

Great Artesian Basin Sustainability Initiative: Phase 3 Final Report South Australia

DEWNR Technical note 2015/28



Government of South Australia
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Water and Natural Resources

Great Artesian Basin Sustainability Initiative: Phase 3 Final Report South Australia

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Summary

The National Partnership Agreement (NPA) on the Great Artesian Basin Sustainability Initiative (GABSI) between the Commonwealth of Australia and member states, South Australia (SA), New South Wales (NSW), Queensland (QLD) and the Northern Territory (NT), commenced in 2009 to fund the capping and piping of GAB wells legally operating in an uncontrolled manner.

GABSI Phase 3 committed \$74.4M from the Commonwealth over five years, of which SA accessed \$3.29M matched by SA.

SA delivered 30 projects under the GABSI 3 program (Table 2.1). Twenty nine projects met the objectives of their specific activities of rehabilitation, decommissioning and/or redrilling as stated in the annual implementation plans. The exception was Johnsons No. 3 Well, for which the Stage 1 feasibility of directional drilling methodology was completed.

The projects resulted in 5.6 gigalitres per annum of water savings that were returned to the environment, and removal of 17 km of bore drains. Localised pressure increases were observed in response to the return of free flowing wells to a controlled state. Sixteen failed wells were decommissioned reducing the long term risk.

DEWNR also undertook a whole of jurisdiction review of flowing wells, their physical condition and antecedent pressure and temperature to gauge the success of the GABSI programs conducted in South Australia. This culminated in a report that provided a headworks condition review and a risk profile for each artesian well in SA by property (Chapman 2015).

Ongoing monitoring of the Great Artesian Basin National Network (GABMN) was also undertaken as a requirement of the GABMN and GABSI 3 agreements.

The final report outlines the conduct, benefit and outcomes of the Program as a whole and degree to which the activity achieved the outcomes stated in the NPA.

1 Introduction

1.1 Background

The NPA between the Commonwealth of Australia and member states, South Australia (SA), New South Wales (NSW), Queensland (QLD) and the Northern Territory (NT), commenced in 2009 to fund the capping and piping of GAB wells legally operating in an uncontrolled manner and related activities. The Commonwealth and member States provided matching funds under the NPA.

GABSI Phase 3 committed \$74.4M from the Commonwealth over five years, of which the SA share was up to \$5M.

Under the terms of the NPA, SA would ensure that:

- *To the fullest extent possible that at least 50% of the water saved would be directed to restoring pressure in the Basin and not be allocated for consumptive purposes*
- *The watered area of a property would not be increased*

At the start of GABSI 3, 37 uncontrolled wells remained in the SA portion of the GAB. Thirty wells including two large free flowing wells in the western margins were eligible for funding under GABSI 3 guidelines.

Implementation of GABSI 3 was subject to approval of annual Implementation Plans (IPs). Three IPs 2009/10, 2012/13 and 2013/14 were agreed by the Commonwealth and SA.

Annual activity statements for each Implementation Plan were provided to the Commonwealth.

1.2 Final report objectives

The final Report provides a stand-alone document for public information and dissemination purposes. The report covers the GABSI 3 2009/10 IP, 2012/13 IP and 2013/14 IP activity periods and describes:

- The conduct, benefits and outcomes of the Program as a whole
- The degree to which the activity has achieved the objectives against the performance indicators in the Implementation Plans.

2 Report

2.1 Conduct, benefits and outcomes of the program as a whole

Conduct

The implementation plan process was overly complex, time consuming and resulted in significant delays between project inception and project start up. This issue was compounded by the need for yearly implementation plans which resulted in projects being carried forward across plans.

The Mid Term Review of GABSI 3 proved to be an excellent synopsis of the GABSI 3 program and provided a number of recommendations for future GAB direction including bore assurance type schemes to help overcome the financial burden of bore maintenance and redrilling/decommissioning.

DEWNR and its predecessors had developed considerable expertise during GABSI Phase 1 and 2 to develop and award tenders to deliver projects and to project manage field operations funded by GABSI Phase 3. GABSI 3 similarly provided opportunity to further develop skills and capacity within the agency and its sub-contractors and to manage succession planning. The work enabled the selected contractors to up skill a number of individuals to increase their knowledge and skills towards or gain a Class 3 Drillers Licence with a GAB endorsement. This will enable these individuals to undertake drilling activities on GAB wells across jurisdictional boundaries. The rapidly declining numbers of active GAB endorsed Class 3 drillers was highlighted as a risk to the ongoing development of water resources within the GAB by the National Uniform Drillers Licensing Committee to the National Groundwater Sub Group of the National Water Reform Committee in 2014.

Most projects outlined in the 2009/10 IP were carried forward into the 2012/13 IP due to unseasonal wet weather during 2009 and 2010, which made access tracks to the wells impassable. Reprioritisation and consolidation of projects resulted in a smaller number of projects from the 2009/10 IP and 2012/13 IP carried forward to the final 2013/14 IP. For a small number of projects which had been split into two stages funded in the 2012/13 IP and 2013/14 IP, implementing both stages at the same time was more cost effective.

Outcomes

SA delivered 30 projects under the GABSI 3 program (Table 2.1). Twenty nine projects met the objectives of their specific activities of rehabilitation, decommissioning and redrill as stated in the annual implementation plans. The exception was Johnsons No. 3 Well.

Of the 29 projects:

- 16 wells were decommissioned
- 5 wells were rehabilitated
- 6 redrills
- 2 water delivery infrastructure projects associated with either redrilling or decommissioning of a failed well.

The decommissioning of Johnsons No. 3 well used a two staged approach due to the technical complexity of the project. Stage 1 was completed and determined that it was feasible to use directional drilling methodology to intersect the well casing at or near the top of the GAB sediments and that further investigation of the technique is warranted to assist in decommissioning wells of this nature. Stage 2 was approved to continue the investigation of the technique but due to logistical and environmental difficulties in mobilising to Poolawanna 3, funding from Johnsons No. 3 (and a number of other small value projects) was redirected to the Poolawanna 3 project.

The attempted rehabilitation of the Haddon Downs 1 well was unsuccessful due to a downhole equipment failure. As a consequence the State and the drilling contractor agreed to finance a replacement well.

Site access conditions and a downhole equipment failure at Poolawanna 3 increased the project costs over and above the stated Implementation Plan estimate. These extra costs were financed by the State.

The combined additional cost to the State of the Haddon Downs redrill and Poolawanna 3 projects is estimated in excess of \$1.3M taking the overall cost of GABSI 3 to in excess of \$7.91M of which the agreed Commonwealth contribution was \$3.29M.

Benefits

An estimated additional 5.6 gigalitres of water savings and removal of 17 km of bore drains was achieved. Sixteen failed wells were decommissioned with only six replacement wells drilled reducing long term exposure to the risk of well failure and associated financial burden. Under GABSI 3 it was agreed that 50% of the water saved would not be reallocated and at this time there are no proposals to allocate the remaining 50%.

Table 2.1 South Australia GABSI 3 project summary

Unit No.	Well Name	Property Name	% Estimated Water Saved (ML/ann)	Estimated Drain Shutdown (Km ²)	Estimated Piping Installed (Km)	Activity ¹
Southwest Springs Management Zone						
6239-4	BERSFORD	Anna Creek	158	0.05	-	3
5942-12	CAMEL CREEK	Arckaringa	316	-	-	1
6538-2	BRANSONS	Marree	3	-	-	3
6538-39	DAVIDS	Marree	3	-	-	3
6538-4	FROME CREEK	Marree	3	-	-	3
6538-210	NEW DAVIDS	Marree	-6	-	-	2
6538-210	NEW DAVIDS - PIPING	Marree	-	-	15.00	4
6439-6	CROWS NEST (LL2)	Muloorina	1263	4.10	-	3
6439-20	MULOORINNA 1	Muloorinna	158	-	-	1
6639-7	CHAPPALANNA	Murnpeowie	158	0.1	-	3
6838-6	LAKE CROSSING NO.4	Murnpeowie	1	-	-	3
6639-19	NEW CHAPPALANNA	Murnpeowie	-47	-	-	2
6739-34	NEW TOONKETCHEN BORE	Murnpeowie	-	-	-	2
6942-207	QUARTPOT BORE	Murnpeowie	1	-	-	1
6739-10	TOONKETCHEN BORE	Murnpeowie	142	-	-	3
6739-11	WARANINNA TANK BORE	Murnpeowie	32	-	-	3
5943-1	ALBERGA	The Peake	253	-	-	3
6141-34	BIG BLYTH	The Peake	947	5.00	-	3
6141-46	EITZENS	The Peake	16	-	-	3
6241-6	JOHNSONS NO3	The Peake	-	3.80	-	5
6141-54	UMBUM No.3 PIPING	The Peake	-	-	5	4
Central Management Zone						
6442-2	WHITE BULL	Kalamurina	1231	0.25	-	1
6643-1	GOYDERS LAGOON	Clifton Hills	788	4	-	3
6643-11	GOYDERS LAGOON NO.2	Clifton Hills	-	-	-	2
7045-17	HADDON DOWNS 1	Cordillo Downs	158	-	-	3
7045-22	HADDON DOWNS 2	Cordillo Downs	-	-	-	2
7036-7	KIDMANS NO.2	Quinyambie	-9	-	-	3
7036-216	KIDMANS NO.2	Quinyambie	-	-	-	2
Western Management Zone						
6442-7	TIRRARI WEST 1 (Stage-1)	Kalamurina	9	-	-	3
6445-4	POOLOWANNA 3	Simpson Desert NP	47	-	-	1

Total Projects 30

Total water savings

5624

17

LEGEND

¹ Itemise for each specific activity for each Project

1. Bore Rehabilitation[#]
2. Redrill
3. Decommission only
4. Pipe^{##}

5. Other: Directional Drilling to intersect well casing below failure (approx 20m below groundlevel) -feasibility test

[#] Bore Rehabilitation means recondition or repair of existing bore.

^{##} Pipe means water delivery infrastructure such as piping, relief valves, tanks and troughs

[%] Estimation from Surface Discharge only and may be considerably greater due to unknown down hole losses

2.2 Outcome of the activity against performance indicators

The 2009/10 IP outlined the following requirements:

1. *Ensure that Projects specified in the Projects Submission are undertaken efficiently with fair, equitable and transparent processes and conformity with the State's best technical, environmental and financial practices.*

All projects were undertaken in accordance to South Australia government standards and procedures and in accordance with the NPA.

All drilling related projects were completed in accordance to Minimum Construction Requirements for Water Bores in Australia 3rd Edition and complied with the South Australian NRM Act 2004.

All bore and pipeline design construction and commissioning/decommissioning were conducted by suitably qualified contractors.

Each project was carefully considered in line with the requirements of the Assessment Guidelines and Project Eligibility Criteria contained in Schedule A to the NPA.

2. *Deliver each approved Project in accordance with the Projects Submission.*

Thirty projects agreed to by the State and Commonwealth were completed as outlined in Table 2.1 above.

3. *Prepare an Annual Performance Reports on achievements against performance benchmarks, indicators and milestones specified for all Projects annexed to each implementation plan.*

Annual activity statements were provided to the Commonwealth using the template provided.

4. *Ensure to the fullest extent possible that at least 50 per cent of the water saved under the Great Artesian Basin Sustainability Initiative will be directed to restoring pressure in the Basin and not be reallocated for consumptive purposes.*

As previously stated the 30 projects achieved 5.6 gigalitres of water savings per annum of which 100% was returned the environment. The total water savings takes into account the water use from the six redrilled wells. Monitoring of the effects of decommissioning Big Blyth showed significant pressure increases after successful decommissioning of this well. It can be inferred from this scenario that all free flowing wells that are returned to a controlled state (or decommissioned) will have a similar effect on regional pressures.

5. *Funding will be used to replace bores and existing bore drains, to decommission bores, and for other approved projects.*

All projects met this requirement (Table 2.1) and complied with the *Pastoral Land Management and Conservation Act 1989 Native Vegetation Act 2003 and NRM Act 2004.*

"In the case where two bores are replaced by a single bore, additional piping will be installed to maintain the distribution of water to the point of the decommissioned bore."

Eitzens well was decommissioned and the excess capacity from Umbum No. 3 well was used to supply water the area formerly serviced by Eitzens. This provided a significant financial benefit as the cost of the piping option was significantly less than the cost of redrilling a new well.

"If the geographical location of the watered area on the property supported by the new controlled water is altered or increases the watered area of a property, the State will ensure that:

- *The overall area served by that system is no greater than the watered area served by the current uncontrolled system*

- *It is no more costly than the cost that would have been incurred to water the original geographical area with a controlled water system*
- *That the landholder acts in accordance with the requirements of the "clearing by grazing" section of the Native Vegetation Act 2003, to protect water remote areas".*

Nil projects lead to alteration of the geographical area of watered area supported by the new controlled water and all complied with the *Pastoral Land Management and Conservation Act 1989, Native Vegetation Act 2003 and NRM Act 2004.*

2.3 Other activities

DEWNR undertook a whole of jurisdiction review of flowing wells, their physical condition and antecedent pressure and temperature to gauge the overall success of the three GABSI programs conducted in South Australia. This culminated in a report that provided stakeholders with a headworks condition review and a risk profile for each artesian well in SA by property. The report and station summaries will be forwarded by the Natural Resources South Australia Arid Lands (NRSAAL) to the pastoralist to assist them with their well maintenance and business planning processes. The report section (Chapman 2015) is available to the public via [WaterConnect](#). In conjunction with this summary the NRSAAL funded a reprint of the Bore Maintenance Handbook (2005) to accompany the release of the pastoral lease bore review report. Each pastoral lessee will receive a copy of the Bore Maintenance Handbook and the chapter of the review report relating to lease.

SA continued to monitor the flowing and non-flowing networks (Appendixes 1 and 2) in accordance with the GAB Monitoring Network Stage 1 and 2 agreements.

3 Bibliography

Anon, 2012, *Minimum Construction Requirements for Water Bores in South Australia*, Third Edition, National Uniform Drillers Licensing Committee, Government of Australia.

Chapman JA, 2015, *GREAT ARTESIAN BASIN Well Condition Review*, DEWNR Technical note 2015/12, Government of South Australia, Department of Environment, Water and Natural Resources, Adelaide
<https://www.waterconnect.sa.gov.au/Content/Publications/DEWNR/GAB-2014-Well-Condition-Review-summary.pdf>

Appendix 1: GAB Flowing Monitoring Wells – SA Network

No.	Unit No	Well Name	Station	GAB Management Zone	SA Network	BHPB Network
1	6643-1	New Goyders Lagoon	Clifton Hills	Central	✓	
2	6744-1	Pandieburra 1	Clifton Hills	Central	✓	
3	7045-22	Haddon Downs 2	Cordillo Downs	Central	✓	
4	6540-14	Georgia Bore	Etadunna	Central	✓	✓
5	7041-100	Dullingari 6	Innamincka	Central	✓	
6	6741-1	Jennet 1	Mulka	Central	✓	
7	6845-8	Claypan Bore	Pandie Pandie	Central	✓	
8	7037-3	Coonee Creek Bore	Quinyambie	Central	✓	
9	7036-226	Kidmans Bore No 2a	Quinyambie	Central	✓	
10	7038-2	Tilcha 2	Quinyambie	Central	✓	
11	5942-47	Stuarts Bore (Hwy Dept)	Allandale	South West Springs	✓	
12	6240-4	Armistice Bore 2	Anna Creek	South West Springs	✓	
13	6139-25	Fergies 1 A	Anna Creek	South West Springs	✓	
14	6239-41	Strangways Bore 2	Anna Creek	South West Springs	✓	
15	6140-39	Sunny Creek Bore 2	Anna Creek	South West Springs	✓	
16	5841-47	Muggers Bore	Arckaringa	South West Springs	✓	
17	6139-22	Margaret Creek 2	Billa Kalina	South West Springs	✓	✓
18	6640-23	BHPB C1	Dulkaninna	South West Springs	✓	
19	6935-8	Black Oak Bore 1	Frome Downs	South West Springs	✓	
20	6937-9	Cootabarlow 3	Frome Downs	South West Springs	✓	
21	6936-13	Lakeside Bore 2	Frome Downs	South West Springs	✓	
22	6044-9	Apperinna Bore 2	Macumba	South West Springs	✓	
23	6142-4	Duckhole 2	Macumba	South West Springs	✓	
24	6142-7	Peachamurranna No.2	Macumba	South West Springs	✓	
25	6143-2	Snake Creek No 2	Macumba	South West Springs	✓	
26	5943-21	Wire Creek Bore 2	Macumba	South West Springs	✓	
27	6838-29	Woolatchie Bore	Moolowatana	South West Springs	✓	
28	5941-1	Raspberry Creek	Mount Barry	South West Springs	✓	
29	5941-46	Wire Yard Bore	Mount Barry	South West Springs	✓	
30	6738-189	BHPB C4	Murnpeowie	South West Springs	✓	
31	6838-6	Lake Crossing Bore 4	Murnpeowie	South West Springs	✓	
32	6738-2	Murnpeowie Homestead	Murnpeowie	South West Springs	✓	
33	5941-6	Fergys Bore	Nilpinna	South West Springs	✓	
34	6040-87	Weedina Bore	Nilpinna	South West Springs	✓	
35	6141-47	Kempes Bore	Peake	South West Springs	✓	
36	6041-37	LHDH 15 (New Peake)	Peake	South West Springs	✓	
37	6141-76	Wood Duck 2	Peake	South West Springs	✓	
38	6239-45	Trig Bore 2	Stuarts Creek	South West Springs	✓	
39	5945-75	3 O'clock Creek Bore	Witjira National Park	South West Springs	✓	
40	6442-2	White Bull (Poonarunna 1)	Kalamurina	Western	✓	
41	6445-4	Poolawanna 3	Simpson Desert	Western	✓	
42	6145-1	Purni 1	Witjira National Park	Western	✓	

Appendix 2: GAB Flowing Monitoring Wells – Additional Wells

No.	Unit No	Well Name	Station	GAB Management Zone	BHPB Network
1	6640-4	Cannawaukaninna 1	Etadunna	Central	✓
2	6540-15	D2	Etadunna	Central	✓
3	6640-1	New Kopperamanna 1	Etadunna	Central	✓
4	6239-759	MB 6	Anna Creek	South West Springs	✓
5	5938-17	Black Oak Bore	Billa Kalina	South West Springs	✓
6	5938-14	Boundary Bore	Billa Kalina	South West Springs	✓
7	5938-42	Hawks Nest Bore	Billa Kalina	South West Springs	✓
8	6438-92	Brolga Bore	Callanna	South West Springs	✓
9	6438-95	Callanna Bore 2	Callanna	South West Springs	✓
10	6438-79	Maynards Bore	Callanna	South West Springs	✓
11	6438-87	Morphetts Bore	Callanna	South West Springs	✓
12	6438-96	S2	Callanna	South West Springs	✓
13	6438-80	WCB 1	Callanna	South West Springs	✓
14	6539-2	Clayton Bore	Clayton	South West Springs	✓
15	6539-9	Clayton Bore 2	Clayton	South West Springs	✓
16	6639-9	Clayton Dam Bore	Clayton	South West Springs	✓
17	6539-15	S5	Clayton	South West Springs	✓
18	6639-18	Tarkaninna 2 ("Bull Ant")	Clayton	South West Springs	✓
19	6639-8	Yarra Hill Bore	Clayton	South West Springs	✓
20	6639-16	Cooryaninna 2	Dulkaninna	South West Springs	✓
21	6539-17	D3	Dulkaninna	South West Springs	✓
22	6539-14	Dulkaninna No.2	Dulkaninna	South West Springs	✓
23	6639-17	Jewellery Creek 2	Dulkaninna	South West Springs	✓
24	6639-2	Sinclair Bore	Dulkaninna	South West Springs	✓
25	6539-1	Peachawarinna Bore	Etadunna	South West Springs	✓
26	6438-1	Charles Angus Bore	Finniss Springs	South West Springs	✓
27	6338-44	GAB 8	Finniss Springs	South West Springs	✓
28	6338-38	HERMIT HILL 1	Finniss Springs	South West Springs	✓
29	6338-39	HERMIT HILL 2	Finniss Springs	South West Springs	✓
30	6338-40	HERMIT HILL 3	Finniss Springs	South West Springs	✓
31	6338-42	HERMIT HILL 4	Finniss Springs	South West Springs	✓
32	6439-9	Morris Ck. Bore	Finniss Springs	South West Springs	✓
33	6438-97	S1	Finniss Springs	South West Springs	✓
34	6338-33	Venables 1A	Finniss Springs	South West Springs	✓
35	6538-70	S3	Marree	South West Springs	✓
36	6438-4	Cooranna Bore	Muloorina	South West Springs	✓
36	6339-6	Jackboot Bore	Muloorina	South West Springs	✓
37	6539-5	Lake Harry Bore	Muloorina	South West Springs	✓
38	6539-4	Marion Bore	Muloorina	South West Springs	✓
39	6339-55	MB 5	Muloorina	South West Springs	✓
40	6439-39	MB 7	Muloorina	South West Springs	✓
41	6439-40	MB 8	Muloorina	South West Springs	✓
42	6439-20	Muloorina 1	Muloorina	South West Springs	✓

Appendix 2 continued

No.	Unit No	Well Name	Station	GAB Management Zone	BHPB Network
43	6439-27	OB 1	Muloorina	South West Springs	✓
44	6439-26	OB 3	Muloorina	South West Springs	✓
45	6439-24	OB 6	Muloorina	South West Springs	✓
46	6539-8	Peters Bore	Muloorina	South West Springs	✓
47	6538-71	S3A	Muloorina	South West Springs	✓
48	6439-18	WCB 2	Muloorina	South West Springs	✓
49	6538-67	Lake Billy 2	Mundowdna	South West Springs	✓
50	6539-16	S4	Mundowdna	South West Springs	✓
51	6538-188	Tent Hill 2	Mundowdna	South West Springs	✓
52	6538-166	Two Mile Bore 2	Mundowdna	South West Springs	✓
53	6538-167	Well Creek Bore 2	Mundowdna	South West Springs	✓
54	6639-7	Chapalanna Bore	Murnpeowie	South West Springs	✓
55	6338-27	GAB 1	Stuarts Creek	South West Springs	✓
56	6338-46	GAB 10	Stuarts Creek	South West Springs	✓
57	6338-47	GAB 11	Stuarts Creek	South West Springs	✓
58	6338-50	GAB 12A	Stuarts Creek	South West Springs	✓
59	6338-53	GAB 15A	Stuarts Creek	South West Springs	✓
60	6338-54	GAB 16A	Stuarts Creek	South West Springs	✓
61	6338-63	GAB 19	Stuarts Creek	South West Springs	✓
62	6338-31	GAB 2	Stuarts Creek	South West Springs	✓
63	6338-66	GAB 21	Stuarts Creek	South West Springs	✓
64	6338-65	GAB 22	Stuarts Creek	South West Springs	✓
65	6339-12	GAB 24 (Lake Eyre South)	Stuarts Creek	South West Springs	✓
66	6338-71	GAB 30A	Stuarts Creek	South West Springs	✓
67	6338-72	GAB 31A	Stuarts Creek	South West Springs	✓
68	6339-15	GAB 33A	Stuarts Creek	South West Springs	✓
69	6338-35	GAB 5	Stuarts Creek	South West Springs	✓
69	6338-36	GAB 5A	Stuarts Creek	South West Springs	✓
70	6338-23	GAB 6A	Stuarts Creek	South West Springs	✓
71	6338-24	GAB 7	Stuarts Creek	South West Springs	✓
72	6339-9	Gosse Springs Bore (MB1)	Stuarts Creek	South West Springs	✓
73	6339-10	MB 4	Stuarts Creek	South West Springs	✓
74	6338-2	New Years Gift	Stuarts Creek	South West Springs	✓

