GOULBURN-MURRAY WATER

IMPACT OF MODERNISATION

WHOLE OF LIFE COST ANALYSIS

PART 1: BACKGROUND AND RESULTS OF KEY SCENARIOS

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Glossary of Terms

Term/Acronym	Description
ACCC	Australian Competition and Consumer Commission
ACR	Asset Condition Rating
AMP	Advanced Maintenance Program
CG	Central Goulburn
COAG	Council Of Australian Governments
DEWHA	Department of Water Heritage and the Arts
DSE	Department of Sustainability and Environment
DTF	Department of Treasury and Finance
EBM	Eroded Bank Material
ESC	Essential Services Commission
FMECA	Failure Mode, Effects and Criticality Analysis
GL	One gigalitre or one thousand megalitres
GMID	Goulburn-Murray Irrigation District
GMW	Goulburn-Murray Water Corporation
HDPE	High Density PolyEthylene
ICT	Information and Communication Technology
LTCE	Long Term Cap Equivalent
ML	One million litres
MV	Murray Valley
NRMMC	Natural Resource Management Ministerial Council
NVIRP	Northern Victoria Irrigation Renewal Project
NWI	National Water Initiative
OH&S	Occupational Health and Safety
PB	Pyramid-Boort
RAB	Regulated Asset Base
RC	Rochester-Campaspe
RIS	Regulatory Impact Statement
SCADA	Supervisory Control And Data Acquisition
Shepp	Shepparton
SMC	Stuart Murray Canal
SMP	Strategic Measurement Project
Torr	Torrumbarry
WOL	Whole of Life

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There are three parts to this report:

PART 1: BACKGROUND AND RESULTS OF KEY SCENARIOS

PART 2: SENSITIVITY ANALYSIS

PART 3: APPENDICES

CONTENTS OF PART 1: BACKGROUND AND RESULTS OF KEY SCENARIOS

1. Executive Summary

1.1 Introduction

The Goulburn-Murray Water (GMW) gravity irrigation distribution systems were constructed over 100 years ago and have been operated and maintained in a condition so as to provide good levels of service to customers over a period of time. However, the distribution assets are very old and are not as efficient and effective with respect to water conservation as more modern systems.

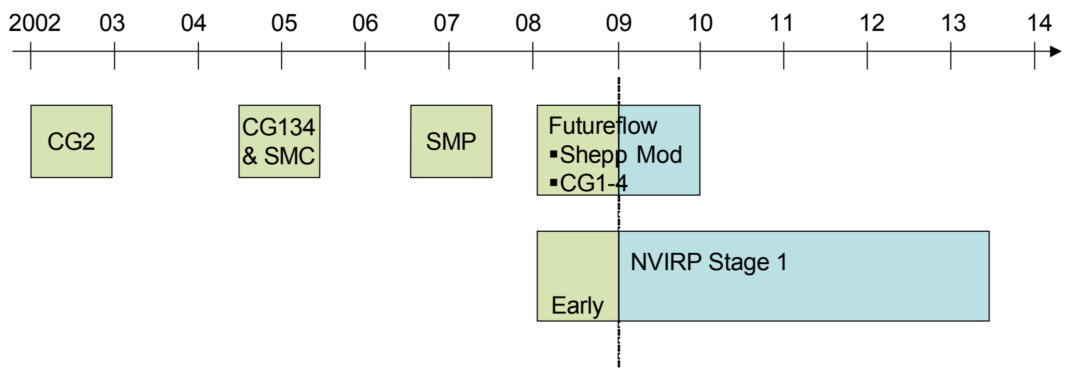
In recent years there has been an increasing emphasis on the need to save water and reduce the losses from the system through leakage, seepage, evaporation and other means. The need to save water has been highlighted by the extended drought.

In response to these issues, GMW in partnership with a number of investors commenced a modernisation program approximately five years ago in an effort to start to re-build the irrigation network in a way that water savings would be maximised whilst maintaining agreed service levels to customers. A number of key modernisation initiatives have been successfully undertaken in that time by GMW.

In the last year or so, the State Government made a significant commitment to modernise almost all of the remaining irrigation system and it formed a new organisation called the Northern Victorian Irrigation Renewal Project (NVIRP) to lead the process with support from GMW.

The NVIRP modernisation project will run over a five year period (with 'early works' having already commenced at the start of 2008) and will result in a complete renewal of a majority of the irrigation infrastructure, including installation of equipment and technology to automate the control of the system throughout all key parts of the network. Combined with the modernisation already undertaken by GMW, the total investment in modernisation will exceed $1.3 billion.

The diagram below summarises the modernisation works undertaken to date and those that are already underway but are yet to be completed:



There are six geographical Irrigation Areas that comprise GMW's business. Central Goulburn (CG) is an Area where there has been significant modernisation undertaken to date (including the CG2, CG134 and CG1-4 part of the Futureflow project). These projects along with the Stuart Murray Canal (SMC) and Strategic Measurement Projects (SMP) were successfully implemented by GMW and became the forerunners to the major Futureflow and NVIRP projects. The Futureflow project will conclude at the end of 2009.

Currently, GMW has the following types of irrigation related assets:

Asset Type	CG	MV	PB	RC	Shepp	Torr	Total
Meters:							
- Large volume (irrigation)	5,422	3,101	2,172	2,455	2,301	4,680	**20,131**
- Small volume (stock/domestic)	2,668	1,319	437	1,633	1,757	1,961	**9,775**
Structures:							
- Regulating	1,447	1,141	1,068	835	910	1,012	**6,413**
- Access	1,142	718	762	536	547	958	**4,663**
- Road/rail	1,263	780	622	456	487	850	**4,458**
- Other	12	10	9	25	12	16	**84**
- Subway/Syphon	457	254	313	169	131	346	**1,670**
Channel Bank Length (km)	2,696	1,863	2,162	1,136	1,140	2,197	**11,194**

1 This asset position was correct at March 2009, and includes work completed to that date in Shepparton, CG1-4 and the NVIRP early works.

2 Totals include ACR 1 to 6 assets within the gravity irrigation districts, total assets within the carrier channels are not presented above

Collectively, the current replacement value of these assets is over $3.8 billion.

Modernisation will result in significant changes to almost every part of GMW's business. At the conclusion, GMW will have near-new assets in many parts of its business but the nature and methods of operating and maintaining its assets will be very different. In addition, the corporate and asset management strategies will change and there will be significant financial implications. In summary, almost every part of the business will be affected, including the IT systems, the underlying business processes, the business strategy and business model, and the people and capability required.

The extent of the change requires GMW to fully understand the impact on its business. Consequently, GMW has undertaken this project, called the Whole of Life (WOL) Cost Analysis Project (the Project), to understand what these changes mean for its business and what the ongoing costs of the business are projected to be in the future.

1.2 Purpose and Structure of This Report

The purpose of this report is to:

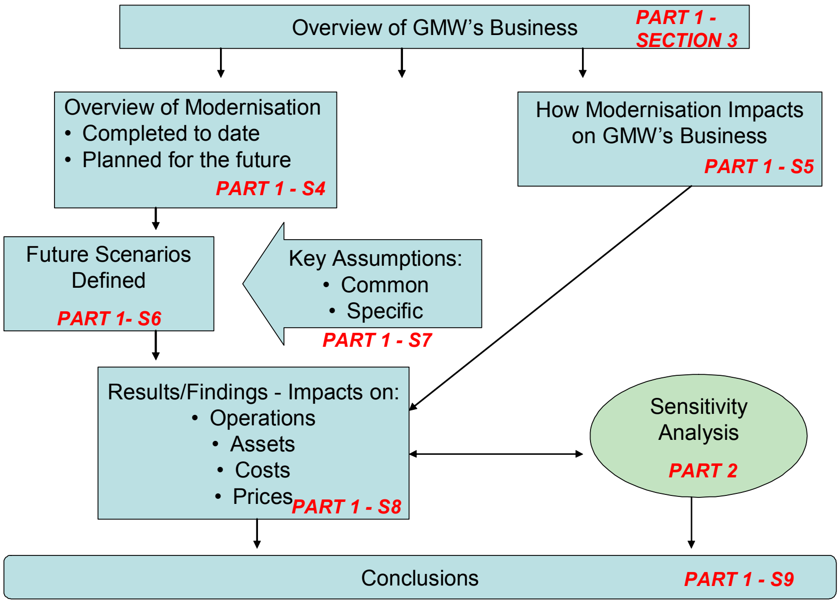
- Identify and define scenarios that represent the potential outcomes in the future both with and without major modernisation;
- Understand the impact of modernisation on GMW's business in the future, including operational activities;
- Analyse the WOL costs for key scenarios (i.e. all of the future costs of GMW's business, including both operational and capital expenditure); and
- Undertake sensitivity analysis on key scenarios taking account of key assumptions and their cost drivers.

The Project has been managed using GMW's proven project management methodology. A project steering committee has overseen the Project and a project assurance group has undertaken an assurance role. A number of external reviews have been undertaken and key models, assumptions and outputs have been checked and verified.

The report has three parts:

1. Part 1: Background and Key Scenarios
2. Part 2: Sensitivity Analysis (to be done at a later date)
3. Part 3: Appendices

The structure and relationships between the sections of the Part 1 and 2 documents is as follows:



This document represents Part 1 of the overall report.

1.3 Scenarios

A number of scenarios have been developed and analysed as part of the Project. Three specific scenarios have been selected that meet the purpose of the Project and these are outlined below.

1.3.1 Scenario 1: No Further Modernisation After Futureflow

This scenario describes the situation where no further modernisation is undertaken once the Futureflow works are completed in 2009. This scenario includes completion of the CG1-4, Shepparton Modernisation, Strategic Measurement and the Reconfiguration projects. It **does not** include the NVIRP early works which were also completed by Futureflow.

1.3.2 Scenario 2: NVIRP Stage 1 Undertaken

NVIRP has advised that for its purposes it has split the GMW irrigation network into two parts, a 'backbone' and a 'non-backbone'. The backbone is defined as being the main irrigation trunk which transports a large volume of water and in general has delivery shares greater than 20 ML/day. The backbone represents approximately 40% of GMW's current distribution network. The non-backbone is defined as being the remaining parts of the network, which are generally smaller and on the 'branches' of the network.

This scenario includes the completion of the modernisation works in scenario 1 and in addition completion of the NVIRP Stage 1 works, which are defined to be:

- All backbone channels are automated (with meters and gates) and a number are also treated to improve conditions (e.g. plastic lining, enhancing access tracks and fencing);
- 28% of the delivery shares on the non-backbone network will be transferred to the backbone. For channels, this means that 28% of the non-backbone (excluding Shepparton) will be rationalised or reconfigured and will not form part of GMW's asset base; and

- For non-backbone meters, this equates to approximately 22% of the meters being either replaced or rationalised (excluding Shepparton). Those that are replaced are replaced directly onto the backbone.

It is assumed that Shepparton will remain unchanged from Scenario 1.

1.3.3 Scenario 3: NVIRP Stage 2

This scenario builds on scenario 2 and it extends NVIRP's modernisation to include a range of further works (which do not form part of NVIRP's current Stage 1 business case). These additional works will be the subject of a further business case and NVIRP has advised that they include the following:

- It is assumed that Shepparton will remain unchanged from Scenario 1;
- No further modernisation work on the backbone;
- All remaining non-backbone channels will be reconfigured or rationalised, which means that after the Stage 2 work is complete GMW will not own or manage any non-backbone channels (or any other non-backbone connection or pipe systems), excluding Shepparton which will continue to have a non-backbone. However, the reconfiguration may result in a number of non-backbone channels being owned and managed by third parties in syndicate arrangements with no operational cost impact to GMW; and
- The reconfiguration and rationalisation of the non-backbone will result in a reduction in the total number of meters owned and managed by GMW (i.e. some of the meters on the non-backbone (excluding Shepparton) will be rationalised and some will be transferred to the backbone). The meters transferred to the backbone will be either directly connected to the backbone or could form part of a syndicate; in either case they will be owned and managed by GMW. It is assumed that half of the meters remaining on the non-backbone following Scenario 2 (i.e. the remaining 78%) are rationalised and half are moved to the backbone.

1.4 Key Assumptions

The following key assumptions have been made which are common to all three scenarios:

- Grandfathering of meters will be adopted which means that all meters/outlets will be upgraded to the proposed national metering standard at the end of their lives;
- All dollars in this report are expressed in real dollars with a base starting year of 2008/09 and are not inflation adjusted;
- All future re-investment required in the new system will be funded by GMW through customer fees and not from other sources such as Government;
- The period of modeling is 50 years for GMW's operational purposes in order to accurately capture the life cycle of the assets. NVIRP has requested data only for the first 25 years for its own purposes;
- The Advanced Maintenance Program (AMP) is only applied on the backbone, not on the non-backbone (except for the small proportion of assets that have previously had AMP treatment and are assumed to have continuation of the AMP program). AMP treatments on the backbone include channel bank beaching (which is placing rocks on the inside slope of the channel banks in the zone where the water fluctuates) and structure refurbishment;
- Corporate overheads are assumed to be the same in all three scenarios. For the period 2009/10 to 2012/13 the overheads are based on those in GMW's agreed regulatory pricing models. The 2012/13 amounts have been adopted and carried

forward for all future years. Corporate overheads are $6.9 million in 2009/10 and $8.1 million in 2012/13. It is recognised that corporate overheads are likely to reduce under Scenarios 2 and 3 and this will be sensitivity tested, however the impact on revenue is expected to be minor; and

- Operations costs comprise staff costs and licence fees for new meters and gates. Staff numbers have been estimated for each scenario based on an analysis of the key tasks that will be undertaken. Positions and actual salary bands have been identified for every individual employee in each Area and using this data, a total salary cost has been calculated for each Area. It is assumed that approximately 70% of staff costs are related to operations and the remainder is maintenance. Licence costs have been based on the Rubicon contracted rates.

The following specific assumptions have been made in relation to each scenario:

1.4.1 Asset Types, Quantities and Treatments

Scenario	Assumptions
1	Under this scenario, there are no further modernisation changes beyond completion of Futureflow's works, except rationalisation that occurs due to the continuation of the existing reconfiguration program. The NVIRP early works, which were also completed by Futureflow, have not been included within this scenario. <u>Channels</u> Under this scenario, it is assumed that there is no further rationalisation or modernisation of the system. However, it is assumed that the Katandra channels are pipelined which is common through all three scenarios. <u>Meters</u> At the end of the useful life of a meter/outlet, GMW will replace it with one that is appropriately sized according to GMW's current metering standards (which will comply with the national metering standards). It is assumed that there is an overall 20% reduction in the number of meters over time and this will be achieved by compensating customers with 50% of the avoided capital which is the benefit to GMW of not having to install the meter. <u>Regulating Gates</u> Most of the regulating assets are currently drop bars (i.e. manually controlled). The major exception is the Shepparton area where there has already been a lot of modernisation. Under this scenario, these assets continue to be owned and managed by GMW until the end of their useful lives, at which time they are replaced with gates (they are replaced mainly due to OH&S requirements due to the health risks associated with lifting the drop bars). The drop bars will be replaced with gates whenever the surrounding concrete structure is due for replacement. <u>Structures</u> Structures comprise concrete offtake points, subways, syphons, road crossings, occupation crossings, inline regulating structures, irrigation crossings and combination structures. Under this scenario they are maintained until the end of their useful life at which time they are replaced with similar structures. <u>Other</u>

<table>
<tr><td></td><td>Other assets comprise fences, access tracks, pipelines and non-standard major items. These items are treated the same as structures i.e. replaced at the end of their useful life with similar items.</td></tr>
<tr><td>2</td><td><u>Channels</u>
Length:
▪ Under this scenario, there is no major change to the length of the backbone channels i.e. there is no rationalisation.
▪ On the non-backbone, NVIRP has advised that 28% of the delivery shares will be moved to the backbone. This means that, in effect, 28% of the non-backbone channel (excluding Shepparton) will be rationalised or reconfigured and it is assumed that this occurs in proportion to the existing mix of channel conditions and capacities.
Modernisation:
▪ Some of the backbone and non-backbone channel is modernised through plastic and clay lining as per data provided by NVIRP.
▪ Channel lining is assumed to have a life of 30 years and then the plastic needs to be replaced.
<u>Meters</u>
NVIRP has advised that 3,374 meters will be rationalised and 5,253 meters (plus early works of 1,047 meters) will be replaced. After the rationalisation and replacements, 22% of all non-backbone meters will have been addressed in some way and 42% of all meters will have been addressed at the completion of scenario 2.
<u>Regulating Gates</u>
On the backbone under this scenario, all drop bars are replaced with gates and some existing gates may be upgraded. NVIRP has identified the numbers and locations of regulating gates to be installed by Area. On the non-backbone, there will be no modernisation as per scenario 1.
<u>Structures</u>
On the backbone, NVIRP has identified a small number of structures to be rationalised. The remaining structures on the backbone will remain as is except those that need to be replaced when new gates are installed – this is assumed to be about 2% of all structures.
On the non-backbone, 28% of all structures (excluding Shepparton) are assumed to be rationalised when the delivery shares are transferred to the backbone.
<u>Other</u>
Other backbone assets are treated the same as per scenario 1.
Other non-backbone assets are assumed to be rationalised by 28% (excluding Shepparton) when the delivery shares are transferred to the backbone.</td></tr>
<tr><td>3</td><td><u>Meters</u>
Under this scenario there are additional meters brought onto the backbone through the complete rationalisation of the non-backbone.
Under scenario 2, 22% of the non-backbone meters are either rationalised or replaced. Under this scenario, the remaining 78% of non-backbone meters are all either rationalised or replaced. It is assumed that 50% of the remaining non-</td></tr>
</table>

	backbone meters are rationalised and 50% replaced on the backbone. The end result after scenario 3 is that of the original 100% of meters on the backbone and non-backbone in scenario 1, 61% end up on the backbone (including 14% that are replaced) and the remaining 39% are rationalised. This excludes Shepparton which continues to have a non-backbone at completion of the Futureflow works. <u>Channels, Regulating Gates, Structures and Other Assets</u> Backbone channels, gates, structures and other assets are treated as per scenario 2. On the non-backbone all of the channels, gates, structures and other assets are assumed to be rationalised. This excludes Shepparton which continues to have a non-backbone at completion of the Futureflow works.

1.4.2 Maintenance

Scenario	Assumptions
1	<u>Channels</u> All channel waterways must be sprayed for weeds periodically. The cost has been based on the actual 5 year historical average rate for each Area. In addition, channel banks are maintained for leaks, weeds etc and the cost is based on the Asset Condition Rating (ACR) and derived from the actual 5 year historical average rate for each Area. The maintenance cost for these banks is reduced by 75% if AMP is conducted. <u>Meters</u> Most existing meters are Dethridge type. All Dethridge meter maintenance costs are based on an average of actual maintenance costs over the last 5 years by Area. Maintenance costs average approximately $94 per meter per annum over all of the Areas. Maintenance costs for newly replaced meters is based on a Failure Mode, Effects and Criticality Analysis (FMECA) which estimates repair costs based on a monte carlo analysis of failure rates and related repair costs. Maintenance costs have been developed for each meter type and for each year over a 30 year profile. An average meter cost for a medium sized smart meter is around $800-900 per meter per annum. <u>Regulating Gates</u> It is assumed that there is no specific maintenance cost for drop bars as it has been included in the maintenance cost for structures. For new Flume gates the maintenance cost is based on the FMECA analysis. For new AWMA gates the maintenance cost is based on the same FMECA analysis but only for the parts that are common to Flume gates - which is the mechanical element (an AWMA does not have a radio part). <u>Structures</u> Structures will not achieve their assumed life unless they are beached. All structures need to be beached up to three times over their life, depending on their condition rating. Beaching maintenance costs are based on historical experience. Ongoing general maintenance costs for structures have been assumed based on the actual 5 year historical average rate for each Area.

	Other Maintenance for other assets under this scenario is based on the 5 year historical average cost by Area.
2 and 3	Channels, Regulator Gates, Structures and Other Assets The same maintenance rates apply as per scenario 1 but the quantities of assets maintained varies as described above in section 1.4.1 Meters Meters not replaced or renewed under the NVIRP program are treated by GMW as per scenario 1 for maintenance costs. Meters that are replaced or renewed incur maintenance costs that have been estimated using FMECA analysis and these rates are the same as outlined in Scenario 1 above.

1.4.3 Capital Expenditure

Scenario	Assumptions
1	Channels Channels on the backbone and non-backbone are treated the same – they are renewed (or remodelled) when they reach their worst condition rating (ACR 6). Channel remodelling costs are based on the capacity of the channels and range between $119 per metre of bank for a channel of capacity 0-100 ML/day and $227 per metre of bank for channel of capacity greater than 1,000 ML/day. Meters The initial capital cost for new meters is based on market data and the Rubicon contract. All meters are assumed to have an asset life of 60 years (civil works), however, major capital expenditure is required after 30 years to renew the major mechanical and electrical components. Regulating Gates The capital cost for regulating gates is based on the contracted cost price for an average sized gate from Rubicon and from AWMA. All gates are assumed to have an asset life of 60 years, however, major capital expenditure is required after 30 years to renew the major mechanical and electrical components. Structures Structures are replaced at the end of their useful life based on the current condition rating. The average life of a structure is 90 years. The cost of replacing structures is based on the actual 5 year historical average rate for each Area for each type of structure. Other Assets Other assets are replaced at end of their useful lives based on the current condition rating and the actual 5 year historical average cost of each item. The only exception is the Katandra pipeline whose life and replacement cost has been advised by Futureflow.
2 and 3	The same cost rates apply as per scenario 1 but the quantities of assets replaced

	and renewed varies as described above in section 1.4.1.

1.4.4 Funding

Scenario	Assumptions
1	No funding required over and above the revenue requirement in the future.
2	The $100 million funding to be contributed by GMW for NVIRP Stage 1 will be paid in equal instalments in 2011/12 and 2012/13. G-MW's $100 million contribution will form part of the funding available to NVIRP to fund its program of asset creation and also of payment of compensation to landowners under the connections program. G-MW proposes to amortise this expense over 15 years. Other financing options including treating the contribution as part of the RAB and depreciating over 30 years have been analysed. The price impact is similar particularly in the early years. On balance, amortisation is consistent with the nature of G-MW's payment and will ensure that the contribution is repaid before GMW begins re-investing in the modernised system.
3	$100 million funding to be provided by GMW for Stage 1 is treated the same as Scenario 2 above. No further funding from GMW is assumed in the analysis for completion of the additional NVIRP works under this scenario.

1.5 Results and Findings

The scenarios impact on GMW's business in a number of different ways:

- Changes in the nature of the infrastructure assets, for example the numbers and types of meters, or the condition and length of channels;
- Changes to the way GMW operates its business, for example, the number of operational and support staff required;
- The financial implications such as the total cost to operate and maintain the assets, capital expenditure and funding requirements;
- Pricing implications, for example the tariffs charged to customers; and
- Impacts on customer service levels.

1.5.1 Financial Implications – Whole Business

The financial implications are assessed in three ways:

1. Revenue requirement (section 1.5.1.1);
2. Cash costs (section 1.5.1.2) and
3. The Net Present Value (NPV) of cash costs (section 1.5.1.4).

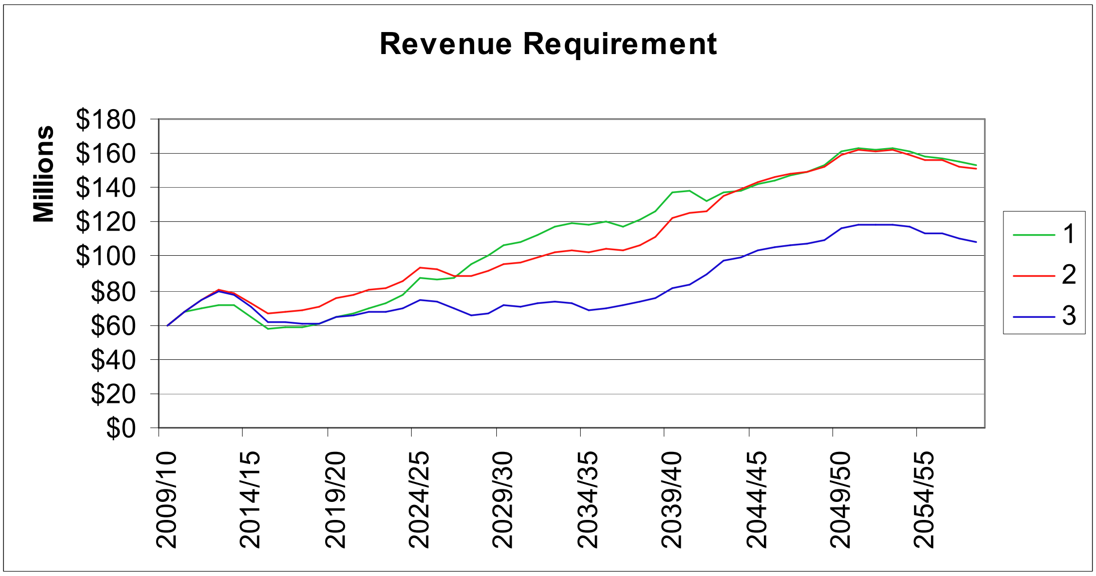
1.5.1.1 Revenue Requirement

The revenue requirement is the amount of money that must be earned by GMW in any given year in order to fully recover its day-to-day operating costs, fund its future capital expenditure commitments over the long term and make a reasonable return on its capital. Under the regulatory regime administered by the Essential Services Commission (ESC), the revenue requirement is determined and approved over a five year cycle which means that there is a degree of smoothing over the period.

The key components of the revenue requirement are:

- Operations and maintenance costs – the day-to-day cost of operating the system and maintaining the assets;
- Distribution costs – the costs of the major distributors that convey water to the district off takes;
- Local costs – a share of the Area water service committee costs allocated to the gravity service, plus within-area transfer payments e.g. channel outfall costs;
- Corporate overheads – the cost of head office management and staff, IT systems, offices accommodation and other support costs; and
- Capital related costs – the depreciation charge against fixed assets, the return on assets, and other funding related costs or contributions. The revenue earned from this capital component needs to be sufficient to fund future capital expenditure in the long term.

The total revenue requirement for GMW under each scenario is shown below:



Note: Scenarios 2 and 3 initially follow the same line on the graph.

The graph illustrates that the key trends in the overall revenue requirement are:

1) The revenue requirement under all scenarios increases over time;
2) Scenario 1 is lowest for the first 10 years and scenario 2 is the highest for the first 17-18 years. Scenario 3 shows a significant improvement in the longer term.
3) The revenue requirement spikes in the first 5 years for all scenarios; and
4) There are spikes or humps occurring for all scenarios around 2025, 2040 and 2050.

These trends are analysed further below and the table below provides an indication of the relative size and importance of the key components of the revenue requirement for each scenario by averaging these items over the first 25 years:

Revenue Requirement Item	Average Over First 25 Years (2009-2034)					
	Scenario 1		Scenario 2		Scenario 3	
	$ million	%	$ million	%	$ million	%
Operations and Maintenance[1]	40.9	51	42.5	52	37.0	54
Distribution and Local Delivery[2]	9.2	11	8.5	10	7.8	11
Corporate Overheads	7.7	10	7.7	9	7.7	11
Capital related	22.6	28	23.6	29	16.2	24
Total	**80.4**	**100%**	**82.4**	**100%**	**68.7**	**100%**

1. Operations and Maintenance includes only the seven gravity irrigation areas.

2. Distribution and Local Delivery includes the major carrier channels and offtakes.

The table indicates that:

- The distribution and local delivery and corporate overhead costs contribute the least to the revenue requirement and are not discussed further in this section of the report; and
- The operations and maintenance and capital related costs are the key costs drivers and collectively make up approximately 80% of the revenue requirement.

Analysis of Key Trends

(1) The revenue requirement under all scenarios increases over time:

This is due to the age and condition of the underlying irrigation assets. In general, the assets are in good condition but they are not new and will increasingly need to be replaced. The key differences between the scenarios with respect to the age and condition of the assets is:

- Timing - when the assets are replaced; and
- Funding - who pays for the replacement.

Each of these items is addressed below.

Timing

In the first scenario, there is little modernisation and the renewal of assets will occur gradually over time as the assets reach the end of their useful lives. This graduated replacement program combined with increasing replacement costs for the assets causes the costs to steadily increase over time. Key capital cost increases occur in metering and channels. In the case of meters, the new national standard requires that more sophisticated (and consequently more expensive) meters are used to provide more accurate metering results. For channels, the cost of renewal is significant for the non-backbone as there are more channels in this part of the network and they are generally not in as good a condition as the backbone. The poorer condition of the non-backbone channel condition is due to a number of factors specific to each Area, such as the age of the channels, the last time major renewals and repairs were undertaken, soil conditions and also due to the recent tendency to focus maintenance efforts more on the backbone channels.

Under scenarios 2 and 3, costs are higher in the earlier stages due primarily to an acceleration of the maintenance costs due to modernisation. The majority of existing meters and regulating gates are replaced very quickly under these scenarios and they are highly specialised and significantly more technologically complex. This leads to much higher overall ongoing maintenance costs as replacement parts are more expensive.

Funding

In the first scenario the capital costs are fully funded by GMW and this contributes significantly to the increasing revenue requirement as discussed above (particularly for meters).

In scenarios 2 and 3 the cost of modernisation is largely funded by NVIRP (except for GMW's contribution). The meters and regulating gates are replaced very quickly under these scenarios which dampens the longer term capital requirements under these scenarios compared with scenario 1. But as noted above, this also brings forward the increased maintenance costs.

There is also an increase in the revenue requirement for scenarios 2 and 3 in the first 15 year period due to GMW's $100 million funding contribution to the NVIRP project. This funding must be recovered by GMW through an increase in its revenue and this is assumed to occur over a 15 year period.

(2) Scenario 1 is lowest for the first 10 years and scenario 2 is the highest for the first 17-18 years. Scenario 3 shows a significant improvement in the longer term

Scenario 1 is more cost effective in the first 10 years for the same timing related reasons as outlined above. Essentially, the capital costs are higher in scenario 1 but these are more than offset by the NVIRP funding related costs in scenarios 2 and 3; and the maintenance costs associated with the new meters and gates are much higher in scenarios 2 and 3 compared with the cost of maintaining the older, more simplistic assets in scenario 1.

In the longer term, this trend reverses and scenario 1 is less cost effective. This is due to the amount of rationalisation that is assumed to occur under scenarios 2 and 3.

A key cost driver is the amount of irrigation network that GMW owns, maintains and operates. Under scenario 1 there is assumed to be very little rationalisation of the system. In the long term, this means that the timing and funding impacts for capital expenditure (as discussed above) will apply to the same underlying asset base and therefore lead to increased costs.

Under scenario 2, the size of the non-backbone network is reduced and under scenario 3 it is rationalised completely (other than the continued non-backbone in Shepparton). This leads to a substantial reduction in the asset base and therefore significant reductions in the operations, maintenance and capital costs over time compared with what they would be if the entire network were to be retained.

(3) The revenue requirement spikes in the first 5 years for all scenarios:

The revenue requirement spikes in the first 5 years due to the impact of AMP. During this period there is assumed to be a significant investment made in extending the lives of key assets on the backbone through targeted maintenance and this applies in all scenarios. The average spend over the first 5 years is approximately $18 million per annum compared with an average spend of approximately $5 million per annum over the following 20 year period.

There is assumed to be no AMP on the non-backbone under all scenarios (except for the small proportion of assets that have previously had AMP treatment and are assumed to have continuation of the AMP program).

(4) There are spikes or humps occurring for all scenarios around 2025, 2040 and 2050.

The key reason that there are spikes occurring at these times for all scenarios is the timing of the replacement or renewal of key components of major asset items. The key items include the replacement of mechanical and electrical components in meters and gates, and latterly, the replacement of plastic lining in channels which is assumed to have a life of 30 years. The spikes tend to coincide more distinctly under scenario 2 and 3 as most of the new assets are planned to be installed about the same time.

1.5.1.2 Key Cash Costs

As noted above, the key revenue requirement drivers are the O&M costs and the capital costs. These items also represent the key cash costs of the business. The annual operations and maintenance cash costs are the same as those in the annual revenue requirement. However, there are timing differences in relation to the capital costs on a cash and revenue requirement basis. The upfront cash cost of capital expenditure is effectively spread over the life of an asset by including it in the revenue requirement annually as a depreciation charge and adding a return on the asset to cover funding costs.

The table below provides an indication of the relative size and importance of the key cash costs for each scenario by averaging these items over the first 25 years:

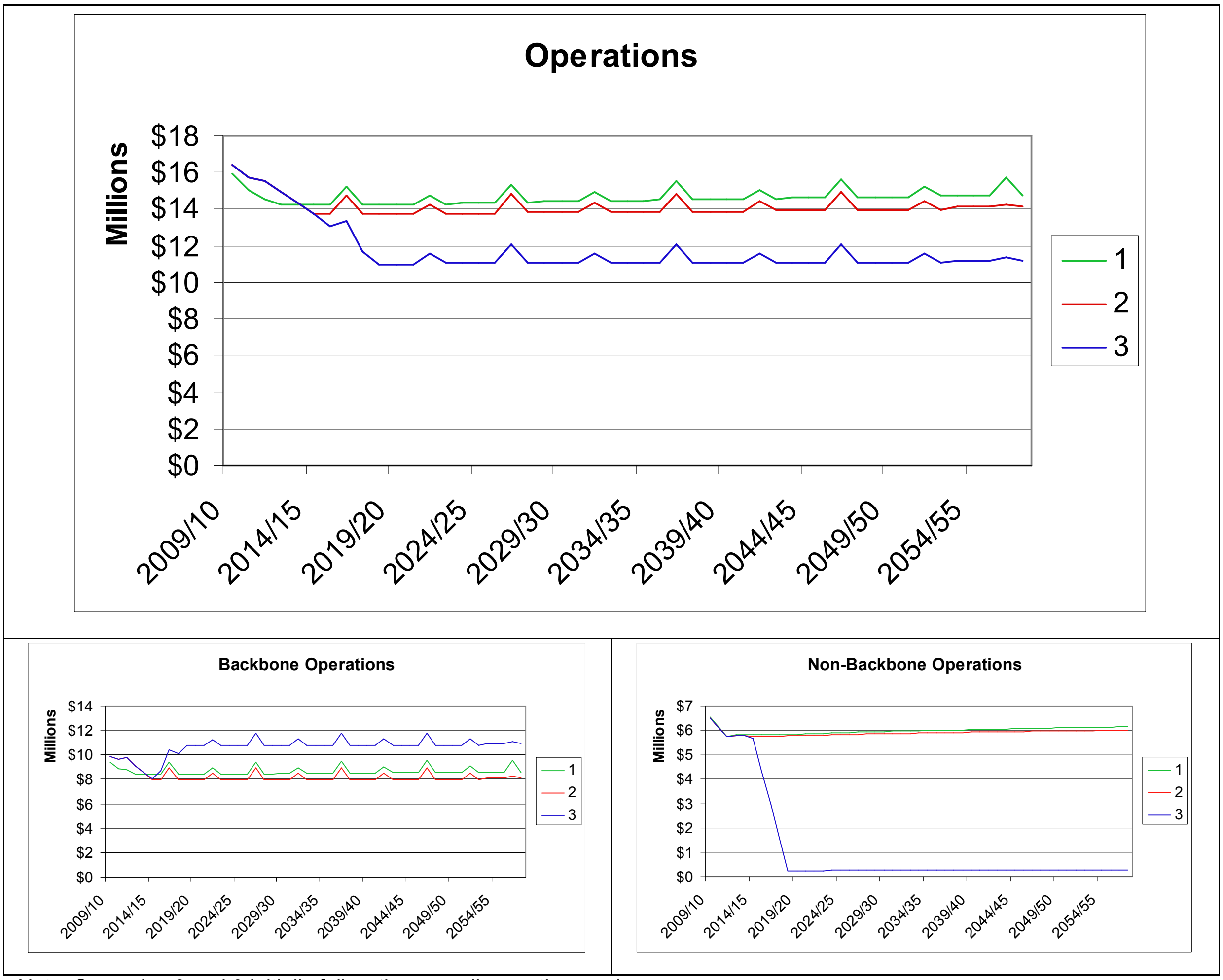
Key Cash Costs	**25 Year Average Cash Cost 2009-2034**					
	Scenario 1		**Scenario 2**		**Scenario 3**	
	$ million	**%**	**$ million**	**%**	**$ million**	**%**
Operations	14.5	19	14.2	21	12.3	25
Maintenance:						
▪ Channel	9.2	12	7.5	11	4.2	8
▪ Meter	4.1	5	7.4	11	8.2	16
▪ Structures	3.3	4	2.8	4	2.1	4
▪ Regulating gates	1.5	2	3.2	5	3.0	6
▪ Radio equipment	0.6	1	0.8	1	0.8	2
▪ Other	2.6	3	2.5	4	2.2	4
▪ AMP	7.7	10	6.8	10	6.7	13
▪ Rationalisation	0.2	0	0.2	0	0.2	0
Total Maint	29.1	38	31.2	45	27.5	55
Total O&M	43.6	58	45.4	66	39.8	79
Capital	31.6	42	23.2	34	10.4	21
Total O&M & Capital	75.2	100	68.6	100	50.2	100

The total O&M cash costs above include O&M on the main distribution channels which are included in distribution and local delivery costs for the purposes of determining the revenue requirement. This results in the total O&M presented above being slightly higher than that presented in the revenue requirement table.

The key cash cost components are the operational costs, the maintenance costs, AMP costs and capital expenditure. Each of these items is analysed in more detail below.

(a) Operations

The graphs below show the operations costs over time in total and also split between the backbone and the non-backbone:



Note: Scenarios 2 and 3 initially follow the same line on the graph.

There are two key costs drivers for Operations: Staffing and Licence Fees.

Staffing:

There are two groups of operations staff:

1. Planners – who primarily plan and schedule customer orders for water. The majority of their work under scenario 1 is manually receiving orders from customers, developing schedules, making changes to orders as requested and instructing field operators as to scheduling. Under scenario 2 automation significantly reduces the amount of manual ordering and scheduling as the backbone will be fully automated (but it is still required on the non-backbone). This saving is partially offset by increased time monitoring the system for alarms

and other things. Under scenario 3 there is very little manual ordering and scheduling as there is no non-backbone (the only planning required is at peak times).

2. Field Operators – work in the field and drive around the network operating the system. Their primary role under scenario 1 is to manually regulate the flows on the channels based on the schedules (i.e. lift and lower drop bars). They work approximately 50/50 on the backbone and non-backbone under this scenario. Another key role under this scenario is monitoring the outlets (i.e. making sure they are not obstructed and are working properly) and reading meters which occurs 3 times per annum. Under scenario 2 automation of the backbone means that it does not require staff to regulate the flows, monitor outlets or read meters (but it is still required on the non-backbone). Under scenario 3, there is no channel regulation on the non-backbone and a substantially reduced requirement to monitor outlets. Similarly, there is significantly reduced meter reading required, however field staff are still required with respect to local read meters.

In summary, each scenario progressively reduces the number of planners and field operators required to operate the system. Under scenario 1 there are 232 operations staff in 2010/11 and under scenario 2 this is assumed to reduce to 217 staff by 2013/14 at the completion of Stage1 and it reduces further to 194 staff by 2017/18 under scenario 3.

Licence Fees:

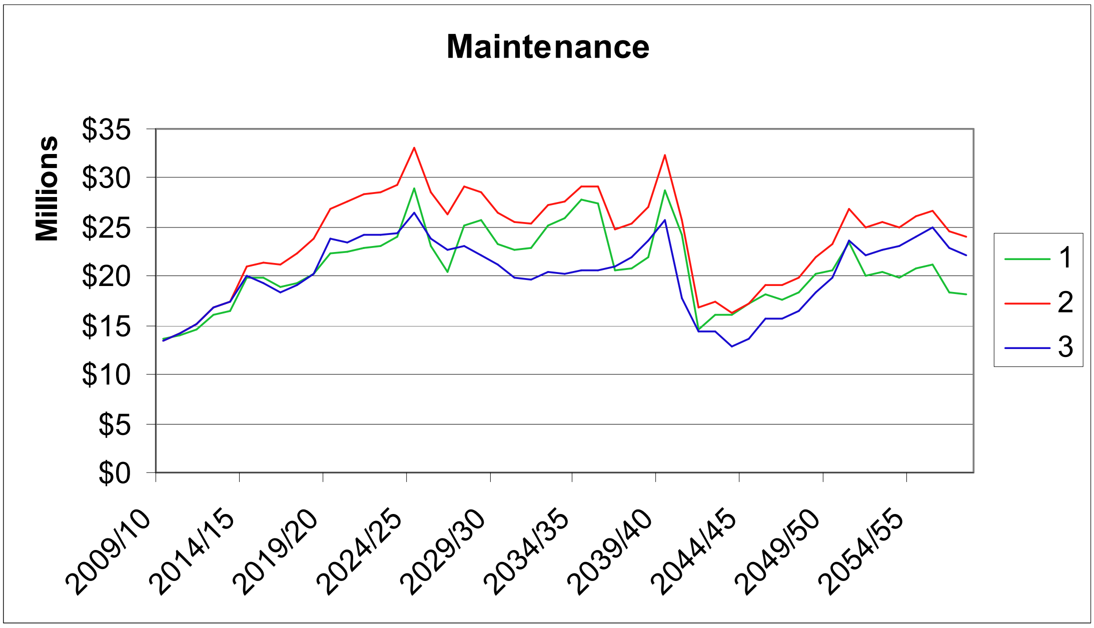
Licence fees are payable on all modernised gates and meters. There are only a few modernised gates and meters under scenario 1 (CG1234 and Shepparton), and slightly more under scenario 3 than 2. Licence fees are charged by the key supplier, Rubicon, at agreed rates per site, per gate and per meter for the life of the assets.

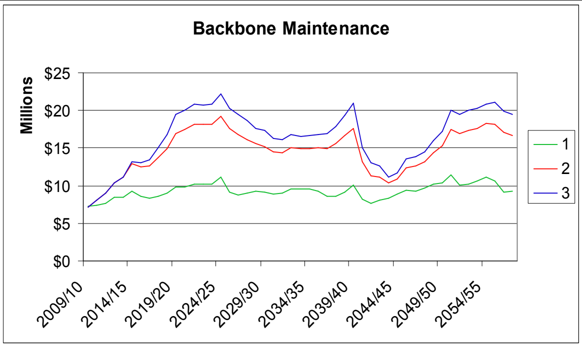
The licence fees are substantial and outweigh the cost savings achieved through the reduction in operational staff numbers. Consequently, the overall net effect is a cost increase.

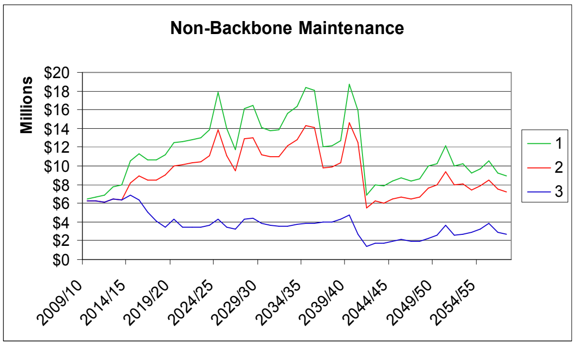
The non-backbone costs continue for scenario 3 beyond completion of Stage 2 due to Shepparton modernisation project providing automation of meter outlets and structures beyond the 20 ML/day backbone definition. This impact also applies to other cost items discussed below.

(b) Maintenance

The graphs below show the maintenance costs over time in total and also split between the backbone and the non-backbone:







Note: Scenarios 2 and 3 initially follow the same line on the graph.

Maintenance costs for the backbone are lowest under scenario 1 and highest under scenario 3. This effect is reversed for the non backbone, where maintenance costs are highest under scenario 1 and lowest under scenario 3.

Backbone:

Under scenario 2 and 3 new meters are installed on the backbone in the first 5-10 years compared with a 'grandfathered' replacement of meters under scenario 1 (which means that the a new meter that meets the proposed metering standards for accuracy will only be installed when the older meter/outlet reaches the end of its useful life). Scenario 3 has a higher maintenance cost than scenario 2 because there are more meters on the backbone due to increased rationalisation and reconfiguration of the non-backbone under scenario 3 (i.e. meters are transferred from the non-backbone to the backbone).

The trend of meter maintenance described above is partially offset by channel maintenance trends. Channel maintenance costs on the backbone are lower under scenario 2 and 3 due to reduced channel length as parts of the backbone are lined with HDPE under these scenarios.

Non-backbone:

On the non-backbone, there are a large number of meters under scenario 1 to be maintained. Under scenarios 2 and 3 these meter numbers are reduced significantly through rationalisation and reconfiguration.

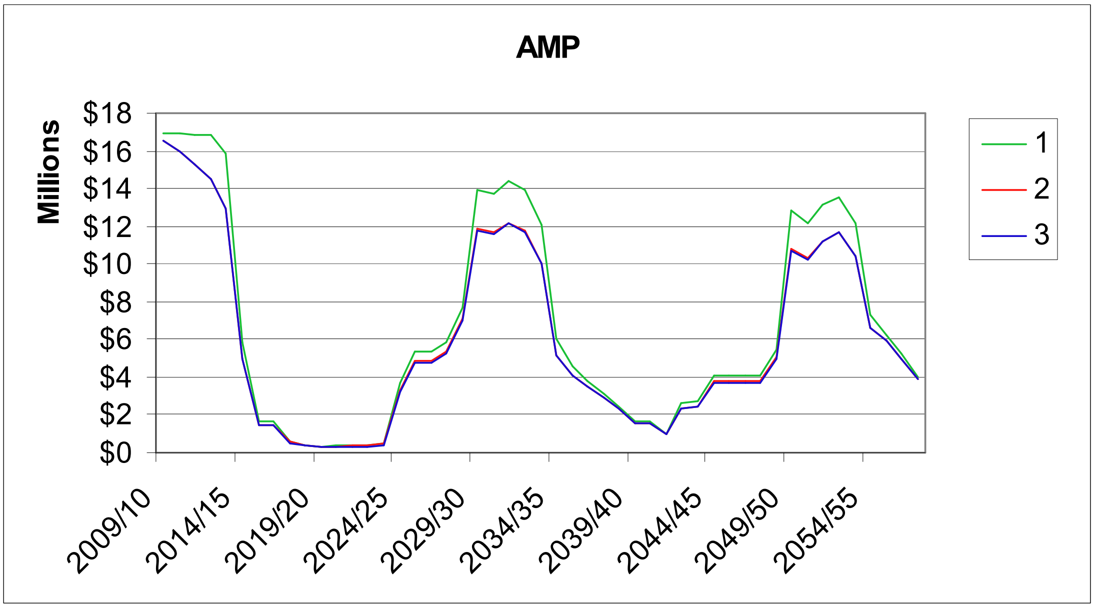
Similarly, 28% of all structures (excluding Shepparton) are assumed to be rationalised when the delivery shares are transferred to the backbone under scenario 2 and all structures (excluding Shepparton) are rationalised under scenario 3.

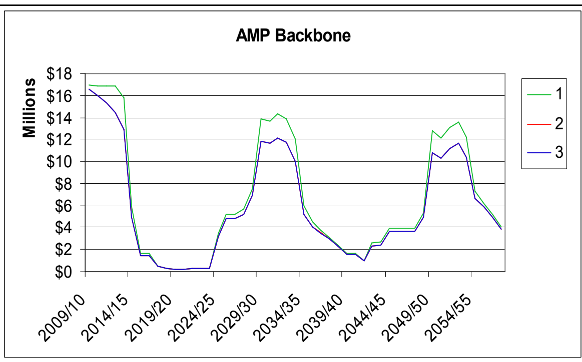
The trend of meter and structure maintenance described above is partially offset by channel maintenance trends. The channel maintenance cost on the non-backbone is lower under scenarios 2 and 3 in line with a reduction in the length of channel maintained due to assumed rationalisation

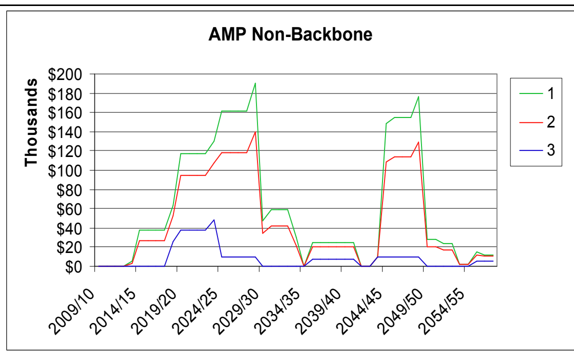
The non-backbone costs continue for scenario 3 beyond completion of Stage 2 due to Shepparton continuing to have a non-backbone.

(c) AMP

The graph below shows the AMP costs over time on the backbone:







Note: Scenarios 2 and 3 initially follow the same line on the non-backbone graph and follow the same line over the entire period on the backbone graph.

It is assumed that there is AMP only on the backbone, not on non-backbone (except for the small proportion of assets that have previously had AMP treatment and are assumed to have continuation of the AMP program). Conducting AMP on the non-backbone is not considered attractive given the significant upfront costs and the uncertainty of achieving the benefits in the longer term.

AMP treatments on the backbone include channel bank beaching (which is placing rocks on the inside of the channel banks in the zone where water fluctuates) and structure refurbishment. Under AMP, once performed, beaching is assumed to both increase the life of the bank and reduce bank maintenance costs by 75% until the end of the life of the bank. Structure refurbishment increases the life of the structure.

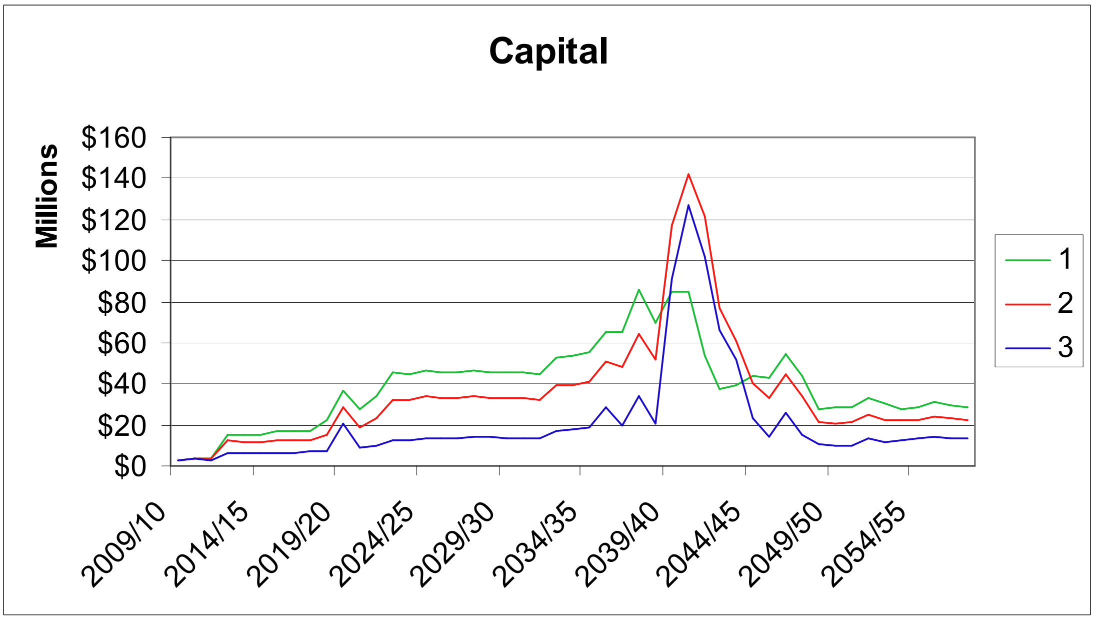
It is assumed that 50% of the structures on the backbone will be refurbished and beached under the AMP program and the remaining ones will be subject to routine maintenance and beaching.

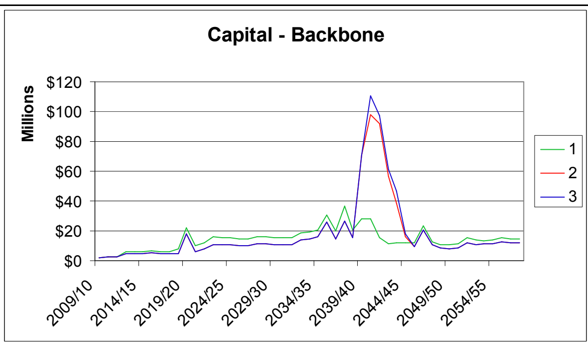
The timing of the expenditure is based on the life cycle of the assets and as the treatments are only on the backbone there is assumed to no difference between scenarios. There is a difference between 1 and 2/3 because there is slightly reduced length and rationalised asset numbers even on the backbone under 2/3.

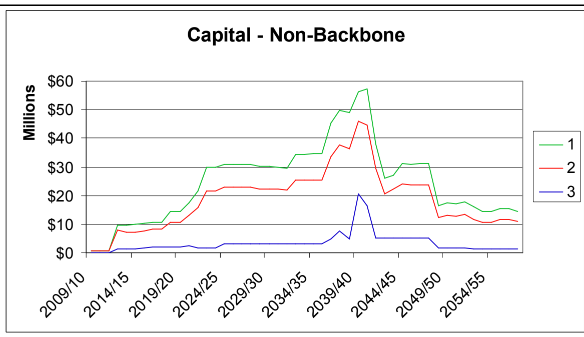
The non-backbone costs continue for scenario 3 beyond completion of Stage 2 due to Shepparton continuing to have a non-backbone.

(d) Capital Expenditure

The graphs below show the total capital expenditure over time in total and also split between the backbone and the non-backbone:







Note: Scenarios 2 and 3 initially follow the same line on the graph.

Capital expenditure increases over time under all scenarios and this impact has been discussed as part of the analysis of the revenue requirement above.

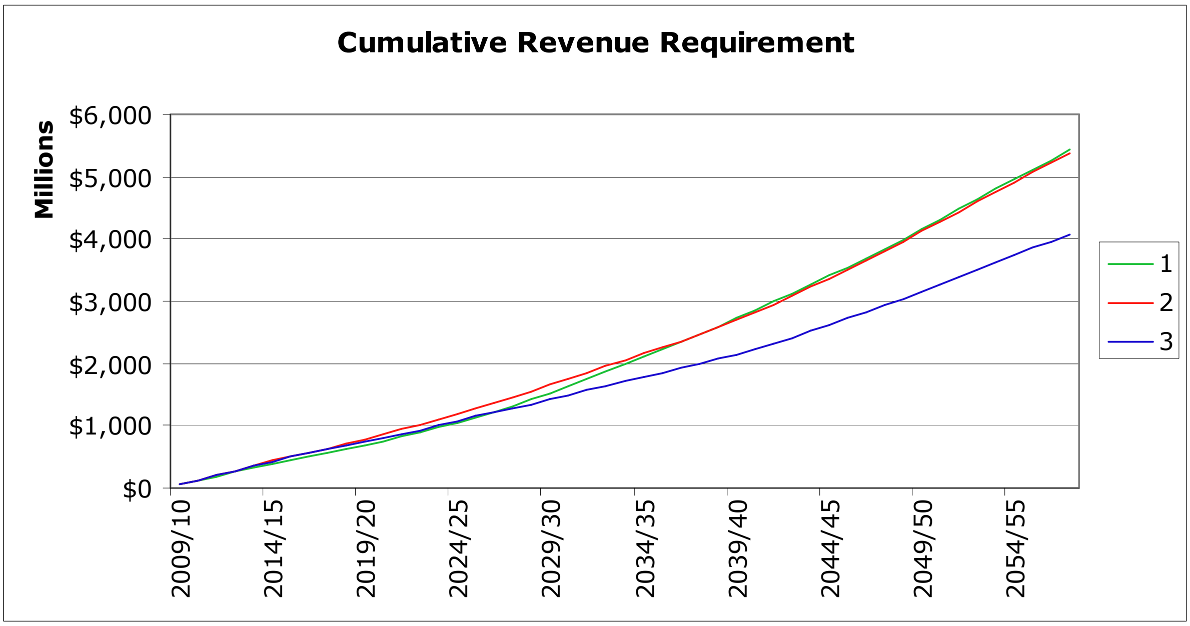
Overall, scenario 1 generally has higher capital expenditure and this is due to a combination of two key factors:

- GMW has to fund the replacement of all meters (albeit slowly over time as the old meters reach the end of their useful lives). This impact is more pronounced in the backbone in the medium term;
- There are significantly greater capital requirements in the non-backbone as there are more assets to manage under scenario 1 compared with scenario 2 and 3. The most significant expenditure item is the ongoing renewal of channels, followed by the replacement of meters. There is a residual ongoing capital expenditure requirement for scenario 3 on the non backbone due to Shepparton continuing to have a non-backbone.

Scenario 2 and 3 have a higher spike in capital costs in the backbone in the period around 2040-2045 and this is due to the far greater number of meters that require major component replacement. Because all of the meters are initially replaced in a short period of time during 2009-2014, the replacements all come at around the same time. Whereas under scenario 1, the meter replacements are spread more due to the gradual roll out of the initial new metering program.

1.5.1.3 Cumulative Revenue Requirement and Cash Flow

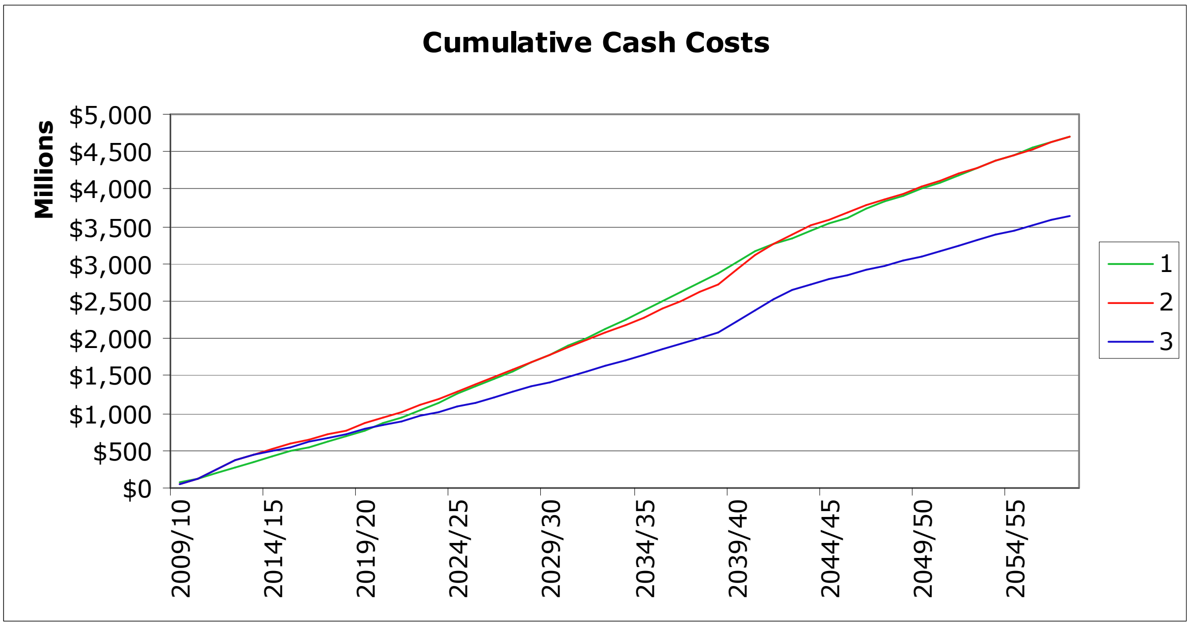
The cumulative revenue requirement and cumulative cash flow for GMW under each scenario is shown below:



Note: Scenarios 2 and 3 initially follow the same line on the graph.

Scenario 1 has the lowest cumulative revenue requirement until around 2023 after which Scenario 3 is lowest. Scenario 2 has the highest cumulative revenue requirement until around 2037 beyond which it and Scenario 1 are similar. Overall, Scenario 3 has a significantly lower cumulative revenue requirement than both Scenarios 1 and 2.

This indicates that in the short term prices would be lower under Scenario 1, but in the longer term customers will have lower prices with Scenario 3.



Note: Scenarios 2 and 3 initially follow the same line on the graph.

Scenario 1 has the lowest cumulative cash cost until around 2020 after which Scenario 3 is lowest. Scenario 2 has the highest cumulative cash cost until around 2037 beyond which it and Scenario 1 are similar. Overall, Scenario 3 has a significantly lower cumulative cash cost than both Scenarios 1 and 2.

1.5.1.4 NPV of Gross Cash Outflow

The table below summarises the NPV of the cash outflows for each scenario using the assumed WACC of 5.8% to discount the cashflows over a period of 50 years.

Scenario	NPV $ Million
1: No further modernisation	(1,418)
2: NVIRP Stage 1	(1,434)
3: NVIRP Stage 2	(1,159)

This indicates that over the whole of the life of business, scenario 3 provides the relatively least cost solution, followed by scenario 1 and then scenario 2. The key reason that scenario 2 is less attractive than scenario 1 is that there are greater cash outflows in the short term primarily due to the effect of the funding contribution to NVIRP and the acceleration of the maintenance costs due to modernisation of meters and gates.

1.5.2 Financial Implications by Area

Area	25 Year Average Revenue Requirement 2009-2034					
	Scenario 1		Scenario 2		Scenario 3	
	$ million	%	$ million	%	$ million	%
Rochester	9.8	12	9.5	12	6.9	10
Campaspe	1.5	2	1.6	2	1.6	2
Central Goulburn	20.7	26	21.3	26	17.6	26
Shepparton	11.8	15	12.5	14	12.5	17
Pyramid-Boort	8.8	11	9.8	12	8.7	13
Murray Valley	12.1	15	12.0	15	9.2	13
Torrumbarry	15.6	19	15.7	19	12.2	18
Total	**80.4**	**100**	**82.4**	**100**	**68.7**	**100**

Central Goulburn is the most significant Area under all scenarios with about a quarter of the total revenue requirement. Murray Valley and Torrumbarry also have a large share of the revenue requirement and they tend to decline under scenario 3 primarily due to the rationalisation of the non-backbone.

Shepparton's share of the revenue requirement grows significantly relative to the other Areas progressing from scenario 1 through to 3. This is because Shepparton's revenue requirement remains relatively stable in absolute dollar terms due to the fact that it has already been largely modernised (so modernisation has already been incorporated into scenario 1) and continues to have a non-backbone in scenario 2 and 3.

Pyramid-Boort increases from scenario 1 to 2 due to the long remaining life expectancy of the existing assets in the Area. Under scenario 2, modernisation is adding new assets to the backbone that are generally of shorter life expectancy than the existing civil asset. This shorter life increases the revenue requirement as replacement of the new assets falls due before the existing assets. A number of factors contribute to the uniquely longer life expectancy of the assets in the Area, such as the less intense farming practices (sheep/cattle grazing), heavy clay soils and the fact that a higher standard of concreting was originally used.

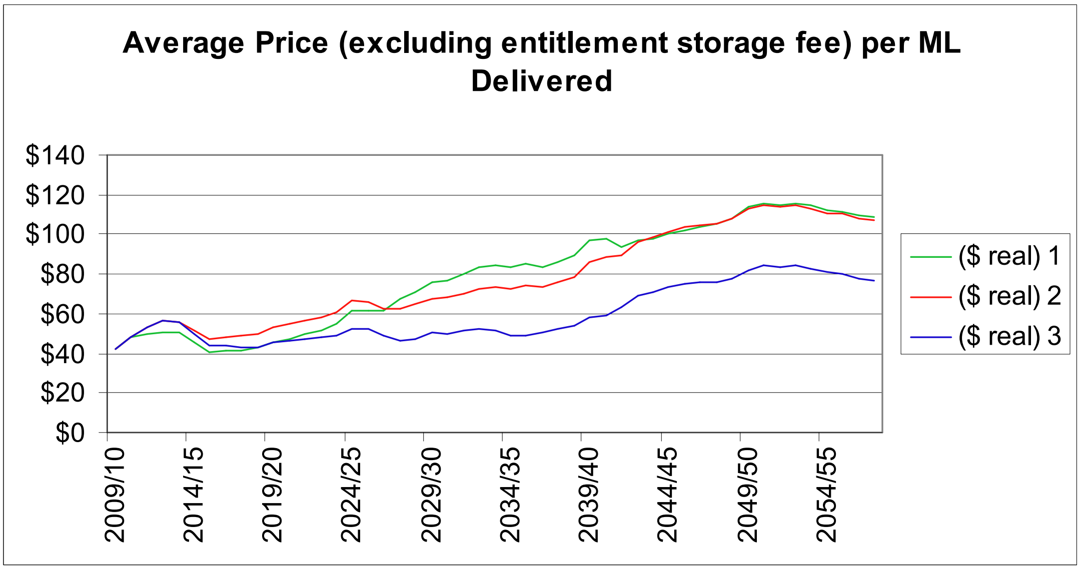
1.5.3 Pricing Implications

The pricing implications of the scenarios has been analysed based on the following key assumptions:

- GMW's existing gravity irrigation tariff structure will be adopted for all scenarios, which leads to about 80% of gravity irrigation revenue being recovered through a fixed charge (the Infrastructure Access Fee);
- Losses for Scenario 1 for each gravity irrigation service are based on information provided by the Department of Sustainability and Environment (DSE). These losses have been adjusted for Scenarios 2 and 3 based on information provided to GMW by NVIRP. The loss volume in each scenario has been multiplied by the bulk water cost (assumed to be constant through time) to calculate the loss entitlement expense; and

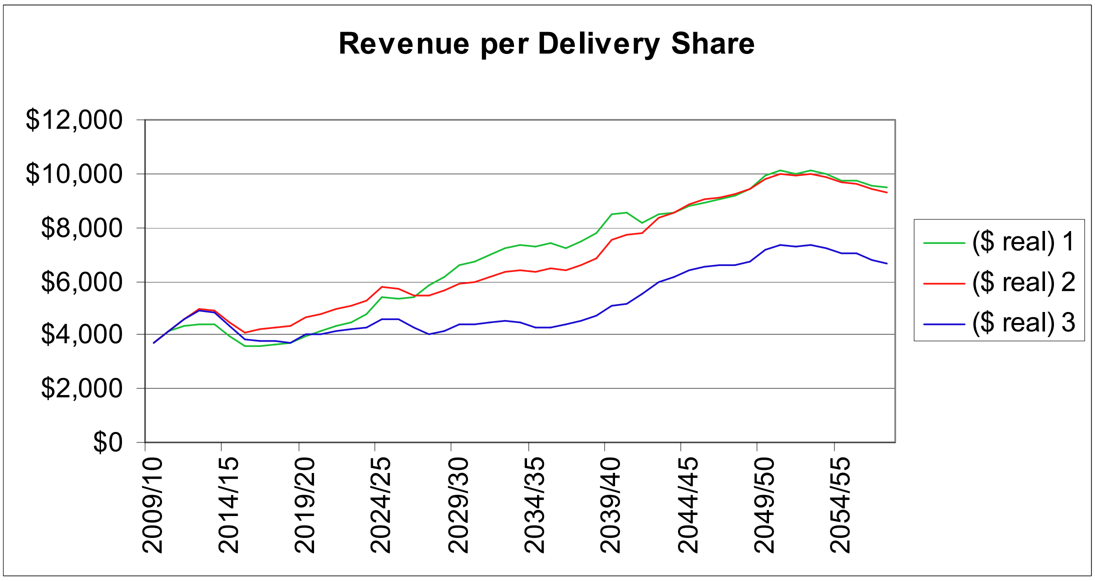
- Local costs are assumed to be the same in all three scenarios.

The graph below shows the average delivery price of water per ML over time (which excludes the costs associated with bulk storage). The trend mirrors the revenue requirement trend and indicates that prices will double in real terms in around 30 years under scenario 1 and 2, but will only increase by about 30% over the same period under scenario 3.



Note: Scenarios 2 and 3 initially follow the same line on the graph.

The graph below shows the real revenue earned per delivery share and also reflects the same trends seen above.



Note: Scenarios 2 and 3 initially follow the same line on the graph.

1.5.4 Customer Service Levels

Automation of channel systems results in more consistent supply levels and improves delivery rate consistency over the whole system and allows the shortening of notice required for orders.

Modernised operating systems can also capture the supply level and flow rate at a customers delivery point when a minimum of a remote read outlet is installed and this allows the actual measurement of all main in field service delivery parameters. New standards and performance index's can be adopted to measure and report individual service levels.

Therefore, it is anticipated that there will be improvements to customer service levels under scenarios 2 and 3.

1.6 Conclusion

GMW concludes that:

- The revenue requirement under all scenarios increases over time due to the ageing nature of the irrigation assets within the system which will need replacement, to varying degrees, under all scenarios;
- Scenario 2 (NVIRP Stage 1) is the least cost effective option over the first 17-18 years of the analysis but is more cost effective than Scenario 1 beyond that period;
- Scenario 3 is also less cost effective than Scenario 1 in the first 10 years or so, but beyond that it is significantly more cost effective and represents the least cost option in the long term. This is also demonstrated by it having the lowest cash cost NPV over the analysis period;
- The results vary somewhat, but not overly significantly, by Area due to the differing current age of the assets, the modernisation work already undertaken to date and also the extent of the works planned to be undertaken in each Area under scenario 2 and 3;
- There are pervasive impacts on GMW's business operations as a result of increasing modernisation. These include significant changes in the key systems and processes in the Operations group and large reductions in the number of associated staff and changes to the types of skills required for those staff that remain;
- It is anticipated that there will be improvements to customer service levels under scenarios 2 and 3;
- It is recognised that there are benefits (such as improved water savings) and social implications (such as those associated with rationalisation) arising from scenarios 2 and 3 which are not considered in this analysis; and

In summary, in order to maintain costs at a relatively stable level, rationalisation of assets is paramount. While NVIRP Stage 1 provides some benefit to GMW's customers (through water savings and improved customer service levels), the key financial benefits are not seen until the completion of Stage 2 where GMW's distribution network is planned to be reduced significantly to 40% of its current size.