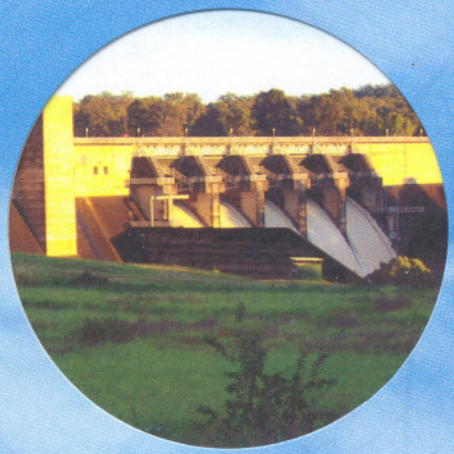

Final Report

Seqwater

Training & Flood Preparedness for Seqwater Dams for the Year Beginning 30 September 2009

Date: October 2009
Ref: P-AEXP-1802-AK-01-03
File: 07-006241

SunWater

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Final Report

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1.0 INTRODUCTION

SunWater has been providing flood management services to the Queensland Bulk Water Supply Authority dams since July 2008. SunWater have now undertaken the contract for the operations of flood operations of Wivenhoe Dam, Somerset Dam and North Pine Dam for 12 years and 3 months. Flood operations at these dams continue to be controlled by the provisions of the following Manuals of Flood Operations:

- Manual of Operational Procedures for Flood Mitigation for Wivenhoe Dam and Somerset Dam, Revision No.6, 20 December 2004; and
- Manual of Operational Procedures for Flood Releases from North Pine Dam, Revision No.4, 5 September 2007;

The Manual for Wivenhoe Dam and Somerset Dam is currently being reviewed to accommodate changes in institutional reforms and supporting legislation.

Clause 7.2 of both Manuals of Flood Operational Procedures requires the Headworks Operator to submit reports to the Queensland Bulk Water Supply Authority (trading as Seqwater) by 30 September each year on the training and the state of preparedness of operations personnel. In addition Clause 7.4 requires the Headworks Operator to review the adequacy of the communication and data gathering facilities.

This report is designed to satisfy both of these requirements. Because of the similarities between the systems adopted for Wivenhoe Dam, Somerset Dam and North Pine Dam a combined report has been prepared.

Under Clause 7.3 of these Manuals, a report is also required to be submitted by 1st May and 1st November each year on the:-

- Reliability of the system over the previous period.
- Reliability of the system under prolonged flood conditions.
- Accuracy of forecasting flood flows and heights.
- Overall state of preparedness of the system.

This current report provides some data on the reliability of the data collection system since 1st April 2009.

In addition to the above manuals, the Seqwater has Emergency Action Plans (EAPs) for Wivenhoe and Somerset Dams and for North Pine Dam. These plans are used for the "*coordination of the necessary actions by the Contractor to provide timely notification to police, counter disaster groups and affected persons in the event of an emergency condition*" at the dams. The current versions of these EAPs were produced in September 2009.

2.0 REPORT ON FLOOD PREPAREDNESS FOR 2009/2010

2.1 STATUS OF STORAGES

At the commencement of the period the storage levels of all of the dams were drawn down to just under half full (92, 33 and 45% respectively for Somerset, Wivenhoe and North Pine Dam). During the period inflows occurred on three occasions, April, May and early June. This resulted in the levels of the dams exceeding 75% combined capacity with a consequent easing of restrictions during the period.

Flood operations were required at Somerset Dam and North Pine Dam on three occasions during the period from April 2009 to September 2009. These events are summarised in a separate report, refer SunWater 2009. These inflows were monitored and provided a good check on the systems and procedures being utilised in the Flood Operations Centre. This provided some opportunity to review the performance of the ALERT network, especially the stream sensors located in the Upper Brisbane and Stanley River catchments.

The table below shows the change in storage level during the period.

Table 2.1: Dam Status

Storage	April 2009		September 2009	
	Storage Level (m AHD)	Storage Volume (ML)	Storage Level (m AHD)	Storage Volume (ML)
Somerset Dam	98.26	349,700 (92.1%)	98.08	342,700 (90.2%)
Wivenhoe Dam	56.50	388,700 (33.4%)	62.54	759,100 (65.1%)
North Pine Dam	32.69	96,700 (45.1%)	39.34	208,700 (97.4%)
	Total	835,300 (47.5%)	Total	1,310,500 (74.5%)

2.2 ARRANGEMENT OF FLOOD RESPONSE TEAMS

There have been some changes in personnel that comprise the flood response team however team arrangements remain the same as for the previous twelve months. Three groups of operational personnel have been organized for the operation of the dams. These groups and the roles that they perform are as follows:

Organisational Group	Nominated Role
Dam Operators	While on duty at a particular dam, a Dam Operator is responsible for the flood operation of that dam. While these operations will normally be under the direction of the Duty Engineer, provision has been made for the operation of each dam in the event of loss of communication with the Duty Engineer.
Duty Engineer	The engineer responsible for directing flood releases from all three Seqwater dams in accordance with the appropriate Manual of Operational Procedures for Floods.
Data Collectors	The technical staff members of the Flood Response Teams who man the Flood Operations Centre, perform data gathering and verification duties on behalf of the Duty Engineer and generally support the Duty Engineer.

As required by the Manuals of Operational Procedures, overall flood operations are under the control of the Senior Flood Operations Engineer. The Senior Flood Operations Engineer organizes the other Duty Engineers and the Data Collectors into the Flood Response Teams and ensures that sufficient personnel are available to man the Flood Operations Centre 24 hours a day, every day of the year.

Currently two engineers are authorized to fulfil the role of Senior Flood Operations Engineer and they are listed in the Schedule of Authorities as:-

- Robert Arnold Ayre
- John Lawrence Ruffini

Rob Ayre is the current Senior Flood Operations Engineer. Duty Flood Operations Engineer John Ruffini is also qualified to act as the Senior Flood Operations Engineer. John and Rob will share these responsibilities during the course of the wet season and Seqwater will be advised in advance as to which of these officers is the SFOE at any particular time.

It is expected that they will be both available throughout the 'wet season' with Rob Ayre normally assuming the role and John Ruffini taking on the role when Rob Ayre is unavailable.

Due to the introduction of new institutional arrangements in South –East Queensland, SunWater only provide flood management services to Seqwater under a service level agreement. This project is managed by Rob Ayre at SunWater.

The Principal Engineer, Dam Safety, John Tibaldi at Seqwater, has the responsibility for ensuring that at least two fully trained operators are available for flood operations at each dam 24 hours a day, every day of the year. John and Terry Malone from Seqwater are the other nominated Duty Engineers.

All of these personnel have been trained to carry out their assigned roles in the event of a flood requiring the operation of each dam. This training is summarized in the following sections.

2.3 FLOOD OPERATION CENTRE PREPAREDNESS

2.3.1 Flood Operation Centre, Level 9 179 Turbot Street

The SunWater Flood Operation Centre (FOC) is located on Level 9, 179 Turbot Street, Brisbane. The FOC is fully operational and ready for flood operations as and when required. The FOC has the following features:-

A. It is lockable with the Duty Engineers and Data Collectors having 24-hour access;

B. It is the location of the Seqwater's computer hardware and software

C. It is connected to the building emergency power system and an un-interruptible power supply (UPS). This unit is currently being upgraded to have sufficient capacity to run the flood computer system for about 2 hours in the event of failure of the emergency power system.

A Back-up Flood Operations Centre facility is established on Level 2 of Mineral House, which mitigates the vulnerability of the Flood Response Team as a whole. The back-up facility houses the backup to the main Linux based Operating System PC, NOAH. It also has duplicate data gathering capability with an independent base station located on the roof.

3.0 REAL TIME FLOOD MODEL PREPAREDNESS

3.1 CURRENT PLATFORM

The RTFM software resides on the Linux Fedora Core Operating System. Both main software components (Flood-Col and Flood-Ops) are running reliably on the Linux PC known as NOAH and the back-up PC located in the Back-up FOC.

Development work on the existing system has now been suspended as Seqwater have established a new project to examine a replacement system. This work is being managed internally by Seqwater and a committee has been formed to steer the development of the new platform.

3.2 ERRTS NETWORK

The current ALERT data collection network has now been operational since 1995. This network was installed by Seqwater using FutureTech equipment and overall the performance has been mostly satisfactory, as evidenced by Section 5 of this report. A summary of the overall performance over the period from 2001 shows the following:

Table 3.1: Rainfall Station Performance

	2001	2002	2003	2004	2005	2006	2007	2008	2009
Number of Stations	71	71	72	70	70	70	70	70	70
Average Availability (%)	84%	92%	91%	89%	85%	81%	91%	78%	85%
Average Duration OAA (Days)	32	27	28	29	62	60	25	60	35

Table 3.2: Stream Height Station Performance

	2001	2002	2003	2004	2005	2006	2007	2008	2009
Number of Stations	51	51	59	56	56	55	55	55	56
Average Availability (%)	82%	84%	83%	88%	74%	76%	84%	72%	71%
Average Duration OAA (Days)	51	49	49	31	78	76	67	78	82

The increase in the average duration of Out of Action (OOA) is the most telling characteristic that the network may be showing its age. These statistics should be tempered somewhat by the acknowledgement that some administration issues over the 2005/06 period have perhaps exaggerated the length of unavailability of the stations. It is recommended that consideration be given to rolling out a new generation of ALERT (ERRTS) sensors as part of the ongoing maintenance of the network over say the next two wet seasons. This strategy would include installation of field equipment sensors that are capable of more frequent check signals (3 hourly as mentioned previously) and get equipment which can use IFlows capability.

Parts of the network also need to be strengthened to ensure redundancy such as at Wivenhoe Dam Headwater gauge. At this time, there are only two headwater gauges, one of which is a 5m Druck and therefore the system is somewhat vulnerable if the main gauge fails.

Additional stations have been installed by other agencies such as Moreton Bay Council, Somerset Regional Council and the Bureau of Meteorology. It is recommended that configuration details be obtained for any such sites and these stations be added to the network. Agreements to pass configuration data between agencies would need to be put in place and it should be recognised that response times for station repairs would be in accordance with service level agreements that each party has instigated.

Recent events have highlighted the potential for some catchment blind spots, particularly in the Brisbane and Jimna Ranges. Consideration of additional rainfall stations is recommended especially with the Jimna site being OAA due to the demolition of the forestry tower.

Previous issues with the configuration of the gate opening sensors are again highlighted in this report. The gate opening sensors are not configured sufficiently well to provide useful data to confirm required gate operations. Checks conducted earlier this year when gate exercising showed poor correlation against actual openings. The calibration of the sensors and the range of coverage may need to be reviewed to ensure the data obtained is useable.

4.0 REPORT ON PERSONNEL TRAINING

All operational personnel required for flood operations have received significant training in the various activities involved in flood operations operations. All continuing members of the flood response teams have undertaken 'refresher' courses and new personnel have been fully trained or have commenced training.

This section summarizes the training received by each group referred to in Section 2.

While training is seen as an ongoing function that will be regularly reviewed, it is also envisaged some form of formal training will normally need to be conducted prior to 30 September each year and this was the case for 2008/09.

4.1 DAM OPERATORS

4.1.1 Training of Dam Operators

Formal training of Dam Operators at North Pine, Somerset and Wivenhoe Dams was undertaken between August and September of this year. During this training, operators were given theoretical and practical instruction in the following aspects of the operation of each dam:

- The use of the following documents, with particular emphasis on use of the documents during flood operation:
  - (a) Standing Operating Procedures
  - (b) Manual of Flood Operations Procedures for Flood Releases
  - (c) Emergency Action Plans
- Operation of the water release infrastructure at each dam that is used during flood operations.
- Flood operation communication procedures and reporting requirements.
- Procedures for use during power and/or equipment failure during flood operations.

4.1.2 Examination of Dam Operators

Examination of dam operators to verify their competency to operate the dams during flood events was undertaken over six days in September of this year. Two days were spent on practical aspects at each of North Pine, Somerset and Wivenhoe Dams including a half day session on theoretical aspects associated with loss of communications. The dates on which dam operators were trained and tested were:-

Somerset Dam	15 and 16 September 2009
North Pine Dam	8 and 9 September 2009
Wivenhoe Dam	1 and 2 September 2009

The general format of the each examination period was as follows. The time spent on each component varied between dams depending on the content of the dam's Manual of Flood Operations Procedures and Emergency Action Plan, and the complexity of operation of the dam's water release infrastructure.

- Practical testing of each individual on the operation of the dam's water release infrastructure.
- Practical testing of each individual on the procedures to be followed during power and/or equipment and/or communication failure during flood operations.
- Classroom review of Manual of Flood Operations Procedures and the Emergency Action Plan and hands-on simulation of the operation of each of the dams.

4.1.3 Results of Dam Operator Testing

Following the completion of testing, the following operators were passed as competent to operate North Pine, Somerset and Wivenhoe Dam during flood events.

Wivenhoe Dam

Doug Grigg, Darren Varley, Chris Hine, Russell Titmarsh, Ray Ballinger, Adam Weller, Mark Granzien, Gary Ludlow, Andrew Edbrooke, Paul Nieuwenhuyzen, Harish Prakash, Phil Jordan, Louw Van Blerk, Giuseppe Menchise, Graham Keegan, Rob Gorian

Somerset Dam

Ag Dagan, Darren Varley, Chris Hine, Russell Titmarsh, Ray Ballinger, Adam Weller, Mark Granzien, Gary Ludlow, Andrew Edbrooke, Paul Nieuwenhuyzen, Harish Prakash, Phil Jordan, Louw Van Blerk, Giuseppe Menchise, Graham Keegan, Ray Dennis, Rob Gorian, Jayam Tennakoon.

North Pine Dam

Brett Schultz, Mal Lane, Keith Steel, Gary Cook, Anthony Walsh, Matt Hegarty, Jason Hine, Louw Van Blerk, Giuseppe Menchise, Rob Gorian

A number of other Seqwater staff members attended the operator sessions at each of the dams. These people include:

Carolyn Ellis Mallard, Stewart Neilsen, Terry Malone, John Tibaldi, Chloe Cross

The training sessions relating to loss of communications were also attended by:

Rob Ayre, John Ruffini and Peter Allen.

4.2 DUTY ENGINEERS

4.2.1 Nominated Duty Engineers

Four Duty Flood Operation Engineers have been trained as "Operations Engineers" for the operation of Wivenhoe Dam, Somerset Dam and North Pine Dam. These engineers, and the positions they hold within SunWater, Seqwater or the Department of Environment and Natural Resources (DERM) are as follows:

Name & Qualifications	Role	Position within SunWater/NRW
Robert Ayre BE(Civil), CPEng (Reg), RPEQ	Senior Flood Operations Engineer	Engineering Design Manager Asset Solutions SunWater
Terry Malone BE(Civil)	Duty Flood Operations Engineer	Principal Hydrologist Seqwater
John Ruffini BE(Agric), MSc (Ag Eng), RPEQ	Duty Engineer & Relief SFOE	Director Water Assessment Management Resource Sciences and Knowledge Dept of Environment and Natural Resources
John Tibaldi BE(Civil) RPEQ	Duty Flood Operations Engineer	Principal Engineer, Dam Safety Seqwater

4.2.2 Training of Duty Engineers

Flood Operations training of the Duty Engineers has become a little more structured with more formal training sessions conducted for both the existing duty engineers and trainee duty engineers. The training is a collective effort with all Duty Engineers contributing to the process.

The current training includes instruction on the use of the RTFM and alternative arrangements for determination of gate operations. Trainee Duty Engineers will be instructed in the use of FLOOD-Col, the data collection module of the RTFM and FLOOD-Ops the data analysis component of the system. It is intended that further training will be undertaken during the course of the wet season and that a number of the candidates will become fully qualified during the course of the next six months.

While training of the Duty Engineers is ongoing, it is considered that as a team they all have sufficient skills to operate the Corporation's dams in accordance with the requirements of the Flood Operations Manuals.

The entire SunWater Flood Response Team was involved in the flood events of May and June 2009. This provided a through test of all aspects of the system and procedures. No major issues were identified during these events.

The Brisbane City Council has scheduled a test of communications with the Flood Information Centre, BoM Flood Warning Centre and the SunWater Flood Operations Centre for late November 2009.

4.3 DATA COLLECTORS

4.3.1 Training of Data Collectors

The following is a list of the current personnel who have been certified to fulfil the role of a Data Collector:

Name	Organisation	Designation
Al NAVRUK	SunWater	Senior Technical Officer
Brendan TREBILCO	SunWater	Civil Engineer
Hassan KIBRIA	SunWater	Graduate Engineer
Jon DAVIDSON	SunWater	Electrical Engineer
Ken PRICE	SunWater	Senior Technical Officer
Kim HANG	SunWater	Engineer (Hydrology)
Lisa CECCHI	SunWater	Project Officer
Neranjala FERNANDO	SunWater	Senior Project Officer
Peter MacTAGGART	SunWater	Project Manager
Roshan SINGH	SunWater	Engineer (Hydrology)
Yong DING	SunWater	Graduate Engineer

In addition to these personnel, thirteen trainee Data Collectors have been training for inclusion in the roster. These trainees will complete training in October 2009 and will be ready for full-time duty during the current wet season.

The trainee Data Collectors are:

Name	Organisation	Designation
Peyman BOZORGMEHR	SunWater, Asset Solutions	Civil Engineer
Suzanne BUROW	SunWater, Corporate Strategy	Yield Hydrology Manager
Steven CHAU	SunWater, Asset Solutions	Graduate Engineer
Vivien CHENG	SunWater, Corporate Strategy	Graduate Engineer
Mitul DESAI	SunWater, Corporate Strategy	Graduate Engineer
Lynden DRUITT	SunWater, Asset Solutions	Senior Technical Officer
Sean FLEMING	SunWater, Asset Solutions	Senior Project Manager
Amir JOORABCHI	SunWater, Asset Solutions	Graduate Engineer
Bhavin KANTHARIA	SunWater, Water Services	Graduate Engineer
Kashyap PAREKH	SunWater, Corporate Strategy	Graduate Engineer
David POKARIER	SunWater, Asset Solutions	Senior Engineer (Hydrology)
Bill STEPHENS	SunWater, Asset Solutions	Project Manager
Bob THWAITE	SunWater, Asset Solutions	Senior Technical Officer

All experienced data collectors are involved in the training of new data collectors. The overall approach to training has been one of maintaining and enhancing their skills through continual use of the model and exposure to the workings of the Flood Operations Centre. A roster system has been operated such that each Data Collector has direct hands on practice using the Flood-COL component of the RTFM every three to four weeks. When they are rostered for 'close call', the Duty Engineer responsible for that period assigns each Data Collector the role of updating and maintaining the RTFM database at least once in the week.

5.0 REPORT ON COMMUNICATION FACILITIES

5.1 COMMUNICATIONS FACILITIES AVAILABLE AT DAMS

Currently there is a combination of standard and mobile telephone services available at Wivenhoe, Somerset Dams and North Pine Dams. Seqwater has also supplied a radio base station for the Flood Operations Centre and two hand held units for each dam.

Details of standard telephones available at each of the dams are as follows:

WIVENHOE DAM	
Office/Dam Wall	[redacted]
Facsimile Machine	[redacted]
Autodialler	[redacted]
SOMERSET DAM	
Office/Dam Wall	[redacted]
Facsimile Machine	[redacted]
Autodialler	[redacted]
NORTH PINE DAM	
Office/Dam Wall	[redacted]
Facsimile Machine	[redacted]
Autodialler	[redacted]

In addition to the above, the dam operators also have mobile phones. In particular, the phone numbers of the full time operators are as follows:

WIVENHOE DAM	
Phone No. 1	[redacted] Doug Grigg
Phone No. 2	[redacted]
SOMERSET DAM*	
Phone No. 1	[redacted] Anthony Dagan
Phone No. 2	[redacted]
NORTH PINE DAM	
Phone No. 1	[redacted] Brett Schultz
Phone No. 2	[redacted] Malcolm Lane

The FOC also houses the SEQWater's two-way radio equipment which enables communication with the dams and SEQWater offices.

5.2 COMMUNICATIONS FACILITIES AVAILABLE AT FLOOD OPERATIONS

Currently there are a number of standard telephone services available at the FCC. These services are listed in the following table:

FLOOD OPERATIONS CENTRE	
Line 1	
Line 2	
Line 3	
Facsimile Machine	
Answering Machine	
ALERT Mobile Data Only	

In addition to these services all Duty Engineers have mobile phones to enable them to be contacted at all times. These mobile phones are relied on whenever the Duty Engineers are absent from the normal working hours location or are away from their homes.

There is still no direct link between the Flood-COL data collection program and the Duty Engineer's mobile phones. Work is progressing on facilitating this option. Until this program is implemented, there is a risk that the Duty Engineer will not be aware of the conditions that generate alarm conditions such as a reservoir rise.

The contact numbers for the Duty Engineers are listed in the following table:

Duty Engineer	Work Phone	Home Phone	Mobile Phone
Robert AYRE			
Terry MALONE			
John RUFFINI			
John TIBALDI			

A message is left on the FOC Answering Machine as to the name and contact numbers of the current Duty Engineer.

Each Data Collector carries a mobile phone while on 'close call'. These phones have a range that includes all of South East Queensland.

Data Collector Mobile Phones	
Data Collector 1	[redacted]
Data Collector 2	
Data Collector 3	[redacted]
Data Collector 4	

The FOC also has a dedicated telephone line to the Duty Forecaster at the Bureau of Meteorology. Officers at the Bureau of Meteorology have also indicated that, in the event of their long-term weather models predicting extreme rainfall events, they will invite us to attend their daily briefings.

5.3 CONTACT REGISTER

All contact phone numbers have been updated in accordance with the numbers provided by Seqwater in September 2008. A check of these numbers in preparation for the coming wet season revealed some changes and these changes are summarized in Appendix A.

6.0 REPORT ON DATA COLLECTION NETWORKS

A range of data is currently available to the Flood Operations Centre. This data includes:

6.1 SEQWATER ALERT NETWORK

The SEQWater ALERT system is the most important element of the overall data collection system available to the SunWater Flood Operations Centre.

It consists of a network of 70 rainfall and 56 river height sensors spread throughout the Pine River and Brisbane River catchments. Thirty gate-opening sensors were incorporated into the system in March 2004, but calibration data for the sensors is not satisfactory. The report on the performance of these sites shows that further re-configuration of the sensors is required to ensure the gate opening data is appropriate for operational requirements. The availability of the gate sensors is not being monitored as per the remainder of the network due to the poor performance of the sensors.

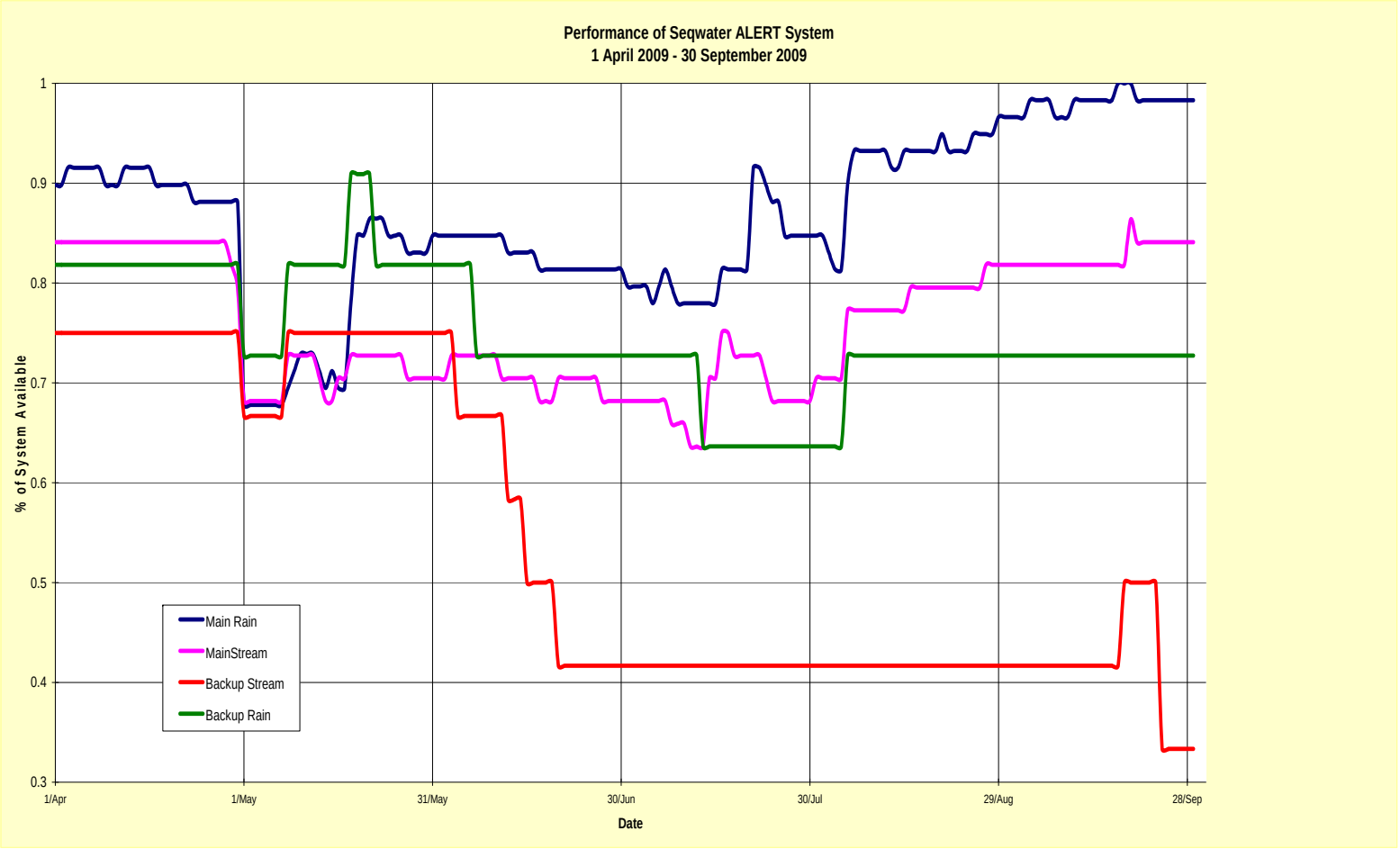
The ALERT system was supplied and installed by the Seqwater and is operated by Seqwater through a third party contract with RoadTek, a business group within the Department of Main Roads. As such, SunWater has no direct responsibility for its performance other than reporting problems to the Seqwater as they are identified.

Some summary data has been extracted on the performance of the ALERT sensors and this is presented in the following table. This data is for the period 1 April 2009 to 30 September 2009, a period of 183 days, except for the last column, which repeats the values from the previous report. Figure 5.1 illustrates this information graphically.

Table 6.1: Alert Network Performance

	Rainfall			River Height				Overall
	Main Rain	Back-up Rain	Overall Rain	Main River	Back-up River	Overall River	Gates	
Number of Sensors	59	11	70	44	12	56	30	126
Average Availability	87%	75%	85%	76%	55%	71%	100%	79%
Maximum Availability	100%	91%	-	86%	75%	-	100%	-
Minimum Availability	68%	64%	-	64%	33%	-	100%	-
Average OOA [{1}]	29	85	35	75	100	82	-	54
Maximum duration OOA for a single station	111	183	-	183	183	-	-	-

[1]OOA represents Out of Action


Performance of Seqwater ALERT System
1 April 2009 - 30 September 2009
% of System Available
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
1/Apr
1/May
31/May
30/Jun
30/Jul
29/Aug
28/Sep
Date
Main Rain
MainStream
Backup Stream
Backup Rain

In this period all of the station groups show an average availability around 79%. This result represents a drop in performance to the previous six months, which had an average availability of 84%.

Overall performance of the network has diminished since the last period, with the average availability dropping from 84% to 79%, and the average duration of 'Out of Action' (OOA) increasing from 43 days to 54 days. This level of performance is assessed as being below an appropriate level of service. Special attention needs to be paid to the prescribed notification and recording procedures, by both Seqwater and SunWater staff.

The figures could potentially have been even better, but for some ongoing problems. Some of these are outlined below:

Table 6.2: Main Rain Stations

Station	Location	Comment
6559	Brisbane R at Savages Crossing	134 days OOA
6619	Mt Castle	118 days OOA
6526	Lockyer Ck at Helidon	105 days OOA
6733	Bremer R at Rosewood	87 days OOA
6633	Lockyer Ck at Lyons Bridge (A)	83 days OOA
6714	Ferris Knob	81 days OOA
6623	Tarome	72 days OOA
6580	Bremer R at Adams Bridge	69 days OOA
6769	South Pine R at Drapers Crossing	68 days OOA
6651	Warrill Ck at Amberley (A)	54 days OOA

Table 6.3: Backup Rain Stations

Station	Location	Comment
6641	Wivenhoe Dam TW (B)	183 days OOA
6653	Warrill Ck at Amberley (B)	132 days OOA
6590	Somerset Dam HW (B)	116 days OOA
6702	Stanley R at Woodford (B)	47 days OOA

Table 6.3: Main River Stations

Station	Location	Comment
6655	Buraraba Ck	183 days OOA
6706	Stanley R at Woodford (A)	183 days OOA
6747	Brisbane R at Grain Terminal	183 days OOA
6761	North Pine Dam HW (A)	183 days OOA
6527	Lockyer Ck at Helidon	93 days OOA
6709	Brisbane R at Devon Hills	85 days OOA
6634	Lockyer Ck at Lyons Bridge (A)	83 days OOA
6731	Brisbane R at Jindalee	80 days OOA
6734	Bremer R at Rosewood	74 days OOA
6769	South Pine R at Drapers Crossing	69 days OOA

Table 6.4: Backup River Stations

Station	Location	Comment
6631	Lockyer Ck at Lyons Bridge (B)	183 days OOA
6642	Wivenhoe Dam TW (B)	183 days OOA
6592	Somerset Dam HW (C)	111 days OOA
6758	Brisbane R at Mt Crosby Weir (B)	108 days OOA
6591	Somerset Dam HW (B)	106 days OOA
6654	Warrill Ck at Amberley (B)	103 days OOA

It is recommended that problems with the stations that are still OOA and which are located above the dams be addressed if possible, prior to the onset of the wet season. Particular attention should be paid to the key stream sites such as North Pine Dam Headwater, Woodford, Lyons Bridge, Devon Hills, and Mt Crosby Weir.

The performance of 6638 (Wivenhoe Dam 5 m Druck) cannot be determined on a regular basis as this sensor is out of water currently and has been for the entire period. The 5m Druck stations are set up to provide more precise water level information when the water level is at or just above Full Supply Level. A new shaft encoder has been installed at North Pine Dam during the period and this sensor is connected to a Campbell's logger which effectively emulates an ALERT sensor.

The new sensor 6768 performed well during the flood events of April, May and June 2009. It is recommended that a new shaft encoder be added to the ALERT telemetry network for redundancy purposes, especially at Wivenhoe Dam.

A number of 'Key' stations were duplicated to improve their reliability. These stations are indicated in the following tables:

Table 6.5: Key Rainfall Station Availability

RAINFALL STATIONS HAVING FULL BACKUP			
Location	**A Station**	**B Station**	**No. of Days BOTH Stations unavailable**
Mt Pechey	6511	6513	0
Brisbane River at Gregors Ck	6514	6517	0
Somerset Dam Headwater	6593	6590	0
Stanley River at Woodford	6705	6702	47
Wivenhoe Dam Headwater	6639	6636	0
Wivenhoe Dam Tailwater	6643	6641	0
Mt Mee	6690	6701	0
Lockyer Ck at Lyons Bridge	6633	6630	0
Bremer R at Walloon	6550	6742	0
Warrill Ck at Amberley	6651	6653	45
Brisbane River at Lowood	6649	6646	0

It is highly desirable to reinstate the Stanley R at Woodford rainfall stations as a matter of priority.

Table 6.6: Key Stream Station Availability

RIVER HEIGHT STATIONS HAVING FULL BACKUP			
Location	**A Station**	**B Station**	**No. of Days BOTH Stations unavailable**
Brisbane River at Gregors Ck	6515	6518	0
Somerset Dam Headwater	6594	6591 6592	0
Stanley River at Woodford	6706	6703	7
Wivenhoe Dam Headwater	6637	6638	0
Wivenhoe Dam Tailwater	6644	6642	0
North Pine Dam Headwater	6761	6768 6762	0
Lockyer Ck at Lyons Bridge	6634	6631	83
Bremer River at Walloon	6551	6743	0
Warrill Ck at Amberley	6652	6654	0
Brisbane R at Lowood	6650	6647	0
Brisbane R at Mt Crosby Weir	6752	6758	73

The situation at Lockyer Ck at Lyons Bridge whereby both river height stations were unavailable for 83 days is a major concern. Also given the use of Mt Crosby Weir as a main downstream reference point, this situation should also be addressed as a priority. The above mentioned situations need to be remedied as a matter of urgency.

The occurrence of both A and B stations being out of action at the same time has increased when compared to the previous six months.

There remains concern that the gate opening sensors are not configured sufficiently well to provide useful data to confirm required gate operations. The calibration of the sensors and the range of coverage may need to be reviewed to ensure the data obtained is useable.

Overall the performance of the ALERT network has diminished over the past twelve months. A concerted effort is required to ensure the network achieves the desired level of performance and is fit for the purpose of providing reliable information in real time.

6.2 DERM HYDROMET TELEPHONE TELEMETRY SYSTEM - SIS

A copy of the DERM HYDROMET telephone telemetry software has been installed on the FOC computers. This software allows for polling of DERM hydrographic stations to obtain the available DERM rainfall and river height data in the Brisbane River and Pine River valleys.

A complete download of all relevant rainfall and river height data for the Brisbane River and Pine Rive catchments is carried out periodically using the SIS system and compared to the ALERT sensor data. No major problems were noted during this period.

6.3 MANUAL DATA GATHERING FROM DAM OPERATORS

Every week the Dam Supervisors provide a check on the performance of the headwater gauges. Considerable drift was noted on the Wivenhoe Dam HW during the flood events of April, May and June. The ALERT sensor data is compared to gauge board readings to ensure that a significant 'drift' in the data has not occurred. It is not possible to check all of the 5m Druck sensors at this time because the water level of all dams is below the lower operating range of these sensors.

6.4 RAPIC WEATHER RADAR

The Flood Operations Centre continues to receive the RAPIC weather radar images from the BoM via the website. The Mt Stapylton Radar is the primary site for South-East Queensland.

6.5 BOM QUANTITATIVE PRECIPITATION FORECASTS

Quantitative Precipitation Forecasts (QPFs) are received twice daily via facsimile from the Bureau of Meteorology. These QPFs are provided for both the Somerset and Wivenhoe catchments and also for the North Pine Dam catchments. They have proved a relatively reliable indicator of the likelihood of rainfall in the catchments up to 24 hours in advance.

6.6 SILO METEOGRAMS

Meteograms provide up to seven-day outlooks on weather variables such as temperature, wind and precipitation. The estimates of the weather variables are derived from latest climatic models and the user can specify the location for which the estimate is required. The estimates can also be obtained at any time, making the service ideal for regular short-term guidance of likely weather conditions. This service is available on subscription.

6.7 SMS – SHORT MESSAGE SERVICE

SMS is available through Optus MobileNet Digital which provides convenient message handling options with the mobile phones issued to the Duty Engineers. Duty Engineers regularly use this facility as a means of remote access to key stations or groups of key stations.

7.0 REFERENCES

DNR State Water Projects, 1999, "*Report to South East Queensland Water Board on Flood Events of February and March 1999 at Somerset Dam, Wivenhoe Dam & North Pine Dam*", 14 September 1999.

SunWater 2001, "*Report to South East Queensland Water on Flood Events of February 2001 at Somerset Dam, Wivenhoe Dam and North Pine Dam*", February 2001.

SunWater 2009, "*Seqwater Flood Event Report 2009at Somerset Dam, and North Pine Dam*", August 2009.

APPENDIX A

REVISED COMMUNICATION LIST

REGISTER – CONTACT LIST FOR EMERGENCIES & FLOOD INFORMATION – NORTH PINE DAM

Agency	Position	Working Hrs Priority	Out of Hrs Priority	Name	Work Ph	Fax	Mobile	After Hrs	Contacted By
Seqwater	Principal Engineer Dam Safety	1	1	John TIBALDI	[redacted]	[redacted]	[redacted]	[redacted]	Seqwater/FCC
	Dam Safety and Source Operations Manager	2	2	Robert DRURY	[redacted]	[redacted]	[redacted]	[redacted]	
	Flood Operations Engineer	3	3	Terry MALONE	[redacted]	[redacted]	[redacted]	[redacted]	
	Operations Coordinator North Coast	4	4	Murray DUNSTAN	[redacted]		[redacted]		
	Executive General Manager, Operations	5	5	Phil ALDRIDGE	[redacted]		[redacted]		
	Land and Water Quality Manager	1	1	Peter SCHNEIDER	[redacted]		[redacted]		
	Chief Executive Officer	3	3	Peter BORROWS	[redacted]	[redacted]	[redacted]	[redacted]	
	Chairman	4	4	Annabelle CHAPLIN	[redacted]	[redacted]	[redacted]		
	Storage Supervisor	1	1	Brett SCHULTZ	[redacted]	[redacted]	[redacted]	[redacted]	
	Standby Officer	2	2	Malcolm LANE	[redacted]	[redacted]	[redacted]	[redacted]	
Department of Natural Resources & Water	Director, Dam Safety	1	1	Peter ALLEN	[redacted]	[redacted]	[redacted]	[redacted]	Seqwater/FCC
	Director, Water Industry Asset Management & Standards	2	2	Peter ARTEMIEFF	[redacted]	[redacted]	[redacted]	[redacted]	
	Dam Safety Engineer	3	3	Ron GUPPY	[redacted]	[redacted]	[redacted]	[redacted]	
Flood Operations Centre (operated by Sunwater)	Principal Engineer Dam Safety	1	1	John TIBALDI	[redacted]	[redacted]	[redacted]	[redacted]	Seqwater/FCC
	Flood Operations Engineer	2	2	Terry MALONE	[redacted]	[redacted]	[redacted]	[redacted]	
	Senior Flood Operations Engineer	3	3	Rob AYRE	[redacted]	[redacted]	[redacted]	[redacted]	
	Senior Flood Operations Engineer	4	4	John RUFFINI*	[redacted]	[redacted]	[redacted]	[redacted]	
	Flood Control Room (Operational)	5	5	General Phones	[redacted]	[redacted]			

Agency	Position	Working Hrs Priority	Out of Hrs Priority	Name	Work Ph	Fax	Mobile	After Hrs	Contacted By
Department of Emergency Services Disaster Operations	Duty Officer* (24 Hours)	1	1	Rostered	[redacted]	[redacted]	[redacted]		Seqwater/FCC
Moreton Bay Regional Council	Local Disaster Response Coordinator	1	1	Tony MARTINI	[redacted]		[redacted]		Seqwater/FCC
	Local Disaster Response Coordinator	2	2	Ed HAMILL	[redacted]		[redacted]		
	Local Disaster Response Coordinator	2	2	Peter SAVAGE	[redacted]		[redacted]		
	Local Disaster Response Coordinator	3	3	Eleanor DAVIDSON	[redacted]	[redacted]	[redacted]		
Brisbane City Council	Local Disaster Response Coordinator	1	1	Duty Officer	[redacted]	[redacted]		[redacted]	Seqwater/FCC
	Flood Information Centre	2	2	Duty Officer	[redacted]			[redacted]	
Emergency Management Queensland	Regional Director, Brisbane District	1	1	Jason CAMERON	[redacted]	[redacted]	[redacted]		Seqwater/FCC
Police					000				Seqwater/FCC
Bureau of Meteorology	Engineer in charge Flood Warning*	1	1		[redacted]	[redacted]			Seqwater/FCC
	Meteorologist in Charge (24 hours)	2	2		[redacted]	[redacted]			
Ambulance					000				Seqwater/FCC

Notes:

1. Contact with an agency is to be made via position with highest priority. That person contacted is then responsible to forward notification to other relevant persons with the agency.
2. Agencies to provide notification of updated contact details to John Tibaldi of Seqwater.

REGISTER – CONTACT LIST FOR EMERGENCIES & FLOOD INFORMATION – SOMERSET DAM

Agency	Position	Working Hrs Priority	Out of Hrs Priority	Name	Work Ph	Fax	Mobile	After Hrs	Contacted By
Seqwater	Principal Engineer Dam Safety	1	1	John TIBALDI	[redacted]	[redacted]	[redacted]	[redacted]	
	Dam Safety and Source Operations Manager	2	2	Robert DRURY	[redacted]	[redacted]	[redacted]	[redacted]	
	Flood Operations Engineer	3	3	Terry MALONE	[redacted]	[redacted]	[redacted]	[redacted]	
	Operations Coordinator Central	4	4	Jayam TENNAKOON	[redacted]		[redacted]		
	Executive General Manager, Operations	5	5	Phil ALDRIDGE	[redacted]		[redacted]		Seqwater/FCC
	Land and Water Quality Manager	1	1	Peter SCHNEIDER	[redacted]		[redacted]		
	Chief Executive Officer	3	3	Peter BORROWS	[redacted]	[redacted]	[redacted]	[redacted]	
	Chairman	4	4	Annabelle CHAPLIN	[redacted]	[redacted]	[redacted]		
	Storage Supervisor	1	1	Anthony DAGAN	[redacted]	[redacted]	[redacted]	[redacted]	
	Standby Officer	2	2						
Department of Natural Resources & Water	Director, Dam Safety	1	1	Peter ALLEN	[redacted]	[redacted]	[redacted]	[redacted]	
	Director, Water Industry Asset Management & Standards	2	2	Peter ARTEMIEFF	[redacted]	[redacted]	[redacted]	[redacted]	Seqwater/FCC
	Dam Safety Engineer	3	3	Ron GUPPY	[redacted]	[redacted]	[redacted]	[redacted]	
Flood Operations Centre (operated by Sunwater)	Principal Engineer Dam Safety	1	1	John TIBALDI	[redacted]	[redacted]	[redacted]	[redacted]	
	Flood Operations Engineer	2	2	Terry MALONE	[redacted]	[redacted]	[redacted]	[redacted]	
	Senior Flood Operations Engineer	3	3	Rob AYRE	[redacted]	[redacted]	[redacted]	[redacted]	Seqwater/FCC
	Senior Flood Operations Engineer	4	4	John RUFFINI*	[redacted]	[redacted]	[redacted]	[redacted]	
	Flood Control Room (Operational)	5	5	General Phones	[redacted]	[redacted]			

Agency	Position	Working Hrs Priority	Out of Hrs Priority	Name	Work Ph	Fax	Mobile	After Hrs	Contacted By
Department of Emergency Services Disaster Operations	Duty Officer* (24 Hours)	1	1	Rostered	[redacted]	[redacted]	[redacted]		Seqwater/FCC
Somerset Regional Council	Local Disaster Response Coordinator	1	1	Tony JACOBS	[redacted]	[redacted]	[redacted]		Seqwater/FCC
	Local Disaster Response Coordinator	2	2	Andy BICKERTON (SES Controller)	[redacted]	[redacted]	[redacted]		
	Local Disaster Response Coordinator	3	3	Robert BAIN (CEO)	[redacted]	[redacted]	[redacted]		
Ipswich City Council	Local Disaster Response Coordinator	1	1	Andrew UNDERWOOD (Strategic Infrastructure Manager)	[redacted]	[redacted]	[redacted]	[redacted]	Seqwater/FCC
	Local Disaster Response Coordinator	1	1	Tony TRACE	[redacted]	[redacted]	[redacted]		
	Local Disaster Response Coordinator	2	2	Ross DRABBLE (Chief Operations Officer)	[redacted]	[redacted]	[redacted]	[redacted]	
	Local Disaster Response Coordinator	3	3	Arie Van Den ENDE (SES Controller)	[redacted]	[redacted]	[redacted]	[redacted]	
Brisbane City Council	Local Disaster Response Coordinator	1	1	Duty Officer	[redacted]	[redacted]		[redacted]	Seqwater/FCC
	Flood Information Centre	2	2	Duty Officer	[redacted]	[redacted]		[redacted]	
Emergency Management Queensland	Regional Director, Brisbane District	1	1	Jason CAMERON	[redacted]	[redacted]	[redacted]		Seqwater/FCC
Police					000				Seqwater/FCC
Bureau of Meteorology	Engineer in charge Flood Warning*	1	1		[redacted]	[redacted]			Seqwater/FCC
	Meteorologist in Charge (24 hours)	2	2		[redacted]	[redacted]			
Ambulance					000				Seqwater/FCC
Notes:	1. Contact with an agency is to be made via position with highest priority. That person contacted is then responsible to forward notification to other relevant persons with the agency.								
	2. Agencies to provide notification of updated contact details to John Tibaldi of Seqwater.								

REGISTER – CONTACT LIST FOR EMERGENCIES & FLOOD INFORMATION – WIVENHOE DAM

Agency	Position	Working Hrs Priority	Out of Hrs Priority	Name	Work Ph	Fax	Mobile	After Hrs	Contacted By
Seqwater	Principal Engineer Dam Safety	1	1	John TIBALDI	[redacted]	[redacted]	[redacted]	[redacted]	Seqwater/FCC
	Dam Safety and Source Operations Manager	2	2	Robert DRURY	[redacted]	[redacted]	[redacted]	[redacted]	
	Flood Operations Engineer	3	3	Terry MALONE	[redacted]	[redacted]	[redacted]	[redacted]	
	Operations Coordinator Central	4	4	Jayam TENNAKOON	[redacted]		[redacted]		
	Executive General Manager, Operations	5	5	Phil ALDRIDGE	[redacted]		[redacted]		
	Land and Water Quality Manager	1	1	Peter SCHNEIDER	[redacted]		[redacted]		
	Chief Executive Officer	3	3	Peter BORROWS	[redacted]	[redacted]	[redacted]	[redacted]	
	Chairman	4	4	Annabelle CHAPLIN	[redacted]	[redacted]	[redacted]		
	Storage Supervisor	1	1	Doug GRIGG	[redacted]	[redacted]	[redacted]	[redacted]	
	Standby Officer	2	2	Mathew O'REILLY	[redacted]	[redacted]	[redacted]	[redacted]	
Department of Natural Resources & Water	Director, Dam Safety	1	1	Peter ALLEN	[redacted]	[redacted]	[redacted]	[redacted]	Seqwater/FCC
	Director, Water Industry Asset Management & Standards	2	2	Peter ARTEMIEFF	[redacted]	[redacted]	[redacted]	[redacted]	
	Dam Safety Engineer	3	3	Ron GUPPY	[redacted]	[redacted]	[redacted]	[redacted]	
Flood Operations Centre (operated by Sunwater)	Principal Engineer Dam Safety	1	1	John TIBALDI	[redacted]	[redacted]	[redacted]	[redacted]	Seqwater/FCC
	Flood Operations Engineer	2	2	Terry MALONE	[redacted]	[redacted]	[redacted]	[redacted]	
	Senior Flood Operations Engineer	3	3	Rob AYRE	[redacted]	[redacted]	[redacted]	[redacted]	
	Senior Flood Operations Engineer	4	4	John RUFFINI*	[redacted]	[redacted]	[redacted]	[redacted]	
	Flood Control Room (Operational)	5	5	General Phones	[redacted]	[redacted]			

Agency	Position	Working Hrs Priority	Out of Hrs Priority	Name	Work Ph	Fax	Mobile	After Hrs	Contacted By
Department of Emergency Services Disaster Operations	Duty Officer* (24 Hours)	1	1	Rostered	[redacted]	[redacted]	[redacted]		Seqwater/FCC
Somerset Regional Council	Local Disaster Response Coordinator	1	1	Tony JACOBS	[redacted]	[redacted]	[redacted]		Seqwater/FCC
	Local Disaster Response Coordinator	2	2	Andy BICKERTON (SES Controller)	[redacted]	[redacted]	[redacted]		
	Local Disaster Response Coordinator	3	3	Robert BAIN (CEO)	[redacted]	[redacted]	[redacted]		
Ipswich City Council	Local Disaster Response Coordinator	1	1	Andrew UNDERWOOD (Strategic Infrastructure Manager)	[redacted]	[redacted]	[redacted]	[redacted]	Seqwater/FCC
	Local Disaster Response Coordinator	1	1	Tony TRACE	[redacted]	[redacted]	[redacted]		
	Local Disaster Response Coordinator	2	2	Ross DRABBLE (Chief Operations Officer)	[redacted]	[redacted]	[redacted]	[redacted]	
	Local Disaster Response Coordinator	3	3	Arie Van Den ENDE (SES Controller)	[redacted]	[redacted]	[redacted]	[redacted]	
Brisbane City Council	Local Disaster Response Coordinator	1	1	Duty Officer	[redacted]	[redacted]		[redacted]	Seqwater/FCC
	Flood Information Centre	2	2	Duty Officer	[redacted]	[redacted]		[redacted]	
Emergency Management Queensland	Regional Director, Brisbane District	1	1	Jason CAMERON	[redacted]	[redacted]	[redacted]		Seqwater/FCC
Police					000				Seqwater/FCC
Bureau of Meteorology	Engineer in charge Flood Warning*	1	1		[redacted]	[redacted]			Seqwater/FCC
	Meteorologist in Charge (24 hours)	2	2		[redacted]	[redacted]			
Ambulance					000				Seqwater/FCC
Notes:	1. Contact with an agency is to be made via position with highest priority. That person contacted is then responsible to forward notification to other relevant persons with the agency.								
	2. Agencies to provide notification of updated contact details to John Tibaldi of Seqwater.								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