

GOULBURN BROKEN –
CATCHMENT MANAGEMENT AUTHORITY

Goulburn River

Environmental Flow Monitoring

November 2011



**GOULBURN
BROKEN**

CATCHMENT
MANAGEMENT
AUTHORITY

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PWL INDICATOR METHODOLOGY

PHASE 1:

During the period 7th – 9th & 15th November 2011 (Eildon releasing approximately 5,000 ML/d), peak water level indicators were installed along the Goulburn River between Lake Eildon and Killingworth at 10 sites pre-determined by GBCMA.

A number of galvanised posts, varying from 2-6 metres in length, were driven in up a bank at each site. A PVC dowel, coated with a water-based paint was inserted inside each post. These dowels acted as the peak water level indicators. Water would ingress inside the posts, washing away the paint leaving a clear indication of the peak level.

In order to obtain greater peak level accuracy;

- multiple holes were drilled at the bottom of each post to allow for water ingress,
- the dowels were securely fixed with wire inside the posts to prevent any up or down movement,
- the top of each dowel was fixed flush with the top of each post,
- the top of each post down to the current water level was measured for future visit referencing (posts in water only) and
- a steel cap was firmly secured over the top of each post to prevent minimal interference from rain, human and wild life.

Prior to leaving each site, a Temporary Bench Mark was determined and clearly identified utilising a bolt in a nearby mature tree/fence post marked with yellow spray-paint. Following this, each post was then levelled and reduced.

PHASE 2:

On the 18th November, after the release of approximately 7,000 ML/d from Eildon, each site was visited to record the peak level. This consisted of removing the coated dowel from inside each post and with a tape measure, measuring the distance from the top of the dowel down to the mark where paint had clearly been washed away. The dowels were then re-painted and re-installed for further monitoring.

The top of each post down to the current water level was also measured and recorded to give an indication of how much the water level had dropped since the peak.

The Eildon Tail Gauge and Killingworth permanent monitoring sites were also physically measured on the 18th November for flow rate and the logger data downloaded.

From the measurements obtained during this phase, it was noted that the peak rise in water level since installation (approx. 5,000 ML/d to approx. 7,000 ML/d) varied between 8mm to 360mm across the 10 sites.

It was also noted that the current drop in water level since reaching the 7,000 ML/d peak level varied between 10mm to 39mm across the 10 sites.

**Note: It is believed that upon the release of a greater amount of water than the current volume, a small 'wave-like-effect' body of water travels at the front of the release which in-turn produce's a slightly higher peak level than what the actual peak main body of water truly is.*

PHASE 3:

On the 24th November, after the release of approximately 10,000 ML/d, each site was visited to record the peak level.

The Alexandra temporary site along with the Eildon Tail Gauge and Killingworth permanent sites were also physically measured on the 24th November for flow rate and the logger data downloaded.

From the measurements obtained during this phase, it was noted that the peak rise in water level since the peak level in Phase 2 (approx. 7,000 ML/d to approx. 10,000 ML/d) varied between 182mm to 431mm across the 10 sites.

It was also noted that the current drop in water level since reaching the 10,000 ML/d peak level varied between 6mm to 30mm across the 10 sites.

SITE 1 – POINT HILL RIVER RESERVE



DETAILS	COMMENTS
Site No. / Identifier	1 – Point Hill River Reserve
Date of Installation	7/11/2011
Time (Eastern Standard Time)	1300
GPS Co-ordinates	398238 5875864
No. of Posts Installed	1 (right bank)
Top of Post 1 to Current Water Level (m)	1.132
Rising / Falling / Steady	Rising
Photos	Yes
Temporary Bench Mark	Yellow bolt – top of end fence post, 8m down-stream of PWL indicators
Reduced Level – TBM (m)	10.000
Reduced Level – Top of Post 1 (m)	7.601
Date of Reading	18/11/2011
Time (EST)	0800
Flow (ML/d)	7,085 = Released out of Eildon (0740 EST) 228.5 = Rubicon River – Site 405241B (0745 EST) 849.5 = Acheron River – Site 405209B (0747 EST) 7,386 = Total @ Killingworth (0742 EST)
Top of Post 1 to Peak Water Level (m)	0.992
Reduced Level – Peak Water Level (m)	6.609
Top of Post 1 to Current Water Level (m)	1.010
Reduced Level – Current Water Level (m)	6.591
Date of Reading	24/11/2011
Time (EST)	0758
Flow (ML/d)	8,980 = Released out of Eildon (0740 EST) 211.2 = Rubicon River – Site 405241B (0742 EST) 840.6 = Acheron River – Site 405209B (0743 EST) 9,446 = Total @ Killingworth (0744 EST)
Top of Post 1 to Peak Water Level (m)	0.611
Reduced Level – Peak Water Level (m)	6.990
Top of Post 1 to Current Water Level (m)	0.624
Reduced Level – Current Water Level (m)	6.977

SITE 2 – TURN-OFF OPPOSITE THOMS LANE



DETAILS	COMMENTS
Site No. / Identifier	2 – Turn-off opposite Thoms Lane
Date of Installation	7/11/2011
Time (Eastern Standard Time)	1440
GPS Co-ordinates	395486 5876587
No. of Posts Installed	2 (right bank)
Top of Post 1 to Current Water Level (m)	0.995
Rising / Falling / Steady	Rising
Photos	Yes
Temporary Bench Mark	Yellow bolt – in top of pine post, left of entrance to site
Reduced Level – TBM (m)	10.000
Reduced Level – Top of Post 1 (m)	7.200
Reduced Level – Top of Post 2 (m)	8.207
Date of Reading	18/11/2011
Time (EST)	0830
Flow (ML/d)	7,085 = Released out of Eildon (0740 EST) 228.5 = Rubicon River – Site 405241B (0745 EST) 849.5 = Acheron River – Site 405209B (0747 EST) 7,386 = Total @ Killingworth (0742 EST)
Top of Post 1 to Peak Water Level (m)	0.904
Reduced Level – Peak Water Level (m)	6.296
Top of Post 1 to Current Water Level (m)	0.922
Reduced Level – Current Water Level (m)	6.278
Date of Reading	24/11/2011
Time (EST)	0819
Flow (ML/d)	8,980 = Released out of Eildon (0740 EST) 211.2 = Rubicon River – Site 405241B (0742 EST) 840.6 = Acheron River – Site 405209B (0743 EST) 9,446 = Total @ Killingworth (0744 EST)
Top of Post 1 to Peak Water Level (m)	0.572
Reduced Level – Peak Water Level (m)	6.628
Top of Post 1 to Current Water Level (m)	0.600
Reduced Level – Current Water Level (m)	6.600

SITE 3 – THORNTON BEACH RIVER RESERVE



DETAILS	COMMENTS
Site No. / Identifier	3 – Thornton Beach River Reserve
Date of Installation	7/11/2011
Time (Eastern Standard Time)	1545
GPS Co-ordinates	393445 5876564
No. of Posts Installed	2 (right bank)
Top of Post 1 to Current Water Level (m)	1.092
Rising / Falling / Steady	Rising
Photos	Yes
Temporary Bench Mark	Yellow ramset pin – North/West corner of bridge abutment
Reduced Level – TBM (m)	10.000
Reduced Level – Top of Post 1 (m)	6.470
Reduced Level – Top of Post 2 (m)	7.347
Date of Reading	18/11/2011
Time (EST)	0845
Flow (ML/d)	7,085 = Released out of Eildon (0740 EST) 228.5 = Rubicon River – Site 405241B (0745 EST) 849.5 = Acheron River – Site 405209B (0747 EST) 7,386 = Total @ Killingworth (0742 EST)
Top of Post 1 to Peak Water Level (m)	1.031
Reduced Level – Peak Water Level (m)	5.439
Top of Post 1 to Current Water Level (m)	1.048
Reduced Level – Current Water Level (m)	5.422
Date of Reading	24/11/2011
Time (EST)	0834
Flow (ML/d)	8,980 = Released out of Eildon (0740 EST) 211.2 = Rubicon River – Site 405241B (0742 EST) 840.6 = Acheron River – Site 405209B (0743 EST) 9,446 = Total @ Killingworth (0744 EST)
Top of Post 1 to Peak Water Level (m)	0.794
Reduced Level – Peak Water Level (m)	5.676
Top of Post 1 to Current Water Level (m)	0.810
Reduced Level – Current Water Level (m)	5.660

SITE 4 – GILMORES BRIDGE



DETAILS	COMMENTS
Site No. / Identifier	4 – Gilmores Bridge
Date of Installation	8/11/2011
Time (Eastern Standard Time)	0900
GPS Co-ordinates	390806 5877790
No. of Posts Installed	2 (right bank)
Top of Post 1 to Current Water Level (m)	0.941
Rising / Falling / Steady	Steady
Photos	Yes
Temporary Bench Mark	Yellow bolt – in tree, 10m North of PWL indicators on walking track
Reduced Level – TBM (m)	10.000
Reduced Level – Top of Post 1 (m)	9.422
Reduced Level – Top of Post 2 (m)	10.414
Date of Reading	18/11/2011
Time (EST)	0900
Flow (ML/d)	7,085 = Released out of Eildon (0740 EST) 228.5 = Rubicon River – Site 405241B (0745 EST) 849.5 = Acheron River – Site 405209B (0747 EST) 7,386 = Total @ Killingworth (0742 EST)
Top of Post 1 to Peak Water Level (m)	0.933
Reduced Level – Peak Water Level (m)	8.489
Top of Post 1 to Current Water Level (m)	0.943
Reduced Level – Current Water Level (m)	8.479
Date of Reading	24/11/2011
Time (EST)	0854
Flow (ML/d)	8,980 = Released out of Eildon (0740 EST) 211.2 = Rubicon River – Site 405241B (0742 EST) 840.6 = Acheron River – Site 405209B (0743 EST) 9,446 = Total @ Killingworth (0744 EST)
Top of Post 1 to Peak Water Level (m)	0.721
Reduced Level – Peak Water Level (m)	8.701
Top of Post 1 to Current Water Level (m)	0.743
Reduced Level – Current Water Level (m)	8.679

SITE 5 – HERITAGE LISTED BRIDGE



DETAILS	COMMENTS
Site No. / Identifier	5 – Heritage Listed Bridge
Date of Installation	8/11/2011
Time (Eastern Standard Time)	1000
GPS Co-ordinates	385696 5877839
No. of Posts Installed	2 (right bank)
Top of Post 1 to Current Water Level (m)	1.031
Rising / Falling / Steady	Steady
Photos	Yes
Temporary Bench Mark	Yellow bolt – North/West corner of bridge
Reduced Level – TBM (m)	10.000
Reduced Level – Top of Post 1 (m)	7.394
Reduced Level – Top of Post 2 (m)	8.309
Date of Reading	18/11/2011
Time (EST)	0920
Flow (ML/d)	7,085 = Released out of Eildon (0740 EST) 228.5 = Rubicon River – Site 405241B (0745 EST) 849.5 = Acheron River – Site 405209B (0747 EST) 7,386 = Total @ Killingworth (0742 EST)
Top of Post 1 to Peak Water Level (m)	1.008
Reduced Level – Peak Water Level (m)	6.386
Top of Post 1 to Current Water Level (m)	1.030
Reduced Level – Current Water Level (m)	6.364
Date of Reading	24/11/2011
Time (EST)	0919
Flow (ML/d)	8,980 = Released out of Eildon (0740 EST) 211.2 = Rubicon River – Site 405241B (0742 EST) 840.6 = Acheron River – Site 405209B (0743 EST) 9,446 = Total @ Killingworth (0744 EST)
Top of Post 1 to Peak Water Level (m)	0.826
Reduced Level – Peak Water Level (m)	6.568
Top of Post 1 to Current Water Level (m)	0.852
Reduced Level – Current Water Level (m)	6.542

SITE 6 – PRIVATE PROPERTY



DETAILS	COMMENTS
Site No. / Identifier	6 – Private Property
Date of Installation	8/11/2011
Time (Eastern Standard Time)	1205
GPS Co-ordinates	383467 5879146
No. of Posts Installed	2 (left bank)
Top of Post 1 to Current Water Level (m)	1.208
Rising / Falling / Steady	Steady
Photos	Yes
Temporary Bench Mark	Yellow bolt – in tree, 5m up-stream of PWL indicators
Reduced Level – TBM (m)	10.000
Reduced Level – Top of Post 1 (m)	9.784
Reduced Level – Top of Post 2 (m)	10.592
Date of Reading	18/11/2011
Time (EST)	1000
Flow (ML/d)	7,085 = Released out of Eildon (0740 EST) 228.5 = Rubicon River – Site 405241B (0745 EST) 849.5 = Acheron River – Site 405209B (0747 EST) 7,386 = Total @ Killingworth (0742 EST)
Top of Post 1 to Peak Water Level (m)	1.158
Reduced Level – Peak Water Level (m)	8.626
Top of Post 1 to Current Water Level (m)	1.193
Reduced Level – Current Water Level (m)	8.591
Date of Reading	24/11/2011
Time (EST)	0950
Flow (ML/d)	8,980 = Released out of Eildon (0740 EST) 211.2 = Rubicon River – Site 405241B (0742 EST) 840.6 = Acheron River – Site 405209B (0743 EST) 9,446 = Total @ Killingworth (0744 EST)
Top of Post 1 to Peak Water Level (m)	0.858
Reduced Level – Peak Water Level (m)	8.926
Top of Post 1 to Current Water Level (m)	0.885
Reduced Level – Current Water Level (m)	8.899

* Owner – Radic Milkovic

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SITE 7 – OFF-STREAM LAGOON



DETAILS	COMMENTS
Site No. / Identifier	7 – Off-Stream Lagoon
Date of Installation	8/11/2011
Time (Eastern Standard Time)	1400
GPS Co-ordinates	379433 5881087
No. of Posts Installed	1 (left bank)
Top of Post 1 to Current Water Level (m)	2.925
Rising / Falling / Steady	Steady
Photos	Yes
Temporary Bench Mark	Yellow bolt – in pine post at gate entrance
Reduced Level – TBM (m)	10.000
Reduced Level – Top of Post 1 (m)	9.471
Date of Reading	18/11/2011
Time (EST)	1035
Flow (ML/d)	7,085 = Released out of Eildon (0740 EST) 228.5 = Rubicon River – Site 405241B (0745 EST) 849.5 = Acheron River – Site 405209B (0747 EST) 7,386 = Total @ Killingworth (0742 EST)
Top of Post 1 to Peak Water Level (m)	2.875
Reduced Level – Peak Water Level (m)	6.596
Top of Post 1 to Current Water Level (m)	2.905
Reduced Level – Current Water Level (m)	6.566
Date of Reading	24/11/2011
Time (EST)	1030
Flow (ML/d)	8,980 = Released out of Eildon (0740 EST) 211.2 = Rubicon River – Site 405241B (0742 EST) 840.6 = Acheron River – Site 405209B (0743 EST) 9,446 = Total @ Killingworth (0744 EST)
Top of Post 1 to Peak Water Level (m)	2.568
Reduced Level – Peak Water Level (m)	6.903
Top of Post 1 to Current Water Level (m)	2.590
Reduced Level – Current Water Level (m)	6.881

* PWL indicator installed off-stream in lagoon

SITE 8 – BERDUE HOMESTEAD



DETAILS	COMMENTS
Site No. / Identifier	8 – Berdue Homestead
Date of Installation	15/11/2011
Time (Eastern Standard Time)	1230
GPS Co-ordinates	376357 5883294
No. of Posts Installed	1 (right bank)
Top of Post 1 to Current Water Level (m)	2.803
Rising / Falling / Steady	Steady
Photos	Yes
Temporary Bench Mark	Yellow bolt – in black tree, 7m up-stream of PWL indicator
Reduced Level – TBM (m)	10.000
Reduced Level – Top of Post 1 (m)	11.080
Date of Reading	18/11/2011
Time (EST)	1115
Flow (ML/d)	7,085 = Released out of Eildon (0740 EST) 228.5 = Rubicon River – Site 405241B (0745 EST) 849.5 = Acheron River – Site 405209B (0747 EST) 7,386 = Total @ Killingworth (0742 EST)
Top of Post 1 to Peak Water Level (m)	2.443
Reduced Level – Peak Water Level (m)	8.637
Top of Post 1 to Current Water Level (m)	2.482
Reduced Level – Current Water Level (m)	8.598
Date of Reading	24/11/2011
Time (EST)	1145
Flow (ML/d)	8,980 = Released out of Eildon (0740 EST) 211.2 = Rubicon River – Site 405241B (0742 EST) 840.6 = Acheron River – Site 405209B (0743 EST) 9,446 = Total @ Killingworth (0744 EST)
Top of Post 1 to Peak Water Level (m)	2.150
Reduced Level – Peak Water Level (m)	8.930
Top of Post 1 to Current Water Level (m)	2.180
Reduced Level – Current Water Level (m)	8.900

* Farm Manager – Luke
Mob: 0439 762 090

* Farm 2IC – Glen
Mob: 0429 047 306

SITE 9 – END OF RIDDS ROAD



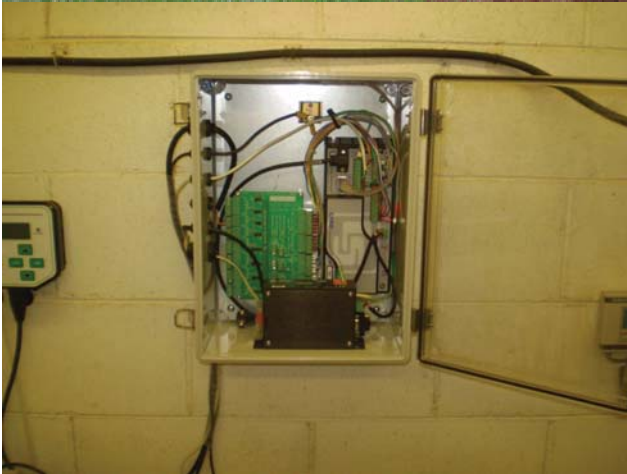
DETAILS	COMMENTS
Site No. / Identifier	9 – End of Ridds Road
Date of Installation	9/11/2011
Time (Eastern Standard Time)	0910
GPS Co-ordinates	373964 5886393
No. of Posts Installed	2 (right bank)
Top of Post 1 to Current Water Level (m)	0.827
Rising / Falling / Steady	Falling
Photos	Yes
Temporary Bench Mark	Yellow – top corner of concrete fence strainer post, 5m up-stream of PWL indicators
Reduced Level – TBM (m)	10.000
Reduced Level – Top of Post 1 (m)	6.872
Reduced Level – Top of Post 2 (m)	7.631
Date of Reading	18/11/2011
Time (EST)	1220
Flow (ML/d)	7,085 = Released out of Eildon (0740 EST) 228.5 = Rubicon River – Site 405241B (0745 EST) 849.5 = Acheron River – Site 405209B (0747 EST) 7,386 = Total @ Killingworth (0742 EST)
Top of Post 1 to Peak Water Level (m)	0.555
Reduced Level – Peak Water Level (m)	6.317
Top of Post 1 to Current Water Level (m)	0.587
Reduced Level – Current Water Level (m)	6.285
Date of Reading	24/11/2011
Time (EST)	1250
Flow (ML/d)	8,980 = Released out of Eildon (0740 EST) 211.2 = Rubicon River – Site 405241B (0742 EST) 840.6 = Acheron River – Site 405209B (0743 EST) 9,446 = Total @ Killingworth (0744 EST)
Top of Post 1 to Peak Water Level (m)	0.220
Reduced Level – Peak Water Level (m)	6.652
Top of Post 1 to Current Water Level (m)	0.232
Reduced Level – Current Water Level (m)	6.640

SITE 10 – MOLESWORTH PEDESTRIAN BRIDGE



DETAILS	COMMENTS
Site No. / Identifier	10 – Molesworth Pedestrian Bridge
Date of Installation	9/11/2011
Time (Eastern Standard Time)	0720
GPS Co-ordinates	370737 5885851
No. of Posts Installed	2 (left bank)
Top of Post 1 to Current Water Level (m)	0.947
Rising / Falling / Steady	Falling
Photos	Yes
Temporary Bench Mark	Red – bolt head on South/West wing wall of pedestrian/bicycle bridge
Reduced Level – TBM (m)	10.000
Reduced Level – Top of Post 1 (m)	6.676
Reduced Level – Top of Post 2 (m)	7.997
Date of Reading	18/11/2011
Time (EST)	1245
Flow (ML/d)	7,085 = Released out of Eildon (0740 EST) 228.5 = Rubicon River – Site 405241B (0745 EST) 849.5 = Acheron River – Site 405209B (0747 EST) 7,386 = Total @ Killingworth (0742 EST)
Top of Post 1 to Peak Water Level (m)	0.755
Reduced Level – Peak Water Level (m)	5.921
Top of Post 1 to Current Water Level (m)	0.785
Reduced Level – Current Water Level (m)	5.891
Date of Reading	24/11/2011
Time (EST)	1310
Flow (ML/d)	8,980 = Released out of Eildon (0740 EST) 211.2 = Rubicon River – Site 405241B (0742 EST) 840.6 = Acheron River – Site 405209B (0743 EST) 9,446 = Total @ Killingworth (0744 EST)
Top of Post 1 to Peak Water Level (m)	0.324
Reduced Level – Peak Water Level (m)	6.352
Top of Post 1 to Current Water Level (m)	0.330
Reduced Level – Current Water Level (m)	6.346

**SITE 405203C – EILDON TAIL GAUGE
(PERMANENT DATA LOGGER SITE)**



DETAILS	COMMENTS
Site No. / Identifier	405203C
GPS Co-ordinates	401380 5877029
Data Logger	Campbell Scientific CR800
Pressure Level Sensor	ES&S 6100
Gauge Plates	0-8m
A.H.D. Gauge Zero	205.729
Bench Mark	SR.79.H30 – Plate set in concrete near marometer shed Reduced Level = 8.269 Elevation = 213.998
Measurement Date	18/11/2011
Time (EST)	0800
Gauge Height	2.150
Flow (ML/d)	7,019
Measurement Date	24/11/2011
Time (EST)	0810
Gauge Height	2.415m
Flow (ML/d)	9,154

**SITE 405332A – ALEXANDRA
(TEMPORARY DATA LOGGER SITE)**



DETAILS	COMMENTS
Site No. / Identifier	405332A
GPS Co-ordinates	383101 5882383
Data Logger	Campbell Scientific CR800
Level Sensor	PS7000
Gauge Plates	6-9m
A.H.D. Gauge Zero	-
Temporary Bench Mark	Bolt in Red Gum tree, 29m down-stream of housing Reduced Level = 9.143m
Measurement Date	24/11/2011
Time (EST)	0931
Gauge Height	7.448m
Flow (ML/d)	10,226

**SITE 405329A – KILLINGWORTH
(PERMANENT DATA LOGGER SITE)**



DETAILS	COMMENTS
Site No. / Identifier	405329A
GPS Co-ordinates	359908 5885762
Data Logger	Campbell Scientific CR800
Pressure Level Sensor	Sontek Side-Looker
Gauge Plates	4-7m
A.H.D. Gauge Zero	-
Bench Mark	2016 top rod in concrete pillar Reduced Level = 10.781
Measurement Date	18/11/2011
Time (EST)	1100
Gauge Height	5.470m
Flow (ML/d)	8,147
Measurement Date	24/11/2011
Time (EST)	1123
Gauge Height	5.772m
Flow (ML/d)	10,244

Appendix A – Map of Sites

