Coleambally IRRIGATION

Annual Compliance Report 2018

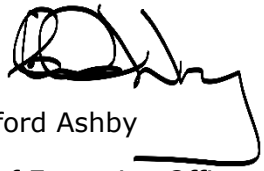
Contents

Statement of Compliance

The Annual Compliance Report 2017/18 is provided to meet the reporting requirements of Coleambally Irrigation Co-operative Limited (CICL) against operating licences held with –

1. NSW DPI Water Combined Water Supply Work Approval and Water Use Approval No 40CA401473 (Murrumbidgee regulated river water source) and Combined Water Supply Work Approval and Water Use Approval for Groundwater extraction 40CA403808 40WA404593; and
2. NSW EPA, EPL No 4652.

I am pleased to advise that from 1st July 2017 to 30th June 2018, CICL has complied with all monitoring and reporting requirements of the Water Access Licences, Water Supply Works, 40CA401473 Approval 2012, Groundwater Works Approvals 40CA403808 and 40WA404593 and Environment Protection Licence EPL (4652) issued by the NSW Government. To the best of my knowledge the information presented in this report is certified as being complete, true and accurate.



Clifford Ashby

Chief Executive Officer

Compliance Conditions

DPI Groundwater Approval 40CA403808 & 40WA404593				
Condition	***Condition No***	***Compliant***	***ACR Reference***	***Comment***
Measurement & reporting of annual volume and water quality	10 &11	✓	Section 6	WaterNSW owned compliant meters. Water quality measured periodically with a hand held meter.
Measure Volume extracted and not to exceed extraction limit	18	✓	Section 6	Compliant meters and extraction volumes within limits
Notification and reporting of non-compliant events		✓		No non-compliant events
DPI Regulated River Works and Water Use Approval No 40CA401473				
Install, maintain and operate an approved metering device at licenced extraction point	5	✓	Appendix A2	CICL operate a high accuracy meter with a secondary meter as a back up, meeting AS 4747 & ISO 6416:2017 requirements.
Demonstrate that the meter is accurate to NSW Standards and validated by a certified person	6	✓	Appendix A2	Validated monthly by a Certified Practicing Hydrographer
Advise WaterNSW if meter fails	7	✓		Meter remained functional and accurate
Provide details of – ▪ Quantity of water extracted ▪ Water delivery infrastructure ▪ Cropping details	8	✓	Table 3.11 & Attachments Crop areas and water use – Table 3.14	Volume extracted measured with accurate meter. Crop areas are estimates provided by farmers at commencement of irrigation
Modification or construction of works for discharge of water	9	✓		No modification or construction of works
Notification of reportable event	10	✓	7.3	Reported to Water NSW and downstream users
Submission of Annual Compliance Report	11	✓		As attached
Plan of operations and works	12.1 & 12.2	✓	Figure 1.3	CICL Works have remained unchanged for 2017/18
Statement of compliance	12.3	✓		

Presentation of data and analysis	12.4 – 12.8	✓	Attachments	Printed summary of all data provided in Appendices and a digital copy emailed
Advise of any new measure implemented to limit groundwater recharge and salt discharge	12.9	✓		No new measures implemented
Reporting on works	12.10 – 12.13	✓	Sect 3 & 4	ACR reports – Volume extracted, all water discharges and deliveries, water balance and cropping areas
Reporting on salinity and salt load	12.14 – 12.16	✓	Section 5	
Reporting on groundwater conditions	12.17	✓	Section 6	Bi–annual measurement. (xls file accompanying report)
QA of monitoring and reporting	13	✓		QA stds applied through calibration and validation
Reporting of noxious aquatic weeds and blue green algae	15 & 16	✓		There were no noxious aquatic weeds events
Monitoring and reporting of all discharge points	Attachment 1	✓	Section 5 & Attachments	Report covers flow and salinity from all licence points
Monitoring and reporting of ground water	Attachment 2	✓	Section 6	Report & Attachments cover all piezometer levels and reports changes and trends.

EPA Operating and Reporting Requirements				
Condition	***Section***	***Compliant***	***ACR Reference***	***Comment***
Report on licenced discharge points flow and water quality	Sect 2 P1.1 – P1.2	✓	Section 3 and attachments	CODD, DC800, CCD, CODO, Continuous Flow and EC
Monitoring & Recording Conditions				
Monitor concentrations of pollutants discharged	M2.1 – 2.5	✓	Appendices	Routine and event sampling undertaken to meet licence requirements
Specific Molinate sampling	M4	✓	Section 7.1	Completed in accordance to specified requirements M4
Continuous recording of flow at licenced discharge points	M7	✓	Attachments	Completed

1. Executive Summary

The season commenced with only 17% allocation, by summer crop planting window it was 23% and concluded with 45% General Security allocation. Rainfall totals in the district were below average with 316.6mm recorded for the year which is approximately 80mm below the Coleambally long term average (LTA) of 399.7mm. The highest monthly rainfall for the period was recorded in December with 108mm. The total evaporation for 2017/18 was 1,995.5mm which was higher than the LTA of 1,715.3mm. This seasonal weather pattern had a negative impact on allocations and therefore cropping programs.

This rainfall and evaporation data is from the CICL 'Depot' daily read weather station.

The area under cropping in CICL's Area of Operations was 34,540 ha, compared to 48,100 ha in 2016/17. Rice continued to be the largest crop both in area and water use although due to allocations and commodity prices cotton's share of the resource increased remarkably.

Table 1.1 Top 5 Crop Areas, Intensity, ML Total and % of Total Use 2017/18.

Crop	Area (Ha)	Intensity (ML/Ha)	Total ML	% Total Use
Rice	6,869	13.5	92,425	36%
Wheat	6,387	2.6	16,409	6%
Cotton	5,796	9.4	54,671	21%
Corn	4,442	8.4	37,248	14%
Pasture	3,921	3.2	12,461	5%

Note: the above cropped areas are based on customer estimate at the start of the season. These figures, are then ground truthed but should only be used as estimates

The key water statistics for the year 2017/18, for the purpose of comparison, are indicated in the following table:

Table 1.2 Water Usage

Key Statistics	2017/18	2016/17	2015/16
Final Allocation	45%	100%	37%
Metered usage to customers	263,634 ML	323,341 ML	183,687 ML
Net channel losses	11,933 ML	11,900 ML	35,971 ML
Ground water usage within Area of Operations	102,043 ML	140,404 ML	89,630 ML

The area of CIA where shallow water table is within two metres of the surface reduced again to one of the lowest recorded areas since the end of the millennial drought (2009). This year the total area where the water table was within two metres of the surface is approximately 470 ha, (0.05% of total area) as compared to 2,896 ha in 2017.

There were ten reportable water quality incidents in 2017/18 involving the detection of Metolachlor, Atrazine, Diazinon, Chlorpyirfos and Diuron at our licenced discharge points.

2. Introduction

2.1 General

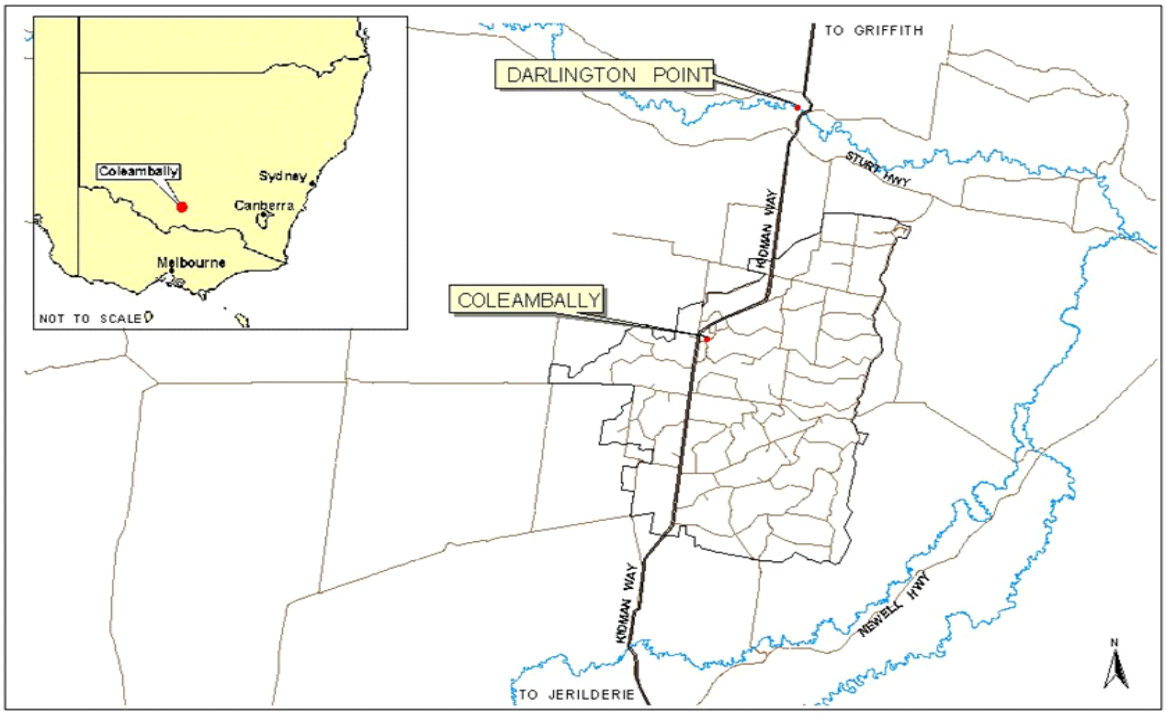
This is CICL's 21st Annual Compliance Report (ACR)[1] submitted to demonstrate CICL's compliance with the following licences:

- Operating Licences, as issued by the NSW DPI Water Access Licences and Nominated Works and Water Use Approvals issued under the Water Management Act 2000 – specifically, amended Approval 40CA401473 of August 2012 (herein referred to as 'Approval 2012'), Approval 40CA403808 (amended 2016) and 40WA404593 (issued 15 March 2011);
- Environment Protection Licence (EPL) #4652 issued by the Environment Protection Authority, under the Protection of Environment Operations Act 1995 (POEO Act before 1995)

2.2 Coleambally Irrigation Area of Operations and Location

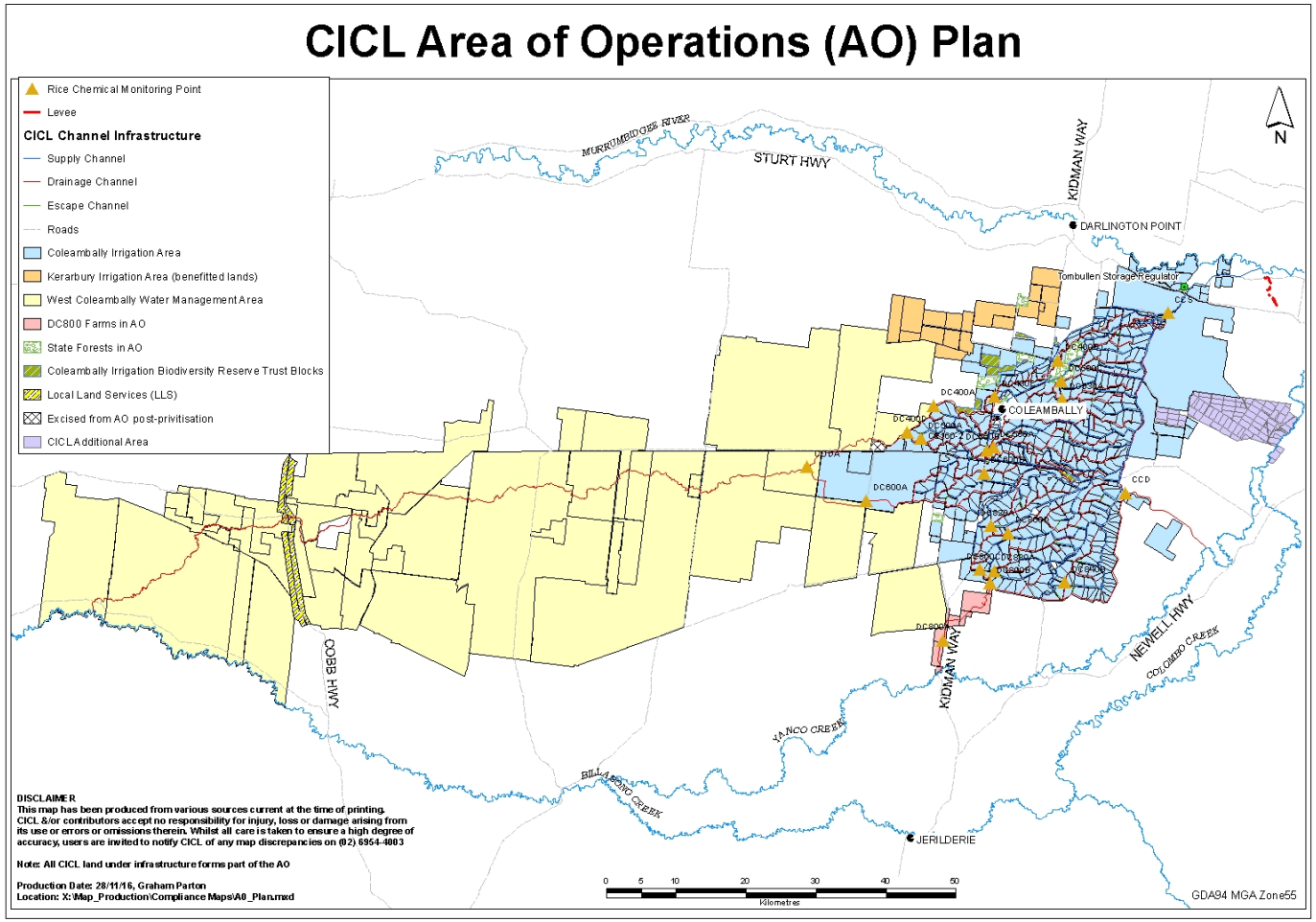
The Coleambally Irrigation Area (CIA) is located south of Griffith between the towns of Darlington Point and Jerilderie, New South Wales in the southern Murray-Darling Basin of Australia as depicted in Figure 2.1

Figure 2.1 CIA Location



[1] Known as Annual Environment Report (AER) prior to 2009/10

Figure 2.2 Current Area of Operation of CICL including benefitted lands.[2] (See attached Appendices A7 for higher level of detail)



[2] The term "benefitted lands" is given to land that receives a benefit from our licence and or licenced works but which are not defined as being within the AO.

2.2 Plans of Works and Monitoring Sites

Figure 2.3 shows the location of Approved Works. The Approval 2012 and the groundwater work approvals 40CA403808 and 40WA404593 issued by the NSW DPI Water include three water extraction works, namely: Coleambally Main Canal Off-take, Col Bore and Hort Bore. The Approval 2012 also includes three drainage discharge points - CCD on the Coleambally Catchment Drain; DC 800A on Drainage Channel 800; and CODD at Bundy on the West Coleambally Channel. One additional monitoring point has also been approved - CODA, on the West Coleambally Channel. The CODA monitoring point is used in conjunction with CICL's Rice Chemical Monitoring Program in lieu of CODD due to CODA's closer proximity to Coleambally. Figure 2.3 also shows the location of the Kerarbury Channel Off-take Regulator which supplies water to the benefitted lands of the Kerarbury Irrigation District.

A total of 737 piezometers are located across the CIA to monitor groundwater levels in the shallow aquifer (0-12m) and the Shepparton formation (12-60m). Their locations are shown in Figure 2.4.

The following table indicates where data contained in this report is derived from. In order to provide the most accurate data possible the source with the highest accuracy is used. All data sources are provided in electronic form if not presented in this report.

Table 2.1 Site Name and Data Source comparison

NSW DPI-Hydrometrics site number	NSW DPI-Water Licenced Site	NSW EPA Licenced Site	ACR Data Source Comment
410110	CODA	1. CODWonga	Salinity from CODA (410110) Flow from CODWonga (Flume)
410108	DC800A	2. DC800A	Salinity and Flow from DC800A
410191	CCD	3. CCD	Salinity from CCD (410191) Flow from CCD Escape (Flume)
410133	CODD	4. CODOaklands	Salinity from CODD (410133) Flow from CODOaklands (Flume)

Figure 2.3 Works Plan

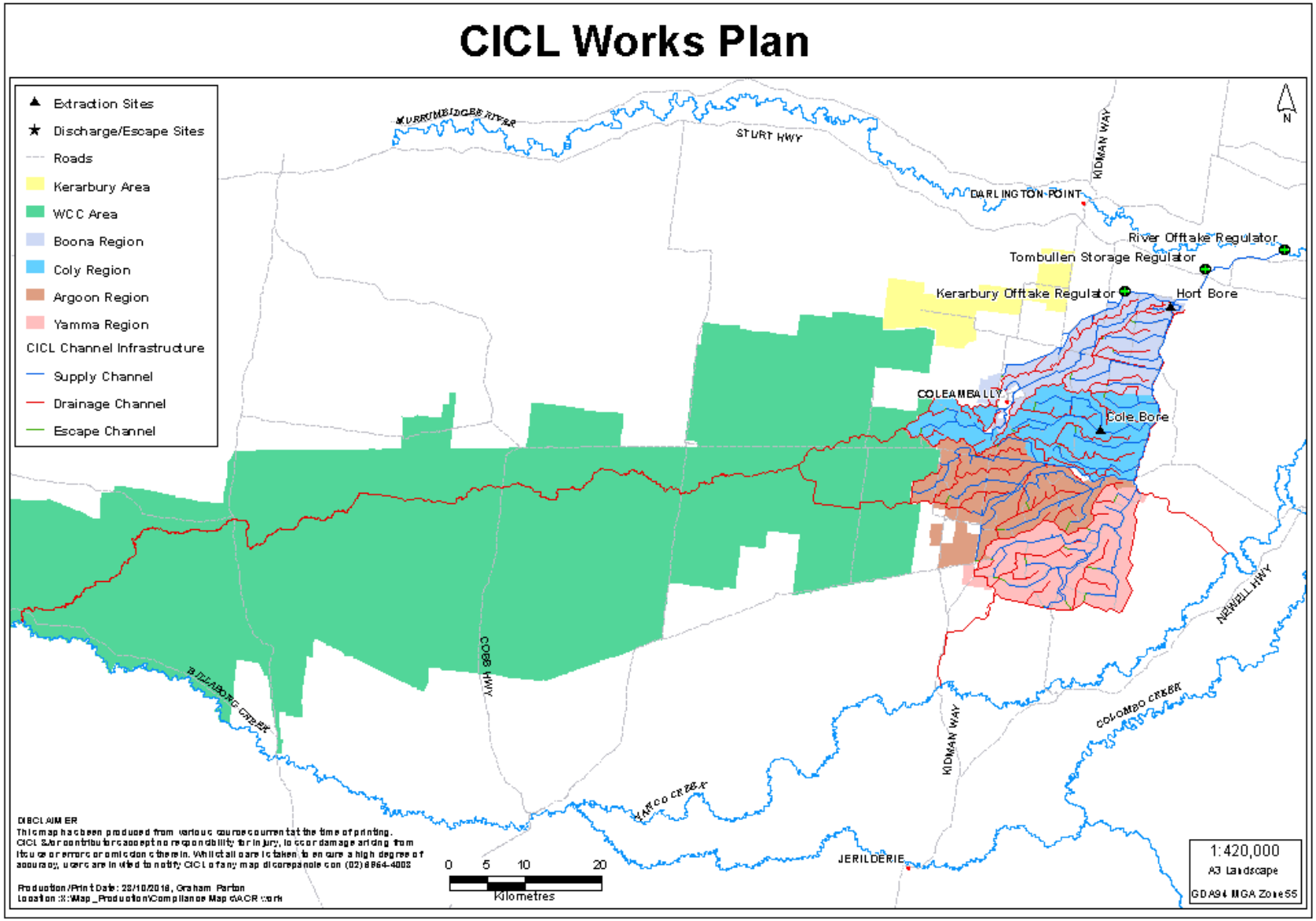
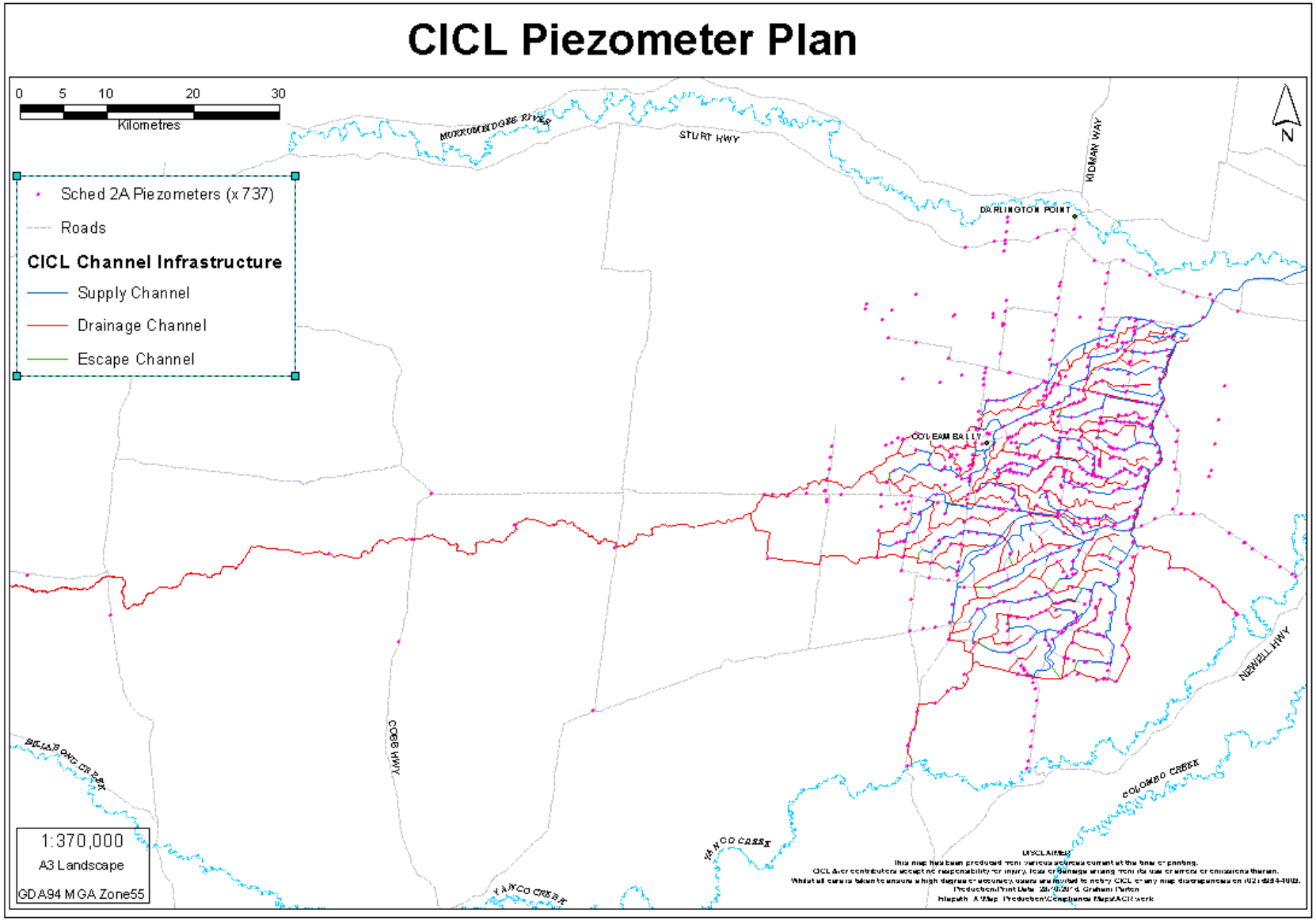


Figure 2.4 Piezometer (Monitoring Sites) Plan



3. Data and Analysis

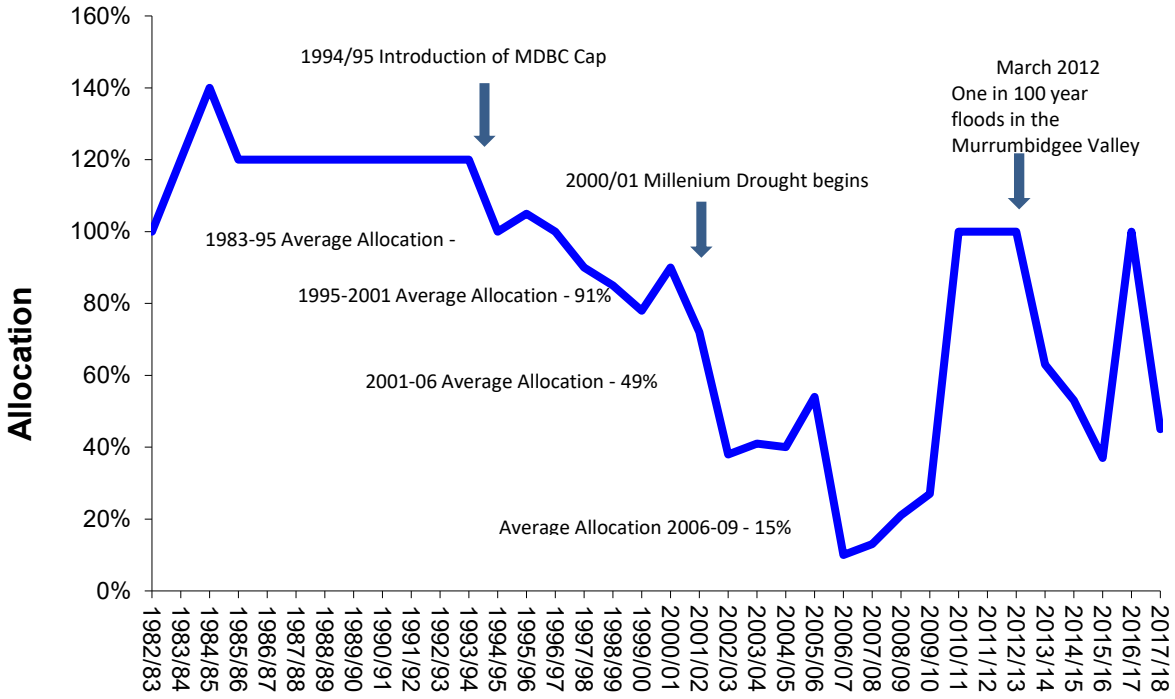
3.1 Water Allocation

Table 3.1 shows the dates and announced General Security allocations in the Murrumbidgee Valley during 2017/18.

Table 3.1 Cumulative General Security Water Allocations for 2017/18

Date	Announced Allocation (%)
1/07/2017	17%
15/08/2017	23%
1/09/2017	29%
15/09/2017	33%
15/02/2018	34%
15/03/2018	38%
15/05/2018	45%

Figure 3.1 shows annual General Security allocations in the Murrumbidgee Valley since 1982/83.



3.2 Monitoring Data

In compliance with Condition 12 of the Approval 2012, the following monitoring data is included:

Monitoring Data provided in Compliance Condition 12, Approval 2012	Reference	Provided
Plan of the Area of Operations	Fig 2.2	✓
Plan showing the current location of works	Fig 2.3	✓
Crop Type, Crop Area and Water Usage data	2.1, 4.15	✓
Piezometer pressure level data	Electronic	✓
Daily Surface Water Extraction and Salinity	Electronic	✓
Daily Drainage, Salinity and Flow Data	Electronic	✓
Monthly Ground Water Extraction from CICL's Approved Works, Salinity and Salt Load	Electronic	✓
Ground Water Extraction from other Approved Works	Electronic	✓
Daily Drainage Flow and Salinity data from three licensed discharge sites and one licensed monitoring site	Electronic	✓
Monthly Drainage Water quality data for Nutrients	A5	✓
Monthly Drainage Water quality data for Chemicals	A5	✓
Weekly Rice Chemical Monitoring Program results	7.2	✓
Additional Detailed Map	Attachment	✓

3.3 Trends

3.31 Salinity

Tables 4.2 to 4.5 show monthly average salinity readings at three discharge points and one monitoring point. EC data is provided from WaterNSW gauging stations. However to obtain more accurate EC, data without flow from a metered site are omitted and likewise metered flows without salinity are given monthly corrected average EC. In these tables, 2017/18 data is compared with data from the previous two years and with the benchmark data. The benchmark was set up through averaging the data of the three seasons immediately preceding the privatisation of CICL in 2000. In the case of salinity data, NF indicates no flow.

Table 3.1: Monthly Salinity Readings at Discharge Point CCD on the Coleambally Catchment Drain (µS/cm)

Month	2017/18	2016/17	2015/16	Benchmark
July	NF	NF	NF	120
August	255	NF	176	164
September	268	260	190	213
October	227	333	286	143
November	339	371	228	98
December	216	214	135	96
January	136	328	219	128
February	161	166	143	16
March	158	133	217	64
April	222	231	194	94
May	NF	197	192	106
June	NF	305	145	158
Average	**217**	**254**	**193**	**117**
Median	**222**	**246**	**192**	**113**

The salinity at CCD appears to be higher than the benchmark, however after investigation by CICL the benchmark was found to be inaccurate with no flow (NF) EC data being included in averages.

Table 3.3: Monthly Average Salinity Readings at Licensed Discharge Point DC800A (410108) on the Drainage Channel DC800 (µS/cm)

Month	2017/18	2016/17	2015/16	Benchmark
July	NF	228	151	1,496
August	261	243	168	1,661
September	213	214	202	338
October	255	247	351	257
November	248	351	261	314
December	342	345	122	306
January	213	332	138	268
February	211	252	153	240
March	168	178	190	268
April	197	228	162	215
May	271	258	168	226
June	201	261	145	534
Average	**234**	**261**	**184**	**510**
Median	**213**	**249**	**165**	**287**

Table 3.4: Monthly Salinity Readings at Monitoring Point CODA on the West Coleambally Channel (µS/cm)

Month	2017/18	2016/17	2015/16	Benchmark
July	437	445	168	1,359
August	475	475	190	1,504
September	327	327	201	886
October	247	246	369	399
November	246	246	211	524
December	240	240	179	526
January	198	198	158	457
February	152	152	168	437
March	269	269	151	367
April	238	238	190	459
May	252	252	221	487
June	284	284	244	1,133
Average	**280**	**281**	**204**	**712**
Median	**252**	**249**	**190**	**506**

Table 3.5: Monthly Salinity Readings at Discharge Point CODD at BUNDY on the West Coleambally Channel (µS/cm)

Month	2017/18	2016/17	2015/16	Benchmark
July	273	275	227	1,868
August	302	275	NF	1,829
September	NF	275	NF	536
October	NF	275	NF	415
November	NF	434	227	450
December	251	524	227	531
January	NF	502	NF	416
February	NF	502	NF	409
March	NF	502	227	374
April	NF	238	227	362
May	NF	273	NF	330
June	NF	267	227	406
Average	**275**	**362**	**227**	**660**
Median	**273**	**275**	**227**	**415**

The above data shows that the monthly average salinity in the last three years at CODA, DC800A and CODD has remained relatively low in comparison to the benchmark years.

While salinity levels in CIA drains have decreased from benchmark figures, this year saw a return to a lower salinity of all drains over the prior year. One factor in the decrease has been the regular use of CCD and DC800 to convey supply water for Water NSW.

3.32 Flow

Tables 3.6 to 3.9 show monthly average drainage flows at three discharge points and one monitoring point. Again 2017/18 data is compared with the previous two years' data and with benchmark data. The benchmark was established through averaging the data from the three season's immediately preceding privatisation of CICL in 2000.

It should be noted that some of the gauged flow data obtained may not be entirely accurate due to high water events on the Yanco and Billabong Creeks, which potentially results in backwater from the creek levels impacting CCD Gauge (410191) and CODD (410133). In addition to backwater impacts from high flow in the Yanco, weed growth and backwater from downstream structures may impact the accuracy of the stage-discharge rating curves particularly at DC800 (410108) and DC500 (410110). These sites are owned and operated by WaterNSW. Where possible therefore CICL uses the more accurate metered flume figures for flow.

Table 3.6: Monthly Flow Readings (ML) at CCD escape on the Coleambally Catchment Drain (substituted for CCD (410191))

Month	2017/18	2016/17	2015/16	Benchmark
July	2,110	0	0	21
August	2,634	0	5,710	290
September	2,913	100	587	887
October	21	419	2,333	1,853
November	2,596	0	782	2,073
December	2,857	2,433	3,102	2,305
January	3,159	2,852	2,952	3,619
February	1,799	4,155	2,101	1,843
March	7,358	7,564	4,856	2,112
April	280	784	2,752	1,756
May	133	699	70	1,430
June	372	70	86	279
Total	**26,232**	**19,076**	**25,331**	**18,468**
Average	**2,186**	**1,590**	**2,111**	**1,539**
Median	2,353	559	2,217	1,800

(Note: CCD is used to deliver water into Yanco Creek for Water NSW)

Table 3.7: Monthly Flow Readings (ML) at Licensed Discharge Point DC800A (410108) on the Drainage Channel DC800

Month	2017/18	2016/17	2015/16	Benchmark
July	0	295	105	432
August	495	102	192	1,197
September	2,369	365	475	4,455
October	645	23	770	5,962
November	1,192	211	315	5,119
December	1,894	621	984	5,162
January	3,118	233	1,463	7,660
February	846	897	945	6,795
March	3,601	2,589	2,333	7,816
April	606	909	579	3,721
May	348	355	317	2,961
June	360	1,269	2,652	1,675
Total	**15,473**	**7,869**	**11,128**	**52,955**
Average	**1,289**	**656**	**927**	**4,413**
Median	746	360	674	4,787

(Note: DC800 is used to deliver water into Yanco Creek for WaterNSW)

Table 3.8: Monthly Flow Readings (ML) CODWonga on the West Coleambally Channel substituted for CODA (410110)

Month	2017/18	2016/17	2015/16	Benchmark
July	108	694	116	619
August	8	254	471	739
September	2,046	1,994	1,095	4,983
October	328	2,102	558	4,494
November	1,031	1,133	1,142	5,014
December	1,536	49	1,426	4,041
January	573	1,104	741	6,806
February	1,361	1,941	742	5,540
March	1,836	4,406	2,557	8,438
April	70	2,216	3,652	4,427
May	180	1,333	268	4,209
June	5	2,565	3,982	2,183
Total	**9,083**	**19,792**	**16,749**	**51,493**
Average	**757**	**1,649**	**1,396**	**4,291**
Median	451	1,637	918	4,460

Table 3.9: Monthly Flow Readings (ML) CODOaklands on the West Coleambally Channel substituted for CODD at Bundy

Month	2017/18	2016/2017	2015/2016	Benchmark
July	2	71	3	282
August	23	56	0	2,150
September	0	490	0	3,327
October	0	1,195	0	1,914
November	76	89	4	3,187
December	268	130	147	1,536
January	0	58	0	3,523
February	0	64	0	4,461
March	77	6	181	3,517
April	0	167	8	1,814
May	0	45	0	2,511
June	0	20	247	3,053
Total	**446**	**2,390**	**590**	**31,275**
Average	**37**	**199**	**49**	**2,606**
Median	0	67	1	2,782

Table 3.10 shows the monthly total amounts of water supplied through the Boona and Argoon escapes which supply planned released water supplied through CODA and CODW and are reported in accordance with the requirements of section M2.5 of EPL 4652.

Table 3.10: Monthly Flow (ML) at Boona and Argoon Escapes 2017/18

Month	Boona	Argoon
July	0	0
August	0	29
September	373	2,068
October	0	126
November	24	1,049
December	19	247
January	12	1,059
February	7	1,576
March	0	1,924
April	0	1
May	0	152
June	83	0
Total	**519**	**8,231**

3.33 Extraction

Table 3.11 shows monthly average extraction at the Coleambally Main Canal Off-take. For all three extraction points 2017/18 data is compared with the previous two seasons' data and with benchmark data. The CCS benchmark was established through averaging the data of three seasons immediately preceding the privatisation of CICL in 2000.

Table 3.11: Monthly Extractions (ML) at licence point CCS (Main Canal Off-take)

Month	2017/18	2016/2017	2015/2016	Benchmark
July	8,012	0	9,702	0
August	18,664	1,658	21,519	0
September	36,919	10,384	28,766	42,294
October	36,089	17,485	46,097	38,311
November	36,338	51,219	23,409	57,310
December	51,245	72,930	52,397	66,774
January	75,328	92,801	47,695	95,277
February	50,146	74,157	35,315	61,406
March	46,478	61,006	27,313	105,786
April	11,489	23,496	16,132	54,865
May	7,532	12,608	1,467	33,506
June	0	0	0	0
Total	**378,239**	**417,743**	**309,812**	**555,533**
Average	**34,385**	**34,812**	**25,818**	**46,294**
Median	36,338	20,491	25,361	48,580

Tables 3.12 to 3.13 show monthly average extractions from both Col Bore and Hort Bore the benchmark is derived from first operational season.

Table 3.12: Monthly Extractions (ML) Col Bore

Month	2017/18	2016/2017	2015/2016	Benchmark 2007/08
July	0	0	0	0
August	0	0	0	184
September	0	0	0	459
October	0	0	0	376
November	61	340	2	180
December	250	425	481	228
January	585	626	364	317
February	647	626	363	218
March	474	448	476	302
April	222	250	0	339
May	0	0	0	209
June	0	0	95	0
Total	**2,239**	**2,715**	**1,781**	**2,812**

Table 3.13: Monthly Extractions (ML) Hort Bore

Month	2017/18	2016/2017	2015/2016	Benchmark 2008/09
July	0	0	0	0
August	0	0	10	0
September	0	0	0	0
October	4	0	62	559
November	160	0	0	120
December	55	0	0	1
January	612	326	0	0
February	179	325	0	0
March	118	288	0	744
April	482	322	0	404
May	1	478	0	0
June	0	54	1	0
Total	**1,611**	**1,793**	**73**	**1,828**

Hort Bore is primarily used to supply high security water on demand outside of the normal CICL irrigation supply period.

Groundwater bore usage is largely influenced by the value of temporary surface water relative to pumping costs.

3.34 Crop Water Use

Table 4.14 shows the crops grown by area within the Coleambally Irrigation District (CID), the quantity of irrigation water supplied by CICL, average crop water usage and the proportion of water supplied to each crop as a percentage of total water supplied by CICL.

Table 3.14: 2017/18 Crop Area, Total Crop Use, Crop Water Use and Proportion of Total Deliveries

Crop	Area (Ha)	Intensity (ML/Ha)	Total ML	% Total Use
Rice	6,869	13.5	92,425	35%
Wheat	6,387	2.6	16,409	6%
Cotton	5,796	9.4	54,671	21%
Corn	4,442	8.4	37,248	14%
Pasture	3,921	3.2	12,461	5%
Other	2,772	2.3	6,480	2%
Canola	2,323	2.5	5,739	2%
Barley	1,038	2.6	2,645	1%
Oats	630	2.1	1,289	0%
Soybeans	362	6.6	2,393	1%
TOTAL	**34,540**		**231,762**	**88%**

The above data was supplied by CICL's customers at the beginning of the irrigation season and is then ground truthed by various means, however it serves only as an approximation of the area actually irrigated and the irrigation intensity.

A tighter water supply year saw Rice improve its water use intensity as farmers selected their lowest water use paddocks. However Rice still required over a third of the total water resource.

Table 3.15 on the following page indicates the change in area of seven major crops in the CID over the last 19 years. CICL expects that the cropping mix will continue to respond to three main drivers: commodity prices (grower returns); the timing and quantum of water allocations and the availability and price of temporary water.

Table 3.15: Crop Areas and Relative Water Usage over Time

Season	Rice		Corn/Maize		Soybeans		Cotton		Wheat		Pasture		Canola		
	Area (ha)	Proportion of delivery (%)	Area (ha)	Proportion of delivery (%)	Area (ha)	Proportion of delivery (%)	Area (ha)	Proportion of delivery (%)	Area (ha)	Proportion of delivery (%)	Area (ha)	Proportion of delivery (%)	Area (ha)	Proportion of delivery (%)	Total (%)
2017/18	6,869	35	4,442	14	2,393	1	5,796	21	6,387	6	3,921	5	2,323	2	88
2016/17	11,484	53.6	5,105	13.5	892	1.9	6,623	17.9	8,462	3.5	10,679	4.1	1,512	1.2	95.7
2015/16	3,603	34.6	8,462	13.5	1,883	3	5,105	20.6	11,484	14.8	6,623	7	892	0.1	94
2014/15	9,103	44	6,757	13	1,666	2	2,602	7	14,226	18	4,737	4	1,716	1	91
2013/14	12,500	43.6	4,358	8.4	1,734	2.4	5,587	6.9	15,071	9.8	5,264	2.8	2,540	1.5	75.4
2012/13	19,071	52.7	4,872	7.7	2,583	3.9	2,089	3	13,698	7.2	6,545	3.6	4,182	1.3	79.4
2011/12	16,745	62.1	4,767	8.2	2,238	2.7	5,280	7.9	15,989	8.7	7,472	4	5,244	1.6	91.2
2010/11	14,512	68.3	4,367	7.2	1,240	1.5	885	1.4	11,334	5.1	8,119	4.2	3,381	1.5	89.2
2009/10	3,668	46	311	2	495	1	0	0	10,635	10	6,903	12	2,523	2	73
2008/09	2,135	33.1	2,472	3.4	308	1.4	0	0	4,215	9.5	4,481	16.3	1,471	4.9	68.7
2007/08	90	1.4	941	1.2	152	0.7	0	0	6,575	20	5,004	20	1,584	6.1	49.4
2006/07	8,518	54.3	1,863	7.6	478	0.8	0	0	12,509	15.9	9,958	7.8	1,602	1	87.4
2005/06	18,025	62.8	3,306	7	2,106	2.9	0	0	13,610	8.4	15,440	8.7	1,748	0.9	90.6
2004/05	8,142	44	3,671	7.2	1,495	2.2	0	0	20,287	18.8	12,865	10.8	2,681	1.3	84.3
2003/04	12,597	55.8	3,545	5.7	1,938	3.5	0	0	21,192	15	12,131	7.5	1,763	0.7	88
2002/03	11,395	46	4,788	9.3	1,788	1	0	0	21,346	20.4	10,183	7.4	2,095	1.7	85.8
2001/02	27,493	67.5	3,808	4.2	3,297	3.4	0	0	21,103	9.2	11,581	6.1	2,191	0.6	91
2000/01	30,440	73.9	4,074	5.7	4,551	5.9	0	0	14,276	4.6	11,998	4.7	2,153	0.4	95.2
1999/00	24,138	77.7	1,178	3.1	2,185	3.9	0	0	12,649	6.1	7,485	4.4	2,152	0.7	95.9
1998/99	24,491	73.8	1,059	1.3	4,339	5.7	0	0	13,963	1.7	13,879	8.1	2,184	1.7	92.3
1997/98	24,624	70.4	1,059	1.3	4,998	7.5	0	0	14,943	7.4	9,964	6.1	2,053	0.4	94.2

3.4 Data Omissions and Discrepancies

This section identifies the variations, discrepancies and data omissions and details of any action undertaken or proposed to remedy any monitoring and/or reporting deficiencies in satisfying condition 12.4 of the Approval 2012.

Salinity data was deleted from all sites during periods where no flow was detected and where flow was present with no salinity the monthly average was used. To achieve improved flow accuracy, CICL has chosen to substitute flow figures for CODA (410110) from the Wonga Rubicon Flume regulator because the installation of this regulator has rendered the CODA gauging less accurate (backwater effects). The flow data from the CICL regulator at COD Oaklands (CODO) has been substituted for the WaterNSW Gauge CODD at Bundy 410133. Apart from backwater effects, the Flumegate regulator has a higher level of accuracy than a standard stage-discharge rating in this stream situation.

CCD is a supply point for WaterNSW customers and these flows are measured at the CICL delivery point – not at the WaterNSW Gauge (410191). As with the CODA site, the flow data from CICL CCD delivery system is used in conjunction with the continuous EC data from the WaterNSW gauge to compute salt load. The WaterNSW CCD gauge is, during period of high flow in the Yanco, impacted by backwater from the Yanco Creek and considered unreliable. The following table indicates where data is sourced.

NSW DPI-Hydrometrics site number	NSW DPI-Water Licenced Site	NSW EPA Licenced Site	ACR Comment
410110	CODA	1. CODWonga	Salinity from CODA (410110) Flow from CODWonga (Flume)
410108	DC800A	2. DC800A	Salinity and Flow from DC800A
410191	CCD	3. CCD	Salinity from CCD (410191) Flow from CCD Escape (Flume)
410133	CODD	4. CODOaklands	Salinity from CODD (410133) Flow from CODOaklands (Flume)

Only 96% of the 737 piezometers were read. Approximately 4% of the piezometers were unserviceable due to physical damage or integrity of the piezometer. There were approximately 10 outlier readings (typographical or observation error) that were discarded. Individual piezometer readings have not been included in the 2017/18 ACR. Summary of piezometer data can be provided as an excel file.

3.41 Monitoring and Testing Data

An electronic copy of of all daily and monthly monitoring and testing data required under section 12.7 of the Combined Licence Package is forwarded by email to relevant authorities.

3.42 Quality Assurance and Control Standards

The following section lists various parameters monitored in compliance with the licence conditions and explains the methodology used for data collection and analysis, and for the calibration of measuring devices.

3.5 Flow Monitoring

3.51 Coleambally Main Canal Off-take

Surface water extraction by CICL is measured at the point of take from the Murrumbidgee River into CICL's Main Canal using an Accusonic transit-time meter with four individual velocity paths. The meter is independently checked by Certified Practicing Hydrographers on a monthly basis and subjected to in-house inspection on a weekly basis. The results of this verification process are shown in Appendix 2.

3.52 Irrigators' Water Supply Points

There are 738 water supply points within CICL's Area of Operations - 538 of these are FlumeGates and two are Slip-Gates (with both gates produced by Rubicon Water Australia); 25 are AgriFlo Doppler flow meters (MACE products); 48 are propeller meters on Horticulture pump outlets and 124 are Stock and Garden meters (small diameter propeller meters).

Verification of customer supply meters is undertaken twice a year by appropriately qualified CICL staff (Certified Meter Validators). A sample of these customer outlets are also verified on an annual basis by an independent meter validator.

3.53 Col Bore and Hort Bore

In addition to its take of surface water, CICL extracts groundwater from its deep water bores – the Col Bore and Hort Bore. WaterNSW owned Magflow meters are installed at both bores.

3.6 Salinity and Salt Load

3.61 Salinity at Water Extraction Works

CICL has continuous monitoring of EC at its Main Canal Off-take. This information is reported back through the SCADA system.

3.62 Salinity at Licensed Discharge Points

CICL uses Electrical Conductivity (EC) data collected by WaterNSW at three licensed discharge points and one licensed monitoring point. These sites continuously monitor flow and EC.

3.63 Salt Load Calculation

The Salt Load has been calculated by using the following formula, which assumes that 1 ML @ 1000µg/L contains 640 kg of salt:

$$SL = (EC/1000 \times 0.64) \times ML$$

3.64 Pesticides in Supply and Drainage Water

In accordance with the EPL, CICL monitors the range of pesticides and nutrients as specified by the EPL in both supply and drainage water. Details of results obtained are contained at Appendices A1 and Section 7.3.

3.65 Turbidity and pH

CICL monitor these parameters in both supply and drainage water using hand-held meters. These meters are calibrated by CICL staff.

3.66 Crop Type and Crop Area

This information is collected from landholders using summer and winter crop type/area forms.

3.67 Crop Water Usage

Crop water usage information is calculated based on actual water orders and crop information provided by landholders prior to the commencement of the irrigation season and as such is an approximation of the actual final area planted. The amount of water diverted onto individual farms is however measured very precisely.

3.68 Groundwater Levels and Groundwater Salinity

These parameters are measured by appropriately trained CICL staff. The methodology for groundwater levels and groundwater salinity monitoring was developed in conjunction with NSW DPI Water.

4. Water Management

Table 4.1 is intended to satisfy the conditions in 12.10 of the Approval 2012. It must be noted however that the data provided reflects an irrigation season which runs from September to June. Tables 4.1 and 4.2 display reconciled monthly volumes of water:

- Taken through each authorised water supply work against the Approval Holder's water access licences;
- Taken through each authorised water supply work against other water access licences; and
- Released from each escape as an authorised credit.

Table 4.1: 2017/18 Water (ML) taken through Water Supply Works against Water Access Licences (mid-month read)

Surface Water Licences (Works Approval 40CA401473)	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Total
Landholder High Security Access Licence **40AL401469**	2,458	0	0	0	0	0	0	0	0	0	0	0	2,458
Converted High Security **40AL405230**	195	5,247	6	0	0	0	0	0	0	0	0	0	5,448
2nd Converted High Security **40AL405343**	0	0	555	0	0	0	0	0	0	0	0	0	555
General Security Access Licence **40AL401471**	0	0	0	0	19,430	34,463	56,167	8,576	21,858	5,251	4,340	0	150,085
General Security Access Licence **40AL405267**	0	0	0	0	0	0	201	36	144	0	255	0	636
Town Water Supply High Security Access Licence **40AL401470**	0	70	0	0	0	0	0	0	0	0	0	0	70
Outfall Drain High Security S & T Access Licence **40AL401472**	0	3,227	0	0	0	0	0	0	0	0	0	0	3,227
Conveyance Loss Allowance Access Licence **40AL402990**	0	0	25,335	28,983	11,230	0	4,534	30,669	2,065	0	0	0	102,816
Supplementary Access Licence **40AL402991**	0	0	0	0	0	5,041	0	0	0	0	0	0	5,041
Total	**2,652**	**8,544**	**25,896**	**28,983**	**30,660**	**39,504**	**60,902**	**39,281**	**24,067**	**5,251**	**4,594**	**0**	**270,336**
Aquifer Access Licence **40AL403806** & Supplementary **40AL403807**													
Col Bore (Works Approval **40CA403808**)	0	0	0	0	61	250	585	647	474	222	0	0	2,239
Hort Bore (Works Approval **40WA404593**)	0	0	0	4	160	55	612	179	118	482	1	0	1,611
Aquifer Total	0	0	0	4	221	305	1197	826	592	704	1	0	3,850
Combined Total	**2,652**	**8,544**	**25,896**	**28,987**	**30,881**	**39,809**	**62,099**	**40,107**	**24,659**	**5,955**	**4,595**	**0**	**274,186**
Authorised Credits													1,381
Total													**275,567**

The following information is provided to satisfy condition 12.11 of the Approval 2012.

Table 4.2: 2017/18 Volumes (ML) Released without Credit, Released from Drain, and Released to Customers

2017/18	Released without credit from escapes	ML Released from Drains	Delivered to CICL Customers
Jul	0	0	0
Aug	0	0	1,359
Sep	0	0	13,842
Oct	0	0	28,094
Nov	0	0	25,608
Dec	0	0	26,688
Jan	0	0	56,491
Feb	0	0	56,840
Mar	0	0	33,498
Apr	0	0	8,310
May	0	0	8,374
Jun	0	0	45,31
Total	**0**	**0**	**263,634**

There were no releases from drains, However in some cases customers water deliveries are sourced from releases to the drainage network(eg WCC). Figures for delivered water are taken from monthly report which is compiled mid month.

4.1 Estimated Annual Volumes

The following information is provided to satisfy condition 12.12 of the Approval 2012.

Table 4.3 indicates the estimated annual volumes of net channel losses, including deliveries, escapes, recycling, evaporation, rainfall, change in storage and seepage.

The gains from rainfall and losses through evaporation have been calculated for the 2017/18 irrigation season only.

For the purpose of calculating evaporation in Table 4.3, the channel surface area has been estimated as 555 ha.

Table 4.3: Net Channel Loss Accounting

Losses	Estimated volume (ML)
Escapes	0
Evaporation	-10,545
Change in storage	0
Seepage	-3,693
Total Losses	**-14,238**
Rainfall	2,306
Net Channel Losses	**-11,933**

4.2 Water Balance for the entire Area of Operations

This CICL system water balance is outlined in Table 4.3 and Table 4.4. This information is presented to satisfy conditions 12.10, 12.11 and 12.12. This balance is taken from licence diversion data and does not include transmission deliveries for Water NSW.

Table 4.4: Water Use (ML) – 2017/18

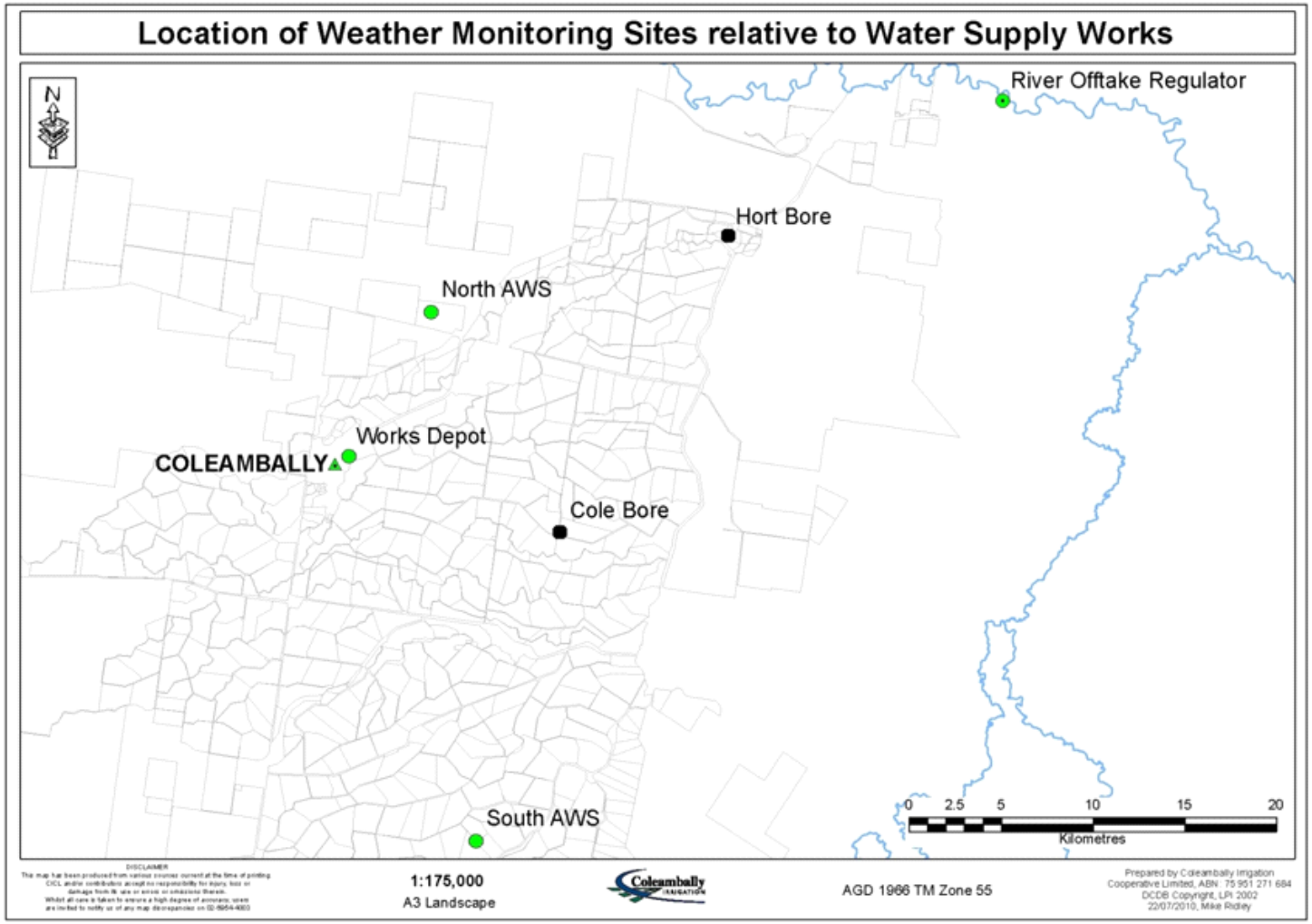
Bulk Accounts	*Debit*	*Credit*
Carryover 16/17		106,672
Allocation (All licences)		278,632
Supplementary		23,502
Net Transfers (all licences)	18,337	
Groundwater		3,850
River Diversion (net of transmission credits)	271,717	
Bore Pumping	3,850	
Carryover 17/18	102,276	
Un-able to be carried over (Supp & HS)	16,476	
As at 30 June 2018	**412,656**	**412,656**

Internal Water Accounting	*Debit*	*Credit*
Net Diversions (Bore pumping + River Div)		275,567
Deliveries	263,634	
Net Channel Losses	11,933	
As at 30 June 2018	**275,567**	**275,567**

4.3 Estimated Annual Rainfall at each Water Supply Work

A map depicting the locations of weather monitoring sites relative to all water supply works is shown in Figure 4.1 below.

Figure 4.1: Location of Weather Monitoring Sites relative to Water Supply Works. (AWS = Automatic Weather Station)



4.4 Estimated Annual Evaporation / Rainfall at each Water Supply Work

Coleambally CICL Depot (CICL Depot) records both rainfall and evaporation (Evap). For the reporting period annual rainfall and evaporation was recorded as 316.6mm and 1,995.5mm respectively. Depot weather data can be found in electronic attachments.

Table 4.5: Rainfall and Evaporation CICL Depot 2017/18

CICL Depot	Rain (mm)	Evap (mm)
July	17.3	53.4
Aug	24.8	73.4
Sept	1.2	144
Oct	52	170.7
Nov	32.4	228.9
Dec	107.6	265.1
Jan	18.5	299
Feb	7	244.5
Mar	4	234.1
Apr	0.8	163.6
May	28.7	77
Jun	22.3	41.8
2017/18 Total	**316.6**	**1,995.5**

5. Salinity and Salt Load

Table 5.1 is provided in satisfaction of requirement 12.14 of Approval 2012.

Table 5.1: Volume of Water Entering CICL's Operational Area (ML), Salinity (µS/cm) and Salt Load (Tonnes) in 2017/18

Month	MAIN CANAL			COL BORE			HORT BORE		
	ML	µS/cm	Salt (T)	ML	µS/cm	Salt (T)	ML	µS/cm	Salt (T)
July	8,012	233	1,228	0	0	0	0	0	0
August	18,664	213	2,432	0	0	0	0	0	0
September	36,919	217	5,197	0	0	0	0	0	0
October	36,089	146	3,406	0	0	0	4	242	1
November	36,338	160	3,748	61	605	24	160	242	25
December	51,245	153	5,179	250	605	97	55	242	9
January	75,328	159	7,669	585	605	227	612	242	95
February	50,146	140	4,515	647	605	251	179	242	28
March	46,478	162	4,843	474	605	184	118	242	18
April	11,489	166	1,218	222	605	86	482	242	75
May	7,532	126	686	0	0	0	1	242	0
June	0	140	0	0	0	0	0	0	0
Total	**378,239**		**40,121**	**2,239**		**867**	**1,611**		**250**
Salt Total	**41,238**								
ML Total	**382,089**								

Tables 5.2 to 5.4 are provided to satisfy requirement 12.15 of Approval 2012.

Table 5.2: Volume of Water exiting CICL's Operational Area (ML), Salinity (µS/cm) and Salt Load (Tonnes) in 2017/18

Month	DC 800@ OUTFALL			Flow @ DC 500 at Wonga			Flow @ CCD Escape			Tombullen		
				EC @ CODA			EC @ CCD			Storage		
	ML	µS/cm	Salt (T)	ML	µS/cm	Salt (T)	ML	µS/cm	Salt (T)	ML	µS/cm	Salt (T)
July	0	0	0	108	360	21	0	NF	0	5,360	233	799
August	495	261	81	8	334	1	701	179	114	8,628	213	1,177
September	2,369	213	290	2,046	259	307	2,068	268	345	5,931	217	822
October	645	255	70	328	340	71	126	227	15	6,296	146	588
November	1,192	248	137	1,031	308	121	1,049	311	34	3,439	160	351
December	1,894	342	309	1,536	274	235	247	216	42	8,956	153	877
January	3,118	213	430	573	129	45	1,059	136	88	6,958	159	710
February	846	211	95	1,361	122	100	1,642	161	173	5,267	140	473
March	3,601	168	369	1,836	232	185	1,924	158	180	13,090	162	1,360
April	896	197	112	70	420	21	1	222	0	422	166	45
May	348	271	57	180	247	28	152	222	18	2,575	126	208
June	360	201	52	5	85	0	0	NF	0	0	140	0
Total	**15,763**		**2,004**	**9,083**		**1,135**	**8,968**		**1,009**	**66,919**		**7,409**
Salt Total	**11,558**											
ML Total	**100,734**											

Table 5.3: Volume of Water exiting CICL's Operational Area at CODO, Salinity (µS/cm) and Salt Load (Tonnes) in 2017/18

Month	Flow @ COD Oaklands EC @ CODD at OUTFALL BUNDY		
	ML	µS/cm	Salt (T)
July	2	273	4
August	23	302	4
September	0		0
October	0		0
November	76	295	14
December	268	151	38
January	0		0
February	0		0
March	77	235	12
April	0		0
May	0		0
June	0		0
Total	**446**		**72**

Table 5.4 represents a **Simple Annual Salt Balance** comprising the imported, exported and retained Salt Load for the area associated with each separate water supply work. This satisfies requirement 12.16 in the Approval 2012.

Table 5.4: CIA Simple Salt Balance (Tonnes) in 2017/18

Inflow Sites	Imported Salt (T)	Outflow Sites	ExportedSalt (T)
Main Canal	40,121	**DC800A**	2,004
Col Bore	867	**DC500**	4,878
Hort Bore	250	**CCD**	1,009
		Tombullen	7,409
Total	**41,238**		**15,300**
Balance	**25,938**		

For this report, a conversion factor of 1,000 µS/cm in 1 ML = 640 kg of salt has been used. In effect, 1 megalitre of water at an EC of 1000 µS/cm contains 640 kg of salt.

6. Groundwater Conditions

6.1 Groundwater conditions within the Area of Operations

CICL has a network of piezometers throughout its Area of Operations which is used to monitor ground water conditions. The licence requires that piezometers be read in August (+/- 2 weeks), and it is CICL's practice to read them again in March in order to have a more complete understanding of groundwater conditions. The related data is analysed using Arc Map GIS and MS Excel software.

In March and September 2018, 696 of CICL's 737 licensed piezometers were read. Of those read, 33 were recorded as being dry, and a further 15 as damaged. There were also 8 outlier readings that were disregarded as typographical or observational error.

Piezometers are read to an accuracy of +/- 5cm with the data obtained presented as per the Licence monitoring requirements. Data analysis and mapping is based on a split set of data being; pressure levels from the upper Shepparton aquifer via piezometers < 12m deep; and pressure levels from the lower Shepparton aquifer via piezometers 12m - 60m deep.

Readings from the upper Shepparton aquifer represent the water table, while readings from the lower Shepparton aquifer represent the piezometric level of the lower confined aquifer.

All piezometers with a recorded depth are mapped, except those recorded as dry/blocked and all those recorded as buried/damaged.

For comparative purposes, ground water levels in the previous year and in the baseline year of 1998 are presented along with the current year. The inclusion of the previous year highlights the change in conditions from the last season to the present, whilst the inclusion of the baseline year allows a comparison with ground water conditions in 1998.

Figures 6.1 and 6.2 are contour maps of the piezometric levels below natural surface for September 2017. A 3D surface of piezometric levels was created from point measurements (depth to water below natural surface at each piezometer) by using the inverse distance weighted (IDW) method of interpolation. This method requires inputs of XY locational coordinates and a Z coordinate for the piezometric level.

Tables 6.1 and 6.2 are tabular representations of Figures 6.1 and 6.2 respectively.

Table 6.1: Groundwater depth below natural surface; 0-12m piezometers; Sept 2018 Comparison of areas 1998, 2017 & 2018

Groundwater Depth Range Below Natural Surface (m)	Years and Area of Groundwater Depth (ha)			Change in Area of Groundwater Depth (ha) [+ = rising][- = falling]	
	1998	2017	2018	2018 vs 1998	2018 vs 2017
0-1	1,939	77	8	-1,931	-69
1-2	34,102	2,819	462	-33,640	-2,357
2-4	41,559	46,689	39,363	-2,196	-7,326
4-6	13,442	22,821	30,566	17,124	-6,424
6-8	4,256	11,000	12,723	8,467	1,723
8+	504	12,396	12,680	12,176	284
Total	**95,802**	**95,802**	**95,802**	**0**	**0**

From Table 6.1 for 0-12m depth piezometers 39,833 ha or 42% of the mapped ground water area existed in the 0-4m zone in 2018, which in Figure 7.1 is represented in red, orange and yellow combined. This compares to 50% last year.

Comparing years 2017 and 2018 the area of the 0-1m range has decreased from 77 ha to 8 ha. For the same period there was also a reduction in area of 1-2 from 2,819 to 462 ha.

By comparison there has been very little change in area of the 2-4 m water level range in 1998, 2017 or 2018. The main difference has occurred has seen a shift from the 0-4m range to the 6-12m range over the benchmark year 1998.

Table 6.2: Change in area of Groundwater depth ranges below natural surface; 12-60m piezometers; years 2017 to 2018, and years 1998 to 2018

Groundwater Depth Range Below Natural Surface (m)	Years and Area of Groundwater Depth (ha)			Change in Area of Groundwater Depth (ha) [+ = rising][- = falling]	
	1998	2017	2018	2018 vs 1998	2018 vs 2017
0-1	760	1	0	-760	-1
1-2	22,264	333	99	-22,165	-234
2-4	33,481	31,994	21,813	-11,668	-10,181
4-6	17,300	23,058	29,546	12,246	6,488
6-8	10,549	11,812	13,412	2,863	1,600
8+	11,448	28,604	30,932	19,484	2,328
Total	**95,802**	**95,802**	**95,802**	**0**	**0**

Table 6.2 Compares the 12 – 60 meter range and demonstrates that there is virtually zero in the 0-1 m range, falling from 1 ha in 2016 to 0 ha in 2017. The area of 1 – 2m water table has decreased from 333 ha from 2017 to 99 ha in 2018.

21,912 ha or 23% of mapped ground water area existed in the 0-4m zone in 2018. This area is significantly lower than the 37% in 2017.

The 0-1, 1-2 and 2-4 metre values are depicted in red, orange and yellow on Fig 6.2.

Figure 6.1: Ground water depth below natural surface; 0-12m piezometers; Sep 2018

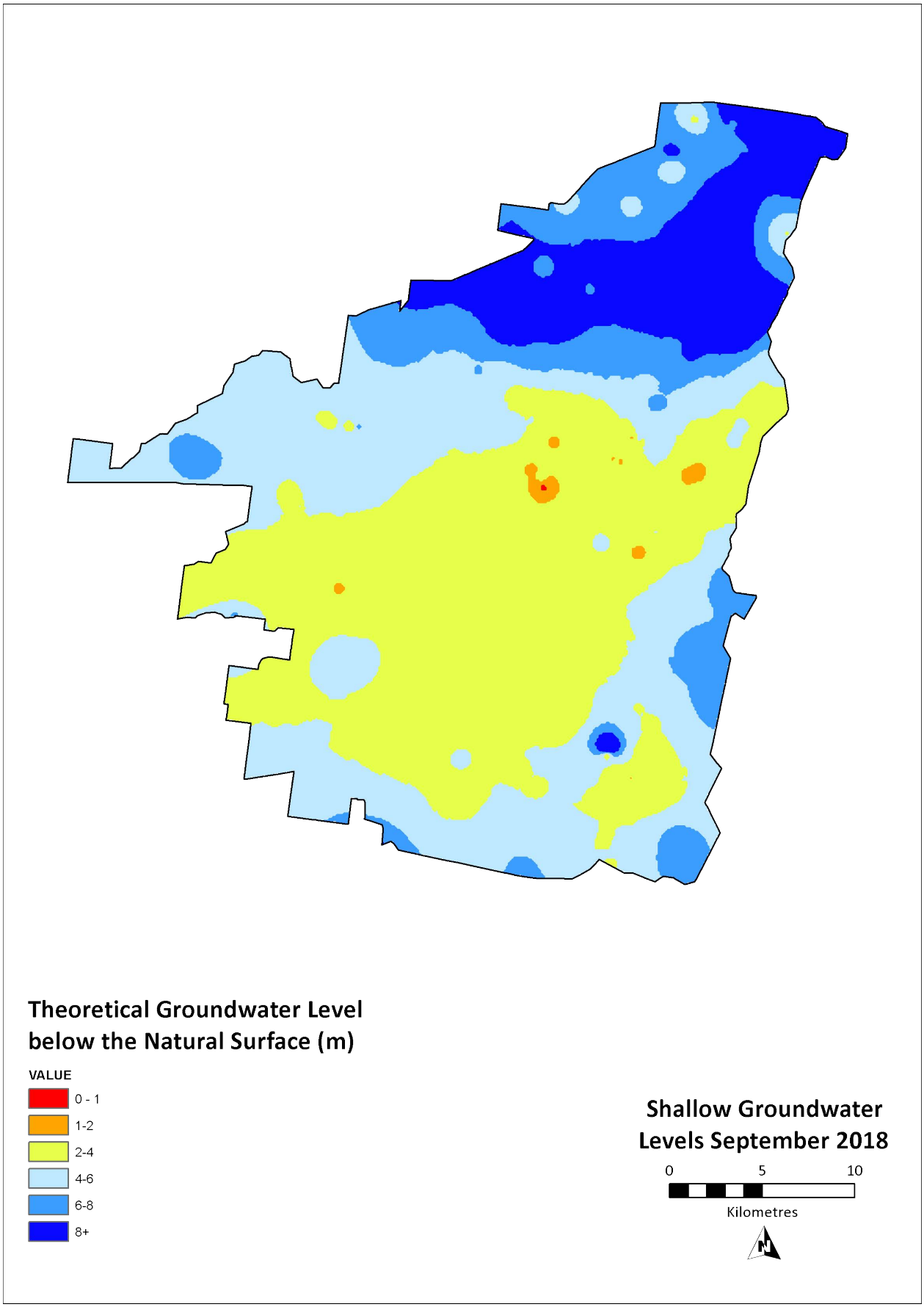
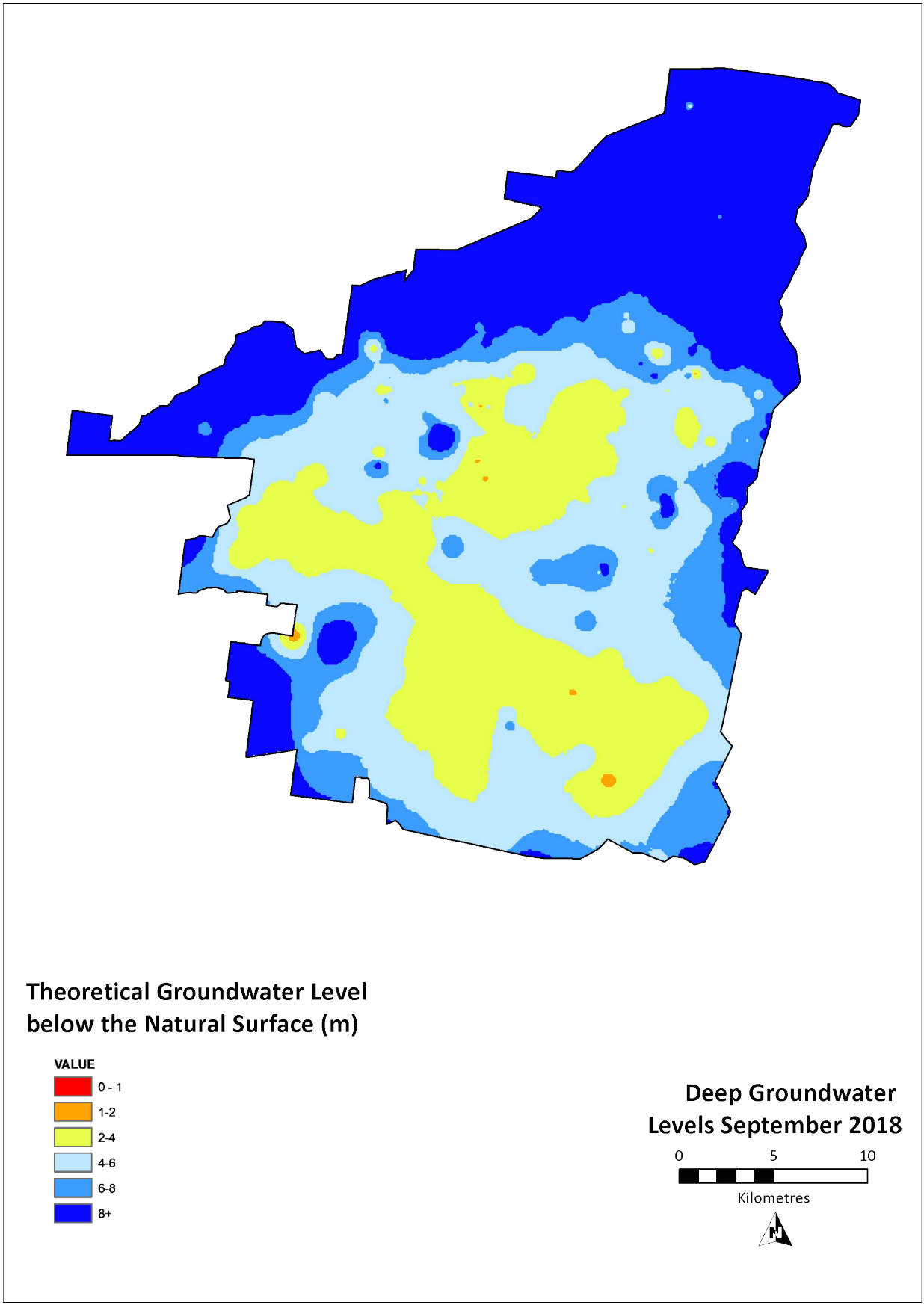


Figure 6.2 Piezometer depth below natural surface: 12-60m Sept 2018



Figures 6.3 and 6.4 depict the ground water depth below natural surface, in the years 2018 and 1998, as converted to the Australian Height Datum (mAHD) and mapped for all of the 0-12m and 12-60m piezometers. These are the upper and lower parts of the Shepparton Aquifer, respectively. These levels represent the ground water height above sea level and can be used to identify the direction of ground water flow. In general, the direction of ground water flow is West South West.

Tables 6.3 and 6.4 are tabular representations of Figures 6.3 and 6.4 respectively.

Table 6.3: Ground Water Depth, below natural surface; 0-12m piezometers; Sep 2018 versus Sep 1998

Ground water Depth Below Natural Surface (mAHD)	2018 Area (Ha)	1998 Area (Ha)
123 – 127 (higher)	1,775	4,151
119 - 122	22,014	39,182
115 - 118	40,243	31,548
111 - 114	29,627	11,211
107 - 110	2,143	5,724
94 – 106 (lower)	0	3,986
Total	**95,802**	**95,802**

Table 6.4: Ground Water Depth, below natural surface; 12-60m piezometers; Sep 2018 versus Sep 1998

Ground water Depth Below Natural Surface (mAHD)	2018 Area (Ha)	1998 Area (Ha)
123 – 127 (higher)	1	6,381
119 - 122	13,654	42,337
115 - 118	34,081	34,921
111 - 114	29,173	11,432
107 - 110	11,293	731
94 – 106 (lower)	7,600	0
Total	**95,802**	**95,802**

Figure 6.3 Groundwater Level (mAHD); 0-12 and 12- 60m piezometers Sept 2018

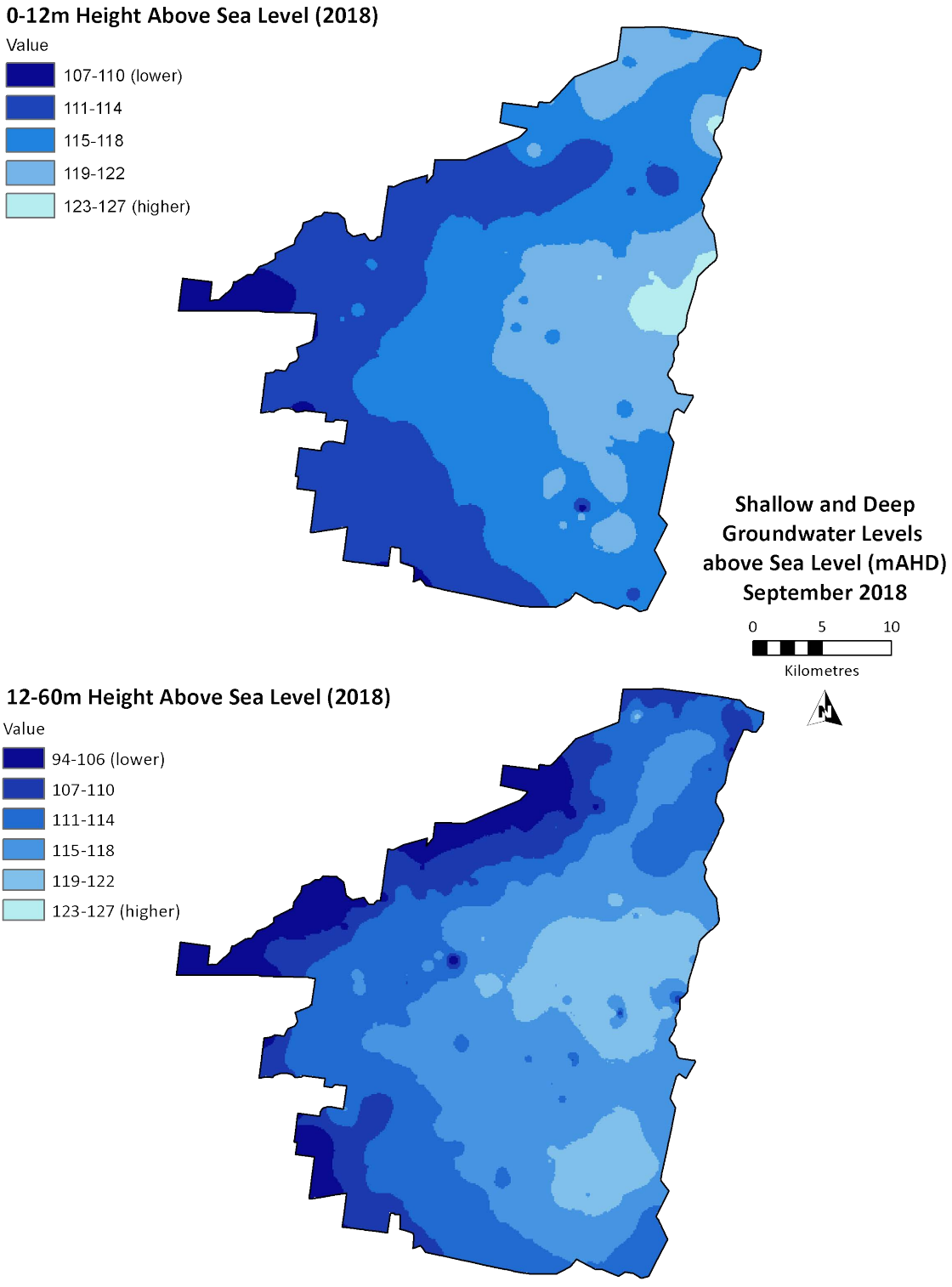


Figure 6.4: Ground Water Level (AHD); 0-12 m & 12-60m piezometers; Sep 1998

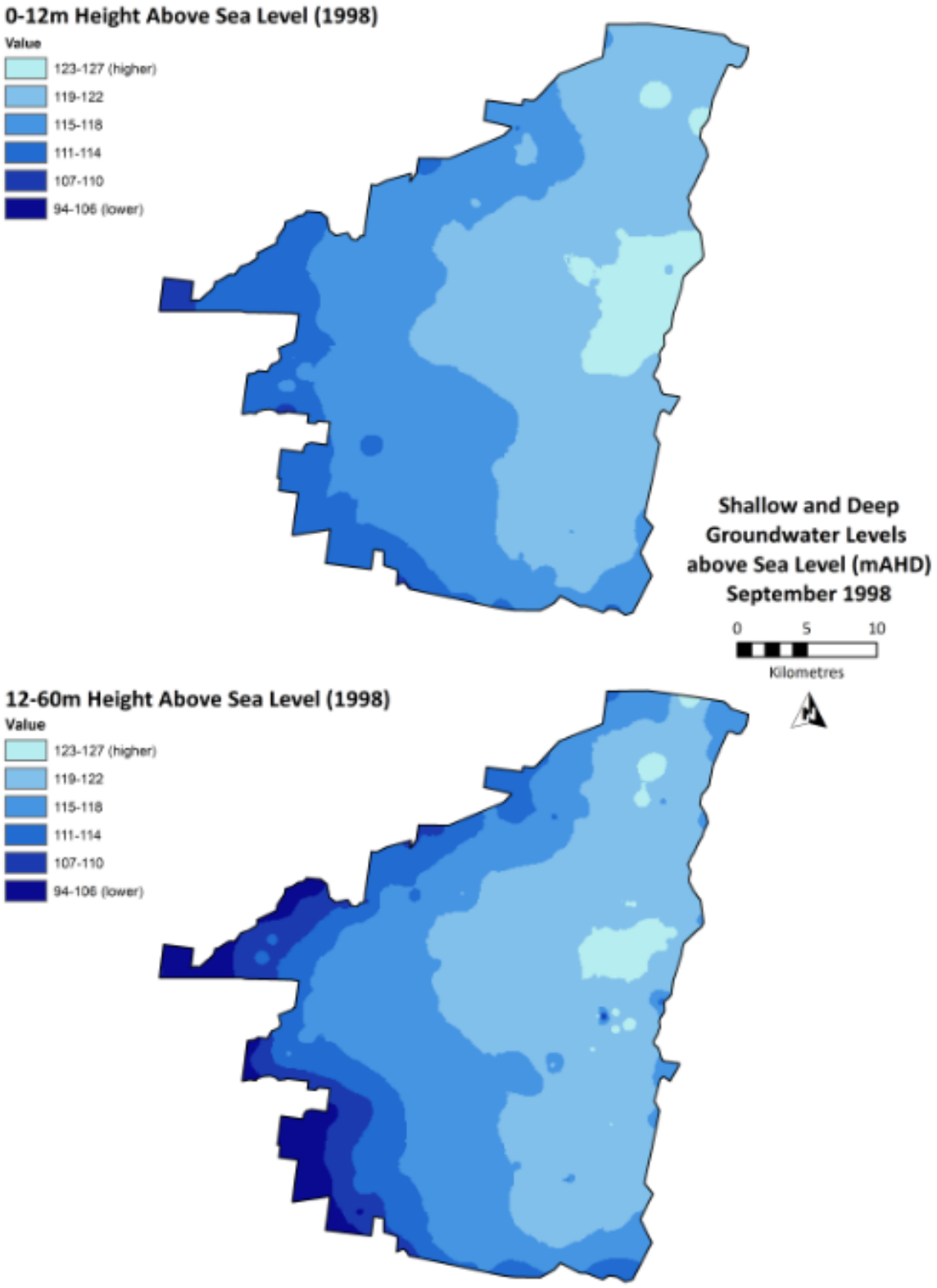


Figure 6.5: Changes in ground water depth, below natural surface 0-12 m piezometers comparing years 2017 to 2018 and 1998 to 2018

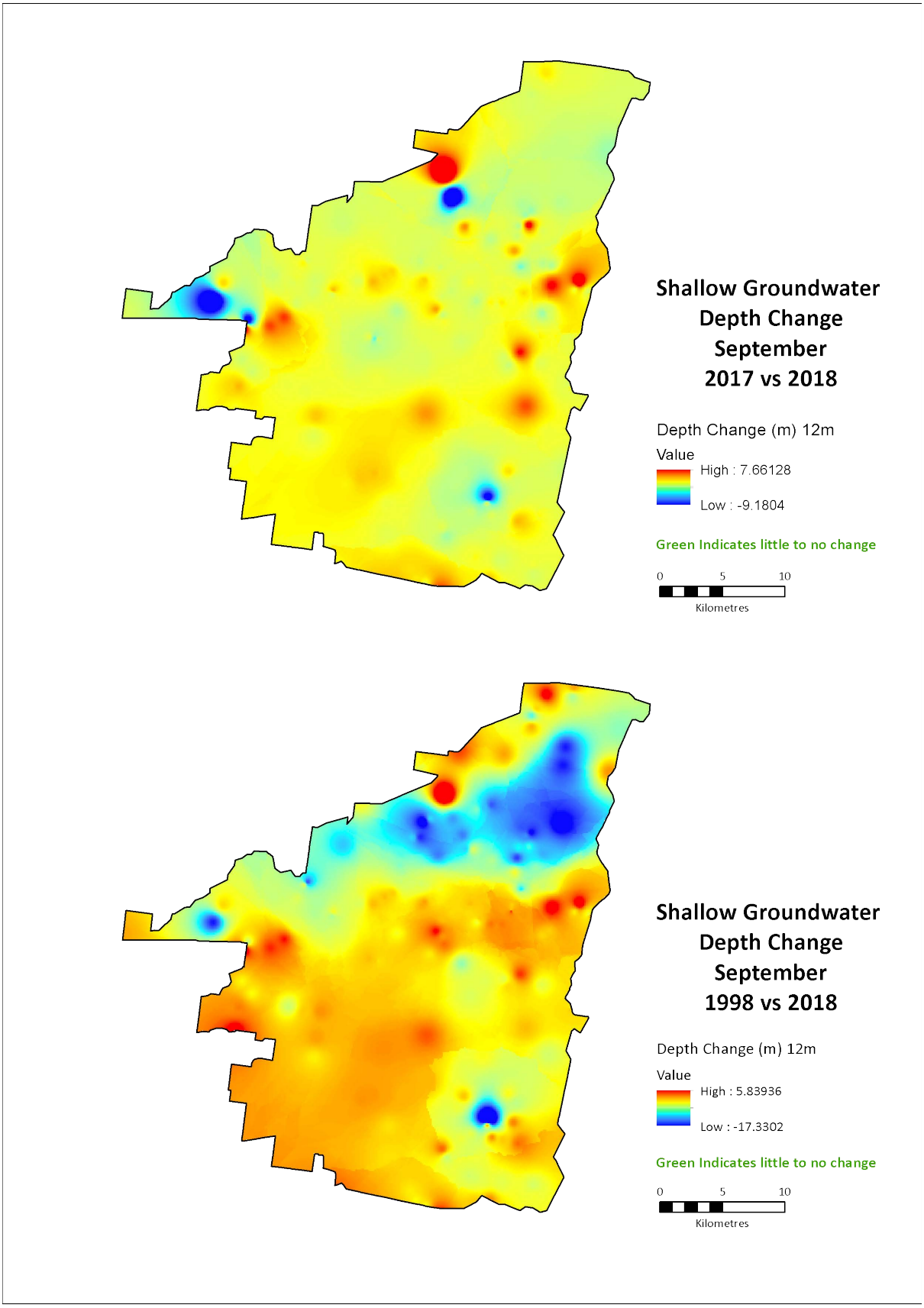


Fig 6.6: Changes in ground water depth, below natural surface 12-60 m piezometers comparing years 2017 to 2018 and 1998 to 2018

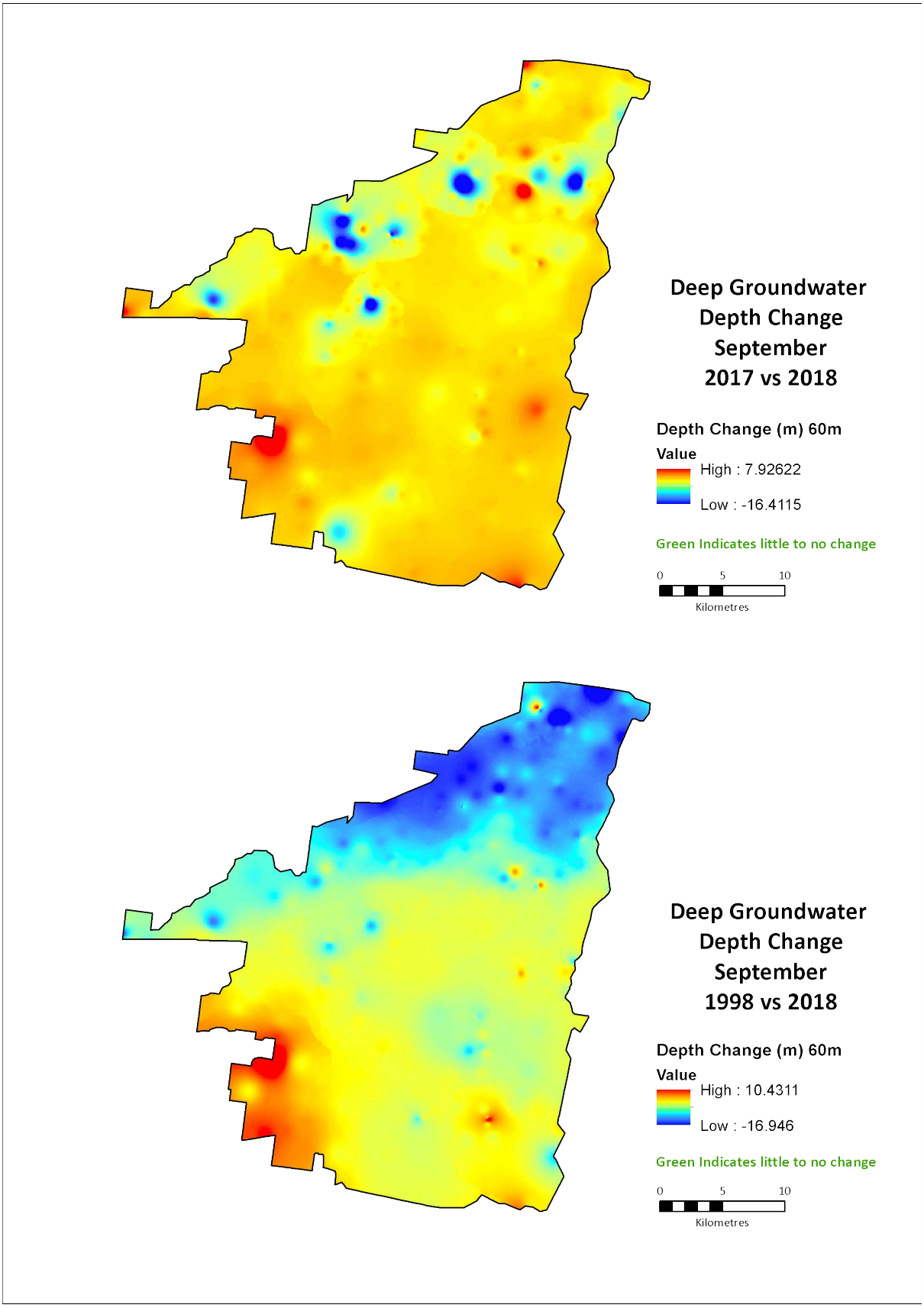
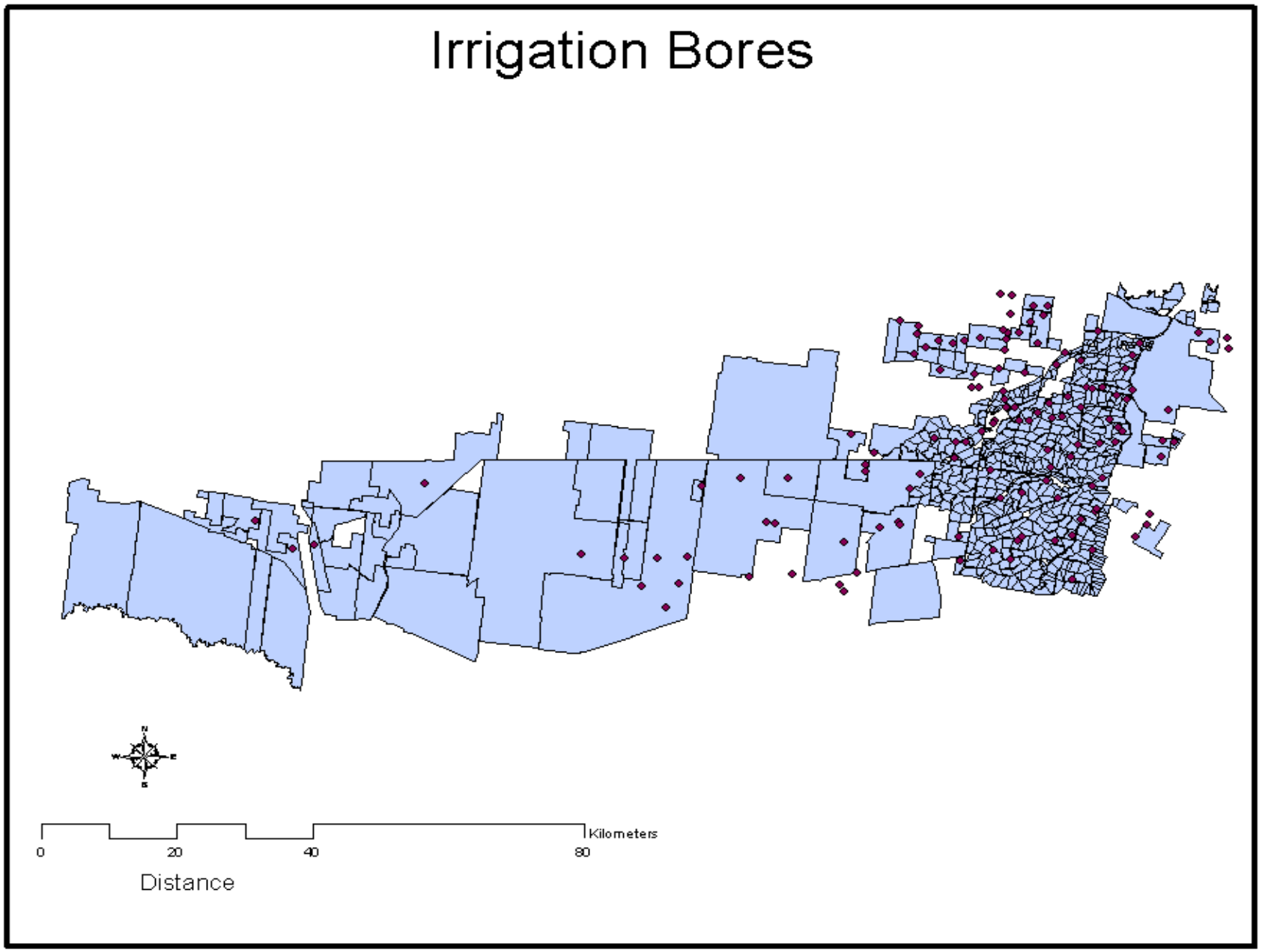


Figure 6.7: Location of CID Irrigation Bores within CICL's Area of Operations



7. Environment Protection Licence

7.1 Water Quality

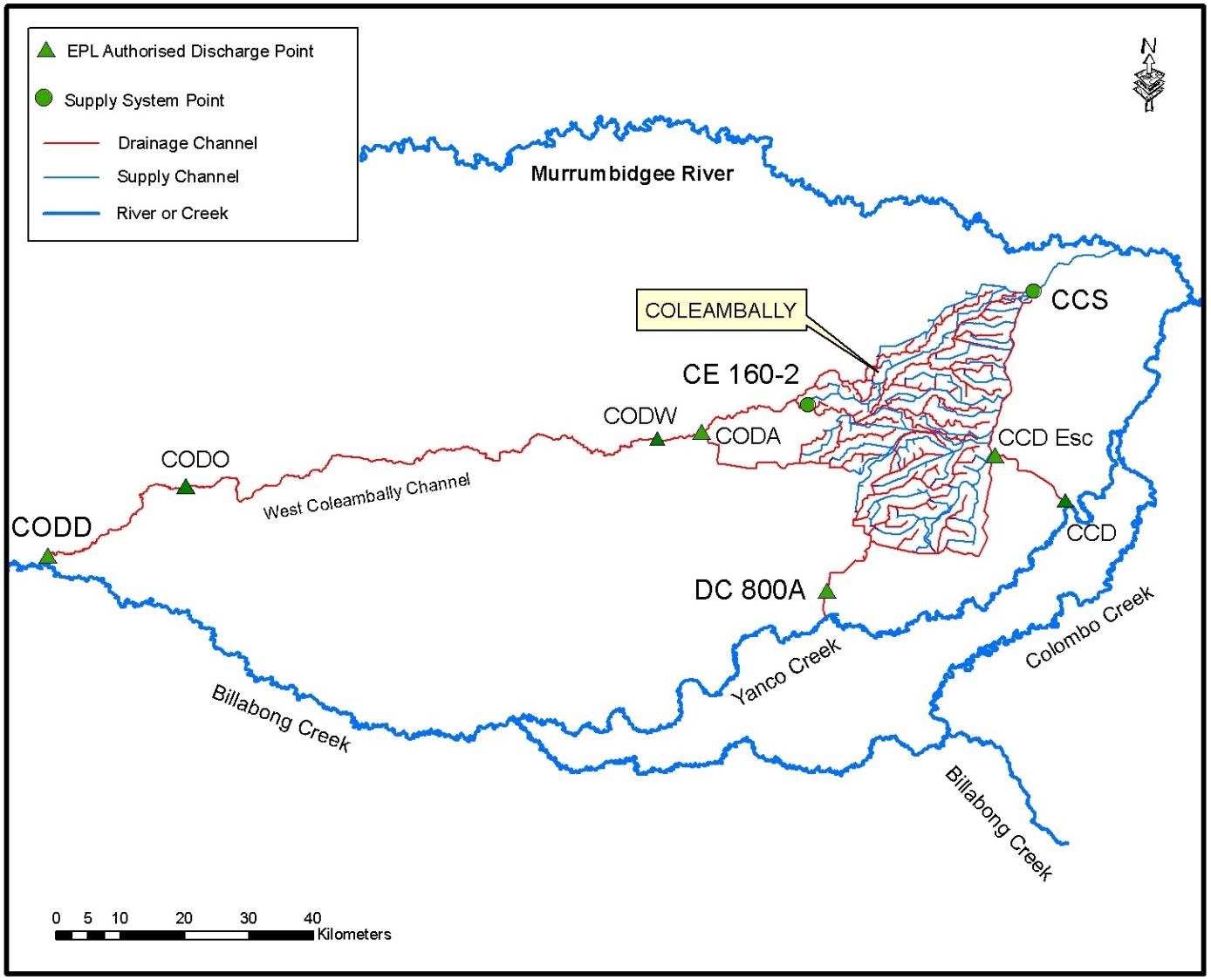
CICL's surface water quality program is aimed at monitoring supply and drainage water quality within CICL's operational area, including at the licensed discharge points. The program monitors flow, turbidity, dissolved oxygen, pH, salinity, chemical and nutrient levels at various points in compliance with licence conditions. CICL's water quality monitoring sites are shown in Figure 7.1.

There are three licensed drainage discharge points; Coleambally Outfall Drain monitoring site A (CODA) is used as a licensed site in place of Coleambally Outfall Drain monitoring site D (CODD) for the Rice Chemical Management Program (RCMP). Although the CODA site is not identified in the Environment Protection Licence (EPL), the site has been selected for its accessibility and is listed as an approved monitoring site. This arrangement has previously been agreed with the Department of Environment and Conservation (DEC), NSW DPI Water and the NSW Environmental Protection Agency.

The Approval 2012 refers to the above discharge points; however a different terminology has been used to identify these sites.

At the licensed sites, flow, salinity and the temperature of drainage water are monitored continuously. Monthly water samples are collected from these sites and are analysed for the presence of chemicals as required by CICL's EPL. Samples are also collected and analysed from one supply site at the Main Canal (CCS) and one escape site (CE-160-2) when flowing. Salinity levels at the CCS are monitored constantly.

Figure 7.1: Water Quality Monitoring Sites



7.2 Rice Chemical Monitoring Program (RCMP)

From October to December each year, water samples are collected from a maximum number of 21 sites (dependent on flow) and are analysed for Molinate residue levels as part of the RCMP.

Molinate residue levels are used as an indicator to the presence of other rice chemicals in the drainage water.

There were no detections of Molinate exceeding either the Notification Level or Action Level. The related results are in Table 7.1.

Table 7.1 RCMP Licence Point Results 2017

Date	Sample ID	Sample point	Report No.	Molinate µg/L
18/10/2017	5	CODW	1726123	<0.005
18/10/2017	18	DC800A	1726123	<0.005
23/10/2017	5	CODW	1726517	<0.005
23/10/2017	18	DC800A	1726517	<0.005
2/11/2017	5	CODW	NS	NS
2/11/2017	18	DC800A	1727575	<0.005
7/11/2017	5	CODW	1729088	<0.005
7/11/2017	18	DC800A	1729088	<0.005
13/11/2017	5	CODW	1728470	0.02
13/11/2017	18	DC800A	1728470	<0.005
20/11/2017	5	CODW	1729208	0.072
20/11/2017	18	DC800A	1729208	<0.005
27/11/2017	5	CODW	1729893	<0.005
27/11/2017	18	DC800A	1729893	<0.005
6/12/2017	5	CODW	1730926	0.028
6/12/2017	18	DC800A	1730926	0.038
11/12/2017	5	CODW	1731417	0.08
11/12/2017	18	DC800A	1731417	0.054

Note:
NS = Not Sampled Supply Water Flow Only
NR = No Result

7.3 Chemical Use

Table 8.2: CICL Chemical Usage in 2017/18

Product	Litres	Kg	Application
Access	**74**		Boxthorns
Surfactant Oil	**1,774**		Surfactant
700 Surfactant	**405**		Surfactant
Dicamba	**1,211**		Weed control
Dalapon		**9,410**	Cumbungi, water couch
Grazon	**8**		Brush weeds
Glyphosate	**3,187**		Weed control
Sulfomac		**6**	Weeds around structures
Teton	**700**		Aquatic Weeds
Tordon	**31**		Woody Weeds

7.4 Reportable Incidents

There were ten reportable water quality incidents in 2017/18 where chemicals exceeded notifiable levels.

Table 7.3 Reportable water quality incidents 2017/18

Month	Program	Chemical	Level	Drainage Area
October	Monthly	Metolachlor	9.96	DC800
November	Monthly	Metolachlor	0.062	CODW
November	Monthly	Atrazine	16.5	DC800
November	Monthly	Metolachlor	5.51	DC800
November	Monthly	Diazinon	0.017	CODO
December	Monthly	Metolachlor	0.745	CODW
December	Monthly	Metolachlor	0.821	DC800
December	Monthly	Diuron	0.276	DC800
January	Monthly	Metolachlor	0.2	DC800
April	Monthly	Chlorpyrifos	0.12	DC800

1. Appendices

A1: Water Quality Data

Table A1.1 Nutrient (mg/L) and Pesticide Data (µg/L) for CCS at Coleambally Main Canal (Tubbo Wells) for 2017/18

Month	Oxidised Nitrogen as N	Soluble Phosphorous	Total Nitrogen	Total Phosphorous	Total Suspended Solids	Atrazine	Chlorpyrifos	Diazinon	Diuron	Malathion	Metolachlor	Molinate	Simazine	Thiobencarb	Trifluralin	2, 4-D
July	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF
Aug	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF
Sep	0.01	<0.01	0.8	0.02	28	<0.005	<0.005	<0.005	<0.005	NA	NA	NA	0.007	NA	<0.005	<0.01
Oct	0.02	<0.01	0.5	0.04	24	<0.005	<0.005	<0.005	<0.005	<0.002	<0.005	<0.005	0.015	<0.005	<0.005	<0.01
Nov	<0.01	<0.01	0.3	0.03	27	<0.005	<0.005	<0.005	<0.005	<0.002	<0.005	<0.005	0.006	<0.005	<0.005	<0.01
Dec	0.26	<0.01	0.8	0.06	50	0.031	<0.005	<0.005	<0.005	<0.002	<0.005	<0.005	0.025	<0.005	<0.005	<0.01
Jan	<0.01	<0.01	0.2	0.02	28	<0.005	<0.005	0.008	<0.005	NA	<0.005	NA	0.117	NA	<0.005	<0.01
Feb	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mar	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Apr	<0.01	<0.01	<0.1	<0.01	<5	0.007	<0.005	<0.005	<0.005	<0.002	NA	NA	0.082	NA	<0.005	<0.01
May	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Jun	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF

NF = No Flow
NA = Not Applicable
NS = Not Sampled

Table A1.2 Nutrient (mg/L) and Pesticide Data (µg/L) for CODW (WCC) at Wonga Station for 2017/18

Month	Oxidised Nitrogen as N	Soluble Phosphorous	Total Nitrogen	Total Phosphorous	Total Suspended Solids	Atrazine	Chlorpyrifos	Diazinon	Diuron	Malathion	Metolachlor	Molinate	Simazine	Thiobencarb	Trifluralin	2, 4-D
July	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aug	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sep	0.02	<0.01	8.2	1.51	40	0.005	<0.005	<0.005	<0.005	NA	NA	NA	0.017	NA	<0.005	0.02
Oct	<0.01	<0.01	1.6	0.15	84	0.26	<0.005	<0.005	0.017	<0.002	0.014	<0.005	0.019	<0.005	<0.005	0.22
Nov	<0.01	<0.01	0.8	0.14	125	2.12	<0.005	0.006	0.012	<0.002	0.062	0.111	0.083	<0.005	<0.005	<0.01
Dec	0.48	<0.01	2.5	0.22	172	2.59	<0.005	<0.005	0.046	<0.002	0.745	0.037	0.104	0.006	<0.005	0.02
Jan	<0.01	<0.01	0.7	0.13	195	0.012	<0.005	<0.005	<0.005	<0.002	<0.005	NA	0.137	NA	<0.005	<0.01
Feb	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mar	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Apr	0.02	<0.01	1.3	0.06	68	0.023	0.122	<0.005	<0.005	<0.002	NA	NA	<0.005	NA	<0.005	0.85
May	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NA	NA	NF	NA	NF	NF
Jun	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

NF = No Flow
NA = Not Applicable
NS = Not Sampled

Table A1.3 Nutrient (mg/L) and Pesticide Data (µg/L) for CCD at Outfall into Yanco Creek for 2017/18

Month	Oxidised Nitrogen as N	Soluble Phosphorous	Total Nitrogen	Total Phosphorous	Total Suspended Solids	Atrazine	Chlorpyrifos	Diazinon	Diuron	Malathion	Metolachlor	Molinate	Simazine	Thiobencarb	Trifluralin	2, 4-D
July	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aug	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sep	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Oct	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nov	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dec	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Jan	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Feb	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mar	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Apr	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
May	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Jun	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

NF = No Flow
NA = Not Applicable
NS = Not Sampled

Table A1.4 Nutrient (mg/L) and Pesticide Data (µg/L) for Coleambally DC800 at Outfall into Yanco Creek for 2017/18

Month	Oxidised Nitrogen as N	Soluble Phosphorous	Total Nitrogen	Total Phosphorous	Total Suspended Solids	Atrazine	Chlorpyrifos	Diazinon	Diuron	Malathion	Metolachlor	Molinate	Simazine	Thiobencarb	Trifluralin	2, 4-D
July	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aug	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sep	0.6	<0.01	6.7	0.21	143	0.296	<0.005	<0.005	<0.005	NA	NA	NA	0.309	NA	<0.005	0.25
Oct	0.22	<0.01	2.0	0.29	248	9.43	<0.005	<0.005	0.197	<0.002	9.96	<0.005	0.125	<0.005	<0.005	0.03
Nov	<0.01	<0.01	1.5	0.20	99	16.5	<0.005	<0.005	0.182	<0.002	5.51	<0.005	0.147	0.006	<0.005	0.3
Dec	<0.01	<0.01	1.6	0.18	126	1.44	<0.005	<0.005	0.276	<0.002	0.821	0.01	0.034	0.241	<0.005	0.02
Jan	<0.01	<0.01	0.6	0.08	110	0.007	<0.005	0.006	<0.005	NA	0.009	NA	0.147	NA	<0.005	0.02
Feb	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mar	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Apr	0.02	<0.01	0.3	0.02	86	<0.005	<0.005	<0.005	<0.005	NA	NA	NA	<0.005	NA	<0.005	<0.01
May	NF	NF	NF	NF	NF	NF	NF	NF	NF	NA	NA	NA	NF	NA	NF	NF
Jun	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

NF = No Flow
NA = Not Applicable
NS = Not Sampled

Table A1.5 Nutrient (mg/L) and Pesticide Data (µg/L) for CODO (WCC) at Oaklands Station for 2017/18

Month	Oxidised Nitrogen as N	Soluble Phosphorous	Total Nitrogen	Total Phosphorous	Total Suspended Solids	Atrazine	Chlorpyrifos	Diazinon	Diuron	Malathion	Metolachlor	Molinate	Simazine	Thiobencarb	Trifluralin	2, 4-D
July	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aug	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sep	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF
Oct	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF
Nov	NA	NA	NA	NA	NA	0.127	<0.005	0.017	<0.005	<0.004	<0.005	<0.005	0.031	<0.005	<0.005	<0.01
Dec	NA	NA	NA	NA	NA	0.634	<0.005	<0.005	0.017	<0.002	0.2	<0.005	0.083	<0.005	<0.005	0.03
Jan	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF
Feb	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mar	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Apr	NF	NF	NF	NF	NF	NF	NF	NF	NF	NA	NA	NA	NF	NA	NF	NF
May	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF
Jun	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

NF = No Flow
NA = Not Applicable
NS = Not Sampled

A2 Gauging Information

In addition to the twice yearly checks of all farm supply points, CICL operate and maintain an Accusonic Transit Time meter at the Main Offtake from Murrumbidgee River. This meter is compliant with *NSW Interim Water Metering Standards for Open Channel Metering* and the reported flow rate is verified on a monthly basis with a gauging undertaken by an independent hydrographic contractor using an Acoustic Doppler Current Profiler (ADCP). The results of the gaugings are shown in the table immediately below. During the verification process, if there is more than 5% difference between the Accusonic meter and the gauging, a second gauging is taken.

Prior to commencing the 2016/17 irrigation season a new Accusonic time of flight flow meter was installed at a location 500 meters downstream of CICL's Main Offtake from Gogelderie Weir. The original meter located upstream of the offtake is still functional but was found to be subject to silt deposition which could impact the accuracy. The downstream meter is now the primary meter.

Table A2.1 ADCP Guaging of Accusonic Transit Time meter at Main Offtake

2017/18 Season	Date	Time	Gauged Flow Cumecs	Gauged Flow ML/Day	Average D/S Accusonic Reading	% Deviation Gauged vs Accus
62	21/09/2017	10:22	**10.59**	**914.976**	875	4.37%
63	21/09/2017	11:06	**10.54**	**910.656**	888	2.49%
64	11/10/2017	9:52	**19.07**	**1,647.65**	1,659	-0.69%
65	11/10/2017	10:25	**19.313**	**1,668.64**	1,640	1.72%
66	16/11/2017	12:08	**14.21**	**1,227.74**	1,236	-0.67%
67	16/11/2017	14:28	**14.38**	**1,242.43**	1,258	-1.25%
68	15/12/2017	8:16	**15.27**	**1,319.33**	1,296	1.77%
69	17/01/2018	8:28	**27.98**	**2,417.47**	2,311	4.40%
70	17/01/2018	9:18	**26.918**	**2,325.72**	2,440	-4.91%
71	15/02/2018	7:51	**16.304**	**1,408.67**	1,384	1.75%
72	15/02/2018	8:38	**16.713**	**1,444**	1,431	0.90%
73	15/03/2018	9:36	**18.66**	**1,612.22**	1,680	-4.20%

Other regular Quality Assurance checks undertaken against this meter include -

- Both meters report back live through CICL's SCADA system. On a daily basis the flow being reported from both of these meters is compared to ensure the reported flow rates are within 5%.
- CICL also regularly run a report to compare that the cumulative flow total reported from both meters are in agreeance.
- The SCADA system reports flow rates, individual velocities of each of the four velocity paths, and the water -level from which the area is calculated. These parameters, along with analytical parameters such as 'signal to noise ratio' are reviewed on a daily basis.
- The recorded water-level is manually checked against an external reading every two weeks.
- The cross-sectional area is extracted from each gauging and over-plotted against the original surveyed cross section to monitor for scour or siltation.

CICL Area of Operations (AO) Plan

- Rice Chemical Monitoring Point
- Levee

CICL Channel Infrastructure

- Supply Channel
- Drainage Channel
- Escape Channel
- Roads
- Coleambally Irrigation Area
- Kerarbury Irrigation Area (benefitted lands)
- West Coleambally Water Management Area
- DC800 Farms in AO
- State Forests in AO
- Coleambally Irrigation Biodiversity Reserve Trust Blocks
- Local Land Services (LLS)
- Excised from AO post-privitisation
- CICL Additional Area

MURRUM BIDGEE RIVER
STURT HWY
KIDMAN WAY
DARLINGTON POINT
Tombullen Storage Regulator
CCS
DC600C
DC400C
DC530A
DC400A
COLEAMBALLY
DC400D
CE160-2DC500A
DC550A
DC530B
CODA
DC600B
DC600A
CCD
DC820A
DC800D
DC800C
DC830A
DC800B
DC840B
DC800A
COBB HWY
KIDMAN WAY
NEWELL HWY
COLOMBO CREEK
TARCO CREEK
BILLABONG CREEK
JERILDERIE

N

0 5 10 20 30 40 50
Kilometres

GDA94 MGA Zone55

DISCLAIMER
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Note: All CICL land under infrastructure forms part of the AO

Production Date: 28/11/16, Graham Parton
Location: X:\Map_Production\Compliance Maps\A0_Plan.mxd