



Inventory of control conditions in northern Victoria

October 2019



Report for Murray Darling Basin Authority

Acknowledgment

We acknowledge and respect Victorian Traditional Owners as the original custodians of Victoria's land and waters, their unique ability to care for Country and deep spiritual connection to it. We honour Elders past and present whose knowledge and wisdom has ensured the continuation of culture and traditional practices.

We are committed to genuinely partner, and meaningfully engage, with Victoria's Traditional Owners and Aboriginal communities to support the protection of Country, the maintenance of spiritual and cultural practices and their broader aspirations in the 21st century and beyond.



© The State of Victoria Department of Environment, Land, Water and Planning 2019



This work is licensed under a Creative Commons Attribution 4.0 International licence. You are free to re-use the work under that licence, on the condition that you credit the State of Victoria as author. The licence does not apply to any images, photographs or branding, including the Victorian Coat of Arms, the Victorian Government logo and the

Department of Environment, Land, Water and Planning (DELWP) logo. To view a copy of this licence, visit <http://creativecommons.org/licenses/by/4.0/>

Disclaimer

This publication may be of assistance to you but the State of Victoria and its employees do not guarantee that the publication is without flaw of any kind or is wholly appropriate for your particular purposes and therefore disclaims all liability for any error, loss or other consequence which may arise from you relying on any information in this publication.

Contents

1. Introduction	1
2. Results	2
3. Priorities	5
4. Next Steps	13
5. Time line	13
Appendix 1 – Control condition site information	15
Appendix 2A – Controls in Northern Victoria (Site Numbers 401208A to 404248)	22
Appendix 2B – Controls in Northern Victoria (Site Numbers 404713A to 405717A)	29
Appendix 2C – Controls in Northern Victoria (Site Numbers 405720A to 407215C)	36
Appendix 2D – Controls in Northern Victoria (Site Numbers 407217A to 409711A)	43
Appendix 2E – Controls in Northern Victoria (Site Numbers 414703A to 415725A)	51

1. Introduction

Under the MDBA Compliance Compact Action VIC 3.5, Victoria will:

- undertake an audit of its surface water monitoring control structure condition in northern Victoria
- prepare a prioritised work program, and,
- report back to the MDBA by 30 June 2019.

This review covers artificial control structures for surface water monitoring sites in northern Victoria that are part of the Regional Water Monitoring Partnership (RWMP). The RWMP brings together over 40 agencies and organisations across Victoria who share the cost of monitoring and data collection. Under this model, DELWP manages and co-ordinates the RWMP and the data collection and site maintenance are undertaken by our external service providers. The service provider for surface water monitoring activities is ALS.

ALS has identified that there were 215 control structures to review. All ALS staff undertaking this review are accredited hydrologists.

The following information was collected for each control:

- Date of assessment, name of surveyor
- Site number
- Bed type
- Flow type
- Control type
- Primary and secondary construction material
- Approximate length, width and height
- Undermining description
- Cracks description
- OH+S issues associated with the control
- Overall condition
- Overall effectiveness

The survey results for the 215 control structures are contained in **Appendix 1**. Photographs for each control are contained in **Appendix 2A to 2E**.

2. Results

There were 16 control structures which exhibited some degree of undermining (Table 1) and 32 control structures that exhibited some degree of cracking (Table 2). There are 4 controls that have both undermining and cracking (403214A, 405238A, 407215C and 407300A).

Table 1 Control structures that exhibited undermining

Site number	Bed type	Flow type	Type of control	Primary construction material	Secondary construction material	Undermining description	Overall condition	Overall effectiveness
402206A	rocks	Permanent	Broad crested	Concrete		Downstream side of control undermined	Fair	Yes
403214A	sand	Permanent	V-Notch	steel	concrete	Concrete stabilisation structure can be prone to movement	Fair	Yes
403218A	gravel	Permanent	Broad crested	Concrete	steel	Concrete is eroding away from steel cap on downstream edge of CTF control	Fair	Yes
403227A	rocks	Permanent	Mixed natural and broad crest	Concrete		Minor	Good	Yes
403232A	bedrock	Permanent	Improved rock	Rocks	concrete	LHS edge rock breaking away intermittently causing a drop in CTF. CTF is now below CTM	Fair	Yes
404239A	Clay	Intermittent – Seasonally Dry	Drop bar	Concrete			Fair	Yes
405212D measuring weir	rocks	Intermittent – Seasonally Dry	Broad crested	Concrete	concrete	Excessive wash away	Poor	No
405238A	rocks	Intermittent – Seasonally Dry	Concrete wall	Concrete	concrete	Leaking through large drain pipe	Fair	Yes
405251A	gravel	Permanent	Broad crested	Concrete		Some left bank	Good	Yes
407215C	gravel	Intermittent – Seasonally Dry	Broad crested	Concrete	steel	L/H section of control has broken away water is getting around the edge at higher flows	Fair	Yes
407237A	gravel	Intermittent – Seasonally Dry	V-Notch	Concrete	steel	Some erosion around the right bank	Fair	Yes
407300A	sand	Intermittent – Seasonally Dry	Broad crested	Concrete	concrete	Control broken into pieces of concrete needs replacing	Poor	No
407314A	gravel	Intermittent – Seasonally Dry	Broad crested	Concrete	steel	Has started leaking under control	Poor	Unknown
407324A	gravel	Intermittent – Seasonally Dry	Broad crested	Concrete	steel	Has a history of being undermined. Show signs of slight erosion at front of control	Fair	Yes
408212A	rocks	Intermittent – Seasonally Dry	Broad crested	Concrete	concrete	U/S pool trickling under control to D/S pool.	Fair	Yes

Site number	Bed type	Flow type	Type of control	Primary construction material	Secondary construction material	Undermining description	Overall condition	Overall effectiveness
414714A	Clay/silt	Intermittent – Seasonally Dry	V-Notch	Concrete	steel	Water flowing underneath control on L/B and comes out D/S under centre of control	Fair	No

Table 2 Control structures that exhibited cracking

Site number	Flow type	Type of control	Primary construction material	Secondary construction material	Cracks description	Overall condition	Overall effectiveness
402220A	Intermittent – Seasonally Dry	Sheet Piling	steel	concrete	Sheet piling severely degrading/ leaking	Poor	No
403209A	Intermittent – Seasonally Dry	Sheet Piling	steel	concrete	Rusted Out	Poor	No
403214A	Permanent	V-Notch	steel	concrete	Cracks in concrete surround structure	Fair	Yes
403223A	Permanent	Sheet Piling	steel	steel	Severe rusting	Poor	Yes
403224B	Intermittent – Seasonally Dry	Broad crested	Concrete	Rocks	Slight cracking along seams	Good	Yes
403226A	Intermittent – Seasonally Dry	Sheet Piling	steel	Rocks	Sheet piling rusted heavily in section in middle	Poor	Yes
403233A	Permanent	Improved rock	Rocks	concrete	Some degradation of concrete observed	Fair	Yes
403240A	Permanent	Natural and broad crested	Concrete	Rocks	Some cracks in concrete section	Fair	Yes
403248A	Intermittent – Seasonally Dry	Sheet Piling	steel	Rocks	Some rust in centre of sheet piling	Fair	Yes
404204B	Intermittent – Seasonally Dry	Broad crested	Concrete	concrete	Minor in main control. skirts major cracks and slumping	Fair	Yes
404214A	Intermittent – Seasonally Dry	Broad crested	Concrete	concrete	Cracks on u/s skirt	Good	Yes
405215A	Permanent	Broad crested		Natural Rock	Concrete deteriorated	Fair	Yes
405238A	Intermittent – Seasonally Dry	Concrete wall	Concrete	concrete	Minor from old age	Fair	Yes
405240A	Intermittent – Seasonally Dry	Broad crested	Concrete	Rocks	Right through LHS wing wall see extra photo	Fair	Yes
405248A	Intermittent – Seasonally Dry	Broad crested	Concrete	Rocks	Old age	Fair	Yes
405269A	Intermittent – Seasonally Dry	Sheet Piling	steel	Rocks	Holes rusted through	Poor	No
405717A	Ephemeral – Extended Dry Periods	Knife edge	Concrete	steel	Small leak on R/H side	Good	Yes
406200B	Permanent	Broad crested	Concrete	steel	Small cracks along concrete joins	Fair	Yes
406250A	Intermittent – Seasonally Dry	Broad crested	Concrete	steel	Cracks along the concrete seams	Fair	Yes
407213C	Intermittent – Seasonally Dry	Broad crested	Concrete	steel	Crack in the centre of control	Fair	Yes
407215C	Intermittent – Seasonally Dry	Broad crested	Concrete	steel	Part of the control has broken away from the rest of the control on the L/H bank, another small crack near the middle of the control	Fair	Yes

Site number	Flow type	Type of control	Primary construction material	Secondary construction material	Cracks description	Overall condition	Overall effectiveness
407220A	Intermittent – Seasonally Dry	Broad crested	Blue stone and bricks	Rocks	Leakage through some blue stone and could be undermining need more flow to check.	Fair	Yes
407224D	Permanent	V-Notch	steel	concrete	Metal V-notch structure in good condition the concrete holding either end of the plate up have been weathered and are letting some water through on low flows.	Fair	Yes
407230B	Intermittent – Seasonally Dry	Broad crested	Concrete	concrete	A few small cracks through the concrete but don't seem to be all the way through	Fair	Yes
407239A	Intermittent – Seasonally Dry	Broad crested	Concrete	concrete	Small crack all the way through control near centre	Fair	Yes
407285A	Ephemeral – Extended Dry Periods	V-Notch	Concrete	concrete	Several cracks on the control some have gone all the way though the concrete unsure if water leaks through as it hasn't flowed for a while.	Fair	Unknown
407300A	Intermittent – Seasonally Dry	Broad crested	Concrete	concrete	control cracked and broken into a few different pieces needs replacing	Poor	No
407732A	Ephemeral – Extended Dry Periods	V-Notch	Concrete	concrete	Minor Cracks do not affect the flow	Good	Yes
415201B	Permanent	Broad crested	Concrete	Rocks	One crack only. superficial.	Fair	Yes
415227A	Intermittent – Seasonally Dry	Broad crested with outlet valves for water release.	Concrete	steel	Small cracks along wall	Good	Yes
415250A	Intermittent – Seasonally Dry	Broad crested	Concrete		Grass / moss growing through parts of concrete	Good	Yes
415257A	Permanent	Broad crested	Concrete	Rocks	Superficial cracks	Fair	Yes

3. Priorities

There are 117 controls are in good condition, 89 in fair condition and 9 in poor condition. There are seven controls that are rated as not being effective, and two that have been rated as unknown.

Three levels of priority have been identified:

Priority level	Description
Priority 1	Controls for further investigation: Seven controls are considered as not effective (Table 3)
Priority 2	Controls for further investigation: 4 controls that have a 'poor' overall condition but are considered effective (Table 4)
Priority 3	Watching brief: 89 controls which are rated as 'fair' (refer Appendix 1)

Table 3 Priority 1 sites – ineffective controls

Site number	Issue	Description	Overall condition	Flow type	Effective overall
402220A	cracking	Sheet piling severely degraded/ leaking	poor	Intermittent – Seasonally Dry	No
403209A	cracking	Sheet piling rusted out and concrete degraded	poor	Intermittent – Seasonally Dry	No
405212D	undermining	Excessive wash away	poor	Intermittent – Seasonally Dry	No
407285A	cracking	Several cracks all the way through the control	fair	Ephemeral – Extended dry periods	Unknown
407314A	undermining	Leaking under the control	poor	Intermittent – Seasonally dry	Unknown
407300A	undermining	Control broken into pieces of concrete	poor	Intermittent – Seasonally Dry	No
407300A	cracking	Control cracked and broken into a number of pieces	poor	Intermittent – Seasonally Dry	No
414714A	undermining	Water flowing under control on left bank and comes out downstream at centre of control	fair	Intermittent – Seasonally Dry	No
415244A	undermining	Knife edge needs replacing	poor	permanent	No

Table 4 Controls that have a 'poor' overall condition but are considered effective

Site number	Bed type	Flow type	Type of control	Primary construction material	Secondary construction material
401208A	sand	permanent	Improved rock	rocks	concrete
403214A	sand	permanent	V Notch	steel	concrete
403223A	sand	permanent	Sheet piling	steel	steel
403227A	gravel	Intermittent – seasonally dry	Sheet piling	steel	rocks
414714A	Clay/silt	Intermittent – Seasonally Dry	V-Notch	Concrete	steel

Site number	Bed type	Flow type	Type of control	Primary construction material	Secondary construction material
407285A	bedrock	Ephemeral – Extended Dry Periods	V-Notch	Concrete	concrete
401215C	gravel	Intermittent – Seasonally Dry	Natural bedrock, with concrete wing walls	Rocks	concrete
402206A	rocks	Permanent	Broad crested	Concrete	
403214A	sand	Permanent	V-Notch	steel	concrete
403218A	gravel	Permanent	Broad crested	Concrete	steel
403232A	bedrock	Permanent	Improved rock	Rocks	concrete
403233A	rocks	Permanent	Improved rock	Rocks	concrete
403240A	gravel	Permanent	Natural and broad crested	Concrete	Rocks
403248A	gravel	Intermittent – Seasonally Dry	Sheet Piling	steel	Rocks
403249A	sand	Intermittent – Seasonally Dry	Sheet Piling	steel	Rocks
403251A	gravel	Intermittent – Seasonally Dry	Gated	Concrete	Wood
404204B	gravel	Intermittent – Seasonally Dry	Broad crested	Concrete	concrete
404239A	Clay	Intermittent – Seasonally Dry	Drop bar	Concrete	
405215A	bedrock	Permanent	Broad crested	Natural Rock	
405238A	rocks	Intermittent – Seasonally Dry	Concrete wall	Concrete	concrete
405240A	rocks	Intermittent – Seasonally Dry	Broad crested	Concrete	Rocks
405248A	gravel	Intermittent – Seasonally Dry	Broad crested	Concrete	Rocks
405758A	gravel	Intermittent – Seasonally Dry	Rock bar	Rocks	Rocks
406200B	gravel	Permanent	Broad crested	Concrete	steel
406250A	gravel	Intermittent – Seasonally Dry	Broad crested	Concrete	steel
407210D	sand	Permanent	Broad crested	Concrete	concrete
407213C	sand	Intermittent – Seasonally Dry	Broad crested	Concrete	steel
407215C	gravel	Intermittent – Seasonally Dry	Broad crested	Concrete	steel
407220A	bedrock	Intermittent – Seasonally Dry	Broad crested	Blue stone and bricks	Rocks
407222A	bedrock	Intermittent – Seasonally Dry	Broad crested	Concrete	steel
407224D	bedrock	Permanent	V-Notch	steel	concrete
407230B	bedrock	Intermittent – Seasonally Dry	Broad crested	Concrete	concrete
407237A	gravel	Intermittent – Seasonally Dry	V-Notch	Concrete	steel
407238A	gravel	Intermittent – Seasonally Dry	Broad crested	Concrete	steel
407239A	bedrock	Intermittent – Seasonally Dry	Broad crested	Concrete	concrete
407324A	gravel	Intermittent – Seasonally Dry	Broad crested	Concrete	steel

Site number	Bed type	Flow type	Type of control	Primary construction material	Secondary construction material
408202A	rocks	Permanent	Broad crested	Concrete	Rocks
408212A	rocks	Intermittent – Seasonally Dry	Broad crested	Concrete	concrete
414705A	sand	Intermittent – Seasonally Dry	Knife edge	Concrete	steel
415200D	rocks	Permanent	Broad crested	Concrete	Rocks
415201B	bedrock	Permanent	Broad crested	Concrete	Rocks
415202C	rocks	Permanent	Broad crested	Concrete	Rocks
415206B	bedrock	Permanent	Broad crested	Concrete	Rocks
415207C	gravel	Permanent	Broad crested	Concrete	Rocks
415220B	rocks	Intermittent – Seasonally Dry	Broad crested	Concrete	Rocks
415237A	rocks	Permanent	Broad crested	Concrete	Rocks
415238A	rocks	Permanent	Broad crested	Concrete	concrete
415241A	rocks	Permanent	Bridge	Concrete	steel
415245A	rocks	Permanent	Broad crested	Concrete	steel
415257A	rocks	Permanent	Broad crested	Concrete	Rocks
415259A	rocks	Intermittent – Seasonally Dry	Broad crested	Concrete	Rocks
425206B	rocks	Permanent	Broad crested	Concrete	Rocks
414714A	Clay/silt	Intermittent – Seasonally Dry	V-Notch	Concrete	steel
407285A	bedrock	Ephemeral – Extended Dry Periods	V-Notch	Concrete	concrete
401215C	gravel	Intermittent – Seasonally Dry	Natural bedrock, with concrete wing walls	Rocks	concrete
402206A	rocks	Permanent	Broad crested	Concrete	
403214A	sand	Permanent	V-Notch	steel	concrete
403218A	gravel	Permanent	Broad crested	Concrete	steel
403232A	bedrock	Permanent	Improved rock	Rocks	concrete
403233A	rocks	Permanent	Improved rock	Rocks	concrete
403240A	gravel	Permanent	Natural and broad crested	Concrete	Rocks
403248A	gravel	Intermittent – Seasonally Dry	Sheet Piling	steel	Rocks
403249A	sand	Intermittent – Seasonally Dry	Sheet Piling	steel	Rocks
403251A	gravel	Intermittent – Seasonally Dry	Gated	Concrete	Wood
404204B	gravel	Intermittent – Seasonally Dry	Broad crested	Concrete	concrete
404239A	Clay	Intermittent – Seasonally Dry	Drop bar	Concrete	
405215A	bedrock	Permanent	Broad crested		Natural Rock
405238A	rocks	Intermittent – Seasonally Dry	Concrete wall	Concrete	concrete
405240A	rocks	Intermittent – Seasonally Dry	Broad crested	Concrete	Rocks
405248A	gravel	Intermittent – Seasonally Dry	Broad crested	Concrete	Rocks

Site number	Bed type	Flow type	Type of control	Primary construction material	Secondary construction material
405758A	gravel	Intermittent – Seasonally Dry	Rock bar	Rocks	Rocks
406200B	gravel	Permanent	Broad crested	Concrete	steel
406250A	gravel	Intermittent – Seasonally Dry	Broad crested	Concrete	steel
407210D	sand	Permanent	Broad crested	Concrete	concrete
407213C	sand	Intermittent – Seasonally Dry	Broad crested	Concrete	steel
407215C	gravel	Intermittent – Seasonally Dry	Broad crested	Concrete	steel
407220A	bedrock	Intermittent – Seasonally Dry	Broad crested	BLUE STONE AND BRICKS	Rocks
407222A	bedrock	Intermittent – Seasonally Dry	Broad crested	Concrete	steel
407224D	bedrock	Permanent	V-Notch	steel	concrete
407230B	bedrock	Intermittent – Seasonally Dry	Broad crested	Concrete	concrete
407237A	gravel	Intermittent – Seasonally Dry	V-Notch	Concrete	steel
407238A	gravel	Intermittent – Seasonally Dry	Broad crested	Concrete	steel
407239A	bedrock	Intermittent – Seasonally Dry	Broad crested	Concrete	concrete
407324A	gravel	Intermittent – Seasonally Dry	Broad crested	Concrete	steel
408202A	rocks	Permanent	Broad crested	Concrete	Rocks
408212A	rocks	Intermittent – Seasonally Dry	Broad crested	Concrete	concrete
414705A	sand	Intermittent – Seasonally Dry	Knife edge	Concrete	steel
415200D	rocks	Permanent	Broad crested	Concrete	Rocks
415201B	bedrock	Permanent	Broad crested	Concrete	Rocks
415202C	rocks	Permanent	Broad crested	Concrete	Rocks
415206B	bedrock	Permanent	Broad crested	Concrete	Rocks
415207C	gravel	Permanent	Broad crested	Concrete	Rocks
415220B	rocks	Intermittent – Seasonally Dry	Broad crested	Concrete	Rocks
415237A	rocks	Permanent	Broad crested	Concrete	Rocks
415238A	rocks	Permanent	Broad crested	Concrete	concrete
415241A	rocks	Permanent	Bridge	Concrete	steel
415245A	rocks	Permanent	Broad crested	Concrete	steel
415257A	rocks	Permanent	Broad crested	Concrete	Rocks
415259A	rocks	Intermittent – Seasonally Dry	Broad crested	Concrete	Rocks
425206B	rocks	Permanent	Broad crested	Concrete	Rocks

Figures 1- 9 are photographs of the ineffective controls.



Figure 1 - 403209A Reedy Creek @ North Wangaratta



Figure 2 - 402220A Kiewa River Anabranh @ Kiewa



Figure 3 - 405212 Sunday Creek @ Tallarook



Figure 4 – 407285 Nine Mile Creek @ Coads Road



Figure 5 – 407314 McCallums Creek u/s Evansford Reservoir



Figure 6 - 407300A Muckleford Creek @ Muckleford Road



Figure 7 – 414714 Red Cliffs Drain @ Stewarts Road



Figure 8 – 415244 Shepherds Creek @ Warrak

4. Next Steps

For the seven priority 1 controls, discussions will be held with the relevant RWMP partners to determine what aspects of the flow duration curve are important to them at these sites. If they are only interested in the high flow component, then remedial work may not be necessary. On the other hand, if partners are interested in low flows, then further investigations will be required. These investigations will need to look at replacement options and costs for the existing controls. If the control has significant OH+S issues, then options to replace the control will also need to be investigated.

Priority 2 controls will be investigated to see if any remedial actions are required to ensure that the control remains stable. An annual inspection will also be carried out.

Priority 3 controls will have an annual inspection to ensure that there is no further deterioration of the control condition.

5. Time line

Priority 1 Actions	Timing
Survey the 2 controls where the efficiency is unknown	December 2019
Talk to RWMP partners who cost share at the seven priority 1 controls to understand flow and accuracy requirements	December 2019
On the basis of these talks, investigate options and costs for the control (remove, fix, modify, add fish ladder)	March 2020
Cost share partners to approve the preferred option and agree to fund the necessary works. If a fish ladder is to be installed, this will need to involve ground surveys, modelling, design and tendering before works can be undertaken	June 2020 (excluding fish ladder option)
Undertake preferred works	July 2021
Priority 2 Actions	Timing
Annual inspection of all priority 2 controls	July 2020
Priority 3 Actions	Timing
Annual inspection of all priority 3 controls	July 2020