Appendix 7.2.2

1995 Groundwater Quality Data

Table 7.12 Location Data for Border Rivers - 1995

Boreid	WQ No.	Date Sampled	Latitude	Longitude
41630058	95/117	14.7.95	29.05.657	151.16.723
41630059	95/118	14.7.95	29.05.741	151.17.231
41630069B	95/119	15.7.95	29.05.679	151.17.068
41630069C	95/120	15.7.95	29.05.679	151.17.068
41630062A	95/135	23.7.95	28.59.306	151.17.341
41630071A	95/126	18.7.95	28.59.306	151.17.341
41630071B	95/127	18.7.95	28.59.306	151.17.341
41630066B	95/130	20.7.95	28.55.101	151.15.002
41630067	95/131	20.7.95	28.55.101	151.15.002
41630064A	95/128	19.7.95	28.51.974	151.09.768
41630064B	95/129	19.7.95	28.51.974	151.09.768
Texas Bridge, Dumaresq River	95/132	21.7.95	28.52.197	151.09.726
Keetah Bridge, Dumaresq River	95/133	22.7.95	28.38.655	150.43.114
41640001B	95/121	16.7.95	28.38.465	150.43.178
41640002	95/122	16.7.95	28.38.465	150.43.178
41640003B	95/134	22.7.95	28.37.210	150.44.141
36694	95/114	13.7.95	28.43.431	150.24.918
Boggabilla Weir, Macintyre River	95/140	25.7.95	28.34.616	150.20.789
41620005	95/125	17.7.95	28.32.067	150.17.612
41620004A	95/113	12.7.95	28.30.877	150.17.812
36962/2	95/139	24.7.95	28.41.431	149.38.682
36957/2	95/138	24.7.95	28.38.860	149.31.885

Table 7.13 Field Measurements for Border Rivers - 1995

Boreid	WQ Number	Date Sampled	Pump Type	Pump Depth (m)	Field EC (uS/cm)	Field pH	Field Eh (mV)	Field DO (mg/L)	Field Temp (Celsius)	Comments
41630058	95/117	14.7.95	G	9.5	484	6.08	121	0.20	20.7	
41630059	95/118	14.7.95	G	11.0	1387	6.65	-39	0.22	21.5	
41630069B	95/119	15.7.95	G	19.5	450	6.44	-78	0.03	21.6	
41630069C	95/120	15.7.95	G	12.5	1228	6.60	-7	0.82	21.6	
41630062A	95/135	23.7.95	G	15.5	1350	6.20	104	0.00	22.6	
41630071A	95/126	18.7.95	G	45.0	948	6.68	-101	0.95	23.1	
41630071B	95/127	18.7.95	G	33.0	851	6.89	-181	0.65	22.9	
41630066B	95/130	20.7.95	G	43.0	730	6.42	-68	0.00	22.1	
41630067	95/131	20.7.95	G	10.0	931	6.42	58	0.13	21.4	
41630064A	95/128	19.7.95	G	48.0	823	6.88	-154	0.12	23.2	
41630064B	95/129	19.7.95	G	25.0	683	6.21	-70	0.22	22.5	
Texas Bridge, Dumaresq River	95/132	21.7.95	G		371	6.82	106	9.34	11.4	Sample taken 10m upriver of bridge
Keetah Bridge, Dumaresq River	95/133	22.7.95	G		614	7.58	79	9.24	9.2	
41640001B	95/121	16.7.95	G	19.5	1191	8.30	-151	0.25	22.9	
41640002	95/122	16.7.95	G	12.0	1120	8.32	-130	0.06	23.1	
41640003B	95/134	22.7.95	G	45.0	1326	8.47	-104	0.41	23.9	1210-1230 pump on at 20L/min. Sample taken at flow of 3L/min
36694	95/114	13.7.95	G	19.0	1452	6.38	121	4.15	23.3	
Boggabilla Weir, Macintyre River	95/140	25.7.95	G		251	6.56	89	9.88	11.5	Sample from centre bridge w/20m pump
41620004A	95/113	12.7.95	G	19.0	1079	6.16	182	2.45	23.5	
41620005	95/125	17.7.95	G	49.0	771	7.59	-50	0.66	23.8	
36962/2	95/139	24.7.95	G	18.0	40400	6.41	84	2.00	22.6	DO possibly high due to low recovery rate of bore - i.e. 'sipping' water off surface. Initial high pump rate - lowered for purging.
36957/2	95/138	24.7.95	G	18.0	37000	5.63	143	0.00	22.9	K10 Conductivity probe used

Table 7.14 Water Levels for Border Rivers - 1995

Boreid	WQ Number	Date Measured	Casing Height (cm)	Meas Water Level (m)	Red Water Level (m)	Total Depth (m)	Red Total Depth (m)	Comments
41630058	95/117	14.7.95	0.62	7.50	6.88	10.85	10.23	
41630059	95/118	14.7.95	0.57	6.87	6.30	13.87	13.3	
41630069B	95/119	15.7.95	0.40	6.70	6.30	35.95	35.55	
41630069C	95/120	15.7.95	0.40	6.50	6.10	16.27	15.87	
41630062A	95/135	23.7.95	0.39	5.60	5.21	17.66	17.27	
41630071A	95/126	18.7.95	0.22	5.83	5.61	52.00	51.78	
41630071B	95/127	18.7.95	0.22	8.83	8.61	42.30	42.08	
41630066B	95/130	20.7.95	0.14	12.39	12.25	47.50	47.36	
41630067	95/131	20.7.95	0.23	5.37	5.14	12.38	12.15	
41630064A	95/128	19.7.95	0.52	13.88	13.36	>50.0	>50	
41630064B	95/129	19.7.95	0.52	12.88	12.36	29.20	28.68	
Texas Bridge, Dumaresq River	95/132	21.7.95						Sample taken 10m upriver of bridge support. Water clear
Keetah Bridge, Dumaresq River	95/133	22.7.95						
41640001B	95/121	16.7.95	0.30	5.10	4.80	46.50	46.2	
41640002	95/122	16.7.95	0.30	8.48	8.18	14.95	14.95	
41640003B	95/134	22.7.95	0.44	3.22	2.78	46.43	45.99	
36694	95/114	13.7.95	0.92	11.07	10.15	29.02	28.1	
Boggabilla Weir, Macintyre River	95/140	25.7.95						sampled from centre of bridge using 20m pump
41620004A	95/113	12.7.95	0.26	10.41	10.15	21.97	21.71	
41620005	95/125	17.7.95	0.35	20.05	19.70	>50.0	>50	
36962/2	95/139	24.7.95	1.14	14.73	13.59	31.70	30.56	
36957/2	95/138	24.7.95	1.16	12.12	10.96	27.40	26.24	

Table 7.15 Major and Minor Inorganic Chemistry for Border Rivers - 1995

Boreid	WQ No.	Comments	Analysis Date		Lab. TDS (Evap)	Lab. pH	Lab. EC (µS/cm)	Ca (mg/L)	Mg (mg/L)	Na (mg/L)	K (mg/L)	
41630058	95/117		30.10.95		390	6.8	541	31.1	16.1	53.4	2.92	
41630059	95/118		30.10.95		988	7.48	1630	65	39.6	222	1.92	
41630069B	95/119		30.10.95		370	7.31	492	31.7	17.3	50.7	1.63	
41630069C	95/120		30.10.95		846	7.35	1470	84.1	54.1	130	2.26	
41630062A	95/135		30.10.95		902	7	1560	81	44	173	2.44	
41630062A	95/136	duplicate	30.10.95		952	7	1560	81.1	44	173	2.46	
41630062A	95/137	spike	30.10.95		882	7.01	1570	80.4	43.6	172	2.45	
41630071A	95/126		30.10.95		684	7.53	1100	56.1	26.7	148	3.15	
41630071B	95/127		30.10.95		590	7.74	972	45.6	20.6	144	3.23	
41630066B	95/130		30.10.95		572	7.21	785	26.1	17.1	114	1.44	
41630067	95/131		30.10.95		688	7.16	1010	30.3	23.2	151	1.07	
41630064A	95/128		30.10.95		528	7.66	889	37.1	19.5	130	3.88	
41630064B	95/129		30.10.95		450	7.01	735	25	15.9	98.7	1.99	
Texas Bridge	95/132		30.10.95		278	8.13	363	17.2	10.4	41.9	2.69	
Keetah Bridge	95/133		30.10.95		456	7.95	617	11.9	6.74	113	3.71	
41640001B	95/121		30.10.95		802	8.63	1230	2.18	0.093	292	1.27	
41640002	95/122		30.10.95		798	8.47	1240	2.29	0.093	293	1.36	
41640002	95/123	50m before blank	30.10.95		ND	ND	ND	0.052	0.093	0.079	<0.149	
41640002	95/124	50m after blank	30.10.95		ND	ND	ND	4.11	7.34	<1.56	13.2	
41640003B	95/134		30.10.95		848	8.42	1320	2.07	0.093	314	1.24	
36694	95/114		30.10.95		1030	7.12	1660	36.7	32.8	254	1.81	
36694	95/115	Duplicate	30.10.95		1010	7.24	1660	36.8	32.9	255	1.83	
36694	95/116	Spike	30.10.95		1010	7.21	1670	36.6	32.7	253	1.79	
Boggabilla Weir	95/140		30.10.95		234	7.77	358	14.8	10.6	32.7	3.05	
41620005	95/125		30.10.95		580	8.13	814	1.25	1.37	193	1.95	
41620004A	95/111	20m before blank	30.10.95		ND	ND	ND	<0.0520	<0.0930	<0.0790	<0.1490	
41620004A	95/112	20m after blank	30.10.95		ND	ND	ND	0.052	0.093	0.079	<0.1490	
41620004A	95/113		30.10.95		830	7.23	1230	35.1	30.8	170	1.78	
36962/2	95/139		30.10.95		26500	7.78	40400	1470	1330	8180	117	
36957/2	95/138		30.10.95		24600	6.9	37900	1360	1170	7700	56.9	
	95/141	20m before blank	30.10.95		ND	ND	ND	0.053	0.093	2.55	<0.149	
	95/142	20m before blank	30.10.95		ND	ND	ND	0.052	0.093	1.57	<0.149	
	95/143	50m before blank	30.10.95		ND	ND	ND	0.052	0.093	0.556	<0.15	
	95/144	50m before blank	30.10.95		ND	ND	ND	<0.052	<0.093	0.303	<0.149	

Table 7.15 Major and Minor Inorganic Chemistry for Border Rivers - 1995

Boreid	Comments	Bicarbonate (mg/L)	Chloride (mg/L)	Sulphate (mg/L)	Fe (mg/L)	Mn (mg/L)	Si (mg/L)	S (mg/L)
41630058		66.25	62.6	84.2	0.03	0.007	15.9	28.8
41630059		312.5	283	49.9	1.24	0.026	23.1	18.7
41630069B		191.25	30.1	5.49	1.28	0.146	24.2	2.12
41630069C		231.25	263	60.8	1.25	0.329	18.7	23.3
41630062A		298.75	288	19.7	0.016	0.443	24.5	7.22
41630062A	duplicate	299.4	291	19.9	0.015	0.442	24.5	7.23
41630062A	spike	298.75	291	20.4	0.252	0.674	24.4	7.18
41630071A		347.5	116	24.2	0.523	0.107	13.1	8.32
41630071B		323.75	80.8	23	0.165	0.064	11.4	8.71
41630066B		140.65	85.1	77.3	0.584	0.148	23.4	29.8
41630067		149.9	122	124	0.038	0.069	25.1	46.2
41630064A		280	88.7	13.7	0.826	0.183	7.27	4.88
41630064B		101.9	128	27.7	2.09	0.313	23.3	10.5
Texas Bridge		76.25	44.2	20.6	0.026	0.005	1.03	7.93
Keetah Bridge		149.4	90.4	7.9	0.84	0.007	8.05	3.22
41640001B		ND	91.8	12.1	0.016	<0.005	6.96	4.29
41640002		ND	93.8	12.4	0.106	0.005	7.31	4.31
41640002	50m before blank	ND	0.74	<0.05	<0.005	<0.005	<0.012	0.005
41640002	50m after blank	ND	0.714	<0.05	<0.005	<0.005	<0.012	1.04
41640003B		487.5	69.7	13.7	0.032	0.005	6.94	5.96
36694		175	346	67.6	0.036	0.042	28.5	25.3
36694	Duplicate	175	344	67.7	0.033	0.04	28.6	25.3
36694	Spike	175	346	67.4	0.257	0.278	28.3	25.2
Boggabilla Weir		81.25	25.6	9.83	0.058	<0.005	7	3.6
41620005		318.75	43.8	13.8	0.048	0.018	22.8	4.95
41620004A	20m before blank	ND	0.708	<0.0500	0.009	<0.0050	0.011	0.026
41620004A	20m after blank	ND	0.708	<0.0500	<0.0050	<0.0050	<0.011	<0.026
41620004A		177.5	240	28.5	0.012	0.041	40.7	10.4
36962/2		378.15	15800	1610	0.082	1.22	15.2	607
36957/2		70	14500	1580	0.185	2.35	28.2	616
	20m before blank	ND	0.79	<0.05	<0.005	<0.005	<0.012	0.026
	20m before blank	ND	1	<0.05	<0.005	<0.005	<0.011	0.026
	50m before blank	ND	0.796	<0.05	<0.005	<0.005	<0.011	0.026
	50m before blank	ND	0.788	<0.05	<0.005	<0.005	<0.012	0.026

Table 7.16 Fluoride and Iodide (ACTEW) for Border Rivers 1995

Boreid	WQ No.	Lab Ref No.	Comments	Fluoride (mg/L)	Iodide (mg/L)
41630058	95/117	58488		0.19	<0.05
41630059	95/118	58489		0.55	<0.05
41630069B	95/119	58490		0.34	<0.05
41630069C	95/120	58491		0.35	<0.05
41630062A	95/135	58418		0.35	<0.05
41630062A	95/136	58419	duplicate	0.33	<0.05
41630062A	95/137	58420	spike	2.90	2.10
41630071A	95/126	58497		0.52	<0.05
41630071B	95/127	58498		0.53	0.06
41630066B	95/130	58501		0.30	<0.05
41630067	95/131	58502		0.39	<0.05
41630064A	95/128	58499		0.54	0.05
41630064B	95/129	58500		0.27	<0.05
Texas Bridge	95/132	58503		0.22	<0.05
Keetah Bridge	95/133	58504		0.22	<0.05
41640001B	95/121	58492		0.56	<0.05
41640002A	95/122	58493		0.56	<0.05
41640002A	95/123	58494	50m before blank	<0.05	<0.05
41640002A	95/124	58495	50m after blank	<0.05	<0.05
41640003B	95/134	58412		0.59	<0.05
36694	95/114	58485		0.17	<0.05
36694	95/115	58486	Duplicate	0.17	<0.05
36694	95/116	58487	Spike	2.70	2.70
Boggabilla Weir	95/140	58423		0.23	<0.05
41620005	95/125	58496		3.40	0.16
41620004A	95/111	58482	20m before blank	<0.05	<0.05
41620004A	95/112	58483	20m after blank	<0.05	<0.05
41620004A	95/113	58484		0.18	<0.05
36962/2	95/139	58422		0.11	0.45
36957/2	95/138	58421		0.12	0.69
	95/141	58424	20m before blank	<0.05	<0.05
	95/142	58425	20m before blank	<0.05	<0.05
	95/143	58426	50m before blank	<0.05	<0.05
	95/144	58427	50m before blank	<0.05	<0.05

Table 7.17 Trace Elements and Metals (AGSO) for Border Rivers - 1995

Boreid	WQ No.	Comments	Analysis Date	Al (mg/L)	Cu (mg/L)	Zn (mg/L)	Sr (mg/L)	Li (mg/L)	Pb (mg/L)	B (mg/L)	U (mg/L)	Ba (mg/L)
41630058	95/117		30.10.95	<0.005	<0.006	0.005	<0.005	<0.01	ND	<0.005	ND	0.083
41630059	95/118		30.10.95	<0.005	<0.006	0.013	0.519	<0.005	ND	0.61	ND	0.247
41630069B	95/119		30.10.95	<0.005	<0.006	0.005	0.224	<0.01	ND	0.021	ND	0.132
41630069C	95/120		30.10.95	<0.005	<0.006	0.027	0.785	<0.005	ND	0.024	ND	0.277
41630062A	95/135		30.10.95	<0.005	<0.006	0.027	0.73	0.013	ND	0.109	ND	0.119
41630062A	95/136	duplicate	30.10.95	<0.005	<0.006	0.027	0.729	0.015	ND	0.111	ND	0.119
41630062A	95/137	spike	30.10.95	0.191	0.222	0.27	0.726	0.252	ND	0.109	ND	0.362
41630071A	95/126		30.10.95	<0.005	<0.006	0.009	0.537	<0.005	ND	0.15	ND	0.244
41630071B	95/127		30.10.95	<5.0	<0.006	0.009	0.513	<0.010	ND	0.184	ND	0.156
41630066B	95/130		30.10.95	<0.005	<0.006	<0.005	0.293	<0.01	ND	0.05	ND	0.105
41630067	95/131		30.10.95	<0.005	<0.006	<0.014	0.338	<0.01	ND	0.051	ND	0.093
41630064A	95/128		30.10.95	<0.005	<0.006	0.01	0.459	<0.01	ND	0.096	ND	0.157
41630064B	95/129		30.10.95	<0.005	<0.006	<0.005	<0.265	<0.01	ND	0.049	ND	0.195
Texas Bridge	95/132		30.10.95	<0.005	<0.005	<0.005	0.123	<0.01	ND	0.026	ND	0.037
Keetah Bridge	95/133		30.10.95	0.611	<0.006	<0.005	0.126	<0.01	ND	0.054	ND	0.041
41640001B	95/121		30.10.95	<0.005	<0.006	<0.005	0.067	0.011	ND	0.061	ND	0.041
41640002A	95/122		30.10.95	0.145	<0.006	<0.005	0.071	0.013	ND	0.066	ND	0.463
41640002A	95/123	50m before blank	30.10.95	<0.005	<0.006	<0.005	<0.005	<0.005	ND	0.009	ND	<0.005
41640002A	95/124	50m after blank	30.10.95	<0.005	<0.006	<0.005	<0.005	<0.0100	ND	<0.009	ND	<0.005
41640003B	95/134		30.10.95	0.1	<0.006	<0.005	0.08	0.012	ND	0.152	ND	0.046
36694	95/114		30.10.95	<0.005	<0.006	0.013	0.672	<0.01	ND	0.014	ND	0.215
36694	95/115	Duplicate	30.10.95	<0.005	<0.006	0.001	0.675	<0.005	ND	0.009	ND	0.217
36694	95/116	Spike	30.10.95	0.192	0.235	0.243	0.671	0.251	ND	<0.005	ND	0.459
Boggabilla Weir	95/140		30.10.95	<0.005	<0.006	0.011	0.099	<0.01	ND	0.025	ND	0.03
41620005	95/125		30.10.95	0.108	<0.006	<0.005	<.005	<0.01	ND	0.137	ND	0.028
41620004A	95/111	20m before blank	30.10.95	<0.005	<0.006	<0.005	<0.005	<0.01	ND	0.026	ND	0.005
41620004A	95/112	20m after blank	30.10.95	<0.005	<0.006	<0.005	<0.005	<0.01	ND	<0.005	ND	<0.005
41620004A	95/113		30.10.95	<0.005	<0.006	<0.005	0.451	<0.01	ND	0.016	ND	0.257
36962/2	95/139		30.10.95	<0.005	0.045	0.217	18.9	0.093	ND	0.134	ND	0.109
36957/2	95/138		30.10.95	<0.005	0.049	0.217	21.5	0.079	ND	0.148	ND	0.025
	95/141	20m before blank	30.10.95	<0.005	<0.006	<0.005	<0.005	<0.01	ND	<0.005	ND	0.005
	95/142	20m before blank	30.10.95	<0.005	<0.006	<0.005	<0.005	<0.01	ND	<0.005	ND	<0.005
	95/143	50m before blank	30.10.95	<0.005	<0.006	<0.005	<0.005	0.01	ND	0.034	ND	<0.005
	95/144	50m before blank	30.10.95	<0.005	<0.006	<0.005	<0.005	<0.01	ND	0.021	ND	<0.005

Appendix 7.2.2

Table 7.17 Trace Elements and Metals (AGSO) for Border Rivers - 1995

Boreid	Comments	V	Cr	As	Cd	Hg
		(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)
41630058		ND	ND	ND	ND	ND
41630059		ND	ND	ND	ND	ND
41630069B		ND	ND	ND	ND	ND
41630069C		ND	ND	ND	ND	ND
41630062A		ND	ND	ND	ND	ND
41630062A	duplicate	ND	ND	ND	ND	ND
41630062A	spike	ND	ND	ND	ND	ND
41630071A		ND	ND	ND	ND	ND
41630071B		ND	ND	ND	ND	ND
41630066B		ND	ND	ND	ND	ND
41630067		ND	ND	ND	ND	ND
41630064A		ND	ND	ND	ND	ND
41630064B		ND	ND	ND	ND	ND
Texas Bridge		ND	ND	ND	ND	ND
Keetah Bridge		ND	ND	ND	ND	ND
41640001B		ND	ND	ND	ND	ND
41640002A		ND	ND	ND	ND	ND
41640002A	50m before blank	ND	ND	ND	ND	ND
41640002A	50m after blank	ND	ND	ND	ND	ND
41640003B		ND	ND	ND	ND	ND
36694		ND	ND	ND	ND	ND
36694	Duplicate	ND	ND	ND	ND	ND
36694	Spike	ND	ND	ND	ND	ND
Boggabilla Weir		ND	ND	ND	ND	ND
41620005		ND	ND	ND	ND	ND
41620004A	20m before blank	ND	ND	ND	ND	ND
41620004A	20m after blank	ND	ND	ND	ND	ND
41620004A		ND	ND	ND	ND	ND
36962/2		ND	ND	ND	ND	ND
36957/2		ND	ND	ND	ND	ND
	20m before blank	ND	ND	ND	ND	ND
	20m before blank	ND	ND	ND	ND	ND
	50m before blank	ND	ND	ND	ND	ND
	50m before blank	ND	ND	ND	ND	ND

Table 7.18 Trace Elements and Metals (ALS) for Border Rivers 1995

Boreid	WQ Number	Comments	Analysis Date	Ag (ug/L)	Al (ug/L)	As (ug/L)	Au (ug/L)	Cd (ug/L)	Co (ug/L)	Cr (ug/L)	Cu (ug/L)	Fe (ug/L)
41630058	95/117		22/08/95	<1	<10	1	<1	<0.2	<1	<1	<1	50
41630059	95/118		22/08/95	<1	<10	8	<1	<0.2	<1	1	<1	1250
41630069B	95/119		22/08/95	<1	<10	<1	<1	<0.2	<1	<1	<1	1300
41630069C	95/120		22/08/95	<1	<10	3	<1	<0.2	<1	<1	<1	1300
41630062A	95/135	Duplicate	22/08/95	<1	<10	1	<1	<0.2	3	<1	<1	100
41630062A	95/136	Duplicate	22/08/95	<1	<10	<1	<1	<0.2	3	<1	<1	100
41630062A	95/137	Spike	22/08/95	<1	280	280	<1	<0.2	3	<1	262	350
41630071A	95/126		22/08/95	<1	<10	<1	<1	<0.2	<1	1	<1	700
41630071B	95/127		22/08/95	<1	30	4	<1	<0.2	<1	<1	<1	250
41630066B	95/130		22/08/95	<1	<10	2	<1	<0.2	<1	<1	<1	690
41630067	95/131		22/08/95	<1	<10	3	<1	<0.2	<1	<1	<1	50
41630064A	95/128		22/08/95	<1	<10	2	<1	<0.2	<1	<1	<1	1000
41630064B	95/129		22/08/95	<1	<10	11	<1	<0.2	2	<1	<1	2800
Texas Bridge	95/132		22/08/95	<1	<10	2	<1	<0.2	<1	<1	<1	50
Keetah Bridge	95/133		22/08/95	<1	400	5	<1	<0.2	<1	1	5	500
41640001B	95/121		22/08/95	<1	<10	<1	<1	<0.2	<1	1	<1	<50
41640002	95/122		22/08/95	<1	130	<1	<1	<0.2	<1	<1	1	50
41640002	95/123	50m before blank	22/08/95	<1	<10	<1	<1	<0.2	<1	<1	<1	<50
41640002	95/124	50m after blank	22/08/95	<1	<10	<1	<1	<0.2	<1	<1	<1	<50
41640003B	95/134		22/08/95	<1	480	<1	<1	<0.2	<1	2	<1	50
36694	95/114	Duplicate	22/08/95	<1	<10	1	<1	<0.2	<1	<1	2	100
36694	95/115	Duplicate	22/08/95	<1	<10	1	<1	<0.2	<1	1	1	100
36694	95/116	Spike	22/08/95	<1	330	140	<1	<0.2	<1	1	282	350
Boggabilla Weir	95/140		22/08/95	<1	50	2	<1	<0.2	<1	<1	2	100
41620005	95/125		22/08/95	<1	100	12	<1	<0.2	<1	1	<1	<50
41620004A	95/111	20m before blank	22/08/95	<1	<10	<1	<1	<0.2	<1	<1	<1	<50
41620004A	95/112	20m after blank	22/08/95	<1	<10	<1	<1	<0.2	<1	<1	<1	<50
41620004A	95/113		22/08/95	<1	<10	7	<1	<0.2	<1	<1	<1	<50
36962/2	95/139		22/08/95	<1	<10	<1	<1	0.2	48	6	6	3250
36957/2	95/138		22/08/95	<1	<10	<1	<1	0.6	79	5	5	2840
	95/141	20m before blank	22/08/95	<1	<10	<1	<1	<0.2	<1	<1	<1	<50
	95/142	20m after blank	22/08/95	<1	<10	<1	<1	<0.2	<1	1	<1	<50
	95/143	50m before blank	22/08/95	<1	<10	<1	<1	<0.2	<1	<1	<1	<50
	95/144	50m after blank	22/08/95	<1	<10	<1	<1	<0.2	<1	<1	<1	<50

Appendix 7.2.2

Table 7.18 Trace Elements and Metals (ALS) for Border Rivers 1995

Boreid	Comments	Hg (ug/L)	Mn (ug/L)	Mo (ug/L)	Ni (ug/L)	Pb (ug/L)	Sb (ug/L)	Se (ug/L)	Sn (ug/L)	U (ug/L)	V (ug/L)	Zn (ug/L)
41630058		<1	12	<1	<1	<1	<1	<10	<1	0.4	<10	2
41630059		<1	40	4	<1	<1	<1	<10	<1	4	<10	1
41630069B		<1	197	<1	<1	<1	<1	<10	<1	<0.1	<10	1
41630069C		<1	430	2	<1	<1	<1	<10	<1	18.1	<10	3
41630062A	Duplicate	<1	539	<1	<1	<1	<1	<10	<1	3.4	<10	3
41630062A	Duplicate	<1	527	<1	<1	<1	<1	<10	<1	3.4	<10	3
41630062A	Spike	<1	771	<1	<1	253	<1	<10	210	272	300	298
41630071A		<1	147	2	<1	<1	<1	<10	<1	<0.1	<10	<1
41630071B		<1	88	3	<1	<1	<1	<10	<1	<0.1	<10	<1
41630066B		<1	189	<1	<1	<1	<1	<10	<1	<0.1	<10	2
41630067		<1	91	1	<1	<1	<1	<10	<1	0.6	<10	2
41630064A		<1	239	2	<1	<1	<1	<10	<1	<0.1	<10	<1
41630064B		<1	400	<1	<1	<1	<1	<10	<1	<0.1	<10	4
Texas Bridge		<1	8	<1	<1	1	<1	<10	<1	0.6	<10	<1
Keetah Bridge		<1	10	2	2	<1	<1	<10	<1	3.5	<10	3
41640001B		<1	7	4	<1	<1	<1	<10	<1	<0.1	<10	<1
41640002		<1	13	4	<1	<1	<1	<10	<1	<0.1	<10	1
41640002	50m before blank	<1	<1	<1	<1	<1	<1	<10	<1	<0.1	<10	<1
41640002	50m after blank	<1	<1	<1	<1	<1	<1	<10	<1	<0.1	<10	2
41640003B		<1	10	5	<1	<1	<1	<10	<1	<0.1	<10	1
36694	Duplicate	<1	54	<1	2	<1	<1	<10	<1	0.100	<10	3
36694	Duplicate	<1	59	<1	2	<1	<1	<10	<1	0.1	<10	2
36694	Spike	<1	370	<1	2	253	<1	10	30	270	330	311
Boggabilla Weir		<1	5	<1	4	<1	<1	<10	<1	0.3	<10	6
41620005		<1	28	19	<1	<1	<1	<10	<1	0.8	20	<1
41620004A	20m before blank	<1	<1	<1	<1	<1	<1	<10	<1	<0.1	<10	<1
41620004A	20m after blank	<1	<1	<1	<1	<1	<1	<10	<1	<0.1	<10	3
41620004A		<1	46	<1	2	<1	<1	<10	<1	0.4	10	3
36962/2		<1	2240	2	9	<1	<1	20	<1	62.2	70	9
36957/2		7	4210	<1	36	<1	<1	<10	<1	1.1	60	8
	20m before blank	<1	<1	<1	<1	<1	<1	<10	<1	<0.1	<10	2
	20m after blank	<1	<1	<1	<1	<1	<1	<10	<1	<0.1	<10	2
	50m before blank	<1	<1	<1	<1	<1	<1	<10	<1	<0.1	<10	1
	50m after blank	<1	<1	<1	<1	<1	<1	<10	<1	<0.1	<10	2

Table 7.19 Nutrients for Border Rivers - 1995

Boreid	WQ Number	Lab Ref No.	Comments	Analysis Date	TOC (mg/l)	Ammonium-N (mg/L)	Nitrite-N (mg/L)	Nitrate-N (mg/L)	Tot Oxid Nitrogen-N (mg/L)	Tot Nitrogen (mg/L)	Orth Phosp-P (mg/L)	Tot Phosp-P (mg/L)
41630058	95/117	58488		7/05/1995	2.50	0.009	<0.01	<0.01	<0.01	0.13	0.032	0.030
41630059	95/118	58489		7/05/1995	0.80	0.060	<0.01	0.04	0.04	0.11	0.073	0.250
41630069B	95/119	58490		7/05/1995	<0.5	0.053	<0.01	<0.01	<0.01	0.05	0.060	0.180
41630069C	95/120	58491		7/05/1995	<0.5	0.066	<0.01	0.30	0.30	0.33	0.012	0.040
41630062A	95/135	58518		7/05/1995	<0.5	0.012	<0.01	0.16	0.16	0.16	0.030	0.031
41630062A	95/136	58519	duplicate	7/05/1995	<0.5	0.017	<0.01	0.16	0.16	0.24	0.032	0.035
41630062A	95/137	58520	spike	7/05/1995	6.90	1.000	<0.01	5.10	5.10	11.00	0.720	0.980
41630071A	95/126	58497		7/05/1995	<0.5	0.081	<0.01	<0.01	<0.01	0.06	0.064	0.140
41630071B	95/127	58498		7/05/1995	0.60	0.120	<0.01	<0.01	<0.01	0.11	0.089	0.110
41630066B	95/130	58501		7/05/1995	0.70	0.043	<0.01	<0.01	<0.01	0.05	0.099	0.160
41630067	95/131	58502		7/05/1995	0.80	0.011	<0.01	0.06	0.06	0.09	0.160	0.180
41630064A	95/128	58499		7/05/1995	<0.5	0.220	<0.01	<0.01	<0.01	0.20	0.054	0.140
41630064B	95/129	58500		7/05/1995	<0.5	0.062	<0.01	<0.01	<0.01	0.07	0.020	0.094
Texas Bridge	95/132	58503		7/05/1995	5.00	0.014	<0.01	<0.01	<0.01	0.31	0.005	0.008
Keetah Bridge	95/133	58504		7/05/1995	9.10	0.013	<0.01	0.05	0.05	0.48	0.043	0.054
41640001B	95/121	58492		7/05/1995	<0.5	0.500	<0.01	<0.01	<0.01	0.47	0.025	0.022
41640002	95/122	58493		7/05/1995	3.00	0.490	<0.01	<0.01	<0.01	0.48	0.034	0.032
41640002	95/123	58494	50m before blank	7/05/1995	<0.5	0.003	<0.01	<0.01	<0.01	0.01	<.002	<.002
41640002	95/124	58495	50m after blank	7/05/1995	17.00	0.004	<0.01	<0.01	<0.01	0.01	<.002	<.002
41640003B	95/134	58512		7/05/1995	<0.5	0.500	<0.01	<0.01	<0.01	0.51	0.032	0.032
36694	95/114	58485		7/05/1995	1.10	0.014	<0.01	1.60	1.60	1.60	0.390	0.480
36694	95/115	58486	Duplicate	7/05/1995	1.00	0.016	<0.01	1.60	1.60	1.80	0.430	0.480
36694	95/116	58487	Spike	7/05/1995	7.90	1.100	<0.01	6.50	6.50	12.00	1.400	1.500
Boggabilla Weir	95/140	58523		7/05/1995	9.20	0.008	<0.01	0.02	0.02	0.45	0.007	0.013
41620005	95/125	58496		7/05/1995	<0.5	0.020	<0.01	<0.01	<0.01	0.03	0.160	0.170
41620004A	95/111	58482	20m before blank	7/05/1995	<0.5	0.012	<0.01	<0.01	<0.01	0.01	0.002	<.002
41620004A	95/112	58483	20m after blank	7/05/1995	17.00	0.007	<0.01	0.02	0.02	0.03	<.002	<.002
41620004A	95/113	58484		7/05/1995	0.60	0.013	<0.01	0.15	0.15	0.17	0.230	0.260
36962/2	95/139	58522		7/05/1995	0.70	0.041	<0.01	0.04	0.04	0.08	0.055	0.063
36957/2	95/138	58521		7/05/1995	<0.5	0.038	<0.01	0.01	0.01	0.03	0.049	0.046
	95/141	58524	20m before blank	7/05/1995	<0.5	0.003	<0.01	<0.01	<0.01	0.01	<.002	<.002
	95/142	58525	20m before blank	7/05/1995	68.00	0.007	<0.01	<0.01	<0.01	<0.01	<.002	<.002
	95/143	58526	50m before blank	7/05/1995	<0.5	0.016	<0.01	<0.01	<0.01	<0.01	<.002	<.002
	95/144	58527	50m before blank	7/05/1995	16.00	0.017	<0.01	<0.01	<0.01	0.01	<.002	<.002

Table 7.20 Environmental Isotopes
Tritium for Border Rivers - 1995

Boreid	WQ Number	ANSTO Sample Number	Tritium Activity (tritium units +/-)
41630058	95/117	9084	3.7 +/- 0.4
41630059	95/118	9085	2.5 +/- 0.3
41630069B	95/119	9086	< 0.3
41630069C	95/120	9087	2.0 +/- 0.2
41630062A	95/135	9100	< 0.5
41630062A	95/136	9101	< 0.5
41630071A	95/126	9091	< 0.5
41630071B	95/127	9092	< 0.3
41630066B	95/130	9095	2.0 +/- 0.2
41630067	95/131	9096	3.0 +/- 0.3
41630064A	95/128	9093	< 0.3
41630064B	95/129	9094	2.6 +/- 0.3
Texas Bridge	95/132	9097	3.1 +/- 0.3
Keetah Bridge	95/133	9098	3.0 +/- 0.3
41640001B	95/121	9088	0.2 +/- 0.2
41640002	95/122	9089	< 0.3
41640003B	95/134	9099	< 0.4
36694	95/114	9082	2.1 +/- 0.2
36694	95/115	9083	2.2 +/- 0.2
Boggabilla Weir	95/140	9104	3.1 +/- 0.3
41620005	95/125	9090	< 0.3
41620004A	95/113	9081	1.0 +/- 0.2
36962/2	95/139	9103	0.5 +/- 0.2
36957/2	95/138	9102	< 0.5

Table 7.21 Environmental Isotopes
Deuterium and Oxygen-18 for Border Rivers - 1995

Boreid	WQ Number	Lab Ref No.	Comments	Lab	Deuterium	Oxygen-18
41630058	95/117	CS28239		CSIRO	-13.8	-1.41
41630059	95/118	CS28240		CSIRO	-29.2	-4.84
41630069B	95/119	CS28241		CSIRO	-32.3	-4.85
41630069C	95/120	CS28242		CSIRO	-28.7	-4.84
41630062A	95/136	CS28256		CSIRO	-33.5	-5.08
41630062A	95/135	CS28255		CSIRO	-31.8	-5.13
41630071A	95/126	CS28246		CSIRO	-30.9	-5.09
41630071B	95/127	CS28247		CSIRO	-31.7	-5.00
41630066B	95/130	CS28250		CSIRO	-23.7	-4.04
41630067	95/131	CS28251		CSIRO	-21.5	-3.62
41630064A	95/128	CS28248		CSIRO	-32.8	-5.30
41630064B	95/129	CS28249		CSIRO	-34.9	-5.51
Texas Bridge	95/132	CS28252		CSIRO	-12.3	-0.51
Keetah Bridge	95/133	CS28253		CSIRO	-31.0	-3.37
41640001B	95/121	CS28243		CSIRO	-41.7	-7.07
41640002	95/122	CS28244		CSIRO	-42.3	-7.19
41640003B	95/134	CS28254		CSIRO	-40.5	-6.33
36694	95/114	CS28237		CSIRO	-30.7	-4.39
36694	95/115	CS28238	duplicate	CSIRO	-29.9	-4.19
Boggabilla Weir	95/140	CS28259		CSIRO	-27.1	-3.14
41620005	95/125	CS28245		CSIRO	-38.1	-5.69
41620004A	95/113	CS28236		CSIRO	-36.8	-5.10
36962/2	95/139	CS28258		CSIRO	-28.1	-3.46
36957/2	95/138	CS28257		CSIRO	-27.2	-3.33

Table 7.22 Environmental Isotopes
Chlorine-36 for Border Rivers - 1995

Boreid	WQ No.	$^{36}Cl/Cl \times 10^{-15}$	Cl. conc.mg/L	$^{36}Cl \times 10^{6}$ (atoms/L)
41630058	95/117	460 (19)	62.6	490 (27)
41630059	95/118	195 (11)	283	940 (70)
41630069B	95/119	135 (8)	30.1	70 (5)
41630069C	95/120	185 (11)	263	830 (60)
41630062A	95/135		288	
41630071A	95/126	157 (9)	115	310 (25)
41630071B	95/127	165 (14)	80.8	225 (25)
41630066B	95/130		85.1	
41630067	95/131		122	
41630064A	95/128	177 (10)	88.7	270 (20)
41630064B	95/129		128	
Texas Bridge	95/132		44.2	
41640001B	95/121	18 (3)	91.8	30 (5)
41640002	95/122	14 (3)	93.8	22 (5)
41640003B	95/134		69.7	
41620005	95/125	101 (7)	43.8	75 (6)
41620004A	95/113	225 (11)	240	920 (60)
Boggabilla Weir	95/140		24.5	

Appendix 7.3

Pesticide Data

APPENDIX 7.3 PESTICIDE DATA

7.3.1 Analyte schedule

Schedules A and B list the analytes for which samples were screened (see Tables 7.23 and 7.24). The schedules contain compounds from various groups of herbicides, insecticides and fungicides (Tomlin, 1997). Schedule A consists of pesticides from various classes that are amenable to extraction on C_{18} solid phase extraction cartridges. Compounds from Schedule B are more acidic, hence their extraction on acidified C_{18} cartridges.

Herbicide groups comprised triazines (eg atrazine, simazine and their degradation products desethylatrazine and desisopropylatrazine), carbamates (eg chlorpropham), chloroacetanilides (eg metolachlor, alachlor), uracils (eg bromacil, terbacil), ureas (eg linuron, diuron, methabenzthiazuron, metoxuron), phenoxyacids (eg 2,4-D, 2,4,5-T, MCPA) and miscellaneous acids (triclopyr, picloram).

Insecticide groups included organochlorines (eg methoxychlor, dieldrin, endosulfan, DDT and its breakdown products), organophosphates (eg diazinon, malathion, parathion, chlorpyrifos), carbamates (eg carbofuran, carbaryl) and pyrethroids (eg permethrin).

Fungicide groups incorporated conazoles (eg cyproconazole, penconazole, triadimenol, triadimefon), phthalimides (eg captafol, captan) and various miscellaneous fungicides (anilazine, chlorothalonil, vinclozolin, chinomethionate, metalaxyl).

In recognition that some compounds degrade over time to products that may also be toxic or carcinogenic, many breakdown products were included in Schedule A (eg DDE, DDD, carbofuran-3-hydroxy, carbofuran-3-keto, endosulfan sulphate, heptachlor epoxide, desethylatrazine, desisopropylatrazine).

It should be noted that the pesticides listed in Schedules A and B are not exhaustive. The scheduled compounds were chosen based on local application information, toxicity, persistence and ease of analysis. Varied extraction and/or analytical techniques could extend these lists further, but the analytical cost involved makes this action prohibitive.

7.3.1 Analyte schedule

Table 7.23 Schedule A analytes and their respective detection limits

ANALYTE	DETECTION LIMIT (µg/L)	ANALYTE	DETECTION LIMIT (µg/L)
Alachlor	0.01	Fluroxypyr	0.05
Aldrin	0.05	HCB	0.05
Ametryn	0.01	Heptachlor	0.05
Anilazine	0.01	Heptachlor epoxide	0.05
Atrazine	0.01	Hexazinone	0.05
Azinphos ethyl	0.05	Iodofenphos	0.05
Azinphos methyl	0.05	Iprodione	0.05
Aziprotyne	0.01	Isoproturon	0.05
Benfluralin	0.05	Lindane	0.05
BHC isomers	0.05	Linuron	0.1
Bromacil	0.05	Malathion	0.05
Bromophos ethyl	0.05	Metalaxyl	0.05
Captafol	0.05	Methabenzthiazuron	0.1
Captan	0.05	Methidathion	0.05
Carbaryl	0.05	Methoprotyne	0.01
Carbofenothion	0.05	Methoxychlor	0.05
Carbofuran	0.05	Metolachlor	0.01
Carbofuran-3-keto	0.1	Metoxuron	0.1
Carbofuran-3-hydroxy	0.1	Metribuzin	0.01
Chinomethionate	0.05	Monocrotophos	0.05
Chlordane	0.05	Monolinuron	0.05
Chlorfenvinphos	0.05	Omethoate	0.05
Chlorothalonil	0.05	Oxychlordane	0.05
Chloroxuron	0.3	Oxyfluorfen	0.05
Chlorpropham	0.02	Parathion	0.05
Chlorpyrifos	0.05	Parathion methyl	0.05
Chlorpyrifos methyl	0.05	Penconazole	0.05
Chlorthal dimethyl	0.05	Pendimethalin	0.05
Coumaphos	0.3	Permethrins	0.05
Cyanazine	0.01	Phorate	0.05
Cyproconazole	0.05	Phosmet	0.05
DDD	0.05	Prochloraz	0.05
DDE	0.05	Profenophos	0.05
DDT	0.05	Prometon	0.01
Desethylatrazine	0.01	Prometryn	0.01
Desisopropylatrazine	0.05	Propachlor	0.05
Demeton-S-methyl	0.05	Propargite	0.05
Desmetryn	0.01	Propazine	0.01
Diazinon	0.05	Propham	0.05
Dichlobenil	0.05	Propiconazole	0.05
Dichloran	0.05	Propoxur	0.05
Dichlorvos	0.05	Propyzamide	0.05
Dicofol	0.05	Quintozene	0.05
Dieldrin	0.05	Sebuthylazine	0.01
Dimethoate	0.05	Siduron	0.05
Disulfoton	0.05	Simazine	0.02
Diuron	0.2	Sulprofos	0.05
Endosulfan	0.05	Terbacil	0.05
Endosulfan sulfate	0.05	Terbumeton	0.01
Endrin	0.05	Terbuthylazine	0.01
Ethion	0.05	Terbutryne	0.01
Fenamiphos	0.05	Tetrachlorvinphos	0.05
Fenarimol	0.05	Triadimenol	0.05
Fenchlorphos	0.05	Triadimefon	0.05
Fenitrothion	0.05	Trietazine	0.01
Fenthion	0.05	Trifluralin	0.05
Fluometuron	0.1	Vinclozolin	0.02

7.3.1 Analyte schedule

Table 7.24 Schedule B analytes and their respective detection limits

ANALYTE	DETECTION LIMIT (µg/L)	ANALYTE	DETECTION LIMIT (µg/L)
2,4-D	0.1	Dichlorprop/2,4-DP	0.1
2,4-DB	0.1	Mecoprop/MCPP	0.1
2,4,5-T	0.1	Dicamba	0.1
2,4,5-TP	0.1	Picloram	0.2
MCPA	0.1	Triclopyr	0.1

7.3.2 Analytical strategy for individual samples

Table 7.25 Samples analysed for Schedule A pesticides

BORE NO.	AGSO LAB NO.	DATE SAMPLED	SITE IDENTIFICATION	QA/QC INFORMATION
-	WQ94/157	13/8/94	-	before blank
-	WQ94/158	13/8/94	-	after blank
36959	WQ94/159	13/8/94		
-	WQ94/160	15/8/94	HOTEL	control
36686	WQ94/162	15/8/94		
36958	WQ94/163	16/8/94		
36957/2	WQ94/164	16/8/94		
36962/2	WQ94/165	17/8/94		
36962/3	WQ94/166	17/8/94		
36698	WQ94/167	18/8/94		
river	WQ94/168	18/8/94	MacIntyre River (west of Goondiwindi)	
36687	WQ94/169	18/8/94		
36694	WQ94/170	19/8/94	Roadside, Bruxner Highway	
36693	WQ94/171	19/8/94	Roadside, Bruxner Highway	
river	WQ94/172	20/8/94	Keetah Bridge, Dumaresq River	
36691/1	WQ94/173	20/8/94		
36691/2	WQ94/174	20/8/94		
36692/1	WQ94/175	21/8/94		
36692/1	WQ94/176	21/8/94		duplicate
36692/1	WQ94/177	21/8/94		spiked triplicate
36685	WQ94/178	22/8/94		
36684/1	WQ94/179	22/8/94		
36684/2	WQ94/180	22/8/94		
36688/1	WQ94/181	23/8/94		
36688/2	WQ94/182	23/8/94		
36692/2	WQ94/183	23/8/94		
-	WQ94/184	24/8/94	-	before blank
-	WQ94/185	24/8/94	-	after blank
-	WQ95/111	12/7/95	-	before blank
-	WQ95/112	12/7/95	-	after blank
41620004A	WQ95/113	12/7/95	POLO ROAD	
36694	WQ95/114	13/7/95	ROADSIDE, BRUXNER HIGHWAY	
36694	WQ95/115	13/7/95	ROADSIDE, BRUXNER HIGHWAY	duplicate
36694	WQ95/116	13/7/95	ROADSIDE, BRUXNER HIGHWAY	spiked triplicate
41630058	WQ95/117	14/7/95		
41630059	WQ95/118	14/7/95		
41630069B	WQ95/119	15/7/95		
41630069C	WQ95/120	15/7/95		
41640001B	WQ95/121	16/7/96		
	WQ95/122	16/7/95		
-	WQ95/123	17/7/95	-	before blank
-	WQ95/124	17/7/95	-	after blank
41620005	WQ95/125	17/7/95		
41630071A	WQ95/126	18/7/95		
41630071B	WQ95/127	18/7/95		
41630064A	WQ95/128	19/7/95		
41630064B	WQ95/129	19/7/95		
41630066B	WQ95/130	20/7/95		
41630067	WQ95/131	20/7/95		
river	WQ95/132	21/7/95	Texas Bridge, Dumaresq River	
river	WQ95/133	22/7/95	Keetah Bridge, Dumaresq rRver	
41640003B	WQ95/134	22/7/95		
41630062A	WQ95/135	23/7/95		
41630062A	WQ95/136	23/7/95		duplicate
41630062A	WQ95/137	23/7/95		spiked triplicate
36957/2	WQ95/138	24/7/95	Cotton gin	
36962/2	WQ95/139	24/7/95	Water storage impoundment	
river	WQ95/140	25/7/95	Boggabilla Weir, MacIntyre River	
-	WQ95/141	25/7/95	-	before blank
-	WQ95/142	25/7/95	-	after blank
-	WQ95/143	26/7/95	-	before blank
-	WQ95/144	26/7/95	-	after blank

7.3.2 Analytical strategy for individual samples

Table 7.26 Samples analysed for Schedule B pesticides

BORE NO.	AGSO LAB NO.	DATE SAMPLED	SITE IDENTIFICATION	QA/QC INFORMATION
-	WQ94/157	13/8/94		before blank
-	WQ94/158	13/8/94		after blank
36959	WQ94/159	13/8/94		
36958	WQ94/163	16/8/94		
36962/2	WQ94/165	17/8/94		
36962/3	WQ94/166	17/8/94		
36698	WQ94/167	18/8/94		
river	WQ94/168	18/8/94	MacIntyre River (west of Goondiwindi)	
36694	WQ94/170	19/8/94		
river	WQ94/172	20/8/94	Keetah Bridge, Dumaresq River	
36692/1	WQ94/175	21/8/94		
36692/1	WQ94/177	21/8/94		duplicate spike
36685	WQ94/178	22/8/94		
36688/1	WQ94/181	23/8/94		
-	WQ94/184	24/8/94		before blank
-	WQ94/185	24/8/94		after blank
-	WQ95/111	12/7/95		before blank
-	WQ95/112	12/7/95		after blank
41620004A	WQ95/113	12/7/95	Polo Road	
36694	WQ95/115	13/7/95	Roadside, Bruxner Highway	
36694	WQ95/116	13/7/95	Roadside, Bruxner Highway	duplicate spike
41630058	WQ95/117	14/7/95		
41630069B	WQ95/119	15/7/95		
41630069C	WQ95/120	15/7/95		
41640001B	WQ95/121	16/7/95		
41640002	WQ95/122	16/7/95		
-	WQ95/123	17/7/95		before blank
-	WQ95/124	17/7/95		after blank
41620005	WQ95/125	17/7/95		
41630071A	WQ95/126	18/7/95		
41630071B	WQ95/127	18/7/95		
41630064A	WQ95/128	19/7/95		
41630064B	WQ95/129	19/7/95		
41630066B	WQ95/130	20/7/95		
41630067	WQ95/131	20/7/95		
river	WQ95/132	21/7/95	Texas Bridge, Dumaresq River	
river	WQ95/133	22/7/95	Keetah Bridge, Dumaresq River	
41640003B	WQ95/134	22/7/95		
41630062A	WQ95/136	23/7/95		
41630062A	WQ95/137	23/7/95		duplicate spike
36957/2	WQ95/138	24/7/95	Cotton gin	
river	WQ95/140	25/7/95	Boggabilla Weir, MacIntyre River	
-	WQ95/141	25/7/95		before blank
-	WQ95/142	25/7/95		after blank
-	WQ95/143	26/7/95		before blank
-	WQ95/144	26/7/95		after blank

7.3.3 Methodology

Sample extraction was based on USEPA Method 525.1 (Eichelberger *et al.*, 1988), with modifications (Sandstrom *et al.*, 1992) as described below. Briefly, samples were filtered and extracted on conditioned C_{18} solid phase extraction cartridges at the bore site to minimise analyte degradation. Pesticides were eluted with solvent in the laboratory and analysed by gas chromatography-mass spectrometry (GC-MS) in full scan and selected ion monitoring modes.

Extraction

Schedule A: Samples were filtered through glass fibre filters (47 mm, 0.7 μm). About 400 mL of filtered sample was weighed into a tared 1 L Teflon bottle. Methanol (3 g) was added to the water sample. The weight of the filtered sample plus methanol was recorded. Surrogate mixture was added (100 μL of ~5 μg/mL solution) with a glass-tipped micropipette. The pre-cleaned cartridge was conditioned with 2 mL of methanol, followed by 2 mL of HPLC-grade water. The cartridge was prevented from running dry; if this occurred the conditioning phase was repeated. A collection beaker was tared. The filtered sample was pumped through the conditioned cartridge at 20-25 mL/min using a FMI-QB1 pump, or equivalent, collecting the spent water into the tared beaker. The processed water in the beaker was weighed. All residual water was removed from the cartridge with a Visi-1 (Supelco) syringe. Dried cartridges were stored in a labelled vial at ambient temperature until laboratory analysis.

Blanks were processed similarly. Distilled water was passed through the pumping equipment, spiked with surrogate solution, extracted and analysed as for the samples.

Field spikes were processed as above, but 50 μL of spike mixture (~ 5 μg/mL solution) was added after the surrogate standard addition.

All bottles and pump lines were cleaned with phosphate-free detergent, followed by rinses with distilled water then methanol. Sample contact with plastic was minimised due to possible analytical interferences.

Schedule B: Samples were filtered through glass fibre filters (47 mm, 0.7 μm). About 400 mL of filtered sample was weighed into a tared 1 L Teflon bottle. The pH of the water was adjusted to 2. The pre-cleaned cartridge was conditioned with 2 mL of methanol, followed by 2 mL of HPLC-Grade water at pH 2. The cartridge was prevented from running dry; if this occurred the conditioning phase was repeated. A collection beaker was tared. The filtered sample was pumped through the conditioned cartridge at 20-25 mL/min using a FMI-QB1 pump, or equivalent, collecting the spent water into the tared beaker. The processed water in the beaker was weighed. All residual water was removed from the cartridge with a Visi-1

(Supelco) syringe. Dried cartridges were stored in a labelled vial at ambient temperature until laboratory analysis.

Blanks were processed similarly. Distilled water was passed through the pumping equipment, extracted and analysed as for the samples.

Field spikes were processed as above, but 100 µL of spike mixture (~10 µg/mL solution) was added prior to extraction.

All bottles and pump lines were cleaned with phosphate-free detergent, followed by rinses with distilled water then methanol. Sample contact with plastic was minimised due to possible analytical interferences.

Analysis

Schedule A: Cartridges were gravity eluted in the laboratory with 2x2 mL of hexane:isopropanol (3:1). Eluates were concentrated to 500 µL and an internal standard (phenanthrene-d_{10}) added. Concentrated extracts were analysed by GC-MS in full scan EI mode to screen for the bulk of Schedule A compounds. The samples were re-analysed by GC-MS in selected ion monitoring mode (SIM) for 21 compounds (this mode has improved sensitivity and lowers the limit of detection of these compounds tenfold). SIM analysis was performed for triazine and chloroacetanilide compounds, which have often been identified in Australian groundwaters.

Schedule B: Cartridges were gravity eluted in the laboratory with 2x2 mL of methanol. Eluates were concentrated to 200 µL prior to derivatisation. Schedule B compounds were analysed by GC-MS in full scan EI mode after derivatization of the extracts. These compounds, because of their acidic nature, are not amenable to gas chromatography without derivatization.

7.3.4 Quality assurance/Quality control

Blanks: Field equipment blanks were extracted for Schedule A (on six occasions) and Schedule B analytes (on five occasions) throughout the sampling periods. The extraction and analysis of blanks ensured that the rinsing procedure between sampling was efficient and that there was no carry-over contamination from the sampling equipment. 'Before blanks' were performed by extracting pesticide-free water. 'After blanks' were performed on pesticide-free water that had passed through the pumping equipment after the routine cleaning of the equipment with detergent, pesticide-free water and methanol.

Replicates: Duplicate extractions (three samples for Schedule A compounds) were analysed alongside the originals. The duplicate results monitor precision of sampling, extraction and analytical methods. Duplicates, spikes and original samples were stored under identical conditions.

Spikes: Three triplicate samples were spiked with a range of compounds representing those pesticide groups of interest from Schedule A, to monitor accuracy of extraction and analysis. These spikes occurred throughout the sampling period, at a level of ~0.625 µg/L.

Duplicate acidified cartridges were spiked (at a level of ~2.5 µg/L) on three occasions with a mixture of acid herbicides. Duplicate and original samples were stored under identical conditions.

Surrogates: All samples, including blanks, duplicates and spikes were spiked with a known quantity of surrogate standards prior to extraction of Schedule A compounds. This solution consisted of the following compounds for the 1994 trip: difluoro-DDE; dibromo-DDE; deuterium-labelled terphenyl (d_{14}). The composition of this solution was altered prior to the 1995 trip to: atrazine-d_5; lindane-d_6; diazinon-d_{10}.

The recovery of these compounds indicates the efficiency of individual cartridge extractions in addition to matrix, processing and storage affects (see Appendix 7.3.8). The consistency of these results is important in identifying problems with specific cartridges.

Drinking water: One control sample (WQ94/160) was taken from the local drinking water supply and analysed for Schedule A compounds.

7.3.5 Discussion of QA/QC data

Blanks: Field equipment blanks were free from pesticide contamination, suggesting that the cleaning procedure between samples was satisfactory.

Replicates: Duplicate samples produced identical results to the original sample. Only in one case were pesticides in the duplicates and originals: Bore 36694 contained 0.01μg/L each of atrazine and desethylatrazine in both the original and duplicate sample.

Spikes: Recovery results from the two field trips were combined for the purposes of statistical analysis (Appendix 7.3.7).

Recoveries of the organophosphate insecticides (azinphos-methyl, coumaphos) were poor, possibly due to analytical errors. Diuron and propoxur often show poor chromatography, due to a combination of matrix and analytical difficulties. Concentrations of these analytes in groundwater samples could only be considered approximate because of these errors.

Acid herbicide recoveries were acceptable, though variation in results was high for dicamba and picloram. Three compounds (2,4-D, 2,4,5-T and picloram) produced inflated recoveries, most probably due to errors in laboratory analysis.

Surrogates: Recoveries of the 1995 field trip were consistently higher than those of the 1994 field trip, due to the use in the 1995 trip of more appropriate surrogate standards (Appendix 7.3.8).

7.3.6 Pesticide results

Table 7.27 Summary of positive pesticide results

BORE NO.	AGSO LAB NO.	DATE SAMPLED	ATRAZINE (µg/L)	DEA (µg/L)	FLUOMETURON (µg/L)	METOLACHLOR (µg/L)
36959	WQ94/159	13/8/94	0.05	0.01	0.1	nd
36694	WQ94/170	19/8/94	0.02	0.02	nd	nd
36694	WQ95/114	13/7/95	0.01	0.01	nd	nd
36686	WQ94/162	15/8/94	0.02	nd	nd	nd
36962/2	WQ94/165	17/8/94	0.05	nd	nd	nd
36962/2	WQ95/139	24/7/95	0.08	nd	nd	nd
hotel tap water	WQ94/160	15/8/94	0.3	0.05	nd	0.08
MacIntyre River	WQ94/168	18/8/94	0.2	0.03	nd	0.04
Boggabilla Weir, MacIntyre River	WQ95/140	25/7/95	0.07	TRACE	nd	nd
Keetah Bridge, Dumaresq River	WQ94/172	20/8/94	0.03	nd	nd	nd
Keetah Bridge, Dumaresq River	WQ95/133	22/7/95	0.03	nd	nd	nd

nd denotes 'not detected'

7.3.7 Recovery data

Table 7.28 Recoveries of Schedule A analytes

COMPOUND	MEAN (%)	S.D. (%)	R.S.D. (%)
Aldrin	52.7	13.7	26
Azinphos-methyl	1159.3	1435.6	124
Carbofuran	122.3	31.2	25
Chlorpyrifos	52.7	40.3	76
Coumaphos	625	779.8	125
Dichlobenil	49.3	17.6	36
Dimethoate	56.7	10.2	18
Diuron b/d	345.7	236	68
Methoxychlor	134	64.4	48
Prometryne	127.7	17.8	14
Prometon	122.3	8.5	7
Propachlor	113.7	10.1	9
Propoxur	254.7	156.9	62

n=3

Table 7.29 Recoveries of Schedule B analytes

COMPOUND	MEAN (%)	S.D. (%)	R.S.D (%)
Dicamba	81.7	37.1	45
MCPP	115	8.2	7
Dichlorprop	116.3	8.3	7
2,4-d	133.3	25.5	19
Triclopyr	116.7	24.5	21
2,4,5-t	142	30	21
2,4-db	99.7	18.1	18
Picloram	324.3	432.2	133

n=3

7.3.8 Surrogate data

Table 7.30 Recovery of surrogate analytes - August 1994

AGSO LAB NO.	RECOVERY (%)		
	Difluoro-DDE	Terphenyl-d_{14}	Dibromo-DDE
WQ94/157	44	15	18
WQ94/158	49	13	22
WQ94/159	51	11	12
WQ94/160	42	12	18
WQ94/162	26	1	5
WQ94/163	33	5	4
WQ94/164	38	11	12
WQ94/165	55	11	11
WQ94/166	50	6	5
WQ94/167	53	8	8
WQ94/168	66	9	6
WQ94/169	54	8	10
WQ94/170	60	9	7
WQ94/171	47	6	10
WQ94/172	64	11	8
WQ94/173	57	16	24
WQ94/174	54	17	29
WQ94/175	42	29	49
WQ94/176	34	9	14
WQ94/177	76	19	40
WQ94/178	62	13	18
WQ94/179	63	13	16
WQ94/180	63	13	21
WQ94/181*	-	-	-
WQ94/182	67	12	9
WQ94/183	56	8	9
WQ94/184	68	18	14
WQ94/185	58	11	12
MEAN (%)	53.0	11.6	15
S.D. (%)	12.0	5.4	11
R.S.D. (%)	23	46	69

*** No recovery data available due to loss of sample**

7.3.8 Surrogate data

Table 7.31 Recovery of surrogate analytes - July 1995

AGSO LAB NO.	RECOVERY (%)		
	Atrazine-d_5	Lindane-d_6	Diazinon-d_{10}
WQ95/111	105	71	49
WQ95/112	126	73	59
WQ95/113	103	74	50
WQ95/114	124	74	67
WQ95/115	105	74	57
WQ95/116	130	77	69
WQ95/117	99	78	47
WQ95/118	115	72	52
WQ95/119	104	74	47
WQ95/120	122	76	47
WQ95/121	102	73	62
WQ95/122	111	76	74
WQ95/123	96	81	34
WQ95/124	104	81	52
WQ95/125	106	77	49
WQ95/126	117	84	45
WQ95/127	117	81	45
WQ95/128	117	78	41
WQ95/129	118	83	36
WQ95/130	127	87	44
WQ95/131	102	84	62
WQ95/132	112	86	40
WQ95/133	105	89	47
WQ95/134	107	77	68
WQ95/135	115	79	77
WQ95/136	109	79	84
WQ95/137	121	80	85
WQ95/138	111	76	68
WQ95/139	107	75	57
WQ95/140	115	88	54
WQ95/141	109	75	53
WQ95/142	105	75	63
WQ95/143	115	77	56
WQ95/144	110	80	70
MEAN (%)	111.5	78.4	56.2
S.D. (%)	8.4	4.7	13.0
R.S.D. (%)	8	6	23

APPENDIX 7.4 PREVIOUS REPORTS IN THIS SERIES

Please, P.M., Watkins, K.L. and Bauld, J., 1996. A groundwater quality assessment of the alluvial aquifers in the Logan-Albert Catchment, SE Queensland. *AGSO Record* 1996/48

Ivkovic, K.M., Watkins, K.L., Cresswell, R.G. and Bauld, J., 1998. A groundwater quality assessment of the fractured rock aquifers of the Piccadilly Valley, South Australia. *AGSO Record* 1998/16

Larsen, R.M., Watkins, K.L., Steel, N.A., Appleyard, S.J. and Bauld, J., 1998. A groundwater quality assessment of the Jandakot Mound, Swan Coastal Plain, Western Australia. *AGSO Record* 1998/18

Radke, B., Watkins, K.L. and Bauld, J., 1998. A groundwater quality assessment of shallow aquifers in the Darwin Rural Area, Northern Territory. *AGSO Record* 1998/20

Radke, B., Ivkovic, K.M., Watkins, K.L. and Bauld, J., 2000. *A Groundwater Quality Assessment of the Upper Onkaparinga Region, Southern Mt Lofty Ranges, South Australia.* BRS, Canberra

Watkins, K.L., Kulatunga, N. and Bauld, J., 1998. Groundwater quality of the Murray-Riverina Catchment, NSW: Wakool-Cadell and Denimein-Berriquin Regions. *AGSO Record* 1998/32

Watkins, K.L. and Bauld, J., 1999. *A Groundwater Quality Assessment of the Murray Region, NSW.* BRS, Canberra

Watkins, K.L., Ivkovic, K.M. and Bauld, J., 1999. *A Groundwater Quality Assessment of the Goulburn Catchment, Victoria: Kyabram-Tongala.* BRS, Canberra

Watkins, K.L., Ivkovic, K.M. and Bauld, J., 1999. *A Groundwater Quality Assessment of the Goulburn Catchment, Victoria: Nagambie-Mangalore.* BRS, Canberra