane City Council (BCC) assessment

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised of the current status.

BCC Technical Officer name	Chris Lavin
BCC Technical Officer position title	Disaster Operations Manager
BCC Technical Officer contact details	[redacted]

Ipswich City Council (ICC) assessment (if required)

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised of the current status.

ICC Technical Officer name	Tony Trace
ICC Technical Officer position title	Local Disaster Response Coordinator
ICC Technical Officer contact details	[redacted]

Somerset Regional Council (SRC) assessment (if required)

(to include predicted local inundation areas and depths of inundation based on the information)

D353

Council has been advised of the current status.

SRC Technical Officer name	Tony Jacobs
SRC Technical Officer position title	Local Disaster Response Coordinator
SRC Technical Officer contact details	[redacted]

Collated and distributed by (Agency)

Contact Officer signature	
Contact Officer name	Rob Drury
Contact Officer position title	Dam Operations Manager

Next TSR due	Date	11.1.2011	Time		Change in strategy

D354

From:	Barry Dennien </O=SOUTH EAST QUEENSLAND WATER GRID MANAGER/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=BARRY.DENNIEN>
Sent:	Monday, January 10, 2011 4:37 PM
To:	stephen.robertson[redacted]; ken.smith[redacted]; Lance McCallum (lance.mccallum[redacted]); tim.watts[redacted]; geoff.stead[redacted]; lauren.sims[redacted]; Martin.PeterJ[redacted]; Dunn.KerryG[redacted]; debbie.best[redacted]
Cc:	pbird[redacted]; SEQWGM Media <media[redacted]>; damien.brown[redacted]; Bob.Reilly[redacted]; Madgwick.DarrenT[redacted]; sstevenson[redacted]; Dan Spiller <Daniel.Spiller[redacted]>; Scott Denner <Scott.Denner[redacted]>
Subject:	FW: FLDWARN for Lower Brisbane and Bremer Rs [SEC=UNCLASSIFIED]

Folks

For information

Barry Dennien

TO::BOM615

IDQ20805

Australian Government Bureau of Meteorology
Queensland

PRIORITY
FLOOD WARNING FOR THE LOCKYER, BREMER, WARRILL AND BRISBANE RIVER BELOW WIVENHOE INCLUDING BRISBANE CITY
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(3 metres at the Brisbane City gauge is about 1.5 metres higher than the highest tide of the year at this location).

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Warrill Ck at Harrisville #	3.82m	rising	03:05 PM MON 10/01/11
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Brisbane R at Moggill #	5.52m	rising	02:59 PM MON 10/01/11
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Brisbane R at City Gauge #	1.36m	falling	03:09 PM MON 10/01/11

*automatic station

Warnings and River Height Bulletins are available at http://www.bom.gov.au/qld/flood/ . Flood Warnings are also available on telephone 1300 659 219 at a low call cost of 27.5 cents, more from mobile, public and satellite phones.

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QLD Bulk Water Supply Authority ABN75450239876 (Trading as Seqwater).

Gina O'Driscoll

From: Barry Dennien
Sent: Monday, 10 January 2011 6:14 PM
To: ken.smith[redacted]
Attachments: Impacts of Wivenhoe releases (DRAFT).docx

Ken

As discussed

Regards

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

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Water Grid

10 JANUARY 2011

IMPACTS OF WIVENHOE RELEASES ON LOCAL SUBURBS

Built in response to the 1974 floods, Wivenhoe Dam's key role is to protect Brisbane City and other communities downstream from major flooding.

Wivenhoe Dam is currently holding back flood waters equivalent to about two times the volume of Sydney Harbour. Without this support from Wivenhoe Dam, current weather patterns would have resulted in huge amounts of water having already inundated large areas of Ipswich, Brisbane and surrounding areas.

Over the past 24 hours, the catchments for Wivenhoe and Somerset dams have received upwards of 300 millimetres of rainfall, seeing dam inflows similar to those experienced in the 1974 floods.

Current inflows into Wivenhoe Dam are approximately 1,032,000 megalitres per day and the dam is now sitting at approximately 153 per cent.

With all five gates open, Wivenhoe Dam is now releasing 170,000 megalitres per day, which is the largest daily release since the dam was built.

The Water Grid operators continue to work closely with relevant local councils and government authorities regarding these controlled releases.

The release of water from Wivenhoe Dam is strictly guided by an established Flood Mitigation Manual.

Wivenhoe Dam controls 50 per cent of the Brisbane catchment, therefore downstream flooding can be heavily influenced by rainfall below the dam.

However, with the forecast for continued rain and the unprecedented releases expected to continue, there will be an impact on property in the Somerset, Brisbane and Ipswich regions.

In Brisbane there is the potential for water entering properties and some households. Affected areas may include low-lying areas of Windsor, Albion, Newstead, Bowen Hills, East Brisbane, River Hills, Oxley Creek, Carindale, Tingalpa, Bulimba Creek, Hemmant and Rocklea.

Affected roads may include Milton Road, Butterfield Street, Waterloo and Ross Street in Newstead, Sandgate Road at Albion and Windsor's Northey Street.

In Ipswich, the Bremer River is expected to peak Tuesday afternoon, 11 January with a height of 12.7 metres. This peak is primarily due to localised flooding, however the higher levels in the Brisbane River, due to Wivenhoe releases, are impacting the localised flooding as well.

Approximately 300 properties will be affected with some houses experiencing inundation.

Importantly, we must release this water safely to be able to store the expected substantial inflows coming with more severe weather.

Cindy Hulsey

From: Barry Dennien
Sent: Monday, 10 January 2011 6:45 PM
To: Madgwick.DarrenT[redacted]; Dunn.KerryG[redacted]; Martin.PeterJ[redacted]
Cc: Dan Spiller; debbie.best[redacted]
Attachments: img-110173945-0001.jpg; Technical Situation Report W37.docx

Categories: T8

Folks

Please find latest Technical report on Wivenhoe releases, BOM forecast of river heights accounting for the releases and downstream flows, and BCC flood maps accounting for the releases and downstream flows. Brisbane forecasts of properties impacted.

Further updates will be issued tomorrow morning.

Australian Government Bureau of Meteorology Queensland

PRIORITY
FLOOD WARNING FOR THE LOCKYER, BREMER, WARRILL AND BRISBANE RIVER BELOW WIVENHOE INCLUDING BRISBANE CITY Issued at 4:16 PM on Monday the 10th of January 2011 by the Bureau of Meteorology, Brisbane.

Stream level rises causing moderate to major flooding are being recorded in Lockyer Creek, Warrill Creek and and along the Bremer River. Major flood levels are likely at Ipswich during Tuesday.

Wivenhoe dam is providing significant mitigation of upper Brisbane floods. River flows from the Bremer and Lockyer catchments combined with releases from Wivenhoe dam are expected to increase levels in Brisbane overnight and through Tuesday.

At the Brisbane City Gauge, a river levels of about 2.1 metres is expected with the afternoon high tide on Tuesday and about 3 metres is expected with the high tides on Wednesday causing moderate flooding.

(3 metres at the Brisbane City gauge is about 1.5 metres higher than the highest tide of the year at this location).

LOCKYER CREEK:
Further rainfall during Monday has led to renewed rises in the Lockyer Creek catchment. Rainfall is forecast to continue this evening and a return to moderate to major flood levels is expected overnight and during Tuesday. Major flood levels are expected to continue at Lyons Bridge with rises above 15 metres likely during Tuesday.

BREMER RIVER:
Rainfall during Monday will lead to renewed rises and a return to moderate flood levels along the Bremer River to Walloon. Levels over 5 metres are expected at Rosewood overnight.

The Bremer River at Ipswich is expected to reach about 12.7 metres on Tuesday afternoon. Higher levels are possible.

WARRILL CREEK
Further rainfall during Monday will lead to increasing river levels along Warrill Creek with levels expected to reach above 6 metres at Amberley overnight.

MIDDLE AND LOWER BRISBANE:
SEQwater advises releases from Wivenhoe Dam will increase during Monday.
Moderate flooding is expected at Savages Crossing and at Mt Crosby Weir overnight tonight and during Tuesday.

The Brisbane River at the City Gauge (lower end of Edward Street and at Thornton Street) is expected to reach about 2.1 metres with the afternoon high tide on Tuesday and reach about 3 metres with the high tides on Wednesday causing moderate flooding.

(3 metres at the Brisbane City gauge is about 1.5 metres higher than the highest tide of the year at this location).

Predicted River Heights/Flows:
Ipswich: Reach about 12.7 metres (major) during Tuesday afternoon. Quicker rises and higher levels are possible depending on further rainfall tonight.

Moggill: Reach about 12 metres (minor) during Tuesday afternoon.

Jindalee: Reach about 7 metres (minor) overnight Tuesday.

Brisbane: Reach about 2.1 metres with the afternoon high tide on Tuesday.
Reach about 3 metres with the high tides on Wednesday causing moderate flooding.

(3 metres at the Brisbane City gauge is about 1.5 metres higher than the highest tide of the year at this location).

Further rises are possible at all four locations depending on further rain.

Next Issue:
The next warning will be issued at about 9pm Monday.

Brisbane Properties affected

Number of properties affected:
- 455 properties (parcels of land) have been identified as experiencing flooding on next Wednesday (at least 221 of these are homes and businesses)
- 7, 731 properties may see some flooding either on the land or outside the property
- More than 400 streets will be affected by flooding in some way

Below is the list of suburbs where the 455 properties that will be affected are located. In brackets is the number of properties/parcels of land that will be affected in each suburb. This is based on the data and modelling we have done to date and we may see increases in these numbers once figures are revised.
- Rocklea (80)
- Albion (49)
- Milton (49)
- Auchenflower (40)
- Norman Park (26)
- Pinkenba (26)
0- Oxley (19)
- New Farm (17)
- Kangaroo Point (16)
- Bulimba & Sherwood (14 each)
- Yeronga (10)

- Graceville (9)
- Newstead (8)
- Yeerongpilly (7)
- Bowen Hills (6)
- Indooroopilly, Windsor (5 each)
- Wacol, Brisbane City, Moggill, East Brisbane, Fortitude Valley (4 each)
- Chelmer, Hemmant, Tennyson (3 each)
- Fairfield, Fig Tree Pocket, Coorparoo, South Brisbane, Lytton, Murrarie (2 each)

7 Rapid Response Group teams will be working from both a map and a database to doorknock/letterbox drop a flyer to the 221 homes and businesses that are predicted as being likely to experience innundation. They will visually check using the map that none of the remaining parcels of land from the total 455 properties identified as experiencing flooding are actually homes or businesses also.

The locations where the 221 homes and businesses are located is Albion, Auchenflower, Brisbane City, Bowen Hills, Bulimba, Fortitude Valley, Graceville, Hemmant, Indooroopilly, Kangaroo Point, Lytton, Milton, New Farm, Newstead, Norman Park, Oxley, Pinkenba, Rocklea, Sherwood, Tennyson, Wacol, Windsor, Yeronga.

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Regards

Barry Dennien
Chief Executive Officer
SEQ Water Grid Manager
[redacted]

Email: barry.dennien[redacted]
Visit: Level 15, 53 Albert Street, Brisbane
Post: PO Box 16205, City East Qld 4002
ABN: 14783 317 630

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

TECHNICAL SITUATION REPORT

TSR Number	W37	Date of TSR release	10.1.2011	Time of TSR release	3pm

Seqwater status of inflows and dam operations

Current status but could change based on inflows or rainfall.

Current objectives	• Continue increasing releases to discharge flood waters but keep impact downstream to minimum.	
Strategy	• All bridges are now inundated . • Ramp up to 2800cumecs which will give a flow in the lower Brisbane River of around 4,000cumecs	
Key considerations	Storage levels:	Above FSL
	Inflows:	Inflows expected around 1,500,000ML which is close to 1974 event.
	Rainfall:	Continuing
	Lockyer/Bremer:	Monitoring their inflows
	Brisbane River:	Impact as below.

Rainfall

Significant rainfall has fallen in the Wivenhoe Dam catchment over the last 3 hours, with falls exceeding 100mm. This rainfall will significantly increase inflows into the dam. A severe weather warning remains current for heavy rainfall in the dam catchment areas. The QPF issued by BOM at 10:00 estimates rainfalls for the 24 hours to 10:00 Tuesday as North Pine Dam (75mm to 150mm); Wivenhoe/Somerset Dam Catchments (50mm – 100mm). Potentially significant rain moving towards the dam catchments is currently evident on the BOM radar.

Somerset Dam (Full Supply Level 99.00 m AHD)

The dam level is 103.41m AHD and rising. Peak inflow to the dam is estimated to be about 4,200 m3/s. Five sluice gates are open releasing about 1,100m3/s (95,000ML/day) into Wivenhoe Dam. At this stage the dam lake level will reach about 103.5m AHD on Monday afternoon. Areas around Kilcoy will continue to be adversely affected.

Wivenhoe Dam (Full Supply Level 67.00 m AHD)

The dam level is 72.41m AHD and rising quickly. The rainfall experienced over the last 2 to 3 hours will result in significant further inflows into the dam and releases from the dam will need to be increased in accordance with Flood Mitigation procedures and to ensure that a fuse plug is not initiated. The initiation of a fuse plug will result in a rapid uncontrolled outflow from the dam of 2,000m3/s being added to the gate release outflow. Outflows into the Brisbane River from both Lockyer Creek and the Bremer River are also increasing.

Five radial gates are currently open at the dam releasing about 2,000m3/s into the Brisbane River and

this will need to be increased steadily to an outflow of 2,800m3/s over the next 9 hours (commencing at 1500). At this stage, the dam will reach about 73.8m AHD during Tuesday morning.

The objective for dam operations is currently to minimise the impact of urban flooding in areas downstream of the dam and to keep river flows in the lower Brisbane River below 4,000m3/s if possible. This is significantly less than the current estimated combined pre-dam peak inflow of 12,000m3/s. If further rainfall occurs, dam releases may need to be increased further and this may result in river flows in the lower Brisbane River approaching or exceeding 5,000m3/s.

Impacts downstream of Wivenhoe Dam

The projected Wivenhoe Dam releases combined with Lockyer Creek flows and local runoff will mean that all crossings downstream of Wivenhoe (Twin Bridges, Fernvale, Savages Crossing, Burtons Bridge, Kholo Bridge, Mt Crosby Weir and Colleges Crossing) will be adversely impacted until at least Sunday 16 January in varying degrees.

Water levels in the lower Brisbane River will be impacted by the combined flows of Lockyer Creek, Bremer River, local runoff and releases from Wivenhoe Dam.

Outlook

Heavy rainfall continues throughout South East Queensland and the situation could deteriorate rapidly over the next 24 hours. The flood operation centre will continue to monitor the situation and provide every six hours until the situation stabilizes.

Seqwater Technical Officer name	Robert Drury
Seqwater Technical Officer position title	Dam Operations Manager
[redacted]	

BoM assessment

(consisting of references to latest Flood Warning for the Brisbane River and other relevant Bureau forecasts and warnings (e.g. weather/rain forecasts, Tropical Cyclone Warning etc) and other updates/comments if needed)

BoM has been advised.

BoM Technical Officer name	Peter Baddiley
BoM Technical Officer position title	
BoM Technical Officer contact details	flood.qld[redacted]

Brisbane City Council (BCC) assessment

(to include predicted local inundation areas and depths of inundation bosed on the information)

Council has been advised of the current status.

BCC Technical Officer name	Chris Lavin
BCC Technical Officer position title	Disaster Operations Manager
BCC Technical Officer contact details	[redacted]

Ipswich City Council (ICC) assessment (if required)

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised of the current status.

ICC Technical Officer name	Tony Trace
ICC Technical Officer position title	Local Disaster Response Coordinator
ICC Technical Officer contact details	[redacted]

Somerset Regional Council (SRC) assessment (if required)

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised of the current status.

SRC Technical Officer name	Tony Jacobs
SRC Technical Officer position title	Local Disaster Response Coordinator
SRC Technical Officer contact details	[redacted]

Collated and distributed by (Agency)

Contact Officer signature	
Contact Officer name	Rob Drury
Contact Officer position title	Dam Operations Manager

Next TSR due	11.1.2011	[redacted]		[redacted]	Change in strategy

D390

Gina O'Driscoll

From: Paul Bird [pbird[redacted]]
Sent: Monday, 10 January 2011 7:31 PM
To: SEQWGM Media; aroebuck[redacted]; greg.swain[redacted]; GSTUBBS[redacted]; Kathy Petrik; lisa.m.martin[redacted]; Paula Weston; tjacobs[redacted]; Arminda Roberts; Bec Middlemiss; Michael Fiechtner; Mike Foster; Tara King; Barry Dennien; Dan Spiller; Scott Denner
Cc: ELT; Michael Lyons; Geoff.Stead[redacted]
Subject: Release update
Attachments: image001.jpg; image004.jpg

As at 7.00 pm on Monday 10 January, the following applies:

SOMERSET DAM:
As a result of rainfall and inflows, water is being released into Wivenhoe through five sluice gates at about 146,000 megalitres per day, reducing to 103,000 megalitres per day by late Tuesday 11 January, and is likely to continue until Thursday 13 January. Areas around Kilcoy are likely to be impacted as a result of the rising dam levels.

WIVENHOE DAM:
Stream levels are rising quickly as a result of significant heavy rainfall. The objective for dam operations will be to minimise the impact of urban flooding in areas downstream of the dam.

Gate Releases are being increased to 240,000 megalitres a day are underway and are to continue until at least Sunday 16 January.

Local Councils have been advised that as a result of Lockyer Creek flows, local runoff and Wivenhoe releases, Twin Bridges, Savages Crossing, Burtons Bridge, Kholo Bridge Colleges Crossing, Fernvale Bridge, and Mt Crosby Weir Bridge may be inundated until at least the weekend.

NORTH PINE DAM:
Five gates are open, releasing around 31,000 megalitres a day and will continue until at least Wednesday 12 January.

The local Council is being kept informed regarding Youngs Crossing.

LESLIE HARRISON DAM:
Gate releases are underway due to rainfall and inflows.

HINZE DAM:
A minor release of around 1200 megalitres a day is being made through the emergency gates. There is no public access to the spillway.

For detailed information on road crossing closures and other potential impacts, always contact your local council.

This information will be updated on the morning of Tuesday 11 January.

Paul Bird
Senior Communications Advisor
Queensland Bulk Water Supply Authority *trading as* Seqwater

seqwater
WATER FOR LIFE

[redacted] E pbird@[redacted]

Level 3, 240 Margaret St, Brisbane City QLD 4000
PO Box 16146, City East QLD 4002
Website | www.seqwater.com.au



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Gina O'Driscoll

From: Rob Drury [rdrury[redacted]]
Sent: Tuesday, 11 January 2011 6:18 AM
To: Dan Spiller
Cc: Barry Dennien; Peter Borrows; Paul Bird; Michael Lyons
Subject: RE: Impact of Lockyer flows
Attachments: image001.jpg; image002.png

Dan,
I will send a report shortly but below are words I was going to send. I have also attached the BoM warning for the Lockyer that they sent this morning.
They are reissuing their warning this morning based on new information.

Basically the FOC was going to try to slow our releases last night to give a small window for the Lockyer flood to go through however we again received and are still receiving heavy rain in the catchments.

Currently the FOC has shut some sluices at Somerset to store more water to keep Wivenhoe below RL74 at which we need to start increasing releases. The first fuse plug goes at about RL 75.7m

The strategy is now to keep releases as is to not worsen the situation downstream as the Lockyer recorded levels higher than any on record. However we may still need to increase releases depending on what happens through the day.

The FOC have given our release strategy (not really different in releases at this stage) to the BoM and they will reissue their flood warnings based on that and other flows in the Lockyer and Bremer.

The FOC have spoken to BCC and ICC and we will send them an update. BCC are having a LDMG meeting this morning. Dan, not sure if anyone from the WGM is going but Chris Lavin is the contact.

Rob

From: Aifs Operational Manager[SMTP:AIFSQLD[redacted]]
Sent: Tuesday, January 11, 2011 4:06:54 AM
To: weather
Subject: BOM: FLDWARN for Lower Brisbane and Bremer Rs [SEC=UNCLASSIFIED] Auto forwarded by a Rule

TO::BOM615

IDQ20805

Australian Government Bureau of Meteorology Queensland

PRIORITY
FLOOD WARNING FOR THE LOCKYER, BREMER, WARRILL AND BRISBANE RIVER BELOW WIVENHOE INCLUDING BRISBANE CITY Issued at 4:06 AM on Tuesday the 11th of January 2011 by the Bureau of Meteorology, Brisbane.

The main flood waters in the Lockyer Creek are now arriving at Lyons Bridge, with strong stream rises expected during Tuesday.

1

Wivenhoe dam is providing significant mitigation of upper Brisbane floods. River flows from the Bremer and Lockyer catchments combined with releases from Wivenhoe dam are expected to increase levels in Brisbane during Tuesday.

At the Brisbane City Gauge, minor flood levels of about 2.1 metres are expected with the afternoon high tide on Tuesday and levels of about 3 metres are expected with the high tides on Wednesday causing moderate flooding.

(3 metres at the Brisbane City gauge is about 1.5 metres higher than the highest tide of the year at this location).

LOCKYER CREEK:
Extremely heavy rainfall during Monday led to extreme rises in the Lockyer Creek catchment and Laidley Creek at Mulgowie. Record flood levels of 18.92 metres were recorded at Gatton Monday evening before the station failed. This level was well above the previous record peak of 16.33 metres from the February 1893 flood.

The main flood waters are currently arriving at Lyons Bridge, with strong stream rises expected in the next few hours. The Lockyer Creek at Glenore Grove peaked at 14.60 metres at 11:30pm, which is 0.3 metres below the 1974 flood.

Renewed stream rises have commenced in Lockyer Creek at Lyons Bridge with a peak between 16 and 16.5 metres expected Tuesday morning. This is likely to be similar in level to the 1996 flood.

BREMER RIVER:
The Bremer River at Walloon has exceeded the moderate flood level. The Bremer River at Rosewood peaked at 5.8 metres around midnight monday.

The Bremer River at Ipswich is expected to reach about 12.7 metres on Tuesday afternoon. Higher levels are possible.

WARRILL CREEK
Warrill Creek at Amberley peaked at 5.98 metres around 9pm Monday.

MIDDLE AND LOWER BRISBANE:
Moderate flooding is developing at Savages Crossing and at Mt Crosby Weir.

At the Brisbane City Gauge (lower end of Edward Street and at Thornton Street), minor flood levels of about 2.1 metres are expected with the afternoon high tide on Tuesday and levels of about 3 metres are expected with the high tides on Wednesday causing moderate flooding.

(3 metres at the Brisbane City gauge is about 1.5 metres higher than the highest tide of the year at this location).

Predicted River Heights/Flows:
Ipswich: Reach about 12.7 metres (major) during Tuesday afternoon.

Moggill: Reach about 12 metres (minor) during Tuesday afternoon.

Jindalee: Reach about 7 metres (minor) overnight Tuesday.

Brisbane: Reach about 2.1 metres (minor) with the afternoon high tide on Tuesday. Reach about 3 metres (moderate) with the high tides on Wednesday.

(3 metres at the Brisbane City gauge is about 1.5 metres higher than the highest tide of the year at this location).

Further rises are possible at all four locations depending on further rain.

Next Issue:
The next warning will be issued at about 8am Tuesday.

Latest River Heights:

Lockyer Ck at Helidon #	12.68m steady	03:02 PM MON 10/01/11
Flagstone Ck at Brown-Zirbels Rd *	3.49m falling	02:10 AM TUE 11/01/11
Sandy Creek at Sandy Creek Road #	2.15m falling	03:19 AM TUE 11/01/11
Ma Ma Ck at Harm's *	3.26m rising	02:30 AM TUE 11/01/11
Tenthill Ck at Tenthill *	5.57m rising	02:40 AM TUE 11/01/11
Lockyer Ck at Gatton #	18.92m rising	06:30 PM MON 10/01/11
Laidley Ck at Mulgowie *	6.39m rising	02:20 AM TUE 11/01/11
Laidley Ck at Laidley	8.7m falling slowly	10:00 PM MON 10/01/11
Laidley Ck at Showground Weir #	7.84m rising	03:25 AM TUE 11/01/11
Laidley Ck at Warrego Hwy *	6.41m rising	02:00 AM TUE 11/01/11
Lockyer Ck at Glenore Grove #	13.8m falling	03:24 AM TUE 11/01/11
Lockyer Ck at Lyons Br #	15.55m rising	03:23 AM TUE 11/01/11
Lockyer Ck at Rifle Range Rd *	15.39m rising	02:40 AM TUE 11/01/11
Lockyer Ck at O'Reilly's Weir #	18m falling	03:28 AM TUE 11/01/11
Brisbane R at Lowood Pump Stn #	15.93m falling	03:31 AM TUE 11/01/11
Brisbane R at Savages Crossing #	15.89m rising	03:29 AM TUE 11/01/11
Brisbane R at Burtons Br #	12.22m rising	03:29 AM TUE 11/01/11
Brisbane R at Kholo Br #	7.99m rising	03:29 AM TUE 11/01/11
Brisbane R at Mt Crosby #	15.82m steady	03:30 AM TUE 11/01/11
Brisbane R at Mt Crosby #	14.08m falling	04:39 PM MON 10/01/11
Brisbane R at Colleges Crossing #	13.91m rising	03:32 AM TUE 11/01/11
Bremer R at Rosewood#	5.56m falling	03:11 AM TUE 11/01/11
Bremer R at Five Mile Br Walloon #	6.4m rising	03:15 AM TUE 11/01/11
Warrill Ck at Greens Rd Amberley #	5.84m falling	03:29 AM TUE 11/01/11
Bremer R at One Mile Br #	13.75m rising	03:31 AM TUE 11/01/11
Bremer R at Hancocks Br Brassall #	11.33m rising	03:22 AM TUE 11/01/11
Bremer R at Ipswich #	8.55m rising	03:31 AM TUE 11/01/11
Brisbane R at Moggill #	7.07m rising	03:29 AM TUE 11/01/11
Brisbane R at Jindalee Br #	4.5m rising	03:29 AM TUE 11/01/11
Brisbane R at City Gauge #	1.4m falling	03:15 AM TUE 11/01/11

*automatic station

Warnings and River Height Bulletins are available at http://www.bom.gov.au/qld/flood/ .
Flood Warnings are also available on telephone 1300 659 219 at a low call cost of 27.5 cents, more from mobile, public and satellite phones.

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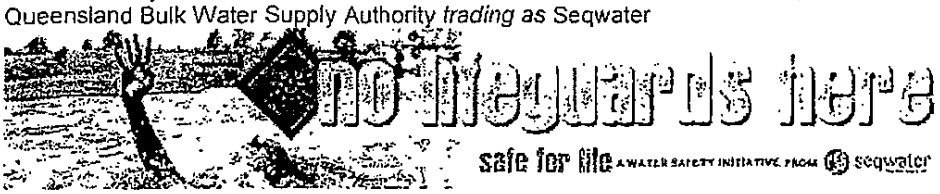
Robert Drury
Dam Operations Manager
Water Delivery
Queensland Bulk Water Supply Authority *trading as* Seqwater



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

From: Dan Spiller [mailto:Daniel.Spiller[redacted]]
Sent: Tuesday, 11 January 2011 6:13 AM
To: Rob Drury
Cc: Barry Dennien; Peter Borrows; Paul Bird; Michael Lyons
Subject: Impact of Lockyer flows

Rob,

I am fielding calls from Gov seeking advice about the impact of the Lockyer Valley flows on Brisbane River levels and on overnight rainfall (I am told that there was 50mm in two hours in Lockyer).

Early advice would be good. There are many nervous people.

Thanks,
Dan

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Litsupport Brisbane

From:	Dan Spiller
Sent:	Tuesday, 11 January 2011 6:29 AM
To:	Debbie Best
Cc:	Martin.PeterJ[redacted]; Dunn.KerryG[redacted]; Barry Dennien; Tim Watts
Subject:	Fwd: Impact of Lockyer flows
Attachments:	Seqwater_No-Lifeguards-Here_email_strap.png; ATT00001.htm; cidimage001.png@01CA24E1.BDB90020; ATT00002.htm

Debbie,

Preliminary advice below. Report being prepared and BoM remodeling.

Dan

Begin forwarded message:

From: Rob Drury <rdrury[redacted]>
Date: 11 January 2011 6:17:48 AM GMT+10:00
To: Dan Spiller <Daniel.Spiller[redacted]>
Cc: Barry Dennien <Barry.Dennien[redacted]>, Peter Borrows <pborrows[redacted]>, Paul Bird <pbird[redacted]>, Michael Lyons <Michael.Lyons[redacted]>
Subject: RE: Impact of Lockyer flows

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Basically the FOC was going to try to slow our releases last night to give a small window for the Lockyer flood to go through however we again received and are still receiving heavy rain in the catchments.

Currently the FOC has shut some sluices at Somerset to store more water to keep Wivenhoe below RL74 at which we need to start increasing releases. The first fuse plug goes at about RL 75.7m

The strategy is now to keep releases as is to not worsen the situation downstream as the Lockyer recorded levels higher than any on record. However we may still need to increase releases depending on what happens through the day.

The FOC have given our release strategy (not really different in releases at this stage) to the BoM and they will reissue their flood warnings based on that and other flows in the Lockyer and Bremer.

The FOC have spoken to BCC and ICC and we will send them an update. BCC are having a LDMG meeting this morning. Dan, not sure if anyone from the WGM is going but Chris Lavin is the contact.

Rob

From: Aifs Operational Manager[SMTP:AIFSQLD[redacted]]

Sent: Tuesday, January 11, 2011 4:06:54 AM

To: weather

Subject: BOM: FLDWARN for Lower Brisbane and Bremer Rs [SEC=UNCLASSIFIED] Auto forwarded by a Rule

TO::BOM615

IDQ20805

Australian Government Bureau of Meteorology Queensland

PRIORITY

FLOOD WARNING FOR THE LOCKYER, BREMER, WARRILL AND BRISBANE RIVER BELOW WIVENHOE INCLUDING BRISBANE CITY Issued at 4:06 AM on Tuesday the 11th of January 2011 by the Bureau of Meteorology, Brisbane.

The main flood waters in the Lockyer Creek are now arriving at Lyons Bridge, with strong stream rises expected during Tuesday.

Wivenhoe dam is providing significant mitigation of upper Brisbane floods. River flows from the Bremer and Lockyer catchments combined with releases from Wivenhoe dam are expected to increase levels in Brisbane during Tuesday.

At the Brisbane City Gauge, minor flood levels of about 2.1 metres are expected with the afternoon high tide on Tuesday and levels of about 3 metres are expected with the high tides on Wednesday causing moderate flooding.

(3 metres at the Brisbane City gauge is about 1.5 metres higher than the highest tide of the year at this location).

LOCKYER CREEK:

Extremely heavy rainfall during Monday led to extreme rises in the Lockyer Creek catchment and Laidley Creek at Mulgowie. Record flood levels of 18.92 metres were recorded at Gatton Monday evening before the station failed. This level was well above the previous record peak of 16.33 metres from the February 1893 flood.

The main flood waters are currently arriving at Lyons Bridge, with strong stream rises expected in the next few hours. The Lockyer Creek at Glenore Grove peaked at 14.60 metres at 11:30pm, which is 0.3 metres below the 1974 flood.

Renewed stream rises have commenced in Lockyer Creek at Lyons Bridge with a peak between 16 and 16.5 metres expected Tuesday morning. This is likely to be similar in level to the 1996 flood.

BREMER RIVER:

The Bremer River at Walloon has exceeded the moderate flood level. The Bremer River at Rosewood peaked at 5.8 metres around midnight monday.

The Bremer River at Ipswich is expected to reach about 12.7 metres on Tuesday afternoon. Higher levels are possible.

WARRILL CREEK

Warrill Creek at Amberley peaked at 5.98 metres around 9pm Monday.

MIDDLE AND LOWER BRISBANE:

Moderate flooding is developing at Savages Crossing and at Mt Crosby Weir.

At the Brisbane City Gauge (lower end of Edward Street and at Thornton Street), minor flood levels of about 2.1 metres are expected with the afternoon high tide on Tuesday and levels of about 3 metres are expected with the high tides on Wednesday causing moderate flooding.

(3 metres at the Brisbane City gauge is about 1.5 metres higher than the highest tide of the year at this location).

Predicted River Heights/Flows:

Ipswich: Reach about 12.7 metres (major) during Tuesday afternoon.

Moggill: Reach about 12 metres (minor) during Tuesday afternoon.

Jindalee: Reach about 7 metres (minor) overnight Tuesday.

D411

Brisbane: Reach about 2.1 metres (minor) with the afternoon high tide on Tuesday. Reach about 3 metres (moderate) with the high tides on Wednesday.

(3 metres at the Brisbane City gauge is about 1.5 metres higher than the highest tide of the year at this location).

Further rises are possible at all four locations depending on further rain.

Next Issue:

The next warning will be issued at about 8am Tuesday.

Latest River Heights:

Lockyer Ck at Helidon #	12.68m steady	03:02 PM MON 10/01/11
Flagstone Ck at Brown-Zirbels Rd *	3.49m falling	02:10 AM TUE 11/01/11
Sandy Creek at Sandy Creek Road #	2.15m falling	03:19 AM TUE 11/01/11
Ma Ma Ck at Harm's *	3.26m rising	02:30 AM TUE 11/01/11
Tenthill Ck at Tenthill *	5.57m rising	02:40 AM TUE 11/01/11
Lockyer Ck at Gatton #	18.92m rising	06:30 PM MON 10/01/11
Laidley Ck at Mulgowie *	6.39m rising	02:20 AM TUE 11/01/11
Laidley Ck at Laidley	8.7m falling slowly	10:00 PM MON 10/01/11
Laidley Ck at Showground Weir #	7.84m rising	03:25 AM TUE 11/01/11
Laidley Ck at Warrego Hwy *	6.41m rising	02:00 AM TUE 11/01/11
Lockyer Ck at Glenore Grove #	13.8m falling	03:24 AM TUE 11/01/11
Lockyer Ck at Lyons Br #	15.55m rising	03:23 AM TUE 11/01/11
Lockyer Ck at Rifle Range Rd *	15.39m rising	02:40 AM TUE 11/01/11

Lockyer Ck at O'Reilly's Weir # 18m falling 03:28 AM TUE 11/01/11

Brisbane R at Lowood Pump Stn # 15.93m falling 03:31 AM TUE 11/01/11

Brisbane R at Savages Crossing # 15.89m rising 03:29 AM TUE 11/01/11

Brisbane R at Burtons Br # 12.22m rising 03:29 AM TUE 11/01/11

Brisbane R at Kholo Br # 7.99m rising 03:29 AM TUE 11/01/11

Brisbane R at Mt Crosby # 15.82m steady 03:30 AM TUE 11/01/11

Brisbane R at Mt Crosby # 14.08m falling 04:39 PM MON 10/01/11

Brisbane R at Colleges Crossing # 13.91m rising 03:32 AM TUE 11/01/11

Bremer R at Rosewood# 5.56m falling 03:11 AM TUE 11/01/11

Bremer R at Five Mile Br Walloon # 6.4m rising 03:15 AM TUE 11/01/11

Warrill Ck at Greens Rd Amberley # 5.84m falling 03:29 AM TUE 11/01/11

Bremer R at One Mile Br # 13.75m rising 03:31 AM TUE 11/01/11

Bremer R at Hancocks Br Brassall # 11.33m rising 03:22 AM TUE 11/01/11

Bremer R at Ipswich # 8.55m rising 03:31 AM TUE 11/01/11

Brisbane R at Moggill # 7.07m rising 03:29 AM TUE 11/01/11

Brisbane R at Jindalee Br # 4.5m rising 03:29 AM TUE 11/01/11

Brisbane R at City Gauge # 1.4m falling 03:15 AM TUE 11/01/11

*automatic station

Warnings and River Height Bulletins are available at http://www.bom.gov.au/qld/flood/ . Flood Warnings are also available on telephone 1300 659 219 at a low call cost of 27.5 cents, more from mobile, public and satellite phones.

----------Safe Stamp----------

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

For more information regarding this service, please contact your service provider.

Robert Drury

Dam Operations Manager

Water Delivery

Queensland Bulk Water Supply Authority *trading as* Seqwater

D415

TECHNICAL SITUATION REPORT

TSR Number	W38	Date of TSR release	11.1.2011	Time of TSR release	6.30am

Seqwater status of inflows and dam operations

Current status but could change based on inflows or rainfall.

Current objectives	• Maintain releases to keep Wivenhoe below RL74 at which significant releases need to be made to ensure the dam security and minimise flood impacts downstream if possible	
Strategy	• Maintain current release of 2750cumecs as long as possible but it may need to be increased • Close sluices at Somerset Dam to store more water however will affect upstream areas. •	
Key considerations	Storage levels:	Above FSL
	Inflows:	Inflows expected around 1,500,000ML which is close to 1974 event.
	Rainfall:	Continuing
	Lockyer/Bremer:	Monitoring their inflows
	Brisbane River:	Impact as below.

Rainfall

Rainfall continues in the North Pine Dam, Somerset Dam and Wivenhoe Dam catchments. Isolated falls in the Upper Brisbane River of up to 125 mm have been recorded with widespread falls of 40 to 70 mm in the Somerset Dam catchment. This rainfall will increase inflows into the dam.

There has also been 20 to 60 mm in the Lockyer Creek catchment in the last 12 hours with falls of up to 30 mm in the Bremer River.

A severe weather warning remains current for heavy rainfall in the dam catchment areas. The QPF issued by BOM at 16:00 estimates rainfalls for the 24 hours to 10:00 Tuesday as North Pine Dam (25mm to 50mm, with isolated falls to 100mm); Wivenhoe/Somerset Dam Catchments (25mm to 50mm, with isolated falls to 100mm).

North Pine Dam (Full Supply Level 39.60 m AHD)

The dam level is 39.80m AHD and has commenced rising again (storing 4,400ML above FSL). Five gates are open releasing 177 m3/s. The inflow into the dam since the commencement of the event is 77,000 ML. Estimated event volume is 88,000 ML assuming no further rainfall. Releases from the dam will continue until at least Wednesday 12 January 2011.

Somerset Dam (Full Supply Level 99.00 m AHD)

The dam level is 103.27m AHD and falling slowly. Peak inflow to the dam is estimated to be about

4,200 m3/s. Total discharge into Wivenhoe Dam is currently 1400 m3/s and this discharge will be decreased in the next few hours to be around 500 m3/s later on Tuesday. This is to ensure that the combined flood mitigation capacity in Somerset and Wivenhoe Dam is maximized.

The dam level peaked at 103.52m AHD at 19:00 on Monday 10 January 2011, (unless further significant rainfall is experienced). Areas around Kilcoy will continue to be adversely affected.

Wivenhoe Dam (Full Supply Level 67.00 m AHD)

The dam level is 73.51m AHD and rising at about 25 mm/hour. Releases from the dam have been held at a rate of 2,750 m3/s since 19:30 hours on Monday 10 January 2011. Outflows into the Brisbane River from both Lockyer Creek and the Bremer River are also increasing.

The BoM has provided further advice about the flash flooding experienced in the upper areas of Lockyer Creek. The rainfall responsible for this event was not observed at any rainfall stations but it is considered to be extreme. Flood levels in the Lockyer Creek catchment will exceed maximum recorded levels in some stations in the upper catchment. This flow will result in increases in Brisbane River levels below the junction of Lockyer Creek.

Five radial gates are currently open at the dam releasing about 2,750m3/s into the Brisbane River. At this stage, the dam will reach just over 74.0m AHD during Tuesday evening.

Above EL 74.0m AHD the objective for dam operations is to maintain the security of the dam and minimise downstream flood flows if possible.

If further rainfall occurs, dam releases may need to be increased further and this may result in river flows in the lower Brisbane River approaching or exceeding 5,000m3/s.

Impacts downstream of Wivenhoe Dam

The projected Wivenhoe Dam releases combined with Lockyer Creek flows and local runoff will mean that all crossings downstream of Wivenhoe (Twin Bridges, Fernvale, Savages Crossing, Burtons Bridge, Kholo Bridge, Mt Crosby Weir and Colleges Crossing) will be adversely impacted until at least Sunday 16 January in varying degrees.

Water levels in the lower Brisbane River will be impacted by the combined flows of Lockyer Creek, Bremer River, local runoff and releases from Wivenhoe Dam.

The BoM will provide further information regarding the magnitude of the flash flood event occurring in Lockyer Creek early Tuesday morning. Consideration was given to modifying the releases from Wivenhoe Dam to try to moderate the peak flows emanating from Lockyer Creek but the rainfall in the past 12 hours in the catchment above the dam makes this option not possible. Therefore instead of decreasing releases to accommodate the Lockyer Creek flows, the strategy will endeavour to maintain the current releases until Lockyer Creek peaks.

Outlook

Heavy rainfall continues throughout South East Queensland and the situation could deteriorate over the next 24 hours. The flood operation centre will continue to monitor the situation and provide situation reports every six hours until the situation stabilizes.

Seqwater Technical Officer name	Robert Drury
Seqwater Technical Officer position title	Dam Operations Manager
[redacted]	

BoM assessment

(consisting of references to latest Flood Warning for the Brisbane River and other relevant Bureau forecasts and warnings (e.g. weather/rain forecasts, Tropical Cyclone Warning etc) and other updates/comments if needed)

BoM has been advised.

BoM Technical Officer name	Peter Baddiley
BoM Technical Officer position title	
BoM Technical Officer contact details	flood.qld [redacted]

Brisbane City Council (BCC) assessment

(to include predicted local inundation areas and depths of inundation based on the informotion)

Council has been advised of the current status.

BCC Technical Officer name	Chris Lavin
BCC Technical Officer position title	Disaster Operations Manager
BCC Technical Officer contact details	[redacted]

Ipswich City Council (ICC) assessment (if required)

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised of the current status.

ICC Technical Officer name	Tony Trace
ICC Technical Officer position title	Local Disaster Response Coordinator
ICC Technical Officer contact details	[redacted]

Somerset Regional Council (SRC) assessment (if required)

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised of the current status.

SRC Technical Officer name	Tony Jacobs
SRC Technical Officer position title	Local Disaster Response Coordinator
SRC Technical Officer contact details	[redacted]

Collated and distributed by (Agency)

Contact Officer signature	
Contact Officer name	Rob Drury
Contact Officer position title	Dam Operations Manager

Next TSR due	Date	11.1.2011	Time	PM	or Event	

1464

Gina O'Driscoll

From: Paul Bird [pbird[redacted]
Sent: Tuesday, 11 January 2011 6:47 AM
To: SEQWGM Media; Reception; aroebuck[redacted]
greg.swain[redacted]; GSTUBBS[redacted]; Kathy Petrik; lisa.m.martin[redacted]; Paula Weston; tjacobs[redacted]
Arminda Roberts; Bec Middlemiss; Michael Fiechtner; Mike Foster; Tara King; Barry Dennien; Dan Spiller; Scott Denner
Cc: Michael Lyons; Mike Foster; Geoff Stead
Subject: Release Update
Attachments: image001.jpg; image004.jpg

As at 7.00 am on Tuesday 11 January, the following applies:

SOMERSET DAM:
Water is being released into Wivenhoe; however the amount discharged can change as conditions change. Levels in Somerset are expected to continue rising.

Areas around Kilcoy are likely to be impacted as a result of the rising dam levels.

WIVENHOE DAM:
Upstream levels are rising quickly as a result of significant heavy rainfall. The objective for dam operations will be to minimise the impact of urban flooding in areas downstream of the dam.

Releases through five gates have been held at around 236,000 megalitres a day since early Monday night 10 January as a result of outflows into the Brisbane River from the Lockyer Creek and Bremer River.

If further rainfall occurs, dam releases may need to be increased further.

Local Councils have been advised that as a result of Lockyer Creek flows, local runoff and Wivenhoe releases, Twin Bridges, Savages Crossing, Burtons Bridge, Kholo Bridge Colleges Crossing, Fernvale Bridge, and Mt Crosby Weir Bridge may be inundated until at Sunday 16 January.

NORTH PINE DAM:
Five gates are open, releasing around 15,000 megalitres a day and will continue until at least Wednesday 12 January.

The local Council is being kept informed regarding Youngs Crossing.

LESLIE HARRISON DAM:
Gate releases are underway due to rainfall and inflows.

HINZE DAM:
A minor release of around 1200 megalitres a day is being made through the emergency gates. There is no public access to the spillway.

For detailed information on road crossing closures and other potential impacts, always contact your local council.

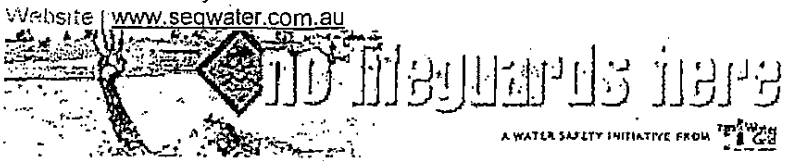
This information will be updated during Tuesday 11 January.

Paul Bird
Senior Communications Advisor
Queensland Bulk Water Supply Authority *trading as* Seqwater

seqwater
WATER FOR LIFE

[redacted]

Level 3, 240 Margaret St, Brisbane City QLD 4000
PO Box 16146, City East QLD 4002
Website | www.seqwater.com.au



Swimming in weirs and fast flowing water is FATAL.

rethink it.

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Gina O'Driscoll

From: Barry Dennien
Sent: Tuesday, 11 January 2011 6:57 AM
To: Madgwick.DarrenT[redacted]; Dunn.KerryG[redacted]; Martin.Peter.J[redacted]
Subject: Wivenhoe releases - Monday PM
Attachments: img-110173945-0001.jpg; Technical Situation Report W37.docx

Folks

Please find latest Technical report on Wivenhoe releases, BOM forecast of river heights accounting for the releases and downstream flows, and BCC flood maps accounting for the releases and downstream flows. Brisbane forecasts of properties impacted.

Further updates will be issued tomorrow morning.

Australian Government Bureau of Meteorology Queensland

PRIORITY
FLOOD WARNING FOR THE LOCKYER, BREMER, WARRILL AND BRISBANE RIVER BELOW WIVENHOE INCLUDING BRISBANE CITY Issued at 4:16 PM on Monday the 10th of January 2011 by the Bureau of Meteorology, Brisbane.

Stream level rises causing moderate to major flooding are being recorded in Lockyer Creek, Warrill Creek and and along the Bremer River. Major flood levels are likely at Ipswich during Tuesday.

Wivenhoe dam is providing significant mitigation of upper Brisbane floods. River flows from the Bremer and Lockyer catchments combined with releases from Wivenhoe dam are expected to increase levels in Brisbane overnight and through Tuesday.

At the Brisbane City Gauge, a river levels of about 2.1 metres is expected with the afternoon high tide on Tuesday and about 3 metres is expected with the high tides on Wednesday causing moderate flooding.

metres at the Brisbane City gauge is about 1.5 metres higher than the highest tide of the year at this location).

LOCKYER CREEK:
Further rainfall during Monday has led to renewed rises in the Lockyer Creek catchment. Rainfall is forecast to continue this evening and a return to moderate to major flood levels is expected overnight and during Tuesday. Major flood levels are expected to continue at Lyons Bridge with rises above 15 metres likely during Tuesday.

BREMER RIVER:
Rainfall during Monday will lead to renewed rises and a return to moderate flood levels along the Bremer River to Walloon. Levels over 5 metres are expected at Rosewood overnight.

The Bremer River at Ipswich is expected to reach about 12.7 metres on Tuesday afternoon. Higher levels are possible.

WARRILL CREEK

Further rainfall during Monday will lead to increasing river levels along Warrill Creek with levels expected to reach above 6 metres at Amberley overnight.

MIDDLE AND LOWER BRISBANE:
SEQwater advises releases from Wivenhoe Dam will increase during Monday.
Moderate flooding is expected at Savages Crossing and at Mt Crosby Weir overnight tonight and during Tuesday.

The Brisbane River at the City Gauge (lower end of Edward Street and at Thornton Street) is expected to reach about 2.1 metres with the afternoon high tide on Tuesday and reach about 3 metres with the high tides on Wednesday causing moderate flooding.

(3 metres at the Brisbane City gauge is about 1.5 metres higher than the highest tide of the year at this location).

Predicted River Heights/Flows:
Ipswich: Reach about 12.7 metres (major) during Tuesday afternoon. Quicker rises and higher levels are possible depending on further rainfall tonight.

Moggill: Reach about 12 metres (minor) during Tuesday afternoon.

Jindalee: Reach about 7 metres (minor) overnight Tuesday.

Brisbane: Reach about 2.1 metres with the afternoon high tide on Tuesday.
Reach about 3 metres with the high tides on Wednesday causing moderate flooding.

(3 metres at the Brisbane City gauge is about 1.5 metres higher than the highest tide of the year at this location).

Further rises are possible at all four locations depending on further rain.

Next Issue:
The next warning will be issued at about 9pm Monday.

Brisbane Properties affected

Number of properties affected:
- 455 properties (parcels of land) have been identified as experiencing flooding on next Wednesday (at least 221 of these are homes and businesses)
- 7, 731 properties may see some flooding either on the land or outside the property
- More than 400 streets will be affected by flooding in some way

Below is the list of suburbs where the 455 properties that will be affected are located. In brackets is the number of properties/parcels of land that will be affected in each suburb. This is based on the data and modelling we have done to date and we may see increases in these numbers once figures are revised.
- Rocklea (80)
- Albion (49)
- Milton (49)
- Auchenflower (40)
- Norman Park (26)
- Pinkenba (26)
0- Oxley (19)
- New Farm (17)
- Kangaroo Point (16)
- Bulimba & Sherwood (14 each)
- Yeronga (10)
- Graceville (9)

- Newstead (8)
- Yeerongpilly (7)
- Bowen Hills (6)
- Indooroopilly, Windsor (5 each)
- Wacol, Brisbane City, Moggill, East Brisbane, Fortitude Valley (4 each)
- Chelmer, Hemmant, Tennyson (3 each)
- Fairfield, Fig Tree Pocket, Coorparoo, South Brisbane, Lytton, Murrarie (2 each)

7 Rapid Response Group teams will be working from both a map and a database to doorknock/letterbox drop a flyer to the 221 homes and businesses that are predicted as being likely to experience innundation. They will visually check using the map that none of the remaining parcels of land from the total 455 properties identified as experiencing flooding are actually homes or businesses also.

The locations where the 221 homes and businesses are located is Albion, Auchenflower, Brisbane City, Bowen Hills, Bulimba, Fortitude Valley, Graceville, Hemmant, Indooroopilly, Kangaroo Point, Lytton, Milton, New Farm, Newstead, Norman Park, Oxley, Pinkenba, Rocklea, Sherwood, Tennyson, Wacol, Windsor, Yeronga.

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- Newstead (8)
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- Wacol, Brisbane City, Moggill, East Brisbane, Fortitude Valley (4 each)
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Regards

Barry Dennien
Chief Executive Officer
SEQ Water Grid Manager
[redacted]
Email: barry.dennien[redacted]
Visit: Level 15, 53 Albert Street, Brisbane

Post: PO Box 16205, City East Qld 4002
ABN: 14783 317 630

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

Litsupport Brisbane

From: Dan Spiller
Sent: Tuesday, 11 January 2011 7:17 AM
To: 'stephen.robertson[redacted]; 'Ken Smith (ken.smith[redacted])'; 'Lance McCallum (lance.mccallum[redacted])'; 'Tim Watts (tim.watts[redacted]'; 'Geoff Stead (geoff.stead[redacted] 'lauren.sims@[redacted] 'Martin.PeterJ[redacted] 'Dunn.KerryG[redacted]
Cc: Barry Dennien; 'pborrows[redacted]'; 'Rob Drury'; 'pbird[redacted]; 'Damien Brown (damien.brown[redacted])'; 'bob.reilly[redacted] 'terry.wall[redacted] 'Madgwick.DarrenT[redacted]
Subject: Water Grid dam release strategy
Attachments: Technical Situation Report W38.docx

All,

Attached is the latest report, with the BoM warning on the Lockyer flood below.

Key points are:

- Current releases are 2,750 cubic metres per second (about 240,000 ML/day). Due to heavy rainfall in the catchment, it was not possible to reduce releases to allow the Lockyer Valley flows to pass.
- Further rainfall may result in the need to increase releases.
- Wivenhoe Dam is at 73.51m AHD and rising at about 25mm/hour. Above 74m, the primary objective becomes maintaining the security of the dam. Releases would be increased at this level with less scope for consideration of downstream impacts.

The BoM is remodeling based on this release strategy. There is some uncertainty about the level of flows coming from the Lockyer.

Please call me or [redacted] if you require any further information.

Debbie and Tim: I recommend that a briefing for the Minister would be appropriate, perhaps around 10am.

Regards,
Daniel Spiller

Australian Government Bureau of Meteorology Queensland

PRIORITY
FLOOD WARNING FOR THE LOCKYER, BREMER, WARRILL AND BRISBANE RIVER BELOW WIVENHOE INCLUDING BRISBANE CITY Issued at 4:06 AM on Tuesday the 11th of January 2011 by the Bureau of Meteorology, Brisbane.

The main flood waters in the Lockyer Creek are now arriving at Lyons Bridge, with strong stream rises expected during Tuesday.

Wivenhoe dam is providing significant mitigation of upper Brisbane floods. River flows from the Bremer and Lockyer catchments combined with releases from Wivenhoe dam are expected to increase levels in Brisbane during Tuesday.

At the Brisbane City Gauge, minor flood levels of about 2.1 metres are expected with the afternoon high tide on Tuesday and levels of about 3 metres are expected with the high tides on Wednesday causing moderate flooding.

(3 metres at the Brisbane City gauge is about 1.5 metres higher than the highest tide of the year at this location).

LOCKYER CREEK:
Extremely heavy rainfall during Monday led to extreme rises in the Lockyer Creek catchment and Laidley Creek at Mulgowie. Record flood levels of 18.92 metres were recorded at Gatton Monday evening before the station failed. This level was well above the previous record peak of 16.33 metres from the February 1893 flood.

The main flood waters are currently arriving at Lyons Bridge, with strong stream rises expected in the next few hours. The Lockyer Creek at Glenore Grove peaked at 14.60 metres at 11:30pm, which is 0.3 metres below the 1974 flood.

Renewed stream rises have commenced in Lockyer Creek at Lyons Bridge with a peak between 16 and 16.5 metres expected Tuesday morning. This is likely to be similar in level to the 1996 flood.

BREMER RIVER:
The Bremer River at Walloon has exceeded the moderate flood level. The Bremer River at Rosewood peaked at 5.8 metres around midnight monday.

The Bremer River at Ipswich is expected to reach about 12.7 metres on Tuesday afternoon. Higher levels are possible.

WARRILL CREEK
Warrill Creek at Amberley peaked at 5.98 metres around 9pm Monday.

MIDDLE AND LOWER BRISBANE:
Moderate flooding is developing at Savages Crossing and at Mt Crosby Weir.

At the Brisbane City Gauge (lower end of Edward Street and at Thornton Street), minor flood levels of about 2.1 metres are expected with the afternoon high tide on Tuesday and levels of about 3 metres are expected with the high tides on Wednesday causing moderate flooding.

(3 metres at the Brisbane City gauge is about 1.5 metres higher than the highest tide of the year at this location).

Predicted River Heights/Flows:
Ipswich: Reach about 12.7 metres (major) during Tuesday afternoon.

Moggill: Reach about 12 metres (minor) during Tuesday afternoon.

Jindalee: Reach about 7 metres (minor) overnight Tuesday.

Brisbane: Reach about 2.1 metres (minor) with the afternoon high tide on Tuesday. Reach about 3 metres (moderate) with the high tides on Wednesday.

(3 metres at the Brisbane City gauge is about 1.5 metres higher than the highest tide of the year at this location).

Further rises are possible at all four locations depending on further rain.

Next Issue:

D429

The next warning will be issued at about 8am Tuesday.

Latest River Heights:

Lockyer Ck at Helidon #	12.68m steady	03:02 PM MON 10/01/11
Flagstone Ck at Brown-Zirbels Rd *	3.49m falling	02:10 AM TUE 11/01/11
Sandy Creek at Sandy Creek Road #	2.15m falling	03:19 AM TUE 11/01/11
Ma Ma Ck at Harm's *	3.26m rising	02:30 AM TUE 11/01/11
Tenthill Ck at Tenthill *	5.57m rising	02:40 AM TUE 11/01/11
Lockyer Ck at Gatton #	18.92m rising	06:30 PM MON 10/01/11
Laidley Ck at Mulgowie *	6.39m rising	02:20 AM TUE 11/01/11
Laidley Ck at Laidley	8.7m falling slowly	10:00 PM MON 10/01/11
Laidley Ck at Showground Weir #	7.84m rising	03:25 AM TUE 11/01/11
Laidley Ck at Warrego Hwy *	6.41m rising	02:00 AM TUE 11/01/11
Lockyer Ck at Glenore Grove #	13.8m falling	03:24 AM TUE 11/01/11
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Brisbane R at Lowood Pump Stn #	15.93m falling	03:31 AM TUE 11/01/11
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Brisbane R at Jindalee Br #	4.5m rising	03:29 AM TUE 11/01/11
Brisbane R at City Gauge #	1.4m falling	03:15 AM TUE 11/01/11

*automatic station

Warnings and River Height Bulletins are available at http://www.bom.gov.au/qld/flood/ . Flood Warnings are also available on telephone 1300 659 219 at a low call cost of 27.5 cents, more from mobile, public and satellite phones.

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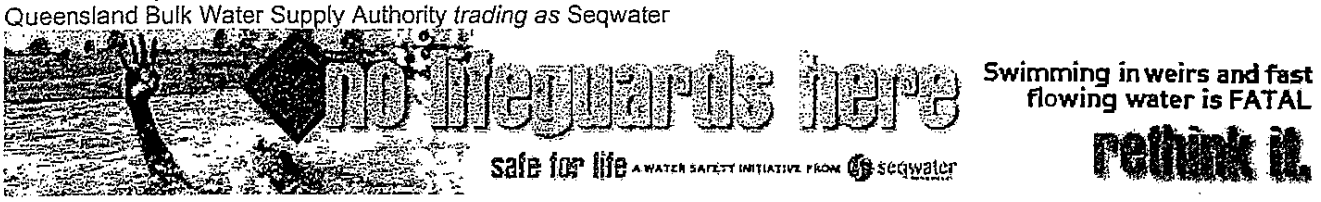
Robert Drury
Dam Operations Manager
Water Delivery
Queensland Bulk Water Supply Authority *trading as* Seqwater



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

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TECHNICAL SITUATION REPORT

TSR Number	W38	Date of TSR release	11.1.2011	Time of TSR release	6.30am

Seqwater status of inflows and dam operations

Current status but could change based on inflows or rainfall.

Current objectives	• Maintain releases to keep Wivenhoe below RL74 at which significant releases need to be made to ensure the dam security and minimise flood impacts downstream if possible	
Strategy	• Maintain current release of 2750cumecs as long as possible but it may need to be increased • Close sluices at Somerset Dam to store more water however will affect upstream areas. •	
Key considerations	Storage levels:	Above FSL
	Inflows:	Inflows expected around 1,500,000ML which is close to 1974 event.
	Rainfall:	Continuing
	Lockyer/Bremer:	Monitoring their inflows
	Brisbane River:	Impact as below.

Rainfall

Rainfall continues in the North Pine Dam, Somerset Dam and Wivenhoe Dam catchments. Isolated falls in the Upper Brisbane River of up to 125 mm have been recorded with widespread falls of 40 to 70 mm in the Somerset Dam catchment. This rainfall will increase inflows into the dam.

There has also been 20 to 60 mm in the Lockyer Creek catchment in the last 12 hours with falls of up to 30 mm in the Bremer River.

A severe weather warning remains current for heavy rainfall in the dam catchment areas. The QPF issued by BOM at 16:00 estimates rainfalls for the 24 hours to 10:00 Tuesday as North Pine Dam (25mm to 50mm, with isolated falls to 100mm); Wivenhoe/Somerset Dam Catchments (25mm to 50mm, with isolated falls to 100mm).

North Pine Dam (Full Supply Level 39.60 m AHD)

The dam level is 39.80m AHD and has commenced rising again (storing 4,400ML above FSL). Five gates are open releasing 177 m3/s. The inflow into the dam since the commencement of the event is 77,000 ML. Estimated event volume is 88,000 ML assuming no further rainfall. Releases from the dam will continue until at least Wednesday 12 January 2011.

Somerset Dam (Full Supply Level 99.00 m AHD)

The dam level is 103.27m AHD and falling slowly. Peak inflow to the dam is estimated to be about

D432

4,200 m3/s. Total discharge into Wivenhoe Dam is currently 1400 m3/s and this discharge will be decreased in the next few hours to be around 500 m3/s later on Tuesday. This is to ensure that the combined flood mitigation capacity in Somerset and Wivenhoe Dam is maximized.

The dam level peaked at 103.52m AHD at 19:00 on Monday 10 January 2011, (unless further significant rainfall is experienced). Areas around Kilcoy will continue to be adversely affected.

Wivenhoe Dam (Full Supply Level 67.00 m AHD)

The dam level is 73.51m AHD and rising at about 25 mm/hour. Releases from the dam have been held at a rate of 2,750 m3/s since 19:30 hours on Monday 10 January 2011. Outflows into the Brisbane River from both Lockyer Creek and the Bremer River are also increasing.

The BoM has provided further advice about the flash flooding experienced in the upper areas of Lockyer Creek. The rainfall responsible for this event was not observed at any rainfall stations but it is considered to be extreme. Flood levels in the Lockyer Creek catchment will exceed maximum recorded levels in some stations in the upper catchment. This flow will result in increases in Brisbane River levels below the junction of Lockyer Creek.

Five radial gates are currently open at the dam releasing about 2,750m3/s into the Brisbane River. At this stage, the dam will reach just over 74.0m AHD during Tuesday evening.

Above EL 74.0m AHD the objective for dam operations is to maintain the security of the dam and minimise downstream flood flows if possible.

If further rainfall occurs, dam releases may need to be increased further and this may result in river flows in the lower Brisbane River approaching or exceeding 5,000m3/s.

Impacts downstream of Wivenhoe Dam

The projected Wivenhoe Dam releases combined with Lockyer Creek flows and local runoff will mean that all crossings downstream of Wivenhoe (Twin Bridges, Fernvale, Savages Crossing, Burtons Bridge, Kholo Bridge, Mt Crosby Weir and Colleges Crossing) will be adversely impacted until at least Sunday 16 January in varying degrees.

Water levels in the lower Brisbane River will be impacted by the combined flows of Lockyer Creek, Bremer River, local runoff and releases from Wivenhoe Dam.

The BoM will provide further information regarding the magnitude of the flash flood event occurring in Lockyer Creek early Tuesday morning. Consideration was given to modifying the releases from Wivenhoe Dam to try to moderate the peak flows emanating from Lockyer Creek but the rainfall in the past 12 hours in the catchment above the dam makes this option not possible. Therefore instead of decreasing releases to accommodate the Lockyer Creek flows, the strategy will endeavour to maintain the current releases until Lockyer Creek peaks.

Outlook

Heavy rainfall continues throughout South East Queensland and the situation could deteriorate over the next 24 hours. The flood operation centre will continue to monitor the situation and provide situation reports every six hours until the situation stabilizes.

Seqwater Technical Officer name	Robert Drury
Seqwater Technical Officer position title	Dam Operations Manager
[redacted]	

D433

BoM assessment

(consisting of references to latest Flood Warning for the Brisbane River and other relevant Bureau forecasts and warnings (e.g. weather/rain forecasts, Tropical Cyclone Warning etc) and other updates/comments if needed)

BoM has been advised.

BoM Technical Officer name	Peter Baddiley
BoM Technical Officer position title	
BoM Technical Officer contact details	flood.qld[redacted]

Brisbane City Council (BCC) assessment

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised of the current status.

BCC Technical Officer name	Chris Lavin
BCC Technical Officer position title	Disaster Operations Manager
BCC Technical Officer contact details	[redacted]

Ipswich City Council (ICC) assessment (if required)

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised of the current status.

ICC Technical Officer name	Tony Trace
ICC Technical Officer position title	Local Disaster Response Coordinator
ICC Technical Officer contact details	[redacted]

Somerset Regional Council (SRC) assessment (if required)

(to include predicted local inundation areas and depths of inundation bosed on the information)

Council has been advised of the current status.

SRC Technical Officer name	Tony Jacobs
SRC Technical Officer position title	Local Disaster Response Coordinator
SRC Technical Officer contact details	[redacted]

D434

Collated and distributed by (Agency)

Contact Officer signature	
Contact Officer name	Rob Drury
Contact Officer position title	Dam Operations Manager

Next TSR due	**Date**	11.1.2011	**Time**	PM	**or Event**	

D435

From: Barry Dennien <Barry.Dennien[redacted]
Sent: Tuesday, January 11, 2011 8:32 AM
To: Dan Spiller <Daniel.Spiller[redacted]
Subject: Re: Levels

Yes
Wed night ipswich
Thurs brisbane

Regards
Barry Dennien

On 11/01/2011, at 8:28 AM, "Dan Spiller" <Daniel.Spiller[redacted]> wrote:

> Based on 3700 cumecs release?
>
> By when?

From: Barry Dennien
Sent: Tuesday, 11 January 2011 8:29 AM
To: Dan Spiller
Subject: Re: Levels

BOM forecast 6000 plus cumecs in river 4 plus meters at port office

74 flood 5.45m

Regards

Barry Dennien

On 11/01/2011, at 8:00 AM, "Dan Spiller" <Daniel.Spiller[redacted]> wrote:

> Wivenhoe Dam: 173%
>
> Somerset Dam: 160%
>
> **Daniel Spiller**
>
> Director, Operations
>
> **SEQ Water Grid Manager**

Phone: [redacted]

Email: daniel.spiller[redacted]

Visit: Level 15, 53 Albert Street Brisbane

Post: PO Box 16205, City East QLD 4002

ABN: 14783 317 630

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Cindy Hulsey

From: Barry Dennien
Sent: Tuesday, 11 January 2011 8:33 AM
To: Dan Spiller
Subject: Re: Levels

Categories: T8

Dan let quu know asap

Regards
Barry Dennien

On 11/01/2011, at 8:28 AM, "Dan Spiller" <Daniel.Spiller[redacted]> wrote:

> Based on 3700 cumecs release?
>
> By when?

From: Barry Dennien
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Regards

Barry Dennien

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> Somerset Dam: 160%
>
> **Daniel Spiller**
>
> Director, Operations
>
> **SEQ Water Grid Manager**

D472

Phone: [redacted]

Email: daniel.spiller[redacted]

Visit: Level 15, 53 Albert Street Brisbane

Post: PO Box 16205, City East QLD 4002

ABN: 14783 317 630

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Cindy Hulsey

From: Tim Watts [Tim.Watts[redacted]
Sent: Tuesday, 11 January 2011 8:52 AM
To: Dan Spiller; Best Debbie; Lance McCallum; Geoff Stead; pborrows[redacted]
Barry Dennien
Subject: RE: Water Grid dam release strategy

Categories: T8

After speaking to Dan, his offer a face-to-face briefing is not required.
We don't want to impact on operations and are happy to be updated by email or phone.
Tim

Tim Watts
Policy Advisor
Office of the Minister for Natural Resources,
Mines and Energy and Minister for Trade
[redacted]

From: Tim Watts
Sent: Tuesday, 11 January 2011 8:32 AM
To: 'Dan Spiller'; 'Best Debbie'; Lance McCallum; Geoff Stead; 'pborrows[redacted]'; Dennien Barry
Subject: RE: Water Grid dam release strategy

Dan Debbie
A briefing would be good at a time appropriate to your setting of the release strategy for the coming hours.
Please confirm if 10am is still your preferred time.
Please also let me know if you require assistance from this end.
Tim

Tim Watts
Policy Advisor
Office of the Minister for Natural Resources,
Mines and Energy and Minister for Trade
[redacted]

From: Dan Spiller [mailto:Daniel.Spiller[redacted]]
Sent: Tuesday, 11 January 2011 7:17 AM
To: Stephen Robertson; 'Ken Smith (ken.smith[redacted])'; Lance McCallum; Tim Watts; Geoff Stead; Lauren Sims; 'Martin.PeterJ[redacted]'; 'Dunn.KerryG[redacted]'
Cc: Barry Dennien; 'pborrows[redacted]'; 'Rob Drury'; 'pbird[redacted]'; 'Damien Brown (damien.brown[redacted])'; 'bob.reilly[redacted]'; 'terry.wal[redacted]'; 'Madgwick.Darren[redacted]'
Subject: Water Grid dam release strategy

All,

Attached is the latest report, with the BoM warning on the Lockyer flood below.

Key points are:

- Current releases are 2,750 cubic metres per second (about 240,000 ML/day). Due to heavy rainfall in the catchment, it was not possible to reduce releases to allow the Lockyer Valley flows to pass.
- Further rainfall may result in the need to increase releases.

- Wivenhoe Dam is at 73.51m AHD and rising at about 25mm/hour. Above 74m, the primary objective becomes maintaining the security of the dam. Releases would be increased at this level with less scope for consideration of downstream impacts.

The BoM is remodeling based on this release strategy. There is some uncertainty about the level of flows coming from the Lockyer.

Please call me on [redacted] if you require any further information.

Debbie and Tim: I recommend that a briefing for the Minister would be appropriate, perhaps around 10am.

Regards,
Daniel Spiller

Australian Government Bureau of Meteorology Queensland

PRIORITY
FLOOD WARNING FOR THE LOCKYER, BREMER, WARRILL AND BRISBANE RIVER BELOW WIVENHOE INCLUDING BRISBANE CITY Issued at 4:06 AM on Tuesday the 11th of January 2011 by the Bureau of Meteorology, Brisbane.

The main flood waters in the Lockyer Creek are now arriving at Lyons Bridge, with strong stream rises expected during Tuesday.

Wivenhoe dam is providing significant mitigation of upper Brisbane floods. River flows from the Bremer and Lockyer catchments combined with releases from Wivenhoe dam are expected to increase levels in Brisbane during Tuesday.

At the Brisbane City Gauge, minor flood levels of about 2.1 metres are expected with the afternoon high tide on Tuesday and levels of about 3 metres are expected with the high tides on Wednesday causing moderate flooding.

(3 metres at the Brisbane City gauge is about 1.5 metres higher than the highest tide of the year at this location).

LOCKYER CREEK:
Extremely heavy rainfall during Monday led to extreme rises in the Lockyer Creek catchment and Laidley Creek at Mulgowie. Record flood levels of 18.92 metres were recorded at Gatton Monday evening before the station failed. This level was well above the previous record peak of 16.33 metres from the February 1893 flood.

The main flood waters are currently arriving at Lyons Bridge, with strong stream rises expected in the next few hours. The Lockyer Creek at Glenore Grove peaked at 14.60 metres at 11:30pm, which is 0.3 metres below the 1974 flood.

Renewed stream rises have commenced in Lockyer Creek at Lyons Bridge with a peak between 16 and 16.5 metres expected Tuesday morning. This is likely to be similar in level to the 1996 flood.

BREMER RIVER:
The Bremer River at Walloon has exceeded the moderate flood level. The Bremer River at Rosewood peaked at 5.8 metres around midnight monday.

The Bremer River at Ipswich is expected to reach about 12.7 metres on Tuesday afternoon. Higher levels are possible.

WARRILL CREEK

Warrill Creek at Amberley peaked at 5.98 metres around 9pm Monday.

MIDDLE AND LOWER BRISBANE:
Moderate flooding is developing at Savages Crossing and at Mt Crosby Weir.

At the Brisbane City Gauge (lower end of Edward Street and at Thornton Street), minor flood levels of about 2.1 metres are expected with the afternoon high tide on Tuesday and levels of about 3 metres are expected with the high tides on Wednesday causing moderate flooding.

(3 metres at the Brisbane City gauge is about 1.5 metres higher than the highest tide of the year at this location).

Predicted River Heights/Flows:
Ipswich: Reach about 12.7 metres (major) during Tuesday afternoon.

Moggill: Reach about 12 metres (minor) during Tuesday afternoon.

Jindalee: Reach about 7 metres (minor) overnight Tuesday.

Brisbane: Reach about 2.1 metres (minor) with the afternoon high tide on Tuesday. Reach about 3 metres (moderate) with the high tides on Wednesday.

(3 metres at the Brisbane City gauge is about 1.5 metres higher than the highest tide of the year at this location).

Further rises are possible at all four locations depending on further rain.

Next Issue:
The next warning will be issued at about 8am Tuesday.

Latest River Heights:

Lockyer Ck at Helidon #	12.68m steady	03:02 PM MON 10/01/11
Flagstone Ck at Brown-Zirbels Rd *	3.49m falling	02:10 AM TUE 11/01/11
Sandy Creek at Sandy Creek Road #	2.15m falling	03:19 AM TUE 11/01/11
Ma Ma Ck at Harm's *	3.26m rising	02:30 AM TUE 11/01/11
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Brisbane R at Moggill #	7.07m rising	03:29 AM TUE 11/01/11

D479

Brisbane R at Jindalee Br #	4.5m rising	03:29 AM TUE 11/01/11
Brisbane R at City Gauge #	1.4m falling	03:15 AM TUE 11/01/11

*automatic station

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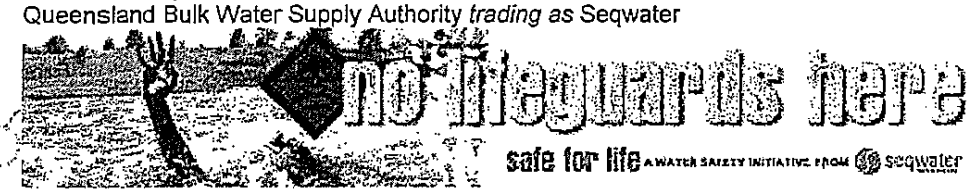
Robert Drury
Dam Operations Manager
Water Delivery
Queensland Bulk Water Supply Authority *trading as* Seqwater



seqwater
WATER FOR LIFE

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

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Cindy Hulsey

From: Dan Spiller
Sent: Tuesday, 11 January 2011 9:06 AM
To: Barry Dennien
Subject: RE: Levels

Categories: T8

Just have.

Colin is sending 5000 cumecs indunation maps and street list now. Starting work on 6000 cumecs impacts.

Seqwater is closing out this strategy. They will then start work on worse case scenarios for this afternoon (ie dam fills to above 75m AHD and all flows need to be passed through). We will provide this to BoM to model river levels and then to Brisbane to model inundation impacts.

QUU advised and planning.

Linkwater advised and planning.

Dan

From: Barry Dennien
Sent: Tuesday, 11 January 2011 9:00 AM
To: Dan Spiller
Subject: Re: Levels

Did you get him

Regards
Barry Dennien

On 11/01/2011, at 8:51 AM, "Dan Spiller" <Daniel.Spiller[redacted]> wrote:

Left msg. Sent email. Ringing again.

From: Barry Dennien
Sent: Tuesday, 11 January 2011 8:52 AM
To: Dan Spiller
Subject: Re: Levels

Dan

Have you rung col Jensen premier has asked

Regards

Barry Dennien

D481

On 11/01/2011, at 8:28 AM, "Dan Spiller" <Daniel.Spiller[redacted]> wrote:

Based on 3700 cumecs release?

By when?

From: Barry Dennien
Sent: Tuesday, 11 January 2011 8:29 AM
To: Dan Spiller
Subject: Re: Levels

BOM forecast 6000 plus cumecs in river 4 plus meters at port office

74 flood 5.45m

Regards

Barry Dennien

On 11/01/2011, at 8:00 AM, "Dan Spiller" <Daniel.Spiller[redacted]> wrote:

Wivenhoe Dam: 173%

Somerset Dam: 160%

Daniel Spiller

Director, Operations

SEQ Water Grid Manager

[redacted]

Email: daniel.spiller[redacted]

Visit: Level 15, 53 Albert Street Brisbane

Post: PO Box 16205, City East QLD 4002

ABN: 14783 317 630

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From: Barry Dennien <Barry.Dennien[redacted]>
Sent: Tuesday, January 11, 2011 9:13 AM
To: Dan Spiller <Daniel.Spiller[redacted]>; Michael Lyons <Michael.Lyons[redacted]>
Subject: Re: Levels

Mike
Can you start preparing a media statement on why we need to release the water

Dam safety in simple English

Secondly things are moving fast we need to think our
Media comments

Regards
Barry Dennien

On 11/01/2011, at 9:06 AM, "Dan Spiller" <Daniel.Spiller[redacted]> wrote:

> Just have.
>
> Colin is sending 5000 cumecs indunation maps and street list now. Starting work on 6000 cumecs impacts.
>
> Seqwater is closing out this strategy. They will then start work on worse case scenarios for this afternoon (ie dam fills to above 75m AHD and all flows need to be passed through). We will provide this to BoM to model river levels and then to Brisbane to model inundation impacts.
>
> QUU advised and planning.
>
> Linkwater advised and planning.
>
> Dan
>
> ---
>
> **From:** Barry Dennien
> **Sent:** Tuesday, 11 January 2011 9:00 AM
> **To:** Dan Spiller

Subject: Re: Levels

Did you get him

Regards

Barry Dennien

On 11/01/2011, at 8:51 AM, "Dan Spiller" <Daniel.Spiller[redacted]> wrote:

Left msg. Sent email. Ringing again.

From: Barry Dennien
Sent: Tuesday, 11 January 2011 8:52 AM
To: Dan Spiller
Subject: Re: Levels

Dan

Have you rung col Jensen premier has asked

Regards

Barry Dennien

On 11/01/2011, at 8:28 AM, "Dan Spiller" <Daniel.Spiller[redacted]> wrote:

Based on 3700 cumecs release?

By when?

From: Barry Dennien
Sent: Tuesday, 11 January 2011 8:29 AM
To: Dan Spiller
Subject: Re: Levels

BOM forecast 6000 plus cumecs in river 4 plus meters at port

office

74 flood 5.45m

Regards

Barry Dennien

On 11/01/2011, at 8:00 AM, "Dan Spiller" <Daniel.Spiller[redacted]> wrote:

Wivenhoe Dam: 173%

Somerset Dam: 160%

Daniel Spiller

Director, Operations

SEQ Water Grid Manager

[redacted]

Email: daniel.spiller[redacted]

Visit: Level 15, 53 Albert Street Brisbane

Post: PO Box 16205, City East QLD 4002

ABN: 14783 317 630

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

Disclaimer

This email, together with any attachments, is intended for the named recipient(s) only; and may contain privileged and confidential information. You understand that any privilege or confidentiality attached to this message is not waived, lost or destroyed because you have received this message in error. If received in error, you are asked to inform the sender as quickly as possible and delete this email and any copies of this from your computer system network.

If not an intended recipient of this email, you must not copy, distribute or take any action(s) that relies on it; any form of disclosure, modification, distribution and/or publication of this email is also prohibited. While all care has been taken, the SEQ Water Grid Manager disclaims all liability for loss or damage to

person or property arising from this message being infected by a computer virus or other contamination. Unless stated otherwise, this email represents only the views of the sender and not the views of the SEQ Water Grid Manager and/or the Queensland Government.

TECHNICAL SITUATION REPORT

TSR Number	W39	Date of TSR release	11.1.2011	Time of TSR release	12.00pm

Seqwater status of inflows and dam operations

Current status but could change based on inflows or rainfall.

Current objectives	• Maintain releases to keep Wivenhoe below fuse plug initiation and releases need to be made to ensure the dam security and minimise flood impacts downstream if possible	
Strategy	• Maintain current release of 3970cumecs as long as possible but it may need to be increased • Close sluices at Somerset Dam to store more water however will affect upstream areas. • Current estimate of peak dam level is between EL74.5 and EL74.8 (assuming no further significant rainfall). However it is noted that rainfall is continuing across the catchment. • Further rainfall in the next 3 hours will require releases to be increased in accordance with Strategy W4, page 29 of the Manual of Operational Procedures for Flood Mitigation at Wivenhoe Dam and Somerset Dam (Flood Operations Manual)	
Key considerations	Storage levels:	Above FSL
	Inflows:	Inflows expected around 1,500,000ML which is close to 1974 event.
	Rainfall:	Continuing
	Lockyer/Bremer:	Monitoring their inflows
	Brisbane River:	Impact as below.

Somerset Dam (Full Supply Level 99.00 m AHD)

The dam level is 103.30 AHD and rising. Peak inflow to the dam is estimated to be about 4,200 m3/s. Volume stored above FSL is 240,00ML at 163.3%

The dam level peaked at 103.52m AHD at 19:00 on Monday 10 January 2011, (unless further significant rainfall is experienced). Areas around Kilcoy will continue to be adversely affected.

Wivenhoe Dam (Full Supply Level 67.00 m AHD)

The dam level is 74.1m AHD and rising at about 25 mm/hour. Holding 930,000ML above FSL and 179.5%.Releases from the dam are currently 3,970cumec/s. Outflows into the Brisbane River from both Lockyer Creek and the Bremer River are also increasing.

At this stage it is considered that without further rainfall the dam can be kept at around 74.8m.

The aim is to prevent fuse plug initiation.

Currently the situation is being assessed every 3 hours.

If further rainfall occurs, dam releases may need to be increased further.

Outlook

Heavy rainfall continues throughout South East Queensland and the situation could deteriorate over the next 24 hours. The flood operation centre will continue to monitor the situation and provide situation reports every six hours until the situation stabilizes.

Seqwater Technical Officer name	Robert Drury
Seqwater Technical Officer position title	Dam Operations Manager
[redacted]	

BoM assessment

(consisting of references to latest Flood Warning for the Brisbane River and other relevant Bureau forecasts and warnings (e.g. weather/rain forecasts, Tropical Cyclone Warning etc) and other updates/comments if needed)

BoM has been advised.

BoM Technical Officer name	Peter Baddiley
BoM Technical Officer position title	
BoM Technical Officer contact details	flood.qld[redacted]

Brisbane City Council (BCC) assessment

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised of the current status.

BCC Technical Officer name	Chris Lavin
BCC Technical Officer position title	Disaster Operations Manager
BCC Technical Officer contact details	[redacted]

Ipswich City Council (ICC) assessment (if required)

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised of the current status.

ICC Technical Officer name	Tony Trace
ICC Technical Officer position title	Local Disaster Response Coordinator
ICC Technical Officer contact details	[redacted]

Somerset Regional Council (SRC) assessment (if required)

(to include predicted local inundation areas and depths of inundation bosed on the information)

Council has been advised of the current status.

SRC Technical Officer name	Tony Jacobs
SRC Technical Officer position title	Local Disaster Response Coordinator
SRC Technical Officer contact details	[redacted]

Collated and distributed by (Agency)

Contact Officer signature	
Contact Officer name	Rob Drury
Contact Officer position title	Dam Operations Manager

Next TSR due	Date	11.1.2011	Time	PM	or Event	

1467

Gina O'Driscoll

From: Paul Bird [pbird[redacted] on behalf of Corporate Communications [corpcommunications[redacted]]
Sent: Tuesday, 11 January 2011 1:02 PM
To: SEQWGM Media; Reception; aroebuck[redacted]; greg.swain[redacted]; GSTUBBS[redacted]; Kathy Petrik; lisa.m.martin[redacted]; Paula Weston; tjacobs[redacted]; Arminda Roberts; Bec Middlemiss; Michael Fiechtner; Mike Foster; Tara King; Barry Dennien; Dan Spiller; Scott Denner
Cc: Michael Lyons; Mike Foster; ELT
Subject: Release Update
Attachments: image001.jpg

As at 1.00 pm on Tuesday 11 January, the following applies:

SOMERSET DAM:
Releases have stopped, however levels in Somerset are expected to continue rising and areas around Kilcoy are likely to be impacted.

WIVENHOE DAM:
Releases through five gates have been increased to 344,000 megalitres as at 1.00pm and may need to be increased to around 516,000 megalitres a day by Wednesday 12 January due to rainfall in the Stanley and Upper Brisbane.

Local Councils have been advised that as a result of Lockyer Creek flows, local runoff and Wivenhoe releases, Twin Bridges, Savages Crossing, Burtons Bridge, Kholo Bridge Colleges Crossing, Fernvale Bridge, and Mt Crosby Weir Bridge may be inundated until at least Sunday 16 January.

NORTH PINE DAM:
Five gates are open, and will continue until at least Wednesday 12 January.

The local Council is being kept informed regarding Youngs Crossing.

LESLIE HARRISON DAM:
Gate releases are underway due to rainfall and inflows.

HINZE DAM:
A minor release of around 4,300 megalitres a day is being made through the emergency gates. There is no public access to the spillway.

For detailed information on river levels, road and crossing closures and other potential impacts, always contact your local council.

RECREATION UPDATE:
Both Wivenhoe and Somerset are closed to all recreational activities.

The following recreation sites are closed –

- O'Sheas Crossing
- Hamon Cove
- Logan Inlet
- Captain Logan Camp
- Lumley Hill
- Spillway Common/ Atkinson's Crossing

1

- Cormorant Bay
- Branch Creek
- Billies Bay/Hays Landing
- The Spit
- Lake Somerset Holiday Park Kirkleagh
- Somerset Park Camping area

This information will be updated during Tuesday 11 January.

Paul Bird
Senior Communications Advisor
Queensland Bulk Water Supply Authority *trading as* Seqwater



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Cindy Hulsey

From: Dan Spiller
Sent: Tuesday, 11 January 2011 1:18 PM
To: Madgwick.DarrenT[redacted]; stephen.robertson[redacted]; Ken Smith (ken.smith[redacted]); Lance McCallum (lance.mccallum[redacted]); Tim Watts (tim.watts[redacted]); lauren.sims[redacted]; Martin.PeterJ[redacted]; Dunn.KerryG[redacted] Debbie Best (debbie.bes[redacted]); terry.wall[redacted]; Geoff Stead (geoff.stead[redacted])
Cc: Barry Dennien; Peter Borrows; Rob Drury (rdrury[redacted]; Stan Stevenson; Madgwick.DarrenT[redacted]
Subject: Wivenhoe Dam release update
Attachments: image001.png; Technical Situation Report W39 (2).docx

Categories: T8

All,

Attached is the updated Technical Situation Report.

Releases from Wivenhoe Dam have needed to be increased to 3,970 cubic metres per second. BoM is modelling based on this strategy.

Based on these releases, Wivenhoe Dam will peak at between 74.5 and 74.8m with no further inflows.

Further inflows will require further releases. Seqwater is considering worst case scenarios to provide to BoM and BCC to model impacts.

Regards,
Daniel Spiller

TECHNICAL SITUATION REPORT

TSR Number	W39	Date of TSR release	11.1.2011	Time of TSR release	12.00pm

Seqwater status of inflows and dam operations

Current status but could change based on inflows or rainfall.

Current objectives	• Maintain releases to keep Wivenhoe below fuse plug initiation and releases need to be made to ensure the dam security and minimise flood impacts downstream if possible	
Strategy	• Maintain current release of 3970cumecs as long as possible but it may need to be increased • Close sluices at Somerset Dam to store more water however will affect upstream areas. • Current estimate of peak dam level is between EL74.5 and EL74.8 (assuming no further significant rainfall). However it is noted that rainfall is continuing across the catchment. • Further rainfall in the next 3 hours will require releases to be increased in accordance with Strategy W4, page 29 of the Manual of Operational Procedures for Flood Mitigation at Wivenhoe Dam and Somerset Dam (Flood Operations Manual)	
Key considerations	Storage levels:	Above FSL
	Inflows:	Inflows expected around 1,500,000ML which is close to 1974 event.
	Rainfall:	Continuing
	Lockyer/Bremer:	Monitoring their inflows
	Brisbane River:	Impact as below.

Somerset Dam (Full Supply Level 99.00 m AHD)

The dam level is 103.30 AHD and rising. Peak inflow to the dam is estimated to be about 4,200 m3/s. Volume stored above FSL is 240,00ML at 163.3%

The dam level peaked at 103.52m AHD at 19:00 on Monday 10 January 2011, (unless further significant rainfall is experienced). Areas around Kilcoy will continue to be adversely affected.

Wivenhoe Dam (Full Supply Level 67.00 m AHD)

The dam level is 74.1m AHD and rising at about 25 mm/hour. Holding 930,000ML above FSL and 179.5%.Releases from the dam are currently 3,970cumec/s. Outflows into the Brisbane River from both Lockyer Creek and the Bremer River are also increasing.

D494

At this stage it is considered that without further rainfall the dam can be kept at around 74.8m.

The aim is to prevent fuse plug initiation.

Currently the situation is being assessed every 3 hours.

If further rainfall occurs, dam releases may need to be increased further.

Outlook

Heavy rainfall continues throughout South East Queensland and the situation could deteriorate over the next 24 hours. The flood operation centre will continue to monitor the situation and provide situation reports every six hours until the situation stabilizes.

Seqwater Technical Officer name	Robert Drury
Seqwater Technical Officer position title	Dam Operations Manager
[redacted]	

BoM assessment

(consisting of references to latest Flood Warning for the Brisbane River and other relevant Bureau forecasts and warnings (e.g. weather/rain forecasts, Tropical Cyclone Warning etc) and other updates/comments if needed)

BoM has been advised.

BoM Technical Officer name	Peter Baddiley
BoM Technical Officer position title	
BoM Technical Officer contact details	flood.qld[redacted]

Brisbane City Council (BCC) assessment

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised of the current status.

BCC Technical Officer name	Chris Lavin
BCC Technical Officer position title	Disaster Operations Manager
BCC Technical Officer contact details	[redacted]

Ipswich City Council (ICC) assessment (if required)

(to include predicted local inundation areas and depths of inundation based on the information)

D495

Council has been advised of the current status.

ICC Technical Officer name	Tony Trace
ICC Technical Officer position title	Local Disaster Response Coordinator
ICC Technical Officer contact details	[redacted]

Somerset Regional Council (SRC) assessment (if required)

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised of the current status.

SRC Technical Officer name	Tony Jacobs
SRC Technical Officer position title	Local Disaster Response Coordinator
SRC Technical Officer contact details	[redacted]

Collated and distributed by (Agency)

Contact Officer signature	
Contact Officer name	Rob Drury
Contact Officer position title	Dam Operations Manager

Next TSR due	Date	11.1.2011	Time	PM	Or Event		

D496

From: Dan Spiller <Daniel.Spiller[redacted]>
Sent: Tuesday, January 11, 2011 4:00 PM
To: Barry Dennien <Barry.Dennien[redacted]>
Subject: Fwd: Technical Situation Report W40.docx
Attach: image.png; ATT00001.htm; Technical Situation Report W40.docx; ATT00002.htm

---

Begin forwarded message:

From: Stan Stevenson <sstevenson[redacted]>
Date: 11 January 2011 3:58:25 PM GMT+10:00
To: SEQWGM Emergency <SEQWGM.Emergency[redacted]>
Cc: Dan Spiller <Daniel.Spiller[redacted]>, Peter Borrows <pborrows[redacted]>, Paul Bird <pbird[redacted]>, Rob Drury <rdrury[redacted]>, Jim Pruss <jpruss[redacted]>
Subject: Technical Situation Report W40.docx

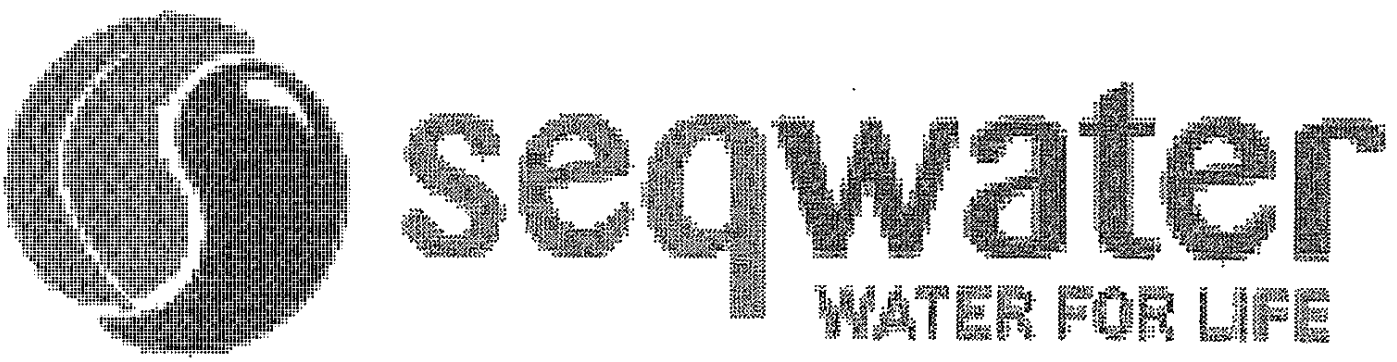
Latest update on releases from Wivenhoe

Regards

Stan Stevenson

Acting EGM Water Delivery

QLD Bulk Water Supply Authority *trading as* Seqwater


seqwater
WATER FOR LIFE

[redacted]
sstevenson[redacted]

Level 3, 240 Margaret St, Brisbane City QLD 4000 Australia
PO Box 16146, City East QLD 4002

Website | www.seqwater.com.au

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TECHNICAL SITUATION REPORT

TSR Number	W40	Date of TSR release	11.1.2011	Time of TSR release	4.00pm

Seqwater status of inflows and dam operations

Current status but could change based on inflows or rainfall.

Current objectives	• Maintain releases to keep Wivenhoe below fuse plug initiation and releases need to be made to ensure the dam security and minimise flood impacts downstream if possible	
Strategy	• Inflows into Wivenhoe in excess of 12000 cumecs. • Maintain current release 5700 cumecs as long as possible but due to the high level in the dam may change frequently due to inflows, this is being reviewed every 30 minutes and releases adjusted accordingly. • Close sluices at Somerset Dam to store more water however will affect upstream areas.	
Key considerations	Storage levels:	Above FSL
	Inflows:	Inflows expected around 1,500,000ML which is close to 1974 event.
	Rainfall:	Continuing
	Lockyer/Bremer:	Monitoring their inflows
	Brisbane River:	Impact as below.

Somerset/Wivenhoe Dam

Our strategy revolves ensuring dam security and is around trying to prevent initiation of the first fuse plug at EL 75.6m. If this happens we will get a rapid increase of about 2,000m3/s in outflow from the dam in addition to the gate release which could be as high as 10,000m3/s at the time. Sluices have been closed at Somerset and this will result in high upstream water levels affecting Kilcoy.

Wivenhoe Dam is rising very quickly and rapid gate openings are required to manage this increase. Based on the current rate of rise, inflow rate is in excess of 12,000m3/s. The situation is being revised constantly and releases will be increased hourly until the water level starts to stabilize. It is possible that the releases will be as high as 10,000m3/s in the next few hours. Heavy rainfall continues in the catchment especially around the dam.

It should be noted that the flow in the lower Brisbane R in 1974 was about 9,500m3/s.

Travel time to Lower Brisbane River is 24 hours.

North Pine

Inflows and outflows are at record levels and increasing within inflows nearing 3,000m3/s, and is approaching an extreme event (possibly as high as 1 in 10,000 AEP)

Seqwater Technical Officer name	Robert Drury
Seqwater Technical Officer position title	Dam Operations Manager
[redacted]	

BoM assessment

(consisting of references to latest Flood Warning for the Brisbane River and other relevant Bureau forecasts and warnings (e.g. weather/rain forecasts, Tropical Cyclone Warning etc) and other updates/comments if needed)

BoM has been advised.

BoM Technical Officer name	Peter Baddiley
BoM Technical Officer position title	
BoM Technical Officer contact details	flood.qld[redacted]

Brisbane City Council (BCC) assessment

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised of the current status.

BCC Technical Officer name	Chris Lavin
BCC Technical Officer position title	Disaster Operations Manager
BCC Technical Officer contact details	[redacted]

Ipswich City Council (ICC) assessment (if required)

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised of the current status.

ICC Technical Officer name	Tony Trace
ICC Technical Officer position title	Local Disaster Response Coordinator
ICC Technical Officer contact details	[redacted]

Somerset Regional Council (SRC) assessment (if required)

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised of the current status.

SRC Technical Officer name	Tony Jacobs
SRC Technical Officer position title	Local Disaster Response Coordinator
SRC Technical Officer contact details	[redacted]

Collated and distributed by (Agency)

Contact Officer signature	
Contact Officer name	Rob Drury
Contact Officer position title	Dam Operations Manager

Next TSR due	Date	11.1.2011	Time	PM	or Event	

Gina O'Driscoll

From: Petula Martinz
Sent: Tuesday, 11 January 2011 4:19 PM
To: Barry Dennien; Bob Reilly; Damien Brown; Darren Madgwick; Geoff Stead; Ken Smith; Kerry Dunn; Lance McCallum; Lauren Sims; Peter Borrows; Peter Martin; Rob Drury; SEQWGM Emergency; Stephen Robertson; Terry Wall; Tim Watts
Subject: Wivenhoe Dam release update
Attachments: Technical Situation Report W40.docx

All,

Current strategy from Flood Control Centre attached.

Dan

TECHNICAL SITUATION REPORT

TSR Number	W40	Date of TSR release	11.1.2011	Time of TSR release	4.00pm

Seqwater status of inflows and dam operations

Current status but could change based on inflows or rainfall.

Current objectives	• Maintain releases to keep Wivenhoe below fuse plug initiation and releases need to be made to ensure the dam security and minimise flood impacts downstream if possible	
Strategy	• Inflows into Wivenhoe in excess of 12000 cumecs. • Maintain current release 5700 cumecs as long as possible but due to the high level in the dam may change frequently due to inflows, this is being reviewed every 30 minutes and releases adjusted accordingly. • Close sluices at Somerset Dam to store more water however will affect upstream areas.	
Key considerations	Storage levels:	Above FSL
	Inflows:	Inflows expected around 1,500,000ML which is close to 1974 event.
	Rainfall:	Continuing
	Lockyer/Bremer:	Monitoring their inflows
	Brisbane River:	Impact as below.

Somerset/Wivenhoe Dam

Our strategy revolves ensuring dam security and is around trying to prevent initiation of the first fuse plug at EL 75.6m. If this happens we will get a rapid increase of about 2,000m3/s in outflow from the dam in addition to the gate release which could be as high as 10,000m3/s at the time. Sluices have been closed at Somerset and this will result in high upstream water levels affecting Kilcoy.

Wivenhoe Dam is rising very quickly and rapid gate openings are required to manage this increase. Based on the current rate of rise, inflow rate is in excess of 12,000m3/s. The situation is being revised constantly and releases will be increased hourly until the water level starts to stabilize. It is possible that the releases will be as high as 10,000m3/s in the next few hours. Heavy rainfall continues in the catchment especially around the dam.

It should be noted that the flow in the lower Brisbane R in 1974 was about 9,500m3/s.

Travel time to Lower Brisbane River is 24 hours.

North Pine

Inflows and outflows are at record levels and increasing within inflows nearing 3,000m3/s, and is approaching an extreme event (possibly as high as 1 in 10,000 AEP)

Seqwater Technical Officer name	Robert Drury
Seqwater Technical Officer position title	Dam Operations Manager
[redacted]	

BoM assessment

(consisting of references to latest Flood Warning for the Brisbane River and other relevant Bureau forecasts and warnings (e.g. weather/rain forecasts, Tropical Cyclone Warning etc) and other updates/comments if needed)

BoM has been advised.

BoM Technical Officer name	Peter Baddiley
BoM Technical Officer position title	
BoM Technical Officer contact details	flood.qld[redacted]

Brisbane City Council (BCC) assessment

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised of the current status.

BCC Technical Officer name	Chris Lavin
BCC Technical Officer position title	Disaster Operations Manager
BCC Technical Officer contact details	[redacted]

Ipswich City Council (ICC) assessment (if required)

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised of the current status.

ICC Technical Officer name	Tony Trace
ICC Technical Officer position title	Local Disaster Response Coordinator
ICC Technical Officer contact details	[redacted]

Somerset Regional Council (SRC) assessment (if required)

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised of the current status.

SRC Technical Officer name	Tony Jacobs
SRC Technical Officer position title	Local Disaster Response Coordinator
SRC Technical Officer contact details	[redacted]

Collated and distributed by (Agency)

Contact Officer signature	
Contact Officer name	Rob Drury
Contact Officer position title	Dam Operations Manager

Next TSR due	Date	11.1.2011	Time	PM	or Event	

1542

TECHNICAL SITUATION REPORT

TSR Number	W41	Date of TSR release	11.1.2011	Time of TSR release	6pm

Seqwater status of inflows and dam operations

Current status but could change based on inflows or rainfall.

Current objectives	• Maintain releases to keep Wivenhoe below fuse plug initiation and releases need to be made to ensure the dam security and minimise flood impacts downstream if possible
Strategy	• Peak inflows into Wivenhoe in excess of 12000 cumecs. • Increase releases to maintain fuse plug and dam integrity. • Close sluices at Somerset Dam to store more water however will affect upstream areas.
Key considerations	Storage levels: Above FSL
	Inflows: Inflows expected well over 1,500,000ML.
	Rainfall: Continuing
	Lockyer/Bremer: Monitoring their inflows
	Brisbane River: Impact as below.

Somerset/Wivenhoe

Our strategy revolves ensuring dam security and is around trying to prevent initiation of the first fuse plug at EL 75.6m. If this happens we will get a rapid increase of about 2,000m3/s in outflow from the dam in addition to the gate release which could be as high as 10,000m3/s at the time.

Sluices have been closed at Somerset and this will result in high upstream water levels affecting Kilcoy. Somerset is at 104.41m holding 671,000ML and 176.6%.

In the last twelve hours totals of up to 370mm have fallen in the area around Wivenhoe Dam. In the last hour, rainfalls between 15 and 30mm have been recorded in the same area. At 1600, the BoM advised that falls between 50 to 100mm are still forecast for the 24hrs to 1600 Wednesday 12 January 2011 for the North Pine and Somerset/Wivenhoe catchments. Current inflows are about 9,000cumecs.

At 1730 Wivenhoe Dam was 74.92m AHD holding 2,200,000ML and 190% and rising slowly and releasing about 6,700m3/s.

The current expectation is that the dam will reach a steady state (outflow equals inflow) within the next 3 hours without further significant rainfall. At this time, release from the dam will be about 8,000 m3/s.

If there is no further rainfall, it may be possible to then slowly reduce this release overnight.

The dam is expected to peak below 75.5m AHD which is 100mmm below the first fuse plug initiation level.

Note that the automatic recorder as indicated on the BoM website is affected by drawdown and is not reflecting the actual lake level and tendency.

The Flood Operations Centre is continuing to monitor rainfalls and water levels through the Brisbane and Pine catchments and reviewing operating strategy every 30 minutes. The FOC is also maintaining close contact with warning agencies and local councils.

It should be noted that the flow in the lower Brisbane R in 1974 was about 9,500m3/s

North Pine Dam:
Five gates are open, and will continue until at least Wednesday 12 January.

The local Council is being kept informed regarding Youngs Crossing.

Leslie Harrison Dam:
Gate releases are underway due to rainfall and inflows.

Hinze Dam:
A release of around 86cumecs or 7396 megalitres a day is being made through the emergency gates and this will increase to around 8,000 megalitres per day by 6.pm Tuesday 11 January There is no public access to the spillway.

Wyralong Dam

As at 5:00pm today 9,680ML/day was passing over the spillway at Wyaralong Dam. This represents a water depth of 0.59m over the spillway. The water level is continuing to rise. Wyaralong Dam Alliance will continue to monitor and advise of water levels and flows.

Seqwater Technical Officer name	Robert Drury
Seqwater Technical Officer position title	Dam Operations Manager
[redacted]	

BoM assessment

(consisting of references to latest Flood Warning for the Brisbane River and other relevant Bureau forecasts and warnings (e.g. weather/rain forecasts, Tropical Cyclone Warning etc) and other updates/comments if needed)

BoM has been advised.

BoM Technical Officer name	Peter Baddiley
BoM Technical Officer position title	
BoM Technical Officer contact details	flood.qld[redacted]

Brisbane City Council (BCC) assessment

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised of the current status.

BCC Technical Officer name	Chris Lavin
BCC Technical Officer position title	Disaster Operations Manager
BCC Technical Officer contact details	[redacted]

Ipswich City Council (ICC) assessment (if required)

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised of the current status.

ICC Technical Officer name	Tony Trace
ICC Technical Officer position title	Local Disaster Response Coordinator
ICC Technical Officer contact details	[redacted]

Somerset Regional Council (SRC) assessment (if required)

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised of the current status.

SRC Technical Officer name	Tony Jacobs
SRC Technical Officer position title	Local Disaster Response Coordinator
SRC Technical Officer contact details	[redacted]

Collated and distributed by (Agency)

Contact Officer signature	
Contact Officer name	Rob Drury
Contact Officer position title	Dam Operations Manager

Next TSR due	**Date**	11.1.2011	**Time**	PM	**or Event**	

Gina O'Driscoll

From: Paul Bird [pbird[redacted]]
Sent: Tuesday, 11 January 2011 6:19 PM
To: SEQWGM Media; aroebuck[redacted]; greg.swain[redacted]; GSTUBBS[redacted]; Kathy Petrik; lisa.m.martin[redacted]; Paula Weston; tjacobs[redacted]; Arminda Roberts; Bec Middlemiss; Michael Fiechtner; Mike Foster; Tara King; Barry Dennien; Dan Spiller; Scott Denner
Cc: Michael Lyons; ELT
Subject: Release Update

As at 6.00 pm on Tuesday 11 January, the following applies:

SOMERSET DAM:
Releases have stopped, however levels in Somerset are expected to continue rising and areas around Kilcoy are likely to be impacted.

WIVENHOE DAM:
Wivenhoe Dam is rising slowly and releasing about 576,000 megalitres per day.

The current expectation is that the dam will reach a steady state (outflow equals inflow) within the next 3 hours without further significant rainfall.

At this time, release from the dam will be about, 688,000 megalitres.

If there is no further rainfall, it may be possible to then slowly reduce this release overnight.

The Flood Operations Centre is continuing to monitor rainfalls and water levels through the Brisbane and Pine catchments and reviewing operating strategy every 30 minutes.

The Centre is also maintaining close contact with warning agencies and local councils.

NORTH PINE DAM:
Five gates are open, and will continue until at least Wednesday 12 January.

The local Council is being kept informed regarding Youngs Crossing.

LIE HARRISON DAM:
Gate releases are underway due to rainfall and inflows.

HINZE DAM:
A minor release of around 8,000 megalitres a day is being made through the emergency gates. There is no public access to the spillway.

For detailed information on river levels, road and crossing closures and other potential impacts, always contact your local council.

This information will be updated during the evening of Tuesday 11 January.

Important information: This email and any attached information is intended only for the addressee and may contain confidential and/or privileged information. If you are not the addressee, you are notified that any transmission, distribution, or other use of this information is strictly prohibited. The confidentiality attached to this email is not waived, lost or destroyed by reasons of mistaken delivery to you. If you have received this email in error please contact the sender immediately and delete the material from your email system. QLD Bulk Water Supply Authority ABN75450239876 (Trading as Seqwater).

Gina O'Driscoll

From: Petula Martinz
Sent: Tuesday, 11 January 2011 6:44 PM
To: Barry Dennien; Bob Reilly; Damien Brown; Darren Madgwick; Geoff Stead; Ken Smith; Kerry Dunn; Lance McCallum; Lauren Sims; Peter Borrows; Peter Martin; Rob Drury; SEQWGM Emergency; Stephen Robertson; Terry Wall; Tim Watts ; SEQWGM Media; john.bradley[redacted]
Subject: Updated technical support report
Attachments: Technical Situation Report W41.docx

All,

Updated report attached.

Regards,
Dan

Petula Martinz
Executive Assistant to Daniel Spiller
Director Operations
SEQ Water Grid Manager
Phone: [redacted]
Email: petula.martinz[redacted]
Visit: Level 15, 53 Albert Street, Brisbane
Post: PO Box 16205, City East Qld 4002
ABN: 14783 317 630

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

TECHNICAL SITUATION REPORT

TSR Number	W41	Date of TSR release	11.1.2011	Time of TSR release	6pm

Seqwater status of inflows and dam operations

Current status but could change based on inflows or rainfall.

Current objectives	• Maintain releases to keep Wivenhoe below fuse plug initiation and releases need to be made to ensure the dam security and minimise flood impacts downstream if possible	
Strategy	• Peak inflows into Wivenhoe in excess of 12000 cumecs. • Increase releases to maintain fuse plug and dam integrity. • Close sluices at Somerset Dam to store more water however will affect upstream areas.	
Key considerations	Storage levels:	Above FSL
	Inflows:	Inflows expected well over 1,500,000ML.
	Rainfall:	Continuing
	Lockyer/Bremer:	Monitoring their inflows
	Brisbane River:	Impact as below.

Somerset/Wivenhoe

Our strategy revolves ensuring dam security and is around trying to prevent initiation of the first fuse plug at EL 75.6m. If this happens we will get a rapid increase of about 2,000m3/s in outflow from the dam in addition to the gate release which could be as high as 10,000m3/s at the time.

Sluices have been closed at Somerset and this will result in high upstream water levels affecting Kilcoy. Somerset is at 104.41m holding 671,000ML and 176.6%.

In the last twelve hours totals of up to 370mm have fallen in the area around Wivenhoe Dam. In the last hour, rainfalls between 15 and 30mm have been recorded in the same area. At 1600, the BoM advised that falls between 50 to 100mm are still forecast for the 24hrs to 1600 Wednesday 12 January 2011 for the North Pine and Somerset/Wivenhoe catchments. Current inflows are about 9,000cumecs.

At 1730 Wivenhoe Dam was 74.92m AHD holding 2,200,000ML and 190% and rising slowly and releasing about 6,700m3/s.

The current expectation is that the dam will reach a steady state (outflow equals inflow) within the next 3 hours without further significant rainfall. At this time, release from the dam will be about 8,000 m3/s.

If there is no further rainfall, it may be possible to then slowly reduce this release overnight.

The dam is expected to peak below 75.5m AHD which is 100mmm below the first fuse plug initiation level.

Note that the automatic recorder as indicated on the BoM website is affected by drawdown and is not reflecting the actual lake level and tendency.

The Flood Operations Centre is continuing to monitor rainfalls and water levels through the Brisbane and Pine catchments and reviewing operating strategy every 30 minutes. The FOC is also maintaining close contact with warning agencies and local councils.

It should be noted that the flow in the lower Brisbane R in 1974 was about 9,500m3/s

North Pine Dam:
Five gates are open, and will continue until at least Wednesday 12 January.

The local Council is being kept informed regarding Youngs Crossing.

Leslie Harrison Dam:
Gate releases are underway due to rainfall and inflows.

Hinze Dam:
A release of around 86cumecs or 7396 megalitres a day is being made through the emergency gates and this will increase to around 8,000 megalitres per day by 6.pm Tuesday 11 January. There is no public access to the spillway.

Wyralong Dam

As at 5:00pm today 9,680ML/day was passing over the spillway at Wyaralong Dam. This represents a water depth of 0.59m over the spillway. The water level is continuing to rise. Wyaralong Dam Alliance will continue to monitor and advise of water levels and flows.

Seqwater Technical Officer name	Robert Drury
Seqwater Technical Officer position title	Dam Operations Manager
[redacted]	

BoM assessment

(consisting of references to latest Flood Warning for the Brisbane River and other relevant Bureau forecasts and warnings (e.g. weather/rain forecasts, Tropical Cyclone Warning etc) and other updates/comments if needed)

BoM has been advised.

BoM Technical Officer name	Peter Baddiley
BoM Technical Officer position title	
BoM Technical Officer contact details	flood.qld[redacted]

Brisbane City Council (BCC) assessment

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised of the current status.

BCC Technical Officer name	Chris Lavin
BCC Technical Officer position title	Disaster Operations Manager
BCC Technical Officer contact details	[redacted]

Ipswich City Council (ICC) assessment (if required)

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised of the current status.

ICC Technical Officer name	Tony Trace
ICC Technical Officer position title	Local Disaster Response Coordinator
ICC Technical Officer contact details	[redacted]

Somerset Regional Council (SRC) assessment (if required)

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised of the current status.

SRC Technical Officer name	Tony Jacobs
SRC Technical Officer position title	Local Disaster Response Coordinator
SRC Technical Officer contact details	[redacted]

Collated and distributed by (Agency)

Contact Officer signature	
Contact Officer name	Rob Drury
Contact Officer position title	Dam Operations Manager

Next TSR due	**Date**	11.1.2011	**Time**	PM	**or Event**	

1552

TECHNICAL SITUATION REPORT

TSR Number	W42	Date of TSR release	11.1.2011	Time of TSR release	7pm

Seqwater status of inflows and dam operations

Current status but could change based on inflows or rainfall.

Current objectives	• Maintain releases to keep Wivenhoe below fuse plug initiation and releases need to be made to ensure the dam security and minimise flood impacts downstream if possible	
Strategy	• Peak inflows into Wivenhoe in excess of 12000 cumecs. • Increase releases to maintain fuse plug and dam integrity. • Close sluices at Somerset Dam to store more water however will affect upstream areas.	
Key considerations	Storage levels:	Above FSL
	Inflows:	Inflows expected well over 1,500,000ML.
	Rainfall:	Continuing
	Lockyer/Bremer:	Monitoring their inflows
	Brisbane River:	Impact as below.

Somerset/Wivenhoe

Our strategy revolves ensuring dam security and is around trying to prevent initiation of the first fuse plug at EL 75.6m. If this happens we will get a rapid increase of about 2,000m3/s in outflow from the dam in addition to the gate release which could be as high as 10,000m3/s at the time.

Sluices have been closed at Somerset and this will result in high upstream water levels affecting Kilcoy. Somerset is at 104.6m holding 684,000ML and 180.0%.

Somerset should peak at around 105.2m (1974 peak level was 106.5m).

At 1900 Wivenhoe Dam was 74.97m AHD holding 2,227,000ML and 191.1% and rising slowly and releasing about 7,500m3/s.

Since the last update, there has only been an increase in release to 7,500cumecs. At this stage there is no planned increase in releases unless there are further inflows.

If there is no further rainfall, it may be possible to then slowly reduce this release overnight.

The dam is expected to peak below 75.5m AHD which is 100mmm below the first fuse plug initiation level.

The Flood Operations Centre is continuing to monitor rainfalls and water levels through the Brisbane and Pine catchments and reviewing operating strategy every 30 minutes. The FOC is also maintaining close contact with warning agencies and local councils.

It should be noted that the flow in the lower Brisbane R in 1974 was about 9,500m3/s

North Pine Dam:
Five gates are open and continuing to drop. Releases may still continue until Wednesday 12 January.

The local Council is being kept informed regarding Youngs Crossing.

Leslie Harrison Dam:
Gate releases are underway due to rainfall and inflows.

Hinze Dam:
A release of around 8,000 megalitres a day is being made through the emergency gates. There is no public access to the spillway.

Wyralong Dam

As at 5:00pm today 9,680ML/day was passing over the spillway at Wyralong Dam. This represents a water depth of 0.59m over the spillway. The water level is continuing to rise. Wyralong Dam Alliance will continue to monitor and advise of water levels and flows.

Seqwater Technical Officer name	Robert Drury
Seqwater Technical Officer position title	Dam Operations Manager
0410378740	[redacted]

BoM assessment

(consisting of references to latest Flood Warning for the Brisbane River and other relevant Bureau forecasts and warnings (e.g. weather/rain forecasts, Tropical Cyclone Warning etc) and other updates/comments if needed)

BoM has been advised.

BoM Technical Officer name	Peter Baddiley
BoM Technical Officer position title	
BoM Technical Officer contact details	flood.qld[redacted]

Brisbane City Council (BCC) assessment

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised of the current strategy

BCC Technical Officer name	Chris Lavin
BCC Technical Officer position title	Disaster Operations Manager
BCC Technical Officer contact details	[redacted]

Ipswich City Council (ICC) assessment (if required)

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised of the current strategy.

ICC Technical Officer name	Tony Trace
ICC Technical Officer position title	Local Disaster Response Coordinator
ICC Technical Officer contact details	[redacted]

Somerset Regional Council (SRC) assessment (if required)

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised of the current strategy.

SRC Technical Officer name	Tony Jacobs
SRC Technical Officer position title	Local Disaster Response Coordinator
SRC Technical Officer contact details	[redacted]

Collated and distributed by (Agency)

Contact Officer signature	
Contact Officer name	Rob Drury
Contact Officer position title	Dam Operations Manager

Next TSR due	**Date**	11.1.2011	**Time**	PM	**or Event**	

TECHNICAL SITUATION REPORT

TSR Number	W43	Date of TSR release	11.1.2011	Time of TSR release	8pm

Seqwater status of inflows and dam operations

Current status but could change based on inflows or rainfall.

Current objectives	• Maintain releases to keep Wivenhoe below fuse plug initiation and releases need to be made to ensure the dam security and minimise flood impacts downstream if possible	
Strategy	• Peak inflows into Wivenhoe in excess of 12000 cumecs. • Increase releases to maintain fuse plug and dam integrity. • Close sluices at Somerset Dam to store more water however will affect upstream areas.	
Key considerations	Storage levels:	Above FSL
	Inflows:	Inflows expected well over 1,500,000ML.
	Rainfall:	Continuing
	Lockyer/Bremer:	Monitoring their inflows
	Brisbane River:	Impact as below.

Somerset/Wivenhoe

Our strategy revolves ensuring dam security and is around trying to prevent initiation of the first fuse plug at EL 75.6m. If this happens we will get a rapid increase of about 2,000m3/s in outflow from the dam in addition to the gate release which could be as high as 10,000m3/s at the time.

Sluices have been closed at Somerset and this will result in high upstream water levels affecting Kilcoy. Somerset is at 104.7m holding 691,500ML and 180.2%.

Somerset should peak at around 105.2m (1974 peak level was 106.5m).

At 2000 Wivenhoe Dam was 74.97m AHD holding 2,227,000ML and 191.1% and steady and releasing about 7,500m3/s.

The levels have stayed the same for an hour so there are no planned increases in releases.

As soon as the levels show they are dropping, releases will be reduced.

The dam is now expected to peak around 74.97m AHD which is around 600mm below the first fuse plug initiation level.

The Flood Operations Centre is continuing to monitor rainfalls and water levels through the Brisbane and Pine catchments and reviewing operating strategy every 30 minutes. The FOC is also maintaining close contact with warning agencies and local councils.

It should be noted that the flow in the lower Brisbane R in 1974 was about 9,500m3/s

North Pine Dam:
Five gates are open and continuing to drop. Releases may still continue until Wednesday 12 January.

The local Council is being kept informed regarding Youngs Crossing.

Leslie Harrison Dam:
Gate releases are underway due to rainfall and inflows.

Hinze Dam:
A release of around 8,000 megalitres a day is being made through the emergency gates. There is no public access to the spillway.

Wyralong Dam

As at 5:00pm today 9,680ML/day was passing over the spillway at Wyaralong Dam. This represents a water depth of 0.59m over the spillway. The water level is continuing to rise. Wyaralong Dam Alliance will continue to monitor and advise of water levels and flows.

Seqwater Technical Officer name	Robert Drury
Seqwater Technical Officer position title	Dam Operations Manager
[redacted]	

BoM assessment

(consisting of references to latest Flood Warning for the Brisbane River and other relevant Bureau forecasts and warnings (e.g. weather/rain forecasts, Tropical Cyclone Warning etc) and other updates/comments if needed)

BoM has been advised.

BoM Technical Officer name	Peter Baddiley
BoM Technical Officer position title	
BoM Technical Officer contact details	flood.qld[redacted]

Brisbane City Council (BCC) assessment

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised of the current strategy

BCC Technical Officer name	Chris Lavin
BCC Technical Officer position title	Disaster Operations Manager
BCC Technical Officer contact details	[redacted]

Ipswich City Council (ICC) assessment (if required)

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised of the current strategy.

ICC Technical Officer name	Tony Trace
ICC Technical Officer position title	Local Disaster Response Coordinator
ICC Technical Officer contact details	[redacted]

Somerset Regional Council (SRC) assessment (if required)

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised of the current strategy.

SRC Technical Officer name	Tony Jacobs
SRC Technical Officer position title	Local Disaster Response Coordinator
SRC Technical Officer contact details	[redacted]

Collated and distributed by (Agency)

Contact Officer signature	
Contact Officer name	Rob Drury
Contact Officer position title	Dam Operations Manager

Next TSR due	**Date**	11.1.2011	**Time**	PM	**or Event**	

TECHNICAL SITUATION REPORT

TSR Number	W44	Date of TSR release	11.1.2011	Time of TSR release	8pm

Seqwater status of inflows and dam operations

Current status but could change based on inflows or rainfall.

Current objectives	• Initiate the gradual reduction of releases.
Strategy	• Peak inflows into Wivenhoe were in excess of 12000 cumecs. • Maintain controlled releases. • Keep sluices closed at Somerset Dam to store more water however will affect upstream areas.
Key considerations	Storage levels: Above FSL
	Inflows: Inflows expected well over 1,500,000ML.
	Rainfall: Continuing
	Lockyer/Bremer: Monitoring their inflows
	Brisbane River: Impact as below.

Somerset/Wivenhoe

Our strategy revolves ensuring dam security and is around trying to prevent initiation of the first fuse plug at EL 75.6m. If this happens we will get a rapid increase of about 2,000m3/s in outflow from the dam in addition to the gate release which could be as high as 10,000m3/s at the time.

Sluices have been closed at Somerset and this will result in high upstream water levels affecting Kilcoy. Somerset is at 104.78m holding 697,400ML and 183.6%.

Somerset should peak at around 105.2m (1974 peak level was 106.5m).

At 2100 Wivenhoe Dam was 74.95m AHD holding 2,223,000ML and 190.8% and slowly dropping.

The levels have now stabilized and commenced to fall slowly.

The FOC has begun an appropriate closure sequence to reduce releases.
Releases will be reduced slowly throughout the night to track dropping levels. First reduction will be to around 7,100cumecs.

Assuming no further rain, the dam has now peaked around 74.97m AHD which was around 600mm below the first fuse plug initiation level.

The Flood Operations Centre is continuing to monitor rainfalls and water levels through the Brisbane and Pine catchments and reviewing operating strategy every 30 minutes. The FOC is also maintaining close contact with warning agencies and local councils.

It should be noted that the flow in the lower Brisbane R in 1974 was about 9,500m3/s

North Pine Dam:
Five gates are open and continuing to drop. Releases may still continue until Wednesday 12 January.

The local Council is being kept informed regarding Youngs Crossing.

Leslie Harrison Dam:
Gate releases are underway due to rainfall and inflows.

Hinze Dam:
A release of around 8,000 megalitres a day is being made through the emergency gates. There is no public access to the spillway.

Seqwater Technical Officer name	Robert Drury
Seqwater Technical Officer position title	Dam Operations Manager
	[redacted]

BoM assessment

(consisting of references to latest Flood Worning for the Brisbane River and other relevant Bureau forecasts and warnings (e.g. weather/rain forecasts, Tropical Cyclone Warning etc) and other updotes/comments if needed)

BoM has been advised.

BoM Technical Officer name	Peter Baddiley
BoM Technical Officer position title	
BoM Technical Officer contact details	flood.qld[redacted]

Brisbane City Council (BCC) assessment

(to include predicted local inundation areos and depths of inundation based on the information)

Council has been advised of the current strategy

BCC Technical Officer name	Chris Lavin
BCC Technical Officer position title	Disaster Operations Manager
BCC Technical Officer contact details	[redacted]

Ipswich City Council (ICC) assessment (if required)

(to include predicted local inundation oreos and depths of inundation based on the information)

Council has been advised of the current strategy.

ICC Technical Officer name	Tony Trace
ICC Technical Officer position title	Local Disaster Response Coordinator
ICC Technical Officer contact details	[redacted]

Somerset Regional Council (SRC) assessment (if required)

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised of the current strategy.

SRC Technical Officer name	Tony Jacobs
SRC Technical Officer position title	Local Disaster Response Coordinator
SRC Technical Officer contact details	[redacted]

Collated and distributed by (Agency)

Contact Officer signature	
Contact Officer name	Rob Drury
Contact Officer position title	Dam Operations Manager

Next TSR due	**Date**	11.1.2011	**Time**	PM	**or Event**		

From: Dan Spiller <Daniel.Spiller[redacted]>
Sent: Tuesday, January 11, 2011 8:25 PM
To: Barry Dennien <Barry.Dennien[redacted]>
Subject: Fwd: Technical Report
Attach: Seqwater_No-Lifeguards-Here_email_strap.png; ATT00001.htm; cidimage001.png@01CA24E1.BDB90020; ATT00002.htm; Technical Situation Report W43.docx; ATT00003.htm

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Begin forwarded message:

From: Rob Drury <rdrury[redacted]>
Date: 11 January 2011 8:19:49 PM GMT+10:00
To: Rob Drury <rdrury[redacted]>, Dan Spiller <Daniel.Spiller[redacted]>, Paul Bird <pbird[redacted]>, Stan Stevenson <sstevenson[redacted]>, Peter Borrows <pborrows[redacted]>, "Peter.Allen[redacted]" <Peter.Allen[redacted]>
Cc: David Roberts <droberts[redacted]>
Subject: RE: Technical Report

Attached report W43.

Levels at Wivenhoe now seem to be steady.

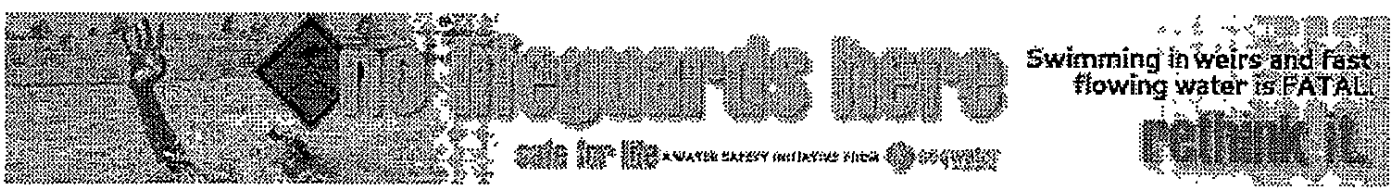
Rob

Robert Drury

Dam Operations Manager

Water Delivery

Queensland Bulk Water Supply Authority *trading as* Seqwater


Swimming in weirs and fast flowing water is FATAL.
rethink it.


seqwater
WATER FOR LIFE

[redacted] | E rdrury[redacted]

Wivenhoe Dam, Brisbane Valley Highway, via Fernvale Q4306 Australia
PO Box 37, Fernvale QLD 4306

Website | www.seqwater.com.au

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TECHNICAL SITUATION REPORT

TSR Number	W43	Date of TSR release	11.1.2011	Time of TSR release	8pm

Seqwater status of inflows and dam operations

Current status but could change based on inflows or rainfall.

Current objectives	• Maintain releases to keep Wivenhoe below fuse plug initiation and releases need to be made to ensure the dam security and minimise flood impacts downstream if possible	
Strategy	• Peak inflows into Wivenhoe in excess of 12000 cumecs. • Increase releases to maintain fuse plug and dam integrity. • Close sluices at Somerset Dam to store more water however will affect upstream areas.	
Key considerations	Storage levels:	Above FSL
	Inflows:	Inflows expected well over 1,500,000ML
	Rainfall:	Continuing
	Lockyer/Bremer:	Monitoring their inflows
	Brisbane River:	Impact as below.

Somerset/Wivenhoe

Our strategy revolves ensuring dam security and is around trying to prevent initiation of the first fuse plug at EL 75.6m. If this happens we will get a rapid increase of about 2,000m3/s in outflow from the dam in addition to the gate release which could be as high as 10,000m3/s at the time.

Sluices have been closed at Somerset and this will result in high upstream water levels affecting Kilcoy. Somerset is at 104.7m holding 691,500ML and 180.2%.

Somerset should peak at around 105.2m (1974 peak level was 106.5m).

At 2000 Wivenhoe Dam was 74.97m AHD holding 2,227,000ML and 191.1% and steady and releasing about 7,500m3/s.

The levels have stayed the same for an hour so there are no planned increases in releases.

As soon as the levels show they are dropping, releases will be reduced.

The dam is now expected to peak around 74.97m AHD which is around 600mm below the first fuse plug initiation level.

The Flood Operations Centre is continuing to monitor rainfalls and water levels through the Brisbane and Pine catchments and reviewing operating strategy every 30 minutes. The FOC is also maintaining close contact with warning agencies and local councils.

It should be noted that the flow in the lower Brisbane R in 1974 was about 9,500m3/s

North Pine Dam:
Five gates are open and continuing to drop. Releases may still continue until Wednesday 12 January.

The local Council is being kept informed regarding Youngs Crossing.

Leslie Harrison Dam:
Gate releases are underway due to rainfall and inflows.

Hinze Dam:
A release of around 8,000 megalitres a day is being made through the emergency gates. There is no public access to the spillway.

Wyralong Dam

As at 5:00pm today 9,680ML/day was passing over the spillway at Wyaralong Dam. This represents a water depth of 0.59m over the spillway. The water level is continuing to rise. Wyaralong Dam Alliance will continue to monitor and advise of water levels and flows.

Seqwater Technical Officer name	Robert Drury
Seqwater Technical Officer position title	Dam Operations Manager
[redacted]	

BoM assessment

(consisting of references to latest Flood Warning for the Brisbane River and other relevant Bureau forecasts and warnings (e.g. weather/rain forecasts, Tropical Cyclone Warning etc) and other updates/comments if needed)

BoM has been advised.

BoM Technical Officer name	Peter Baddiley
BoM Technical Officer position title	
BoM Technical Officer contact details	flood.qld[redacted]

Brisbane City Council (BCC) assessment

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised of the current strategy

BCC Technical Officer name	Chris Lavin
BCC Technical Officer position title	Disaster Operations Manager

BCC Technical Officer contact details	[redacted]

Ipswich City Council (ICC) assessment (if required)

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised of the current strategy.

ICC Technical Officer name	Tony Trace
ICC Technical Officer position title	Local Disaster Response Coordinator
ICC Technical Officer contact details	[redacted]

Somerset Regional Council (SRC) assessment (if required)

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised of the current strategy.

SRC Technical Officer name	Tony Jacobs
SRC Technical Officer position title	Local Disaster Response Coordinator
SRC Technical Officer contact details	[redacted]

Collated and distributed by (Agency)

Contact Officer signature	
Contact Officer name	Rob Drury
Contact Officer position title	Dam Operations Manager

Next TSR due	Date	11.1.2011	Time	PM	or Event

From:	Barry Dennien </O=SOUTH EAST QUEENSLAND WATER GRID MANAGER/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=BARRY.DENNIEN>
Sent:	Tuesday, January 11, 2011 8:31 PM
To:	Dan Spiller <Daniel.Spiller[redacted]>
Subject:	RE: Technical Report

Do not send as yet

From: Dan Spiller
Sent: Tuesday, 11 January 2011 8:25 PM
To: Barry Dennien
Subject: Fwd: Technical Report

Begin forwarded message:

From: Rob Drury <rdrury[redacted]>
Date: 11 January 2011 8:19:49 PM GMT+10:00
To: Rob Drury <rdrury[redacted]>, Dan Spiller <Daniel.Spiller[redacted]>, Paul Bird <pbird[redacted]>, Stan Stevenson <sstevenson[redacted]>, Peter Borrows <pborrows[redacted]>, "Peter.Allen[redacted]" <Peter.Allen[redacted]>
Cc: David Roberts <droberts[redacted]>
Subject: RE: Technical Report

Attached report W43.

Levels at Wivenhoe now seem to be steady.

Rob

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

Gina O'Driscoll

From: Paul Bird [pbird[redacted]]
Sent: Tuesday, 11 January 2011 8:33 PM
To: SEQWGM Media; aroebuck[redacted]; greg.swain[redacted]; GSTUBBS[redacted]; Kathy Petrik; lisa.m.martin[redacted]; Paula Weston; tjacobs[redacted]; Arminda Roberts; Bec Middlemiss; Michael Fiechtner; Mike Foster; Tara King; Barry Dennien; Dan Spiller; Scott Denner
Cc: Michael Lyons; ELT
Subject: Release Update

As at 8.30 pm on Tuesday 11 January, the following applies:

SOMERSET DAM:
Releases have stopped, however levels in Somerset are expected to continue rising and areas around Kilcoy are likely to be impacted.

WIVENHOE DAM:
Wivenhoe Dam is currently releasing about 654,000 megalitres per day.

e levels have stayed the same for an hour so at this stage there are no planned increases in releases.

As soon as the levels show they are consistently dropping, releases will be reduced.

The Flood Operations Centre is continuing to monitor rainfalls and water levels through the Brisbane and Pine catchments and reviewing operating strategy every 30 minutes.

The Centre is also maintaining close contact with warning agencies and local councils.

NORTH PINE DAM:
Five gates are open, and will continue until at least Wednesday 12 January.

The local Council is being kept informed regarding Youngs Crossing.

LESLIE HARRISON DAM:
Gate releases are underway due to rainfall and inflows.

IZE DAM:
A minor release of around 8,000 megalitres a day is being made through the emergency gates. There is no public access to the spillway.

For detailed information on river levels, road and crossing closures and other potential impacts, always contact your local council.

This information will be updated in the event of a significant change.

Important information: This email and any attached information is intended only for the addressee and may contain confidential and/or privileged information. If you are not the addressee, you are notified that any transmission, distribution, or other use of this information is strictly prohibited. The confidentiality attached to this email is not waived, lost or destroyed by reasons of mistaken delivery to you. If you have received this email in error please contact the sender immediately and delete the material from your email system. QLD Bulk Water Supply Authority ABN75450239876 (Trading as Seqwater).

TECHNICAL SITUATION REPORT

TSR Number	W45	Date of TSR release	11.1.2011	Time of TSR release	10pm

Seqwater status of inflows and dam operations

Current status but could change based on inflows or rainfall.

Current objectives	• Gradual reduction of releases.	
Strategy	• Peak inflows into Wivenhoe were in excess of 12000 cumecs. • Maintain controlled releases. • Keep sluices closed at Somerset Dam to store more water however will affect upstream areas.	
Key considerations	Storage levels:	Above FSL
	Inflows:	Inflows expected well over 1,500,000ML.
	Rainfall:	Continuing
	Lockyer/Bremer:	Monitoring their inflows
	Brisbane River:	Impact as below.

Somerset/Wivenhoe

Our strategy revolves ensuring dam security and is around trying to prevent initiation of the first fuse plug at EL 75.6m. If this happens we will get a rapid increase of about 2,000m3/s in outflow from the dam in addition to the gate release which could be as high as 10,000m3/s at the time.

Sluices have been closed at Somerset and this will result in high upstream water levels affecting Kilcoy. Somerset is at 104.85m holding 702,260ML and 185%.

Somerset should peak at around 105.2m (1974 peak level was 106.5m).

At 2200 Wivenhoe Dam was 74.95m AHD holding 2,223,000ML and 190.8%.

The FOC has begun an appropriate closure sequence to reduce releases.
Releases will be reduced slowly throughout the night to track dropping levels. First reduction has been to around 7,100cumecs.

Assuming no further rain, the dam peaked around 74.97m AHD which was around 600mm below the first fuse plug initiation level.

The Flood Operations Centre is continuing to monitor rainfalls and water levels through the Brisbane and Pine catchments and reviewing operating strategy every 30 minutes. The FOC is also maintaining close contact with warning agencies and local councils.

It should be noted that the flow in the lower Brisbane R in 1974 was about 9,500m3/s

North Pine Dam:
Five gates are open and continuing to drop. Releases may still continue until Wednesday 12 January.

The local Council is being kept informed regarding Youngs Crossing.

Leslie Harrison Dam:
Gate releases are underway due to rainfall and inflows.

Hinze Dam:
A release of around 8,000 megalitres a day is being made through the emergency gates. There is no public access to the spillway.

Seqwater Technical Officer name	Robert Drury
Seqwater Technical Officer position title	Dam Operations Manager
	[redacted]

BoM assessment

(consisting of references to latest Flood Warning for the Brisbane River and other relevant Bureau forecasts and warnings (e.g. weather/rain forecasts, Tropical Cyclone Warning etc) and other updates/comments if needed)

BoM has been advised.

BoM Technical Officer name	Peter Baddiley
BoM Technical Officer position title	
BoM Technical Officer contact details	flood.qld[redacted]

Brisbane City Council (BCC) assessment

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised of the current strategy

BCC Technical Officer name	Chris Lavin
BCC Technical Officer position title	Disaster Operations Manager
BCC Technical Officer contact details	[redacted]

Ipswich City Council (ICC) assessment (if required)

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised of the current strategy.

ICC Technical Officer name	Tony Trace
ICC Technical Officer position title	Local Disaster Response Coordinator
ICC Technical Officer contact details	[redacted]

Somerset Regional Council (SRC) assessment (if required)

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised of the current strategy.

SRC Technical Officer name	Tony Jacobs
SRC Technical Officer position title	Local Disaster Response Coordinator
SRC Technical Officer contact details	[redacted]

Collated and distributed by (Agency)

Contact Officer signature	
Contact Officer name	Rob Drury
Contact Officer position title	Dam Operations Manager

Next TSR due	**Date**	11.1.2011	**Time**	PM	**or Event**	

Cindy Hulsey

From: Dan Spiller
Sent: Tuesday, 11 January 2011 10:19 PM
To: stephen.robertson[redacted]; Lance McCallum (lance.mccallum[redacted]); Tim Watts (tim.watts[redacted]); Geoff Stead (geoff.stead[redacted]); lauren.sims[redacted]; John Bradley (john.bradley[redacted]; Debbie Best (debbie.best[redacted]); Martin.PeterJ[redacted]; Dunn.KerryG[redacted]; Ken Smith (ken.smith[redacted])
Cc: Rob Drury (rdrury[redacted]); Barry Dennien; Peter Borrows; SEQWGM Media; SEQWGM Emergency; Madgwick.DarrenT[redacted]
Subject: Wivenhow Dam update
Attachments: Technical Situation Report W44.docx

Categories: T8

All,

Attached is the most recent technical situation report.

Note that Wivenhoe Dam levels have stabilised and are now falling slowly. Without further rainfall, release rates will be reduced progressively. The first reduction will be to 7,100 cubic metres per second.

Regards,
Daniel Spiller

D546

TECHNICAL SITUATION REPORT

TSR Number	W44	Date of TSR release	11.1.2011	Time of TSR release	8pm

Seqwater status of inflows and dam operations

Current status but could change based on inflows or rainfall.

Current objectives	• Initiate the gradual reduction of releases.	
Strategy	• Peak inflows into Wivenhoe were in excess of 12000 cumecs. • Maintain controlled releases. • Keep sluices closed at Somerset Dam to store more water however will affect upstream areas.	
Key considerations	Storage levels:	Above FSL
	Inflows:	Inflows expected well over 1,500,000ML.
	Rainfall:	Continuing
	Lockyer/Bremer:	Monitoring their inflows
	Brisbane River:	Impact as below.

Somerset/Wivenhoe

Our strategy revolves ensuring dam security and is around trying to prevent initiation of the first fuse plug at EL 75.6m. If this happens we will get a rapid increase of about 2,000m3/s in outflow from the dam in addition to the gate release which could be as high as 10,000m3/s at the time.

Sluices have been closed at Somerset and this will result in high upstream water levels affecting Kilcoy. Somerset is at 104.78m holding 697,400ML and 183.6%.

Somerset should peak at around 105.2m (1974 peak level was 106.5m).

At 2100 Wivenhoe Dam was 74.95m AHD holding 2,223,000ML and 190.8% and slowly dropping.

The levels have now stabilized and commenced to fall slowly.

The FOC has begun an appropriate closure sequence to reduce releases.
Releases will be reduced slowly throughout the night to track dropping levels. First reduction will be to around 7,100cumecs.

Assuming no further rain, the dam has now peaked around 74.97m AHD which was around 600mm below the first fuse plug initiation level.

The Flood Operations Centre is continuing to monitor rainfalls and water levels through the Brisbane and Pine catchments and reviewing operating strategy every 30 minutes. The FOC is also maintaining close contact with warning agencies and local councils.

D547

It should be noted that the flow in the lower Brisbane R in 1974 was about 9,500m3/s

North Pine Dam:
Five gates are open and continuing to drop. Releases may still continue until Wednesday 12 January.

The local Council is being kept informed regarding Youngs Crossing.

Leslie Harrison Dam:
Gate releases are underway due to rainfall and inflows.

Hinze Dam:
A release of around 8,000 megalitres a day is being made through the emergency gates. There is no public access to the spillway.

Seqwater Technical Officer name	Robert Drury
Seqwater Technical Officer position title	Dam Operations Manager
[redacted]	

BoM assessment

(consisting of references to latest Flood Warning for the Brisbane River and other relevant Bureau forecasts and warnings (e.g. weather/rain forecasts, Tropical Cyclone Warning etc) and other updates/comments if needed)

BoM has been advised.

BoM Technical Officer name	Peter Baddiley
BoM Technical Officer position title	
BoM Technical Officer contact details	flood.qld[redacted]

Brisbane City Council (BCC) assessment

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised of the current strategy

BCC Technical Officer name	Chris Lavin
BCC Technical Officer position title	Disaster Operations Manager
BCC Technical Officer contact details	[redacted]

Ipswich City Council (ICC) assessment (if required)

(to include predicted local inundation areas and depths of inundation based on the information)

D548

Council has been advised of the current strategy.

ICC Technical Officer name	Tony Trace
ICC Technical Officer position title	Local Disaster Response Coordinator
ICC Technical Officer contact details	[redacted]

Somerset Regional Council (SRC) assessment (if required)

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised of the current strategy.

SRC Technical Officer name	Tony Jacobs
SRC Technical Officer position title	Local Disaster Response Coordinator
SRC Technical Officer contact details	[redacted]

Collated and distributed by (Agency)

Contact Officer signature	
Contact Officer name	Rob Drury
Contact Officer position title	Dam Operations Manager

Next TSR due	Date	11.1.2011	Time	PM	Or Event

D549

Gina O'Driscoll

From:	Paul Bird [pbird[redacted]
Sent:	Tuesday, 11 January 2011 10:21 PM
To:	SEQWGM Media; aroebuck[redacted]; greg.swain[redacted]; GSTUBBS[redacted]; Kathy Petrik; lisa.m.martin[redacted]; Paula Weston; tjacobs[redacted]; Arminda Roberts; Bec Middlemiss; Michael Fiechtner; Mike Foster; Tara King; Barry Dennien; Dan Spiller; Scott Denner
Cc:	Michael Lyons; ELT
Subject:	Release Update

For detailed information on river levels, road and crossing closures and other potential impacts, always contact your local council.

As at 10.30 pm on Tuesday 11 January, the following applies:

SOMERSET DAM:
Releases have stopped, however levels in Somerset are expected to continue rising and areas around Kilcoy are likely to be impacted.

VENHOE DAM:
The Flood Operations Centre has begun an appropriate closure sequence to reduce releases.

Releases will be reduced slowly throughout the night to track dropping levels. First reduction has been to around 610,000 megalitres per day.

The Flood Operations Centre is continuing to monitor rainfalls and water levels through the Brisbane and Pine catchments and reviewing operating strategy every 30 minutes.

The Centre is also maintaining close contact with warning agencies and local councils.

NORTH PINE DAM:
Five gates are open, and will continue until at least Wednesday 12 January.

The local Council is being kept informed regarding Youngs Crossing.

ESLIE HARRISON DAM:
e releases are underway due to rainfall and inflows.

HINZE DAM:
A minor release of around 8,000 megalitres a day is being made through the emergency gates. There is no public access to the spillway.

For detailed information on river levels, road and crossing closures and other potential impacts, always contact your local council.

This information will be updated in the event of a significant change.

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TECHNICAL SITUATION REPORT

TSR Number	W46	Date of TSR release	11.1.2011	Time of TSR release	11pm

Seqwater status of inflows and dam operations

Current status but could change based on inflows or rainfall.

Current objectives	• Gradual reduction of releases.
Strategy	• Peak inflows into Wivenhoe were in excess of 12000 cumecs. • Maintain controlled releases. • Keep sluices closed at Somerset Dam to store more water however will affect upstream areas.
Key considerations	Storage levels: Above FSL
	Inflows: Inflows expected well over 1,500,000ML.
	Rainfall: Continuing
	Lockyer/Bremer: Monitoring their inflows
	Brisbane River: Impact as below.

Somerset/Wivenhoe

Our strategy revolves ensuring dam security and is around trying to prevent initiation of the first fuse plug at EL 75.6m. If this happens we will get a rapid increase of about 2,000m3/s in outflow from the dam in addition to the gate release which could be as high as 10,000m3/s at the time.

Sluices have been closed at Somerset and this will result in high upstream water levels affecting Kilcoy. Somerset is at 104.90m holding 705,730ML and 185.8%.

Somerset should peak at around 105.2m (1974 peak level was 106.5m).

At 2300 Wivenhoe Dam was 74.92m AHD holding 2,219,000ML and 190.4%.

The FOC has begun an appropriate closure sequence to reduce releases.
Releases will be reduced throughout the night to track dropping levels. Another reduction will commence around 23:30 to 6,100cumecs. Further reductions will occur over night.

Assuming no further rain, the dam peaked around 74.97m AHD which was around 600mm below the first fuse plug initiation level.

The Flood Operations Centre is continuing to monitor rainfalls and water levels through the Brisbane and Pine catchments and reviewing operating strategy every 30 minutes. The FOC is also maintaining close contact with warning agencies and local councils.

It should be noted that the flow in the lower Brisbane R in 1974 was about 9,500m3/s

North Pine Dam:
Five gates are open and continuing to drop. Releases may still continue until Wednesday 12 January.

The local Council is being kept informed regarding Youngs Crossing.

Leslie Harrison Dam:
Gate releases are underway due to rainfall and inflows.

Hinze Dam:
A release of around 8,000 megalitres a day is being made through the emergency gates. There is no public access to the spillway.

Seqwater Technical Officer name	Robert Drury
Seqwater Technical Officer position title	Dam Operations Manager
[redacted]	

BoM assessment

(consisting of references to latest Flood Warning for the Brisbane River and other relevant Bureau forecasts and warnings (e.g. weather/rain forecasts, Tropical Cyclone Warning etc) and other updates/comments if needed)

BoM has been advised.

BoM Technical Officer name	Peter Baddiley
BoM Technical Officer position title	
BoM Technical Officer contact details	flood.qld[redacted]

Brisbane City Council (BCC) assessment

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised of the current strategy

BCC Technical Officer name	Chris Lavin
BCC Technical Officer position title	Disaster Operations Manager
BCC Technical Officer contact details	[redacted]

Ipswich City Council (ICC) assessment (if required)

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised of the current strategy.

ICC Technical Officer name	Tony Trace
ICC Technical Officer position title	Local Disaster Response Coordinator
ICC Technical Officer contact details	[redacted]

Somerset Regional Council (SRC) assessment (if required)

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised of the current strategy.

SRC Technical Officer name	Tony Jacobs
SRC Technical Officer position title	Local Disaster Response Coordinator
SRC Technical Officer contact details	[redacted]

Collated and distributed by (Agency)

Contact Officer signature	
Contact Officer name	Rob Drury
Contact Officer position title	Dam Operations Manager

Next TSR due	**Date**	12.1.2011	**Time**	AM	**or Event**	

From: Dan Spiller
Sent: Tuesday, 11 January 2011 11:43 PM
To: 'stephen.robertson[redacted]'; 'Ken Smith (ken.smith[redacted])'; 'john.bradley[redacted]'; 'Lance McCallum (lance.mccallum[redacted])'; 'Tim Watts (tim.watts[redacted])'; 'Geoff Stead (geoff.stead[redacted])'; 'lauren.sims[redacted]' 'Martin.Peter.J[redacted]'; 'Dunn.KerryG[redacted]'
Cc: Barry Dennien; 'pborrows[redacted]'; 'Rob Drury'; SEQWGM Media; SEQWGM Emergency; 'bob.reill[redacted]'; 'Damien Brown (damien.brown[redacted])'; 'Madgwick.DarrenT[redacted]'
Subject: Updated Wivenhoe Dam releases
Attachments: image001.jpg; image002.png; Technical Situation Report W46.docx

All,

Updated report attached.

At 2300, Wivenhoe Dam was at 74.92m AHD (190.4%) and holding.

The Flood Operations Centre has commenced a closure sequence. At 2330, releases will be reduced to 6,100 cubic metres per second.

The centre will continue to monitor rainfall and inflows and adjust as necessary.

With releases having peaked, the next report will be provided at 0500.

Regards,
Dan

From: Rob Drury [mailto:rdrury[redacted]
Sent: Tuesday, January 11, 2011 11:21 PM
To: Rob Drury; Dan Spiller; Paul Bird; Stan Stevenson; Peter Borrows; Peter.Allen[redacted]
Cc: David Roberts; Duty Seq
Subject: RE: Technical Report

Attached report W46.

Next report will be 5am Wednesday 12.1.2011.

Rob

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



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

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TECHNICAL SITUATION REPORT

TSR Number	W48	Date of TSR release	12.1.2011	Time of TSR release	8am

Seqwater status of inflows and dam operations

Current status but could change based on inflows or rainfall.

Current objectives	• Gradual reduction of releases.	
Strategy	• Peak inflows into Wivenhoe were in excess of 12000 cumecs. • Develop and implement closing plan for next 7 or so days	
Key considerations	Storage levels:	Above FSL
	Inflows:	Inflows expected well over 2,000,000ML.
	Rainfall:	Continuing
	Lockyer/Bremer:	Monitoring their inflows
	Brisbane River:	Impact as below.

Rainfall

No significant rain has fallen over the catchments in the past twelve hours. Less than 10 to 15 millimeters of rainfall is expected over the next 24-48 hours.

Somerset/Wivenhoe

Somerset Dam has peaked at 105.11 m AHD at 08:00 on 12 January 2011 and the dam is discharging 1,230 m3/s over the spillway. Sluice gates will be utilised to assist the draining of the flood storage compartment commencing later Wednesday. At 8am Somerset was 105.11m and 720,400ML at 189.7%.

Wivenhoe Dam peaked at 74.97 m AHD at 19:00 on 11 January 2011 with a corresponding discharge of 7,450 m3/s. Wivenhoe Dam was 74.75 m AHD at 2,192,000ML and 188.1% at 07:30 and generally falling slowly.

The releases from Wivenhoe Dam have been temporarily reduced to 2,500 m3/s at 07:30 to allow the peak of Lockyer Creek to enter the Brisbane River. After the downstream peak in the lower Brisbane River has passed, releases will be increased to maximum of 3,500 m3/s. This release will then be maintained to drain the flood storage component within the required 7 days.

The combined flood event volume in Somerset and Wivenhoe Dams is estimated to be in excess of 2 million megalitres.

North Pine

At 07:00 North Pine Dam was 39.78 mAHD falling and releasing about 105 m3/s. North Pine has

peaked at 41.11 mAHD at 14:00 on 11 January 1974 with peak release of 2,800 m3/s. The event has a volume of around 200,000 ML. It is expected that gates will be close later Wednesday or early Thursday

Strategy

The Flood Operations Centre is continuing to monitor rainfalls and water levels through the Brisbane and Pine catchments and reviewing operating strategy every 30 minutes. The FOC is maintaining close contact with warning agencies and local councils.

Leslie Harrison Dam:
Gate releases are underway due to rainfall and inflows.

Hinze Dam:
A release of around 8,000 megalitres a day is being made through the emergency gates. There is no public access to the spillway.

Seqwater Technical Officer name	Robert Drury
Seqwater Technical Officer position title	Dam Operations Manager
[redacted]	

BoM assessment

(consisting of references to latest Flood Warning for the Brisbane River and other relevant Bureau forecosts ond warnings (e.g. weather/rain forecasts, Tropical Cyclone Warning etc) and other updates/comments if needed)

BoM has been advised.

BoM Technical Officer name	Peter Baddiley
BoM Technical Officer position title	
BoM Technical Officer contact details	flood.qld[redacted]

Brisbane City Council (BCC) assessment

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised of the current strategy

BCC Technical Officer name	Chris Lavin
BCC Technical Officer position title	Disaster Operations Manager
BCC Technical Officer contact details	[redacted]

D568

Ipswich City Council (ICC) assessment (if required)

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised of the current strategy.

ICC Technical Officer name	Tony Trace
ICC Technical Officer position title	Local Disaster Response Coordinator
ICC Technical Officer contact details	[redacted]

Somerset Regional Council (SRC) assessment (if required)

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised of the current strategy.

SRC Technical Officer name	Tony Jacobs
SRC Technical Officer position title	Local Disaster Response Coordinator
SRC Technical Officer contact details	[redacted]

Collated and distributed by (Agency)

Contact Officer signature	
Contact Officer name	Rob Drury
Contact Officer position title	Dam Operations Manager

Next TSR due	Date	12.1.2011	Time	11am	or Event	

D569

From: Dan Spiller <Daniel.Spiller[redacted]>
Sent: Tuesday, January 11, 2011 11:49 PM
To: 'ceo[redacted]
Cc: Barry Dennien <Barry.Dennien[redacted]>; 'john.bradley[redacted]
Subject: Dam release update

Colin,

A quick update on dam operations. I understand that the Flood Operations Centre has been speaking to your staff directly.

At 2300, Wivenhoe Dam was at 74.92m AHD (190.4%) and holding. Somerset is at 105.2m AHD (185.8%).

The Flood Operations Centre has commenced a closure sequence. At 2330, releases will be reduced to 6,100 cubic metres per second.

The centre will continue to monitor rainfall and inflows and adjust as necessary.

Please call on mobile if you have any queries.

Regards,
Dan

TECHNICAL SITUATION REPORT

TSR Number	W47	Date of TSR release	12.1.2011	Time of TSR release	5am

Seqwater status of inflows and dam operations

Current status but could change based on inflows or rainfall.

Current objectives	• Gradual reduction of releases.
Strategy	• Peak inflows into Wivenhoe were in excess of 12000 cumecs. • Maintain controlled releases. • Keep sluices closed at Somerset Dam to store more water however will affect upstream areas.
Key considerations	Storage levels: Above FSL
	Inflows: Inflows expected well over 1,500,000ML.
	Rainfall: Continuing
	Lockyer/Bremer: Monitoring their inflows
	Brisbane River: Impact as below.

Somerset/Wivenhoe

Our strategy revolved ensuring dam security and was around trying to prevent initiation of the first fuse plug at EL 75.6m. If this happens we will get a rapid increase of about 2,000m3/s in outflow from the dam in addition to the gate release which could be as high as 10,000m3/s at the time.

Only minimal falls occurred overnight in the order of mm.

Sluices have been closed at Somerset and this will result in high upstream water levels affecting Kilcoy. Somerset is at 105.1m holding 719730ML and 189.5%. Some flows are going over the Somerset spillway.

Somerset should peak at around 105.2m (1974 peak level was 106.5m).

At 0500 Wivenhoe Dam was 74.77m AHD holding 2,195,287ML and 188%.

The FOC has begun an appropriate closure sequence to reduce releases.

Current release rate is 4,300cumecs.
Further reductions will occur throughout the week..

Assuming no further rain, the dam peaked around 74.97m AHD which was around 600mm below the first fuse plug initiation level.

The Flood Operations Centre is continuing to monitor rainfalls and water levels through the Brisbane and Pine catchments and reviewing operating strategy every 30 minutes. The FOC is also maintaining close contact with warning agencies and local councils.

It should be noted that the flow in the lower Brisbane R in 1974 was about 9,500m3/s

North Pine Dam:
Five gates are open and continuing to drop. Releases may still continue until Wednesday 12 January. The event magnitude is estimated to be a 1:10,000 year excedance probability.

The local Council is being kept informed regarding Youngs Crossing.

Leslie Harrison Dam:
Gate releases are underway due to rainfall and inflows.

Hinze Dam:
A release of around 8,000 megalitres a day is being made through the emergency gates. There is no public access to the spillway.

Seqwater Technical Officer name	Robert Drury
Seqwater Technical Officer position title	Dam Operations Manager
[redacted]	

BoM assessment

(consisting of references to latest Flood Warning for the Brisbane River and other relevant Bureau forecasts and warnings (e.g. weather/rain forecasts, Tropical Cyclone Warning etc) and other updates/comments if needed)

BoM has been advised.

BoM Technical Officer name	Peter Baddiley
BoM Technical Officer position title	
BoM Technical Officer contact details	flood.qlc[redacted]

Brisbane City Council (BCC) assessment

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised of the current strategy

BCC Technical Officer name	Chris Lavin
BCC Technical Officer position title	Disaster Operations Manager
BCC Technical Officer contact details	[redacted]

Ipswich City Council (ICC) assessment (if required)

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised of the current strategy.

ICC Technical Officer name	Tony Trace
ICC Technical Officer position title	Local Disaster Response Coordinator
ICC Technical Officer contact details	[redacted]

Somerset Regional Council (SRC) assessment (if required)

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised of the current strategy.

SRC Technical Officer name	Tony Jacobs
SRC Technical Officer position title	Local Disaster Response Coordinator
SRC Technical Officer contact details	[redacted]

Collated and distributed by (Agency)

Contact Officer signature	
Contact Officer name	Rob Drury
Contact Officer position title	Dam Operations Manager

Next TSR due	**Date**	12.1.2011	**Time**	PM	**or Event**	

From:	Dan Spiller <Daniel.Spiller[redacted]>
Sent:	Wednesday, January 12, 2011 5:37 AM
To:	stephen.robertson[redacted]; ken.smith[redacted]; Bradley John <John.Bradley[redacted]>; lance.mccallum[redacted]; Tim.Watts[redacted]; Geoff.Stead[redacted]; Lauren.Sims[redacted]; 'Martin.Peter[redacted]; 'Dunn.KerryG[redacted]; Best Debbie <Debbie.Best[redacted]>
Cc:	Barry Dennien <Barry.Dennien[redacted]>; Peter Borrows <pborrows[redacted]>; Rob Drury <rdrury[redacted]>; SEQWGM Media <media[redacted]>; SEQWGM Emergency <SEQWGM.Emergency[redacted]>; Madgwick.DarrenT[redacted]; damien.brown[redacted] Reilly Bob <Bob.Reilly[redacted]>
Subject:	Dam release update
Attach:	Technical Situation Report W47.docx

All,

Attached is the most recent situation report.

There was minimum rainfall in the catchment last night, meaning that dam levels and release rates were reduced.

Wivenhoe Dam is currently at 188%, having peaked at about 191% (74.97m AHD, about 0.6m below the first fuse peak). Somerset Dam is at about 190%, which is its peak level.

Releases are now at 4,300 cubic metres per second (about 370,000 ML/day), having peaked at 7,500 cubic metres per second (about 650,000 ML/day) for a couple of hours.

We will update the report about every three hours. The next report will include more information about the closing sequence, including the broad timeframes for dam levels to be reduced. Note that, while dam levels are reducing, they remain at critical levels.

An update on water treatment will be provided later this morning.

Please call me on [redacted] if you require further information.

Regards,
Dan

Daniel Spiller
Director, Operations
SEQ Water Grid Manager
[redacted]
Visit: Level 15, 53 Albert Street Brisbane
Post: PO Box 16205, City East QLD 4002
ABN: 14783 317 630

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TECHNICAL SITUATION REPORT

TSR Number	W47	Date of TSR release	12.1.2011	Time of TSR release	5am

Seqwater status of inflows and dam operations

Current status but could change based on inflows or rainfall.

Current objectives	• Gradual reduction of releases.	
Strategy	• Peak inflows into Wivenhoe were in excess of 12000 cumecs. • Maintain controlled releases. • Keep sluices closed at Somerset Dam to store more water however will affect upstream areas.	
Key considerations	Storage levels:	Above FSL
	Inflows:	Inflows expected well over 1,500,000ML
	Rainfall:	Continuing
	Lockyer/Bremer:	Monitoring their inflows
	Brisbane River:	Impact as below.

Somerset/Wivenhoe

Our strategy revolved ensuring dam security and was around trying to prevent initiation of the first fuse plug at EL 75.6m. If this happens we will get a rapid increase of about 2,000m3/s in outflow from the dam in addition to the gate release which could be as high as 10,000m3/s at the time.

Only minimal falls occurred overnight in the order of mm.

Sluices have been closed at Somerset and this will result in high upstream water levels affecting Kilcoy. Somerset is at 105.1m holding 719730ML and 189.5%. Some flows are going over the Somerset spillway.

Somerset should peak at around 105.2m (1974 peak level was 106.5m).

At 0500 Wivenhoe Dam was 74.77m AHD holding 2,195,287ML and 188%.

The FOC has begun an appropriate closure sequence to reduce releases.

Current release rate is 4,300cumecs.
Further reductions will occur throughout the week..

Assuming no further rain, the dam peaked around 74.97m AHD which was around 600mm below the first fuse plug initiation level.

The Flood Operations Centre is continuing to monitor rainfalls and water levels through the Brisbane and Pine catchments and reviewing operating strategy every 30 minutes. The FOC is also maintaining close contact with warning agencies and local councils.

It should be noted that the flow in the lower Brisbane R in 1974 was about 9,500m3/s

North Pine Dam:
Five gates are open and continuing to drop. Releases may still continue until Wednesday 12 January. The event magnitude is estimated to be a 1:10,000 year excedance probability.

The local Council is being kept informed regarding Youngs Crossing.

Leslie Harrison Dam:
Gate releases are underway due to rainfall and inflows.

Hinze Dam:
A release of around 8,000 megalitres a day is being made through the emergency gates. There is no public access to the spillway.

Seqwater Technical Officer name	Robert Drury
Seqwater Technical Officer position title	Dam Operations Manager
[redacted]	

BoM assessment

(consisting of references to latest Flood Warning for the Brisbane River and other relevant Bureau forecasts and warnings (e.g. weather/rain forecasts, Tropical Cyclone Warning etc) and other updates/comments if needed)

BoM has been advised.

BoM Technical Officer name	Peter Baddiley
BoM Technical Officer position title	
BoM Technical Officer contact details	flood.qld[redacted]

Brisbane City Council (BCC) assessment

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised of the current strategy

BCC Technical Officer name	Chris Lavin
BCC Technical Officer position title	Disaster Operations Manager
BCC Technical Officer contact details	[redacted]

Ipswich City Council (ICC) assessment (if required)

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised of the current strategy.

ICC Technical Officer name	Tony Trace
ICC Technical Officer position title	Local Disaster Response Coordinator
ICC Technical Officer contact details	[redacted]

Somerset Regional Council (SRC) assessment (if required)

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised of the current strategy.

SRC Technical Officer name	Tony Jacobs
SRC Technical Officer position title	Local Disaster Response Coordinator
SRC Technical Officer contact details	[redacted]

Collated and distributed by (Agency)

Contact Officer signature	
Contact Officer name	Rob Drury
Contact Officer position title	Dam Operations Manager

Next TSR due	Date	12.1.2011	Time	PM	or Event		

. O'Driscoll

From: Paul Bird [pbird[redacted]
Sent: Wednesday, 12 January 2011 6:05 AM
To: SEQWGM Media; Geoff Stead; aroebuck[redacted] greg.swain@[redacted] STUBBS[redacted] Kathy Petrik; lisa.m.martin[redacted] Paula Weston; tjacobs[redacted]; Arminda Roberts; Bec Middlemiss; Michael Fiechtner; Mike Foster; Tara King; Barry Dennien; Dan Spiller; Scott Denner
Cc: Michael Lyons; ELT
Subject: Release Update

As at 6.00 am on Wednesday 12 January, the following applies:

SOMERSET DAM:
Releases have stopped, however levels in Somerset are expected to continue rising and areas around Kilcoy are likely to be impacted. Some releases are going over the spillway and releases into Wivenhoe will need to recommence in the near future.

WIVENHOE DAM:
The Flood Operations Centre has begun an appropriate closure sequence to reduce releases.

Releases have been reduced slowly during the night to drop levels and are currently at 369,800 megalitres per day.

The Flood Operations Centre is continuing to monitor rainfalls and water levels through the Brisbane and Pine catchments and reviewing operating strategy every 30 minutes.

The Centre is also maintaining close contact with warning agencies and local councils.

NORTH PINE DAM:
Five gates are open, and will continue. It is expected with no further rain to close the gates today or tomorrow.

The local Council is being kept informed regarding Youngs Crossing.

LESLIE HARRISON DAM:
Gate releases are underway due to rainfall and inflows. It is expected that the dam release may finish later today.

HINZE DAM:
A minor release of around 8,000 megalitres a day is being made through the emergency gates. There is no public access to the spillway.

For detailed information on river levels, road and crossing closures and other potential impacts, always contact your local council.

This information will be updated during the morning of Wednesday January 12

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From: Barry Dennien <Barry.Dennien[redacted]

Sent: Wednesday, January 12, 2011 6:15 AM

To: Dan Spiller <Daniel.Spiller[redacted]>; Colin Jensen <colin.jensen[redacted]

Subject: Re: Dam release update

Col

Further info

Regards
Barry Dennien

On 12/01/2011, at 5:37 AM, "Dan Spiller" <Daniel.Spiller[redacted]> wrote:

All,

Attached is the most recent situation report.

There was minimum rainfall in the catchment last night, meaning that dam levels and release rates were reduced.

Wivenhoe Dam is currently at 188%, having peaked at about 191% (74.97m AHD, about 0.6m below the first fuse peak). Somerset Dam is at about 190%, which is its peak level.

Releases are now at 4,300 cubic metres per second (about 370,000 ML/day), having peaked at 7,5003D1&btmpl cubic metres per second (about 650,000 ML/day) for a couple of hours.

We will update the report about every three hours. The next report will include more information about the closing sequence, including the broad timeframes for dam levels to be reduced. Note that, while dam levels are reducing, they remain at critical levels.

An update on water treatment will be provided later this morning.

Please call me on [redacted] if you require further information.

Regards,

Dan

Daniel Spiller

Director, Operations

SEQ Water Grid Manager

[redacted]

Visit: Level 15, 53 Albert Street Brisbane

Post: PO Box 16205, City East QLD 4002

ABN: 14783 317 630

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

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<Technical Situation Report W47.docx>

From: Dan Spiller <Daniel.Spiller[redacted]
Sent: Wednesday, January 12, 2011 7:59 AM
To: Barry Dennien <Barry.Dennien[redacted]
Subject: FW: Dam release update

From: Rob Drury [mailto:rdrury[redacted]
Sent: Wednesday, January 12, [redacted]
To: Dan Spiller
Subject: RE: Dam release update

Rainfall

No significant rain has fallen over the catchments in the past twelve hours. Less than 10 to 15 millimeters of rainfall is expected over the next 24-48 hours.

Somerset/Wivenhoe

Somerset Dam has peaked at 105.11 mAHD at 06:00 on 12 January 2011 and the dam is discharging 1,230 m3/s over the spillway. Sluice gates will be utilised to assist the draining of the flood storage compartment commencing later Wednesday.

Wivenhoe Dam peaked at 74.97 mAHD at 19:00 on 11 January 2011 with a corresponding discharge of 7,450 m3/s. Wivenhoe Dam was 74.75 m AHD at 07:30 and generally falling slowly.

The releases from Wivenhoe Dam have been temporarily reduced to 2,500 m3/s at 07:30 to allow the peak of Lockyer Creek to enter the Brisbane River. After the downstream peak in the lower Brisbane River has passed, releases will be increased to maximum of 3,500 m3/s. This release will then be maintained to drain the flood storage component within the required 7 days.

The combined flood event volume in Somerset and Wivenhoe Dams is estimated to be in excess of 2 million megalitres.

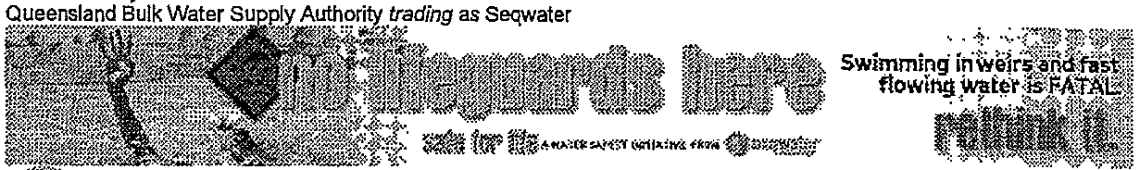
North Pine

At 07:00 North Pine Dam was 39.78 mAHD falling and releasing about 105 m3/s. North Pine has peaked at 41.11 mAHD at 14:00 on 11 January 1974 with peak release of 2,800 m3/s. The event has a volume of around 200,000 ML. It is expected that gates will be close later Wednesday or early Thursday.

Strategy

The Flood Operations Centre is continuing to monitor rainfalls and water levels through the Brisbane and Pine catchments and reviewing operating strategy every 30 minutes. The FOC is maintaining close contact with warning agencies and local councils.

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





[redacted] | E rdrury[redacted]
Wivenhoe Dam, Brisbane Valley Highway, via Fernvale Q4306 Australia
PO Box 37, Fernvale QLD 4306

Website | www.seqwater.com.au

From: Dan Spiller [mailto:Daniel.Spille[redacted]
Sent: Wednesday, 12 January 2011 5:37 AM
To: stephen.robertson[redacted]; ken.smith[redacted]; Bradley John; lance.mccallum[redacted] Tim.Watts[redacted]; Geoff.Stead[redacted]; Lauren.Sims[redacted] 'Martin.PeterJ[redacted]'; 'Dunn.KerryG[redacted]; Best Debbie
Cc: Barry Dennien; Peter Borrows; Rob Drury; SEQWGM Media; SEQWGM Emergency; Madgwick.DarrenT@[redacted]; damien.brown@[redacted]; Reilly Bob
Subject: Dam release update

All,

Attached is the most recent situation report.

There was minimum rainfall in the catchment last night, meaning that dam levels and release rates were reduced.

Wivenhoe Dam is currently at 188%, having peaked at about 191% (74.97m AHD, about 0.6m below the first fuse peak). Somerset Dam is at about 190%, which is its peak level.

Releases are now at 4,300 cubic metres per second (about 370,000 ML/day), having peaked at 7,500 cubic metres per second (about 650,000 ML/day) for a couple of hours.

We will update the report about every three hours. The next report will include more information about the closing sequence, including the broad timeframes for dam levels to be reduced. Note that, while dam levels are reducing, they remain at critical levels.

An update on water treatment will be provided later this morning.

Please call me on [redacted] if you require further information.

Regards,
Dan

Daniel Spiller
Director, Operations
SEQ Water Grid Manager
[redacted]
Visit: Level 15, 53 Albert Street Brisbane
Post: PO Box 16205, City East QLD 4002
ABN: 14783 317 630

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TECHNICAL SITUATION REPORT

TSR Number	W48	Date of TSR release	12.1.2011	Time of TSR release	8am

Seqwater status of inflows and dam operations

Current status but could change based on inflows or rainfall.

Current objectives	• Gradual reduction of releases.	
Strategy	• Peak inflows into Wivenhoe were in excess of 12000 cumecs. • Develop and implement closing plan for next 7 or so days	
Key considerations	Storage levels:	Above FSL
	Inflows:	Inflows expected well over 2,000,000ML.
	Rainfall:	Continuing
	Lockyer/Bremer:	Monitoring their inflows
	Brisbane River:	Impact as below.

Rainfall

No significant rain has fallen over the catchments in the past twelve hours. Less than 10 to 15 millimeters of rainfall is expected over the next 24-48 hours.

Somerset/Wivenhoe

Somerset Dam has peaked at 105.11 m AHD at 08:00 on 12 January 2011 and the dam is discharging 1,230 m3/s over the spillway. Sluice gates will be utilised to assist the draining of the flood storage compartment commencing later Wednesday. At 8am Somerset was 105.11m and 720,400ML at 189.7%.

Wivenhoe Dam peaked at 74.97 m AHD at 19:00 on 11 January 2011 with a corresponding discharge of 7,450 m3/s. Wivenhoe Dam was 74.75 m AHD at 2,192,000ML and 188.1% at 07:30 and generally falling slowly.

The releases from Wivenhoe Dam have been temporarily reduced to 2,500 m3/s at 07:30 to allow the peak of Lockyer Creek to enter the Brisbane River. After the downstream peak in the lower Brisbane River has passed, releases will be increased to maximum of 3,500 m3/s. This release will then be maintained to drain the flood storage component within the required 7 days.

The combined flood event volume in Somerset and Wivenhoe Dams is estimated to be in excess of 2 million megalitres.

North Pine

At 07:00 North Pine Dam was 39.78 mAHD falling and releasing about 105 m3/s. North Pine has peaked at 41.11 mAHD at 14:00 on 11 January 1974 with peak release of 2,800 m3/s. The event has a volume of around 200,000 ML. It is expected that gates will be close later Wednesday or early Thursday

Strategy

The Flood Operations Centre is continuing to monitor rainfalls and water levels through the Brisbane and Pine catchments and reviewing operating strategy every 30 minutes. The FOC is maintaining close contact with warning agencies and local councils.

Leslie Harrison Dam:
Gate releases are underway due to rainfall and inflows.

Hinze Dam:
A release of around 8,000 megalitres a day is being made through the emergency gates. There is no public access to the spillway.

Seqwater Technical Officer name	Robert Drury
Seqwater Technical Officer position title	Dam Operations Manager
	[redacted]

BoM assessment

(consisting of references to latest Flood Warning for the Brisbane River and other relevant Bureau forecasts and warnings (e.g. weather/rain forecasts, Tropical Cyclone Warning etc) and other updates/comments if needed)

BoM has been advised.

BoM Technical Officer name	Peter Baddiley
BoM Technical Officer position title	
BoM Technical Officer contact details	flood.qld[redacted]

Brisbane City Council (BCC) assessment

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised of the current strategy

BCC Technical Officer name	Chris Lavin
BCC Technical Officer position title	Disaster Operations Manager
BCC Technical Officer contact details	[redacted]

Ipswich City Council (ICC) assessment (if required)

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised of the current strategy.

ICC Technical Officer name	Tony Trace
ICC Technical Officer position title	Local Disaster Response Coordinator
ICC Technical Officer contact details	[redacted]

Somerset Regional Council (SRC) assessment (if required)

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised of the current strategy.

SRC Technical Officer name	Tony Jacobs
SRC Technical Officer position title	Local Disaster Response Coordinator
SRC Technical Officer contact details	[redacted]

Collated and distributed by (Agency)

Contact Officer signature	
Contact Officer name	Rob Drury
Contact Officer position title	Dam Operations Manager

Next TSR due	**Date**	12.1.2011	**Time**	11am	**or Event**	

Gina O'Driscoll

From: Paul Bird [pbird[redacted]
Sent: Wednesday, 12 January 2011 8:26 AM
To: SEQWGM Media; ELT; Geoff Stead; aroebuck[redacted] greg.swain[redacted] GSTUBBS[redacted] Kathy Petrik; lisa.m.martin[redacted]; Paula Weston; tjacobs[redacted] Arminda Roberts; Bec Middlemiss; Michael Fiechtner; Mike Foster; Tara King; Barry Dennien; Dan Spiller; Scott Denner
Cc: Jade Simmons; Shelley Banks; Michael Lyons; John Adcock
Subject: Release Update

As at 8.00 am on Wednesday 12 January, the following applies:

SOMERSET DAM:
Releases have stopped and the level in Somerset has almost peaked.
Some releases are going over the spillway and sluice releases into Wivenhoe will need to recommence later on Wednesday 12 January.

WIVENHOE DAM:
The Flood Operations Centre has begun an appropriate closure sequence to reduce releases.

The releases from Wivenhoe Dam have been temporarily reduced to 215,000 megalitres per day to allow the peak of Lockyer Creek to enter the Brisbane River.

After the downstream peak in the lower Brisbane River has passed, releases will be increased to maximum of 301,000 megalitres per day.

The Flood Operations Centre is continuing to monitor rainfalls and water levels through the Brisbane and Pine catchments and reviewing operating strategy every 30 minutes.

The Centre is also maintaining close contact with warning agencies and local councils.

NORTH PINE DAM:
Five gates are open, and will continue. It is expected with no further rain to close the gates today or tomorrow.

The local Council is being kept informed regarding Youngs Crossing.

LESLIE HARRISON DAM:
Gate releases are underway due to rainfall and inflows. It is expected that the dam release may finish later today.

HINZE DAM:
A minor release of around 8,000 megalitres a day is being made through the emergency gates. There is no public access to the spillway.

For detailed information on river levels, road and crossing closures and other potential impacts, always contact your local council.

RECREATION UPDATE:
Both Wivenhoe and Somerset are closed to all recreational activities.

The following recreation sites are closed –

- O'Sheas Crossing
- Hamon Cove

- Logan Inlet
- Captain Logan Camp
- Lumley Hill
- Spillway Common/ Atkinson's Crossing
- Cormorant Bay
- Branch Creek
- Billies Bay/Hays Landing
- The Spit
- Lake Somerset Holiday Park Kirkleagh
- Somerset Park Camping area

This information will be updated during the morning of Wednesday January 12

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From: Dan Spiller <Daniel.Spiller[redacted]
Sent: Wednesday, January 12, 2011 9:01 AM
To: 'ceo[redacted]
Cc: Barry Dennien <Barry.Dennien[redacted]>
Subject: FW: Dam release update
Attach: Technical Situation Report W48.docx

Colin,

Further to our discussion earlier, attached is the release strategy.

Dan

From: Dan Spiller
Sent: Wednesday, January 12, 2011 9:00 AM
To: 'stephen.robertson[redacted]; 'ken.smith[redacted]'; 'Bradley John'; 'lance.mccallum[redacted]'; 'Tim.Watts[redacted]; 'Geoff.Stead[redacted]; 'Lauren.Sims[redacted] 'Martin.PeterJ[redacted]; 'Dunn.KerryG[redacted] 'Best Debbie'
Cc: Barry Dennien; 'Peter Borrows'; 'Rob Drury'; SEQWGM Media; SEQWGM Emergency; 'Madgwick.DarrenT[redacted]; 'damien.brown[redacted]; 'Reilly Bob'
Subject: Dam release update

All,

Attached is an updated Technical Support Report, including advice about the gate closure process.

Note that releases have been reduced to 2,500 cubic metres per second while peak Lockyer Valley flows pass. Increases will then increase to 3,500 cubic metres per second.

Please call me on [redacted] if you require further information.

Regards,
Dan

Daniel Spiller
Director, Operations
SEQ Water Grid Manager
[redacted]
Visit: Level 15, 53 Albert Street Brisbane
Post: PO Box 16205, City East QLD 4002
ABN: 14783 317 630

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TECHNICAL SITUATION REPORT

TSR Number	W48	Date of TSR release	12.1.2011	Time of TSR release	8am

Seqwater status of inflows and dam operations

Current status but could change based on inflows or rainfall.

Current objectives	• Gradual reduction of releases.	
Strategy	• Peak inflows into Wivenhoe were in excess of 12000 cumecs. • Develop and implement closing plan for next 7 or so days	
Key considerations	Storage levels:	Above FSL
	Inflows:	Inflows expected well over 2,000,000ML
	Rainfall:	Continuing
	Lockyer/Bremer:	Monitoring their inflows
	Brisbane River:	Impact as below.

Rainfall

No significant rain has fallen over the catchments in the past twelve hours. Less than 10 to 15 millimeters of rainfall is expected over the next 24-48 hours.

Somerset/Wivenhoe

Somerset Dam has peaked at 105.11 m AHD at 08:00 on 12 January 2011 and the dam is discharging 1,230 m3/s over the spillway. Sluice gates will be utilised to assist the draining of the flood storage compartment commencing later Wednesday. At 8am Somerset was 105.11m and 720,400ML at 189.7%.

Wivenhoe Dam peaked at 74.97 m AHD at 19:00 on 11 January 2011 with a corresponding discharge of 7,450 m3/s. Wivenhoe Dam was 74.75 m AHD at 2,192,000ML and 188.1% at 07:30 and generally falling slowly.

The releases from Wivenhoe Dam have been temporarily reduced to 2,500 m3/s at 07:30 to allow the peak of Lockyer Creek to enter the Brisbane River. After the downstream peak in the lower Brisbane River has passed, releases will be increased to maximum of 3,500 m3/s. This release will then be maintained to drain the flood storage component within the required 7 days.

The combined flood event volume in Somerset and Wivenhoe Dams is estimated to be in excess of 2 million megalitres.

North Pine

At 07:00 North Pine Dam was 39.78 mAHD falling and releasing about 105 m3/s. North Pine has

peaked at 41.11 mAHD at 14:00 on 11 January 1974 with peak release of 2,800 m3/s. The event has a volume of around 200,000 ML. It is expected that gates will be close later Wednesday or early Thursday

Strategy

The Flood Operations Centre is continuing to monitor rainfalls and water levels through the Brisbane and Pine catchments and reviewing operating strategy every 30 minutes. The FOC is maintaining close contact with warning agencies and local councils.

Leslie Harrison Dam:
Gate releases are underway due to rainfall and inflows.

Hinze Dam:
A release of around 8,000 megalitres a day is being made through the emergency gates. There is no public access to the spillway.

Seqwater Technical Officer name	Robert Drury
Seqwater Technical Officer position title	Dam Operations Manager
[redacted]	

BoM assessment

(consisting of references to latest Flood Warning for the Brisbane River and other relevant Bureau forecasts and warnings (e.g. weather/rain forecasts, Tropical Cyclone Warning etc) and other updates/comments if needed)

BoM has been advised.

BoM Technical Officer name	Peter Baddiley
BoM Technical Officer position title	
BoM Technical Officer contact details	flood.qld[redacted]

Brisbane City Council (BCC) assessment

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised of the current strategy

BCC Technical Officer name	Chris Lavin
BCC Technical Officer position title	Disaster Operations Manager
BCC Technical Officer contact details	[redacted]

Ipswich City Council (ICC) assessment (if required)

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised of the current strategy.

ICC Technical Officer name	Tony Trace
ICC Technical Officer position title	Local Disaster Response Coordinator
ICC Technical Officer contact details	[redacted]

Somerset Regional Council (SRC) assessment (if required)

(to include predicted local inundation areas and depths of inundation bosed on the information)

Council has been advised of the current strategy.

SRC Technical Officer name	Tony Jacobs
SRC Technical Officer position title	Local Disaster Response Coordinator
SRC Technical Officer contact details	[redacted]

Collated and distributed by (Agency)

Contact Officer signature	
Contact Officer name	Rob Drury
Contact Officer position title	Dam Operations Manager

Next TSR due	Date	12.1.2011	Time	11am	or Event	

From: Barry Dennien <Barry.Dennien[redacted]>
Sent: Wednesday, January 12, 2011 9:24 AM
To: Dan Spiller <Daniel.Spiller[redacted]; Peter Borrows <pborrows[redacted]
Subject: Fwd: Wivenhoe Dam Flood Operations
Attach: SEQ WGM PrelimRep 12012011.docx; ATT00001.htm

Guys urgent proof check please looks ok to me

Regards
Barry Dennien

Begin forwarded message:

> **From:** Brian Cooper Consulting <brian.cooper.consult[redacted]
> **Date:** 12 January 2011 9:12:28 AM AEST
> **To:** Barry Dennien <Barry.Dennien[redacted]
> **Cc:** Elaina Smouha <Elaina.Smouha[redacted]
> **Subject: Wivenhoe Dam Flood Operations**
>
> Dear Barry,
>
> Please find attached, my letter report giving my initial findings regarding the operations of Wivenhoe and Somerset Dams. Please do not hesitate to call me if you have any questions.
>
> Regards,
>
> Brian Cooper

P.O. Box 205, BELROSE WEST NSW 2085
phone: [redacted]
mobile: [redacted]
email: brian.cooper.consult[redacted]
ABN: 56154707619

brian cooper

12 January 2011

Mr. Barry Dennien
CEO, SEQ Water Grid Manager
PO Box 16205
City East QLD 4002

Dear Barry,

This letter report:

- presents my preliminary findings on a review of the operation of Wivenhoe Dam (including controlled releases) for compliance against the Flood Mitigation Manual for the period 12 December 2010 to date (Flood Event), and;
- provides initial advice on the prudence and appropriateness of the decisions and actions taken during the Flood Event regarding the operation of Wivenhoe Dam in light of the Flood Mitigation Manual's requirements and the circumstances of the Flood Event.

The findings and advice are provided on the basis of information provided by SEQ Water Grid Manager which comprised the Flood Mitigation Manual and Technical Situation Reports. The latter were daily (sometimes twice daily) reports for the subject period. They gave a log of rainfall over the dam catchments and the downstream river (Lockyer Ck. And Bremer R.) catchments; inflows to Somerset and Wivenhoe Dams; storage levels; releases from the dams; details of the operation of gates and other outlets (gate openings/discharges); proposed changes in operating strategies and impacts on the various access crossings downstream of Wivenhoe Dam. In reviewing the Technical Situation Reports, I prepared a spreadsheet summarising the reports so that a timeline of the Flood Event could be seen at a glance. This provided a good overview of the Flood Event as it unfolded.

The main aspects of the Flood Mitigation Manual are the various strategies for operating Wivenhoe Dam and Somerset Dam as well as a number of requirements relating to flood operations personnel, flood preparedness and flood training.
At Wivenhoe Dam there are four main strategies for operating the dam (W1 to W4) and at Dam there are three (S1 to S3). These strategies are hierarchical and are based on a number of flood objectives. These in descending order of importance, are:

- Ensure the structural safety of the dams;
- 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 (FSL) at the conclusion of the Flood Event, and;
- Minimise impacts to riparian flora and fauna during the drain down phase of the Flood Event.

Normal procedures require a return to FSL within 7 days of the flood event peak passing through the dams so that the potential effects of closely spaced Flood Events can be allowed for.

It is apparent from the Technical Situation Reports that emphasis has been given to communicating changes in flood operations strategies with local authorities and the Bureau of Meteorology (BOM).

Until the last day or so, Wivenhoe Dam has been below EL74.0 and accordingly, would be operating under Strategy W1 i.e. make releases such that bridges downstream of the dam do not have to be closed prematurely. At various times during the Flood Event some of the downstream bridges have been closed. However, it is evident that action has been taken to vary dam releases such that various bridges could be re-opened as soon as possible. This appears to have been done in accordance with the flood operating strategies.

Over the last couple of days, the storage level in Wivenhoe Dam has increased to above EL 74.0 and the storage level in Somerset Dam is at EL 103.3 and is rising. This situation would demand strategy W3 for Wivenhoe Dam (*limit flow in the Brisbane River at Moggill to less than 4,000m^3/s*) and strategy S2 for Somerset Dam (*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 a graph. 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*). These strategies have been followed, although there appears to have been some discretion used in varying the releases from Somerset Dam (water has been held back in that dam). The last Technical Situation Report (W39 on 11/1/2011) however, indicated that there may need to be a move to Strategy W4 for Wivenhoe Dam (fuse plug triggering likely).

I conclude then, that the strategies as set out in the Flood Mitigation Manual have been followed, allowing for the discretion given to making variations in order to maximise flood mitigation effects. As a means of reviewing processes followed during a flood, it would be useful to present a timeline of the flood event showing graphs of storage levels, rainfall events, storage inflows, releases made and critical levels and discharges together with strategies adopted and projected strategies. The actions taken and decisions made during the Flood Event appear to have been prudent and appropriate in the context of the available knowledge available to those responsible for flood operations and the way events unfolded. I am informed by the Queensland Dam Safety Regulator (Peter Allen) that the various requirements of the Flood Mitigation Manual relating to requirements for flood operations personnel, flood preparedness and flood training have been adhered to.

Regards,

[redacted]

Brian Cooper

Gina O'Driscoll

From: Barry Dennien
Sent: Wednesday, 12 January 2011 9:39 AM
To: Peter Borrows
Subject: Re: Wivenhoe Dam Flood Operations

Ta

Regards
Barry Dennien

On 12/01/2011, at 9:36 AM, "Peter Borrows" <pborrows[redacted]> wrote:

> OK by me.
>
> Peter

From: Barry Dennien <Barry.Dennien[redacted]
To: Dan Spiller <Daniel.Spiller[redacted]; Peter Borrows
Sent: Wed Jan 12 09:24:06 2011
Subject: Fwd: Wivenhoe Dam Flood Operations

Guys urgent proof check please looks ok to me

Regards
Barry Dennien

Begin forwarded message:

> **From:** Brian Cooper Consulting <brian.cooper.consult[redacted]
> **Date:** 12 January 2011 9:12:28 AM AEST
> **To:** Barry Dennien <Barry.Dennien[redacted]
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> **Subject: Wivenhoe Dam Flood Operations**
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> Regards,
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P.O. Box 205, BELROSE WEST NSW 2085
[redacted]
ABN: 56154707619
brian cooper consulting

12 January 2011

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PO Box 16205
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Regards,

[redacted]

Brian Cooper

TECHNICAL SITUATION REPORT

TSR Number	W49	Date of TSR release	12.1.2011	Time of TSR release	11am

Seqwater status of inflows and dam operations

Current status but could change based on inflows or rainfall.

Current objectives	• Gradual reduction of releases.
Strategy	• Peak inflows into Wivenhoe were in excess of 12000 cumecs. • Develop and implement closing plan for next 7 or so days • Maintain lower releases until Lockyer peak has passed. • Begin dropping Somerset Dam to relieve upstream areas.
Key considerations	Storage levels: Above FSL
	Inflows: Inflows expected well over 1,500,000ML.
	Rainfall: Continuing
	Lockyer/Bremer: Monitoring their inflows
	Brisbane River: Impact as below.

Rainfall

No significant rain has fallen over the catchments in the past twelve hours. Less than 10 to 15 millimeters of rainfall is expected over the next 24-48 hours.

Somerset/Wivenhoe

Somerset Dam has peaked at 105.11 m AHD at 08:00 on 12 January 2011 and the dam is discharging over the spillway.
One Sluice gate has been opened around 11am to assist the draining of the flood storage compartment. Further sluices may be opened during the day to relieve upstream impacts.
At 11am Somerset was 105.06m and 716,900ML at 188.7% and dropping slightly.

Wivenhoe Dam peaked at 74.97 m AHD at 19:00 on 11 January 2011 with a corresponding discharge of 7,450 m3/s.
At 11am Wivenhoe Dam was 74.78 m AHD at 2,197,000ML and 188.5% and generally steady.

The releases from Wivenhoe Dam have been temporarily reduced to 2,500 m3/s at 07:30 to allow the peak of Lockyer Creek to enter the Brisbane River. After the downstream peak in the lower Brisbane River has passed, releases will be increased to maximum of 3,500 m3/s. This release will then be maintained to drain the flood storage component within the required 7 days.

The combined flood event volume in Somerset and Wivenhoe Dams is estimated to be around 2.3 million megalitres.

North Pine

At 11:00 North Pine Dam was 39.77 mAHD and falling and still releasing from 5 gates.
North Pine has peaked at 41.11 mAHD at 14:00 on 11 January 1974 with peak release of 2,800 m3/s.
The event has a volume of around 200,000 ML. It is expected that gates will now not close until Thursday or Friday.

Strategy

The Flood Operations Centre is continuing to monitor rainfalls and water levels through the Brisbane and Pine catchments and reviewing operating strategy every 30 minutes. The FOC is maintaining close contact with warning agencies and local councils.

Leslie Harrison Dam:
Gate releases are underway due to rainfall and inflows.

Hinze Dam:
A release of around 8,000 megalitres a day is being made through the emergency gates. There is no public access to the spillway.

Seqwater Technical Officer name	Robert Drury
Seqwater Technical Officer position title	Dam Operations Manager
[redacted]	

BoM assessment

(consisting of references to latest Flood Warning for the Brisbane River and other relevant Bureau forecasts and warnings (e.g. weather/rain forecasts, Tropical Cyclone Warning etc) and other updates/comments if needed)

BoM has been advised.

BoM Technical Officer name	Peter Baddiley
BoM Technical Officer position title	
BoM Technical Officer contact details	flood.qld[redacted]

Brisbane City Council (BCC) assessment

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised of the current strategy

BCC Technical Officer name	Chris Lavin

BCC Technical Officer position title	Disaster Operations Manager
BCC Technical Officer contact details	[redacted]

Ipswich City Council (ICC) assessment (if required)

(to include predicted local inundation oreas and depths of inundation based on the information)

Council has been advised of the current strategy.

ICC Technical Officer name	Tony Trace
ICC Technical Officer position title	Local Disaster Response Coordinator
ICC Technical Officer contact details	[redacted]

Somerset Regional Council (SRC) assessment (if required)

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised of the current strategy.

SRC Technical Officer name	Tony Jacobs
SRC Technical Officer position title	Local Disaster Response Coordinator
SRC Technical Officer contact details	[redacted]

Collated and distributed by (Agency)

Contact Officer signature	
Contact Officer name	Rob Drury
Contact Officer position title	Dam Operations Manager

Next TSR due	**Date**	12.1.2011	**Time**	2pm	**or Event**	

TECHNICAL SITUATION REPORT

TSR Number	W50	Date of TSR release	12.1.2011	Time of TSR release	3pm

Seqwater status of inflows and dam operations

Current status but could change based on inflows or rainfall.

Current objectives	• Gradual release of stored floodwaters with minimal impact.	
Strategy	• Peak inflows into Wivenhoe were in excess of 12000 cumecs. • Continue release of water from Somerset into Wivenhoe to reduce impacts upstream in Kilcoy area • Maintain reduced release from Wivenhoe until Lockyer flows are reduced and then increase to discharge flood waters over 7 days	
Key considerations	Storage levels:	Above FSL
	Inflows:	Inflows expected well over 2,300,000ML.
	Rainfall:	Continuing
	Lockyer/Bremer:	Monitoring their inflows
	Brisbane River:	Impact as below.

Rainfall

Rainfall in the last 12 hours is generally below 5mm with a couple of 10mm falls in the Stanley and North Pine catchments. There is no significant rain expected fin the next 4 days.

Somerset/Wivenhoe

Somerset Dam has peaked at 105.11 m AHD at 08:00 on 12 January 2011 and the dam has been discharging over the spillway. One sluice was opened at 1030 12 January 2011 and the dam is discharging 1,440 m3/s. Sluice gates will be utilised to drain of the flood storage compartment during the next 5 days.

At 3pm Somerset was 104.94m and 708,505ML at 186.5%.

Wivenhoe Dam peaked at 74.97 m AHD at 19:00 on 11 January 2011 with a corresponding discharge of 7,450 m3/s

The releases from Wivenhoe Dam have been temporarily reduced to 2,500 m3/s at 07:30 to allow the peak of Lockyer Creek to enter the Brisbane River. After the downstream peak in the lower Brisbane River has passed, releases will be increased to maximum of 3,500 m3/s. This release will then be maintained to drain the flood storage component within the required 7 days.

At 3pm Wivenhoe Dam was 74.81 m AHD at 2,201,636ML and 188.9% and fluctuating slightly due to the releases coming from Somerset but relatively steady.

The combined flood event volume in Somerset and Wivenhoe Dams is estimated to be approximately 2.6 million megalitres.

North Pine

North Pine peaked at 41.11 mAHD at 14:00 on 11 January 1974 with peak release of 2,800 m3/s. The event has a volume of around 200,000 ML.

At 3.00pm North Pine Dam was 39.74 mAHD and 217,370 ML and 101.4% and slowly falling. It is expected that gates will be closed Thursday or Friday.

Strategy

The Flood Operations Centre is continuing to monitor rainfalls and water levels through the Brisbane and Pine catchments and reviewing operating strategy every 30 minutes. The FOC is maintaining close contact with warning agencies and local councils.

Leslie Harrison Dam:
Gate releases are underway due to rainfall and inflows.

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Seqwater Technical Officer name	Robert Drury
Seqwater Technical Officer position title	Dam Operations Manager
[redacted]	

BoM assessment

(consisting of references to latest Flood Warning for the Brisbane River and other relevant Bureau forecasts and warnings (e.g. weather/rain forecasts, Tropical Cyclone Warning etc) and other updates/comments if needed)

BoM has been advised.

BoM Technical Officer name	Peter Baddiley
BoM Technical Officer position title	
BoM Technical Officer contact details	flood.qld[redacted]

Brisbane City Council (BCC) assessment

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised of the current strategy

BCC Technical Officer name	Chris Lavin
BCC Technical Officer position title	Disaster Operations Manager
BCC Technical Officer contact details	[redacted]

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(to include predicted local inundation areas and depths of inundation based on the information)

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ICC Technical Officer name	Tony Trace
ICC Technical Officer position title	Local Disaster Response Coordinator
ICC Technical Officer contact details	[redacted]

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(to include predicted local inundation areas and depths of inundation based on the information)

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SRC Technical Officer name	Tony Jacobs
SRC Technical Officer position title	Local Disaster Response Coordinator
SRC Technical Officer contact details	[redacted]

Collated and distributed by (Agency)

Contact Officer signature	
Contact Officer name	Rob Drury
Contact Officer position title	Dam Operations Manager

Next TSR due	**Date**	12.1.2011	**Time**	8pm	**or Event**	

From: Dan Spiller <Daniel.Spiller[redacted]>
Sent: Wednesday, January 12, 2011 3:52 PM
To: 'stephen.robertson[redacted]'; 'ken.smith[redacted]; 'Bradley John' <John.Bradley[redacted]; 'lance.mccallum[redacted] 'Tim.Watts[redacted]; 'Geoff.Stead[redacted]; 'Lauren.Sims@[redacted] 'Martin.PeterJ[redacted] 'Dunn.KerryG[redacted]; 'Best Debbie' <Debbie.Best[redacted].
Cc: Barry Dennien <Barry.Dennien[redacted]>; 'Peter Borrows' <pborrows[redacted]>; 'Rob Drury' <rdrury[redacted]>; SEQWGM Media <media[redacted]>; SEQWGM Emergency <SEQWGM.Emergency[redacted] 'Madgwick.DarrenT@[redacted] 'damien.brown[redacted] 'Reilly Bob' <Bob.Reilly[redacted]>; seqwgm[redacted]
Subject: Dam release update
Attach: Technical_Situation_Report_W50.docx

All,

Attached is an updated Technical Support Report, including advice about the gate closure process.

The Wivenhoe Dam release rate has been maintained at 2,500 cubic metres per second. Dam levels have reduced slightly.

Please call me on [redacted] if you require further information.

Regards,
Dan

Daniel Spiller
Director, Operations
SEQ Water Grid Manager
[redacted]
Visit: Level 15, 53 Albert Street Brisbane
Post: PO Box 16205, City East QLD 4002
ABN: 14783 317 630

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

Disclaimer
This email, together with any attachments, is intended for the named recipient(s) only; and may contain privileged and confidential information. You understand that any privilege or confidentiality attached to this message is not waived, lost or destroyed because you have received this message in error. If received in error, you are asked to inform the sender as quickly as possible and delete this email and any copies of this from your computer system network.
If not an intended recipient of this email, you must not copy, distribute or take any action(s) that relies on it; any form of disclosure, modification, distribution and/or publication of this email is also prohibited. While all care has been taken, the SEQ Water Grid Manager disclaims all liability for loss or damage to person or property arising from this message being infected by a computer virus or other contamination. Unless stated otherwise, this email represents only the views of the sender and not the views of the SEQ Water Grid Manager and/or the Queensland Government.

TECHNICAL SITUATION REPORT

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Seqwater Technical Officer position title	Dam Operations Manager
[redacted]	

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Collated and distributed by (Agency)

Contact Officer signature	
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Gina O'Driscoll

From: Elaina Smouha [elainamir[redacted]]
Sent: Wednesday, 12 January 2011 4:03 PM
To: Barry Dennien; pborrows[redacted]
Subject: Fwd: Wivenhoe Dam Flood Ops
Attachments: SEQ WGM FinalRep 12012011.docx; ATT00001.htm; TechReports - Summary.xlsx; ATT00002.htm

Elaina Smouha
Director, Governance and Regulatory Compliance
SEQ Water Grid Manager
[redacted]
Visit: Level 15, 53 Albert Street Brisbane
Post: PO Box 16205, City East QLD 4002
ABN: 14783 317 630

Begin forwarded message:

From: "Brian Cooper Consulting" <brian.cooper.consul[redacted]
Date: 12 January 2011 3:31:18 PM GMT+10:00
To: "'Elaina Smouha'" <elainamir[redacted]
Subject: RE: Wivenhoe Dam Flood Ops

Dear Elaina,

Please find attached my final report. The attached spreadsheet is part of the report. Again, if you or Barry have any questions, please do not hesitate to call me.

Regards,

Brian Cooper

From: Elaina Smouha [mailto:elainamir[redacted]]
Sent: Wednesday, 12 January 2011 3:25 PM
To: Brian Cooper Consulting
Subject: Re: Wivenhoe Dam Flood Ops

Brian,

Our work email system is still down, so could you please email through your final report to this email address?

Thanks

Elaina

On Wed, Jan 12, 2011 at 10:53 AM, Brian Cooper Consulting <brian.cooper.consult[redacted]> wrote:

Dear Elaina,

Report attached as requested.

Regards,

Brian Cooper

P.O. Box 205, BELROSE WEST NSW 2085
[redacted]
ABN: 56154707619
brian cooper consulting

12 January 2011

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PO Box 16205
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- presents my final findings on a review of the operation of Wivenhoe Dam (including controlled releases) for compliance against the Flood Mitigation Manual for the period 12 December 2010 to date (Flood Event), and;
- provides advice on the prudence and appropriateness of the decisions and actions taken during the Flood Event regarding the operation of Wivenhoe Dam in light of the Flood Mitigation Manual's requirements and the circumstances of the Flood Event.

The report follows on from my preliminary report sent to you earlier today. The findings and advice are provided on the basis of information provided by SEQ Water Grid Manager which comprised the Flood Mitigation Manual and Technical Situation Reports. The latter were daily (sometimes twice daily) reports for the subject period. They gave a log of rainfall over the dam catchments and the downstream river (Lockyer Ck. and Bremer R.) catchments; inflows to Somerset and Wivenhoe Dams; storage levels; releases from the dams; details of the operation of gates and other outlets (gate openings/discharges); proposed changes in operating strategies and impacts on the various access crossings downstream of Wivenhoe Dam. In reviewing the Technical Situation Reports, I prepared a spreadsheet (see separate attachment of Excel spreadsheet *Tech Reports – Summary*, summarising the reports so that a timeline of the Flood Event could be seen at a glance. This provided a good overview of the Flood Event as it unfolded and showed what information may or may not have been included in a particular report. The Queensland Director Dam Safety (Water Supply) informed me that the Flood Operation Logs contain much more detailed information including details of the communications that were carried out and some of the more detailed information that is not necessarily included in the Technical Situation Reports. I have been provided with a draft of the "*Protocol for the Communication of Flooding Information for the Brisbane River Catchment – Including Floodwater Releases from Wivenhoe and Somerset Dams*" developed in October/November last year and currently being used. The Technical Situation Reports appear to have been an outcome of that Protocol.

The various requirements and required actions detailed in the Flood Mitigation Manual are summarised in the Table given in Attachment A. The Table also gives my comments (where appropriate) on whether there is evidence from the information presented to me, that there is satisfactory compliance with these requirements and actions.

The main aspects of the Flood Mitigation Manual are the various strategies for operating Wivenhoe Dam and Somerset Dam as well as a number of requirements relating to flood operations personnel, flood preparedness and flood training.

At Wivenhoe Dam there are four main strategies for operating the dam (W1 to W4) and at Dam there are three (S1 to S3). These strategies are hierarchical and are based on a number of flood objectives. These in descending order of importance, are:

- Ensure the structural safety of the dams;
- 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 (FSL) at the conclusion of the Flood Event, and;
- Minimise impacts to riparian flora and fauna during the drain down phase of the Flood Event.

Normal procedures require a return to FSL within 7 days of the flood event peak passing through the dams so that the potential effects of closely spaced Flood Events can be allowed for.

It is apparent from the Technical Situation Reports that emphasis has been given to communicating changes in flood operations strategies with local authorities and the Bureau of Meteorology (BOM).

Until the last day or so, Wivenhoe Dam has been below EL74.0 and accordingly, would be operating under Strategy W1 i.e. make releases such that bridges downstream of the dam do not have to be closed prematurely. For a few days at the end of December and for the last day or so before yesterday's big rise, Strategy W2 would be in place (restrain releases from Wivenhoe Dam such that Brisbane River flows are maintained within the upper limit of non-damaging floods at Lowood (3,500 m3/s)). At various times during the Flood Event some of the downstream bridges have been closed. However, it is evident that action has been taken to vary dam releases such that various bridges could be re-opened as soon as possible. This appears to have been done in accordance with the flood operating strategies. The operations then moved onto Strategy W4 when the storage in Wivenhoe Dam reached about EL 73.5 (before the W4 trigger level of EL 74) when yesterday's heavy rain came on and it was assessed that there was a chance that the first (central) fuse plug could be triggered. It was then a matter of juggling the radial gate openings in an attempt to circumvent any fuse plug triggering. A graph of storage levels for Wivenhoe and Somerset Dams (from information taken from the Technical Situation Reports) showing the limits for the various Wivenhoe Dam flood strategies is given in Attachment A. It is apparent from this graph, that the appropriate flood operation strategies were adopted. The Technical Situation Reports indicate that proposed changes in strategy were appropriately communicated with appropriate authorities in accordance with the new Communication Protocol.

Summary:

The Technical Situation Reports comply with the requirements of the new Communication Protocol. However, I feel that there could be more consistency in the information presented. There seem to be gaps in information presented such as storage levels (see spreadsheet and graph in Attachment A). It would be useful to specify the minimum information required to be presented in the Technical Situation Reports (storage levels, inflows, recent/current rainfall, forecast rainfall, releases from dams, estimated flows from downstream tributaries, current flood operating strategy for each dam and proposed change in strategy, gate and regulator operations, state of downstream road crossings etc). Most of the minimum information is already given, but not in a consistent manner. As a means of reviewing processes followed during a flood, it would be useful to present a timeline of the flood event showing graphs of storage levels and other data that can be easily presented in a graphical manner.

I am informed by the Queensland Director Dam Safety (Water Supply) that the various requirements of the Flood Mitigation Manual relating to requirements for flood operations personnel, flood preparedness and flood training have been adhered to. There are a number of other requirements however, that I am not able to say whether they were satisfied as I had insufficient information. These requirements (see Table in Attachment A) should be subject to a separate audit.

It appears to me that the decision to implement Strategy W4 was a prudent one. While it would cause some damage in the Brisbane River downstream, its implementation, considering forecast rainfalls

and projected flows in Lockyer Ck. And the Bremer River, would allow reduction of the storage level in Wivenhoe Dam. This reduction in storage level would hopefully provide a sufficient buffer that would minimise the chance of a fuse plug triggering in the auxiliary spillway. Triggering of the first (central) fuse plug would cause a sudden increase of flow of some 2,000m^3/s from Wivenhoe Dam. This increase in flow would cause significantly more flooding in the lower Brisbane River than that caused by early implementation of Strategy W4.

Conclusions:

The strategies as set out in the Flood Mitigation Manual have been followed, allowing for the discretion given to making variations in order to maximise flood mitigation effects. The actions taken and decisions made during the Flood Event appear to have been prudent and appropriate in the context of the available knowledge available to those responsible for flood operations and the way events unfolded.

There are a number of requirements where there was insufficient information for me to demonstrate compliance. However, satisfaction or otherwise of these requirements would have had little impact on the operation of the two dams during this particular Flood Event. They should be audited separately.

There are aspects of the Technical Situation Reports that could be improved and these have been discussed above.

Regards,

[redacted]

Brian Cooper

ATTACHMENT A

Action Requirements extracted from the Flood Mitigation Manual:

Action	Comment
The Flood Mitigation Manual contains the operational procedures for Wivenhoe Dam and Somerset Dam for the purposes of flood mitigation and must be used for the operation of the dams during flood events.	Appears to have been done
Sufficient numbers of suitably qualified personnel are available to operate the dams if a Flood Event occurs.	Director of Dam Safety is satisfied
The level of flooding as a result of emptying stored floodwaters after the peak has passed is to be less than the flood peak unless accelerated release is necessary to reduce the risk of overtopping.	Not sufficient information for me to say
A regular process of internal audit and management review must be maintained by Seqwater to achieve improvements in the operation of the RTFM.	Not sufficient information for me to say
Seqwater must maintain a log of the performance of the data collection network. The log must include all revised field calibrations and changes to the number, type and locations of gauges. Senior Flood Operations and Flood Operations Engineers are to be notified of all significant changes to the Log.	Not sufficient information for me to say
Seqwater must maintain a log of the performance of the RTFM. Any faults to the computer hardware or software are to be noted and promptly and appropriately attend to.	Not sufficient information for me to say
Seqwater must ensure that all available data and other documentation is appropriately collected and catalogued for future use.	Not sufficient information for me to say
Seqwater must ensure that information relevant to the calibration of its field stations is shared with appropriate agencies.	Not sufficient information for me to say
Seqwater must liaise and consult with these agencies with a view to ensuring all information relative to the flood event is consistent and used in accordance with agreed responsibilities: • Bureau of Meteorology (issue of flood warnings for Brisbane River basin); • Department of Environment and Resource Management (review of flood and discretionary powers); • Somerset Regional Council (flood level information for upstream of Somerset Dam and upstream and downstream of Wivenhoe Dam); • Ipswich City Council (flood level information for Ipswich), and; • Brisbane City Council (flood level information for Brisbane City).	Required also by draft of Communications Protocol. Technical Situation Reports infer compliance
Seqwater must report to the Chief Executive by 30 September each year on the training and state of preparedness of operations personnel.	Not sufficient information for me to say
Seqwater must provide a report to the Chief Executive by 30 September each year on the state of the Flood Monitoring and Forecasting System and Communication Networks.	Not sufficient information for me to say
After each significant flood event, Seqwater must report to the Chief Executive on the effectiveness of the operational procedures contained in this manual.	Pending?

Action	Comment
Prior to the expiry of the approval period, Seqwater must review the Manual pursuant to provisions of the Act.	Not sufficient information for me to say
Strategies are changed in response to changing rainfall forecasts and stream flow conditions to maximise the flood mitigation benefits of the dams.	Technical Situation Reports indicate that this is done
When determining dam outflows within all strategies, peak outflow should generally not exceed peak inflow.	Not sufficient information for me to say
Protocol for use of discretionary powers (i.e. who gets told)	Director of Dam Safety is satisfied – I don't know whether appropriate CEO's have approved

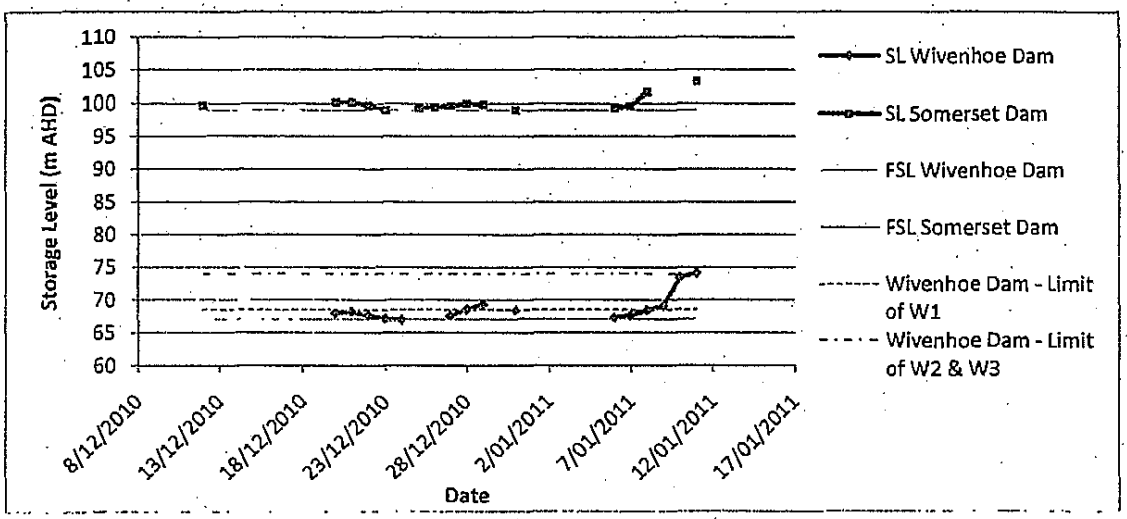
For a number of the above actions, there was not sufficient information for me to comment. These actions should be audited separately.

Action	Comment
Flood Strategies for Wivenhoe Dam:	
The intent of Strategy W1 is to not to submerge the bridges downstream of the dam prematurely (see Appendix I). The limiting condition for Strategy W1 is the submergence of Mt Crosby Weir Bridge that occurs at approximately 1,900 m^3/s . For situations where flood rains are occurring on the catchment upstream of Wivenhoe Dam and only minor rainfall is occurring downstream of the dam, releases are to be regulated to limit, as much as appropriate in the circumstances, downstream flooding.	Technical Situation Reports indicate that every attempt was made to keep the specified road crossings open
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 nondamaging floods at Lowood (3,500 m^3/s). In these instances, the combined peak river flows should not exceed those shown in the following table:	Technical Situation Reports indicate that Wivenhoe Dam releases were made considering concurrent
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	

Action	Comment
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.	flows in the Bremer River & Lockyer Ck. To delay damaging floods as long as possible
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 EL74.0 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. There are no restrictions on gate opening increments or gate operating frequency once the storage level exceeds EL74.0 AHD, as the safety of the dam is of primary concern at these storage levels.	Technical Situation Reports indicate that Wivenhoe Dam releases were such as to delay adopting this strategy as long as possible
Where possible, total releases during closure should not produce greater flood levels downstream than occurred during the flood event.	Technical Situation Reports indicate that this requirement was satisfied
The aim should always be to empty stored floodwaters stored above EL 67.0m within seven days after the flood peak has passed through the dams.	Technical Situation Reports indicate that emphasis was given to satisfying this requirement
Flow in the spillway to be as symmetrical as possible with the centre gates opened first.	Technical Situation Reports indicate that this was done
The bottom edge of the radial gates must always be at least 500mm below the release flow surface.	Not sufficient information for me to say

Action	Comment
Flood Strategies for Somerset Dam:	
The intent of Strategy S1 (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) 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.	Technical Situation Reports indicate that this was done
The intent of Strategy S2 (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). This to maximise the benefits of the flood storage capabilities of the dam while protecting the structural safety of both dams. The Flood Mitigation Manual contains a graph that shows the intended interaction of the Wivenhoe Dam and Somerset Dam storage levels.	Technical Situation Reports indicate that this was done – little information on the operation of the radial gates at Somerset Dam. How the graph was followed not really demonstrated
The intent of Strategy S3 (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) is to maximise the benefits of the flood storage capabilities of the dam while protecting the structural safety of both dams.	Not relevant at this stage
The safety of Somerset Dam is the primary consideration and cannot be compromised and its peak level cannot exceed EL 109.7.	Maximum level only EL103.3

Wivenhoe & Somerset Dams – Storage Level Behaviour (as presented in Technical Situation Reports)



Date	Time	TSR	Wivenhoe Dam Release (m^3/s)				Gate No.	Opening (m)	Storage Level	Rainfall (mm)
			Regulators	Hydro	Gates	Total				
12/12/2010	1400	W1								
13/12/2010	1300	W2		10	290	300				
15/12/2010	1800	W3								
16/12/2010	1600	W4			0					
17/12/2010	1200	W5								Large storms yesterday pm and night 50 forecast tonight
17/12/2010	1800	W6	Closed		Opening Op. Initiated					20-50 forecast o/n
	1830			13		50	63	3	0.5	
18/12/2010	0700	W7								40-50 since 16/12/2010
19/12/2010	0700	W8				350	350	3	3.5	20-30 upper Brisbane R.
19/12/2010	1800	W9				300	300	3	3	
20/12/2010	0700	W10								
20/12/2010	0900	W11							68 expected this afternoon	
20/12/2010	0900	W12								
21/12/2010	0730	W13				peak 1,280 (0500)			peak 68.24 (0400); currently 68.22 (112% cap.) falling slowly	
22/12/2010	0830	W14							currently @ 67.61 (107% cap.) falling slowly	none since 300 on 20/12/2010
22/12/2010	1600	W15			Closing sequence				to finish just>FSL	
									When gates closed,	

25/12/2010	0930 W20			10-20 over last 24 hrs
26/12/2010	0800 W21			Rel. minor over last 24 hrs.
27/12/2010	0800 W22			40-50 over dam CA last 24 hrs.
28/12/2010	0700 W23	347 (initially) then back to 46		20-40 over dam CA's ;ast 24 hrs
29/12/2010	0700 W24		69.26 (@ 0600) - aim is to return to FSL by 2/1/2011	No/very little in last 24 hrs.
30/12/2010	0700 W25	Wivenhoe+Lockyer = 1,600m^3/s	69.33 peak yesterday @ 1200 (2.3m > FSL) 69.07 this am	No/very little in last 24 hrs.
31/12/2010	0700 W26 W27	Wivenhoe+Lockyer = 1,600m^3/s	68.4 @ 0500	No/very little in last 24 hrs.
6/01/2011	1200 W28	Commence opening RG @ 1800 & ramp up to 300m^3/s by 2200.	67.31 @ 0700	20-30 widespread with up to 50 on d CA's
				30-50 with isolated falls up to 75; sig

9/01/2011	0700 W32		1,343	Currently 68.58 (falling slowly)	For last 12 hrs. av. of 40 for Somerset & <10 for Wivenhoe CA
	W33				
9/01/2011	2100 W34		1,400	Currently @ 69.1;	Very heavy rainfall -totals for 24 hrs : 300; Severe weather warning for hea rainfall
	W35				
	W36				
	W37				
11/01/2011	0630 W38	2,750 since 1930 on 10/1/2011	All (5) gates	73.51 rising @ 25mm/hr.	20-60 last 12 hrs in Lockyer CA; 30 in Bremer R.; Isol. Falls of 125 in upper Brisbane R. & widespread falls of 40 - in Somerset CA
11/01/2011	1200 W39		3,970	74.1 (179.5% cap.) rising @ 25mm/hr.	

1646

Comments	Cros
45,000Ml from Somerset; WL|Somerset to peak at 99.7 on 13/12/2010; 150m^3/s expected through Brisbane; 30,000Ml expected into Wivenhoe from upper Brisbane R.; peak WL in Wivenhoe expected to be 67.6; Releases expected from Wivenhoe on afternoon of 13/12/2010 ramping up to 300m^3/s; Reg. will be closed & Gate 3 opened to 3m to get WL back to 67.25; Incr. release will impact on 3 crossings; Dam Regulator informed	
138m^3/s from Somerset;	Gate release will impact on 3 crossings
Releases from Wivenhoe will cease on 16/12/2010; Hydro will continue during fish recovery ops.	
Gate closed 1000	
Decision to commence a release tonight was made this am by Duty Flood Engineers to provide as much notice to impacted Councils as possible; 60,000Ml needs to be released from Wivenhoe & Somerset to maintain FSL	
Need to release >60,000Ml from Wivenhoe & Somerset to achieve FSL	
Releases could increase to 300m^3/s;	Would impact Twin Bridges, Savages Crossing, Colleges C
100,000Ml to be drained in next 4 days; Q|Brisbane R. to be maintained at 300-350m^3/s;Transfer from Somerset via 2 reg.; Wivenhoe Q incr. to 150m^3/s o/n; Will incr. further to 300m^3/s as Q|Lock.Ck. Subside over next 24 hrs.; Q|Lock.Ck. Currently 130m^3/s	Twin Bridges & Savages Crossing currently closed; Colleg
12,000Ml/day from Somerset; Release expected until 22/12/2010;	Twin Bridges, Savages Crossing, Colleges Crossing current
Somerset rel. steady (Q|reg.=140m^3/s); Q}Wivenhoe to be maintained at 300m^3/s (Lock.Ck. Permitting) to allow Burtons Bridge to remain open; WL|Wivenhoe expected to incr. to 67.4 over next 2 days;	Twin Bridges, Savages Crossing and Colleges Crossing are considered if more rain or inflows
Somerset risen to 100.2 - sluice gate releases to be made until am of 22/12/2010 when FSL expected; WL|Wivenhoe at 68 expected this pm; Q|Wivenhoe expected to be >1,200m^3/s - discuss with impacted Cncls.- strategy decision by 10000; Wivenhoe inflows excl.	
Q|Somerset peak tomorrow at 1800m^3/s	Both Burtons and Kholo bridges likely to be inundated
Inflow to Somerset to peak today at 700m^3/s; Somerset & Wivenhoe currently storing 140,000Ml above FSL; further inflows occurring; releases to be incr. o/n to ~1,200m^3/s; various Cncls. Given heads up; BOM advised	Wivenhoe releases reduced slightly to keep Burtons Brid residents affected by Burtons Bridge
Same as W11	
410m^3/s from Somerset sluice gates; Somerset peaked @100.43 (1300 on 20/12/2010), currently @ 100.23 (114% of cap.); 110,700Ml Inflow to Somerset,67,500Ml discharged into Wivenhoe; Wivenhoe inflow (excl. Somerset releases) = 157,900Ml, 103,000Ml released; Total Inflow to both dams ~310,000Ml; Continued gate operations may be necessary if forecast rainfall results in subsequent river rises	Kholo Bridge is also expected to be inundated by mid-mo these bridges should be back in service by late Thursday should be trafficable for Christmas providing no further r
410m^3/s from Somerset sluice gates; Somerset currently @ 99.68 (108% cap.); 121,500Ml inflow to Somerset, 103,000Ml released to Wivenhoe; Gate Ops. @ Wivenhoe; High tides expected to coincide with peak levels in Brisbane R.	Burtons Bridge & Kholo Bridge expected to be back trafficable by Xmas provided no further rain
BOM aware of all releases	Gate closing sequence to allow bridges to be accessible
	Projected crossing openings: Burtons Bridge – 18:00 Thur Savages Crossing – 19:00 Thursday 23 December 2010

Somerset WL incr. from 99.18 yesterday @ 0600 to 99.33 @ 0730 today; 99.5 tomorrow if no gate ops.; Wivenhoe currently 4,200Ml through hydro & reg.; 15,00Ml expected just from upper Brisbane R. in next few days; WL cont. to fall in Lock. Ck; Small rises expected in Bremer & Warrill systems; WL in Wivenhoe incr. to 67.28 @ 600

Twin Bridges, Savages and Colleges Crossing rema
runoff. Burtons and Kholo Bridges would be currentl
regarding repairs.

BOM issued severe weather warning @ 0 445; Somerset WL incr. to 99.46 (0.46m> FSL) - 2 regs. To be opened today (140m^3/s); Wivenhoe WL incr. to 67.37 (0.37m > FSL); RG to be opened later today following discussions with local authorities; further gate ops may be necessary if rainfall incr. river levels

Crossings downstream of the dam are currently impa
releases from Wivenhoe). Lockyer Creek outflows ir
Twin Bridges, Savages and Colleges Crossings will l
depending on flows downstream so as to not impact

BOM continues with severe weather warning & widespread rainfall over dam CA's; 2 regs. @ Somerset giving 139m^3/s release, lake contd. To rise to 99.6 (0.6m> FSL); RG ops @ Wivenhoe commenced yesterday @ 0900, WL contd. To rise to 67.57 (0.57m > FSL);Q|Wivenhoe reduced o/n because of incr. Q|Lockyer to ensure Burtons Bridge remains open; RG @ Wivenhoe wound back as Q|Lockyer incr. > 250m^3/s; Q|Lockyer expected to peak>500m^3/s later today/tomorrow - will innundate Burtons Bridge;When this happens, Q|Wivenhoe will be incr. to get WL back to FSL; further gate ops may be necessary in coming days

Twin Bridges, Savages Crossing and Colleges Cross
will be closed later today/tomorrow; Kholo Bridge ren
expectation that either Mt Crosby Weir Bridge or Fer
updated estimate of the time of closure of Burtons Br

RG discharge dropped back to 46m3/s to ensure Bu
Crossing, Colleges Crossing, Burtons Bridge and Kh
either Mt Crosby Weir Bridge or Fernvale Bridge will
being closely monitored and may come close to impa
access is not impacted yet

Sever weather warning no longer current; Somerset release through regs' ~ 208m^3/s;WL|Somerset incr. to 99.96 (0.96m>FSL) - inflows decreasing; RG opening dependent on Q|Lockyer; Wivenhoe WL currently @ 68.55 (1.55m > FSL); Inflows to Wivenhoe decr.

Twin Bridges, Savages Crossing, Colleges Crossing
current expectation that Mt Crosby Weir Bridge or F
stage, estimated that the flow at Burtons Bridge will

Further 2 sluices opened @ Somerset; WL @ Somerset 99.83 & falling slowly, 2 sluices to be closed @ 1200; Intended to incr. Wivenhoe releases so Q|Wivenhoe+Q|Lockyer maintained @ 1,600m^3/s (similar Q to mid Oct &mid Dec 2010)

2 sluices @ Somerset remain open (405m^3/s) - FSL expected by 6/1/2011; RG closing sequence expected to start mid tomorrow- RG expected to be closed on 2/1/2011

Twin Bridges, Savages Crossing, Colleges Crossing

WL @ Somerset 99.01 (falling from peak of 100.0 - 1200 28/12/2010) - currently 2 regs;

Twin Bridges, Savages Crossing, Colleges Crossing
to inundation

Not included

Somerset @ 99.34 (0.34m > FSL) & rising slowly; Wivenhoe 67.31 (0.31m > FSL) & rising slowly; Gates will be opened in next 24 hrs; Lockyer Ck peak of about 100m3/s Friday afternoon

Lockyer Ck peak of about 100m3/s Friday afternoor
Savages Crossing. Colleges Crossing could be take
strategy is to keep Burton Bridge free. Gate release
450m^3/s).

100-200mm rain forecast for SE Qld next 5 days; Somerset WL @ 99.58 (0.59m > FSL) rising slowly - currently releasing 35m^3/s; Wivenhoe WL @ 67.64 (0.64m > FSL & > gate trigger level) rising slowly; u/s of dam river levels peaked @ Linville and Gregors Ck gauges; A peak of about 470 cumecs is expected from Lockyer Creek by mid-afternoon; Wivenhoe gate releases will occur after the impact of Lockyer flows on Burtons Bridge has been ascertained and flood levels in the lower Lockyer subside Q|Wivenhoe may be as

Q|Lockyer may be of sufficient magnitude to inundat
Council and Brisbane City Council have been advise
hours; The relatively high Lockyer flows will adversel
Colleges Crossing for several days, may also later in
be any adverse impacts upon Fernvale Bridge or Mt

Somerset currently @ 100.27 - 60mm rain in last 2 hrs will cause significant inflow later today; 405m^3/s being released into Wivenhoe; maintain combined Q of 1,600m^3/s in mid-Brisbane R.
Not included

Somerset @ 101.68 rising quickly; 5 sluice gates open releasing ~1,100m^3/s; WL expected to reach 103.5 by am 11/1/2011; River levels u/s Wivenhoe rising fast; Q|Brisbane R. @ Gregors Ck @ 6,700m^3/s; Wivenhoe expected to reach 73.0 by 11/1/2011 - need to incr. Q|Wivenhoe am of 10/1/2011 - crank up to 2,600m^3/s by am 11/1/2011; Attempt to keep combined Q < 3,500m^3/s - < limit of urban damages in the City
Not included
Not included
Not included

Somerset WL @ 103.27 & falling slowly ; currently 1,400m^3/s released to Wivenhoe- to be reduced to 500m^3/s later in the day - to ensure flood mitigation of Somerset & Wivenhoe are maximized; BOM provided advice on flash flooding in Lockyer Ck.; WL in Wivenhoe will reach 74 by evening; May need to increase Q further - may result inQ|lower Brisbane R. >5,000m^3/s

Somerset @ 103.3 & rising; Outflows into the Brisbane River from both Lockyer Creek and the Bremer River are also increasing; If no further rain, can hold @ 74.8 - aim is to prevent fuse plug triggering, situation assessed every 3 hrs.; Heavy rainfall continues throughout South East Queensland and the situation could deteriorate over the next 24 hours. The flood operation centre will continue to monitor the situation and provide situation reports every six hours until the situation stabilizes.

The current Wivenhoe Dam release combined with L
crossings downstream of Wivenhoe (Twin Bridges, S
Colleges Crossing) will be adversely impacted until a
Mt Crosby Weir Bridge are not expected to be affect
eventuate and higher releases from Wivenhoe Dam
strategy

The projected Wivenhoe Dam releases combined wi
downstream of Wivenhoe (Twin Bridges, Fernvale, S
Weir and Colleges Crossing) will be adversely impac
Water levels in the lower Brisbane R will be impacte
runoff and releases from Wivenhoe Dam

The projected Wivenhoe Dam releases combined wi
crossings downstream of Wivenhoe (Twin Bridges, F
Mt Crosby Weir and Colleges Crossing) will be adve
be impacted by the combined flows of Lockyer Creel
Dam.

TECHNICAL SITUATION REPORT

TSR Number	W51	Date of TSR release	12.1.2011	Time of TSR release	6pm

Seqwater status of inflows and dam operations

Current status but could change based on inflows or rainfall.

Current objectives	• Gradual release of stored floodwaters with minimal impact.
Strategy	• Peak inflows into Wivenhoe were in excess of 12000 cumecs. • Continue release of water from Somerset into Wivenhoe to reduce impacts upstream in Kilcoy area • Maintain reduced release from Wivenhoe until Lockyer flows are reduced and then increase to discharge flood waters over 7 days
Key considerations	Storage levels: Above FSL
	Inflows: Inflows expected well over 2,300,000ML.
	Rainfall: Continuing
	Lockyer/Bremer: Monitoring their inflows
	Brisbane River: Impact as below.

Rainfall

Rainfall in the last 12 hours is generally below 5mm with a couple of 10mm falls in the Stanley and North Pine catchments. There is no significant rain expected fin the next 4 days.

Somerset/Wivenhoe

Somerset Dam has peaked at 105.11 mAHD at 06:00 on 12 January 2011. One sluice was opened at 1030 12 January 2011 and discharging 1,410 m3/s. Sluice gates will be utilised to drain of the flood storage compartment during the next 5 days.

At 5pm Somerset was 104.86m and 702,953ML at 185.1%.

Wivenhoe Dam peaked at 74.97 mAHD at 19:00 on 11 January 2011 with a corresponding discharge of 7,450 m3/s.

The release from Wivenhoe Dam was reduced to 2,500 m3/s at 07:30 12 January 2011 to allow the peak of Lockyer Creek to enter the Brisbane River and this release has been maintained since. After the downstream peak in the lower Brisbane River has passed, releases will be increased to maximum of 3,500 m3/s. The release is expected to commence Thursday and then be maintained at this level to drain the flood storage component within the required 7 days. The releases will not result in any renewed rises at downstream locations.

At 5pm Wivenhoe Dam was 74.82 m AHD at 2,203,223ML and 189.1% and fluctuating slightly due to the releases coming from Somerset but relatively steady.

The combined flood event volume in Somerset and Wivenhoe Dams is estimated to be approximately 2.6 million megalitres.

North Pine

At 17:00 North Pine Dam had all gates open 1 increment, releasing about 80 m3/s. North Pine peaked at 41.11 mAHD at 14:00 on 11 January 2011 with peak release of 2,800 m3/s. The event has a volume of around 200,000 ML

At 5.00pm North Pine Dam was 39.74 mAHD and 217,370 ML and 101.4% and slowly falling. It is expected that gates will be closed Thursday or Friday.

Strategy

The Flood Operations Centre is continuing to monitor rainfalls and water levels through the Brisbane and Pine catchments and reviewing operating strategy every 30 minutes. The FOC is maintaining close contact with warning agencies and local councils.

Leslie Harrison Dam:
Gate releases finished late this afternoon.

Hinze Dam:
A release of around 8,000 megalitres a day is being made through the emergency gates. There is no public access to the spillway.

Seqwater Technical Officer name	Robert Drury
Seqwater Technical Officer position title	Dam Operations Manager
[redacted]	

BoM assessment

(consisting of references to latest Flood Warning for the Brisbane River and other relevant Bureau forecasts and warnings (e.g. weather/rain forecasts, Tropical Cyclone Warning etc) and other updates/comments if needed)

BoM has been advised.

BoM Technical Officer name	Peter Baddiley
BoM Technical Officer position title	
BoM Technical Officer contact details	flood.qld[redacted]

Brisbane City Council (BCC) assessment

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised of the current strategy

BCC Technical Officer name	Chris Lavin
BCC Technical Officer position title	Disaster Operations Manager
BCC Technical Officer contact details	[redacted]

Ipswich City Council (ICC) assessment (if required)

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised of the current strategy.

ICC Technical Officer name	Tony Trace
ICC Technical Officer position title	Local Disaster Response Coordinator
ICC Technical Officer contact details	[redacted]

Somerset Regional Council (SRC) assessment (if required)

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised of the current strategy.

SRC Technical Officer name	Tony Jacobs
SRC Technical Officer position title	Local Disaster Response Coordinator
SRC Technical Officer contact details	[redacted]

Collated and distributed by (Agency)

Contact Officer signature	
Contact Officer name	Rob Drury
Contact Officer position title	Dam Operations Manager

Next TSR due	**Date**	13.1.2011	**Time**	8am	**or Event**	

From: Dan Spiller <Daniel.Spiller[redacted]

Sent: Wednesday, January 12, 2011 8:34 PM

To: 'stephen.robertson[redacted], 'ken.smith[redacted]
'Bradley John' <John.Bradley[redacted];
'lance.mccallum[redacted], 'Tim.Watts@[redacted];
'Geoff.Stead[redacted]; 'Lauren.Sims@[redacted]
'Martin.PeterJ@[redacted]; 'Dunn.KerryG[redacted]; 'Best
Debbie' <Debbie.Best@[redacted]>

Cc: Barry Dennien <Barry.Dennien[redacted]; 'Peter Borrows'
<pborrows[redacted]>; 'Rob Drury' <rdrury[redacted]
SEQWGM Media <media[redacted]>; SEQWGM Emergency
<SEQWGM.Emergency@[redacted]
'Madgwick.DarrenT[redacted]; 'damien.brown[redacted]
'Reilly Bob' <Bob.Reilly[redacted]>; seqwgm@[redacted]

Subject: RE: Dam release update

Attach: Technical_Situation_Report_W51.docx

All,

Attached is an updated Technical Support Report.

Please call me on[redacted] if you require further information.

Regards,
Dan

Daniel Spiller
Director, Operations
SEQ Water Grid Manager
[redacted]
Visit: Level 15, 53 Albert Street Brisbane
Post: PO Box 16205, City East QLD 4002
ABN: 14783 317 630

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

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If not an intended recipient of this email, you must not copy, distribute or take any action(s) that relies on it; any form of disclosure, modification, distribution and/or publication of this email is also prohibited. While all care has been taken, the SEQ Water Grid Manager disclaims all liability for loss or damage to person or property arising from this message being infected by a computer virus or other contamination. Unless stated otherwise, this email represents only the views of the sender and not the views of the SEQ Water Grid Manager and/or the Queensland Government.

TECHNICAL SITUATION REPORT

TSR Number	W51	Date of TSR release	12.1.2011	Time of TSR release	6pm

Seqwater status of inflows and dam operations

Current status but could change based on inflows or rainfall.

Current objectives	• Gradual release of stored floodwaters with minimal impact.	
Strategy	• Peak inflows into Wivenhoe were in excess of 12000 cumecs. • Continue release of water from Somerset into Wivenhoe to reduce impacts upstream in Kilcoy area • Maintain reduced release from Wivenhoe until Lockyer flows are reduced and then increase to discharge flood waters over 7 days	
Key considerations	Storage levels:	Above FSL
	Inflows:	Inflows expected well over 2,300,000ML.
	Rainfall:	Continuing
	Lockyer/Bremer:	Monitoring their inflows
	Brisbane River:	Impact as below.

Rainfall

Rainfall in the last 12 hours is generally below 5mm with a couple of 10mm falls in the Stanley and North Pine catchments. There is no significant rain expected fin the next 4 days.

Somerset/Wivenhoe

Somerset Dam has peaked at 105.11 mAHD at 06:00 on 12 January 2011. One sluice was opened at 1030 12 January 2011 and discharging 1,410 m3/s. Sluice gates will be utilised to drain of the flood storage compartment during the next 5 days.

At 5pm Somerset was 104.86m and 702,953ML at 185.1%.

Wivenhoe Dam peaked at 74.97 mAHD at 19:00 on 11 January 2011 with a corresponding discharge of 7,450 m3/s.

The release from Wivenhoe Dam was reduced to 2,500 m3/s at 07:30 12 January 2011 to allow the peak of Lockyer Creek to enter the Brisbane River and this release has been maintained since. After the downstream peak in the lower Brisbane River has passed, releases will be increased to maximum of 3,500 m3/s. The release is expected to commence Thursday and then be maintained at this level to drain the flood storage component within the required 7 days. The releases will not result in any renewed rises at downstream locations.

At 5pm Wivenhoe Dam was 74.82 m AHD at 2,203,223ML and 189.1% and fluctuating slightly due to the releases coming from Somerset but relatively steady.

The combined flood event volume in Somerset and Wivenhoe Dams is estimated to be approximately 2.6 million megalitres.

North Pine

At 17:00 North Pine Dam had all gates open 1 increment, releasing about 80 m3/s. North Pine peaked at 41.11 mAHD at 14:00 on 11 January 2011 with peak release of 2,800 m3/s. The event has a volume of around 200,000 ML

At 5.00pm North Pine Dam was 39.74 mAHD and 217,370 ML and 101.4% and slowly falling. It is expected that gates will be closed Thursday or Friday.

Strategy

The Flood Operations Centre is continuing to monitor rainfalls and water levels through the Brisbane and Pine catchments and reviewing operating strategy every 30 minutes. The FOC is maintaining close contact with warning agencies and local councils.

Leslie Harrison Dam:
Gate releases finished late this afternoon.

Hinze Dam:
A release of around 8,000 megalitres a day is being made through the emergency gates. There is no public access to the spillway.

Seqwater Technical Officer name	Robert Drury
Seqwater Technical Officer position title	Dam Operations Manager
[redacted]	

BoM assessment

(consisting of references to latest Flood Warning for the Brisbane River and other relevant Bureau forecasts and warnings (e.g. weather/rain forecasts, Tropical Cyclone Warning etc) and other updates/comments if needed)

BoM has been advised.

BoM Technical Officer name	Peter Baddiley
BoM Technical Officer position title	
BoM Technical Officer contact details	flood.qld[redacted]

Brisbane City Council (BCC) assessment

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised of the current strategy

BCC Technical Officer name	Chris Lavin
BCC Technical Officer position title	Disaster Operations Manager
BCC Technical Officer contact details	[redacted]

Ipswich City Council (ICC) assessment (if required)

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised of the current strategy.

ICC Technical Officer name	Tony Trace
ICC Technical Officer position title	Local Disaster Response Coordinator
ICC Technical Officer contact details	[redacted]

Somerset Regional Council (SRC) assessment (if required)

(to include predicted local inundation oreas and depths of inundation based on the information)

Council has been advised of the current strategy.

SRC Technical Officer name	Tony Jacobs
SRC Technical Officer position title	Local Disaster Response Coordinator
SRC Technical Officer contact details	[redacted]

Collated and distributed by (Agency)

Contact Officer signature	
Contact Officer name	Rob Drury
Contact Officer position title	Dam Operations Manager

Next TSR due	Date	13.1.2011	Time	8am	or Event	

TECHNICAL SITUATION REPORT

TSR Number	W52	Date of TSR release	13.1.2011	Time of TSR release	6am

Seqwater status of inflows and dam operations

Current status but could change based on inflows or rainfall.

Current objectives	• Gradual release of stored floodwaters with minimal impact.
Strategy	• Peak inflows into Wivenhoe were in excess of 12000 cumecs. • Continue release of water from Somerset into Wivenhoe to reduce impacts upstream in Kilcoy area • Maintain reduced release from Wivenhoe until Lockyer flows are reduced and then increase to discharge flood waters over 7 days
Key considerations	Storage levels: Above FSL
	Inflows: Inflows expected well over 2,300,000ML.
	Rainfall: Continuing
	Lockyer/Bremer: Monitoring their inflows
	Brisbane River: Impact as below.

Rainfall

Rainfall in the last 12 hours is generally below 5mm with isolated falls of up to 15mm in the Stanley, Lockyer and Pine River catchments. There is no significant rain expected fin the next 4 days.

Somerset/Wivenhoe

Somerset Dam has peaked at 105.11 mAHD at 06:00 on 12 January 2011. One sluice was opened at 1030 12 January 2011 and discharging 1,410 m3/s. Sluice gates will be utilised to drain of the flood storage compartment during the next 5 days.

At 5am Somerset was 104.32m and 666,225ML at 175.39%.

Wivenhoe Dam peaked at 74.97 mAHD at 19:00 on 11 January 2011 with a corresponding discharge of 7,450 m3/s.

The releases from Wivenhoe Dam have been temporarily reduced to 2,500 m3/s at 07:30 on Wednesday 12 January 2011 to allow the peak of Lockyer Creek to enter the Brisbane River. The Brisbane River has peaked at the Port Office Gauge early Thursday morning. Releases from Wivenhoe Dam will be managed to achieve a target flow of around 3,500 m3/s at Moggill. This release will then be maintained to drain the flood storage component within the required 7 days.

At 5am Wivenhoe Dam was 74.74 m AHD at 2,194,043ML and 188.29% and dropping slowly due to the releases coming from Somerset.

The combined flood event volume in Somerset and Wivenhoe Dams is estimated to be in excess of 2.6 million megalitres.

North Pine

At 17:00 North Pine Dam still gates open releasing about 80 m3/s. North Pine peaked at 41.11 mAHD at 14:00 on 11 January 2011 with peak release of 2,800 m3/s. The event has a volume of around 200,000 ML

At 5.00am North Pine Dam was 39.70 mAHD and 216,494ML and 100.71% and slowly falling. It is expected that gates will be closed Friday.

Strategy

The Flood Operations Centre is continuing to monitor rainfalls and water levels through the Brisbane and Pine catchments and reviewing operating strategy every 30 minutes. The FOC is maintaining close contact with warning agencies and local councils.

Leslie Harrison Dam:
Gates closed..

Hinze Dam:
A release of around 8,000 megalitres a day is being made through the emergency gates. The Lake Level is dropping. There is no public access to the spillway.

Seqwater Technical Officer name	Robert Drury
Seqwater Technical Officer position title	Dam Operations Manager
	[redacted]

BoM assessment

(consisting of references to latest Flood Warning for the Brisbane River and other relevant Bureau forecasts and warnings (e.g. weather/rain forecasts, Tropical Cyclone Warning etc) and other updates/comments if needed)

BoM has been advised.

BoM Technical Officer name	Peter Baddiley
BoM Technical Officer position title	
BoM Technical Officer contact details	flood.qld[redacted]

Brisbane City Council (BCC) assessment

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised of the current strategy

BCC Technical Officer name	Chris Lavin
BCC Technical Officer position title	Disaster Operations Manager
BCC Technical Officer contact details	[redacted]

Ipswich City Council (ICC) assessment (if required)

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised of the current strategy.

ICC Technical Officer name	Tony Trace
ICC Technical Officer position title	Local Disaster Response Coordinator
ICC Technical Officer contact details	[redacted]

Somerset Regional Council (SRC) assessment (if required)

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised of the current strategy.

SRC Technical Officer name	Tony Jacobs
SRC Technical Officer position title	Local Disaster Response Coordinator
SRC Technical Officer contact details	[redacted]

Collated and distributed by (Agency)

Contact Officer signature	
Contact Officer name	Rob Drury
Contact Officer position title	Dam Operations Manager

Next TSR due	**Date**	13.1.2011	**Time**	12pm	**or Event**	

Suzie Emery

From: Bradley John [John.Bradley[redacted]]
Sent: Saturday, 15 January 2011 10:34 AM
To: Lance.McCallum[redacted]; Dan Spiller
Cc: tim.watts[redacted]; Barry Dennien
Subject: Re: Urgent - Cabinet in confidence

Thanks Lance - we have anticipated the need for something like this - seqwgm work underway - I will talk to SEQWGM when out of SDMG now on.

Regards
John B

From: Lance McCallum [mailto:Lance.McCallum[redacted]]
Sent: Saturday, January 15, 2011 10:30 AM
To: spiller daniel [redacted]; Bradley John
Cc: Tim Watts <Tim.Watts[redacted]>
Subject: Urgent - Cabinet in confidence

John/Dan

The Minister has asked that preparation be done over the weekend that will enable him to go to the Emergncy Cabinet meeting on Monday with a position on how the Govt is going to handle the issues of reviewing operational decisions made by SEQwater and SEQWGM in relation to releases from the dams.

I understand that in further to the recent independent review of the Wivenhoe operations manual the WGM is also undertaking further work by compiling a list of the operational experts who authored the manual.

Happy to discuss further.

Thanks, Lance.

+--+

Think B4U Print

1 ream of paper = 6% of a tree and 5.4kg CO2 in the atmosphere

3 sheets of A4 paper = 1 litre of water

+--+

Suzie Emery

From: Barry Dennien [Barry.Dennien[redacted]]
Sent: Saturday, 15 January 2011 12:10 PM
To: Dan Spiller; John Bradley (john.bradley[redacted]); Elaina Smouha; Peter Borrows; bob.reilly[redacted]
Subject: 2 pm phone hook up - Wivenhoe operations brief preparation

Folks

Details of phone hook up:

[redacted]

Agenda to follow in approx one hour

Barry Dennien

Suzie Emery

From: Elaina Smouha [elainamir[redacted]]
Sent: Saturday, 15 January 2011 1:42 PM
To: john.bradley[redacted]
Cc: Barry Dennien; Dan Spiller; pborrows[redacted]; bob.reilly[redacted]
Subject: Cabinet in confidence - discussion points
Attachments: Public inquiry strategy - brief.docx

John

Attached are some discussion points for our 2pm teleconference about Monday's Emergency Cabinet meeting.

Regards

Elaina

Discussion points for teleconference

What is the objective?

a) Ensuring public transparency
b) To answer the State's questions on the performance of Wivenhoe Dam operations
c) Preparation for a public inquiry
d) Normal and logical course of conduct after the occurrence of a major flood event – Review requirement under the Flood Mitigation Manual

Background

1) Design of Dam – Storages/Spillway upgrade (Responsible: Seqwater)
2) How does Wivenhoe Dam work as a flood mitigator? Stats on how much did Wivenhoe Dam knock off the flood peak? **[Priority to get out to the public]** (*Responsible: Seqwater*)
3) Development of Flood Mitigation Manual (*Responsible: Seqwater/DERM*)
    a. Four strategies
    b. History of Flood Mitigation Manual updates and peer review
4) Responsibility under the *Water Supply (Safety and Reliability) Act 2008* (*Responsible: DERM*)
    a. What is the formal reporting process following a major flood event?
5) "The Event" – operation of Wivenhoe Dam (*Responsible: Seqwater*)
    a. Event report under the Flood Mitigation Manual
6) "The Event" – management of the Water Grid emergency under the SEQ Water Grid Emergency Response Plan (*Responsible: SEQ Water Grid Manager*)
7) What next?
    a. SWOT
        i. Community feedback
        ii. A significant (from a national perspective)

Seqwater report

Flood Mitigation Manual requires a report to the Chief Executive after a significant flood event, on the effectiveness of the operational procedures:

- Get more comprehensive report from Brian Cooper? – review appropriateness of trigger levels – take into account the accuracy of rainfall forecasts provided by BOM at the time – reliability of weather forecasts.
- Set up expert panel for Flood Mitigation Manual review
- Communication Protocol and incorporation into the Flood Mitigation Manual (revisit in the next fortnight)

Seqwater to procure review.

Urgent accelerated review due to anticipated further rainfall.

Suzie Emery

From: Elaina Smouha [elainamir[redacted]]
Sent: Saturday, 15 January 2011 4:37 PM
To: Barry Dennien; Dan Spiller; Michael Lyons
Subject: Ministerial brief - outline
Attachments: Ministerial brief - contents outline.docx

Discussion points for teleconference

What is the objective?

a) Ensuring public transparency
b) To answer the State's questions on the performance of Wivenhoe Dam operations
c) Preparation for a public inquiry
d) Normal and logical course of conduct after the occurrence of a major flood event – Review requirement under the Flood Mitigation Manual

Background (focus on Brisbane River flooding issues)

1) Design of Dam – Storages/Spillway upgrade (*Information provider: **Seqwater and Peter Allen** - DERM*) [1/3 to ½ a page]

2) "The Flood Event" – Q&A (*Informotion provider: **Seqwater***) [2 ½ pages]

    a. Chronology - High level time step of events and significant decision making/changes – more detailed time step information for Tuesday afternoon (i.e. what was the BOM forecast at the time, narrow peak etc.)
    b. How does Wivenhoe Dam work as a flood mitigator?
    c. What are the factors being balanced when making decisions about the amount of dam releases? To what extent does information from the Bureau of Meteorology/rain gauges influence decisions? How reliable is this information?
    d. Statistics on how much did Wivenhoe Dam knock off the flood peak.
    e. What would have happened if Wivenhoe Dam had not been built and we only had Somerset Dam? What damage would have been caused compared to what has currently been experienced (damage statistics)?
    f. If we have undertaken pre-emptive dam releases to bring Wivenhoe Dam's full supply level down to lower than what we had maintained (i.e. 60%), what would have been the river height for the period that this flood event occurred?
    g. If pre-emptive dam releases would not have made a difference, why? (i.e. why did we not release earlier?)
    h. Why was Wivenhoe Dam only allowed to rise up to 191% and not 230%?
    i. What is the fuse plug and why did it need to be maintained?
    j. What damage or town isolation occurred during the Wivenhoe Dam releases that occurred since October 2010?
    k. Did Seqwater have time to reduce the dam level between the 5 events? If so, would it have made a difference to this flood event?

3) The Flood Mitigation Manual (*Information Provider: **Seqwater/DERM***) [½ to 1 page]

   a. Describe the decision making framework - Four strategies
   b. How is the Manual designed to work?
   c. History of Flood Mitigation Manual updates and peer review – who was on the panels, studies that fed into previous versions of the Manual and who was involved in these studies?
   d. **Attach** Minister Robertson's request for advice on pre-emptive release and our response (*Information provider: **SEQ Water Grid Manager***)

4) Regulatory context - *Water Supply (Safety and Reliability) Act 2008* (*Information provider: **Peter Allen - DERM***)

   a. Flood Mitigation Manual approval
   b. Formal reporting process under the Flood Mitigation Manual – **attach** report resulting from the February 1999 flood event
   c. Decision making process under the Flood Mitigation Manual –
      i. Who makes the flood release decisions under the Manual?
      ii. who is informed/consulted?
      iii. effect of the recent Flood Communication Protocol?

5) Brian Cooper Flood Mitigation Manual compliance review (*Responsible: **SEQ Water Grid Manager***)

Seqwater report

(*Information provider: **Seqwater, Peter Allen and Bob Reilly***)

Seqwater, in consultation with Peter Allen and Bob Reilly, to set out how Seqwater's Flood Mitigation Manual Report to the Chief Executive on the effectiveness of the operational procedures will be undertaken.

- **Attach** table of contents of the 1999 Flood Mitigation Manual report
- Reflect Brian Cooper's compliance review
- Peer review – establishment of an expert panel – who will be on it? Peter Allen and Bob Reilly may provide some input.
- Communication Protocol and incorporation into the Flood Mitigation Manual (revisit in the next fortnight?)

Timeframes on the development of the report – consider urgency due to anticipated further rainfall during this summer.

CTS No. [redacted]

SEQ Water Grid Manager and Seqwater
MINISTERIAL BRIEFING NOTE

Advisor .....☐ Ok
Dated / /
☐ Approved ☐ Not Approved ☐ Noted
☐ Further information required
Minister [redacted]...
Dated 16/1/10

RECEIVED
MINISTERIAL OFFICE
17 JAN 2011

☐ MINISTER
☐ POL ADV
☐ MEDIA ADV
☐ PARL SEC
☐ ADMIN
☐ .....

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

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

REQUESTED BY

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

TIMEFRAME

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

RECOMMENDATION

It is recommended that the Minister:

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

BACKGROUND

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

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

File Ref:

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

CURRENT ISSUES

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

RESOURCE/IMPLEMENTATION IMPLICATIONS

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

PROPOSED ACTION

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

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

File Ref:

OTHER INFORMATION

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

MINISTER'S COMMENTS

ATTACHMENTS

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

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

File Ref: Page 3 of

Ministerial Briefing Note

17 January 2010

Flood Event January 2011

1. BACKGROUND INFORMATION ON WIVENHOE DAM

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

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1 BACKGROUND INFORMATION ON WIVENHOE DAM

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

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

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

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

2 WIVENHOE DAM FLOOD MITIGATION AND FLOOD OPERATIONS

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

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

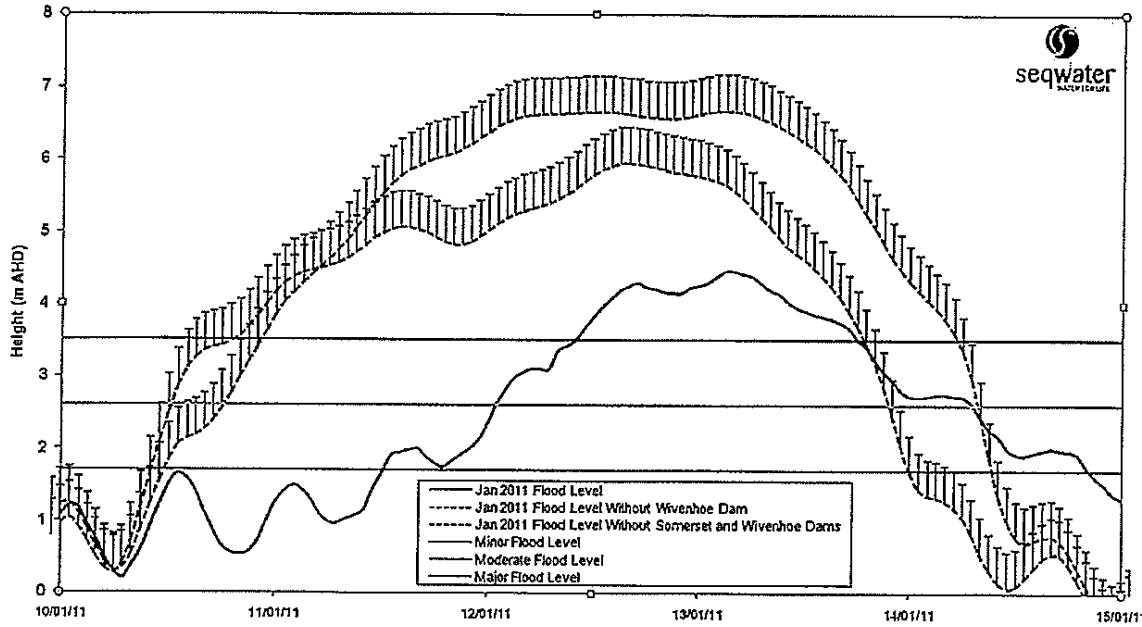
This equates to significant reduction in the potential for loss of life as well as saving in damages in the order of up to $1.6 billion based on current damage curves. Up to 13,000 more properties would have been impacted by the event without the Dam. (Source: Flood Damage Tables provided to Seqwater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

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

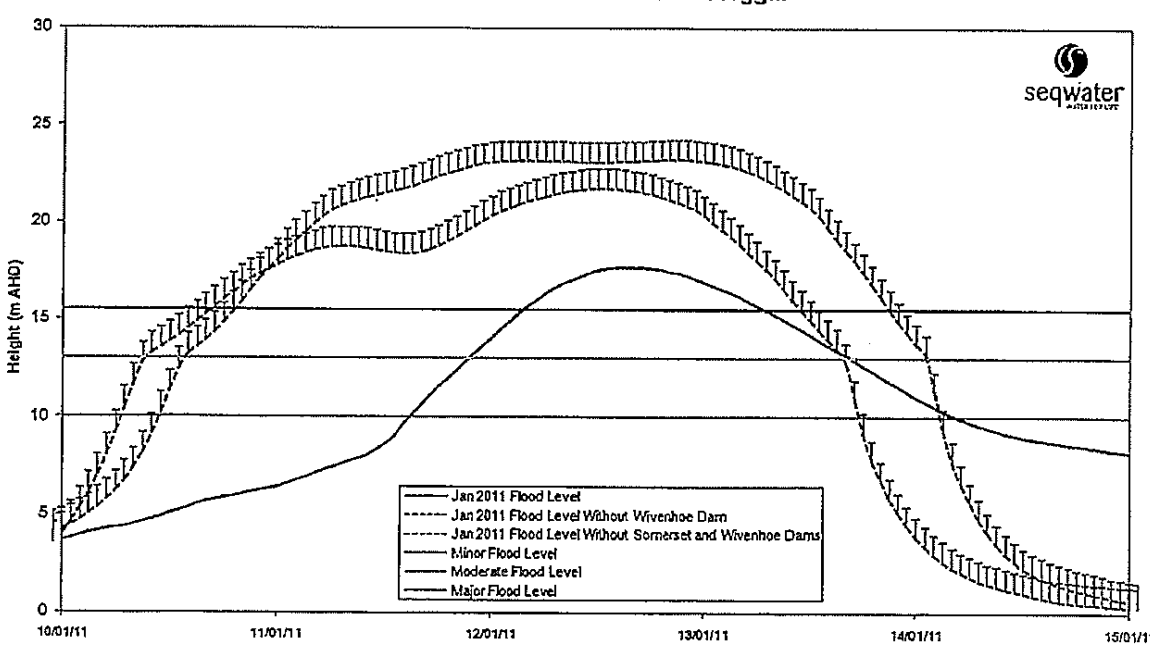
Depending on the nature of the event, the presence of Wivenhoe Dam could also potentially increase flood warning times to impacted areas. How these times may have been increased during the current event is presently difficult to quantify, but discussions will be held with BOM on this issue at a later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

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

JANUARY 2011 BRISBANE FLOOD
Assessment of Flood Levels at Brisbane City



JANUARY 2011 BRISBANE FLOOD
Assessment of Flood Levels at Moggill



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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

3.2 What is contained in the Manual?

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

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

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

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

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

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

4 REGULATORY CONTEXT

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

The Flood Mitigation Manual requires, amongst other matters:

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

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

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

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

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

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

5 SEQWATER REPORT

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

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

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

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



seqwater

WATER FOR LIFE

JANUARY 2011 FLOOD EVENT

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1 INTRODUCTION

Wivenhoe Dam was constructed by the Queensland Government between 1977 and 1984. The dam is a 56 m AHD high and 2.3 kilometre long earth and rock embankment separated into two parts by a concrete gravity spillway. The spillway is controlled by 5 radial gates, each 12.0 metres wide by 16.0 m AHD high. Two saddle dam embankments are located on the left side of the reservoir.

The dam spillway capacity was upgraded in 2005. This was done primarily through the construction of a 164 metre wide secondary spillway through the right abutment of the existing dam. This spillway contains three erodible earth fill fuse plug embankments that are initiated at different dam levels in excess of EL 75.6.

The dam has two main functions by providing:

- A 1,165,000 ML storage at full supply level (FSL EL 67.0) providing an urban water supply for Brisbane and surrounding areas;
- Flood mitigation in the Brisbane River by providing a dedicated flood storage volume of 1,450,000 ML up to EL77 (this flood level was increased as part the 2005 upgrade to allow a water level of EL80m and a temporary flood storage volume of 1,966,000 ML with all fuse plugs initiated and the dam at the point of failure).

The dam has an EXTREME hazard classification under ANCOLD guidelines because of the significant development downstream in the Brisbane and Ipswich metropolitan areas, with the population at risk in the event of a dam failure numbering in the hundreds of thousands.

In accordance with the Queensland Regulatory program for dam spillway upgrades, a further upgrade of Wivenhoe Dam for dam safety reasons only is scheduled to occur prior to 2035 to enable the dam to safely pass the Probable Maximum Flood. This work will involve the reconstruction of Saddle Dam 2 as a fuse plug spillway.

Wivenhoe Dam is in excellent condition. Comprehensive Dam Safety reviews undertaken in accordance with ANCOLD guidelines have been undertaken in 1997 (Gutteridge, Haskins & Davey Pty Ltd), 2003 (Wivenhoe Alliance), 2006 (NSW Department of Commerce), 2009 (GHD) and September 2010 (Seqwater). The reports concluded that the design of the dam is in accordance with modern day standards and that there are no significant outstanding design or construction issues that require investigation.

2 WIVENHOE DAM FLOOD MITIGATION AND FLOOD OPERATIONS

2.1 Flood Mitigation

The Brisbane River catchment covers an area of approximately 14,000 square kilometres of which about half is below Wivenhoe Dam. Maximum overall flood mitigation effect is achieved by operating Wivenhoe Dam in conjunction with Somerset Dam. Although Somerset and Wivenhoe Dam reduce flooding in Brisbane City, major flooding can still occur. The Lockyer-Laidley Valley drains into the Brisbane River through Lockyer Creek that enters the Brisbane River just downstream of Wivenhoe Dam near Lowood. Another major tributary, the Bremer River, flows into the Brisbane River at Moggill. Wivenhoe Dam has no control over inflows into the Brisbane River from both these major tributaries.

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

Therefore the basis of all flood operation decision making is to ensure the dam never fails. This is the reason that the dam's flood storage compartment would never be intentionally fully filled as additional inflows after this point would result in a dam failure. Similarly, there will be uncertainty on future rainfall that could occur which could not be releases if there was insufficient flood storage which could not be stored or released.

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

2.2 Flood Operations

A real time flood monitoring and forecasting system has been established in the Wivenhoe and Somerset Dam catchments. This system employs radio telemetry to collect, transmit and receive rainfall and stream flow information. The system consists of around 230 field stations that automatically record rainfall and/or river heights at selected locations in the dam catchments. Most of these field stations are owned by Seqwater with the remainder belonging to other agencies.

The rainfall and river height data is transmitted to Seqwater's Flood Operations Centre in real time. Once received in the Flood Operations Centre, the data is processed using a Real Time Flood Model (RTFM) to estimate likely dam inflows and evaluate a range of possible inflow scenarios based on forecast and recorded rainfall in the dam catchments. The RTFM is a suite of hydrologic computer programs that utilise the real time data to assist in the operation of the dams during flood events.

Seqwater engineers use the RTFM for flood monitoring and forecasting during flood events to operate the dams in accordance with a Manual of Flood Mitigation (the origin of and objectives and procedures contained in the Manual of Flood Mitigation are explained in the following section of this document). Releases of water from the dams are optimised to minimise the impacts of flooding in accordance with the objectives and procedures contained in a Manual of Flood Mitigation.

The RTFM and data collection network performed well During the January 2011 event, with no failures experienced that compromised the ability of Seqwater to operate the dam.

3 MANUAL OF FLOOD MITIGATION FOR WIVENHOE AND SOMERSET DAMS

The Manual of Flood Mitigation for Wivenhoe and Somerset Dams, in its current form, was developed in 1992 during an extensive hydrological study of the Brisbane and Pine Rivers catchments by DPI, Water Resources. The final reports were subject to extensive internal review by the Water Resources Group before being reviewed by an independent review panel comprising Professor Colin Apelt, Head of Department, Department of Civil Engineering, University of Queensland and Mr Eric Lesleighter, Principal Hydraulic Engineer and Chief Engineer Water Resources, Snowy Mountains Engineering Corporation.

Subsequently, the Manual was extensively reviewed during the Brisbane Valley Flood Damages Minimisation Study in 2006, with the latest comprehensive review of the Manual undertaken in 2009. Both of these reviews have included expert review panels comprising key stakeholders, with the most recent review involving representatives from DERM, BOM, BCC and SunWater.

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

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

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

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

- **Strategy W1** – Primary consideration is given to Minimising Disruption to Downstream Rural Life. Under this strategy, the predicted water level is below 68.50 m AHD and the maximum release is 1,900m3/s.

- **Strategy W2** – Transition Phase moving from Minimising Disruption to Protecting Downstream Urban Areas. Under this strategy, the water level is predicted to be between 68.5 and 74.0 m AHD and the maximum release is less than 3,500m3/s.

- **Strategy W3** – Primary consideration is to Protect of Urban Areas from Inundation. Under this strategy, the water level is predicted to be between 68.5 and 74.0 m AHD but the maximum release is less than 4,000m3/s.

- **Strategy W4** – Primary consideration is to protecting the structural safety of the Dam. Under this strategy, the water level is predicted to exceed 74.0 m AHD and there is no limit to the maximum release. Consideration is given to managing flood releases to avoid fuse plug initiation if at all possible as this would compromise flood mitigation capacity in the short to medium term.

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

4 JANUARY 2011 FLOOD EVENT

4.1 Background

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

EVENT	EVENT START DATE	EVENT END DATE	VOLUME RELEASED (ML)
1	13/12/2010	16/12/2010	70,000
2	17/12/2010	24/12/2010	150,000
3	26/12/2010	02/01/2010	470,000

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

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

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

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

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

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

4.2 Event Decision Making

The following table contains a summary of the key decisions points associated with the current event. As at 16 January 2011, the event remains in progress.

DATE AND TIME	FLOOD EVENT MILESTONE
07:00 06/01/2011 (Thursday)	Rainfall is experienced in the dam catchments that will result in flood releases, however Wivenhoe releases are delayed for 24 hours to allow Lockyer Creek flood flows to pass downstream and prevent the isolation of the community dependent of Burtons Bridge. The forecast is for 150mm over the next 24 hours.
15:00 07/01/2011 (Friday)	Wivenhoe releases commence, with operational strategy W1 in use. Rainfall for the next four days is estimated to be between 140mm and 300mm, with a forecast for rain easing on Tuesday 11 January 2011. All bridges downstream of the dam with the exception of Fernvale Bridge and Mt Crosby Weir Bridge are expected to be inundated for a number of days.

06:00 09/01/2011 (Sunday)	Moderate to heavy rain periods forecast until Tuesday, but both Wivenhoe and Somerset dam levels were falling slowly, with Somerset at 1.27 m AHD above FSL and Wivenhoe 1.58 m AHD above FSL.
15:30 09/01/2011 (Sunday)	Following significant rain during the day a meeting of Duty Engineers is held. The QPF issued at 16:00 indicates 50mm to 80mm over the next 24 hours. Based on this forecast, it is anticipated that dam levels can be held to a maximum of 3.50 m AHD above FSL in Somerset and 5.5 m AHD above FSL in Wivenhoe. However, by 19:00 it was apparent that both Fernvale Bridge and Mt Crosby Weir Bridge would be inundated by the combined dam releases and Lockyer Creek flows and that the operational strategy had progressed to W2.
06:30 10/01/2011 (Monday)	Rainfall continued during the night and based on rainfall on the ground it was apparent the operational strategy had progressed to W3.
06:30 10/01/2011 (Monday)	Rainfall continued during the day but based on rainfall on the ground, operational strategy W3 remained in use. However it was apparent that any further heavy rain would result in progression of the operational strategy to W4.
08:00 11/01/2011 (Tuesday)	Rainfall continued during the night with isolated heavy falls in the Wivenhoe Dam catchment area and based on rainfall on the ground it was apparent the operational strategy would soon progress to W4 with Wivenhoe Dam exceeding 8.00 m AHD above FSL. The objective now was to limit outflows and subsequent flood damage to urban areas, while ensuring the structural safety of the dam.
11:00 11/01/2011 (Tuesday)	Rapid inflows were experienced in Wivenhoe Dam, with the dam rising almost a metre in eight hours. Releases were increased until the dam level stabilised in accordance with Strategy W4. Computer models were not reflecting actual dam inflows due to intense point rainfalls in the immediate catchment around the dam. Falls are estimated to be similar to those experienced at both Toowoomba and Upper Lockyer the previous day and are falling outside and between existing rain gauges.
21:00 11/01/2011 (Tuesday)	Wivenhoe Dam peaked. Peak release of 7450 cumecs with a level of 0.7 metres below fuse plug trigger.
22:00 11/01/2011	Wivenhoe Dam releases were closed off as quickly as possible over the

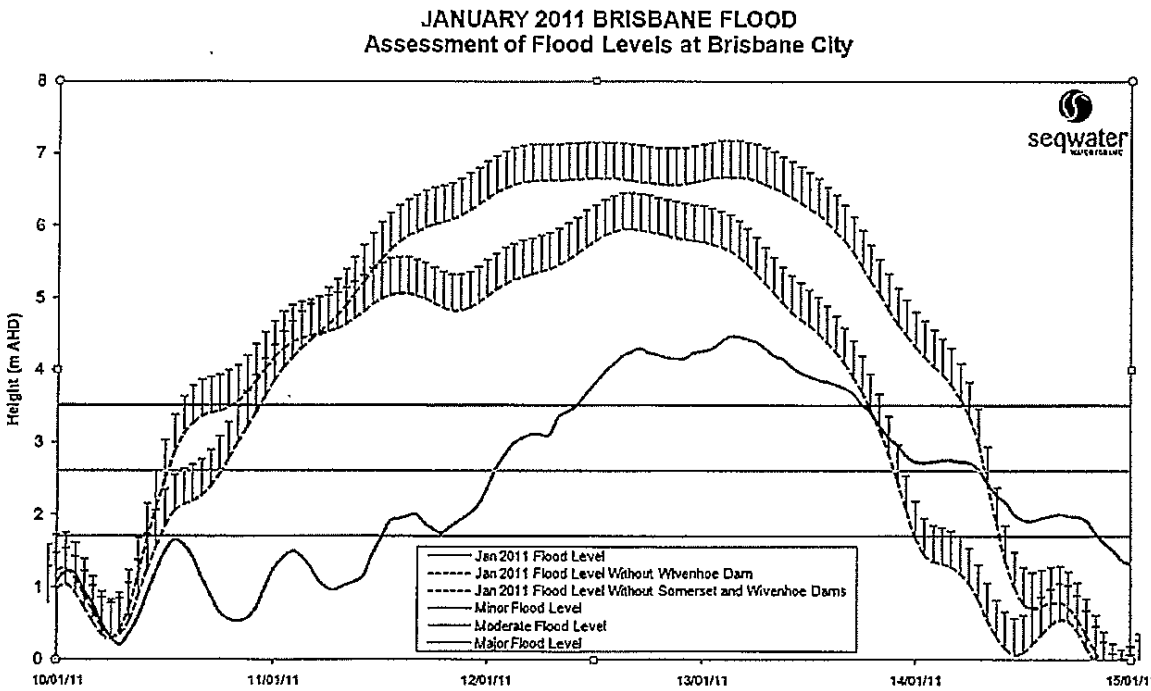
(Tuesday)	next 11 hours, while ensuring water levels in the dam did not rise further and initiate a fuse plug embankment.
08:00 12/01/2011 (Wednesday)	Minimum possible release level reached, with inflows matching outflows. Further reductions in release rate would likely cause the dam level to rise.
21:00 13/01/2011 (Thursday)	The 7 day dam drain down is commenced as Lockyer Creek and Bremer River peaks pass the Lower Brisbane area. Maximum release target is the limit of damaging floods in Brisbane being 3500 cumecs.
09:00 17/01/2011 (Monday)	Drain down continues, with released expected to cease on Wednesday 19 January 2011 unless further rainfall is experienced.

4.3 Flood Mitigation Benefits of Wivenhoe Dam

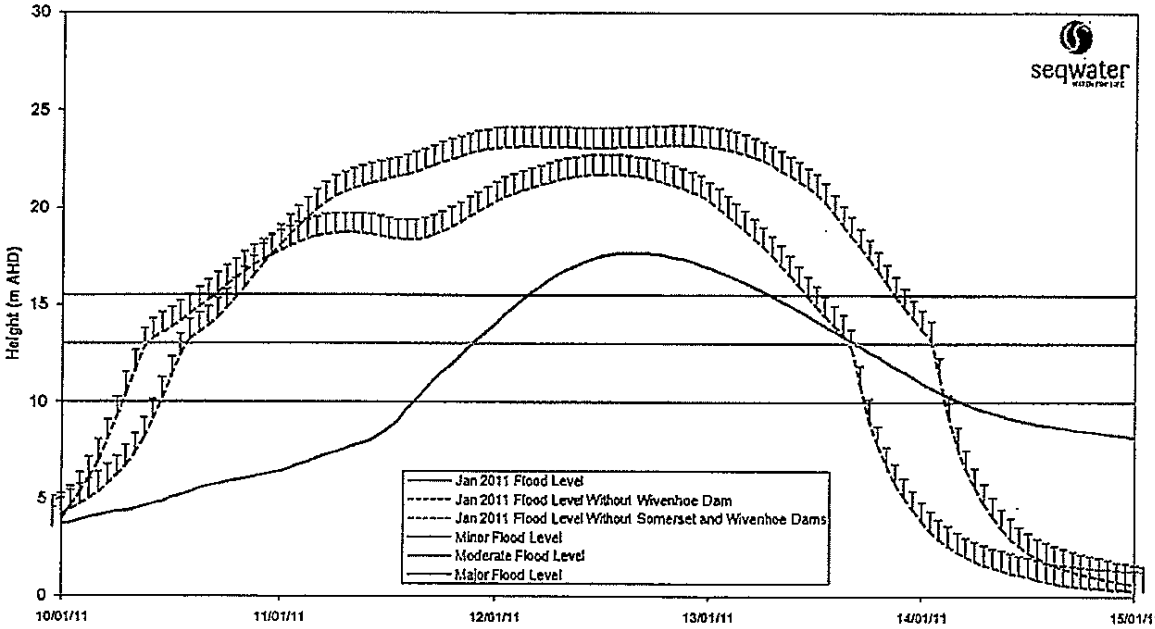
The following graphs demonstrate the significant benefits of Wivenhoe Dam in mitigating the current flood event, with reductions in flood peak of up to 2.5 metres in the City area and up to 5.5 metres in the Moggill area further upstream.

This equates to significant reduction in the potential for loss of life as well as saving in damages in the order of up to $1.6 billion based on current damage curves. Up to 13,000 more properties would have been impacted by the event without the Dam.

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



JANUARY 2011 BRISBANE FLOOD
Assessment of Flood Levels at Moggill



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

This notion is supported by BOM.

5 EVENT REVIEW

Under the Manual of Operational Procedures for Flood Mitigation at Wivenhoe Dam and Somerset Dam that are approved and gazetted by the Department of Environment and Resource Management, there is a regulatory requirement that a report must be prepared as per the below wording:

"Seqwater must prepare a report after each Flood Event. The report must contain details of the procedures used, the reasons therefore and other pertinent information. Seqwater must forward the report to the Chief Executive within six weeks of the completion of the Flood Event."

Such a report was prepared for the flood events of February and March 2010 and copies are available. A copy of the Table of Contents of that report is included as Appendix 1. For this event, the report would be a comprehensive summary of all procedures, actions, outcomes and processes during the event.

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

- In the short term, utilise this report attached to this briefing note as the basis for communications and discussion.
- Prepare any Interim Reports as agreed to provide information and input as required.
- Seqwater prepare a Comprehensive Report as per the existing regulatory requirements of the Act and the gazetted manual and any requirements of the Dam Safety Regulator. This would be done within 6 weeks of the closure of the current event as per the manual. This timeframe is subject to any new mobilisation of the Flood Operations Centre. The Table of Contents would include:
    - Introduction
    - Flood Event Summary
    - Mobilisation and Staffing
    - Event Rainfall
    - Inflow and Release Details
    - Data Collection System Performance
    - Data Analysis Performance
    - Communication
    - Flood Management Strategies and Manual Compliance
    - Improvements in data collection systems, practices and processes.
    - improvements by interacting agencies

- Review of factors impacting on the protection of urban areas
- Recommendations & Conclusions

- The report would then be reviewed by the Dam Safety Regulator in conjunction with any peer review they require. The review should cover:
    - Were the provisions of the manual complied with?
    - What improvements to either facilities e.g. stream gauges, or work practices, are desirable to improve Sewater's ability to predict inflows into the dams.
    - Are improvements to either Seqwater's facilities or work practices desirable to improve Seqwater's ability to manage events? For example, investigations to raise the dam to improve its flood storage capacity, If so, what are they and their implications.
    - Are changes to the facilities or work practices of other organisations desirable to improve Seqwater's abilities to manage these events?
    - whether it is worth investigating increasing the flood capacity of Wivenhoe
    - whether the Brisbane River crossings which act, under some situations as a constraint on the releases from Wivenhoe, should be replaced by bridges. For example if the smallest could pass , for example, 2,500 cumecs, then this could enable higher releases under some circumstances.
    - Whether the policy of draining the flood compartment within 7 days should be modified.
    - Given the manual's order of priorities i.e. protection of the dam etc, are any changes in the flood release strategies for either dam desirable? If so, what are they, and their implications
- Based on this review, a review of the Manual of Operational Procedures for Flood Mitigation at Wivenhoe Dam and Somerset Dam would occur utilising an expert panel of review including representatives of DERM, Seqwater, BoM, affected Local Governments and other stakeholders as necessary.

Appendix A

FINAL REPORT – FLOOD EVENTS AT WIVENHOE, SOMERSET AND NORTH PINE DAMS FOR FEBRUARY AND MARCH 2010

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Queensland Government

Ref [redacted]

25 OCT 2010

RECEIVED

28 OCT 2010

[redacted]

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

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

Dear Mr Humphrys

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

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

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

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

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

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

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

[redacted]

Queensland Government

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

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

Thank you in advance for your assistance.

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

Yours sincerely

[redacted]

STEPHEN ROBERTSON MP

[redacted]

[redacted]

24 December 2010

Hon Stephen Robertson MP
Minister for Natural Resources, Mines and Energy
and Minister for Trade
PO Box 15216
Brisbane Qld 4001

Dear Minister

I am pleased to respond to your letter of 25 October 2010 regarding options to and benefits of releasing water from key storages in anticipation of major inflows over the current wet season. Our advice follows, based on discussions with Seqwater.

Only four of the dams in South East Queensland region are gated, with the ability to release significant amounts of water in anticipation of major inflows. These are Wivenhoe, Somerset, North Pine and Leslie Harrison dams.

Detailed operational procedures have been approved for each of the gated dams. The dams will continue to be operated in accordance with these procedures. These procedures generally relate to the management of the dams and should be managed above Full Supply Level. This advice relates to the water security aspect of the management of the dams below Full Supply Level.

Based on information currently available, Seqwater has advised that releasing water to below Full Supply Level may provide some benefits in terms of reduced community and operational impacts during minor inflow events, such as has occurred over the past month. For medium and major flood events, it considers that pre-emptive releases will provide negligible benefits.

Informed by this advice, the SEQ Water Grid Manager has advised Seqwater that, from a water security perspective, it has no in-principle objection to minor releases from Wivenhoe, Somerset and North Pine dams to minimise the operational and community impacts of gate releases. Specifically, it has advised that it has no in-principle objection to:

- Wivenhoe and Somerset dams being drawn down to 95 per cent of their combined Full Supply Level
- North Pine Dam being drawn down to 97.5 per cent of its Full Supply Level.

The SEQ Water Grid Manager has assessed the water security implications of the release to be negligible, having no impact on our ability to meet the risk criteria specified in the System Operating Plan or our ability to meet our supply obligations to Grid Customers. From a water security perspective, the Queensland Water Commission has also confirmed that it does not have any objections to the potential release.

Please note that these arranges are intended to apply for the current wet season only, taking into account the level of storages and the rainfall forecasts over coming months.

For future wet seasons, the SEQ Water Grid Manager will continue to work with Seqwater to investigate the optimal arrangements. In particular, we propose to further investigate options that may reduce the frequency or duration of intermediate level flows (between 1,900 and 3,500 cubic metres per second). In addition, we recommend that the investigations with the Queensland Water Commission to examine the opportunity of raising the full supply level of Wivenhoe Dam for water supply be expanded to include options involving the release of the additional water once major inflows are forecast.

I trust that this advice is sufficient. If you have any questions, please do not hesitate to contact Mr Dan Spiller, Director Operations, by telephone on [redacted] or by email on dan.spiller[redacted]

Yours sincerely

[redacted]

Gary Humphrys
Chair

ATTACHMENT

Wivenhoe and Somerset dams

Wivenhoe Dam can store up to 1.15 million litres (ML) of drinking water. In addition, it has the capacity to store an additional 1.45 ML of flood water.

While large, the flood compartment can be filled within days. For example, following heavy rainfall in October 2010 Wivenhoe Dam received inflows equivalent to almost half of the flood storage compartment capacity in just a few days.

Several factors influence flood release strategies for Wivenhoe and Somerset dams.

First, rain events that have caused flooding have historically been prolonged events over several days, often with a second event occurring several days to a week after the first. As a result, the operational procedures for the dam are designed to ensure that all water held in the flood compartments is released within seven days of a rain event, ensuring that the flood compartment is available for any future inflows.

Secondly, the dam only controls flood waters from part of the Brisbane River catchment area. About 50 per cent of the catchment area of the Brisbane River is upstream of the Wivenhoe Dam wall, and can be potentially controlled by it. No flood mitigation structures exist for most of the potential run-off from the other 50 per cent of the catchment area.

Third, the Bureau of Meteorology has had limited success in plotting rainfall distribution accurately to assess where most flooding risk lies above or below the dam wall. Historical floods have demonstrated that flooding can occur from both. For example, the 1974 flood flows primarily occurred below the dam wall whilst the 1890's event occurred above the dam wall. As a result, when releasing water from Wivenhoe Dam it is very important to predict and monitor below the dam wall flows so as to understand combined river flows that cause flood impacts.

Taking these factors into account, the flood release strategy for Wivenhoe and Somerset dams has a hierarchy of objectives:

- Ensure the structural safety of the dam
- Provide optimum protection of urbanised areas from inundation
- Minimise disruption to rural life
- Retain full supply level after a flood event
- Minimise impacts to flora and fauna during the drain down phase.

Within this framework, flood releases from Wivenhoe Dam typically fall into two categories of flood events based on the impact they cause when combined with below the dam wall catchment runoff:

- Larger events typically involving combined river flows greater than 3,500 cubic meters per second measured at Moggill. These events would have flood impacts on

urban areas in Brisbane. This scale of release has not been required since Wivenhoe Dam was completed.

- Smaller events with combined river flows of less than 1,900 cubic meters per second measured at the Mt Crosby weir which can inundate up to seven rural bridges isolating up to 50 households and causing inconvenience to many more. There has been six of these events since 1984, when Wivenhoe Dam was completed.

Our assessment of the benefits of lowering dam storage levels to reduce flooding impacts is below for these two event types.

Large events

Seqwater has advised that releases of greater than 3,500 cubic metres per second (m3/s) from Wivenhoe Dam are likely to impact on urban areas in Brisbane. Events of this nature have not been experienced since Wivenhoe Dam was completed in 1984.

Seqwater has advised that:

- pre-emptive releases are likely to have negligible impacts on the extent of these impacts
- any impacts would require releases of at least 250,000 ML. This is equivalent to a release of about 16 per cent of the combined storage capacity of Wivenhoe and Somerset dams.

A pre-emptive release of this scale is not recommended, based on information currently available. The potential water security impacts are considered to be more significant than the negligible benefits. These potential security impacts include costs associated with the earlier or avoidable operation of the desalination facility at capacity, as well as the increased probability of triggering the implementation of a drought response plan.

More detailed investigation of opportunities to actively manage flood storage is recommended, including options to increase flood supply level on a temporary basis. These investigations need to be led by Seqwater, and involve the Bureau of Meterology, Councils and the SEQ Water Grid Manager.

In particular, t has been identified that it is worth investigating the impacts on downstream flooding for intermediate level flows (flows between 1900 and 3500 cm^3/s).

Seqwater will undertake extensive investigations for the Queensland Water Commission in early 2011 to examine the opportunity of raising the full supply level of Wivenhoe Dam for water supply. We will recommended that the scope of this work be widened to consider the benefits of pre-lowering storage levels based on mid range rainfall events and the reduced impacts to river levels and subsequent property impacts. It is noted that predicting rainfall intensity and location, even as events are about to occur has not been accurate, however the Bureau of Meteorology is improving its methods.

Smaller events

Pre-emptive releases from Wivenhoe Dam may reduce the impacts of minor gate releases (strategies W1A to W1E in the operational procedures).

Minor gate releases may result in the closure of up to six bridges, isolating up to 50 dwellings and inconveniencing many more. As stated in existing flood management plans, releases should be managed to minimise the impacts on these residents. Over the immediate term, Councils have requested that bridge closures be avoided over the Christmas to New Year period, if at all possible. In addition:

- There are resource implications involved in the activation of the flood control centre. Under flood management plans, the centre must be staffed by suitability qualified officers at all times during gate releases. There are currently only four quality duty engineers, who have staffed the flood centre for much of period since the initial release in October.
- Gate releases during the Christmas holiday period would result in closure of dams to water based activities, impacting on up to 150,000 people who are expected to use the recreational facilities over the holiday period.

The Water Grid Manager has advised Seqwater that, from a water security perspective, it would not object to water being released from Wivenhoe and Somerset dams to 95 per cent of storage capacity at any time until end March 2010.

Under this recommendation, storage levels could potentially be reduced by up to about 77,250 ML. This is equivalent to the amount of water released between 13 and 16 December 2010, through a single gate.

Pre-emptive releases will be managed so as to minimise the likelihood of gate releases due to small storms and local rainfall. Storage capacity will usually be reduced through a combination of:

- Extended gate releases, especially for strategy W1C. For comparison, up to 130,000 ML/day was released during in November and mid December 2010. At this rate, the additional releases could occur in about half a day.
- Ongoing gate releases of up to 30,000 ML/day, which do not isolate any residents but can inundate some lower bridges that cause inconvenience.
- Ongoing valve release of up to about 4,300 ML/day, which can be maintained without inundate any bridges.

Actual releases would be decided by Seqwater based on operational considerations and in accordance with its statutory and regulatory obligations.

Water security impacts

The water security impacts of releases will be zero if the dams fill over the remainder of the wet season. Current forecasts indicate that there is a high probability of this occurring:

- Heavy rainfall is forecast over the Christmas holiday period, as noted above.
- Over the remainder of the wet season, advice from the Bureau of Meteorology is that sea surface temperatures are likely to remain at levels typical of a La Niña event into the first quarter of 2011, with the majority of the models indicating the event will gradually weaken over the coming months.

The water security impacts will be minimal, even if there were no further inflows to the dams. Modelling indicates that the reduction would have a minimal impact on the probability of key water Grid storages falling to 40 per cent of capacity over the next five years.

North Pine and Leslie Harrison dams

North Pine and Leslie Harrison dams do not have flood mitigation potential. Once the dams have reached Full Supply Level, all water flows into the dam must be released to protect the structural safety of the dam.

Seqwater has advised that, without major releases, there are negligible benefits to reducing volumes stored in North Pine or Leslie Harrison dams for the purposes of reducing the extent or duration of any downstream flooding impacts.

For North Pine Dam, there may be some operational and community benefits to minor releases to below Full Supply Level in some circumstances. Any gate operation at North Pine Dam results in inundation of Youngs Crossing Road, which isolates a number of residents. These impacts are currently being minimised by releasing from North Pine Dam at night. With further rainfall forecast, Seqwater may choose to reduce the level to below Full Supply Level in order to reduce the frequency of night releases or the likelihood of releases being required during the day.

For this dam, the SEQ Water Grid Manager has advised Seqwater that, from a water security perspective, it would not object to water being released to 97.5 per cent of storage capacity at any time until end March 2010.

For Leslie Harrison Dam, gate operations do not impact on public roads and generally only inconvenience the general public during large flood events. There is no scope to reduce this inconvenience through small pre-emptive releases. Accordingly, no in-principle approval be made for pre-emptive releases from this dam.

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brian cooper consulting

12 January 2011

Mr. Barry Dennien
CEO, SEQ Water Grid Manager
PO Box 16205
City East QLD 4002

Dear Barry,

This letter report:

- presents my final findings on a review of the operation of Wivenhoe Dam (including controlled releases) for compliance against the Flood Mitigation Manual for the period 12 December 2010 to date (Flood Event), and;
- provides advice on the prudence and appropriateness of the decisions and actions taken during the Flood Event regarding the operation of Wivenhoe Dam in light of the Flood Mitigation Manual's requirements and the circumstances of the Flood Event.

The report follows on from my preliminary report sent to you earlier today. The findings and advice are provided on the basis of information provided by SEQ Water Grid Manager which comprised the Flood Mitigation Manual and Technical Situation Reports. The latter were daily (sometimes twice daily) reports for the subject period. They gave a log of rainfall over the dam catchments and the downstream river (Lockyer Ck. and Bremer R.) catchments; inflows to Somerset and Wivenhoe Dams; storage levels; releases from the dams; details of the operation of gates and other outlets (gate openings/discharges); proposed changes in operating strategies and impacts on the various access crossings downstream of Wivenhoe Dam. In reviewing the Technical Situation Reports, I prepared a spreadsheet (see separate attachment of Excel spreadsheet *Tech Reports – Summary*, summarising the reports so that a timeline of the Flood Event could be seen at a glance. This provided a good overview of the Flood Event as it unfolded and showed what information may or may not have been included in a particular report. The Queensland Director Dam Safety (Water Supply) informed me that the Flood Operation Logs contain much more detailed information including details of the communications that were carried out and some of the more detailed information that is not necessarily included in the Technical Situation Reports. I have been provided with a draft of the "*Protocol for the Communication of Flooding Information for the Brisbane River Catchment – Including Floodwater Releases from Wivenhoe and Somerset Dams*" developed in October/November last year and currently being used. The Technical Situation Reports appear to have been an outcome of that Protocol.

The various requirements and required actions detailed in the Flood Mitigation Manual are summarised in the Table given in Attachment A. The Table also gives my comments (where appropriate) on whether there is evidence from the information presented to me, that there is satisfactory compliance with these requirements and actions.

The main aspects of the Flood Mitigation Manual are the various strategies for operating Wivenhoe Dam and Somerset Dam as well as a number of requirements relating to flood operations personnel, flood preparedness and flood training.

At Wivenhoe Dam there are four main strategies for operating the dam (W1 to W4) and at Dam there are three (S1 to S3). These strategies are hierarchical and are based on a number of flood objectives. These in descending order of importance, are:

- 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 (FSL) at the conclusion of the Flood Event, and;
- Minimise impacts to riparian flora and fauna during the drain down phase of the Flood Event.

Normal procedures require a return to FSL within 7 days of the flood event peak passing through the dams so that the potential effects of closely spaced Flood Events can be allowed for.

It is apparent from the Technical Situation Reports that emphasis has been given to communicating changes in flood operations strategies with local authorities and the Bureau of Meteorology (BOM).

Until the last day or so, Wivenhoe Dam has been below EL74.0 and accordingly, would be operating under Strategy W1 i.e. make releases such that bridges downstream of the dam do not have to be closed prematurely. For a few days at the end of December and for the last day or so before yesterday's big rise, Strategy W2 would be in place (restrain releases from Wivenhoe Dam such that Brisbane River flows are maintained within the upper limit of non-damaging floods at Lowood (3,500 m3/s)). At various times during the Flood Event some of the downstream bridges have been closed. However, it is evident that action has been taken to vary dam releases such that various bridges could be re-opened as soon as possible. This appears to have been done in accordance with the flood operating strategies. The operations then moved onto Strategy W4 when the storage in Wivenhoe Dam reached about EL 73.5 (before the W4 trigger level of EL 74) when yesterday's heavy rain came on and it was assessed that there was a chance that the first (central) fuse plug could be triggered. It was then a matter of juggling the radial gate openings in an attempt to circumvent any fuse plug triggering. A graph of storage levels for Wivenhoe and Somerset Dams (from information taken from the Technical Situation Reports) showing the limits for the various Wivenhoe Dam flood strategies is given in Attachment A. It is apparent from this graph, that the appropriate flood operation strategies were adopted. The Technical Situation Reports indicate that proposed changes in strategy were appropriately communicated with appropriate authorities in accordance with the new Communication Protocol.

Summary:

The Technical Situation Reports comply with the requirements of the new Communication Protocol. However, I feel that there could be more consistency in the information presented. There seem to be gaps in information presented such as storage levels (see spreadsheet and graph in Attachment A). It would be useful to specify the minimum information required to be presented in the Technical Situation Reports (storage levels, inflows, recent/current rainfall, forecast rainfall, releases from dams, estimated flows from downstream tributaries, current flood operating strategy for each dam and proposed change in strategy, gate and regulator operations, state of downstream road crossings etc). Most of the minimum information is already given, but not in a consistent manner. As a means of reviewing processes followed during a flood, it would be useful to present a timeline of the flood event showing graphs of storage levels and other data that can be easily presented in a graphical manner.

I am informed by the Queensland Director Dam Safety (Water Supply) that the various requirements of the Flood Mitigation Manual relating to requirements for flood operations personnel, flood preparedness and flood training have been adhered to. There are a number of other requirements however, that I am not able to say whether they were satisfied as I had insufficient information. These requirements (see Table in Attachment A) should be subject to a separate audit.

It appears to me that the decision to implement Strategy W4 was a prudent one. While it would cause some damage in the Brisbane River downstream, its implementation, considering forecast rainfalls and projected flows in Lockyer Ck. And the Bremer River, would allow reduction of the storage level in

Wivenhoe Dam. This reduction in storage level would hopefully provide a sufficient buffer that would minimise the chance of a fuse plug triggering in the auxiliary spillway. Triggering of the first (central) fuse plug would cause a sudden increase of flow of some 2,000m^3/s from Wivenhoe Dam. This increase in flow would cause significantly more flooding in the lower Brisbane River than that caused by early implementation of Strategy W4.

Conclusions:

The strategies as set out in the Flood Mitigation Manual have been followed, allowing for the discretion given to making variations in order to maximise flood mitigation effects. The actions taken and decisions made during the Flood Event appear to have been prudent and appropriate in the context of the available knowledge available to those responsible for flood operations and the way events unfolded.

There are a number of requirements where there was insufficient time given the urgency of this review, to source the necessary information for me to demonstrate compliance. However, satisfaction or otherwise of these requirements would have had little impact on the operation of the two dams during this particular Flood Event. It is intended that they be audited when time permits, after the Flood Event.

There are aspects of the Technical Situation Reports that could be improved and these have been discussed above.

Regards,



Brian Cooper

ATTACHMENT A

Action Requirements extracted from the Flood Mitigation Manual:

Action	Comment
The Flood Mitigation Manual contains the operational procedures for Wivenhoe Dam and Somerset Dam for the purposes of flood mitigation and must be used for the operation of the dams during flood events.	Appears to have been done
Sufficient numbers of suitably qualified personnel are available to operate the dams if a Flood Event occurs.	Director of Dam Safety is satisfied
The level of flooding as a result of emptying stored floodwaters after the peak has passed is to be less than the flood peak unless accelerated release is necessary to reduce the risk of overtopping.	See Note 1
A regular process of internal audit and management review must be maintained by Seqwater to achieve improvements in the operation of the RTFM.	See Note 1
Seqwater must maintain a log of the performance of the data collection network. The log must include all revised field calibrations and changes to the number, type and locations of gauges. Senior Flood Operations and Flood Operations Engineers are to be notified of all significant changes to the Log.	See Note 1
Seqwater must maintain a log of the performance of the RTFM. Any faults to the computer hardware or software are to be noted and promptly and appropriately attend to.	See Note 1
Seqwater must ensure that all available data and other documentation is appropriately collected and catalogued for future use.	See Note 1
Seqwater must ensure that information relevant to the calibration of its field stations is shared with appropriate agencies.	See Note 1
Seqwater must liaise and consult with these agencies with a view to ensuring all information relative to the flood event is consistent and used in accordance with agreed responsibilities: • Bureau of Meteorology (issue of flood warnings for Brisbane River basin); • Department of Environment and Resource Management (review of flood and discretionary powers); • Somerset Regional Council (flood level information for upstream of Somerset Dam and upstream and downstream of Wivenhoe Dam); • Ipswich City Council (flood level information for Ipswich), and; • Brisbane City Council (flood level information for Brisbane City).	Required also by draft of Communications Protocol. Technical Situation Reports infer compliance
Seqwater must report to the Chief Executive by 30 September each year on the training and state of preparedness of operations personnel.	See Note 1
Seqwater must provide a report to the Chief Executive by 30 September each year on the state of the Flood Monitoring and Forecasting System and Communication Networks.	See Note 1

Action	Comment
After each significant flood event, Seqwater must report to the Chief Executive on the effectiveness of the operational procedures contained in this manual.	It is too early for this action to be implemented. Will be implemented when the Flood Event is finished
Prior to the expiry of the approval period, Seqwater must review the Manual pursuant to provisions of the Act.	It is too early for this action to be implemented
Strategies are changed in response to changing rainfall forecasts and stream flow conditions to maximise the flood mitigation benefits of the dams.	Technical Situation Reports indicate that this is done
When determining dam outflows within all strategies, peak outflow should generally not exceed peak inflow.	Information from Seqwater indicates that the requirement was satisfied
Protocol for use of discretionary powers (i.e. who gets told)	Director of Dam Safety is satisfied – I don't know whether Seqwater CEO or Chairperson approved – See Note 1

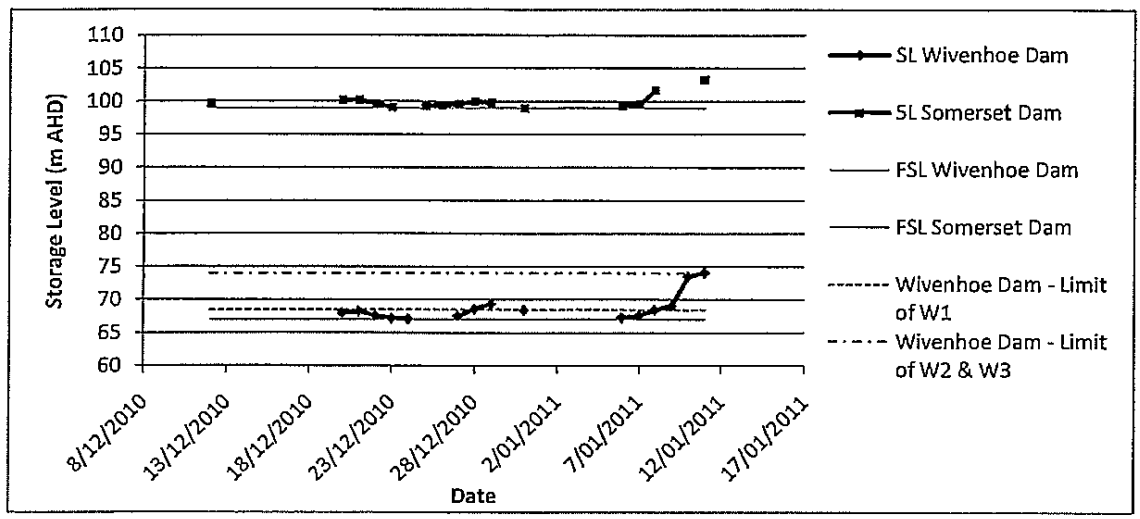
Note1: For a number of the above actions, given the short time frame for the review on compliance of actual flood operations with the Flood Mitigation Manual, it was not possible to source some of the information required to confirm that requirements had been fulfilled. These actions will be audited separately, when time permits.

Action	Comment
Flood Strategies for Wivenhoe Dam:	
The intent of Strategy W1 is to not to submerge the bridges downstream of the dam prematurely (see Appendix I). The limiting condition for Strategy W1 is the submergence of Mt Crosby Weir Bridge that occurs at approximately 1,900 m^3/s . For situations where flood rains are occurring on the catchment upstream of Wivenhoe Dam and only minor rainfall is occurring downstream of the dam, releases are to be regulated to limit, as much as appropriate in the circumstances, downstream flooding.	Technical Situation Reports indicate that every attempt was made to keep the specified road crossings open
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). In these instances, the combined peak river flows should not exceed those shown in the following table:	Technical Situation Reports indicate that Wivenhoe Dam releases were made considering concurrent flows in the Bremer River & Lockyer Ck. To delay damaging floods as long as possible
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.	
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 EL74.0 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. There are no restrictions on gate opening increments or gate operating frequency once the storage level exceeds EL74.0 AHD, as the safety of the dam is of primary concern at these storage levels.	Technical Situation Reports indicate that Wivenhoe Dam releases were such as to delay adopting this strategy as long as possible
Where possible, total releases during closure should not produce greater flood levels downstream than occurred during the flood event.	Technical Situation Reports indicate that this requirement was satisfied
The aim should always be to empty stored floodwaters stored above EL 67.0m within seven days after the flood peak has passed through the dams.	Technical Situation Reports indicate that

Action	Comment
	emphasis was given to satisfying this requirement
Flow in the spillway to be as symmetrical as possible with the centre gates opened first.	Technical Situation Reports indicate that this was done
The bottom edge of the radial gates must always be at least 500mm below the release flow surface.	See Note 1 above

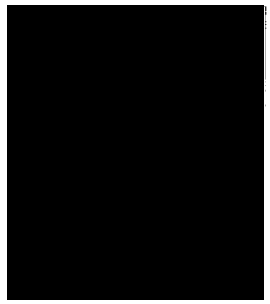
Action	Comment
Flood Strategies for Somerset Dam:	
The intent of Strategy S1 (Somerset Dam Level expected to exceed EL 99.0 and Wivenhoe Dam not expected to reach EL 67.0 (FSL) during the course of the Flood Event) is to return the dam to full supply level while minimising the impact on rural life upstream of the dam. Consideration is also given to minimising the downstream environmental impacts from the release.	Technical Situation Reports indicate that this was done
The intent of Strategy S2 (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). This to maximise the benefits of the flood storage capabilities of the dam while protecting the structural safety of both dams. The Flood Mitigation Manual contains a graph that shows the intended interaction of the Wivenhoe Dam and Somerset Dam storage levels.	Technical Situation Reports indicate that this was done – little information on the operation of the radial gates at Somerset Dam. How the graph was followed not really demonstrated
The intent of Strategy S3 (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) is to maximise the benefits of the flood storage capabilities of the dam while protecting the structural safety of both dams.	Not relevant at this stage
The safety of Somerset Dam is the primary consideration and cannot be compromised and its peak level cannot exceed EL 109.7.	Maximum level only EL103.3

Wivenhoe & Somerset Dams – Storage Level Behaviour (as presented in Technical Situation Reports)



Date	Time	TSR	Wivenhoe Dam Release (m^3/s)				Gate No.	Opening (m)	Sto
			Regulators	Hydro	Gates	Total			
12/12/2010	1400	W1							
13/12/2010	1300	W2		10	290	300			
15/12/2010	1800	W3							
16/12/2010	1600	W4			0				
17/12/2010	1200	W5							
17/12/2010	1800	W6	Closed		Opening Ops. Initiated				
	1830			13	50	63	3	0.5	
18/12/2010	0700	W7							
19/12/2010	0700	W8			350	350	3	3.5	
19/12/2010	1800	W9			300	300	3	3	
20/12/2010	0700	W10							
20/12/2010	0900	W11							68. aft
20/12/2010	0900	W12							
21/12/2010	0730	W13				peak 1,280 (0500)			pe cur (11 slo cur (10 slo to f
22/12/2010	0830	W14							
22/12/2010	1600	W15			Closing sequence				
23/12/2010	0800	W16			All gates expected to be closed by 1500				Wh will FSL ope lev
23/12/2010	1430	W17				350	3	3.5	
24/12/2010	0630	W18			All gates expected to be closed by 1800				67. wh clo
24/12/2010	1130	W19	4,200Ml/d by from reg. & Hydro		Radial gate ops ceased @ 1900		3 zero		
25/12/2010	0830	W20							
26/12/2010	0800	W21							
27/12/2010	0600	W22							
28/12/2010	0700	W23			347 (initially) then back to 46				
29/12/2010	0700	W24							69. aim FSL 69. yes (1. this
30/12/2010	0700	W25			Wivenhoe+Lockyer = 1,600m^3/s				
31/12/2010	0700	W26			Wivenhoe+Lockyer = 1,600m^3/s				68.
		W27							
06/01/2011	1100	W28			Commence opening RG @ 1800 & ramp up to 300m^3/s by 2200				67.
07/01/2011	0700	W29							67.
07/01/2011	1500	W30			Release started 1500 to be incr. slowly to ~1,200m^3/s by 1400 tomorrow				
08/01/2011	0700	W31			~890		All (5) RG's open		68. ste
09/01/2011	0700	W32				1,343			Cur (fal
		W33							
09/01/2011	2100	W34				1,400			Cur
		W35							
		W36							
		W37							
11/01/2011	0630	W38			2,750 since 1930 on 10/1/2011		All (5) gates		73. 25m
11/01/2011	1200	W39				3,970			74. risi

brian cooper consulting



Brian Cooper

Dams Engineer

Qualifications & Affiliations

Short courses on finite element analysis, embankment dam engineering, earthquake engineering. Published technical papers – ICOLD. ANCOLD and I.E. Aust. Attended dam safety course at USBR (Denver, USA) in 2002

Bachelor of Engineering (B.E. Hons), 1968 and Master of Engineering Science (M.Eng.Sc.), 1971

University of New South Wales

Graduate Diploma of Engineering Management, 1994 Deakin University

F.I.E. Aust.,C.P.Eng. RPEQ

Expertise

Brian has approximately 40 years experience in investigation and design of major dams, weirs and hydraulic structures, having started his career designing farm dams and small irrigation schemes. He retired from NSW Department of Commerce in 2005. Brian now works as a private consultant specialising in dams engineering and fish passage at dams and weirs. He has a special interest in risk assessment and computer modelling in general and the seismic analysis of dams in particular. Engineering software (concrete dam stability analysis and flood routing) written by Brian is still used extensively in the Dams & Civil Group of the Department of Commerce. He also has particular experience with concrete dams and the use of post tensioned ground anchors for strengthening those dams. He was a member of the Australian National Committee on Large Dams (ANCOLD) Working Group that developed guidelines for 'Design of Dams for Earthquakes' and a member of the Working Group that revised the guidelines for 'Risk Assessment for Dams'. He has been a guest lecturer for a number of years (most recently in 2009) on concrete dam engineering for the University of NSW post graduate Embankment Dam Engineering Course, and on the history of dams in NSW at Sydney University.

He has been the project director and project manager for a number of feasibility studies, design reviews, site investigations and detail design consultancies for major dams and weirs including the direction and co-ordination of all specialist services including dambreak studies, preparation of dam safety emergency plans and risk assessments. He is currently an expert reviewer for a number of Australian water authorities and consultants (State Water Corporation (NSW), Hydro Tasmania, SunWater (Queensland), Brisbane City Council, Goulburn-Murray Water, Goulburn Valley Water, WA Water Corporation, Southern Rural Water (Victoria), URS, GHD, Hobart Water, NT PowerWater, and TrustPower (NZ)). He has also worked as a sub-consultant for a number of consulting firms (URS, MWH, GHD).

Brian is the Engineers Australia representative for the NSW Dams Safety Committee (the dam safety regulator in NSW) and is currently the Chairman of that organisation. He has been a member of the Murray Darling Basin Authority's Fish Passage Task Force which advises inter alia on the installation of fishways on the Murray River as part of the Living Murray Program.

Brian is a registered engineer in Queensland (RPEQ No. 6819). He started his own consulting business in 2008, advising on dam safety, dam design and analysis, dam risk assessments and dam upgrades as well as fish passage for dams. He is providing specialist advice through *Brian Cooper Consulting* as a sole trader.

resumé

Professional Experience

2008 to Present: Principal of Brian Cooper Consulting

2010
Five yearly comprehensive dam safety inspection of Carcoar Dam (double curvature arch dam).
Internal reviewer to URS (Melbourne) on concept design of regulator structures and associated fishways for the Hipwell Road project for watering the Gunbower Forest
Specialist adviser to Melbourne Water – valve behaviour on Sugarloaf Dam pipeline, structural behaviour of pumping station floor slab and pump bases at Cardinia Dam Pumping Station
Commenced work as member of ANCOLD working group re-writing the Earthquake Guidelines – responsible for re-writing sections relating to concrete dams.
Continuing involvement with Alluvium in the design of the weir upgrade and the new fishway for Booligal Weir.
Continuing external peer review services to State Water Corporation for the detail design of new auxiliary fuse plug spillways for Copeton and Chaffey Dams, detail design of raising and post tensioned strengthening of Keepit Dam, detail design of upgrade works for Wyangala Dam, finite element analysis of Carcoar Dam (double curvature arch dam).
Further work with GHD (Perth) on risk assessment for Serpentine Dam.
Continuing involvement with Hydro Tasmania, as Chair of external review panel for Catagunya Dam.

2009
Part of URS' comprehensive inspection team for Melbourne Water's Maroondah Dam.
Part of URS' business risk assessment team for Southern Rural Water's Cowwarr and Maffra Weirs.
Part of Alluvium's design team upgrading Booligal Weir and providing a fishway at the weir, for State Water Corporation.
Part of GHD's design team for Lower Fitzroy River Infrastructure Project designing fishways for Rookwood and Eden Bann Weirs near Rockhampton in Queensland.
Project Manager on behalf of SA Water and reviewer for study into vibration of a crane rail beam at Lock 5 on the River Murray.
Expert reviewer for State Water Corporation for 3D finite element analysis of Carcoar Dam (double curvature arch dam).
Internal reviewer for URS on Laanecoorie Dam Upgrade.
Expert reviewer for State Water Corporation for risk assessments for Oberon and Rydal Dams.
Member of GHD's Serpentine Dam risk assessment team for WA WaterCorp.
Expert reviewer for SunWater in Queensland for the comprehensive risk assessment undertaken for Fairbairn Dam and Coolmunda Dam.
Expert reviewer for State Water Corporation for major upgrade works at Keepit, Copeton, Chaffey and Wyangala Dams.
Appointed as Chairman of the NSW Dams Safety Committee (the dam safety regulator in NSW).
Provided external peer review for Goulburn Valley Water, on Nine Mile Creek Dam Upgrade.
Internal reviewer for URS (Adelaide) for Lake Victoria Outlet Regulator options studies.
Provided advice to URS (Melbourne) on the Mildura Weir Fishway design.
Member of expert panel advising State Water Corporation on revised dam surveillance regime.
Part of Ecosmart bid team - prepared concept designs for fish passage facility at proposed Wyaralong Dam in Queensland.
Continuing expert review role for Catagunya Dam upgrade.

2008
Started as a private specialist dams consultant - *Brian Cooper Consulting.*
Worked through the URS Corporation for the USBR and the USACE in developing a risk toolbox for lined spillways.
Advised TrustPower in New Zealand on replacement of post tensioned anchors at Mahinerangi No. 1 Dam.
Adviser to State Water Corporation and to URS on further upgrade works for Hume Dam.
Provided specialist advice to WA Water Corporation on Wellington Dam post tensioning.
Peer reviewer on behalf of URS for Warren Dam in South Australia.
Part of URS team carrying out portfolio risk assessment of Melbourne Water's dams.
Member of Expert Review Panel for Darwin River and Manton Dams for NT PowerWater.

1987 to 2008: Dams & Civil Section of NSW Department of Public Works and Services/NSW Department of Commerce.

2008	Carried out detailed 3D finite element analysis of radial gate at Wyangala Dam spillway for State Water Corporation. Continuing review role for Tillegra Dam. Continuing review role for Hinze and Lake Manchester Dams in Queensland and Catagunya Dam in Tasmania. Prepared options report on Burrendong Dam spillway modifications for State Water Corporation.
2007	Continuing roles on Lake Manchester, Hinze, Catagunya and Redbank Ck. Dams. Internal peer reviewer for NSW Dept. of Commerce regarding design of Tillegra Dam. Advised State Water on feasibility of fish passage facilities at a number of their major irrigation dams. Expert reviewer for GHD on a flood retarding basin in south west Sydney. Part of expert panel for River Murray Water risk assessments for Hume and Dartmouth Dams, Torrumbarry and Yarrowonga Weirs and Lake Victoria. Re-elected as Deputy Chairman of the Dams Safety Committee
2006	Project director for 3D finite element analysis of Bendora Dam (double curvature arch dam) Chair of external peer review panel for upgrading of Lake Manchester Dam (concrete gravity dam) in Queensland Internal peer reviewer and senior consultant for the raising of Hinze Dam (earth and rockfill embankment) in Queensland Project director for preliminary and detailed design of Redbank Creek Dam (single curvature arch dam) upgrading Project director for Keepit Dam fish passage investigations Part of expert panel for URS undertaking portfolio risk assessment for dams owned by River Murray Water External peer reviewer for Hydro Tasmania for Catagunya Dam (concrete gravity dam) upgrading; Project director for 3D finite element analysis of Upper Cordeaux No. 2 Dam (single curvature arch dam owned by SCA) for BHP Billiton
2005	Project design engineer for dam related aspects of Nepean Dam Deepwater Access Project: Pipeline crossing end of spillway; outlet works for end of pipeline Project design engineer for Avon Dam Deepwater Access Project: tunnel design through rockfill buttressing; new low level outlet works
2004	Internal reviewer to URS Australia for Pykes Ck Dam Investigations (Southern Rural Water, Victoria) Internal reviewer to URS Australia for Lower Reservoir Dam (Hobart Water, Tasmania) Member of expert review panel for the Melton Dam upgrade design (Southern Rural Water, Victoria)
2003/04	Designer for retrofitting multi-level offtake for Tallowa Dam (Sydney Catchment Authority). Member of the Independent Technical Expert Panel for the Eildon Dam Upgrading in Victoria for Goulburn-Murray Water. Currently the design director for the Wivenhoe Dam Alliance carrying out the flood capacity upgrading for Wivenhoe Dam in Queensland – included directing major computational fluid dynamics modelling investigations of existing spillway
2003	Carried out options study for environmental upgrading works at Keepit Dam (selective withdrawal facility, additional outlet works and fish passage) Carried out assessment of spillway capacity for Hume Dam using computational fluid dynamics modelling (by a sub-consultant) Carried out detail design for anchoring Bellfield Dam (Victoria) Intake Tower Carried out detailed finite element analysis of Keepit Dam radial gates
2002	Carried out review of large farm dam with seepage problems. Directed computational fluid dynamics modelling of drum gate and radial gates at Warragamba Dam together with structural analysis of gates (modelling carried out by sub-consultant) to ensure gates can handle more

rigorous operating conditions
Adviser to the Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) on civil engineering matters related to the replacement reactor project at Lucas Heights
Expert reviewer for Goulburn-Murray Water for remedial works at Cairn Curran Dam in Victoria
Project Director for Lerderderg Weir safety review and risk assessment for Southern Rural Water (Victoria). Carried out finite element analysis of radial gate

2001

Project Director for design of further remedial works at Hume Dam.
Technical director on behalf of NPWS for quantitative risk assessment for Snowy Mountains roads
Chairman of the committee producing a geotechnical response plan for the Alpine Way in the Snowy Region for NPWS
Carried out non-linear finite element analysis (earthquake loading) for outlet tower at Bellfield Dam for Wimmera-Mallee Water (Victoria)
Joined the MDBC's Fish Passage Reference Group and reviewed fishway designs
Consultant to DLWC for their portfolio risk assessment of thirty dams
Provided advice on the post tensioning system at Waitakere Dam in New Zealand.

Director of Dam Surveillance Group responsible for the surveillance of DLWC dams and participant of a number of 5 yearly surveillance inspections
Project Director of review of DLWC Intake Towers Earthquake Stability Review
Directed DPWS input into the Earthquake Stability of the structural elements of Yarrawonga Weir as sub-consultant to URS Australia – included detail design of anchoring system for the weir. Also provided design advice on design of stone columns to provide protection against liquefaction of alluvial foundations.
Member of the expert panel for the risk assessment studies being undertaken for Goulburn-Murray Water
Project Director for safety review and preliminary design of remedial options for Blowering Dam (DLWC)
Acted as reviewer for a number of projects carried out by URS (incl. Cardinia Dam outlet tower, Bellfield Dam embankment/spillway)
Directed functionality study (including business risk assessment) for Yallourn Weir for Southern Rural Water (Victoria)

2000

Project Director for design of further investigations and remedial works at Hume Dam.
Safety reviews for Bamarang and Flat Rock Dams
Director of Dam Surveillance Group responsible for the surveillance of DLWC dams and participant of a number of 5 yearly surveillance inspections
Project Director for earthquake studies on intake towers and appurtenant works at DLWC dams
Consultant to DLWC to manage their portfolio risk assessment
Project Director for a number of dambreak studies and preparation of dam safety emergency plans
Member of the consulting team carrying out risk assessments for Goulburn-Murray Water (Victoria) for Eppalock Dam
Carried out review of Earthquake Stability Review of the Outlet Tower at Eppalock Dam in Victoria for G-MW.
Reviewed URS Australia designs for Alpine Way remedial works

1999

Project Director of earthquake studies on Wyangala Dam
Project Director for design of further remedial works at Hume Dam. Included design of ground improvement works (stone columns) for protecting alluvial foundations against liquefaction
Peer reviewer of Leslie Dam (Queensland) Safety Report.
Peer reviewer of DLWC's Screening Level Risk Assessment

1998

Project Director for portfolio risk assessment for six dams owned by a Southern Rural Water in Victoria.
Directed structural analysis of spillway gates on Narracan Dam for Southern Rural Water
Project Director for concept design and DD&C contract documentation for Warragamba Dam auxiliary spillway. Dam to be upgraded the dam to cater for increased inflow flood estimates. Upgrading works estimated to cost $135M. An auxiliary spillway is to be constructed adjacent to the existing dam - involves excavating some 2,000,000m³ of rock and constructing concrete lining, training walls, fuse plug embankments, large scale cement stabilised sandstone fill, a multi

span bridge across the spillway, post tensioned ground anchors for dissipator/training walls, modifications of existing spillway gates. Design involved extensive physical hydraulic model testing.

1997 Feasibility options study for remediation of Redbank Ck. Dam near Mudgee (NSW) Karapiro Dam, New Zealand - Part of international consulting team reviewing this concrete arch dam's security and determining appropriate remedial options (mass concrete buttressing). Director of risk assessment studies for Tenterfield Dam

1993-1997 Hume Dam Investigations - Project Manager of Investigation and Design Studies for the embankments at the dam. Work involves:

- review of the stability of the embankments under static and earthquake loadings
- investigation of liquefaction
- potential of embankments' foundations
- development of stabilising options
- development of options to provide increased flood security including provision of new auxiliary spillways and modifications to existing works
- detail design and documentation of stabilising works for the embankments including a key trench into the dam's foundations, stabilising berms, slurry wall cut-offs, drainage/filter curtains and strengthening of critical gravity training walls with both horizontal and vertical post tensioning.
- part of advisory and review team for the risk assessment of the dam and its components.

1990-1996 Warragamba Dam Upgrading for Sydney Water Corporation - Project Manager of Investigation Concept Design Studies for upgrading the dam to cater for increased inflow flood estimates and provide substantial flood mitigation. Upgrading works estimated to cost $280M. The existing dam was to be strengthened with mass concrete buttressing – some 600,000m³.

1996 Project Director for Safety Review (including Finite Element Analysis) of Wellington Dam

1993-1996 Hume Dam Gates for Department of Water Resources - Project Manager for the design of new maintenance baulks and emergency closure gates. Involves development of proposals for underwater installation.

1995 Redbank Creek Dam and Lithgow No. 2 Dam for NSW Public Works Dams Surveillance - Project Manager for safety reviews and finite element analysis of two 15m high arch dams. Clarrie Hall Dam for NSW Public Works Dams Surveillance - Project Manager for dambreak studies.

1994 Burrinjuck Dam Gates for NSW Department of Water Resources - Project Manager for the design of new control and emergency closure gates. Involves underwater installation. Karangi Dam for Coffs Harbour City Water Project - Project Manager for dambreak studies.

1993 Mardi Dam for Wyong Council - Project Manager for safety review of earth embankment.

1988-1990 Nepean Dam Remedial Works for Sydney Water Corporation - Project Manager for investigation studies, design development and detail design. Work involved:

- initial flood security studies and development of options
- co-ordination of hydraulic model studies
- detail design and contract documentation for modified spillway, large size post-tensioned ground anchors and rockfill buttressing.

1987-1989 Boggabilla Weir for NSW Department of Water Resources - Project Manager for detail design and contract documentation of a large gated re-regulation weir with fishway. Involved liaison with fisheries expert in developing optimum geometry for fish ladder.

Chaffey Dam for NSW Department of Water Resources - Project Manager for upgrading of dam. Work involved:

- development of options and preliminary design
- finite element analyses for raised morning glory spillway
- stability analyses for raised earth/rockfill embankment
- co-ordination of hydraulic model studies for raised spillway.

1969-1987: ***Water Resources Commission of NSW (WRC) (now Department of Land and Water Conservation).***

1986-1987 Flood Security studies for WRC - Project Design Engineer for investigation into flood security of Chaffey and Glennies Creek Dams. Involved co-ordinating dambreak studies, development of remedial options, economic risk studies.

1985-1987 Hume Dam Strengthening for WRC - Project Design Engineer for detail design and contract documentation. Work included:

- design of large size post-tensioned ground anchors including development of appropriate grouting procedures
- design of structural modifications to the concrete gravity dam
- design of a new road bridge over the dam.
- establishing the rationale for replacing the existing post tensioning system

Contact

Tel: [redacted]
Mobile: [redacted]
Email: brian.cooper.consult[redacted]

SEQ Water Grid

Talking Points

TRIM reference: D/11/	Enquiry received:
Purpose: Wivenhoe Dam release	

Impacts of Wivenhoe and Somerset dams

- Wivenhoe and Somerset dams reduced the flood peak by 2.5 metres in the City and 5.5 metres at Moggill.
- Without the dams, up to 13,000 more houses would have been flooded. They prevented up to $1.6 billion of damages.
- Without the dams, major flooding would have lasted for three days.
- Wivenhoe and Somerset dams controlled 2.6 million megalitres of floodwater. This is 1.1 million megalitres more than in 1974.
- The dams controlled these floodwaters, providing time for peak flows from the Lockyer and Bremer to pass.
- Total flow in the Brisbane River in 1974 was 9,500 cubic metres per second. The estimated flow from this event would have been 13,000 cubic metres per second if Wivenhoe did not exist.

Operation of Wivenhoe and Somerset dams

- The dams were operated strictly in accordance with the approved Operational Procedures.
- The Operational Procedures were developed by Australia's best hydrologists, including:
    - Professor Colin Apelt, Head of Department, Department of Civil Engineering, University of Queensland
    - Mr Eric Lesleighter, Principal Hydraulic Engineer and Chief Engineer Water Resources, Snowy Mountains Engineering Corporation.
- Professor Apelt is Chair of the Brisbane City Council flood taskforce.

Flood report

- There is a regulatory requirement that Seqwater prepare a flood report.
- By regulation, the report will be submitted within six weeks of the gates closing.

- The report will be a comprehensive summary of all procedures, actions, outcomes and processes during the event. It will consider factors impacting on the protection of urban areas.
- The report will be reviewed by the Dam Safety Regulator and independent experts.
- The report and its review will be submitted to the Government and inform a review of the Operational Procedures.
- The review of Operational Procedures will utilise an expert panel, including representatives of the Bureau of Meteorology and Councils.

Rainfall forecasts

- Dam operations were based on forecasts provided by the Bureau of Meteorology.
- The rainfall during the event exceeded all forecasts.
- Rainfall was local and intense, as demonstrated by the tragic events in Toowoomba.

From: Barry Dennien <Barry.Dennien[redacted]>
Sent: Sunday, January 16, 2011 12:25 PM
To: Dan Spiller <Daniel.Spiller[redacted]
Subject: Fwd: Cabinet in confidence - Ministerial brief outline - Regulatory context
Attach: Regulatory context for the dams.doc; ATT00001.htm

Regards
Barry Dennien

Begin forwarded message:

From: "peter_aller[redacted]
Date: 16 January 2011 11:57:56 AM AEST
To: "rdrury[redacted]
"pborrows[redacted]>,
"dutyseq[redacted] "john.bradley[redacted]
<john.bradley@[redacted], Barry Dennien <Barry.Dennien@[redacted]
"daniel[redacted]
"michael.lyons[redacted]elaina.smouha[redacted]
<michael.lyons[redacted]elaina.smouha[redacted]>,
"peter.allen[redacted]
"mfoster[redacted]
"bob.reilly[redacted]
Cc: "threereillys[redacted]
Subject: Re: Fw: Cabinet in confidence - Ministerial brief outline - Regulatory context

Barry,

This is the proposed regiulatory context to go into the Ministerial Briefing. Both Bob Reilly and Peter Borrows have reviewed it and are happy with it.

Peter Allen
Director Dam Safety (Water Supply)
DERM

Allen Peter <Peter.Aller[redacted] wrote:

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

From: Elaina Smouha <elainamir[redacted]

To: mfoster[redacted]; Allen Peter;

Reilly Bob; pborrows <pborrows[redacted]>;

71SA

rdrury[redacted]

<rdrury[redacted]; dutyseq[redacted]
<dutyseq[redacted]

Cc: Bradley John; Dennien Barry [redacted]; spiller daniel[redacted]
SEQWGM; Lyons

Michael [redacted]; smouha elaina [redacted]

Sent: Sat Jan 15 17:02:53 2011

Subject: Cabinet in confidence - Ministerial brief outline

Dear All

To assist, attached is a Ministerial brief outline as per our recent teleconference, for Monday's Emergency Cabinet meeting. It also records those who will be providing information for the Background and Flood Mitigation Manual report process.

As discussed, the brief needs to be provided to Minister Robertson tomorrow (Sunday, 16 January 2011).

Regards

Elaina

Elaina Smouha

Director, Governance and Regulatory Compliance

SEQ Water Grid Manager

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Email: elaina.smouha[redacted]

715B

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ABN: 14783 317 630

+----------+

Think B4U Print

1 ream of paper = 6% of a tree and 5.4kg CO2 in the atmosphere

3 sheets of A4 paper = 1 litre of water

+----------+

715C

Regulatory context for the dams' flood operations

These are contained in the Flood Mitigation Manual (manual) approved under sections 370 to 374 of the *Water Supply (Safety and Reliability) Act 2008.* The Chief Executive Officer (CEO) of DERM (or his delegate) approves the manual, and the approval is notified in the Queensland Government Gazette. Approval can be for a period of up to five years, after which the approval needs to be renewed. There are no decision-making criteria specified in the Act for the CEO to take into account when approving the manual.

The manual for the dams requires, amongst other matters:

a) Flood operations to be conducted in accordance with manual's provisions. (There is an approval process specified in the manual, if Seqwater considers a different flood release strategy is desirable to deal with a particular flood event. This was not used in the January 2011 flood event)

b) Flood operations to be under the control of CEO-approved engineers (who are highly qualified and experienced)

c) Annual reporting on the preparedness and status of the flood control system for flood operations, and the training of the personnel who manage the flood events.

d) Reporting on the flood operations during flood events.

e) Reviews after flood events such as the January 2011 event. For this flood event, the Queensland Government engaged Mr Brian Cooper, an independent consulting engineer, to review compliance with the manual. Mr Cooper concluded (Attachment??):

> "...The strategies in the Flood Mitigation Manual have been followed, allowing for the discretion given to make variations in order to maximise flood mitigation effects. The actions taken and decisions made during the Flood Event appear to have been prudent and appropriate in the context of the available knowledge available to these responsible for flood operations and the way events unfolded..." (p.3 of the final report or other appropriate reference??)

The manual is separate from a draft communication protocol (Insert name) between the Local, State and Commonwealth government agencies that are affected by the dams' flood operations. This protocol is not binding on the parties to it is not subject to regulatory approval/review.

Some DERM staff, because of their specialist skills, work in the Flood Operations Centre that Seqwater activates to manage such events. None of them are involved in any of the regulatory decisions concerning the dams or are members of the work unit (Office of the Water Supply Regulator) which undertakes the CEO's regulatory functions.

715D

Suzie Emery

From: Bradley John [John.Bradley[redacted]
Sent: Sunday, 16 January 2011 12:55 PM
To: Barry Dennien; Dan Spiller
Subject: RE: Should the Wivenhoe have been bigger? | Courier Mail Andrew Bolt Blog

Barry

Can you pls ask Peter B to add this question to the BN today

Is it true Wivenhoe didn't comply with ANCOLD standard?

Why didn't you implement recommendations of the 2007 report ?

John Bradley
Director-General
Department of Environment and Resource Management
Telephone:[redacted]
Email: John.Bradley[redacted]
www.derm.qld.gov.au

Department of Environment and Resource Management
400 George Street, Brisbane Q 4000
GPO Box 2454, Brisbane Q 4001

From: Barry Dennien [mailto:Barry.Dennien[redacted]]
Sent: Sunday, 16 January 2011 7:25 AM
To: spiller daniel [redacted]; Bradley John
Subject: Fwd: Should the Wivenhoe have been bigger? | Courier Mail Andrew Bolt Blog

For note

Regards
Barry Dennien

Begin forwarded message:

> **From:** Barry Dennien <Barry.Dennien[redacted]>
> **Date:** 16 January 2011 7:00:05 AM AEST
> **To:** Peter Borrows <pborrows[redacted]>
> **Subject: Should the Wivenhoe have been bigger? | Courier Mail Andrew Bolt Blog**
>
> http://blogs.news.com.au/couriermail/andrewbolt/index.php/couriermail/comments/should_the_wivenhoe_have_been_bigger/
>
> Peter
>
> It may be worthwhile starting to gather all dam studies and reports
>
> Note this blog is selectively picking bits of information from the 2007 report
>
> Talk later
>
> Barry

Regards
Barry Dennien

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+----------+----------+

Think B4U Print

1 ream of paper = 6% of a tree and 5.4kg CO2 in the atmosphere

3 sheets of A4 paper = 1 litre of water

+----------+----------+

Suzie Emery

From: Lance McCallum [Lance.McCallum[redacted]
Sent: Sunday, 16 January 2011 2:45 PM
To: Bradley John; Dan Spiller; Barry Dennien; Hunt Dan
Cc: Kirstie Ross; Tim Watts; Geoff Stead
Subject: Special cabinet Meeting - Monday 17 January 2010 - Pre Brief

Confidential

John,Dan('s) ,Barry

I confirm a pre-cabinet briefing tomorrow morning from 9am in Minister Robertson's boardroom.

Thanks

Lance.

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Please consider the environment before printing this email.

Suzie Emery

From: Peter Borrows [pborrows[redacted]
Sent: Sunday, 16 January 2011 3:59 PM
To: bob.reilly[redacted]; Rob Drury; Duty Seq; john.bradley[redacted]; Barry Dennien; Dan Spiller
Cc: Michael Lyons; Mike Foster; Elaina Smouha; peter.allen[redacted]
Subject: Cabinet in confidence - Ministerial brief outline
Attachments: Ministerial brief - contents outline.docx

Please see attached draft with attachment.

In relation to the draft contents outline sent yesterday, the following is a cross reference FYI.

Regards, Peter.

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

seqwater
WATER FOR LIFE

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



From: Elaina Smouha [mailto:elainamir[redacted]
Sent: Saturday, 15 January 2011 5:03 PM
To: Mike Foster; peter.allen[redacted]; bob.reilly[redacted]; Peter Borrows; Rob Drury; Duty Seq
Cc: john.bradley[redacted]; barry.dennien[redacted]; daniel.spiller[redacted]; michael.lyons@[redacted]; Elaina Smouha
Subject: Cabinet in confidence - Ministerial brief outline

Dear All

To assist, attached is a Ministerial brief outline as per our recent teleconference, for Monday's Emergency Cabinet meeting. It also records those who will be providing information for the Background and Flood Mitigation Manual report process.

As discussed, the brief needs to be provided to Minister Robertson tomorrow (Sunday, 16 January 2011).

Regards

Elaina

Elaina Smouha

Director, Governance and Regulatory Compliance
SEQ Water Grid Manager
[redacted]
Email: elaina.smouha[redacted]
Visit: Level 15, 53 Albert Street Brisbane
Post: PO Box 16205, City East QLD 4002
ABN: 14783 317 630
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Ministerial brief outline

What is the objective?

a) Ensuring public transparency
b) To answer the State's questions on the performance of Wivenhoe Dam operations
c) Preparation for a public inquiry
d) Normal and logical course of conduct after the occurrence of a major flood event – Review requirement under the Flood Mitigation Manual

Background (focus on Brisbane River flooding issues)

1) Design of Dam – Storages/Spillway upgrade (*Information provider:* ***Seqwater and Peter Allen*** *- DERM*) [1/3 to ½ a page]

2) "The Flood Event" – Q&A (*Information provider:* ***Seqwater***) [2 ½ pages]

    a. Chronology - High level time step of events and significant decision making/changes – more detailed time step information for Tuesday afternoon (i.e. what was the BOM forecast at the time, narrow peak etc.)
    b. How does Wivenhoe Dam work as a flood mitigator?
    c. What are the factors being balanced when making decisions about the amount of dam releases? To what extent does information from the Bureau of Meteorology/rain gauges influence decisions? How reliable is this information?
    d. Statistics on how much did Wivenhoe Dam knock off the flood peak.
    e. What would have happened if Wivenhoe Dam had not been built and we only had Somerset Dam? What damage would have been caused compared to what has currently been experienced (damage statistics)?
    f. If we have undertaken pre-emptive dam releases to bring Wivenhoe Dam's full supply level down to lower than what we had maintained (i.e. 60%), what would have been the river height for the period that this flood event occurred?
    g. If pre-emptive dam releases would not have made a difference, why? (i.e. why did we not release earlier?)
    h. Why was Wivenhoe Dam only allowed to rise up to 191% and not 230%?
    i. What is the fuse plug and why did it need to be maintained?
    j. What damage or town isolation occurred during the Wivenhoe Dam releases that occurred since October 2010?
    k. Did Seqwater have time to reduce the dam level between the 5 events? If so, would it have made a difference to this flood event?

3) The Flood Mitigation Manual (*Information Provider: **Seqwater/DERM***) [½ to 1 page]

   a. Describe the decision making framework - Four strategies
   b. How is the Manual designed to work?
   c. History of Flood Mitigation Manual updates and peer review – who was on the panels, studies that fed into previous versions of the Manual and who was involved in these studies?
   d. **Attach** Minister Robertson's request for advice on pre-emptive release and our response (*Information pravider: **SEQ Water Grid Manager***)

4) Regulatory context - *Water Supply (Safety and Reliability) Act 2008* (*Information provider: **Peter Allen - DERM***)

   a. Flood Mitigation Manual approval
   b. Formal reporting process under the Flood Mitigation Manual – **attach** report resulting from the February 1999 flood event
   c. Decision making process under the Flood Mitigation Manual –
      i. Who makes the flood release decisions under the Manual?
      ii. who is informed/consulted?
      iii. effect of the recent Flood Communication Protocol?

5) Brian Cooper Flood Mitigation Manual compliance review (*Responsible: **SEQ Water Grid Manager***)

Seqwater report

(*Information provider: **Seqwater, Peter Allen and Bob Reilly***)

Seqwater, in consultation with Peter Allen and Bob Reilly, to set out how Seqwater's Flood Mitigation Manual Report to the Chief Executive on the effectiveness of the operational procedures will be undertaken.

- **Attach** table of contents of the 1999 Flood Mitigation Manual report
- Reflect Brian Cooper's compliance review
- Peer review – establishment of an expert panel – who will be on it? Peter Allen and Bob Reilly may provide some input.
- Communication Protocol and incorporation into the Flood Mitigation Manual (revisit in the next fortnight?)

Timeframes on the development of the report – consider urgency due to anticipated further rainfall during this summer.

Suzie Emery

From: Elaina Smouha [elainamir[redacted]]
Sent: Sunday, 16 January 2011 4:07 PM
To: Dan Spiller; Barry Dennien
Subject: Cabinet in confidence - Regulatory context
Attachments: Regulatory_context_for_the_dams[1].docx

I have tracked my changes.

Elaina

Regulatory context for the dams' flood operations

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

The ~~manual for the dams~~Flood Mitigation Manual requires, amongst other matters:

a) Flood operations to be conducted in accordance with manual's provisions, unless Seqwater considers that it is necessary to depart from the procedures of the Flood Mitigation Manual to meet the flood mitigation objectives of the Flood Mitigation Manual. ~~(There is an approval process specified in the manual, if Seqwater considers a different flood release strategy is desirable to deal with a particular flood event.~~ This discretion was not ~~used~~exercised in the January 2011 flood event~~)~~.

b) Flood operations to be under the control of CE~~O~~-approved engineers (who are highly qualified and experienced)

c) Annual reporting on the preparedness and status of the flood control system for flood operations, and the training of the personnel who manage the flood events.

d) Reporting on the flood operations during flood events.

~~e)~~ Reviews after flood events such as the January 2011 event, and a Seqwater report containing details of the procedures used, the reasons for such and other pertinent information. Seqwater must forward this report to the CE within six weeks of the completion of a flood event. ~~For this flood event, the Queensland Government engaged Mr Brian Cooper, an independent consulting engineer, to review compliance with the manual. Mr Cooper concluded (Attachment??):~~

~~e) "...The strategies in the Flood Mitigation Manual have been followed, allowing for the discretion given to make variations in order to maximise flood mitigation effects. The actions taken and decisions made during the Flood Event appear to have been prudent and appropriate in the context of the available knowledge available to these responsible for flood operations and the way events unfolded..." (p.3 of the final report or other appropriate reference??)~~

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

> *(1) The chief executive or a member of the council does not incur civil liability for an act done, or omission made, honestly and without negligence under this part.*

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

During November 2010, Commonwealth, State and local government agencies developed a *Protocol for Communication of Flooding Information for the Brisbane River Catchment – including Floodwater Releases from Wivenhoe and Somerset Dams* to "*ensure the provision of consistent and robust information to the community*". This is separate from the Flood Mitigation Manual, ~~The manual is separate from a draft communication protocol (Insert name) between the Local, State and Commonwealth government agencies that are affected by the dams' flood operations. This protocol~~ is not legally binding ~~on the parties to it~~and is not subject to regulatory approval/review.

Some DERM staff, because of their specialist skills, work in the Flood Operations Centre that Seqwater activates to manage such events in accordance with the Flood Mitigation Manual. The Flood Operations Centre is ~~None of them are~~not involved in any of the regulatory decisions concerning the dams or are members of the ~~work unit~~ (Office of the Water Supply Regulator, Department of Environment and Resource Management,) which undertakes the CE~~O~~'s regulatory functions.

From:	Peter Borrows <pborrows[redacted]>
Sent:	Sunday, January 16, 2011 4:28 PM
To:	bob.reilly[redacted]; Rob Drury <rdrury[redacted]>; Duty Seq <dutyseq[redacted]>; john.bradley[redacted]; Barry Dennien <Barry.Dennien[redacted]>; Dan Spiller <Daniel.Spiller[redacted]>
Cc:	Michael Lyons <Michael.Lyons[redacted]>; Mike Foster <mfoster[redacted]>; Elaina Smouha <elainamir[redacted]>; peter.aller[redacted]
Subject:	Cabinet in co nfidence - Ministerial brief outline
Attach:	Ministerial brief - contents outline.docx; Ministerial Briefing Note January 17 2011 Final Draft for distribution.doc; Jan 2011 Flood Event_Ver 1_draft for distribution.docx

Please see attached draft with attachment.

In relation to the draft contents outline sent yesterday, the following is a cross reference FYI.

The attached Ministerial Briefing Note addresses the questions contained in the Ministerial Information Request as follows:

1) Design of Dam – Storages/Spillway upgrade

Refer Section 1

2) "The Flood Event" – Q&A

a. Chronology - High level time step of events and significant decision making/changes – more detailed time step information for Tuesday afternoon (i.e. what was the BOM forecast at the time, narrow peak etc.)

Refer Section 2.5

b. How does Wivenhoe Dam work as a flood mitigator?

Refer Sections 2.1, 2.3 and 3.1

c. What are the factors being balanced when making decisions about the amount of dam releases? To what extent does information from the Bureau of Meteorology/rain gauges influence decisions? How reliable is this information?

Refer Sections 3.1 and 3.2

d. Statistics on how much did Wivenhoe Dam knock off the flood peak.

Refer Section 2.1

e. What would have happened if Wivenhoe Dam had not been built and we only had Somerset Dam? What damage would have been caused compared to what has currently been experienced (damage statistics)?

Refer Sections 2.1 and 2.2

f. If we have undertaken pre-emptive dam releases to bring Wivenhoe Dam's full supply level down to lower than what we had maintained (i.e. 60%), what would have been the river height for the period that this flood event occurred?

Refer Section 2.4

g. If pre-emptive dam releases would not have made a difference, why? (i.e. why did we not release earlier?)

1201F

Refer Section 2.4

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

Refer Section 2.2

i. What is the fuse plug and why did it need to be maintained?

Refer Section 2.3

j. What damage or town isolation occurred during the Wivenhoe Dam releases that occurred since October 2010?

Refer Section 2.4

k. Did Seqwater have time to reduce the dam level between the 5 events? If so, would it have made a difference to this flood event?

Refer Section 2.4

3) The Flood Mitigation Manual

Refer Section 3.1

a. Describe the decision making framework - Four strategies

Refer Section 3.2

b. How is the Manual designed to work?

Refer Section 3.2

c. History of Flood Mitigation Manual updates and peer review – who was on the panels, studies that fed into previous versions of the Manual and who was involved in these studies?

Refer Section 3.1

4) Regulatory context - *Water Supply (Safety and Reliability) Act 2008* (Information provider: Peter Allen - DERM)

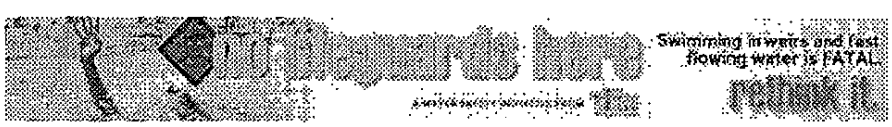
Refer Section 4

Regards, Peter.

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

seqwater
WATER FOR LIFE

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



From: Elaina Smouha [mailto:elainamir[redacted]
Sent: Saturday, 15 January 2011 5:03 PM
To: Mike Foster; peter.allen[redacted]; bob.reilly[redacted]; Peter Borrows; Rob Drury; Duty Seq

1201G

Cc: john.bradley[redacted]; barry.dennier[redacted]; daniel.spiller[redacted]; michael.lyons[redacted]; Elaina Smouha
Subject: Cabinet in confidence - Ministerial brief outline

Dear All

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As discussed, the brief needs to be provided to Minister Robertson tomorrow (Sunday, 16 January 2011).

Regards

Elaina

Elaina Smouha
Director, Governance and Regulatory Compliance
SEQ Water Grid Manager
[redacted]
Email: elaina.smouha[redacted]
Visit: Level 15, 53 Albert Street Brisbane
Post: PO Box 16205, City East QLD 4002
ABN: 14783 317 630

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1201H

Ministerial brief outline

What is the objective?

a) Ensuring public transparency
b) To answer the State's questions on the performance of Wivenhoe Dam operations
c) Preparation for a public inquiry
d) Normal and logical course of conduct after the occurrence of a major flood event – Review requirement under the Flood Mitigation Manual

Background (focus on Brisbane River flooding issues)

1) Design of Dam – Storages/Spillway upgrade (*Information provider:* ***Seqwater and Peter Allen*** *- DERM*) [1/3 to ½ a page]

2) "The Flood Event" – Q&A (*Information provider:* ***Seqwater***) [2 ½ pages]

   a. Chronology - High level time step of events and significant decision making/changes – more detailed time step information for Tuesday afternoon (i.e. what was the BOM forecast at the time, narrow peak etc.)
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   e. What would have happened if Wivenhoe Dam had not been built and we only had Somerset Dam? What damage would have been caused compared to what has currently been experienced (damage statistics)?
   f. If we have undertaken pre-emptive dam releases to bring Wivenhoe Dam's full supply level down to lower than what we had maintained (i.e. 60%), what would have been the river height for the period that this flood event occurred?
   g. If pre-emptive dam releases would not have made a difference, why? (i.e. why did we not release earlier?)
   h. Why was Wivenhoe Dam only allowed to rise up to 191% and not 230%?
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   k. Did Seqwater have time to reduce the dam level between the 5 events? If so, would it have made a difference to this flood event?

1201 I

3) The Flood Mitigation Manual (*Information Provider: **Seqwater/DERM***) [½ to 1 page]

   a. Describe the decision making framework - Four strategies
   b. How is the Manual designed to work?
   c. History of Flood Mitigation Manual updates and peer review – who was on the panels, studies that fed into previous versions of the Manual and who was involved in these studies?
   d. **Attach** Minister Robertson's request for advice on pre-emptive release and our response (*Information provider: **SEQ Water Grid Manager***)

4) Regulatory context - *Water Supply (Safety and Reliability) Act 2008* (*Information provider: **Peter Allen - DERM***)

   a. Flood Mitigation Manual approval
   b. Formal reporting process under the Flood Mitigation Manual – **attach** report resulting from the February 1999 flood event
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      i. Who makes the flood release decisions under the Manual?
      ii. who is informed/consulted?
      iii. effect of the recent Flood Communication Protocol?

5) Brian Cooper Flood Mitigation Manual compliance review (*Responsible: **SEQ Water Grid Manager***)

Seqwater report

(*Information provider: **Seqwater, Peter Allen and Bob Reilly***)

Seqwater, in consultation with Peter Allen and Bob Reilly, to set out how Seqwater's Flood Mitigation Manual Report to the Chief Executive on the effectiveness of the operational procedures will be undertaken.

- **Attach** table of contents of the 1999 Flood Mitigation Manual report
- Reflect Brian Cooper's compliance review
- Peer review – establishment of an expert panel – who will be on it? Peter Allen and Bob Reilly may provide some input.
- Communication Protocol and incorporation into the Flood Mitigation Manual (revisit in the next fortnight?)

Timeframes on the development of the report – consider urgency due to anticipated further rainfall during this summer.

1201 J

Ministerial Briefing Note
17 January 2010
Flood Event January 2011

1. BACKGROUND INFORMATION ON WIVENHOE DAM

2. WIVENHOE DAM FLOOD MITIGATION AND FLOOD OPERATIONS

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

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

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

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

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

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

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

3.2 What is contained in the Manual?

4. REGULATORY CONTEXT

5. COMPLIANCE WITH MANUAL

6. SEQWATER REPORT

1201K

1 BACKGROUND INFORMATION ON WIVENHOE DAM

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

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

In accordance with the Queensland Regulatory program for dam spillway upgrades, a further upgrade of Wivenhoe Dam is scheduled to occur prior to 2035.

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

1201L

2 WIVENHOE DAM FLOOD MITIGATION AND FLOOD OPERATIONS

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

The following graphs demonstrate the significant benefits of Wivenhoe Dam in mitigating the current flood event, with reductions in flood peak of up to 2.5 metres in the City area and up to 5.5 metres in the Moggill area further upstream.

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

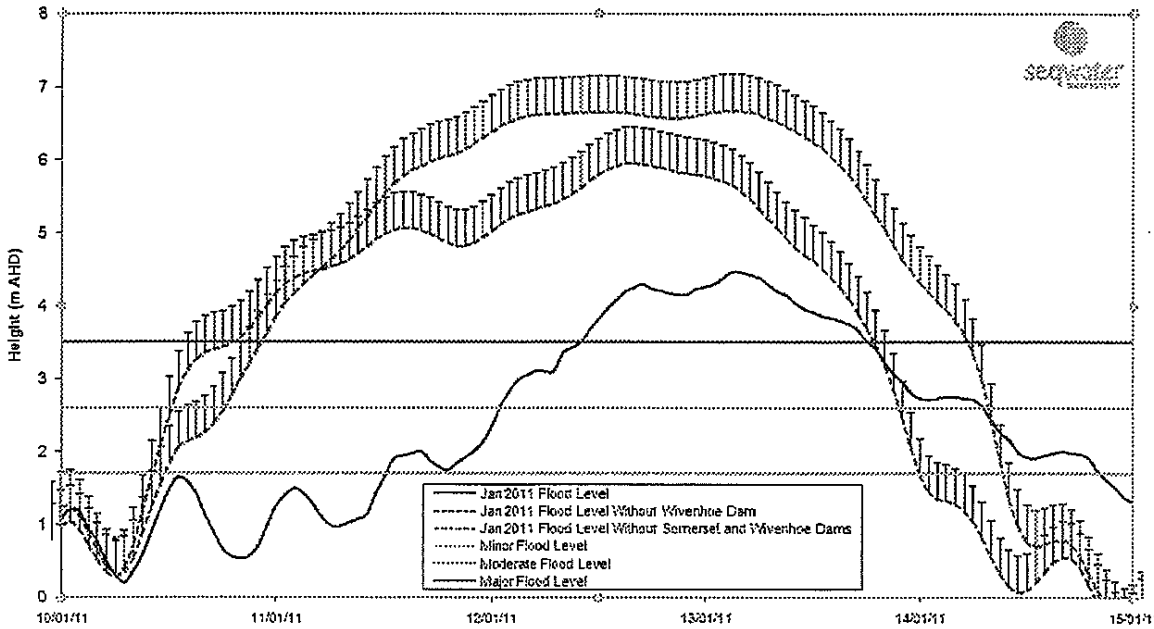
The time at which flood levels remained elevated above major levels has also been reduced by up to 3 days by the dam. This has significant benefits to impact on the population of the city, property damage and the recovery operation.

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

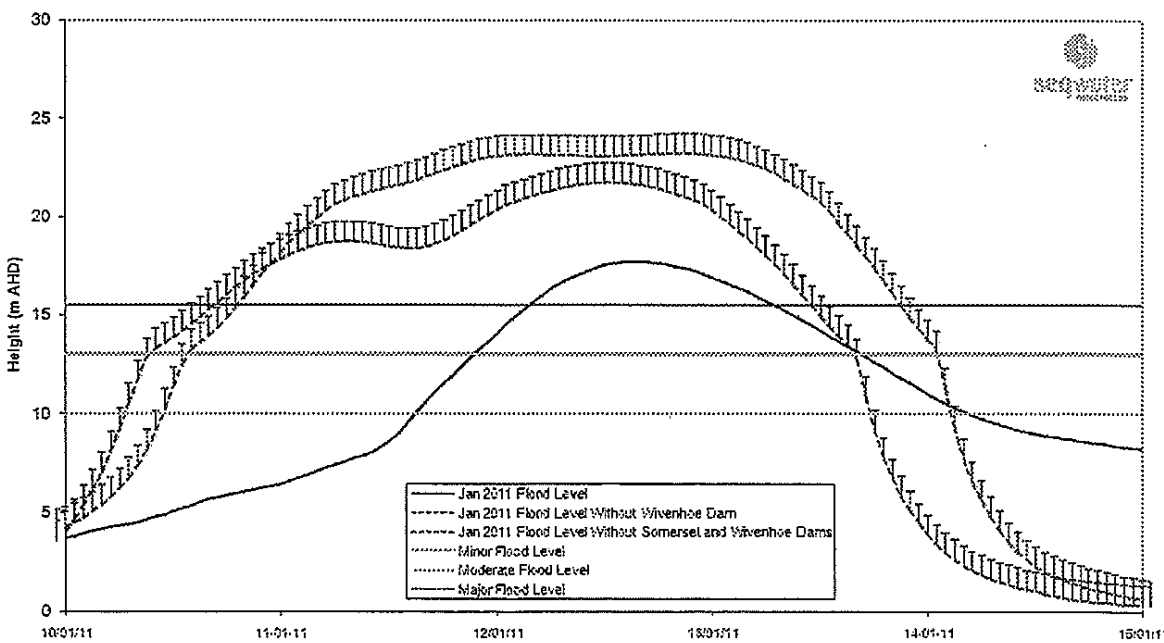
In addition, the strategy adopted to quickly close off releases once the peak in the dam had been reached and rain stopped falling certainly reduced the predicted flood peak by at least one metre in the lower Brisbane River area.

120 m

JANUARY 2011 BRISBANE FLOOD
Assessment of Flood Levels at Brisbane City



JANUARY 2011 BRISBANE FLOOD
Assessment of Flood Levels at Moggill



1201N

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

3.2 What is contained in the Manual?

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

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

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

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

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

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

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4 REGULATORY CONTEXT (Provided by Peter Allen and unedited)

These are contained in the Flood Mitigation Manual (manual) approved under sections 370 to 374 of the *Water Supply (Safety and Reliability) Act 2008.* The Chief Executive Officer (CEO) of DERM (or his delegate) approves the manual, and the approval is notified in the Queensland Government Gazette. Approval can be for a period of up to five years, after which the approval needs to be renewed. There are no decision-making criteria specified in the Act for the CEO to take into account when approving the manual.

The manual for the dams requires, amongst other matters:

1. Flood operations to be conducted in accordance with manual's provisions. (There is an approval process specified in the manual, if Seqwater considers a different flood release strategy is desirable to deal with a particular flood event. This was not used in the January 2011 flood event)
2. Flood operations to be under the control of CEO-approved engineers (who are highly qualified and experienced)
3. Annual reporting on the preparedness and status of the flood control system for flood operations, and the training of the personnel who manage the flood events.
4. Reporting on the flood operations during flood events.
5. Reviews after flood events such as the January 2011 event. For this flood event, the Queensland Government engaged Mr Brian Cooper, an independent consulting engineer, to review compliance with the manual. Mr Cooper concluded (Attachment??): "...The strategies in the Flood Mitigation Manual have been followed, allowing for the discretion given to make variations in order to maximise flood mitigation effects. The actions taken and decisions made during the Flood Event appear to have been prudent and appropriate in the context of the available knowledge available to these responsible for flood operations and the way events unfolded..." (p.3 of the final report or other appropriate reference??)

The manual is separate from a draft communication protocol (Insert name) between the Local, State and Commonwealth government agencies that are affected by the dams' flood operations. This protocol is not binding on the parties to it is not subject to regulatory approval/review.

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Some DERM staff, because of their specialist skills, work in the Flood Operations Centre that Seqwater activates to manage such events. None of them are involved in any of the regulatory decisions concerning the dams or are members of the work unit (Office of the Water Supply Regulator) which undertakes the CEO's regulatory functions.

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5 COMPLIANCE WITH THE MANUAL

(To be provided)

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6 SEQWATER REPORT

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

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

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- Are changes to the facilities or work practices of other organisations desirable to improve Seqwater's abilities to manage these events? If so, what are they and their implications? (For example, would it be worth funding Brisbane River crossing upgrades so that floodwater could be released faster, while not adversely affecting access to properties--or maybe alternative strategies e.g. resupply operations could be put in place to achieve similar outcomes?)
- Given the manual's order of priorities i.e. protection of the dam etc, are any changes in the flood release strategies for either dam desirable? If so, what are they, and their implications

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

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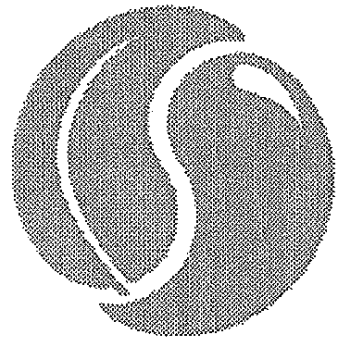

seqwater

WATER FOR LIFE

JANUARY 2011 FLOOD EVENT

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1 INTRODUCTION

Wivenhoe Dam was constructed by the Queensland Government between 1977 and 1984. The dam is a 56 m AHD high and 2.3 kilometre long earth and rock embankment separated into two parts by a concrete gravity spillway. The spillway is controlled by 5 radial gates, each 12.0 metres wide by 16.0 m AHD high. Two saddle dam embankments are located on the left side of the reservoir.

The dam spillway capacity was upgraded in 2005. This was done primarily through the construction of a 164 metre wide secondary spillway through the right abutment of the existing dam. This spillway contains three erodible earth fill fuse plug embankments that are initiated at different dam levels in excess of EL 75.6.

The dam has two main functions by providing:

- A 1,165,000 ML storage at full supply level (FSL EL 67.0) providing an urban water supply for Brisbane and surrounding areas;
- Flood mitigation in the Brisbane River by providing a dedicated flood storage volume of 1,450,000 ML up to EL77 (this flood level was increased as part the 2005 upgrade to allow a water level of EL80m and a temporary flood storage volume of 1,966,000 ML with all fuse plugs initiated and the dam at the point of failure).

The dam has an EXTREME hazard classification under ANCOLD guidelines because of the significant development downstream in the Brisbane and Ipswich metropolitan areas, with the population at risk in the event of a dam failure numbering in the hundreds of thousands.

In accordance with the Queensland Regulatory program for dam spillway upgrades, a further upgrade of Wivenhoe Dam is scheduled to occur prior to 2035 to enable the dam to safely pass the Probable Maximum Flood. This work will involve the reconstruction of Saddle Dam 2 as a fuse plug spillway.

Wivenhoe Dam is in excellent condition. Comprehensive Dam Safety reviews undertaken in accordance with ANCOLD guidelines have been undertaken in 1997 (Gutteridge, Haskins & Davey Pty Ltd), 2003 (Wivenhoe Alliance), 2006 (NSW Department of Commerce), 2009 (GHD) and September 2010 (Seqwater). The reports concluded that the design of the dam is in accordance with modern day standards and that there are no significant outstanding design or construction issues that require investigation.

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2 WIVENHOE DAM FLOOD MITIGATION AND FLOOD OPERATIONS

2.1 Flood Mitigation

The Brisbane River catchment covers an area of approximately 14,000 square kilometres of which about half is below Wivenhoe Dam. Maximum overall flood mitigation effect is achieved by operating Wivenhoe Dam in conjunction with Somerset Dam. Although Somerset and Wivenhoe Dam reduce flooding in Brisbane City, major flooding can still occur. The Lockyer-Laidley Valley drains into the Brisbane River through Lockyer Creek that enters the Brisbane River just downstream of Wivenhoe Dam near Lowood. Another major tributary, the Bremer River, flows into the Brisbane River at Moggill. Wivenhoe Dam has no control over inflows into the Brisbane River from both these major tributaries.

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

Therefore the basis of all flood operation decision making is to ensure the dam never fails. This is the reason that the dam's flood storage compartment would never be intentionally fully filled as additional inflows after this point would result in a dam failure. Similarly, there will be uncertainty on future rainfall that could occur which could not be releases if there was insufficient flood storage which could not be stored or released.

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

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2.2 Flood Operations

A real time flood monitoring and forecasting system has been established in the Wivenhoe and Somerset Dam catchments. This system employs radio telemetry to collect, transmit and receive rainfall and stream flow information. The system consists of around 230 field stations that automatically record rainfall and/or river heights at selected locations in the dam catchments. Most of these field stations are owned by Seqwater with the remainder belonging to other agencies.

The rainfall and river height data is transmitted to Seqwater's Flood Operations Centre in real time. Once received in the Flood Operations Centre, the data is processed using a Real Time Flood Model (RTFM) to estimate likely dam inflows and evaluate a range of possible inflow scenarios based on forecast and recorded rainfall in the dam catchments. The RTFM is a suite of hydrologic computer programs that utilise the real time data to assist in the operation of the dams during flood events.

Seqwater engineers use the RTFM for flood monitoring and forecasting during flood events to operate the dams in accordance with a Manual of Flood Mitigation (the origin of and objectives and procedures contained in the Manual of Flood Mitigation are explained in the following section of this document). Releases of water from the dams are optimised to minimise the impacts of flooding in accordance with the objectives and procedures contained in a Manual of Flood Mitigation.

The RTFM and data collection network performed well During the January 2011 event, with no failures experienced that compromised the ability of Seqwater to operate the dam.

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3 MANUAL OF FLOOD MITIGATION FOR WIVENHOE AND SOMERSET DAMS

The Manual of Flood Mitigation for Wivenhoe and Somerset Dams, in its current form, was developed in 1992 during an extensive hydrological study of the Brisbane and Pine Rivers catchments by DPI, Water Resources. The final reports were subject to extensive internal review by the Water Resources Group before being reviewed by an independent review panel comprising Professor Colin Apelt, Head of Department, Department of Civil Engineering, University of Queensland and Mr Eric Lesleighter, Principal Hydraulic Engineer and Chief Engineer Water Resources, Snowy Mountains Engineering Corporation.

Subsequently, the Manual was extensively reviewed during the Brisbane Valley Flood Damages Minimisation Study in 2006, with the latest comprehensive review of the Manual undertaken in 2009. Both of these reviews have included expert review panels comprising key stakeholders, with the most recent review involving representatives from DERM, BOM, BCC and SunWater.

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

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

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

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

- **Strategy W1** – Primary consideration is given to Minimising Disruption to Downstream Rural Life. Under this strategy, the predicted water level is below 68.50 m AHD and the maximum release is 1,900m3/s.

- **Strategy W2** – Transition Phase moving from Minimising Disruption to Protecting Downstream Urban Areas. Under this strategy, the water level is predicted to be between 68.5 and 74.0 m AHD and the maximum release is less than 3,500m3/s.

- **Strategy W3** – Primary consideration is to Protect of Urban Areas from Inundation. Under this strategy, the water level is predicted to be between 68.5 and 74.0 m AHD but the maximum release is less than 4,000m3/s.

- **Strategy W4** – Primary consideration is to protecting the structural safety of the Dam. Under this strategy, the water level is predicted to exceed 74.0 m AHD and there is no limit to the maximum release. Consideration is given to managing flood releases to avoid fuse plug initiation if at all possible as this would compromise flood mitigation capacity in the short to medium term.

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

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4 JANUARY 2011 FLOOD EVENT

4.1 Background

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

EVENT	EVENT START DATE	EVENT END DATE	VOLUME RELEASED (ML)
1	13/12/2010	16/12/2010	70,000
2	17/12/2010	24/12/2010	150,000
3	26/12/2010	02/01/2010	470,000

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

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

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

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

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

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

4.2 Event Decision Making

The following table contains a summary of the key decisions points associated with the current event. As at 16 January 2011, the event remains in progress.

DATE AND TIME	FLOOD EVENT MILESTONE
07:00 06/01/2011 (Thursday)	Rainfall is experienced in the dam catchments that will result in flood releases, however Wivenhoe releases are delayed for 24 hours to allow Lockyer Creek flood flows to pass downstream and prevent the isolation of the community dependent of Burtons Bridge. The forecast is for 150mm over the next 24 hours.
15:00 07/01/2011 (Friday)	Wivenhoe releases commence, with operational strategy W1 in use. Rainfall for the next four days is estimated to be between 140mm and 300mm, with a forecast for rain easing on Tuesday 11 January 2011. All bridges downstream of the dam with the exception of Fernvale Bridge and Mt Crosby Weir Bridge are expected to be inundated for a number of days.

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06:00 09/01/2011 (Sunday)	Moderate to heavy rain periods forecast until Tuesday, but both Wivenhoe and Somerset dam levels were falling slowly, with Somerset at 1.27 m AHD above FSL and Wivenhoe 1.58 m AHD above FSL.
15:30 09/01/2011 (Sunday)	Following significant rain during the day a meeting of Duty Engineers is held. The QPF issued at 16:00 indicates 50mm to 80mm over the next 24 hours. Based on this forecast, it is anticipated that dam levels can be held to a maximum of 3.50 m AHD above FSL in Somerset and 5.5 m AHD above FSL in Wivenhoe. However, by 19:00 it was apparent that both Fernvale Bridge and Mt Crosby Weir Bridge would be inundated by the combined dam releases and Lockyer Creek flows and that the operational strategy had progressed to W2.
06:30 10/01/2011 (Monday)	Rainfall continued during the night and based on rainfall on the ground it was apparent the operational strategy had progressed to W3.
06:30 10/01/2011 (Monday)	Rainfall continued during the day but based on rainfall on the ground, operational strategy W3 remained in use. However it was apparent that any further heavy rain would result in progression of the operational strategy to W4.
08:00 11/01/2011 (Tuesday)	Rainfall continued during the night with isolated heavy falls in the Wivenhoe Dam catchment area and based on rainfall on the ground it was apparent the operational strategy would soon progress to W4 with Wivenhoe Dam exceeding 8.00 m AHD above FSL. The objective now was to limit outflows and subsequent flood damage to urban areas, while ensuring the structural safety of the dam.
11:00 11/01/2011 (Tuesday)	Rapid inflows were experienced in Wivenhoe Dam, with the dam rising almost a metre in eight hours. Releases were increased until the dam level stabilised in accordance with Strategy W4. Computer models were not reflecting actual dam inflows due to intense point rainfalls in the immediate catchment around the dam. Falls are estimated to be similar to those experienced at both Toowoomba and Upper Lockyer the previous day and are falling outside and between existing rain gauges.
21:00 11/01/2011 (Tuesday)	Wivenhoe Dam peaked. Peak release of 7450 cumecs with a level of 0.7 metres below fuse plug trigger.
22:00 11/01/2011	Wivenhoe Dam releases were closed off as quickly as possible over the

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(Tuesday)	next 11 hours, while ensuring water levels in the dam did not rise further and initiate a fuse plug embankment.
08:00 12/01/2011 (Wednesday)	Minimum possible release level reached, with inflows matching outflows. Further reductions in release rate would likely cause the dam level to rise.
21:00 13/01/2011 (Thursday)	The 7 day dam drain down is commenced as Lockyer Creek and Bremer River peaks pass the Lower Brisbane area. Maximum release target is the limit of damaging floods in Brisbane being 3500 cumecs.
09:00 17/01/2011 (Monday)	Drain down continues, with released expected to cease on Wednesday 19 January 2011 unless further rainfall is experienced.

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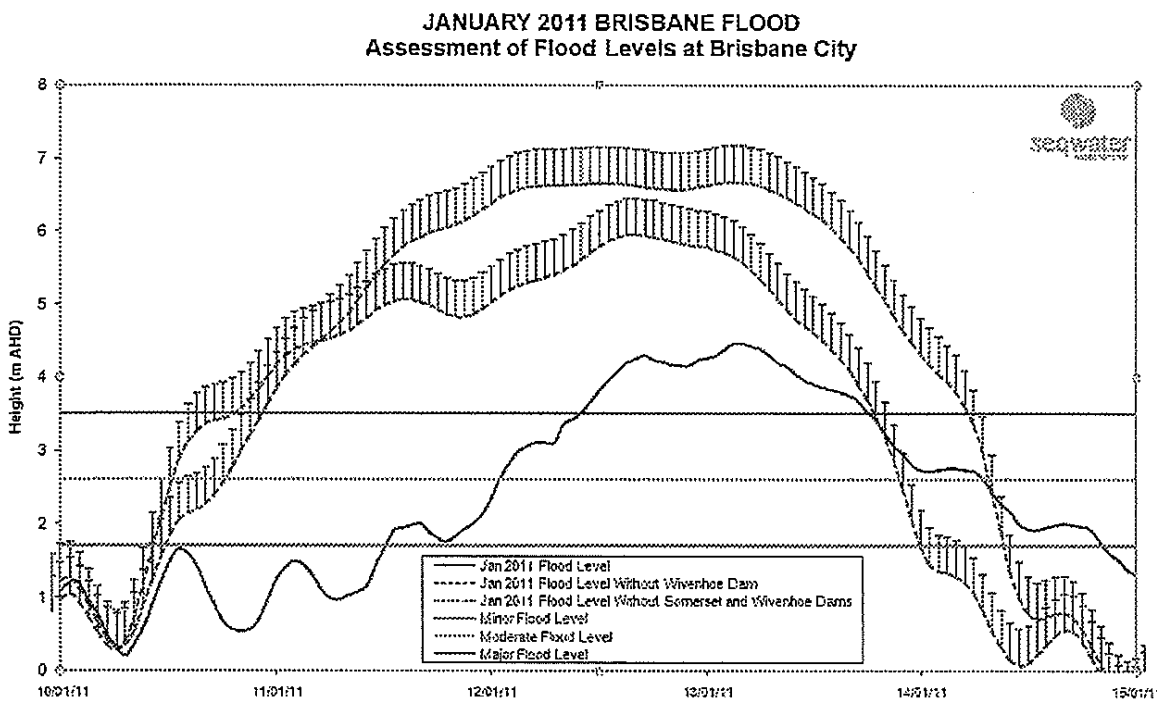
4.3 Flood Mitigation Benefits of Wivenhoe Dam

The following graphs demonstrate the significant benefits of Wivenhoe Dam in mitigating the current flood event, with reductions in flood peak of up to 2.5 metres in the City area and up to 5.5 metres in the Moggill area further upstream.

This equates to significant reduction in the potential for loss of life as well as saving in damages in the order of up to $1.6 billion based on current damage curves. Up to 13,000 more properties would have been impacted by the event without the Dam.

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



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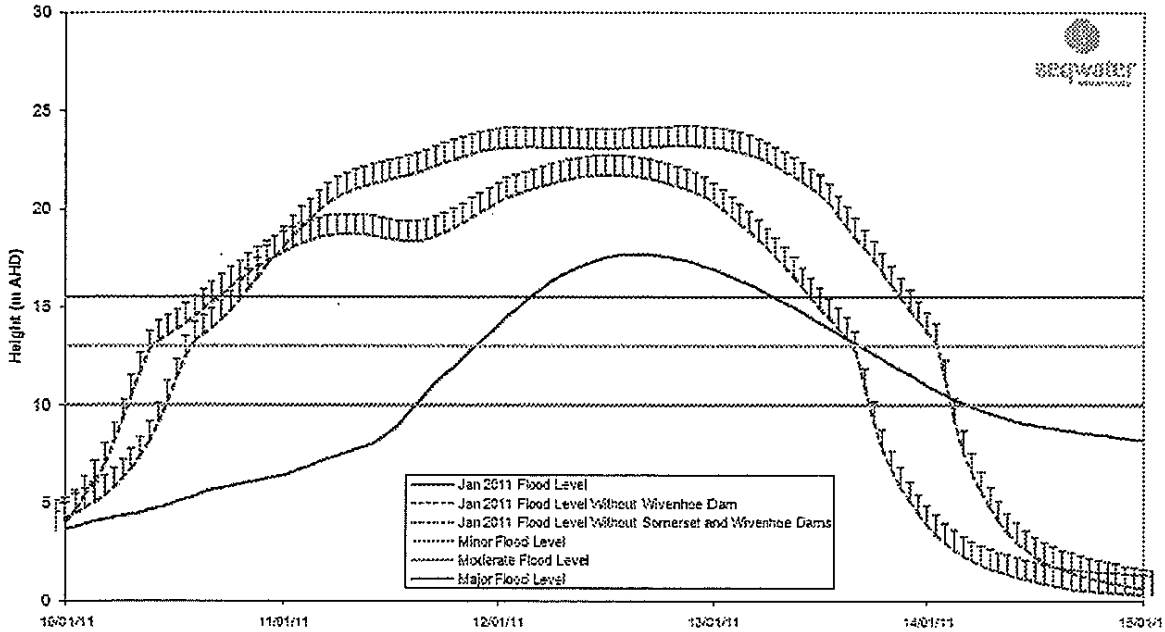
JANUARY 2011 BRISBANE FLOOD
Assessment of Flood Levels at Moggill



The strategy adopted to quickly close off releases once the peak in the dam had been reached and rain stopped falling certainly reduced the predicted flood peak by at least one metre in the lower Brisbane River area. This notion is supported by BOM.

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5 EVENT REVIEW

Under the Manual of Operational Procedures for Flood Mitigation at Wivenhoe Dam and Somerset Dam that are approved and gazetted by the Department of Environment and Resource Management, there is a regulatory requirement that a report must be prepared as per the below wording:

"Seqwater must prepare a report after each Flood Event. The report must contain details of the procedures used, the reasons therefore and other pertinent information. Seqwater must forward the report to the Chief Executive within six weeks of the completion of the Flood Event."

Such a report was prepared for the flood events of February and March 2010 and copies are available. A copy of the Table of Contents of that report is included as Appendix 1. For this event, the report would be a comprehensive summary of all procedures, actions, outcomes and processes during the event.

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

- In the short term, utilise this report attached to this briefing note as the basis for communications and discussion.
- Prepare any Interim Reports as agreed to provide information and input as required.
- Seqwater prepare a Comprehensive Report as per the existing regulatory requirements of the Act and the gazetted manual and any requirements of the Dam Safety Regulator. This would be done within 6 weeks of the closure of the current event as per the manual. This timeframe is subject to any new mobilisation of the Flood Operations Centre. The Table of Contents would include:
    - Introduction
    - Flood Event Summary
    - Mobilisation and Staffing
    - Event Rainfall
    - Inflow and Release Details
    - Data Collection System Performance
    - Data Analysis Performance
    - Communication
    - Flood Management Strategies and Manual Compliance
    - Improvements in data collection systems, practices and processes.
    - improvements by interacting agencies

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- Review of factors impacting on the protection of urban areas
- Recommendations & Conclusions

- The report would then be reviewed by the Dam Safety Regulator in conjunction with any peer review they require. The review should cover:
  - Were the provisions of the manual complied with?
  - What improvements to either facilities e.g. stream gauges, or work practices, are desirable to improve Sewater's ability to predict inflows into the dams.
  - Are improvements to either Seqwater's facilities or work practices desirable to improve Seqwater's ability to manage events? For example, investigations to raise the dam to improve its flood storage capacity, If so, what are they and their implications.
  - Are changes to the facilities or work practices of other organisations desirable to improve Seqwater's abilities to manage these events? If so, what are they and their implications? (For example, would it be worth funding Brisbane River crossing upgrades so that floodwater could be released faster, while not adversely affecting access to properties--or maybe alternative strategies e.g. resupply operations could be put in place to achieve similar outcomes?)
  - Given the manual's order of priorities i.e. protection of the dam etc, are any changes in the flood release strategies for either dam desirable? If so, what are they, and their implications
- Based on this review, a review of the Manual of Operational Procedures for Flood Mitigation at Wivenhoe Dam and Somerset Dam would occur utilising an expert panel of review including representatives of DERM, Seqwater, BoM, affected Local Governments and other stakeholders as necessary.

1201AM

Appendix A

1201 AN

FINAL REPORT – FLOOD EVENTS AT WIVENHOE, SOMERSET AND NORTH PINE DAMS FOR FEBRUARY AND MARCH 2010

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1201 AP

From:	Barry Dennien </O=SOUTH EAST QUEENSLAND WATER GRID MANAGER/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=BARRY.DENNIEN>
Sent:	Sunday, January 16, 2011 4:39 PM
To:	watergridmedia[redacted]
Subject:	FW: Cabinet in co nfidence - Ministerial brief outline
Attach:	Ministerial brief - contents outline.docx; Ministerial Briefing Note January 17 2011 Final Draft for distribution.doc; Jan 2011 Flood Event_Ver 1_draft for distribution.docx

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From: Peter Borrows [pborrows[redacted]
Sent: Sunday, 16 January 2011 4:28 PM
To: bob.reilly[redacted]; Rob Drury; Duty Seq; john.bradley[redacted]; Barry Dennien; Dan Spiller
Cc: Michael Lyons; Mike Foster; Elaina Smouha; peter.allen[redacted]
Subject: Cabinet in co nfidence - Ministerial brief outline

Please see attached draft with attachment.

In relation to the draft contents outline sent yesterday, the following is a cross reference FYI.

The attached Ministerial Briefing Note addresses the questions contained in the Ministerial Information Request as follows:

1) Design of Dam – Storages/Spillway upgrade

Refer Section 1

2) "The Flood Event" – Q&A

a. Chronology - High level time step of events and significant decision making/changes – more detailed time step information for Tuesday afternoon (i.e. what was the BOM forecast at the time, narrow peak etc.)

Refer Section 2.5

b. How does Wivenhoe Dam work as a flood mitigator?

Refer Sections 2.1, 2.3 and 3.1

c. What are the factors being balanced when making decisions about the amount of dam releases? To what extent does information from the Bureau of Meteorology/rain gauges influence decisions? How reliable is this information?

Refer Sections 3.1 and 3.2

d. Statistics on how much did Wivenhoe Dam knock off the flood peak.

Refer Section 2.1

e. What would have happened if Wivenhoe Dam had not been built and we only had Somerset Dam? What damage would have been caused compared to what has currently been experienced (damage statistics)?

Refer Sections 2.1 and 2.2

f. If we have undertaken pre-emptive dam releases to bring Wivenhoe Dam's full supply level down to lower than what we had maintained (i.e. 60%), what would have been the river height for the period that this flood event occurred?

Refer Section 2.4

g. If pre-emptive dam releases would not have made a difference, why? (i.e. why did we not release earlier?)

Refer Section 2.4

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

Refer Section 2.2

i. What is the fuse plug and why did it need to be maintained?

Refer Section 2.3

j. What damage or town isolation occurred during the Wivenhoe Dam releases that occurred since October 2010?

Refer Section 2.4

k. Did Seqwater have time to reduce the dam level between the 5 events? If so, would it have made a difference to this flood event?

Refer Section 2.4

3) The Flood Mitigation Manual

Refer Section 3.1

a. Describe the decision making framework - Four strategies

Refer Section 3.2

b. How is the Manual designed to work?

Refer Section 3.2

c. History of Flood Mitigation Manual updates and peer review – who was on the panels, studies that fed into previous versions of the Manual and who was involved in these studies?

Refer Section 3.1

4) Regulatory context - *Water Supply (Safety and Reliability) Act 2008* (Information provider: Peter Allen - DERM)

Refer Section 4

Regards, Peter.

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

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WATER FOR LIFE

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Swimming in weirs and fast flowing water is FATAL. Reflect it.

From: Elaina Smouha [mailto:elainami[redacted]
Sent: Saturday, 15 January 2011 5:03 PM
To: Mike Foster; peter.allen[redacted]; bob.reilly[redacted]; Peter Borrows; Rob Drury; Duty Seq
Cc: john.bradley[redacted]; barry.dennien[redacted]; daniel.spiller[redacted]; michael.lyons[redacted]; Elaina Smouha
Subject: Cabinet in confidence - Ministerial brief outline

Dear All

To assist, attached is a Ministerial brief outline as per our recent teleconference, for Monday's Emergency Cabinet meeting. It also records those who will be providing information for the Background and Flood Mitigation Manual report process.

As discussed, the brief needs to be provided to Minister Robertson tomorrow (Sunday, 16 January 2011).

Regards

Elaina

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Director, Governance and Regulatory Compliance
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Ministerial brief outline

What is the objective?

a) Ensuring public transparency
b) To answer the State's questions on the performance of Wivenhoe Dam operations
c) Preparation for a public inquiry
d) Normal and logical course of conduct after the occurrence of a major flood event – Review requirement under the Flood Mitigation Manual

Background (focus on Brisbane River flooding issues)

1) Design of Dam – Storages/Spillway upgrade (*Information provider:* ***Seqwater and Peter Allen*** *- DERM*) [1/3 to ½ a page]

2) "The Flood Event" – Q&A (*Information provider:* ***Seqwater***) [2 ½ pages]

   a. Chronology - High level time step of events and significant decision making/changes – more detailed time step information for Tuesday afternoon (i.e. what was the BOM forecast at the time, narrow peak etc.)
   b. How does Wivenhoe Dam work as a flood mitigator?
   c. What are the factors being balanced when making decisions about the amount of dam releases? To what extent does information from the Bureau of Meteorology/rain gauges influence decisions? How reliable is this information?
   d. Statistics on how much did Wivenhoe Dam knock off the flood peak.
   e. What would have happened if Wivenhoe Dam had not been built and we only had Somerset Dam? What damage would have been caused compared to what has currently been experienced (damage statistics)?
   f. If we have undertaken pre-emptive dam releases to bring Wivenhoe Dam's full supply level down to lower than what we had maintained (i.e. 60%), what would have been the river height for the period that this flood event occurred?
   g. If pre-emptive dam releases would not have made a difference, why? (i.e. why did we not release earlier?)
   h. Why was Wivenhoe Dam only allowed to rise up to 191% and not 230%?
   i. What is the fuse plug and why did it need to be maintained?
   j. What damage or town isolation occurred during the Wivenhoe Dam releases that occurred since October 2010?
   k. Did Seqwater have time to reduce the dam level between the 5 events? If so, would it have made a difference to this flood event?

3) The Flood Mitigation Manual (*Information Provider:* ***Seqwater/DERM***) [½ to 1 page]

   a. Describe the decision making framework - Four strategies
   b. How is the Manual designed to work?
   c. History of Flood Mitigation Manual updates and peer review – who was on the panels, studies that fed into previous versions of the Manual and who was involved in these studies?
   d. **Attach** Minister Robertson's request for advice on pre-emptive release and our response (*Information provider:* ***SEQ Water Grid Manager***)

4) Regulatory context - *Water Supply (Safety and Reliability) Act 2008* (*Information provider:* ***Peter Allen - DERM***)

   a. Flood Mitigation Manual approval
   b. Formal reporting process under the Flood Mitigation Manual – **attach** report resulting from the February 1999 flood event
   c. Decision making process under the Flood Mitigation Manual –
      i. Who makes the flood release decisions under the Manual?
      ii. who is informed/consulted?
      iii. effect of the recent Flood Communication Protocol?

5) Brian Cooper Flood Mitigation Manual compliance review (*Responsible:* ***SEQ Water Grid Manager***)

Seqwater report

(*Information provider:* ***Seqwater, Peter Allen and Bob Reilly***)

Seqwater, in consultation with Peter Allen and Bob Reilly, to set out how Seqwater's Flood Mitigation Manual Report to the Chief Executive on the effectiveness of the operational procedures will be undertaken.

- **Attach** table of contents of the 1999 Flood Mitigation Manual report
- Reflect Brian Cooper's compliance review
- Peer review – establishment of an expert panel – who will be on it? Peter Allen and Bob Reilly may provide some input.
- Communication Protocol and incorporation into the Flood Mitigation Manual (revisit in the next fortnight?)

Timeframes on the development of the report – consider urgency due to anticipated further rainfall during this summer.

Ministerial Briefing Note

17 January 2010

Flood Event January 2011

1. BACKGROUND INFORMATION ON WIVENHOE DAM

2. WIVENHOE DAM FLOOD MITIGATION AND FLOOD OPERATIONS

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

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

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

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

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

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

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

3.2 What is contained in the Manual?

4. REGULATORY CONTEXT

5. COMPLIANCE WITH MANUAL

6. SEQWATER REPORT

1 BACKGROUND INFORMATION ON WIVENHOE DAM

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

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

In accordance with the Queensland Regulatory program for dam spillway upgrades, a further upgrade of Wivenhoe Dam is scheduled to occur prior to 2035.

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

2 WIVENHOE DAM FLOOD MITIGATION AND FLOOD OPERATIONS

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

The following graphs demonstrate the significant benefits of Wivenhoe Dam in mitigating the current flood event, with reductions in flood peak of up to 2.5 metres in the City area and up to 5.5 metres in the Moggill area further upstream.

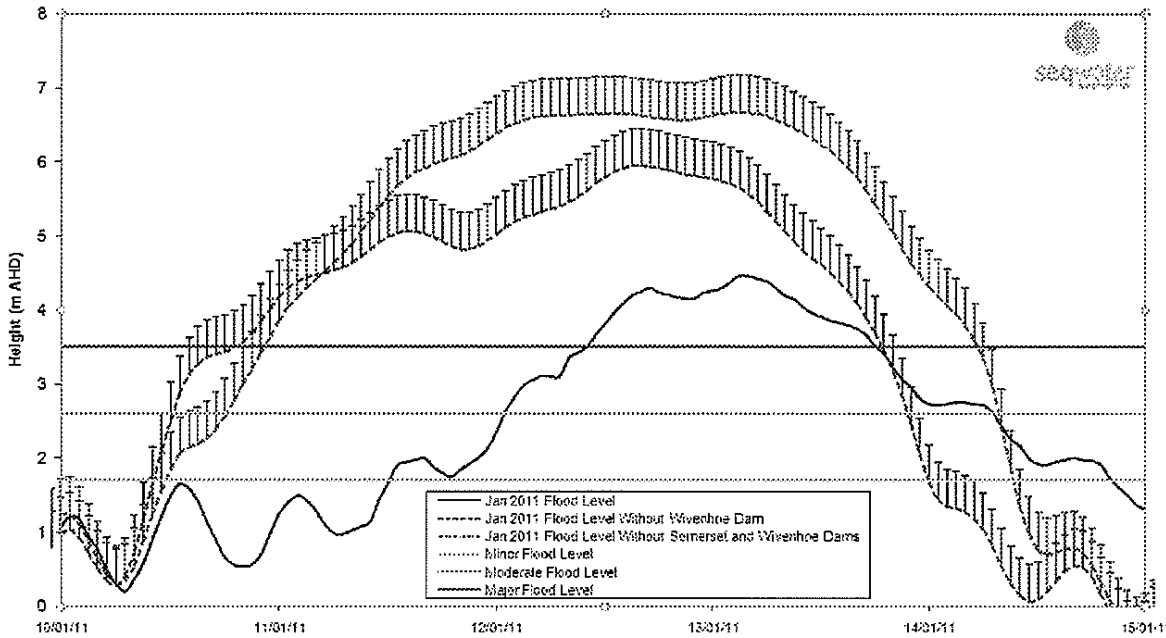
This equates to significant reduction in the potential for loss of life as well as saving in damages in the order of up to $1.6 billion based on current damage curves. Up to 13,000 more properties would have been impacted by the event without the Dam. (Source: Flood Damage Tables provided to Seqwater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

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

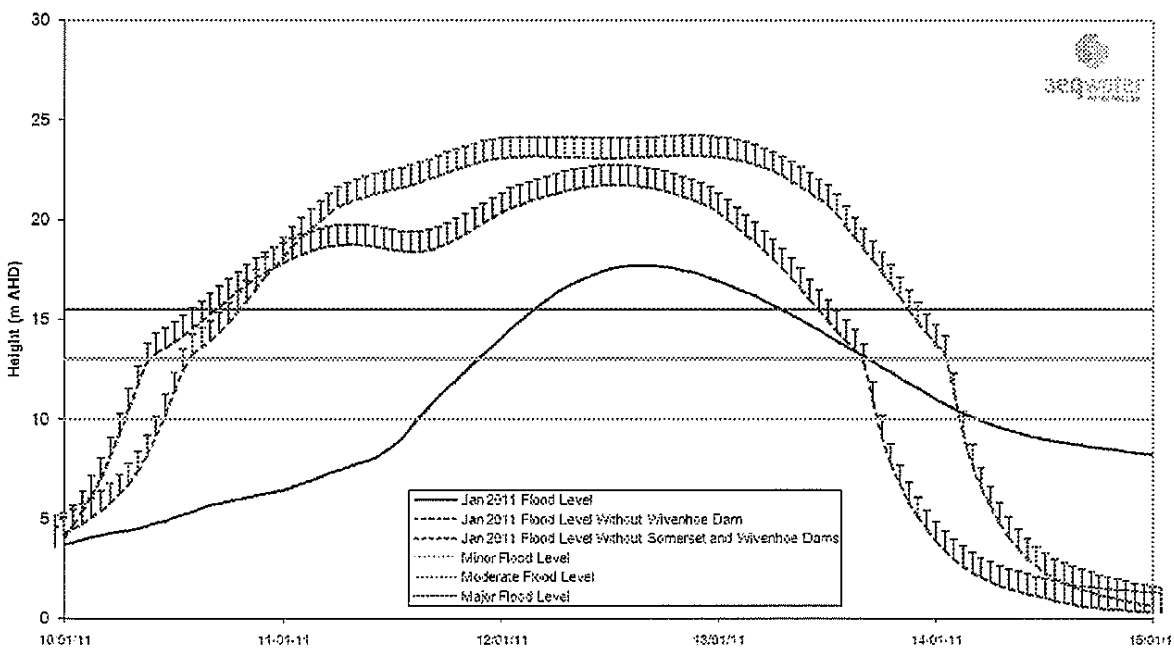
Depending on the nature of the event, the presence of Wivenhoe Dam could also potentially increase flood warning times to impacted areas. How these times may have been increased during the current event is presently difficult to quantify, but discussions will be held with BOM on this issue at a later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

In addition, the strategy adopted to quickly close off releases once the peak in the dam had been reached and rain stopped falling certainly reduced the predicted flood peak by at least one metre in the lower Brisbane River area.

JANUARY 2011 BRISBANE FLOOD
Assessment of Flood Levels at Brisbane City



JANUARY 2011 BRISBANE FLOOD
Assessment of Flood Levels at Moggill



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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

3.2 What is contained in the Manual?

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

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

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

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

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

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

4 REGULATORY CONTEXT (Provided by Peter Allen and unedited)

These are contained in the Flood Mitigation Manual (manual) approved under sections 370 to 374 of the *Water Supply (Safety and Reliability) Act 2008.* The Chief Executive Officer (CEO) of DERM (or his delegate) approves the manual, and the approval is notified in the Queensland Government Gazette. Approval can be for a period of up to five years, after which the approval needs to be renewed. There are no decision-making criteria specified in the Act for the CEO to take into account when approving the manual.

The manual for the dams requires, amongst other matters:

1. Flood operations to be conducted in accordance with manual's provisions. (There is an approval process specified in the manual, if Seqwater considers a different flood release strategy is desirable to deal with a particular flood event. This was not used in the January 2011 flood event)
2. Flood operations to be under the control of CEO-approved engineers (who are highly qualified and experienced)
3. Annual reporting on the preparedness and status of the flood control system for flood operations, and the training of the personnel who manage the flood events.
4. Reporting on the flood operations during flood events.
5. Reviews after flood events such as the January 2011 event. For this flood event, the Queensland Government engaged Mr Brian Cooper, an independent consulting engineer, to review compliance with the manual. Mr Cooper concluded (Attachment??): "...The strategies in the Flood Mitigation Manual have been followed, allowing for the discretion given to make variations in order to maximise flood mitigation effects. The actions taken and decisions made during the Flood Event appear to have been prudent and appropriate in the context of the available knowledge available to these responsible for flood operations and the way events unfolded..." (p.3 of the final report or other appropriate reference??)

The manual is separate from a draft communication protocol (Insert name) between the Local, State and Commonwealth government agencies that are affected by the dams' flood operations. This protocol is not binding on the parties to it is not subject to regulatory approval/review.

Some DERM staff, because of their specialist skills, work in the Flood Operations Centre that Seqwater activates to manage such events. None of them are involved in any of the regulatory decisions concerning the dams or are members of the work unit (Office of the Water Supply Regulator) which undertakes the CEO's regulatory functions.

5 COMPLIANCE WITH THE MANUAL

(To be provided)

6 SEQWATER REPORT

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

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

- Are changes to the facilities or work practices of other organisations desirable to improve Seqwater's abilities to manage these events? If so, what are they and their implications? (For example, would it be worth funding Brisbane River crossing upgrades so that floodwater could be released faster, while not adversely affecting access to properties--or maybe alternative strategies e.g. resupply operations could be put in place to achieve similar outcomes?)
- Given the manual's order of priorities i.e. protection of the dam etc, are any changes in the flood release strategies for either dam desirable? If so, what are they, and their implications

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



seqwater

WATER FOR LIFE

JANUARY 2011 FLOOD EVENT

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1 INTRODUCTION

Wivenhoe Dam was constructed by the Queensland Government between 1977 and 1984. The dam is a 56 m AHD high and 2.3 kilometre long earth and rock embankment separated into two parts by a concrete gravity spillway. The spillway is controlled by 5 radial gates, each 12.0 metres wide by 16.0 m AHD high. Two saddle dam embankments are located on the left side of the reservoir.

The dam spillway capacity was upgraded in 2005. This was done primarily through the construction of a 164 metre wide secondary spillway through the right abutment of the existing dam. This spillway contains three erodible earth fill fuse plug embankments that are initiated at different dam levels in excess of EL 75.6.

The dam has two main functions by providing:

- A 1,165,000 ML storage at full supply level (FSL EL 67.0) providing an urban water supply for Brisbane and surrounding areas;

- Flood mitigation in the Brisbane River by providing a dedicated flood storage volume of 1,450,000 ML up to EL77 (this flood level was increased as part the 2005 upgrade to allow a water level of EL80m and a temporary flood storage volume of 1,966,000 ML with all fuse plugs initiated and the dam at the point of failure).

The dam has an EXTREME hazard classification under ANCOLD guidelines because of the significant development downstream in the Brisbane and Ipswich metropolitan areas, with the population at risk in the event of a dam failure numbering in the hundreds of thousands.

In accordance with the Queensland Regulatory program for dam spillway upgrades, a further upgrade of Wivenhoe Dam is scheduled to occur prior to 2035 to enable the dam to safely pass the Probable Maximum Flood. This work will involve the reconstruction of Saddle Dam 2 as a fuse plug spillway.

Wivenhoe Dam is in excellent condition. Comprehensive Dam Safety reviews undertaken in accordance with ANCOLD guidelines have been undertaken in 1997 (Gutteridge, Haskins & Davey Pty Ltd), 2003 (Wivenhoe Alliance), 2006 (NSW Department of Commerce), 2009 (GHD) and September 2010 (Seqwater). The reports concluded that the design of the dam is in accordance with modern day standards and that there are no significant outstanding design or construction issues that require investigation.

2 WIVENHOE DAM FLOOD MITIGATION AND FLOOD OPERATIONS

2.1 Flood Mitigation

The Brisbane River catchment covers an area of approximately 14,000 square kilometres of which about half is below Wivenhoe Dam. Maximum overall flood mitigation effect is achieved by operating Wivenhoe Dam in conjunction with Somerset Dam. Although Somerset and Wivenhoe Dam reduce flooding in Brisbane City, major flooding can still occur. The Lockyer-Laidley Valley drains into the Brisbane River through Lockyer Creek that enters the Brisbane River just downstream of Wivenhoe Dam near Lowood. Another major tributary, the Bremer River, flows into the Brisbane River at Moggill. Wivenhoe Dam has no control over inflows into the Brisbane River from both these major tributaries.

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

Therefore the basis of all flood operation decision making is to ensure the dam never fails. This is the reason that the dam's flood storage compartment would never be intentionally fully filled as additional inflows after this point would result in a dam failure. Similarly, there will be uncertainty on future rainfall that could occur which could not be releases if there was insufficient flood storage which could not be stored or released.

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

2.2 Flood Operations

A real time flood monitoring and forecasting system has been established in the Wivenhoe and Somerset Dam catchments. This system employs radio telemetry to collect, transmit and receive rainfall and stream flow information. The system consists of around 230 field stations that automatically record rainfall and/or river heights at selected locations in the dam catchments. Most of these field stations are owned by Seqwater with the remainder belonging to other agencies.

The rainfall and river height data is transmitted to Seqwater's Flood Operations Centre in real time. Once received in the Flood Operations Centre, the data is processed using a Real Time Flood Model (RTFM) to estimate likely dam inflows and evaluate a range of possible inflow scenarios based on forecast and recorded rainfall in the dam catchments. The RTFM is a suite of hydrologic computer programs that utilise the real time data to assist in the operation of the dams during flood events.

Seqwater engineers use the RTFM for flood monitoring and forecasting during flood events to operate the dams in accordance with a Manual of Flood Mitigation (the origin of and objectives and procedures contained in the Manual of Flood Mitigation are explained in the following section of this document). Releases of water from the dams are optimised to minimise the impacts of flooding in accordance with the objectives and procedures contained in a Manual of Flood Mitigation.

The RTFM and data collection network performed well During the January 2011 event, with no failures experienced that compromised the ability of Seqwater to operate the dam.

3 MANUAL OF FLOOD MITIGATION FOR WIVENHOE AND SOMERSET DAMS

The Manual of Flood Mitigation for Wivenhoe and Somerset Dams, in its current form, was developed in 1992 during an extensive hydrological study of the Brisbane and Pine Rivers catchments by DPI, Water Resources. The final reports were subject to extensive internal review by the Water Resources Group before being reviewed by an independent review panel comprising Professor Colin Apelt, Head of Department, Department of Civil Engineering, University of Queensland and Mr Eric Lesleighter, Principal Hydraulic Engineer and Chief Engineer Water Resources, Snowy Mountains Engineering Corporation.

Subsequently, the Manual was extensively reviewed during the Brisbane Valley Flood Damages Minimisation Study in 2006, with the latest comprehensive review of the Manual undertaken in 2009. Both of these reviews have included expert review panels comprising key stakeholders, with the most recent review involving representatives from DERM, BOM, BCC and SunWater.

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

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

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

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

- **Strategy W1** – Primary consideration is given to Minimising Disruption to Downstream Rural Life. Under this strategy, the predicted water level is below 68.50 m AHD and the maximum release is 1,900m3/s.

- **Strategy W2** – Transition Phase moving from Minimising Disruption to Protecting Downstream Urban Areas. Under this strategy, the water level is predicted to be between 68.5 and 74.0 m AHD and the maximum release is less than 3,500m3/s.

- **Strategy W3** – Primary consideration is to Protect of Urban Areas from Inundation. Under this strategy, the water level is predicted to be between 68.5 and 74.0 m AHD but the maximum release is less than 4,000m3/s.

- **Strategy W4** – Primary consideration is to protecting the structural safety of the Dam. Under this strategy, the water level is predicted to exceed 74.0 m AHD and there is no limit to the maximum release. Consideration is given to managing flood releases to avoid fuse plug initiation if at all possible as this would compromise flood mitigation capacity in the short to medium term.

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

4 JANUARY 2011 FLOOD EVENT

4.1 Background

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

EVENT	EVENT START DATE	EVENT END DATE	VOLUME RELEASED (ML)
1	13/12/2010	16/12/2010	70,000
2	17/12/2010	24/12/2010	150,000
3	26/12/2010	02/01/2010	470,000

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

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

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

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

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

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

4.2 Event Decision Making

The following table contains a summary of the key decisions points associated with the current event. As at 16 January 2011, the event remains in progress.

DATE AND TIME	FLOOD EVENT MILESTONE
07:00 06/01/2011 (Thursday)	Rainfall is experienced in the dam catchments that will result in flood releases, however Wivenhoe releases are delayed for 24 hours to allow Lockyer Creek flood flows to pass downstream and prevent the isolation of the community dependent of Burtons Bridge. The forecast is for 150mm over the next 24 hours.
15:00 07/01/2011 (Friday)	Wivenhoe releases commence, with operational strategy W1 in use. Rainfall for the next four days is estimated to be between 140mm and 300mm, with a forecast for rain easing on Tuesday 11 January 2011. All bridges downstream of the dam with the exception of Fernvale Bridge and Mt Crosby Weir Bridge are expected to be inundated for a number of days.

06:00 09/01/2011 (Sunday)	Moderate to heavy rain periods forecast until Tuesday, but both Wivenhoe and Somerset dam levels were falling slowly, with Somerset at 1.27 m AHD above FSL and Wivenhoe 1.58 m AHD above FSL.
15:30 09/01/2011 (Sunday)	Following significant rain during the day a meeting of Duty Engineers is held. The QPF issued at 16:00 indicates 50mm to 80mm over the next 24 hours. Based on this forecast, it is anticipated that dam levels can be held to a maximum of 3.50 m AHD above FSL in Somerset and 5.5 m AHD above FSL in Wivenhoe. However, by 19:00 it was apparent that both Fernvale Bridge and Mt Crosby Weir Bridge would be inundated by the combined dam releases and Lockyer Creek flows and that the operational strategy had progressed to W2.
06:30 10/01/2011 (Monday)	Rainfall continued during the night and based on rainfall on the ground it was apparent the operational strategy had progressed to W3.
06:30 10/01/2011 (Monday)	Rainfall continued during the day but based on rainfall on the ground, operational strategy W3 remained in use. However it was apparent that any further heavy rain would result in progression of the operational strategy to W4.
08:00 11/01/2011 (Tuesday)	Rainfall continued during the night with isolated heavy falls in the Wivenhoe Dam catchment area and based on rainfall on the ground it was apparent the operational strategy would soon progress to W4 with Wivenhoe Dam exceeding 8.00 m AHD above FSL. The objective now was to limit outflows and subsequent flood damage to urban areas, while ensuring the structural safety of the dam.
11:00 11/01/2011 (Tuesday)	Rapid inflows were experienced in Wivenhoe Dam, with the dam rising almost a metre in eight hours. Releases were increased until the dam level stabilised in accordance with Strategy W4. Computer models were not reflecting actual dam inflows due to intense point rainfalls in the immediate catchment around the dam. Falls are estimated to be similar to those experienced at both Toowoomba and Upper Lockyer the previous day and are falling outside and between existing rain gauges.
21:00 11/01/2011 (Tuesday)	Wivenhoe Dam peaked. Peak release of 7450 cumecs with a level of 0.7 metres below fuse plug trigger.
22:00 11/01/2011	Wivenhoe Dam releases were closed off as quickly as possible over the

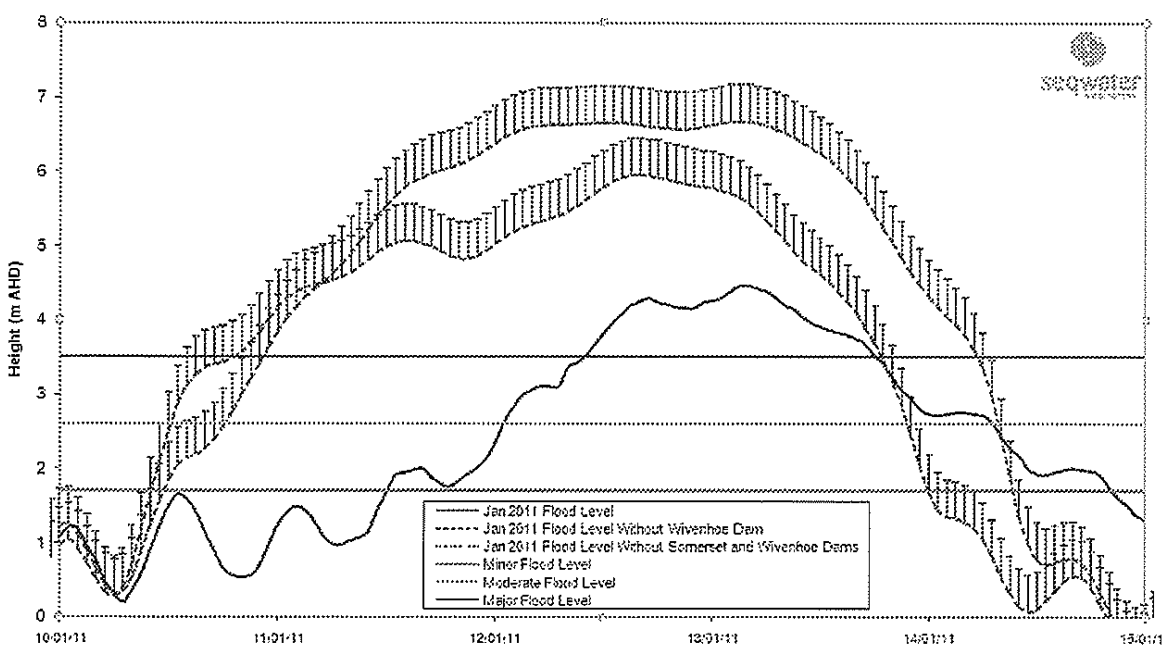
(Tuesday)	next 11 hours, while ensuring water levels in the dam did not rise further and initiate a fuse plug embankment.
08:00 12/01/2011 (Wednesday)	Minimum possible release level reached, with inflows matching outflows. Further reductions in release rate would likely cause the dam level to rise.
21:00 13/01/2011 (Thursday)	The 7 day dam drain down is commenced as Lockyer Creek and Bremer River peaks pass the Lower Brisbane area. Maximum release target is the limit of damaging floods in Brisbane being 3500 cumecs.
09:00 17/01/2011 (Monday)	Drain down continues, with released expected to cease on Wednesday 19 January 2011 unless further rainfall is experienced.

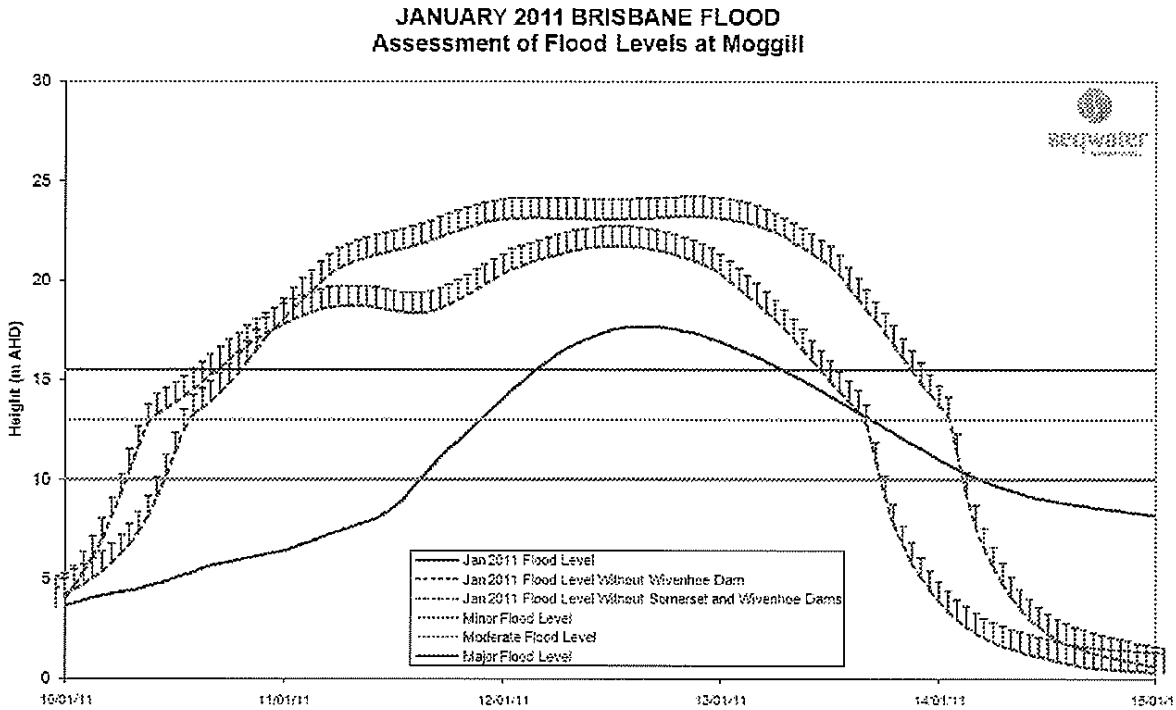
4.3 Flood Mitigation Benefits of Wivenhoe Dam

The following graphs demonstrate the significant benefits of Wivenhoe Dam in mitigating the current flood event, with reductions in flood peak of up to 2.5 metres in the City area and up to 5.5 metres in the Moggill area further upstream.

This equates to significant reduction in the potential for loss of life as well as saving in damages in the order of up to $1.6 billion based on current damage curves. Up to 13,000 more properties would have been impacted by the event without the Dam.

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





The strategy adopted to quickly close off releases once the peak in the dam had been reached and rain stopped falling certainly reduced the predicted flood peak by at least one metre in the lower Brisbane River area. This notion is supported by BOM.

5 EVENT REVIEW

Under the Manual of Operational Procedures for Flood Mitigation at Wivenhoe Dam and Somerset Dam that are approved and gazetted by the Department of Environment and Resource Management, there is a regulatory requirement that a report must be prepared as per the below wording:

"Seqwater must prepare a report after each Flood Event. The report must contain details of the procedures used, the reasons therefore and other pertinent information. Seqwater must forward the report to the Chief Executive within six weeks of the completion of the Flood Event."

Such a report was prepared for the flood events of February and March 2010 and copies are available. A copy of the Table of Contents of that report is included as Appendix 1. For this event, the report would be a comprehensive summary of all procedures, actions, outcomes and processes during the event.

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

- In the short term, utilise this report attached to this briefing note as the basis for communications and discussion.
- Prepare any Interim Reports as agreed to provide information and input as required.
- Seqwater prepare a Comprehensive Report as per the existing regulatory requirements of the Act and the gazetted manual and any requirements of the Dam Safety Regulator. This would be done within 6 weeks of the closure of the current event as per the manual. This timeframe is subject to any new mobilisation of the Flood Operations Centre. The Table of Contents would include:
    - Introduction
    - Flood Event Summary
    - Mobilisation and Staffing
    - Event Rainfall
    - Inflow and Release Details
    - Data Collection System Performance
    - Data Analysis Performance
    - Communication
    - Flood Management Strategies and Manual Compliance
    - Improvements in data collection systems, practices and processes.
    - improvements by interacting agencies

- Review of factors impacting on the protection of urban areas
- Recommendations & Conclusions

- The report would then be reviewed by the Dam Safety Regulator in conjunction with any peer review they require. The review should cover:
  - Were the provisions of the manual complied with?
  - What improvements to either facilities e.g. stream gauges, or work practices, are desirable to improve Sewater's ability to predict inflows into the dams.
  - Are improvements to either Seqwater's facilities or work practices desirable to improve Seqwater's ability to manage events? For example, investigations to raise the dam to improve its flood storage capacity, If so, what are they and their implications.
  - Are changes to the facilities or work practices of other organisations desirable to improve Seqwater's abilities to manage these events? If so, what are they and their implications? (For example, would it be worth funding Brisbane River crossing upgrades so that floodwater could be released faster, while not adversely affecting access to properties--or maybe alternative strategies e.g. resupply operations could be put in place to achieve similar outcomes?)
  - Given the manual's order of priorities i.e. protection of the dam etc, are any changes in the flood release strategies for either dam desirable? If so, what are they, and their implications
- Based on this review, a review of the Manual of Operational Procedures for Flood Mitigation at Wivenhoe Dam and Somerset Dam would occur utilising an expert panel of review including representatives of DERM, Seqwater, BoM, affected Local Governments and other stakeholders as necessary.

Appendix A

FINAL REPORT – FLOOD EVENTS AT WIVENHOE, SOMERSET AND NORTH PINE DAMS FOR FEBRUARY AND MARCH 2010

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Gina O'Driscoll

From: Kathy Reilly [threereillys[redacted]
Sent: Sunday, 16 January 2011 6:00 PM
To: Reilly Bob; pborrows[redacted]; john bradley[redacted]; Barry Dennien, Dan Spiller; peter.allen[redacted]
Subject: Re: Cabinet in co nfidence - Ministerial brief outline

Hi Peter

Peter Allen will provide you with some technical commentary, so I will concentrate on the wider issues. In the interests of time, I have not checked my comments with Peter Allen so he and your staff can feel to correct me if I have got my facts wrong.

Dam failure versus fuse plug activation

In the current event, the critical issue we were trying to avoid was activation of the fuse plugs, with the first one being activated at (I recall) 75.6 metres--not sure what this was in terms of percentage of capacity. As well as the adverse impacts of such activation cited in the text, the practical effect would also have been to increase, I understand, flood eights by about 0.5 metres in Brisbane. So, we had to avoid this outcome. (Also what the 0.5 metres been worth in rms of avoided property damage?)

Personally, I would emphasise more the arguments around what we had to do to avoid this outcome.

Reducing the peak flood in brisbane--last paragarph p.3

This is an important point. However the argument would be strengthened if you more comprehensively explained the reasoning behind the statement. For example, are we saying that because seqwater reduced the flow from 6,000 cumecs to 2,500 cumecs, then this was the outcome, and that the only reason we could do that was because we were still 0.5 metres or so below fuse plug activation (and thus had a buffer if there was an unexpected surge in inflows?)

Also what is the 1 metre worth in terms of reduced property damage?

Section 2.4

Playing the devil's advocate for a moment with respect to the table on p.7, could someone convincingly argue that if the starting level had been 50% of FSL, you would have had the ability to reduce the releases from Wivenhoe below ?,500 cumecs at the height of the flood event, and thus further reduce the peak height in Brisbane /Ipswich?

eqwater report (p.13)

The specific additional issues that I suggest we include are:

- whether it is worth investigating increasing the flood capacity of Wivenhoe--I know a fair bit of work has been done on this issue
- whether the Brisbane River crossings which act, under some situations as a constraint on the releases from Wivenhoe, should be replaced by bridges. For example if the smallest could pass , for example, 2,500 cumecs, then this could enable higher releases under some circumstances.
- Whether the policy of draining the flood compartment within 7 days should be modified.

I also suggest the review be undertaken by an independent expert and that an expert panel be formed to provide review of the report and identification of any additional issues requiring investigation--this is important if you are picking up possibel improvement by otehr agencies.

Minor points.

- throughout the text can we be clear what we mean by the term "failure"--to the Minister I suspect this means the dam will collapse and I do not think this is what meant in some cases.
- the spillway upgrade in 2035 is not intended to improve flood mitgation capacity, I understand (p.2)

- the first few paragraphs in section 2.1 refer to the sceanrio where Wivenhoe did not exist--could this be made clearer in the text?
- Finally, could we make the point that Wivenhoe/Somerset does not control Lockyer/Bremer and that the flood flow at the river peak was compromised of x % from these sources. In the last few days, I have explained to many people around Milton/Auchenflower (where there was significant flooding) this point and they are always surprised. There appears to be a strong view in the community that Wivenhoe was supposed to stop any repetition of the 1974 flood and therefore it "failed" in this task given what has happened.

egards

)b

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

From: Reilly Bob
To: threereillys[redacted]
Sent: Sunday, January 16, 2011 4:33 PM
Subject: Fw: Cabinet in co nfidence - Ministerial brief outline

----- Original Message -----
From: Peter Borrows <pborrows[redacted]
To: Reilly Bob; Rob Drury <rdrury[redacted]>; Duty Seq <dutyseq[redacted]>; Bradley John; Dennien Barry[redacted] SEQWGM; spiller daniel[redacted]
Cc: Lyons Michael[redacted]; Mike Foster <mfoster[redacted]>; Elaina Smouha <elainamit[redacted]>; Allen Peter
Sent: Sun Jan 16 16:28:29 2011
Subject: Cabinet in co nfidence - Ministerial brief outline

Please see attached draft with attachment.

n relation to the draft contents outline sent yesterday, the following is a cross reference FYI.

The attached Ministerial Briefing Note addresses the questions contained in the Ministerial Information Request as follows:

1) Design of Dam – Storages/Spillway upgrade

Refer Section 1

2) "The Flood Event" – Q&A

a. Chronology - High level time step of events and significant decision making/changes – more detailed time step information for Tuesday afternoon (i.e. what was the BOM forecast at the time, narrow peak etc.)

Refer Section 2.5

b. How does Wivenhoe Dam work as a flood mitigator?

Refer Sections 2.1, 2.3 and 3.1

c. What are the factors being balanced when making decisions about the amount of dam releases? To what extent does information from the Bureau of Meteorology/rain gauges influence decisions? How reliable is this information?

Refer Sections 3.1 and 3.2

d. Statistics on how much did Wivenhoe Dam knock off the flood peak.

Refer Section 2.1

e. What would have happened if Wivenhoe Dam had not been built and we only had Somerset Dam? What damage would have been caused compared to what has currently been experienced (damage statistics)?

Refer Sections 2.1 and 2.2

f. If we have undertaken pre-emptive dam releases to bring Wivenhoe Dam's full supply level down to lower than what we had maintained (i.e. 60%), what would have been the river height for the period that this flood event occurred?

Refer Section 2.4

If pre-emptive dam releases would not have made a difference, why? (i.e. why did we not release earlier?)

Refer Section 2.4

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

Refer Section 2.2

i. What is the fuse plug and why did it need to be maintained?

Refer Section 2.3

j. What damage or town isolation occurred during the Wivenhoe Dam releases that occurred since October 2010?

Refer Section 2.4

k. Did Seqwater have time to reduce the dam level between the 5 events? If so, would it have made a difference to this flood event?

Refer Section 2.4

3) The Flood Mitigation Manual

Refer Section 3.1

a. Describe the decision making framework - Four strategies

Refer Section 3.2

b. How is the Manual designed to work?

Refer Section 3.2

c. History of Flood Mitigation Manual updates and peer review – who was on the panels, studies that fed into previous versions of the Manual and who was involved in these studies?

Refer Section 3.1

4) Regulatory context - Water Supply (Safety and Reliability) Act 2008 (Information provider: Peter Allen - DERM)

Refer Section 4

Regards. Peter.

Peter Borrows

Chief Executive Officer

Queensland Bulk Water Supply Authority trading as Seqwater

[redacted] | E pborrows[redacted]

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From: Elaina Smouha [mailto:elainami[redacted]
Sent: Saturday, 15 January 2011 5:03 PM
To: Mike Foster; peter.aller[redacted] bob.reilly[redacted]; Peter Borrows; Rob Drury; Duty Seq
Cc: john.bradley[redacted]; barry.dennier[redacted]; daniel.spiller[redacted];
michael.lyons[redacted]; Elaina Smouha
Subject: Cabinet in confidence - Ministerial brief outline

Dear All

To assist, attached is a Ministerial brief outline as per our recent teleconference, for Monday's Emergency Cabinet meeting. It also records those who will be providing information for the Background and Flood Mitigation Manual report process.

As discussed, the brief needs to be provided to Minister Robertson tomorrow (Sunday, 16 January 2011).

Regards

Elaina

Elaina Smouha

Director, Governance and Regulatory Compliance

SEQ Water Grid Manager

[redacted]

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+----------+

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+----------+

Suzie Emery

From: Elaina Smouha [elainamir[redacted]]
Sent: Sunday, 16 January 2011 6:05 PM
To: Peter Borrows
Cc: Barry Dennien; Dan Spiller
Subject: Re: Cabinet in co nfidence - Ministerial brief outline
Attachments: Seqwater Jan_2011_Flood_Event_Ver_1_draft_for_distribution[1].docx; Seqwater Ministerial_Briefing_Note_January_17_2011_Final_Draft_for_distribution[1].docx

Peter

As per your conversation with Barry, we have highlighted some queries within your attached reports.

Regards

Elaina

On Sun, Jan 16, 2011 at 4:28 PM, Peter Borrows <pborrows[redacted]> wrote:

Please see attached draft with attachment.

In relation to the draft contents outline sent yesterday, the following is a cross reference FYI.

The attached Ministerial Briefing Note addresses the questions contained in the Ministerial Information Request as follows:

1) Design of Dam – Storages/Spillway upgrade

Refer Section 1

2) "The Flood Event" – Q&A

a. Chronology - High level time step of events and significant decision making/changes – more detailed time step information for Tuesday afternoon (i.e. what was the BOM forecast at the time, narrow peak etc.)

Refer Section 2.5

b. How does Wivenhoe Dam work as a flood mitigator?

Refer Sections 2.1, 2.3 and 3.1

c. What are the factors being balanced when making decisions about the amount of dam releases? To what extent does information from the Bureau of Meteorology/rain gauges influence decisions? How reliable is this information?

Refer Sections 3.1 and 3.2

d. Statistics on how much did Wivenhoe Dam knock off the flood peak.

Refer Section 2.1

e. What would have happened if Wivenhoe Dam had not been built and we only had Somerset Dam? What damage would have been caused compared to what has currently been experienced (damage statistics)?

Refer Sections 2.1 and 2.2

f. If we have undertaken pre-emptive dam releases to bring Wivenhoe Dam's full supply level down to lower than what we had maintained (i.e. 60%), what would have been the river height for the period that this flood event occurred?

Refer Section 2.4

g. If pre-emptive dam releases would not have made a difference, why? (i.e. why did we not release earlier?)

Refer Section 2.4

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

Refer Section 2.2

i. What is the fuse plug and why did it need to be maintained?

Refer Section 2.3

j. What damage or town isolation occurred during the Wivenhoe Dam releases that occurred since October 2010?

Refer Section 2.4

k. Did Seqwater have time to reduce the dam level between the 5 events? If so, would it have made a difference to this flood event?

Refer Section 2.4

3) The Flood Mitigation Manual

Refer Section 3.1

a. Describe the decision making framework - Four strategies

Refer Section 3.2

b. How is the Manual designed to work?

Refer Section 3.2

c. History of Flood Mitigation Manual updates and peer review – who was on the panels, studies that fed into previous versions of the Manual and who was involved in these studies?

Refer Section 3.1

4) Regulatory context - *Water Supply (Safety and Reliability) Act 2008* (Information provider: Peter Allen - DERM)

Refer Section 4

Regards, Peter.

Peter Borrows

Chief Executive Officer

Queensland Bulk Water Supply Authority *trading as* Seqwater

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From: Elaina Smouha [mailto:elainamit[redacted]
Sent: Saturday, 15 January 2011 5:03 PM
To: Mike Foster; peter.allen[redacted]; bob.reilly[redacted]; Peter Borrows; Rob Drury; Duty Seq
Cc: john.bradley[redacted]; barry.dennien[redacted]; daniel.spiller[redacted]
michael.lyons[redacted]; Elaina Smouha
Subject: Cabinet in confidence - Ministerial brief outline

Dear All

To assist, attached is a Ministerial brief outline as per our recent teleconference, for Monday's Emergency Cabinet meeting. It also records those who will be providing information for the Background and Flood Mitigation Manual report process.

As discussed, the brief needs to be provided to Minister Robertson tomorrow (Sunday, 16 January 2011).

Regards

Elaina

Elaina Smouha

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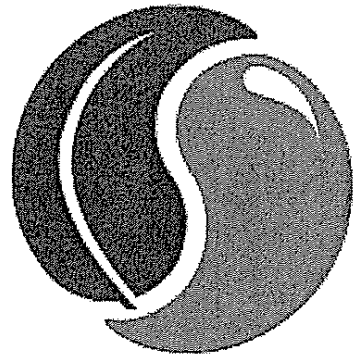

seqwater

WATER FOR LIFE

JANUARY 2011 FLOOD EVENT

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1 INTRODUCTION

Wivenhoe Dam was constructed by the Queensland Government between 1977 and 1984. The dam is a 56 m AHD high and 2.3 kilometre long earth and rock embankment separated into two parts by a concrete gravity spillway. The spillway is controlled by 5 radial gates, each 12.0 metres wide by 16.0 m AHD high. Two saddle dam embankments are located on the left side of the reservoir.

The dam spillway capacity was upgraded in 2005. This was done primarily through the construction of a 164 metre wide secondary spillway through the right abutment of the existing dam. This spillway contains three erodible earth fill fuse plug embankments that are initiated at different dam levels in excess of EL 75.6.

The dam has two main functions by providing:

- A 1,165,000 ML storage at full supply level (FSL EL 67.0) providing an urban water supply for Brisbane and surrounding areas;

- Flood mitigation in the Brisbane River by providing a dedicated flood storage volume of 1,450,000 ML up to EL77 (this flood level was increased as part the 2005 upgrade to allow a water level of EL80m and a temporary flood storage volume of 1,966,000 ML with all fuse plugs initiated and the dam at the point of failure).

The dam has an EXTREME hazard classification under ANCOLD guidelines because of the significant development downstream in the Brisbane and Ipswich metropolitan areas, with the population at risk in the event of a dam failure numbering in the hundreds of thousands.

In accordance with the Queensland Regulatory program for dam spillway upgrades, a further upgrade of Wivenhoe Dam is scheduled to occur prior to 2035 to enable the dam to safely pass the Probable Maximum Flood. This work will involve the reconstruction of Saddle Dam 2 as a fuse plug spillway.

Wivenhoe Dam is in excellent condition. Comprehensive Dam Safety reviews undertaken in accordance with ANCOLD guidelines have been undertaken in 1997 (Gutteridge, Haskins & Davey Pty Ltd), 2003 (Wivenhoe Alliance), 2006 (NSW Department of Commerce), 2009 (GHD) and September 2010 (Seqwater). The reports concluded that the design of the dam is in accordance with modern day standards and that there are no significant outstanding design or construction issues that require investigation.

2 WIVENHOE DAM FLOOD MITIGATION AND FLOOD OPERATIONS

2.1 Flood Mitigation

The Brisbane River catchment covers an area of approximately 14,000 square kilometres of which about half is below Wivenhoe Dam. Maximum overall flood mitigation effect is achieved by operating Wivenhoe Dam in conjunction with Somerset Dam. Although Somerset and Wivenhoe Dam reduce flooding in Brisbane City, major flooding can still occur. The Lockyer-Laidley Valley drains into the Brisbane River through Lockyer Creek that enters the Brisbane River just downstream of Wivenhoe Dam near Lowood. Another major tributary, the Bremer River, flows into the Brisbane River at Moggill. Wivenhoe Dam has no control over inflows into the Brisbane River from both these major tributaries.

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

Therefore the basis of all flood operation decision making is to ensure the dam never fails. This is the reason that the dam's flood storage compartment would never be intentionally fully filled as additional inflows after this point would result in a dam failure. Similarly, there will be uncertainty on future rainfall that could occur which could not be releases if there was insufficient flood storage which could not be stored or released.

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

2.2 Flood Operations

A real time flood monitoring and forecasting system has been established in the Wivenhoe and Somerset Dam catchments. This system employs radio telemetry to collect, transmit and receive rainfall and stream flow information. The system consists of around 230 field stations that automatically record rainfall and/or river heights at selected locations in the dam catchments. Most of these field stations are owned by Seqwater with the remainder belonging to other agencies.

The rainfall and river height data is transmitted to Seqwater's Flood Operations Centre in real time. Once received in the Flood Operations Centre, the data is processed using a Real Time Flood Model (RTFM) to estimate likely dam inflows and evaluate a range of possible inflow scenarios based on forecast and recorded rainfall in the dam catchments. The RTFM is a suite of hydrologic computer programs that utilise the real time data to assist in the operation of the dams during flood events.

Seqwater engineers use the RTFM for flood monitoring and forecasting during flood events to operate the dams in accordance with a Manual of Flood Mitigation (the origin of and objectives and procedures contained in the Manual of Flood Mitigation are explained in the following section of this document). Releases of water from the dams are optimised to minimise the impacts of flooding in accordance with the objectives and procedures contained in a Manual of Flood Mitigation.

The RTFM and data collection network performed well During the January 2011 event, with no failures experienced that compromised the ability of Seqwater to operate the dam.
Inconsistent with statement on page 8?

3 MANUAL OF FLOOD MITIGATION FOR WIVENHOE AND SOMERSET DAMS

The Manual of Flood Mitigation for Wivenhoe and Somerset Dams, in its current form, was developed in 1992 during an extensive hydrological study of the Brisbane and Pine Rivers catchments by DPI, Water Resources. The final reports were subject to extensive internal review by the Water Resources Group before being reviewed by an independent review panel comprising Professor Colin Apelt, Head of Department, Department of Civil Engineering, University of Queensland and Mr Eric Lesleighter, Principal Hydraulic Engineer and Chief Engineer Water Resources, Snowy Mountains Engineering Corporation.

Subsequently, the Manual was extensively reviewed during the Brisbane Valley Flood Damages Minimisation Study in 2006, with the latest comprehensive review of the Manual undertaken in 2009. Both of these reviews have included expert review panels comprising key stakeholders, with the most recent review involving representatives from DERM, BOM, BCC and SunWater.

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

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

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

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

- **Strategy W1** – Primary consideration is given to Minimising Disruption to Downstream Rural Life. Under this strategy, the predicted water level is below 68.50 m AHD and the maximum release is 1,900m3/s.

- **Strategy W2** – Transition Phase moving from Minimising Disruption to Protecting Downstream Urban Areas. Under this strategy, the water level is predicted to be between 68.5 and 74.0 m AHD and the maximum release is less than 3,500m3/s. River flows at Moggill? Not releases?

- **Strategy W3** – Primary consideration is to Protect of Urban Areas from Inundation. Under this strategy, the water level is predicted to be between 68.5 and 74.0 m AHD but the maximum release is less than 4,000m3/s. River flows at Moggill? Not releases?

- **Strategy W4** – Primary consideration is to protecting the structural safety of the Dam. Under this strategy, the water level is predicted to exceed 74.0 m AHD and there is no limit to the maximum release. Consideration is given to managing flood releases to avoid fuse plug initiation if at all possible as this would compromise flood mitigation capacity in the short to medium term.

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

4 JANUARY 2011 FLOOD EVENT

4.1 Background

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

EVENT	EVENT START DATE	EVENT END DATE	VOLUME RELEASED (ML)
1	13/12/2010	16/12/2010	70,000
2	17/12/2010	24/12/2010	150,000 Should this be 370,000 as per teleconference?
3	26/12/2010	02/01/2010	470,000

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

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

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

The specific impact on the Lower Brisbane River of these reduced dam levels requires the use of a complex hydraulic model. The results of this modelling would still contain a degree of uncertainty as illustrated by the difficulties in estimating the final flood peak in Brisbane during the event. This

is because the rapid closure of the gates after peak inflow was achieved resulted in significant water level reductions downstream and this is difficult to model accurately.

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

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

Assumptions for model?

Is it a dual or triple peak? Should we explain in detail why is it so unique?

4.2 Event Decision Making

The following table contains a summary of the key decisions points associated with the current event. As at 16 January 2011, the event remains in progress.

Weather forecasts were consistently less than actual. Emphasise reliance on BOM advice.

Need to specify BOM forecasts and actual rainfall experienced for each time step.

DATE AND TIME	FLOOD EVENT MILESTONE
07:00 06/01/2011 (Thursday)	Rainfall is experienced in the dam catchments that will result in flood releases, however Wivenhoe releases are delayed for 24 hours to allow Lockyer Creek flood flows to pass downstream and prevent the isolation of the community dependent of Burtons Bridge. The forecast is for 150mm over the next 24 hours.
15:00 07/01/2011 (Friday)	Wivenhoe releases commence, with operational strategy W1 in use. Rainfall for the next four days is estimated to be between 140mm and 300mm, with a forecast for rain easing on Tuesday 11 January 2011. All bridges downstream of the dam with the exception of Fernvale Bridge and

	Mt Crosby Weir Bridge are expected to be inundated for a number of days.

06:00 09/01/2011 (Sunday)	Moderate to heavy rain periods forecast until Tuesday, but both Wivenhoe and Somerset dam levels were falling slowly, with Somerset at 1.27 m AHD above FSL and Wivenhoe 1.58 m AHD above FSL.
15:30 09/01/2011 (Sunday)	Following significant rain during the day a meeting of Duty Engineers is held. The QPF issued at 16:00 indicates 50mm to 80mm over the next 24 hours. Based on this forecast, it is anticipated that dam levels can be held to a maximum of 3.50 m AHD above FSL in Somerset and 5.5 m AHD above FSL in Wivenhoe. However, by 19:00 it was apparent that both Fernvale Bridge and Mt Crosby Weir Bridge would be inundated by the combined dam releases and Lockyer Creek flows and that the operational strategy had progressed to W2.
06:30 10/01/2011 (Monday)	Rainfall continued during the night and based on rainfall on the ground it was apparent the operational strategy had progressed to W3.
06:30 10/01/2011 (Monday)	Rainfall continued during the day but based on rainfall on the ground, operational strategy W3 remained in use. However it was apparent that any further heavy rain would result in progression of the operational strategy to W4.
08:00 11/01/2011 (Tuesday)	Rainfall continued during the night with isolated heavy falls in the Wivenhoe Dam catchment area and based on rainfall on the ground it was apparent the operational strategy would soon progress to W4 with Wivenhoe Dam exceeding 8.00 m AHD above FSL. The objective now was to limit outflows and subsequent flood damage to urban areas, while ensuring the structural safety of the dam.
11:00 11/01/2011 (Tuesday)	Rapid inflows were experienced in Wivenhoe Dam, with the dam rising almost a metre in eight hours. Releases were increased until the dam level stabilised in accordance with Strategy W4. Computer models were not reflecting actual dam inflows due to intense point rainfalls in the immediate catchment around the dam. Falls are estimated to be similar to those experienced at both Toowoomba and Upper Lockyer the previous day and are falling outside and between existing rain gauges.
21:00 11/01/2011 (Tuesday)	Wivenhoe Dam peaked. Peak release of 7450 cumecs with a level of 0.7 metres below fuse plug trigger.
22:00 11/01/2011	Wivenhoe Dam releases were closed off as quickly as possible over the

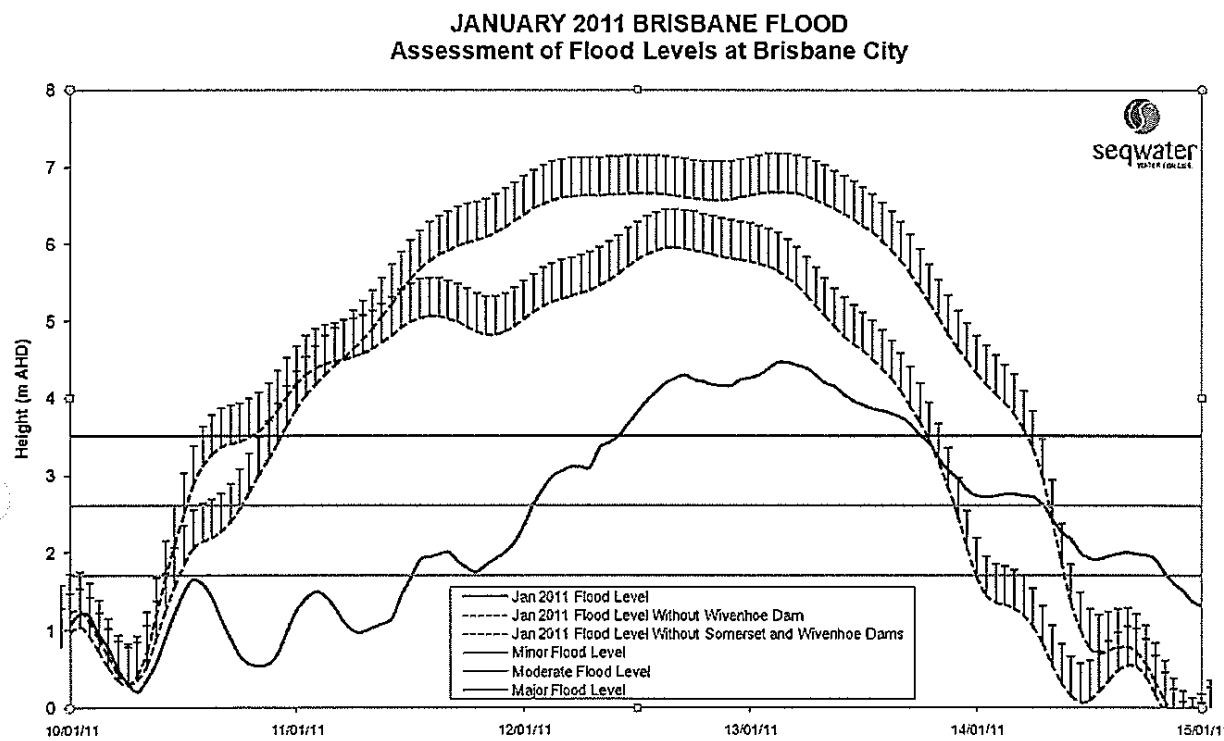
(Tuesday).	next 11 hours, while ensuring water levels in the dam did not rise further and initiate a fuse plug embankment.
08:00 12/01/2011 (Wednesday)	Minimum possible release level reached, with inflows matching outflows. Further reductions in release rate would likely cause the dam level to rise.
21:00 13/01/2011 (Thursday)	The 7 day dam drain down is commenced as Lockyer Creek and Bremer River peaks pass the Lower Brisbane area. Maximum release target is the limit of damaging floods in Brisbane being 3500 cumecs.
09:00 17/01/2011 (Monday)	Drain down continues, with released expected to cease on Wednesday 19 January 2011 unless further rainfall is experienced.

4.3 Flood Mitigation Benefits of Wivenhoe Dam

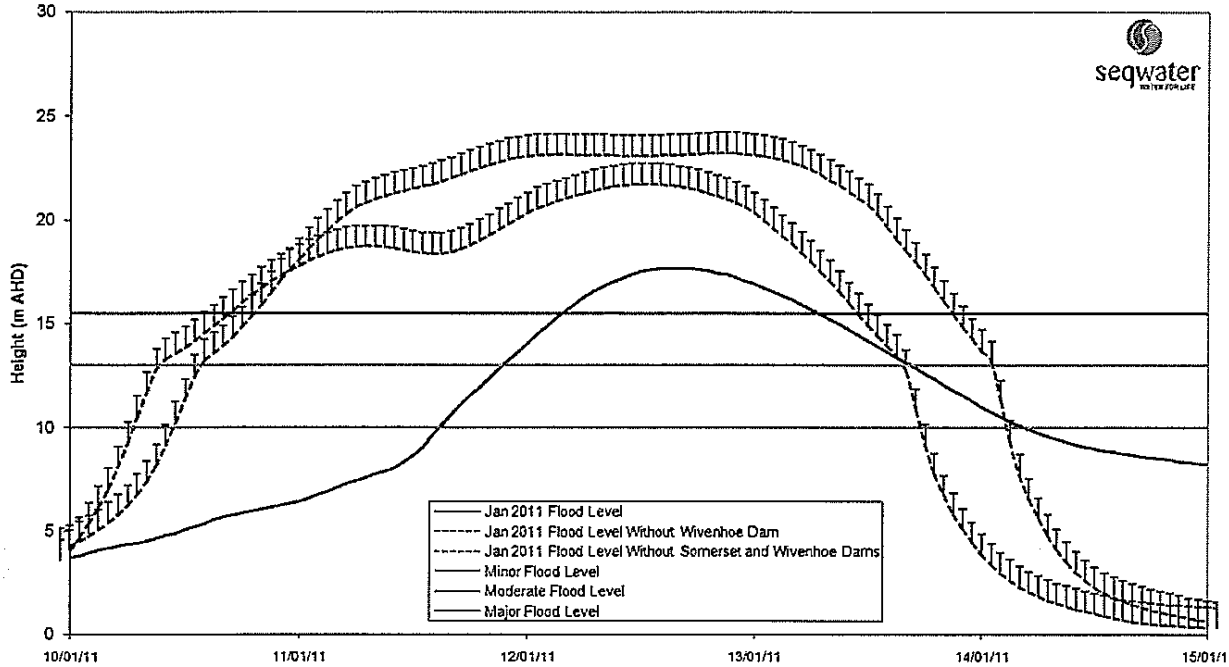
The following graphs demonstrate the significant benefits of Wivenhoe Dam in mitigating the current flood event, with reductions in flood peak of up to 2.5 metres in the City area and up to 5.5 metres in the Moggill area further upstream.

This equates to significant reduction in the potential for loss of life as well as saving in damages in the order of up to $1.6 billion based on current damage curves. Up to 13,000 more properties would have been impacted by the event without the Dam.

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



JANUARY 2011 BRISBANE FLOOD
Assessment of Flood Levels at Moggill



The strategy adopted to quickly close off releases once the peak in the dam had been reached and rain stopped falling certainly reduced the predicted flood peak by at least one metre in the lower Brisbane River area. This notion is supported by BOM.

Blue line of graph – Breakdown the component of % of Wivenhoe Dam release and downstream inflows.

5 EVENT REVIEW

Under the Manual of Operational Procedures for Flood Mitigation at Wivenhoe Dam and Somerset Dam that are approved and gazetted by the Department of Environment and Resource Management, there is a regulatory requirement that a report must be prepared as per the below wording:

"Seqwater must prepare a report after each Flood Event. The report must contain details of the procedures used, the reasons therefore and other pertinent information. Seqwater must forward the report to the Chief Executive within six weeks of the completion of the Flood Event."

Such a report was prepared for the flood events of February and March 2010 and copies are available. A copy of the Table of Contents of that report is included as Appendix 1. For this event, the report would be a comprehensive summary of all procedures, actions, outcomes and processes during the event.

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

- In the short term, utilise this report attached to this briefing note as the basis for communications and discussion.
- Prepare any Interim Reports as agreed to provide information and input as required.
- Seqwater prepare a Comprehensive Report as per the existing regulatory requirements of the Act and the gazetted manual and any requirements of the Dam Safety Regulator. This would be done within 6 weeks of the closure of the current event as per the manual. This timeframe is subject to any new mobilisation of the Flood Operations Centre. The Table of Contents would include:
    - Introduction
    - Flood Event Summary
    - Mobilisation and Staffing
    - Event Rainfall
    - Inflow and Release Details
    - Data Collection System Performance
    - Data Analysis Performance
    - Communication
    - Flood Management Strategies and Manual Compliance
    - Improvements in data collection systems, practices and processes.
    - improvements by interacting agencies

- Review of factors impacting on the protection of urban areas
- Recommendations & Conclusions

- The report would then be reviewed by the Dam Safety Regulator in conjunction with any peer review they require. The review should cover:
  - Were the provisions of the manual complied with?
  - What improvements to either facilities e.g. stream gauges, or work practices, are desirable to improve Sewater's ability to predict inflows into the dams.
  - Are improvements to either Seqwater's facilities or work practices desirable to improve Seqwater's ability to manage events? For example, investigations to raise the dam to improve its flood storage capacity, If so, what are they and their implications.
  - Are changes to the facilities or work practices of other organisations desirable to improve Seqwater's abilities to manage these events? If so, what are they and their implications? (For example, would it be worth funding Brisbane River crossing upgrades so that floodwater could be released faster, while not adversely affecting access to properties--or maybe alternative strategies e.g. resupply operations could be put in place to achieve similar outcomes?)
  - Given the manual's order of priorities i.e. protection of the dam etc, are any changes in the flood release strategies for either dam desirable? If so, what are they, and their implications
- Based on this review, a review of the Manual of Operational Procedures for Flood Mitigation at Wivenhoe Dam and Somerset Dam would occur utilising an expert panel of review including representatives of DERM, Seqwater, BoM, affected Local Governments and other stakeholders as necessary.

Appendix A

FINAL REPORT – FLOOD EVENTS AT WIVENHOE, SOMERSET AND NORTH PINE DAMS FOR FEBRUARY AND MARCH 2010

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Ministerial Briefing Note

17 January 2010

Flood Event January 2011

1. BACKGROUND INFORMATION ON WIVENHOE DAM

2. WIVENHOE DAM FLOOD MITIGATION AND FLOOD OPERATIONS

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

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

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

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

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

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

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

3.2 What is contained in the Manual?

4. REGULATORY CONTEXT

5. COMPLIANCE WITH MANUAL

6. SEQWATER REPORT

1 BACKGROUND INFORMATION ON WIVENHOE DAM

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

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

In accordance with the Queensland Regulatory program for dam spillway upgrades, a further upgrade of Wivenhoe Dam is scheduled to occur prior to 2035. Would it have made any difference to the current flood event?

Was it relevant to this event i.e any di? Would water have been released through it? Would the Flood Mitigation Manual decision levels changed?

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

2 WIVENHOE DAM FLOOD MITIGATION AND FLOOD OPERATIONS

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

The following graphs demonstrate the significant benefits of Wivenhoe Dam in mitigating the current flood event, with reductions in flood peak of up to 2.5 metres in the City area and up to 5.5 metres in the Moggill area further upstream.

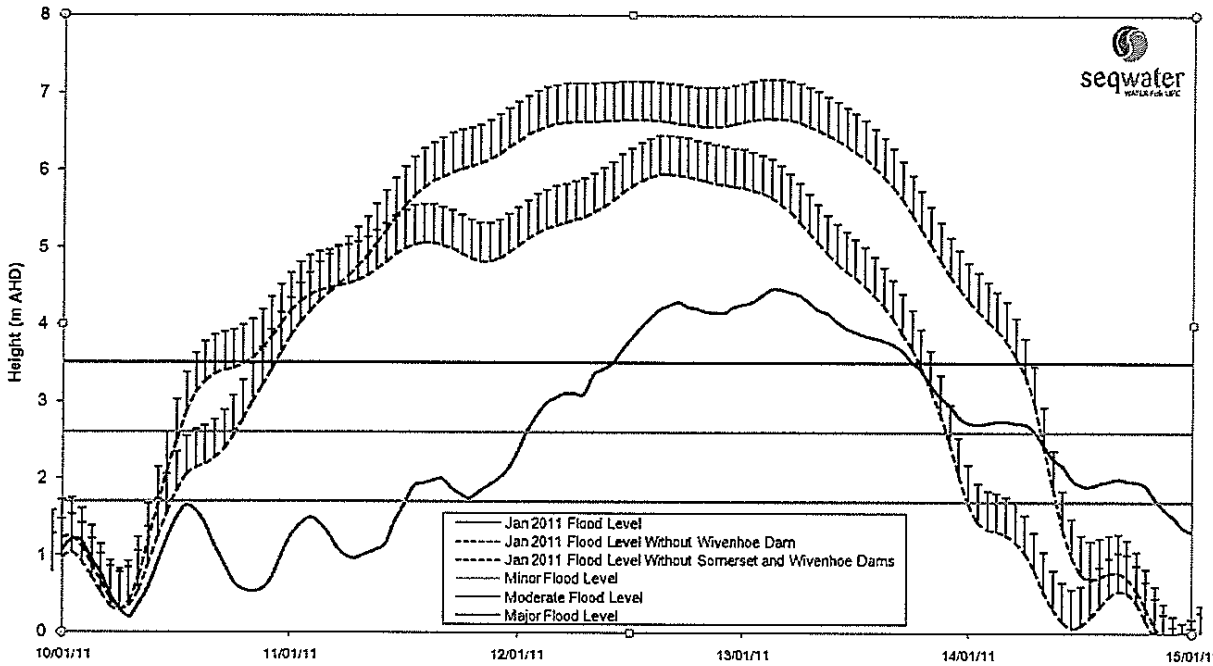
This equates to significant reduction in the potential for loss of life as well as saving in damages in the order of up to $1.6 billion based on current damage curves. Up to 13,000 more properties would have been impacted by the event without the Dam. (Source: Flood Damage Tables provided to Seqwater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

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

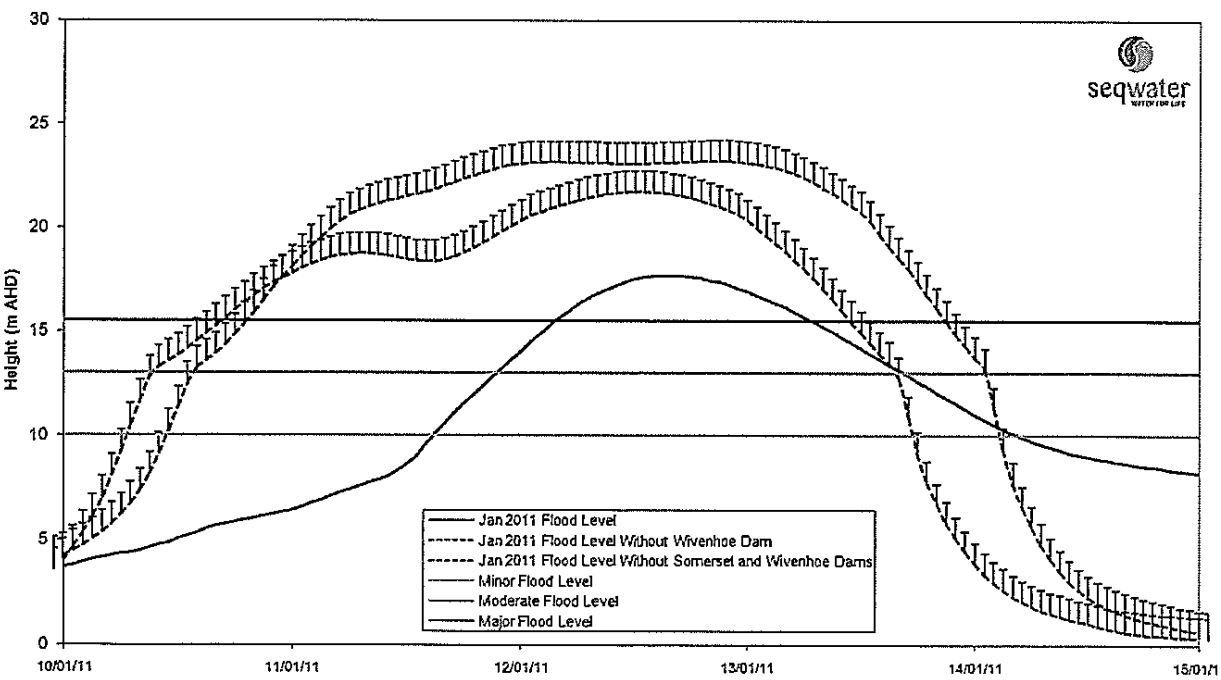
Depending on the nature of the event, the presence of Wivenhoe Dam could also potentially increase flood warning times to impacted areas. How these times may have been increased during the current event is presently difficult to quantify, but discussions will be held with BOM on this issue at a later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

In addition, the strategy adopted to quickly close off releases once the peak in the dam had been reached and rain stopped falling certainly reduced the predicted flood peak by at least one metre in the lower Brisbane River area.

JANUARY 2011 BRISBANE FLOOD
Assessment of Flood Levels at Brisbane City



JANUARY 2011 BRISBANE FLOOD
Assessment of Flood Levels at Moggill



Blue line of graph – Breakdown the component of % of Wivenhoe Dam release and downstream inflows.

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

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

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

Why didn't we let the first fuse plug go? Why not 200%? Why not 205%? Dam is rock core etc.

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

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

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

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

Detail specific impacts – which bridges knocked out, how long people isolated, which towns impacted, how many people impacted?

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

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

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

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

What are the assumptions in terms of the releases at different levels?

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

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

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

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

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

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

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

Can we attach CV of experts? Note Colin Apelt chaired the Brisbane Flood Study and chairs the current Brisbane Flood taskforce.

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

3.2 What is contained in the Manual?

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

- Ensure the structural safety of the dams;
- Provide optimum protection of urbanised areas from inundation;

- Minimise disruption to rural life in the valleys of the Brisbane and Stanley Rivers primarily, this involves minimising inundation of the seven bridges below the dam upstream of Moggill);
- Retain the storage at Full Supply Level at the conclusion of the Flood Event.
- Minimise impacts to riparian flora and fauna during the drain down phase of the Flood Event.

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

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

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

4 REGULATORY CONTEXT (Provided by Peter Allen and unedited)

These are contained in the Flood Mitigation Manual (manual) approved under sections 370 to 374 of the *Water Supply (Safety and Reliability) Act 2008.* The Chief Executive Officer (CEO) of DERM (or his delegate) approves the manual, and the approval is notified in the Queensland Government Gazette. Approval can be for a period of up to five years, after which the approval needs to be renewed. There are no decision-making criteria specified in the Act for the CEO to take into account when approving the manual.

The manual for the dams requires, amongst other matters:

1. Flood operations to be conducted in accordance with manual's provisions. (There is an approval process specified in the manual, if Seqwater considers a different flood release strategy is desirable to deal with a particular flood event. This was not used in the January 2011 flood event)
2. Flood operations to be under the control of CEO-approved engineers (who are highly qualified and experienced)
3. Annual reporting on the preparedness and status of the flood control system for flood operations, and the training of the personnel who manage the flood events.
4. Reporting on the flood operations during flood events.
5. Reviews after flood events such as the January 2011 event. For this flood event, the Queensland Government engaged Mr Brian Cooper, an independent consulting engineer, to review compliance with the manual. Mr Cooper concluded (Attachment??): "...The strategies in the Flood Mitigation Manual have been followed, allowing for the discretion given to make variations in order to maximise flood mitigation effects. The actions taken and decisions made during the Flood Event appear to have been prudent and appropriate in the context of the available knowledge available to these responsible for flood operations and the way events unfolded..." (p.3 of the final report or other appropriate reference??)

The manual is separate from a draft communication protocol (Insert name) between the Local, State and Commonwealth government agencies that are affected by the dams' flood operations. This protocol is not binding on the parties to it is not subject to regulatory approval/review.

Some DERM staff, because of their specialist skills, work in the Flood Operations Centre that Seqwater activates to manage such events. None of them are involved in any of the regulatory decisions concerning the dams or are members of the work unit (Office of the Water Supply Regulator) which undertakes the CEO's regulatory functions.

5 COMPLIANCE WITH THE MANUAL

(To be provided)

6 SEQWATER REPORT

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

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

- Are changes to the facilities or work practices of other organisations desirable to improve Seqwater's abilities to manage these events? If so, what are they and their implications? (For example, would it be worth funding Brisbane River crossing upgrades so that floodwater could be released faster, while not adversely affecting access to properties--or maybe alternative strategies e.g. resupply operations could be put in place to achieve similar outcomes?)
- Given the manual's order of priorities i.e. protection of the dam etc, are any changes in the flood release strategies for either dam desirable? If so, what are they, and their implications

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

Suzie Emery

From: Barry Dennien [Barry.Dennier[redacted]]
Sent: Sunday, 16 January 2011 7:36 PM
To: Dan Spiller
Subject: Fwd: River height calculation [SEC=UNCLASSIFIED]

Regards
Barry Dennien

Begin forwarded message:

From: Peter Baddiley <P.Baddiley[redacted]>
Date: 16 January 2011 7:05:22 PM AEST
To: Barry Dennien <Barry.Dennien[redacted]>
Cc: Rob Vertessy <R.Vertessy[redacted]>, Peter Baddiley <P.Baddiley[redacted]>
Subject: RE: River height calculation [SEC=UNCLASSIFIED]

Thanks Barry for your kind remark. It is a testing time for all of us.

Re your request, I think the Bureau need to respond to this request because it relates to questions about predicted flood levels which is a Bureau responsibility.

From what I can see now with the data that the Bureau has and from my involvement in the events on Tuesday/Wednesday, the significant increase in WD discharges through Tuesday clearly has a significant impact (increase) on downstream peak flood levels, rates of rise and timing.

However, again from my understanding of what happened based on operational data, modelling and the warning and predicting operations through Tue/Wed, the dam operators firstly increased the releases to manage the dam level and its safety (by necessity of course because of the intense Tuesday rainfalls); but then, when the dam was at a high level, very quickly moved to rapidly reducing the releases to minimise or mitigate the downstream flooding.

I believe, again from what I have before me, that this decision did reduce levels from what they otherwise would have been if a more conservative operation had applied. I don't have experience in operating dams, but it seemed to me a very solid, but "big" decsion to make in the timeframe it seems to have been made (again from the reduced discharges evident during Wed morning).

All of thes initial viewpoints, of course, needs to be tested with more detailed assessment and modelling yet to happen.

regards, peter

Peter Baddiley
Regional Hydrology Manager
Climate & Water Division
Bureau of Meteorology
[redacted] Ann Street
GPO Box 413, BRISBANE, QLD, AUSTRALIA 4001
Phone:[redacted]
EMAIL: p.baddiley[redacted]

EMAIL for flood matters: flood.qld[redacted]
WWW : www.bom.gov.au

From: Barry Dennien [mailto:Barry.Dennien[redacted]
Sent: Sunday, 16 January 2011 1:17 PM
To: Peter Baddiley
Subject: River height calculation

Hi Peter

You and your team are doing a great job.

We are getting many requests for stats on Wivenhoe's performance during the flood event.

One stat that would be useful to hold back the media until all info is collated is how much impact on river levels did the peak release on Tuesday night have on the river (tuesday noon to midnight). I understand not much however an estimate at this stage would be good.

Regards

Barry

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Suzie Emery

From: Bradley John [John.Bradley[redacted]
Sent: Sunday, 16 January 2011 7:41 PM
To: Lance.McCallum[redacted]; Dan Spiller
Cc: tim.watts[redacted]; Barry Dennien
Subject: Re: Urgent - Cabinet in confidence

Follow Up Flag: Follow up
Flag Status: Flagged

Lance

I am sorry for the delay on the brief requested for tonight for Minister - Barry and his team have been working hard all day on this among their other issues - but have had challenges with input from seqwater.

Seqwater has struggled to provide their input in a congent form and so Barry, Dan and others are still there awaiting for some stuff and finalising it at the end of a very long week.

We think we are about 60 to 90 minutes away at this point. I will forward it to you and Minister as soon asap and we will talk through at 9 am.

John B

From: Bradley John
Sent: Saturday, January 15, 2011 10:33 AM
To: 'Lance.McCallum[redacted] <Lance.McCallum[redacted]>; spiller daniel[redacted]
Cc: 'tim.watts[redacted] <tim.watts[redacted]>; Dennien Barry [redacted]
Subject: Re: Urgent - Cabinet in confidence

Thanks Lance - we have anticipated the need for something like this - seqwgm work underway - I will talk to SEQWGM when out of SDMG now on.

Regards
John B

From: Lance McCallum [mailto:Lance.McCallum[redacted]
Sent: Saturday, January 15, 2011 10:30 AM
To: spiller daniel[redacted] Bradley John
Cc: Tim Watts <Tim.Watts[redacted]
Subject: Urgent - Cabinet in confidence

John/Dan

The Minister has asked that preparation be done over the weekend that will enable him to go to the Emergncy Cabinet meeting on Monday with a position on how the Govt is going to handle the issues of reviewing operational decisions made by SEQwater and SEQWGM in relation to releases from the dams.

I understand that in further to the recent independent review of the Wivenhoe operations manual the WGM is also undertaking further work by compiling a list of the operational experts who authored the manual.

Happy to discuss further.

Thanks, Lance.

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+-------------------------------------------------------------+

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3 sheets of A4 paper = 1 litre of water

+-------------------------------------------------------------+
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From:	Peter Borrows <pborrows[redacted]
Sent:	Sunday, January 16, 2011 9:33 PM
To:	Barry Dennien <Barry.Dennien[redacted]
Cc:	Peter Borrows <pborrows[redacted]; Rob Drury <rdrury[redacted] Duty Seq <dutyseq[redacted]
Subject:	Fw: Cabinet in co nfidence - Ministerial brief outline
Attach:	WGM Brief with replies.docx; WGM Report with replies.docx; Ministerial Briefing Note January 17 2011 Final Draft for distribution.doc; Jan 2011 Flood Event_Ver 1_draft for distribution.docx

Barry, a lot of the extra questions will have to be picked up after the event in an interim or final report.

Sorry it has taken so long.

I think everyone is taking longer now.

Peter

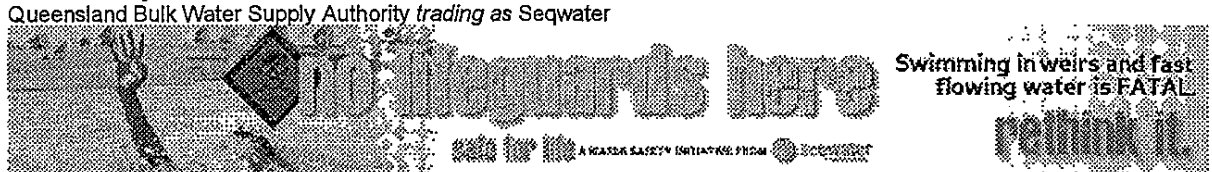
From: Rob Drury
To: Peter Borrows
Cc: John Tibaldi; Paul Bird
Sent: Sun Jan 16 21:20:33 2011
Subject: FW: Cabinet in co nfidence - Ministerial brief outline

Peter,

- Below is a reply to Bob covering most of his comments. Some have been included in the updated Brief and Report and others explained.
- Attached is an updated copy of the Report and the Brief with some minor changes. Most changes are in the fuse plugs and the Report section at the end
- Copies of the WGM comments named appropriately with our comments in red as to whether we made changes or reasons why we didn't. if we said reasons why we couldn't, we did not change the brief or Report in that area.

Rob

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





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

From: Peter Borrows
Sent: Sunday, 16 January 2011 6:06 PM
To: Rob Drury
Cc: John Tibaldi; Paul Bird; Jim Pruss; Peter Borrows
Subject: Fw: Cabinet in co nfidence - Ministerial brief outline

Have a look.

I'll call in a while. You'll have to get input from John T I think.

From: Kathy Reilly <threereillys[redacted]
To: Reilly Bob <Bob.Reilly[redacted]>; Peter Borrows; john.bradley[redacted]
<john.bradley[redacted]; barry.dennien[redacted] <barry.dennien[redacted]
dan.spiller[redacted] <dan.spiller[redacted]>; peter.allen[redacted]
<peter.aller[redacted]
Sent: Sun Jan 16 17:59:36 2011
Subject: Re: Cabinet in co nfidence - Ministerial brief outline

Hi Peter

Peter Allen will provide you with some technical commentary, so I will concentrate on the wider issues. In the interests of time, I have not checked my comments with Peter Allen so he and your staff can feel to correct me if I have got my facts wrong.

Dam failure versus fuse plug activation

In the current event, the critical issue we were trying to avoid was activation of the fuse plugs, with the first one being activated at (I recall) 75.6 metres--not sure what this was in terms of percentage of capacity. As well as the adverse impacts of such activation cited in the text, the practical effect would also have been to increase, I understand, flood heights by about 0.5 metres in Brisbane. So, we had to avoid this outcome. (Also what the 0.5 metres been worth in terms of avoided property damage?)

This is not necessarily correct, the main reasons are as per the document rather than a 0.5m increase as we could shut down gates, although this again increases the levels to make up for the fuse plug flow.
Personally, I would emphasise more the arguments around what we had to do to avoid this outcome.

Reducing the peak flood in brisbane--last paragarph p.3

This is an important point. However the argument would be strengthened if you more comprehensively explained the reasoning behind the statement. For example, are we saying that because seqwater reduced the flow from 6,000 cumecs to 2,500 cumecs, then this was the outcome, and that the only reason we could do that was because we were still 0.5 metres or so below fuse plug activation (and thus had a buffer if there was an unexpected surge in inflows?) We really did this because we managed to stop the increase in the dam rising. Did try to cover this in the report.

Also what is the 1 metre worth in terms of reduced property damage?Haven't been able to quantify this yet.

Section 2.4

Playing the devil's advocate for a moment with respect to the table on p.7, could someone convincingly argue that if the starting level had been 50% of FSL, you would have had the ability to reduce the releases from Wivenhoe below 2,500 cumecs at the height of the flood event, and thus further reduce the peak height in Brisbane /Ipswich?
Possibly, but at no stage had 50% reduction in Wivenhoe been seriously canvassed by Govt nor could we have probably got to 50% after every event.

Seqwater report (p.13)

The specific additional issues that I suggest we include are:

- whether it is worth investigating increasing the flood capacity of Wivenhoe--I know a fair bit of work has been done on this issue
- whether the Brisbane River crossings which act, under some situations as a constraint on the releases from Wivenhoe, should be replaced by bridges. For example if the smallest could pass , for example, 2,500 cumecs, then this could enable higher releases under some circumstances.
- Whether the policy of draining the flood compartment within 7 days should be modified.

Included in report.

I also suggest the review be undertaken by an independent expert and that an expert panel be formed to provide review of the report and identification of any additional issues requiring investigation--this is important if you are picking up possibel improvement by otehr agencies.

Left out of report as a decision not by Seqwater.

1201A<

Minor points.

- throughout the text can we be clear what we mean by the term "failure"--to the Minister I suspect this means the dam will collapse and I do not think this is what meant in some cases.
- the spillway upgrade in 2035 is not intended to improve flood mitgation capacity, I understand (p.2)
- the first few paragraphs in section 2.1 refer to the sceanrio where Wivenhoe did not exist--could this be made clearer in the text?
- Finally, could we make the point that Wivenhoe/Somerset does not control Lockyer/Bremer and that the flood flow at the river peak was compromised of x % from these sources. In the last few days, I have explained to many people around Milton/Auchenflower (where there was significant flooding) this point and they are always surprised. There appears to be a strong view in the community that Wivenhoe was supposed to stop any repetition of the 1974 flood and therefore it "failed" in this task given what has happened.

Most of these comments included but we cannot split up what source contributes what levels downstream without serious analysis of the whole system. Best estimate the BoM came up with was 50% but that was just an estimate however we agree.

Bob

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

From: Reilly Bob
To: threereillys[redacted]
Sent: Sunday, January 16, 2011 4:33 PM
Subject: Fw: Cabinet in co nfidence - Ministerial brief outline

----- Original Message -----
From: Peter Borrows <pborrows[redacted]
To: Reilly Bob; Rob Drury <rdrury[redacted]; Duty Seq <dutyseq[redacted]>; Bradley John; Dennien Barry[redacted]
SEQWGM; spiller daniel[redacted]
Cc: Lyons Michael[redacted] Mike Foster <mfoste[redacted]>; Elaina Smouha <elainami[redacted]>; Allen Peter
Sent: Sun Jan 16 16:28:29 2011
Subject: Cabinet in co nfidence - Ministerial brief outline

Please see attached draft with attachment.

In relation to the draft contents outline sent yesterday, the following is a cross reference FYI.

The attached Ministerial Briefing Note addresses the questions contained in the Ministerial Information Request as follows:

1) Design of Dam – Storages/Spillway upgrade

Refer Section 1

2) "The Flood Event" – Q&A

a. Chronology - High level time step of events and significant decision making/changes – more detailed time step information for Tuesday afternoon (i.e. what was the BOM forecast at the time, narrow peak etc.)

Refer Section 2.5

b. How does Wivenhoe Dam work as a flood mitigator?

1201 AT

Refer Sections 2.1, 2.3 and 3.1

c. What are the factors being balanced when making decisions about the amount of dam releases? To what extent does information from the Bureau of Meteorology/rain gauges influence decisions? How reliable is this information?

Refer Sections 3.1 and 3.2

d. Statistics on how much did Wivenhoe Dam knock off the flood peak.

Refer Section 2.1

e. What would have happened if Wivenhoe Dam had not been built and we only had Somerset Dam? What damage would have been caused compared to what has currently been experienced (damage statistics)?

Refer Sections 2.1 and 2.2

f. If we have undertaken pre-emptive dam releases to bring Wivenhoe Dam's full supply level down to lower than what we had maintained (i.e. 60%), what would have been the river height for the period that this flood event occurred?

Refer Section 2.4

g. If pre-emptive dam releases would not have made a difference, why? (i.e. why did we not release earlier?)

Refer Section 2.4

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

Refer Section 2.2

i. What is the fuse plug and why did it need to be maintained?

Refer Section 2.3

j. What damage or town isolation occurred during the Wivenhoe Dam releases that occurred since October 2010?

Refer Section 2.4

k. Did Seqwater have time to reduce the dam level between the 5 events? If so, would it have made a difference to this flood event?

Refer Section 2.4

3) The Flood Mitigation Manual

Refer Section 3.1

a. Describe the decision making framework - Four strategies

Refer Section 3.2

b. How is the Manual designed to work?

Refer Section 3.2

c. History of Flood Mitigation Manual updates and peer review – who was on the panels, studies that fed into previous versions of the Manual and who was involved in these studies?

Refer Section 3.1

4) Regulatory context - Water Supply (Safety and Reliability) Act 2008 (Information provider: Peter Allen - DERM)

Refer Section 4

1201AU

Regards, Peter.

Peter Borrows

Chief Executive Officer

Queensland Bulk Water Supply Authority trading as Seqwater

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From: Elaina Smouha [mailto:elainamir[redacted]
Sent: Saturday, 15 January 2011 5:03 PM
To: Mike Foster; peter.allen[redacted]; bob.reilly[redacted]; Peter Borrows; Rob Drury; Duty Seq
Cc: john.bradley[redacted]; barry.dennien[redacted]; daniel.spiller[redacted];
michael.lyons[redacted]; Elaina Smouha
Subject: Cabinet in confidence - Ministerial brief outline

Dear All

To assist, attached is a Ministerial brief outline as per our recent teleconference, for Monday's Emergency Cabinet meeting. It also records those who will be providing information for the Background and Flood Mitigation Manual report process.

As discussed, the brief needs to be provided to Minister Robertson tomorrow (Sunday, 16 January 2011).

Regards

Elaina

Elaina Smouha

Director, Governance and Regulatory Compliance

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1201AV

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1201 AW

Ministerial Briefing Note

17 January 2010

Flood Event January 2011

1. BACKGROUND INFORMATION ON WIVENHOE DAM

2. WIVENHOE DAM FLOOD MITIGATION AND FLOOD OPERATIONS

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

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

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

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

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

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

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

3.2 What is contained in the Manual?

4. REGULATORY CONTEXT

5. COMPLIANCE WITH MANUAL

6. SEQWATER REPORT

1201AX

1 BACKGROUND INFORMATION ON WIVENHOE DAM

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

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

In accordance with the Queensland Regulatory program for dam spillway upgrades, a further upgrade of Wivenhoe Dam is scheduled to occur prior to 2035. Would it have made any difference to the current flood event?

Was it relevant to this event i e any di? Would water have been released through it? Would the Flood Mitigation Manual decision levels changed?
Such an upgrade is only for dam security for PMF not flood mitigation. Changed some wording to reflect this.

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

1201AY

2 WIVENHOE DAM FLOOD MITIGATION AND FLOOD OPERATIONS

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

The following graphs demonstrate the significant benefits of Wivenhoe Dam in mitigating the current flood event, with reductions in flood peak of up to 2.5 metres in the City area and up to 5.5 metres in the Moggill area further upstream.

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

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

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

In addition, the strategy adopted to quickly close off releases once the peak in the dam had been reached and rain stopped falling certainly reduced the predicted flood peak by at least one metre in the lower Brisbane River area.

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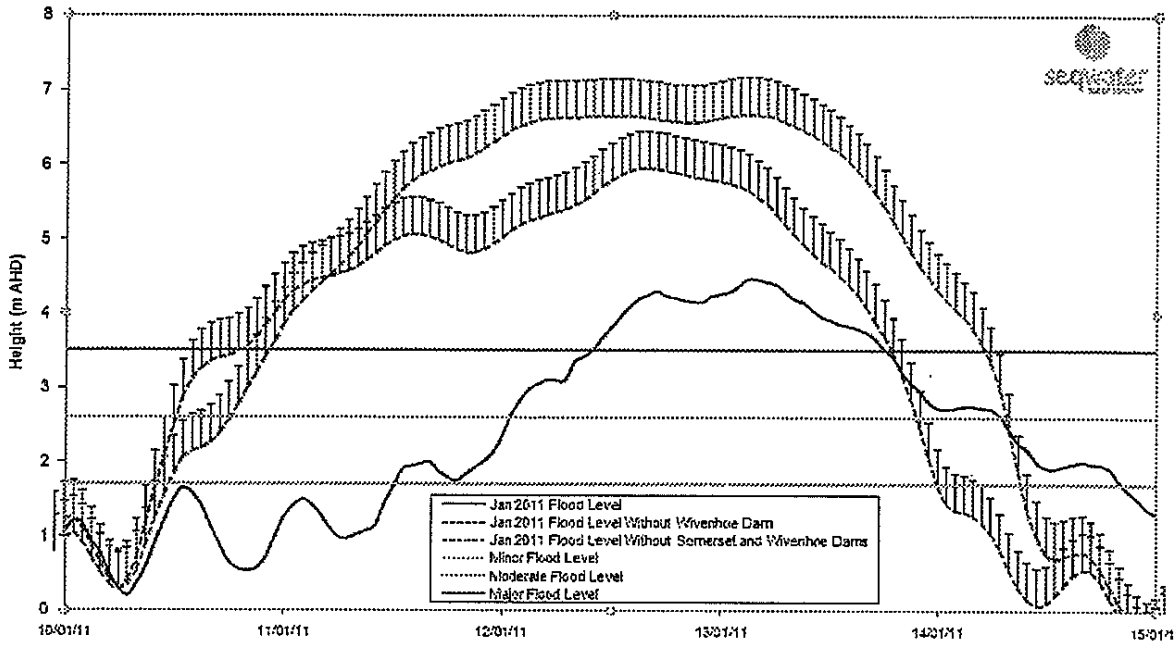
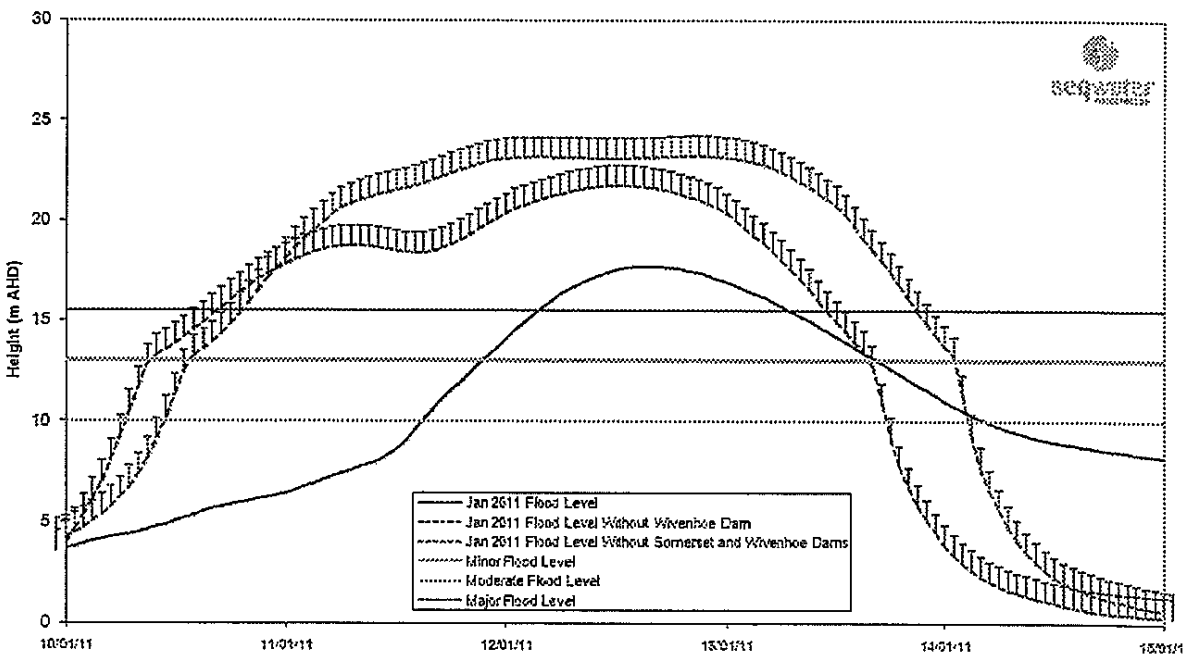
JANUARY 2011 BRISBANE FLOOD
Assessment of Flood Levels at Brisbane City



JANUARY 2011 BRISBANE FLOOD
Assessment of Flood Levels at Moggill



Blue line of graph – Breakdown the component of % of Wivenhoe Dam release and downstream inflows. Seqwater will undertake this work with the BoM but will take some time.

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

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

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

Why didn't we let the first fuse plug go? Why not 200%? Why not 205%? Dam is rock core etc. **See below reasons for not allowing fuse plugs to go.**

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

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

1201BC

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

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

Detail specific impacts – which bridges knocked out, how long people isolated, which towns impacted, how many people impacted?This will take quite some time to collate even in terms of times bridges are out, we are still in the middle of a release. Numbers of people will come from council but these details cannot be collated at the moment. Will attempt to do in the next week or so during meetings planned with Councils over the next few weeks.

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

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

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

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

1201BD

achieved resulted in significant water level reductions downstream and this is difficult to model accurately.

What are the assumptions in terms of the releases at different levels? Don't fully understand, can address at a leter date.

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

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

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

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

1201BE

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

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

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

Can we attach CV of experts? Note Colin Apelt chaired the Brisbane Flood Study and chairs the current Brisbane Flood taskforce. Not available at the moment and would not be the CV when he was involved in 1992.

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

3.2 What is contained in the Manual?

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

- Ensure the structural safety of the dams;
- Provide optimum protection of urbanised areas from inundation;

1291 BF

- Minimise disruption to rural life in the valleys of the Brisbane and Stanley Rivers primarily, this involves minimising inundation of the seven bridges below the dam upstream of Moggill);
- Retain the storage at Full Supply Level at the conclusion of the Flood Event.
- Minimise impacts to riparian flora and fauna during the drain down phase of the Flood Event.

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

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

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

1201 BG

4 REGULATORY CONTEXT (Provided by Peter Allen and unedited)

These are contained in the Flood Mitigation Manual (manual) approved under sections 370 to 374 of the *Water Supply (Safety and Reliability) Act 2008.* The Chief Executive Officer (CEO) of DERM (or his delegate) approves the manual, and the approval is notified in the Queensland Government Gazette. Approval can be for a period of up to five years, after which the approval needs to be renewed. There are no decision-making criteria specified in the Act for the CEO to take into account when approving the manual.

The manual for the dams requires, amongst other matters:

1. Flood operations to be conducted in accordance with manual's provisions. (There is an approval process specified in the manual, if Seqwater considers a different flood release strategy is desirable to deal with a particular flood event. This was not used in the January 2011 flood event)
2. Flood operations to be under the control of CEO-approved engineers (who are highly qualified and experienced)
3. Annual reporting on the preparedness and status of the flood control system for flood operations, and the training of the personnel who manage the flood events.
4. Reporting on the flood operations during flood events.
5. Reviews after flood events such as the January 2011 event. For this flood event, the Queensland Government engaged Mr Brian Cooper, an independent consulting engineer, to review compliance with the manual. Mr Cooper concluded (Attachment??):
   "...The strategies in the Flood Mitigation Manual have been followed, allowing for the discretion given to make variations in order to maximise flood mitigation effects. The actions taken and decisions made during the Flood Event appear to have been prudent and appropriate in the context of the available knowledge available to these responsible for flood operations and the way events unfolded..." (p.3 of the final report or other appropriate reference??)

See Peter Allen

The manual is separate from a draft communication protocol (Insert name) between the Local, State and Commonwealth government agencies that are affected by the dams' flood operations. This protocol is not binding on the parties to it is not subject to regulatory approval/review.

1201B H

Some DERM staff, because of their specialist skills, work in the Flood Operations Centre that Seqwater activates to manage such events. None of them are involved in any of the regulatory decisions concerning the dams or are members of the work unit (Office of the Water Supply Regulator) which undertakes the CEO's regulatory functions.

1201 B1

5 COMPLIANCE WITH THE MANUAL

(To be provided)

1201BJ

6 SEQWATER REPORT

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

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

1201 BK

- Are changes to the facilities or work practices of other organisations desirable to improve Seqwater's abilities to manage these events? If so, what are they and their implications? (For example, would it be worth funding Brisbane River crossing upgrades so that floodwater could be released faster, while not adversely affecting access to properties--or maybe alternative strategies e.g. resupply operations could be put in place to achieve similar outcomes?)
- Given the manual's order of priorities i.e. protection of the dam etc, are any changes in the flood release strategies for either dam desirable? If so, what are they, and their implications

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

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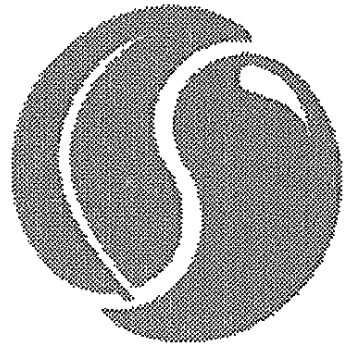

seqwater

WATER FOR LIFE

JANUARY 2011 FLOOD EVENT

J201Bm

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1 INTRODUCTION

Wivenhoe Dam was constructed by the Queensland Government between 1977 and 1984. The dam is a 56 m AHD high and 2.3 kilometre long earth and rock embankment separated into two parts by a concrete gravity spillway. The spillway is controlled by 5 radial gates, each 12.0 metres wide by 16.0 m AHD high. Two saddle dam embankments are located on the left side of the reservoir.

The dam spillway capacity was upgraded in 2005. This was done primarily through the construction of a 164 metre wide secondary spillway through the right abutment of the existing dam. This spillway contains three erodible earth fill fuse plug embankments that are initiated at different dam levels in excess of EL 75.6.

The dam has two main functions by providing:

- A 1,165,000 ML storage at full supply level (FSL EL 67.0) providing an urban water supply for Brisbane and surrounding areas;
- Flood mitigation in the Brisbane River by providing a dedicated flood storage volume of 1,450,000 ML up to EL77 (this flood level was increased as part the 2005 upgrade to allow a water level of EL80m and a temporary flood storage volume of 1,966,000 ML with all fuse plugs initiated and the dam at the point of failure).

The dam has an EXTREME hazard classification under ANCOLD guidelines because of the significant development downstream in the Brisbane and Ipswich metropolitan areas, with the population at risk in the event of a dam failure numbering in the hundreds of thousands.

In accordance with the Queensland Regulatory program for dam spillway upgrades, a further upgrade of Wivenhoe Dam is scheduled to occur prior to 2035 to enable the dam to safely pass the Probable Maximum Flood. This work will involve the reconstruction of Saddle Dam 2 as a fuse plug spillway.

Wivenhoe Dam is in excellent condition. Comprehensive Dam Safety reviews undertaken in accordance with ANCOLD guidelines have been undertaken in 1997 (Gutteridge, Haskins & Davey Pty Ltd), 2003 (Wivenhoe Alliance), 2006 (NSW Department of Commerce), 2009 (GHD) and September 2010 (Seqwater). The reports concluded that the design of the dam is in accordance with modern day standards and that there are no significant outstanding design or construction issues that require investigation.

120180

2 WIVENHOE DAM FLOOD MITIGATION AND FLOOD OPERATIONS

2.1 Flood Mitigation

The Brisbane River catchment covers an area of approximately 14,000 square kilometres of which about half is below Wivenhoe Dam. Maximum overall flood mitigation effect is achieved by operating Wivenhoe Dam in conjunction with Somerset Dam. Although Somerset and Wivenhoe Dam reduce flooding in Brisbane City, major flooding can still occur. The Lockyer-Laidley Valley drains into the Brisbane River through Lockyer Creek that enters the Brisbane River just downstream of Wivenhoe Dam near Lowood. Another major tributary, the Bremer River, flows into the Brisbane River at Moggill. Wivenhoe Dam has no control over inflows into the Brisbane River from both these major tributaries.

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

Therefore the basis of all flood operation decision making is to ensure the dam never fails. This is the reason that the dam's flood storage compartment would never be intentionally fully filled as additional inflows after this point would result in a dam failure. Similarly, there will be uncertainty on future rainfall that could occur which could not be releases if there was insufficient flood storage which could not be stored or released.

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

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2.2 Flood Operations

A real time flood monitoring and forecasting system has been established in the Wivenhoe and Somerset Dam catchments. This system employs radio telemetry to collect, transmit and receive rainfall and stream flow information. The system consists of around 230 field stations that automatically record rainfall and/or river heights at selected locations in the dam catchments. Most of these field stations are owned by Seqwater with the remainder belonging to other agencies.

The rainfall and river height data is transmitted to Seqwater's Flood Operations Centre in real time. Once received in the Flood Operations Centre, the data is processed using a Real Time Flood Model (RTFM) to estimate likely dam inflows and evaluate a range of possible inflow scenarios based on forecast and recorded rainfall in the dam catchments. The RTFM is a suite of hydrologic computer programs that utilise the real time data to assist in the operation of the dams during flood events.

Seqwater engineers use the RTFM for flood monitoring and forecasting during flood events to operate the dams in accordance with a Manual of Flood Mitigation (the origin of and objectives and procedures contained in the Manual of Flood Mitigation are explained in the following section of this document). Releases of water from the dams are optimised to minimise the impacts of flooding in accordance with the objectives and procedures contained in a Manual of Flood Mitigation.

The RTFM and data collection network performed well During the January 2011 event, with no failures experienced that compromised the ability of Seqwater to operate the dam.
Inconsistent with statement on page 8?**No, in general the system worked well, the fact that a high intensity event could happen where we do not have stations can occur regardless of how many you have, it could happen over the lake and the only way to really monitor is lake rise.**

12018Q

3 MANUAL OF FLOOD MITIGATION FOR WIVENHOE AND SOMERSET DAMS

The Manual of Flood Mitigation for Wivenhoe and Somerset Dams, in its current form, was developed in 1992 during an extensive hydrological study of the Brisbane and Pine Rivers catchments by DPI, Water Resources. The final reports were subject to extensive internal review by the Water Resources Group before being reviewed by an independent review panel comprising Professor Colin Apelt, Head of Department, Department of Civil Engineering, University of Queensland and Mr Eric Lesleighter, Principal Hydraulic Engineer and Chief Engineer Water Resources, Snowy Mountains Engineering Corporation.

Subsequently, the Manual was extensively reviewed during the Brisbane Valley Flood Damages Minimisation Study in 2006, with the latest comprehensive review of the Manual undertaken in 2009. Both of these reviews have included expert review panels comprising key stakeholders, with the most recent review involving representatives from DERM, BOM, BCC and SunWater.

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

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

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

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

1201BR

- **Strategy W1** – Primary consideration is given to Minimising Disruption to Downstream Rural Life. Under this strategy, the predicted water level is below 68.50 m AHD and the maximum release is 1,900m3/s.

- **Strategy W2** – Transition Phase moving from Minimising Disruption to Protecting Downstream Urban Areas. Under this strategy, the water level is predicted to be between 68.5 and 74.0 m AHD and the maximum release is less than 3,500m3/s. River flows at Moggill? Not releases? True, but we have just inserted straight from the manual rather than add too much detail, but it is true that there is a relationship to Moggill.

- **Strategy W3** – Primary consideration is to Protect of Urban Areas from Inundation. Under this strategy, the water level is predicted to be between 68.5 and 74.0 m AHD but the maximum release is less than 4,000m3/s. River flows at Moggill? Not releases? True, but we have just inserted straight from the manual rather than add too much detail, but it is true that there is a relationship to Moggill.

- **Strategy W4** – Primary consideration is to protecting the structural safety of the Dam. Under this strategy, the water level is predicted to exceed 74.0 m AHD and there is no limit to the maximum release. Consideration is given to managing flood releases to avoid fuse plug initiation if at all possible as this would compromise flood mitigation capacity in the short to medium term.

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

120185

4 JANUARY 2011 FLOOD EVENT

4.1 Background

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

EVENT	EVENT START DATE	EVENT END DATE	VOLUME RELEASED (ML)
1	13/12/2010	16/12/2010	70,000
2	17/12/2010	24/12/2010	150,000 Should this be 370,000 as per teleconference?
3	26/12/2010	02/01/2010	470,000

Leave as 150,000 as we believe this is correct, will confirm if 350,000 was based on some other numbers.

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

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

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

The specific impact on the Lower Brisbane River of these reduced dam levels requires the use of a complex hydraulic model. The results of this modelling would still contain a degree of uncertainty as illustrated by the difficulties in estimating the final flood peak in Brisbane during the event. This

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is because the rapid closure of the gates after peak inflow was achieved resulted in significant water level reductions downstream and this is difficult to model accurately.

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

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

Assumptions for model?The model was developed by the Expert Panel as part of the Manual review in 2009, we did not include this in the report as we should check with the panel first.

Is it a dual or triple peak? Should we explain in detail why is it so unique?**It is a dual peak, we have removed unique as all are unique.**

4.2 Event Decision Making

The following table contains a summary of the key decisions points associated with the current event. As at 16 January 2011, the event remains in progress.

Weather forecasts were consistently less than actual. Emphasise reliance on BOM advice. Need to specify BOM forecasts and actual rainfall experienced for each time step.

We will need to do significant investigation into this and discussions with the BoM before we make any claims regarding forecast accuracy. The BoM issues a variety of forecasts both qualitative and quantitative.

DATE AND TIME	FLOOD EVENT MILESTONE
07:00 06/01/2011 (Thursday)	Rainfall is experienced in the dam catchments that will result in flood releases, however Wivenhoe releases are delayed for 24 hours to allow Lockyer Creek flood flows to pass downstream and prevent the isolation of the community dependent of Burtons Bridge. The forecast is for 150mm

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	over the next 24 hours.
15:00 07/01/2011 (Friday)	Wivenhoe releases commence, with operational strategy W1 in use. Rainfall for the next four days is estimated to be between 140mm and 300mm, with a forecast for rain easing on Tuesday 11 January 2011. All bridges downstream of the dam with the exception of Fernvale Bridge and Mt Crosby Weir Bridge are expected to be inundated for a number of days.

1201BV

06:00 09/01/2011 (Sunday)	Moderate to heavy rain periods forecast until Tuesday, but both Wivenhoe and Somerset dam levels were falling slowly, with Somerset at 1.27 m AHD above FSL and Wivenhoe 1.58 m AHD above FSL.
15:30 09/01/2011 (Sunday)	Following significant rain during the day a meeting of Duty Engineers is held. The QPF issued at 16:00 indicates 50mm to 80mm over the next 24 hours. Based on this forecast, it is anticipated that dam levels can be held to a maximum of 3.50 m AHD above FSL in Somerset and 5.5 m AHD above FSL in Wivenhoe. However, by 19:00 it was apparent that both Fernvale Bridge and Mt Crosby Weir Bridge would be inundated by the combined dam releases and Lockyer Creek flows and that the operational strategy had progressed to W2.
06:30 10/01/2011 (Monday)	Rainfall continued during the night and based on rainfall on the ground it was apparent the operational strategy had progressed to W3.
06:30 10/01/2011 (Monday)	Rainfall continued during the day but based on rainfall on the ground, operational strategy W3 remained in use. However it was apparent that any further heavy rain would result in progression of the operational strategy to W4.
08:00 11/01/2011 (Tuesday)	Rainfall continued during the night with isolated heavy falls in the Wivenhoe Dam catchment area and based on rainfall on the ground it was apparent the operational strategy would soon progress to W4 with Wivenhoe Dam exceeding 8.00 m AHD above FSL. The objective now was to limit outflows and subsequent flood damage to urban areas, while ensuring the structural safety of the dam.
11:00 11/01/2011 (Tuesday)	Rapid inflows were experienced in Wivenhoe Dam, with the dam rising almost a metre in eight hours. Releases were increased until the dam level stabilised in accordance with Strategy W4. Computer models were not reflecting actual dam inflows due to intense point rainfalls in the immediate catchment around the dam. Falls are estimated to be similar to those experienced at both Toowoomba and Upper Lockyer the previous day and are falling outside and between existing rain gauges.
21:00 11/01/2011 (Tuesday)	Wivenhoe Dam peaked. Peak release of 7450 cumecs with a level of 0.7 metres below fuse plug trigger.
22:00 11/01/2011	Wivenhoe Dam releases were closed off as quickly as possible over the

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(Tuesday)	next 11 hours, while ensuring water levels in the dam did not rise further and initiate a fuse plug embankment.
08:00 12/01/2011 (Wednesday)	Minimum possible release level reached, with inflows matching outflows. Further reductions in release rate would likely cause the dam level to rise.
21:00 13/01/2011 (Thursday)	The 7 day dam drain down is commenced as Lockyer Creek and Bremer River peaks pass the Lower Brisbane area. Maximum release target is the limit of damaging floods in Brisbane being 3500 cumecs.
09:00 17/01/2011 (Monday)	Drain down continues, with released expected to cease on Wednesday 19 January 2011 unless further rainfall is experienced.

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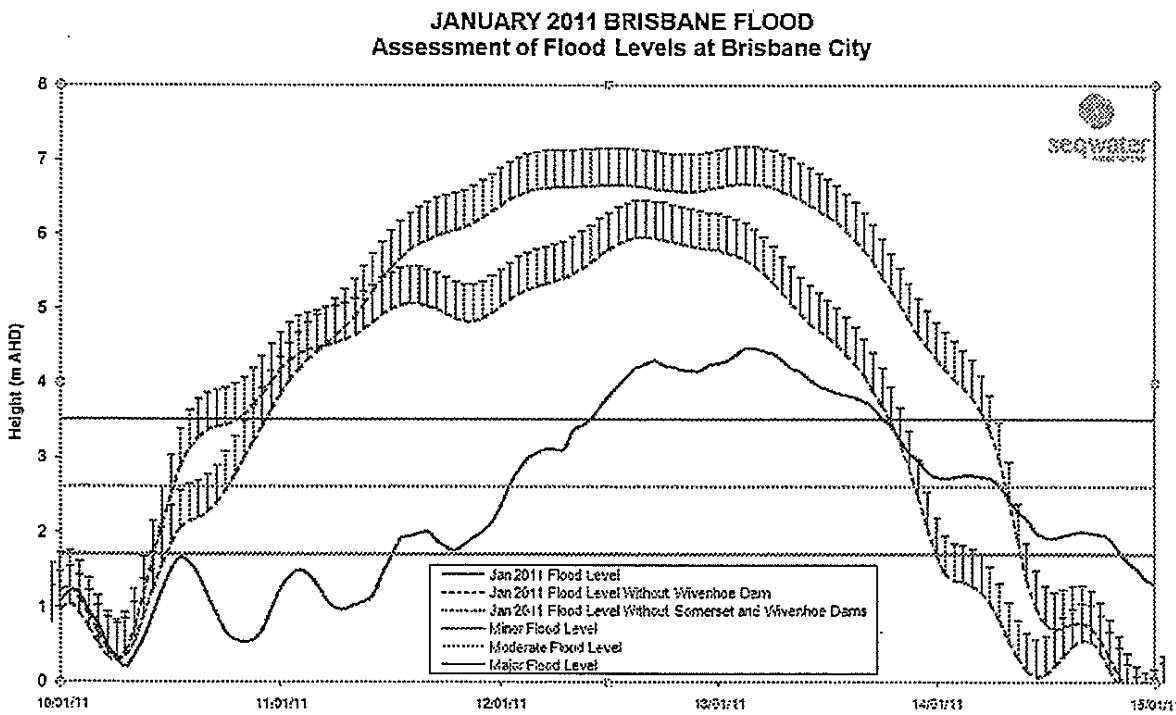
4.3 Flood Mitigation Benefits of Wivenhoe Dam

The following graphs demonstrate the significant benefits of Wivenhoe Dam in mitigating the current flood event, with reductions in flood peak of up to 2.5 metres in the City area and up to 5.5 metres in the Moggill area further upstream.

This equates to significant reduction in the potential for loss of life as well as saving in damages in the order of up to $1.6 billion based on current damage curves. Up to 13,000 more properties would have been impacted by the event without the Dam.

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



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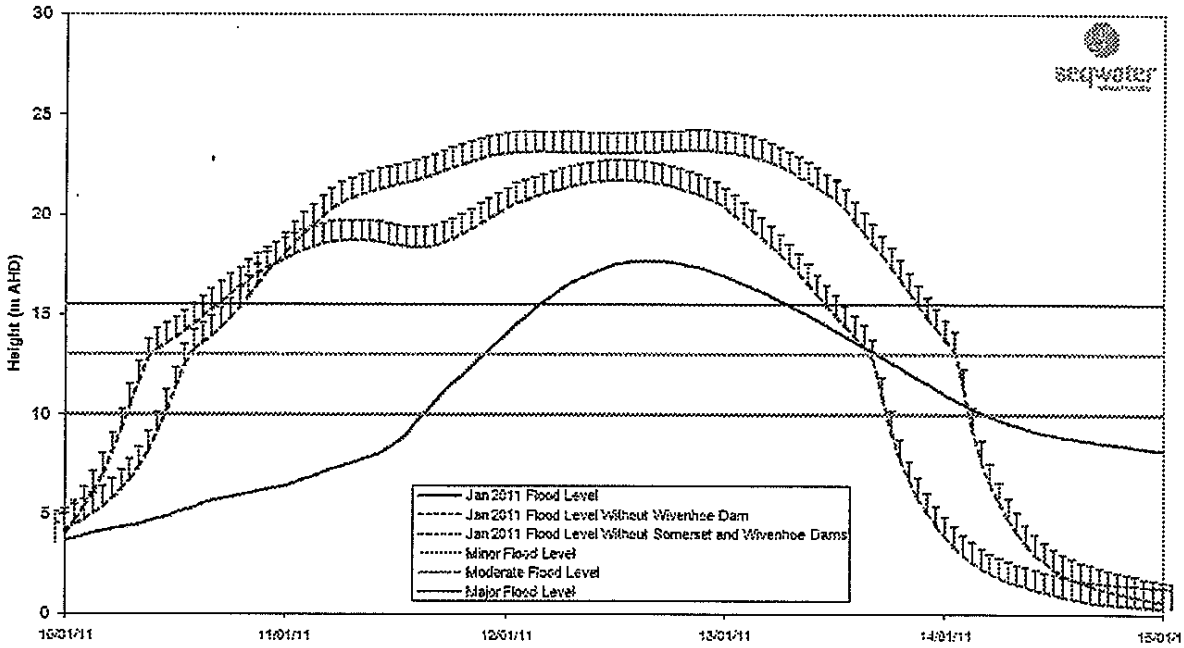
JANUARY 2011 BRISBANE FLOOD
Assessment of Flood Levels at Moggill



The strategy adopted to quickly close off releases once the peak in the dam had been reached and rain stopped falling certainly reduced the predicted flood peak by at least one metre in the lower Brisbane River area. This notion is supported by BOM.

Blue line of graph – Breakdown the component of % of Wivenhoe Dam release and downstream inflows. As per briefing note comment.

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5 EVENT REVIEW

Under the Manual of Operational Procedures for Flood Mitigation at Wivenhoe Dam and Somerset Dam that are approved and gazetted by the Department of Environment and Resource Management, there is a regulatory requirement that a report must be prepared as per the below wording:

"Seqwater must prepare a report after each Flood Event. The report must contain details of the procedures used, the reasons therefore and other pertinent information. Seqwater must forward the report to the Chief Executive within six weeks of the completion of the Flood Event."

Such a report was prepared for the flood events of February and March 2010 and copies are available. A copy of the Table of Contents of that report is included as Appendix 1. For this event, the report would be a comprehensive summary of all procedures, actions, outcomes and processes during the event.

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

- In the short term, utilise this report attached to this briefing note as the basis for communications and discussion.
- Prepare any Interim Reports as agreed to provide information and input as required.
- Seqwater prepare a Comprehensive Report as per the existing regulatory requirements of the Act and the gazetted manual and any requirements of the Dam Safety Regulator. This would be done within 6 weeks of the closure of the current event as per the manual. This timeframe is subject to any new mobilisation of the Flood Operations Centre. The Table of Contents would include:
    - Introduction
    - Flood Event Summary
    - Mobilisation and Staffing
    - Event Rainfall
    - Inflow and Release Details
    - Data Collection System Performance
    - Data Analysis Performance
    - Communication
    - Flood Management Strategies and Manual Compliance
    - Improvements in data collection systems, practices and processes.
    - improvements by interacting agencies

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- Review of factors impacting on the protection of urban areas
- Recommendations & Conclusions

- The report would then be reviewed by the Dam Safety Regulator in conjunction with any peer review they require. The review should cover:
    - Were the provisions of the manual complied with?
    - What improvements to either facilities e.g. stream gauges, or work practices, are desirable to improve Sewater's ability to predict inflows into the dams.
    - Are improvements to either Seqwater's facilities or work practices desirable to improve Seqwater's ability to manage events? For example, investigations to raise the dam to improve its flood storage capacity, If so, what are they and their implications.
    - Are changes to the facilities or work practices of other organisations desirable to improve Seqwater's abilities to manage these events? If so, what are they and their implications? (For example, would it be worth funding Brisbane River crossing upgrades so that floodwater could be released faster, while not adversely affecting access to properties--or maybe alternative strategies e.g. resupply operations could be put in place to achieve similar outcomes?)
    - Given the manual's order of priorities i.e. protection of the dam etc, are any changes in the flood release strategies for either dam desirable? If so, what are they, and their implications
- Based on this review, a review of the Manual of Operational Procedures for Flood Mitigation at Wivenhoe Dam and Somerset Dam would occur utilising an expert panel of review including representatives of DERM, Seqwater, BoM, affected Local Governments and other stakeholders as necessary.

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Appendix A

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FINAL REPORT – FLOOD EVENTS AT WIVENHOE, SOMERSET AND NORTH PINE DAMS FOR FEBRUARY AND MARCH 2010

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Ministerial Briefing Note
17 January 2010
Flood Event January 2011

1. BACKGROUND INFORMATION ON WIVENHOE DAM

2. WIVENHOE DAM FLOOD MITIGATION AND FLOOD OPERATIONS

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

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

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

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

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

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

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

3.2 What is contained in the Manual?

4. REGULATORY CONTEXT

5. COMPLIANCE WITH MANUAL

6. SEQWATER REPORT

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1 BACKGROUND INFORMATION ON WIVENHOE DAM

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

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

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

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

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2 WIVENHOE DAM FLOOD MITIGATION AND FLOOD OPERATIONS

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

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

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

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

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

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

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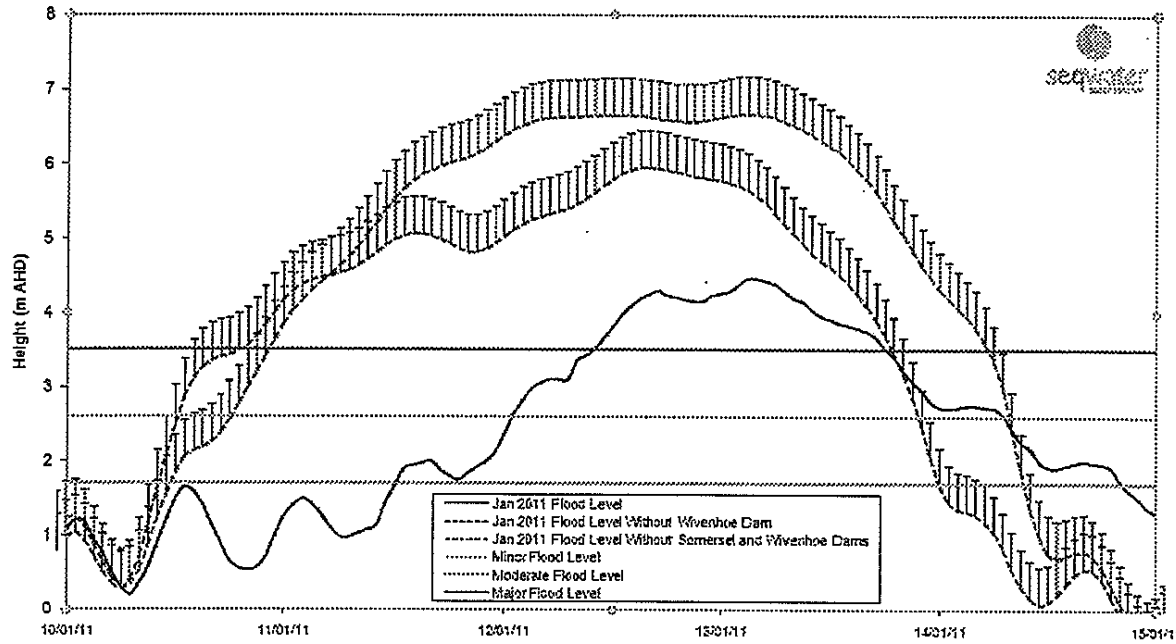
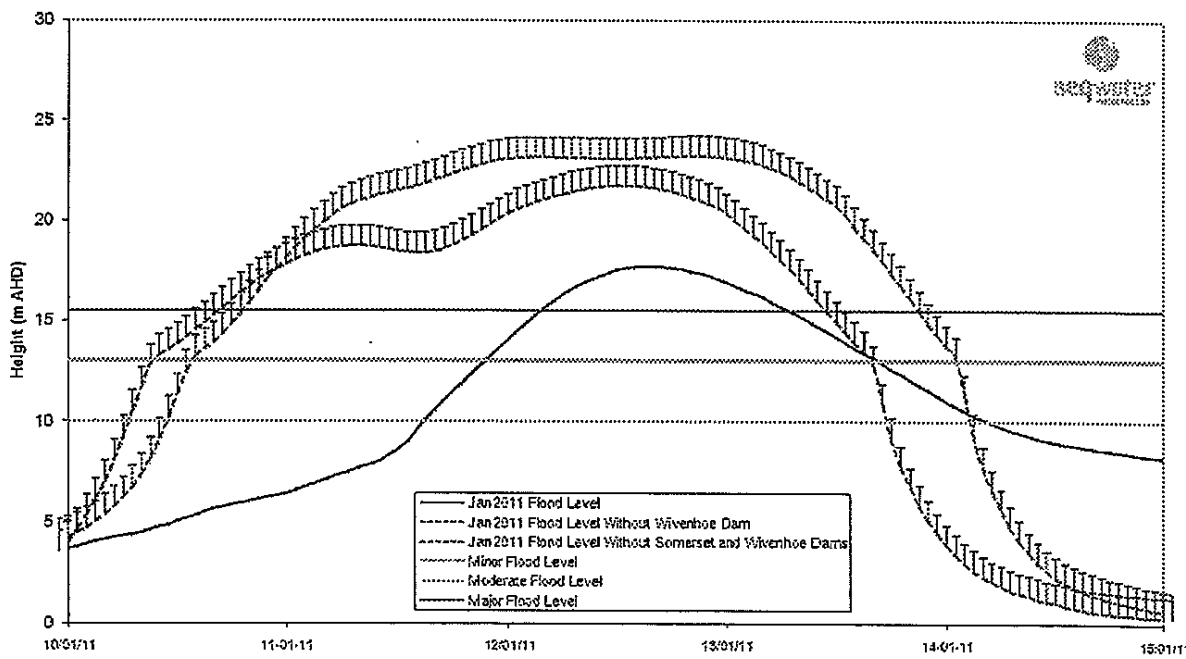
JANUARY 2011 BRISBANE FLOOD
Assessment of Flood Levels at Brisbane City



JANUARY 2011 BRISBANE FLOOD
Assessment of Flood Levels at Moggill



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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

1201 CM

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

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

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

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

3.2 What is contained in the Manual?

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

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

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

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

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

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

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4 REGULATORY CONTEXT (Provided by Peter Allen and unedited)

These are contained in the Flood Mitigation Manual (manual) approved under sections 370 to 374 of the *Water Supply (Safety and Reliability) Act 2008.* The Chief Executive Officer (CEO) of DERM (or his delegate) approves the manual, and the approval is notified in the Queensland Government Gazette. Approval can be for a period of up to five years, after which the approval needs to be renewed. There are no decision-making criteria specified in the Act for the CEO to take into account when approving the manual.

The manual for the dams requires, amongst other matters:

1. Flood operations to be conducted in accordance with manual's provisions. (There is an approval process specified in the manual, if Seqwater considers a different flood release strategy is desirable to deal with a particular flood event. This was not used in the January 2011 flood event)
2. Flood operations to be under the control of CEO-approved engineers (who are highly qualified and experienced)
3. Annual reporting on the preparedness and status of the flood control system for flood operations, and the training of the personnel who manage the flood events.
4. Reporting on the flood operations during flood events.
5. Reviews after flood events such as the January 2011 event. For this flood event, the Queensland Government engaged Mr Brian Cooper, an independent consulting engineer, to review compliance with the manual. Mr Cooper concluded (Attachment??): "...The strategies in the Flood Mitigation Manual have been followed, allowing for the discretion given to make variations in order to maximise flood mitigation effects. The actions taken and decisions made during the Flood Event appear to have been prudent and appropriate in the context of the available knowledge available to these responsible for flood operations and the way events unfolded..." (p.3 of the final report or other appropriate reference??)

The manual is separate from a draft communication protocol (Insert name) between the Local, State and Commonwealth government agencies that are affected by the dams' flood operations. This protocol is not binding on the parties to it is not subject to regulatory approval/review.

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Some DERM staff, because of their specialist skills, work in the Flood Operations Centre that Seqwater activates to manage such events. None of them are involved in any of the regulatory decisions concerning the dams or are members of the work unit (Office of the Water Supply Regulator) which undertakes the CEO's regulatory functions.

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5 COMPLIANCE WITH THE MANUAL

(To be provided)

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6 SEQWATER REPORT

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

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

1201CS

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

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

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seqwater

WATER FOR LIFE

JANUARY 2011 FLOOD EVENT

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1 INTRODUCTION

Wivenhoe Dam was constructed by the Queensland Government between 1977 and 1984. The dam is a 56 m AHD high and 2.3 kilometre long earth and rock embankment separated into two parts by a concrete gravity spillway. The spillway is controlled by 5 radial gates, each 12.0 metres wide by 16.0 m AHD high. Two saddle dam embankments are located on the left side of the reservoir.

The dam spillway capacity was upgraded in 2005. This was done primarily through the construction of a 164 metre wide secondary spillway through the right abutment of the existing dam. This spillway contains three erodible earth fill fuse plug embankments that are initiated at different dam levels in excess of EL 75.6.

The dam has two main functions by providing:

- A 1,165,000 ML storage at full supply level (FSL EL 67.0) providing an urban water supply for Brisbane and surrounding areas;
- Flood mitigation in the Brisbane River by providing a dedicated flood storage volume of 1,450,000 ML up to EL77 (this flood level was increased as part the 2005 upgrade to allow a water level of EL80m and a temporary flood storage volume of 1,966,000 ML with all fuse plugs initiated and the dam at the point of failure).

The dam has an EXTREME hazard classification under ANCOLD guidelines because of the significant development downstream in the Brisbane and Ipswich metropolitan areas, with the population at risk in the event of a dam failure numbering in the hundreds of thousands.

In accordance with the Queensland Regulatory program for dam spillway upgrades, a further upgrade of Wivenhoe Dam for dam safety reasons only is scheduled to occur prior to 2035 to enable the dam to safely pass the Probable Maximum Flood. This work will involve the reconstruction of Saddle Dam 2 as a fuse plug spillway.

Wivenhoe Dam is in excellent condition. Comprehensive Dam Safety reviews undertaken in accordance with ANCOLD guidelines have been undertaken in 1997 (Gutteridge, Haskins & Davey Pty Ltd), 2003 (Wivenhoe Alliance), 2006 (NSW Department of Commerce), 2009 (GHD) and September 2010 (Seqwater). The reports concluded that the design of the dam is in accordance with modern day standards and that there are no significant outstanding design or construction issues that require investigation.

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2 WIVENHOE DAM FLOOD MITIGATION AND FLOOD OPERATIONS

2.1 Flood Mitigation

The Brisbane River catchment covers an area of approximately 14,000 square kilometres of which about half is below Wivenhoe Dam. Maximum overall flood mitigation effect is achieved by operating Wivenhoe Dam in conjunction with Somerset Dam. Although Somerset and Wivenhoe Dam reduce flooding in Brisbane City, major flooding can still occur. The Lockyer-Laidley Valley drains into the Brisbane River through Lockyer Creek that enters the Brisbane River just downstream of Wivenhoe Dam near Lowood. Another major tributary, the Bremer River, flows into the Brisbane River at Moggill. Wivenhoe Dam has no control over inflows into the Brisbane River from both these major tributaries.

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

Therefore the basis of all flood operation decision making is to ensure the dam never fails. This is the reason that the dam's flood storage compartment would never be intentionally fully filled as additional inflows after this point would result in a dam failure. Similarly, there will be uncertainty on future rainfall that could occur which could not be releases if there was insufficient flood storage which could not be stored or released.

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

1201 CX

2.2 Flood Operations

A real time flood monitoring and forecasting system has been established in the Wivenhoe and Somerset Dam catchments. This system employs radio telemetry to collect, transmit and receive rainfall and stream flow information. The system consists of around 230 field stations that automatically record rainfall and/or river heights at selected locations in the dam catchments. Most of these field stations are owned by Seqwater with the remainder belonging to other agencies.

The rainfall and river height data is transmitted to Seqwater's Flood Operations Centre in real time. Once received in the Flood Operations Centre, the data is processed using a Real Time Flood Model (RTFM) to estimate likely dam inflows and evaluate a range of possible inflow scenarios based on forecast and recorded rainfall in the dam catchments. The RTFM is a suite of hydrologic computer programs that utilise the real time data to assist in the operation of the dams during flood events.

Seqwater engineers use the RTFM for flood monitoring and forecasting during flood events to operate the dams in accordance with a Manual of Flood Mitigation (the origin of and objectives and procedures contained in the Manual of Flood Mitigation are explained in the following section of this document). Releases of water from the dams are optimised to minimise the impacts of flooding in accordance with the objectives and procedures contained in a Manual of Flood Mitigation.

The RTFM and data collection network performed well During the January 2011 event, with no failures experienced that compromised the ability of Seqwater to operate the dam.

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3 MANUAL OF FLOOD MITIGATION FOR WIVENHOE AND SOMERSET DAMS

The Manual of Flood Mitigation for Wivenhoe and Somerset Dams, in its current form, was developed in 1992 during an extensive hydrological study of the Brisbane and Pine Rivers catchments by DPI, Water Resources. The final reports were subject to extensive internal review by the Water Resources Group before being reviewed by an independent review panel comprising Professor Colin Apelt, Head of Department, Department of Civil Engineering, University of Queensland and Mr Eric Lesleighter, Principal Hydraulic Engineer and Chief Engineer Water Resources, Snowy Mountains Engineering Corporation.

Subsequently, the Manual was extensively reviewed during the Brisbane Valley Flood Damages Minimisation Study in 2006, with the latest comprehensive review of the Manual undertaken in 2009. Both of these reviews have included expert review panels comprising key stakeholders, with the most recent review involving representatives from DERM, BOM, BCC and SunWater.

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

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

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

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

12aC2

- **Strategy W1** – Primary consideration is given to Minimising Disruption to Downstream Rural Life. Under this strategy, the predicted water level is below 68.50 m AHD and the maximum release is 1,900m3/s.

- **Strategy W2** – Transition Phase moving from Minimising Disruption to Protecting Downstream Urban Areas. Under this strategy, the water level is predicted to be between 68.5 and 74.0 m AHD and the maximum release is less than 3,500m3/s.

- **Strategy W3** – Primary consideration is to Protect of Urban Areas from Inundation. Under this strategy, the water level is predicted to be between 68.5 and 74.0 m AHD but the maximum release is less than 4,000m3/s.

- **Strategy W4** – Primary consideration is to protecting the structural safety of the Dam. Under this strategy, the water level is predicted to exceed 74.0 m AHD and there is no limit to the maximum release. Consideration is given to managing flood releases to avoid fuse plug initiation if at all possible as this would compromise flood mitigation capacity in the short to medium term.

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

1201 DA

4 JANUARY 2011 FLOOD EVENT

4.1 Background

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

EVENT	EVENT START DATE	EVENT END DATE	VOLUME RELEASED (ML)
1	13/12/2010	16/12/2010	70,000
2	17/12/2010	24/12/2010	150,000
3	26/12/2010	02/01/2010	470,000

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

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

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

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

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

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

4.2 Event Decision Making

The following table contains a summary of the key decisions points associated with the current event. As at 16 January 2011, the event remains in progress.

DATE AND TIME	FLOOD EVENT MILESTONE
07:00 06/01/2011 (Thursday)	Rainfall is experienced in the dam catchments that will result in flood releases, however Wivenhoe releases are delayed for 24 hours to allow Lockyer Creek flood flows to pass downstream and prevent the isolation of the community dependent of Burtons Bridge. The forecast is for 150mm over the next 24 hours.
15:00 07/01/2011 (Friday)	Wivenhoe releases commence, with operational strategy W1 in use. Rainfall for the next four days is estimated to be between 140mm and 300mm, with a forecast for rain easing on Tuesday 11 January 2011. All bridges downstream of the dam with the exception of Fernvale Bridge and Mt Crosby Weir Bridge are expected to be inundated for a number of days.

120 IDC

06:00 09/01/2011 (Sunday)	Moderate to heavy rain periods forecast until Tuesday, but both Wivenhoe and Somerset dam levels were falling slowly, with Somerset at 1.27 m AHD above FSL and Wivenhoe 1.58 m AHD above FSL.
15:30 09/01/2011 (Sunday)	Following significant rain during the day a meeting of Duty Engineers is held. The QPF issued at 16:00 indicates 50mm to 80mm over the next 24 hours. Based on this forecast, it is anticipated that dam levels can be held to a maximum of 3.50 m AHD above FSL in Somerset and 5.5 m AHD above FSL in Wivenhoe. However, by 19:00 it was apparent that both Fernvale Bridge and Mt Crosby Weir Bridge would be inundated by the combined dam releases and Lockyer Creek flows and that the operational strategy had progressed to W2.
06:30 10/01/2011 (Monday)	Rainfall continued during the night and based on rainfall on the ground it was apparent the operational strategy had progressed to W3.
06:30 10/01/2011 (Monday)	Rainfall continued during the day but based on rainfall on the ground, operational strategy W3 remained in use. However it was apparent that any further heavy rain would result in progression of the operational strategy to W4.
08:00 11/01/2011 (Tuesday)	Rainfall continued during the night with isolated heavy falls in the Wivenhoe Dam catchment area and based on rainfall on the ground it was apparent the operational strategy would soon progress to W4 with Wivenhoe Dam exceeding 8.00 m AHD above FSL. The objective now was to limit outflows and subsequent flood damage to urban areas, while ensuring the structural safety of the dam.
11:00 11/01/2011 (Tuesday)	Rapid inflows were experienced in Wivenhoe Dam, with the dam rising almost a metre in eight hours. Releases were increased until the dam level stabilised in accordance with Strategy W4. Computer models were not reflecting actual dam inflows due to intense point rainfalls in the immediate catchment around the dam. Falls are estimated to be similar to those experienced at both Toowoomba and Upper Lockyer the previous day and are falling outside and between existing rain gauges.
21:00 11/01/2011 (Tuesday)	Wivenhoe Dam peaked. Peak release of 7450 cumecs with a level of 0.7 metres below fuse plug trigger.
22:00 11/01/2011	Wivenhoe Dam releases were closed off as quickly as possible over the

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(Tuesday)	next 11 hours, while ensuring water levels in the dam did not rise further and initiate a fuse plug embankment.
08:00 12/01/2011 (Wednesday)	Minimum possible release level reached, with inflows matching outflows. Further reductions in release rate would likely cause the dam level to rise.
21:00 13/01/2011 (Thursday)	The 7 day dam drain down is commenced as Lockyer Creek and Bremer River peaks pass the Lower Brisbane area. Maximum release target is the limit of damaging floods in Brisbane being 3500 cumecs.
09:00 17/01/2011 (Monday)	Drain down continues, with released expected to cease on Wednesday 19 January 2011 unless further rainfall is experienced.

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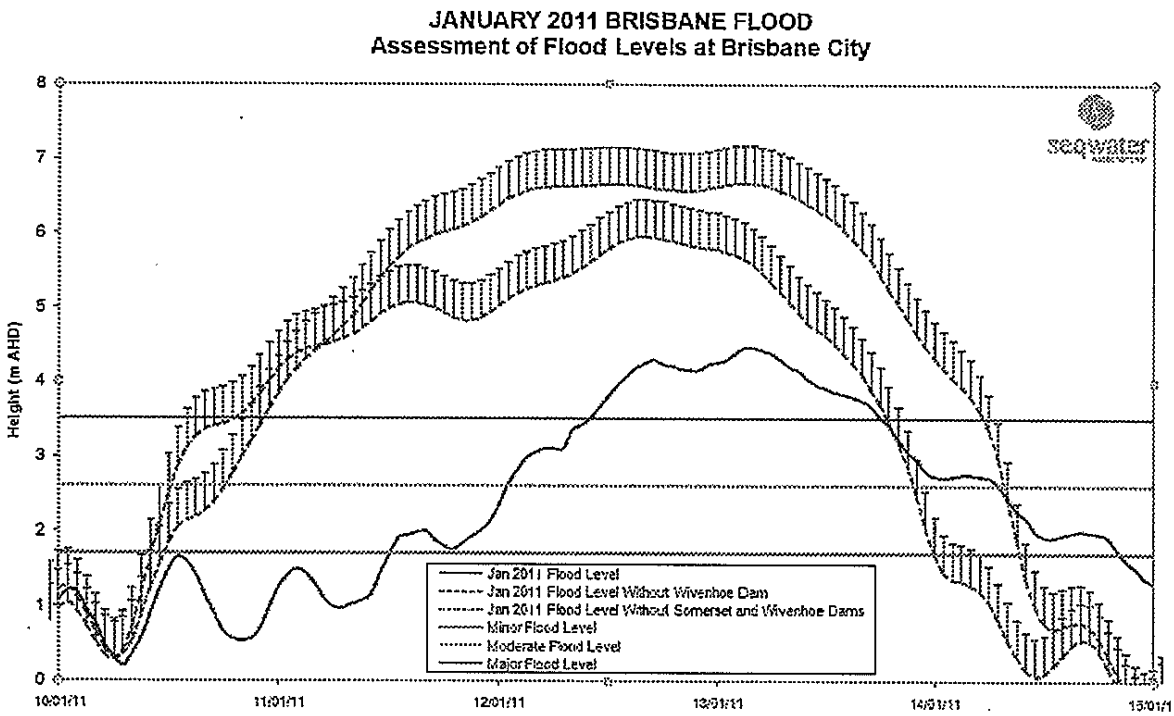
4.3 Flood Mitigation Benefits of Wivenhoe Dam

The following graphs demonstrate the significant benefits of Wivenhoe Dam in mitigating the current flood event, with reductions in flood peak of up to 2.5 metres in the City area and up to 5.5 metres in the Moggill area further upstream.

This equates to significant reduction in the potential for loss of life as well as saving in damages in the order of up to $1.6 billion based on current damage curves. Up to 13,000 more properties would have been impacted by the event without the Dam.

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



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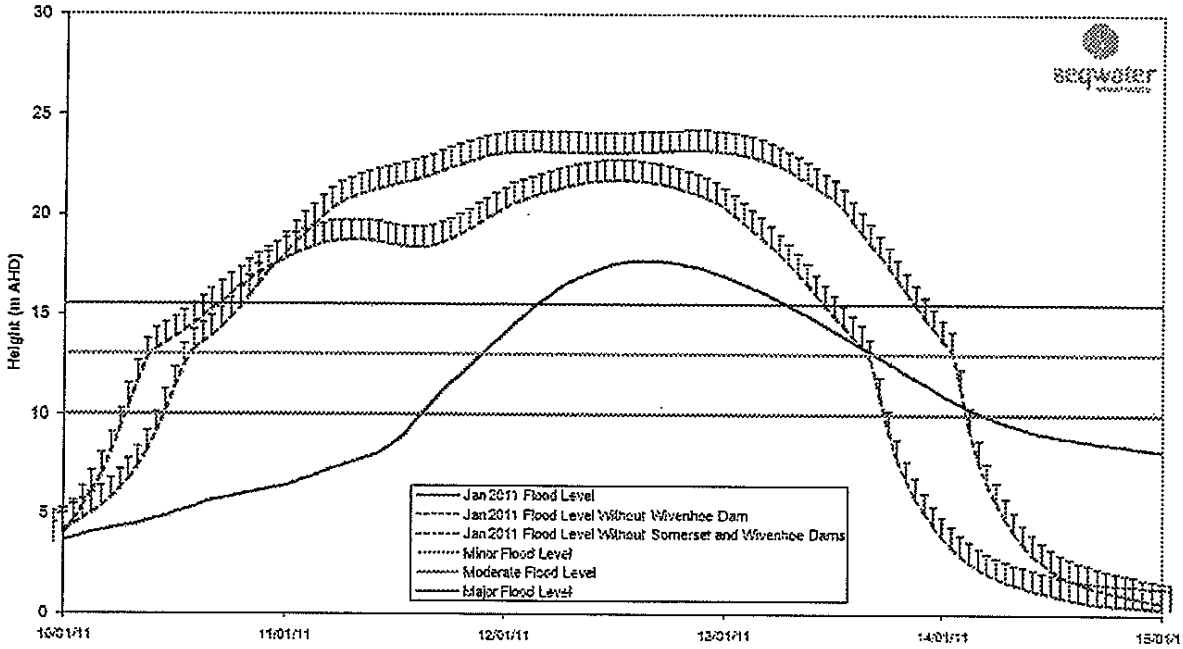
JANUARY 2011 BRISBANE FLOOD
Assessment of Flood Levels at Moggill



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

This notion is supported by BOM.

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5 EVENT REVIEW

Under the Manual of Operational Procedures for Flood Mitigation at Wivenhoe Dam and Somerset Dam that are approved and gazetted by the Department of Environment and Resource Management, there is a regulatory requirement that a report must be prepared as per the below wording:

"Seqwater must prepare a report after each Flood Event. The report must contain details of the procedures used, the reasons therefore and other pertinent information. Seqwater must forward the report to the Chief Executive within six weeks of the completion of the Flood Event."

Such a report was prepared for the flood events of February and March 2010 and copies are available. A copy of the Table of Contents of that report is included as Appendix 1. For this event, the report would be a comprehensive summary of all procedures, actions, outcomes and processes during the event.

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

- In the short term, utilise this report attached to this briefing note as the basis for communications and discussion.
- Prepare any Interim Reports as agreed to provide information and input as required.
- Seqwater prepare a Comprehensive Report as per the existing regulatory requirements of the Act and the gazetted manual and any requirements of the Dam Safety Regulator. This would be done within 6 weeks of the closure of the current event as per the manual. This timeframe is subject to any new mobilisation of the Flood Operations Centre. The Table of Contents would include:
    - Introduction
    - Flood Event Summary
    - Mobilisation and Staffing
    - Event Rainfall
    - Inflow and Release Details
    - Data Collection System Performance
    - Data Analysis Performance
    - Communication
    - Flood Management Strategies and Manual Compliance
    - Improvements in data collection systems, practices and processes.
    - improvements by interacting agencies

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- Review of factors impacting on the protection of urban areas
- Recommendations & Conclusions

- The report would then be reviewed by the Dam Safety Regulator in conjunction with any peer review they require. The review should cover:
  - Were the provisions of the manual complied with?
  - What improvements to either facilities e.g. stream gauges, or work practices, are desirable to improve Sewater's ability to predict inflows into the dams.
  - Are improvements to either Seqwater's facilities or work practices desirable to improve Seqwater's ability to manage events? For example, investigations to raise the dam to improve its flood storage capacity, If so, what are they and their implications.
  - Are changes to the facilities or work practices of other organisations desirable to improve Seqwater's abilities to manage these events?
  - whether it is worth investigating increasing the flood capacity of Wivenhoe
  - whether the Brisbane River crossings which act, under some situations as a constraint on the releases from Wivenhoe, should be replaced by bridges. For example if the smallest could pass , for example, 2,500 cumecs, then this could enable higher releases under some circumstances.
  - Whether the policy of draining the flood compartment within 7 days should be modified.
  - Given the manual's order of priorities i.e. protection of the dam etc, are any changes in the flood release strategies for either dam desirable? If so, what are they, and their implications
- Based on this review, a review of the Manual of Operational Procedures for Flood Mitigation at Wivenhoe Dam and Somerset Dam would occur utilising an expert panel of review including representatives of DERM, Seqwater, BoM, affected Local Governments and other stakeholders as necessary.

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Appendix A

1201DK

FINAL REPORT – FLOOD EVENTS AT WIVENHOE, SOMERSET AND NORTH PINE DAMS FOR FEBRUARY AND MARCH 2010

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1201DN

From: Barry Dennien <Barry.Dennien[redacted]>
Sent: Sunday, January 16, 2011 9:39 PM
To: Elaina Smouha <elainami[redacted]
Subject: Fwd: Cabinet in co nfidence - Ministerial brief outline
Attach: WGM Brief with replies.docx; ATT00001.htm; WGM Report with replies.docx; ATT00002.htm; Ministerial Briefing Note January 17 2011 Final Draft for distribution.doc; ATT00003.htm; Jan 2011 Flood Event_Ver 1_draft for distribution.docx; ATT00004.htm

---

Regards
Barry Dennien

Begin forwarded message:

From: "Peter Borrows" <pborrows[redacted]
To: "Barry Dennien" <Barry.Dennien[redacted]
Cc: "Peter Borrows" <pborrows[redacted]>, "Rob Drury" <rdrury[redacted]>, "Duty Seq" <dutysec[redacted]
Subject: Fw: Cabinet in co nfidence - Ministerial brief outline

Barry, a lot of the extra questions will have to be picked up after the event in an interim or final report.

Sorry it has taken so long.

I think everyone is taking longer now.

Peter

From: Rob Drury
To: Peter Borrows
Cc: John Tibaldi; Paul Bird
Sent: Sun Jan 16 21:20:33 2011
Subject: FW: Cabinet in co nfidence - Ministerial brief outline

Peter,

? Below is a reply to Bob covering most of his comments. Some have been included in the updated Brief and Report and others explained.

? Attached is an updated copy of the Report and the Brief with some minor changes. Most changes are in the fuse plugs and the Report section at the end

? Copies of the WGM comments named appropriately with our comments in red as to whether we made changes or reasons why we didn□t. if we said reasons why we couldn□t, we did not change the brief or Report in that area.

Rob

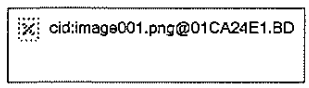
Robert Drury

Dam Operations Manager

Water Delivery

Queensland Bulk Water Supply Authority *trading as* Seqwater





[redacted] E rdrury[redacted]

Wivenhoe Dam, Brisbane Valley Highway, via Fernvale Q4306 Australia
PO Box 37, Fernvale QLD 4306

Website | www.seqwater.com.au

From: Peter Borrows
Sent: Sunday, 16 January 2011 6:06 PM
To: Rob Drury
Cc: John Tibaldi; Paul Bird; Jim Pruss; Peter Borrows
Subject: Fw: Cabinet in co nfidence - Ministerial brief outline

Have a look.

I'll call in a while. You'll have to get input from John T I think.

From: Kathy Reilly <threereillys[redacted]>
To: Reilly Bob <Bob.Reilly[redacted]>; Peter Borrows; john.bradley[redacted]
<john.bradley[redacted]; barry.dennien[redacted]<barry.dennien[redacted]
dan.spiller[redacted]<dan.spiller[redacted]; peter.allen[redacted]
<peter.allen[redacted]
Sent: Sun Jan 16 17:59:36 2011
Subject: Re: Cabinet in co nfidence - Ministerial brief outline

Hi Peter

Peter Allen will provide you with some technical commentary, so I will concentrate on the wider issues. In the interests of time, I have not checked my comments with Peter Allen so he and your staff can feel to correct me if I have got my facts wrong.

Dam failure versus fuse plug activation

In the current event, the critical issue we were trying to avoid was activation of the fuse plugs, with the first one being activated at (I recall) 75.6 metres--not sure what this was in terms of percentage of capacity. As well as the adverse impacts of such activation cited in the text, the practical effect would also have been to increase, I understand, flood heights by about 0.5 metres in Brisbane. So, we had to avoid this outcome. (Also what the 0.5 metres been worth in terms of avoided property damage?)

This is not necessarily correct, the main reasons are as per the document rather than a 0.5m increase as we could shut

down gates, although this again increases the levels to make up for the fuse plug flow.

Personally, I would emphasise more the arguments around what we had to do to avoid this outcome.

Reducing the peak flood in brisbane--last paragarph p.3

This is an important point. However the argument would be strengthened if you more comprehensively explained the reasoning behind the statement. For example, are we saying that because seqwater reduced the flow from 6,000 cumecs to 2,500 cumecs, then this was the outcome, and that the only reason we could do that was because we were still 0.5 metres or so below fuse plug activation (and thus had a buffer if there was an unexpected surge in inflows?) We really did this because we managed to stop the increase in the dam rising. Did try to cover this in the report.

Also what is the 1 metre worth in terms of reduced property damage?Haven□t been able to quantify this yet.

Section 2.4

Playing the devil's advocate for a moment with respect to the table on p.7, could someone convincingly argue that if the starting level had been 50% of FSL, you would have had the ability to reduce the releases from Wivenhoe below 2,500 cumecs at the height of the flood event, and thus further reduce the peak height in Brisbane /Ipswich?

Possibly, but at no stage had 50% reduction in Wivenhoe been seriously canvassed by Govt nor could we have probably got to 50% after every event.

Seqwater report (p.13)

The specific additional issues that I suggest we include are:

- whether it is worth investigating increasing the flood capacity of Wivenhoe--I know a fair bit of work has been done on this issue
- whether the Brisbane River crossings which act, under some situations as a constraint on the releases from Wivenhoe, should be replaced by bridges. For example if the smallest could pass , for example, 2,500 cumecs, then this could enable higher releases under some circumstances.
- Whether the policy of draining the flood compartment within 7 days should be modified.

Included in report.

I also suggest the review be undertaken by an independent expert and that an expert panel be formed to provide review of the report and identification of any additional issues requiring investigation--this is important if you are picking up possibel improvement by otehr agencies.

Left out of report as a decision not by Seqwater.

Minor points.

- throughout the text can we be clear what we mean by the term "failure"--to the Minister I suspect this means the dam will collapse and I do not think this is what meant in some cases.
- the spillway upgrade in 2035 is not intended to improve flood mitgation capacity, I understand (p.2)
- the first few paragraphs in section 2.1 refer to the sceanrio where Wivenhoe did not exist--could this be made clearer in the text?
- Finally, could we make the point that Wivenhoe/Somerset does not control Lockyer/Bremer and that the flood flow at

the river peak was compromised of x % from these sources. In the last few days, I have explained to many people around Milton/Auchenflower (where there was significant flooding) this point and they are always surprised. There appears to be a strong view in the community that Wivenhoe was supposed to stop any repetition of the 1974 flood and therefore it "failed" in this task given what has happened.

Most of these comments included but we cannot split up what source contributes what levels downstream without serious analysis of the whole system. Best estimate the BoM came up with was 50% but that was just an estimate however we agree.

Bob

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

From: Reilly Bob

To: threereillys[redacted]

Sent: Sunday, January 16, 2011 4:33 PM

Subject: Fw: Cabinet in co nfidence - Ministerial brief outline

----- Original Message -----
From: Peter Borrows <pborrows[redacted]>
To: Reilly Bob; Rob Drury <rdrury[redacted]>; Duty Seq <dutyseq[redacted]>; Bradley John; Dennien Barry[redacted] SEQWGM; spiller daniel[redacted]
Cc: Lyons Michael[redacted]; Mike Foster <mfoster[redacted]>; Elaina Smouha <elainamin[redacted]>; Allen Peter
Sent: Sun Jan 16 16:28:29 2011
Subject: Cabinet in co nfidence - Ministerial brief outline

Please see attached draft with attachment.

In relation to the draft contents outline sent yesterday, the following is a cross reference FYI.

The attached Ministerial Briefing Note addresses the questions contained in the Ministerial Information Request as follows:

1) Design of Dam □ Storages/Spillway upgrade

Refer Section 1

2) □The Flood Event□ □ Q&A

a. Chronology - High level time step of events and significant decision making/changes □ more detailed time step information for Tuesday afternoon (i.e. what was the BOM forecast at the time, narrow peak etc.)

Refer Section 2.5

b. How does Wivenhoe Dam work as a flood mitigator?

Refer Sections 2.1, 2.3 and 3.1

c. What are the factors being balanced when making decisions about the amount of dam releases? To what extent does information from the Bureau of Meteorology/rain gauges influence decisions? How reliable is this information?

Refer Sections 3.1 and 3.2

d. Statistics on how much did Wivenhoe Dam knock off the flood peak.

Refer Section 2.1

e. What would have happened if Wivenhoe Dam had not been built and we only had Somerset Dam? What damage would have been caused compared to what has currently been experienced (damage statistics)?

Refer Sections 2.1 and 2.2

f. If we have undertaken pre-emptive dam releases to bring Wivenhoe Dam□s full supply level down to lower than what we had maintained (i.e. 60%), what would have been the river height for the period that this flood event occurred?

Refer Section 2.4

g. If pre-emptive dam releases would not have made a difference, why? (i.e. why did we not release earlier?)

Refer Section 2.4

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

Refer Section 2.2

i. What is the fuse plug and why did it need to be maintained?

Refer Section 2.3

j. What damage or town isolation occurred during the Wivenhoe Dam releases that occurred since October 2010?

Refer Section 2.4

k. Did Seqwater have time to reduce the dam level between the 5 events? If so, would it have made a difference to this flood event?

Refer Section 2.4

3) The Flood Mitigation Manual

Refer Section 3.1

a. Describe the decision making framework - Four strategies

Refer Section 3.2

b. How is the Manual designed to work?

Refer Section 3.2

c. History of Flood Mitigation Manual updates and peer review □ who was on the panels, studies that fed into previous versions of the Manual and who was involved in these studies?

Refer Section 3.1

4) Regulatory context - Water Supply (Safety and Reliability) Act 2008 (Information provider: Peter Allen - DERM)

Refer Section 4

Regards, Peter.

Peter Borrows

Chief Executive Officer

Queensland Bulk Water Supply Authority trading as Seqwater

[redacted] E pborrows[redacted]

[redacted]Margaret St, Brisbane City QLD 4000
PO Box 16146, City East QLD 4002

Website | www.seqwater.com.au <http://www.seqwater.com.au/>

From: Elaina Smouha [mailto:elainamin[redacted]
Sent: Saturday, 15 January 2011 5:03 PM
To: Mike Foster; peter.aller[redacted]; bob.reilly[redacted]; Peter Borrows; Rob Drury; Duty Seq
Cc: john.bradley[redacted] barry.dennie[redacted]; daniel.spiller[redacted]
michael.lyons[redacted]; Elaina Smouha
Subject: Cabinet in confidence - Ministerial brief outline

Dear All

To assist, attached is a Ministerial brief outline as per our recent teleconference, for Monday's Emergency Cabinet meeting. It also records those who will be providing information for the Background and Flood Mitigation Manual report process.

As discussed, the brief needs to be provided to Minister Robertson tomorrow (Sunday, 16 January 2011).

Regards

Elaina

Elaina Smouha

Director, Governance and Regulatory Compliance

SEQ Water Grid Manager

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Ministerial Briefing Note

17 January 2010

Flood Event January 2011

1. BACKGROUND INFORMATION ON WIVENHOE DAM

2. WIVENHOE DAM FLOOD MITIGATION AND FLOOD OPERATIONS

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

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

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

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

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

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

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

3.2 What is contained in the Manual?

4. REGULATORY CONTEXT

5. COMPLIANCE WITH MANUAL

6. SEQWATER REPORT

1 BACKGROUND INFORMATION ON WIVENHOE DAM

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

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

In accordance with the Queensland Regulatory program for dam spillway upgrades, a further upgrade of Wivenhoe Dam is scheduled to occur prior to 2035. Would it have made any difference to the current flood event?

Was it relevant to this event i e any di? Would water have been released through it? Would the Flood Mitigation Manual decision levels changed?
Such an upgrade is only for dam security for PMF not flood mitigation. Changed some wording to reflect this.

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

2 WIVENHOE DAM FLOOD MITIGATION AND FLOOD OPERATIONS

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

The following graphs demonstrate the significant benefits of Wivenhoe Dam in mitigating the current flood event, with reductions in flood peak of up to 2.5 metres in the City area and up to 5.5 metres in the Moggill area further upstream.

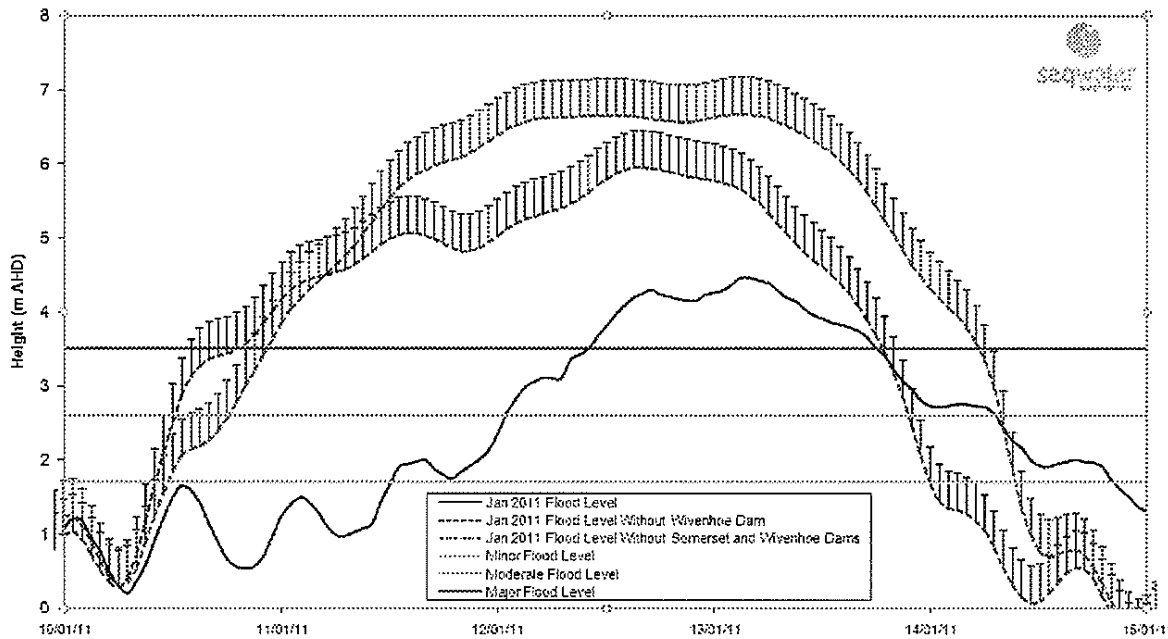
This equates to significant reduction in the potential for loss of life as well as saving in damages in the order of up to $1.6 billion based on current damage curves. Up to 13,000 more properties would have been impacted by the event without the Dam. (Source: Flood Damage Tables provided to Seqwater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

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

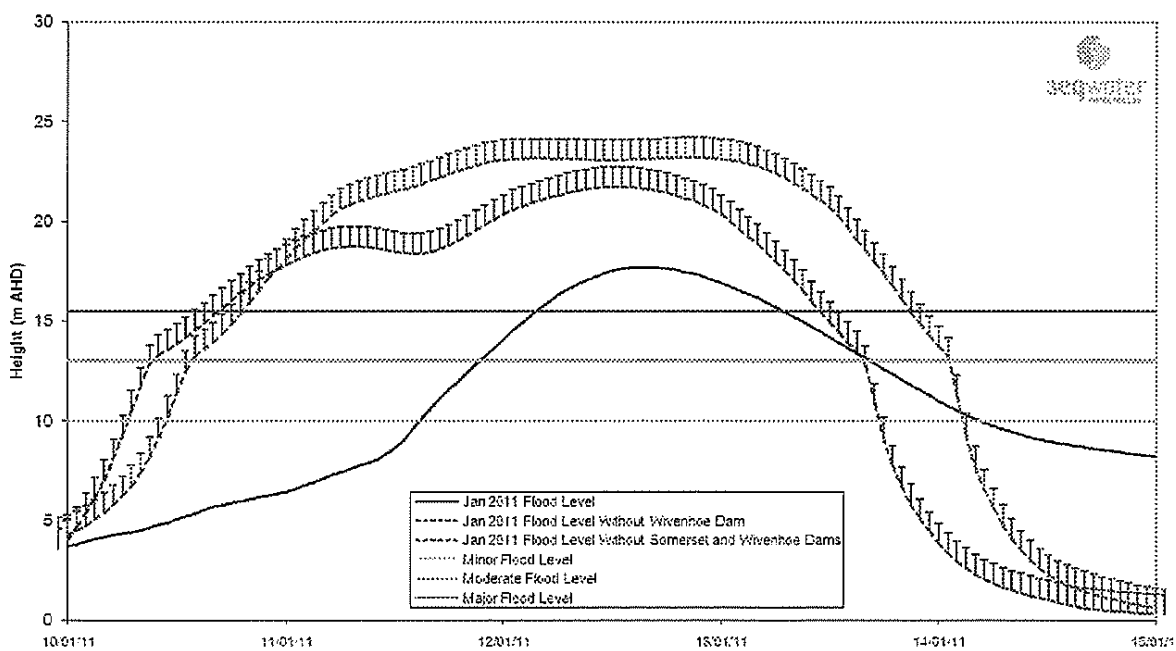
Depending on the nature of the event, the presence of Wivenhoe Dam could also potentially increase flood warning times to impacted areas. How these times may have been increased during the current event is presently difficult to quantify, but discussions will be held with BOM on this issue at a later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

In addition, the strategy adopted to quickly close off releases once the peak in the dam had been reached and rain stopped falling certainly reduced the predicted flood peak by at least one metre in the lower Brisbane River area.

JANUARY 2011 BRISBANE FLOOD
Assessment of Flood Levels at Brisbane City



JANUARY 2011 BRISBANE FLOOD
Assessment of Flood Levels at Moggill



Blue line of graph – Breakdown the component of % of Wivenhoe Dam release and downstream inflows. Seqwater will undertake this work with the BoM but will take some time.

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

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

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

Why didn't we let the first fuse plug go? Why not 200%? Why not 205%? Dam is rock core etc. See below reasons for not allowing fuse plugs to go.

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

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

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

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

Detail specific impacts – which bridges knocked out, how long people isolated, which towns impacted, how many people impacted?This will take quite some time to collate even in terms of times bridges are out, we are still in the middle of a release. Numbers of people will come from council but these details cannot be collated at the moment. Will attempt to do in the next week or so during meetings planned with Councils over the next few weeks.

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

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

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

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

achieved resulted in significant water level reductions downstream and this is difficult to model accurately.

What are the assumptions in terms of the releases at different levels?Don't fully understand, can address at a leter date.

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

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

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

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

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

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

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

Can we attach CV of experts? Note Colin Apelt chaired the Brisbane Flood Study and chairs the current Brisbane Flood taskforce Not available at the moment and would not be the CV when he was involved in 1992.

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

3.2 What is contained in the Manual?

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

- Ensure the structural safety of the dams;
- Provide optimum protection of urbanised areas from inundation;

- Minimise disruption to rural life in the valleys of the Brisbane and Stanley Rivers primarily, this involves minimising inundation of the seven bridges below the dam upstream of Moggill);
- Retain the storage at Full Supply Level at the conclusion of the Flood Event.
- Minimise impacts to riparian flora and fauna during the drain down phase of the Flood Event.

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

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

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

4 REGULATORY CONTEXT (Provided by Peter Allen and unedited)

These are contained in the Flood Mitigation Manual (manual) approved under sections 370 to 374 of the *Water Supply (Safety and Reliability) Act 2008.* The Chief Executive Officer (CEO) of DERM (or his delegate) approves the manual, and the approval is notified in the Queensland Government Gazette. Approval can be for a period of up to five years, after which the approval needs to be renewed. There are no decision-making criteria specified in the Act for the CEO to take into account when approving the manual.

The manual for the dams requires, amongst other matters:

1. Flood operations to be conducted in accordance with manual's provisions. (There is an approval process specified in the manual, if Seqwater considers a different flood release strategy is desirable to deal with a particular flood event. This was not used in the January 2011 flood event)
2. Flood operations to be under the control of CEO-approved engineers (who are highly qualified and experienced)
3. Annual reporting on the preparedness and status of the flood control system for flood operations, and the training of the personnel who manage the flood events.
4. Reporting on the flood operations during flood events.
5. Reviews after flood events such as the January 2011 event. For this flood event, the Queensland Government engaged Mr Brian Cooper, an independent consulting engineer, to review compliance with the manual. Mr Cooper concluded (Attachment??): "...The strategies in the Flood Mitigation Manual have been followed, allowing for the discretion given to make variations in order to maximise flood mitigation effects. The actions taken and decisions made during the Flood Event appear to have been prudent and appropriate in the context of the available knowledge available to these responsible for flood operations and the way events unfolded..." (p.3 of the final report or other appropriate reference??)

See Peter Allen

The manual is separate from a draft communication protocol (Insert name) between the Local, State and Commonwealth government agencies that are affected by the dams' flood operations. This protocol is not binding on the parties to it is not subject to regulatory approval/review.

Some DERM staff, because of their specialist skills, work in the Flood Operations Centre that Seqwater activates to manage such events. None of them are involved in any of the regulatory decisions concerning the dams or are members of the work unit (Office of the Water Supply Regulator) which undertakes the CEO's regulatory functions.

5 COMPLIANCE WITH THE MANUAL

(To be provided)

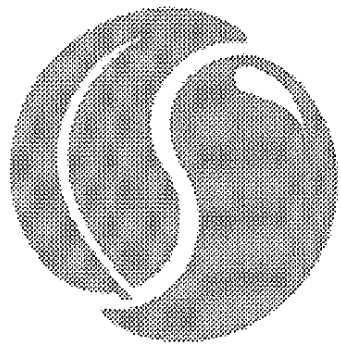
6 SEQWATER REPORT

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

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

- Are changes to the facilities or work practices of other organisations desirable to improve Seqwater's abilities to manage these events? If so, what are they and their implications? (For example, would it be worth funding Brisbane River crossing upgrades so that floodwater could be released faster, while not adversely affecting access to properties--or maybe alternative strategies e.g. resupply operations could be put in place to achieve similar outcomes?)
- Given the manual's order of priorities i.e. protection of the dam etc, are any changes in the flood release strategies for either dam desirable? If so, what are they, and their implications

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



seqwater

WATER FOR LIFE

JANUARY 2011 FLOOD EVENT

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1 INTRODUCTION

Wivenhoe Dam was constructed by the Queensland Government between 1977 and 1984. The dam is a 56 m AHD high and 2.3 kilometre long earth and rock embankment separated into two parts by a concrete gravity spillway. The spillway is controlled by 5 radial gates, each 12.0 metres wide by 16.0 m AHD high. Two saddle dam embankments are located on the left side of the reservoir.

The dam spillway capacity was upgraded in 2005. This was done primarily through the construction of a 164 metre wide secondary spillway through the right abutment of the existing dam. This spillway contains three erodible earth fill fuse plug embankments that are initiated at different dam levels in excess of EL 75.6.

The dam has two main functions by providing:

- A 1,165,000 ML storage at full supply level (FSL EL 67.0) providing an urban water supply for Brisbane and surrounding areas;
- Flood mitigation in the Brisbane River by providing a dedicated flood storage volume of 1,450,000 ML up to EL77 (this flood level was increased as part the 2005 upgrade to allow a water level of EL80m and a temporary flood storage volume of 1,966,000 ML with all fuse plugs initiated and the dam at the point of failure).

The dam has an EXTREME hazard classification under ANCOLD guidelines because of the significant development downstream in the Brisbane and Ipswich metropolitan areas, with the population at risk in the event of a dam failure numbering in the hundreds of thousands.

In accordance with the Queensland Regulatory program for dam spillway upgrades, a further upgrade of Wivenhoe Dam is scheduled to occur prior to 2035 to enable the dam to safely pass the Probable Maximum Flood. This work will involve the reconstruction of Saddle Dam 2 as a fuse plug spillway.

Wivenhoe Dam is in excellent condition. Comprehensive Dam Safety reviews undertaken in accordance with ANCOLD guidelines have been undertaken in 1997 (Gutteridge, Haskins & Davey Pty Ltd), 2003 (Wivenhoe Alliance), 2006 (NSW Department of Commerce), 2009 (GHD) and September 2010 (Seqwater). The reports concluded that the design of the dam is in accordance with modern day standards and that there are no significant outstanding design or construction issues that require investigation.

2 WIVENHOE DAM FLOOD MITIGATION AND FLOOD OPERATIONS

2.1 Flood Mitigation

The Brisbane River catchment covers an area of approximately 14,000 square kilometres of which about half is below Wivenhoe Dam. Maximum overall flood mitigation effect is achieved by operating Wivenhoe Dam in conjunction with Somerset Dam. Although Somerset and Wivenhoe Dam reduce flooding in Brisbane City, major flooding can still occur. The Lockyer-Laidley Valley drains into the Brisbane River through Lockyer Creek that enters the Brisbane River just downstream of Wivenhoe Dam near Lowood. Another major tributary, the Bremer River, flows into the Brisbane River at Moggill. Wivenhoe Dam has no control over inflows into the Brisbane River from both these major tributaries.

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

Therefore the basis of all flood operation decision making is to ensure the dam never fails. This is the reason that the dam's flood storage compartment would never be intentionally fully filled as additional inflows after this point would result in a dam failure. Similarly, there will be uncertainty on future rainfall that could occur which could not be releases if there was insufficient flood storage which could not be stored or released.

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

2.2 Flood Operations

A real time flood monitoring and forecasting system has been established in the Wivenhoe and Somerset Dam catchments. This system employs radio telemetry to collect, transmit and receive rainfall and stream flow information. The system consists of around 230 field stations that automatically record rainfall and/or river heights at selected locations in the dam catchments. Most of these field stations are owned by Seqwater with the remainder belonging to other agencies.

The rainfall and river height data is transmitted to Seqwater's Flood Operations Centre in real time. Once received in the Flood Operations Centre, the data is processed using a Real Time Flood Model (RTFM) to estimate likely dam inflows and evaluate a range of possible inflow scenarios based on forecast and recorded rainfall in the dam catchments. The RTFM is a suite of hydrologic computer programs that utilise the real time data to assist in the operation of the dams during flood events.

Seqwater engineers use the RTFM for flood monitoring and forecasting during flood events to operate the dams in accordance with a Manual of Flood Mitigation (the origin of and objectives and procedures contained in the Manual of Flood Mitigation are explained in the following section of this document). Releases of water from the dams are optimised to minimise the impacts of flooding in accordance with the objectives and procedures contained in a Manual of Flood Mitigation.

The RTFM and data collection network performed well During the January 2011 event, with no failures experienced that compromised the ability of Seqwater to operate the dam.
Inconsistent with statement on page 8?No, **in general the system worked well, the fact that a high intensity event could happen where we do not have stations can occur regardless of how many you have, it could happen over the lake and the only way to really monitor is lake rise.**

3 MANUAL OF FLOOD MITIGATION FOR WIVENHOE AND SOMERSET DAMS

The Manual of Flood Mitigation for Wivenhoe and Somerset Dams, in its current form, was developed in 1992 during an extensive hydrological study of the Brisbane and Pine Rivers catchments by DPI, Water Resources. The final reports were subject to extensive internal review by the Water Resources Group before being reviewed by an independent review panel comprising Professor Colin Apelt, Head of Department, Department of Civil Engineering, University of Queensland and Mr Eric Lesleighter, Principal Hydraulic Engineer and Chief Engineer Water Resources, Snowy Mountains Engineering Corporation.

Subsequently, the Manual was extensively reviewed during the Brisbane Valley Flood Damages Minimisation Study in 2006, with the latest comprehensive review of the Manual undertaken in 2009. Both of these reviews have included expert review panels comprising key stakeholders, with the most recent review involving representatives from DERM, BOM, BCC and SunWater.

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

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

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

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

- **Strategy W1** – Primary consideration is given to Minimising Disruption to Downstream Rural Life. Under this strategy, the predicted water level is below 68.50 m AHD and the maximum release is 1,900m3/s.

- **Strategy W2** – Transition Phase moving from Minimising Disruption to Protecting Downstream Urban Areas. Under this strategy, the water level is predicted to be between 68.5 and 74.0 m AHD and the maximum release is less than 3,500m3/s. River flows at Moggill? Not releases? True, but we have just inserted straight from the manual rather than add too much detail, but it is true that there is a relationship to Moggill.

- **Strategy W3** – Primary consideration is to Protect of Urban Areas from Inundation. Under this strategy, the water level is predicted to be between 68.5 and 74.0 m AHD but the maximum release is less than 4,000m3/s. River flows at Moggill? Not releases? True, but we have just inserted straight from the manual rather than add too much detail, but it is true that there is a relationship to Moggill.

- **Strategy W4** – Primary consideration is to protecting the structural safety of the Dam. Under this strategy, the water level is predicted to exceed 74.0 m AHD and there is no limit to the maximum release. Consideration is given to managing flood releases to avoid fuse plug initiation if at all possible as this would compromise flood mitigation capacity in the short to medium term.

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

4 JANUARY 2011 FLOOD EVENT

4.1 Background

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

EVENT	EVENT START DATE	EVENT END DATE	VOLUME RELEASED (ML)
1	13/12/2010	16/12/2010	70,000
2	17/12/2010	24/12/2010	150,000 Should this be 370,000 as per teleconference?
3	26/12/2010	02/01/2010	470,000

Leave as 150,000 as we believe this is correct, will confirm if 350,000 was based on some other numbers.

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

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

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

The specific impact on the Lower Brisbane River of these reduced dam levels requires the use of a complex hydraulic model. The results of this modelling would still contain a degree of uncertainty as illustrated by the difficulties in estimating the final flood peak in Brisbane during the event. This

is because the rapid closure of the gates after peak inflow was achieved resulted in significant water level reductions downstream and this is difficult to model accurately.

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

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

Assumptions for model?The model was developed by the Expert Panel as part of the Manual review in 2009, we did not include this in the report as we should check with the panel first.

Is it a dual or triple peak? Should we explain in detail why is it so unique?**It is a dual peak, we have removed unique as all are unique.**

4.2 Event Decision Making

The following table contains a summary of the key decisions points associated with the current event. As at 16 January 2011, the event remains in progress.

Weather forecasts were consistently less than actual. Emphasise reliance on BOM advice. Need to specify BOM forecasts and actual rainfall experienced for each time step.

We will need to do significant investigation into this and discussions with the BoM before we make any claims regarding forecast accuracy. The BoM issues a variety of forecasts both qualitative and quantitative.

DATE AND TIME	FLOOD EVENT MILESTONE
07:00 06/01/2011 (Thursday)	Rainfall is experienced in the dam catchments that will result in flood releases, however Wivenhoe releases are delayed for 24 hours to allow Lockyer Creek flood flows to pass downstream and prevent the isolation of the community dependent of Burtons Bridge. The forecast is for 150mm

	over the next 24 hours.
15:00 07/01/2011 (Friday)	Wivenhoe releases commence, with operational strategy W1 in use. Rainfall for the next four days is estimated to be between 140mm and 300mm, with a forecast for rain easing on Tuesday 11 January 2011. All bridges downstream of the dam with the exception of Fernvale Bridge and Mt Crosby Weir Bridge are expected to be inundated for a number of days.

06:00 09/01/2011 (Sunday)	Moderate to heavy rain periods forecast until Tuesday, but both Wivenhoe and Somerset dam levels were falling slowly, with Somerset at 1.27 m AHD above FSL and Wivenhoe 1.58 m AHD above FSL.
15:30 09/01/2011 (Sunday)	Following significant rain during the day a meeting of Duty Engineers is held. The QPF issued at 16:00 indicates 50mm to 80mm over the next 24 hours. Based on this forecast, it is anticipated that dam levels can be held to a maximum of 3.50 m AHD above FSL in Somerset and 5.5 m AHD above FSL in Wivenhoe. However, by 19:00 it was apparent that both Fernvale Bridge and Mt Crosby Weir Bridge would be inundated by the combined dam releases and Lockyer Creek flows and that the operational strategy had progressed to W2.
06:30 10/01/2011 (Monday)	Rainfall continued during the night and based on rainfall on the ground it was apparent the operational strategy had progressed to W3.
06:30 10/01/2011 (Monday)	Rainfall continued during the day but based on rainfall on the ground, operational strategy W3 remained in use. However it was apparent that any further heavy rain would result in progression of the operational strategy to W4.
08:00 11/01/2011 (Tuesday)	Rainfall continued during the night with isolated heavy falls in the Wivenhoe Dam catchment area and based on rainfall on the ground it was apparent the operational strategy would soon progress to W4 with Wivenhoe Dam exceeding 8.00 m AHD above FSL. The objective now was to limit outflows and subsequent flood damage to urban areas, while ensuring the structural safety of the dam.
11:00 11/01/2011 (Tuesday)	Rapid inflows were experienced in Wivenhoe Dam, with the dam rising almost a metre in eight hours. Releases were increased until the dam level stabilised in accordance with Strategy W4. Computer models were not reflecting actual dam inflows due to intense point rainfalls in the immediate catchment around the dam. Falls are estimated to be similar to those experienced at both Toowoomba and Upper Lockyer the previous day and are falling outside and between existing rain gauges.
21:00 11/01/2011 (Tuesday)	Wivenhoe Dam peaked. Peak release of 7450 cumecs with a level of 0.7 metres below fuse plug trigger.
22:00 11/01/2011	Wivenhoe Dam releases were closed off as quickly as possible over the

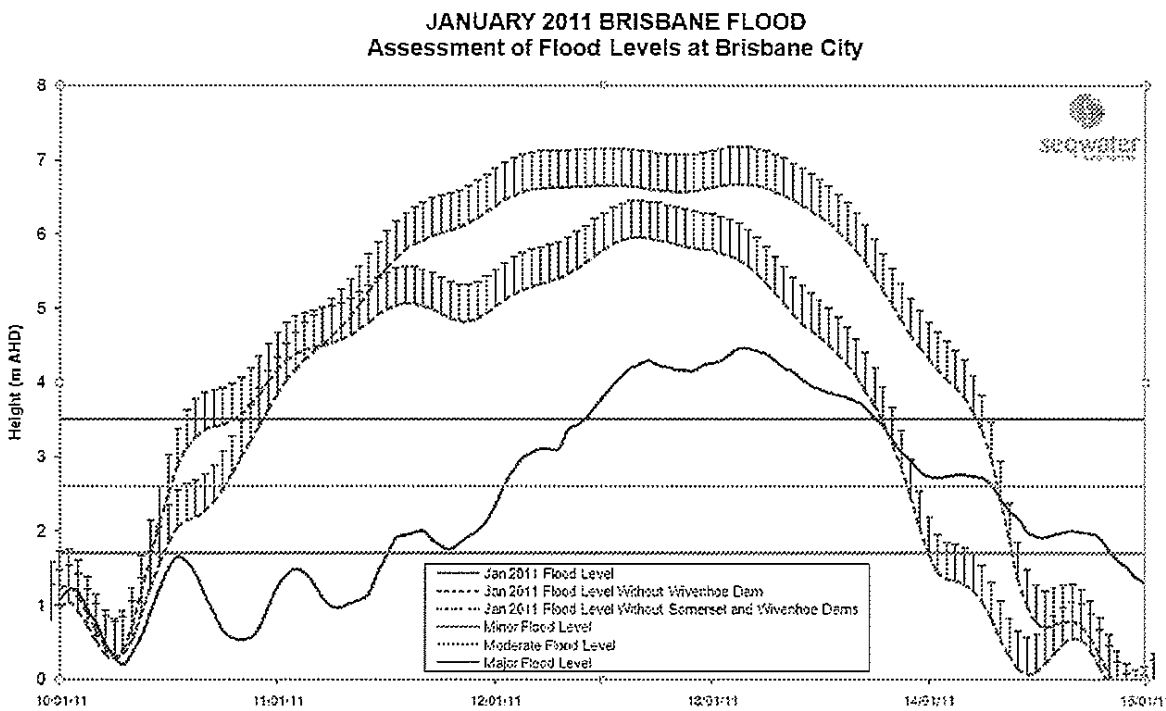
(Tuesday)	next 11 hours, while ensuring water levels in the dam did not rise further and initiate a fuse plug embankment.
08:00 12/01/2011 (Wednesday)	Minimum possible release level reached, with inflows matching outflows. Further reductions in release rate would likely cause the dam level to rise.
21:00 13/01/2011 (Thursday)	The 7 day dam drain down is commenced as Lockyer Creek and Bremer River peaks pass the Lower Brisbane area. Maximum release target is the limit of damaging floods in Brisbane being 3500 cumecs.
09:00 17/01/2011 (Monday)	Drain down continues, with released expected to cease on Wednesday 19 January 2011 unless further rainfall is experienced.

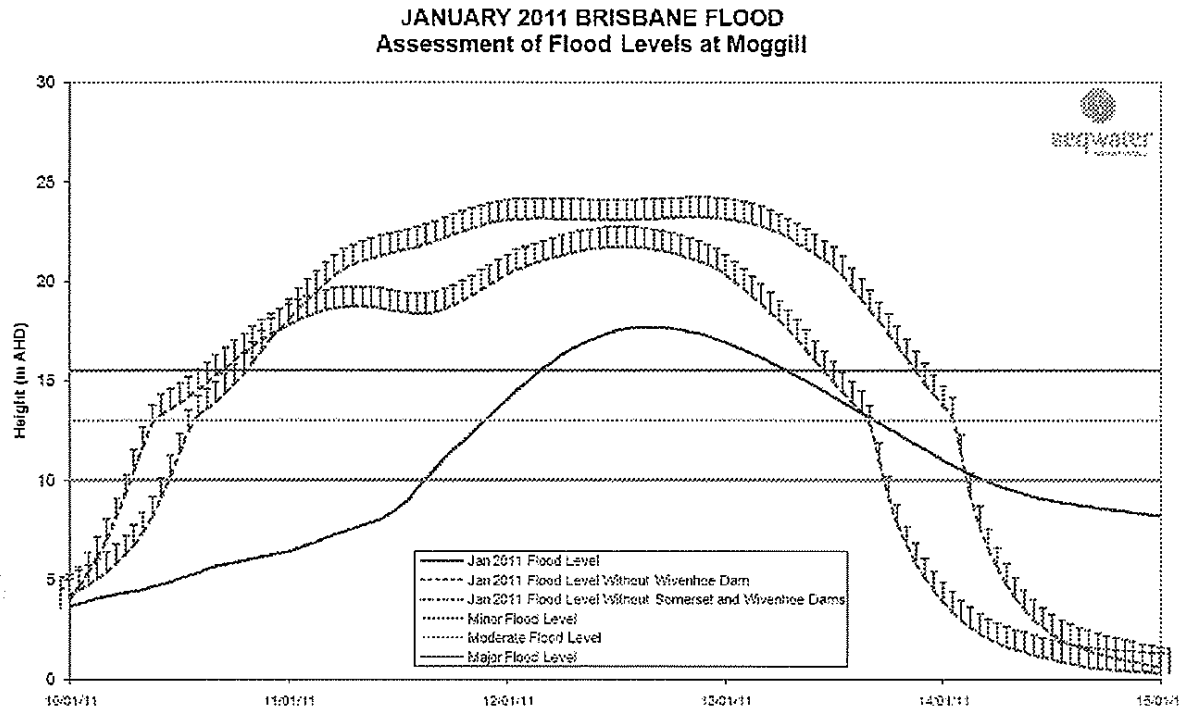
4.3 Flood Mitigation Benefits of Wivenhoe Dam

The following graphs demonstrate the significant benefits of Wivenhoe Dam in mitigating the current flood event, with reductions in flood peak of up to 2.5 metres in the City area and up to 5.5 metres in the Moggill area further upstream.

This equates to significant reduction in the potential for loss of life as well as saving in damages in the order of up to $1.6 billion based on current damage curves. Up to 13,000 more properties would have been impacted by the event without the Dam.

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





The strategy adopted to quickly close off releases once the peak in the dam had been reached and rain stopped falling certainly reduced the predicted flood peak by at least one metre in the lower Brisbane River area. This notion is supported by BOM.

Blue line of graph – Breakdown the component of % of Wivenhoe Dam release and downstream inflows. As per briefing note comment.

5 EVENT REVIEW

Under the Manual of Operational Procedures for Flood Mitigation at Wivenhoe Dam and Somerset Dam that are approved and gazetted by the Department of Environment and Resource Management, there is a regulatory requirement that a report must be prepared as per the below wording:

"Seqwater must prepare a report after each Flood Event. The report must contain details of the procedures used, the reasons therefore and other pertinent information. Seqwater must forward the report to the Chief Executive within six weeks of the completion of the Flood Event."

Such a report was prepared for the flood events of February and March 2010 and copies are available. A copy of the Table of Contents of that report is included as Appendix 1. For this event, the report would be a comprehensive summary of all procedures, actions, outcomes and processes during the event.

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

- In the short term, utilise this report attached to this briefing note as the basis for communications and discussion.
- Prepare any Interim Reports as agreed to provide information and input as required.
- Seqwater prepare a Comprehensive Report as per the existing regulatory requirements of the Act and the gazetted manual and any requirements of the Dam Safety Regulator. This would be done within 6 weeks of the closure of the current event as per the manual. This timeframe is subject to any new mobilisation of the Flood Operations Centre. The Table of Contents would include:
    - Introduction
    - Flood Event Summary
    - Mobilisation and Staffing
    - Event Rainfall
    - Inflow and Release Details
    - Data Collection System Performance
    - Data Analysis Performance
    - Communication
    - Flood Management Strategies and Manual Compliance
    - Improvements in data collection systems, practices and processes.
    - improvements by interacting agencies

- Review of factors impacting on the protection of urban areas
- Recommendations & Conclusions

- The report would then be reviewed by the Dam Safety Regulator in conjunction with any peer review they require. The review should cover:
  - Were the provisions of the manual complied with?
  - What improvements to either facilities e.g. stream gauges, or work practices, are desirable to improve Sewater's ability to predict inflows into the dams.
  - Are improvements to either Seqwater's facilities or work practices desirable to improve Seqwater's ability to manage events? For example, investigations to raise the dam to improve its flood storage capacity, If so, what are they and their implications.
  - Are changes to the facilities or work practices of other organisations desirable to improve Seqwater's abilities to manage these events? If so, what are they and their implications? (For example, would it be worth funding Brisbane River crossing upgrades so that floodwater could be released faster, while not adversely affecting access to properties--or maybe alternative strategies e.g. resupply operations could be put in place to achieve similar outcomes?)
  - Given the manual's order of priorities i.e. protection of the dam etc, are any changes in the flood release strategies for either dam desirable? If so, what are they, and their implications
- Based on this review, a review of the Manual of Operational Procedures for Flood Mitigation at Wivenhoe Dam and Somerset Dam would occur utilising an expert panel of review including representatives of DERM, Seqwater, BoM, affected Local Governments and other stakeholders as necessary.

Appendix A

FINAL REPORT – FLOOD EVENTS AT WIVENHOE, SOMERSET AND NORTH PINE DAMS FOR FEBRUARY AND MARCH 2010

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Ministerial Briefing Note

17 January 2010

Flood Event January 2011

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2. WIVENHOE DAM FLOOD MITIGATION AND FLOOD OPERATIONS

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

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

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

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

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

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

3.2 What is contained in the Manual?

4. REGULATORY CONTEXT

5. COMPLIANCE WITH MANUAL

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1 BACKGROUND INFORMATION ON WIVENHOE DAM

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

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

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

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

2 WIVENHOE DAM FLOOD MITIGATION AND FLOOD OPERATIONS

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

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

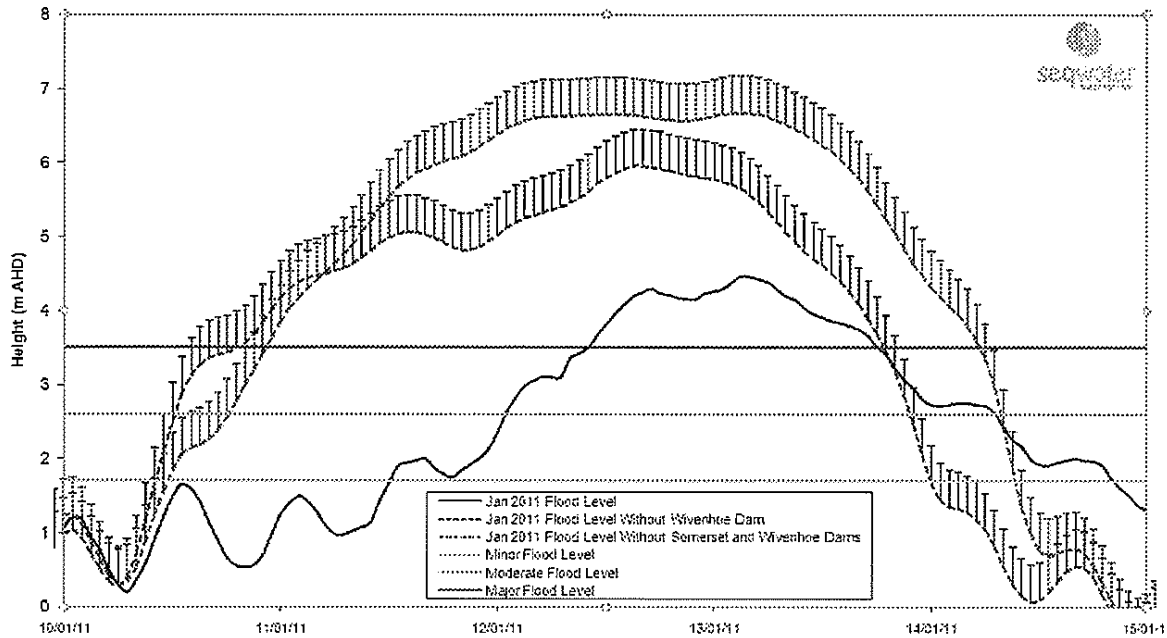
This equates to significant reduction in the potential for loss of life as well as saving in damages in the order of up to $1.6 billion based on current damage curves. Up to 13,000 more properties would have been impacted by the event without the Dam. (Source: Flood Damage Tables provided to Seqwater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

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

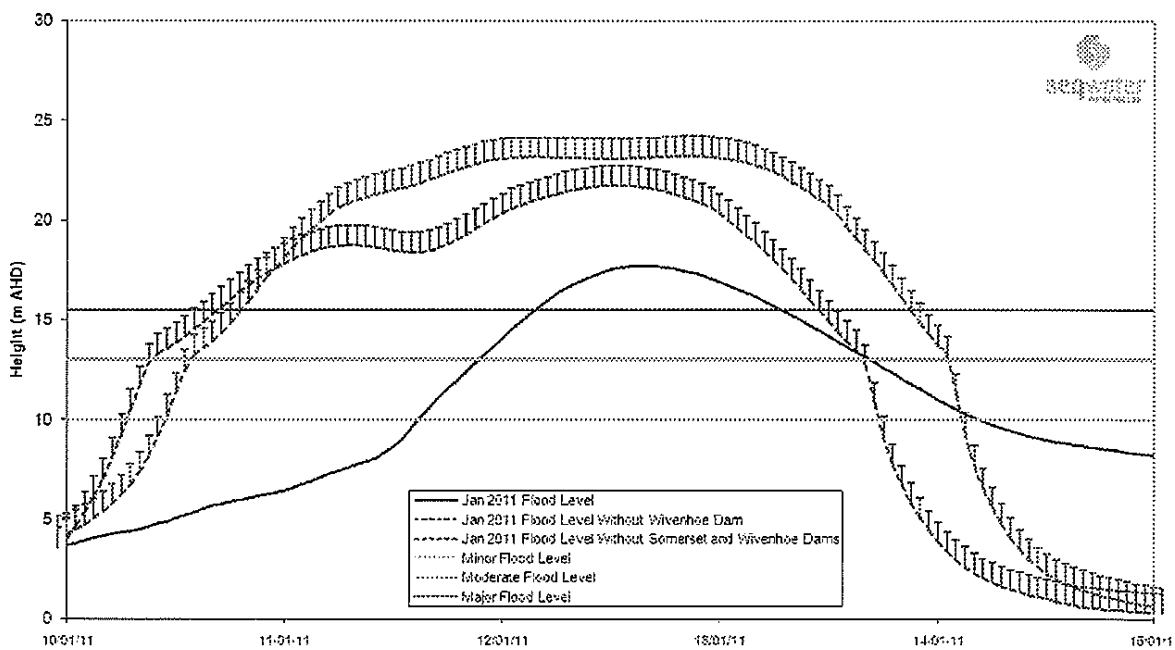
Depending on the nature of the event, the presence of Wivenhoe Dam could also potentially increase flood warning times to impacted areas. How these times may have been increased during the current event is presently difficult to quantify, but discussions will be held with BOM on this issue at a later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

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

JANUARY 2011 BRISBANE FLOOD
Assessment of Flood Levels at Brisbane City



JANUARY 2011 BRISBANE FLOOD
Assessment of Flood Levels at Moggill



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

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

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

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

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

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

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

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

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

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

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

JANUARY 2011 FLOOD			
Starting Level		Peak Height	Capacity
%	m AHD	m AHD	%
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It should be noted that the possible reductions shown above are based up a unique dual peaked flood hydrograph with a volume of about 2,600,000 ML which occurred during this event. A hydrograph with the same volume but a different distribution could result in a significantly lower reduction in peak water levels.
Flood operations at the dam are also highly dependent upon the flood inflow volume and a slight variation in the flood volume could significantly reduce the benefits associated with draining down the dam prior to a flood event.

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

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

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

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

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

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

3.2 What is contained in the Manual?

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

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

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

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

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

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

4 REGULATORY CONTEXT (Provided by Peter Allen and unedited)

These are contained in the Flood Mitigation Manual (manual) approved under sections 370 to 374 of the *Water Supply (Safety and Reliability) Act 2008.* The Chief Executive Officer (CEO) of DERM (or his delegate) approves the manual, and the approval is notified in the Queensland Government Gazette. Approval can be for a period of up to five years, after which the approval needs to be renewed. There are no decision-making criteria specified in the Act for the CEO to take into account when approving the manual.

The manual for the dams requires, amongst other matters:

1. Flood operations to be conducted in accordance with manual's provisions. (There is an approval process specified in the manual, if Seqwater considers a different flood release strategy is desirable to deal with a particular flood event. This was not used in the January 2011 flood event)
2. Flood operations to be under the control of CEO-approved engineers (who are highly qualified and experienced)
3. Annual reporting on the preparedness and status of the flood control system for flood operations, and the training of the personnel who manage the flood events.
4. Reporting on the flood operations during flood events.
5. Reviews after flood events such as the January 2011 event. For this flood event, the Queensland Government engaged Mr Brian Cooper, an independent consulting engineer, to review compliance with the manual. Mr Cooper concluded (Attachment??): "...The strategies in the Flood Mitigation Manual have been followed, allowing for the discretion given to make variations in order to maximise flood mitigation effects. The actions taken and decisions made during the Flood Event appear to have been prudent and appropriate in the context of the available knowledge available to these responsible for flood operations and the way events unfolded..." (p.3 of the final report or other appropriate reference??)

The manual is separate from a draft communication protocol (Insert name) between the Local, State and Commonwealth government agencies that are affected by the dams' flood operations. This protocol is not binding on the parties to it is not subject to regulatory approval/review.

Some DERM staff, because of their specialist skills, work in the Flood Operations Centre that Seqwater activates to manage such events. None of them are involved in any of the regulatory decisions concerning the dams or are members of the work unit (Office of the Water Supply Regulator) which undertakes the CEO's regulatory functions.

5 COMPLIANCE WITH THE MANUAL

(To be provided)

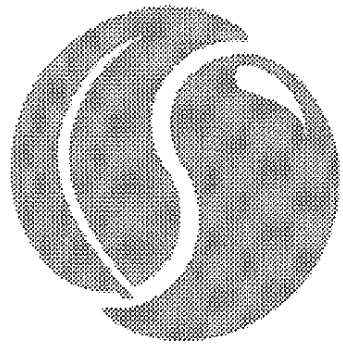
6 SEQWATER REPORT

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

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

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

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



seqwater

WATER FOR LIFE

JANUARY 2011 FLOOD EVENT

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1 INTRODUCTION

Wivenhoe Dam was constructed by the Queensland Government between 1977 and 1984. The dam is a 56 m AHD high and 2.3 kilometre long earth and rock embankment separated into two parts by a concrete gravity spillway. The spillway is controlled by 5 radial gates, each 12.0 metres wide by 16.0 m AHD high. Two saddle dam embankments are located on the left side of the reservoir.

The dam spillway capacity was upgraded in 2005. This was done primarily through the construction of a 164 metre wide secondary spillway through the right abutment of the existing dam. This spillway contains three erodible earth fill fuse plug embankments that are initiated at different dam levels in excess of EL 75.6.

The dam has two main functions by providing:

- A 1,165,000 ML storage at full supply level (FSL EL 67.0) providing an urban water supply for Brisbane and surrounding areas;
- Flood mitigation in the Brisbane River by providing a dedicated flood storage volume of 1,450,000 ML up to EL77 (this flood level was increased as part the 2005 upgrade to allow a water level of EL80m and a temporary flood storage volume of 1,966,000 ML with all fuse plugs initiated and the dam at the point of failure).

The dam has an EXTREME hazard classification under ANCOLD guidelines because of the significant development downstream in the Brisbane and Ipswich metropolitan areas, with the population at risk in the event of a dam failure numbering in the hundreds of thousands.

In accordance with the Queensland Regulatory program for dam spillway upgrades, a further upgrade of Wivenhoe Dam for dam safety reasons only is scheduled to occur prior to 2035 to enable the dam to safely pass the Probable Maximum Flood. This work will involve the reconstruction of Saddle Dam 2 as a fuse plug spillway.

Wivenhoe Dam is in excellent condition. Comprehensive Dam Safety reviews undertaken in accordance with ANCOLD guidelines have been undertaken in 1997 (Gutteridge, Haskins & Davey Pty Ltd), 2003 (Wivenhoe Alliance), 2006 (NSW Department of Commerce), 2009 (GHD) and September 2010 (Seqwater). The reports concluded that the design of the dam is in accordance with modern day standards and that there are no significant outstanding design or construction issues that require investigation.

2 WIVENHOE DAM FLOOD MITIGATION AND FLOOD OPERATIONS

2.1 Flood Mitigation

The Brisbane River catchment covers an area of approximately 14,000 square kilometres of which about half is below Wivenhoe Dam. Maximum overall flood mitigation effect is achieved by operating Wivenhoe Dam in conjunction with Somerset Dam. Although Somerset and Wivenhoe Dam reduce flooding in Brisbane City, major flooding can still occur. The Lockyer-Laidley Valley drains into the Brisbane River through Lockyer Creek that enters the Brisbane River just downstream of Wivenhoe Dam near Lowood. Another major tributary, the Bremer River, flows into the Brisbane River at Moggill. Wivenhoe Dam has no control over inflows into the Brisbane River from both these major tributaries.

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

Therefore the basis of all flood operation decision making is to ensure the dam never fails. This is the reason that the dam's flood storage compartment would never be intentionally fully filled as additional inflows after this point would result in a dam failure. Similarly, there will be uncertainty on future rainfall that could occur which could not be releases if there was insufficient flood storage which could not be stored or released.

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

2.2 Flood Operations

A real time flood monitoring and forecasting system has been established in the Wivenhoe and Somerset Dam catchments. This system employs radio telemetry to collect, transmit and receive rainfall and stream flow information. The system consists of around 230 field stations that automatically record rainfall and/or river heights at selected locations in the dam catchments. Most of these field stations are owned by Seqwater with the remainder belonging to other agencies.

The rainfall and river height data is transmitted to Seqwater's Flood Operations Centre in real time. Once received in the Flood Operations Centre, the data is processed using a Real Time Flood Model (RTFM) to estimate likely dam inflows and evaluate a range of possible inflow scenarios based on forecast and recorded rainfall in the dam catchments. The RTFM is a suite of hydrologic computer programs that utilise the real time data to assist in the operation of the dams during flood events.

Seqwater engineers use the RTFM for flood monitoring and forecasting during flood events to operate the dams in accordance with a Manual of Flood Mitigation (the origin of and objectives and procedures contained in the Manual of Flood Mitigation are explained in the following section of this document). Releases of water from the dams are optimised to minimise the impacts of flooding in accordance with the objectives and procedures contained in a Manual of Flood Mitigation.

The RTFM and data collection network performed well During the January 2011 event, with no failures experienced that compromised the ability of Seqwater to operate the dam.

3 MANUAL OF FLOOD MITIGATION FOR WIVENHOE AND SOMERSET DAMS

The Manual of Flood Mitigation for Wivenhoe and Somerset Dams, in its current form, was developed in 1992 during an extensive hydrological study of the Brisbane and Pine Rivers catchments by DPI, Water Resources. The final reports were subject to extensive internal review by the Water Resources Group before being reviewed by an independent review panel comprising Professor Colin Apelt, Head of Department, Department of Civil Engineering, University of Queensland and Mr Eric Lesleighter, Principal Hydraulic Engineer and Chief Engineer Water Resources, Snowy Mountains Engineering Corporation.

Subsequently, the Manual was extensively reviewed during the Brisbane Valley Flood Damages Minimisation Study in 2006, with the latest comprehensive review of the Manual undertaken in 2009. Both of these reviews have included expert review panels comprising key stakeholders, with the most recent review involving representatives from DERM, BOM, BCC and SunWater.

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

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

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

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

- **Strategy W1** – Primary consideration is given to Minimising Disruption to Downstream Rural Life. Under this strategy, the predicted water level is below 68.50 m AHD and the maximum release is 1,900m3/s.

- **Strategy W2** – Transition Phase moving from Minimising Disruption to Protecting Downstream Urban Areas. Under this strategy, the water level is predicted to be between 68.5 and 74.0 m AHD and the maximum release is less than 3,500m3/s.

- **Strategy W3** – Primary consideration is to Protect of Urban Areas from Inundation. Under this strategy, the water level is predicted to be between 68.5 and 74.0 m AHD but the maximum release is less than 4,000m3/s.

- **Strategy W4** – Primary consideration is to protecting the structural safety of the Dam. Under this strategy, the water level is predicted to exceed 74.0 m AHD and there is no limit to the maximum release. Consideration is given to managing flood releases to avoid fuse plug initiation if at all possible as this would compromise flood mitigation capacity in the short to medium term.

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

4 JANUARY 2011 FLOOD EVENT

4.1 Background

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

EVENT	EVENT START DATE	EVENT END DATE	VOLUME RELEASED (ML)
1	13/12/2010	16/12/2010	70,000
2	17/12/2010	24/12/2010	150,000
3	26/12/2010	02/01/2010	470,000

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

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

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

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

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

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

4.2 Event Decision Making

The following table contains a summary of the key decisions points associated with the current event. As at 16 January 2011, the event remains in progress.

DATE AND TIME	FLOOD EVENT MILESTONE
07:00 06/01/2011 (Thursday)	Rainfall is experienced in the dam catchments that will result in flood releases, however Wivenhoe releases are delayed for 24 hours to allow Lockyer Creek flood flows to pass downstream and prevent the isolation of the community dependent of Burtons Bridge. The forecast is for 150mm over the next 24 hours.
15:00 07/01/2011 (Friday)	Wivenhoe releases commence, with operational strategy W1 in use. Rainfall for the next four days is estimated to be between 140mm and 300mm, with a forecast for rain easing on Tuesday 11 January 2011. All bridges downstream of the dam with the exception of Fernvale Bridge and Mt Crosby Weir Bridge are expected to be inundated for a number of days.

06:00 09/01/2011 (Sunday)	Moderate to heavy rain periods forecast until Tuesday, but both Wivenhoe and Somerset dam levels were falling slowly, with Somerset at 1.27 m AHD above FSL and Wivenhoe 1.58 m AHD above FSL.
15:30 09/01/2011 (Sunday)	Following significant rain during the day a meeting of Duty Engineers is held. The QPF issued at 16:00 indicates 50mm to 80mm over the next 24 hours. Based on this forecast, it is anticipated that dam levels can be held to a maximum of 3.50 m AHD above FSL in Somerset and 5.5 m AHD above FSL in Wivenhoe. However, by 19:00 it was apparent that both Fernvale Bridge and Mt Crosby Weir Bridge would be inundated by the combined dam releases and Lockyer Creek flows and that the operational strategy had progressed to W2.
06:30 10/01/2011 (Monday)	Rainfall continued during the night and based on rainfall on the ground it was apparent the operational strategy had progressed to W3.
06:30 10/01/2011 (Monday)	Rainfall continued during the day but based on rainfall on the ground, operational strategy W3 remained in use. However it was apparent that any further heavy rain would result in progression of the operational strategy to W4.
08:00 11/01/2011 (Tuesday)	Rainfall continued during the night with isolated heavy falls in the Wivenhoe Dam catchment area and based on rainfall on the ground it was apparent the operational strategy would soon progress to W4 with Wivenhoe Dam exceeding 8.00 m AHD above FSL. The objective now was to limit outflows and subsequent flood damage to urban areas, while ensuring the structural safety of the dam.
11:00 11/01/2011 (Tuesday)	Rapid inflows were experienced in Wivenhoe Dam, with the dam rising almost a metre in eight hours. Releases were increased until the dam level stabilised in accordance with Strategy W4. Computer models were not reflecting actual dam inflows due to intense point rainfalls in the immediate catchment around the dam. Falls are estimated to be similar to those experienced at both Toowoomba and Upper Lockyer the previous day and are falling outside and between existing rain gauges.
21:00 11/01/2011 (Tuesday)	Wivenhoe Dam peaked. Peak release of 7450 cumecs with a level of 0.7 metres below fuse plug trigger.
22:00 11/01/2011	Wivenhoe Dam releases were closed off as quickly as possible over the

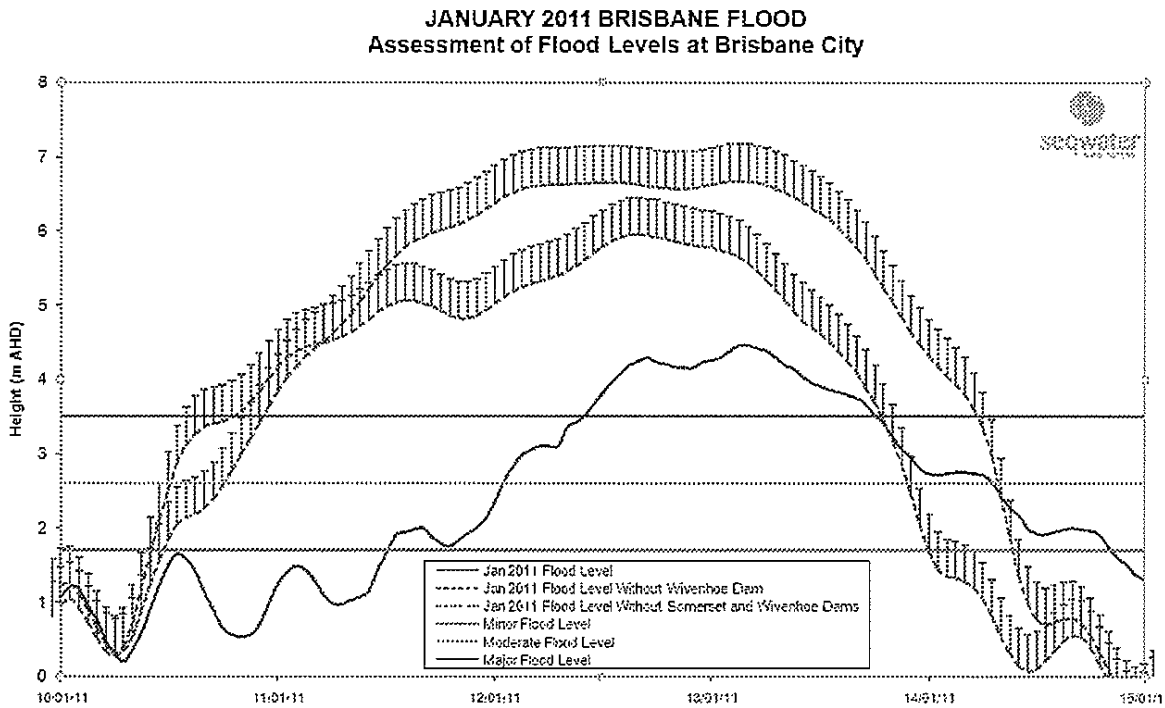
(Tuesday)	next 11 hours, while ensuring water levels in the dam did not rise further and initiate a fuse plug embankment.
08:00 12/01/2011 (Wednesday)	Minimum possible release level reached, with inflows matching outflows. Further reductions in release rate would likely cause the dam level to rise.
21:00 13/01/2011 (Thursday)	The 7 day dam drain down is commenced as Lockyer Creek and Bremer River peaks pass the Lower Brisbane area. Maximum release target is the limit of damaging floods in Brisbane being 3500 cumecs.
09:00 17/01/2011 (Monday)	Drain down continues, with released expected to cease on Wednesday 19 January 2011 unless further rainfall is experienced.

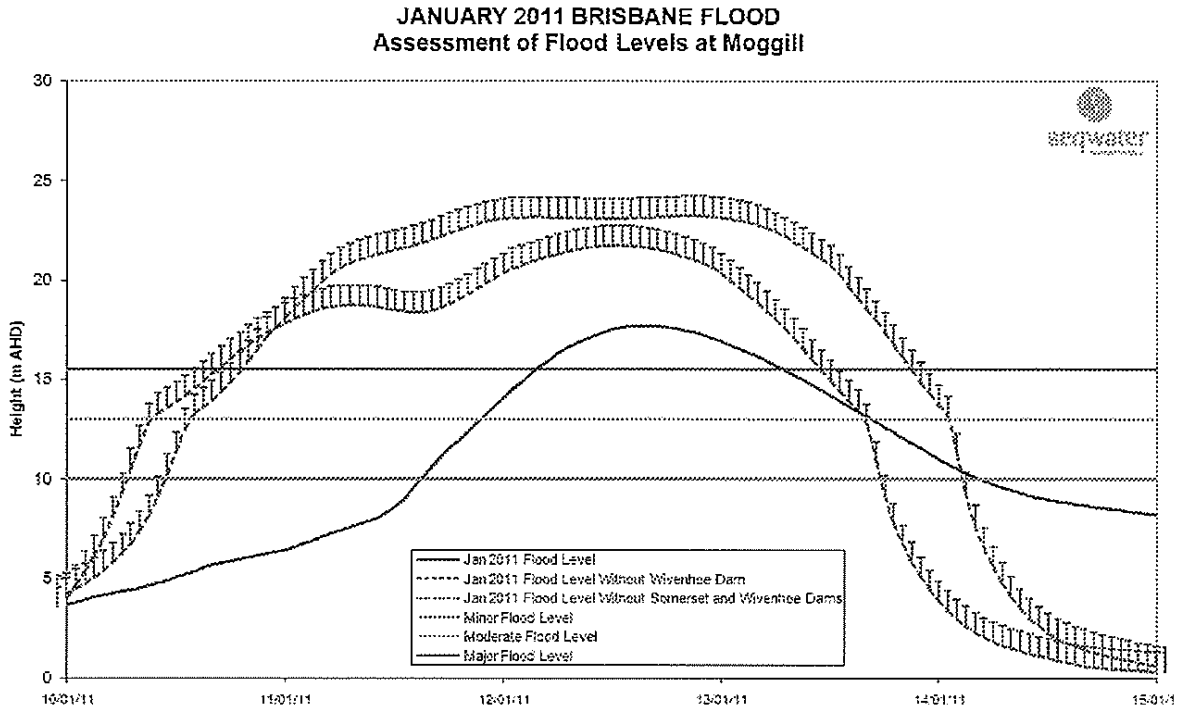
4.3 Flood Mitigation Benefits of Wivenhoe Dam

The following graphs demonstrate the significant benefits of Wivenhoe Dam in mitigating the current flood event, with reductions in flood peak of up to 2.5 metres in the City area and up to 5.5 metres in the Moggill area further upstream.

This equates to significant reduction in the potential for loss of life as well as saving in damages in the order of up to $1.6 billion based on current damage curves. Up to 13,000 more properties would have been impacted by the event without the Dam.

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





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

This notion is supported by BOM.

5 EVENT REVIEW

Under the Manual of Operational Procedures for Flood Mitigation at Wivenhoe Dam and Somerset Dam that are approved and gazetted by the Department of Environment and Resource Management, there is a regulatory requirement that a report must be prepared as per the below wording:

"Seqwater must prepare a report after each Flood Event. The report must contain details of the procedures used, the reasons therefore and other pertinent information. Seqwater must forward the report to the Chief Executive within six weeks of the completion of the Flood Event."

Such a report was prepared for the flood events of February and March 2010 and copies are available. A copy of the Table of Contents of that report is included as Appendix 1. For this event, the report would be a comprehensive summary of all procedures, actions, outcomes and processes during the event.

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

- In the short term, utilise this report attached to this briefing note as the basis for communications and discussion.
- Prepare any Interim Reports as agreed to provide information and input as required.
- Seqwater prepare a Comprehensive Report as per the existing regulatory requirements of the Act and the gazetted manual and any requirements of the Dam Safety Regulator. This would be done within 6 weeks of the closure of the current event as per the manual. This timeframe is subject to any new mobilisation of the Flood Operations Centre. The Table of Contents would include:
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    - Flood Management Strategies and Manual Compliance
    - Improvements in data collection systems, practices and processes.
    - improvements by interacting agencies

- Review of factors impacting on the protection of urban areas
- Recommendations & Conclusions

- The report would then be reviewed by the Dam Safety Regulator in conjunction with any peer review they require. The review should cover:
  - Were the provisions of the manual complied with?
  - What improvements to either facilities e.g. stream gauges, or work practices, are desirable to improve Sewater's ability to predict inflows into the dams.
  - Are improvements to either Seqwater's facilities or work practices desirable to improve Seqwater's ability to manage events? For example, investigations to raise the dam to improve its flood storage capacity, If so, what are they and their implications.
  - Are changes to the facilities or work practices of other organisations desirable to improve Seqwater's abilities to manage these events?
  - whether it is worth investigating increasing the flood capacity of Wivenhoe
  - whether the Brisbane River crossings which act, under some situations as a constraint on the releases from Wivenhoe, should be replaced by bridges. For example if the smallest could pass , for example, 2,500 cumecs, then this could enable higher releases under some circumstances.
  - Whether the policy of draining the flood compartment within 7 days should be modified.
  - Given the manual's order of priorities i.e. protection of the dam etc, are any changes in the flood release strategies for either dam desirable? If so, what are they, and their implications
- Based on this review, a review of the Manual of Operational Procedures for Flood Mitigation at Wivenhoe Dam and Somerset Dam would occur utilising an expert panel of review including representatives of DERM, Seqwater, BoM, affected Local Governments and other stakeholders as necessary.

Appendix A

FINAL REPORT – FLOOD EVENTS AT WIVENHOE, SOMERSET AND NORTH PINE DAMS FOR FEBRUARY AND MARCH 2010

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Suzie Emery

From: Elaina Smouha [elainami[redacted]
Sent: Sunday, 16 January 2011 10:14 PM
To: john.bradley[redacted]
Cc: Barry Dennien; Dan Spiller; WaterGridMedia; debbie.best[redacted]; pborrows
Subject: Cabinet in confidence - Ministerial brief - Flood event and Wivenhoe Dam
Attachments: Letter_from_Stephen_Robertson_MP_RE__Release_of_Water_from_Key_Storages[1].pdf; Letter_to_Minister_-_flood_management[1].docx; BrianCooperCV09122010.pdf; Brian Cooper - final report.docx; Brian Cooper - final report attachment.xlsx; Seqwater Ministerial_Briefing_Note_January_17_2011_Final_Draft_for_distribution[1].docx; Seqwater Jan_2011_Flood_Event_Ver_1_draft_for_distribution[1].docx; FINAL Ministerial_Brief_-_Wivenhoe_Operations[3].docx; Talking points_Wivenhoe Dam releases.docx

John

Attached is the Ministerial Brief and accompanying attachments for the Emergency Cabinet meeting scheduled on 17 January 2011.

Regards

Elaina

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brian cooper consulting

12 January 2011

Mr. Barry Dennien
CEO, SEQ Water Grid Manager
PO Box 16205
City East QLD 4002

Dear Barry,

This letter report:

- presents my final findings on a review of the operation of Wivenhoe Dam (including controlled releases) for compliance against the Flood Mitigation Manual for the period 12 December 2010 to date (Flood Event), and;
- provides advice on the prudence and appropriateness of the decisions and actions taken during the Flood Event regarding the operation of Wivenhoe Dam in light of the Flood Mitigation Manual's requirements and the circumstances of the Flood Event.

The report follows on from my preliminary report sent to you earlier today. The findings and advice are provided on the basis of information provided by SEQ Water Grid Manager which comprised the Flood Mitigation Manual and Technical Situation Reports. The latter were daily (sometimes twice daily) reports for the subject period. They gave a log of rainfall over the dam catchments and the downstream river (Lockyer Ck. and Bremer R.) catchments; inflows to Somerset and Wivenhoe Dams; storage levels; releases from the dams; details of the operation of gates and other outlets (gate openings/discharges); proposed changes in operating strategies and impacts on the various access crossings downstream of Wivenhoe Dam. In reviewing the Technical Situation Reports, I prepared a spreadsheet (see separate attachment of Excel spreadsheet *Tech Reports – Summary*, summarising the reports so that a timeline of the Flood Event could be seen at a glance. This provided a good overview of the Flood Event as it unfolded and showed what information may or may not have been included in a particular report. The Queensland Director Dam Safety (Water Supply) informed me that the Flood Operation Logs contain much more detailed information including details of the communications that were carried out and some of the more detailed information that is not necessarily included in the Technical Situation Reports. I have been provided with a draft of the "*Protocol for the Communication of Flooding Information for the Brisbane River Catchment – Including Floodwater Releases from Wivenhoe and Somerset Dams*" developed in October/November last year and currently being used. The Technical Situation Reports appear to have been an outcome of that Protocol.

The various requirements and required actions detailed in the Flood Mitigation Manual are summarised in the Table given in Attachment A. The Table also gives my comments (where appropriate) on whether there is evidence from the information presented to me, that there is satisfactory compliance with these requirements and actions.

The main aspects of the Flood Mitigation Manual are the various strategies for operating Wivenhoe Dam and Somerset Dam as well as a number of requirements relating to flood operations personnel, flood preparedness and flood training.

At Wivenhoe Dam there are four main strategies for operating the dam (W1 to W4) and at Dam there are three (S1 to S3). These strategies are hierarchical and are based on a number of flood objectives. These in descending order of importance, are:

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- 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 (FSL) at the conclusion of the Flood Event, and;
- Minimise impacts to riparian flora and fauna during the drain down phase of the Flood Event.

Normal procedures require a return to FSL within 7 days of the flood event peak passing through the dams so that the potential effects of closely spaced Flood Events can be allowed for.

It is apparent from the Technical Situation Reports that emphasis has been given to communicating changes in flood operations strategies with local authorities and the Bureau of Meteorology (BOM).

Until the last day or so, Wivenhoe Dam has been below EL74.0 and accordingly, would be operating under Strategy W1 i.e. make releases such that bridges downstream of the dam do not have to be closed prematurely. For a few days at the end of December and for the last day or so before yesterday's big rise, Strategy W2 would be in place (restrain releases from Wivenhoe Dam such that Brisbane River flows are maintained within the upper limit of non-damaging floods at Lowood (3,500 m3/s)). At various times during the Flood Event some of the downstream bridges have been closed. However, it is evident that action has been taken to vary dam releases such that various bridges could be re-opened as soon as possible. This appears to have been done in accordance with the flood operating strategies. The operations then moved onto Strategy W4 when the storage in Wivenhoe Dam reached about EL 73.5 (before the W4 trigger level of EL 74) when yesterday's heavy rain came on and it was assessed that there was a chance that the first (central) fuse plug could be triggered. It was then a matter of juggling the radial gate openings in an attempt to circumvent any fuse plug triggering. A graph of storage levels for Wivenhoe and Somerset Dams (from information taken from the Technical Situation Reports) showing the limits for the various Wivenhoe Dam flood strategies is given in Attachment A. It is apparent from this graph, that the appropriate flood operation strategies were adopted. The Technical Situation Reports indicate that proposed changes in strategy were appropriately communicated with appropriate authorities in accordance with the new Communication Protocol.

Summary:

The Technical Situation Reports comply with the requirements of the new Communication Protocol. However, I feel that there could be more consistency in the information presented. There seem to be gaps in information presented such as storage levels (see spreadsheet and graph in Attachment A). It would be useful to specify the minimum information required to be presented in the Technical Situation Reports (storage levels, inflows, recent/current rainfall, forecast rainfall, releases from dams, estimated flows from downstream tributaries, current flood operating strategy for each dam and proposed change in strategy, gate and regulator operations, state of downstream road crossings etc). Most of the minimum information is already given, but not in a consistent manner. As a means of reviewing processes followed during a flood, it would be useful to present a timeline of the flood event showing graphs of storage levels and other data that can be easily presented in a graphical manner.

I am informed by the Queensland Director Dam Safety (Water Supply) that the various requirements of the Flood Mitigation Manual relating to requirements for flood operations personnel, flood preparedness and flood training have been adhered to. There are a number of other requirements however, that I am not able to say whether they were satisfied as I had insufficient information. These requirements (see Table in Attachment A) should be subject to a separate audit.

It appears to me that the decision to implement Strategy W4 was a prudent one. While it would cause some damage in the Brisbane River downstream, its implementation, considering forecast rainfalls and projected flows in Lockyer Ck. And the Bremer River, would allow reduction of the storage level in

Wivenhoe Dam. This reduction in storage level would hopefully provide a sufficient buffer that would minimise the chance of a fuse plug triggering in the auxiliary spillway. Triggering of the first (central) fuse plug would cause a sudden increase of flow of some 2,000m^3/s from Wivenhoe Dam. This increase in flow would cause significantly more flooding in the lower Brisbane River than that caused by early implementation of Strategy W4.

Conclusions:

The strategies as set out in the Flood Mitigation Manual have been followed, allowing for the discretion given to making variations in order to maximise flood mitigation effects. The actions taken and decisions made during the Flood Event appear to have been prudent and appropriate in the context of the available knowledge available to those responsible for flood operations and the way events unfolded.

There are a number of requirements where there was insufficient time given the urgency of this review, to source the necessary information for me to demonstrate compliance. However, satisfaction or otherwise of these requirements would have had little impact on the operation of the two dams during this particular Flood Event. It is intended that they be audited when time permits, after the Flood Event.

There are aspects of the Technical Situation Reports that could be improved and these have been discussed above.

Regards,

[redacted]

Brian Cooper

ATTACHMENT A

Action Requirements extracted from the Flood Mitigation Manual:

Action	Comment
The Flood Mitigation Manual contains the operational procedures for Wivenhoe Dam and Somerset Dam for the purposes of flood mitigation and must be used for the operation of the dams during flood events.	Appears to have been done
Sufficient numbers of suitably qualified personnel are available to operate the dams if a Flood Event occurs.	Director of Dam Safety is satisfied
The level of flooding as a result of emptying stored floodwaters after the peak has passed is to be less than the flood peak unless accelerated release is necessary to reduce the risk of overtopping.	See Note 1
A regular process of internal audit and management review must be maintained by Seqwater to achieve improvements in the operation of the RTFM.	See Note 1
Seqwater must maintain a log of the performance of the data collection network. The log must include all revised field calibrations and changes to the number, type and locations of gauges. Senior Flood Operations and Flood Operations Engineers are to be notified of all significant changes to the Log.	See Note 1
Seqwater must maintain a log of the performance of the RTFM. Any faults to the computer hardware or software are to be noted and promptly and appropriately attend to.	See Note 1
Seqwater must ensure that all available data and other documentation is appropriately collected and catalogued for future use.	See Note 1
Seqwater must ensure that information relevant to the calibration of its field stations is shared with appropriate agencies.	See Note 1
Seqwater must liaise and consult with these agencies with a view to ensuring all information relative to the flood event is consistent and used in accordance with agreed responsibilities: • Bureau of Meteorology (issue of flood warnings for Brisbane River basin); • Department of Environment and Resource Management (review of flood and discretionary powers); • Somerset Regional Council (flood level information for upstream of Somerset Dam and upstream and downstream of Wivenhoe Dam); • Ipswich City Council (flood level information for Ipswich), and; • Brisbane City Council (flood level information for Brisbane City).	Required also by draft of Communications Protocol. Technical Situation Reports infer compliance
Seqwater must report to the Chief Executive by 30 September each year on the training and state of preparedness of operations personnel.	See Note 1
Seqwater must provide a report to the Chief Executive by 30 September each year on the state of the Flood Monitoring and Forecasting System and Communication Networks.	See Note 1

Action	Comment
After each significant flood event, Seqwater must report to the Chief Executive on the effectiveness of the operational procedures contained in this manual.	It is too early for this action to be implemented. Will be implemented when the Flood Event is finished
Prior to the expiry of the approval period, Seqwater must review the Manual pursuant to provisions of the Act.	It is too early for this action to be implemented
Strategies are changed in response to changing rainfall forecasts and stream flow conditions to maximise the flood mitigation benefits of the dams.	Technical Situation Reports indicate that this is done
When determining dam outflows within all strategies, peak outflow should generally not exceed peak inflow.	Information from Seqwater indicates that the requirement was satisfied
Protocol for use of discretionary powers (i.e. who gets told)	Director of Dam Safety is satisfied – I don't know whether Seqwater CEO or Chairperson approved – See Note 1

Note1: For a number of the above actions, given the short time frame for the review on compliance of actual flood operations with the Flood Mitigation Manual, it was not possible to source some of the information required to confirm that requirements had been fulfilled. These actions will be audited separately, when time permits.

Action	Comment
Flood Strategies for Wivenhoe Dam:	
The intent of Strategy W1 is to not to submerge the bridges downstream of the dam prematurely (see Appendix I). The limiting condition for Strategy W1 is the submergence of Mt Crosby Weir Bridge that occurs at approximately 1,900 m^3/s . For situations where flood rains are occurring on the catchment upstream of Wivenhoe Dam and only minor rainfall is occurring downstream of the dam, releases are to be regulated to limit, as much as appropriate in the circumstances, downstream flooding.	Technical Situation Reports indicate that every attempt was made to keep the specified road crossings open
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). In these instances, the combined peak river flows should not exceed those shown in the following table:	Technical Situation Reports indicate that Wivenhoe Dam releases were made considering concurrent flows in the Bremer River & Lockyer Ck. To delay damaging floods as long as possible
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.	
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 EL74.0 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. There are no restrictions on gate opening increments or gate operating frequency once the storage level exceeds EL74.0 AHD, as the safety of the dam is of primary concern at these storage levels.	Technical Situation Reports indicate that Wivenhoe Dam releases were such as to delay adopting this strategy as long as possible
Where possible, total releases during closure should not produce greater flood levels downstream than occurred during the flood event.	Technical Situation Reports indicate that this requirement was satisfied
The aim should always be to empty stored floodwaters stored above EL 67.0m within seven days after the flood peak has passed through the dams.	Technical Situation Reports indicate that

Action	Comment
	emphasis was given to satisfying this requirement
Flow in the spillway to be as symmetrical as possible with the centre gates opened first.	Technical Situation Reports indicate that this was done
The bottom edge of the radial gates must always be at least 500mm below the release flow surface.	See Note 1 above

Action	Comment
Flood Strategies for Somerset Dam:	
The intent of Strategy S1 (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) 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.	Technical Situation Reports indicate that this was done
The intent of Strategy S2 (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). This to maximise the benefits of the flood storage capabilities of the dam while protecting the structural safety of both dams. The Flood Mitigation Manual contains a graph that shows the intended interaction of the Wivenhoe Dam and Somerset Dam storage levels.	Technical Situation Reports indicate that this was done – little information on the operation of the radial gates at Somerset Dam. How the graph was followed not really demonstrated
The intent of Strategy S3 (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) is to maximise the benefits of the flood storage capabilities of the dam while protecting the structural safety of both dams.	Not relevant at this stage
The safety of Somerset Dam is the primary consideration and cannot be compromised and its peak level cannot exceed EL 109.7.	Maximum level only EL103.3

Suzie Emery

From: Elaina Smouha [elainami[redacted]]
Sent: Sunday, 16 January 2011 10:14 PM
To: john.bradley[redacted]
Cc: Barry Dennien; Dan Spiller; WaterGridMedia; debbie.best[redacted]; pborrows
Subject: Cabinet in confidence - Ministerial brief - Flood event and Wivenhoe Dam
Attachments: Letter_from_Stephen_Robertson_MP_RE__Release_of_Water_from_Key_Storages[1].pdf; Letter_to_Minister_-_flood_management[1].docx; BrianCooperCV09122010.pdf; Brian Cooper - final report.docx; Brian Cooper - final report attachment.xlsx; Seqwater Ministerial_Briefing_Note_January_17_2011_Final_Draft_for_distribution[1].docx; Seqwater Jan_2011_Flood_Event_Ver_1_draft_for_distribution[1].docx; FINAL Ministerial_Brief_-_Wivenhoe_Operations[3].docx; Talking points_Wivenhoe Dam releases.docx

John

Attached is the Ministerial Brief and accompanying attachments for the Emergency Cabinet meeting scheduled on 17 January 2011.

Regards

Elaina

Elaina Smouha
Director, Governance and Regulatory Compliance
SEQ Water Grid Manager
[redacted]
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Visit: Level 15, 53 Albert Street Brisbane
Post: PO Box 16205, City East QLD 4002
ABN: 14783 317 630

P.O. Box 205, BELROSE WEST NSW 2085
phone: [redacted]
mobile [redacted]
email: brian.cooper.consult[redacted]
ABN: 56154707619

brian cooper consulting

12 January 2011

Mr. Barry Dennien
CEO, SEQ Water Grid Manager
PO Box 16205
City East QLD 4002

Dear Barry,

This letter report:

- presents my final findings on a review of the operation of Wivenhoe Dam (including controlled releases) for compliance against the Flood Mitigation Manual for the period 12 December 2010 to date (Flood Event), and;
- provides advice on the prudence and appropriateness of the decisions and actions taken during the Flood Event regarding the operation of Wivenhoe Dam in light of the Flood Mitigation Manual's requirements and the circumstances of the Flood Event.

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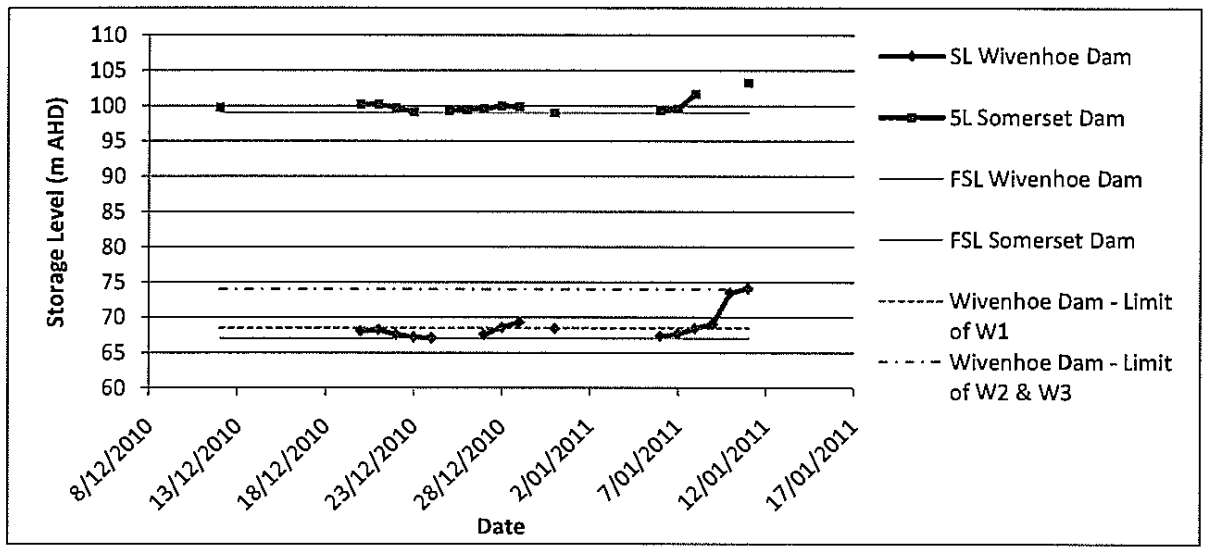
The safety of Somerset Dam is the primary consideration and cannot be compromised and its peak level cannot exceed EL 109.7.	Maximum level only EL103.3

Wivenhoe & Somerset Dams – Storage Level Behaviour (as presented in Technical Situation Reports)



[redacted]

24 December 2010

Hon Stephen Robertson MP
Minister for Natural Resources, Mines and Energy
and Minister for Trade
PO Box 15216
Brisbane Qld 4001

Dear Minister

I am pleased to respond to your letter of 25 October 2010 regarding options to and benefits of releasing water from key storages in anticipation of major inflows over the current wet season. Our advice follows, based on discussions with Seqwater.

Only four of the dams in South East Queensland region are gated, with the ability to release significant amounts of water in anticipation of major inflows. These are Wivenhoe, Somerset, North Pine and Leslie Harrison dams.

Detailed operational procedures have been approved for each of the gated dams. The dams will continue to be operated in accordance with these procedures. These procedures generally relate to the management of the dams and should be managed above Full Supply Level. This advice relates to the water security aspect of the management of the dams below Full Supply Level.

Based on information currently available, Seqwater has advised that releasing water to below Full Supply Level may provide some benefits in terms of reduced community and operational impacts during minor inflow events, such as has occurred over the past month. For medium and major flood events, it considers that pre-emptive releases will provide negligible benefits.

Informed by this advice, the SEQ Water Grid Manager has advised Seqwater that, from a water security perspective, it has no in-principle objection to minor releases from Wivenhoe, Somerset and North Pine dams to minimise the operational and community impacts of gate releases. Specifically, it has advised that it has no in-principle objection to:

- Wivenhoe and Somerset dams being drawn down to 95 per cent of their combined Full Supply Level
- North Pine Dam being drawn down to 97.5 per cent of its Full Supply Level.

The SEQ Water Grid Manager has assessed the water security implications of the release to be negligible, having no impact on our ability to meet the risk criteria specified in the System Operating Plan or our ability to meet our supply obligations to Grid Customers. From a water security perspective, the Queensland Water Commission has also confirmed that it does not have any objections to the potential release.

Please note that these arranges are intended to apply for the current wet season only, taking into account the level of storages and the rainfall forecasts over coming months.

For future wet seasons, the SEQ Water Grid Manager will continue to work with Seqwater to investigate the optimal arrangements. In particular, we propose to further investigate options that may reduce the frequency or duration of intermediate level flows (between 1,900 and 3,500 cubic metres per second). In addition, we recommend that the investigations with the Queensland Water Commission to examine the opportunity of raising the full supply level of Wivenhoe Dam for water supply be expanded to include options involving the release of the additional water once major inflows are forecast.

I trust that this advice is sufficient. If you have any questions, please do not hesitate to contact Mr Dan Spiller, Director Operations, by telephone on [redacted] or by email on dan.spiller@[redacted]

Yours sincerely

[redacted]

Gary Humphrys
Chair

ATTACHMENT

Wivenhoe and Somerset dams

Wivenhoe Dam can store up to 1.15 million litres (ML) of drinking water. In addition, it has the capacity to store an additional 1.45 ML of flood water.

While large, the flood compartment can be filled within days. For example, following heavy rainfall in October 2010 Wivenhoe Dam received inflows equivalent to almost half of the flood storage compartment capacity in just a few days.

Several factors influence flood release strategies for Wivenhoe and Somerset dams.

First, rain events that have caused flooding have historically been prolonged events over several days, often with a second event occurring several days to a week after the first. As a result, the operational procedures for the dam are designed to ensure that all water held in the flood compartments is released within seven days of a rain event, ensuring that the flood compartment is available for any future inflows.

Secondly, the dam only controls flood waters from part of the Brisbane River catchment area. About 50 per cent of the catchment area of the Brisbane River is upstream of the Wivenhoe Dam wall, and can be potentially controlled by it. No flood mitigation structures exist for most of the potential run-off from the other 50 per cent of the catchment area.

Third, the Bureau of Meteorology has had limited success in plotting rainfall distribution accurately to assess where most flooding risk lies above or below the dam wall. Historical floods have demonstrated that flooding can occur from both. For example, the 1974 flood flows primarily occurred below the dam wall whilst the 1890's event occurred above the dam wall. As a result, when releasing water from Wivenhoe Dam it is very important to predict and monitor below the dam wall flows so as to understand combined river flows that cause flood impacts.

Taking these factors into account, the flood release strategy for Wivenhoe and Somerset dams has a hierarchy of objectives:

- Ensure the structural safety of the dam
- Provide optimum protection of urbanised areas from inundation
- Minimise disruption to rural life
- Retain full supply level after a flood event
- Minimise impacts to flora and fauna during the drain down phase.

Within this framework, flood releases from Wivenhoe Dam typically fall into two categories of flood events based on the impact they cause when combined with below the dam wall catchment runoff:

- Larger events typically involving combined river flows greater than 3,500 cubic meters per second measured at Moggill. These events would have flood impacts on

urban areas in Brisbane. This scale of release has not been required since Wivenhoe Dam was completed.

- Smaller events with combined river flows of less than 1,900 cubic meters per second measured at the Mt Crosby weir which can inundate up to seven rural bridges isolating up to 50 households and causing inconvenience to many more. There has been six of these events since 1984, when Wivenhoe Dam was completed.

Our assessment of the benefits of lowering dam storage levels to reduce flooding impacts is below for these two event types.

Large events

Seqwater has advised that releases of greater than 3,500 cubic metres per second (m3/s) from Wivenhoe Dam are likely to impact on urban areas in Brisbane. Events of this nature have not been experienced since Wivenhoe Dam was completed in 1984.

Seqwater has advised that:

- pre-emptive releases are likely to have negligible impacts on the extent of these impacts
- any impacts would require releases of at least 250,000 ML. This is equivalent to a release of about 16 per cent of the combined storage capacity of Wivenhoe and Somerset dams.

A pre-emptive release of this scale is not recommended, based on information currently available. The potential water security impacts are considered to be more significant than the negligible benefits. These potential security impacts include costs associated with the earlier or avoidable operation of the desalination facility at capacity, as well as the increased probability of triggering the implementation of a drought response plan.

More detailed investigation of opportunities to actively manage flood storage is recommended, including options to increase flood supply level on a temporary basis. These investigations need to be led by Seqwater, and involve the Bureau of Meterology, Councils and the SEQ Water Grid Manager.

In particular, t has been identified that it is worth investigating the impacts on downstream flooding for intermediate level flows (flows between 1900 and 3500 cm^3/s).

Seqwater will undertake extensive investigations for the Queensland Water Commission in early 2011 to examine the opportunity of raising the full supply level of Wivenhoe Dam for water supply. We will recommended that the scope of this work be widened to consider the benefits of pre-lowering storage levels based on mid range rainfall events and the reduced impacts to river levels and subsequent property impacts. It is noted that predicting rainfall intensity and location, even as events are about to occur has not been accurate, however the Bureau of Meteorology is improving its methods.

Smaller events

Pre-emptive releases from Wivenhoe Dam may reduce the impacts of minor gate releases (strategies W1A to W1E in the operational procedures).

Minor gate releases may result in the closure of up to six bridges, isolating up to 50 dwellings and inconveniencing many more. As stated in existing flood management plans, releases should be managed to minimise the impacts on these residents. Over the immediate term, Councils have requested that bridge closures be avoided over the Christmas to New Year period, if at all possible. In addition:

- There are resource implications involved in the activation of the flood control centre. Under flood management plans, the centre must be staffed by suitability qualified officers at all times during gate releases. There are currently only four quality duty engineers, who have staffed the flood centre for much of period since the initial release in October.
- Gate releases during the Christmas holiday period would result in closure of dams to water based activities, impacting on up to 150,000 people who are expected to use the recreational facilities over the holiday period.

The Water Grid Manager has advised Seqwater that, from a water security perspective, it would not object to water being released from Wivenhoe and Somerset dams to 95 per cent of storage capacity at any time until end March 2010.

Under this recommendation, storage levels could potentially be reduced by up to about 77,250 ML. This is equivalent to the amount of water released between 13 and 16 December 2010, through a single gate.

Pre-emptive releases will be managed so as to minimise the likelihood of gate releases due to small storms and local rainfall. Storage capacity will usually be reduced through a combination of:

- Extended gate releases, especially for strategy W1C. For comparison, up to 130,000 ML/day was released during in November and mid December 2010. At this rate, the additional releases could occur in about half a day.
- Ongoing gate releases of up to 30,000 ML/day, which do not isolate any residents but can inundate some lower bridges that cause inconvenience.
- Ongoing valve release of up to about 4,300 ML/day, which can be maintained without inundate any bridges.

Actual releases would be decided by Seqwater based on operational considerations and in accordance with its statutory and regulatory obligations.

Water security impacts

The water security impacts of releases will be zero if the dams fill over the remainder of the wet season. Current forecasts indicate that there is a high probability of this occurring:

- Heavy rainfall is forecast over the Christmas holiday period, as noted above.
- Over the remainder of the wet season, advice from the Bureau of Meteorology is that sea surface temperatures are likely to remain at levels typical of a La Niña event into the first quarter of 2011, with the majority of the models indicating the event will gradually weaken over the coming months.

The water security impacts will be minimal, even if there were no further inflows to the dams. Modelling indicates that the reduction would have a minimal impact on the probability of key water Grid storages falling to 40 per cent of capacity over the next five years.

North Pine and Leslie Harrison dams

North Pine and Leslie Harrison dams do not have flood mitigation potential. Once the dams have reached Full Supply Level, all water flows into the dam must be released to protect the structural safety of the dam.

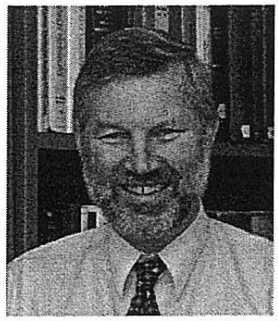
Seqwater has advised that, without major releases, there are negligible benefits to reducing volumes stored in North Pine or Leslie Harrison dams for the purposes of reducing the extent or duration of any downstream flooding impacts.

For North Pine Dam, there may be some operational and community benefits to minor releases to below Full Supply Level in some circumstances. Any gate operation at North Pine Dam results in inundation of Youngs Crossing Road, which isolates a number of residents. These impacts are currently being minimised by releasing from North Pine Dam at night. With further rainfall forecast, Seqwater may choose to reduce the level to below Full Supply Level in order to reduce the frequency of night releases or the likelihood of releases being required during the day.

For this dam, the SEQ Water Grid Manager has advised Seqwater that, from a water security perspective, it would not object to water being released to 97.5 per cent of storage capacity at any time until end March 2010.

For Leslie Harrison Dam, gate operations do not impact on public roads and generally only inconvenience the general public during large flood events. There is no scope to reduce this inconvenience through small pre-emptive releases. Accordingly, no in-principle approval be made for pre-emptive releases from this dam.

brian cooper consulting



Brian Cooper

Dams Engineer

Qualifications & Affiliations

Short courses on finite element analysis, embankment dam engineering, earthquake engineering. Published technical papers – ICOLD. ANCOLD and I.E. Aust. Attended dam safety course at USBR (Denver, USA) in 2002

Bachelor of Engineering (B.E. Hons), 1968 and Master of Engineering Science (M.Eng.Sc.), 1971

University of New South Wales

Graduate Diploma of Engineering Management, 1994 Deakin University

F.I.E. Aust.,C.P.Eng. RPEQ

Expertise

Brian has approximately 40 years experience in investigation and design of major dams, weirs and hydraulic structures, having started his career designing farm dams and small irrigation schemes. He retired from NSW Department of Commerce in 2005. Brian now works as a private consultant specialising in dams engineering and fish passage at dams and weirs. He has a special interest in risk assessment and computer modelling in general and the seismic analysis of dams in particular. Engineering software (concrete dam stability analysis and flood routing) written by Brian is still used extensively in the Dams & Civil Group of the Department of Commerce. He also has particular experience with concrete dams and the use of post tensioned ground anchors for strengthening those dams. He was a member of the Australian National Committee on Large Dams (ANCOLD) Working Group that developed guidelines for 'Design of Dams for Earthquakes' and a member of the Working Group that revised the guidelines for 'Risk Assessment for Dams'. He has been a guest lecturer for a number of years (most recently in 2009) on concrete dam engineering for the University of NSW post graduate Embankment Dam Engineering Course, and on the history of dams in NSW at Sydney University.

He has been the project director and project manager for a number of feasibility studies, design reviews, site investigations and detail design consultancies for major dams and weirs including the direction and co-ordination of all specialist services including dambreak studies, preparation of dam safety emergency plans and risk assessments. He is currently an expert reviewer for a number of Australian water authorities and consultants (State Water Corporation (NSW), Hydro Tasmania, SunWater (Queensland), Brisbane City Council, Goulburn-Murray Water, Goulburn Valley Water, WA Water Corporation, Southern Rural Water (Victoria), URS, GHD, Hobart Water, NT PowerWater, and TrustPower (NZ)). He has also worked as a sub-consultant for a number of consulting firms (URS, MWH, GHD).

Brian is the Engineers Australia representative for the NSW Dams Safety Committee (the dam safety regulator in NSW) and is currently the Chairman of that organisation. He has been a member of the Murray Darling Basin Authority's Fish Passage Task Force which advises inter alia on the installation of fishways on the Murray River as part of the Living Murray Program.

Brian is a registered engineer in Queensland (RPEQ No. 6819). He started his own consulting business in 2008, advising on dam safety, dam design and analysis, dam risk assessments and dam upgrades as well as fish passage for dams. He is providing specialist advice through *Brian Cooper Consulting* as a sole trader.

Professional Experience

2008 to Present: Principal of Brian Cooper Consulting

2010
Five yearly comprehensive dam safety inspection of Carcoar Dam (double curvature arch dam).
Internal reviewer to URS (Melbourne) on concept design of regulator structures and associated fishways for the Hipwell Road project for watering the Gunbower Forest
Specialist adviser to Melbourne Water – valve behaviour on Sugarloaf Dam pipeline, structural behaviour of pumping station floor slab and pump bases at Cardinia Dam Pumping Station
Commenced work as member of ANCOLD working group re-writing the Earthquake Guidelines – responsible for re-writing sections relating to concrete dams.
Continuing involvement with Alluvium in the design of the weir upgrade and the new fishway for Booligal Weir.
Continuing external peer review services to State Water Corporation for the detail design of new auxiliary fuse plug spillways for Copeton and Chaffey Dams, detail design of raising and post tensioned strengthening of Keepit Dam, detail design of upgrade works for Wyangala Dam, finite element analysis of Carcoar Dam (double curvature arch dam).
Further work with GHD (Perth) on risk assessment for Serpentine Dam.
Continuing involvement with Hydro Tasmania, as Chair of external review panel for Catagunya Dam.

2009
Part of URS' comprehensive inspection team for Melbourne Water's Maroondah Dam.
Part of URS' business risk assessment team for Southern Rural Water's Cowwarr and Maffra Weirs.
Part of Alluvium's design team upgrading Booligal Weir and providing a fishway at the weir, for State Water Corporation.
Part of GHD's design team for Lower Fitzroy River Infrastructure Project designing fishways for Rookwood and Eden Bann Weirs near Rockhampton in Queensland.
Project Manager on behalf of SA Water and reviewer for study into vibration of a crane rail beam at Lock 5 on the River Murray.
Expert reviewer for State Water Corporation for 3D finite element analysis of Carcoar Dam (double curvature arch dam).
Internal reviewer for URS on Laanecoorie Dam Upgrade.
Expert reviewer for State Water Corporation for risk assessments for Oberon and Rydal Dams.
Member of GHD's Serpentine Dam risk assessment team for WA WaterCorp.
Expert reviewer for SunWater in Queensland for the comprehensive risk assessment undertaken for Fairbairn Dam and Coolmunda Dam.
Expert reviewer for State Water Corporation for major upgrade works at Keepit, Copeton, Chaffey and Wyangala Dams.
Appointed as Chairman of the NSW Dams Safety Committee (the dam safety regulator in NSW).
Provided extemal peer review for Goulburn Valley Water, on Nine Mile Creek Dam Upgrade.
Internal reviewer for URS (Adelaide) for Lake Victoria Outlet Regulator options studies.
Provided advice to URS (Melbourne) on the Mildura Weir Fishway design.
Member of expert panel advising State Water Corporation on revised dam surveillance regime.
Part of Ecosmart bid team - prepared concept designs for fish passage facility at proposed Wyaralong Dam in Queensland.
Continuing expert review role for Catagunya Dam upgrade.

2008
Started as a private specialist dams consultant - *Brian Cooper Consulting*.
Worked through the URS Corporation for the USBR and the USACE in developing a risk toolbox for lined spillways.
Advised TrustPower in New Zealand on replacement of post tensioned anchors at Mahinerangi No. 1 Dam.
Adviser to State Water Corporation and to URS on further upgrade works for Hume Dam.
Provided specialist advice to WA Water Corporation on Wellington Dam post tensioning.
Peer reviewer on behalf of URS for Warren Dam in South Australia.
Part of URS team carrying out portfolio risk assessment of Melbourne Water's dams.
Member of Expert Review Panel for Darwin River and Manton Dams for NT PowerWater.

1987 to 2008: Dams & Civil Section of NSW Department of Public Works and Services/NSW Department of Commerce.

2008 Carried out detailed 3D finite element analysis of radial gate at Wyangala Dam spillway for State Water Corporation.
Continuing review role for Tillegra Dam.
Continuing review role for Hinze and Lake Manchester Dams in Queensland and Catagunya Dam in Tasmania.
Prepared options report on Burrendong Dam spillway modifications for State Water Corporation.

2007 Continuing roles on Lake Manchester, Hinze, Catagunya and Redbank Ck. Dams.
Internal peer reviewer for NSW Dept. of Commerce regarding design of Tillegra Dam.
Advised State Water on feasibility of fish passage facilities at a number of their major irrigation dams.
Expert reviewer for GHD on a flood retarding basin in south west Sydney.
Part of expert panel for River Murray Water risk assessments for Hume and Dartmouth Dams, Torrumbarry and Yarrowonga Weirs and Lake Victoria.
Re-elected as Deputy Chairman of the Dams Safety Committee

2006 Project director for 3D finite element analysis of Bendora Dam (double curvature arch dam)
Chair of external peer review panel for upgrading of Lake Manchester Dam (concrete gravity dam) in Queensland
Internal peer reviewer and senior consultant for the raising of Hinze Dam (earth and rockfill embankment) in Queensland
Project director for preliminary and detailed design of Redbank Creek Dam (single curvature arch dam) upgrading
Project director for Keepit Dam fish passage investigations
Part of expert panel for URS undertaking portfolio risk assessment for dams owned by River Murray Water
External peer reviewer for Hydro Tasmania for Catagunya Dam (concrete gravity dam) upgrading;
Project director for 3D finite element analysis of Upper Cordeaux No. 2 Dam (single curvature arch dam owned by SCA) for BHP Billiton

2005 Project design engineer for dam related aspects of Nepean Dam Deepwater Access Project: Pipeline crossing end of spillway; outlet works for end of pipeline
Project design engineer for Avon Dam Deepwater Access Project: tunnel design through rockfill buttressing; new low level outlet works

2004 Internal reviewer to URS Australia for Pykes Ck Dam Investigations (Southern Rural Water, Victoria)
Internal reviewer to URS Australia for Lower Reservoir Dam (Hobart Water, Tasmania)
Member of expert review panel for the Melton Dam upgrade design (Southern Rural Water, Victoria)

2003/04 Designer for retrofitting multi-level offtake for Tallowa Dam (Sydney Catchment Authority).
Member of the Independent Technical Expert Panel for the Eildon Dam Upgrading in Victoria for Goulburn-Murray Water.
Currently the design director for the Wivenhoe Dam Alliance carrying out the flood capacity upgrading for Wivenhoe Dam in Queensland – included directing major computational fluid dynamics modelling investigations of existing spillway

2003 Carried out options study for environmental upgrading works at Keepit Dam (selective withdrawal facility, additional outlet works and fish passage)
Carried out assessment of spillway capacity for Hume Dam using computational fluid dynamics modelling (by a sub-consultant)
Carried out detail design for anchoring Bellfield Dam (Victoria) Intake Tower
Carried out detailed finite element analysis of Keepit Dam radial gates

2002 Carried out review of large farm dam with seepage problems. Directed computational fluid dynamics modelling of drum gate and radial gates at Warragamba Dam together with structural analysis of gates (modelling carried out by sub-consultant) to ensure gates can handle more

rigorous operating conditions
Adviser to the Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) on civil engineering matters related to the replacement reactor project at Lucas Heights
Expert reviewer for Goulburn-Murray Water for remedial works at Cairn Curran Dam in Victoria
Project Director for Lerderderg Weir safety review and risk assessment for Southern Rural Water (Victoria). Carried out finite element analysis of radial gate

2001

Project Director for design of further remedial works at Hume Dam.
Technical director on behalf of NPWS for quantitative risk assessment for Snowy Mountains roads
Chairman of the committee producing a geotechnical response plan for the Alpine Way in the Snowy Region for NPWS
Carried out non-linear finite element analysis (earthquake loading) for outlet tower at Bellfield Dam for Wimmera-Mallee Water (Victoria)
Joined the MDBC's Fish Passage Reference Group and reviewed fishway designs
Consultant to DLWC for their portfolio risk assessment of thirty dams
Provided advice on the post tensioning system at Waitakere Dam in New Zealand.

Director of Dam Surveillance Group responsible for the surveillance of DLWC dams and participant of a number of 5 yearly surveillance inspections
Project Director of review of DLWC Intake Towers Earthquake Stability Review
Directed DPWS input into the Earthquake Stability of the structural elements of Yarrawonga Weir as sub-consultant to URS Australia – included detail design of anchoring system for the weir. Also provided design advice on design of stone columns to provide protection against liquefaction of alluvial foundations.
Member of the expert panel for the risk assessment studies being undertaken for Goulburn-Murray Water
Project Director for safety review and preliminary design of remedial options for Blowering Dam (DLWC)
Acted as reviewer for a number of projects carried out by URS (incl. Cardinia Dam outlet tower, Bellfield Dam embankment/spillway)
Directed functionality study (including business risk assessment) for Yallourn Weir for Southern Rural Water (Victoria)

2000

Project Director for design of further investigations and remedial works at Hume Dam.
Safety reviews for Bamarang and Flat Rock Dams
Director of Dam Surveillance Group responsible for the surveillance of DLWC dams and participant of a number of 5 yearly surveillance inspections
Project Director for earthquake studies on intake towers and appurtenant works at DLWC dams
Consultant to DLWC to manage their portfolio risk assessment
Project Director for a number of dambreak studies and preparation of dam safety emergency plans
Member of the consulting team carrying out risk assessments for Goulburn-Murray Water (Victoria) for Eppalock Dam
Carried out review of Earthquake Stability Review of the Outlet Tower at Eppalock Dam in Victoria for G-MW.
Reviewed URS Australia designs for Alpine Way remedial works

1999

Project Director of earthquake studies on Wyangala Dam
Project Director for design of further remedial works at Hume Dam. Included design of ground improvement works (stone columns) for protecting alluvial foundations against liquefaction
Peer reviewer of Leslie Dam (Queensland) Safety Report.
Peer reviewer of DLWC's Screening Level Risk Assessment

1998

Project Director for portfolio risk assessment for six dams owned by a Southern Rural Water in Victoria.
Directed structural analysis of spillway gates on Narracan Dam for Southern Rural Water
Project Director for concept design and DD&C contract documentation for Warragamba Dam auxiliary spillway. Dam to be upgraded the dam to cater for increased inflow flood estimates. Upgrading works estimated to cost $135M. An auxiliary spillway is to be constructed adjacent to the existing dam - involves excavating some 2,000,000m³ of rock and constructing concrete lining, training walls, fuse plug embankments, large scale cement stabilised sandstone fill, a multi

span bridge across the spillway, post tensioned ground anchors for dissipator/training walls, modifications of existing spillway gates. Design involved extensive physical hydraulic model testing.

1997 Feasibility options study for remediation of Redbank Ck. Dam near Mudgee (NSW) Karapiro Dam, New Zealand - Part of international consulting team reviewing this concrete arch dam's security and determining appropriate remedial options (mass concrete buttressing). Director of risk assessment studies for Tenterfield Dam

1993-1997 Hume Dam Investigations - Project Manager of Investigation and Design Studies for the embankments at the dam. Work involves:

- review of the stability of the embankments under static and earthquake loadings
- investigation of liquefaction
- potential of embankments' foundations
- development of stabilising options
- development of options to provide increased flood security including provision of new auxiliary spillways and modifications to existing works

- detail design and documentation of stabilising works for the embankments including a key trench into the dam's foundations, stabilising berms, slurry wall cut-offs, drainage/filter curtains and strengthening of critical gravity training walls with both horizontal and vertical post tensioning.

- part of advisory and review team for the risk assessment of the dam and its components.

1990-1996 Warragamba Dam Upgrading for Sydney Water Corporation - Project Manager of Investigation Concept Design Studies for upgrading the dam to cater for increased inflow flood estimates and provide substantial flood mitigation. Upgrading works estimated to cost $280M. The existing dam was to be strengthened with mass concrete buttressing – some 600,000m³.

1996 Project Director for Safety Review (including Finite Element Analysis) of Wellington Dam

1993-1996 Hume Dam Gates for Department of Water Resources - Project Manager for the design of new maintenance baulks and emergency closure gates. Involves development of proposals for underwater installation.

1995 Redbank Creek Dam and Lithgow No. 2 Dam for NSW Public Works Dams Surveillance - Project Manager for safety reviews and finite element analysis of two 15m high arch dams. Clarrie Hall Dam for NSW Public Works Dams Surveillance - Project Manager for dambreak studies.

1994 Burrinjuck Dam Gates for NSW Department of Water Resources - Project Manager for the design of new control and emergency closure gates. Involves underwater installation. Karangi Dam for Coffs Harbour City Water Project - Project Manager for dambreak studies.

1993 Mardi Dam for Wyong Council - Project Manager for safety review of earth embankment.

1988-1990 Nepean Dam Remedial Works for Sydney Water Corporation - Project Manager for investigation studies, design development and detail design. Work involved:

- initial flood security studies and development of options
- co-ordination of hydraulic model studies
- detail design and contract documentation for modified spillway, large size post-tensioned ground anchors and rockfill buttressing.

1987-1989 Boggabilla Weir for NSW Department of Water Resources - Project Manager for detail design and contract documentation of a large gated re-regulation weir with fishway. Involved liaison with fisheries expert in developing optimum geometry for fish ladder.

Chaffey Dam for NSW Department of Water Resources - Project Manager for upgrading of dam. Work involved:

- development of options and preliminary design
- finite element analyses for raised morning glory spillway
- stability analyses for raised earth/rockfill embankment
- co-ordination of hydraulic model studies for raised spillway.

1969-1987: ***Water Resources Commission of NSW (WRC) (now Department of Land and Water Conservation).***

1986-1987 Flood Security studies for WRC - Project Design Engineer for investigation into flood security of Chaffey and Glennies Creek Dams. Involved co-ordinating dambreak studies, development of remedial options, economic risk studies.

1985-1987 Hume Dam Strengthening for WRC - Project Design Engineer for detail design and contract documentation. Work included:

- design of large size post-tensioned ground anchors including development of appropriate grouting procedures
- design of structural modifications to the concrete gravity dam
- design of a new road bridge over the dam.
- establishing the rationale for replacing the existing post tensioning system

Contact

Tel: [redacted]
Mobile: [redacted]
Email: brian.cooper.consult[redacted]

Queensland Government

[redacted]

25 OCT 2010

RECEIVED
28 OCT 2010
[redacted]

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

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

Dear Mr Humphrys

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

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

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

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

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

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

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

[redacted]

Queensland Government

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

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

Thank you in advance for your assistance.

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

Yours sincerely

[redacted]

STEPHEN ROBERTSON MP

[redacted]

Date	Time	TSR	Wivenhoe Dam Release (m^3/s)				Gate No.	Opening (m)	Storage Level	Rainfall (mm)
			Regulators	Hydro	Gates	Total				
12/12/2010	1400	W1								
13/12/2010	1300	W2		10	290	300				
15/12/2010	1800	W3								
16/12/2010	1600	W4			0					
17/12/2010	1200	W5								Large storms yesterday pm and night; 20-50 forecast tonight
17/12/2010	1800	W6	Closed		Opening Op. Initiated					20-50 forecast o/n
	1830			13	50	63	3	0.5		
18/12/2010	0700	W7								40-50 since 16/12/2010
19/12/2010	0700	W8			350	350	3	3.5		20-30 upper Brisbane R.
19/12/2010	1800	W9			300	300	3	3		
20/12/2010	0700	W10								
20/12/2010	0900	W11							68 expected this afternoon	
20/12/2010	0900	W12								
21/12/2010	0730	W13				peak 1,280 (0500)			peak 68.24 (0400); currently 68.22 (112% cap.) falling slowly	
22/12/2010	0830	W14							currently @ 67.61 (107% cap.) falling slowly	none since 300 on 20/12/2010
22/12/2010	1600	W15			Closing sequence				to finish just>FSL	
23/12/2010	0800	W16			All gates expected to be closed by 1500				When gates closed, will be 67.2 (0.2m > FSL) & 50mm <gate opening trigger level	
23/12/2010	1430	W17			350		3	3.5	67.23	10-30 in CA over last 24 hrs.; further heavy rain expected to start on 29/12/2010
24/12/2010	0630	W18			All gates expected to be closed by 1300				67.07 expected when all gates closed	little or no rainfall
24/12/2010	1330	W19	4,200Ml/day from reg. & Hydro		Radial gate ops ceased @ 1300		3 zero			
25/12/2010	0930	W20								10-20 over last 24 hrs

26/12/2010	0800 W21					Rel. minor over last 24 hrs.
27/12/2010	0800 W22					40-50 over dam CA last 24 hrs.
28/12/2010	0700 W23	347 (initially) then back to 46				20-40 over dam CA's ;ast 24 hrs
29/12/2010	0700 W24				69.26 (@ 0600) - aim is to return to FSL by 2/1/2011	No/very little in last 24 hrs.
30/12/2010	0700 W25	Wivenhoe+Lockyer = 1,600m^3/s			69.33 peak yesterday @ 1200 (2.3m > FSL) 69.07 this am	No/very little in last 24 hrs.
31/12/2010	0700 W26 W27	Wivenhoe+Lockyer = 1,600m^3/s			68.4 @ 0500	No/very little in last 24 hrs.
06/01/2011	1200 W28	Commence opening RG @ 1800 & ramp up to 300m^3/s by 2200			67.31 @ 0700	20-30 widespread with up to 50 on dam CA's
07/01/2011	0700 W29				67.64 @ 0600	30-50 with isolated falls up to 75; signif. Rain on Lock. Ck.
07/01/2011	1500 W30	Release started 1500 to be incr. slowly to ~1,200m^3/s by 1400 tomorrow				
08/01/2011	0700 W31	~890		All (5) RG's open	68.45 @ 0600 rising steadily	Widespread rain 20-40 over dam CA's since 0900 yesterday; further high rainfall predicted for next 4 days
09/01/2011	0700 W32 W33		1,343		Currently 68.58 (falling slowly)	For last 12 hrs. av. of 40 for Somerset CA & <10 for Wivenhoe CA
09/01/2011	2100 W34		1,400		Currently @ 69.1;	Very heavy rainfall -totals for 24 hrs 100 - 300; Severe weather warning for heavy rainfall

		W35				
		W36				
		W37				
11/01/2011	0630	W38	2,750 since 1930 on 10/1/2011	All (5) gates	73.51 rising @ 25mm/hr.	20-60 last 12 hrs in Lockyer CA; 30 in Bremer R.; Isol. Falls of 125 in upper Brisbane R. & widespread falls of 40 - 70 in Somerset CA
11/01/2011	1200	W39	3,970		74.1 (179.5% cap.) rising @ 25mm/hr.	

Comments	Crossing Closures
45,000Ml from Somerset; WL|Somerset to peak at 99.7 on 13/12/2010; 150m^3/s expected through Brisbane; 30,000Ml expected into Wivenhoe from upper Brisbane R.; peak WL in Wivenhoe expected to be 67.6; Releases expected from Wivenhoe on afternoon of 13/12/2010 ramping up to 300m^3/s; Reg. will be closed & Gate 3 opened to 3m to get WL back to 67.25; Incr. release will impact on 3 crossings; Dam Regulator informed	
138m^3/s from Somerset;	Gate release will impact on 3 crossings
Releases from Wivenhoe will cease on 16/12/2010; Hydro will continue during fish recovery ops.	
Gate closed 1000	
Decision to commence a release tonight was made this am by Duty Flood Engineers to provide as much notice to impacted Councils as possible; 60,000Ml needs to be released from Wivenhoe & Somerset to maintain FSL	
Need to release >60,000Ml from Wivenhoe & Somerset to achieve FSL	
Releases could increase to 300m^3/s;	Would impact Twin Bridges, Savages Crossing, Colleges Crossing
100,000Ml to be drained in next 4 days; Q|Brisbane R. to be maintained at 300-350m^3/s;Transfer from Somerset via 2 reg.; Wivenhoe Q incr. to 150m^3/s o/n; Will incr. further to 300m^3/s as Q|Lock.Ck. Subside over next 24 hrs.; Q|Lock.Ck. Currently 130m^3/s	Twin Bridges & Savages Crossing currently closed; Colleges Crossing to be impacted in afternoon
12,000Ml/day from Somerset; Release expected until 22/12/2010;	Twin Bridges, Savages Crossing, Colleges Crossing currently closed
Somerset rel. steady (Q|reg.=140m^3/s); Q|Wivenhoe to be maintained at 300m^3/s (Lock.Ck. Permitting) to allow Burtons Bridge to remain open; WL|Wivenhoe expected to incr. to 67.4 over next 2 days;	Twin Bridges, Savages Crossing and Colleges Crossing are closed; closing of Burtons Bridge and Kholo Bridge will be considered if more rain or inflows
Somerset risen to 100.2 - sluice gate releases to be made until am of 22/12/2010 when FSL expected; WL|Wivenhoe at 68 expected this pm; Q|Wivenhoe expected to be >1,200m^3/s - discuss with impacted Cncls.- strategy decision by 10000; Wivenhoe inflows excl. Q|Somerset peak tomorrow at 1800m^3/s	Both Burtons and Kholo bridges likely to be inundated
Inflow to Somerset to peak today at 700m^3/s; Somerset & Wivenhoe currently storing 140,000Ml above FSL; further inflows occurring; releases to be incr. o/n to ~1,200m^3/s; various Cncls. Given heads up; BOM advised	Wivenhoe releases reduced slightly to keep Burtons Bridge open - then incr. releases after Somerset RegnlCncl inform residents affected by Burtons Bridge
Same as W11	
410m^3/s from Somerset sluice gates; Somerset peaked @100.43 (1300 on 20/12/2010), currently @ 100.23 (114% of cap.); 110,700Ml Inflow to Somerset,67,500Ml discharged into Wivenhoe; Wivenhoe inflow (excl. Somerset releases) = 157,900Ml, 103,000Ml released; Total Inflow to both dams ~310,000Ml; Continued gate operations may be necessary if forecast rainfall results in subsequent river rises	Kholo Bridge is also expected to be inundated by mid-morning ; In accordance with the adopted operational strategy these bridges should be back in service by late Thursday and all bridges (with the possible exception of Twin Bridges) should be trafficable for Christmas providing no further rainfall occurs.
410m^3/s from Somerset sluice gates; Somerset currently @ 99.68 (108% cap.); 121,500Ml inflow to Somerset, 103,000Ml released to Wivenhoe; Gate Ops. @ Wivenhoe; High tides expected to coincide with peak levels in Brisbane R.	Burtons Bridge & Kholo Bridge expected to be back in service by 23-24/12/2010; All bridges expected to be trafficable by Xmas provided no further rain
BOM aware of all releases	Gate closing sequence to allow bridges to be accessible
	Projected crossing openings: Burtons Bridge – 18:00 Thursday 23 December 2010. Savages Crossing – 19:00 Thursday 23 December 2010 Kholo Bridge – 21:00 Thursday 23 December 2010 Colleges Crossing – 08:00 Friday 23 December 2010
1 sluice open @ Somerset to be closed @ 0900 - WL will be 0.1m> FSL; Est. Inflow to Somerset 135,000ML, majority discharged into Wivenhoe; Gate closure ops @ Wivenhoe in progress; Wivenhoe inflow (excl. Somerset inflow) = 204,000Ml; A total of 324,000Ml has been released; Contd. gate ops may be necessary if forecast rain results in river rises; Gate closure ops sequence to be reviewed	
Somerset gate ops ceased @ 0900, WL @ 99.1; Gate closure sequence extended to pm of 24/12/2010; Contd. Gate ops may be necessary if forecast rainfall gives incr. river levels	Projected crossing openings: Burtons Bridge – 18:00 Thursday 23 December 2010, Kholo Bridge - 21:00 Thursday 23 December 2010; Other bridges expected to remain closed until Xmas Day
Gate ops @ Somerset ceased yesterday, reg. to be opened to bring lake to FSL; Gate ops continuing @ Wivenhoe -1 gate incr. every 5-6 hrs to ensure Brisbane R. Q not incr. due to incr. Lock. Ck. Outflows & maintain Burtons Bridge open;	Twin Bridges, Savages Crossing and Colleges Crossing are currently closed and should remain so for some time due in part to current outflows into the Brisbane River from Lockyer Creek that will peak in excess of 200 cumecs late today.
Flood Centre to monitor o/n & consider options tomorrow am based on inflows & rainfall; further gate ops may be necessary in coming days	
Somerset WL incr. from 99.18 yesterday @ 0600 to 99.33 @ 0730 today; 99.5 tomorrow if no gate ops.; Wivenhoe currently 4,200Ml through hydro & reg.; 15,00Ml expected just from upper Brisbane R. in next few days; WL cont. to fall in Lock. Ck; Small rises expected in Bremer & Warrill systems; WL in Wivenhoe incr. to 67.28 @ 600	Twin Bridges, Savages Crossing and Colleges Crossing may still be affected by flows from the Lockyer. Twin Bridges, Savages and Colleges Crossing remain impacted by Wivenhoe releases and Lockyer and local runoff. Burtons and Kholo Bridges would be currently unaffected. Kholo will no doubt still be closed by Council regarding repairs.

BOM issued severe weather warning @ 0 445; Somerset WL incr. to 99.46 (0.46m> FSL) - 2 regs. To be opened today (140m³/s); Wivenhoe WL incr. to 67.37 (0.37m > FSL); RG to be opened later today following discussions with local authorities; further gate ops may be necessary if rainfall incr. river levels	Crossings downstream of the dam are currently impacted primarily by non-controlled river flows only (no RG releases from Wivenhoe). Lockyer Creek outflows into the Brisbane River are currently in the order of 60m³/s. Twin Bridges, Savages and Colleges Crossings will be inundated but the plan is to release around 300-350m³/s depending on flows downstream so as to not impact Burtons Bridge.
BOM continues with severe weather warning & widespread rainfall over dam CA's; 2 regs. @ Somerset giving 139m³/s release, lake contd. To rise to 99.6 (0.6m> FSL); RG ops @ Wivenhoe commenced yesterday @ 0900, WL contd. To rise to 67.57 (0.57m > FSL);Q|Wivenhoe reduced o/n because of incr. Q|Lockyer to ensure Burtons Bridge remains open; RG @ Wivenhoe wound back as Q|Lockyer incr. > 250m³/s; Q|Lockyer expected to peak>500m³/s later today/tomorrow - will innundate Burtons Bridge;When this happens, Q|Wivenhoe will be incr. to get WL back to FSL; further gate ops may be necessary in coming days	Twin Bridges, Savages Crossing and Colleges Crossing currently closed; Burtons Bridge is currently open, but will be closed later today/tomorrow; Kholo Bridge remains unserviceable due to flood damage; No current expectation that either Mt Crosby Weir Bridge or Fernvale Bridge will be impacted by the current event; An updated estimate of the time of closure of Burtons Bridge this afternoon will be provided to Council RG discharge dropped back to 46m3/s to ensure Burtons Bridge can remain open; Twin Bridges, Savages Crossing, Colleges Crossing, Burtons Bridge and Kholo Bridge are currently closed; No current expectation that either Mt Crosby Weir Bridge or Fernvale Bridge will be impacted by the current event; Lockyer Creek outflows being closely monitored and may come close to impacting upon the Mt Crosby Weir Bridge; England Creek access is not impacted yet
Sever weather warning no longer current; Somerset release through regs' ~ 208m³/s;WL|Somerset incr. to 99.96 (0.96m>FSL) - inflows decreasing; RG opening dependent on Q|Lockyer; Wivenhoe WL currently @ 68.55 (1.55m > FSL); Inflows to Wivenhoe decr.	
Further 2 sluices opened @ Somerset; WL @ Somerset 99.83 & falling slowly, 2 sluices to be closed @ 1200; Intended to incr. Wivenhoe releases so Q|Wivenhoe+Q|Lockyer maintained @ 1,600m³/s (similar Q to mid Oct &mid Dec 2010)	Twin Bridges, Savages Crossing, Colleges Crossing, Burtons Bridge and Kholo Bridge are currently closed; no current expectation that Mt Crosby Weir Bridge or Fernvale Bridge will be impacted by current event. At this stage, estimated that the flow at Burtons Bridge will fall below the bridge deck on Sunday morning.
2 sluices @ Somerset remain open (405m³/s) - FSL expected by 6/1/2011; RG closing sequence expected to start mid tomorrow- RG expected to be closed on 2/1/2011	
WL @ Somerset 99.01 (falling from peak of 100.0 - 1200 28/12/2010) - currently 2 regs;	Twin Bridges, Savages Crossing, Colleges Crossing, Burtons Bridge and Kholo Bridge are currently closed Twin Bridges, Savages Crossing, Colleges Crossing, Burtons Bridge and Kholo Bridge are currently closed due to inundation Not included
Somerset @ 99.34 (0.34m > FSL) & rising slowly; Wivenhoe 67.31 (0.31m > FSL) & rising slowly; Gates will be opened in next 24 hrs; Lockyer Ck peak of about 100m3/s Friday afternoon	Lockyer Ck peak of about 100m3/s Friday afternoon. This will take out Twin Bridges and nearly inundate Savages Crossing. Colleges Crossing could be taken out by a combined Lockyer and local runoff. Current strategy is to keep Burton Bridge free. Gate release would limit mid-Brisbane Q to 400m³/s ((Burtons capacity 450m³/s).
100-200mm rain forecast for SE Qld next 5 days; Somerset WL @ 99.58 (0.59m > FSL) rising slowly - currently releasing 35m³/s; Wivenhoe WL @ 67.64 (0.64m > FSL & > gate trigger level) rising slowly; u/s of dam river levels peaked @ Linville and Gregors Ck gauges; A peak of about 470 cumecs is expected from Lockyer Creek by mid-afternoon; Wivenhoe gate releases will occur after the impact of Lockyer flows on Burtons Bridge has been ascertained and flood levels in the lower Lockyer subside Q|Wivenhoe may be as high as 1,200m³/s	Q|Lockyer may be of sufficient magnitude to inundate Burtons Bridge; Somerset Regional Council, Ipswich City Council and Brisbane City Council have been advised of the potential for gate operations during the next 24 hours; The relatively high Lockyer flows will adversely impact upon Twin Bridges, Savages Crossing, and Colleges Crossing for several days, may also later impact upon Burtons Bridge & Kholo Bridge; not expected to be any adverse impacts upon Fernvale Bridge or Mt Crosby Weir Bridge; Councils have been advised of this strategy and are contacting residents
Somerset releasing 35m³/s; 50,000Ml into Somerset; Gate release @ Wivenhoe - strategy to be reviewed tomorrow (dependent on further rainfall)	All of the crossings downstream of Wivenhoe with the exception of Fernvale and Mt Crosby Weir Bridge will be adversely impacted; Councils have been advised of this strategy and are contacting residents
Somerset WL @100.42 & rising (0500) - 1 open sluice gate; Water temp. held in Wivenhoe - strategy may need to be reviewed (depend. On confidence in estimates of Wivenhoe inflows); Intended to ramp Wivenhoe up to 1,200m³/s by 1200 - likely to be incr. next week; since 2/1/2011, ~200,000Ml has flowed into Wivenhoe (incl. Somerset releases), further 180,000Ml expected based on recorded rainfall; ~ 50,000Ml released via reg. & hydro (@50m³/s)	The projected Wivenhoe release of 1,200m3/s combined with Lockyer flows and local runoff will mean that all crossings downstream of Wivenhoe (Twin Bridges, Savages Crossing, Burtons Bridge, Kholo Bridge and Colleges Crossing) will be adversely impacted for several days. At this stage Fernvale and Mt Crosby Weir Bridge are not expected to be affected but they could potentially be affected if the predicted rainfall totals eventuate.
Somerset currently @ 100.27 - 60mm rain in last 2 hrs will cause significant inflow later today; 405m³/s being released into Wivenhoe; maintain combined Q of 1,600m³/s in mid-Brisbane R. Not included	The current Wivenhoe Dam release combined with Lockyer flows and local runoff will mean that all low level crossings downstream of Wivenhoe (Twin Bridges, Savages Crossing, Burtons Bridge, Kholo Bridge and Colleges Crossing) will be adversely impacted until at least Wednesday 12 January. At this stage Fernvale and Mt Crosby Weir Bridge are not expected to be affected, but this may be revised if the predicted rainfall totals eventuate and higher releases from Wivenhoe Dam are considered necessary. Cncls advised of Wivenhoe op. strategy
Somerset @ 101.68 rising quickly; 5 sluice gates open releasing ~1,100m³/s; WL expected to reach 103.5 by am 11/1/2011; River levels u/s Wivenhoe rising fast; Q|Brisbane R. @ Gregors Ck @ 6,700m³/s; Wivenhoe expected to reach 73.0 by 11/1/2011 - need to incr. Q|Wivenhoe am of 10/1/2011 - crank up to 2,600m³/s by am 11/1/2011; Attempt to keep combined Q < 3,500m³/s - < limit of urban damages in the City	The projected Wivenhoe Dam releases combined with Lockyer flows and local runoff will mean that all crossings downstream of Wivenhoe (Twin Bridges, Fernvale, Savages Crossing, Burtons Bridge, Kholo Bridge, Mt Crosby Weir and Colleges Crossing) will be adversely impacted until at least Saturday 15 January in varying degrees; Water levels in the lower Brisbane R will be impacted by the combined flows of Lockyer Ck, Bremer River, local runoff and releases from Wivenhoe Dam

Not included
Not included
Not included

Somerset WL @ 103.27 & falling slowly ; currently 1,400m^3/s released to Wivenhoe- to be reduced to 500m^3/s later in the day - to ensure flood mitigation of Somerset & Wivenhoe are maximized; BOM provided advice on flash flooding in Lockyer Ck.; WL in Wivenhoe will reach 74 by evening; May need to increase Q further - may result inQ|lower Brisbane R. >5,000m^3/s

Somerset @ 103.3 & rising; Outflows into the Brisbane River from both Lockyer Creek and the Bremer River are also increasing; If no further rain, can hold @ 74.8 - aim is to prevent fuse plug triggering, situation assessed every 3 hrs.; Heavy rainfall continues throughout South East Queensland and the situation could deteriorate over the next 24 hours. The flood operation centre will continue to monitor the situation and provide situation reports every six hours until the situation stabilizes.

The projected Wivenhoe Dam releases combined with Lockyer Creek flows and local runoff will mean that all crossings downstream of Wivenhoe (Twin Bridges, Femvale, Savages Crossing, Burtons Bridge, Kholo Bridge, Mt Crosby Weir and Colleges Crossing) will be adversely impacted; Water levels in the lower Brisbane River will be impacted by the combined flows of Lockyer Creek, Bremer River, local runoff and releases from Wivenhoe Dam.

Suzie Emery

From: Bradley John [John.Bradley[redacted]]
Sent: Sunday, 16 January 2011 10:35 PM
To: Elaina Smouha
Cc: Barry Dennien; Dan Spiller; Best Debbie; pborrows; Reilly Bob
Subject: RE: Cabinet in confidence - Ministerial brief - Flood event and Wivenhoe Dam

Follow Up Flag: Follow up
Flag Status: Flagged

Many thanks to all for thier hard work at the end of an exceptionally long week,

I have sent to Minister and look forward to seeing Barry/Dan, Peter Borrows and Bob Reilly at 9 am in Minister Robertson's office,

thanks
John B

From: Elaina Smouha [mailto:elainamir[redacted]]
Sent: Sunday, 16 January 2011 10:14 PM
To: Bradley John
Cc: Dennien Barry[redacted]; spiller daniel[redacted] WaterGridMedia; Best Debbie; pborrows
Subject: Cabinet in confidence - Ministerial brief - Flood event and Wivenhoe Dam

John

Attached is the Ministerial Brief and accompanying attachments for the Emergency Cabinet meeting scheduled on 17 January 2011.

Regards

Elaina

Elaina Smouha
Director, Governance and Regulatory Compliance
SEQ Water Grid Manager
[redacted]
Email: elaina.smouha[redacted]
Visit: Level 15, 53 Albert Street Brisbane
Post: PO Box 16205, City East QLD 4002
ABN: 14783 317 630

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Gina O'Driscoll

From: Barry Dennien
Sent: Tuesday, 25 January 2011 4:32 PM
To: john.bradley[redacted]
Cc: Dan Spiller; elaina.smouha[redacted]; pborrows[redacted]; Reilly Bob
Subject: Public inquiry discussion points - brief - Cabinet in confidence
Attachments: Public inquiry strategy - brief.docx

Importance: High

John

Attached are some discussion points in preparation for the 2pm teleconference about Monday's Emergency Cabinet meeting.

Regards

Barry

Discussion points for teleconference

What is the objective?

a) Ensuring public transparency
b) To answer the State's questions on the performance of Wivenhoe Dam operations
c) Preparation for a public inquiry
d) Normal and logical course of conduct after the occurrence of a major flood event – Review requirement under the Flood Mitigation Manual

Background

1) Design of Dam – Storages/Spillway upgrade (Responsible: Seqwater)
2) How does Wivenhoe Dam work as a flood mitigator? Stats on how much did Wivenhoe Dam knock off the flood peak? **[Priority to get out to the public]** (*Responsible: Seqwater*)
3) Development of Flood Mitigation Manual (*Responsible: Seqwater/DERM*)
    a. Four strategies
    b. History of Flood Mitigation Manual updates and peer review
4) Responsibility under the *Water Supply (Safety and Reliability) Act 2008* (*Responsible: DERM*)
    a. What is the formal reporting process following a major flood event?
5) "The Event" – operation of Wivenhoe Dam (*Responsible: Seqwater*)
    a. Event report under the Flood Mitigation Manual
6) "The Event" – management of the Water Grid emergency under the SEQ Water Grid Emergency Response Plan (*Responsible: SEQ Water Grid Manager*)
7) What next?
    a. SWOT
        i. Community feedback
        ii. A significant (from a national perspective)

Seqwater report

Flood Mitigation Manual requires a report to the Chief Executive after a significant flood event, on the effectiveness of the operational procedures:

- Get more comprehensive report from Brian Cooper? – review appropriateness of trigger levels – take into account the accuracy of rainfall forecasts provided by BOM at the time – reliability of weather forecasts.
- Set up expert panel for Flood Mitigation Manual review
- Communication Protocol and incorporation into the Flood Mitigation Manual (revisit in the next fortnight)

Seqwater to procure review.

Urgent accelerated review due to anticipated further rainfall.

From: Dan Spiller <dan.spiller[redacted]>
Sent: Monday, March 7, 2011 6:19 PM
To: 'Bradley John' <John.Bradley[redacted]>;
'Debbie.Best[redacted]'Reilly Bob' <Bob.Reilly[redacted]>
Cc: Barry Dennien <Barry.Dennier[redacted]>
Subject: Summary report
Attach: January flood event_Summary of information released_FINAL.PDF

All,

Report as provided to Stark and CM.

Dan

Daniel Spiller
Director, Operations
SEQ Water Grid Manager
Phone:[redacted]
Email: daniel.spiller[redacted]
Visit: Level 15, 53 Albert Street Brisbane
Post: PO Box 16205, City East QLD 4002
ABN: 14783 317 630

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SEQ Water Grid

January 2011 flood event
Summary of dam operations

January 2011

safe secure sustainable

G149

1.0 Introduction

A flood event occurred in South East Queensland in January 2011.

Throughout this event, the Water Grid provided regular updates on the levels of key storages and the management of releases. The releases were provided to media outlets and Councils, and made available on the Water Grid website (www.watergrid.com.au). The updates released during the flood event have been collated under **Attachment 1**.

Updates focused on the four dams in South East Queensland that are gated, with the ability to control the rate of release of floodwater. These are Wivenhoe, Somerset, North Pine and Leslie Harrison dams.

The updates include information about the storage levels of each dam and releases from those dams. They also contain most general information about:

- flows from the Lockyer and Bremer, which enter the Brisbane River downstream of Wivenhoe Dam
- impacts on downstream bridges, based on advice from the Councils that own those bridges
- rainfall forecasts, based on advice from the Bureau of Meteorology.

Information about the regulatory framework for the management of Wivenhoe and Somerset dams is contained in Section 2.

Information about the operation of Wivenhoe and Somerset dams is summarised in Section 3.

Information about the operation of North Pine and Leslie Harrison dams is summarised in Section 4. Information on Hinze Dam releases are also included.

All of these dams are owned and operated by Seqwater. The information provided in the updates was based on information provided by Seqwater.

As outlined in Section 5, more detailed information about the impact of dam releases on river levels is being prepared by the Bureau of Meteorology and responsible Councils.

2.0 Regulatory framework

Detailed operational procedures have been approved for each of the gated dams.

Seqwater is the owner and operator of Wivenhoe and Somerset Dams.

Under Section 370 of the *Water Supply (Safety and Reliability) Act 2008*, it is required to prepare a flood mitigation manual for approval by the Dam Safety Regulator.

Seqwater's approved *Manual of Operational Procedures for Flood Mitigation at Wivenhoe Dam and Somerset Dam* (Operations Manual) can be viewed at www.derm.qld.gov.au. At the request of Seqwater, some sections of the published version Operations Manual have been deducted for security reasons relating to critical infrastructure.

The Operations Manual sets out clear priorities for the strategies to manage water supplies in the dams.

The Operations Manual lists the structural safety of the dam as the highest priority, particularly in extreme weather events where there is the threat of the dam over-topping which could lead to damage to the dam wall.

With the structural safety of the dam secure, the next objectives in order of priority are to provide optimum protection of urbanised areas from inundation, minimise disruption to rural life in the valley of the Brisbane and Stanley Rivers, provide full water supply storage after the flood, and minimise impacts to riparian flora and fauna during the drain down phase of the flood event.

The operational procedures outlined in the Operations Manual have been developed and progressively refined over many years, and have been reviewed by Australia's leading water experts.

They include Professor Colin Apelt, Head of Department, Department of Civil Engineering and Chair of the Brisbane City Council flood taskforce; University of Queensland and Mr Eric Lesleighter, Principal Hydraulic Engineer and Chief Engineer Water Resources, Snowy Mountains Engineering Corporation.
The Operations Manual in its current form was developed in 1992 and has had six revisions since this time, with the latest review taking place in 2009, and finalised in January 2010.

More general information about the operation of Wivenhoe Dam is contained in a factsheet at **Attachment 2**.

3.0 Wivenhoe and Somerset dams

Table 1 summarises the information released during the event, including the dam levels and release rates. For some days, dam levels are not specified. For those days, levels were not specified in the releases or updated on the Seqwater website.

On 13 February 2010, Seqwater announced that Wivenhoe Dam would be reduced to 75 per cent of its full supply level. This is an interim measure for the remainder of the summer, with the longer term approach to be shaped by the Commission of Inquiry's outcomes. Seqwater advises that a reduction in Wivenhoe Dam storage level to 75 per cent of its Full Supply Level will provide appreciable flood mitigation benefits ahead of any major rain events in the remainder of the wet season.

The operational decision reflects current circumstances, rather than issues which likely to be considered by the Commission of Inquiry into the recent floods. The Commission of Inquiry will continue to assess dam operations during the January flood event and whether any changes to the long term framework are required.

Table 1: Wivenhoe and Somerset dam operation

Update	Wivenhoe Dam		Somerset Dam		Bridges inundated							Key statements from updates
	Level	Releases	Level	Releases into Wivenhoe Dam	Twin	Savages	Burtons	Kholo	Colleges	Fernvale	Mt Crosby	
Saturday 1 January	-	130,000 ML/day	-	Through regulator valve	x	x	x	x	x			• The gradual gate closure sequence at Wivenhoe began overnight and by sometime Sunday all gates will be closed.
Sunday 2 January	-	All five gates closed Sunday morning	-	Through regulator valve	x	x						• All five gates were fully closed this morning.
Monday 3 January	-	-	-	-	x							• No update
Tuesday 4 January	102%	Through regulator valve	103%	Through regulator valve								• No update
Wednesday 5 January	102%	Through regulator valve	103%	Through regulator valve								• No update
Thursday 6 January	103%	Through regulator valve. Gate operations will be required	104%	Through regulator valve	x	x	x	x	x			• Gate operations at Wivenhoe Dam will be required. To minimise downstream impacts, these releases will commence when flood levels in the lower Lockyer Creek subside. • Local flows, and the expected Wivenhoe Dam release, may impact upon Twin Bridges, Savages Crossing, Burtons Bridge, Kholo Bridge and Colleges Crossing for several days.
Friday 7 January	106%	Through regulator valve. Gate operations will be required at 130,000 ML/day	107%	Through regulator valve	x	x	x	x	x			• To minimise downstream impacts, these releases will commence when flood levels in the lower Lockyer Creek subside. The rate of release will be similar to last week, at up to 130,000 megalitres per day.
Saturday 8 January	-	100,00 ML/day through all 5 gates	-	Through one gate	x	x	x	x	x			• Releases will be reviewed and may change depending on rainfall, inflows into the dam and river flows.
Sunday 9 January	-	116,000 ML/day	-	Through sluice gates	x	x	x	x	x			• Gate operations will continue to be reviewed and may change at short notice depending on rainfall, inflows into the dam and river flows. • These releases are expected to continue until next week.

Update	Wivenhoe Dam		Somerset Dam		Bridges inundated							Key statements from updates
	Level	Releases	Level	Releases into Wivenhoe Dam	Twin	Savages	Burtons	Kholo	Colleges	Fernvale	Mt Crosby	
Monday 10 January (Morning)	140%	170,000 ML/day	150%	Through sluice gates	x	x	x	x	x	x	x	• Overnight, Fernvale and Mt Crosby Weir Bridges together with a number of local roads became inundated. They joined the others already impacted, including Twin Bridges, Savages Crossing, Burtons Bridge, Kholo Bridge and Colleges Crossing. • In order to relieve the quickly filling flood storage compartment, and with more rain forecast, controlled releases from the dam have been increased today from 116,000 megalitres per day to 170,000 megalitres per day. These releases are a necessity. • Releases are being reviewed in consultation with the Bureau of Meteorology and local councils, utilising a strategy to limit impacts where possible downstream.
Monday 10 January (Evening)	154%	Increasing to 240,000 ML/day	158%	Through sluice gates	x	x	x	x	x	x	x	• In order to relieve the quickly filling flood storage compartment, and with more rain forecast, controlled releases from the dam have been increased today from 116,000 megalitres per day to 172,000 megalitres per day. Further increases to the release rate are planned, to approximately 240,000 megalitres per day by midnight. • These releases are a necessity as, at the peak, Wivenhoe Dam was receiving more than twice the volume of Sydney Harbour each day. • Releases are continually being reviewed in consultation with the Bureau of Meteorology and local councils, utilising a strategy to limit impacts where possible downstream.
Tuesday 11 January (Morning)	173%	Further increases today	160%	Through sluice gates	x	x	x	x	x	x	x	• Significant rainfall received across catchments has caused waterways upstream of Somerset and Wivenhoe Dams to rise quickly overnight. • Controlled releases through the five gates have been

Update	Wivenhoe Dam		Somerset Dam		Bridges inundated							Key statements from updates
	Level	Releases	Level	Releases into Wivenhoe Dam	Twin	Savages	Burtons	Kholo	Colleges	Fernvale	Mt Crosby	
												held at around 236,000 megalitres since early last night but will need to be increased further today.
Tuesday 11 January (Evening 5.19PM)	190%	490,000 ML/day	176%	176,000 ML/day through sluice gates	x	x	x	x	x	x	x	• Controlled releases through Wivenhoe's five radial gates have now been increased to around 490,000 megalitres per day. This is expected to increase. • While substantial amounts of water are being released into Wivenhoe from Somerset Dam, water levels in Somerset are expected to continue to rising today and areas around Kilcoy are likely to be impacted by these rising dam levels.
Tuesday 11 January (Evening 10.30PM)	190%	645,000 ML/day	183%	Releases ceased, but expected to recommence overnight	x	x	x	x	x	x	x	• At 10pm Wivenhoe Dam was at 190 per cent with water levels falling slowly. • Controlled releases through Wivenhoe's five radial gates of 645,000 megalitres per day are expected to reduce slightly overnight due to easing rainfall. • Somerset Dam is at 183 per cent and releases into Wivenhoe are expected to recommence overnight however high upstream levels are expected to continue to affect Kilcoy.
Wednesday 12 January (Morning)	190%	205,000 ML/day, down from an overnight peak of 645,000 ML/day	190%	Through sluice gates	x	x	x	x	x	x	x	• Wivenhoe's five radial gates are currently releasing 205,000 megalitres per day, down from 370,000 megalitres and an overnight peak of 645,000 megalitres. • This strategy is to allow for the Bremer and Lockyer Rivers to subside. • After the expected downstream peak in the lower Brisbane River has passed, releases will need to be increased to 301,000 megalitres per day. • However, this increase is unlikely to cause a second significant rise in the river.

Update	Wivenhoe Dam		Somerset Dam		Bridges inundated							Key statements from updates
	Level	Releases	Level	Releases into Wivenhoe Dam	Twin	Savages	Burtons	Kholo	Colleges	Fernvale	Mt Crosby	
Wednesday 12 January (Evening)	189%	215,000 ML/day	186%	123,000 ML/day	x	x	x	x	x	x	x	• These controlled releases must continue in order to relieve Wivenhoe Dam's swollen flood storage compartment in order to create space for further rainfall and inflows. • Wivenhoe's five radial gates continue to release 215,000 megalitres per day. This is considerably down from an overnight peak of 645,000 megalitres and will remain at this level to allow for the Bremer and Lockyer Rivers to subside. • After the expected downstream peak in the lower Brisbane River has passed, releases will be increased to 301,000 megalitres per day, however, this increase is unlikely to cause a second significant rise in the river.
Thursday 13 January (Morning)	187%	215,000 ML/day	174%	121,000 ML/day	x	x	x	x	x	x	x	• Wivenhoe Dam is at 187 per cent, and is dropping gradually with controlled releases through all five gates of 215,000 megalitres per day. • The dam's slow recession is due in part to inflows of 121,000 megalitres per day via a sluice gate from Somerset Dam. Somerset is at 174 per cent.
Thursday 13 January (Evening)	186%	228,000 ML/day	167%	120,000 ML/day	x	x	x	x	x	x	x	• Wivenhoe Dam is at 186 per cent, and is dropping gradually with controlled releases through all five gates of 228,000 megalitres per day.
Friday 14 January (Morning)	179%	301,000 ML/day	151%	111,800 ML/day	x	x	x	x	x	x	x	• Wivenhoe Dam is at 179 per cent, and continues to drop steadily. Releases have been graduated to 301,000 megalitres per day in a 7 day strategy designed to draw down the flood storage compartment with no noticeable effects downstream. • The continuing releases are necessary in order to prepare Wivenhoe for any future weather events

Update	Wivenhoe Dam		Somerset Dam		Bridges inundated							Key statements from updates
	Level	Releases	Level	Releases into Wivenhoe Dam	Twin	Savages	Burtons	Kholo	Colleges	Fernvale	Mt Crosby	
												should they occur.
Friday 14 January (Evening)	172%	301,000 ML/day	140%	111,800 ML/day	x	x	x	x	x	x	x	• Wivenhoe Dam is at 172 per cent, and continues to drop steadily. • Inflows and water levels in the Brisbane and Pine catchments are being continually monitored.
Saturday 15 January (Morning)	163%	301,000 ML/day	129%	79,000 ML/day	x	x	x	x	x	x	x	• Wivenhoe Dam is at 163 per cent, and continues to drop steadily.
Saturday 15 January (Evening)	154%	301,000 ML/day	121%	79,000 ML/day	x	x	x	x	x	x	x	• Wivenhoe Dam is at 154 per cent, and continues to drop steadily.
Sunday 16 January	138%	299,000 ML/day	106%	70,500 ML/day	x	x	x	x	x	x	x	• Wivenhoe Dam is at 138 per cent, and continues to drop steadily. Releases continue at around 299,000 megalitres per day. This flow will be maintained to drain the flood storage compartment this week.
Monday 17 January	123%	299,000 ML/day	100%	Small discharges	x	x	x	x	x	x	x	• Wivenhoe Dam is at 123 per cent capacity and continues to drop steadily. Releases continue at around 299,000 megalitres per day. • Somerset Dam is at 100 per cent with small discharges through the cone valves into Wivenhoe.
Tuesday 18 January	107%	176,000 ML/day and reducing with the gate closing sequence	99%	Small discharges	x	x	x	x	x	x	x	• Wivenhoe Dam is at 107 per cent and continues to drop steadily. • Releases remained constant overnight at around 176,000 megalitres per day and are now reducing with the commencement of the gate closing sequence which began at 9am this morning.
Wednesday 19 January	99%	Gate closing sequence expected to be completed by Thursday	100%	Sluice gates closed	x	x	x	x	x	x	x	• Wivenhoe Dam is at 99.3 per cent with the gate closing sequence expected to be complete by late afternoon today.

Update	Wivenhoe Dam		Somerset Dam		Bridges inundated							Key statements from updates
	Level	Releases	Level	Releases into Wivenhoe Dam	Twin	Savages	Burtons	Kholo	Colleges	Fernvale	Mt Crosby	
Thursday 20 January	99.6%	One gate partially open	100.8%	Sluice gates closed	x							• Somerset Dam is at 100 per cent capacity with all sluice gates currently closed. Depending on inflows into the catchment, further releases into Wivenhoe Dam may be made over the next 24 hours. • Last night's storms over the catchment have resulted in one gate being partially opened at Wivenhoe Dam this morning. This will see a small controlled release over the course of today to maintain the dam at or near 100%.

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4.0 Other dams

Controlled releases were made from North Pine, Leslie Harrison and Hinze dams. These releases are summarised in **Table 2.**

Table 2: Other dam operation

Update	North Pine		Hinze		Leslie Harrison	
	Dam level	Releases	Dam level	Releases	Dam level	Releases
Thursday 30 December	99.9%	-	100.0%	Minor releases	97.6%	-
Friday 31 December	100.2%	-	100.0%	Minor releases	97.8%	-
Saturday 1 January	-	Minor releases underway	-	Minor releases	-	-
Sunday 2 January	-	Minor release overnight, gates closed early morning	-	Minor releases	-	-
Monday 3 January	-	-	-	-	-	-
Tuesday 4 January	99.0%	-	99.6%	-	98.8%	-
Wednesday 5 January	99.1%	-	99.6%	-	98.8%	-
Thursday 6 January	100.0%	Releases expected today	99.9%	-	98.8%	Releases commenced
Friday 7 January	-	Spillway operations commenced	100.0%	-	96.2%	Releases underway
Saturday 8 January	-	Minor releases underway	-	Releases predicted	-	Releases underway
Sunday 9 January	-	Release operations being reviewed	-	Minor releases underway	-	Releases ceased
Monday 10 January am	103.9%	5 gates open releasing 43,000 ML/day	100.0%	Minor releases 1,200 ML/day	100.0%	Releases underway
Tuesday 11 January am	105.3%	5 gates open releasing 15,000 ML/day	100.0%	Minor releases 1,200 ML/day	96.8%	Releases underway
Wednesday 12 January am	101.8%	5 gates open, releasing 6,800 ML/day	112.1%	Minor releases 8,000 ML/day	96.1%	Releases underway
Thursday 13 January am	100.4%	5 gates open. Expected to close Friday	-	Minor releases 8,000 ML/day	96.9%	Releases ceased
Friday 14 January am	-	Releases ceased	100.0%	Minor releases 8,000 ML/day	97.3%	-
Saturday 15 January am	-	-	-	Minor releases 8,000 ML/day	-	-
Sunday 16 January	96.0%	-	-	Minor releases 6,800 ML/day	-	-
Monday 17 January	99.4%	-	99.8%	Minor releases 6,800 ML/day	97.7%	-

5.0 Additional information

A range of modelling is required to be undertaken to ascertain the precise downstream impact of releases from Wivenhoe Dam during the January 2011 flood event.

Compiling this technical information requires the following tasks:

- validation the water outflows from Wivenhoe Dam
- calculation and validation Brisbane River levels as a result of the water outflows
- determination of the impact of inundation based on those Brisbane River levels.

Seqwater has responsibility for providing and validating water outflows over the event.

Both the Bureau of Meteorology and the Brisbane City Council have developed models for determining Brisbane River levels for various water outflows from Wivenhoe Dam. This includes taking into account flows down both the Lockyer and Bremer rivers and other localised flows. Brisbane City Council has developed the modelling to determine the impact of Brisbane River levels on the flooding properties and households.

Seqwater dam levels and water outflows during the January event are required to be validated and provided to the Dam Safety Regulator as part of a comprehensive report into the event. This report will also be provided to the Commission of Inquiry into the Queensland floods which is now underway.

In addition, Bureau of Meteorology has agreed to be the clearing house for all data requests in relation to either river or rainfall gauges across the region in relation to the January flood event. Any request for this data should be directed to climate.qld[redacted]

Attachment 1: Update

TRIM reference: D/	Date and time: 1/01/11 10:45am
Title : MEDIA UPDATE - 01.01.11	
Summary: Dam safety for South East Queensland over holiday season, Most recreation facilities open	
Note: Issued to all key media and stakeholders in South East Queensland	

MEDIA UPDATE
1 January 2011

Dam safety for South East Queensland over holiday season

Controlled floodwater releases over several days will see Wivenhoe Dam return to full supply level this weekend.

With the flood compartment empty, Wivenhoe Dam will be ready for more rain forecast next week.

Over the last week, Wivenhoe Dam's flood storage compartment has significantly reduced the flood risk for Brisbane and Ipswich.

The gradual gate closure sequence at Wivenhoe began overnight and by sometime Sunday all gates will be closed.

Water Grid operators continue to work closely with councils regarding dam releases and Twin Bridges, Savages Crossing, Colleges Crossing, Kholo and Burton Bridges will continue to be inundated until Sunday.

Somerset Dam continues to make minor releases into Wivenhoe.

A minor release is being made from North Pine Dam however no impact on Youngs Crossing is expected.

No releases are currently being made from Leslie Harrison Dam

Hinze Dam continues to discharge flood waters and this is expected to continue until early next week. There is no public access to the spillway.

For information on local flood impacts, including road closures, members of the public should always contact the local council.

For recorded information on current dam releases in South east Queensland, call [redacted]

Most recreation facilities open

Lower dam levels mean that both Somerset and Wivenhoe Dams are now open to water based activities.

All recreation sites are now open, except for:

- River access at Atkinson's Crossing
- Billies Bay/Hay's Landing

For further information on the Water Grid: www.watergrid.com.au

ENDS

Notes to the editor

About the SEQ Water Grid

Established in June 2008 in response to the crippling Millennium Drought, the SEQ Water Grid represents one of Australia's largest investments in water infrastructure.

Through a network of climate resilient water sources, treatment facilities, new two-way pipes and existing pipelines, the SEQ Water Grid gives the South East Queensland region the ability to support water demands, water quality, economic prosperity and lifestyle - regardless of climate change and population growth.

For further details contact the SEQ Water Grid Communications Unit on:

Ph: [redacted]

TRIM reference: D/	Date and time: 2/01/11 9:50am
Title : MEDIA UPDATE - 02.01.11	
Summary: Dam safety for South East Queensland over holiday season, Most recreation facilities open	
Note: Issued to all key media and stakeholders in South East Queensland	

MEDIA UPDATE
2 January 2011

Dam safety for South East Queensland over holiday season

All five gates at Wivenhoe Dam were fully closed on Sunday morning.

This means the flood compartment at Wivenhoe Dam is ready for more rain forecast next week.

Councils have been advised and they will make decisions about opening Twin Bridges, Savages Crossing, Colleges Crossing, Kholo and Burton Bridges as inundation levels drop.

Somerset Dam continues to make minor releases into Wivenhoe.

A minor release was made overnight at North Pine Dam with gates closed early Sunday morning.

No releases are being made from Leslie Harrison Dam

Flood water releases from Hinze Dam will reduce during today and the gate is expected to close sometime tomorrow. There is no public access to the spillway.

For information on local flood impacts, including road closures, members of the public should always contact the local council.

For recorded information on current dam releases in South East Queensland, call [redacted]

Most recreation facilities open

Both Somerset and Wivenhoe Dams are open to water based activities.

All recreation sites are now open, except for:
- River access at Atkinson's Crossing
- Billies Bay/Hay's Landing

which are both expected to re-open sometime today.

Due to the ground being saturated, care should be taken around all recreation sites. Vehicles must only be parked in designated parking areas and should not be driven on off roads or onto grassed areas.

For further information on the Water Grid: www.watergrid.com.au

ENDS

Notes to the editor

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For further details contact the SEQ Water Grid Communications Unit on: [redacted]

TRIM reference: D/	Date and time: 6/01/11 4:13pm
Title : SEQ dam release and flooding update - 06.01.11	
Summary: Dam releases, Recreation update, Gold Coast Desalination Plant update	
Note: Issued to all key media and stakeholders in South East Queensland	

SEQ dam release and flooding update - 06.01.11

MEDIA RELEASE - 6 JANUARY 2011

Dam Releases

With recent heavy rainfall across South East Queensland and the forecast of more to come, releases are being made from some of the region's water storages.

Gate operations at Wivenhoe Dam will be required. To minimise downstream impacts, these releases will commence when flood levels in the lower Lockyer Creek subside.

Local flows, and the expected Wivenhoe Dam release, may impact upon Twin Bridges, Savages Crossing, Burtons Bridge, Kholo Bridge and Colleges Crossing for several days. Local councils should be consulted for detailed information on road crossing closures and other impacts.

At this stage, no impacts are expected for Fernvale Bridge or Mt Crosby Weir Bridge.

Water from Somerset Dam is being released into Wivenhoe Dam through a regulator valve, which may increase later today.

A release through the gate at North Pine Dam is expected to commence later today.

A release from Leslie Harrison is underway and may continue until the weekend.

No water is currently being released from Hinze Dam.

The Water Grid is working with local councils regarding the current releases and the likely impacts, which are being managed in accordance with approved flood management plans.

Recreation update

Dams are currently open for water-based recreational activities, however this may change depending on the weather. Visitors should check the Water Grid website for additional information for each recreation site.

Gold Coast Desalination Plant

SEQ Water Grid

Media updates issued during the January flood event

Even though the regions dams are at or near full capacity, recent heavy rains have resulted in high sediment levels in the Brisbane River. These increased levels present challenges for water treatment plants like those at Mt Crosby, which are the main supply for Brisbane.

The Gold Coast Desalination facility was recently brought up to full capacity to address the flood associated issues at Mt Crosby without compromising water security or quality for Brisbane.

The Gold Coast Desalination facility is now operating at 33 per cent capacity to ensure the highest water quality for the South East Queensland region.

PLEASE NOTE: While releases are being made from the region's water storages, routine updates will be provided.

Community Assistance:
Please direct the community to contact **telephone -** [redacted] This number has been established for members of the public seeking information on which dams are spilling in South East Queensland. Members of the public seeking detailed information on **potential impacts in their local areas including road closures should direct inquiries to their local councils**.

For further details contact the Water Grid Communications Unit on:
[redacted]

TRIM reference: D/	Date and time: 7/01/11 10:03am
Title : SEQ dam release and flooding update - 07.01.11	
Summary: Dam releases, Recreation update, Gold Coast Desalination Plant update	
Note: Issued to all key media and stakeholders in South East Queensland	

SEQ dam release and flooding update - 07.01.11

MEDIA RELEASE - 7 JANUARY 2011

Dam releases

With recent heavy rainfall across South East Queensland and the forecast of more to come, releases are being made from some of the region's water storages.

Water from Somerset Dam is being released into Wivenhoe Dam through a regulator valve. The releases may be increased to utilise sluice gates later today or over the weekend.

Gate operations at Wivenhoe Dam will be required. To minimise downstream impacts, these releases will commence when flood levels in the lower Lockyer Creek subside. The rate of release will be similar to last week, at up to 130,000 megalitres per day.

Local flows, and the expected Wivenhoe Dam release, may impact upon Twin Bridges, Savages Crossing, Burtons Bridge, Kholo Bridge and Colleges Crossing for several days. Local councils should be consulted for detailed information on road crossing closures and other impacts.

At this stage, no impacts are expected for Fernvale Bridge or Mt Crosby Weir Bridge.

Spillway gate operations commenced yesterday evening at North Pine Dam. These releases may continue until next week, depending upon further rainfall.

A release from Leslie Harrison is underway and may continue until the weekend.

No water is currently being released from Hinze Dam.

The Water Grid is working with local councils regarding the current releases and the likely impacts, which are being managed in accordance with approved flood management plans.

Telephone - [redacted] has been established for members of the public seeking information on which dams are spilling in South East Queensland.

Members of the public seeking information on potential impacts in their local areas should direct inquiries to their local councils.

Recreation update

Due to water levels, Wivenhoe Dam is **closed** to all water based recreational activities as of this morning. The closure will most likely extend over the weekend.

At this stage Lake Somerset is open to all water based recreational activities, however this may change with short notice.

Lake Baroon has also been closed to all water based recreational activities but is open for picnics and barbeques. Care should be taken at the recreation sites, and vehicles must be parked in designated parking areas only.

Moogerah and Maroon Dam remains open, but swimming and skiing should be avoiding.

The following recreational sites are currently **closed** to the public –

- O'Sheas Crossing
- Hamon Cove
- Logan inlet
- Captain Logan Camp
- River access at Atkinson's Crossing
- Billies Bay and Hays Landing

Visitors should check the Water Grid website for additional information for each recreation site.

Gold Coast Desalination Plant

Even though the regions dams are at or near full capacity, recent heavy rains have resulted in high sediment levels in the Brisbane River. These increased levels may present challenges for water treatment plants like those at Mt Crosby, which are the main supply for Brisbane.

The Gold Coast Desalination facility was recently brought up to full capacity to address the flood associated issues at Mt Crosby without compromising water security or quality for Brisbane.

The Gold Coast Desalination facility is now operating at 33 per cent capacity to ensure the highest water quality for the South East Queensland region.

PLEASE NOTE: While releases are being made from the region's water storages, routine updates will be provided.

For further details contact the Water Grid Communications Unit on: [redacted]

TRIM reference: D/	Date and time: 7/01/11 4:42pm
Title : SEQ dam release and flooding update - 07.01.11	
Summary: Friday Grid Update, Dam releases	
Note: Issued to all key media and stakeholders in South East Queensland	

SEQ dam release and flooding update - 07.01.11

WEEKLY GRID UPDATE
FRIDAY 7 JANUARY 2011

DAM RELEASES

Gate operations have commenced at Wivenhoe Dam and releases are expected to reach around 100,000 megalitres a day by tomorrow afternoon. Releases will be reviewed and may change depending on rainfall, inflows into the dam and river flows.

Twin Bridges, Savages Crossing, Burtons Bridge, Kholo Bridge and Colleges Crossing may be inundated for several days. Local councils should be consulted for detailed information on road crossing closures and other impacts.

At this stage, no impacts are expected for Fernvale Bridge or Mt Crosby Weir Bridge.

Water from Somerset Dam is being released into Wivenhoe Dam through a regulator valve. The releases may increase to utilise sluice gates later today or over the weekend to manage rainfall and inflows.

Spillway gate operations commenced yesterday evening at North Pine Dam. These releases may continue into next week, depending upon further rainfall. The local council has been advised that Youngs Crossing Road may be inundated.

A release from Leslie Harrison Dam is underway and may continue until next week.

A release through the emergency gates at Hinze Dam is expected during the weekend.

The Water Grid is working with local councils regarding the current releases and the likely impacts, which are being managed in accordance with approved flood management plans.

Telephone - [redacted] has been established for members of the public seeking information on which dams are spilling in South East Queensland.

Members of the public seeking information on potential impacts in their local areas should direct inquiries to their local councils.

RECREATION UPDATE

Due to high water levels, Lake Wivenhoe is currently closed to all water based recreational activities. The closure will most likely extend over the next few days.

The following recreation sites at Wivenhoe are currently closed due to submerged infrastructure, or dangerous conditions:

- O'Sheas Crossing
- Hamon Cove
- Logan inlet
- Captain Logan Camp
- River access at Atkinson's Crossing
- Billies Bay and Hays Landing

Other recreation areas at Wivenhoe are open for land based activities. The Spillway Lookout recreation area is open, however visitors are advised that there may be long delays due to the number of people visiting the site. Security staff and traffic controllers will be on site and all visitors will need to follow their directions.

Lake Somerset will be temporarily closed to all water based recreational activities from 6pm tonight and is expected to remain closed over the weekend and possibly into next week.

Access to Lake Borumba is not available as Yabba Creek Road between Imbil and Borumba Dam is currently closed. Access is expected to remain closed for several days.

Lake Baroon has also been closed to all water based recreational activities but is open for picnics and barbeques. Care should be taken at the recreation sites, and vehicles must be parked in designated parking areas only.

Lake Maroon remains closed to water skiing and swimming but remains open to boating and fishing.

Visitors should check the Water Grid website (www.watergrid.com.au) for additional information on each recreation site.

GOLD COAST DESALINATION PLANT

Even though the regions dams are at or near full capacity, recent heavy rains have resulted in high sediment levels in the Brisbane River. These increased levels may

present challenges for water treatment plants like those at Mt Crosby, which are the main supply for Brisbane.

The Gold Coast Desalination facility was recently brought up to full capacity to address the flood associated issues at Mt Crosby without compromising water security or quality for Brisbane.

The Gold Coast Desalination facility is now operating at 33 per cent capacity to ensure the highest water quality for the South East Queensland region.

GRID TWELVE

The current supply capacity of the **Grid Twelve is 100.0 %,** no change from last week. The Grid Twelve makes up nearly 90 % of South East Queensland's total water storage volume. See below for further breakdowns:

Dam	Current capacity (%)	Change in capacity on last week (%)	Rainfall (mm over past seven days)
Wivenhoe	**100%**	No change	72mm
Somerset	**100%**	No change	74mm
North Pine	**98.4%**	1.8% ↓	82mm
Hinze	**100%**	No change	72mm
Baroon Pocket	**100%**	No change	95mm
Leslie Harrison	**96.2%**	1.6% ↓	121mm
Ewen Maddock	**100%**	No change	105mm
Cooloolabin	**100%**	No change	92mm
Lake Kurwongbah	**100%**	No change	82mm
Lake MacDonald	**100%**	No change	90mm
Little Nerang	**100%**	No change	72mm
Wappa	**100%**	No change	92mm

The current supply capacity of the **Grid Three 3 (Wivenhoe, Somerset and North Pine) is 100 %,** no change from last week.

Note: The Grid Twelve and Grid Three % full is calculated by dividing the combined current storage volume of the dams in the group by the combined full storage volume.

DID YOU KNOW?

By maintaining the Gold Coast Desalination Plant in standby mode, the Water Grid can ensure that the plant is online and available at any stage. This ensures water quality issues can be addressed without compromising water security for the South East Queensland region. The flexibility of the Water Grid allows us to safely isolate, transfer and blend water from multiple sources across the region.

Notes to the Editor: While releases are being made from the region's water storages, routine updates will be provided.

Community Assistance: Please direct the community to contact **telephone** [redacted]. This number has been established for members of the public seeking information on which dams are spilling in South East Queensland.

Members of the public seeking information on **potential impacts in their local areas** should **direct inquiries to their local councils.**

About the Water Grid: Established in June 2008 in response to the crippling Millennium Drought, the Water Grid represents one of Australia's largest investments in water infrastructure.

Through a network of climate resilient water sources, treatment facilities, new two-way pipes and existing pipelines, the Water Grid gives the South East Queensland region the ability to support water demands, water quality, economic prosperity and lifestyle - regardless of climate change and population growth.

CONTACT DETAILS

Please direct all media enquiries to the Water Grid Communications Unit:

Phone [redacted]
Email: media[redacted]
Website: www.watergrid.com.au

TRIM reference: D/	Date and time: 8/01/11 10:26am
Title : SEQ dam release and flooding update - 08.01.11	
Summary: Dam releases, Recreation update, Gold Coast Desalination Plant update	
Note: Issued to all key media and stakeholders in South East Queensland	

SEQ dam release and flooding update - 08.01.11

MEDIA RELEASE - 8 JANUARY 2011

Dam releases

With recent heavy rainfall across South East Queensland and the forecast of more to come, releases are being made from some of the region's water storages.

Water from Somerset Dam is being released into Wivenhoe Dam through one gate.

At Wivenhoe Dam, all five gates are now open. Releases are expected to reach around 100,000 megalitres a day by this afternoon. Releases will be reviewed and may change depending on rainfall, inflows into the dam and river flows.

Wivenhoe Dam releases may impact upon Twin Bridges, Savages Crossing, Burtons Bridge, Kholo Bridge and Colleges Crossing for several days. Local councils should be consulted for detailed information on road crossing closures and other impacts.

At this stage, no impacts are expected for Fernvale Bridge or Mt Crosby Weir Bridge, although this may change depending on rainfall.

Spillway gate operations commenced during the evening of Thursday 6 January 2011. These releases may continue until next week, depending upon further rainfall.

A release from Leslie Harrison is underway and may continue until the weekend.

Releases through the emergency gates of Hinze Dam is expected to occur sometime over the weekend.

The Water Grid is continuing to work with local councils regarding the current releases and the likely impacts, which are being managed in accordance with approved flood management plans.

Telephone - [redacted] has been established for members of the public seeking information on which dams are spilling in South East Queensland.

Members of the public seeking information on potential impacts in their local areas should direct inquiries to their local councils.

Recreation update

Due to water levels, Wivenhoe Dam and Somerset Dam are **closed** for all water based recreational activities and is expected to remain closed for some days.

The following recreational sites are currently **closed** to the public –

- O'Sheas Crossing
- Hamon Cove
- Logan inlet
- Captain Logan Camp
- River access at Atkinson's Crossing
- Billies Bay and Hays Landing
- The Spit
- Lake Somerset Holiday Park Kirkleagh (Boat ramps only)

Other recreation areas at Wivenhoe are open for land based activities. The Spillway Lookout recreation area is open, however visitors are advised that there may be long delays due to the number of people visiting the site. Security staff and traffic controllers will be on site and all visitors will need to follow their directions.

Access to Borumba Dam is currently not available as Yabba Creek Road between Imbil and Borumba Dam is closed.

Lake Baroon has also been closed to all water based recreational activities but is open for picnics and barbeques. Care should be taken at the recreation sites, and vehicles must be parked in designated parking areas only.

Lake Maroon remains closed to water skiing and swimming but remains open to boating and fishing.

Visitors should check the Water Grid website for additional information for each recreation site.

Gold Coast Desalination Plant

Even though the regions dams are at or near full capacity, recent heavy rains have resulted in high sediment levels in the Brisbane River. These increased levels may present challenges for water treatment plants like those at Mt Crosby, which are the main supply for Brisbane.

The Gold Coast Desalination facility was recently brought up to full capacity to address the flood associated issues at Mt Crosby without compromising water security or quality for Brisbane.

The Gold Coast Desalination facility is now operating at 33 per cent capacity to ensure the highest water quality for the South East Queensland region.

PLEASE NOTE: While releases are being made from the region's water storages, routine updates will be provided.

Community Assistance:
Please direct the community to contact **telephone -** [redacted]. This number

has been established for members of the public seeking information on which dams are spilling in South East Queensland. Members of the public seeking detailed information on **potential impacts in their local areas including road closures should direct inquiries to their local councils**.

For further details contact the Water Grid Communications Unit on:
[redacted] | Email: media[redacted]

TRIM reference: D/	Date and time: 9/01/11 9:29am
Title : SEQ dam release and flooding update - 9.01.11	
Summary: Dam releases, Recreation update, Gold Coast Desalination Plant update	
Note: Issued to all key media and stakeholders in South East Queensland	

SEQ dam release and flooding update - 09.01.11

MEDIA RELEASE - 9 JANUARY 2011

Dam releases

With recent heavy rainfall across South East Queensland and the forecast of more to come, releases are being made from some of the region's water storages. Based on current forecasts, all release operations may change at short notice.

Water from Somerset Dam is being released into Wivenhoe Dam through the sluice gates.

At Wivenhoe Dam, releases commenced during the evening of Thursday 6 January 2011, with all five gates opened by Saturday 8 January 2011. Releases have reached around 116,000 megalitres a day. Gate operations will continue to be reviewed and may change at short notice depending on rainfall, inflows into the dam and river flows.

Wivenhoe Dam releases may impact upon Twin Bridges, Savages Crossing, Burtons Bridge, Kholo Bridge and Colleges Crossing for several days. Local councils should be consulted for detailed information on road crossing closures and other impacts.

At this stage, no impacts are expected for Fernvale Bridge or Mt Crosby Weir Bridge, although this may change depending on rainfall.

These releases are expected to continue until next week.

Release operations at North Pine Dam are being reviewed and may result in the closure of gates later today or tomorrow, however this action is dependent on whether further rainfall is received in the catchment.

Releases from Leslie Harrison Dam have now ceased, however further inflows received may see gate operations re-occur at short notice.

Minor releases through the emergency gates of Hinze Dam have commenced.

The Water Grid is continuing to work with local councils regarding the current releases and the likely impacts, which are being managed in accordance with approved flood management plans.

Telephone - [redacted] has been established for members of the public seeking information on which dams are spilling in South East Queensland.

Members of the public seeking information on potential impacts in their local areas should direct inquiries to their local councils.

Recreation update

Due to water levels, Wivenhoe Dam and Somerset Dam are **closed** for all water based recreational activities and is expected to remain closed into next week.

The following recreational sites are currently **closed** to the public –

- O'Sheas Crossing
- Hamon Cove
- Logan inlet
- Captain Logan Camp
- River access at Atkinson's Crossing
- Billies Bay and Hays Landing
- The Spit
- Lake Somerset Holiday Park Kirkleagh (Boat ramps only)

Other recreation areas at Wivenhoe are open for land based activities. The Spillway Lookout recreation area is open, however visitors are advised that there may be long delays due to the number of people visiting the site. Security staff and traffic controllers will be on site and all visitors will need to follow their directions.

Access to Borumba Dam is currently not available as Yabba Creek Road between Imbil and Borumba Dam is closed.

Lake Baroon has also been closed to all water based recreational activities but is open for picnics and barbeques. Care should be taken at the recreation sites, and vehicles must be parked in designated parking areas only.

Lake Maroon remains closed to water skiing and swimming but remains open to boating and fishing.

Visitors should check the Water Grid website for additional information for each recreation site.

Gold Coast Desalination Plant

Even though the regions dams are at or near full capacity, recent heavy rains have resulted in high sediment levels in the Brisbane River. These increased levels may present challenges for water treatment plants like those at Mt Crosby, which are the main supply for Brisbane.

The Gold Coast Desalination facility was recently brought up to full capacity to address the flood associated issues at Mt Crosby without compromising water security or quality for Brisbane.

The Gold Coast Desalination facility is now operating at 33 per cent capacity to ensure the highest water quality for the South East Queensland region.

PLEASE NOTE: While releases are being made from the region's water storages, routine updates will be provided.

Community Assistance:
Please direct the community to contact **telephone -** [redacted] This number has been established for members of the public seeking information on which dams are spilling in South East Queensland. Members of the public seeking detailed information on **potential impacts in their local areas including road closures should direct inquiries to their local councils.**

For further details contact the Water Grid Communications Unit on: [redacted]

TRIM reference: D/	Date and time: 10/01/11 7:15am
Title : SEQ dam release and flooding update - 10.01.11 AM	
Summary: Wivenhoe Dam releases	
Note: Issued to all key media and stakeholders in South East Queensland	

SEQ dam release and flooding update - 10.01.11 AM

MEDIA RELEASE - 10 JANUARY 2011

Wivenhoe Dam releases

Significant rainfall received across catchments has lifted Wivenhoe Dam's level to above 140 per cent and Somerset Dam to above 150 per cent. Although releases are being made, significant quantities of water have been held back to manage impacts downstream and allow for inflows which have occurred below Wivenhoe Dam.

Overnight, this weather has inundated Fernvale Bridge and Mt Crosby Weir bridge together with a number of local roads. They join a number of other bridges already impacted, including Twin Bridges, Savages Crossing, Burtons Bridge, Kholo Bridge and Colleges Crossing.

In order to relieve the dam's flood storage compartment and with more rain forecast, controlled releases are being increased today from 116,000 megalitres per day to 150,000 megalitres per day. This will be done in consultation with the Bureau of Meteorology and local councils, utilising a strategy to limit impacts where possible downstream, noting that these releases are a necessity.

Residents are urged to contact local councils for detailed information on road crossing closures and other impacts.

Telephone - [redacted] has been established for members of the public seeking information on which dams are spilling in South East Queensland.

ENDS

Note to the Editor: While releases are being made from the region's water storages, routine updates will be provided.

Community Assistance: Please direct the community to contact **telephone -** [redacted]. This number has been established for members of the public seeking information on which dams are spilling in South East Queensland.

Members of the public seeking information on **potential impacts in their local areas should direct inquiries to their local councils.**

About the SEQ Water Grid: Established in June 2008 in response to the crippling Millennium Drought, the SEQ Water Grid represents one of Australia's largest investments in water infrastructure.

Through a network of climate resilient water sources, treatment facilities, new two-way pipes and existing pipelines, the SEQ Water Grid gives the South East Queensland region the ability to support water demands, water quality, economic prosperity and lifestyle - regardless of climate change and population growth.

For further information on the Water Grid: www.watergrid.com.au

For further details contact the SEQ Water Grid Communications Unit on: [redacted]

TRIM reference: D/	Date and time: 10/01/11, 10:42am
Title : SEQ dam release and flooding update - 10.01.11 AM	
Summary: Dam releases, Recreation update, Gold Coast Desalination Plant update	
Note: Issued to all key media and stakeholders in South East Queensland	

SEQ dam release and flooding update - 10.01.11 AM

MEDIA RELEASE - 10 JANUARY 2011

Dam releases

Significant rainfall across the catchment has lifted Wivenhoe Dam's level to above 140 per cent and Somerset Dam to above 150 per cent.

Although releases are being made, large quantities of water continue to flow into the dams and are being held back in order to manage impacts downstream and allow for other inflows from urban runoff, and the Lockyer and Bremer Rivers to subside.

Overnight, Fernvale and Mt Crosby Weir Bridges together with a number of local roads became inundated. They joined the others already impacted, including Twin Bridges, Savages Crossing, Burtons Bridge, Kholo Bridge and Colleges Crossing.

In order to relieve the quickly filling flood storage compartment, and with more rain forecast, controlled releases from the dam have been increased today from 116,000 megalitres per day to 170,000 megalitres per day. These releases are a necessity.

Releases are being reviewed in consultation with the Bureau of Meteorology and local councils, utilising a strategy to limit impacts where possible downstream.

Water from Somerset Dam is being released into Wivenhoe Dam through the sluice gates.

Spillway gate operations are continuing at North Pine Dam, with all five gates open. These releases may continue until next week, depending upon further rainfall.

At Leslie Harrison Dam, gate releases are underway. A minor release of around 1200 megalitres a day is being made through the emergency gates of Hinze Dam.

The Water Grid is working with local councils regarding the current releases and the likely impacts, which are being managed in accordance with approved flood management plans.

Telephone - [redacted] has been established for members of the public seeking information on which dams are spilling in South East Queensland.

Members of the public seeking information on potential impacts in their local areas should direct inquiries to their local councils.

Recreation update

Due to water levels, both Wivenhoe and Somerset are **closed** to all recreational activities, and will remain so for some days.

The following recreation sites are **closed** –

- O'Sheas Crossing
- Hamon Cove
- Logan Inlet
- Captain Logan Camp
- Lumley Hill
- Spillway Common/ Atkinson's Crossing
- Cormorant Bay
- Branch Creek
- Billies Bay/Hays Landing
- The Spit
- Lake Somerset Holiday Park Kirkleagh

Numerous roads are cut including the highway at Kilcoy and Fernvale, and conditions are extremely dangerous.

Moogerah and Maroon Dam remains open, however, swimming and skiing should be avoiding.

Access to Borumba Dam is currently not available as Yabba Creek Road between Imbil and Borumba Dam is closed.

Lake Baroon has also been closed to all water based recreational activities but is open for picnics and barbeques. Care should be taken at the recreation sites, and vehicles must be parked in designated parking areas only.

Visitors should check the Water Grid website for additional information for each recreation site.

Gold Coast Desalination Plant

Even though the regions dams are at or near full capacity, recent heavy rains have resulted in high sediment levels in the Brisbane River. These increased levels may present challenges for water treatment plants like those at Mt Crosby, which are the main supply for Brisbane.

The Gold Coast Desalination facility was recently brought up to full capacity to address the flood associated issues at Mt Crosby without compromising water security or quality for Brisbane.

With Mt Crosby now back to normal the Gold Coast Desalination facility has now been reduced to 33 per cent capacity.

PLEASE NOTE: While releases are being made from the region's water storages, routine updates will be provided.

Community Assistance:
Please direct the community to contact **telephone -** [redacted]. This number has been established for members of the public seeking information on which dams are spilling in South East Queensland. Members of the public seeking detailed information on **potential impacts in their local areas including road closures should direct inquiries to their local councils**.

For further details contact the Water Grid Communications Unit on:
[redacted]

TRIM reference: D/	Date and time: 10/01/11 4:50pm
Title : SEQ dam release and flooding update - 10.01.11 PM	
Summary: Dam releases, Recreation update, Gold Coast Desalination Plant update	
Note: Issued to all key media and stakeholders in South East Queensland	

SEQ dam release and flooding update - 10.01.11 PM

MEDIA RELEASE - 10 JANUARY 2011

Dam releases

Significant rainfall in the catchments has lifted Wivenhoe Dam's level to 154 per cent and Somerset Dam to 158 per cent, despite continuing releases.

Although releases are being made, large quantities of water continue to flow into the dams. Water is being held back in order to manage impacts downstream and allow for other inflows from urban runoff, the Lockyer and Bremer Rivers to subside.

Overnight, Fernvale and Mt Crosby Weir Bridges together with a number of local roads became inundated. They joined the others already impacted, including Twin Bridges, Savages Crossing, Burtons Bridge, Kholo Bridge and Colleges Crossing.

In order to relieve the quickly filling flood storage compartment, and with more rain forecast, controlled releases from the dam have been increased today from 116,000 megalitres per day to 172,000 megalitres per day. Further increases to the release rate are planned, to approximately 240,000 megalitres per day by midnight.

These releases are a necessity as, at the peak, Wivenhoe Dam was receiving more than twice the volume of Sydney Harbour each day.

Releases are continually being reviewed in consultation with the Bureau of Meteorology and local councils, utilising a strategy to limit impacts where possible downstream.

Water from Somerset Dam is being released into Wivenhoe Dam through the sluice gates.

Spillway gate operations are continuing at North Pine Dam, with all five gates open, releasing around 43,000 megalitres a day. These releases may continue until Wednesday 12 January 2011.

At Leslie Harrison Dam, gate releases are underway. A minor release of around 1200 megalitres a day is being made through the emergency gates of Hinze Dam.

The Water Grid is working with local councils regarding the current releases and the likely impacts. Releases are being managed in accordance with approved flood management plans.

Telephone - [redacted] has been established for members of the public seeking information on which dams are spilling in South East Queensland.

Members of the public seeking information on potential impacts in their local areas should direct inquiries to their local councils.

Recreation update

Due to water levels, both Wivenhoe and Somerset are **closed** to all recreational activities, and will remain so for some days.

The following recreation sites are **closed** –

- O'Sheas Crossing
- Hamon Cove
- Logan Inlet
- Captain Logan Camp
- Lumley Hill
- Spillway Common/ Atkinson's Crossing
- Cormorant Bay
- Branch Creek
- Billies Bay/Hays Landing
- The Spit
- Lake Somerset Holiday Park Kirkleagh

Numerous roads are cut including the highway at Kilcoy and Fernvale, and conditions are extremely dangerous.

Moogerah and Maroon Dam remains open, however, swimming and skiing should be avoiding.

Access to Borumba Dam is currently not available as Yabba Creek Road between Imbil and Borumba Dam is closed.

Lake Baroon has also been closed to all water based recreational activities but is open for picnics and barbeques. Care should be taken at the recreation sites, and vehicles must be parked in designated parking areas only.

Visitors should check the Water Grid website for additional information for each recreation site.

Gold Coast Desalination Plant

Even though the regions dams are at or near full capacity, recent heavy rains have resulted in high sediment levels in the Brisbane River. These increased levels may present challenges for water treatment plants like those at Mt Crosby, which are the main supply for Brisbane.

The Gold Coast Desalination facility was recently brought up to full capacity to address the flood associated issues at Mt Crosby without compromising water security or quality for Brisbane.

With Mt Crosby now back to normal the Gold Coast Desalination facility has now been reduced to 33 per cent capacity.

PLEASE NOTE: While releases are being made from the region's water storages, routine updates will be provided.

Community Assistance:
Please direct the community to contact **telephone** [redacted]. This number has been established for members of the public seeking information on which dams are spilling in South East Queensland. Members of the public seeking detailed information on **potential impacts in their local areas including road closures should direct inquiries to their local councils**.

For further details contact the Water Grid Communications Unit on:
[redacted]

TRIM reference: D/	Date and time: 11/01/11 8:39am
Title : SEQ dam release and flooding update - 11.01.11 AM	
Summary: Unprecedented Wivenhoe Dam releases, Residents urged to conserve water supply, Upper Somerset townships urged to conserve water	
Note: Issued to all key media and stakeholders in South East Queensland	

SEQ dam release and flooding update - 11.01.11 AM

MEDIA RELEASE - 11 JANUARY 2011

UNPRECEDENTED WIVENHOE DAM RELEASES

NOTE: All SEQ dams are safe, stable and operating within their design specifications.

Significant rainfall received across catchments has caused waterways upstream of Somerset and Wivenhoe Dams to rise quickly overnight.

Wivenhoe Dam is currently at 173% and rising. Somerset Dam is at 160%.

Controlled releases through the five gates have been held at around 236,000 megalitres since early last night but will need to be increased further today.

These releases will are being made in consultation with the Bureau of Meteorology and local councils and aim to limit downstream impacts where possible.

Note these large releases are necessary for the safe management of the dam.

Release levels will be progressively reviewed depending on rainfall across the catchments today.

Local Councils have been advised that as a result of Lockyer Creek flows, local runoff and Wivenhoe releases, Twin Bridges, Savages Crossing, Burtons Bridge, Kholo Bridge Colleges Crossing, Fernvale Bridge, and Mt Crosby Weir Bridge may be inundated until at Sunday 16 January.

Residents are urged to contact local councils for detailed information on road crossing closures and other impacts.

All recreations areas around Somerset and Wivenhoe are closed, and given the dam levels and the need for safety around spillways, we will not be able to facilitate any land-based media access to our sites today.

While substantial amounts of water is being released into Wivenhoe from Somerset Dam, water levels in Somerset are expected to continue to rising today and areas around Kilcoy are likely to be impacted by these rising dam levels.

Five gates are open at North Pine Dam, releasing around 15,000 megalitres a day and will continue until at least Wednesday 12 January.

The local Council is being kept informed regarding Youngs Crossing.

Gate releases at Leslie Harrison Dam are underway due to rainfall and inflows.

A minor release of around 1200 megalitres a day is being made through the emergency gates at Hinze Dam. There is no access to the spillway.

Telephone - [redacted] has been established for members of the public seeking information on which dams are spilling in South East Queensland.

Members of the public seeking detailed information on **potential impacts in their local areas including road closures should direct inquiries to their local councils.**

RESIDENTS URGED TO CONSERVE WATER SUPPLY

All Somerset, Scenic Rim and Lockyer Valley residents are being urged to conserve water due to the impacts of local flooding on water infrastructure.

Water Grid spokesperson Dan Spiller said vital water infrastructure in these regions has been damaged by flood waters, cutting off the raw water supply.

"Although we have a limited supply in the local reservoirs, we are unable to get tankers in to replenish this supply due to flooded roads. We are also facing issues with loss of power at some water treatment plants.

"We are therefore urging residents to restrict all non-essential use until further notice.

The Water Grid Manager, Queensland Urban Utilities and Emergency Management Queensland are working closely to gain access to the plants and to rectify all situations.

"We are working urgently to find ways for tankers to get in and replenish supplies. We are also considering options for getting bottled water in to those areas," said Mr Spiller.

Residents with further enquiries can contact the local water retailer, Queensland Urban Utilities on [redacted]**, or for emergencies please call** [redacted].

UPPER SOMERSET TOWNSHIPS URGED TO CONSERVE WATER

Residents in the upper Somerset townships of Kilcoy, Jimna and Linville are being urged to conserve water due to the impacts of local flooding on water infrastructure.

Water Grid spokesperson Dan Spiller said vital water infrastructure in these regions has been damaged by flood waters, cutting off the raw water supply.

"We have a limited supply in local reservoirs that is expected to last one to three days. However, we will ensure that critical supplies are maintained. In the meantime we are asking people to conserve water while we repair equipment and organise alternate supplies," he said.

The power is currently down at the main water treatment plant in Kilcoy, with flood water restricting access to rectify the situation.

In Jimna and Linville rising waters have impacted infrastructure that supports the region's supply.

Approximately 1,000 residents on town water across these three areas are impacted.

"We are asking people to restrict non-essential water use, including limiting shower times and considering alternative water supplies where possible," said Mr Spiller.

The Water Grid Manager is working closely with Emergency Management Queensland to gain access to the plants and to rectify all situations. Current demand and supply levels are being closely monitored and alternate water supplies are being considered.

"We are looking at trucking in tankers to fill the reservoirs and are also considering the supply of bottled water if necessary. Obviously we cannot truck in water while roads are closed," said Mr Spiller.

PLEASE NOTE: While releases are being made from the region's water storages, routine updates will be provided.

Community Assistance:
Please direct the community to contact **telephone -** [redacted]. This number has been established for members of the public seeking information on which dams are spilling in South East Queensland. Members of the public seeking detailed information on **potential impacts in their local areas including road closures should direct inquiries to their local councils.**

For further details contact the Water Grid Communications Unit on:
Ph: [redacted]

TRIM reference: D/	Date and time: 11/01/11 5:19pm
Title : SEQ dam release and flooding update - 11.01.11 PM	
Summary: Increased controlled releases from Wivenhoe	
Note: Issued to all key media and stakeholders in South East Queensland	

SEQ dam release and flooding update - 11.01.11 PM

MEDIA RELEASE - 11 JANUARY 2011

Increased controlled releases from Wivenhoe Dam

NOTE: All SEQ dams are safe, stable and operating within their design specifications.

Wivenhoe Dam is currently at 190 per cent and rising. Somerset Dam is at 176 per cent and also rising.

Controlled releases through Wivenhoe's five radial gates have now been increased to around 490,000 megalitres per day. This is expected to increase. Releases are being made in consultation with the Bureau of Meteorology and local councils and an effort to limit downstream impacts where possible. Note these large releases are necessary for the safe management of the dam.

Due to a combination of Lockyer Creek, local runoff and Wivenhoe releases, Twin Bridges, Savages Crossing, Burtons Bridge, Kholo Bridge Colleges Crossing, Fernvale Bridge, and Mt Crosby Weir Bridge may be inundated until at least Sunday 16 January. Residents are urged to contact local councils for detailed information on road crossing closures and other impacts.

All recreations areas around Somerset and Wivenhoe are closed, and given the dam levels and the need for safety around spillways, **we will not be able to facilitate any land-based media access to our sites today.**

While substantial amounts of water is being released into Wivenhoe from Somerset Dam, water levels in Somerset are expected to continue to rising today and areas around Kilcoy are likely to be impacted by these rising dam levels.

Five gates are open at North Pine Dam, releasing around 15,000 megalitres a day and will continue until at least Wednesday 12 January. The local Council is being kept informed regarding Youngs Crossing.

Gate releases at Leslie Harrison Dam are underway due to rainfall and inflows.

Water has spilled from Wyaralong Dam after it exceeded 100 per cent capacity this morning.

A minor release of around 6,600 megalitres a day is being made through the emergency gates at Hinze Dam, which is likely to increase to around 8,000 megalitres per day by 6.00 pm Tuesday 11 January .

For detailed information on road crossing closures and other potential impacts, always contact your local council.

ENDS

Note to the Editor: While releases are being made from the region's water storages, routine updates will be provided.

Community Assistance: Please direct the community to contact **telephone -** [redacted]. This number has been established for members of the public seeking information on which dams are spilling in South East Queensland.

Members of the public seeking information on **potential impacts in their local areas** should **direct inquiries to their local councils.**

About the SEQ Water Grid: Established in June 2008 in response to the crippling Millennium Drought, the SEQ Water Grid represents one of Australia's largest investments in water infrastructure.

Through a network of climate resilient water sources, treatment facilities, new two-way pipes and existing pipelines, the SEQ Water Grid gives the South East Queensland region the ability to support water demands, water quality, economic prosperity and lifestyle - regardless of climate change and population growth.

For further information on the Water Grid: www.watergrid.com.au

For further details contact the SEQ Water Grid Communications Unit on:

[redacted]

TRIM reference: D/	Date and time: 11/01/11 10:30pm
Title : SEQ dam release and flooding update - 11.01.11 PM	
Summary: Controlled releases from Wivenhoe Dam decreasing	
Note: Issued to all key media and stakeholders in South East Queensland	

SEQ dam release and flooding update - 11.01.11 PM

MEDIA RELEASE - 11 JANUARY 2011

Controlled releases from Wivenhoe Dam decreasing

NOTE: All SEQ dams remain safe, stable and operating within their design specifications.

At 10pm Wivenhoe Dam was at 190 per cent with water levels falling slowly.

Controlled releases through Wivenhoe's five radial gates of 645,000 megalitres per day are expected to reduce slightly overnight due to easing rainfall.

Releases are being made in consultation with the Bureau of Meteorology and local councils and every effort to limit downstream impacts where possible is being made. Note that these large releases are necessary for the continued safe management of the dam.

Somerset Dam is at 183 per cent and releases into Wivenhoe are expected to recommence overnight however high upstream levels are expected to continue to affect Kilcoy.

Due to a combination of Lockyer Creek, local runoff and Wivenhoe releases, Twin Bridges, Savages Crossing, Burtons Bridge, Kholo Bridge Colleges Crossing, Fernvale Bridge, and Mt Crosby Weir Bridge may be inundated until at least Sunday 16 January. Residents are urged to contact local councils for detailed information on road crossing closures and other impacts.

All recreations areas around Somerset and Wivenhoe are closed, and given the dam levels and the need for safety around spillways, **we will not be able to facilitate any land-based media access to our sites today.**

Five gates are open at North Pine Dam and will continue until at least Wednesday 12 January. The local Council is being kept informed regarding Youngs Crossing.

Gate releases at Leslie Harrison Dam are underway due to rainfall and inflows.

Water has spilled from Wyaralong Dam after it exceeded 100 per cent capacity this morning.

A minor release of around 8,000 megalitres a day is being made through the emergency gates at Hinze Dam. There is no public access to the spillway.

For detailed information on river levels, road and crossing closures and other potential impacts, always contact your local council.

ENDS

Note to the Editor: While releases are being made from the region's water storages, routine updates will be provided.

Community Assistance: Please direct the community to contact **telephone –** [redacted]. This number has been established for members of the public seeking information on which dams are spilling in South East Queensland.

Members of the public seeking information on **potential impacts in their local areas** should **direct inquiries to their local councils.**

About the SEQ Water Grid: Established in June 2008 in response to the crippling Millennium Drought, the SEQ Water Grid represents one of Australia's largest investments in water infrastructure.

Through a network of climate resilient water sources, treatment facilities, new two-way pipes and existing pipelines, the SEQ Water Grid gives the South East Queensland region the ability to support water demands, water quality, economic prosperity and lifestyle - regardless of climate change and population growth.

For further information on the Water Grid: www.watergrid.com.au

For further details contact the SEQ Water Grid Communications Unit on:

[redacted]

TRIM reference: D/	Date and time: 12/01/11 8:39am
Title : SEQ dam release and flooding update - 12.01.11 AM	
Summary: Controlled releases from Wivenhoe Dam decreasing	
Note: Issued to all key media and stakeholders in South East Queensland	

SEQ dam release and flooding update - 12.01.11 AM

MEDIA RELEASE - 12 JANUARY 2011

CONTROLLED RELEASES FROM WIVENHOE DAM DECREASING

NOTE: All SEQ dams are safe, stable and operating within their design specifications.

Currently, Wivenhoe Dam is at 190 per cent down from 191 per cent overnight.

This reflects the current ease in the weather. Somerset Dam is now at 190 per cent.

Wivenhoe's five radial gates are currently releasing 205,000 megalitres per day, down from 370,000 megalitres and an overnight peak of 645,000 megalitres.

This strategy is to allow for the Bremer and Lockyer Rivers to subside.

After the expected downstream peak in the lower Brisbane River has passed, releases will need to be increased to 301,000 megalitres per day.

However, this increase is unlikely to cause a second significant rise in the river.

These controlled releases must continue in order to relieve Wivenhoe Dam's swollen flood storage compartment in order to create space for further rainfall and inflows.

They are being made in consultation with the Bureau of Meteorology and local councils and every effort is being made to limit downstream impacts where possible.

Due to a combination of Lockyer Creek, local runoff and Wivenhoe releases, Twin Bridges, Savages Crossing, Burtons Bridge, Kholo Bridge Colleges Crossing, Fernvale Bridge, and Mt Crosby Weir Bridge may be inundated until at least Sunday 16 January.

Residents are urged to contact local councils for detailed information on road crossing closures and other impacts.

All recreations areas around Somerset and Wivenhoe are **closed**, and given the dam levels and the need for safety around spillways, **we will not be able to facilitate any land-based media access to our sites today.**

Five gates are open at North Pine Dam, however with no further rainfall, the gates are expected to close today or tomorrow. The local Council is being kept informed regarding Youngs Crossing.

Gate releases at Leslie Harrison Dam are underway due to rainfall and inflows, however these may cease later today.

Water has spilled from Wyaralong Dam after it exceeded 100 per cent capacity yesterday morning.

A minor release of around 8,000 megalitres a day is being made through the emergency gates at Hinze Dam. There is no public access to the spillway.

Telephone – [redacted] has been established for members of the public seeking information on which dams are spilling in South East Queensland.

Members of the public seeking detailed information on **potential impacts in their local areas including road closures should direct inquiries to their local councils.**

PLEASE NOTE: While releases are being made from the region's water storages, routine updates will be provided.

Community Assistance:
Please direct the community to contact **telephone –** [redacted]. This number has been established for members of the public seeking information on which dams are spilling in South East Queensland. Members of the public seeking detailed information on **potential impacts in their local areas including road closures should direct inquiries to their local councils.**

For further details contact the Water Grid Communications Unit on:
[redacted]

TRIM reference: D/	Date and time: 12/01/11 12:47pm
Title : SEQ dam release and flooding update - 12.01.11 PM	
Summary: Controlled releases from Wivenhoe Dam are continuing	
Note: Issued to all key media and stakeholders in South East Queensland	

SEQ dam release and flooding update - 12.01.11 PM

MEDIA RELEASE - 12 JANUARY 2011

CONTROLLED RELEASES FROM WIVENHOE DAM ARE CONTINUING

NOTE: All SEQ dams remain safe, stable and operating within their design specifications.

Currently, Wivenhoe Dam is at 189 per cent, down from 191 per cent overnight. This reflects the current ease in the weather. Somerset Dam is now at 186 per cent, discharging 123,000 megalitres per day into Wivenhoe Dam via a sluice gate.

Wivenhoe's five radial gates continue to release 215,000 megalitres per day. This is considerably down from an overnight peak of 645,000 megalitres and will remain at this level to allow for the Bremer and Lockyer Rivers to subside.

After the expected downstream peak in the lower Brisbane River has passed, releases will be increased to 301,000 megalitres per day, however, this increase is unlikely to cause a second significant rise in the river.

These controlled releases must continue in order to relieve Wivenhoe Dam's swollen flood storage compartment in order to create space for further rainfall and inflows, should they occur.

They are being made in consultation with the Bureau of Meteorology and local councils and every effort is being made to limit downstream impacts where possible.

Due to a combination of Lockyer Creek, local runoff and Wivenhoe releases, Twin Bridges, Savages Crossing, Burtons Bridge, Kholo Bridge Colleges Crossing, Fernvale Bridge, and Mt Crosby Weir Bridge may be inundated until at least Sunday 16 January.

Residents are urged to contact local councils for detailed information on road crossing closures and other impacts.

All recreations areas around Somerset and Wivenhoe are closed, and given the dam levels and the need for safety around spillways, we will not be able to facilitate any land-based media access to our sites today.

Five gates are open at North Pine Dam releasing 6,800 megalitres per day, however with no further rainfall, the gates are expected to close in the next coming days. The local Council is being kept informed regarding Youngs Crossing.

Gate releases at Leslie Harrison Dam are underway due to rainfall and inflows.

Water has spilled from Wyaralong Dam after it exceeded 100 per cent capacity yesterday morning.

A minor release of around 8,000 megalitres a day is being made through the emergency gates at Hinze Dam. There is no public access to the spillway.

Telephone - [redacted] has been established for members of the public seeking information on which dams are spilling in South East Queensland.

For detailed information on river levels, road and crossing closures and other potential impacts, always contact your local council.

ENDS

Owing to technical issues caused by the flood, a temporary email contact is in use. Please email to **watergridmedia@linkwater.com.au**

PLEASE NOTE: While releases are being made from the region's water storages, routine updates will be provided.

Community Assistance:
Please direct the community to contact **telephone -** [redacted]. This number has been established for members of the public seeking information on which dams are spilling in South East Queensland. Members of the public seeking information on **potential impacts in their local areas should direct inquiries to their local councils.**

For further details contact the Water Grid Communications Unit on:
[redacted]

TRIM reference: D/	Date and time: 13/01/11 8:30am
Title : SEQ dam release and flooding update - 13.01.11 AM	
Summary: Controlled releases from Wivenhoe Dam continue	
Note: Issued to all key media and stakeholders in South East Queensland	

SEQ dam release and flooding update - 13.01.11 AM

MEDIA RELEASE - 13 JANUARY 2011

CONTROLLED RELEASES FROM WIVENHOE DAM CONTINUE

NOTE: All SEQ dams remain safe, stable and operating within their design specifications.

Wivenhoe Dam is at 187 per cent, and is dropping gradually with controlled releases through all five gates of 215,000 megalitres per day. This is down from the peak of 645,000 megalitres earlier in the week.

The dam's slow recession is due in part to inflows of 121,000 megalitres per day via a sluice gate from Somerset Dam. Somerset is at 174 per cent.

After the expected downstream peak in the lower Brisbane River has passed, releases will be increased to 301,000 megalitres per day.

This increase is unlikely to cause a second significant rise in the river and is necessary in order to relieve Wivenhoe Dam's swollen flood storage compartment in order to create space for further rainfall and inflows, should they occur.

All releases are being made in consultation with the Bureau of Meteorology and local councils and every effort is being made to limit downstream impacts where possible.

Due to a combination of Lockyer Creek, local runoff and Wivenhoe releases, Twin Bridges, Savages Crossing, Burtons Bridge, Kholo Bridge Colleges Crossing, Fernvale Bridge, and Mt Crosby Weir Bridge may be inundated until at least Sunday 16 January.

Residents are urged to contact local councils for detailed information on road crossing closures and other impacts.

All recreations areas around Somerset and Wivenhoe are **closed**, and given the dam levels and the need for safety around spillways, **we will not be able to facilitate any land-based media access to our sites today.**

Five gates are open at North Pine Dam, however are expected to close Friday. The local Council is being kept informed regarding Youngs Crossing.

Gate releases at Leslie Harrison Dam have now ceased.

Water has spilled from Wyaralong Dam after it exceeded 100 per cent capacity yesterday morning.

A minor release of around 8,000 megalitres a day is being made through the emergency gates at Hinze Dam. There is no public access to the spillway.

For detailed information on river levels, road and crossing closures and other potential impacts, always contact your local council.

ENDS

Owing to technical issues caused by the flood, a temporary email contact is in use. Please email to **watergridmedia@linkwater.com.au**

PLEASE NOTE: While releases are being made from the region's water storages, routine updates will be provided.

Community Assistance:
Please direct the community to contact **telephone -** [redacted]. This number has been established for members of the public seeking information on which dams are spilling in South East Queensland. Members of the public seeking information on **potential impacts in their local areas should direct inquiries to their local councils.**

For further details contact the Water Grid Communications Unit on:
[redacted]

TRIM reference: D/	Date and time: 13/01/11 5:30pm
Title : SEQ dam release and flooding update - 13.01.11 PM	
Summary: Controlled releases from Wivenhoe Dam continue	
Note: Issued to all key media and stakeholders in South East Queensland	

SEQ dam release and flooding update - 13.01.11 PM

MEDIA RELEASE - 13 JANUARY 2011

CONTROLLED RELEASES FROM WIVENHOE DAM CONTINUE

NOTE: All SEQ dams remain safe, stable and operating within their design specifications.

Wivenhoe Dam is at 186 per cent, and is dropping gradually with controlled releases through all five gates of 228,000 megalitres per day. This is down from the peak of 645,000 megalitres earlier in the week.

The dam's slow recession is due in part to inflows of 120,000 megalitres per day via a sluice gate from Somerset Dam. Somerset is at 167 per cent.

Releases are being made in consultation with the Bureau of Meteorology and local councils and every effort is being made to limit downstream impacts where possible.

Due to a combination of Lockyer Creek, local runoff and Wivenhoe releases, Twin Bridges, Savages Crossing, Burtons Bridge, Kholo Bridge Colleges Crossing, Fernvale Bridge, and Mt Crosby Weir Bridge may be inundated until at least Sunday 16 January.

Residents are urged to contact local councils for detailed information on road crossing closures and other impacts.

All recreations areas around Somerset and Wivenhoe are **closed**, and given the dam levels and the need for safety around spillways, **we will not be able to facilitate any land-based media access to our sites today.**

Five gates are open at North Pine Dam, however, are expected to close Friday. The local Council is being kept informed regarding Youngs Crossing.

Gate releases at Leslie Harrison Dam have now ceased.

Water has spilled from Wyaralong Dam after it exceeded 100 per cent capacity earlier this week.

A minor release of around 8,000 megalitres a day is being made through the emergency gates at Hinze Dam. There is no public access to the spillway.

For detailed information on river levels, road and crossing closures and other potential impacts, always contact your local council.

ENDS

Owing to technical issues caused by the flood, a temporary email contact is in use. Please email to **watergridmedia** [redacted]

PLEASE NOTE: While releases are being made from the region's water storages, routine updates will be provided.

Community Assistance:
Please direct the community to contact **telephone -** [redacted]. This number has been established for members of the public seeking information on which dams are spilling in South East Queensland. Members of the public seeking information on **potential impacts in their local areas should direct inquiries to their local councils.**

For further details contact the Water Grid Communications Unit on:
[redacted]

TRIM reference: D/	Date and time: 14/01/11 8:00am
Title : SEQ dam release and flooding update - 14.01.11 AM	
Summary: Controlled releases from Wivenhoe Dam continue	
Note: Issued to all key media and stakeholders in South East Queensland	

SEQ dam release and flooding update - 14.01.11 AM

MEDIA RELEASE - 14 JANUARY 2011

CONTROLLED RELEASES FROM WIVENHOE DAM CONTINUE

NOTE: All SEQ dams remain safe, stable and operating within their design specifications.

Wivenhoe Dam is at 179 per cent, and continues to drop steadily. Releases have been graduated to 301,000 megalitres per day in a 7 day strategy designed to draw down the flood storage compartment with no noticeable effects downstream.

The continuing releases are necessary in order to prepare Wivenhoe for any future weather events should they occur. Somerset Dam is at 151 percent and also dropping steadily with 111,800 megalitres per day being released into Wivenhoe via the sluice gates.

Inflows and water levels in the Brisbane and Pine catchments are being continually monitored.

Releases are being made in consultation with the Bureau of Meteorology and local councils and every effort is being made to limit downstream impacts where possible.

Due to a combination of Lockyer Creek, local runoff and Wivenhoe releases, Twin Bridges, Savages Crossing, Burtons Bridge, Kholo Bridge Colleges Crossing, Fernvale Bridge, and Mt Crosby Weir Bridge may be inundated until at least Sunday 16 January.

Residents are urged to contact local councils for detailed information on road crossing closures and other impacts.

All recreations areas around Somerset and Wivenhoe are **closed**, and given the dam levels and the need for safety around spillways, **we will not be able to facilitate any land-based media access to our sites today.**

People are advised not to travel to any recreation sites during the flood crisis, even if the roads are open.

Recreation sites may need to remain closed until they can be properly inspected and any public safety issues assessed.

All five gates at North Pine Dam closed this morning.

Gate releases at Leslie Harrison Dam have ceased.

Water has spilled from Wyaralong Dam after it exceeded 100 per cent capacity earlier this week.

A minor release of around 8,000 megalitres a day is being made through the emergency gates at Hinze Dam.

This release may reduce slowly over the next few days but will continue until next week. There is no public access to the spillway.

For detailed information on river levels, road and crossing closures and other potential impacts, always contact your local council.

ENDS

Owing to technical issues caused by the flood, a temporary email contact is in use. Please email to **watergridmedia**[redacted]

PLEASE NOTE: While releases are being made from the region's water storages, routine updates will be provided.

Community Assistance:
Please direct the community to contact **telephone -** [redacted]. This number has been established for members of the public seeking information on which dams are spilling in South East Queensland. Members of the public seeking information on **potential impacts in their local areas should direct inquiries to their local councils.**

For further details contact the Water Grid Communications Unit on:
[redacted]

TRIM reference: D/	Date and time: 14/01/11 4:00pm
Title : SEQ dam release and flooding update - 14.01.11 PM	
Summary: Non-flood affected residents urged to use water wisely	
Note: Issued to all key media and stakeholders in South East Queensland	

SEQ dam release and flooding update - 14.01.11 PM

MEDIA RELEASE - 14 JANUARY 2011

NON-FLOOD AFFECTED RESIDENTS URGED TO USE WATER WISELY

Despite significant operational challenges caused by flooding, the major water supplies remain reliable in the Water Grid supplying Brisbane, Ipswich and the Gold Coast.

Deputy Premier Paul Lucas said that the region's major water treatment plant at Mount Crosby had been partly flooded and impacted by poor water quality in the Brisbane River.

"While production is increasing, some of our water treatment infrastructure was impacted by floods and the output is still being affected by turbidity in the Brisbane and North Pine Rivers.

"One of Mount Crosby's two water treatment plants, East Bank, was flooded resulting in substantial mechanical damage to large pumps moved by the force of the water.

"Both Mt Crosby plants are now back on line and gradually being brought up to maximum production.

"We are also using the desalination plant and transfers across the Water Grid to resupply local water reservoirs where water levels declined while Mount Crosby was off line."

Mr Lucas urged residents and businesses in Brisbane, Logan and Ipswich who had not been affected by floods to use only what they need for the next few days.

"Our key priority in these areas is maintaining sufficient water for those households and businesses who need to use more in the immediate flood recovery.

"Flood affected residents and businesses will need to use a lot more water than normal, so its important that people who haven't been affected try to use water wisely," he said.

"In suburbs not directly, affected like Wynnum and Manly, we don't need to use a lot of water, so I'd ask every one to do their part in the Queenslander tradition."

Water Grid Manager CEO Barry Dennien said that people who haven't been affected by the flood can help by using the same cautious water use practices that saw us through the drought. These include:

- take only short 4 minute showers
- don't water gardens
- don't hose buildings, driveways and footpaths
- delay washing your cars
- don't fill pools
- only use dishwashers when you have a full load
- turn-off taps when you don't need water

"During the drought South East Queenslanders showed how well we could conserve water. This latest crisis means residents and businesses outside the directly flooded affected areas need to do the same again" Mr Dennien said.

"I can assure everyone who has not been directly impacted by flooding that by conserving valuable water over the next few days you will make a real and important contribution to the flood recovery effort" said Mr Dennien.

The Water Grid is working closely with local councils to prioritise water use for the cleanup of key roads first, followed by other areas later after water treatment plants are operating normally again.

ENDS

Owing to technical issues caused by the flood, a temporary email contact is in use. Please email to **watergridmedia**[redacted]

PLEASE NOTE: While releases are being made from the region's water storages, routine updates will be provided.

Community Assistance:
Please direct the community to contact **telephone -** [redacted]. This number has been established for members of the public seeking information on which dams are spilling in South East Queensland. Members of the public seeking information on **potential impacts in their local areas should direct inquiries to their local councils**.

For further details contact the Water Grid Communications Unit on:
[redacted]

TRIM reference: D/	Date and time: 14/01/11 6:00pm
Title : SEQ dam release and flooding update - 14.01.11 PM	
Summary: Controlled releases from Wivenhoe Dam continue	
Note: Issued to all key media and stakeholders in South East Queensland	

SEQ dam release and flooding update - 14.01.11 PM

MEDIA RELEASE - 14 JANUARY 2011

CONTROLLED RELEASES FROM WIVENHOE DAM CONTINUE

NOTE: All SEQ dams remain safe, stable and operating within their design specifications.

Wivenhoe Dam is at 172 per cent, and continues to drop steadily. Releases have been graduated to 301,000 megalitres per day in a 7 day strategy designed to draw down the flood storage compartment without contributing to further flooding.

The continuing releases are necessary in order to prepare Wivenhoe for any future weather events should they occur.

Somerset Dam is at 140 per cent and also dropping steadily with 111,800 megalitres per day being released into Wivenhoe via the sluice gates. Inflows and water levels in the Brisbane and Pine catchments are being continually monitored.

Releases are being made in consultation with the Bureau of Meteorology and local councils and every effort is being made to limit downstream impacts where possible.

Due to a combination of Lockyer Creek, local runoff and Wivenhoe releases, Twin Bridges, Savages Crossing, Burtons Bridge, Kholo Bridge Colleges Crossing, Fernvale Bridge, and Mt Crosby Weir Bridge may be inundated until the middle of next week.

Residents are urged to contact local councils for detailed information on road crossing closures and other impacts.

All recreations areas around Somerset and Wivenhoe are **closed**, and given the dam levels and the need for safety around spillways, **we will not be able to facilitate any land-based media access to our sites.**

People are advised not to travel to any recreation sites during the flood crisis, even if the roads are open.

Recreation sites may need to remain closed until they can be properly inspected and any public safety issues assessed.

All five gates at North Pine Dam closed this morning.

Gate releases at Leslie Harrison Dam have ceased.

Water has spilled from Wyaralong Dam after it exceeded 100 per cent capacity earlier this week.

A minor release of around 8,000 megalitres a day is being made through the emergency gates at Hinze Dam. This release may reduce slowly over the next few days but will continue until next week. There is no public access to the spillway.

For detailed information on river levels, road and crossing closures and other potential impacts, always contact your local council.

ENDS

Owing to technical issues caused by the flood, a temporary email contact is in use. Please email to **watergridmedia@**[redacted]

PLEASE NOTE: While releases are being made from the region's water storages, routine updates will be provided.

Community Assistance:
Please direct the community to contact **telephone -** [redacted]. This number has been established for members of the public seeking information on which dams are spilling in South East Queensland. Members of the public seeking information on **potential impacts in their local areas should direct inquiries to their local councils.**

For further details contact the Water Grid Communications Unit on:
[redacted]

TRIM reference: D/	Date and time: 15/01/11 9:30am
Title : SEQ dam release and flooding update - 15.01.11 AM	
Summary: Controlled releases from Wivenhoe Dam continue, Water quality	
Note: Issued to all key media and stakeholders in South East Queensland	

SEQ dam release and flooding update - 15.01.11 AM

MEDIA RELEASE - 15 JANUARY 2011

CONTROLLED RELEASES FROM WIVENHOE DAM CONTINUE

NOTE: All SEQ dams remain safe, stable and operating within their design specifications.

Wivenhoe Dam is at 163 per cent, and continues to drop steadily. Releases continue at around 301,000 megalitres per day as part of a strategy designed to draw down the flood storage compartment by mid-next week without contributing to further flooding.

The continuing releases are necessary in order to prepare Wivenhoe for any future weather events should they occur.

Somerset Dam is at 129 per cent and also dropping slowly with about 79,000 megalitres per day being released into Wivenhoe via the sluice gates.

Inflows and water levels in the Brisbane and Pine catchments are being continually monitored.

Releases are being made in consultation with the Bureau of Meteorology and local councils and every effort is being made to limit downstream impacts where possible.

Due to a combination of Lockyer Creek, local runoff and Wivenhoe releases, Twin Bridges, Savages Crossing, Burtons Bridge, Kholo Bridge Colleges Crossing, Fernvale Bridge, and Mt Crosby Weir Bridge may be inundated until the middle of next week.

Residents are urged to contact local councils for detailed information on road crossing closures and other impacts.

All recreations areas around Somerset and Wivenhoe are closed, and given the dam levels and the need for safety around spillways, **we will not be able to facilitate any land-based media access to our sites.**

People are advised not to travel to any recreation sites during the flood crisis, even if the roads are open.

Recreation sites may need to remain closed until they can be properly inspected and any public safety issues assessed.

All five gates at North Pine Dam closed this morning.

Gate releases at Leslie Harrison Dam have ceased.

Water has spilled from Wyaralong Dam after it exceeded 100 per cent earlier this week.

A minor release of around 8,000 megalitres a day is being made through the emergency gates at Hinze Dam.

This release may reduce slowly over the next few days but will continue until next week.

There is no public access to the spillway.

For detailed information on river levels, road and crossing closures and other potential impacts, always contact your local council.

RESIDENTS AND BUSINESSES STRONGLY URGED TO USE WATER WISELY

The connected Water Grid continues to maintain safe and secure water supplies in the face of unprecedented flooding impacts.

Water Treatment Plants across the connected Water Grid are producing at maximum rates however very high demand associated with the clean-up of flood impacts is expected over the weekend.

Given the critical need to ensure adequate water supplies for the clean-up, residents and businesses in areas not directly impacted by flooding are strongly urged to use water wisely.

Within areas affected by flooding, residents should use what water is needed to clean-up immediate flood impacts.

Sensible water conservation practices are strongly encouraged such as using a high pressure hose or trigger nozzle.

Outside immediately impacted areas, residents and businesses are urged to conserve water by adopting the same water use practices that saw us through the drought.These include:

- take only short 4 minute showers
- don't water gardens
- delay washing your cars
- don't fill pools
- only use dishwashers when you have a full load
- turn-off taps when you don't need water

WATER QUALITY

Water across Brisbane and the Sunshine and Gold Coasts remains safe to drink. While some people may see minor discolouration of their tap water, they should not be concerned.

Water Grid suppliers are continually monitoring water quality across the network as well working closely with Queensland Health.

While Queensland Urban Utilities have a precautionary Boiled Water Alert currently in place for Marburg, water in the Ipswich area is also safe to drink.

Boil water alerts are in place for locations in the Lockyer Valley and Somerset council areas and residents and businesses are urged to visit the Queensland Urban Utilities website **www.urbanutilities.com.au** for more details.

ENDS

Owing to technical issues caused by the flood, a temporary email contact is in use. Please email to **watergridmedia**[redacted]

PLEASE NOTE: While releases are being made from the region's water storages, routine updates will be provided.

Community Assistance:
Please direct the community to contact **telephone -** [redacted]. This number has been established for members of the public seeking information on which dams are spilling in South East Queensland. Members of the public seeking information on **potential impacts in their local areas should direct inquiries to their local councils**.

For further details contact the Water Grid Communications Unit on:
[redacted]

TRIM reference: D/	Date and time: 15/01/11 6:00pm
Title : SEQ dam release and flooding update - 15.01.11 PM	
Summary: Controlled releases from Wivenhoe Dam continue, Water Quality	
Note: Issued to all key media and stakeholders in South East Queensland	

SEQ dam release and flooding update - 15.01.11 PM

MEDIA RELEASE - 15 JANUARY 2011

CONTROLLED RELEASES FROM WIVENHOE DAM CONTINUE

NOTE: All SEQ dams remain safe, stable and operating within their design specifications.

Wivenhoe Dam is at 154 per cent, and continues to drop steadily. Releases continue at around 301,000 megalitres per day as part of a strategy designed to draw down the flood storage compartment by mid-next week without contributing to further flooding.

The continuing releases are necessary in order to prepare Wivenhoe for any future weather events should they occur.

Somerset Dam is at 121 per cent and also dropping slowly with about 79,000 megalitres per day being released into Wivenhoe via the sluice gates.

Inflows and water levels in the Brisbane and Pine catchments are being continually monitored.

Releases are being made in consultation with the Bureau of Meteorology and local councils and every effort is being made to limit downstream impacts where possible.

Due to a combination of Lockyer Creek, local runoff and Wivenhoe releases, Twin Bridges, Savages Crossing, Burtons Bridge, Kholo Bridge Colleges Crossing, Fernvale Bridge, and Mt Crosby Weir Bridge may be inundated until the middle of next week.

Residents are urged to contact local councils for detailed information on road crossing closures and other impacts.

All recreations areas around Somerset and Wivenhoe are **closed**, and given the dam levels and the need for safety around spillways, **we will not be able to facilitate any land-based media access to our sites.**

People are advised not to travel to any recreation sites during the flood crisis, even if the roads are open.

Recreation sites may need to remain closed until they can be properly inspected and any public safety issues assessed.

All five gates at North Pine Dam closed this morning.

Gate releases at Leslie Harrison Dam have ceased.

As at 7:00am today, 1,693 megalitres was passing over the spillway at Wyaralong Dam. This represents a water depth of 0.19m over the spillway.

A minor release of around 8,000 megalitres a day is being made through the emergency gates at Hinze Dam.

This release may reduce slowly over the next few days but will continue until next week.

There is no public access to the spillway.

For detailed information on river levels, road and crossing closures and other potential impacts, always contact your local council.

RESIDENTS AND BUSINESSES STRONGLY URGED TO USE WATER WISELY

The connected Water Grid continues to maintain safe and secure water supplies in the face of unprecedented flooding impacts.

Water Treatment Plants across the connected Water Grid are producing at maximum rates however very high demand associated with the clean-up of flood impacts is expected over the weekend.

Given the critical need to ensure adequate water supplies for the clean-up, residents and businesses in areas not directly impacted by flooding are strongly urged to use water wisely.

Within areas affected by flooding, residents should use what water is needed to clean-up immediate flood impacts.

Sensible water conservation practices are strongly encouraged such as using a high pressure hose or trigger nozzle.

Outside immediately impacted areas, residents and businesses are urged to conserve water by adopting the same water use practices that saw us through the drought.These include:

- take only short 4 minute showers
- don't water gardens
- delay washing your cars
- don't fill pools
- only use dishwashers when you have a full load
- turn-off taps when you don't need water

WATER QUALITY

Water across Brisbane and the Sunshine and Gold Coasts remains safe to drink. While some people may see minor discolouration of their tap water, they should not be concerned.

Water Grid suppliers are continually monitoring water quality across the network as well working closely with Queensland Health.

While Queensland Urban Utilities have a precautionary Boiled Water Alert currently in place for Marburg, water in the Ipswich area is also safe to drink.

Boil water alerts are in place for locations in the Lockyer Valley and Somerset council areas and residents and businesses are urged to visit the Queensland Urban Utilities website **www.urbanutilities.com.au** for more details.

ENDS

Owing to technical issues caused by the flood, a temporary email contact is in use. Please email to **watergridmedia**[redacted]

PLEASE NOTE: While releases are being made from the region's water storages, routine updates will be provided.

Community Assistance:
Please direct the community to contact **telephone -** [redacted]. This number has been established for members of the public seeking information on which dams are spilling in South East Queensland. Members of the public seeking information on **potential impacts in their local areas should direct inquiries to their local councils.**

For further details contact the Water Grid Communications Unit on:
[redacted]

TRIM reference: D/	Date and time: 15/01/11 3:30pm
Title : SEQ dam release and flooding update - 15.01.11	
Summary: Water Grid gears-up for the clean-up	
Note: Issued to all key media and stakeholders in South East Queensland	

SEQ dam release and flooding update - 15.01.11

MEDIA RELEASE - 15 JANUARY 2011: Issued at 3:30pm

Water Grid gears-up for the clean-up

The expected spike in water use this weekend has started with every asset in the Water Grid currently in use.

Real-time bulk water consumption data from LinkWater today showed water use increasing rapidly due to the big clean-up across Brisbane and Ipswich now taking place.

Water Grid spokesperson Barry Dennien said typically Brisbane and Ipswich areas use about 700 megalitres over a weekend period, but already these areas had reached 215 megalitres by mid morning today.

"We've noticed a rapid rise in water use over the last few hours and expect the total to reach over 950 megalitres by tomorrow evening," said Mr Dennien.

"If people see minor discolouration of their tap water, they should not be concerned – Brisbane's water is absolutely safe to drink.

"A precautionary boil water notice has been issued for Marburg, however water across Ipswich and the Sunshine and Gold Coasts also remains safe to drink," he said.

Seqwater maintenance and operations staff are working around the clock to get major water treatment plants back to full production.

"A large spike in water demand so soon after flooding presents a real challenge - but it's a challenge that with the communities help we are up to," he said.

Brisbane's biggest water treatment plant at Mt Crosby is now stretching production to 410 megalitres per day after recovering from significant flood impacts.

The Gold Coast Desalination Plant currently at 66% or 88 megalitres per day is also making an important contribution.

The enormous demand means that within areas affected by flooding, residents should sensibly use whatever water is needed.

Outside flood impacted areas, consumers are also asked to make an extra effort to conserve water by adopting the same water use practices that saw us through the drought.

Together the Water Grid and Queensland Urban Utilities have been working to ensure Lowood, Gatton, Helidon, Fernvale and Laidley are resupplied with drinking water as fast as possible.

Lowood's severely affected pump station and water treatment plant are back on line and are about to supply Lowood, Gatton, Helidon, Fernvale and Laidley.

Queensland Urban Utility crews, who worked through the night, remain on site repairing the town's reticulation system.

"These crews have done a tremendous job to get water supply to these local communities back on line so quickly after some considerable damage" said Mr Dennien.

For more information on boil water notices in the Queensland Urban Utilities supply area, including Somerset and Lockyer Valley, go to **www.urbanutilities.com.au.**

ENDS

Owing to technical issues caused by the flood, a temporary email contact is in use. Please email to **watergridmedia**[redacted]

Community Assistance:
Please direct the community to contact **telephone -** [redacted]. This number has been established for members of the public seeking information on which dams are spilling in South East Queensland. Members of the public seeking information on **potential impacts in their local areas should direct inquiries to their local councils.**

For further details contact the Water Grid Communications Unit on:
[redacted]

TRIM reference: D/	Date and time: 16/01/11
Title : SEQ dam release and flooding update - 16.01.11	
Summary: Controlled releases from Wivenhoe Dam continue	
Note: Issued to all key media and stakeholders in South East Queensland	

SEQ dam release and flooding update - 16.01.11

MEDIA RELEASE - 16 JANUARY 2011

CONTROLLED RELEASES FROM WIVENHOE DAM CONTINUE

NOTE: All SEQ dams remain safe, stable and operating within their design specifications.

Wivenhoe Dam is at 138 per cent, and continues to drop steadily. Releases continue at around 299,000 megalitres per day. This flow will be maintained to drain the flood storage compartment this week.

The continuing releases are necessary in order to prepare Wivenhoe for any future weather events should they occur.

Inflows and water levels continue to be monitored in the Brisbane and Pine catchments.

Somerset Dam is at 106 per cent and also dropping slowly with about 70,500 megalitres per day being released into Wivenhoe via the sluice gates.

Water levels in Somerset will fall slowly in the next 24 hours.

Releases are being made in consultation with the Bureau of Meteorology and local councils and every effort is being made to limit downstream impacts where possible.

Due to a combination of Lockyer Creek, local runoff and Wivenhoe releases, Twin Bridges, Savages Crossing, Burtons Bridge, Kholo Bridge, Colleges Crossing, Fernvale Bridge, and Mt Crosby Weir Bridge may be inundated until the middle of next week.

Residents are urged to contact local councils for detailed information on road crossing closures and other impacts.

All recreations areas around Somerset and Wivenhoe are **closed**, and given the dam levels and the need for safety around spillways, **we will not be able to facilitate any land-based media access to our sites.**

People are advised not to travel to any recreation sites during the flood crisis, even if the roads are open.

Recreation sites may need to remain **closed** until they can be properly inspected and any public safety issues assessed.

North Pine Dam is at 96 per cent and all five gates remain closed.

Water has spilled from Wyaralong Dam after it exceeded 100 per cent capacity earlier this week.

A minor release of around 6,800 megalitres a day is being made through the emergency gates at Hinze Dam. This release may reduce slowly over the next few days but will continue until next week.

There is no public access to the spillway.

For detailed information on river levels, road and crossing closures and other potential impacts, always contact your local council.

RESIDENTS AND BUSINESSES STRONGLY URGED TO USE WATER WISELY

The connected Water Grid continues to maintain safe and secure water supplies in the face of unprecedented flooding impacts.

Water Treatment Plants across the connected Water Grid are producing at maximum rates however very high demand associated with the clean-up of flood impacts is expected over the weekend.

Given the critical need to ensure adequate water supplies for the clean-up, residents and businesses in areas not directly impacted by flooding are strongly urged to use water wisely.

Within areas affected by flooding, residents should use what water is needed to clean-up immediate flood impacts.

Sensible water conservation practices are strongly encouraged such as using a high pressure hose or trigger nozzle.

Outside immediately impacted areas, residents and businesses are urged to conserve water by adopting the same water use practices that saw us through the drought.These include:

- take only short 4 minute showers
- don't water gardens
- delay washing your cars
- don't fill pools
- only use dishwashers when you have a full load
- turn-off taps when you don't need water

WATER QUALITY

Water across Brisbane and the Sunshine and Gold Coasts remains safe to drink. While some people may see minor discolouration of their tap water, they should not be concerned.

Water Grid suppliers are continually monitoring water quality across the network as well working closely with Queensland Health.

While Queensland Urban Utilities have a precautionary Boiled Water Alert currently in place for Marburg, water in the Ipswich area is also safe to drink.

Boil water alerts are in place for locations in the Lockyer Valley and Somerset council areas and residents and businesses are urged to visit the Queensland Urban Utilities website **www.urbanutilities.com.au** for more details.

ENDS

Owing to technical issues caused by the flood, a temporary email contact is in use. Please email to **watergridmedia** [redacted]

PLEASE NOTE: While releases are being made from the region's water storages, routine updates will be provided.

Community Assistance:
Please direct the community to contact [redacted] This number has been established for members of the public seeking information on which dams are spilling in South East Queensland. Members of the public seeking information on **potential impacts in their local areas should direct inquiries to their local councils.**

For further details contact the Water Grid Communications Unit on:
[redacted]

TRIM reference: D/	Date and time: 17/01/11 11:05am
Title : SEQ dam release and flooding update - 17.01.11	
Summary: Controlled releases from Wivenhoe Dam continue, Water Quality	
Note: Issued to all key media and stakeholders in South East Queensland	

SEQ dam release and flooding update - 17.01.11

MEDIA RELEASE - 17 JANUARY 2011

CONTROLLED RELEASES FROM WIVENHOE DAM CONTINUE

NOTE: All SEQ dams remain safe, stable and operating within their design specifications.

Wivenhoe Dam is at 123 per cent capacity and continues to drop steadily. Releases continue at around 299,000 megalitres per day and this flow will be maintained to drain the flood storage compartment.

The continuing releases are necessary in order to prepare Wivenhoe for any future weather events should they occur. It is expected that releases from Wivenhoe Dam will cease mid-week.

Inflows and water levels continue to be monitored in the Brisbane and Pine catchments.

Somerset Dam is at 100 per cent with small discharges through the cone valves into Wivenhoe.

Releases are being made in consultation with the Bureau of Meteorology and local councils and every effort is being made to limit downstream impacts where possible.

Due to a combination of Lockyer Creek, local runoff and Wivenhoe releases, Twin Bridges, Savages Crossing, Burtons Bridge, Kholo Bridge, Colleges Crossing, Fernvale Bridge, and Mt Crosby Weir Bridge may be inundated until the middle the week.

Residents are urged to contact local councils for detailed information on road crossing closures and other impacts.

All recreations areas around Somerset and Wivenhoe are **closed**, and given the dam levels and the need for safety around spillways, **we will not be able to facilitate any land-based media access to our sites.**

People are advised not to travel to any recreation sites during the flood crisis, even if the roads are open.

Recreation sites may need to remain **closed** until they can be properly inspected and any public safety issues assessed.

North Pine Dam is at 99 per cent and all five gates remain closed.

Water has spilled from Wyaralong Dam after it exceeded 100 per cent capacity earlier last week.

A minor release of around 6,800 megalitres a day is being made through the emergency gates at Hinze Dam. This release may reduce slowly over the next few days but will continue until mid-week. There is no public access to the spillway.

For detailed information on river levels, road and crossing closures and other potential impacts, always contact your local council.

WATER QUALITY

Water across Brisbane and the Sunshine and Gold Coasts remains safe to drink. While some people may see minor discolouration of their tap water, they should not be concerned.

Water Grid suppliers are continually monitoring water quality across the network as well working closely with Queensland Health.

While Queensland Urban Utilities have a precautionary Boiled Water Alert currently in place for Marburg, water in the Ipswich area is also safe to drink.

Boil water alerts are in place for locations in the Lockyer Valley and Somerset council areas and residents and businesses are urged to visit the Queensland Urban Utilities website **www.urbanutilities.com.au** for more details.

ENDS

Owing to technical issues caused by the flood, a temporary email contact is in use. Please email to **watergridmedia**[redacted]

PLEASE NOTE: While releases are being made from the region's water storages, routine updates will be provided.

Community Assistance:
Please direct the community to contact **telephone -** [redacted]. This number has been established for members of the public seeking information on which dams are spilling in South East Queensland. Members of the public seeking information on **potential impacts in their local areas should direct inquiries to their local councils**.

TRIM reference: D/	Date and time: 18/01/11 11:45am
Title : SEQ dam release and flooding update - 18.01.11	
Summary: Gate closure commenced at Wivenhoe	
Note: Issued to all key media and stakeholders in South East Queensland	

SEQ dam release and flooding update - 18.01.11

MEDIA RELEASE - 18 JANUARY 2011

GATE CLOSURE COMMENCED AT WIVENHOE DAM

NOTE: All SEQ dams remain safe, stable and operating within their design specifications.

Wivenhoe Dam is at 107 per cent and continues to drop steadily. Releases remained constant overnight at around 176,000 megalitres per day and are now reducing with the commencement of the gate closing sequence which began at 9am this morning.

The five radial gates are expected to be shut by Thursday to allow for the high tides that have been predicted for later this week.

Subject to weather, it is expected that the dam's flood storage compartment will have been returned to near zero from Thursday with any smaller excesses discharged via a smaller cone valve.

Inflows and water levels continue to be monitored in the Brisbane and Pine catchments.

Somerset Dam is at 99 per cent with small discharges through the cone valves into Wivenhoe.

All sluice gates at Somerset are closed.

Releases are being made in consultation with the Bureau of Meteorology and local councils and every effort is being made to limit downstream impacts where possible.

Residents are urged to contact local councils for detailed information on road crossing closures and other impacts.

Recreation areas around Somerset and Wivenhoe remain closed until further notice due to safety.

People are advised <u>not</u> to travel to any recreation sites during the flood situation, even if the roads are open.

North Pine Dam is at 99 per cent and all five gates remain closed.

The gates at Hinze Dam closed this morning.

For detailed information on river levels, road and crossing closures and other potential impacts, always contact your local council.

A single dam update will now be issued mid-morning each day.

ENDS

PLEASE NOTE: While releases are being made from the region's water storages, routine updates will be provided.

Community Assistance:
Please direct the community to contact **telephone -** [redacted]. This number has been established for members of the public seeking information on which dams are spilling in South East Queensland. Members of the public seeking information on **potential impacts in their local areas should direct inquiries to their local councils.**

TRIM reference: D/	Date and time: 19/01/11 10:00am
Title : SEQ dam release and flooding update - 19.01.11	
Summary: Dam update, Water quality	
Note: Issued to all key media and stakeholders in South East Queensland	

SEQ dam release and flooding update - 19.01.11

MEDIA RELEASE - 19 JANUARY 2011

DAM UPDATE

Wivenhoe Dam is at 99.3 per cent with the gate closing sequence expected to be complete by late afternoon today.

Inflows and water levels continue to be monitored in the Brisbane and Pine catchments, with more than 20mm of rain received in the Wivenhoe Dam catchment over the last 24 hours.

Small excesses will continue to be released through the cone valve at the base of the Wivenhoe Dam wall once all gates are closed.

Somerset Dam is at 100 per cent capacity with all sluice gates currently closed. Depending on inflows into the catchment, further releases into Wivenhoe Dam may be made over the next 24 hours.

All dam releases are being made in consultation with the Bureau of Meteorology and local councils and every effort is being made to limit downstream impacts where possible.

Residents should contact local councils for detailed information on road crossing closures and other impacts.

Recreation areas around Somerset and Wivenhoe dams remain **closed** until further notice due to safety.

Further releases from North Pine Dam were made overnight, to cater for the inflows from yesterday's storms. All gates at North Pine Dam were closed at 5.00am this morning.

There have been no further releases from Hinze Dam or Leslie Harrison Dam.

WATER QUALITY

SEQ Water Grid

Media updates issued during the January flood event

Water across Brisbane and the Sunshine and Gold Coasts remains safe to drink. Water Grid suppliers are continually monitoring water quality across the network and are working closely with Queensland Health.

While Queensland Urban Utilities have a precautionary Boil Water Alert currently in place for Marburg, water in the Ipswich area is also safe to drink.

Boil water alerts are in place for locations in the Lockyer Valley and Somerset council areas and residents and businesses are urged to visit the Queensland Urban Utilities website **www.urbanutilities.com.au** for more details.

A single dam update will now be issued mid-morning each day.

ENDS

PLEASE NOTE: While releases are being made from the region's water storages, routine updates will be provided.

Community Assistance:
Please direct the community to contact **telephone -** [redacted]. This number has been established for members of the public seeking information on which dams are spilling in South East Queensland. Members of the public seeking information on **potential impacts in their local areas should direct inquiries to their local councils**.

TRIM reference: D/	Date and time: 20/01/11 10:42am
Title : SEQ dam release and flooding update - 20.01.11	
Summary: Small releases from Wivenhoe Dam after overnight storms	
Note: Issued to all key media and stakeholders in South East Queensland	

SEQ dam release and flooding update - 20.01.11

MEDIA RELEASE - 20 JANUARY 2011

SMALL RELEASES FROM WIVENHOE DAM AFTER OVERNIGHT STORMS

Last night's storms over the catchment have resulted in one gate being partially opened at Wivenhoe Dam this morning. This will see a small controlled release over the course of today to maintain the dam at or near 100 per cent.

The Bureau of Meteorology has forecast showers and possible thunderstorms later today meaning water releases will be reassessed over the next 24 hours.

Somerset Dam is just over 100 per cent capacity with all sluice gates currently closed. Depending on catchment inflows, further releases into Wivenhoe Dam may be made over the next 24 hours.

The Flood Operations Centre continues to monitor rainfalls and water levels throughout the Brisbane and Pine River catchments and consult with the Bureau of Meteorology and local councils to limit downstream impacts where possible.

While Twin Bridges remains inundated, overnight rainfall in the Lockyer catchment may affect inundation of Savages and Colleges Crossing in coming days. Residents should always contact the local council for detailed information on road crossing closures and other impacts.

Further releases from North Pine Dam began overnight to cater for the inflows from last night's storms. All five gates are currently open and are expected to operate throughout the day.

There have been no further releases from Hinze Dam or Leslie Harrison Dam.

Recreation areas around Somerset and Wivenhoe dams remain closed until further notice due to safety.

Water has spilled from Wyaralong Dam after it exceeded 100 per cent capacity on Tuesday 11 January 2011.

WATER QUALITY

SEQ Water Grid

Media updates issued during the January flood event

Water across Brisbane and the Sunshine and Gold Coasts remains safe to drink. Water Grid suppliers are continually monitoring water quality across the network and are working closely with Queensland Health.

While Queensland Urban Utilities have a precautionary Boil Water Alert currently in place for Marburg, water in the Ipswich area is also safe to drink.

Boil water alerts are in place for locations in the Lockyer Valley and Somerset council areas and residents and businesses are urged to visit the Queensland Urban Utilities website **www.urbanutilities.com.au** for more details.

A single dam update will now be issued mid-morning each day.

ENDS

PLEASE NOTE: While releases are being made from the region's water storages, routine updates will be provided.

Community Assistance:
Please direct the community to contact **telephone -** [redacted]. This number has been established for members of the public seeking information on which dams are spilling in South East Queensland. Members of the public seeking information on **potential impacts in their local areas should direct inquiries to their local councils.**

TRIM reference: D/	Date and time: 20/01/11 12:30pm
Title : SEQ dam release and flooding update - 20.01.11	
Summary: Gates now closed at Wivenhoe Dam, Water quality	
Note: Issued to all key media and stakeholders in South East Queensland	

SEQ dam release and flooding update - 20.01.11

MEDIA RELEASE - 20 JANUARY 2011

GATES NOW CLOSED AT WIVENHOE DAM

All gates are now closed at Wivenhoe Dam, after last night's small water release in the wake of storms.

The Bureau of Meteorology has forecast showers and possible thunderstorms later today meaning water releases will be reassessed over the next 24 hours.

Somerset Dam is just over 100 per cent capacity with all sluice gates currently closed. Depending on catchment inflows, further releases into Wivenhoe Dam may be made over the next 24 hours.

The Flood Operations Centre continues to monitor rainfalls and water levels throughout the Brisbane and Pine River catchments and consult with the Bureau of Meteorology and local councils to limit downstream impacts where possible.

While Twin Bridges remains inundated, overnight rainfall in the Lockyer catchment may affect inundation of Savages and Colleges Crossing in coming days. Residents should always contact the local council for detailed information on road crossing closures and other impacts.

Further releases from North Pine Dam began overnight to cater for the inflows from last night's storms. All five gates are currently open and are expected to operate throughout the day.

There have been no further releases from Hinze Dam or Leslie Harrison Dam.

Recreation areas around Somerset and Wivenhoe dams remain closed until further notice due to safety.

Water has spilled from Wyaralong Dam after it exceeded 100 per cent capacity on Tuesday 11 January 2011.

WATER QUALITY

Water across Brisbane and the Sunshine and Gold Coasts remains safe to drink. Water Grid suppliers are continually monitoring water quality across the network and are working closely with Queensland Health.

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Boil water alerts are in place for locations in the Lockyer Valley and Somerset council areas and residents and businesses are urged to visit the Queensland Urban Utilities website **www.urbanutilities.com.au** for more details.

A single dam update will now be issued mid-morning each day.

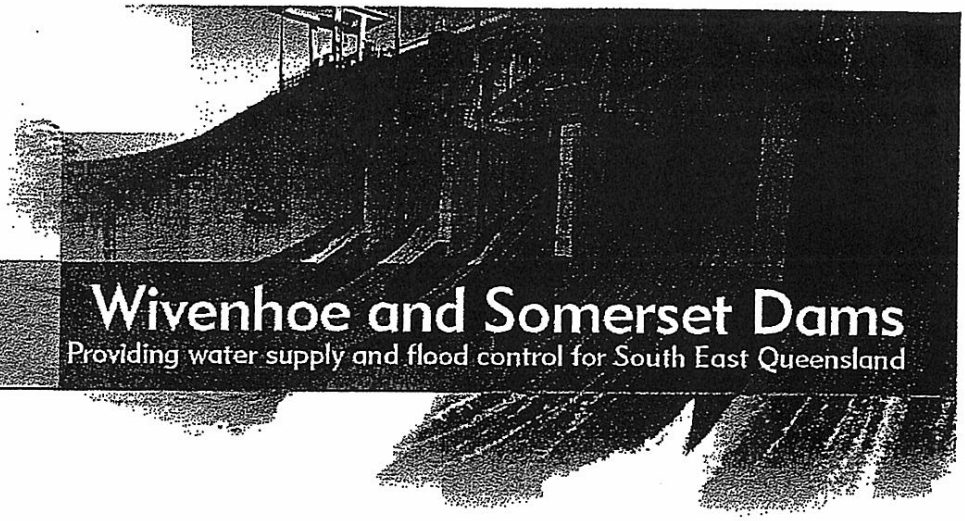
ENDS

PLEASE NOTE: While releases are being made from the region's water storages, routine updates will be provided.

Community Assistance:
Please direct the community to contact **telephone -** [redacted]. This number has been established for members of the public seeking information on which dams are spilling in South East Queensland. Members of the public seeking information on **potential impacts in their local areas should direct inquiries to their local councils.**

Attachment 2: Wivenhoe Dam factsheet

SEQ Water Grid



Wivenhoe and Somerset Dams

Providing water supply and flood control for South East Queensland

A FEW FACTS

Wivenhoe Dam was built in response to the 1974 floods and is an award-winning feat of hydrological and structural engineering.

Connected to Wivenhoe Dam, Somerset Dam was completed in 1959. In the event of heavy rains, which may cause Somerset Dam to reach capacity, water is released downstream from Somerset to Wivenhoe Dam.

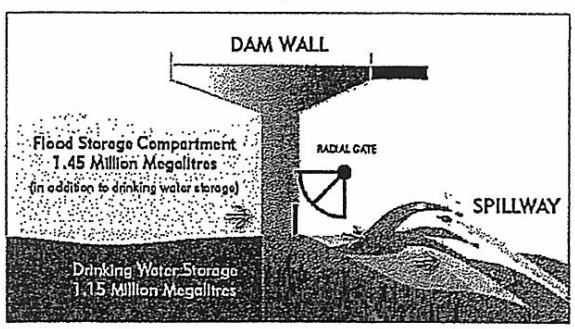
On top of storing 1.15 million megalitres of precious drinking water, Wivenhoe Dam can also store an additional 1.45 million megalitres, equal to 2.5 times the volume of Sydney Harbour. This additional space is known as the dam's flood storage compartment and works to hold back the flood waters which gather in the Brisbane Valley. These flood waters can threaten Brisbane after heavy weather events.

The flood storage compartment at Wivenhoe Dam temporarily stores flood water and releases it at a controlled rate to minimise downstream impacts. Flood levels along the Brisbane River and in the Ipswich and Brisbane urban areas would be much higher without the support of Wivenhoe and Somerset dams.

The Wivenhoe Dam wall is designed to withstand an extreme flood event, much worse than anything on record to date.

In a flood event similar to 1974, there would still be a large amount of local flooding in and around the Ipswich and Brisbane regions, simply due to the heavy local rainfalls. However, water levels along the Brisbane River would be reduced due to the mitigating impacts of Somerset and Wivenhoe dams.

Wivenhoe Dam Flood Storage Compartment



If it wasn't for Wivenhoe and Somerset dams, a considerable number of people, properties and infrastructure could be at an even greater risk of serious flooding. These dams are a crucial component of South East Queensland's flood mitigation plan and something Queenslanders can be proud of.

Spectacular pictures – but why does Wivenhoe Dam have to release stored flood water?

South East Queensland has a weather pattern that often sees prolonged or multiple rain events in close succession.



As soon as Wivenhoe Dam's flood storage compartment begins to fill, it has to be carefully emptied in order to make room for additional heavy rainfall events that may occur. Wivenhoe Dam's flood storage compartment can fill in less than three days following heavy rainfall. This highlights the need for strategic management of dam levels. Controlled releases consider the following flood factors: catchment runoff below the dam wall, urban runoff and river levels.

Following heavy rainfall in October 2010, Wivenhoe Dam received inflows equivalent to almost half the flood storage compartment capacity - in just a few days.

Wivenhoe Dam controls 50 per cent of the Brisbane catchment. It is therefore possible for Brisbane to flood from other sources such as rainfall in the catchment below the dam wall.

A fundamental principle in the management of Wivenhoe Dam is that all floodwater should be released within seven days. This means the greater the volume received in the flood storage compartment, the greater the discharge required.

safe secure sustainable

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seqwater LinkWater WaterSecure SEQ Water Grid

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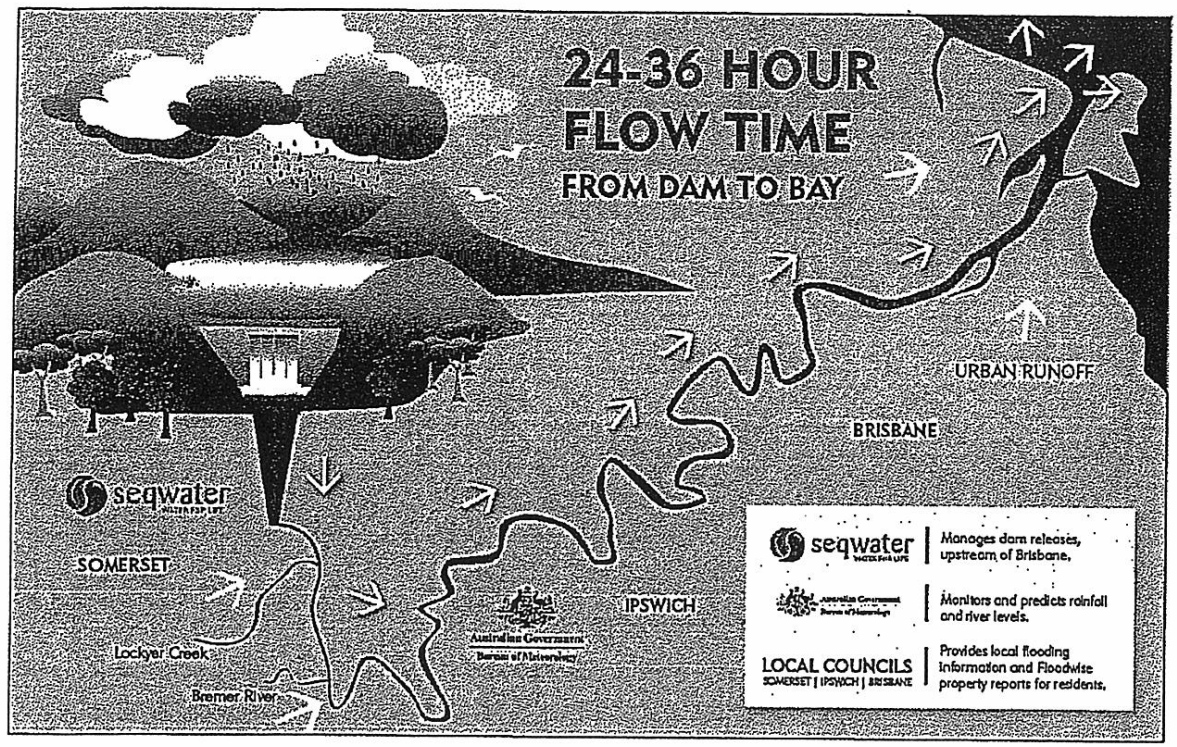

How are the releases managed?

Before Wivenhoe Dam begins a controlled release from its flood storage compartment, a dedicated 24-hour Flood Operations Centre is activated. The specific purpose of the centre is to manage any potential impacts of releases downstream.

The actions of the Flood Operations Centre are guided by a Flood Mitigation Manual. The Queensland State Government, local councils and relevant emergency services are consulted before the water releases from dams take place, to ensure communities are warned and can take all necessary precautions.

The amount of water released from Wivenhoe Dam depends on the level of water inside the flood storage compartment, as well as the incoming flows and downstream tributaries.

During a major flooding event, the SEQ Water Grid Manager, Seqwater (the dam operators), the Bureau of Meteorology and local councils work together to formulate recommendations. Members of the public and relevant emergency services are then advised on how to best manage impending localised flooding.

Rainfall is continually monitored throughout all South East Queensland catchments during a flood event. The Bureau of Meteorology provides rainfall forecasts to Seqwater who then monitor the surrounding catchments.

Together with weather predictions, a comprehensive network of river sensors, providing real-time data, work to inform the basis for a formulated schedule of controlled dam releases. The schedule works to ensure the maximum protection from flooding in urban areas is achieved.

Based on the weather forecast from the Bureau of Meteorology, and Seqwater's decisions to release water from Wivenhoe Dam, councils then work with residents regarding local area impacts. Councils know their areas best and work to advise residents about road and bridge closures, as well as local flooding.

The following priorities are considered when determining how much water is to be released from Wivenhoe Dam, and at what capacity:

- the structural safety of the dam
- maximising protection from flooding in urbanised areas
- minimising disruption to rural industries along the Brisbane River and Stanley River valleys
- minimising impacts to flora and fauna during the water release phase of a flood event
- the ability to retain the dam at full supply level at the conclusion of a flood event.

How do I find out further information?

For more information on the status of dam levels and Water Grid recreation sites visit www.watergrid.com.au

For information on local flooding, including road closures, contact your local council or visit their website.

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