Audit of Irrigation Modernisation Water Recovery 2012/13 Irrigation season

Report

Prepared for Department of Environment and Primary Industries, Office of Water

7 January 2014

Cardno
Shaping the Future

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Summary of findings

Background and scope

This report details the findings from Cardno's audit of the estimates of the water recovery achieved through irrigation modernisation in northern Victoria for 2012/13. The majority of the water recovery is being delivered through the Goulburn-Murray Water (G-MW) Connections Project (GCP). The GCP is being implemented in two stages. Stage 1, which is funded by the Victorian Government, has been underway since 2008 and Stage 2, which is funded by the Commonwealth, commenced in 2012. The GCP must be audited each year. This is the fifth annual audit of water savings from irrigation modernisation in the Goulburn-Murray Irrigation District.

The scope of activities included in this audit, as described in the audit brief, is as follows:

- The irrigation modernisation works in place for the 2012/13 'water year' (1 July 2012 to 30 June 2013).
- The GCP operating area which is the whole Goulburn-Murray Irrigation District (Central Goulburn, Rochester, Pyramid-Boort, Murray Valley, Shepparton and Torrumbarry Irrigation Areas).
- Irrigation modernisation works and savings separately accountable to GCP Stage 1 GCP Stage 2 and the Shepparton and CG1234 irrigation modernisation project.
- The cumulative water entitlement purchases up to 30 June 2013 converted to average equivalent water recovery.
- The cumulative water entitlement purchases up to 30 June 2013 from the Inter-project funding of $7.7 million converted to average equivalent water recovery.

Audited Water Savings Estimates

Water savings are achieved through modernisation of irrigation infrastructure. The scope of the audit is to review Phase 3 and Phase 4 water savings estimates. The Phase 3 water savings estimates represent actual savings realised in the 2012/13 irrigation season as a result of works completed. Phase 4 savings represent the long term average savings that might be expected from the works completed to date.

The audited Phase 3 and Phase 4 estimates are set out in the following tables and, as required in the project brief, are separately accounted to the:

- Stage 1 project,
- Stage 2 project,
- Shepparton and CG1-4 residual works (formerly the Futureflow project),
- Inter-Project Agreement (IPA) Funding share acquisitions (former Reconfiguration Work) shares.

Water savings from Stage 1 project (2012/13)

Water Savings Intervention	CG 5-9	MV	RO	PB	TO	TOTAL
Phase 3 water savings						
Channel Rationalisation (ML)	902	1,681	377	1,474	4,196	8,630
Channel Automation (ML)	27,159	5,802	4,765	2,617	5,623	45,966
Service Point Replacement (ML)	13,726	6,934	5,873	6,223	5,683	38,438
Service Point Rationalisation (ML)	1,805	1,954	1,649	1,934	2,640	9,982

Water Savings Intervention	CG 5-9	MV	RO	PB	TO	TOTAL
Channel Remediation (ML)	4,485	4,528	2,652	-	3,808	15,473
Total Phase 3 savings (ML)	**48,076**	**20,899**	**15,316**	**12,247**	**21,951**	**118,489**
Phase 4 water savings						
Channel Rationalisation (ML)	1,090	3,839	467	2,076	6,352	13,824
Channel Automation (ML)	31,102	5,700	5,549	2,809	6,443	51,603
Service Point Replacement (ML)	15,107	8,174	6,593	7,454	6,886	44,215
Service Point Rationalisation (ML)	2,075	2,520	1,997	2,587	3,595	12,775
Channel Remediation (ML)	4,420	4,186	2,434	-	2,750	13,790
Total Phase 4 savings (ML)	**53,795**	**24,419**	**17,040**	**14,927**	**26,025**	**136,206**

Water savings from Stage 2 project (2012/13)

Water Savings Intervention	SH	CG 5-9	RO	PB	MV	TO	TOTAL
Phase 3 water savings							
Channel Rationalisation (ML)		41	286	32	14	42	416
Channel Automation (ML)		-	-	-	-	-	0
Service Point Replacement (ML)		33	151	67	40	109	401
Service Point Rationalisation (ML)	9	7	37	14	4	64	134
Channel Remediation (ML)		-	-	-	-	-	0
Total Phase 3 savings (ML)	**9**	**81**	**475**	**113**	**58**	**215**	**951**
Phase 4 water savings							
Channel Rationalisation (ML)		119	950	124	25	568	1,786
Channel Automation (ML)		-	-	-	-	-	0
Service Point Replacement (ML)	3	96	204	85	109	180	676
Service Point Rationalisation (ML)	14	7	49	21	12	95	199
Channel Remediation (ML)		-	-	-	-	-	0
Total Phase 4 savings (ML)	**17**	**222**	**1,202**	**230**	**146**	**843**	**2,660**

Shepparton and CG1-4 Residual works (2012/13)

Water Savings Intervention	Shepparton	CG1-4	TOTAL
Phase 3 water savings			
Service Point Replacement (ML)	151	194	346
Service Point Rationalisation (ML)	1	48	50
Total Phase 3 savings (ML)	**153**	**243**	**395**
Phase 4 water savings			
Service Point Replacement (ML)	355	310	665
Service Point Rationalisation (ML)	3	83	86
Total Phase 4 savings	359	393	752

Total water estimated savings for all projects

Project	SH	CG1-4	CG 5-9	MV	RO	PB	TO	Total
Phase 3 water savings								
Stage 1 project (ML)			48,076	20,899	15,316	12,247	21,951	118,489
Stage 2 project (ML)	9		81	475	113	58	215	951
Shepparton - CG1-4 residual works (ML)	153	243						395
Total Phase 3 savings (ML)	**162**	**243**	**48,157**	**21,373**	**15,429**	**12,305**	**22,166**	**119,835**
Phase 4 water savings								
Stage 1 project (ML)			53,795	24,419	17,040	14,927	26,025	136,206
Stage 2 project (ML)	17		222	1,202	230	146	843	2,660
Shepparton - CG1-4 residual works (ML)	359	393						752
Total Phase 4 savings (ML)	**376**	**393**	**54,017**	**25,621**	**17,270**	**15,073**	**26,869**	**139,617**

Note – Totals may not sum due to rounding

Water Entitlement Entities

The audit scope requires that the ownership and details of the Water Entitlement Entities (WEEs) claimed by G-MW as being in its ownership at 30 June 2013 are to be confirmed. The calculation of the long term diversion limit equivalent (LTDLE) associated with these WEEs is also required using the conversion factors provided by DEPI.

Water recovery due to entitlement purchases are to be expressed against the following projects:

- Stage 1 project
- Inter-project agreement ($7.7M funding)

We reconciled the ownership and details of the WEEs claimed by G-MW against the details on Victorian Water Register as at 30 June 2013. We found that while the great majority of WEEs claimed by G-MW reconciled with the details held on the Register and that their ownership was also recorded as being in G-MW's name. For 964.3ML of high reliability water shares and 330.3ML of low reliability water shares claimed by G-MW, we found that these were recorded as being held by parties other than G-MW. For all of these shares (or parts of shares), G-MW provided evidence of their entitlement to the share.

We also identified instances where the details of the WEEs claimed by G-MW did not reconcile with the Register. This was primarily due to the WEE ID provided by G-MW referring to a WEE where the original WEE had been cancelled and the share transferred to a new WEE. Following investigation of these discrepancies, two adjustments to the WEEs originally claimed by G-MW were made:

- Removal of 3.0ML of high reliability water share associated with WEE051531 as this WEE had been cancelled.
- Reclassification of 77.5ML of water share associated with WEE048963 as high reliability (it was originally classified by G-MW as low reliability).

Following confirmation of the WEEs the entitlement volumes were converted into LTDLE volume using the conversion factors provided by DEPI as shown in the table below. The LTDE volume has been shown split between the Stage 1 and Stage 2 projects.

Calculation of Long Term Diversion Equivalent

Project / Irrigation area	Volumes		Conversion factors		Long Term Diversion Equivalent		
	Low reliability (ML)	High reliability (ML)	Low reliability (ML share / ML LTDE)	High reliability (ML share / ML LTDE)	Accruing from low reliability (ML)	Accruing from high reliability (ML)	Total (ML)
Stage 1 projects							
Goulburn	1,869.3	5,347.8	0.546	0.927	1,020.6	4,957.4	5,978.0
Murray	2,229.6	6,105.1	0.659	0.913	1,469.3	5,574.0	7,043.3
Campaspe	-	15,052.0	n/a	0.961		14,465.0	14,465.0
Total							**27,486.3**
Inter-project agreement project							
Goulburn	1,427.9	2,138.6	0.546	0.927	779.6	1,982.5	2,762.1
Murray	3,893.6	1,032.3	0.659	0.913	2,565.9	942.5	3,508.4
Total							**6,270.5**
Total – Stage 1 and Inter-project agreement							**33,756.8**

Systems and Processes

Our review for the 2012/13 audit of the information systems and processes used by G-MW has found that they continue to be sufficiently robust to generate data and inputs that are as accurate as could reasonably be expected for the purpose of calculating water recoveries.

We recommend that G-MW continue to improve the way it records, reports and validates outfall volume data in order to increase the reliability of these figures. We understand that G-MW is undertaking work in this area but that it will not be finalised for a number of years.

We reviewed construction records for a sample of modernisation works to confirm that the works claimed were complete. We found that most assets included in our samples for data trailing had sufficient evidence to support the fact that they have been constructed and commissioned. The exception being for channel rationalisation work where for 31% of the sites reviewed, there was either no construction record provided or only photos post-construction. For a further 21% of the sites reviewed, construction records were provided but they did not include the ITP certificate. While we are generally satisfied that G-MW has completed the works claimed in the calculations, we believe that G-MW must improve how it documents completion of channel rationalisation works. Similar problems were observed in the review of construction records for service point replacement and service point rationalisation but were less prevalent.

We recommend that G-MW ensure that ITP certificates and work packs are completed and retained for all construction works, including channel rationalisation and service point rationalisation.

Water Savings Protocol Reporting Requirements

The Water Savings Audit Process[1] is a document under the Water Savings Protocol that sets out the approach to be taken to the independent audit of water savings. The scope of independent audit work relating to irrigation modernisation is to include the elements detailed below. Where each element is addressed in this report is set out below the individual element.

Verifying that the Phase 3 (and Phase 4) water savings calculations have been calculated in accordance with the Technical Manual for the Quantification of Water Savings.

[1] *Water Savings Audit Process (Water Savings Protocol), Department of Sustainability and Environment Victoria, Version 2.0 June 2009.*

We address this requirement in Section 6 of this report.

Checking that the data collection and inputs are as accurate as could reasonably be expected for the purpose of calculating water savings.

We address this requirement in Section 4 and 5 of this report.

Spot checks that the program of works has been implemented as documented in the water saving calculations.

We address this requirement in Section 5 of this report.

Checking that water savings have been calculated based on the nature and the extent of all modernisation works

We address this requirement in Section 5 of this report.

Providing a corrected estimate of the water savings for any component where the project proponent calculations are found to be non-compliant or deficient.

We address this requirement in Section 6 of this report.

Identifying potential improvements to the data collection, data analysis, assumptions and methods used to estimate the water savings. Recommend changes to the Technical Manual for the Quantification of Water Savings to the Director of Allocations and Licences within DSE (now DEPI) that will improve useability and accuracy of water savings.

We address this requirement in Section 8 of this report.

Checking if suggestions from the previous year's audit have been actioned upon and report upon the status of each of the suggested improvements.

We address this requirement in Section 9 of this report.

Glossary

A	Ratio of the length of channel to be or actually automated to the total length of channel in the defined system (%)
CG	Central Goulburn
CG134	Central Goulburn Channel 1, 3 and 4
CG2	Central Goulburn Channel 2 System
CL	Ratio of length of spur channel length rationalised to total spur channel length in system
D_{base}	Customer Deliveries in the Baseline Year in the irrigation system
DEPI	Department of Environment and Primary Industries
DF	Durability factor to account for the durability of water savings interventions
DF_{error}	Durability factor for reducing measurement error
$DF_{leakage\ around}$	Durability factor for reducing leakage around the meter
$DF_{leakage\ through}$	Durability factor for reducing leakage through the meter
$DF_{unauthorised}$	Durability factor for reducing unauthorised use
D_{Mbase}	Customer deliveries through the Rationalised meters in the Baseline Year
$D_{MYear\ X}$	Customer deliveries through the replaced meters for the year in question
DSE	The Department of Sustainability and Environment
$D_{Year\ x}$	Customer deliveries in the year in question to the irrigation system
E_{Base}	Evaporation in Baseline Year
$EF_{bank\ leakage}$	Effectiveness Factor Channel automation (bank leakage)
EF_{error}	Effectiveness Factor for reducing measurement error
$EF_{leakage\ around}$	Effectiveness Factor for reducing leakage around the meter
$EF_{leakage\ through}$	Effectiveness Factor for reducing leakage through the meter
$EF_{rationaliation}$	Effectiveness Factor for channel rationalisation
$EF_{remediation}$	Effectiveness Factor for channel remediation
$EF_{unauthorised}$	Effectiveness Factor for reducing unauthorised use
$F(LTCE_{Base})$	Long Term Cap Equivalent Factor to convert Baseline Year volumes to Long Term Cap Equivalent volume
$F(LTCE_{Year\ X})$	Long Term Cap Equivalent Factor to convert Current Year volumes to Long Term Cap Equivalent volume
F(PA)	Pondage Testing Adjustment Factor to account for dynamic losses in addition to static losses
FL	Proportion of bank leakage recognised as fixed
GCP	G-MW Connections Project
GIS	Geographic Information System
GMID	Goulburn Murray Irrigation District
G-MW	Goulburn Murray Water
HR	High Reliability
IPA	Inter-Project Agreement
IPM	Irrigation Planning Module
ITP	Inspection Test Procedure
L_{Base}	Leakage in Baseline Year
$L_{Post\ works}$	Post works bank leakage

LR	Low Reliability
LTA	Defined Fixed Leakage Rate (ML/year/service point) around service points
LTCE	Long Term Cap Equivalent
LTDLE	Long Term Diversion Limit Equivalent
LTT	Defined Fixed Leakage Rate (ML/year/service point) through service points
M&E	mechanical and electrical
MCF	Adopted Meter Correction Factor for Dethridge Meter Service Points or associated with deemed Service Points
MV	Murray Valley
$N_{rationalised}$	Number of meters rationalised
$N_{replaced}$	Number of meters replaced
NVIRP	Northern Victoria Irrigation Renewal Project
O_{Base}	Outfalls in Baseline Year
OP_{yearx}	Ratio of the length of time a channel has been automated in the year in question relative to the irrigation season length in the Baseline Year
O_{yearx}	Outfalls in Current Year
PB	Pyramid-Boort
RL	Ratio of length of channel length remediated to total channel length in system
RO	Rochester
S_{Base}	Seepage in Baseline Year
SCADA	Supervisory Control and Data Acquisition
SH	Shepparton
SMC	Stuart Murray Canal
SMP	Strategic Measurement Project
$S_{post\ works}$	Post works seepage
the *Manual*	the Water Savings Protocol *Technical Manual*
the *Protocol*	the Water Savings Protocol for the Quantification of Water Savings from Irrigation Modernisation Projects
the *Technical Manual*	*Technical Manual for the Quantification of Water Savings*
t_m	Ratio of the length of time that the service point was replaced for irrigation purposes in the year in question to the irrigation season length in the Baseline Year
TO	Torrumbarry
t_r	Ratio of the length of time a channel has been rationalised in the year in question relative to the irrigation season length in the Baseline Year
TSA	Transfield Services Australia
U_{Base}	Unauthorised use loss in the Baseline Year
V_d	Deemed customer deliveries through individual unmetered service points in the Baseline Year
VL	Proportion of bank leakage recognised as variable
WEE	Water Entitlement Entity

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Appendices

1 Introduction

1.1 Introduction and purpose

The Victorian State Government and the Commonwealth Government have committed significant funding for the renewal and modernisation of the Goulburn-Murray Irrigation District (GMID). The water savings achieved through the renewal and modernisation works are to be shared between the environment, Melbourne and irrigation customers. The works are also expected to improve the efficiency of delivery and increase the level of service provided to irrigation customers.

Goulburn-Murray Water (G-MW) is the owner and operator of the GMID. The G-MW Connections Project (GCP) (previously the Northern Victorian Irrigation Renewal Project but since 1 July 2012 part of G-MW) forms the greater part of the modernisation of the Goulburn-Murray Irrigation District (GMID).

The water savings achieved by the GCP are to be audited each year. Cardno has been engaged by the Department of Environment and Primary Industries (DEPI) to undertake an independent audit of the water recovery for the 2012/13 irrigation season. This purpose of this report is to present the findings of this independent audit. This is the fifth annual audit of the water savings achieved by the renewal and modernisation works in the GMID.

1.2 Water Savings Protocol

The Victorian State Government has developed a Water Savings Protocol so that water savings can be consistently and transparently calculated and audited. The Water Savings Protocol is a series of documents including the 'Audit Process' and 'Technical Manual'. The Audit Process document sets out that independent audit of water savings is to include:

- Verifying that the Phase 3 (and Phase 4) water recoveries calculations have been calculated in accordance with the Technical Manual for the Quantification of Water Savings
- Checking that the data collection and inputs are as accurate as could reasonably be expected for the purpose of calculating water recoveries
- Spot checks that the program of works has been implemented as documented in the water saving calculations
- Checking that water recoveries have been calculated based on the nature and the extent of all modernisation works completed prior to 30th June [2]in the year of the audit
- Providing a corrected estimate of the water recoveries for any component where the project proponent calculations are found to be non-compliant or deficient
- Identifying potential improvements to the data collection, data analysis, assumptions and methods used to estimate the water recoveries. Recommend changes to the Technical Manual for the Quantification of Water Savings to the Director of Allocations and Licences within DEPI that will improve useability and accuracy of water recoveries
- Checking if suggestions from the previous year's audit have been acted upon and report upon the status of each of the suggested improvements.

The Technical Manual defines the components of water savings and the methodology for estimating them. This is the principal document against which water savings estimates are verified.

A copy of the Protocol is available on the "Our Water Our Future" website at this location: http://www.ourwater.vic.gov.au/programs/irrigation-renewal/water-savings-protocol/water-savings-protocol-technical-manual.

[2] The Audit Protocol previously set the end date for the completion of modernisation works as 15 May. The brief for this year's audit has revised the end date for the water year to be 30 June.

1.3 Scope of 2012/13 irrigation season irrigation modernisation water recovery audit

The scope of the irrigation modernisation water recovery audit for the 2012/13 irrigation season has been set by DEPI as follows:

- The irrigation modernisation works in place for the 2012-13 'water year' (1 July 2012 to 30 June 2013).
- The GCP operating area which is the whole Goulburn-Murray Irrigation District (Central Goulburn, Rochester, Pyramid-Boort, Murray Valley, Shepparton and Torrumbarry Irrigation Areas).
- Irrigation modernisation works and savings separately accountable to GCP Stage 1 and GCP Stage 2 and the Shepparton - CG1234 irrigation modernisation project.
- The cumulative water entitlement purchases up to 30 June 2013 converted to average equivalent water recovery.
- The cumulative water entitlement purchases up to 30 June 2013 from the Inter-Project Agreement (IPA) funding of $7.7 million converted to average equivalent water recovery.

This is the first year that water savings are to be separately accounted to the Stage 1 and Stage 2 projects. Additionally, some residual works are currently being undertaken for the Shepparton and CG1234 project and these savings are to be identified. This project is largely completed and has been subject to previous annual audits. The background to each of the projects is set out in Section 2.3.

2 Background

2.1 Goulburn Murray Irrigation District

The Goulburn Murray Irrigation District (GMID) is composed of the following six main irrigation areas located in northern Victoria:

- Central Goulburn (CG) (which is divided into sub-areas CG1-4 and CG5-9)
- Murray Valley (MV)
- Pyramid-Boort (PB)
- Rochester (RO)
- Shepparton (SH), and
- Torrumbarry (TO).

Goulburn Murray Water (G-MW) is responsible as both the Water Resource Manager and System Operator for the GMID. Figure 2-1 shows the location of the GMID and the main irrigation district.

Figure 2-1 Goulburn Murray Irrigation District

Source: http://www.g-mwater.com.au/about/regionalmap

2.2 Irrigation modernisation

In 2004, the Victorian Government put in place a long-term plan for water resource management titled “Our Water Our Future”. A key initiative to deliver the sustainable outcomes targeted in this plan is modernisation of irrigation areas in northern and southern Victoria. Irrigation modernisation seeks to improve the efficiency of irrigation systems.

Irrigation modernisation typically involves the automation of channel infrastructure, construction of pipelines, upgrading the accuracy of metered outlets to farms, lining and remodelling of channels and rationalising the

channel network. Many systems are currently controlled manually and the automation of these systems allows water flows to be delivered more accurately and more quickly. These capital works, in unison with changed operational approaches, should have the twin benefits of reducing the amount of water lost in irrigation systems and improving service levels to customers.

The Our Water Our Future website[3] outlines the following main elements of irrigation modernisation:

Channel automation

Channel automation is a way of improving the efficiency of irrigation networks by using new technology to control the flow of water from the storage (usually a dam) through the distribution system to the irrigator. It involves replacing manual flow control structures in channels with updated gates that accurately measure flows, provide real time measurement data and, in most cases, are automated. The automation greatly reduces the water spilt from the end of channels (known as outfalls). Further the gate measurement allows more accurate location of the worst seepage and leakage losses and more effective targeting of channel remediation works.

Automation of the gates also provides the ability to interact with meters and on-farm automation equipment, so best practice irrigation methods can be employed on farms. Other benefits include constant flows and faster water delivery times.

Pipes and channels

Much of the irrigation system relies on open earthen channels to transport water. Inefficient operation and leaky sections result in up to 30%of the total volume being lost. Water losses can be minimised by reducing outfall losses, lining, remodelling or pipelining parts of the channel system.

Improved meter accuracy

Dethridge wheels are inaccurate and on average under-measure water delivery by about 8%. They fail to meet the new metering standards introduced by the Australian Government that specify a maximum of plus or minus 5 per cent measurement inaccuracy. There are also occupational health and safety risks associated with using Dethridge wheels.

2.3 Irrigation modernisation projects

The GCP is being implemented in two stages. Stage 1, which is funded by the Victorian Government, has been underway since 2008 and Stage 2, which is funded by the Commonwealth, commenced in 2012. Additionally, G-MW is also responsible for the delivery of the Shepparton and Central-Goulburn 1234 irrigation modernisation project which was largely complete in 2010.

2.3.1 Shepparton and CG1234 Project

The Shepparton and CG1234 project was undertaken several years ago as an alliance, (named Futureflow), between G-MW, a consultant and a contractor and was substantially completed by the 15 May 2010. The water savings from this project were audited in 2011. However, some works, principally meter replacements are not yet completed. The water savings achieved for the remaining works under this project also require audit.

2.3.2 Stage 1 Project

Under the funding arrangement between the State and Commonwealth Governments, signed in October 2011, Stage 1 of the project is being funded by contributions from the Victorian Government ($600 million initial contribution and $100 Million from a portion of the funds relevant to the sale of 102 GL of water

[3] *http://www.ourwater.vic.gov.au/programs/irrigation-renewal/about. Note - minor edits have been made to this text to clarify its meaning.*

associated with G-MW Connections Project) and Melbourne Water ($300 Million). This stage commenced in 2008 and will be completed in 2018.

The objectives of the Stage 1 project are to:

- Deliver a long-term average of 225 GL of annual project generated water by July 2018 to be shared equally between irrigators, the environment and other funding contributors
- Deliver a modernised backbone channel water distribution system
- Connect approximately 30% of those customers currently supplied by smaller spur channels to the backbone channel via a modern connection \
- Upgrade metering (including real time measurement) on up to 50 per cent of customer supply points, by July 2018, and
- Provide channel remediation to reduce high loss channel pools.

2.3.3 Stage 2 project

The Commonwealth and Victorian Governments are providing funding of $1.059 billion for Stage 2 of the G-MW Connections Project, which commenced delivery in 2012 and is planned to be completed in 2018. The Commonwealth Government is contributing $953 million and $106 million from a portion of the funds associated with the sale of 102 GL of water associated with G-MW Connections Project.

The Stage 2 project is planned to raise the efficiency of the GMID system to over 85%, generating a long-term average of 204 GL of annual water savings from reduced distribution losses. Half of these savings are to be transferred to the Commonwealth Government for environmental use and in particular, contributing to Sustainable Diversion Limits in the Murray Darling Basin.

The works planned to be implemented under Stage 2 include:

- Metering: installation of 5,900 national measurement standard compliant irrigation meters, many of which will be fully automated with remote monitoring.
- Connections: development of new connections for 3,400 customers currently supplied by smaller spur channels (approximately 2,259km) and not dealt with in Stage 1. This also provides for new on-farm infrastructure and restructuring incentives for customers wishing to retire land from irrigation.
- Modernisation works across all irrigation areas,
- Channel lining: lining of 75 km of high loss pools Service enhancement projects: construction of a number of projects to improve service standards in the GMID including key bottlenecks in the Torrumbarry irrigation area.
- Environmental enhancement projects: implementation of projects to enhance key environmental assets in the GMID including construction of a fishway at Box Creek.

The continuing works of this stage and other future works are planned to be managed by GCP until the project's estimated completion in 2018.

2.3.4 Inter Project Agreement Funding

Under the Inter-Project Agreement Funding, the former Northern Victorian Irrigation Renewal Project was provided with funding for to acquire water shares.

3 Audit Methodology

3.1 Water Savings Audit Process requirements

The Water Savings Audit Process[4] is a document under the Water Savings Protocol that sets out the approach to be taken to the independent audit of water savings. The scope of independent audit work relating to irrigation modernisation is to include the elements detailed below. Where each element is addressed in this report is set out below the individual element.

Verifying that the Phase 3 (and Phase 4) water savings calculations have been calculated in accordance with the Technical Manual for the Quantification of Water Savings.

We address this requirement in Section 6 of this report.

Checking that the data collection and inputs are as accurate as could reasonably be expected for the purpose of calculating water savings.

We address this requirement in Section 4 and 5 of this report.

Spot checks that the program of works has been implemented as documented in the water saving calculations.

We address this requirement in Section 5 of this report.

Checking that water savings have been calculated based on the nature and the extent of all modernisation works

We address this requirement in Section 5 of this report.

Providing a corrected estimate of the water savings for any component where the project proponent calculations are found to be non-compliant or deficient.

We address this requirement in Section 6 of this report.

Identifying potential improvements to the data collection, data analysis, assumptions and methods used to estimate the water savings. Recommend changes to the Technical Manual for the Quantification of Water Savings to the Director of Allocations and Licences within DSE (now DEPI) that will improve useability and accuracy of water savings.

We address this requirement in Section 8 of this report.

Checking if suggestions from the previous year's audit have been actioned upon and report upon the status of each of the suggested improvements.

We address this requirement in Section 9 of this report.

The Audit Process also defines the expected content of the water savings audit report. The minimum requirements of the report and where they are fulfilled in this report is summarised following:

[4] *Water Savings Audit Process (Water Savings Protocol), Department of Sustainability and Environment Victoria, Version 2.0 June 2009.*

Table 3-1 Expected Content of Water Savings Audit Report

Requirement	Relevant Section
A summary of findings.	Summary of Findings
An audited supporting data set and reports.	Section 6
Full evaluation of water savings estimation against protocol.	Section 6
Documentation of any instances of non-compliance and the required changes to the proponent's estimates.	Section 5 and 6
Full tabulation of water savings estimation against Project Proponent's Business Case targets.	Summary of Findings
Description of the audit process undertaken, including a description of how the information was audited and/or verified (e.g. sighted documentation, persons spoken to etc.).	Section 3
In addition to the audit report, the auditor can recommend, to DSE, improvements to the method for estimation, calculation and reporting water savings for future years. This may include recommendations of revisions to the Technical Manual for the Quantification of Water Savings, or to the Project Proponent's processes for estimating and reporting water savings.	Section 8

The following sub-sections detail the audit process undertaken.

3.2 Overview of audit methodology

The Cardno approach to auditing water recoveries is based around structured interviews with key authority staff. These structured interviews allow us to scrutinise the water recovery calculations and assess the veracity of the supporting information. Our audit focuses on these areas:

- Reviewing the systems and procedures in place to manage the data used in the calculations, including trailing the data used in the calculations back to source records
- Verifying that the works claimed are complete and commissioned through review of works handover and commissioning documents
- Checking that the audit calculations have been performed correctly
- Validating the WEE register maintained by GCP
- Reviewing GCP's progress on the implementation of previous audit recommendations.

3.3 Schedule of audit meetings

Table 3-2 lists the meetings held to complete the audit work.

Table 3-2 Schedule of Audit Meetings

Date	Audit Work	Auditee	Position
Monday 21 October 2013	Start-up Meeting	Peter Roberts	Project Manager, Water Savings
		Ben Morse	Water Savings Analyst
		Mellissa Crosby	Connections Project Manager
		Kane Dougherty	Snr Project Manager- Mod Plan
		Fiona Nioa	Snr Engineer RPS
		Ross Plunkett	Manager Planning & Design
	Audit of water savings calculations	Peter Roberts	Project Manager, Water Savings
		Ben Morse	Water Savings Analyst
Tuesday	Audit of water savings calculations	Peter Roberts	Project Manager, Water Savings

Date	Audit Work	Auditee	Position
22 October 2013		Ben Morse	Water Savings Analyst
Wednesday 23 October 2013	Review of IPM and customer deliveries	Mick Doherty	Water Systems Planner
		Peter Roberts	Project Manager, Water Savings
	Assignment of works to Stage 1 and Stage 2 projects	Irais Medegico	Business Analyst
		Peter Roberts	Project Manager, Water Savings
	Shepparton and CG1234 residual works	Jeremy Nolan	Principal Project Manager
		Peter Roberts	Project Manager, Water Savings
	Works pack review	Garrick Rogers	Project Manager, Transcom
Thursday 24 October 2012	Audit of WEE registers	Melissa Crosby	Connections Project Manager
		Peter Roberts	Project Manager, Water Savings
		Ian Rodgers	Project Director
		Peter Roberts	Project Manager, Water Savings
	Close out meeting	Mellissa Crosby	Connections Project Manager
		Ben Morse	Water Savings Analyst
		Fiona Nioa	Senior Engineer RPS

3.4 Document register

A list of the documents received before, during and after the audit are included in Appendix A.

4 Information Systems and Processes Supporting Water Savings Calculations

4.1 Introduction

Our audit considers the systems and processes in use by G-MW and its contractors that support the calculation of water recoveries to determine whether they are sufficiently reliable to produce accurate, repeatable and transparent data. Our review of systems and processes focuses on those business areas central to the water recovery estimates:

- Planning and delivery of construction works
- Outfall measurement and recording
- Customer deliveries.

Because of the importance of demonstrating that the water recoveries have been calculated based on accurate information, we have complemented this review of systems and processes, with trailing of selected data, used in the calculations, to their source. The results of this trailing are documented in Section 5.

To operate its irrigation network, G-MW employs a number of information systems. The key systems are:

- SCADA – provides real time monitoring of gate operation, including trending. Field readings are stored and can be accessed through a data warehouse.
- Maximo – asset information system and computerised maintenance management system
- GIS – records location of channels and control gates. Channel lengths and widths are measured from here.
- The Irrigation Planning Module (IPM) takes customer orders, checks system capacity to deliver orders and records delivered volumes.

4.2 Planning and delivery of construction works

In previous years, construction records were held across a number of different systems reflecting the different parties responsible for providing infrastructure. However, as the project has progressed, the majority of works are undertaken by a single contractor, TransCom Connect with construction records stored in its document management system, Aconex. TransCom Connect is a joint venture between Transfield Services Australia and Comdain Infrastructure. Previously, works were predominantly constructed by Transfield Services Australia alone. The Aconex system has been in use for a number of years.

TransCom Connect as the managing contractor typically manages a number of sub-contractors including designers, civil works contractors and mechanical and electrical (M&E) contractors to complete the required works. Works within the channels (e.g. regulator gate automation and channel remediation) are usually completed outside of the irrigation season, while service point replacements and rationalisations are delivered throughout the year.

Delivery of the modernisation assets generally follows the following sequence:

1. G-MW's planners determines the schedule of works to be undertaken
2. TransCom Connect project manages the asset delivery:
    a. Engage designer to complete detailed design
    b. Engage civil subcontractor to complete civil works
    c. Engage M&E subcontractor to complete M&E works
3. Asset commissioning

4. Handover of assets to G-MW.

When new assets are commissioned, or redundant channel decommissioned, an Inspection Test Procedure (ITP) certificate is produced which records relevant commissioning/decommissioning details. These ITP certificates are stored on Aconex along with other documents relevant to the construction and commissioning of each site. These documents are collectively referred to as the 'work pack' for the constructed asset.

While handover of assets to G-MW following a defects liability period is important for the successful ongoing operation of the modernisation works, we have focused on asset commissioning rather than handover, as water recoveries are typically achieved from the time that an asset is commissioned. Asset commissioning dates are recorded by TransCom Connect on schedules and forwarded to G-MW. G-MW then uses these dates in its water recovery calculations.

We believe that G-MW's and TransCom Connect's systems for asset delivery and commissioning are sufficiently robust to completely and correctly record the details of irrigation modernisation asset installation and commissioning. TransCom Connect's document management system provides the reference database for the storage and retrieval of all construction and commissioning records. The database has been in use for several years.

4.3 Recording of outfall flow volumes

The volumes of flows through outfalls are an important data input into water savings calculations as savings from outfalls currently are a significant component of all water savings achieved. Now that irrigation modernisation works in the GMID have been in progress for several years, most major outfalls have online flow measurement which is recorded in the G-MW SCADA. A number of unmetered outfalls where flows are estimated by operators remain in operation (mainly on spur channels that may be decommissioned in the future). However, these account for only a small proportion of the water savings achieved.

Where an outfall has online measurement, field staff record the outfall volume each day in a logsheet. There is a separate logsheet for each irrigation area. The field staff review the SCADA data and, if necessary, make adjustments for any erroneous readings, e.g. if the water level in the channel is particularly low, the flow reading may be a false high reading when in fact no water is leaving the outfall.

4.4 Customer delivery volumes

The IPM is the business system used by G-MW to manage irrigation supply orders and plan the delivery of these orders. When an order is placed by a customer online or by telephone, it is sent to IPM. For customers on fully automated channels, IPM essentially sends the order to the customer's outlet. The orders specify the times to open and close the customer outlet and the ordered flow rate. The channel automation system uses a combination of feedback control on water level with feed-forward on flow to control to the channel.

IPM also provides management reporting facilities on a range of operational aspects and records delivery volumes for billing purposes. It also records delivery volumes against entitlements and rejects orders where the entitlement has been exceeded.

For the purposes of the water savings calculations, IPM is used to determine customer deliveries through service points. We have reviewed the procedures for extracting this data from IPM and found that they adequately describe the process. We also undertook trailing of some delivery volume records for 2012/13.

4.5 Conclusions

Our review for the 2012/13 audit of the information systems and processes used by G-MW has found that they continue to be sufficiently robust to generate data and inputs that are as accurate as could reasonably be expected for the purpose of calculating water recoveries.

4.6 Recommendations

We recommend that G-MW continues to improve the way it records, reports and validates outfall volume data in order to increase the reliability of these figures. We understand that G-MW is undertaking work in this area but that it will not be finalised for a number of years.

5 Data trailing of calculation inputs

5.1 Objective

We have trailed data used in the calculation of water savings back to source systems and original data sets as part of our audit to test that the inputs utilised to estimate water savings is based on complete and accurate data contained in G-MW information systems. The data trailing undertaken at the audit is a combination of random and targeted sampling.

We discuss the data trailing undertaken in the following sections.

5.2 Construction records

5.2.1 General

Our review for the 2012/13 audit was primarily focused on the assets constructed during this year as we have reviewed samples of assets constructed in previous years through previous audits. As noted in Section 4.2, construction of modernised irrigation infrastructure in 2012/13 was predominantly undertaken by TransCom Connect, a joint venture between Transfield Services Australia and Comdain Infrastructure. Previously, works were predominantly constructed by Transfield Services Australia alone.

5.2.2 Service point replacement and rationalisation – Stage 1 and Stage 2 project

We requested commissioning certificates (ITP certificates) for a sample of 43 sites where service points had been replaced or rationalised to confirm that the works have been completed. We also checked that that the date of the commissioning certificates agreed with the date claimed in the water recovery calculations.

The results of reconciling these records with the data used in the water savings calculation is summarised in Table 5-1.

Table 5-1 Results of service point replacement and rationalisation data trailing

Region	Asset	Constructed	Commiss-ioned	Audit notes
Central Goulburn	RN24SMC	27/06/2012		Map only provided
Central Goulburn	TN5057	6/07/2012		Work pack provided but does not include ITP certificate
Central Goulburn	RN30SMC	14/07/2012		Map only provided
Central Goulburn	TN12929	20/07/2012		Work pack provided
Central Goulburn	RN1521	9/08/2012		Work pack provided
Central Goulburn	TN13023	10/08/2012		Work pack provided
Central Goulburn	RN32SMC	9/08/2012	1/05/2013	Work pack provided
Central Goulburn	RN18SMC	4/07/2012	10/05/2013	Work pack provided
Central Goulburn	RN31SMC	9/08/2012	14/05/2013	Work pack provided but does not include ITP certificate
Central Goulburn	TN2853	3/05/2013	16/05/2013	Work pack provided
Central Goulburn	TNDS6493A	15/02/2012	15/02/2012	Work pack provided
Murray Valley	MV6832	16/01/2013		Work pack provided but does not include ITP certificate
Murray Valley	MV1208	18/01/2013		Work pack provided but does not include ITP certificate
Murray Valley	MV3187	22/01/2013		Work pack provided but does not include ITP certificate
Murray Valley	MV5601	22/01/2013		No records provided
Murray Valley	MV5600	23/01/2013		Work pack provided but does not include ITP certificate
Murray Valley	MV3066	11/01/2013	14/01/2013	Work pack provided

Region	Asset	Constructed	Commiss-ioned	Audit notes
Murray Valley	MV3159A	21/12/2012	17/01/2013	Work pack provided
Murray Valley	MV3159	11/01/2013	21/01/2013	Work pack provided
Murray Valley	MV3165	19/01/2013	1/02/2013	Work pack provided
Murray Valley	MV2281	24/01/2013	1/02/2013	Work pack provided
Murray Valley	MV5065	7/12/2012	1/03/2013	Work pack provided however there is a discrepancy between the ITP certificate date and that used in calculations
Murray Valley	MV5180A	24/04/2013	2/05/2013	Work pack provided
Murray Valley	MV4029A	5/06/2013	25/06/2013	Work pack provided
Pyramid-Boort	PH207	14/09/2012	14/05/2013	Work pack provided however there is a discrepancy between the ITP certificate date and that used in calculations
Pyramid-Boort	PH2592	13/03/2013	14/05/2013	Work pack provided but does not include ITP certificate
Pyramid-Boort	PH1426	30/04/2013	16/05/2013	Work pack provided
Pyramid-Boort	PH2589	9/05/2013	20/05/2013	Work pack provided
Torrumbarry	TO2155A	23/10/2012	15/11/2012	Work pack provided however there is a discrepancy between the ITP certificate date and that used in calculations
Torrumbarry	TO2199A	7/11/2012	28/11/2012	Work pack provided however there is a discrepancy between the ITP certificate date and that used in calculations. Date on ITP certificate is approximately three months later than that used in calculations
Pyramid-Boort	PHDS1825	6/12/2012	6/12/2012	Work pack provided
Rochester	RO4035	16/01/2012		Work pack provided but does not include ITP certificate
Rochester	RO4036	17/01/2012		Work pack provided but does not include ITP certificate
Rochester	RO5090	27/04/2012	30/04/2012	Work pack provided however there is a discrepancy between the ITP certificate date and that used in calculations
Rochester	RO5617	27/04/2012	2/05/2012	Work pack provided
Rochester	RO6174	30/04/2012	8/05/2012	Work pack provided
Torrumbarry	TO2451	16/08/2012	12/09/2012	Work pack provided
Torrumbarry	TO1632	20/07/2012	13/09/2012	Work pack provided however there is a discrepancy between the ITP certificate date and that used in calculations
Torrumbarry	TO1620	30/08/2012	17/09/2012	Work pack provided however there is a discrepancy between the ITP certificate date and that used in calculations
Torrumbarry	TO2783	4/09/2012	17/09/2012	Work pack provided
Torrumbarry	SH3425	25/06/2012	2/10/2012	Work pack provided but does not include ITP certificate
Torrumbarry	TO2189A	23/04/2013	21/05/2013	Work pack provided
Torrumbarry	SH960	21/05/2013	20/06/2013	Work pack provided but does not include ITP certificate

The analysis in Table 5-1 shows that:

- For 22 (51%) of the sites reviewed, a work pack that included an ITP was provided
- For seven (16%) of the sites reviewed, a work pack was provided, but the date of decommissioning recorded on the ITP certificate was different from that used by G-MW in its calculations. In all instances except one, the date on the ITP certificate was earlier than that used in the calculations, meaning that these errors would have a very minor bias towards underestimating Phase 3 savings. The different dates would not affect the Phase 4 water savings

- For 11 (26%) of the sites reviewed, construction records were provided but the records did not include an ITP certificate.
- For two (5%) of the sites reviewed, a map was the only construction record that could be provided.
- For one (2%) of the sites reviewed, no construction records were provided.

While the information provided by G-MW is generally sufficient to confirm that the works claimed have been completed, there are 14 sites where no ITP certificate could be provided. As the ITP certificate is formal sign off for commissioning works, we would expect to be provided with this document for all sites. We recommend that G-MW ensure that ITP certificates are completed for all service point works. A possible means of achieving this is to link contractor payments to receipt of complete ITP certificates and work pack records.

The seven sites where it was observed that the ITP commissioning date was different to that used in the calculations appears to be a systematic error, perhaps due to the date the record was entered into Aconex being used instead of the commissioning date. This error will lead to a very minor underreporting of the Phase 3 water savings achieved and is not material.

5.2.3 Service point replacement – Shepparton and CG1234 project

For this audit, we are required to review the water savings resulting from the completion of residual service point replacement works in 2012/13. The majority of this project was completed in previous years and has been subject to audit.

The remaining works to be audited this year are the replacement or rationalisation of 70 meters. 15 of these meters are located in the Shepparton irrigation area and the remaining 55 are in the Central Goulburn 1-4 area. The works were originally included in the scope of the Futureflow alliance but were not completed because large diameter meters were required (large diameter meters have not become available until recently).

We requested G-MW to provide to us ITP certificates for 14 sites. For 13 sites, the ITP certificates were provided. For the remaining site, SP2083, G-MW could only provide a photo confirming that the new meter had been installed. While we are satisfied that all works claimed are complete, the missing ITP certificate continues the trend seen for other service point works noted in the previous section. We note however that the frequency of missing certificates is lower in this sample.

5.2.4 Rationalisation

We requested that G-MW provide us with construction records verifying that the channel rationalisation works claimed in the water recovery calculations have been completed for a sample of 29 sites. The results of this record trailing are detailed in Table 5-2.

Table 5-2 Results of channel rationalisation construction record trailing

Business Case	Region	A-ID	IPM/Asset Code	Notes
106	Rochester	A0106B	CH013257	Work pack provided. However no IPT certificate provided in work pack.
239	Torrumbarry	A0239B	ST000908	G-MW was only able to provide photos to confirm that this channel section had been decommissioned. No construction records or ITP certificate were provided.
264	Murray Valley	A0264A	MV3185	Work pack provided. However no IPT certificate provided in work pack.
369	Murray Valley	A0369B	ST040274	Work pack provided
405	Murray Valley	0405-101	CH014273 Block	G-MW was only able to provide photos to confirm that this channel section had been decommissioned. No construction records or ITP certificate were provided.
470	Murray Valley	0470-100	ST057822	Work pack provided
470	Murray Valley	0470-102	ST057834	Work pack provided

Business Case	Region	A-ID	IPM/Asset Code	Notes
598	Torrumbarry	0598-113	CH003118	Unable to confirm from work pack that these assets have been decommissioned.
598	Torrumbarry	0598-113	ST002305	Work pack provided and includes map referencing this asset where the channel has been blocked.
642	Torrumbarry	A0642A	TO3213	Work pack provided
672	Torrumbarry	A0672B	ST000719	Work pack provided. However no ITP certificate provided in work pack.
683	Pyramid-Boort	A0683A-P3	ST023299	Work pack provided. However records relate to meter PH1092. Unable to reconcile to IPM code or asset code.
793	Murray Valley	A0793B	ST058524	Work pack provided with construction records confirming rationalisation. Date of rationalisation on IPT is 21/12/11 but 9/4/13 used in calculations
863	Murray Valley	A0863A	ST058367	Work pack provided
869	Central Goulburn	A0869A	ST046488	Work pack provided
898	Murray Valley	0898-100	CH011650	G-MW was only able to provide photos to confirm that this channel section had been decommissioned. No construction records or ITP certificate were provided.
926	Central Goulburn	A0926B	ST006523	Work pack provided. However no ITP certificate provided in work pack.
948	Murray Valley	0948-100	ST057141	No records provided
989	Torrumbarry	A0989B	ST027909	Work pack provided
1064	Pyramid-Boort	A1064B	CH000753	Work pack provided with construction records confirming rationalisation. Date of rationalisation on IPT is 27/8/12 but 7/2/13 used in calculations
1263	Torrumbarry	A1263A	CH000337	Work pack provided with construction records confirming rationalisation. Date of rationalisation on ITP is 2/10/12 but 29/4/13 used in calculations
1430	Central Goulburn	1430-103	RN2224	G-MW provided a photo and some construction records to demonstrate that this asset had been decommissioned. No ITP certificate was provided.
1452	Pyramid-Boort	1452-101	CH000811	Work pack provided with construction records confirming rationalisation. Date of rationalisation on ITP is 21/8/12 but 22/4/13 used in calculations
1479	Murray Valley	1479-104	ST056677	Work pack provided. However, no ITP certificate provided in work pack.
1498	Murray Valley	A1498B	ST056575	Work pack provided. However, no ITP certificate provided in work pack.
1499	Rochester	A1499A	CH003982	Work pack provided
1510	Torrumbarry	1510-106	CH007877	G-MW was only able to provide photos to confirm that this channel section had been decommissioned. No construction records or ITP certificate were provided.
1548	Central Goulburn	1548-101	ST045152	G-MW was only able to provide photos to confirm that this channel section had been decommissioned. No construction records or ITP certificate were provided.
2094	Torrumbarry	2094-500	TO2754	G-MW was only able to provide photos to confirm that this channel section had been decommissioned. No construction records or ITP certificate were provided.

The analysis in Table 5-2 shows that:

- For nine (31%) of the sites reviewed, a work pack that included an ITP was provided
- For five (17%) of the sites reviewed, a work pack was provided, but the date of decommissioning recorded on the ITP certificate was different from that used by G-MW in its calculations. In all instances, the date on the ITP certificate was earlier than that used in the calculations, meaning that these errors would have a very minor conservative bias towards underestimating Phase 3 savings.

- For six (21%) of the sites reviewed, construction records were provided but the records did not include an ITP certificate.
- For five (17%) of the sites reviewed, photographs were the only record of construction provided.
- For four (14%) of the sites reviewed, no records were provided or the records provided could not be definitely linked to the site in question.

We have observed for a number of years that the records maintained for channel rationalisation works are not as robust as the records maintained for other modernisation works. This is likely in part because the works relate to the decommissioning of assets rather than construction of new assets and therefore the planning, design and construction documentation required is less substantial.

Nevertheless, channel rationalisation is an important means for achieving water savings and its significance will increase as Stage 2 of the project progresses. We have recommended in previous years and recommend again this year that G-MW improve its processes for recording channel rationalisation works. We recommend that the following records be kept:

- An ITP certificate detailing the assets (channel lengths, service points, etc.) decommissioned and the date the decommissioning became effective.
- A map showing the location of the decommissioned assets and the means of decommissioning (e.g. location of a channel block).
- Photos of the decommissioning works during construction and when complete.
- Other relevant work pack documents to provide additional assurance, e.g. safe work method statement and environmental plan.

We recommend that G-MW consider linking payment for works to receipt of a signed and complete ITP certificate and work pack for that work.

5.2.5 Remediation

We requested that G-MW provide construction records for a sample of remediation works completed in 2012/13 to verify that the channel remediation works claimed in the water recovery calculations had been completed. A total of nine pools were remediated in 2012/13. Four pools were included in the sample of sites reviewed and these are detailed in Table 5-3.

The records provided included maps, photos, track sheets and commissioning paperwork. We also reviewed progress payment claims and Certificates of Practical Completion. Based on the evidence provided, we were able to confirm that the works in our sample are complete.

Table 5-3 Sample of remediation sites

Channel	Pool
MV 2	MV100-MV200
TO 1	TO414-TO477
TO 1	TO626-TO633
TO 3	TO98-TO109

5.3 Outfall volumes

G-MW provided to us ‘area spreadsheets’ that summarise outfall volumes for each irrigation area. We selected a number of outfalls included in the calculation of water savings due to automation and trailed the outfall volumes back to these area spreadsheets. While we were able reconcile the outfall volumes used the calculations with the area spreadsheets, we note that the areas use different approaches to recording and reporting outfall volumes. Outfalls are also typically referred to by their channel number or a colloquial name. This can make identifying the outfall site difficult. We recommend that the IPM code and/or structure code be used to refer to outfalls. G-MW is aware of these inconsistencies and is undertaking work to standardise

practices, as well as make greater use of SCADA. However, G-MW advised that this work will take a number of years to complete.

5.4 Customer delivery volumes

We selected a sample of customer service points and trailed the recorded delivery volume to IPM which is the source system for storing this information. The service points included in the sample were:

- TN4380
- RN1643
- TN5496
- RN2013
- TN4671
- TN1050.

For all sites, the delivery volume used in the water savings calculations agreed with the delivery volume recorded in IPM. Although this is a relatively small sample compared to the population of service points, this data trailing provides additional assurance that this information is being correctly included in the water savings calculations.

5.5 Mitigating Flows

Mitigating flows are volumes of water that have been identified for alleviating the impacts of irrigation modernisation on wetlands and waterways of high environmental value. These flows are subtracted from water savings due to automation. Mitigating flow volumes are set out in Environmental Watering Plans approved by the relevant Minister. The approved Environmental Watering Plans are published on G-MW's website at this location:

http://www.g-mwater.com.au/connections/planningandenvironment/the_environment/effects

Mitigating flows have been included in the water savings calculation for 2012/13 at 12 sites. We reviewed the Environmental Watering Plans relating to each of these sites to confirm that the correct allowance for mitigating flows had been made in the water savings calculations. The result of this data trailing is summarised in Table 5-4.

Table 5-4 Findings of review of Environmental Watering Plans

IPM Code	Asset Code	Site of environmental significance	Environmental Water Plan	Audit notes
PH1052A	ST025235	Lake Leaghur	Lake Leaghur	Confirmed correct allowance made for mitigating flows
PH1249	ST008516	Little Lake Boort	Lake Little Boort	Confirmed correct allowance made for mitigating flows
PH1119	ST023738	Duncan	Loddon River	Confirmed correct allowance made for mitigating flows
PH1138A	ST023656	Lake Meran	Lake Meran	Confirmed correct allowance made for mitigating flows
PH1186	ST023234	River Pool	Loddon River	Confirmed correct allowance made for mitigating flows
PH1211	ST025135	Dowdy's	Loddon River	Confirmed correct allowance made for mitigating flows
PH1096	ST047427	Gannons	Loddon River	Confirmed correct allowance made for mitigating flows
PH1224	ST073298	Delamare	Loddon River	Discrepancy between G-MW ST code and that in Environmental Watering Plan. Environmental Watering Plan refers to ST0023628.
TO1025	ST004154	Lake Elizabeth	Lake Elizabeth	Confirmed correct allowance made for mitigating flows
		Pig Swamp	Pig Swamp	Confirmed correct allowance made for mitigating flows

TO70	ST001206	McDonald's Swamp	McDonald's Swamp	Confirmed correct allowance made for mitigating flows
PH1052A	ST025235	Lake Leaghur	Lake Leaghur	Confirmed correct allowance made for mitigating flows

For one site (Delamare, Loddon River), we identified a discrepancy between the structure code (ST code) used by G-MW to identify an outfall from which environmental flows are sourced and that recorded in the Environmental Watering Plan. For all other sites we were able to confirm that G-MW had made the correct allowance in its calculation of water savings for mitigating water.

For the site where we identified the discrepancy in the reference structure code, G-MW was able to demonstrate through its GIS and through description of the waterway in the Environmental Watering Plan that the discrepancy only relates to the referencing of the site; the mitigating flows have been correctly accounted for in its estimate of water savings. We recommend that G-MW document this discrepancy and publish a short note confirming the details of the mitigating flow site as referenced in its own systems compared with that in the Environmental Watering Plan.

5.6 Conclusions

We found that most assets included in our samples for data trailing had sufficient evidence to support the fact that they have been constructed and commissioned. The exception being for channel rationalisation work where for 31% of the sites reviewed, there was either no construction record provided or only photos post-construction. For a further 21% of the sites reviewed, construction records were provided but they did not include the ITP certificate. While we are generally satisfied that G-MW has completed the works claimed in the calculations, we believe that G-MW must improve how it documents completion of channel rationalisation works. Similar problems were observed in the review of construction records for service point replacement and rationalisation but were less prevalent.

While there were some minor discrepancies observed for commissioning dates of modernised infrastructure, these do not materially impact upon the water recoveries claimed.

We found, as in previous years, that there are inconsistent approaches between areas for recording and reporting outfall volumes. G-MW is aware of these issues and has planned to address them but advise that this will take a number of years to take effect.

We found that for our small sample of customer delivery volumes, the volumes used in the calculations were consistent with the volumes recorded in IPM.

We found in trailing mitigating flow volumes that for one site (Delamare, Loddon River), there is a discrepancy between the structure code (ST code) used by G-MW to identify an outfall from which environmental flows are sourced and that recorded in the Environmental Watering Plan. The outfall site physically exists but losses were not material to the water savings estimates or mitigating flows. For all other sites we were able to confirm that G-MW had made the correct allowance in its calculation of water savings for mitigating water. This discrepancy does not impact the water savings calculations.

5.7 Recommendations

Based on our trailing of source data used in the calculations, we make the following recommendations:

- We recommend that G-MW ensure that ITP certificates are completed for all construction works, including channel rationalisation and service point rationalisation. A possible means of achieving this is to link contractor payments to receipt of complete ITP certificates and work pack records.
- In addition to ensuring that ITP certificates are in place for all channel rationalisation works, we recommend that these works be better documented and that complete work packs, including maps and photos, be collected for all completed works.

- We recommend that G-MW document the discrepancy in the Structure Code reference for the Delamare Site on the Loddon River and publish a short note confirming the details of the mitigating flow site as referenced in its own systems compared with that in the Environmental Watering Plan.

6 Audit Findings –Water Savings Calculations

6.1 Structure of this chapter

This chapter has been structured to align with the structure of the *Technical Manual,* with each water saving intervention presented in the same order as found in that document. The *Technical Manual* provides additional discussion on the application of the water savings calculations that has been omitted from this report to avoid repetition.

For each water saving intervention (channel rationalisation, channel automation, service point replacement and rationalisation and channel remediation) we detail:

- The nature of the works that lead to water recovery and the scope of works undertaken to date
- An overview of the components that contribute to water recovery in each area
- The calculations from the *Technical Manual* used to determine the savings in that area
- The data used in the calculation. Input data is sourced mainly from the *Technical Manual*, the baseline year water balance and operational records
- The water savings resulting from applying the calculation.

The scope of this audit is to review Phase 3 and Phase 4 water savings achieved, where:

- Phase 3 water savings are the annual post-works measurement or verification of interim water savings able to be allocated from the water savings account
- Phase 4 water savings are the assessment of the overall long term water savings achieved through the modernisation program.

6.2 Baseline year water balance

In calculating water savings, reference is made for some components to water loss that occurred in a baseline year. For most water savings components, the baseline year was the 2004/05 irrigation season. A water balance that establishes the value for water loss components in each irrigation area for this baseline year was compiled by G-MW. This baseline year water balance has been previously independently audited.

Since the completion of this independent audit, G-MW has revisited the baseline year water balance and made some revisions on the basis of better information being available or a more complete understanding of the nature of losses in the irrigation districts. This revised baseline year water balance was independently audited in 2012 and has been used as the basis of this audit.

6.3 Overview of water recovery achieved in 2012/13

For the first time, the 2012/13 audit requires water savings to be separately accounted to the Stage 1 and Stage 2 projects. The Stage 1 project has been in progress since 2008 while the Stage 2 project commenced in 2012. Therefore, the Stage 1 project accounts for the great majority of savings, as shown in Table 6-1. Note that this table excludes savings from the residual works undertaken in the Shepparton and CG1-4 irrigation areas.

Table 6-1 Audited Phase 4 water savings by project

Project	Phase 4 water savings (ML)	% total
Stage 1 project	136,206	98%
Stage 2 project	2,660	2%
Total	138,866	

Figure 6-1 provides an overview of the contribution of the different modernisation activities to the audited Phase 4 water savings for 2012/13 for both the Stage 1 and Stage 2 projects. This figure shows that Channel Automation (37%) and service point replacement (32%) are the most significant contributors to water savings achieved to date. Channel Automation works are largely complete and the share accountable to this intervention will reduce as a proportion of the total with time. As the Stage 2 project progress, savings due to service point replacement and rationalisation and channel rationalisation are expected to increase.

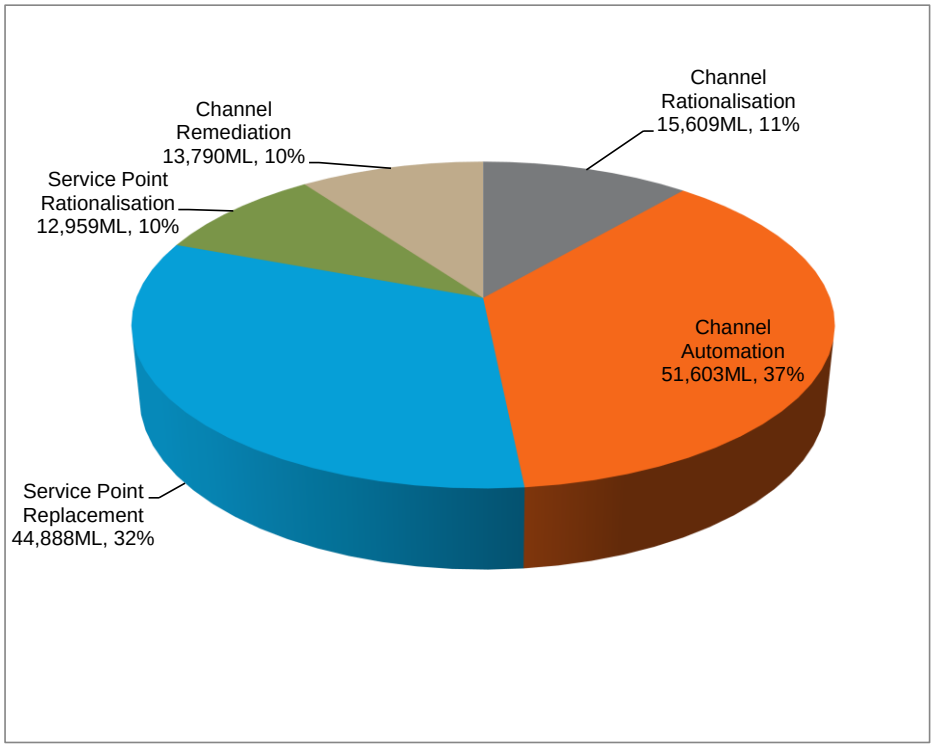

Figure 6-1 Audited Phase 4 Water Savings Estimates (Stage 1 and Stage 2 projects) 2012/13

6.4 Savings from Channel Rationalisation

6.4.1 Scope of Channel Rationalisation Works

Channel rationalisation involves redesigning the channel network so that channel length can be minimised while still providing service to customers. Channels that are determined to be redundant are abandoned and isolated from the distribution network and no flows enter them. This means that there are water savings due to reduced evaporation, bank seepage and bank leakage.

Channel rationalisation has been completed under the Stage 1 project and for the first time in 2012/13, the Stage 2 project. Rationalisation of spur channels under the Stage 2 project is expected to contribute significantly to water savings in future years as the Connections project progresses.

Figure 6-2 details the length of channels rationalised in each irrigation area under the Stage 1 and Stage 2 projects.

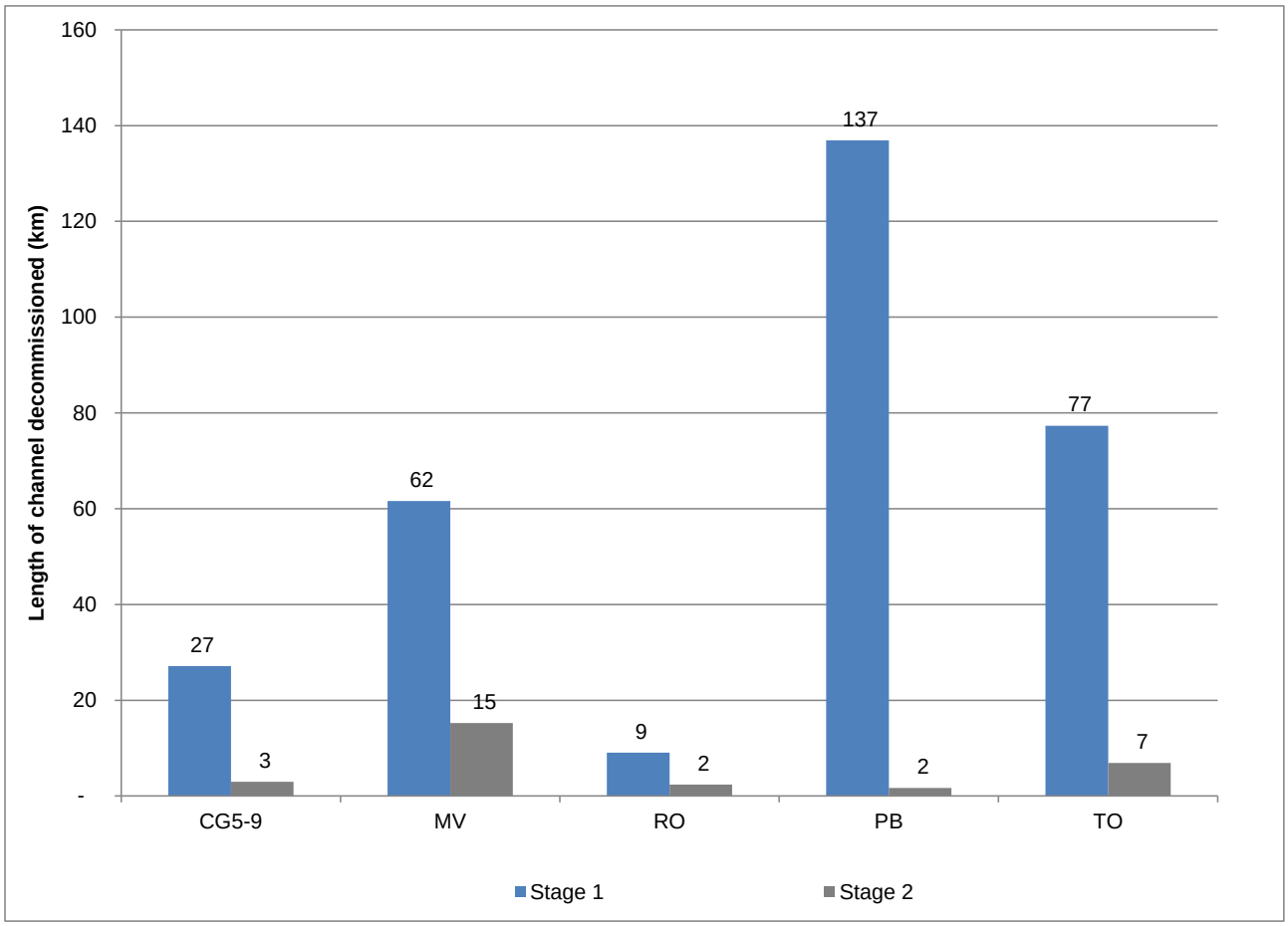

Figure 6-2 Length of rationalised channel by irrigation area under Stage 1 and Stage 2 project

6.4.2 Overview

Water savings due to channel rationalisation are the sum of the savings due to water no longer being lost in the channel to seepage, bank leakage and evaporation:

Phase 3: $WS_{Year\ X} = WS_{Seepage} + WS_{bank\ leakage} + WS_{evaporation}$

Phase 4: $WS_{(LTCE)} = WS_{Seepage(LTCE)} + WS_{bank\ leakage(LTCE)} + WS_{evaporation\ (LTCE)}$

6.4.3 Water Savings Calculations

Phase 3 Calculations

Phase 3 water savings have been calculated by G-MW using the Phase 3 channel rationalisation formulae from the *Technical Manual*:

$$WS_{Seepage} = S_{Base} \times CL \times tr \times EF$$

$$WS_{bank\ leakage} = [(L_{Base} \times FL) + (L_{Base} \times VL \times (D_{Year} \times / D_{Base})] \times CL \times t_r \times EF$$

$$WS_{evaporation} = E_{Base} \times CL \times t_r \times EF$$

Phase 4 Calculations

Phase 4 water savings due to channel rationalisation are estimated by the following equations from the *Technical Manual*:

$$WS_{Seepage(LTCE)} = S_{Base} \times CL \times EF \times DF$$

$$WS_{bank\ leakage(LTCE)} = [(L_{Base} \times FL) + (L_{Base} \times VL \times F(LTCE_{Base}))] \times CL \times EF \times DF$$

$$WS_{evaporation\ (LTCE)} = E_{Base} \times CL \times EF \times DF$$

The differences between the Phase 4 calculations and the Phase 3 calculations is the addition of the durability factor (DF) and the replacement of the deliveries ratio with F(LTCE). The revision of the *Technical Manual* for Version 4 has also eliminated the time factor t_r from the Phase 4 calculation.

The revision of the baseline year in 2011/12 adjusted the baseline year losses for leakage, seepage and evaporation losses. Seepage and evaporation losses are also now taken to occur over a full year rather than just the irrigation season.

G-MW applies the calculations on a channel by channel basis which gives a more accurate assessment of Phase 3 estimates than if the time and length factors were applied as an average across the entire irrigation area.

6.4.4 Input Data

The inputs required to calculate Phase 3 and Phase 4 water savings due to channel rationalisation are summarised in Table 6-2 and Table 6-3. The first table details the parameters that are fixed or have been previously audited, e.g. the baseline year parameters. The second table details the input data from the current year.

Table 6-2 Fixed Parameters and Baseline Year Parameters for Channel Rationalisation Water Savings Calculation

Parameter	Description	Source
S_{Base}	Seepage in Baseline Year	Baseline Year water balance
L_{Base}	Leakage in Baseline Year	Baseline Year water balance
E_{Base}	Evaporation in Baseline Year	Baseline Year water balance
D_{Base}	Deliveries in Baseline Year	Baseline Year water balance
FL	Proportion of bank leakage recognised as fixed	Technical Manual
VL	Proportion of bank leakage recognised as variable	Technical Manual
EF	Effectiveness Factor for channel rationalisation	Technical Manual
DF	Durability Factor to account for the durability of water savings	Technical Manual
$F_{(LTCE)}$	Long Term Cap Equivalent Factor to convert Current Year volumes to Long Term Cap Equivalent volume	Calculated from deliveries and base figure advised by Department of Environment and Primary Industries

Table 6-3 Current Year Parameters for Channel Rationalisation Water Savings Calculation

Parameter	Description	Source
CL	Ratio of length of spur channel length rationalised to total spur channel length in system	GIS and direct measurement
t_r	Ratio of the length of time a channel has been rationalised in the year in question relative to the irrigation season length in the Baseline Year	Construction records
D_{Year} **x**	Customer deliveries in the year in question to the irrigation system	IPM reports

We have reviewed the input data and confirm that the fixed parameters sourced from the *Technical Manual* are correct. We cross checked the baseline year values against the baseline year audit report and confirmed that G-MW has used values from the spur channels water balance.

Our review of the current year parameters used in the calculations found the following:

Customer Deliveries in the Current Year ($D_{Year\ X}$)

Customer deliveries through the meters replaced in each irrigation district are determined through IPM. These delivery volumes are used for customer billing, as noted previously, and therefore we believe they will be reliable due to the scrutiny they are subject to by G-MW and customers. We outline the results of our data trailing of customer delivery volumes in Section 5.4.

Ratio of Channel Length Rationalised to Total Channel Length (CL)

We confirm that G-MW has correctly used the length of spur channels in each irrigation area as the denominator in this calculation. The numerator is the length of channels rationalised. We believe that the systems used for capturing and reporting lengths of channel rationalised are robust. G-MW has improved its processes for estimating channel lengths with additional verification through GIS. We comment on our trailing of channel rationalisation records in Section 5.2.3.

Ratio of Length of Time Channels Rationalised to Baseline Year (t)

This variable is determined from the channel de-commissioning date recorded. Currently this factor materially impacts on Phase 3 water savings estimates as the total volume of work completed is relatively small compared with the volume completed in 2012/13. However, as the works progress and the majority of works will be in place for the entire year this factor will become less important.

We have commented in our trailing of construction records in Section 5 that commissioning dates are not reliably recorded by G-MW water for some works, particularly channel rationalisation. The date of commissioning is only important for the estimation of Phase 3 water savings. We consider that while G-MW should improve its practices, this does not bring in to question the water savings claimed because the impact of the inaccuracy in dates will not be significant across all savings and will lessen in time as the proportion of assets constructed in the current year decreases compared with the total length of all decommissioning works.

6.4.5 Results

We found that G-MW has correctly applied the water savings formulae to the input data. The audited water savings due to channel rationalisation are summarised in Table 6-4 for Phase 3 savings and Table 6-5 for Phase 4 savings.

Table 6-4 Phase 3 Water Savings due to Channel Rationalisation – Stage 1 and Stage 2

	CG5-9	MV	RO	PB	TO	Total
Stage 1						
Seepage (ML)	307	475	105	974	961	2,822
Bank leakage (ML)	463	996	226	1	2,910	4,596
Evaporation (ML)	131	210	46	499	325	1,211
Total	**902**	**1,681**	**377**	**1,474**	**4,196**	**8,630**
Stage 2						
Seepage (ML)	14	85	10	9	15	133
Bank leakage (ML)	21	163	18	0	22	224
Evaporation (ML)	6	38	4	5	5	58

Total	**41**	**286**	**32**	**14**	**42**	**416**
Total (Stage and Stage 2)	**943**	**1,968**	**409**	**1,488**	**4,238**	**9,045**

Table 6-5 Phase 4 Water Savings due to Channel Rationalisation – Stage 1 and Stage 2

	CG5-9	MV	RO	PB	TO	Total
Stage 1						
Seepage (ML)	354	1,013	122	2	1,086	2,577
Bank leakage (ML)	586	2,377	291	1,372	4,898	9,523
Evaporation (ML)	151	448	54	702	368	1,723
Total	**1,090**	**3,839**	**467**	**2,076**	**6,352**	**13,824**
Stage 2						
Seepage (ML)	39	251	32	0	97	419
Bank leakage (ML)	64	588	77	17	438	1,184
Evaporation (ML)	16	111	14	9	33	183
Total	**119**	**950**	**124**	**25**	**568**	**1,786**
Total (Stage and Stage 2)	**1,209**	**4,788**	**590**	**2,101**	**6,920**	**15,609**

6.5 Savings from Channel Automation

6.5.1 Scope of Automation Works

Automation involves the replacement of manual flow control structures with modern automated gates that accurately measure flows, provide real time operational data and can be controlled to meet the flow demands of customers. Automation greatly reduces the water spillage from the end of channels (outfalls), and reduces bank leakage by maintaining the level of water in a pool within a relatively restricted band.

Automation of the backbone channels in the GCP works areas is complete for the Central Goulburn 5-9, Rochester and Pyramid-Boort areas. Backbone automation in the Murray Valley and Torrumbarry areas is still to be completed.

We have not undertaken trailing of the construction records associated with automation works (e.g. regulators and outfall gates) as little of this work was completed in 2012/13 and we have audited construction records in previous years. Also, the confirmation that automation works have been complete is ultimately evidenced by the reduction in outfall volumes from automated systems.

6.5.2 Overview

Water savings due to automation are the sum of the savings realised through reduced outfall volumes:

Phase 3: $WS_{Year\ X} = WS_{outfalls}$

Phase 4: $WS_{Year\ X(LTCE)} = WS_{outfalls(LTCE)}$

There has been an important change in determining savings due to automation in that the updated version of the *Technical Manual* no longer includes savings due to reduced upper bank leakage in this component. Savings due to upper bank leakage when calculated previously composed less than 1% of all savings so it was not material. However, there is significant uncertainty in this estimate. Therefore, it has been omitted from the calculation until stronger evidence supporting its inclusion in savings estimates is established.

6.5.3 Water Savings Calculations

Phase 3 Calculations

Phase 3 water savings have been calculated by GCP using the Phase 3 outfalls formula from the *Technical Manual*:

$$WS_{outfalls} = \sum [(O_{base} \times (D_{Year} X / D_{Base})) - (O_{YearX})]$$

Phase 4 Calculations

Phase 4 water savings due to reduction in outfalls are estimated by the following equations from the *Technical Manual*:

$$WS_{outfalls} = \sum [(O_{base} \times F_{(LTCE\ base)}) - (O_{YearX} \times F_{(LTCEYearX)}] \times DF$$

The updated version of the *Technical Manual* has omitted the time factor OP which was the ratio expressing the proportion of the irrigation season for which the channels had been fully automated.

6.5.4 Input Data

The inputs required to calculate Phase 3 and Phase 4 water savings due to outfall automation are summarised in Table 6-6 and Table 6-7. The first table details the parameters that are fixed or have been previously audited, i.e. the baseline year parameters. The second table details the input data from the current year.

Table 6-6 Fixed parameters and baseline year parameters for Automation water savings calculation

Parameter	Description	Source
O_{Base}	Outfalls in Baseline Year	Baseline Year water balance
D_{base}	Customer Deliveries in the Baseline Year in the irrigation system	Baseline Year water balance
DF	Durability factor to account for the durability of water savings interventions	Technical Manual
$F_{(LTCEBase)}$	Long Term Cap Equivalent Factor to convert Baseline Year volumes to Long Term Cap Equivalent volume	Department of Environment and Primary Industries

Table 6-7 Current Year Parameters for Automation Water Savings Calculation

Parameter	Description	Source
O_{yearx}	Outfalls in Current Year	SCADA and operator logsheets
D_{yearx}	Customer Deliveries in the Current Year in the irrigation system	IPM reports
$F_{(LTCEYear\ X)}$	Long Term Cap Equivalent Factor to convert Current Year volumes to Long Term Cap Equivalent volume	Calculated from deliveries and base figure advised by Department of Environment and Primary Industries

We have reviewed the input data and confirm that the fixed parameters sourced from the Technical Manual are correct. We also found that the parameters sourced from the Baseline Year Water Balance are correct, noting that only outfall volumes for channels that have now been automated are included in the 2012/13 calculations.

G-MW has applied an adjustment factor of 1.6 to the volumes recorded at unmetered outfalls in the baseline year to arrive at an adjusted baseline outfall volume.

The following summary is a review of the inputs from the current operating year:

Outfalls in Current Year (O_{yearx})

The largest outfalls responsible for the greatest water savings are generally measured on-line with feedback to G-MW's SCADA. Operators review the SCADA and enter daily volumes into logsheets. These logsheets are used as the source of the outfall flow volumes for the water savings calculations.

For 2012/13, G-MW has acted on the recommendation included in the 2011/12 audit and not set equal to zero the savings from groups of outfalls (pods) where the outflow in the current year exceeded that in the baseline year (which would result in 'negative' savings) unless it has been able to find sufficient justification for doing so[5]. G-MW commissioned a consultant to investigate each outfall where outfalls had been found to be generating 'negative' savings. We reviewed a draft of this report and note that for most outfalls it is recommended that they not be set to zero as there is sufficient evidence to suggest that the observed 'negative' savings are due to operational practices. The report also identifies that there is some uncertainty over a number of the baseline year outfall records. While outside of the scope of this audit, we recommend that G-MW investigate the veracity of the baseline year outfalls further, noting that reliable information may be hard to locate given the time that has passed.

The impact of this change is material – in 2011/12, the zeroing of outfalls contributed 1,831ML to Phase 4 savings. For the current year, the zeroing of outfalls contributes only 95ML, a 1,737ML (95%) reduction. We support this conservative approach.

G-MW has subtracted from its savings volumes that are environmental mitigating flows. Environmental mitigating flows are specified in Environmental Watering Plans and are volumes determined by catchment managers as necessary to support specific high value habitats. Mitigating flows occur only in the Torrumbarry and Pyramid-Boort irrigation areas. Because mitigating flows occur through some outfalls that have 'negative' savings (i.e. the outfall in this year is greater than that in the baseline year) the mitigating flow cannot be subtracted from the outfall meaning that it is not possible to reconcile outfall savings and mitigating flows on an outfall by outfall basis. In this case the mitigating flow is zeroed and the loss is deducted from the overall automation savings.

As decommissioning of channels occurs, where an outfall previously existed, this may cause; outfall volumes to be directed to neighbouring outfalls, increasing outfall at neighbouring sites relative to 2004/05 losses, potentially creating negative losses. Over the next few years with decommissioning of outfalls occurring the interaction of outfalls into larger groups or for the operating system, needs to be taken into account by G-MW.

We have commented in Section 5.3 on our trailing of outfall volumes to source systems.

Customer Deliveries in the Current Year ($D_{Year\ X}$)

Customer deliveries in each irrigation district are determined from IPM reports. The volumes used are sourced from the same reports used for G-MW's annual reporting. We outline the results of our data trailing of customer delivery volumes in Section 4.4.

Long Term Cap Equivalent Factor $F_{(LTCEYear\ X)}$

This factor has been calculated by G-MW in accordance with the formula in the Technical Manual using a factor of 1.3 for $LTCE_{Base}$ as advised by the Department of Environment and Primary Industries. The ratio of delivered volumes has been applied for all operating areas.

[5] Where the outfalls from a pod in the current year exceeded that in the baseline year the calculated saving would be less than zero, i.e. worse performance than in the baseline year. The *Technical Manual* allows these negative numbers to be set to zero on the basis that they are considered to be operational aberrations that would disappear in time. However, we consider that it is more appropriate, and a better indication of current water savings performance, to not set these values to zero. If these are operational aberrations, the savings will be 'caught up' in future

6.5.5 Results

The audited water savings due to channel automation are summarised in Table 6-8. All channel automation works are attributable to the Phase 1 project.

Table 6-8 Phase 3 and Phase 4 Water Savings due to Chanel Automation

	CG5-9	MV	RO	PB	TO	Total
Inputs						
O_{base} (ML)	26,503	9,150	6,396	3,691	6,423	52,163
O_{yearx} (ML)	1,428	5,013	2,832	399	764	10,436
D_{base} (ML)	312,082	293,026	199,271	221,668	405,049	1,431,096
D_{yearx}(ML)	336,616	346,039	217,695	235,031	438,216	1,573,597
Phase 3 Water Savings						
Gross Phase 3 savings (ML)	27,159	5,773	4,833	3,561	6,349	47,675
Zeroed outfalls (ML)	0	29	-68	25.3	0	-14
Mitigating flows (ML)	0	0	0	-969	-726.79	-1,696
Net Phase 3 savings (ML)	**27,159**	**5,802**	**4,765**	**2,617**	**5,623**	**45,966**
Phase 4 Water Savings						
Gross Phase 4 savings (ML)	31,102	5,559	5,625	4,166	7,248	53,700
Zeroed outfalls (ML)	0	141	-76	29.5	0	95
Mitigating flows (ML)	0	0	0	-1,386	-805.6	-2,192
Net Phase 4 savings (ML)	31,102	5,700	5,549	2,809	6,443	51,603

6.6 Savings from Service Point Replacement and Rationalisation

6.6.1 Scope of Service Point Replacement and Rationalisation Works

Water savings are achieved when existing customer service points, usually Dethridge Wheels, are replaced with modern outlets. The modern designs are typically pipes with magflow meters or flume gates. Savings may also be achieved when existing service points are removed and not replaced (i.e. rationalised). The savings achieved are due to the improved construction of the service points, preventing leakage through and around the meter, as well as the increased accuracy of the new meters which better account for water use.

Service point replacement and rationalisation has been completed under the Stage 1 and Stage 2 projects. For this audit, we are also required to review residual works undertaken in 2012/13 for the Shepparton and CG1234 Project. The water savings achieved under this project have previously been audited and reported separately.

Figure 6-3 shows the number of service points replaced and rationalised in each irrigation area. Because the numbers of service points replaced and rationalised under the Stage 2 project (69 and 24 respectively) are relatively small compared to the numbers for the Stage 1 project, all projects have been shown combined. Note that in 2012/13, five service points were replaced or rationalised in Shepparton East under the Stage 2 project. Because of their small number, they are not shown in Figure 6-4.

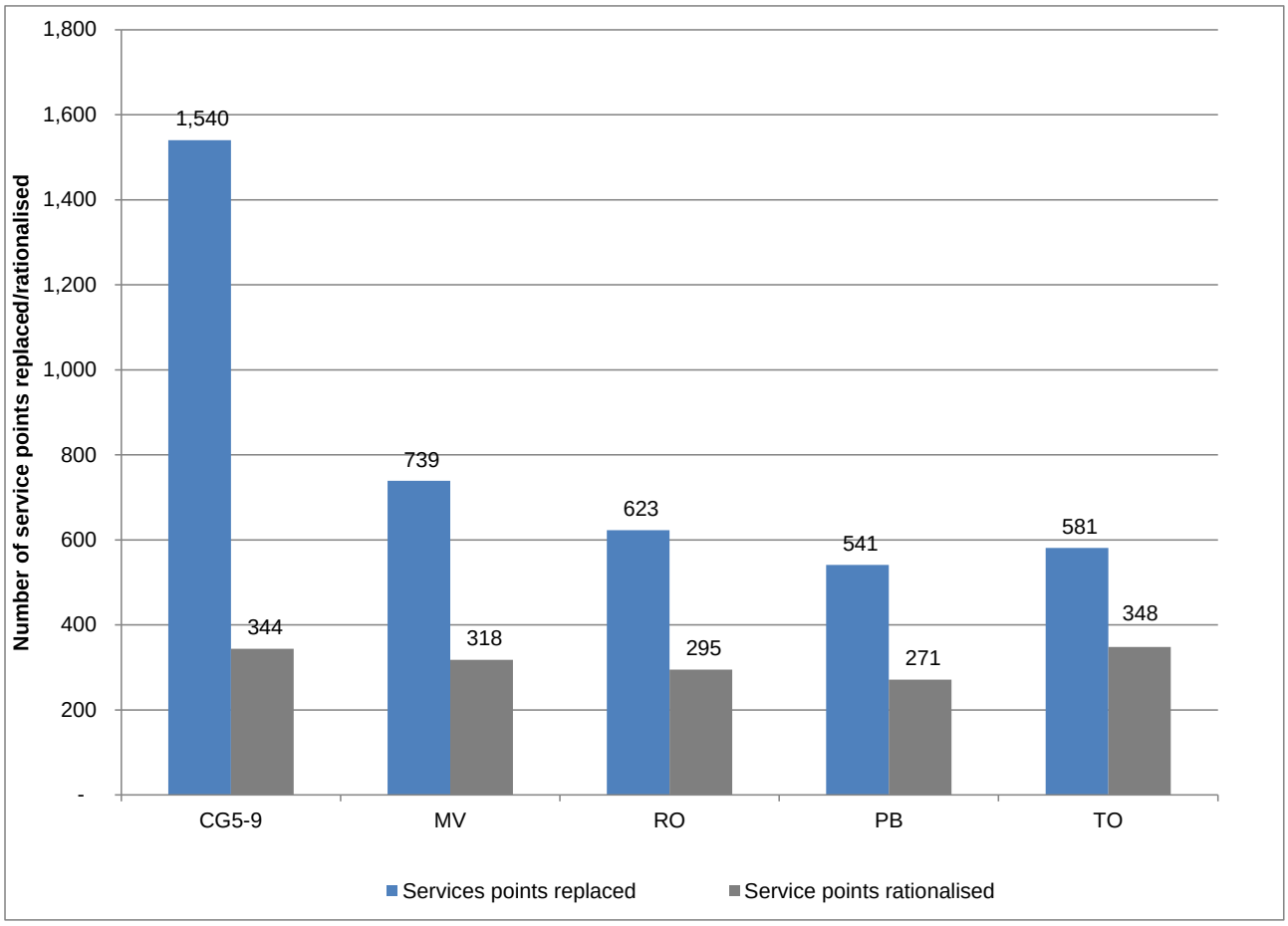

Figure 6-3 Numbers of service points replaced and rationalised (Stage 1 and Stage 2)

6.6.2 Overview

Water savings due to service point replacements and rationalisations are the sum of the savings realised through reduced meter errors, lowered leakage through and around the old meter, previously unmetered volumes and reduced unauthorised use. The same high level Phase 3 and 4 equations apply to both replacements and rationalisations although the individual components are determined differently.

The high level equations are the same for both Phase 3 and Phase 4 savings:

$$WS_{Year\ X} = WS_{meter\ error} + WS_{leakage\ through} + WS_{leakage\ around} + WS_{unauthorised}$$

6.6.3 Water Savings Calculations

The components of the Phase 3 and 4 water savings calculations are detailed following. Version 4 of the *Technical Manual* no longer includes the time discounting factor (t_m) in the Phase 4 calculations for either replacement or rationalisation of service points. G-MW does not include the component for savings due to unmetered volumes as it believes that these are negligible.

Phase 3 Calculations – Service Point Replacement

Phase 3 water savings have been calculated by G-MW using the formula in the *Technical Manual*:

$$WS_{meter\ error} = D_{MYear\ X} \times (1/MCF) \times (MCF - 1) \times EF_{meter\ error}$$

$$WS_{leakage\ through} = N_{replaced} \times t_m \times LTT \times EF_{leakage\ through}$$

$$WS_{leakage\ around} = N_{replaced} \times t_m \times LTA \times EF_{leakage\ around}$$

$$WS_{unauthorised} = N_{replaced} \times U_{Base} \times EF_{unauthorised} \times (D_{Year\ X}/D_{base}) \times tm$$

Phase 3 Calculations – Service Point Rationalisation

Phase 3 water savings due to service point rationalisation have been calculated by G-MW using the formula in the *Technical Manual*:

$$WS_{meter\ error} = (D_{MBase} \times (MCF - 1) \times EF_{meter\ error}) \times (D_{Year\ X}/D_{base})$$

$$WS_{leakage\ through} = N_{rationalised} \times t_m \times LTT \times EF_{leakage\ through}$$

$$WS_{leakage\ around} = N_{rationalised} \times t_m \times LTA \times EF_{leakage\ around}$$

$$WS_{unauthorised} = N_{rationalised} \times U_{Base} \times EF_{unauthorised} \times (D_{Year\ X}/D_{base}) \times tm$$

Phase 4 Calculations – Service Point Replacement

Phase 4 water savings have been calculated by G-MW using the formula in the *Technical Manual*:

$$WS_{meter\ error} = DM_{Year\ X} \times (1/MCF) \times (MCF - 1) \times EF_{meter\ error} \times DF_{error} \times F_{(LTCEYear\ X)}$$

$$WS_{leakage\ through} = N_{replaced} \times LTT \times EF_{leakage\ through} \times DF_{leakage\ through}$$

$$WS_{leakage\ around} = N_{replaced} \times LTA \times EF_{leakage\ around} \times DF_{leakage\ around}$$

$$WS_{unauthorised} = N_{replaced} \times U_{Base} \times EF_{unauthorised} \times DF_{unauthorised} \times F_{(LTCEbase)}$$

Phase 4 Calculations – Service Point Rationalisation

Phase 4 water savings due to service point rationalisation have been calculated by G-MW using the formula in the *Technical Manual:*

$$WS_{meter\ error} = (D_{MBase\ x} \times (MCF - 1) \times EF_{error} \times DF_{error}) \times F_{(LTCEBase)}$$

$$WS_{leakage\ through} = N_{rationalised} \times LTT \times EF_{leakage\ through} \times DF_{leakage\ through}$$

$$WS_{leakage\ around} = N_{rationalised} \times LTA \times EF_{leakage\ around} \times DF_{leakage\ around}$$

$$WS_{unauthorised} = N_{rationalised} \times U_{Base} \times EF_{unauthorised} \times DF_{unauthorised} \times F_{(LTCEBase)}$$

6.6.4 Input Data

The inputs required to calculate Phase 3 and Phase 4 water savings due to service point replacement and rationalisation are summarised in Table 6-9 and Table 6-10.

Table 6-9 details the parameters that are fixed or have been previously audited. Table 6-10 details the input data from the current year.

Table 6-9 Fixed Parameters and Baseline Year Parameters for Service Point Replacement and Rationalisation Water Savings Calculation

Parameter	Description	Source
MCF	Adopted Meter Correction Factor for Dethridge Meter Service Points or associated with deemed Service Points	Technical Manual
$EF_{meter\ error}$	Effectiveness Factor for reducing measurement error	Technical Manual
$EF_{leakage\ through}$	Effectiveness Factor for reducing leakage through the meter	Technical Manual
$EF_{leakage\ around}$	Effectiveness Factor for reducing leakage around the meter	Technical Manual

Parameter	Description	Source
$EF_{unauthorised}$	Effectiveness Factor for reducing unauthorised use	Technical Manual
LTA	Defined Fixed Leakage Rate (ML/year/service point) around service points	Technical Manual
LTT	Defined Fixed Leakage Rate (ML/year/service point) through service points	Technical Manual
U_{Base}	Unauthorised use loss in the Baseline Year	Technical Manual
D_{Base}	Customer Deliveries in the Baseline Year	Baseline Year water balance
DM_{base}	Customer deliveries through the Rationalised meters in the Baseline Year	Baseline Year water balance
DF_{error}	Durability factor for reducing measurement error	Technical Manual
$DF_{leakage\ through}$	Durability factor for reducing leakage through the meter	Technical Manual
$DF_{leakage\ around}$	Durability factor for reducing leakage around the meter	Technical Manual
$DF_{unauthorised}$	Durability factor for reducing unauthorised use	Technical Manual
$F_{(LTCEbase)}$	Long Term Cap Equivalent Conversion Factor for the baseline year	Department of Environment and Primary Industries

Table 6-10 Fixed Parameters and Baseline Year Parameters for Service Point Replacement and Rationalisation Water Savings Calculation

Parameter	Description	Source
$D_{MYear\ X}$	Customer deliveries through the replaced meters for the year in question	IPM reports
$D_{Year\ X}$	Customer deliveries in the year in question to the irrigation system	IPM reports
$N_{replaced}$	Number of meters replaced	Construction records
$N_{rationalised}$	Number of meters rationalised	Construction records
$F_{(LTCEYear\ X)}$	Long Term Cap Equivalent Factor to convert Current Year volumes to Long Term Cap Equivalent volume	Calculated from deliveries

We have reviewed the input data and confirm that the fixed parameters sourced from the Technical Manual are correct. G-MW has correctly applied the different effectiveness factors for preventing leakage through automated (100%) and manual (90%) meters.

We also found that the parameters sourced from the Baseline Year Water Balance are correct. The following summary is a review of the inputs from the current operating year:

Customer Deliveries through Replaced Service Points ($D_{M\ Year\ X}$) and in the Irrigation System ($D_{Year\ X}$)

Customer deliveries through the replaced meters and in each irrigation district are determined through IPM. These delivered volumes are used for customer billing and, as noted previously, we believe they will be reliable due to the scrutiny they are subject to by G-MW and customers. We outline the results of our data trailing of customer delivery volumes in Section 5.4.

Number of Service Points Replaced and Rationalised ($N_{replaced}$, $N_{rationalised}$)

The number of meters replaced and rationalised is determined from construction records. G-MW demonstrated the process it undertakes for handling service point record data. This process includes collating data from different sources and then filtering this data and removing any duplicate or

anomalous records. We are satisfied that this process is robust. G-MW also achieves meter error savings where new meters have been installed as part of system decommissioning works.

We reviewed the commissioning certificates for a sample of service points under the Stage 1 and Stage 2 projects, as outlined in Section 5.2.2. We also reviewed this year work packs and commissioning certificates for service points replaced under the Shepparton and CG1234 project as outlined in Section 5.2.3. This review provided evidence that the sample of works claimed as complete by G-MW had been completed.

Ratio of time Service Point in use compared to Baseline Year (t_m)

This factor is calculated by G-MW based on the commissioning (or de-commissioning in the case of rationalisation) dates for each service point. Our review of commissioning certificates for a sample of service points is outlined in Section 5.2.2 and found that there were some missing and some inconsistently recorded commissioning dates. However, the great majority of the service points have been in place or rationalised for the full irrigation season. Therefore, commissioning dates only have a very small impact on the savings estimated. We found that the t_m factor has been calculated and applied correctly by G-MW for service point replacements.

Long Term Cap Equivalent Factor F($LTCE_{Base}$)

This factor has been calculated by G-MW in accordance with the formula in the Technical Manual using a factor of 1.3 for $LTCE_{Base}$ as advised by the Department of Environment and Primary Industries. The ratio of deliveries volumes has been applied for all of the G-MW operating areas.

6.6.5 Results

The audited water savings due to service point replacements are summarised in Table 6-11 and Table 6-12. Note that G-MW performs these calculations on a meter by meter basis and not for an irrigation area nor as a whole system.

Table 6-11 Phase 3 and Phase 4 Water Savings due to Service Point Replacement – Stage 1 project

	CG5-9	MV	RO	PB	TO	Total
Service point replacement						
Phase 3 Water Savings						
Meter error (ML)	9,180	4,935	4,142	4,772	4,094	27,123
Leakage through service points (ML)	2,772	1,192	1,056	897	970	6,887
Leakage around service points (ML)	604	258	227	189	209	1,488
Unauthorised Use (ML)	1,170	549	447	364	409	2,941
Total (ML)	**13,726**	**6,934**	**5,873**	**6,223**	**5,683**	**38,438**
Phase 4 Water Savings						
Meter error (ML)	10,920	6,265	4,972	6,028	5,374	33,559
Leakage through service points (ML)	2,210	1,010	860	762	800	5,642
Leakage around service points (ML)	571	259	220	191	205	1,446
Unauthorised Use (ML)	1,406	639	542	474	507	3,567
Total (ML)	**15,107**	**8,174**	**6,593**	**7,454**	**6,886**	**44,215**
Service point rationalisation						
Phase 3 Water Savings						

	CG5-9	MV	RO	PB	TO	Total
Meter error (ML)	740	1,106	826	1,191	1,711	5,575
Leakage through service points (ML)	618	479	476	433	539	2,546
Leakage around service points (ML)	130	101	100	91	113	535
Unauthorised Use (ML)	316	268	247	218	278	1,326
Total (ML)	**1,805**	**1,954**	**1,649**	**1,934**	**2,640**	**9,982**
Phase 4 Water Savings						
Meter error (ML)	916	1,508	1,033	1,668	2,500	7,626
Leakage through service points (ML)	635	555	528	503	599	2,820
Leakage around service points (ML)	134	115	111	106	125	591
Unauthorised Use (ML)	391	342	325	310	371	1,739
Total (ML)	**2,075**	**2,520**	**1,997**	**2,587**	**3,595**	**12,775**
Total Phase 3 savings (Replacement and rationalisation)	**15,530**	**8,887**	**7,522**	**8,156**	**8,324**	**48,420**
Total Phase 4 savings (Replacement and rationalisation)	**17,182**	**10,694**	**8,590**	**10,042**	**10,481**	**56,989**

Table 6-12 Phase 3 and Phase 4 Water Savings due to Service Point Replacement – Stage 2 project

	SH	CG5-9	MV	RO	PB	TO	Total
Service point replacement							
Phase 3 Water Savings							
Meter error (ML)	0	24	110	50	25	75	284
Leakage through service points (ML)	0	6	25	10	9	21	71
Leakage around service points (ML)	0	1	5	2	2	4	15
Unauthorised Use (ML)	0	2	11	4	4	9	31
Total (ML)	**0**	**33**	**151**	**67**	**40**	**109**	**401**
Phase 4 Water Savings							
Meter error (ML)		77	153	68	89	138	525
Leakage through service points (ML)	1	10	27	9	10	22	80
Leakage around service points (ML)	0	3	7	2	3	6	20
Unauthorised Use (ML)	1	7	17	6	7	14	50
Total (ML)	**3**	**96**	**204**	**85**	**109**	**180**	**676**
Service point rationalisation							
Phase 3 Water Savings							
Meter error (ML)	0	0	30	6	2	25	64
Leakage through service points (ML)	8	4	4	5	1	23	43
Leakage around service points (ML)	2	1	1	1	0	5	10
Unauthorised Use (ML)	0	2	2	2	0	12	19
Total (ML)	**9**	**7**	**37**	**14**	**4**	**64**	**134**

	SH	CG5-9	MV	RO	PB	TO	Total
Phase 4 Water Savings							
Meter error (ML)		0	42	8	9	46	105
Leakage through service points (ML)	8	4	4	8	2	27	52
Leakage around service points (ML)	2	1	1	2	0	6	11
Unauthorised Use (ML)	5	2	2	5	1	16	32
Total (ML)	**14**	**7**	**49**	**21**	**12**	**95**	**199**
Total Phase 3 savings (Replacement and rationalisation)	**9**	**40**	**188**	**81**	**44**	**174**	**535**
Total Phase 4 savings (Replacement and rationalisation)	**17**	**103**	**253**	**106**	**121**	**275**	**874-**

Table 6-13 Phase 3 and Phase 4 Water Savings due to Service Point Replacement – Shepparton and CG1-4 residual works

	SH	CG1-4	Total
Service point replacement			
Phase 3 Water Savings			
Meter error (ML)	136	108	244
Leakage through service points (ML)	13	54	67
Leakage around service points (ML)	3	11	14
Unauthorised Use (ML)	0	21	21
Total (ML)	**151**	**194**	**346**
Phase 4 Water Savings			
Meter error (ML)	319	205	524
Leakage through service points (ML)	20	56	76
Leakage around service points (ML)	5	14	19
Unauthorised Use (ML)	12	34	46
Total (ML)	**355**	**310**	**665**
Service point rationalisation			
Phase 3 Water Savings			
Meter error (ML)	0	22	22
Leakage through service points (ML)	1	16	17
Leakage around service points (ML)	0	3	3
Unauthorised Use (ML)	0	8	8
Total (ML)	**1**	**48**	**50**
Phase 4 Water Savings			
Meter error (ML)	0	34	34
Leakage through service points (ML)	2	27	29
Leakage around service points (ML)	0	6	6
Unauthorised Use (ML)	1	16	18
Total (ML)	**3**	**83**	**86**

	SH	CG1-4	Total
Service point replacement			
Total Phase 3 savings (Replacement and rationalisation)	**153**	**243**	**395**
Total Phase 4 savings (Replacement and rationalisation)	**359**	**393**	**752**

6.7 Savings from Channel Remediation

6.7.1 Scope of Irrigation Channel Remediation Works

Channel remediation involves lining earthen channels, replacing channels with pipelines and bank remodelling. These works can generate irrigation water savings through reduced bank seepage and reduced bank leakage. A total of 154.9km of channel lining has been completed to date. 25.4km was completed in 2012/13 compared with 60.0km in 2011/12. The length of channel that has been remediated by irrigation area is shown in Figure 6-4.

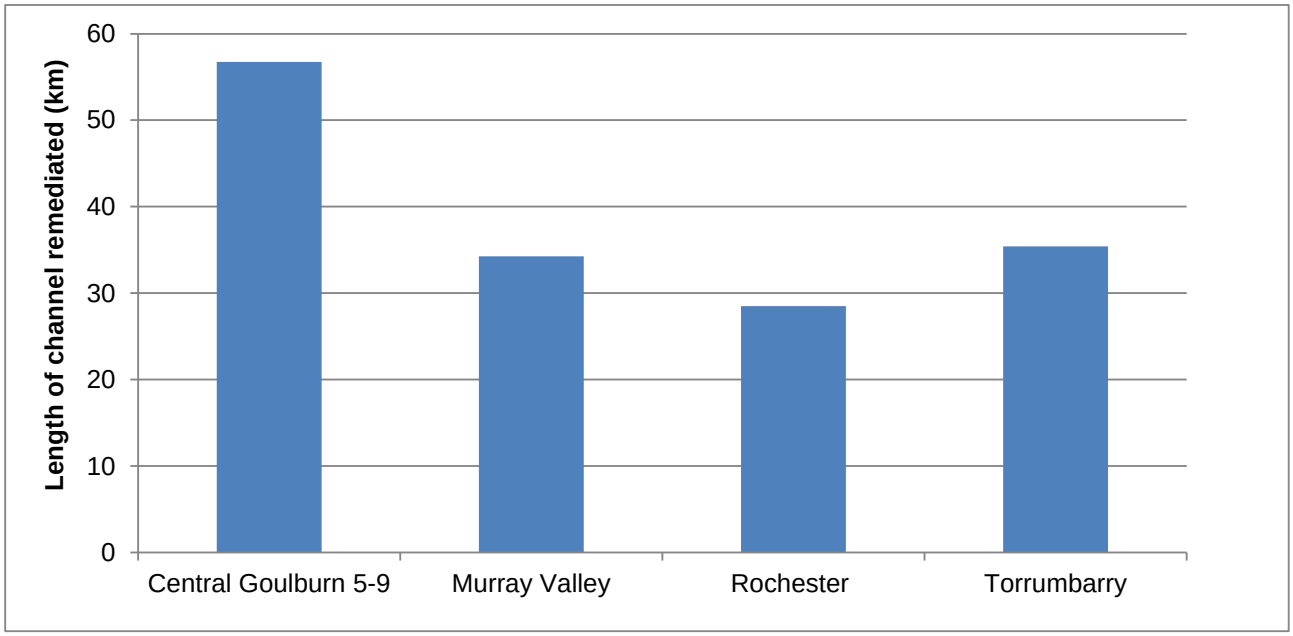

Figure 6-4 Length of channel remediated by irrigation area

6.7.2 Overview

The type of calculation employed for determining water savings due to channel remediation depends on the availability of pre and post works pondage data as detailed in Table 6-14.

Table 6-14 Calculation methods for Channel remediation works

Data availability	Calculation method
No pre or post remediation pondage testing data available	Theoretical method (No pre-works pondage test data)
Pre remediation pondage testing only available	Theoretical method (using pre-works pondage test data)
Both pre and post remediation pondage testing data available	Direct method

For the remediation works completed in 2008 (5km), no pre or post works pondage test data is available. Therefore, the theoretical method has been used for these works. The inputs and method is unchanged from the 2009/10 audit report for these works from 2008 and will not be discussed further.

For the works completed in 2009 pre-works pondage data is available for all sites except one. Post-works pondage testing data is only available for three of the 13 sites. For the works completed in 2010, 30 of 42 sites have both pre and post works pondage testing data available. This total is an increase on the 27 sites where both pre and post works data was available. The remaining sites from 2010 have only pre works pondage testing data available.

Of the 42 sites remediated in 2011, 19 have both pre and post works pondage test data available (up from 1 in 2011/12). The remaining sites have only pre works pondage test data available.

Savings estimates made using only pre works data and historical typical expected effectiveness factors will be validated with post works data over time. This may adjust the savings claimed in later years.

G-MW omits the evaporation component from its savings as it assumes that there is likely to be negligible change in surface area of a channel pre and post remediation. This is a reasonable assumption and is conservative.

Both direct and theoretical equations have the same high level form:

$$WS_{Year\ X} = WS_{bank\ leakage} + WS_{seepage} + WS_{evaporation}$$

6.7.3 Water Savings Calculations

Theoretical Phase 3 calculations, where no pre-works pondage testing data is available, are not discussed as these only apply to the 2008 works. These were reviewed in 2009/10 and there has been no change since then. The equations in the updated *Technical Manual* for determining savings due channel remediation have been revised with the length and time discounting factors being removed.

Theoretical Method - Phase 3 Calculations– Pre-works pondage test data available

$$WS_{leakage} = [(L_{pre\ works} \times VL \times F(PA) \times (D_{Year\ X}/D_{base})) + (L_{pre\ works} \times FL \times F(PA)] \times EF$$

$$WS_{seepage} = S_{pre\ works} \times EF \times F(PA)$$

Direct Method - Phase 3 Calculations– Measured pre-works and post-works pondage test data is available

$$WS_{leakage} = (L_{pre\ works} - L_{Post\ works}) \times F(PA)$$

$$WS_{seepage} = (S_{pre\ works} - S_{Post\ works}) \times F(PA)$$

Theoretical Method - Phase 4 Calculations– Pre-works pondage test data available

$$WS_{leakage} = [(L_{pre\ works} \times VL \times F(LTCE)) + (L_{pre\ works} \times FL)] \times DF \times EF \times F(PA)$$

$$WS_{seepage} = S_{pre\ works} \times EF \times DF \times F(PA)$$

Direct Method - Phase 4 Calculations – Measured pre-works pondage test data is available

$$WS_{leakage} = [(L_{pre\ works} - L_{Post\ works}) \times F(PA) \times FL] + [(L_{pre\ works} - L_{Post\ works}) \times F(PA) \times VL \times F_{(LTCEYear\ x)}] \times DF$$

$$WS_{seepage} = (S_{pre\ works} - S_{Post\ works}) \times F(PA) \times DF$$

The revised baseline year water balance[6], has removed the concept of system fill. System fill was treated as operational flows that were not impacted by improved irrigation infrastructure because they occurred outside of the irrigation season. However, it has now been recognised that most channels that have been lined will hold water over the full year, including the non-irrigation season, and therefore water savings occur across the full year. In particular, there is reduced seepage in both the irrigation and non-irrigation seasons. As a result, the interpretation of the seepage calculation has been updated to be applied across the full 365 days of the year of operation, instead of only the irrigation season as previously calculated.

[6] The revised baseline year water balance was independently audited in 2011/12.

G-MW has adjusted the water savings estimated due to channel remediation downwards for old leaking outlets existing when pondage tests were carried out. This is to avoid any possibility of double counting savings on both the remediation program and from service point upgrade works. This adjustment has reduced the Phase 3 savings estimate by 329ML and the Phase 4 savings estimate by 397 ML, which equates to around 3% of the total for each Phase.

6.7.4 Input Data

The inputs required to calculate Phase 3 and Phase 4 water savings due to channel remediation are summarised in Table 6-15 and Table 6-16. The first table details the parameters that are fixed or have been previously audited. The second table details the input data from the current year.

Table 6-15 Fixed Parameters and Baseline Year Parameters for Channel Remediation Water Savings Calculation

Parameter	Description	Source
VL	Proportion of bank leakage recognised as variable	Technical Manual
FL	Proportion of bank leakage recognised as fixed	Technical Manual
D_{base}	Customer deliveries in the baseline year	Baseline Year water balance
EF	Effectiveness Factor for channel remediation	Technical Manual

Table 6-16 Current Year Parameters for Service Point Replacement and Rationalisation Water Savings Calculation

Parameter	Description	Source
$L_{Pre\ works}$	Pre works bank leakage	Pondage testing
$L_{Post\ works}$	Post works bank leakage	Pondage testing
$D_{Year\ X}$	Customer deliveries in the year in question to the irrigation system	IPM reports
F(PA)	Pondage Testing Adjustment Factor to account for dynamic losses in addition to static losses	Technical Manual Appendix F
$S_{pre\ works}$	Pre works seepage	Pondage testing
$S_{post\ works}$	Post works seepage	Pondage testing

We have reviewed the input data and confirm that the fixed parameters sourced from the Technical Manual are correct, as are the deliveries in the Baseline Year sourced from the Baseline Year Water Balance. G-MW has adopted an EF estimate of 90% where no post-works pondage testing data is available. This will be revised in the future as more pre and post-works pondage testing data becomes available.

The following summary is a review of the inputs from the current operating year:

Pre Works and Post Works bank Leakage and Seepage ($L_{pre\ works}$, $L_{Post\ works}$, $S_{pre\ works}$, $S_{Post\ works}$)

Where pondage testing data is available, pre and post works leakage and seepage are determined through evaluation of site testing results. We have reviewed the pondage testing methodology and results in previous audits and commented that we believe that the pre and post works seepage and leakage estimates, determined through site testing, are sound. Where post pondage data is estimated from pre works data and assumed remediation effectiveness (based on the measured remediation effectiveness in other pools), follow-up validation of the estimates with measured post pondage test data, needs to be made in the future.

Customer Deliveries in the Current Year ($D_{Year\ X}$)

We have commented on this variable before and the results of our data trailing of customer delivery volumes are outlined in 5.4.

6.7.5 Results

Water savings due to channel remediation are calculated on a channel by channel basis as each channel has a different leakage and seepage rate. The meter error correction is applied to whole irrigation areas.

All channel remediation works are attributable to the Phase 1 project.

Table 6-17 Phase 3 and Phase 4 Water Savings due to Chanel Remediation

	CG 5-9	MV	RO	PB	TO	Total
Phase 3 savings (ML)	4,485	4,528	2,652	-	3,808	**15,474**
Phase 4 savings (ML)	4,420	4,186	2,434	-	2,749.65	**13,789**

7 Findings from Review of Water Entitlement Entities (WEEs)

7.1 Requirement for confirming WEEs

The audit scope requires that the ownership and details of the Water Entitlement Entities (WEEs) claimed by G-MW as being in its ownership at 30 June 2013 are to be confirmed. Specifically, the following details of WEEs held by G-MW were to be cross-checked against the Victorian Water Register:

- Water Entitlement Entity (WEE) number
- Water entitlement volumes related to particular WEE number
- Date of entry in the Victorian Water Register
- Classification of water entitlements as either high or low reliability
- Evidence of ownership of entitlements whether in the name of G-MW or not.

The audit also requires the auditor to check the calculation of long term diversion limit equivalent (LTDLE) water recovery as per the conversion factors detailed in the Audit Brief.

Water recovery due to entitlement purchases are to be expressed against the following projects:

- Stage 1 project
- Inter-project agreement ($7.7M funding)

G-MW includes in the Stage 1 project entitlement purchases the following sub-projects:

- On-Farm efficiency
- Stage 1 entitlement purchases
- Campaspe entitlement purchases.

7.2 Approach to auditing WEEs

To complete this requirement of the audit, we undertook the following:

1. Obtained from G-MW a spreadsheet (SPREAD PLAN v1 Water Shares LTCE estimates to Cardno.xlsx) detailing its WEE holdings and relevant information about the Entitlements including WEE number and volume.
2. Provided the list of WEE numbers claimed by G-MW to the Department of Environment and Primary Industries, Water Entitlements and Trading and requested them to provide the volume, reliability classification, date of entry onto the register, and ownership details relating to each claimed WEE number.
3. Reconciled the details provided to us by the Department of Environment and Primary Industries, Water Entitlements and Trading from the Victorian Water Register against the schedule provided to us by G-MW. For WEEs claimed by G-MW where the Victorian Water Register confirmed the WEE details and that the Entitlement was in G-MW's ownership, we accepted this WEE for inclusion in the calculation of the Long Term Diversion Equivalent. We discuss this further in Section 7.3.
4. For WEEs claimed by G-MW where the Victorian Water Register recorded the ownership of the WEE as being in the name of a party other than G-MW, we required G-MW to provide secondary evidence to confirm its ownership of the Entitlement, such as a mortgage over the WEE. We discuss this further in Section 7.3.
5. For all WEEs confirmed as being in G-MW's ownership, we applied the conversion factors to the WEE volumes to determine the Long Term Diversion Equivalent. These calculations are set out in Section 7.4.

7.3 Results of reconciliation of WEEs claimed by G-MW against the Victorian Water Register

Following reconciliation between G-MW's schedule of claimed WEEs and the Victorian Water Register, we were able to divide the Entities claimed by G-MW into the following categories:

- WEEs where the details were confirmed and are registered in G-MW's name
- WEEs where the details were confirmed but are held in the name of others
- WEEs where there was some discrepancy in the details recorded on the Victorian Water Register.

The volume of WEEs (high reliability, low reliability) in each of the above categories is summarised in Table 7-1. Note that this table does not include the Entitlements relating to the decommissioning of the Campaspe irrigation area. We were provided by an Allocation Account Statement dated 3 July 2013 confirming G-MW as the holder of these Entitlements. This volume is 15,052ML of high reliability water share.

Table 7-1 Results of initial reconciliation

Category	High Reliability Water Share (ML)	Low Reliability Water Share (ML)
Details confirmed, and in the name of GMW	13,335.2	7,077.4
Details confirmed but held the name of others	964.3	330.3
Discrepancies	283.1	2,078.7

For the WEEs claimed by G-MW but recorded on the Register in the name of others, we asked G-MW to provide us with evidence of their ownership of the WEEs. For all WEEs in this category, G-MW was able to provide sufficient evidence in the form of mortgage documents, contracts of sale or transfer documents. The WEEs in this category are listed in Table 7-2.

Table 7-2 WEEs claimed by G-MW but in the name of others

WEE number	Reliability	Volume (ML)
WEE003450	Low	111.4
WEE004010	Low	36.5
WEE004293	High	234.2
WEE004375	High	1
WEE005665	High	13
WEE005666	Low	5.8
WEE008625	High	16
WEE009629	High	1
WEE011859	High	26.5
WEE011860	Low	11.5
WEE012418	High	25.3
WEE013094	High	86
WEE013095	Low	38.4
WEE013667	High	223.5
WEE016827	High	11.7
WEE024802	Low	38.4
WEE026652	High	10
WEE026653	Low	1.9

WEE number	Reliability	Volume (ML)
WEE029674	High	57
WEE029675	Low	24
WEE030444	Low	68.2
WEE030596	High	124.4
WEE031109	High	12.1
WEE043728	High	1
WEE046417	High	47.4
WEE046467	High	19.6
WEE047844	High	20
WEE047846	High	20
WEE049877	High	5.2
WEE052384	High	11.4

Table 7-3 details the discrepancies identified between the WEEs claimed by G-MW and the Victorian Water Register as well as the resolution of the discrepancy.

Table 7-3 Investigation of observed discrepancies

WEE	Volume (ML)		Discrepancy	Resolution
	High	Low		
WEE004065	91.1		This WEE has been cancelled on the Register	G-MW advised that this entitlement has been transferred to WEE057043. We confirmed the details of this WEE and that it is in G-MW's ownership
WEE012418	25.3		G-MW has claimed two WEEs with the same ID (WEE012418) but different volumes (25.3ML and 11.5ML).	G-MW advised that ID for the second WEE should have been listed as WEE012419, not WEE012418. We confirmed that both WEE012418 and WEE012419 are in G-MW's ownership and that the volumes claimed for each (25.3Ml and 11.5Ml respectively) are correct.
WEE025432	103.8		This WEE has been cancelled on the Register	G-MW advised that this entitlement has been transferred to WEE057147. We confirmed the details of this WEE and that it is in G-MW's ownership.
WEE026652	8.0		The Register records the volume of this WEE as 10ML	G-MW advised that 2.0ML of this WEE has been set aside for stock and domestic use and therefore 8.0ML is the correct volume to claim.
WEE034801		1.2	This WEE has been cancelled on the Register	G-MW advised that this entitlement has been transferred to WEE055748. We confirmed the details of this WEE and that it is in G-MW's ownership.
WEE048963		77.5	The Register records this WEE as high reliability, not low reliability	G-MW confirmed that this WEE had been incorrectly claimed as low reliability and should instead be high reliability.
WEE051531	3.0		This WEE has been cancelled on the Register	Remove from G-MW's claimed total
WEE051564	51.90		This WEE has been cancelled on the Register	G-MW advised that this entitlement has been transferred to WEE055608. We checked the details of this WEE against the register and found that it is for a volume of 71ML and is not held in G-MW's name. G-MW provided us with evidence that it has entitlement to 51.9ML of this WEE. Therefore, this volume can be included in G-MW's claimed total.
WEE053402		2,000.0	Cancelled on register	G-MW advised that this entitlement has been transferred to WEE055737. We confirmed the details of this WEE and that it is in G-MW's ownership.

Following resolution of the above discrepancies, only two adjustments to the total claimed by G-MW have been made:

- Removal of the 3.0ML of high reliability water share associated with WEE051531
- Reclassification of the 77.5ML of water share associated with WEE048963 as high reliability (it was originally classified by G-MW as low reliability).

7.4 Calculation of long term diversion limit equivalent

Following confirmation of the WEEs held by G-MW as outlined above, the entitlement volumes have been converted into long term diversion limit equivalent (LTDLE) volume in Table 7-4 using the conversion factors provided by DEPI. The LTDE volume has been shown split between the Stage 1 and Stage 2 projects.

Table 7-4 Calculation of Long Term Diversion Equivalent

Project / Irrigation area	Volumes		Conversion factors		Long Term Diversion Equivalent		
	Low reliability (ML)	High reliability (ML)	Low reliability (ML share / ML LTDE)	High reliability (ML share / ML LTDE)	Accruing from low reliability (ML)	Accruing from high reliability (ML)	Total (ML)
Stage 1 projects							
Goulburn	1,869.3	5,347.8	0.546	0.927	1,020.6	4,957.4	5,978.0
Murray	2,229.6	6,105.1	0.659	0.913	1,469.3	5,574.0	7,043.3
Campaspe	-	15,052.0	n/a	0.961		14,465.0	14,465.0
Total							**27,486.3**
Inter-project agreement project							
Goulburn	1,427.9	2,138.6	0.546	0.927	779.6	1,982.5	2,762.1
Murray	3,893.6	1,032.3	0.659	0.913	2,565.9	942.5	3,508.4
Total							**6,270.5**
Total – Stage 1 and Inter-project agreement							**33,756.8**

8 Recommendations on Technical Manual and Water Savings Approach

The Audit Protocol requires that comment be made following audit work regarding:

- Potential improvements to estimate the water savings in the areas of :
  - data collection,
  - data analysis,
  - assumptions, and
  - Methods.
- Recommended changes to the Technical Manual for the Quantification of Water Savings.

We have observed improvements in the methods employed by G-MW (and previously NVIRP) over the five years for which Cardno has completed audits of water savings estimates. This year, we see no grounds for making recommendations regarding the Technical Manual. The recommendations we make this year are largely regarding better documenting existing assets and the construction of new assets. We have made the following recommendations in this report:

- We recommend that G-MW continues to improve the way it records, reports and validates outfall volume data in order to increase the reliability of these figures. We understand that G-MW is undertaking work in this area but that it will not be finalised for a number of years.
- We recommend that G-MW ensure that ITP certificates are completed for all construction works, including channel rationalisation and service point rationalisation. A possible means of achieving this is to link contractor payments to receipt of complete ITP certificates and work pack records.
- In addition to ensuring that ITP certificates are in place for all channel rationalisation works, we recommend that these works be better documented and that complete work packs, including maps and photos, be collected for all completed works.
- We recommend that G-MW document the discrepancy in the Structure Code reference for the Delamare Site on the Loddon River and publish a short note confirming the details of the mitigating flow site as referenced in its own systems compared with that in the Environmental Watering Plan

9 Progress against previous audit recommendations

The Audit Protocol requires the current year audit to report on the progress made by the relevant organisations in achieving the recommendations from previous audits. The tracking of audit actions had becoming convoluted with some actions repeated from year to year with minor variations. Therefore, for this year, the register of actions has been consolidated into a list of unique actions. It has also been organised by audit area rather than chronologically and completed actions have been removed.

The revised schedule detailing the actions and progress to date is shown in Table 9-1.

Table 9-1 Schedule of progress against previous audit actions

Ref (12/13)	Year	Area	Comment	G-MW Response	2012/13 Audit comment
1	2011/12,	Outfalls	As noted in previous years we recommend that the SCADA be used as the primary point of reference for recording, storing and reporting outfall measurement data given that most major outfalls now have online measurement. Operators should continue to record where adjustments to flows need to be made, e.g. if a sensor is out of the flow. The SCADA may be programmed to identify (automatically or by manual prompting) rainfall flood water discharge events and thereby report an outfall figure that is net of flood volumes; and	G-MW recognises the importance of having reliable outfall data and the capability SCADA provides. It is progressing these recommendations beginning with reconciling outfalls. It commenced this work during 2012/13. A desktop review was initially undertaken. Then data including photos, attributes and asset names were reconciled.	We discussed with G-MW the progress of the outfall reconciliation and other initiative. We will monitor the progress of implementation of these recommendations in coming years
2	2011/12,	Outfalls	We recommend that G-MW undertakes reconciliation of its outfall information. The exercise should compare the outfall IPM number, structure number, SCADA reference, location in GIS and actual location recorded on site. The works should be prioritised so that those outfalls most critical to the water savings calculations be investigated first. This recommendation follows on from our 2009/10 recommendation that the outfall names used by G-MW should be reconciled with the outfall names used in the SCADA.		
3	2010/11	Outfalls	We believe that G-MW must improve how it records and uses outfall data for the purpose of water savings audits. Our recommendations for this area are summarised in our response to Item 4 from 2009/10 in Appendix A. We are of the opinion that G-MW Operations		

Ref (12/13)	Year	Area	Comment	G-MW Response	2012/13 Audit comment
			must take the lead in these initiatives and that these should be largely implemented before the commencement of the 2012/13 irrigation season given that two years have passed since the first recommendations were made in this area.		
4	2011/12,	WEEs	As WEEs are traded regularly, the audit is a point in time snapshot. To eliminate the effect of movements, a snapshot of the Victorian Water Register on 1 July each year should be taken and used as the reference point for NVIRP's WEE register and the audit;	The observed issues in WEE reconciliation are being addressed as more WEEs are being transferred into the name of G-MW. For the WEEs in the name of others, appropriate records are being kept. G-MW now has an improved database for recording WEE and undertakes regular reconciliation against the Victorian Water Register.	We found that G-MW has significantly improved its documentation of WEEs and we were readily able to reconcile the majority of WEEs this year. We consider this issue closed.
5	2011/12,	WEE	If the 'transfer date' as recorded on the Victorian Water Register is to be continued to be used by the DSE as the reference for ownership, NVIRP needs to account for this by ensuring that all purchases are completed in sufficient time to be recorded on the Register prior to 30 June each year		
6	2011/12	WEEs	It is recommended that Rural Finance provide a statement as of 30 June 2013 to detail WEEs held on G-MW's behalf for the next year's audit.		
7	2011/12	WEE	It is recommended that NVIRP/G-MW initiate an annual year end reconciliation of its WEE register with the DSE's records to ensure that each WEE's volume, date of entry into the Water Register, reliability classification, water source system, status, and ownership is consistent thereby providing additional integrity to the data contained within the WEE register		

Audit of Irrigation Modernisation Water Recovery 2012/13 Irrigation season

APPENDIX A

Document Register

Cardno
Shaping the Future

Document Name
Construction work pack for Business Case 239
Construction work pack for Business Case 405
Construction work pack for Business Case 470
Construction work pack for Business Case 598
Construction work pack for Business Case 642
Construction work pack for Business Case 683
Construction work pack for Business Case 869
Construction work pack for Business Case 898
Construction work pack for Business Case 1430
Construction work pack for Business Case 1510
Construction work pack for Business Case 1548
Construction work pack for Business Case 2094
Stage 1 & 2 FF ver 10 Summary 2012 13 Water Recovery Tables Summary.xlsx
Stage 1 & 2 FF ver 12 Summary 2012 13 Water Recovery Tables Summary.xlsx
Summary Stage 1 &2 & FF ver 15 2012 13 Water Recovery.xlsx
Summary Stage 1 &2 & FF ver 16 2012 13 Water Recovery.xlsx
CP-13-021 A0 L Regulator Rollout CG.pdf
CP-13-021 A0 L Regulator Rollout LV.pdf
CP-13-021 A0 L Regulator Rollout MV.pdf
CP-13-021 A0 L Regulator Rollout RO.pdf
CP-13-021 A0 L Regulator Rollout TO.pdf
SPREAD PLAN – v8 estimated Automation Savings 2012 2013.xls
CP-13-116 A0-L CG Channel Rationalisation_Year.pdf
CP-13-116 A0-L LV Channel Rationalisation_Year.pdf
CP-13-116 A0-L MV Channel Rationalisation_Year.pdf
CP-13-116 A0-L RO Channel Rationalisation_Year.pdf
CP-13-116 A0-L TO Channel Rationalisation_Year.pdf
SPREAD-PLAN –v5 Decommissioning channels with rev data 16 Oct 2013 audit channel removal
SPREAD PLAN Sent to Cardno ver19 meter savings estimates .xlsx
SPREAD PLAN ver 20 meter savings estimates.xlsx
BC 264 MV3187 Issued works pack 160113.pdf
BC 400 MV4035 & MV 4036 WORK PACK RO 400-120112.pdf
BC 1017 MV1208 IssuedWorkPack 101212.pdf
BC1023 MV5600 Issued Works Pack 160113.pdf
MAP ISSUED 09032012 RN30SMC.pdf
MAP ISSUED 28022011 RN24SMC.pdf
PHDS1825.pdf
RN31SMC workpack.pdf
RN1521 workpack.pdf
SH960 workpack.pdf

Document Name
TN12929 workpack.pdf
TN13023 workpack.pdf
TNDS6493A workpack.pdf
WORK PACK MV 6832 BC 527-190612.pdf
WP MV4029A.zip
WP MV5065.zip
WP MV5180A.zip
WP PH207.zip
WP RO5090.zip
WP RO5617.zip
WP RO6174.zip
WP TO1620.zip
WP TO1632.zip
WP TO2155A.zip
WP TO2189A.zip
WP TO2199A.zip
TATDOC-#2967908-v2-PONDAGE_TEST_SUMMARY_-_GMID_ALL_YEARS.XLS
v8 of SPREAD-PLAN-Estimate of Channel remediation to 2012.xls
SPREAD PLAN v1 Water Shares LTCE estimates to Cardno.xlsx
V5 analysis of water shares.xlsx
Transfer and ownership documents relating to WEEs claimed by G-MW in the name of others (hardcopies sighted)
Lake Leaghur Environmental Watering Plan
Lake Little Boort Environmental Watering Plan
Loddon River Environmental Watering Plan
Lake Meran Environmental Watering Plan
Lake Elizabeth Environmental Watering Plan
Pig Swamp Environmental Watering Plan
McDonald's Swamp Environmental Watering Plan
Analysis of PB outfall values - corrected for 2012-13.XLS
CG_-_OUTFALLS_RECORD.XLS update.XLS
Copy of TATDOC-#3620642-v1-MNE_-_FINAL_OUTFALL_VOLUMES_2012_13_-_YEAR_TO_YEAR_.XLSX
FW 201213 Outfall volumes.msg
TATDOC-#2697676-v3-TORRUMBARRY_OUTFALL_DATABASE.XLS
TATDOC-#3248820-v2-PYRAMID_BOORT_OUTFAL_2011_12.XLS
TATDOC-#3259989-v1-GBO_SHEPPARTON_OUTFALLS_PASSING_2011_12_&_2012_13.XLS

Audit of Irrigation Modernisation Water Recovery 2012/13 Irrigation season

APPENDIX B

WEES CLAIMED BY G-MW IN WATER SAVINGS CALCULATION

WEE ID	High reliability volume (ML)	Low reliability volume (ML)	River System	Zone	Project	Registered name
WEE000069	14.50		Murray	7 Vic Murray Barmah to SA	Stage 1	Goulburn-Murray Rural Water Corporation
WEE000070		1	Murray	7 Vic Murray Barmah to SA	Stage 1	Goulburn-Murray Rural Water Corporation
WEE000333		28.80	Murray	7 Vic Murray Barmah to SA	Stage 1	Goulburn-Murray Rural Water Corporation
WEE000604	5.00		Goulburn	1A Greater goulburn	Stage 1	Goulburn-Murray Rural Water Corporation
WEE000605		1.90	Goulburn	1A Greater goulburn	Stage 1	Goulburn-Murray Rural Water Corporation
WEE000660		158.40	Goulburn	1A Greater goulburn	Stage 1	Goulburn-Murray Rural Water Corporation
WEE001111		191.00	Goulburn	1A Greater goulburn	Inter-project agreement	Goulburn-Murray Rural Water Corporation
WEE001603		78.20	Murray	7 Vic Murray Barmah to SA	Stage 1	Goulburn-Murray Rural Water Corporation
WEE002024		85.40	Goulburn	1A Greater goulburn	Stage 1	Goulburn-Murray Rural Water Corporation
WEE002116	12.80		Goulburn	1A Greater Goulburn	Stage 1	Goulburn-Murray Rural Water Corporation
WEE002117		0.50	Goulburn	1A Greater Goulburn	Stage 1	Goulburn-Murray Rural Water Corporation
WEE002178		19.70	Murray	6 Vic Murray Dart to Barmah	Inter-project agreement	Goulburn-Murray Rural Water Corporation
WEE002201		29.30	Murray	6 Vic Murray Dart to Barmah	Inter-project agreement	Goulburn-Murray Rural Water Corporation
WEE002499		42.70	Goulburn	1A Greater goulburn	Stage 1	Goulburn-Murray Rural Water Corporation
WEE002587	132.10		Murray	7 Vic Murray Barmah to SA	Stage 1	Goulburn-Murray Rural Water Corporation
WEE002588		60.00	Murray	7 Vic Murray Barmah to SA	Stage 1	Goulburn-Murray Rural Water Corporation
WEE002836	3.20		Goulburn	1A Greater goulburn	Inter-project agreement	Goulburn-Murray Rural Water Corporation
WEE002837		1.00	Goulburn	1A Greater goulburn	Inter-project agreement	Goulburn-Murray Rural Water Corporation
WEE002900	12.50		Goulburn	1A Greater goulburn	Inter-project agreement	Goulburn-Murray Rural Water Corporation
WEE003338		90.20	Murray	6 Vic Murray Dart to Barmah	Inter-project agreement	Goulburn-Murray Rural Water Corporation
WEE003448		26.90	Murray	7 Vic Murray Barmah to SA	Stage 1	Goulburn-Murray Rural Water Corporation
WEE003450		111.40	Goulburn	1A Greater goulburn	Inter-project agreement	Not G-MW
WEE003765	1.00		Goulburn	1B Boort	Inter-project agreement	Goulburn-Murray Rural Water Corporation
WEE003885	22.1		Murray	7 Vic Murray Barmah to SA	Stage 1	Goulburn-Murray Rural Water Corporation
WEE003886		9.6	Murray	7 Vic Murray Barmah to SA	Stage 1	Goulburn-Murray Rural Water Corporation

WEE ID	High reliability volume (ML)	Low reliability volume (ML)	River System	Zone	Project	Registered name
WEE003971	1.00		Murray	6 Vic Murray Dart to Barmah	Inter-project agreement	Goulburn-Murray Rural Water Corporation
WEE004010		36.50	Goulburn	1A Greater goulburn	Inter-project agreement	Not G-MW
WEE004066		42.70	Murray	7 Vic Murray Barmah to SA	Stage 1	Goulburn-Murray Rural Water Corporation
WEE004293	234.20		Goulburn	1A Greater goulburn	Inter-project agreement	Not G-MW
WEE004375	1.00		Goulburn	1A Greater goulburn	Inter-project agreement	Not G-MW
WEE004404	173.50		Murray	6B Lower Broken Creek	Inter-project agreement	Goulburn-Murray Rural Water Corporation
WEE004405		77.30	Murray	6B Lower Broken Creek	Inter-project agreement	Goulburn-Murray Rural Water Corporation
WEE005300	127.20		Goulburn	1A Greater Goulburn	Stage 1	Goulburn-Murray Rural Water Corporation
WEE005301		56.60	Goulburn	1A Greater Goulburn	Stage 1	Goulburn-Murray Rural Water Corporation
WEE005456		112.80	Goulburn	1A Greater Goulburn	Stage 1	Goulburn-Murray Rural Water Corporation
WEE005458		81.10	Goulburn	1A Greater Goulburn	Stage 1	Goulburn-Murray Rural Water Corporation
WEE005485		1.00	Goulburn	1A Greater Goulburn	Stage 1	Goulburn-Murray Rural Water Corporation
WEE005506		10.60	Goulburn	1A Greater goulburn	Inter-project agreement	Goulburn-Murray Rural Water Corporation
WEE0055737		2,000.00	Murray	6 Vic Murray Dart to Barmah	Inter-project agreement	Goulburn-Murray Rural Water Corporation
WEE005662	12.50		Murray	7 Vic Murray Barmah to SA	Inter-project agreement	Goulburn-Murray Rural Water Corporation
WEE005665	13.00		Goulburn		Stage 1	Not G-MW
WEE005666		5.8	Goulburn		Stage 1	Not G-MW
WEE005735		177.10	Murray	7 Vic Murray Barmah to SA	Stage 1	Goulburn-Murray Rural Water Corporation
WEE006173		61.40	Goulburn	1A Greater Goulburn	Stage 1	Goulburn-Murray Rural Water Corporation
WEE006364		10.60	Murray	7 Vic Murray Barmah to SA	Stage 1	Goulburn-Murray Rural Water Corporation
WEE006477		21.10	Goulburn	1A Greater goulburn	Stage 1	Goulburn-Murray Rural Water Corporation
WEE006962	21.10		Goulburn	1A Greater goulburn	Stage 1	Goulburn-Murray Rural Water Corporation
WEE006963		9.60	Goulburn	1A Greater goulburn	Stage 1	Goulburn-Murray Rural Water Corporation
WEE007308	5.00		Murray	7 Vic Murray Barmah to SA	Stage 1	Goulburn-Murray Rural Water Corporation
WEE007309		1.90	Murray	7 Vic Murray Barmah to SA	Stage 1	Goulburn-Murray Rural Water Corporation
WEE007439		104.20	Goulburn	1A Greater goulburn	Stage 1	Goulburn-Murray Rural Water Corporation
WEE007803	118.40		Murray	7 Vic Murray Barmah to SA	Stage 1	Goulburn-Murray Rural Water Corporation

WEE ID	High reliability volume (ML)	Low reliability volume (ML)	River System	Zone	Project	Registered name
WEE007804		53.80	Murray	7 Vic Murray Barmah to SA	Stage 1	Goulburn-Murray Rural Water Corporation
WEE008211		9.10	Goulburn	1A Greater Goulburn	Stage 1	Goulburn-Murray Rural Water Corporation
WEE008625	16.00		Goulburn	1A Greater goulburn	Inter-project agreement	Not G-MW
WEE008626		7.20	Goulburn	1A Greater goulburn	Inter-project agreement	Goulburn-Murray Rural Water Corporation
WEE008774		79.70	Goulburn	1A Greater goulburn	Inter-project agreement	Goulburn-Murray Rural Water Corporation
WEE008883	309.20		Murray	6 Vic Murray Dart to Barmah	Stage 1	Goulburn-Murray Rural Water Corporation
WEE008884	161.00		Murray	6B Lower Broken Creek	Stage 1	Goulburn-Murray Rural Water Corporation
WEE009035	1.00		Goulburn	1B Boort	Inter-project agreement	Goulburn-Murray Rural Water Corporation
WEE009159		12.00	Murray	7 Vic Murray Barmah to SA	Stage 1	Goulburn-Murray Rural Water Corporation
WEE009175		22.60	Murray	7 Vic Murray Barmah to SA	Inter-project agreement	Goulburn-Murray Rural Water Corporation
WEE009178	12.5		Murray	7 Vic Murray Barmah to SA	Stage 1	Goulburn-Murray Rural Water Corporation
WEE009379	36.10		Murray	7 Vic Murray Barmah to SA	Stage 1	Goulburn-Murray Rural Water Corporation
WEE009380		16.30	Murray	7 Vic Murray Barmah to SA	Stage 1	Goulburn-Murray Rural Water Corporation
WEE009629	1.00		Goulburn	1A Greater goulburn	Inter-project agreement	Not G-MW
WEE010214		40.80	Murray	7 Vic Murray Barmah to SA	Inter-project agreement	Goulburn-Murray Rural Water Corporation
WEE010266	63		Murray	7 Vic Murray Barmah to SA	Stage 1	Goulburn-Murray Rural Water Corporation
WEE010267		23	Murray	7 Vic Murray Barmah to SA	Stage 1	Goulburn-Murray Rural Water Corporation
WEE010579		82.1	Goulburn	1A Greater goulburn	Inter-project agreement	Goulburn-Murray Rural Water Corporation
WEE010590	10.80		Murray	7 Vic Murray Barmah to SA	Stage 1	Goulburn-Murray Rural Water Corporation
WEE010777		2.90	Murray	6 Vic Murray Dart to Barmah	Inter-project agreement	Goulburn-Murray Rural Water Corporation
WEE010783		7.70	Murray	7 Vic Murray Barmah to SA	Inter-project agreement	Goulburn-Murray Rural Water Corporation
WEE010911		174.20	Murray	7 Vic Murray Barmah to SA	Inter-project agreement	Goulburn-Murray Rural Water Corporation
WEE010931		9.60	Murray	7 Vic Murray Barmah to SA	Stage 1	Goulburn-Murray Rural Water Corporation
WEE011011		120.00	Murray	7 Vic Murray Barmah to SA	Inter-project agreement	Goulburn-Murray Rural Water Corporation
WEE011172	188.50		Goulburn	1A Greater goulburn	Stage 1	Goulburn-Murray Rural Water Corporation
WEE011173		84.50	Goulburn	1A Greater goulburn	Stage 1	Goulburn-Murray Rural Water Corporation
WEE011261		13.90	Murray	6 Vic Murray Dart to Barmah	Inter-project agreement	Goulburn-Murray Rural Water Corporation

WEE ID	High reliability volume (ML)	Low reliability volume (ML)	River System	Zone	Project	Registered name
WEE011503	102.50		Murray	7 Vic Murray Barmah to SA	Stage 1	Goulburn-Murray Rural Water Corporation
WEE011504		46.60	Murray	7 Vic Murray Barmah to SA	Stage 1	Goulburn-Murray Rural Water Corporation
WEE011586	3.00		Goulburn	1A Greater Goulburn	Stage 1	Goulburn-Murray Rural Water Corporation
WEE011613	152.40		Goulburn	1A Greater Goulburn	Stage 1	Goulburn-Murray Rural Water Corporation
WEE011614		68.20	Goulburn	1A Greater Goulburn	Stage 1	Goulburn-Murray Rural Water Corporation
WEE011634		0.50	Goulburn	1A Greater Goulburn	Stage 1	Goulburn-Murray Rural Water Corporation
WEE011806		12.50	Murray	6 Vic Murray Dart to Barmah	Inter-project agreement	Goulburn-Murray Rural Water Corporation
WEE011859	26.50		Goulburn	1A Greater goulburn	Inter-project agreement	Not G-MW
WEE011860		11.50	Goulburn	1A Greater goulburn	Inter-project agreement	Not G-MW
WEE011935	131.00		Murray	6 Vic Murray Dart to Barmah	Stage 1	Goulburn-Murray Rural Water Corporation
WEE012084		13.40	Murray	6 Vic Murray Dart to Barmah	Inter-project agreement	Goulburn-Murray Rural Water Corporation
WEE012094		131.50	Goulburn	1A Greater Goulburn	Stage 1	Goulburn-Murray Rural Water Corporation
WEE012418	25.30		Goulburn	1A Greater goulburn	Inter-project agreement	Not G-MW
WEE012419		11.50	Goulburn	1A Greater goulburn	Inter-project agreement	Not G-MW
WEE012419		11.50	Goulburn	1A Greater goulburn	Stage 1	Goulburn-Murray Rural Water Corporation
WEE012582		48.50	Goulburn	1A Greater Goulburn	Stage 1	Goulburn-Murray Rural Water Corporation
WEE012657	449.50		Goulburn	1A Greater Goulburn	Stage 1	Goulburn-Murray Rural Water Corporation
WEE012658		209.80	Goulburn	1A Greater Goulburn	Stage 1	Goulburn-Murray Rural Water Corporation
WEE013090		19.20	Murray	7 Vic Murray Barmah to SA	Inter-project agreement	Goulburn-Murray Rural Water Corporation
WEE013094	86.00		Goulburn	1A Greater goulburn	Inter-project agreement	Not G-MW
WEE013095		38.40	Goulburn	1A Greater goulburn	Inter-project agreement	Not G-MW
WEE013189	294.50		Murray	6 Vic Murray Dart to Barmah	Inter-project agreement	Goulburn-Murray Rural Water Corporation
WEE013190		135.40	Murray	6 Vic Murray Dart to Barmah	Inter-project agreement	Goulburn-Murray Rural Water Corporation
WEE013347	1.00		Murray	6 Vic Murray Dart to Barmah	Inter-project agreement	Goulburn-Murray Rural Water Corporation
WEE013349	42.80		Murray	6 Vic Murray Dart to Barmah	Inter-project agreement	Goulburn-Murray Rural Water Corporation
WEE013350		19.20	Murray	6 Vic Murray Dart to Barmah	Inter-project agreement	Goulburn-Murray Rural Water Corporation
WEE013357		287.00	Goulburn	1B Boort	Stage 1	Goulburn-Murray Rural Water Corporation

WEE ID	High reliability volume (ML)	Low reliability volume (ML)	River System	Zone	Project	Registered name
WEE013417	226.20		Murray	6 Vic Murray Dart to Barmah	Stage 1	Goulburn-Murray Rural Water Corporation
WEE013418		105.10	Murray	6 Vic Murray Dart to Barmah	Stage 1	Goulburn-Murray Rural Water Corporation
WEE013556		56.60	Murray	7 Vic Murray Barmah to SA	Stage 1	Goulburn-Murray Rural Water Corporation
WEE013667	223.50		Goulburn	1A Greater Goulburn	Inter-project agreement	Not G-MW
WEE013668		101.30	Goulburn	1A Greater goulburn	Inter-project agreement	Goulburn-Murray Rural Water Corporation
WEE013754	141.60		Murray	7 Vic Murray Barmah to SA	Stage 1	Goulburn-Murray Rural Water Corporation
WEE013755		64.30	Murray	7 Vic Murray Barmah to SA	Stage 1	Goulburn-Murray Rural Water Corporation
WEE014246	12.50		Murray	7 Vic Murray Barmah to SA	Inter-project agreement	Goulburn-Murray Rural Water Corporation
WEE014463		163.20	Murray	7 Vic Murray Barmah to SA	Inter-project agreement	Goulburn-Murray Rural Water Corporation
WEE014583		58.10	Goulburn	1A Greater Goulburn	Stage 1	Goulburn-Murray Rural Water Corporation
WEE015999		3.80	Murray	7 Vic Murray Barmah to SA	Inter-project agreement	Goulburn-Murray Rural Water Corporation
WEE016505	12.40		Goulburn	1A Greater goulburn	Inter-project agreement	Goulburn-Murray Rural Water Corporation
WEE016827	11.70		Goulburn	1A Greater goulburn	Inter-project agreement	Not G-MW
WEE016856		84.50	Goulburn	1A Greater Goulburn	Stage 1	Goulburn-Murray Rural Water Corporation
WEE020784		56.20	Murray	7 Vic Murray Barmah to SA	Stage 1	Goulburn-Murray Rural Water Corporation
WEE021963	1.00		Murray	6 Vic Murray Dart to Barmah	Stage 1	Goulburn-Murray Rural Water Corporation
WEE022463		21.20	Murray	7 Vic Murray Barmah to SA	Inter-project agreement	Goulburn-Murray Rural Water Corporation
WEE022691		28.80	Goulburn	1A Greater goulburn	Inter-project agreement	Goulburn-Murray Rural Water Corporation
WEE024092		50.90	Murray	7 Vic Murray Barmah to SA	Stage 1	Goulburn-Murray Rural Water Corporation
WEE024212		27.80	Murray	6 Vic Murray Dart to Barmah	Inter-project agreement	Goulburn-Murray Rural Water Corporation
WEE024473		55.20	Murray	7 Vic Murray Barmah to SA	Stage 1	Goulburn-Murray Rural Water Corporation
WEE024671	196.30		Goulburn	1A Greater goulburn	Inter-project agreement	Goulburn-Murray Rural Water Corporation
WEE024672		88.30	Goulburn	1A Greater goulburn	Inter-project agreement	Goulburn-Murray Rural Water Corporation
WEE025432	103.80		Murray	7 Vic Murray Barmah to SA	Stage 1	Goulburn-Murray Rural Water Corporation
WEE026652	8.00		Goulburn	1A Greater goulburn	Inter-project agreement	Not G-MW
WEE026653		1.90	Goulburn	1A Greater goulburn	Inter-project agreement	Not G-MW
WEE026743		81.10	Goulburn	1A Greater goulburn	Inter-project agreement	Goulburn-Murray Rural Water Corporation

WEE ID	High reliability volume (ML)	Low reliability volume (ML)	River System	Zone	Project	Registered name
WEE027058		339.20	Murray	6 Vic Murray Dart to Barmah	Stage 1	Goulburn-Murray Rural Water Corporation
WEE027059		38.90	Murray	6B Lower Broken Creek	Stage 1	Goulburn-Murray Rural Water Corporation
WEE027121	244.90		Murray	7 Vic Murray Barmah to SA	Stage 1	Goulburn-Murray Rural Water Corporation
WEE027122		111.80	Murray	7 Vic Murray Barmah to SA	Stage 1	Goulburn-Murray Rural Water Corporation
WEE027433		216.00	Murray	7 Vic Murray Barmah to SA	Inter-project agreement	Goulburn-Murray Rural Water Corporation
WEE027542		21.60	Murray	7 Vic Murray Barmah to SA	Stage 1	Goulburn-Murray Rural Water Corporation
WEE028063	48.90		Murray	6 Vic Murray Dart to Barmah	Stage 1	Goulburn-Murray Rural Water Corporation
WEE028064		21.6	Murray	6 Vic Murray Dart to Barmah	Stage 1	Goulburn-Murray Rural Water Corporation
WEE028099	6.90		Goulburn	1A Greater goulburn	Stage 1	Goulburn-Murray Rural Water Corporation
WEE028101	359.60		Goulburn	1A Greater goulburn	Stage 1	Goulburn-Murray Rural Water Corporation
WEE028503	8.40		Murray	7 Vic Murray Barmah to SA	Inter-project agreement	Goulburn-Murray Rural Water Corporation
WEE028520		14.40	Murray	7 Vic Murray Barmah to SA	Stage 1	Goulburn-Murray Rural Water Corporation
WEE028522		111.40	Murray	7 Vic Murray Barmah to SA	Stage 1	Goulburn-Murray Rural Water Corporation
WEE028999		9.60	Murray	7 Vic Murray Barmah to SA	Stage 1	Goulburn-Murray Rural Water Corporation
WEE029674	57.00		Goulburn	1A Greater goulburn	Inter-project agreement	Not G-MW
WEE029675		24.00	Goulburn	1A Greater goulburn	Inter-project agreement	Not G-MW
WEE030444		68.20	Goulburn	1A Greater goulburn	Inter-project agreement	Not G-MW
WEE030596	100.00		Goulburn	1A Greater goulburn	Inter-project agreement	Not G-MW
WEE030596	24.40		Goulburn	1A Greater goulburn	Stage 1	Not G-MW
WEE030597		54.70	Goulburn	1A Greater goulburn	Inter-project agreement	Goulburn-Murray Rural Water Corporation
WEE031109	12.10		Goulburn		Stage 1	Not G-MW
WEE031335		39.90	Murray	6 Vic Murray Dart to Barmah	Inter-project agreement	Goulburn-Murray Rural Water Corporation
WEE031694		143.00	Murray	7 Vic Murray Barmah to SA	Inter-project agreement	Goulburn-Murray Rural Water Corporation
WEE031869	72.20		Murray	6 Vic Murray Dart to Barmah	Inter-project agreement	Goulburn-Murray Rural Water Corporation
WEE031870		29.00	Murray	6 Vic Murray Dart to Barmah	Inter-project agreement	Goulburn-Murray Rural Water Corporation
WEE032437		34.10	Murray	7 Vic Murray Barmah to SA	Inter-project agreement	Goulburn-Murray Rural Water Corporation
WEE034800	4.00		Murray	6 Vic Murray Dart to Barmah	Stage 1	Goulburn-Murray Rural Water Corporation

WEE ID	High reliability volume (ML)	Low reliability volume (ML)	River System	Zone	Project	Registered name
WEE035568		7.20	Murray	7 Vic Murray Barmah to SA	Stage 1	Goulburn-Murray Rural Water Corporation
WEE035756	5.40		Goulburn	1A Greater goulburn	Inter-project agreement	Goulburn-Murray Rural Water Corporation
WEE035984		52.40	Murray	6 Vic Murray Dart to Barmah	Inter-project agreement	Goulburn-Murray Rural Water Corporation
WEE036174	162.50		Murray	6 Vic Murray Dart to Barmah	Stage 1	Goulburn-Murray Rural Water Corporation
WEE036211	300.00		Goulburn	1A Greater goulburn	Stage 1	Goulburn-Murray Rural Water Corporation
WEE037267	2.10		Murray	6 Vic Murray Dart to Barmah	Stage 1	Goulburn-Murray Rural Water Corporation
WEE039164	7.60		Goulburn	1A Greater goulburn	Stage 1	Goulburn-Murray Rural Water Corporation
WEE039241	1.80		Murray	7 Vic Murray Barmah to SA	Inter-project agreement	Goulburn-Murray Rural Water Corporation
WEE042969	100.50		Murray	6 Vic Murray Dart to Barmah	Stage 1	Goulburn-Murray Rural Water Corporation
WEE043001	270.00		Murray	6 Vic Murray Dart to Barmah	Stage 1	Goulburn-Murray Rural Water Corporation
WEE043302		39.40	Goulburn	1A Greater goulburn	Stage 1	Goulburn-Murray Rural Water Corporation
WEE043728	1.00		Murray	7 Vic Murray Dart to Barmah	Inter-project agreement	Not G-MW
WEE043875		179.00	Goulburn	1A Greater goulburn	Inter-project agreement	Goulburn-Murray Rural Water Corporation
WEE043876		19.7	Goulburn	1A Greater goulburn	Inter-project agreement	Goulburn-Murray Rural Water Corporation
WEE044909		156.00	Murray	7 Vic Murray Barmah to SA	Inter-project agreement	Goulburn-Murray Rural Water Corporation
WEE044910		169.40	Murray	7 Vic Murray Barmah to SA	Inter-project agreement	Goulburn-Murray Rural Water Corporation
WEE045267		1.10	Murray	7 Vic Murray Barmah to SA	Inter-project agreement	Goulburn-Murray Rural Water Corporation
WEE045825	291.50		Murray	6 Vic Murray Dart to Barmah	Inter-project agreement	Goulburn-Murray Rural Water Corporation
WEE046417	47.40		Goulburn	1A Greater goulburn	Inter-project agreement	Not G-MW
WEE046467	19.60		Goulburn	1A Greater goulburn	Inter-project agreement	Not G-MW
WEE047639	18.00		Murray	7 Vic Murray Barmah to SA	Stage 1	Goulburn-Murray Rural Water Corporation
WEE047821	294.30		Goulburn	1A Greater goulburn	Inter-project agreement	Goulburn-Murray Rural Water Corporation
WEE047844	20.00		Goulburn	1A Greater goulburn	Inter-project agreement	Not G-MW
WEE047846	20.00		Goulburn	1A Greater goulburn	Inter-project agreement	Not G-MW
WEE048037		13	Murray	7 Vic Murray Barmah to SA	Stage 1	Goulburn-Murray Rural Water Corporation
WEE048115	139.50		Goulburn	1A Greater goulburn	Stage 1	Goulburn-Murray Rural Water Corporation
WEE048488	52.00		Murray	6 Vic Murray Dart to Barmah	Stage 1	Goulburn-Murray Rural Water Corporation

WEE ID	High reliability volume (ML)	Low reliability volume (ML)	River System	Zone	Project	Registered name
WEE048492	44.60		Murray	6 Vic Murray Dart to Barmah	Stage 1	Goulburn-Murray Rural Water Corporation
WEE048902	250.00		Goulburn	1A Greater goulburn	Stage 1	Goulburn-Murray Rural Water Corporation
WEE048963	77.50		Murray	7 Vic Murray Barmah to SA	Stage 1	Goulburn-Murray Rural Water Corporation
WEE049877	5.20		Goulburn	1A Greater goulburn	Inter-project agreement	Not G-MW
WEE050303	4.60		Goulburn	1A Greater goulburn	Inter-project agreement	Goulburn-Murray Rural Water Corporation
WEE050632	98.00		Murray	6 Vic Murray -Dart to Barmah	Stage 1	Goulburn-Murray Rural Water Corporation
WEE050689	71.00		Murray	6B Lower Broken Creek	Stage 1	Goulburn-Murray Rural Water Corporation
WEE050769	46.00		Goulburn	1B Boort	Stage 1	Goulburn-Murray Rural Water Corporation
WEE050876	16.00		Goulburn	1A Greater Goulburn	Stage 1	Goulburn-Murray Rural Water Corporation
WEE050931	58.50		Murray	7 Vic Murray Barmah to SA	Stage 1	Goulburn-Murray Rural Water Corporation
WEE050997	45.00		Murray	6 Vic Murray -Dart to Barmah	Stage 1	Goulburn-Murray Rural Water Corporation
WEE051040	1.40		Goulburn	1A Greater goulburn	Stage 1	Goulburn-Murray Rural Water Corporation
WEE051087	49.00		Murray	7 Vic Murray -Barmah to SA	Stage 1	Goulburn-Murray Rural Water Corporation
WEE051089	4.00		Murray	7 Vic Murray Barmah to SA	Stage 1	Goulburn-Murray Rural Water Corporation
WEE051094	2.00		Murray	7 Vic Murray Barmah to SA	Stage 1	Goulburn-Murray Rural Water Corporation
WEE051096	72.70		Murray	7 Vic Murray Barmah to SA	Stage 1	Goulburn-Murray Rural Water Corporation
WEE051192	7.5		Murray	7 Vic Murray Barmah to SA	Stage 1	Goulburn-Murray Rural Water Corporation
WEE051296	3.00		Goulburn	1A Greater Goulburn	Stage 1	Goulburn-Murray Rural Water Corporation
WEE051298	53.00		Murray	6 Vic Murray Dart to Barmah	Stage 1	Goulburn-Murray Rural Water Corporation
WEE051302	2.10		Goulburn	1A Greater goulburn	Stage 1	Goulburn-Murray Rural Water Corporation
WEE051411	137.00		Goulburn	1B Boort	Stage 1	Goulburn-Murray Rural Water Corporation
WEE051568	40.00		Goulburn	3 Lower Goulburn	Stage 1	Goulburn-Murray Rural Water Corporation
WEE051621	50.00		Goulburn	1A Greater Goulburn	Stage 1	Goulburn-Murray Rural Water Corporation
WEE051628	67.00		Murray	6B Lower Broken Creek	Stage 1	Goulburn-Murray Rural Water Corporation
WEE051630		30.00	Murray	6B Lower Broken Creek	Stage 1	Goulburn-Murray Rural Water Corporation
WEE051720		144.00	Murray	7 Vic Murray Barmah to SA	Stage 1	Goulburn-Murray Rural Water Corporation
WEE051827	189.40		Goulburn	1A Greater goulburn	Stage 1	Goulburn-Murray Rural Water Corporation

WEE ID	High reliability volume (ML)	Low reliability volume (ML)	River System	Zone	Project	Registered name
WEE052384	11.40		Goulburn	1A Greater goulburn	Inter-project agreement	Not G-MW
WEE052462	1.00		Goulburn	1A Greater goulburn	Stage 1	Goulburn-Murray Rural Water Corporation
WEE052638	2.40		Goulburn	1A Greater goulburn	Stage 1	Goulburn-Murray Rural Water Corporation
WEE052943	1.00		Goulburn	1A Greater goulburn	Stage 1	Goulburn-Murray Rural Water Corporation
WEE052949	3.00		Murray	7 Vic Murray Barmah to SA	Stage 1	Goulburn-Murray Rural Water Corporation
WEE053348	28.00		Goulburn	1A Greater goulburn	Stage 1	Goulburn-Murray Rural Water Corporation
WEE053753		200.00	Goulburn	1A Greater goulburn	Inter-project agreement	Goulburn-Murray Rural Water Corporation
WEE053943	49.00		Goulburn	1A Greater goulburn	Stage 1	Goulburn-Murray Rural Water Corporation
WEE054474	12.70		Goulburn	1A Greater Goulburn	Stage 1	Goulburn-Murray Rural Water Corporation
WEE054546	400.50		Goulburn	1A Greater goulburn	Inter-project agreement	Goulburn-Murray Rural Water Corporation
WEE054621	7.00		Murray	6 Vic Murray Dart to Barmah	Inter-project agreement	Goulburn-Murray Rural Water Corporation
WEE054751	8.50		Murray	7 Vic Murray Barmah to SA	Inter-project agreement	Goulburn-Murray Rural Water Corporation
WEE054755	90.00		Goulburn	1A Greater goulburn	Inter-project agreement	Goulburn-Murray Rural Water Corporation
WEE055241	37.30		Goulburn	1A Greater goulburn	Inter-project agreement	Goulburn-Murray Rural Water Corporation
WEE055583	166.30		Goulburn	1A Greater goulburn	Inter-project agreement	Goulburn-Murray Rural Water Corporation
WEE055607	98.10		Murray	7 Vic Murray Barmah to SA	Stage 1	Goulburn-Murray Rural Water Corporation
WEE055608	51.90		Murray	7 Vic Murray Barmah to SA	Stage 1	Goulburn-Murray Rural Water Corporation
WEE055737		2,000.00	Murray	6 Vic Murray Dart to Barmah	Inter-project agreement	Goulburn-Murray Rural Water Corporation
WEE055748		1.20	Murray	6 Vic Murray Dart to Barmah	Stage 1	Goulburn-Murray Rural Water Corporation
WEE055750	53.00		Murray	6 Vic Murray Dart to Barmah	Inter-project agreement	Goulburn-Murray Rural Water Corporation
WEE056753		379.30	Murray	7 Vic Murray Barmah to SA	Stage 1	Goulburn-Murray Rural Water Corporation
WEE056754	51.10		Murray	7 Vic Murray Barmah to SA	Inter-project agreement	Goulburn-Murray Rural Water Corporation
WEE056754	501.60		Murray	7 Vic Murray Barmah to SA	Stage 1	Goulburn-Murray Rural Water Corporation
WEE056845	15,052.00		Campaspe	4A Compaspe - Eppalock to WWC	Stage 1	Goulburn-Murray Rural Water Corporation
WEE057037	12.00		Murray	7 Vic Murray Barmah to SA	Stage 1	Goulburn-Murray Rural Water Corporation
WEE057043	91.10		Murray	7 Vic Murray Barmah to SA	Stage 1	Goulburn-Murray Rural Water Corporation
WEE057045	121.10		Murray	7 Vic Murray Barmah to SA	Stage 1	Goulburn-Murray Rural Water Corporation

WEE ID	High reliability volume (ML)	Low reliability volume (ML)	River System	Zone	Project	Registered name
WEE057052	57.40		Murray	7 Vic Murray Barmah to SA	Stage 1	Goulburn-Murray Rural Water Corporation
WEE057056	6.50		Murray	7 Vic Murray Barmah to SA	Stage 1	Goulburn-Murray Rural Water Corporation
WEE057058	200.00		Goulburn	1A Greater goulburn	Stage 1	Goulburn-Murray Rural Water Corporation
WEE057060		100.00	Goulburn	1A Greater goulburn	Stage 1	Goulburn-Murray Rural Water Corporation
WEE057099	166.80		Murray	7 Vic Murray Barmah to SA	Stage 1	Goulburn-Murray Rural Water Corporation
WEE057127	108.60		Murray	7 Vic Murray Barmah to SA	Stage 1	Goulburn-Murray Rural Water Corporation
WEE057129	21.70		Murray	7 Vic Murray Barmah to SA	Stage 1	Goulburn-Murray Rural Water Corporation
WEE057147		38.40	Murray	6 Vic Murray Dart to Barmah	Inter-project agreement	Not G-MW
WEE057149	3.00		Murray	7 Vic Murray Barmah to SA	Stage 1	Goulburn-Murray Rural Water Corporation
WEE057153	20.20		Murray	7 Vic Murray Barmah to SA	Stage 1	Goulburn-Murray Rural Water Corporation
WEE057214	19.70		Murray	7 Vic Murray Barmah to SA	Stage 1	Goulburn-Murray Rural Water Corporation
WEE057247	153.30		Murray	7 Vic Murray Barmah to SA	Stage 1	Goulburn-Murray Rural Water Corporation
WEE057251	110.40		Murray	7 Vic Murray Barmah to SA	Stage 1	Goulburn-Murray Rural Water Corporation
WEE057330	128.00		Murray	6 Vic Murray -Dart to Barmah	Stage 1	Goulburn-Murray Rural Water Corporation
WEE057330	77.00		Murray	6 Vic Murray -Dart to Barmah	Stage 1	Goulburn-Murray Rural Water Corporation
WEE057330	69.00		Murray	6 Vic Murray -Dart to Barmah	Stage 1	Goulburn-Murray Rural Water Corporation
WEE057330	27.00		Murray	6 Vic Murray -Dart to Barmah	Stage 1	Goulburn-Murray Rural Water Corporation
WEE057330	91.00		Murray	6 Vic Murray -Dart to Barmah	Stage 1	Goulburn-Murray Rural Water Corporation
WEE057330	73.00		Murray	6 Vic Murray -Dart to Barmah	Stage 1	Goulburn-Murray Rural Water Corporation
WEE057330	71.00		Murray	6 Vic Murray -Dart to Barmah	Stage 1	Goulburn-Murray Rural Water Corporation
WEE057330	79.00		Murray	6 Vic Murray -Dart to Barmah	Stage 1	Goulburn-Murray Rural Water Corporation
WEE057409	125.00		Murray	7 Vic Murray -Barmah to SA	Stage 1	Goulburn-Murray Rural Water Corporation
WEE057409	119.00		Murray	7 Vic Murray -Barmah to SA	Stage 1	Goulburn-Murray Rural Water Corporation
WEE057409	31.00		Murray	7 Vic Murray -Barmah to SA	Stage 1	Goulburn-Murray Rural Water Corporation
WEE057409	90.00		Murray	7 Vic Murray -Barmah to SA	Stage 1	Goulburn-Murray Rural Water Corporation
WEE057409	24.20		Murray	7 Vic Murray -Barmah to SA	Stage 1	Goulburn-Murray Rural Water Corporation
WEE057409	60.00		Murray	7 Vic Murray -Barmah to SA	Stage 1	Goulburn-Murray Rural Water Corporation

WEE ID	High reliability volume (ML)	Low reliability volume (ML)	River System	Zone	Project	Registered name
WEE057409	81.00		Murray	7 Vic Murray -Barmah to SA	Stage 1	Goulburn-Murray Rural Water Corporation
WEE057409	100.00		Murray	7 Vic Murray -Barmah to SA	Stage 1	Goulburn-Murray Rural Water Corporation
WEE057409	50.00		Murray	7 Vic Murray -Barmah to SA	Stage 1	Goulburn-Murray Rural Water Corporation
WEE057409	87.00		Murray	7 Vic Murray -Barmah to SA	Stage 1	Goulburn-Murray Rural Water Corporation
WEE057409	33.00		Murray	7 Vic Murray -Barmah to SA	Stage 1	Goulburn-Murray Rural Water Corporation
WEE057413	95.00		Goulburn	1A Greater Goulburn	Stage 1	Goulburn-Murray Rural Water Corporation
WEE057413	268.00		Goulburn	1A Greater Goulburn	Stage 1	Goulburn-Murray Rural Water Corporation
WEE057413	143.00		Goulburn	1A Greater Goulburn	Stage 1	Goulburn-Murray Rural Water Corporation
WEE057413	252.00		Goulburn	1A Greater Goulburn	Stage 1	Goulburn-Murray Rural Water Corporation
WEE057413	14.00		Goulburn	1A Greater Goulburn	Stage 1	Goulburn-Murray Rural Water Corporation
WEE057413	13.00		Goulburn	1A Greater Goulburn	Stage 1	Goulburn-Murray Rural Water Corporation
WEE057413	79.80		Goulburn	1A Greater Goulburn	Stage 1	Goulburn-Murray Rural Water Corporation
WEE057413	50.00		Goulburn	1A Greater Goulburn	Stage 1	Goulburn-Murray Rural Water Corporation
WEE057413	13.00		Goulburn	1A Greater Goulburn	Stage 1	Goulburn-Murray Rural Water Corporation
WEE057413	14.00		Goulburn	1A Greater Goulburn	Stage 1	Goulburn-Murray Rural Water Corporation
WEE057413	34.00		Goulburn	1A Greater Goulburn	Stage 1	Goulburn-Murray Rural Water Corporation
WEE057413	39.00		Goulburn	1A Greater Goulburn	Stage 1	Goulburn-Murray Rural Water Corporation
WEE057413	10.00		Goulburn	1A Greater Goulburn	Stage 1	Goulburn-Murray Rural Water Corporation
WEE057413	46.00		Goulburn	1A Greater Goulburn	Stage 1	Goulburn-Murray Rural Water Corporation
WEE057413	50.00		Goulburn	1A Greater Goulburn	Stage 1	Goulburn-Murray Rural Water Corporation
WEE057413	10.00		Goulburn	1A Greater Goulburn	Stage 1	Goulburn-Murray Rural Water Corporation
WEE057413	45.00		Goulburn	1A Greater Goulburn	Stage 1	Goulburn-Murray Rural Water Corporation
WEE057413	125.00		Goulburn	1A Greater Goulburn	Stage 1	Goulburn-Murray Rural Water Corporation
WEE057413	190.00		Goulburn	1A Greater Goulburn	Stage 1	Goulburn-Murray Rural Water Corporation
WEE057413	55.00		Goulburn	1A Greater Goulburn	Stage 1	Goulburn-Murray Rural Water Corporation
WEE057413	13.00		Goulburn	1A Greater Goulburn	Stage 1	Goulburn-Murray Rural Water Corporation
WEE057413	23.00		Goulburn	1A Greater Goulburn	Stage 1	Goulburn-Murray Rural Water Corporation

WEE ID	High reliability volume (ML)	Low reliability volume (ML)	River System	Zone	Project	Registered name
WEE057413	35.00		Goulburn	1A Greater Goulburn	Stage 1	Goulburn-Murray Rural Water Corporation
WEE057413	61.00		Goulburn	1A Greater Goulburn	Stage 1	Goulburn-Murray Rural Water Corporation
WEE057413	32.00		Goulburn	1A Greater Goulburn	Stage 1	Goulburn-Murray Rural Water Corporation
WEE057413	10.00		Goulburn	1A Greater Goulburn	Stage 1	Goulburn-Murray Rural Water Corporation
WEE057413	28.00		Goulburn	1A Greater Goulburn	Stage 1	Goulburn-Murray Rural Water Corporation
WEE057413	47.40		Goulburn	1A Greater Goulburn	Stage 1	Goulburn-Murray Rural Water Corporation
WEE057413	34.00		Goulburn	1A Greater Goulburn	Stage 1	Goulburn-Murray Rural Water Corporation
WEE057413	53.00		Goulburn	1A Greater Goulburn	Stage 1	Goulburn-Murray Rural Water Corporation
WEE057413	23.00		Goulburn	1A Greater Goulburn	Stage 1	Goulburn-Murray Rural Water Corporation
WEE057413	28.00		Goulburn	1A Greater Goulburn	Stage 1	Goulburn-Murray Rural Water Corporation
WEE057413	37.00		Goulburn	1A Greater Goulburn	Stage 1	Goulburn-Murray Rural Water Corporation
WEE057413	153.00		Goulburn	1A Greater Goulburn	Stage 1	Goulburn-Murray Rural Water Corporation
WEE057413	10.00		Goulburn	1A Greater Goulburn	Stage 1	Goulburn-Murray Rural Water Corporation
WEE057413	175.00		Goulburn	1A Greater Goulburn	Stage 1	Goulburn-Murray Rural Water Corporation
WEE057413	21.00		Goulburn	1A Greater Goulburn	Stage 1	Goulburn-Murray Rural Water Corporation
WEE057413	21.00		Goulburn	1A Greater Goulburn	Stage 1	Goulburn-Murray Rural Water Corporation
WEE057413	12.00		Goulburn	1A Greater Goulburn	Stage 1	Goulburn-Murray Rural Water Corporation
WEE057413	57.00		Goulburn	1A Greater Goulburn	Stage 1	Goulburn-Murray Rural Water Corporation
WEE057413	51.00		Goulburn	1A Greater Goulburn	Stage 1	Goulburn-Murray Rural Water Corporation
WEE057413	26.00		Goulburn	1A Greater Goulburn	Stage 1	Goulburn-Murray Rural Water Corporation