sunwater

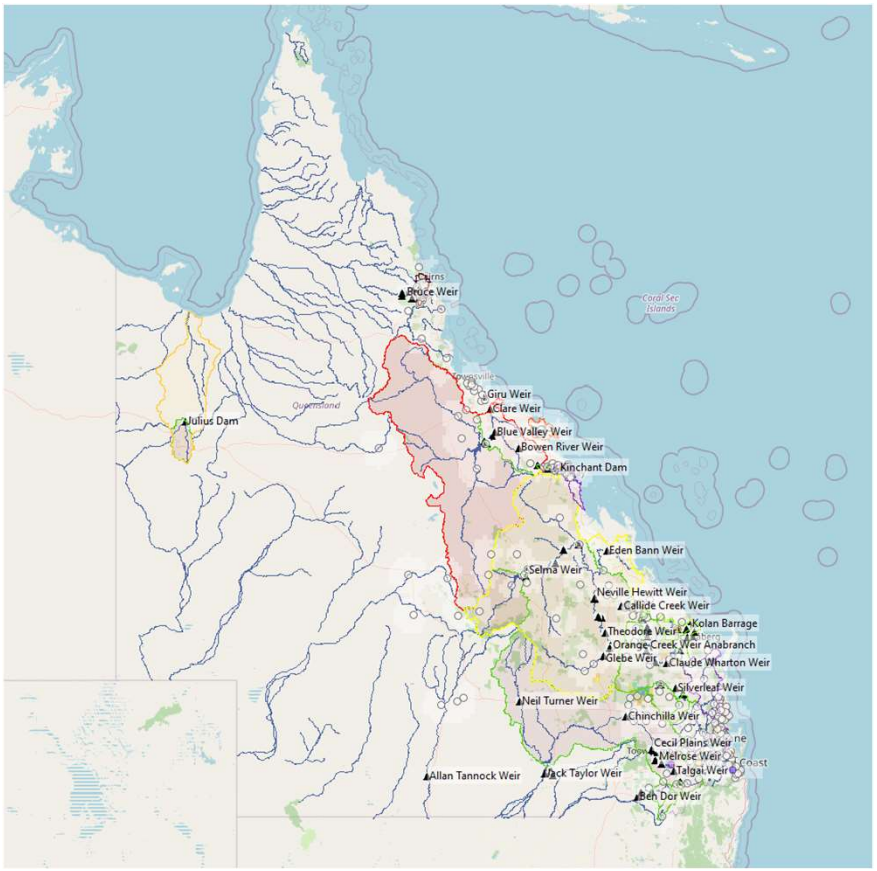
Development Updates on the Sunwater Decision Support system (SuDS)

sunwater

‘Kicking the bucket’

Brief Overview of the Sunwater Decision Support System (SuDS)

Covers a large area of QLD



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Brief Overview of the Sunwater Decision Support System (SuDS)

North

Capacity 98.93%

Burdekin Falls Dam

Mount Wyatt

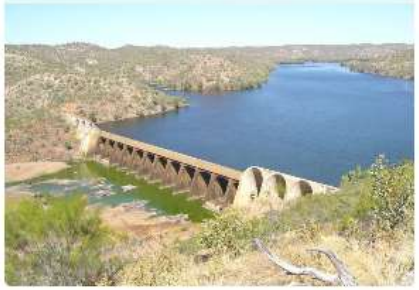
SCHEME
Burdekin Haughton

Capacity 86.7%

Julius Dam

Mount Isa

SCHEME
Julius Dam



Capacity 53.89%

Peter Faust Dam

Lake Proserpine

SCHEME
Proserpine River

Capacity 94.38%

Tinaroo Falls Dam

Lake Tinaroo

SCHEME
Mareeba Dimbulah

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Brief Overview of the Sunwater Decision Support System (SuDS)

Central

Capacity 67.68%

Callide Dam

Mount Murchison

SCHEME
Callide Valley

Capacity 88.69%

Eungella Dam

Eungella Dam

SCHEME
Bowen Broken Rivers

Capacity 21.22%

Fairbairn Dam

Gindie

SCHEME
Nogoa Mackenzie

Capacity 84.99%

Kinchant Dam

Kinchant Dam

SCHEME
Eton

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Brief Overview of the Sunwater Decision Support System (SuDS)

Burnett and Lower Mary

Capacity	100.82%	Capacity	100.24%	Capacity	36.75%	Capacity	101.58%	Capacity	96.53%	Capacity	81.63%
Bjelke-Petersen Dam		**Boondooma Dam**		**Cania Dam**		**Fred Haigh Dam**		**Paradise Dam**		**Wuruma Dam**	
Moffatdale		Okeden		Cania		Lake Monduran		Good Night		Wuruma Dam	
SCHEME		SCHEME		SCHEME		SCHEME		SCHEME		SCHEME	
Barker Barambah		Boyne River and Tarong		Three Moon Creek		Bundaberg		Bundaberg		Upper Burnett	






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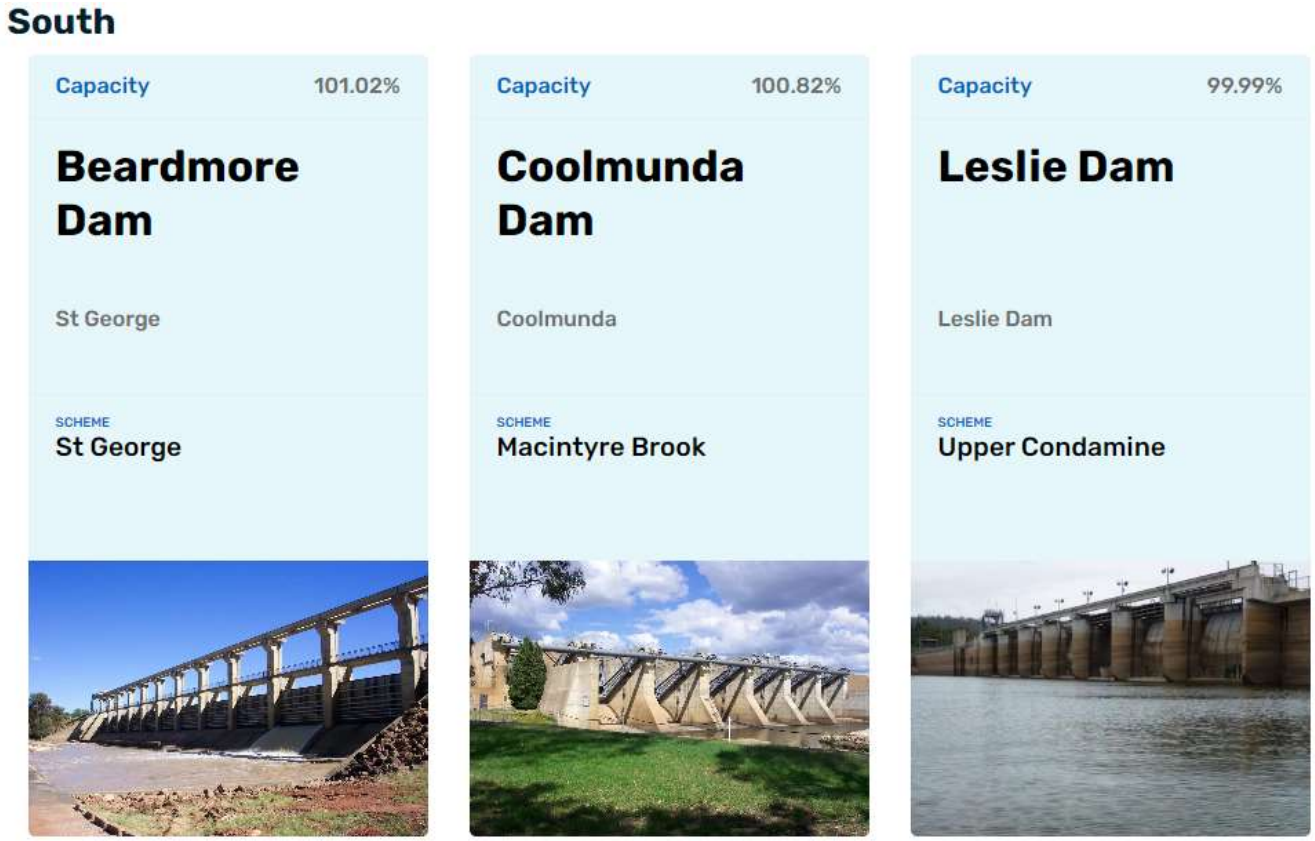
Brief Overview of the Sunwater Decision Support System (SuDS)



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Brief Overview of the Sunwater Decision Support System (SuDS)

Automated Daily Flood Summary Reporting

- FEWS driven process
- Forecast rainfall
- Soil Moisture
- Storage capacity
- Updated with every Obs rainfall import (15min)
- Complimented with an Obs Rainfall catchment average

Storage Forecast Summary
Generated: 23/08/2022 12:21 AEST
Forecast Date: 23/08/2022 04:00 AEST

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Region	Referable Dam	Current Capacity to Spillway Level (%)	Spill on Observed Streamflow	Rainfall to Spill (mm)	24Hr Rainfall	48Hr Rainfall	72Hr Rainfall	96Hr Rainfall	120Hr Rainfall	144Hr Rainfall
NORTH	Tinaroo Falls Dam	94.4	No	146	0	0	0	6	16	27
	Burdekin Falls Dam *	98.9	No	55	0	0	0	1	2	5
	Peter Faust Dam	53.9	No	900	0	0	0	1	7	14
	Julius Dam	86.7	No	63	0	0	0	0	0	0
CENTRAL	Eungella Dam	88.7	No	176	0	0	0	2	7	11
	Kinchant Dam	85.0	No	408	0	0	0	2	7	13
	Teemburra Dam	98.0	No	136	0	0	0	2	8	13
	Fairbairn Dam *	21.2	No	123	0	0	0	0	0	2
	Callide Dam	63.6	No	78	0	0	0	0	1	2
	Kroombit Dam	5.6	No	82	0	0	0	0	1	2
	Moura OSS	76.1	No	707	0	0	0	0	0	2
BURNETT	Cania Dam	36.8	No	239	0	0	0	0	1	2
	Fred Haigh Dam	101.6	No	0	0	0	0	0	1	2
	Paradise Dam *	96.5	No	40	0	0	0	0	1	2
	Wuruma Dam	81.6	No	58	0	0	0	0	1	2
	Boondooma Dam	100.2	No	0	1	1	1	1	1	1
	Bjelke-Petersen Dam	100.8	No	0	1	1	1	1	1	2
	Woongarra OSS	66.3	No	618	0	0	0	0	1	2
	Isis OSS	94.0	No	182	0	0	0	0	1	2
SOUTH	Leslie Dam	100.0	No	0	2	2	2	2	2	3
	Coolmunda Dam	100.8	No	0	2	2	2	2	2	2
	Glenlyon Dam	100.4	No	0	3	3	3	3	3	3
	Beardmore Dam *	100.7	Yes	0	0	0	0	0	0	1

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Brief Overview of the Sunwater Decision Support System (SuDS)

Automated Daily Flood Summary Reporting

- FEWS driven process
- Forecast rainfall
- Soil Moisture
- Storage capacity
- Updated with every Obs rainfall import (15min)
- **Complimented with an Obs Rainfall catchment average**

Observed Catchment Average Rainfall

Generated: 23/08/2022 12:11 AEST
Observation Date: 23/08/2022 12:00 AEST

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Region	Referable Dam	Current Capacity (%)	Rainfall Required to Spill (mm)	24Hr Rainfall	48Hr Rainfall	72Hr Rainfall	96Hr Rainfall	120Hr Rainfall
NORTH	Tinaroo Falls Dam	94.4	146	0	0	0	0	0
	Burdekin Falls Dam *	98.9	55	0	0	0	0	0
	Peter Faust Dam	53.9	900	0	0	0	0	0
	Julius Dam	86.7	63	0	0	0	0	0
CENTRAL	Eungella Dam	88.7	176	1	1	1	1	1
	Kinchant Dam	85.0	408	0	0	0	0	0
	Teemburra Dam	98.0	136	0	0	0	0	0
	Fairbairn Dam *	21.2	123	0	0	0	0	0
	Callide Dam	63.6	78	0	0	1	1	1
	Kroombit Dam	5.6	82	0	0	0	2	2
	Moura OSS	76.1	707	0	0	1	1	1
BURNETT	Cania Dam	36.8	239	0	0	0	0	1
	Fred Haigh Dam	101.6	0	0	0	0	1	1
	Paradise Dam *	96.5	40	0	0	0	0	0
	Wuruma Dam	81.6	58	0	0	0	0	0
	Boondooma Dam	100.2	0	0	0	1	1	1
	Bjelke-Petersen Dam	100.8	0	0	0	0	0	0
	Woongarra OSS	66.3	618	0	0	0	0	0
	Isis OSS	94.0	182	0	0	0	0	0
SOUTH	Leslie Dam	100.0	0	0	0	0	0	4
	Coolmunda Dam	100.8	0	0	0	0	0	0
	Glenlyon Dam	100.4	0	0	0	0	0	0
	Beardmore Dam *	100.7	0	0	1	1	1	2

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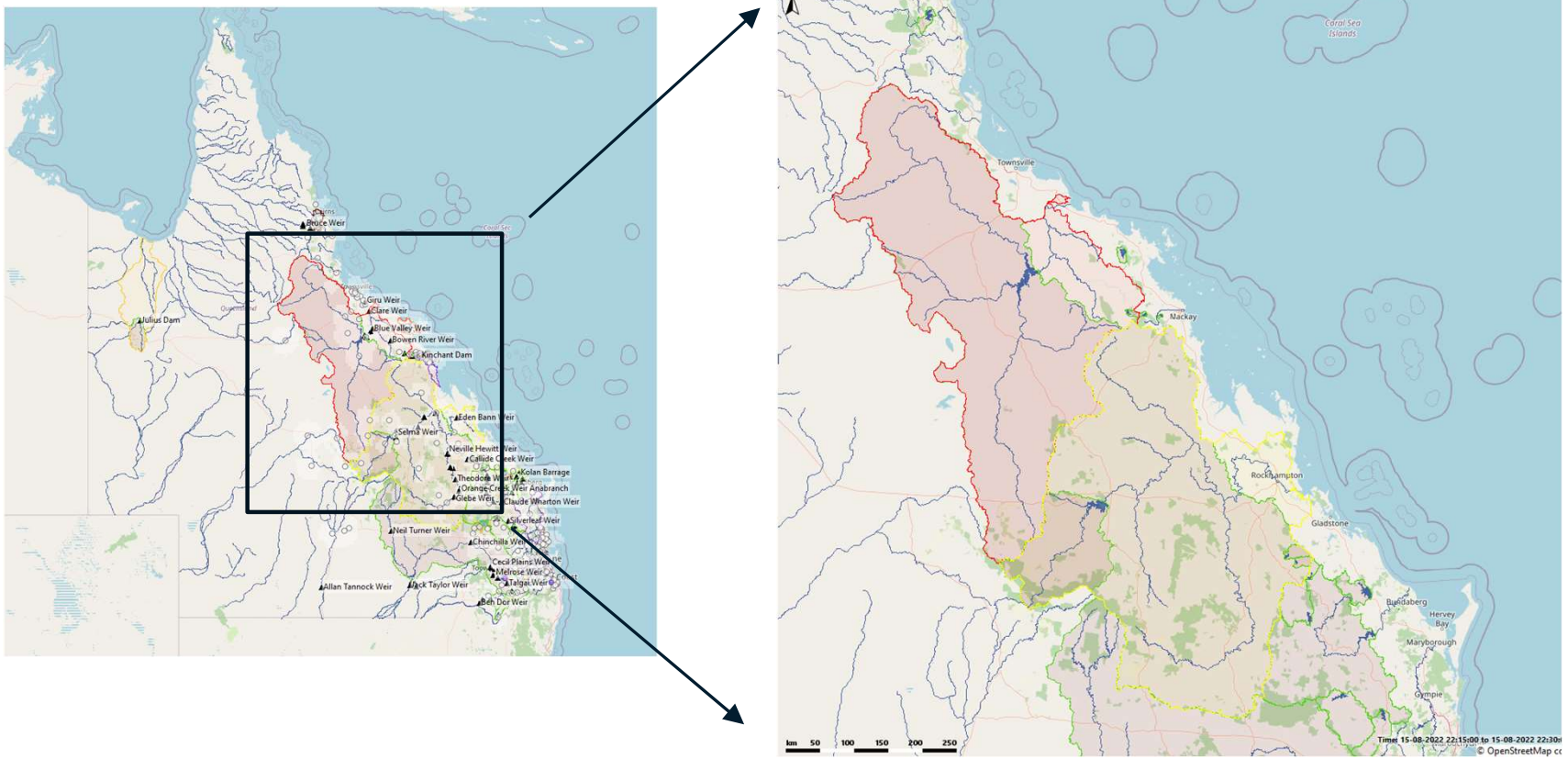
Brief Overview of the Sunwater Decision Support System (SuDS)

Covers a large area of QLD



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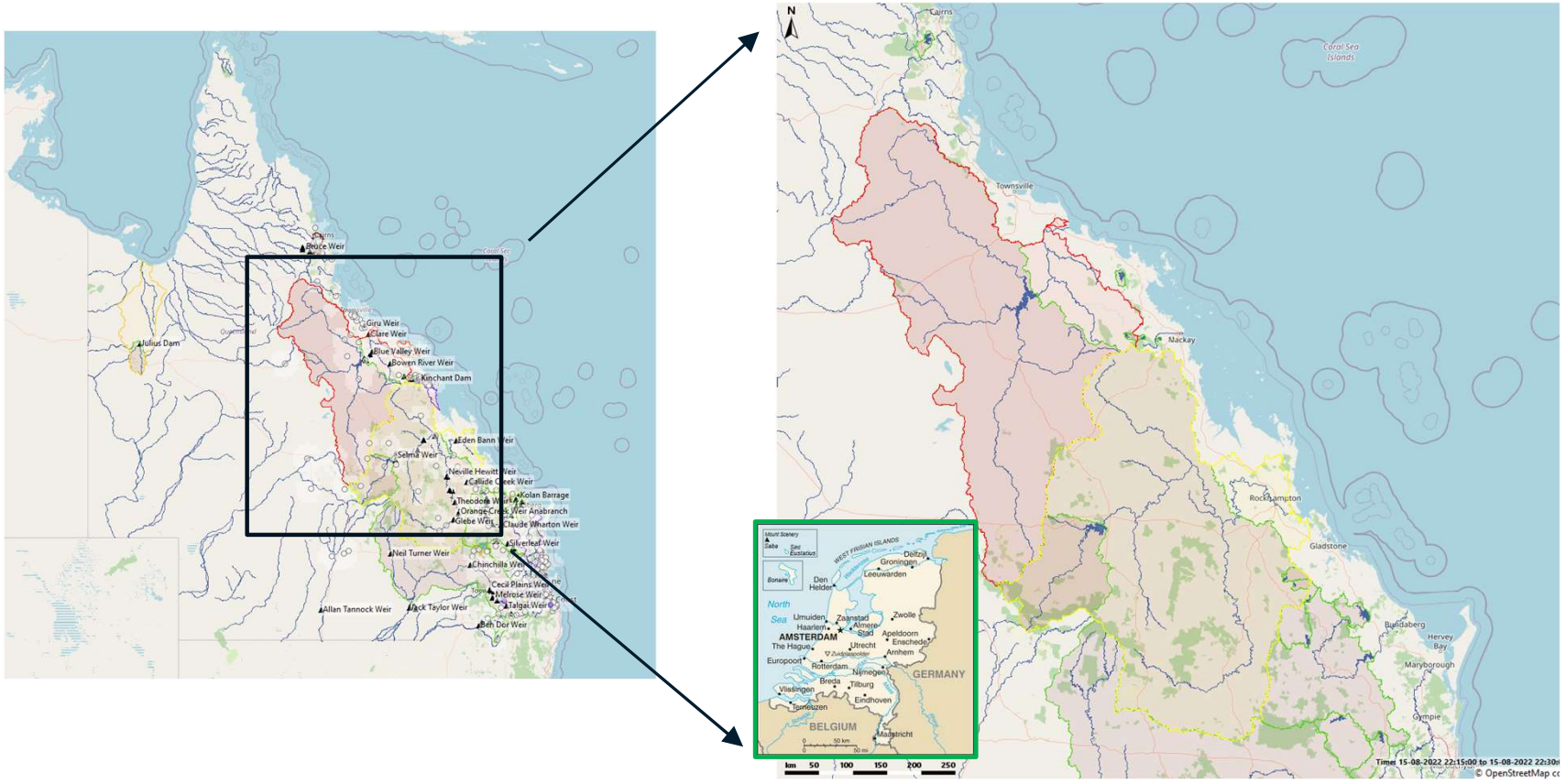
Brief Overview of the Sunwater Decision Support System (SuDS)

Covers a large area of QLD



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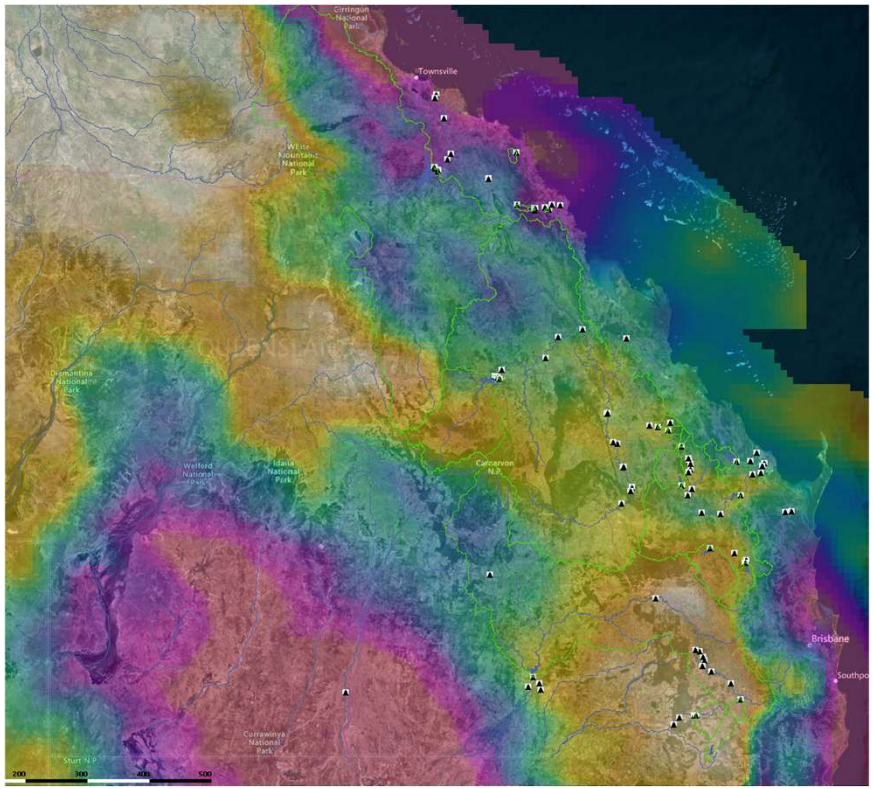
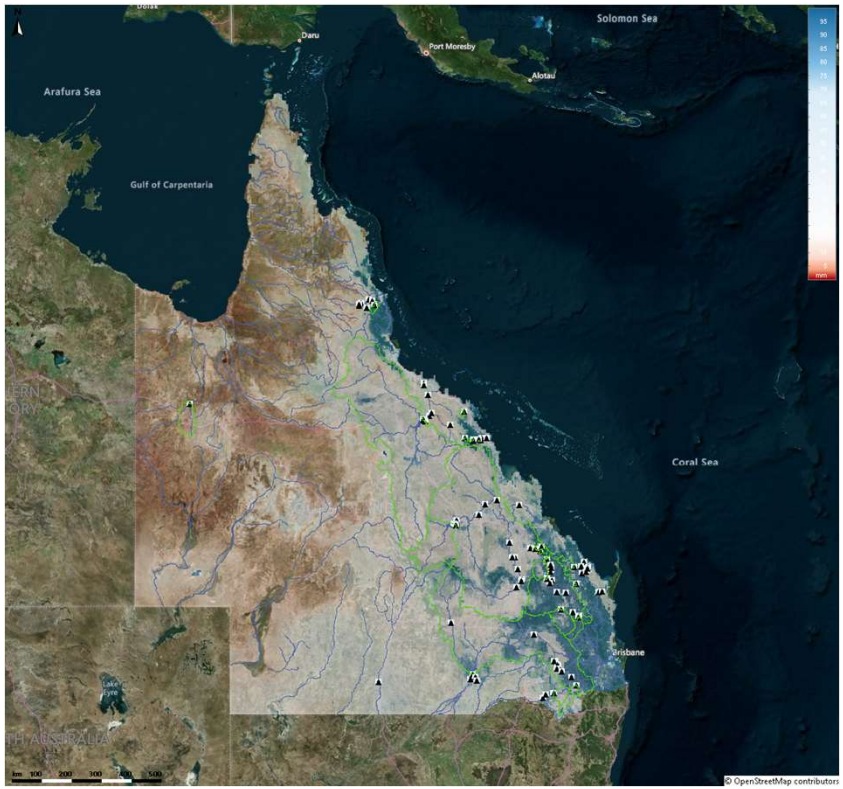
Brief Overview of the Sunwater Decision Support System (SuDS)

NWPs and large catchments





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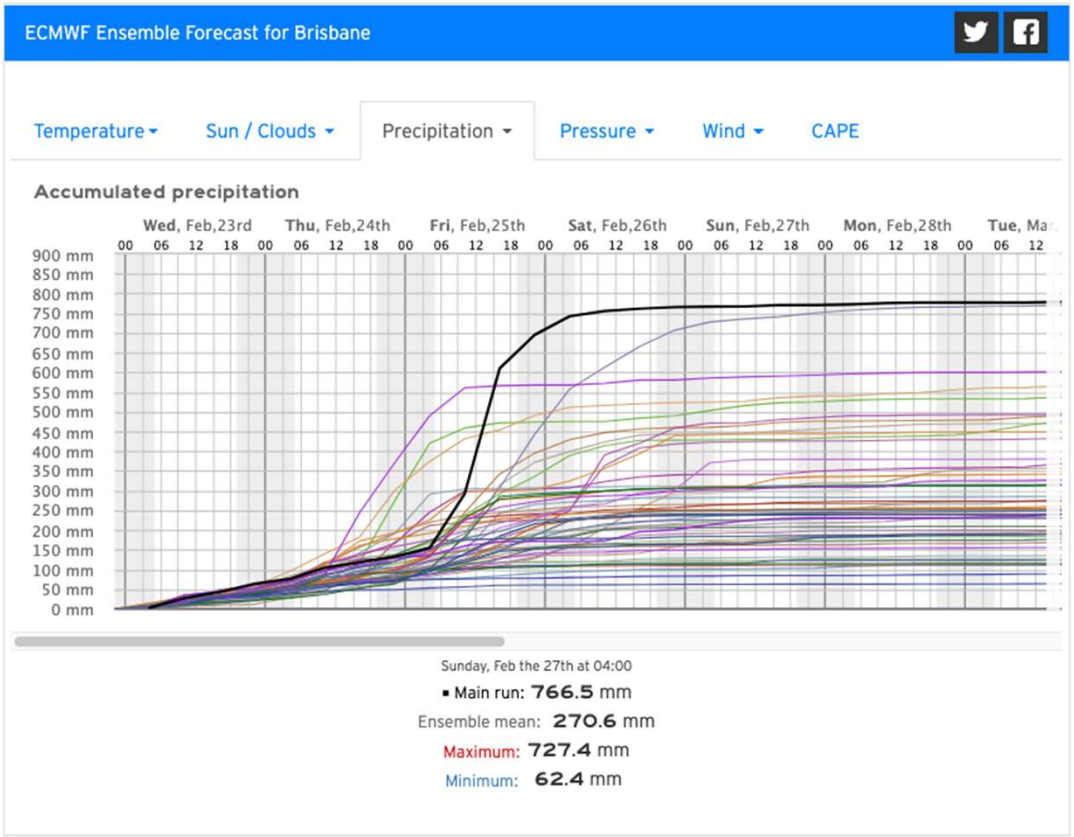
SuDS Improvements



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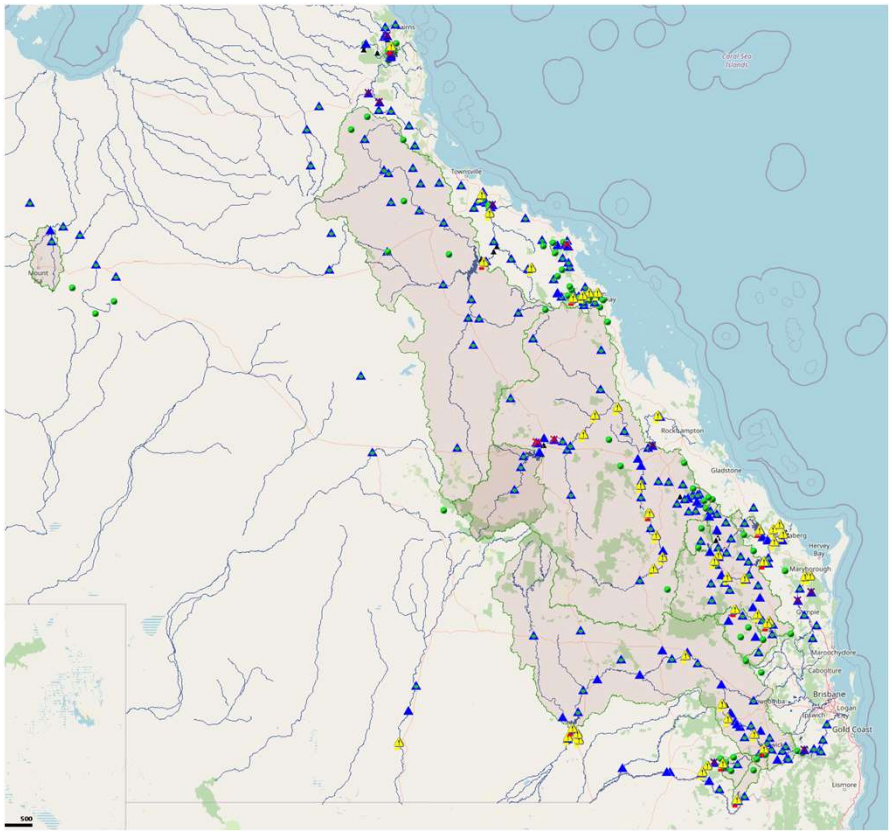
SuDS Improvements – How many gauges is enough?



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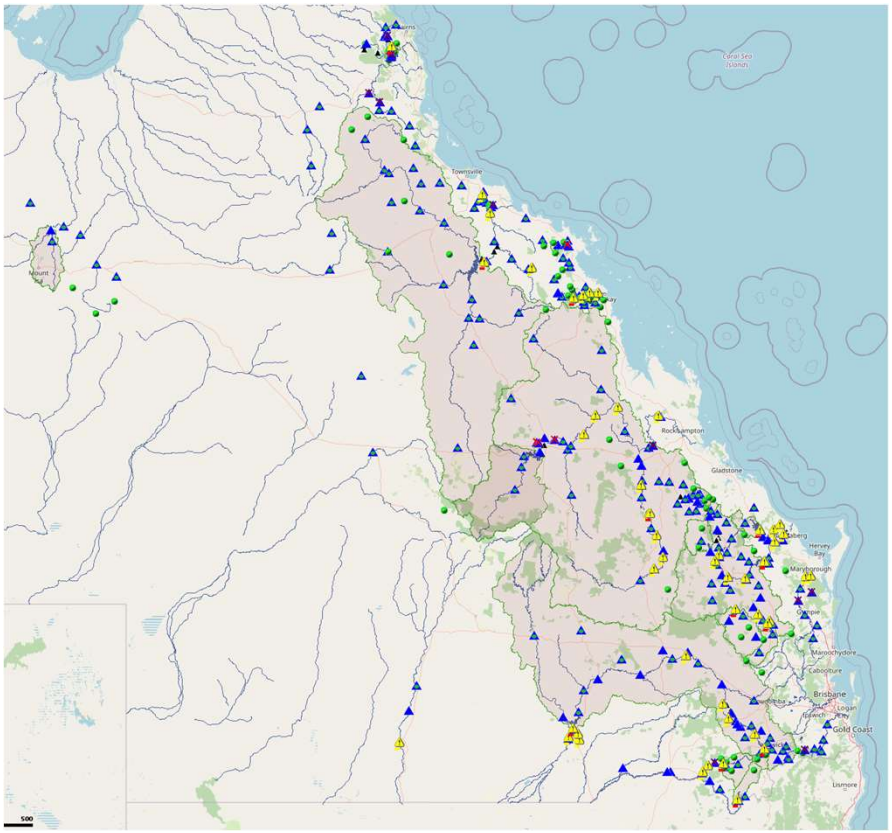
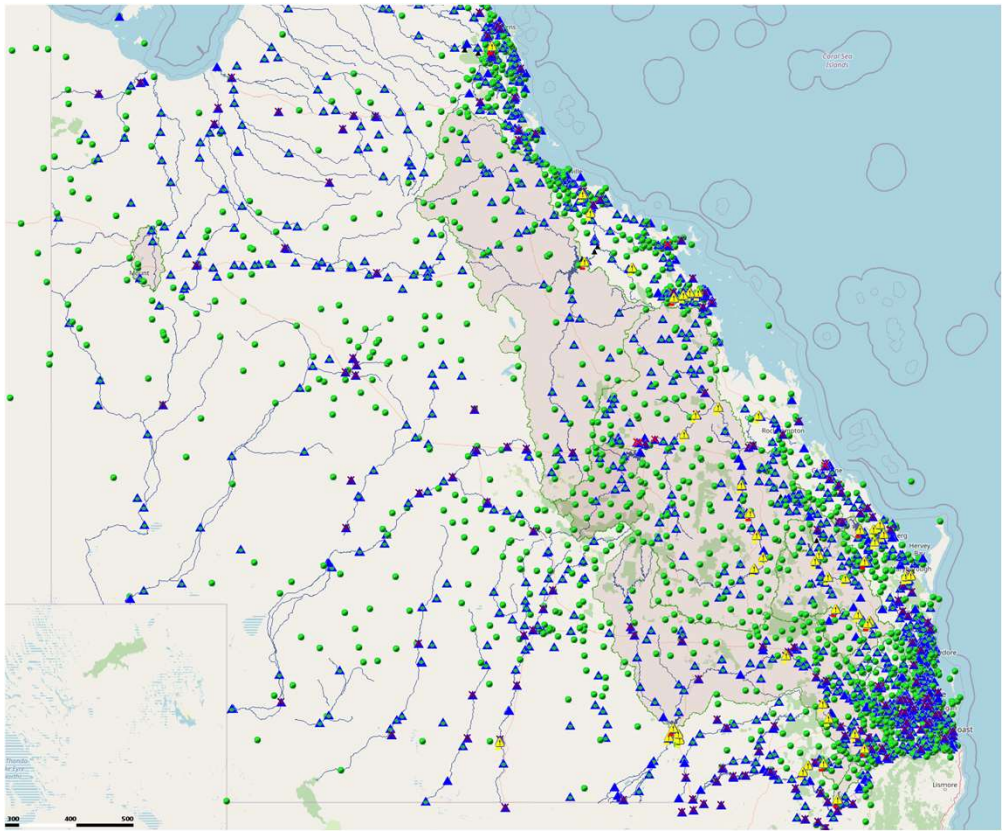
SuDS Improvements – Can never have enough gauges





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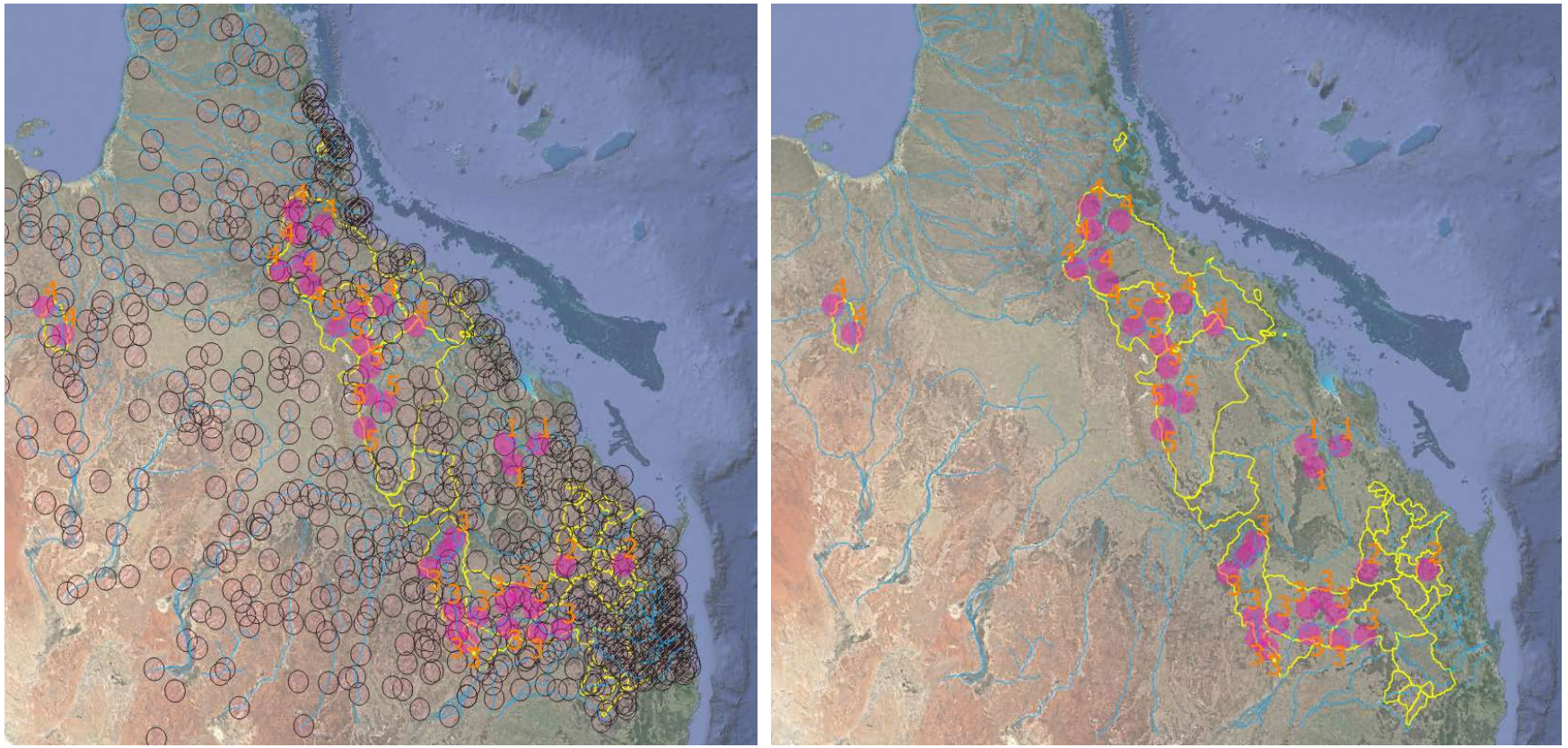
SuDS Improvements – Can never have enough gauges



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SuDS Improvements

Model Recalibration

- Increase events
- Shift focus of calibration (high to low)
- Introduce additional modelling parameters such as recovery factors

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SuDS Improvements

Model Recalibration

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SuDS Improvements

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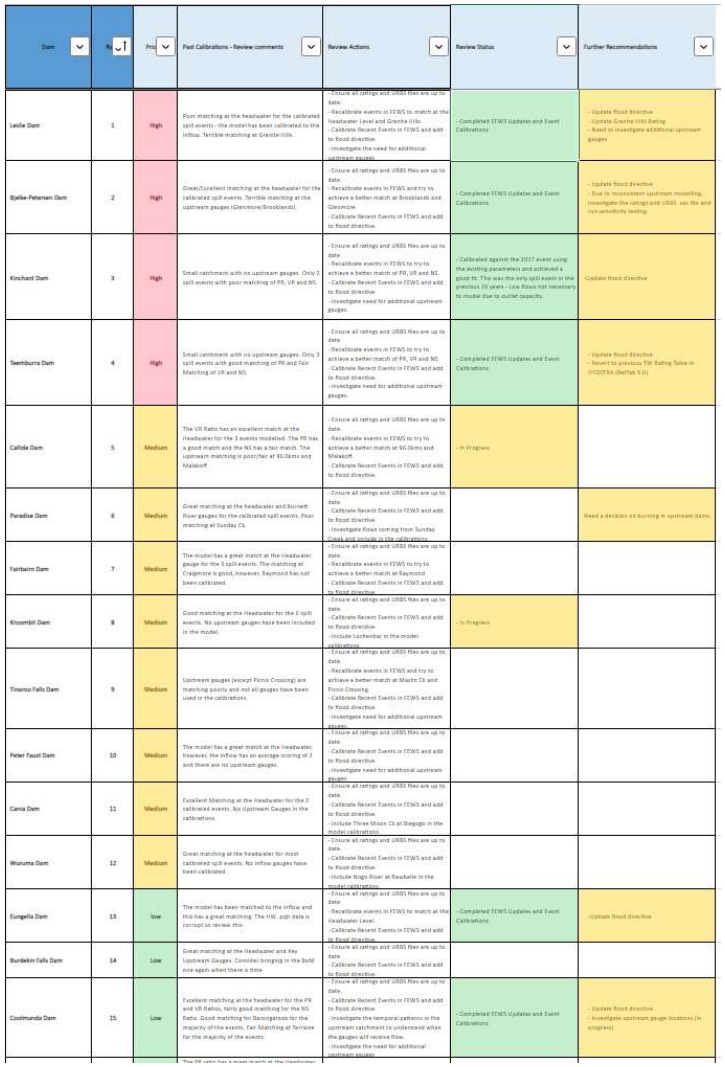

Dam	No.	Priority	Post Calibrations - Review comments	Review Actions	Review Status	Further Recommendations
Leslie Dam	1	High	Poor matching at the headwater for the calibrated spill events - the model has been calibrated to the Inflow. Terrible matching at Granite Hills.	- Ensure all ratings and URBS files are up to date. - Recalibrate events in FEWS to match at the Headwater Level and Granite Hills. - Calibrate Recent Events in FEWS and add to flood directive. - Investigate the need for additional upstream gauges.	- Completed FEWS Updates and Event Calibrations	- Update flood directive - Update Granite HW Rating - Need to investigate additional upstream gauges
Bjelke-Petersen Dam	2	High	Great/Excellent matching at the headwater for the calibrated spill events. Terrible matching at the upstream gauges (Glenmore/Brooklands).	- Ensure all ratings and URBS files are up to date. - Recalibrate events in FEWS and try to achieve a better match at Brooklands and Glenmore. - Calibrate Recent Events in FEWS and add to flood directive.	- Completed FEWS Updates and Event Calibrations	- Update flood directive - Due to inconsistent upstream modelling, investigate the ratings and URBS .sac file and run sensitivity testing.
Kinchant Dam	3	High	Small catchment with no upstream gauges. Only 2 spill events with poor matching of PR, VR and NS.	- Ensure all ratings and URBS files are up to date. - Recalibrate events in FEWS to try to achieve a better match of PR, VR and NS. - Calibrate Recent Events in FEWS and add to flood directive. - Investigate need for additional upstream gauges.	- Calibrated against the 2017 event using the existing parameters and achieved a good fit. This was the only spill event in the previous 10 years - Low flows not necessary to model due to outlet capacity.	- Update flood directive
Teemburra Dam	4	High	Small catchment with no upstream gauges. Only 3 spill events with good matching of PR and Fair Matching of VR and NS.	- Ensure all ratings and URBS files are up to date. - Recalibrate events in FEWS to try to achieve a better match of PR, VR and NS. - Calibrate Recent Events in FEWS and add to flood directive. - Investigate need for additional upstream gauges.	- Completed FEWS Updates and Event Calibrations	- Update flood directive - Revert to previous TW Rating Table in HYDSTRA (RefTab 9.0)
Callide Dam	5	Medium	The VR Ratio has an excellent match at the Headwater for the 3 events modelled. The PR has a good match and the NS has a fair match. The upstream matching is poor/fair at 60.0kms and Malakoff.	- Ensure all ratings and URBS files are up to date. - Recalibrate events in FEWS to try to achieve a better match at 60.0kms and Malakoff. - Calibrate Recent Events in FEWS and add to flood directive.	- In Progress	
Paradise Dam	6	Medium	Great matching at the headwater and Burnett River gauges for the calibrated spill events. Poor matching at Sunday Ck.	- Ensure all ratings and URBS files are up to date. - Calibrate Recent Events in FEWS and add to flood directive. - Investigate flows coming from Sunday Creek and include in the calibrations.		Need a decision on burning in upstream dams
Fairbairn Dam	7	Medium	The model has a great match at the Headwater gauge for the 3 spill events. The matching at Craigmore is good, however, Raymond has not been calibrated.	- Ensure all ratings and URBS files are up to date. - Recalibrate events in FEWS to try to achieve a better match at Raymond - Calibrate Recent Events in FEWS and add to flood directive.		
Kroombit Dam	8	Medium	Good matching at the Headwater for the 5 spill events. No upstream gauges have been included in the model.	- Ensure all ratings and URBS files are up to date. - Calibrate Recent Events in FEWS and add to flood directive. - Include Lochenbar in the model calibrations.	- In Progress	
Tinaroo Falls Dam	9	Medium	Upstream gauges (except Picnic Crossing) are matching poorly and not all gauges have been used in the calibrations.	- Ensure all ratings and URBS files are up to date. - Recalibrate events in FEWS and try to achieve a better match at Mazlin Ck and Picnic Crossing. - Calibrate Recent Events in FEWS and add to flood directive. - Investigate need for additional upstream gauges.		
Peter Faust Dam	10	Medium	The model has a great match at the Headwater, however, the Inflow has an average scoring of 2 and there are no upstream gauges.	- Ensure all ratings and URBS files are up to date. - Calibrate Recent Events in FEWS and add to flood directive. - Investigate need for additional upstream gauges.		
Cania Dam	11	Medium	Excellent Matching at the Headwater for the 2 calibrated events. No Upstream Gauges in the calibrations.	- Ensure all ratings and URBS files are up to date. - Calibrate Recent Events in FEWS and add to flood directive. - Include Three Moon Ck at Baggio in the model calibrations.		
Wuruma Dam	12	Medium	Great matching at the Headwater for most calibrated spill events. No inflow gauges have been calibrated.	- Ensure all ratings and URBS files are up to date. - Calibrate Recent Events in FEWS and add to flood directive. - Include Nogo River at Roadside in the model calibrations.		
Eungella Dam	13	low	The model has been matched to the inflow and this has a great matching. The HW - gsh data is corrupt so review this.	- Ensure all ratings and URBS files are up to date. - Recalibrate events in FEWS to match at the Headwater Level. - Calibrate Recent Events in FEWS and add to flood directive.	- Completed FEWS Updates and Event Calibrations	- Update flood directive
Burdekin Falls Dam	14	Low	Great matching at the Headwater and Key Upstream Gauges. Consider bringing in the Solid one again when there is time	- Ensure all ratings and URBS files are up to date. - Calibrate Recent Events in FEWS and add to flood directive.		
Coolmunda Dam	15	Low	Excellent matching at the headwater for the PR and VR Ratios, fairly good matching for the NS Ratio. Good matching for Senningarook for the majority of the events, Fair Matching at Terrace for the majority of the events.	- Ensure all ratings and URBS files are up to date. - Calibrate Recent Events in FEWS and add to flood directive. - Investigate the temporal patterns in the upstream catchment to understand when the gauges will receive flow. - Investigate the need for additional upstream gauges.	- Completed FEWS Updates and Event Calibrations	- Update flood directive - Investigate upstream gauge locations (in progress)

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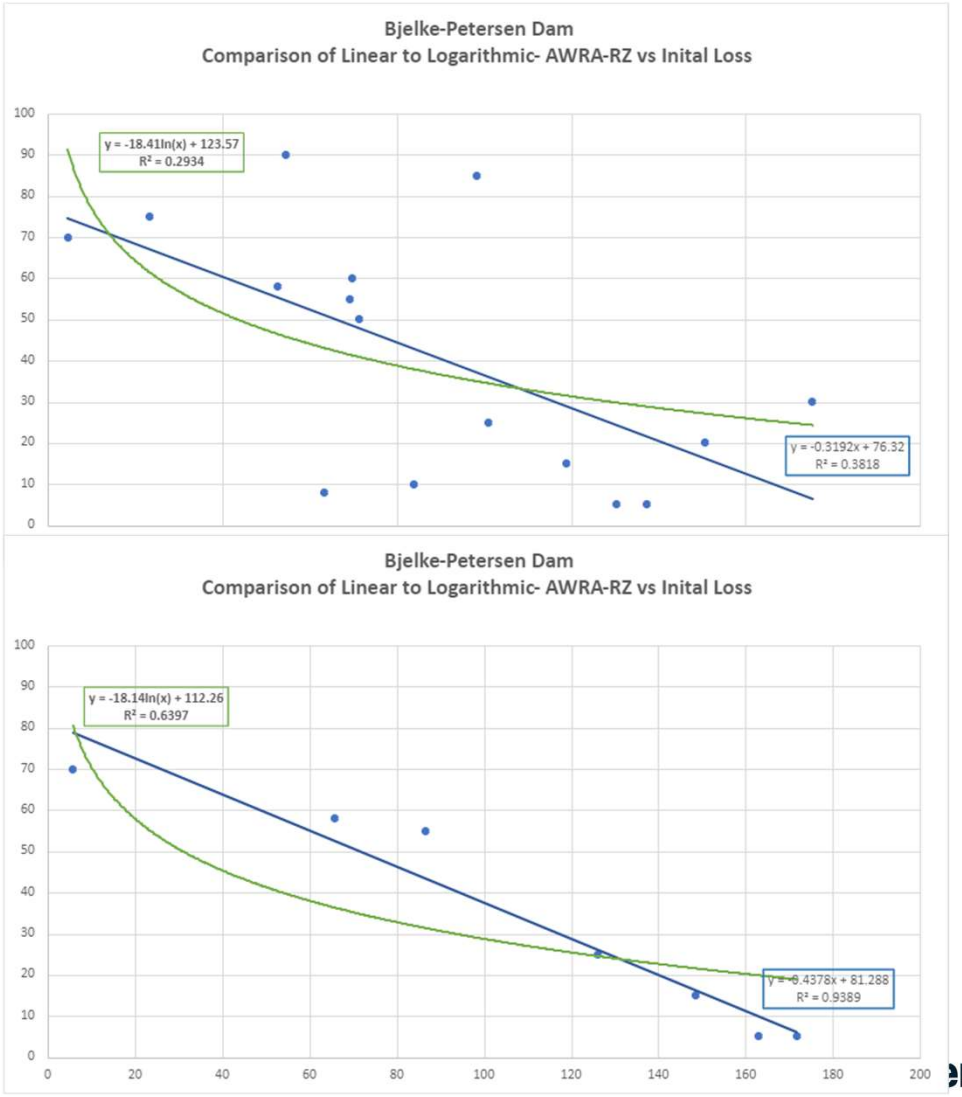
SuDS Improvements

Model Recalibration

- Increase events
- Shift focus of calibration (high to low)
- Introduce additional modelling parameters such as recovery factors



SuDS Improvements

Spill Overtopping protocols for Project Teams on site

- Issue daily reports to on site project teams
- Sites have various lead times, trigger levels and key locations (coffer dams, site access roads, crane pads)

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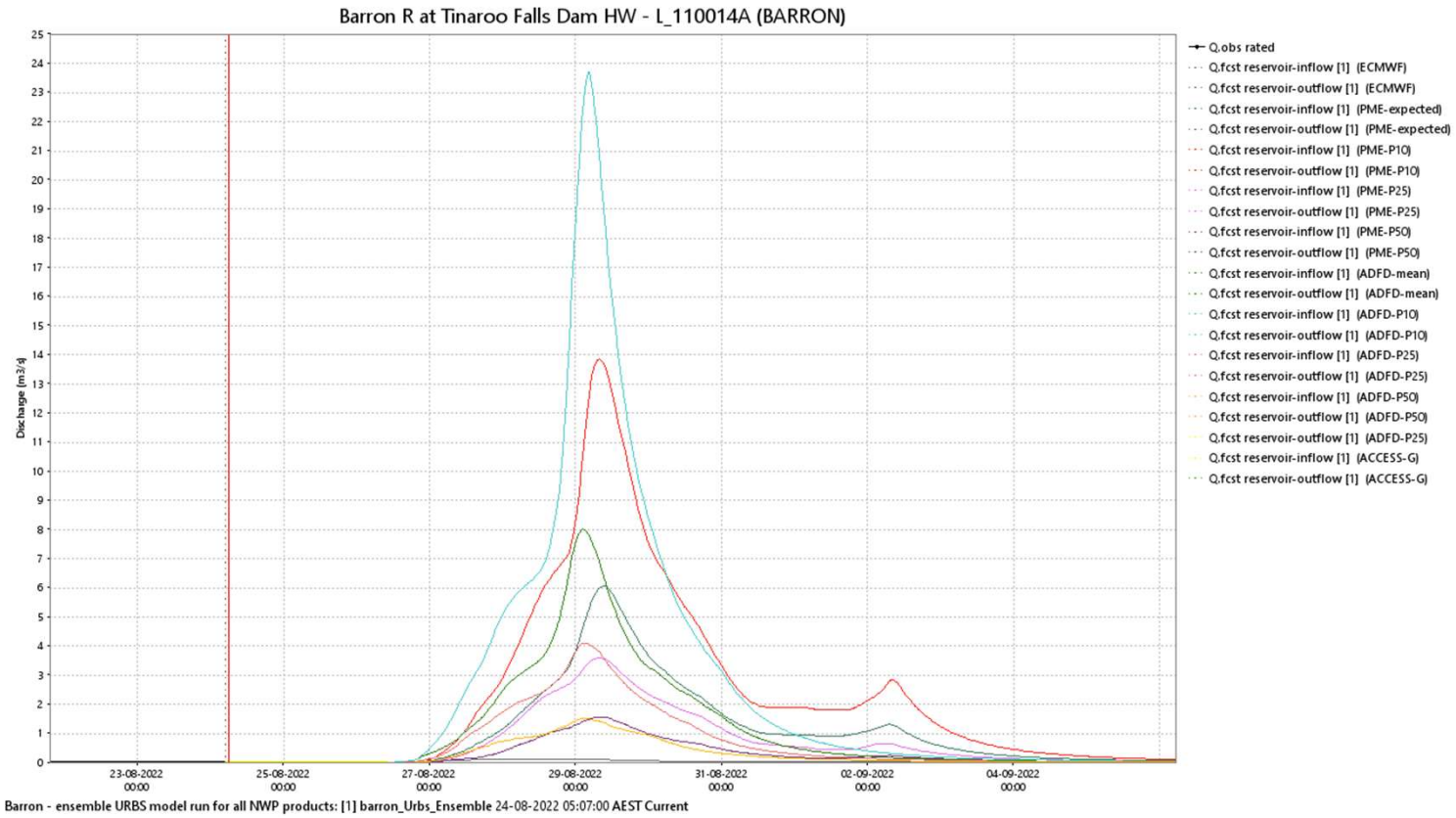
SuDS Improvements

Model ensemble runs

- Run with current NWP data
- Scheduled every morning
- Model parameters updated with best fit or saved
- Saves pre-run time



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SuDS Improvements

Improved Automated Daily Flood Summary Reporting

- FEWS driven process
- Forecast rainfall
- Soil Moisture
- Storage capacity
- Updated daily
- Running on Test Server

Storage Volume Forecast Summary

Generated: 10/08/2022 05:41 AEST
Forecast Date: 10/08/2022 04:00 AEST

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Region	Referable Dam	Capacity to Spill [%]	Spill on Observed Streamflow	Air Volume [ML]	24Hr Volume [ML]	48Hr Volume [ML]	72Hr Volume [ML]	96Hr Volume [ML]	120Hr Volume [ML]	144Hr Volume [ML]
NORTH	Tinaroo Falls Dam	97.0	No	22	9	52	104	128	138	145
	Burdekin Falls Dam	97.0	Yes	93	0	0	0	0	0	0
	Peter Faust Dam	97.0	No	25	3	4	13	24	26	31
	Julius Dam	97.0	No	5	0	0	0	0	0	0
CENTRAL	Eungella Dam	97.0	No	6	0	0	3	4	4	5
	Kinchant Dam	97.0	No	4	0	10	34	55	60	62
	Teemburra Dam	97.0	No	7	0	29	73	118	125	124
	Fairbairn Dam	97.0	No	65	355	565	697	1586	5525	16008
	Callide Dam	97.0	No	3	3	4	109	1541	1966	1996
	Kroombit Dam	97.0	No	1	3	4	93	1071	1318	1338
BURNETT	Cania Dam	97.0	No	4	1	0	3	21	30	31
	Fred Haigh Dam	97.0	Yes	28	32	47	329	2588	5188	5770
	Paradise Dam	97.0	No	8	58	93	117	131	143	145
	Wuruma Dam	97.0	No	8	2	4	5	35	60	78
	Boondooma Dam	97.0	No	10	1	2	5	76	130	156
	Bjelke-Petersen Dam	97.0	Yes	7	1	2	3	59	112	140
SOUTH	Leslie Dam	97.0	No	5	0	0	0	0	0	0
	Coolmunda Dam	97.0	No	4	0	0	34	225	285	301
	Glenlyon Dam	97.0	No	13	0	0	0	0	0	0
	Beardmore Dam	97.0	Yes	4	0	0	0	7	125	368

NOTES:
2. Air volume is derived from the current dam level.
3. Spill on Observed Streamflow indicates if sufficient observed streamflow on ground can exceed the storage air gap and a spill is expected. The Rainfall to Spill is no longer applicable.
4. Paradise Catchment includes upstream dams and associated catchments.
Improvements are being investigated. Please contact the On-Call FODM should you require further information (07 3120 0264).

Spill not predicted
Spill possible on high end rainfall
Spill likely on expected rainfall or observed streamflow

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SuDS Improvements

Some other activities in the past year

- Stepped up from 2017 to 2021.01
- Development of a Water Balance Assessment Module
- Auto Reporting Modules
- Introduction of Flood Mapping
- Implementation of a Test Server Version

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SuDS Improvements

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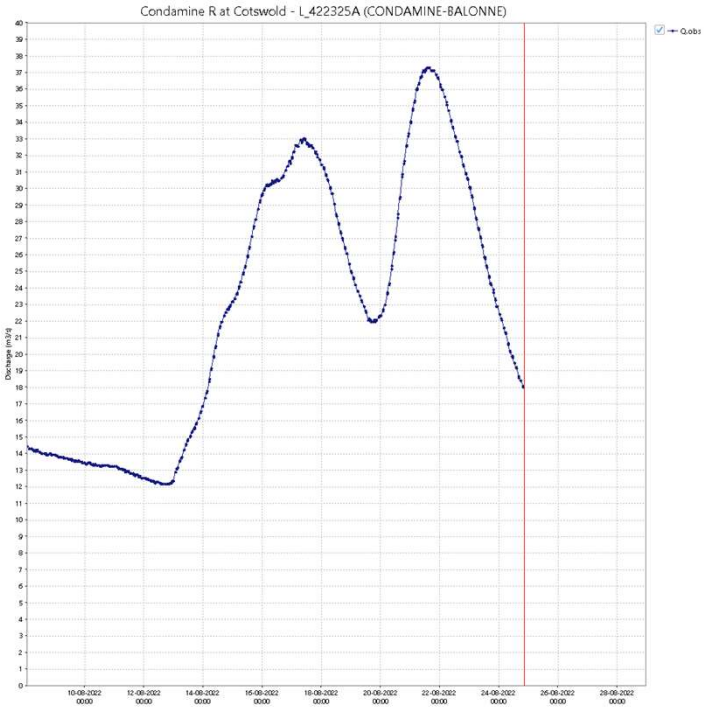
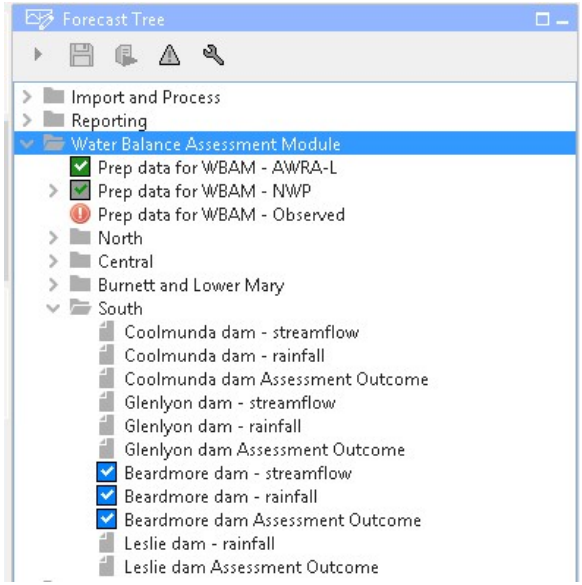
- **Implementation of a Test Server Version**





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SuDS Improvements

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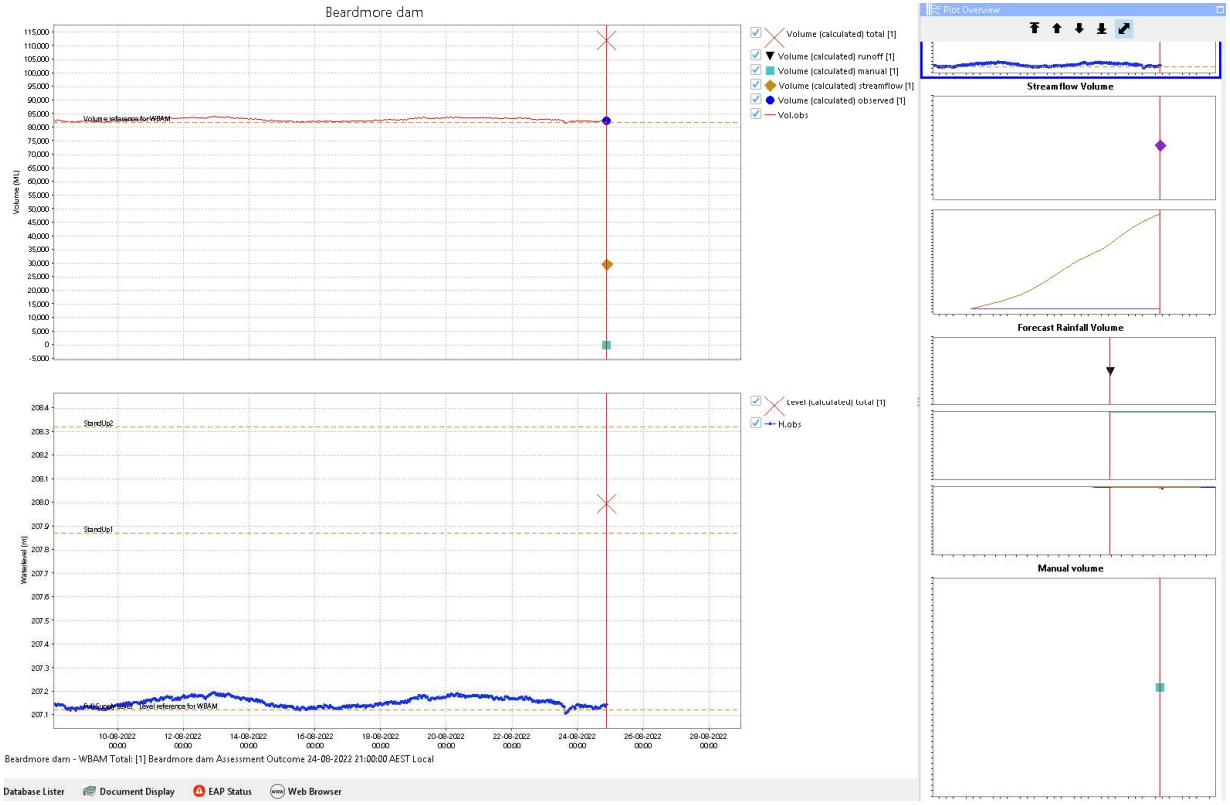

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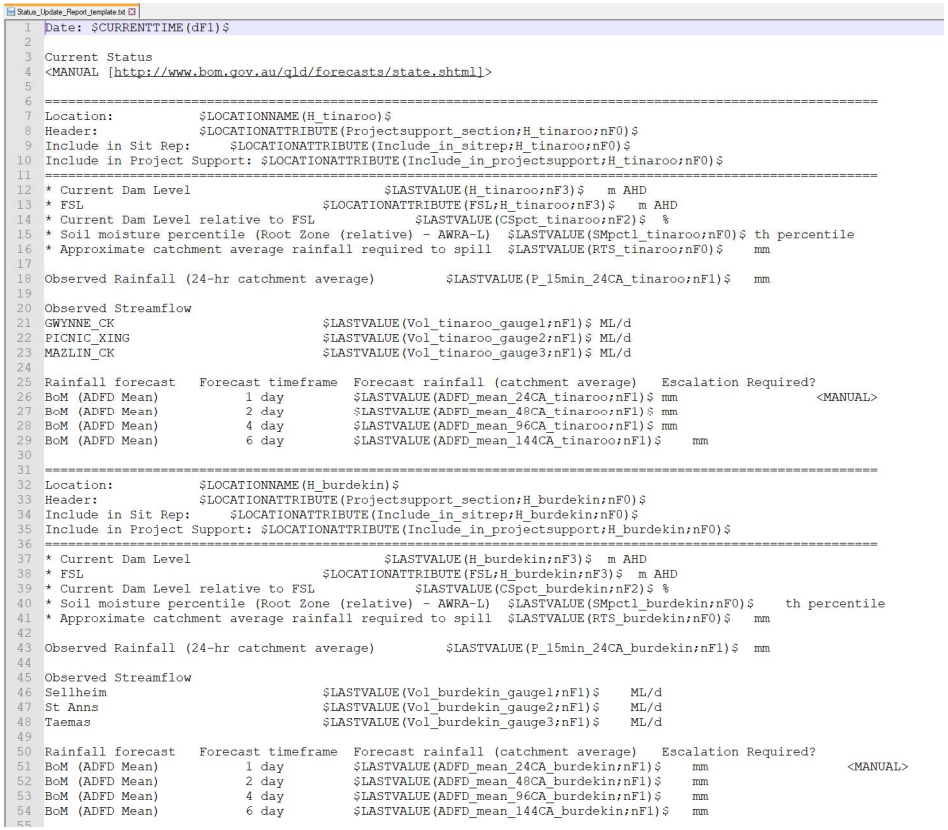

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Current Status
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Header:             $LOCATIONATTRIBUTE(Projectsupport_section;H_tinaroo;nF0)$
Include in Sit Rep:     $LOCATIONATTRIBUTE(Include_in_sitrep;H_tinaroo;nF0)$
Include in Project Support: $LOCATIONATTRIBUTE(Include_in_projectsupport;H_tinaroo;nF0)$
=============================================================================================================
* Current Dam Level                      $LASTVALUE(H_tinaroo;nF3)$   m AHD
* FSL                                $LOCATIONATTRIBUTE(FSL;H_tinaroo;nF3)$   m AHD
* Current Dam Level relative to FSL            $LASTVALUE(CSpct_tinaroo;nF2)$  %
* Soil moisture percentile (Root Zone (relative) - AWRA-L)  $LASTVALUE(SMpctl_tinaroo;nF0)$ th percentile
* Approximate catchment average rainfall required to spill  $LASTVALUE(RTS_tinaroo;nF0)$    mm

Observed Rainfall (24-hr catchment average)         $LASTVALUE(P_15min_24CA_tinaroo;nF1)$   mm

Observed Streamflow
GWYNNE_CK                       $LASTVALUE(Vol_tinaroo_gauge1;nF1)$ ML/d
PICNIC_XING                     $LASTVALUE(Vol_tinaroo_gauge2;nF1)$ ML/d
MAZLIN_CK                       $LASTVALUE(Vol_tinaroo_gauge3;nF1)$ ML/d

Rainfall forecast   Forecast timeframe  Forecast rainfall (catchment average)   Escalation Required?
BoM (ADFD Mean)           1 day         $LASTVALUE(ADFD_mean_24CA_tinaroo;nF1)$ mm                  <MANUAL>
BoM (ADFD Mean)           2 day         $LASTVALUE(ADFD_mean_48CA_tinaroo;nF1)$ mm
BoM (ADFD Mean)           4 day         $LASTVALUE(ADFD_mean_96CA_tinaroo;nF1)$ mm
BoM (ADFD Mean)           6 day         $LASTVALUE(ADFD_mean_144CA_tinaroo;nF1)$    mm

=============================================================================================================
Location:           $LOCATIONNAME(H_burdekin)$
Header:             $LOCATIONATTRIBUTE(Projectsupport_section;H_burdekin;nF0)$
Include in Sit Rep:     $LOCATIONATTRIBUTE(Include_in_sitrep;H_burdekin;nF0)$
Include in Project Support: $LOCATIONATTRIBUTE(Include_in_projectsupport;H_burdekin;nF0)$
=============================================================================================================
* Current Dam Level                      $LASTVALUE(H_burdekin;nF3)$  m AHD
* FSL                                $LOCATIONATTRIBUTE(FSL;H_burdekin;nF3)$  m AHD
* Current Dam Level relative to FSL           $LASTVALUE(CSpct_burdekin;nF2)$ %
* Soil moisture percentile (Root Zone (relative) - AWRA-L)  $LASTVALUE(SMpctl_burdekin;nF0)$    th percentile
* Approximate catchment average rainfall required to spill  $LASTVALUE(RTS_burdekin;nF0)$   mm

Observed Rainfall (24-hr catchment average)         $LASTVALUE(P_15min_24CA_burdekin;nF1)$  mm

Observed Streamflow
Sellheim                        $LASTVALUE(Vol_burdekin_gauge1;nF1)$    ML/d
St Anns                         $LASTVALUE(Vol_burdekin_gauge2;nF1)$    ML/d
Taemas                          $LASTVALUE(Vol_burdekin_gauge3;nF1)$    ML/d

Rainfall forecast   Forecast timeframe  Forecast rainfall (catchment average)   Escalation Required?
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```


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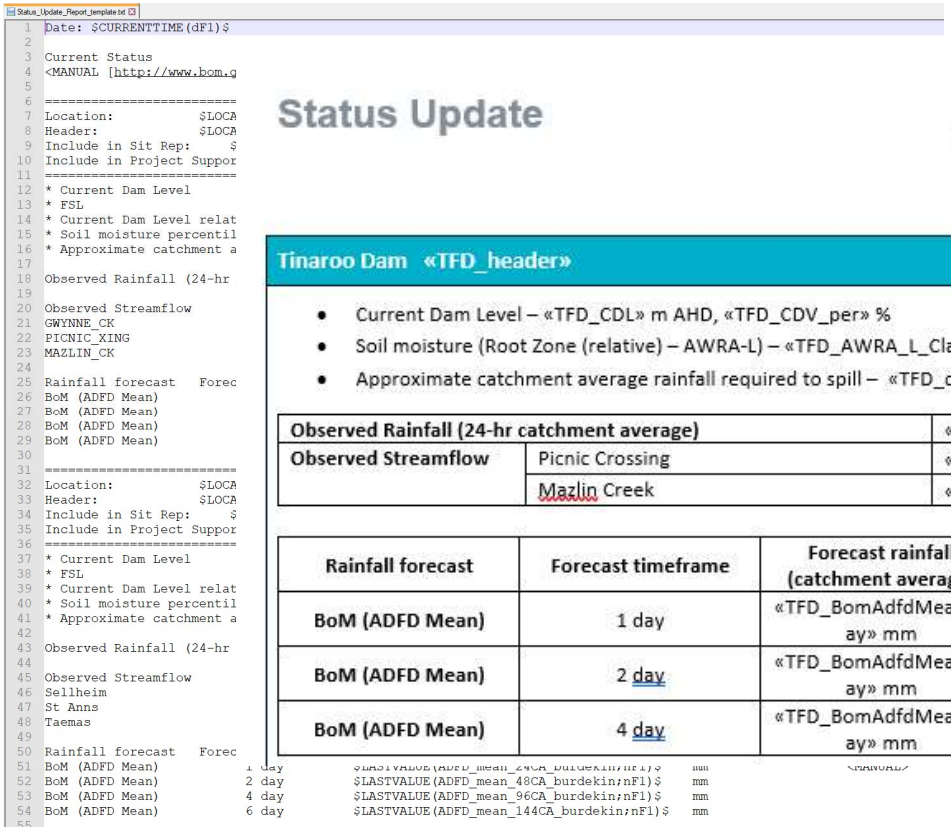
SuDS Improvements

Some other activities in the past year

- Stepped up from 2017 to 2021.01
- Development of a Water Balance Assessment Module
- **Auto Reporting Modules**
- Introduction of Flood Mapping
- **Implementation of a Test Server Version**



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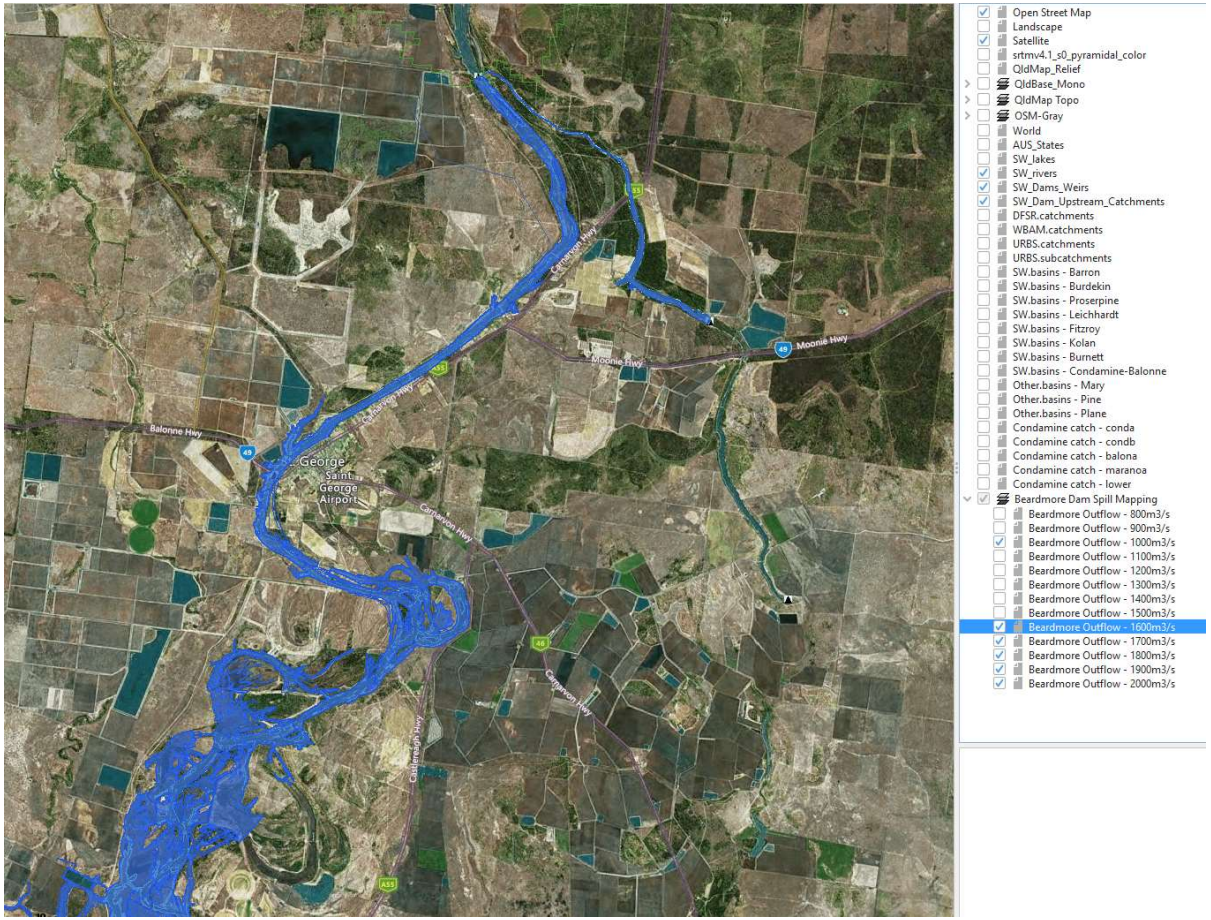

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Forward planning – 2022/23

FEWS changes down the pipeline

- Commitment to archive system
- Setup Web API access and interaction
- Grid based hydrological modelling
- Scheme visualization projects

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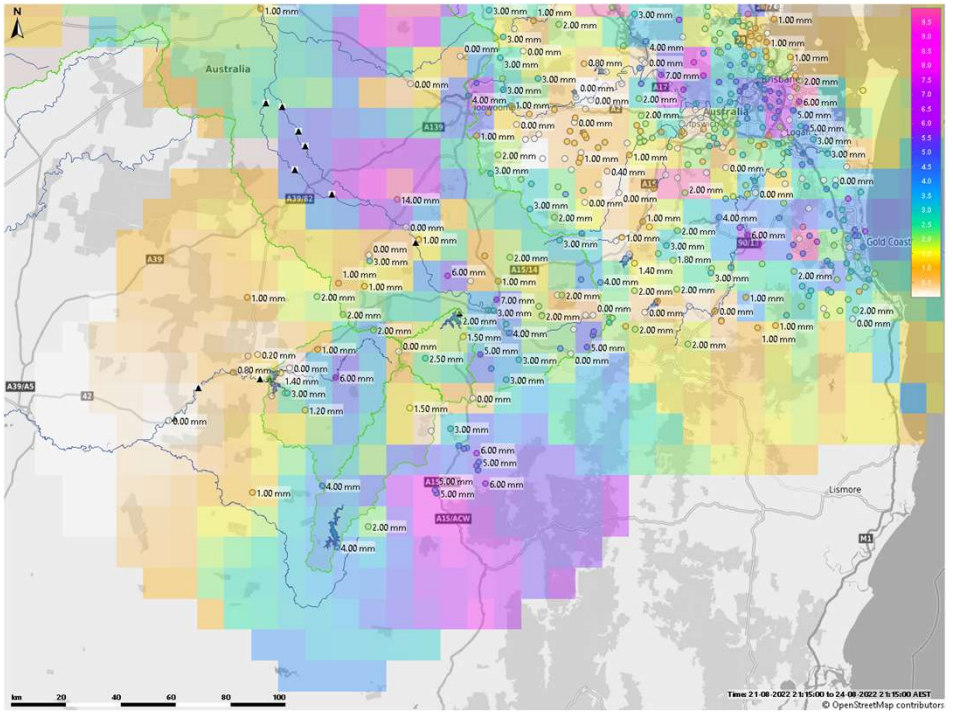

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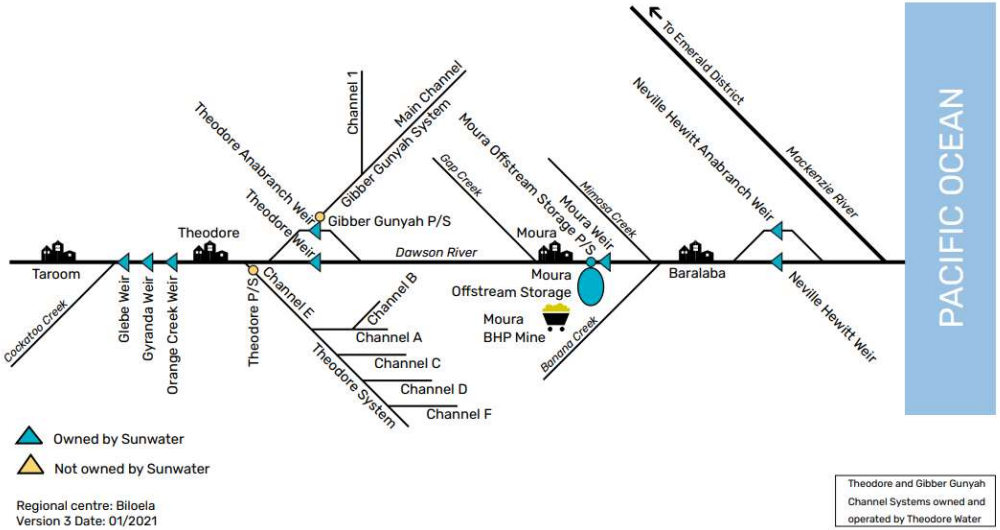

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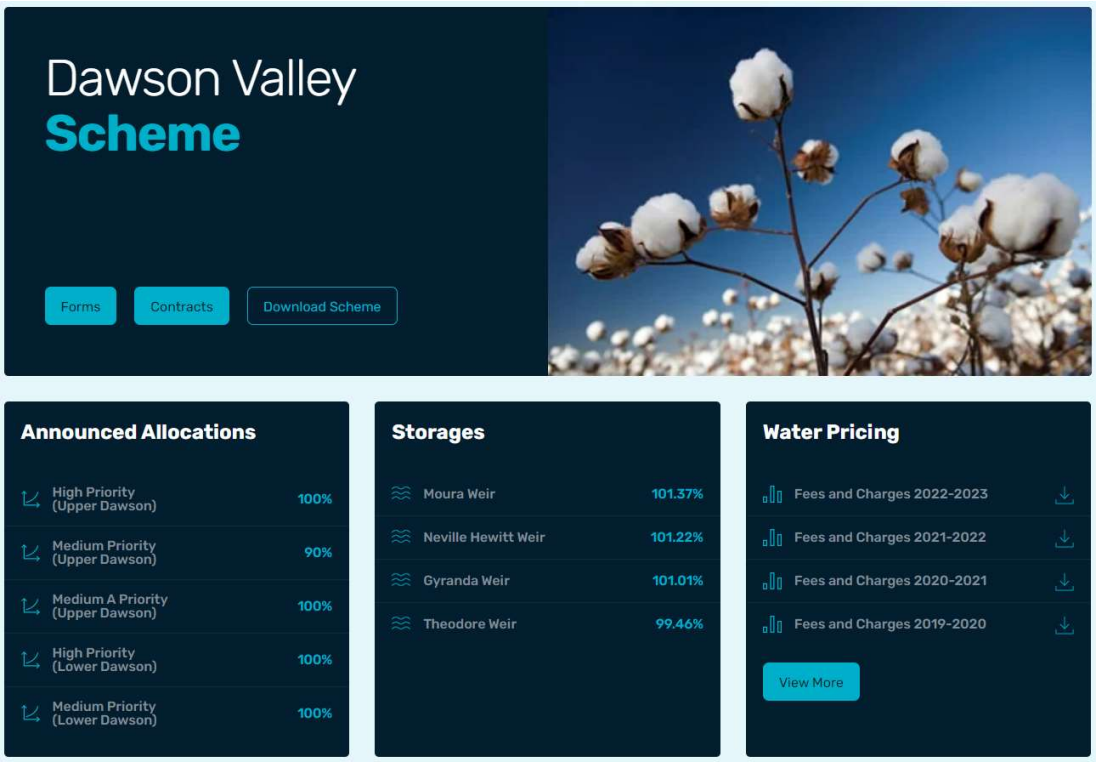

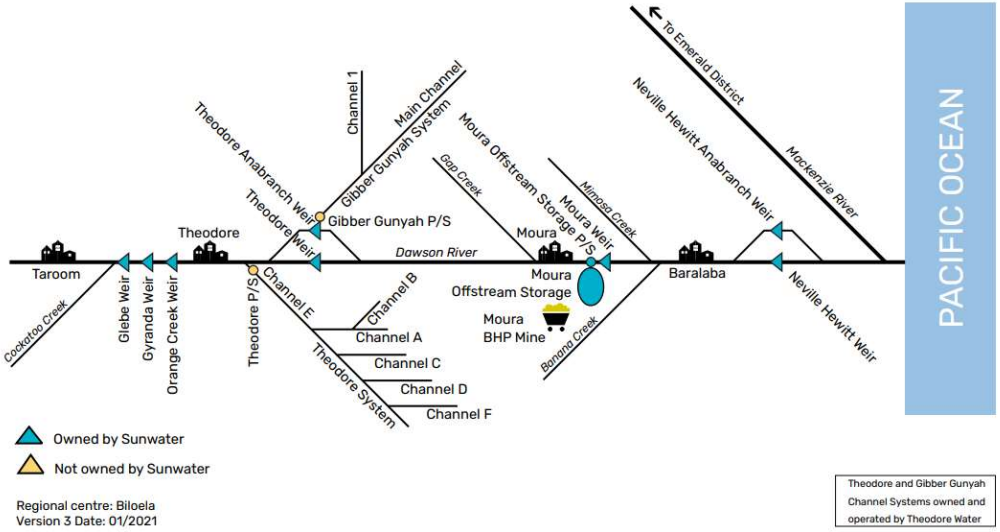

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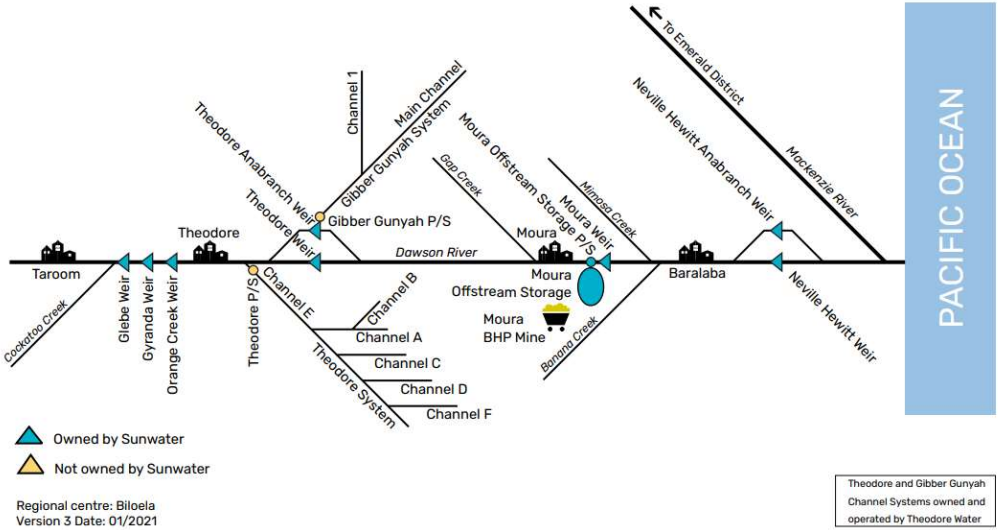

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Delivering water for prosperity

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