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Department of Water, Land and Biodiversity Conservation

REVIEW OF QLOCK APPLICATION, RIVER MURRAY LOCK1. - PRELIMINARY REPORT – PHASE 1.

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1 INTRODUCTION

This paper summarises the first phase of a review of the QLock application used to calculate the flow over Lock weirs on the River Murray.

The review of Qlock at Lock 1 was conducted as part of a package of drought-related investigations initiated in late 2007. The review of the 'QLock' application forms part of a project to assist in monitoring the effect of flow modifications in the upper Murray on subsequent flows at Blanchetown by providing accurate, reliable flow measurements at Lock 1.

This integrates with a parallel project to determine the accuracy of QLock at all River Murray Lock weirs in South Australia.

2 BACKGROUND

During the current period of exceptional low flow in the River Murray various strategies and actions may be used to manage water levels and water quality in different segments of the river system. It is important that the effect of any actions aimed at changing conditions in the lower reach of the River Murray below Lock 1 can be accurately recorded.

Flow over Lock 1 is currently estimated daily, based on manual readings of upstream and downstream water levels and 'accounts' of the crest level of segments of the weir structure. This data is entered into a PC based application known as QLock, which uses weir flow formula to produce an estimate of total flow over the weir. An overall leakage volume can be incorporated into the calculation. The value of the leakage is estimated by the lock personnel based on their experience. No allowance is made for water passing downstream via operations of the lock chamber.

The weir flow 'calibration factor' that is used in the flow calculations is based on actual flow measurements made over 20 years ago at Locks 2, 3 and 8 and it is not certain if the same factors are applicable at other lock weirs.

It is essential that reliable, accurate flow data be available at Lock 1. This project seeks to determine the accuracy of current (and historical) flow data using the QLock application at Lock 1 and if necessary provide recommendations for improving the method used to determine Lock 1 flow.

3 OBJECTIVES – COMBINED PROJECTS

1. Undertake monthly flow gauging at Locks 1 to 7 using the most appropriate methods and technology to provide accurate flow measurements for a flow of less than 5000 ML/day.

2. Determine the accuracy of the daily QLock calculation by comparing results of flow measurements to the daily calculations of flow.

3. Determine the volume of actual leakage occurring through the Lock structures.

4. **Review the configuration of the QLock application and determine what, if any, changes need to be made to incorporate recent changes to the weir structure including the construction of fish passages and modifications to the navigable passes.**

5. If necessary, determine a more appropriate weir flow coefficient for each Lock.

This paper addresses Objective 4 for Lock 1 only and provides a summary of investigations to date related to other objectives of these projects

4 QLOCK APPLICATION

The QLock application used on a daily basis to calculate flow at the River Murray weirs in South Australia is based on a body of work undertaken in 1987 by CRCE Water Studies Pty Ltd for the Engineering and Water Supply Department of South Australia. As part of this work the coefficient applied in the formula used for calculation of the weir flow were revised (CRCE 1987). In addition, a computer program 'QLOCK' was developed that allowed the user to input historical water level and weir configuration data and produce an output of daily weir flows for a period in an annual table format. This program used two input files, one containing the lock level data and the other the weir geometry details. The two input files needed to be manually edited by the user prior to running the program.

Whilst this program was useful for producing historical data sets, it was not suitable for more interactive daily use.

A new application, also known as QLock, was developed in-house in 1988 specifically to calculate a single (daily) flow figure. This operational version of QLock is still in daily use at most weirs from Lock 1 to Lock 9. This application uses only one data file that contains a single day's weir geometry and water level data (see Appendices 1, 2 and 3).

QLock allows the user to interactively modify the water level values. If necessary, the users can also modify the weir configuration data by adjusting the measured distance from the weir rail lines down to the top of the weir sections using the QLock application without the need to manually edit the data file. These measured distance define the height of the weir crest and together with the water level values determine the head over each section of the weir. Measurements are not physically taken every day or at each change in weir configuration but are estimated by accounting for stop log movements and the height of each log installed or removed. Routine (monthly) check measurements are required to ensure that all log movements have been accounted for. It is not known what action is taken to back calculate or adjust flow data should an error be discovered.

The flow values produced by the QLock application are used for operational purposes by SA Water and River Murray Water (MDBC), are published on the WWW by SA Water and form part of River Murray Water and DWLBC primary data sets.

The QLock application has been in use for 20 years and was written in Turbo Pascal for a DOS environment. By current standards, the application is 'clunky' to use and it is doubtful that it will be supported by future computer operating systems.

In 2006, SA Water commissioned the development of a replacement application, 'Qlock V2' based on a spreadsheet system (Excel). This new application is being trialled at Lock 6 and is capable of being tailored for use at each Lock. Qlock V2 was not tested as part of this project.

During 2008, it is planned to commence installing water level and salinity data loggers at each lock weir that will incorporate telemetry functions. Lock 1 installation is currently underway.

As part of the data logging and telemetry program there is potential to create a 'complete, integrated' SA River Murray data collection and publishing system. That system could potentially incorporate a interactive tool for calculating weir flow. It is likely however that the measurement of weir crest levels will remain a manual task.

5 WEIR MODIFICATIONS

During 2007, modifications were made to the weir at Lock 1. This included the removal of all 30 boule panel bays, forming the navigable channel section of the weir, being replaced by five new stop log bays and the shortening of the left bank stop log bay to accommodate a fish passage structure.

Similar modifications have been completed at Lock 7, Lock 8 and Lock 9.

The replacement of the boule panels and the construction of the fish passage significantly alter the geometry and configuration of the weir and thus impact on the calculation of flow due to differences in discharge coefficients between the boule panels and stop logs. The discharge coefficient for boule bays is a constant value whilst the coefficient for stop log bays is a variable value dependent on head (see Appendix 4).

To account for these changes to the weir structure SA Water altered the data file that holds the weir geometry data used by the QLock application (see Appendices 1, 2). One issue that arose when making these alterations was that the QLock application does not allow for zero number of boule bays. SA Water manoeuvred around this problem by adding to the data file the five new stop log bays but retaining one boule bay that is actually the shortened stop log bay adjacent the fish passage (see Appendix 2). The result is that the five new stop log bays are incorporated correctly into the calculation and the previous 30 boule bays no longer exist however, the shortened stop log bay is treated as a boule bay and flow over this section would not be correctly calculated.

As part of this project a modified QLock data file (see Appendix 3) was developed that correctly accounts for the changes in the weir structure by including all 24 stop log bays and uses a 'dummy' boule bay entry with zero dimensions to enable the application to run.

Comparisons of flow calculated using the data file containing 23 stop log bays and one boule bay (SA Water 2007 version) and the data file containing all 24 stop log bays and nil boule panels shows that the later version produces a total flow figure 10 ML/day less than the SA Water operational version currently being used. This is for total flows in the range of 1200 ML/day representing less than 1% error.

As an additional check of the QLock calculation a spreadsheet was developed that calculates lock weir flow using the precise formula as detailed by CRCE 1987.

The spreadsheet produces a flow value between 10 ML/day and 20 ML/day greater than the daily data values produced from the operational QLock application. This is for total flows in the range of 1200 ML/day representing less than 2% difference. The difference between the calculated results is expected to be due to rounding off or other inherent arithmetic functions.

5.1 CONCLUSION

Lock 1 daily flow as calculated using the current operational QLock application is producing flow values in line with the methodology outlined in CRCE 1987. Minor improvement could be obtained by using the more recently produced data file that correctly incorporates all stop log bays.

6 CHECK DISCHARGE MEASUREMENTS

Whilst it has been proven that the QLock application correctly follows the calculation specified in CRCE 1987 no actual measurements of flow have been made at this location to ensure that the discharge coefficient used in QLock, developed from data obtained at other weirs, is appropriate to Lock 1.

As part of this project gaugings are to be conducted at Lock 1 every month and at significant changes in flow. To date, only two gaugings have been completed and thus it is too early to make any conclusions however, the results so far do show a departure between QLock results and actual discharge measurements (see Table1).

6.1 GAUGING RESULTS

During December 2007 and January 2008 two discharge measurements were conducted at Lock 1 using Acoustic Doppler Current Profiler (ADCP) equipment. An ADCP was used as stream velocities were slower than could be reliably measured using conventional fan type mechanical current meters. Whilst there is currently no Australian Standard for use of ADCP equipment for stream flow measurement United States Geological Survey standard methods were adhered to (USGS, 2005).

First Check Gauging

On the 18th Dec 2007 nine ADCP transects were completed over a 5 hour period with decreasing discharges recorded throughout the day. The transect discharges ranged from 1936 ML/day to 1180 ML/day with a rise in stage at the Lock 1 downstream gauge board of 10mm to 20mm. This is thought to be due to the influence of windy conditions on the lower lakes and Murray, forcing water upstream.

Second Check Gauging

On the 21st January 2008 another measurement was undertaken with only 6 transects completed at the same site as the previous measurement. Very windy conditions were encountered over the first two transects with the other four completed in much more stable conditions. The wind was predominately in an upstream direction. The last four transects returned similar discharges and had similar velocity distributions over the channel. A water level logger was placed on the downstream side of the weir to better understand stage changes throughout the measurement period. The logger showed a reduction in water level by 30mm over the period of the measurements and this coincided with the change in wind strength.

On both occasions, the acoustic device used was a Teldyne RDI Rio Grande 600Khz ADCP unit. The 600 KHz unit provides both Mode 5 operation as well a depth range for lower velocity. Each transect was completed on a fixed cable, manually moving the boat as slowly as possible across the section.

Table 1 provides a summary of the gauging results and a comparison with the published QLock flow.

Table 1. Summary of Gauging Results

Date	QLock (ML/day)	Gauging (ML/day)	Difference (ML/day)	Difference %
18-12-2007	1410	1610	200	12%
21-01-2008	1650	2110	460	22%

6.2 GAUGING SECTION SELECTION

Because of the low flow currently being experienced over the Lock 1 weir, velocity measurements become difficult as the main channel both upstream and downstream only provide low velocity, with varying channel conditions. Velocity immediately upstream of the weir speeds up but previous attempts to measure velocity and flow across the front of these weirs shows that flow characteristics in this area are very turbulent and variable and not suitable for accurate flow measurement. Further upstream of the weir in the pool area the water is deep and velocities are extremely slow, below the level that can be reliably measured by any instrumentation. The most likely location for a suitable flow measurement site was considered to be downstream of the weir where shallower sections and higher velocities would allow more accurate measurements.

Channel surveys were conducted using ADCP instruments to locate the best section that provided the most even bottom profile and uniform velocity across the channel. Appendix 5 shows results of a recent bathymetric survey conducted in this area and Appendix 6 provides an aerial view of the same area.

Downstream of the weir, close to the structure, angular flow and variations in the channel depth and shape make measurement less reliable and more difficult to repeat, particularly as water flow across the weir varies considerably due to weir operations and configuration.

Although the channel is reasonably straight below the weir for approximately 1.8km the channel depth can vary as much as 8 meters and flow across the section is uneven (see Appendix 5). Approximately 1.8km downstream of the Lock there is an 80º bend in the river where it is deflected by limestone cliffs on the left bank.

At the bend the channel deepens on the left bank adjacent to the cliffs however approximately 0.5 km downstream of the bend the channel becomes more uniform in shape with more even velocity conditions.

This section has been used in the past for higher flow current meter gauging in the range of 50,000 ML/day to 120,000 ML/day. When low flow conditions exist flow measurement using rotating-element current meter is not possible because the low velocities encountered. Acoustic and electromagnetic velocity measurement devices are more suitable because of their ability to measure these lower velocities. One of the requirements of the acoustic devices is that when conducting a moving boat measurement the boat should not be travelling greater than the speed of the water. Velocities encountered are in the order of 50mm per second, so control over the speed of the boat is crucial to the accuracy of the measurement. To traverse the section at these slower speeds requires a fixed cable across the channel to which the boat is attached. This provides for manual movement of the boat across the section at controlled low speeds, significantly improving repeatability of area calculations, in addition to repeatability of velocity sampling.

During field investigations at Lock 1 it has been noted that velocity measurements are affected by many environmental factors. These varying conditions include wind strength and direction in the immediate area, and downstream water movement induced by wind conditions and possibly from pumping from the main channel in the lower Murray River and lower lakes system. Water level between Lock 1 and the Goolwa Barrages can have as little as 300mm fall over the 250km length of river. Wind has a significant influence on water levels over the whole reach, affecting flows, water levels and velocities. It is vital to monitor water level changes that indicate a change in conditions during the flow measurement period.

6.3 WEIR CONFIGURATION

To enable a valid comparison to be made between the results of QLock and a discharge measurement result it is important that the QLock data be accurate and reliable. The measurements down from the rail line to the top of the stop logs combined with the staff gauge readings provide the crest level data that is the primary variable in the QLock calculation. As the rail to top of logs measurement is not undertaken for each log change the measurement values are provided by adding or subtracting a 'standard' height for each log type. Over a period, differences between actual distances and estimated distances may accumulate. In addition, there is potential for a stop log movement not to be recorded, creating a more significant error.

It is uncertain when the last physical check measurement was completed at Lock 1 and this creates a degree of uncertainty of the QLock result. When undertaking the check discharge measurements it would be an advantage for check measurement of the weir crests to be performed and a comparison with the ‘estimated’ values made.

6.4 WATER LEVEL READINGS

In addition to the measurements of the weir crest level the manual readings of the gauge boards, particularly the upstream gauge board, are critical to the QLock result.

Gauge boards at the locks are located on the inside end of the lock chamber outer wall. Both the upstream and downstream boards are subject to wind waves and turbulence and can only be read from the opposite side of the lock chamber looking down at an angle. At times waves of up to 0.3m in height may be experienced at the gauge board locations. These conditions make it difficult to obtain an accurate reading.

Furthermore, it is not known if the gauge boards are accurately set to level, or when the last check survey was undertaken.

These factors create another degree of uncertainty in the QLock results.

Continuous recording water level instruments will be installed on each of the weirs to provide more detailed data on sub-daily water level fluctuations to determine what influence there may be on flow in addition to providing more detailed data to assist with understanding ecological responses within the river system. The water level sensors will be placed in stilling wells to reduce the localised effect of waves and turbulence. Small stilling well tubes will also be place immediately adjacent to the gauge boards to be used with an Electronic Depth Sounder (EDS) that will provide a more reliable manual reading of water level to be used as a check measurement of the water level sensor.

Once installed, the EDS stilling well tubes could be used by lock personnel, in addition to manual gauge board observations, to increase reliability and accuracy of this data.

On 21st January 2008 a temporary water level recorder was installed on the downstream side of Lock 1 in the stilling well that will be used for the planned permanent instrument. This was to provide continuous water level data during discharge measurements and salinity sampling downstream of Lock 1 as part of another drought-related project. Data from the Greenspan PS2100 sensor/logger instrument is provided in Appendix 7, providing a comparison to daily gauge board readings as published and hydrographic manual readings taken during the work period. It should be noted however that the actual time of the manual daily reading is only assumed to be at 09:00 and given the diurnal variation in level, which is assumed to be wind related, comparison of the logger value with the daily value cannot be taken too literally. However, differences of up to 0.35m occur between the daily reading and the recorded water level with daily readings on the 25th and 30th appearing to be spurious.

Whilst the level of the downstream gauge board during low flow has no effect on the QLock calculation, should similar issues be occurring in the upstream water level reading this would have a significant effect on the QLock results.

7 SUMMARY

- Lock 1 daily QLock flow is being calculated in line with the methodology outlined in CRCE 1987. Minor improvement could be obtained by using the more recently produced data file that correctly incorporates all stop log bays.

- The current QLock application is based on old IT systems and it is uncertain how much longer it can be sustained. It would be prudent to commence planing for a replacement system.

- Further gaugings are required to provide an adequate check of the accuracy of the QLock calculation. The proposed program of gauging at all weirs is endorsed.

- Gaugings need to be undertaken during very stable conditions using a fixed cross cable to reduce uncertainties of the measurement and provide the most reliable results.
- There is uncertainty in the QLock results due to estimated measured distance from rails to weir crests and the difficulty in taking accurate gauge board readings.
- More reliable and accurate daily water level readings could be made by lock personnel using EDS and stilling wells that are to be installed as part of the monitoring instrumentation project.
- Water levels downstream of the Lock vary significantly during a daily period and these variations indicate a variation in flow. Water levels need to be monitored during gaugings.
- Experience gained at Lock 1 should be applied to check gaugings conducted at all other Lock weirs.

8 RECOMMENDATIONS

- SA Water adopt the new data file that correctly accounts for all stop log bays for use in daily calculations of flow using the existing QLock application for Lock 1 and any other Lock weirs that have been modified.
- SA Water adopts the use of Electric Depth Sounding equipment to undertake daily upstream and downstream water levels when suitable infrastructure has been installed.
- Accurate measurements of weir crest level should be undertaken at each weir in association with check gaugings and this information used to determine the degree of uncertainty associated with the current practice of crest level estimation.
- At this point in time no recommendations can be made regarding the accuracy of flow data produced by the QLock application however, from work so far completed, the need for routine check gaugings at all Locks is supported.

APPENDICES

A. QLOCK DATA FILE – ORIGINAL WEIR, 1988 VERSION

Lock 01
Sluice bays 19
Boule bays 30
Last survey date ??/??/????
Last reinstatement date ??/??/????
File last changed 27/05/1997
Printout comment LOCK CONFIGURATION TEST 1.
Print file name F:\QLOCK\LOCK1.PRT
Upper pool level 3.250
Lower pool level 0.920

Sluice bay dimensions

bay	log	log	bay	rail	rail
no.	left	right	width	upstream	downstream
1	2.090	2.060	4.790	4.356	4.358
2	2.060	2.050	5.175	4.356	4.360
3	2.030	2.040	5.140	4.356	4.362
4	2.040	2.040	5.170	4.364	4.369
5	2.130	2.120	5.485	4.369	4.369
6	2.130	2.120	5.790	4.364	4.358
7	2.120	2.110	5.755	4.358	4.354
8	2.120	2.130	5.820	4.352	4.348
9	2.130	2.100	5.780	4.352	4.354
10	1.410	1.400	5.810	4.354	4.356
11	1.700	1.730	5.790	4.351	4.353
12	1.710	1.740	5.795	4.348	4.354
13	1.430	1.410	5.800	4.349	4.351
14	1.420	1.400	5.790	4.348	4.327
15	1.400	1.430	5.795	4.351	4.351
16	1.420	1.410	5.800	4.348	4.349
17	1.420	1.440	5.790	4.342	4.347
18	1.450	1.440	5.810	4.345	4.350
19	1.440	1.410	5.800	4.352	4.354

Only 19 Stop Log Bays in the original structure.

Boule bay dimensions

bay	panel	bay	rail	rail
no.	dist	width	upstream	downstream
1	1.875	0.790	4.351	4.353
2	1.640	0.864	4.345	4.349
3	1.610	0.858	4.345	4.342
4	1.610	0.864	4.346	4.349
5	1.640	0.862	4.349	4.350
6	1.620	0.860	4.354	4.349
7	1.640	0.870	4.356	4.348
8	1.640	0.865	4.349	4.349

30 Boule Bays in the original structure

9	1.610	0.859	4.345	4.347
10	1.410	0.860	4.341	4.346
11	1.640	0.865	4.342	4.353
12	1.600	0.859	4.345	4.354
13	1.650	0.878	4.345	4.352
14	1.600	0.860	4.343	4.350
15	1.630	0.865	4.342	4.349
16	1.620	0.860	4.342	4.349
17	1.610	0.864	4.346	4.352
18	1.630	0.864	4.352	4.354
19	1.620	0.870	4.353	4.356
20	1.640	0.854	4.353	4.357
21	1.630	0.872	4.355	4.356
22	1.640	0.855	4.353	4.356
23	1.650	0.857	4.352	4.356
24	1.630	0.866	4.356	4.357
25	1.630	0.873	4.353	4.356
26	1.620	0.862	4.349	4.356
27	1.620	0.864	4.350	4.356
28	1.570	0.860	4.351	4.359
29	1.570	0.855	4.355	4.359
30	1.590	0.215	4.357	4.360

B. QLOCK DATA FILE – MODIFIED WEIR, SA WATER 2007 VERSION

Lock 1
Sluice bays 23
Boule bays 1
Last survey date ??/??/????
Last reinstatement date ??/??/????
File last changed 18/12/2007
Printout comment
Print file name QLOCK.PRT
Upper pool level 3.250
Lower pool level -0.130
Leakage type ESTIMATED
Leakage estimate 50.000

Sluice bay dimensions

bay no.	log left	log right	bay width	rail upstream	rail downstream
1	1.340	1.345	5.347	4.365	4.365
2	1.350	1.340	4.900	4.364	4.365
3	0.940	0.930	4.902	4.365	4.366
4	0.940	0.935	4.906	4.369	4.365
5	0.950	0.955	4.857	4.366	4.367
6	0.890	0.915	4.675	4.364	4.366
7	0.890	0.910	4.943	4.371	4.368
8	0.920	0.920	4.962	4.375	4.366
9	0.900	0.895	4.971	4.368	4.365
10	0.890	0.925	5.300	4.369	4.367
11	1.105	1.095	5.790	4.367	4.362
12	1.095	1.090	5.755	4.362	4.359
13	1.095	1.080	5.820	4.355	4.356
14	1.095	1.105	5.780	4.356	4.356
15	1.085	1.080	5.810	4.358	4.360
16	1.090	1.105	5.790	4.355	4.356
17	1.100	1.110	5.795	4.354	4.358
18	1.115	1.090	5.800	4.353	4.356
19	1.395	1.390	5.790	4.353	4.356
20	1.390	1.420	5.795	4.355	4.353
21	1.415	1.405	5.800	4.353	4.352
22	1.720	1.735	5.790	4.348	4.352
23	1.440	1.420	5.810	4.350	4.354

Only 23 Stop Log Bays included.

Boule bay dimensions

bay no.	panel dist	bay width	rail upstream	rail downstream
1	1.232	2.540	4.351	4.357

One Boule Bay with dimensions of shortened Stop Log Bay

C. QLOCK DATA FILE – MODIFIED WEIR, SA WATER 2007 VERSION

Lock 1
Sluice bays 24
Boule bays 1
Last survey date ??/??/????
Last reinstatement date ??/??/????
File last changed 15/01/2008
Printout comment For modified weir with boule bays replaced with new stop log bays plus fish passage.
Print file name QLOCK.PRT
Upper pool level 3.250
Lower pool level -0.130
Leakage type ESTIMATED
Leakage estimate 50.000

Sluice bay dimensions

bay no.	log left	log right	bay width	rail upstream	rail downstream
1	1.340	1.345	5.347	4.365	4.365
2	1.350	1.340	4.900	4.364	4.365
3	0.940	0.930	4.902	4.365	4.366
4	0.940	0.935	4.906	4.369	4.365
5	0.950	0.955	4.857	4.366	4.367
6	0.890	0.915	4.675	4.364	4.366
7	0.890	0.910	4.943	4.371	4.368
8	0.920	0.920	4.962	4.375	4.366
9	0.900	0.895	4.971	4.368	4.365
10	0.890	0.925	5.300	4.369	4.367
11	1.105	1.095	5.790	4.367	4.362
12	1.095	1.090	5.755	4.362	4.359
13	1.095	1.080	5.820	4.355	4.356
14	1.095	1.105	5.780	4.356	4.356
15	1.085	1.080	5.810	4.358	4.360
16	1.090	1.105	5.790	4.355	4.356
17	1.100	1.110	5.795	4.354	4.358
18	1.115	1.090	5.800	4.353	4.356
19	1.395	1.390	5.790	4.353	4.356
20	1.390	1.420	5.795	4.355	4.353
21	1.415	1.405	5.800	4.353	4.352
22	1.720	1.735	5.790	4.348	4.352
23	1.440	1.420	5.810	4.350	4.354
24	1.232	1.232	2.540	4.351	4.357

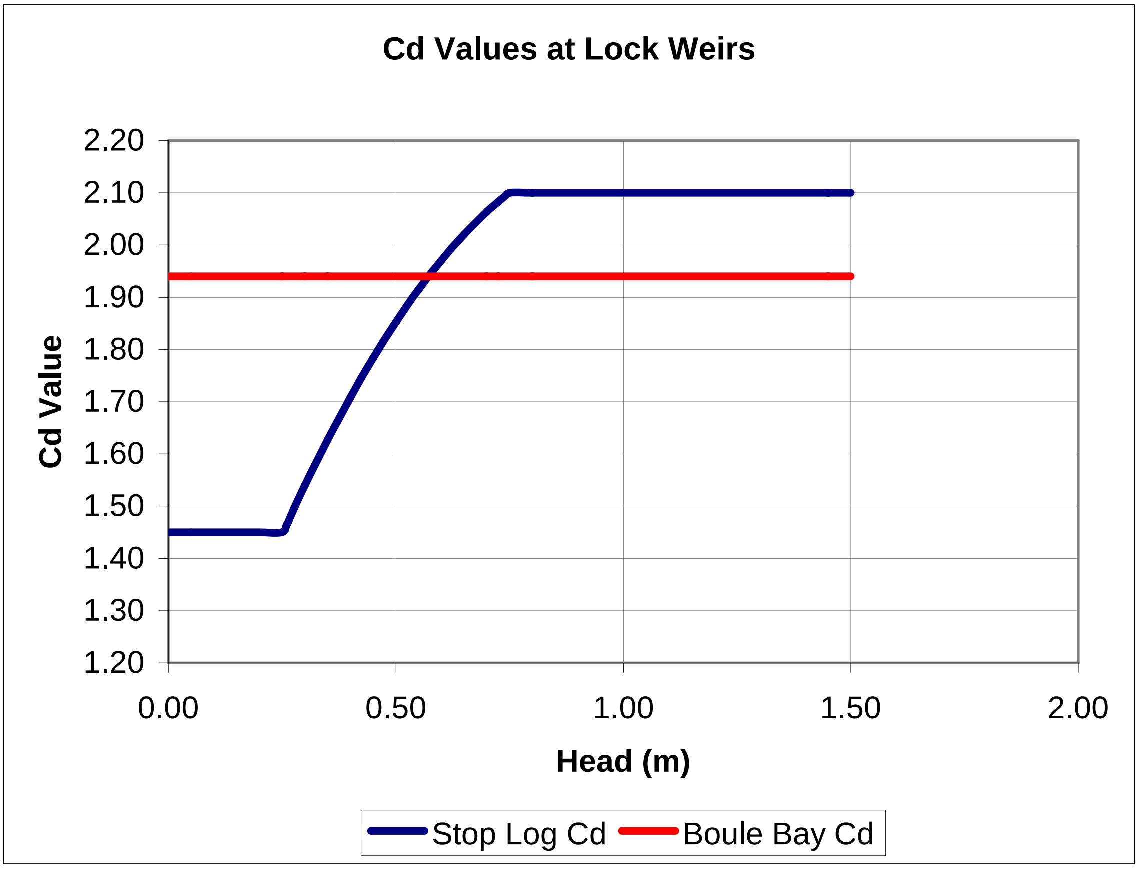
All 24 Stop Log Bays included.

Boule bay dimensions

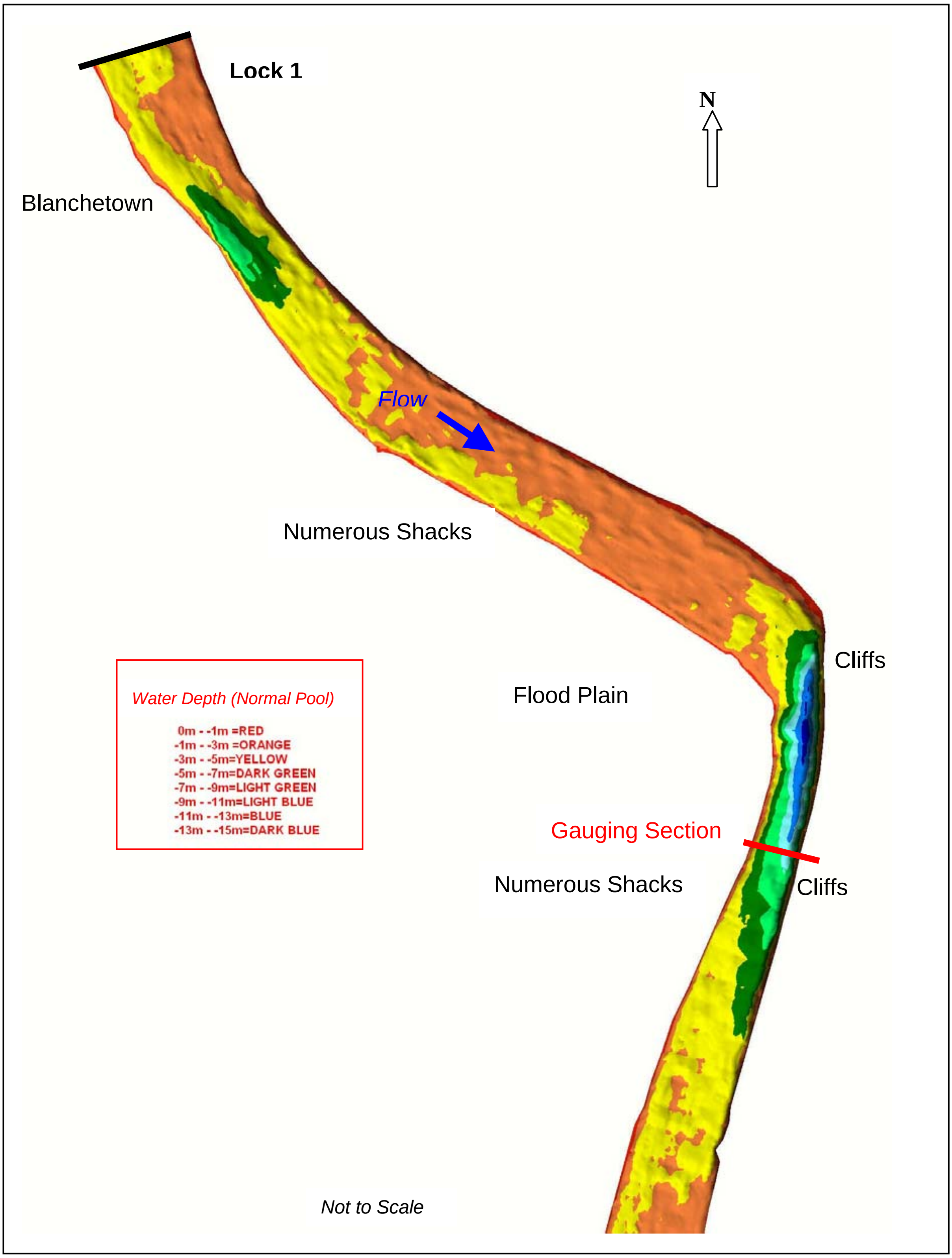
bay no.	panel dist	bay width	rail upstream	rail downstream
1				

Dummy Boule Bay with nil dimensions

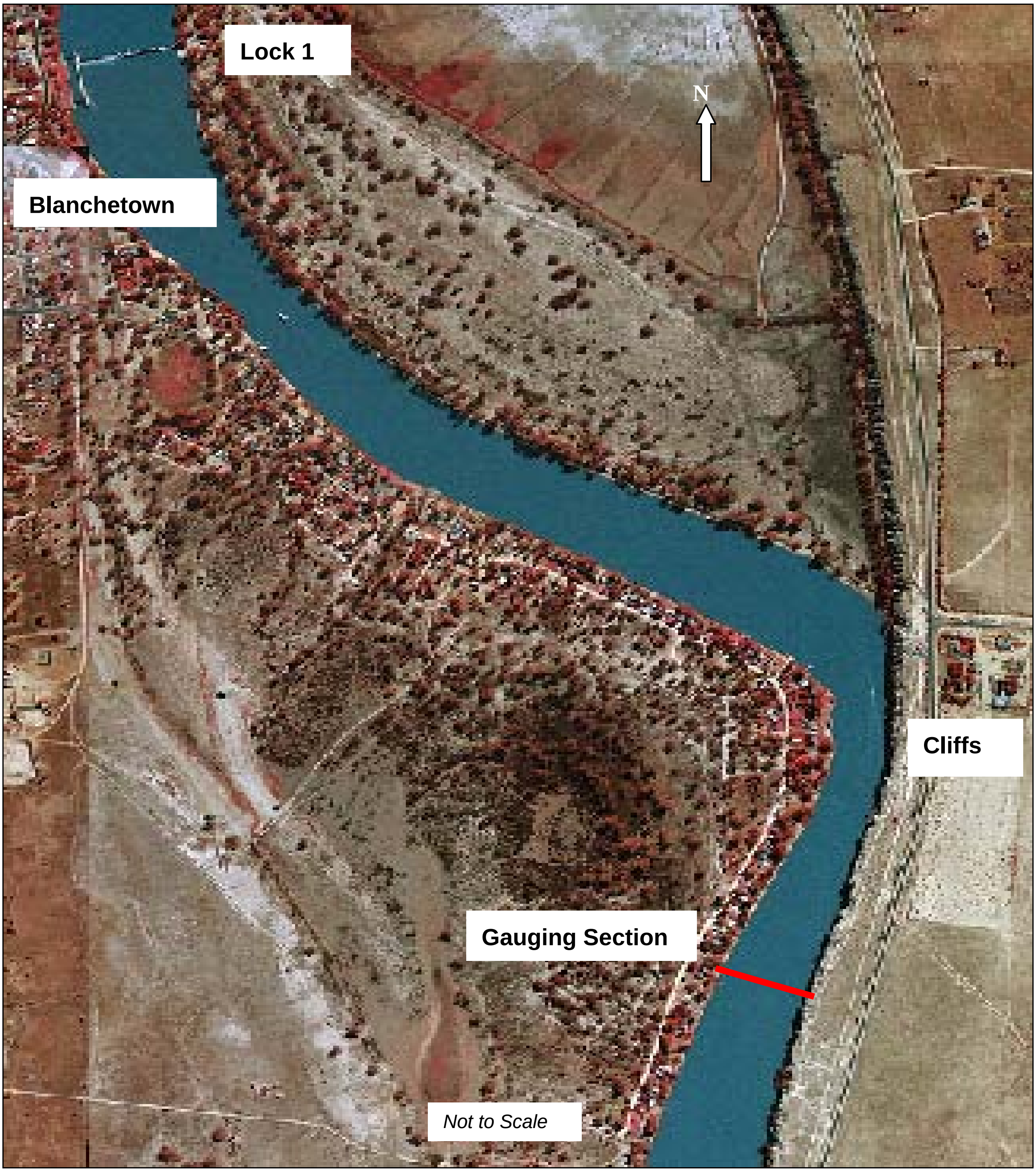
D. LOCK WEIR DISCHARGE COEFFICIENTS



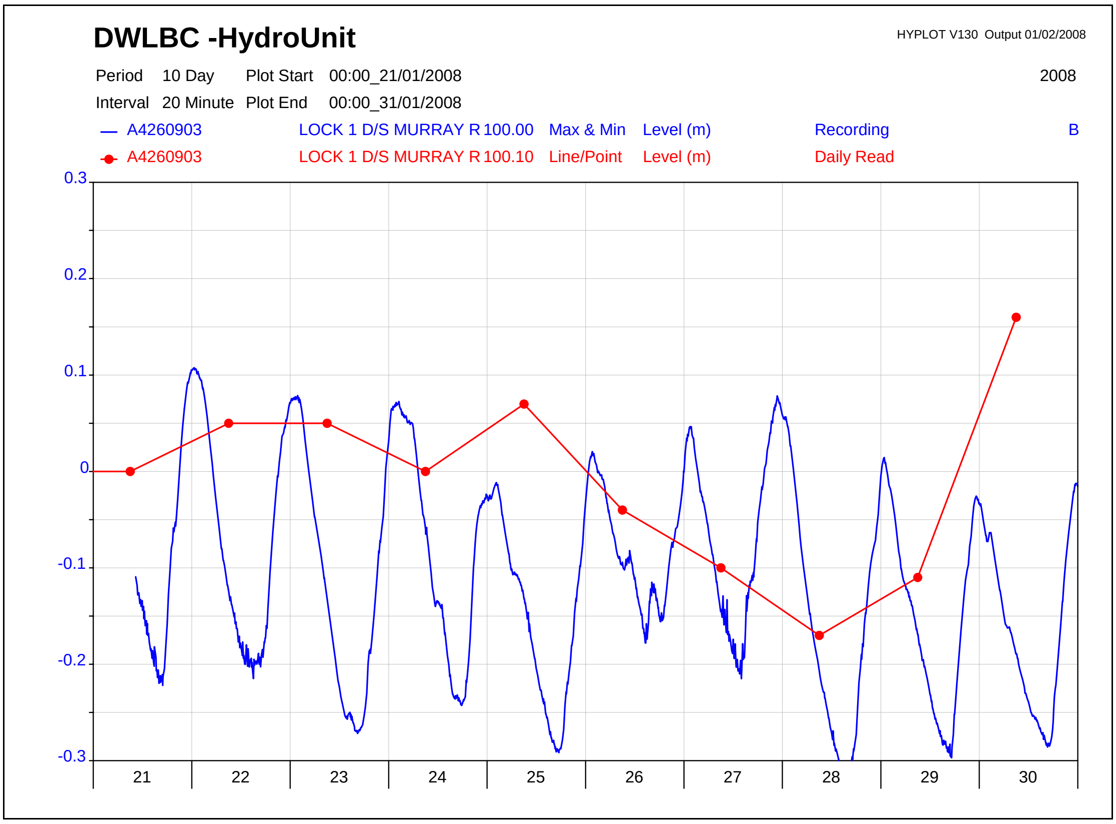
E. BATHYMETRIC SURVEY DOWNSTREAM LOCK 1



F. AERIAL VIEW DOWNSTREAM LOCK 1



G. RECORDED AND DAILY READ WATER LEVEL DOWNSTREAM LOCK 1



Date and Time	Recorded WL	Daily Read WL	Difference Rec - Daily	Hydrographic Reading	Recorded Daily Mean
21/01/2008 **09:00**		0.000			
21/01/2008 10:05	-0.110			-0.110	
21/02/2008 12:35	-0.158			-0.140	
22/01/2008 **09:00**	-0.125	0.050	+ 0.175		NA
23/01/2008 **09:00**	-0.132	0.050	+ 0.182		-0.074
24/01/2008 **09:00**	-0.059	0.000	+ 0.059		-0.102
25/01/2008 **09:00**	-0.132	0.070	+ 0.202		-0.116
26/01/2008 **09:00**	-0.094	-0.040	+ 0.054		-0.138
27/01/2008 **09:00**	-0.143	-0.100	+ 0.043		-0.081
28/01/2008 **09:00**	-0.208	-0.170	+ 0.038		-0.077
29/01/2008 **09:00**	-0.169	-0.110	+ 0.059		-0.165
30/01/2008 **09:00**	-0.189	0.160	+ 0.349		-0.162
31/01/2008 12:30	-0.180			-0.180	

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