Our Ref: lw090916 Submission Ltr

Mr Michael Keating
Chairman
Independent Pricing and Regulatory Tribunal
PO Box Q290
QVB Post Office NSW 1230

16 September 2009

Dear Mr Keating

I am pleased to provide to you State Water's submission to IPART's 2010 review of bulk water prices. You will be aware that State Water also emailed the submission to IPART on 11 September.

I have attached two copies of State Water's submission, one of which includes commercial in confidence references to our recent credit rating reviews. Due to the agreement between Treasury and the ratings agencies, these ratings cannot be released publicly. Accordingly, these sections have been blacked out in the version of State Water's submission which is intended to be made publicly available. The two submissions are otherwise identical.

As requested by IPART, State Water engaged Walter Turnbull to complete an external quality check of the submission, the Special Information Return and other supporting documents. I am satisfied that the information used in State Water's submission is complete and accurate.

I look forward to working with IPART during the Determination process.

Yours sincerely

George Warne
Chief Executive Officer

STATE WATER CORPORATION

SUBMISSION TO IPART

2010 PRICING DETERMINATION

TABLE OF CONTENTS

PART B – CUSTOMER PRICING OUTCOMES

PART C – APPENDICES

EXECUTIVE SUMMARY

State Water has experienced significant challenges during the current regulatory period. A severe drought has gripped the Murray Darling Basin (MDB), where 90% of State Water's operations are located. The large southern Murray, Murrumbidgee and Lachlan valleys are enduring historically new levels of drought reduced water availability, whilst water availability in the northern valleys has also been affected. Across the state, water deliveries have been less than 30% of historical average levels. For State Water, this has presented extremely challenging operating conditions and created large unforeseen shortfalls in operating revenues.

As a result of the drought and climate change impacts, there has been growing acceptance from all levels of Government that water availability in the MDB has shifted significantly below historical levels. The crisis in the MDB has prompted an unprecedented intervention by the Federal Government in water management, culminating in the *Water Act 2007*. This will result in numerous changes to water management in NSW, including the establishment of a Basin Plan to provide for integrated water management in the MDB, as well as the creation of the Commonwealth Environmental Water Holder as a large player in the permanent water market. The Act also established new roles for the Australian Consumer and Competition Commission in regulating water markets and water charging, meaning that this will be IPART's last Determination of State Water's charges.

Despite these challenges, State Water has continued to provide a high level of service delivery to customers, as evidenced by recent audits of State Water's compliance with its Operating Licence. State Water has achieved a 20.4% reduction in operating expenditure since 2006/07 and it has emerged as an even more streamlined, efficient and effective business than it was at the time of the 2006 Determination. Improved asset management practices will result in State Water meeting capital expenditure targets.

Due to reduced water availability and the current ratio of fixed to variable prices, State Water has not achieved a commercial rate of return to its shareholders. Indeed, in some years, State Water's returns have been negative due to drought reduced usage revenues. The failure of the current tariff design to achieve full cost recovery is threatening State Water's financial viability and failing to provide a reasonable return to shareholders. State Water believes IPART needs to address this issue in the 2010 Determination.

Key Parameters

The key parameters underpinning this submission are summarised below.

- A focus on financial viability, accommodating customer tariff design preferences where possible.
- An increase of 9% in operating expenditure over the regulatory period, including a 6% reduction in baseline expenditure for efficiency improvements.
- Total capital expenditure over the new four year regulatory period of $342 million, driven largely by the dam safety upgrade program and associated environmental obligations.
- Unchanged government/user cost shares from the 2006 Determination, but requesting that IPART review these cost shares in light of the increasing share of State Water costs being borne by the Government.
- Total customer contributions of $231.7 million over the four year regulatory period, excluding Murray Darling Basin Authority and Border Rivers Commission costs.

- Total government contributions of $166.8 million over the four year regulatory period, excluding Murray Darling Basin Authority and Border Rivers Commission costs.
- More realistic consumption forecasts, involving an average reduction of 19.9%.
- A tariff design based on a ratio of fixed to variable revenues of 40/60, which is unchanged from the 2006 Determination, and continues to be strongly influenced by customer preference as revealed through extensive consultation State Water conducted with customers and stakeholders.
- A Weighted Average Cost of Capital (WACC) of 7.9%, compared to 6.5% in the recent metropolitan water business Determinations.
- An alternative tariff design of 90/10 fixed to variable revenues required to retain a 6.5% WACC, noting that this tariff structure is not supported by customers.
- A High Security premium which better reflects the level of security of supply enjoyed by High Security licence holders and results in a greater proportion of fixed costs being borne by High Security users relative to General Security users.
- Prices based on full recovery of upper and lower bound costs in each year, as required under the NSW commitments to the National Water Initiative, but acknowledging that IPART may choose a smoothed price path to minimise price shocks.
- A metering service charge for new meters levied on Works Approvals to cover ongoing maintenance costs, with the initial charge based on marginal costs only (assuming the capital costs of the installation are funded under the Commonwealth's priority projects program).
- A four year regulatory period – 2010/11 to 2013/14.

Outcomes of the 2006 Determination

Over the four year period of the current Determination (2006/07 to 2009/10), State Water expects to under recover user share revenues by $83.2 million ($2009/10). $27.1 million of this shortfall was due to prices being set by IPART at less than full cost recovery. In line with the Commercial Policy Framework, the NSW Government paid State Water an Operating Subsidy to meet the shortfall. The size of the Operating Subsidy reduced over the regulatory period, as prices increased to full cost recovery levels in all valleys except the Peel, North Coast and South Coast.

The remaining $56 million comprised forgone usage based revenues due to the drought. The tariff design in the current Determination was mandated by State Water's previous Operating Licence which required 60% of State Water's costs to be recovered from variable charges. The water deliveries over the regulatory period were only 28.7% of the level estimated by IPART, leading the significant under recovery of revenues and downgrades of State Water's credit rating in both 2008 and 2009.

Despite the drought, State Water achieved a 20% reduction in regulated operating expenditure, and expects to meet the IPART determined efficient level of expenditure of $36.1 million in 2009/10. This reduction was achieved through a fundamental reorganisation of the business along functional rather than geographical lines.

State Water will also slightly exceed its total capital expenditure target of $117.3 million ($2009/10), by $4.7 million, which is a substantial improvement on previous regulatory period during which State Water significantly under spent on regulatory capital expenditure.

Projected Expenditure in the 2006 Determination

State Water is forecasting regulated operating expenditure to increase by 8.7% by the end of the new regulatory period. This level of expenditure will allow State Water to maintain its current level of service provision to customers, and meet new and existing regulatory obligations. It also includes a total of $0.6 million endorsed by the relevant Customer Service Committees to provide enhanced services including small water efficiency projects and the maintenance of new gauging stations.

This increased expenditure is partly offset by a 6% efficiency target, to be phased in at 2% per year commencing in 2011/12. During the remainder of 2009/10 and 2010/11, State Water will finalise implementation of the new organisational structure and fully implement the new systems required to maintain services with a reduced number of employees. This includes the new internet based water ordering system and remote operation of assets. Once these have been completed, State Water will achieve the additional efficiency reductions through a realignment of the senior management structure and the introduction of new technologies to support water delivery.

State Water's capital expenditure is projected to be $342 million over the regulatory period, primarily spent in rural NSW. This substantial increase in expenditure is driven by the construction phase of State Water's dam safety upgrade program and associated fish passage and cold water pollution works. Although this expenditure is ultimately funded by users and Government via a rate of return over the lives of the new assets, State Water will initially debt fund the expenditure upfront, leading to an increase in gearing levels to 45.8% by the end of the regulatory period. The capital expenditure also includes $6 million for drought proofing the Fish River Water Supply Scheme, fully funded by users who have endorsed the additional expenditure.

Consumption Forecasting

Consumption forecasts are used to calculate usage based charges. In the 2006 Determination, IPART's consumption forecasts were developed using the Long Run Average (LRA) Approach, based on output from the Integrated Quantity and Quality Model (IQQM) of the then Department of Water and Energy. This models water availability and extractions that would have occurred based on the current Water Sharing Plan rules and agricultural development.

Statistical analysis suggests that the current low extractions reflect a structural break in patterns of water availability rather than normal climatic variability. Consequently, historical water availability is unlikely to accurately represent future extractions. State Water proposes that IPART adopt a rolling 15 year average based on actual extractions as the basis for consumption forecasting in the new Determination. On average, this results in a 19.9% reduction in expected consumption, with a corresponding increase in usage based charges. Despite this reduction, State Water still expects high annual volatility in the availability of water between years to continue due to normal climatic variability.

Ongoing Financial Viability

Under the NSW Treasury Commercial Policy Framework, State Water is required to maintain an investment grade credit rating. The under recovery of user share revenues in the current regulatory period, plus increasing debt levels to fund the dam safety upgrade program, means that State Water is unlikely to retain its investment grade rating unless the revenue volatility risks are addressed in the next regulatory period.

It is in the interests of both the Government and customers for State Water to be financially viable, so that it can maintain service delivery and pay a return to its Government shareholders. State Water contends that the parameters on which the current Determination is based are not sufficient for State Water's ongoing financial viability.

Addressing Revenue Volatility

As outlined above, the current ratio of fixed to variable prices has contributed to a significant deterioration in State Water's financial position. State Water's Operating Licence no longer requires it to retain the 40/60 fixed to variable ratio. Increasing the proportion of fixed charges would reduce the volatility of State Water's revenues and immediately improve financial viability. However, State Water is aware from extensive consultation that customers value the usage based charge as a natural hedge during drought, as is currently being experienced. Therefore, State Water has endeavoured to develop a tariff design which both achieves financial viability but also retains the 60% usage charge.

State Water proposes that IPART should compensate State Water for the risk of revenue volatility through an increased Weighted Average Cost of Capital (WACC). State Water contends that the 6.5% real pre-tax WACC provided in IPART's 2006 Determination does not adequately compensate for the underlying revenue volatility risks faced by State Water. The current WACC was based on low business risk assumptions normally associated with metropolitan water businesses with stable and predictable regulated cash flows.

However as clearly evidenced over the current regulatory period, State Water's regulated water sales and cash flows are subject to significantly greater volatility than the metropolitan water businesses. This volatility exists even in periods that are not drought affected. Therefore, State Water is seeking a 1.4% increase in the WACC, based on WACC parameters which assume a lower level of gearing than those included in the current WACC of 6.5%. This higher WACC is required to improve State Water's financial viability, and consequently, enable State Water to retain its investment grade rating.

Government and User Cost Shares

In the 2006 Determination, IPART endorsed an 'impactor pays' approach to sharing costs between users and government. Broadly speaking, IPART allocated 100% of regular operations and maintenance costs to users, whilst the costs incurred to meet community standards or regulatory standards are shared between users and Government. IPART also applied the 'legacy principle', highlighting that legacy dam safety costs for standards in place prior to the 1997 'line in the sand', should be apportioned fully to government. The current cost share are summarised in Table 1.

Table 1: User Cost Shares

Activity Name	User Share
Customer Support and Billing	100
Metering, Compliance	100
Water Delivery and Other Operations	100
Flood Operations	50
Hydrometric Monitoring	90
Public Liability Insurances	100
Corrective and Routine Maintenance	100
Asset Management Planning	100
Dam Safety Compliance – pre 1997	0
Dam Safety Compliance – post 1997	50
Environmental Compliance and Water Quality Monitoring	50
Renewal and Replacement of Assets	90
Structural and other enhancements	100

The application of the existing cost shares between Government and users will result in a shift towards the Government share of costs, with Government shares increasing by 149% whilst user shares increase by just 22.2% over the regulatory period. State Water requests IPART to revisit the rationale for the allocation of cost shares, taking into account the cost recovery principles of the National Water Initiative.

Revenue Requirements from Users and Government

Given State Water's budgeted operating and capital expenditure outlined above, and using a WACC of 7.9%, the allocation of State Water's revenue requirements to users and Government by 2013/14, the proposed final year of the determination, are summarised in Table 2.

Table 2: Revenue Requirements 2013/14 ($2009/10)

$M ($2009/10)	Users	Government	Total
Operating costs	35.8	3.6	39.3
Return of Capital (depreciation)	3.2	6.0	9.1
Return on Capital (7.9%)	20.2	38.1	58.4
Total	**59.1**	**47.7**	**106.8**

Note: totals may not add due to rounding.

Impact on Prices

There are broadly three types of licences for charging purposes – high security (HS), general security (GS) and supplementary licences. Both GS and HS licence charges comprise a fixed entitlement charge and all three licence types also include a usage based charge. High security licences pay a premium on the entitlement charge, reflecting the increased access to water available to this licence category. The usage charge is the same for supplementary, general and high security licences and is payable on actual metered extractions.

The current conversion factors do not accurately reflect the benefit of holding a HS licence over a GS licence. State Water proposes that the HS premium be adjusted by a scarcity premium based on allocations over the last 15 years. The application of this premium results in large increases in the proposed HS premium in valleys where the security of GS licences has deteriorated relative to HS licences. As HS licence holders generally receive near to full allocations every year, they also have a greater capacity to meet higher water charges than GS licence holders.

The proposed prices for regulated rivers are shown in Table 3.

Table 3: Proposed Prices for Regulated Rivers ($2009/10)

	2009/10	2010/11	2011/12	2012/13	2013/14
High Security Entitlement Charge $/ML					
Border	4.37	10.57	10.44	10.84	10.36
Gwydir	6.08	11.54	11.70	12.17	13.16
Namoi	9.31	12.37	13.53	14.01	14.68
Peel	11.50	23.72	24.22	24.34	23.37
Lachlan	7.02	17.64	17.97	19.35	19.59
Macquarie	5.78	14.62	15.12	15.67	16.50
Murray Lower Darling	2.75	4.17	4.66	4.91	4.63
Murrumbidgee	2.46	3.36	3.48	3.57	3.49
North Coast	5.60	75.10	75.89	77.70	75.51
Hunter	20.22	26.55	26.56	27.16	26.50
South Coast	10.61	46.70	46.57	47.47	46.28
General Security Entitlement Charge $/ML					
Border	3.41	3.22	3.18	3.30	3.16
Gwydir	3.37	3.52	3.57	3.71	4.01
Namoi	7.44	7.41	8.10	8.39	8.79
Peel	1.71	2.03	2.08	2.09	2.00
Lachlan	2.86	3.08	3.14	3.38	3.42
Macquarie	3.07	2.83	2.93	3.04	3.20
Murray	2.20	1.67	1.87	1.97	1.86
Murrumbidgee	1.51	1.12	1.16	1.19	1.16
North Coast	4.48	48.77	49.28	50.46	49.03
Hunter	6.74	8.25	8.25	8.43	8.23
South Coast	6.24	18.46	18.41	18.76	18.29
Usage charges $/ML					
Border	6.54	8.88	8.77	9.10	8.69
Gwydir	8.96	11.11	11.27	11.71	12.67
Namoi	12.56	17.62	19.29	19.96	20.92
Peel	25.72	62.36	63.68	64.02	61.47
Lachlan	10.83	20.01	20.38	21.94	22.22
Macquarie	8.47	13.41	13.87	14.37	15.13
Murray	4.00	4.90	5.48	5.78	5.45
Murrumbidgee	3.54	3.46	3.58	3.67	3.59
North Coast	27.84	373.67	377.45	386.16	375.62
Hunter	12.28	15.52	15.53	15.88	15.49
South Coast	24.96	79.14	78.94	80.45	78.47

Based on full cost recovery, there would be large price increases for the Peel, North Coast and South Coast Valleys for both entitlement and usage charges. Prices in these valleys are currently well below full cost recovery. Prices in the Hunter Valley are also currently less than full cost recovery, although to a lesser extent than the Peel, North Coast and South Coast Valleys. In the remaining valleys, HS entitlement charges are expected to increase by between 32.8% (Namoi) and 153.1% (Macquarie) driven partly by the increases in revenue requirements, but more significantly by the proposed new HS conversion factors.

The proposed increase in the HS premium has resulted in lesser increases in GS entitlement charges, while in several valleys these charges have actually reduced. In all but the Peel, North Coast and South Coast Valleys, GS entitlement charges are expected to increase between 4.5% (Gwydir) and 22.4% (Hunter). Valleys which would enjoy reductions in the GS entitlement charge are the Border (-5.5%), Namoi (-0.5%), Macquarie (-7.7%), Murray (-23.9%) and Murrumbidgee (-26.1%).

Of those valleys already at cost recovery, usage charges have increased by up to 84.7% except the Murrumbidgee (2.5% decrease), driven mainly by the revised consumption forecasts. Customers have a greater ability to pay usage charges than entitlement charges as usage charges are only incurred when water has been made available.

The proposed charges for the Fish River Water Supply Scheme are shown in Table 4.

Table 4: Proposed Prices Fish River Water Supply Scheme ($2009/10)

	2010/11	2010/11	2011/12	2012/13	2013/14
BULK RAW WATER					
Minimum Annual Quantity (MAQ) ($/kL)					
- Delta Electricity	0.24	0.32	0.34	0.36	0.36
- Sydney Catchment Authority	0.24	0.32	0.34	0.36	0.36
- Oberon Council	0.24	0.32	0.34	0.36	0.36
- Individual Minor Customers	0.30	0.40	0.43	0.45	0.44
Usage up to MAQ ($/kl)					
- Delta Electricity	0.27	0.36	0.39	0.40	0.40
- Sydney Catchment Authority	0.27	0.36	0.39	0.40	0.40
- Oberon Council	0.27	0.36	0.39	0.40	0.40
- Individual Minor Customers	0.54	0.71	0.77	0.81	0.80
Usage in excess of MAQ ($/kL)					
- Delta Electricity	0.51	0.68	0.73	0.76	0.75
- Sydney Catchment Authority	0.51	0.68	0.73	0.76	0.75
- Oberon Council	0.51	0.68	0.73	0.76	0.75
- Individual Minor Customers	0.84	1.11	1.20	1.26	1.24
BULK FILTERED WATER					
Minimum Annual Quantity (MAQ) ($/kL)					
- Lithgow Council	0.36	0.48	0.52	0.54	0.53
- Individual Minor Customers	0.42	0.56	0.60	0.63	0.62
Usage up to MAQ ($/kl)					
- Lithgow Council	0.39	0.52	0.56	0.58	0.58
- Individual Minor Customers	0.66	0.87	0.95	0.99	0.98
Usage in excess of MAQ ($/kL)					
- Lithgow Council	0.75	0.99	1.07	1.12	1.11
- Individual Minor Customers	1.08	1.43	1.55	1.62	1.60

Customer Ability to Pay Higher Water Charges

State Water is aware that higher water charges will impact on customers, particularly for those customers in the irrigation industry. With the exception of the South Coast, North Coast and Peel Valleys, where prices are not currently at full cost recovery, State Water's analysis of customers' ability to pay higher water charges indicates that the proposed price increases will have a relatively small impact on customer income and profitability.

Metering Service Charge

The NSW Metering Scheme is one of the NSW Government's priority projects for the Australian Government's *Water for the Future* Program. The Australian Government has agreed in principle to fund the NSW Metering Scheme to the amount of $221 million, including $90 million for meters on regulated rivers. The project will provide for State Water and Government owned meters on customer works in the Murray Darling Basin and will result in a new regulatory regime for irrigators in NSW. The project involves moving from entitlement holder owned meters to State Water and Government owned meters.

State Water proposes that the on-going operating, maintenance and replacement cost be recovered from Works Approvals holders through an IPART-determined Metering Service Charge (MSC). During the new regulatory period customers will be required to fund planned maintenance, unplanned maintenance (not covered by meter warranty), remote meter reading and data information processing. These costs are independent of meter size as there are no capital replacement costs and will only apply once a meter has been installed and ownership transferred from the contractor to State Water.

During the next regulatory period meter reading costs will be rolled into the meter service change along with capital costs for meter replacement. The meter reading costs to be incorporated into the meter service charge will be net of the actual dollar savings resulting from reduced field meter reading costs.

Structure of the Submission

This submission is structured in three parts. Part A comprises Chapters 1 to 7 and establishes State Water's revenue requirements. It includes an overview of State Water, outcomes of the current Determination, past and future operating and capital expenditure, revenue required for capital expenditure, cost shares and resultant building block requirements for Government and customers.

Part B comprises Chapters 8 to 12 which detail customer pricing outcomes including consumption forecasts, the structure of prices, proposed prices and expected outcomes of pricing decisions.

Part C comprises the appendices to the submission, covering a map of State Water's area of operations, cost drivers, valley based operating and capital expenditure and consumption forecasting.

1. BACKGROUND AND CONTEXT

1.1 Overview of State Water Corporation

State Water Corporation (State Water) is New South Wales' rural bulk water delivery business. State Water owns, maintains, manages and operates major infrastructure assets that enable delivery of bulk water to approximately 6,300 licensed bulk water users on the state's regulated rivers along with associated environmental flows. Historically, this has involved delivery of an average of 5,500 GL per annum, but in the current extreme drought conditions, diversions have fallen to as low as 1,110 GL. State Water also owns, maintains and operates the assets of Fish River Water Supply (FRWS) as a water supply authority to deliver bulk water through a system of pipelines to four major consumers and 230 minor consumers.

The competing demands for water between irrigation (extractive use), town water supply and the environment are governed by a series of the statutory Water Sharing Plans (WSPs) relevant to each water source.

River operations, headwork storage operation and delivery of water are underpinned by asset and commercial management practices which support State Water's bulk water delivery business. State Water owns, maintains, manages and operates a diverse portfolio of assets worth $3.6 billion (Modern Engineering Equivalent Replacement Asset value of the assets, dated 1 July 2008).

State Water operates 20 major dams, 280 weirs and regulators and associated assets to provide water to customers, who include irrigators, town water supply, power stations and stock and domestic users. State Water's head office is located in Dubbo. There are also major regional offices located in Sydney, Leeton, Tamworth and Albury, as well as smaller offices at other locations around the state.

State Water was established as a State Owned Corporation on 1 July 2004, under the *State Water Corporation Act 2004 (SWCA 2004).* In accordance with the *SWCA 2004*, the principal objectives of State Water are to capture, store and release water in an efficient, effective, safe and financially responsible manner.

The other objectives of State Water are:

- to be a successful business and, to that end:
  - to operate at least as efficiently as any comparable business, and
  - to maximise the net worth of the state's investment in the corporation;
- to exhibit a sense of social responsibility by having regard to the interests of the community in which it operates;
- where its activities affect the environment, to conduct its operations in compliance with the principles of ecologically sustainable development contained in section 6 (2) of the *Protection of the Environment Administration Act 1991;* and
- to exhibit a sense of responsibility towards regional development and decentralisation in the way in which it operates.

State Water's area of operations is defined in the *SWCA 2004* as the whole of the state, (including the Fish River Water Supply) other than the area of operations of Sydney Water Corporation, Sydney Catchment Authority, Hunter Water Corporation and the areas of operation of any water supply authorities. State Water's area of operations is detailed in the map attached at appendix 1.

1.2 Regulatory Environment

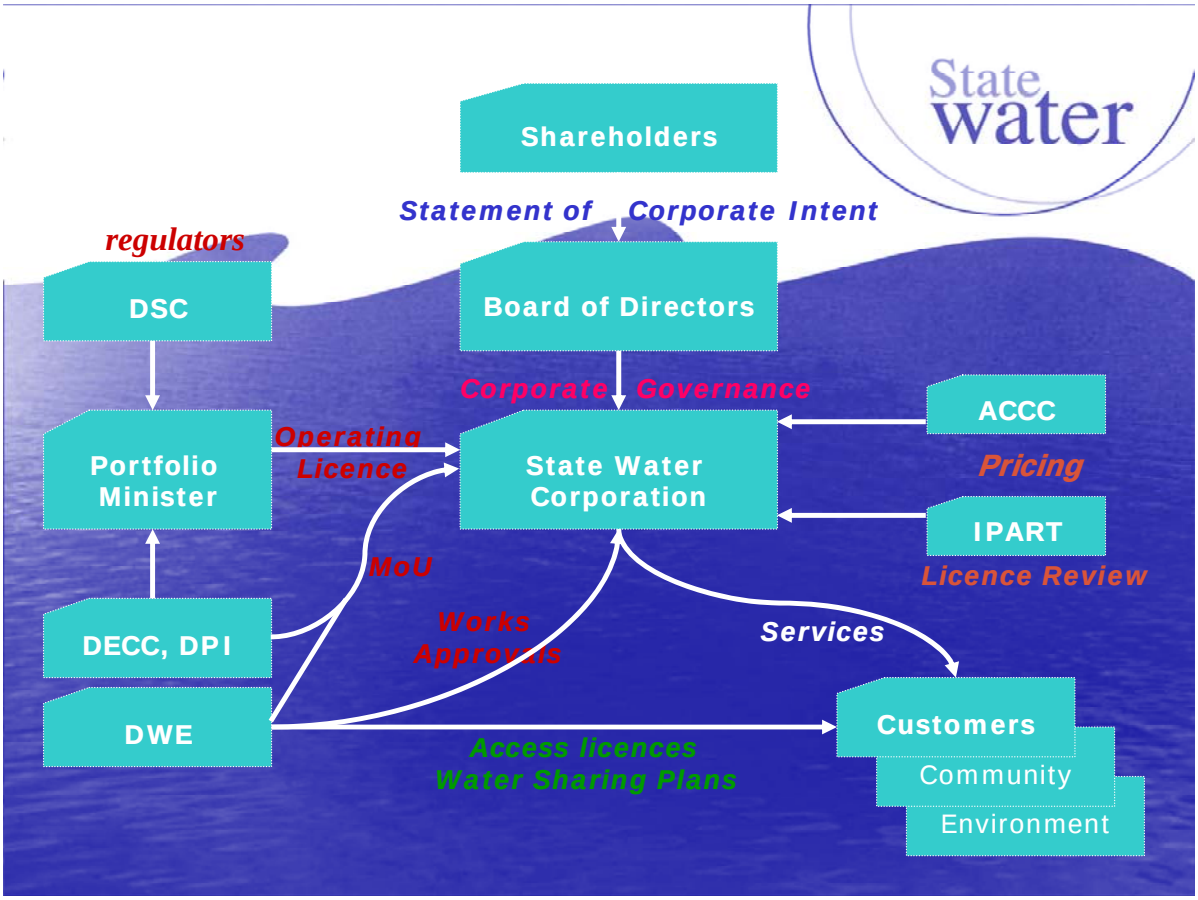
1.2.1 NSW Regulatory Framework

State Water operates in a highly regulated environment. The main statutory and regulatory instruments are:

- *State Water Corporation Act 2004*
- *State Owned Corporation Act 1989*
- *Dams Safety Act 1978*
- *Water Act 2007 (Commonwealth)*
- *Water Management Act 2000*
- Works Approvals (under development by Office of Water)

State Water's corporate governance arrangements, main regulators and regulatory instruments are shown in Figure 1 below.

Figure 1.1: State Water's Regulatory Framework



New Operating Licence

State Water has an Operating Licence, granted under the *SWCA 2004.* Clause 1.1 of the Licence states:

> *The purpose of the licence is to set out the terms and conditions under which State Water is to:*
>
> *(a) meet the objectives and other requirements imposed on it in the Act;*

(b) provide, construct, operate, manage and maintain efficient, co-ordinated and commercially viable systems and services for capturing, storing and releasing water;

(c) recognise the rights given to customers and the community by the licence;

(d) be subject to audits of compliance with the licence;

(e) undertake the functions of the Minister administering the Water Management Act 2000 under that Act or the Water Act 1912 or the Ministerial Corporation under any Act or law conferred on State Water by the licence; and

(f) comply with the quality and performance standards in the licence.

The Operating Licence does this by:

- stipulating the terms and conditions of operation;
- establishing performance standards, and
- ensuring compliance with Operating Licence obligations, through an audit program.

IPART recently renewed State Water's Operating Licence. The new licence is largely based on State Water's previous licence, updated to reflect changes on the regulatory framework, such as the Works Approvals and the *Water Act 2007 (Cwth)*, and other issues raised by State Water and/or stakeholders. In addition, the new licence more clearly articulates State Water's responsibilities with respect to metering and the management of allocated water.

In developing the new Operating Licence, IPART considered the allocation of functions between State Water and the then Department of Water and Energy (DWE). The allocation of those responsibilities has been articulated in the recently signed Memorandum of Understanding between State Water and DWE. The water resource management functions of DWE are now undertaken by the Office of Water within the Department of Environment, Climate Change and Water (DECCW).

Works Approvals

Since the legal vesting of State Water's assets, State Water has been assisting the then DWE in developing the Works Approvals under the *Water Management Act 2000*. The Works Approvals authorise State Water to construct and use specified water supply works to capture, store and release water for regulated water releases. Works Approvals are binding and have their own compliance regime.

A range of issues are covered by the Works Approvals including environmental water, bulk water transfer, water delivery, floods, cold water pollution and monitoring. They also outline the necessary procedures for record keeping, incident reporting and compliance anomalies. The Works Approvals clarify the associated roles of the Office of Water and State Water, and also streamline reporting procedures.

The Office of Water has completed Works Approvals for the Namoi, Gwydir, Hunter, Paterson and Lachlan Valleys, with the rest to be completed by the end of 2009/10.

1.2.2 Federal Regulatory Framework

Water Act 2007

The Commonwealth *Water Act 2007*, and subsequent amendments, enacts the transfer of powers in respect of water management in the Murray Darling Basin (MDB) from the Basin States. The Water Act:

- establishes the Murray Darling Basin Authority and a Basin Community Committee;
- provides for the development of a Basin-wide plan and implementation of a new, enforceable, sustainable and integrated cap on surface water and groundwater diversions;
- preserves state water plans for the life of those plans;
- establishes a role for the Australian Competition and Consumer Commission to monitor and enforce water charge and market rules in the Basin; and
- enhances the role of the Bureau of Meteorology in measuring and monitoring water resources.

Basin Plan
The Basin Plan will be put into operation via water resource plans implemented by the states. The water resource plans will replace the existing WSPs as they expire. As the existing WSPs do not expire until 2014, State Water does not expect the Basin Plan to affect its service delivery until the next regulatory period.

ACCC
The ACCC is currently finalising its advice to the Commonwealth Minister for Water on water charge rules. Under the draft rules, the ACCC will commence regulating State Water's charges in the Basin after the end of the new determination. The Water Act includes an opt in provision which would allow the ACCC's jurisdiction to extend to valleys outside the Basin.

Water for the Future
As part of the states' agreement to the referral of powers, the Commonwealth agreed in principle to provide $3.7 billion to Basin states' for priority projects, including $1.358 billion for NSW subject to due diligence. This includes $90 million for State Water's regulated river metering project and $130 million for unregulated and groundwater metering projects of the Office of Water. More details on the regulated metering project are provided in Chapter 10.

1.3 Monopoly Activities

State Water's monopoly activities are the capture, storage and release of water in rural NSW, as per the *SWCA 2004*. To provide these functions, State Water undertakes a range of supporting tasks, which are captured in the activities listed below. These activities also form the basis of State Water's financial reporting.

Table 1.1: State Water Activities

ACTIVITY	DESCRIPTION
Customer Support	• Customer Service Committees' management and meetings. • Related organisations and interested party liaison and meetings. • Customer and organisational information services and support. • Customer complaint, government issues and other related internal and external concerns handling, meetings and responses.
Customer Billing	• Billing, receipts, debtors ledger and associated communication/consultation.

ACTIVITY	DESCRIPTION
Metering and Compliance	All activities associated with customer water account management: • Meter reading, fault recording and reporting. • Data transfer to water accounting system. • Regulatory compliance reviews and audits including meter compliance. • Non-compliance incident, penalty and prosecution handling and liaison with associated authorities/agencies.
Water Delivery and Other Operations	• Routine operations of river system/structures and piped/pumped and treatment systems operations (including power & chemicals). • Normal environment and system flows (includes supplementary/uncontrolled flow management). • Navigation through locks including system and delivery planning. • Use of SCADA/telemetry, all data and associated quality control management, OH&S requirements, training and meetings. • Water ordering receipt and data transfer for system operations planning. • Major water transfers between major dams, specific environmental releases or system transfers requiring special planning, risk and environmental assessment. • Regional, customer and river frontage landowners' consultation and post evaluation. • Operations planning, including resource assessment calculations, drought contingency planning, allocation forecasting and all communications. • Water delivery compliance reporting for Water Sharing Plans, Water Supply Works Approvals, Operating Licence and annual reporting.
Flood Operations	• River/systems/structures flood operations (including all planning, OH&S requirements, training, meetings, risk assessment, monitoring, routing and incident management. • Liaison with emergency services and media. • Use of SCADA/telemetry, all data and associated quality control management.
Hydrometric Monitoring	Hydrographic station measurement (flow/quantity), recording, data quality control, assessing and transfer of data into useable form.
Water Quality Monitoring	• Monitoring of all types/parameters and at all locations. Covers planning, sampling, data entry and transfer, analysis/verification and reporting. • Review and audit of planning, results and action outcomes.
Corrective Maintenance	• Breakdown maintenance or failure repair resulting in an interruption to service levels, reduction in safety standards which increases the environmental impact or potential impact or risk to the asset's function.

ACTIVITY	DESCRIPTION
Routine Maintenance	• Normal/preventative maintenance activities repeated at least annually or more frequently to maintain the asset so as to achieve the most economic whole of life outcome.
Asset Management Planning and Replacement	Asset/river/system management and planning including the following: • Plans and information systems development and implementation. • Whole of life assessments including maintenance management regime and replacement analysis. • Business risk assessment including portfolio and critical infrastructure security and associated emergency management planning. Investigations, contract management, surveys and drafting. Assessments of levels of service, business efficiency and opportunity. OH&S management. Training, meetings. Review and audit. Valuations/costing/budgeting.
Dam Safety Compliance	• Dam and weir safety surveillance, inspections, surveys, reviews and audits, analysis and associated risk assessment. • Dam and weir safety emergency plan maintenance/testing/review, early warning systems testing & maintenance. • Incident management, post evaluation and resulting communication with regulator, emergency services, community, media/ government and associated training and meetings.
Environmental Planning and Protection	• Environmental strategic and specific planning and assessment including development of plans and targets, associated training and meetings, reviews (eg heritage), monitoring, audit of compliance. • Environmental protection/improvement activities on assets not specifically identified as having an environmental function. • Related liaison with associated agencies/local government.
Structural and other enhancements	• Discretionary expenditure endorsed by customers.
Water Transfers	• Receipt, processing and approval or rejection of water allocation assignments and temporary and permanent entitlement transfers.
Corporate Systems	• Corporate-wide systems that are not directly related to service delivery but are required to support service delivery. Examples include payroll and financial systems.

1.4 Assessment of performance since the 2006 Determination

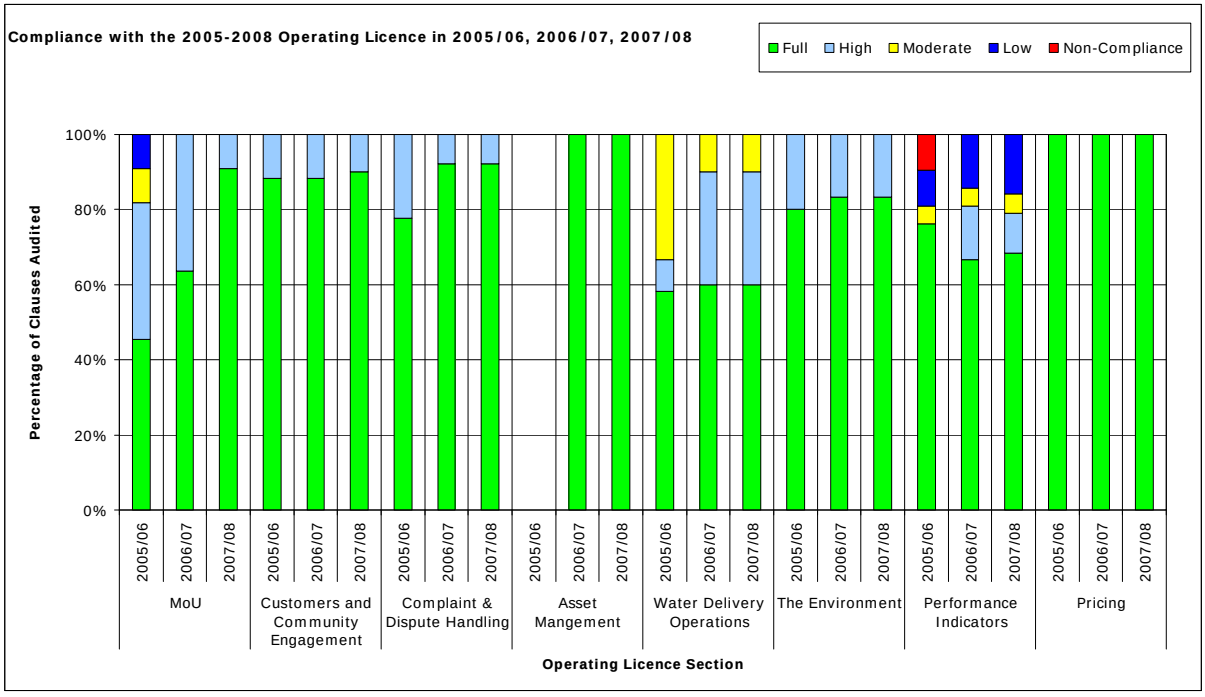
1.4.1 Service Delivery

State Water's service standards are codified within the Operating Licence. Audits of State Water's compliance with the requirements of the Operating Licence during 2006/07 and 2007/08, found that overall, State Water achieved a high level of compliance. The audit indicated a notable improvement in performance compared to the 2005/06 audit.

The percentage of requirements assessed as full compliance increased from 76% in 2005/06 to 83% in 2007/08. The percentage of requirements assessed as full or high compliance was 88% in the 2005/06 audit compared to 94% for 2006/07 and 2007/08 audit.

Figure 1.2 below summarises State Water's improvement in each of the auditable sections of the Operating Licence.

Figure 1.2: Compliance with the Operating Licence



1.4.2 Improved Corporate Systems

In late 2006, State Water commenced the Corporate Management Information Systems Project. The purpose of the project was to ensure that accurate and reliable financial reporting within the business to enable better decision making, including the identification of efficiencies, and also reporting for external stakeholders. The project comprises three components:

- *Integrated Financial Management System (IFMS) Review.* This project involved streamlining State Water's chart of accounts, addressing system deficiencies to improve the financial system; and upgrading the finance software. This project was completed in March 2008.
- *State Water IT Systems and Infrastructure Project*. This project entailed providing State Water with a stand-alone IT platform separate to that of the then DWE and ensuring all State Water's sites, including remote locations, have appropriate access to IT systems. This project was completed in June 2008.
- *Asset Management Review.* The aim of this project was to determine industry best practice standards and investigate areas for efficiency improvements. This project became the basis for State Water's new organisational arrangements, which are detailed in section 1.4.4 below.

The IFMS Review has resulted in significant improvements in the quality and timeliness of financial reporting. As part of the project, State Water's chart of accounts was

reconfigured to simplify the complex structure previously established, improve the quality of financial reporting and ensure that reporting deadlines to stakeholders are met. The project included changing the classification of expenditure from the product codes used in the 2006 Determination to new activities which more accurately describe State Water's functions. Details of the new activities are provided in section 1.3 above, whilst a reconciliation of the old and new activities, including cost shares is contained in Chapter 6.

The IFMS is structured to capture costs at a project or asset/activity level designated as either IPART or Non-IPART. This determination is made by the project manager, in consultation with finance and ensures that Non-IPART costs are isolated from the regulatory costs of the business.

1.4.3 Reporting Obligations

State Water demonstrated a significant improvement in meeting reporting obligations of IPART and customers during the regulatory period. This improvement was facilitated by the IFMS Review outlined above. State Water provided IPART and the valley-based CSCs full year reports for 2006/07 and 2007/08, including financial statements.

The CSCs now receive year-to-date financial reports prior to every meeting. Furthermore, State Water also reports to CSCs against the water delivery performance indicators in the Operating Licence.

1.4.4 Organisational Achievements

In its 2006 Determination, IPART assessed that State Water's operating expenditure was not to a level considered efficient and prudent. IPART therefore imposed a reduction of 18.1% to State Water's operating expenditure over the following four year regulatory period. State Water agreed with the shareholders through its annual Statements of Corporate Intent (SCI) that this target would be achieved progressively over the regulatory period. This enabled State Water to maintain service delivery whilst it transitioned to a more efficient level of expenditure.

To meet the 2007/08 SCI operating expenditure target, State Water took the following actions:

- Limiting any new activities to critical essentials and high priority corporate initiatives.
- Increasing cost recovery from non-regulated (non-IPART) programs.
- Reducing operating expenses through tools such as the increased use of teleconferencing and introduction of videoconferencing.
- Implementing a targeted reduction in the cost of the hydrometric service level agreement by 10%.
- Clustering of dam maintenance and other minor restructuring.
- Deferring maintenance on a risk assessment basis.
- Implementing a targeted reduction on leave liability.
- Not filling/budgeting for staff vacancies or positions made vacant by acting arrangements.
- Reducing contract staff working on regulated operating expenditure to a bare minimum.
- Having 8% vacancies at any one time.

Although the above measures resulted in cost savings of $2.2 million ($2009/10), they did not involve any fundamental change to the business. The business continued undertaking the same activities within the same structure. It soon became apparent,

however, that to achieve the additional required annual savings of $7.1 million, a fundamental change to the structure of the business was required.

State Water therefore embarked on a major organisational restructure. The restructure had three key drivers:

- To satisfy IPART's regulated operating expenditure efficiency targets;
- To enable State Water to be an efficient and effective business; and
- To provide a strong platform for the future growth of the business.

State Water considered a range of options, including the outsourcing of non-core business functions, before determining the final organisational structure. All options were judged on whether they met the three key drivers and their effect on customer service levels.

The final option involved reorganising State Water along functional lines, rather than geographical lines. This option provided greater management flexibility and efficiency opportunities and had the greatest potential to achieve further overall operational savings in the future.

The previous State Water structure was based on the regional structure in place when State Water was a business unit within the Department of Land and Water Conservation. The structure had six separate and self contained business units, all with their own tailored procedures and processes. For a small organisation there were significant disadvantages, including:

- No benefits of scale. Although State Water has river operators located across the state, an operator could only complete tasks within a single business unit because there was no standardisation.
- Duplication of basic tasks between each business unit.
- Each business unit used different versions of software and systems, increasing procurement and service costs.
- Limited information sharing between business units.
- Different procedures for operations and reporting made data collection/analysis difficult and inconsistent.

A move from a geographically based organisation to a functional based one is a major change for State Water with substantial benefits, including:

- Separation of asset planning, maintenance and major project functions to improve accountabilities. Under the old structure, these functions were undertaken in the same business unit and often by the same individuals. In the new structure, Asset plans are prepared by the asset owner with execution of these plans undertaken by the Maintenance and Services and Major Project functional areas.
- Common systems, operations and procedures across the whole business. Some benefits of standardisation include:
  - River operators can manage the same task in multiple valleys. This has allowed river operator numbers to be reduced.
  - Information can be shared across the organisation reducing the dependence on individuals. Water trading is now handled by dedicated staff in one location rather than in by staff in each valley.
  - Centralised data collection has enabled the establishment of a call centre to improve service quality to our customers, whilst reducing the number of Customer Service Officers in the field.
  - Improved quality of data available for management reporting and decision making.

The restructure also involved a corporate restructure that changed the way corporate services are supplied across the business. The restructure of the corporate area resulted in a reallocation of corporate functions to other business units, a removal of the position of Corporate Services Manager and rationalisation of the number of employees to achieve cost reductions proportionate to those achieved on the operations side of the business.

Implementation of the new organisational structure was largely completed in the first quarter of 2009. In total, it resulted in a one off cost of $9 million, mostly for redundancy and relocation costs. State Water reduced the number of full time equivalent staff across the whole organisation by 17%, or 58 people. Overall, by 2009/10 State Water achieved ongoing savings of $9.3 million per year, relative to operating expenditure levels at the start of the regulatory period.

State Water is now implementing the remaining systems required to support the new organisational arrangements. More details on this are provided in Chapter 3.

1.4.5 Asset Management

As well as the centralisation of asset management functions outlined above, State Water has made substantial progress on implementing centralised asset management processes. A new water infrastructure asset register has been compiled and a verification audit completed. In addition, criticality, condition, risk and service potential assessments have been undertaken on all asset components on the new register. The water infrastructure asset class have also been revalued in accordance with Treasury policies using a Modern Engineering Equivalent Replacement Asset approach. This new asset information has been up loaded into State Water's Facilities Maintenance Management System (FMMS). Substantial progress has been made on engaging field staff in the use of FMMS with resulting improvements in the quality and completeness of data collected.

1.4.6 Performance Indicators

In the 2006 Determination, IPART advised that State Water should develop and publish some performance indicators which could be used by stakeholders to monitor delivery against forecast outputs and outcomes. State Water notes that the 2008-2013 Operating Licence includes several water delivery and compliance performance indicators, against which State Water reports annually to IPART and quarterly to CSCs.

Water Delivery indicators:

- percentage of customers contacted within one working day of a non-complying water order being placed.
- percentage of complying orders identified as being delivered outside of ±1 day of the scheduled day of delivery, measured by customer complaints.
- percentage of water orders rescheduled in consultation with customers within one working day of a known shortage or delivery delay.
- percentage of time that daily minimum flow targets are met.
- percentage of complying intra-valley transfers processed within four working days of State Water's receipt of correctly completed application form and fee.

Compliance indicators:

- volume of water taken in excess of access licence conditions under the Water Management Act 2000 and number of licences and licence breaches involved.

- value of penalties imposed by State Water for taking of water in excess of licence conditions under the *Water Management Act 2000* or the *Water Act 1912*.
- volume of penalties imposed by State Water for taking water in excess of access licence conditions under the *Water Management Act 2000* (ML)
- number of licences and entitlements suspended under the *Water Management Act 2000* or the *Water Act 1912*
- number of approvals suspended under the *Water Management Act 2000*.
- number of water supply works audited for compliance with metering conditions and the proportion of those works that comply with metering conditions; and
- number of "alleged breach reports" forwarded to the Department of Water and Energy.

Fish River Water Supply indicators:

- the average response time for unplanned supply interruptions
- number of planned water supply interruptions
- number of unplanned water supply interruptions
- average duration of planned water supply interruptions
- average duration of unplanned water supply interruptions.
- percentage compliance with Australian Drinking Water Guidelines

In addition, State Water has developed corporate-wide indicators which will be used to monitor performance during the 2010 Determination regulatory period. These indicators are outlined in the Table 1.2.

Table 1.2: Performance Indicators

Performance Indicators	Unit of Measurement	Target			
		2010/11	2011/12	2012/13	2013/14
Regulated Business Performance					
Compliance with the Operating Licence	% Full compliance	100%	100%	100%	100%
Compliance with Works Approvals	% Full compliance	85%	90%	95%	100%
Efficient opex	IPART target	100%	100%	100%	100%
Efficient capex	IPART target	100%	100%	100%	100%
Commercial Business Performance					
Maintain an investment grade rating	Credit Rating	BBB	BBB	BBB	BBB
Generate a commercial rate of return	Return on assets	8.5% (reg) 20% (unreg)			
Asset Management					
Asset Management Plans to guide prudent and efficient expenditure (opex and capex) on assets	100% structures have a plan in place by 2014	100% physical assets by 2012, 100% intangible assets by 2014.			
Implement asset management projects (operational and capital) that achieves time cost and quality objectives	% of completed projects over $100K that meet design objectives, timeframes and budget	90%	90%	90%	90%
Water Delivery					
Maximise sales to release ratio	sales to release ratio	wet, dry and normal targets tba			
Call centre take-up	% of customer calls through call centre	50%	60%	70%	80%
Metering and Compliance					
Taking action against extraction in excess of licence conditions	% of instances of over extraction where action is taken as per Overuse Policy	100%	100%	100%	100%
Increase water ordering	% customers using iWAS to place orders	20%	30%	40%	50%

In addition to corporate-wide performance indicators, State Water has also been working with the valley based CSCs to develop water delivery performance indicators tailored to each system's specific characteristics. These performance indicators are reported regularly to the CSCs and are used to improve State Water's performance, and manage customer expectations.

1.5 Murray Darling Basin Authority and Border Rivers Commission Costs

State Water is not proposing any variation to the way in which Murray Darling Basin Authority (MDBA) and Border Rivers Commission (BRC) costs were treated in the 2006 Determination. This approach involves adding NSW Government contributions to the MDBA and BRC to State Water's revenue requirements, and using information obtained from the MDBA and BRC to allocate the costs to activities and valleys.

State Water wishes to highlight that it has included these costs simply to assist the NSW Government in establishing a mechanism for cost recovery of MDBA and BRC costs attributable to users, as required by the National Water Initiative. State Water passes through to the NSW Government the revenue collected from users for the MDBA and BRC costs. Consequently, there is no net revenue to State Water from including these costs in the proposed prices. State Water does not have the authority to review the efficiency of these costs, nor the levels of service provided by these organisations.

In preparing its submission, State Water obtained information from New South Wales Treasury on the level of expected NSW Government contributions to the MDBA and the BRC and information from the Office of Water regarding the allocation of this contribution to bulk water and resource management activities.

It should be noted that the NSW Government has not yet committed to funding MDBA activities past 2010/11. Future MDBA activities and ongoing contributions are due to be considered by the Murray Darling Basin Ministerial Council in November 2009. Pending this consideration, State Water has assumed that the 2010/11 level of contributions is maintained for the rest of the regulatory period.

In order to allocate Government contributions to State Water activities and user cost share, State Water sought information from the MDBA and BRC on projected costs over the new regulatory period and, in the case of the MDBA, the appropriate allocation of costs to MDB valleys. The BRC provided the information as requested, but the MDBA was unable to provide the information within the timeframe required for incorporation in State Water's price modelling. Consequently, for the purposes of calculating user shares, State Water has applied a pro-rata split to Government contributions based on total State Water expenditure in each activity. State Water has requested MDBA provide financial forecasts directly to IPART.

The MDBA and BRC costs included in proposed prices are attached at Appendix 4 for the information of IPART and stakeholders. However, these costs are excluded from State Water's revenue requirements and accordingly, are not included in the analysis in this submission.

1.6 Length of Regulatory Period

State Water proposes a regulatory period of four years, the same length as the 2006 Determination. As outlined above, State Water anticipates that the next Determination will be undertaken by the ACCC. A four year Determination period will align with the timeframes anticipated by the ACCC for its first Determination of State Water.

2 STATE WATER'S FINANCIAL POSITION

2.1 Current Period Regulatory Outcomes

The long-term financial sustainability of State Water is a key regulatory outcome for all stakeholders, including shareholders and customers. It is important that State Water has the financial capacity to invest in required bulk water infrastructure and undertake appropriate operating and maintenance expenditure. It is also important that State Water has the capacity to meet its debt obligations and provide a commercial return to equity holders, otherwise incentives for new investment are weakened.

In undertaking pricing determinations, IPART is required under section 15 of the *IPART Act*, to have regard to matters including:

- the cost of providing the services concerned
- the appropriate rate of return on public sector assets

Regulatory outcomes over the current determination period have contributed to a significant deterioration in State Water's financial position. State Water has not recovered the cost of providing services nor achieved an appropriate return on assets.

Financial performance has been particularly affected by the drought. Table 2.1 shows the significant shortfalls in water sales relative to the forecast adopted in IPART's 2006 determination:

Table 2.1: Forecast versus Actual Consumption (GL)

	06/07	07/08	08/09	09/10 (forecast)
Regulatory Forecast	5,450	5,450	5,450	5,450
Actual / Forecast	2,188	1,111	1,448	1,500
Variance	**(3,262)**	**(4,339)**	**(4,002)**	**(3,950)**
Percentage Variance	(60%)	(80%)	(73%)	(72%)

Financial impacts associated with lower than forecast consumption volumes have been exacerbated by:

- A transitional price path that significantly under recovers notional revenue requirements;
- Current pricing structures that incorporate a 60% variable charge to end users, resulting in significant revenue volatility;
- High operating leverage – operating costs are predominantly fixed, meaning that reductions in sales revenue flow directly through to earnings; and
- Low regulated rate of return – a 6.5 per cent real pre-tax WACC does not reflect the underlying business risk of State Water.

Table 2.2 shows the substantial deviation between the user share notional revenue requirements and actual / forecast customer revenue over the current regulatory period.

Table 2.2: Notional User Share Revenue ($09/10 million)*

	06/07	07/08	08/09	09/10 (fcst)	Total
Notional Revenue	50.4	48.5	48.4	48.5	195.8
Actual Revenue	28.2	26.9	28.5	29.0	112.6
Variance to Notional	**(22.2)**	**(21.6)**	**(19.9)**	**(19.5)**	**(83.2)**

* Excludes MDBC / DBBRC pass through revenue

State Water expects to under-recover notional user share revenue requirements by approximately $83 million ($09/10) over the current regulatory period. This represents a 42.5 per cent shortfall relative to the underlying operating cost, depreciation and return on asset building blocks used to derive notional revenue requirements. Approximately $56 million of the shortfall relates to lower than forecast consumption, with the remaining $27 million shortfall resulting from the transitional price path adopted by IPART.

Table 2.3 shows the impacts of revenue shortfalls on regulated EBIT, assuming operating cost, depreciation and RAB allowances from IPART's 2006 determination. Return on assets averages less that 1.0 per cent over the regulatory period, compared to the regulatory allowance of 6.5 per cent.

Table 2.3: Regulated EBIT ($09/10 million)*

	06/07	07/08	08/09	09/10 (fcst)
Revenue from Customers	28.2	26.9	28.5	29.0
Revenue from Government	16.3	16.3	16.9	18.9
Total Revenue	44.6	43.2	45.4	47.9
Allowed Operating Costs	(41.3)	(38.6)	(37.4)	(36.3)
Allowed Depreciation	(2.7)	(3.0)	(3.3)	(3.8)
Regulated EBIT	0.5	1.6	4.7	7.7
Allowed RAB	372.9	393.7	442.4	510.1
Return on Assets	0.1%	0.4%	1.1%	1.5%

*Excludes MDBC / DBBRC pass through revenue

Table 2.4 shows impacts on pre-tax profit, assuming 60 percent debt gearing assumptions, consistent with the efficient gearing benchmark adopted in IPART's 2006 determination.

Table 2.4: Regulated Pre-tax Profit ($09/10 million)

	06/07	07/08	08/09	09/10 (fcst)
Debt (60% gearing)	223.7	236.2	265.4	306.0
Regulated EBIT	0.5	1.6	4.7	7.7
Interest Expense *	(15.7)	(16.5)	(18.6)	(21.4)
Pre-tax Profit (Loss)	**(15.1)**	**(14.9)**	**(13.9)**	**(13.7)**

*Assuming 60 per cent gearing and 7 per cent cost of debt adopted in IPART's 2006 determination.

The above analysis highlights the significant regulatory risks faced by State Water, especially given the extreme variability in water availability and resultant uncertainty surrounding consumption forecasts. The extended drought has also impacted on other NSW water businesses, but not to the same extent as for State Water.

[redacted]

However, operating subsidies from Government will cease at the end of the current regulatory period. Further, substantial capital expenditure requirements over the next regulatory period are expected to significantly increase gearing levels, placing strong downward pressure on State Water's debt servicing ratios and credit rating outcomes. Significant improvement in financial position is required for State Water to retain an investment grade rating and remain financially sustainable over the medium to long term. In terms of regulatory outcomes, this requires:

- Volume forecasts that reflect recent structural changes in climatic conditions.
- Full cost recovery of notional 'building block' revenue requirements over the regulatory period.
- Lower financial leverage assumptions reflecting State Water's revenue volatility, high operating leverage and resultant moderate debt servicing capacity.
- An increased regulated return on assets to reflect State Water's higher business and regulatory risks.

2.2 Business Risk

Business risk is a key determinant of regulated revenue requirements. Business risk impacts on factors including credit rating, capacity for financial leverage and the asset beta used to determine the regulated return on assets.

As natural monopolies, regulated water utilities typically have low business risk, largely predicated on the supportiveness of the regulatory framework (i.e. stability and predictability of regulated cash flows) and the size and diversity of the customer base. To reflect the low business risk characteristics of water utilities, regulators generally adopt an asset beta that is well below the market average (i.e 0.4 versus 0.7) and a financial leverage benchmark (i.e. debt gearing) that is well above the market average (i.e. 60 per cent versus 30 per cent). Below average business risk and above average financial risk have cancelling effects on equity risk, meaning that regulators generally adopt an equity beta that is close to the market average of 1.0. [1]

The regulatory environment is a key determinant of business risk for water utilities. Stable and predictable regulatory outcomes translate to lower business risk, enabling most water utilities to adopt relatively aggressive financial profiles. However regulatory risk can vary between water utilities, depending largely on volumetric risks associated with water availability and demand, and the supportiveness of the regulatory framework.

[1] IPART has previously adopted an equity beta range of 0.8 to 1.0.

Revenue risk is a function of both volumetric risk and the form of regulation (i.e. price versus revenue cap) and earnings risk is a function of revenue risk and operating leverage (i.e. extent to which operating costs are fixed).

State Water is exposed to significantly higher volumetric risks relative to NSW metropolitan water businesses:

- On the supply side, water availability is largely dependent on surface water (i.e. rainfall run-off) and therefore supply is highly exposed to drought conditions. Relative to other NSW water businesses, State Water does not have equivalent storage volumes or availability of alternative sources of water supply such as desalination and recycled water.
- On the demand side, State Water's customer base is comprised mainly of large irrigators whose consumption is further impacted by weather and economic conditions. Water demand is highest during dry conditions when availability is often low (and conversely demand is generally lower during wet conditions when availability is high).
- The current global financial crisis impacts are greater on water consumed by large rural customers relative to small domestic customers. The price received for output from irrigated activities influences irrigators' decisions on the scale of irrigation activities undertaken in a given year. In the short term, volatility in commodity prices is likely to continue, given the uncertainty in the world economic outlook.

[redacted]

Similarly, the CIE's review of State Water's consumption forecasts presented evidence that recent climatic conditions are outside what would be expected from normal climatic volatility and that the magnitude of changes remains highly uncertain, particularly at the regional level relevant for consumption of bulk water:[3]

> *"Climate change represents a significant (and likely systematic) risk for State Water. Climate change means that historical averages of consumption are less applicable to the future than they would otherwise be. Forecasts based on historical averages may be systematically biased upwards.*
>
> *The CSIRO expects that changes in climatic conditions will result in lower water availability throughout regional NSW. Though there is considerable uncertainty*

[2] Fitch Ratings, Credit Analysis State Water Corporation (Private and Confidential), April 2008.
[3] The Centre for International Economics, State Water Consumption Forecasts for the 2010 Pricing Determination.

depending on the climate model used, with some models predicting increases in extractions and other predicting much larger reductions."

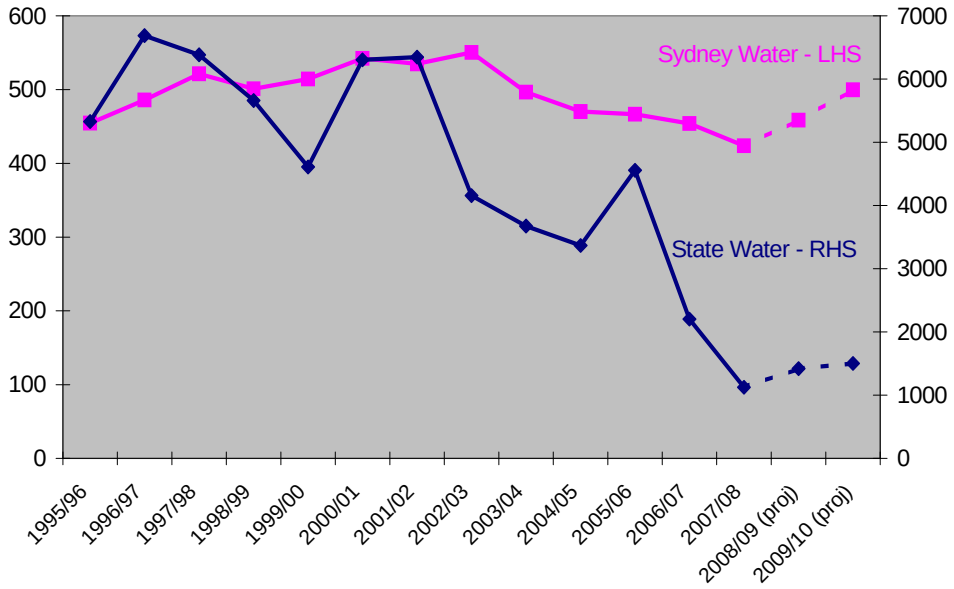
Based on advice from CIE, State Water has adopted an alternative consumption forecasting mechanism for this determination, based on a moving average of actual extractions over the past 15 years. This overcomes shortfalls associated with the previous methodology based on 100 years of historic data that did not reflect current structural shifts in climatic conditions.

The adoption of an alternative forecasting methodology does not mitigate risk associated with demand volatility, but rather attempts to provide a more accurate estimate of expected average demand. Volumetric risk is only reduced if the consumption forecast is adjusted below the expected mean (e.g. adjusted downward by one standard deviation), although State Water does not propose such an adjustment for this determination.

Average demand over the current regulatory period is expected to be approximately 65 per cent below the revised consumption forecast of 4,500 GL, demonstrating the significant uncertainty surrounding the revised forecast. Future consumption will continue to be volatile given unprecedented climatic volatility and economic uncertainty.

Both Sydney Water and State Water have been impacted by drought in recent years. However, Figure 2.1 shows the dramatic difference in terms of impacts on volumetric sales. Between 2001/02 and 2007/08, State Water's sales volumes fell 82 per cent, from 6347 GL to 1111 GL. Over the same period, Sydney Water's sales volumes fell by approximately 20 per cent, from 535 GL to 424 GL.

Figure 2.1: Historic Water Consumption, State Water and Sydney Water (GL)

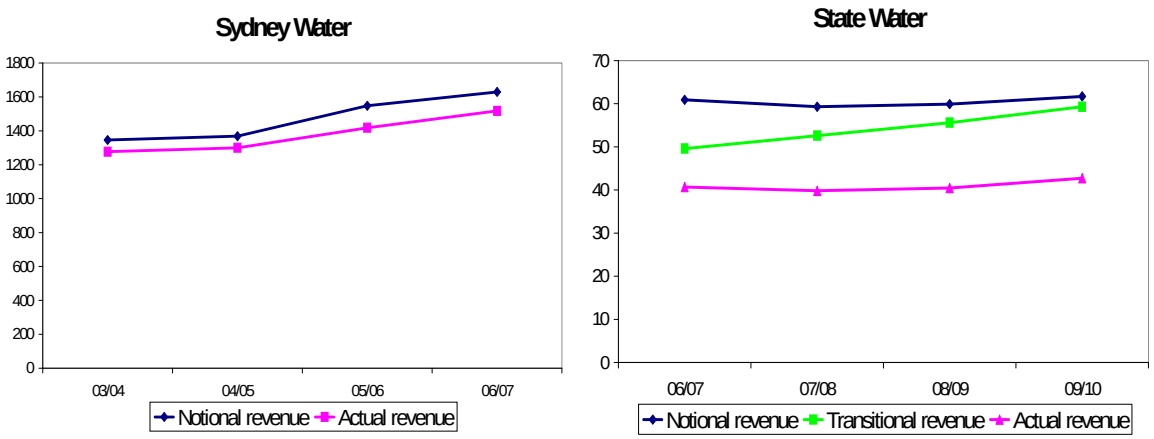


Under the current price cap form of regulation, 60 per cent of sales revenue from bulk water customers is recovered through usage charges, subjecting State Water to significant revenue volatility. Revenue risk is exacerbated by high operating leverage (i.e. State Water's operating costs are predominantly fixed), meaning that revenue shortfalls associated with lower than forecast consumption impact directly on regulated earnings. While other NSW water businesses operate under a similar regulatory

framework, they are not subject to the same level of volumetric risk. As such, they are able to achieve more stable and predictable regulated cash flows relative to State Water.

Figure 2.2 shows actual versus notional regulated revenue for Sydney Water and State Water. Including sales revenue from both end users and Government, State Water expects to recover 68 per cent of notional revenue requirements and 75 per cent of transitional revenue requirements over the current regulatory period. In contrast, Sydney Water recovered approximately 94% of notional revenue requirements over the regulatory period from 2003/04 to 2006/07.[4] The proposed Kurnell desalination plant will further reduce volumetric risk for Sydney Water.

Figure 2.2: Regulated Revenue, Actual versus Notional ($million)



Volumetric risk can be mitigated through the regulatory framework by aligning regulated revenue with underlying costs. Under a fixed revenue cap form of regulation, State Water could fully recover regulated revenue allowances, regardless of volumetric sales. However a revenue cap form of regulation is not considered appropriate for State Water as it would potentially require large adjustments in annual prices to compensate for revenue under/over recovery from the previous year. Under current pricing structures, the variable price component would fluctuate wildly depending on previous years actual versus projected sales volumes.

Alternatively, volumetric risk can be mitigated by increasing the fixed charge component of prices to better align with State Water's fixed operating cost structure. Table 2.5 shows expected revenue outcomes for State Water over the current regulatory period under alternative fixed/variable pricing structures. Note that revenue outcomes include sales to Government that are already 100 per cent fixed. Revenue recovery is determined against IPART's transitional (rather than notional) revenue allowance in order to isolate impacts associated with variations in volumetric sales.

[4] Sydney Water Submission to IPART, 14 September 2007, Page 8

Table 2.5: Sales Revenue Under Alternative Price Structures ($09/10 million)

State Water	06/07	07/08	08/09	09/10 (fcst)	Total	Revenue Recovery
Notional Revenue	66.7	65.0	65.5	67.5	264.7	
Allowed Revenue	54.3	57.6	60.9	64.9	237.7	
Expected Revenue:						
- 40% fixed [1]	44.6	43.2	45.4	47.9	181.1	76.2%
- 50% fixed	46.2	45.6	48.0	50.8	190.5	80.2%
- 60% fixed	47.8	48.0	50.6	53.6	200.0	84.1%
- 70% fixed	49.4	50.4	53.1	56.4	209.4	88.1%
- 80% fixed	51.1	52.8	55.7	59.3	218.8	92.1%
- 90% fixed	52.7	55.2	58.3	62.1	228.2	96.0%
- 100% fixed [2]	54.3	57.6	60.9	64.9	237.7	100.0%

[1] represents expected sales revenue under current price structure.
[2] represents full cost recovery of notional revenue requirements.

In previous determinations, IPART has applied an equivalent WACC across all NSW water businesses, despite acknowledging that State Water is exposed to higher levels of demand fluctuation and revenue volatility. Regulatory outcomes over the current determination have highlighted the significant volumetric risks faced by State Water relative to other NSW water businesses.

Ultimately, higher volumetric risks can be borne by customers through higher fixed charges or by State Water through higher volatility in regulated earnings. State Water estimates that the fixed component of customer tariffs would need to increase from the current level of 40 per cent to around 90 per cent in order to provide an equivalent level of revenue stability as afforded to NSW metropolitan water businesses.

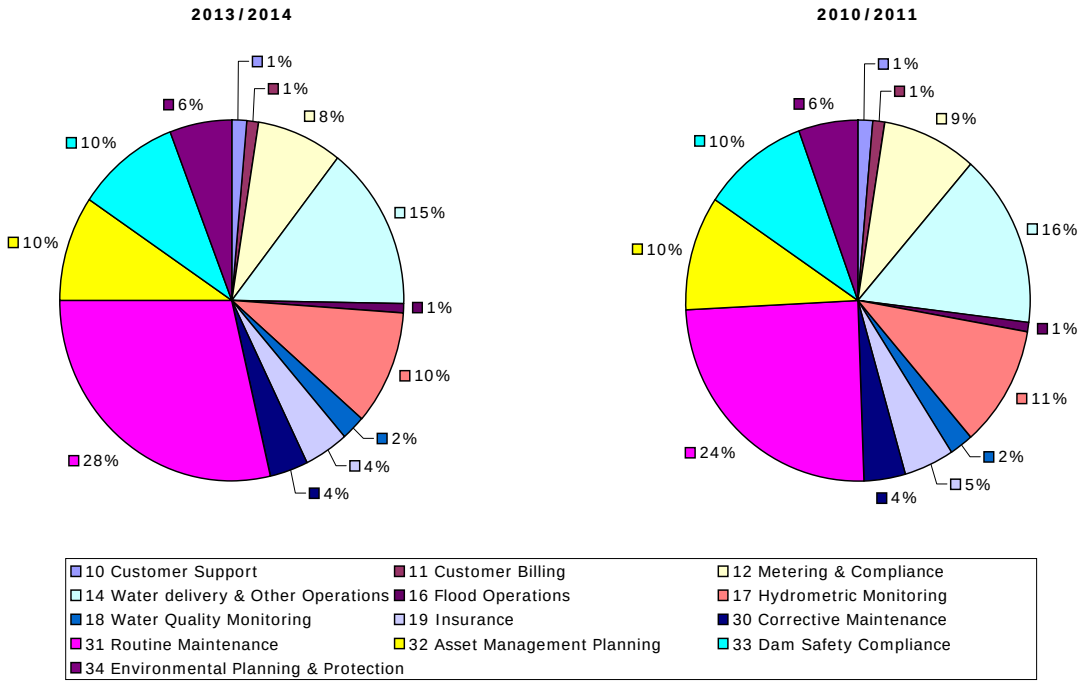
Alternatively, State Water should be compensated for higher volumetric and regulatory risk through a higher WACC. Preliminary discussions held with bulk water customers have indicated a preference for a higher WACC, rather than higher fixed charges. Implications for the WACC are discussed in Section 5.2 on Rate of Return.

3 OPERATING EXPENDITURE

3.1 Operating Cost Drivers and Outcomes

State Water incurs operating expenditures which are recovered from its customers. A breakdown by activity of the IPART regulated operating expenditures is shown in Figure 3.1.

Figure 3.1: 2009 IPART Operating Expenditures by Activity



Of the above expenditures hydrometric monitoring and insurance are largely non-controllable expenditures, the former being subject to service level agreement with the former DWE (now the Office of Water) and the latter being a competitive market cost.

The material controllable direct expenditures are therefore:

- Routine maintenance
- Water delivery and other operations
- Dam safety compliance
- Metering and compliance
- Asset management planning and replacement

State Water operates within a complex, highly regulated framework with a large number of legislated and non-legislated cost drivers. Details of regulatory, statutory and business cost drivers for State Water's activities are provided in Appendix 2.

3.2 Performance between 2006/07 and 2009/10

Valley-based past expenditure is included in Appendix 3. Over the current determination, State Water achieved significant efficiencies improvements, resulting in a decrease in regulated OPEX from $45.4 million in 2006/07 to $36.1 million in 2009/10, a reduction of 20.4% in real terms over the regulatory period, as indicated in Table 3.1.

Table 3.1: Operating Expenditure - Current Determination ($09/10 million)

	2006/07	2007/08	2008/09	2009/10
IPART Determination	41.0	38.4	37.3	36.1
State Water Actual/Forecast	45.4	43.2	38.5	36.1
Variance	4.4	4.8	1.3	0.0
Variance %	10.6%	12.5%	3.4%	0.1%

Note: differences are due to rounding

State Water achieved corresponding reductions of 20.1% in OPEX attributed to users, over the regulatory period, as detailed in Table 3.2.

Table 3.2: User Share Operating Expenditure for the Current Determination ($09/10 million)

	2006/07	2007/08	2008/09	2009/10
IPART Determination	37.7	35.2	34.6	34.2
State Water Actual/Forecast	41.8	40.1	35.9	33.6
Variance	4.1	4.8	1.3	-0.6
Variance %	10.8%	13.7%	3.8%	-1.7%

Note: differences are due to rounding

Following the announcement of the 2006 Determination State Water undertook an immediate review of the costs of the business. This review incorporated the identification of the key drivers for operational expenditure to ensure that the service activities and outcomes were aligned with these drivers. The review resulted in implementation of measures to reduce IPART regulated OPEX, focusing on discretionary non-salary costs. State Water identified that the required savings could not be realised through these measures alone, and that a fundamental change to the salary base of the business was required.

The implementation of the cost structure reform process required a staged approach resulting in negative variances from the efficient OPEX levels in the period 2006-2009, with the final year (2009/10) forecasting a positive variance indicating the successful transition to the new organisational arrangements. These changes to OPEX were negotiated, and agreed, with the shareholders to ensure that service delivery could be maintained during the transition phase. The restructure timeline detailed below.

2006/07 – Investigation and development of a cost reform strategy. This process commenced around December 2006.

2007/08 – Formation of the principles surrounding the restructure. The fundamentals of the restructure involved:

- Moving from an area based to functionally aligned business – reduction on the workforce from 350 staff to 300 staff (less with vacancies);
- Technological improvements to support a modern business;
- Revisiting dam safety surveillance requirements; and
- Rationalisation of employment conditions.

2008/09 – Finalisation and implementation of the composition of the new State Water workforce. In the initial stages of the cost structure reform process, State Water retained a higher staff vacancy rate then would otherwise be sustainable, until the composition and structure of the realigned business was confirmed.

2009/10 – Implementation of technological improvements. The initial stages of the systems development will be completed by the end of the current Determination Period. However, there is a significant amount of additional work to complete in the 2010 – 2014 timeframe.

To date the efficiency gains that have been identified relate to: changes in the structure and composition of the workforce and higher vacancy rates which were sustainable during the prolonged drought.

The implementation of these cost structure reforms over the period has resulted in State Water realising the efficiencies required to meet the efficient OPEX target for 2009/10.

Over the 2006 Determination Period the system changes have focused on enabling State Water to continue to deliver core services in its current operating environment (drought) with a restructured substantially smaller workforce. Further efficiencies will materialise over the ensuing period as more emphasis is placed on systems development, as outlined in Section 3.3.1 below. These systems will also ensure that State Water can operate during normal conditions with the reduced staffing levels.

Moving to a Functionally Aligned Business
The Water Delivery group now delivers water and services to customers across NSW in a consistent and increasingly standardised manner. The introduction of state-wide processes such as water delivery planning, not only improve the efficient delivery of water but also provides the regulator (the Office of Water) with consistent information to make available water determinations (AWDs). The Water Delivery group also manages the CSCs and handles all customer and stakeholder liaison, providing consistent reporting/information on water delivery planning, water delivery efficiency, river operations, water policy and regulatory affairs.

The newly formed Customer Operations Group provides frontline customer services for State Water. This group provides a Customer Information Centre (call centre) and is developing internet access for customers to place orders, input meter readings and access their water account data. The group also provides field-based services including meter reading, compliance monitoring and meter calibration and is responsible for billing. The unit manages customer concerns and complaints.

Maintenance functions are now carried out by an independent Maintenance and Services group, which acts as an 'internal outsourcing' division to separate strategic decisions and maintenance functions, thereby improving accountabilities. Maintenance and Services carry out maintenance functions using an efficient mix of internal and external resources.

State Water is currently undertaking a vast range of projects as a result of the Dam Safety Upgrade, business reorganisation and Water for the Future funding. State Water has created the Business Improvement and Major Projects Groups to ensure cost effective, timely and quality delivery and appropriate support of agreed projects.

The Major Projects Group undertakes, deliver and support major, high risk and key regional projects. The group provide expert advice and support on project issues and also oversee the management of the corporate capital program.

The Business Improvements Group investigates, develop, resource and implement all operations information systems projects that State Water requires for water delivery and planning, asset management and operation and customer systems projects.

Revisting Dams Surveillance Requirements
The levels of surveillance monitoring that applies to each dam specified by the Dams Safety Committee (DSC) drives a large portion of State Water's regulatory costs. This is key driver for a 7 day a week staff presence at each dam. State Water has consulted with the DSC to optimise the level of surveillance with a view to developing a risk based approach that is consistent with the latest dam safety data.

In developing a risk based approach, State Water created a process for evaluating the safety requirements for each of its dams and assessing it against the latest knowledge. Input was also sought from renowned dam safety experts who on the Independent Expert Panel for this exercise. The objective was to make the inspection and surveillance process as efficient as possible without compromising our safety obligations. This analysis has allowed the organisation to:

- Secure the Dams Safety Committee's interim approval for 5 days/week surveillance for dams with storage levels below 20%.
- Secure approval to permanently change surveillance regime at four dams, with another two (Glennies Creek and Burrinjuck) approved to 5 times per week subjected to installation of telemetry.

State Water has assessed that the introduction of 5 day, rather than 7 day inspection rosters on most dams and the introduction of 3 day rosters to the lowest risk dams will be consistent with both our cost and safety objectives.

Rationalisation of Employment Conditions
In 2007, State Water commenced negotiations with the relevant unions to develop a single enterprise agreement covering all employees. The enterprise agreement was finalised in 2008/9 and is a stand alone single industrial instrument that replaces five separate awards and agreements at State Water.

The enterprise agreement rationalises conditions of employment at State Water so a single set of conditions applies to all employees. The conditions are also linked to commercial operating conditions and are now separate from and different to the public sector conditions of employment.

The enterprise agreement supports the new organisational arrangements implemented in 2008 and provides for more efficient operating arrangements especially in relation to conducting surveillance and operations work. The conditions now allow State Water to flex and optimise staffing levels and associated costs with environmental changes, water levels and business needs in a timely and cost effective manner. This allows for significantly reduced staffing levels during times of low water levels in the storages in line with agreed dam safety requirements and schedules.

Technological Improvements

Integrated Financial Management System (IFMS) Review:
As outlined in Chapter 1, this project involved streamlining State Water's chart of accounts, addressing system deficiencies to improve the financial system, and upgrading the finance software. The project has resulted in significant improvements in the quality and timeliness of financial reporting.

Computer Aided Improved River Operations (CAIRO):
CAIRO is State Water's river operation tool. Previously, State Water did not have a uniform SCADA system, rather a combination of small and independent systems divided into regions. The individuality of each system limits connectivity and increases management and overall support costs. Each valley had its own copy and interpretation of CAIRO and was appropriately staffed for that situation.

Under the new organisational structure, river operators are required to work in more than one valley. To date the system changes have focused on standardising CAIRO across the state so that it can be operated from any location. Future work will focus of developing/replacing the tool to achieve both efficiencies in water delivery (i.e. water savings) and OPEX.

Supervisory Control and Data Acquisition (SCADA):
SCADA is an enabling tool for efficient river operations. As with CAIRO it was previously valley based. Current work has focused on transferring SCADA onto State Water's IT network to allow it to be utilised and controlled from any location. As with CAIRO, future work will focus on improvement and development to enable more efficient delivery of services and reduced OPEX.

Business Improvements Committee (BIC):
The BIC has been established under the leadership of the Chief Operating Office to oversee the identification and delivery of technological business improvement projects. This provides a process for initiation, approval, procurement and control of technological business projects such as IT systems. In the past, there was no centralised way of assessing and prioritising the requirements of the business or the benefits achievable by technological business investments. Another key improvement is creating a process by which technological efficiency improvements can be identified. Templates are now available that can be filled out by any employee with an idea for efficiency gains. These ideas are then bought to the attention of the BIC.

3.3 Forecast Operating Expenditure 2010/11 to 2013/14

State Water's budgeted regulated operating expenditure for the new regulatory period is provided in the table below. Valley-based future expenditure is included in Appendix 4. The 2009/10 budget reflects the significant efficiency improvements achieved over the 2006 determination period to meet IPART efficient OPEX levels. The 2009/10 budget is therefore used as the base to forecast operational expenditure over the next determination period.

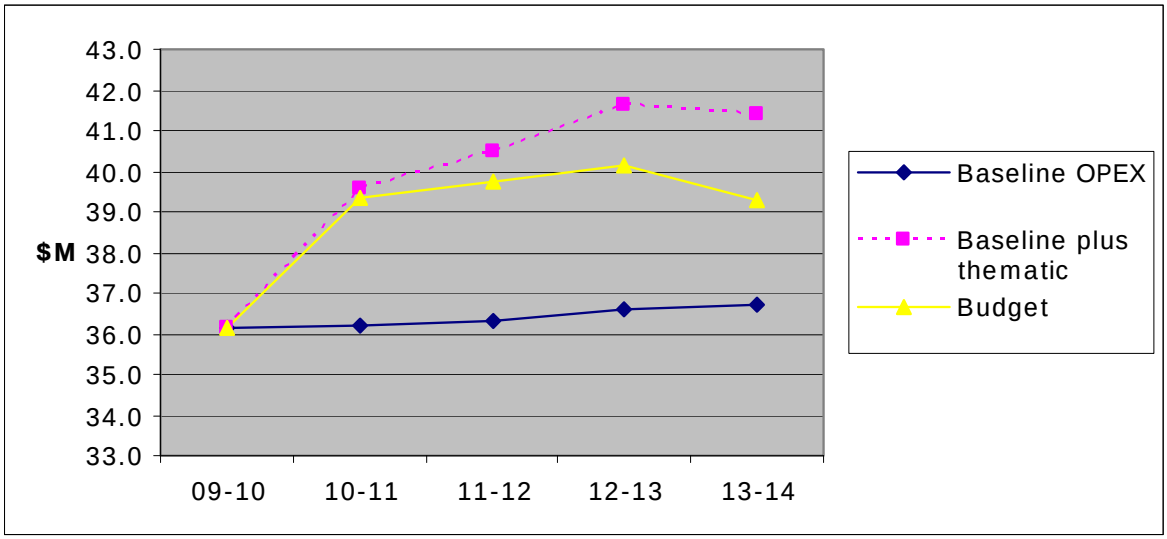
To consolidate the efficiency savings made during the 2006 Determination, State Water will be implementing a 'Platform for the Future' initiative during the next determination period. This initiative involves rolling out technological advancements, further elaborated in Section 3.3.1. Forecast operating expenditure for the next determination period is therefore projected to reduce by 2% per year commencing 2011/12, with some minor savings expected in 2010/11. This will result in a reduction of 6%, or $2.2 million, over the determination period relative to the 2009/10 baseline. A number of system improvement projects are currently being implemented and are likely to be completed by 2010/11, and hence only limited efficiency reductions are therefore anticipated in the first year of the next determination period.

State Water has identified a number of regulatory and statutory requirements that require additional expenditure above the 2009/10 baseline. These expenditure requirements are captured in a range of Thematic Plans, which are further discussed in Section 3.3.2 below. Once these additional expenditure requirements are incorporated into the forecast OPEX, OPEX is expected to increase by 8.7% over the next determination period relative to 2009/10 OPEX, as shown in Table 3.3 and Figure 3.2.

Table 3.3: Budgeted Operating Expenditure ($09/10 million)

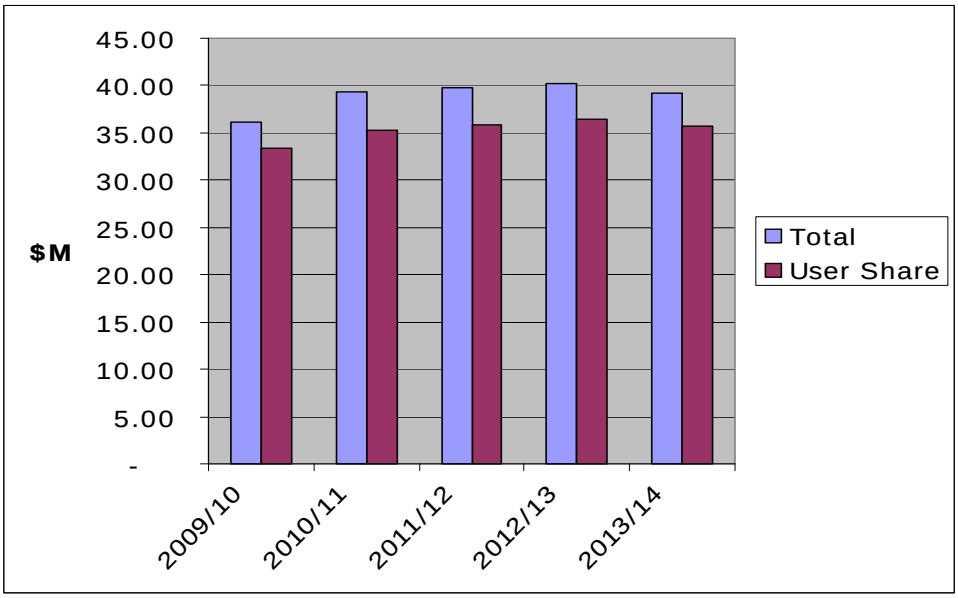
	2010/11	2011/12	2012/13	2013/14
Baseline OPEX	36.2	36.3	36.6	36.7
less Efficiencies	-0.2	-0.7	-1.4	-2.2
plus Thematic Expenditure	3.4	4.2	5.0	4.7
Budgeted OPEX	**39.3**	**39.8**	**40.2**	**39.3**

Figure 3.2: Expenditure Profile



As shown in Figure 3.3, State Water's OPEX continues to be largely user share expenditure.

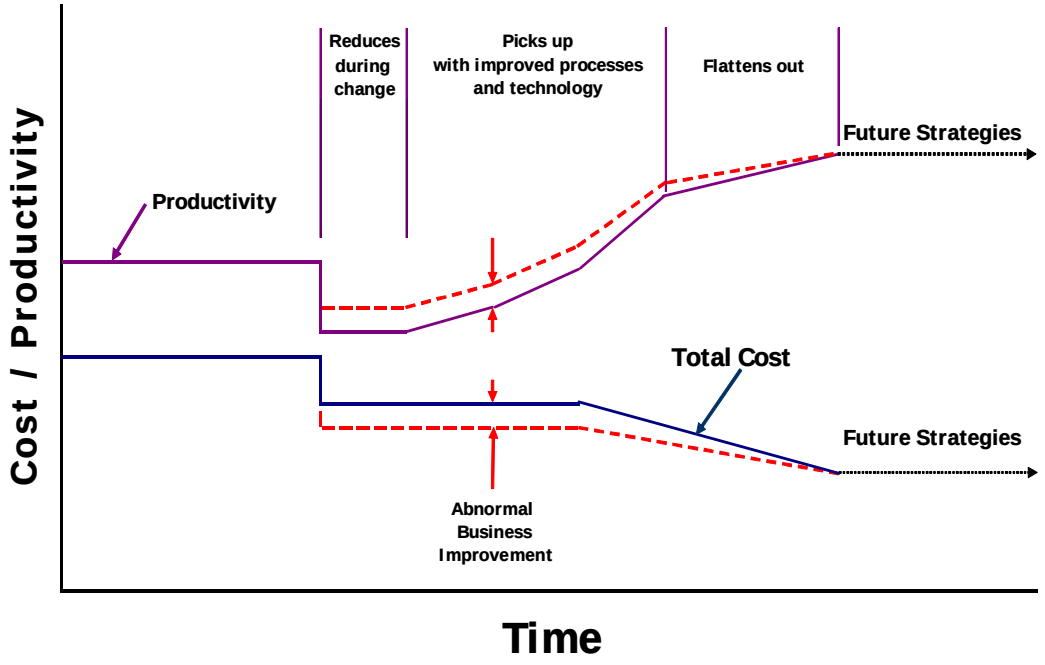
Figure 3.3: Total and User Share OPEX ($09/10 million)



3.3.1 Business Efficiency Improvement – Platform for the Future

The plan for implementing the cost structure reform called for progressive implementation throughout 2008/09 and 2009/10. The restructure however progressed at a faster rate than was originally planned with the restructure essentially being completed in 2008/09. A downside to the accelerated restructure is that, with reduced staff, State Water has a theoretical deficiency in its capability until strategies, processes and in particular the enabling technology/systems with associated procedures are effectively operational to offset reduced staffing. Figure 3.5 demonstrates the theoretical drop in capability, the impact of OPEX resources being allocated to a business improvement backlog, and the rise in capability as the new arrangements bear fruit.

Figure 3.5: Impact of Restructure and Technology Improvement



The backlog of business improvement projects includes:

- Fully developing the new asset planning system
- Change management, skills building and new processes in engineering, maintenance, customer operations and water delivery
- New systems for water delivery, customer service, asset planning, maintenance and projects

From a total cost reduction perspective, this means that there is a plateau in State Water's ability to meet further cost reductions for at least two years (2009/10 and 2010/11). This will be followed by a growing capability to achieve further efficiency/productivity improvements resulting in further OPEX cost reductions when the new systems and technology are effectively bedded down.

State Water has achieved substantial reductions in costs by implementing a new structure which provides a solid basis for ongoing improvements. State Water has in place a business improvement program ('Platform for the Future') which, in 2009/10 and 2010/11, will consolidate the gains made prior to 2009/10, followed by a period of

continuous improvement over the three years 2011/12 to 2013/14. Efficiency gains will be pursued within the following broad categories:

1. Management structure realignment
2. Introduction of new technology
3. Prioritising activities
4. Renegotiation of service levels

Management Structure Realignment

The current structure was set up to deal with the business improvement backlog. While it is not proposed that, in the term of the next determination, State Water will need another fundamental restructure, it is proposed the structure will be refined as the business improvement backlog is addressed. Given the major change the organisation has already been through, further changes should primarily focus on management with minimal major change at lower levels of the organisation.

The main refinements of the structure envisaged once the business improvement backlog is addressed are outlined below:

1. The Chief Operating Officer (COO) will not be required in the longer term as this position was established to mange the transition to the new structure and the business improvement backlog.
2. The existing number of managers reporting to CEO and COO, is too large for an organisation of State Water's size.
3. Given the expected growth in the unregulated business, it is appropriate for a Manager to have full accountability for this business.

It is estimated that the above measures will result in savings of over $0.5 million per year commencing 2011/12.

Introduction of New Technology

The restructure of the business from a valley based to functionally based business has required significant new investment in information technology. Previously there was no standardisation of systems. Each valley had different interfaces and processes. The Operations Systems unit has been set up to manage the standardisation of valley based systems to ensure each has a uniform interface, software and processes. It is anticipated that by the end of the next determination period, these technological improvements will begin to deliver annual efficiency savings of over $1.6 million.

Some of the significant system upgrades that are being implemented include:

SCADA Development Program:

The SCADA Development Program is underpinned by a Strategic Plan developed for 2009-2012. This Strategic Plan provides an upgrade strategy for the existing legacy Supervisory Control and Data Acquisition (SCADA) and control systems to reduce operational losses, achieve water savings and improve efficiency of water resource operations throughout State Water delivery systems.

The plan outlines the strategic options for State Water to apply new communications and technology which will support the business functions and achieve business goals over the next three years.

The technology base for these system upgrades will provide the foundation for State Water's completed SCADA program of works. The upgraded SCADA system will provide a centralised 'view anywhere' capability and will allow near real time operation of remote and complex control systems across State Water, improving water delivery to users and the environment to meet quantity, timing and quality requirements.

This project provides an integrated and coordinated approach, building on sound operational principles and implementing best practice technological systems and processes. The project is broken into logical groupings of strategic focus and deliverables. Each group consists of work programs and discrete tasks or projects, as follows.

Management and Controls	
• Project Management • Document Management • Change Management • Risk Management • System Ownership and Responsibility • Service Level Agreements • Functional Requirements	• Standards and Specifications • Configuration Policies and Procedures • Products and Materials Selection • Assets Register and Planning • Operating and Maintenance Manuals • Training

Security and Network Architecture	
• Physical security • Electronic security • Communications • Disaster recovery • Redundancy	• System interfaces • Response capabilities • Awareness and skills • Third party risks • Ongoing governance

Field Monitoring and Control	
• Legacy Control Systems upgrades • Dam Safety Surveillance 'real-time' Systems • Remote Monitoring and Control systems • Customer Metering Telemetry Systems	• Customer Metering Telemetry Systems • Standard Products and Materials • Standard Construction Techniques and Methods

The approach outlined above will improve SCADA system efficiency, labour efficiency and business operational efficiency.

CAIRO Centralisation:
CAIRO is a legacy water delivery system which has evolved over the last 15 plus years. There are 11 standalone versions of CAIRO, each with specialised code, script and software which require specialist technical maintenance, database administration and system configuration.

State Water has been working to centralise CAIRO into one location with multi-user access and one register of codes for maintenance and configuration. This will not only make future maintenance cheaper and easier, but will also mean operators can move across valleys. Business reporting tools will be able to access the one system for information, saving significant data collection time.

The centralised CAIRO system will enable the construction of automated resource assessment, operational forecast, revenue forecasts, annual water balance, IPART and Office of Water compliance reports. These reports generated from a centralised system will significantly reduce time and cost to the business and increase process reliability and repeatability within defined business rules.

Koncentrator Project:
This is a centralised collection point for manual and SCADA data sources. Currently this data is captured in 9 SCADA servers across NSW. The Koncentrator will capture data once and transfer it into a single database. This will simplify data trails for new development and ongoing maintenance, accelerate system diagnostics, meet the regulatory data requirements of the Bureau of Meteorology, ensure data trails are auditable to enhance transparency and permit State Water to fully move onto its own IT network.

Prioritising Activities
Asset Plans are in place for every significant asset in the organisation and will dictate the projects needed to keep the assets in the required operational and physical state, and to meet our regulatory requirements. These Plans cover provision for capital works and renewals, maintenance and operational requirements, including emergency and security planning. Through the Asset Planning process capital expenditure and maintenance on assets is subjected to extensive planning procedures that limit the amount of unplanned expenditure and control the risk of cost overruns.

Under the new arrangements, all expenditure on State Water assets (operational and capital) is documented and recommended through Asset Plans. These are a formal requirement prior to any projects being approved for funding . These changes have been made to prioritise and tighten expenditure controls in both operating and capital expenditure.

Systems, such as the Facilities Maintenance Management System (FMMS), are a key interface, providing both inputs and outputs to the Asset Planning process. FMMS is the computer based planning tool for programming maintenance tasks on assets. State Water is undertaking a range of improvements to the FMMS including:

- Reconfiguring the system to the new organisational structure.
- Improving the work procedure detail and quality of both planning and historical information contained in FMMS.
- Entering surveillance inspection reports, and the resulting maintenance tasks.
- Establishing benchmarks for reporting to assist in planning future work and associated costs.

Renegotiating Service Levels
There is a strong linkage between service levels and cost. State Water has identified two key areas for agreement and change in service levels

Customer service is a key driver of expenditure. State Water maintains close contact with the wishes of customers through interactions with Customer Service Committees in each valley. This process of consultation allows State Water to receive feedback on the outcomes of current service levels and demand for new services in the future. State Water aims to provide a high value and relevant service to our customers that is consistent with their willingness to pay.

There are two large investment projects currently underway to achieve these goals:

- iWAS (internet Water Accounting System) will move customer relations to a self service model. The system will allow billing, orders and accounts to be accessible at any time over the internet. It will result in better information management for State Water's customers and will also free up labour resources to be used elsewhere. Field officers will no longer have to travel distances to answer basic customer queries, a process that previously incurred high costs. iWAS was launched in the Macquarie

and Gwydir Valleys in August 2009, with 88 customers using the system so far. iWAS will be rolled out to other valleys over the next few months. It is projected that the iWAS project will deliver an annual efficiency saving of $100,000 from 2011/12 onwards.

- Continued customer migration to a telephone based service. 2009 saw State Water set up a centralised telephone number for customer enquiries initially handling billing enquiries. Over the next 2-3 years, customer enquiries that cannot be handled by iWAS (self serve channel) will be migrated to the call centre for answering, lowering their cost of service compared to manned offices or field personnel. The current focus of migration is water ordering, as changes to the Water Management Act have made it an offence to take water without placing an order in advance.

State Water also intends to keep working with the Dams Safety Committee and industry experts over the next 12 months to further review surveillance at the remaining dams.

3.3.2 Additional Thematic Expenditure

In reviewing service levels and efficient costs, State Water has identified a number of areas where additional expenditure is required over the new regulatory period. In most cases this additional expenditure represents spending necessary to meet statutory and regulatory obligations. These areas of expenditure have been incorporated into the asset management framework as individual Thematic Plans. Table 3.4 summarises this thematic expenditure.

Table 3.4: Additional Thematic Expenditure ($09/10 '000)

	2010/11	2011/12	2012/13	2013/14
Works Approvals	190	190	190	190
Environmental and Heritage	1,985	2,770	3,644	3,478
Dam Safety	250	250	450	250
Research*	150	140	90	40
Land Management	300	300	300	300
Emergency and Security	50	100	150	250
Corporate	355	270	8	8
Discretionary Services	96	146	198	198
TOTAL	**3,376**	**4,166**	**5,030**	**4,714**

* Includes only dam safety/engineering research expenditure. Other Thematic Plans also include elements of research.

The thematic plans and their cost drivers are outlined below.

1. Environmental and Heritage Thematic Plan

State Water's Environment Management Plan (EMP) 2006-2011, outlines a series of objectives, strategies and targets which shape State Water's overall Environment and Heritage program. As the EMP was developed after the 2006 Determination, it contains a number of unfunded requirements. State Water has developed a set of projects, programs and initiatives to allow the effective implementation of the EMP over the coming four years. The EMP, as well as additional legislative and compliance requirements, drives the following components which make up the Environment and Heritage Thematic Plan:

EMP implementation

State Water is to develop and utilise a monitoring, evaluation and reporting framework for the targets and strategies under each of the objectives within the EMP, (s5 of the EMP). Taking this one step further, State Water will also identify a strategy for implementing internal and external audit with the framework.

Drivers

State Water's Operating Licence mandates the development and implementation of an Environment Management Plan (EMP) to guide the strategic direction for its environmental commitments and initiatives. This EMP has been developed, in consultation with regulatory stakeholders to ensure it is compatible with the interrelated policies and legislation, both state and federal (listed in Appendix C of the EMP). The Operating Licence requires State Water to report to IPART on its environmental performance no later than 1st September each year, with operational audits to occur bi-annually.

Environmental and Heritage Assessment Procedures

State Water has recently finalised the development of a set of Environment and Heritage Assessment Procedures to ensure the consistent application of environmental legislation across State Water for all appropriate activities. The procedures contain a set of step-by-step guides for Project Managers and a variety of tools to allow the identification of environmental impacts associated with State Water activities.

Drivers

The development of these Procedures is a key target under Objective 5 of State Water's EMP. It is also a requirement that State Water undertakes the appropriate assessment and obtains the relevant approvals under the *Environmental Planning and Assessment Act 1979* as well as a range of other environmental legislation including the *Threatened Species Conservation Act 1995, Heritage Act 1977, Fisheries Management Act 1994, National Parks and Wildlife Act 1974* and the *Commonwealth Environment Protection and Biodiversity Conservation Act 1999*. This set of Procedures and the associated staff training and awareness will ensure State Water complies with all legislative requirements.

Fish Passage Program

The Fish Passage Program integrates State Water's Strategic 10 Year Fish Passage Program and State Water's Fishway Monitoring Program – two initiatives which have been developed under the MoU with the Department of Industry and Investment (DII), formerly the Department of Primary Industries. The Program outlines State Water's commitments in terms of fish passage investigations, capital works and monitoring to ensure the capture of fish passage activities across the portfolio into one strategic planning document.

Drivers

The development of a Strategic Fish Passage Program is a key target under Objective 4 of State Water's EMP. The MoU between State Water and DII is also a requirement of State Water's Operating Licence. The Key Performance Criteria within both the EMP and MoU refer to the number of kilometres State Water opens up to the passage of fish via the construction and operation of fishways. The monitoring undertaken by State Water allows this criterion to be reported in its Annual Reports and IPART Performance Reports. The implementation of fish passage works also meets State Water's requirements under the *Fisheries Management Act 1994*.

Heritage Management Program

In 2008/09, State Water developed a Heritage Management Framework, pulling together State Water's heritage responsibilities (both European and indigenous) and key actions and requirements into one strategic planning document. The Heritage Management Program aims to implement the actions and requirements outlined in the Framework over the next fours years including: finalisation of State Water's Heritage Asset Management Strategy; finalisation of State Water's s170 Heritage Register; development of Minimum Standards of Maintenance for heritage items; development of (Heritage) Conservation Management Plans for our State significant heritage assets; and finalisation of State Water's Cultural Heritage Policy and Strategy.

Drivers

The Heritage Management Program is based on State Water's compliance requirements under Objective 9 of State Water's EMP, the State Agency Heritage Guide, the *NSW Heritage Act 1977* and the *National Parks and Wildlife Act 1974*.

Water Quality Program

EMP Objective 2, Monitor Water Quality, and Objective 3, Manage Storage Releases to Optimise Water Quality, include strategies and targets for an effective water quality program that will be continuously improved to meet our water quality obligations. State Water has commissioned a strategic review of its Water Quality activities to develop a program that addresses business needs and regulatory compliance requirements.

Drivers

The revised program arising from the strategic review will reflect EMP commitments such as algal monitoring in line with the Regional Algal Contingency Plans, as well as cold water pollution monitoring in line with the new works approvals under the Water Management Act 2000). It will also address Operating Licence requirements for asset management responsibilities under the Dam Safety Act 1978 (dam seepage monitoring) and operational monitoring for the Fish River Water Supply Scheme (drinking water quality monitoring).

2. Dam Safety Thematic Plan

One of State Water's key responsibilities is the safety of its dams. Prior to corporatisation State Water undertook a Portfolio Risk Analysis (PRA) of dams under its control. The base data however, particularly the consequence of dam failure assessments rely on studies undertaken in 2001. By 2012 much of the data underlying the current PRA will be ten years old and therefore considered to be in need of major revision incorporating changed circumstances at the dams as well as advances in dam engineering. This thematic plan involves revising the consequence assessments to ensure they meet current best practice which will enable State Water to accurately assess the current risks due to dam failures at its major storages.

Drivers

On August 22, 2006 the NSW Cabinet endorsed a "Risk Management Policy Framework for Dam Safety" put forward by the NSW Government Dams Safety Committee. This framework sets out a 'goal-based regulation' whereby compliance with established standards is sought in the long term, with a risk management regime to apply until the standards are met. The framework requires dam owners to "keep the risks of a dam under review" (Principle D.2 p4), which requires periodic revision of the PRA analysis.

3. Research Thematic Plan

This thematic plan is geared to Dam Safety/ engineering research. State Water is currently, and intends to continue, encouraging and undertaking research in areas that will assist the business and the wider community. There is a shortage of dam engineers available in Australia and State Water is addressing this by sponsoring a lecturer in dam engineering at the University of New South Wales over a five year period. In addition, State Water is engaging students from the University of Technology Sydney to undertake Capstone Projects, which are research projects of six months duration on an area of the student's interest, related to State Water's business.

For more detailed research State Water is to enter an agreement with Curtin University to sponsor PHD students to undertake research relevant to the core business. State Water will also continue to support employees to undertake research in house. An example is the Cooperative Research Centre (CRC) Forge project, the objective of which is to develop a revised hydrology methodology which will be applied by State Water staff. The CRC Forge method offers increased accuracy and certainty in flood estimation.

Drivers

The key drivers behind this thematic plan are numerous. State Water's vision is to be Australia's leading water business. Adopting industry best practises and undertaking research to be at the cutting edge of water technology are crucial to achieving the vision. To ensure that research can be effectively applied in practice requires establishing strong links between State Water and research organisations. To this end, State Water will need to continue to strengthen existing relationships with UNSW, UTS and Curtin University. Further research drivers are the regulations and expectations of the NSW Dams Safety Committee.

4. Land Management Thematic Plan

The Water Administration Ministerial Corporation is the registered proprietor of land associated with State Water's infrastructure. As a prudent, efficient and responsible owner and operator of water infrastructure assets, State Water needs to identify the extent of the land over which access or rights are required in order to fulfil its statutory functions (to capture, store and deliver water). Once the operational land is identified, a strategy to ensure continued access is to be developed. State Water is also investigating current commercial arrangements and potential increased levels of commercial activities at the storages.

Drivers

This plan is being developed in order to address two key criteria. The first is that inadequate or insufficient knowledge of the operating environment and land requirements associated with this may expose State Water to unacceptable levels of business risks. For example without ownership or restrictive covenants on land in the immediate vicinity of a storage, activities that adversely impact water quality may be conducted by local land holders. State Water will likely incur costs associated with remediation if degradation of water quality occurs. The second key driver is the requirement of the State Water Corporation Act 2004 "to maximise the net worth of the State's investment in the Corporation". This will be achieved by investigating options to maximise the business returns, without compromising its statutory functions. Such options may include increased grazing leases, generation of revenue through leases for wind farm developments or developing uses such as carbon sequestration.

5. Emergency and Security Thematic Plan

State Water's emergency and security planning has evolved from the original focus on managing dam safety emergency plans to a broader approach. State Water is implementing a holistic approach to business resilience to address the requirements of government acts, regulations and policies. Beyond State Water's long-term commitment to emergency management is the roll out of security systems at all major dam sites. This represents a significant commitment to asset security.

Drivers

The September 11 attack, Bali Bombings and other terrorist threats and incidents changed the way we goes about our business. The safety of Critical Infrastructure Dams and other water systems has also become an utmost priority. State Water is currently reviewing the safety of its dam sites, and where gaps are identified in security management, appropriate actions will be implemented. The Dams Safety Committee has completed Draft Guidelines on Security Arrangements for dam owners. Furthermore, the NSW Department of Premier and Cabinet has formalised protocols for implementation by owners of Critical Infrastructure to secure their structures and assets.

Key reference documents guiding the Emergency and Security Thematic Plan are:

- Critical Infrastructure Emergency Risk Management & Assurance; Emergency Management Australia
- DR07019 Planning for Emergencies (DRAFT); Standards Australia
- DSC2H Dam Security (DRAFT); Dam Safety Committee
- Guidelines on Dam Safety Management; ANCOLD
- Guidelines on Risk Assessment: ANCOLD
- HB167 Security Risk Management; Standards Australia
- AS27001 IT Security Management System Requirements; Standards Australia

6. Works Approvals

With the creation of the new Works Approvals under the *Water Management Act 2000*, State Water is now required to pay annual Works Approvals management fees to the New South Wales Office of Water. The fee will cover the costs incurred by the Office to monitor and audit State Water's compliance with the Works Approvals.

7. Corporate

Changes in State Water's regulatory environment require action to identify deficiencies and amend corporate systems to ensure compliance. Some of the key initiatives in this area include:

Data Cleansing

The Water Accounting System (WAS) data cleansing project involves three main components:

1. NSW Office of Water correction to 71Q calculation;
2. Archiving of historical water year data (water accounts, water source parameters, supplementary events etc.); and
3. Corrections to hierarchical and annual Announcements (such as carryover limits, account limits) due to Water Sharing Plan rule changes over the last 5 years by the then DWE (now the NSW Office of Water).

Interstate Tagging
The Water Accounting System (WAS) requires an enhancement to support interstate tagging. Interstate tagging is the procedure whereby an interstate licence and/or Works Approval nominates a NSW approval and/or licence, respectively. This is a requirement of the National Water Initiatives (NWI) as developed by the Council of Australian Governments (COAG).

Multiple Water Sources
The *Water Management Act 2000* has been implemented by Water Sharing Plans (WSPs). Typically these WSPs detail how a single water source type will be managed. Water source types are Regulated, Unregulated and Groundwater. Recently, there has been a number of WSPs gazetted that detail rules for more than one water source type. Hence the Water Accounting System (WAS) needs to be enhanced to support WSPs where there is more than one water source type.

OH&S Audits
Changes in OH&S regulations with respect to hazardous substances, dangerous goods and fall arrest systems have potential to impact on a number of State Water facilities and activities. Investigations are required to identify potential risks and plan specific treatment options.

8. Discretionary Service Levels

State Water has undertaken extensive consultation with CSCs regarding discretionary service levels. Consultation was undertaken in 3 stages:

- Establishing baseline service delivery and identifying areas of interest for additional services.
- Providing information on costs and performance indicators for additional services.
- Demonstrating the price impact of additional services.

This consultation confirmed that, for the most part, State Waters customers are satisfied with the current level of service. Broadly, this includes quarterly CSC meetings, quarterly meter reading, auditing 25% of meters annually, provision of information to customers at a local level and compliance action as per State Water's compliance procedures.

A number of CSCs endorsed additional expenditure, as outlined in Table 3.5. State Water will be accountable to the CSCs for the successful delivery of these expenditure items, with the performance indicators to be agreed with CSCs in future meetings.

Table 3.5: Discretionary Services
($09/10 '000)

	2010/11	2011/12	2112/13	2013/14
Namoi - maintenance of 2 new gauging stations	-	26	26	26
Hunter - 7 days a week operations	-	-	52	52
Fish River - maintenance of 2 new gauging stations	18	26	26	26
Lachlan - water efficiency projects	50	50	50	50
Gwydir - maintenance of 2 new gauging stations	8	24	24	24
Total	**76**	**126**	**178**	**178**

4 CAPITAL EXPENDITURE

4.1 Capital Cost Drivers and Outcomes

State Water's infrastructure assets, with a replacement value of $3.5 billion, are critical to its operation as a bulk water supply business. Therefore one of the key objectives of State Water's capital expenditure (CAPEX) program is to provide safe and functional water infrastructure that meets appropriate regulatory requirements.

State Water operates in a complex legislative and regulatory framework that requires a number of specific deliverables. Some of the major cost drivers of our CAPEX program are:

- NSW Dams Safety Committee Requirements,
- *Fisheries Management Act,*
- NSW State Weirs Policy,
- *Occupational Health and Safety Act,*
- State Water Corporation Operating Licence,
- NSW Government Cold Water Pollution Mitigation Strategy,
- State Water's Environmental Management Plan,
- Maximisation of the economic benefits of water, and
- Minimisation of the risks associated with potential flood events.

4.2 Capital Expenditure Performance between 2006/07 and 2009/10

As shown in Table 4.1, the total CAPEX over the current regulatory period is expected to be $122 million, with the Government share amounting to $89.4 million. CAPEX is expected to exceed the 2006 determination (allowed) target by $4.7 million over this period.

Figure 4.1 shows that the majority of State Water's capital expenditure over the 2006 determination period was financed by government. This is particularly evident in 2009/10 when the projected user share for 2009/10 CAPEX amounts to $11.6 million, while the government share for the same year is forecast to be $62.0 million. The majority of the Government's share, $59.7 million, is for dam safety compliance.

Table 4.1: Actual/Forecast and Allowed Capital Expenditure ($09/10 million)

$M	06/07	07/08	08/09	09/10	Total
Government Share Allowed	7.0	4.5	28.4	44.0	84.0
Government Share Actual/Forecast*	6.7	9.0	11.8	62.0	89.4
Government Share Variation	**(0.4)**	**4.5**	**(16.6)**	**17.9**	**5.5**
User Share Allowed	13.0	6.2	7.3	6.7	33.3
User Share Actual/Forecast*	7.1	9.4	4.4	11.6	32.5
User Share Variation	**(5.9)**	**3.3**	**(2.9)**	**4.9**	**(0.7)**
Total Allowed	20.1	10.7	35.8	50.8	117.3
Total Actual/Forecast*	13.8	18.4	16.2	73.6	122.0
Total Variation	**(6.3)**	**7.7**	**(19.6)**	**22.8**	**4.7**

* 2009/10 figures are forecast, not actual expenditure

Figure 4.1: Actual & Allowed Capital Expenditure by User and Government Share ($09/10 million)

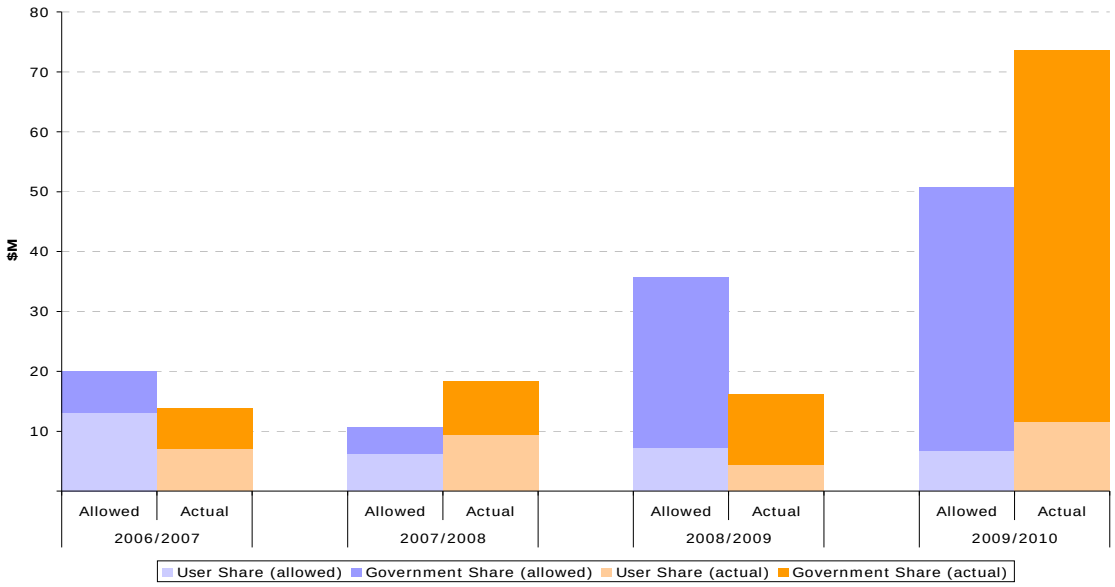
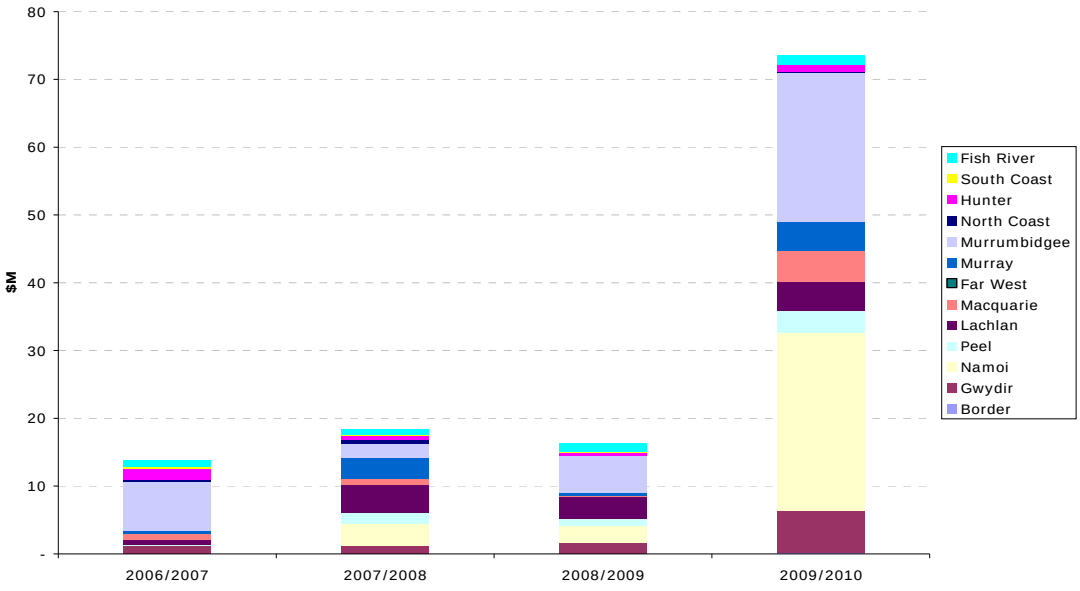


Table 4.1 and Figure 4.2 indicate that over the current determination period, the phasing of the CAPEX program is weighted towards 2009/10. This is driven by the Government share and reflects increased spending on projects as they enter the construction phase.

CAPEX was markedly underspent in 2008/09 due primarily to the organisational restructure. In addition, there were a number of delays relating to the investigation stages of the dam safety upgrade projects. Section 4.3 provides details. A significant catch-up of the 2008/09 underspend is projected for 2009/10, with several projects under construction. In addition, State Water has implemented enhanced project delivery systems during the current determination period (detailed in Section 4.4), which provide confidence that expenditure forecasts will be met.

Figure 4.2: Actual/Forecast Capital Expenditure by Valley ($09/10 million)



* 2009/10 figures are forecast, not actual expenditure

Table 4.2 shows that the Namoi and Murrumbidgee valleys features have significant CAPEX programs, due to the Keepit and Blowering dam safety upgrades respectively. Expenditure on these projects in 2009/10 is forecast at $24.8 million (Keepit dam upgrade) and $16.4 million (Blowering dam upgrade).

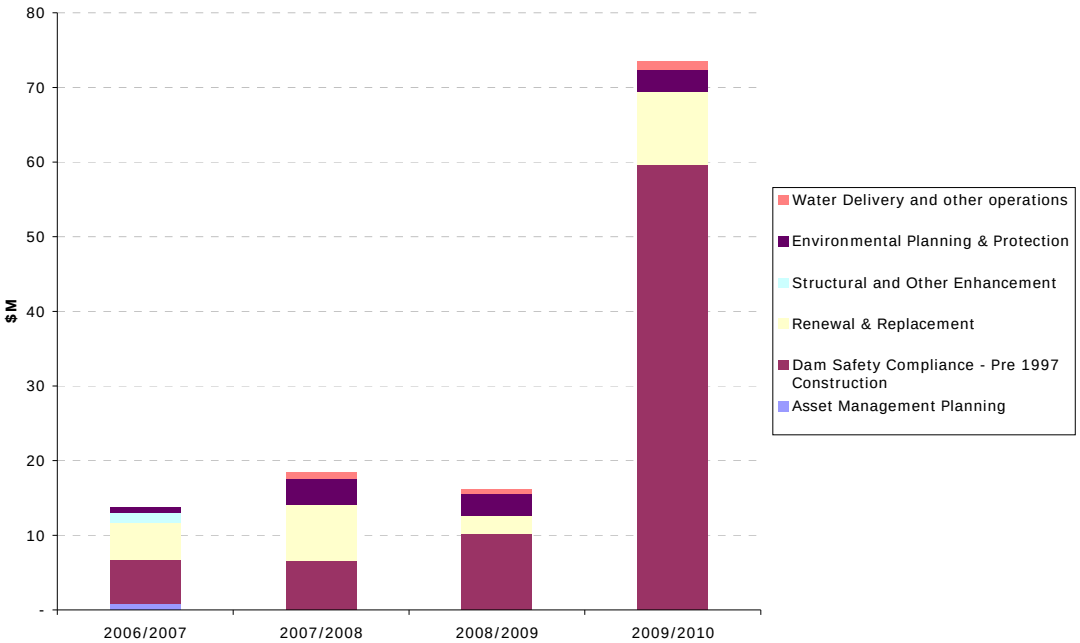
Table 4.2: Actual/Forecast Capital Expenditure by Valley ($09/10 million)

$M	2006/07	2007/08	2008/09	2009/10	Total
Border	0.1	0.1	0.1	0.1	**0.4**
Gwydir	1.1	1.1	1.5	6.2	**9.9**
Namoi	0.0	3.3	2.6	26.3	**32.3**
Peel	0.2	1.6	1.0	3.2	**6.0**
Lachlan	0.7	4.1	3.3	4.3	**12.4**
Macquarie	0.8	0.8	0.2	4.5	**6.3**
Murray	0.4	3.2	0.4	4.3	**8.4**
Murrumbidgee	7.4	2.1	5.3	21.9	**36.7**
North Coast	0.3	0.5	0.1	0.2	**1.1**
Hunter	1.5	0.6	0.5	1.0	**3.6**
South Coast	0.4	0.2	0.0	0.1	**0.6**
Fish River	0.9	0.8	1.2	1.4	**4.3**
Total Actual/Forecast*	**13.8**	**18.4**	**16.2**	**73.6**	**122.0**

* 2009/10 figures are forecast, not actual expenditure

As shown in Figure 4.3 and Table 4.3, dam safety compliance projects formed a major part of State Water's CAPEX during the 2006 Determination period. This trend is also expected to continue during the next determination period.

Figure 4.3: Actual Capital Expenditure by Activity ($09/10 million)



During the current determination period State Water spent $24.6 million in asset renewal and replacement program. A further $10.1 million was spent in environmental compliance, including cold water pollution mitigation activities.

Table 4.3: Actual and Allowed Capital Expenditure by Activity ($09/10 million)

$M	06/07	07/08	08/09	09/10	Total
Asset Management Planning	0.9	-	-	-	**0.9**
Dam Safety Compliance - Pre 1997	5.8	6.6	10.2	59.7	**82.3**
Renewal and Replacement	4.9	7.5	2.4	9.8	**24.6**
Structural and Other Enhancements	1.3	-	-	-	**1.3**
Environmental Planning & Protection	0.7	3.4	3.0	2.9	**10.1**
Water Delivery & Other Operations	-	0.9	0.6	1.1	**2.7**
Total Actual/Forecast*	13.8	18.4	16.2	73.6	**122.0**

* 2009/10 figures are forecast, not actual expenditure

4.3 Variance from 2006 Determination

As previously stated, during the 2006 determination period the implementation of the cost structure reform process led to significant staff turnover and major changes to the workforce. These changes led to deferral of non-critical maintenance programs impacting on renewal and replacement capital expenditure.

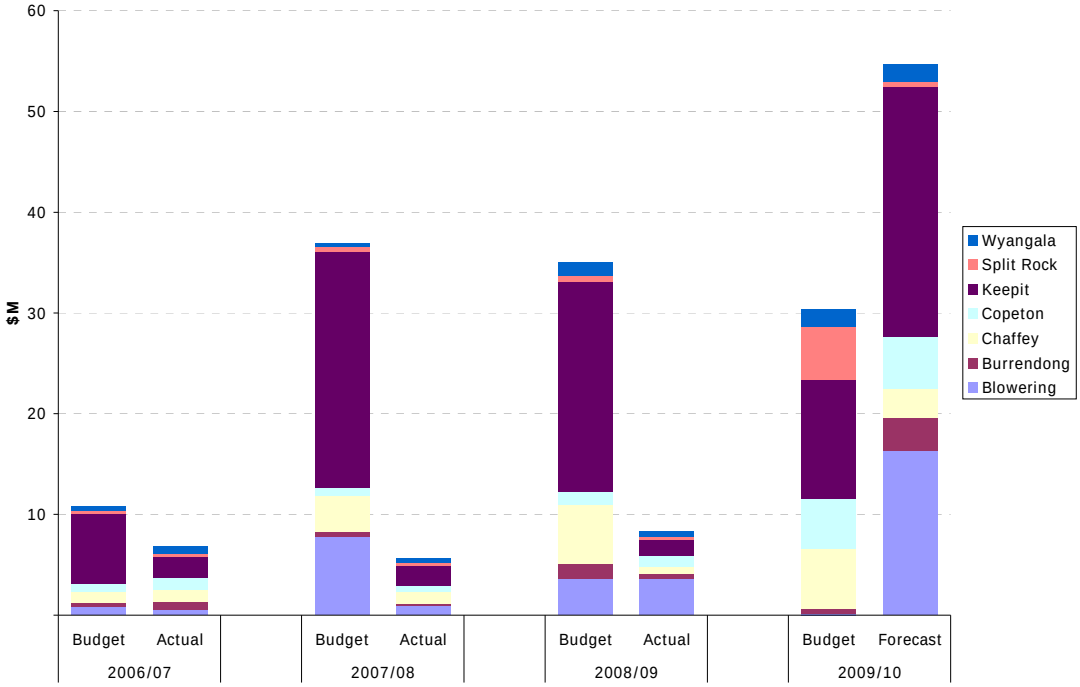
Major Projects Variations

Reprioritisation of several major projects also resulted in variations in actual/forecast expenditure relative to budget amounts. These variations are shown in Table 4.4 and Figure 4.4.

Table 4.4: Budget & Actual/Forecast CAPEX for Dam Safety Upgrade Projects ($nominal)

$M	2006/07		2007/08		2008/09		2009/10	
	Budget	Actual	Budget	Actual	Budget	Actual	Budget	Forecast
Blowering	0.89	0.56	7.80	0.89	3.68	3.61	0.12	16.36
Burrendong	0.42	0.75	0.53	0.25	1.41	0.49	0.56	3.30
Chaffey	1.00	1.30	3.50	1.18	5.90	0.77	5.90	2.81
Copeton	0.77	1.09	0.75	0.56	1.20	1.01	5.00	5.13
Keepit	6.95	2.06	23.50	2.00	20.95	1.57	11.80	24.84
Split Rock	0.35	0.35	0.50	0.30	0.50	0.36	5.20	0.49
Wyangala	0.42	0.76	0.40	0.47	1.37	0.52	1.76	1.68
Total	**10.81**	**6.87**	**36.98**	**5.65**	**35.01**	**8.33**	**30.34**	**54.61**

Figure 4.4: Projected and Actual Capital Expenditure (nominal $)



Further details on the reasons for variations in each of these projects follows.

Blowering Upgrade

The expenditures in 2006/07 and 2007/08 were less than budgeted because the commencement of construction was postponed to 2008/09 financial year to allow additional investigative works on embankment and training wall stability issues, which were identified during the detailed design phase.

Consequently, the detailed design took longer time than expected, and the Early Contractors Involvement (ECI) process was pushed forward to 2008/09. There were resulting delays in finalising the construction contract documents, as well as in calling for tenders for Stage 1 Works. Overall, the construction is approximately one year behind than what was predicted at the time of 2006 determination. The project is now under construction and is expected to be completed in 2011/12.

Burrendong Upgrade

Some of the investigations scheduled in 2007/08 were undertaken during 2006/07 to complement related engagements such as geotechnical and cold water pollution studies. Construction scheduled for 2008/09 was postponed to 2009/10 due to further options refinement instigated by the value management exercise.

Following options refinement in 2006/07, the flood security upgrade program was revised and a staged upgrade approach to full Probable Maximum Flood (PMF) compliance was recommended internally and approved by the Board of State Water. While the adopted approach was deemed more cost efficient, it resulted in additional investigations, thereby pushing the detailed design and construction program forward by one year. Construction is now expected to commence in 2010.

Chaffey Upgrade

The Chaffey Dam safety Upgrade was programmed to commence in 2006 but was delayed so that the funding of the potential augmentation could be considered by stakeholders. There has been strong local support for the proposal to augment the dam to a 100GL storage capacity, in conjunction with the dam safety upgrade works. State Water has been engaged in extended negotiations with the stakeholders on the appropriate cost share for the proposed augmentation. As this issue is still to be resolved, State Water intends to proceed to construction, for the dam safety upgrade works only, in early 2010.

Keepit Upgrade

The environmental impact assessment process identified a number of issues that required consideration and investigation, including fish passage, inundation impacts in the Peel valley and associated compensation arrangements, and other land matters.

The requirements of the then Department of Primary Industries (DPI) to provide a fish passage at Keepit Dam would have cost in excess of $35 million. State Water subsequently entered into a lengthy negotiation with the then DPI and agreed on an offset fish passage program in the downstream weirs which will cost $18 million, resulting in a saving of $17 million. However, these negotiations and associated studies delayed the start of construction by two years, to 2009/10.

Split Rock Upgrade

The construction of the Split Rock upgrade was delayed as it was tied in with the environmental impact assessment process identified for Keepit, and in particular, the fish passage issues.

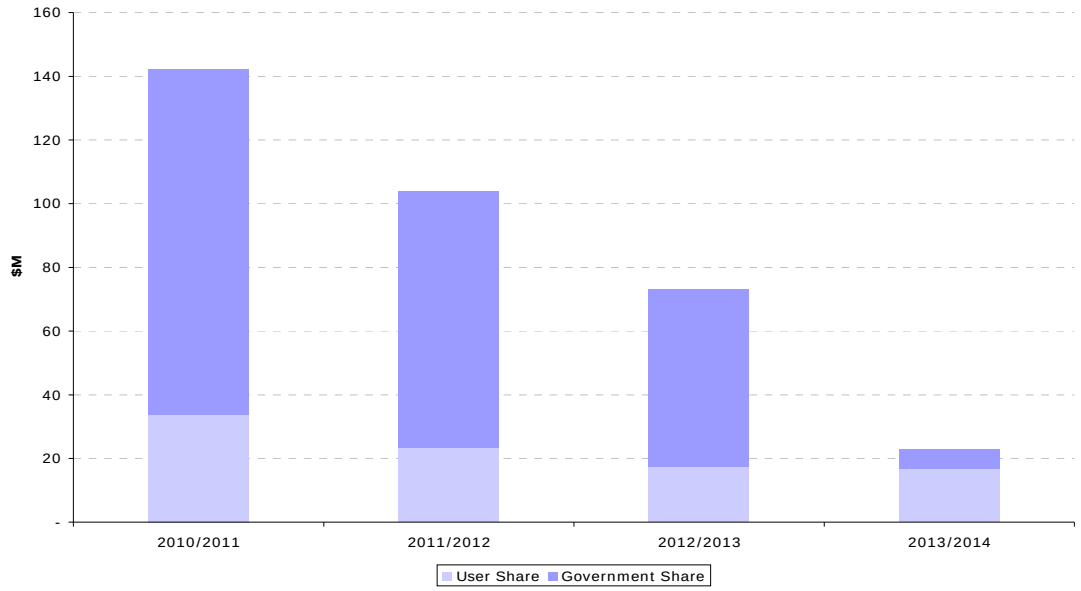
Wyangala Upgrade

Wyangala Upgrade has been delayed due to need to investigate additional spillway gate raising options, based on similar experience by other water authorities. Initially, a staged upgrade to PMF was envisaged, which involved complex investigation to confirm the scope of works. This was reviewed and it was decided to undertake a lower risk reduction option and to reassess the residual risks at a later date. The project is now divided into three contracts with three separate environmental assessments, with construction on the first part of the project expected to commence in 2010.

4.4 2010/14 Forecast Capital Expenditure Program

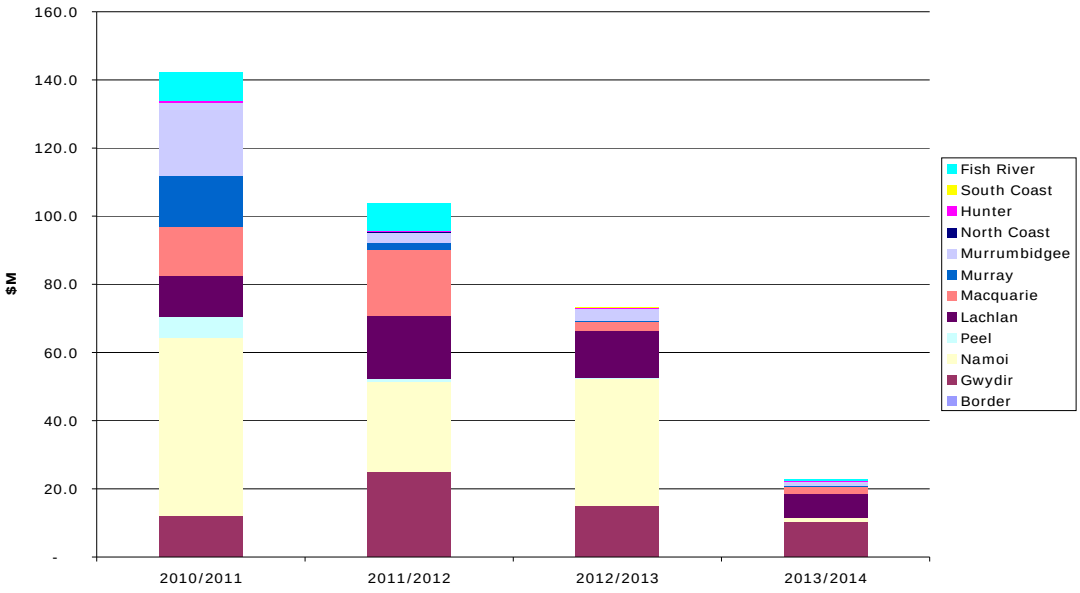
Figure 4.5 shows that the majority of State Water's projected capital expenditure over the next determination period is projected to be financed by government.

Figure 4.5: Forecast Capital Expenditure by Government and User Share ($09/10 million)



State Water is proposing a CAPEX program of $342 million for the next determination period, a substantial increase over the current CAPEX program. The increase is primarily due to construction activity of the dam safety upgrade projects, and related environment compliance works, being at their peak during the next determination period. Figure 4.6 provides a breakdown of this proposed CAPEX program.

Figure 4.6: Forecast Capital Expenditure by Valley ($09/10 million)



As previously indicated, the bulk of the forecast CAPEX relates to dam safety compliance projects. Therefore valleys such as Namoi, Gwydir and Murrumbidgee where some of the big dam safety upgrade projects will be implemented, show extensive CAPEX (see Table 4.5). Further valley-based expenditure details are provided in Appendix 4.

Table 4.5: Forecast Capital Expenditure by Valley ($09/10 million)

$M	2010/11	2011/12	2012/13	2013/14	Total
Border	0.2	0.1	0.1	0.0	**0.4**
Gwydir	11.9	25.0	15.0	10.1	**62.1**
Namoi	52.1	26.3	37.3	1.3	**117.1**
Peel	6.3	0.8	0.1	0.1	**7.3**
Lachlan	12.1	18.5	13.9	7.1	**51.7**
Macquarie	14.5	19.3	2.6	1.8	**38.2**
Murray	14.7	2.2	0.2	0.3	**17.4**
Murrumbidgee	21.4	3.0	3.6	1.3	**29.3**
North Coast	0.1	0.0	0.0	0.0	**0.1**
Hunter	0.5	0.3	0.2	0.1	**1.1**
South Coast	0.1	0.1	0.1	0.0	**0.3**
Fish River	8.2	8.1	0.0	0.5	**16.9**
Total	**142.1**	**103.9**	**73.1**	**22.8**	**342.0**

Note: Totals may not sum due to rounding

A breakdown of forecast CAPEX by activity for 2010/11 (first year of the next determination period) and 2013/14 (the last year of next determination period) is shown in Figure 4.7. The figure highlights a major shift in the structure of State Water's CAPEX program over the next determination period. The pre-1997 dam safety compliance projects that make up 71% of the total CAPEX in the first year of the next determination will reduce to just 2% by the end of the next determination period.

Figure 4.7: Forecast Capital Expenditure by Activity

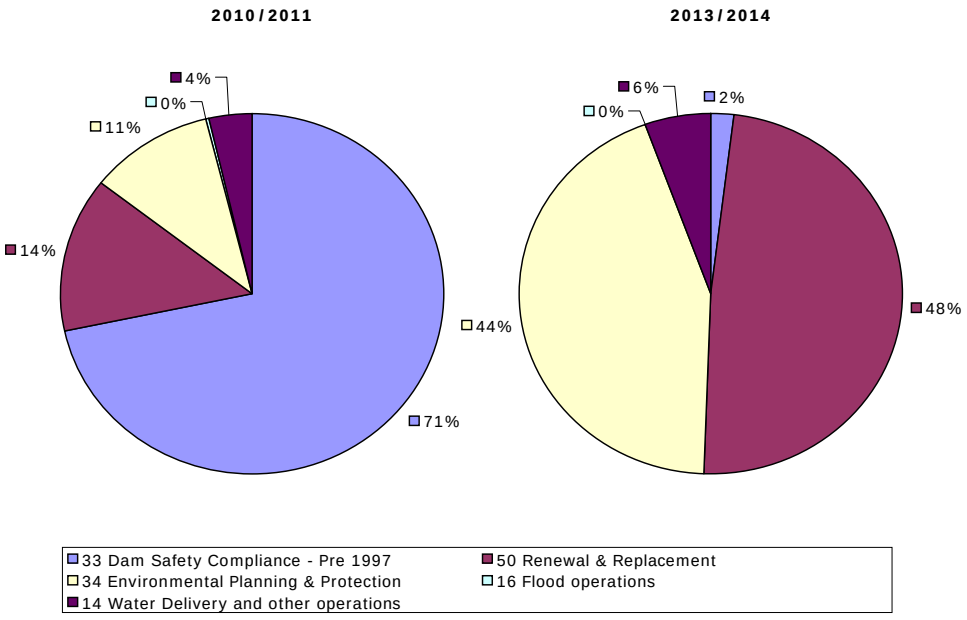
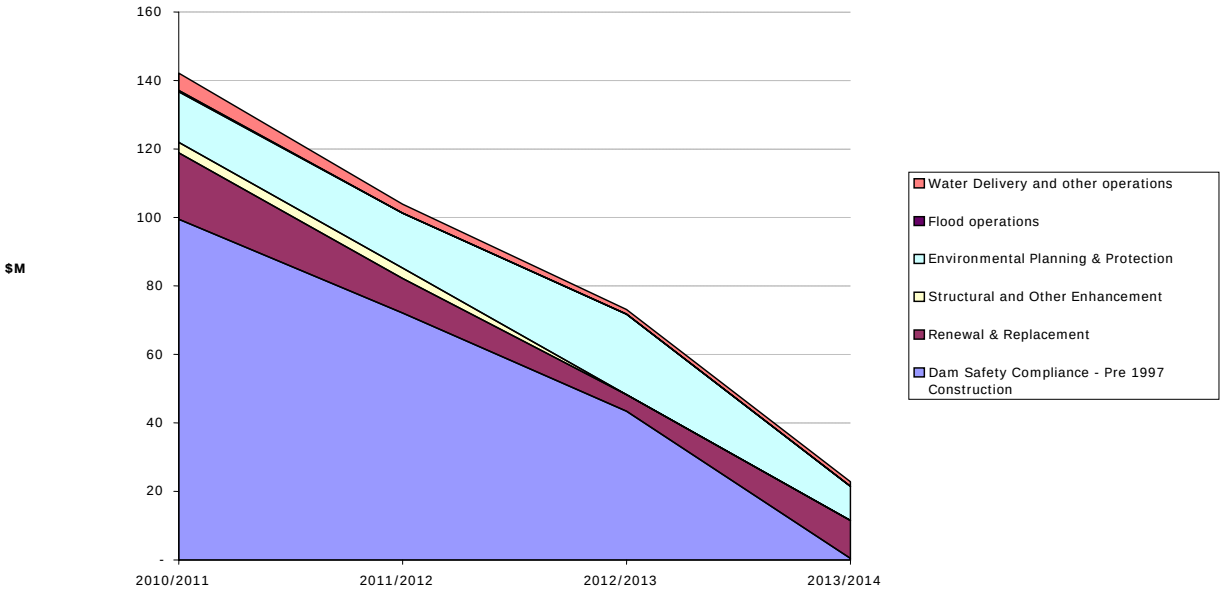


Figure 4.8 shows the ramping down of dam safety expenditure during the next Determination period.

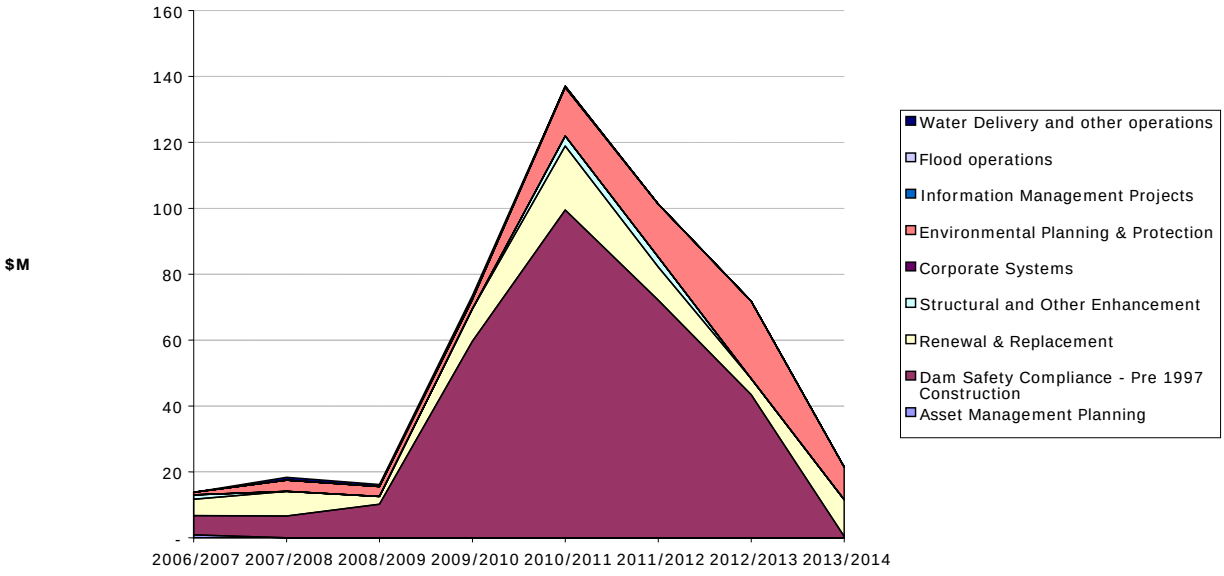
Figure 4.8: Forecast Capital Expenditure by Activity ($09/10 million)



While dam safety compliance forms the bulk of forecast CAPEX, significant expenditure, amounting to $45.5 million, is also planned in renewal and replacement of assets over the next determination period. As previously outlined, these projects have been identified through the asset criticality and service potential assessment process.

In addition, during the next determination period, $10.3 million will be spent in upgrading and modernising water delivery and other operational aspects of business. These projects are required to deliver future efficiency benefits for the business.

Figure 4.9: Past and Forecast Capital Expenditure by Activity ($09/10 million)



4.4.1 Efficiency of 2010/11 to 2013/14 Forecast CAPEX Program

State Water has developed a Capital Investment Strategy (CIS) to ensure it correctly focuses its resources to achieve effective and efficient enhancement of its asset base. The CIS has been developed in the context of State Water's:

- Corporate Plan
- Statement of Corporate Intent
- Asset Management Framework
- Total Asset Management Plan

Priorities identified within State Water's Asset and Thematic plans also impact on the CIS process. Under the CIS, requirements for expenditure of capital on new assets are determined from drivers such as customer service, regulation and compliance, new business opportunities and various stakeholder inputs.

The CIS defines the process by which State Water develops its Capital Investment Plan (CIP). The CIP details State Water's list of prioritised capital works projects that have been selected to progress to the construction phase.

The condition, service capability, technical currency, regulatory compliance and the criticality of all assets is reviewed at least once every five years. These assessments, conducted as part of a rolling program, provide the basis for capital expenditure requirements to be determined.

Figure 4.10: Risk Cost (x and y axis) and MEERA Replacement Costs (circle area) of State Water assets.

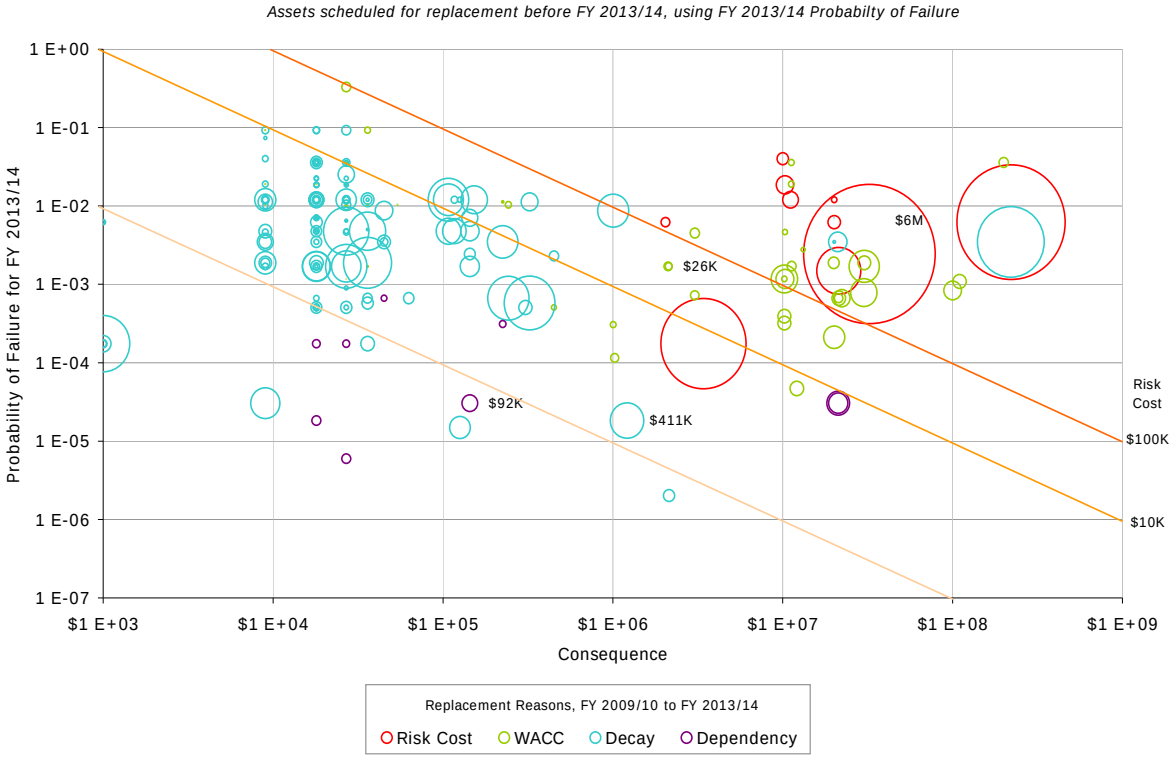


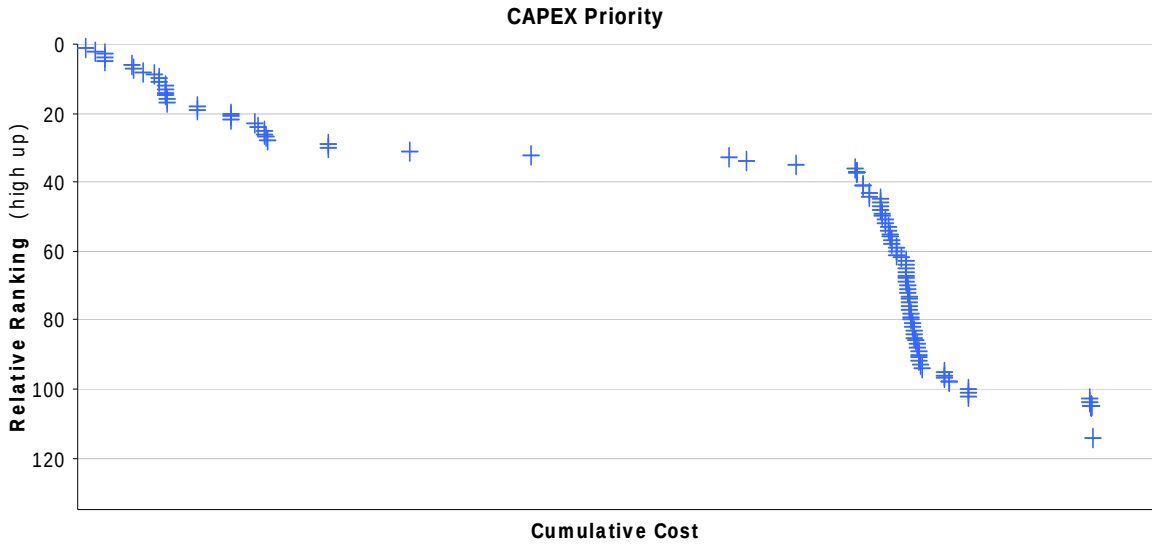
Figure 4.10 represents risk costs of State Water assets, showing assets identified for renewal and/or replacement over the next determination period. Assets with a high probability of failure (as measure on the y-axis) and a high monetary consequence associated with that failure (as measure on the x-axis) are scheduled for intervention (renewal or replacement) because of their high risk cost. Other assets, costing less but also with high consequences associated with failure, have been identified for intervention because it costs less to intervene than to bear the annual risk cost, based on the weighted average cost of capital (WACC). A third category of assets have been identified as those expected to reach the end of their design life. The last category are assets which would be replaced as part of the replacement program for any of the preceding assets, as their physical construction is dependent upon the same.

State Water has developed a stringent set of project initiation procedures under its Capital Investment Strategy. Following identification of the need for a project, the Project Sponsor must appoint a Project Manager. The Project Manager must complete a Project Charter, which includes the scope, rationale and priority of the project, and a summary of the expected costs and benefits.

For higher value and/or higher risk projects further consideration of options and completion of a Basic Economic Assessment may need to be carried out. The Project Charter also indicates the level of documentation required to justify the project, ranging from the Project Charter only to a fully developed business case, depending on expected cost and risk of the project.

All Project Charters are submitted to State Water's Budget and Expenditure Review Panel (BERP). The information contained in the Project Charters (predominantly the NPV analysis and priority) allows the BERP to recommend a prioritised annual budget, including capital expenditure expectations for approval by the Board of State Water. Figure 4.11 shows the forecast CAPEX over the next determination period, ranked on the basis of NPV/I.

Figure 4.11: Capital Expenditure Prioritisation



4.4.2 Deliverability of Forecast CAPEX Program

To ensure the successful completion of this large CAPEX program, State Water has created the Major Projects business unit whose principle focus is to be the internal service provider responsible for delivery of major projects assigned under the asset plans.

Under the new Asset Management Framework, the performance of the CAPEX program is now monitored to ensure its timely and cost effective delivery. Two internal review mechanisms that enable this ongoing review are:

Business Expenditure Review Panel (BERP)

The BERP's role is to:

- Specify budgetary processes and requirements for approval, performance review and forecasting
- Review annual business unit operating and capital budget submissions for consistency with corporate objectives and strategies
- Review investment proposals for consistency with corporate objectives and strategies
- Recommend prioritised annual budgets, investment proposals and forecasts for approval by the Chief Executive Officer and the Board
- Monitor and review overall performance of State Water's operating and capital programs during the budget year against budgetary and physical objectives
- Review corporate implementation strategies and outcomes against corporate plans, and undertakings made in the Statement of Corporate Intent, the Operating Licence, and in other relevant documents
- Recommend remedial actions to the Chief Executive Officer
- Provide reports on program performance, forecasts and issues

The BERP meets quarterly or as required by the annual budgetary cycle or events. The BERP will meet to monitor and review, among other things, State Water's operating and capital submissions, investment proposals and performance. The BERP is a key group in the implementation of the CAPEX program. It is responsible for recommending projects for inclusion in TAMP, asset plans and the Capital Investment Plan.

Program Control Group (PCG), Major Projects

The PCG reports to the State Water Executive and comprises senior State Water project managers and as well as independent members with expertise in the delivery of major projects. It is responsible for monitoring and reviewing major projects and their planning and performance. The PCG meets on monthly basis and provides the Board of State Water with a monthly performance update on all major capital projects.

5 REVENUE REQUIRED FOR CAPITAL INVESTMENT

5.1 Rolling forward State Water's Regulatory Asset Based for long lived assets

An opening RAB value of $465.5 million has been established by rolling forward the previously determined 1 July 2005 RAB of $294.2 million by:

- Adding actual / forecast prudent capital expenditure over this period (net of capital contributions)
- deducting allowed regulatory depreciation
- indexing the annual closing regulatory asset base for actual/forecast inflation.

Table 5.1: Roll Forward of Regulatory Asset Base Values (2005/06 to 2009/10)

Nominal $M	2005/06	2006/07	2007/08	2008/09	2009/10
Opening value	294.2	313.9	333.5	360.0	385.0
Capital Expenditure	12.1	12.6	17.4	15.8	73.6
Depreciation	(2.0)	(2.3)	(2.5)	(2.9)	(3.6)
Disposals	-	-	-	-	-
Indexation	9.6	9.3	11.6	12.1	10.5
Closing value	**313.9**	**333.5**	**360.0**	**385.0**	**465.5**

Note: Totals may not add due to rounding

Table 5.2 shows resulting RAB values over the determination period, based on forecast capital expenditure requirements outlined in Chapter 4, depreciation based on average asset lives of 83 years and forecast CPI indexation of assets.

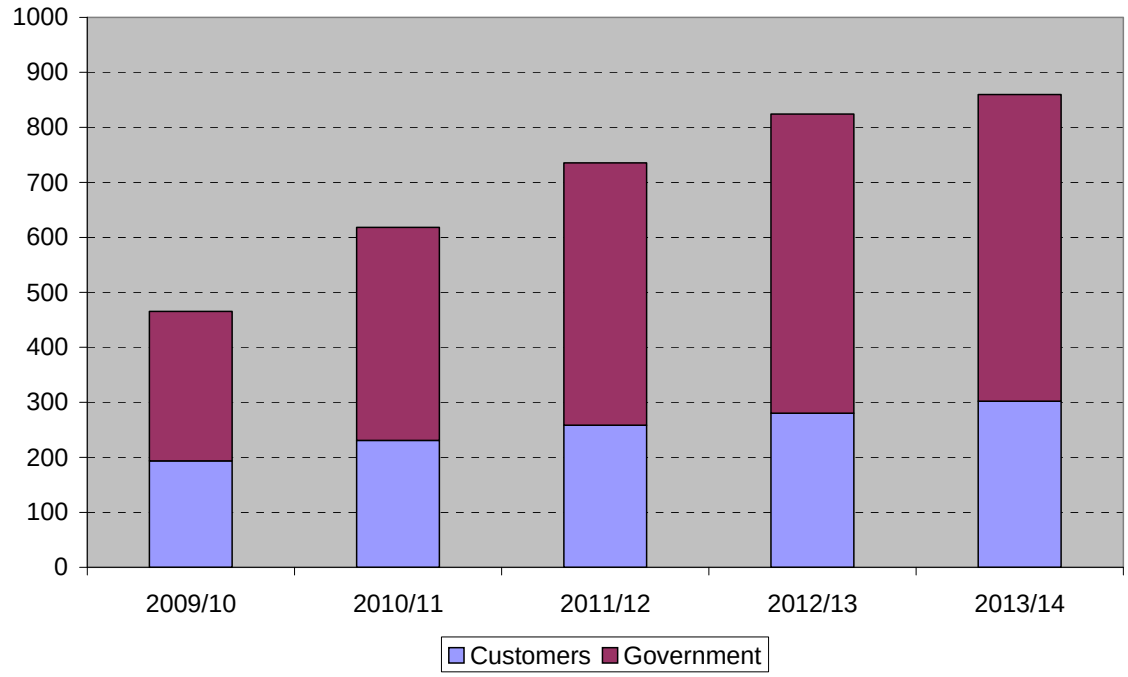
Table 5.2: Roll Forward of Regulatory Asset Base Values (2009/10 to 2013/14)

Nominal $M	2009/10	2010/11	2011/12	2012/13	2013/14
Opening value	385.0	465.5	618.0	735.6	824.0
Capital Expenditure	73.6	145.7	109.1	78.8	25.2
Depreciation	(3.6)	(6.6)	(8.3)	(9.7)	(10.6)
Disposals	-	-	-	-	-
Indexation	10.5	13.5	16.8	19.4	20.9
Closing value	465.5	618.0	735.6	824.0	859.5

Note: Totals may not add due to rounding

The significant increase in RAB is driven primarily by the large increases in dam safety expenditure, which is 100 per cent funded by Government. Graph 5.1 shows the allocation of RAB between Government and customers.

Graph 5.1: Closing RAB Values for Government and Customers 2009/10 to 2013/14 (nominal $million)



5.2 Rate of Return

5.2.1 Proposed WACC

The weighted average cost of capital (WACC) represents a return to debt and equity holders for committing capital to State Water and bearing the risks associated with the business. It is a key parameter within the regulatory framework, both in terms of ensuring the ongoing financial viability of State Water and providing incentive for efficient investment in essential water infrastructure.

In its review of the National Access Regime, the Productivity Commission's observed that regulators should 'err' on the side of promoting long term investment in new and existing infrastructure assets:

> *"The possible disincentives for investment in essential infrastructure services are the main concern. In essence, third party access over the longer term is only possible if there is investment to make these services available on a continuing basis. Such investment may be threatened if inappropriate provision of access, or regulated terms and conditions of access, lead to insufficient returns for facility owners."* [1]

State Water contends that the 6.5 per cent real pre-tax WACC provided in IPART's 2006 Determination[2] does not adequately compensate for the underlying risks faced by State Water. State Water has experienced significant shortfalls in regulated earnings over the current regulatory period, highlighting the significant regulatory risk associated with demand fluctuation given State Water's volumetric based prices and fixed costs.

[1] Productivity Commission, Review of the National Access Regime, Position Paper
[2] IPART, Bulk Water Prices for State Water Corporation and Water Administration Ministerial Corporation, September 2006

IPART has established WACC parameters in recent water determinations predicated on low business risk assumptions normally associated with metropolitan water businesses with stable and predictable regulated cash flows. However as clearly evidenced over the current regulatory period, State Water's regulated cash flows are subject to significant volatility. The volatility is exacerbated by State Water's high operating leverage (operating costs are predominantly fixed) and high financial leverage under IPART's assumed 60 per cent debt gearing benchmark.

State Water's regulatory framework does not provide the same level of earnings stability offered to metropolitan water utilities. As a result, debt and equity holders require higher rates of return to compensate for the higher relative regulatory risk. If higher returns are not provided through the regulatory framework, then incentives to invest are weakened and owners will seek to invest in lower risk assets offering equivalent rates of return.

State Water's unique risk characteristics warrant reconsideration of WACC parameters adopted in recent metropolitan water determinations. Specifically, State Water proposes a higher WACC through either:

- An increased equity beta and lower credit rating benchmark, assuming that debt gearing assumptions remain unchanged, or
- Lower debt gearing, assuming that equity beta and credit rating assumptions remain unchanged.

State Water believes that the latter option better reflects market practice, where companies with higher business risk generally adopt lower financial risk in order to maintain an 'average' equity risk position (i.e. equity beta of around 1.0). The above average financial risk and below average business risk attributes of regulated utilities have cancelling effects on the equity beta. However, given that State Water has higher business risk relative to most regulated utilities, a more conservative debt gearing profile is required in order to maintain an 'average' equity risk position and an investment grade credit rating.

State Water proposes that a debt gearing level of 30 per cent represents an efficient capital structure for a rural bulk water business. Based on State Water's business risk profile, a reduction in the target gearing benchmark is required to enable State Water to maintain an investment grade rating based on notional revenue requirements outlined in this submission.

State Water supports the real pre-tax WACC framework and cost of debt and equity formulations adopted in previous determinations. Based on market-based parameters adopted by IPART in recent water determinations, State Water proposes a real pre-tax WACC of 7.9 per cent. This represents a 1.4 per cent increase to the WACC adopted in State Water's 2006 Determination, largely driven by:

- An increase in debt margin from 1.2 per cent to 3.15 per cent, reflecting significant increases in credit spreads in response to the global financial crisis; and
- A reduction in debt gearing and increase in asset beta, reflecting State Water's higher volumetric risks associated with water availability and demand fluctuation, 60 per cent variable pricing and high operating leverage.

The proposed changes to debt gearing and asset beta are the only variations to the WACC parameters adopted in recent IPART determinations for Sydney Catchment Authority, Gosford City Council and Wyong Shire Council.

Table 5.3: Comparison of WACC Parameters

IPART Determinations WACC Parameters (Mid-point)	2006 State Water	2008 Sydney Water	2009 SCA	2009 Gosford / Wyong Councils	2010 State Water Proposed
Nominal Risk Free Rate	5.8%	6.1%	4.3%	4.3%	4.3%
Inflation	3.3%	3.6%	2.5%	2.5%	2.5%
Real Risk Free Rate	2.4%	2.4%	1.8%	1.8%	1.8%
Market Risk Premium	6.0%	6.0%	6.0%	6.0%	6.0%
Debt Margin	1.2%	3.4%	3.15%	3.15%	3.15%
Debt to Total Assets	60%	60%	60%	60%	30%
Gamma	0.4	0.4	0.4	0.4	0.4
Asset Beta	0.37	0.37	0.37	0.37	0.65
Equity Beta	0.9	0.9	0.9	0.9	0.9
Tax Rate	30%	30%	30%	30%	30%
Cost of Equity (nominal)	11.2%	11.5%	9.7%	9.7%	9.8%
Cost of Debt (nominal)	7.0%	9.5%	7.5%	7.5%	7.5%
WACC (real pre-tax)	**6.5%**	**7.5%**	**6.5%**	**6.5%**	**7.9%**

The proposed increase in WACC from 6.5 per cent to 7.9 per cent is expected to impact average prices to end-users by a cumulative 8.2 per cent in real terms over the 4 year regulatory period (refer Chapter 7 for further information). Preliminary discussions held with bulk water customers have indicated a preference for a higher WACC, rather than an increase to the fixed charge component of tariffs.

5.2.2 WACC Parameters

Risk Free Rate and Inflation

State Water supports the use of the 10-year nominal government bond rate for the nominal risk free rate, swap market data to estimate inflation and the Fisher equation to derive the real risk free rate. For the purposes of this submission, State Water has used the risk free rate and inflation parameters adopted in IPART's recent determinations for the Sydney Catchment Authority, Gosford City Council and Wyong Shire Council.

State Water acknowledges that both the nominal risk free rate and expected inflation parameters should be updated close to the date of the final determination to reflect prevailing market conditions. Pending this update, the proposed parameters are as follows:

Proposed Nominal Risk Free Rate: 4.3 per cent

Proposed Inflation Estimate: 2.5 per cent

Proposed Real Risk Free Rate: 1.8 per cent

Market Risk Premium

In recent water determinations, IPART has adopted a market risk premium (MRP) range of 5.5 per cent to 6.5 per cent. There is also substantial regulatory precedence from other Australian regulators in support of a mid-point MRP of 6.0 per cent.

The AER's recent final decision on its review of WACC parameters for electricity transmission and distribution networks determined an MRP value of 6.5 per cent, stating that prevailing market conditions suggest a MRP of over 6.0 per cent may be reasonable given the uncertainty surrounding the global economic crisis.[3]

However, having regard to the desirability of regulatory certainty and stability, State Water proposes that a mid-point market risk premium value of 6.0 per cent be retained.

Proposed Market Risk Premium: 6.0 per cent

Debt Gearing

Common regulatory practice is to benchmark a regulated business's capital structure by reference to gearing levels of businesses operating in similar industries rather than using the regulated business's actual capital structure. In this regard, it is important that that an efficient capital structure benchmark for State Water be based on the operating characteristics and risk profiles of similar rural bulk water entities, not large metropolitan retail water entities.

In previous determinations IPART has adopted a 60 per cent debt gearing benchmark for both State Water and metropolitan water businesses. However, a 60 per cent debt gearing benchmark does not represent an efficient capital structure for State Water given:

- High volumetric risks, high operating leverage and resultant volatility in regulated earnings, reduces State Water's capacity for financial leverage and necessitates higher levels of financial flexibility,
- Adoption of 60 per cent gearing would result in State Water's stand-alone credit rating falling well below investment grade, and
- The relative benefits of debt versus equity financing as a means of reducing cost of capital are reduced given recent significant increases in debt margins following the global financial crisis.

Business risk is an important determinant of capital structure:

> *"Generally, the capital structure of a firm is driven by the business risk of the firm and the cost of debt versus equity. Where the business risk of a firm is high, it is expected that the firm will carry less debt and vice versa."* [4]

Regulated water and electricity utilities can generally afford to take on higher levels of financial leverage, underpinned by stable and predictable regulated cash flows. Recent regulatory determinations suggest that 50 per cent to 60 per cent gearing forms an efficient benchmark for Australian water utilities. However, these outcomes relate to relatively larger water companies with stable demand and predictable cash flows. State Water does not benefit from stable and predictable regulated cash flows. Higher business risk means that State Water cannot afford the same level of financial leverage typical of lower risk metropolitan water utilities.

[3] Australian Energy Regulator, Review of the weighted average cost of capital (WACC) parameters, Electricity transmission and distribution network service providers, May 2009

[4] IPART, NSW Rail Access Undertaking - Review of rate of return and remaining mine life from 1 July 2009, May 2009, p28

Actual gearing levels of Australian rural water businesses are typically well below the 60 per cent benchmark previously adopted by IPART. Sun Water (Queensland) has the highest gearing levels at 36.6 per cent. However Sun Water has a large, diversified customer base, comprising predominantly of urban and industrial customers. Similarly, SA Water (South Australia) and Water Corporation (Western Australia) supply both urban and rural customers. Table 5.4 shows that predominantly rural based water businesses (both wholesale and retail) typically have little or no debt.

Table 5.4: Debt Gearing of Rural Water Businesses

30 June 2008	State	Customer Base	Debt Gearing
State Water	NSW	Rural Wholesale	10.5%
Goulburn Murray Valley	VIC	Rural Wholesale	1.1%
Southern Rural Water	VIC	Rural Wholesale	0.0%
Lower Murray	VIC	Rural Wholesale	0.1%
GWM Water	VIC	Rural Wholesale	1.6%
Sun Water	QLD	Urban / Rural	36.6%
SA Water	SA	Urban / Rural	19.7%
Water Corporation	WA	Urban / Rural	20.1%
Murray Irrigation	NSW	Rural Retail	0.0%
Murrumbidgee Irrigation	NSW	Rural Retail	0.0%

Source: Annual Reports

In order to maintain an investment grade rating, State Water is required to maintain adequate debt servicing capacity during periods of both high and low volumetric water sales. Due to high variability in water availability, volumetric pricing and high operating leverage, State Water's regulated earnings are very volatile, limiting capacity for financial leverage. High gearing levels would increase the overall level of fixed costs (through higher interest charges), thereby increasing volatility in both pre-tax earnings and interest coverage.

[redacted]

Based on the notional revenue requirements outlined in this submission, State Water's projected credit metrics under alternative debt gearing assumptions are shown in Table 5.5:

[5] Fitch Ratings, Credit Analysis State Water Corporation (Private and Confidential), April 2008

[6] At the time of the submission, State Water's 2009 credit rating was being reviewed by Moody's.

Table 5.5: Credit Rating Outcomes Based on Notional Revenue Requirements

2010/11 to 2013/14	20% Gearing	30% Gearing	40% Gearing	50% Gearing	60% Gearing
FFO Interest Cover - 4 Year Average - Rating	5.9 A+	4.0 BBB+	3.0 BBB	2.4 BB+	2.0 B+
EBIT Interest Cover - 4 Year Average - Rating	5.1 A+	3.4 BBB+	2.5 BBB	2.0 BBB	1.7 BB
FFO to Total Debt - 4 Year Average - Rating	36.7% AA	22.0% BBB+	14.6% BB+	10.2% BB+	7.3% B+

The above analysis shows that gearing assumptions of 30 per cent are consistent with the BBB to BBB+ credit rating benchmark used to determine debt margin. At gearing levels of 40 per cent and above, rating outcomes are at risk of falling below investment grade.

Financial outcomes tabled above assume 100 per cent cost recovery of notional revenue requirements. Given the considerable uncertainty surrounding State Water's consumption forecasts, there is a significant risk that State Water will under recover notional revenue requirements. Prudent business practice allows for adequate financial flexibility in the target capital structure to allow for unexpected variations in key assumptions. Those businesses with higher earnings volatility (such as State Water) normally require greater financial flexibility.

Table 5.6 shows credit rating outcomes assuming annual water sales of 3000 GL per annum, compared to revenue allowances based on State Water's forecast of 4500 GL. Given that actual water sales over the current regulatory period are projected to average less than 1600 GL per annum, analysis of credit rating outcomes under 3000 GL volume assumptions represents a reasonable sensitivity. The analysis demonstrates that State Water is offered reasonable financial flexibility under the proposed 30 per cent debt gearing assumptions. However under higher debt gearing assumptions, credit rating outcomes fall well below investment grade.

Table 5.6: Credit Rating Outcomes Based on Annual Water Sales of 3000GL

2010/11 to 2013/14	20% Gearing	30% Gearing	40% Gearing	50% Gearing	60% Gearing
FFO Interest Cover - 4 Year Average - Rating	4.8 A	3.2 BBB	2.4 BB+	1.9 B+	1.6 B
EBIT Interest Cover - 4 Year Average - Rating	3.9 BBB+	2.6 BBB	2.0 BB+	1.6 BB	1.3 B+
FFO to Total Debt - 4 Year Average - Rating	28.0% A	16.2% BBB	10.3% BB+	6.7% B+	4.4% B

Recommended Debt Gearing: 30 per cent

Credit Rating and Debt Margin

The regulated cost of debt is determined by the benchmark credit rating and the corresponding observed debt margin above the nominal risk-free rate. State Water supports a regulatory approach that determines debt margin based on benchmark corporate bond yields that:

- reflect a 10-year maturity, consistent with the adoption of a 10 year risk free rate and in recognition of the increasing risk of default over time, and
- have a BBB+ to BBB rating.

A BBB+ to BBB credit rating benchmark is appropriate for State Water based on the proposed debt gearing of 30 per cent. [redacted] The adoption of higher gearing assumptions would translate to a lower credit rating benchmark and therefore a higher debt margin for State Water.[7]

IPART currently derives debt margin estimates based on fair value yield curve data for BBB and BBB+ rated Australian corporate bonds with a maturity of 10 years, as well as actual bond yields for BBB and BBB+ rated securities. State Water is concerned that IPART's selected portfolio of proxy corporate bonds may underestimate the debt margin given their maturity periods are significantly shorter than the 10 year risk free period.

In May 2009, IPART released a discussion paper on debt margin that acknowledged the relatively short maturity period of the traditional set of securities used in IPART's portfolio of proxy bonds.[8] The Discussion Paper suggests that a standard methodology be used to extend the term structure of debt margins obtained from Australian corporate bonds to match the term of the risk free rate. State Water supports this approach.

For the purposes of this submission, State Water has adopted the mid-point of the debt margin range adopted by IPART in recent determinations for the Sydney Catchment Authority, Gosford City Council and Wyong Shire Council. However, State Water notes that the low end of this range is based on proxy corporate bonds that may require adjustment to reflect the 10-year risk free rate period. State Water further acknowledges that the debt margin is a market based parameter and should be updated to reflect market conditions approaching the date of the final determination.

Recommended Debt Margin: 3.15 per cent (based on 30 per cent gearing assumptions).

Beta

The asset beta measures the 'ungeared' risk of a business and is a function of both underlying revenue volatility and operating leverage (i.e. proportion of fixed operating costs). The equity beta is determined by re-levering the asset beta by the proportion of interest costs from financial leverage. The asset beta is indicative of business risk whereas the equity beta incorporates both business risk and financial risk.

[7] Under NSW Treasury's credit rating model, State Water's stand-alone rating falls to B+ under 60 per cent gearing assumptions. Should IPART retain a 60 per cent debt gearing benchmark for State Water, then State Water contends that debt margin should be based on credit spreads using B+ rated corporate bonds.

[8] IPART, Estimating the debt margin for the weighted average cost of capital, Analysis and Policy Development — Discussion Paper, May 2009

The level of risk associated with equity (i.e. equity beta) is magnified according to the proportion of debt in the funding mix. The greater the proportion of debt, the greater the risk associated with the residual cashflows available to equity holders, and the greater the difference between the asset and equity beta. For otherwise identical investments, a company with more debt in its capital structure will have a higher equity beta and a higher required rate of return on equity than a company with less debt. Due to the impact of leverage, it is therefore possible for 'low risk' regulated utilities to have equity betas close to the market average of 1.0.

Estimating betas empirically requires information on the economic returns to a particular business. This information is available only for businesses that are listed on the stock exchange. In this regard, there are no Australian water utilities listed on the Australian Stock Exchange, let alone listed rural bulk-water utilities. Overseas beta estimates are of limited value due to significant variations in the operating characteristics, regulatory environment and underlying pricing and cost structures.

The majority of Australian regulatory precedents for the determination of water sector betas are for metropolitan retail water supply businesses, or for bulk water supply businesses that provide water predominantly to urban or industrial customers. Few jurisdictions have explicitly considered an appropriate beta range for rural bulk water businesses. State Water supports the approach adopted in the 2006 Determination where IPART estimated an equity beta for State Water by reviewing the systematic risks it faces relative to NSW metropolitan water businesses.

It is often argued that regulation insulates businesses from market volatility, by adding an element of predictability to the revenue stream. However as evidenced over the current regulatory period, State Water does not benefit from predictable regulated cash flows. A significant proportion of State Water's revenue is derived from volumetric pricing while operating and financing costs are largely fixed. Combined with high levels of volume fluctuation, this exposes State Water to greater earnings volatility relative to most regulated utilities. A more detailed discussion on business risk is included in Chapter 2.2.

State Water contends that its asset beta should be higher than the range established for metropolitan water businesses that benefit from greater stability and predictability in regulated cash flows. State Water's demand for water is more subject to economic and climatic vagaries than for metropolitan based water businesses that have greater storage capacity, alternative sources of water supply (eg. desalination) and larger, more diversified customer bases.

In the 2006 Determination, IPART acknowledged the higher relative risks faced by State Water relative to Sydney Water:

> *"The Tribunal acknowledges that although Sydney Water and State Water have a similar pricing structure (fixed vs. variable revenue), State Water is likely to face higher levels of demand fluctuation and therefore revenue volatility. State Water's demand can be volatile as demand for irrigation water is a derived demand dependent on international factors, such as international commodity markets and exchange rates and climatic patterns. Further, irrigation water is a supplementary source of water and as such, rainfall variability causes volatility in demand for irrigation water."*

Despite this acknowledgment, IPART determined that there was no conclusive evidence that State Water's systematic risk profile warranted a different asset beta to that used for the metropolitan water businesses. Rather, IPART made an allowance for State Water's revenue volatility in selecting a point rate of return that was slightly above the mid-point of the proposed range. State Water considers that this approach lacks

transparency and potentially under-compensates for the higher business risks faced by State Water.

The WACC only compensates investors for systematic risk, i.e. risks that are common across the entire market and cannot be reduced through diversification. The WACC does not compensate for firm specific risks. IPART's Issues Paper raises the issue as to whether volumetric risks faced by State Water are systematic or firm specific. State Water contends that risks associated with economic and climatic conditions impact both on State Water and the overall economy and are therefore systematic in nature. Volumetric risks associated with economic conditions and climate change, are non-diversifiable, uninsurable and cannot be hedged. It is therefore appropriate to compensate for such risks through the WACC.

In terms of demand-side volumetric risks, State Water's customer base is comprised mainly of large irrigators whose consumption is impacted by economic conditions. The price received for output from irrigated activities influences irrigators' decisions on the scale of irrigation activities undertaken in a given year and hence their demand for water. Risks associated with global financial conditions and commodity markets impact on the economy as a whole and are therefore clearly systematic in nature. Such risks have a far greater impact on demand from rural bulk water customers served by State Water, relative to that of small domestic customers served by metropolitan based retail water suppliers.

On the supply side, climate change represents a risk both to the overall economy and State Water, and therefore can be considered systematic in nature. The Garnaut Climate Change Review examined the impacts of climate change on the Australian economy and concluded:[9]

> *"the structure of our economy means that our terms of trade would be damaged more by the effects of climate change than would those of any other developed country."*

The primary source of volumetric risk for State Water relates to water availability, which in turn is impacted by long-term changes in climatic conditions. The CIE's review of State Water's consumption forecasts presented evidence that recent climatic conditions are outside what would be expected from normal climatic volatility and that the magnitude of changes remains highly uncertain, particularly at the regional level relevant for consumption of bulk water:[10]

> *"Climate change represents a significant (and likely systematic) risk for State Water. Climate change means that historical averages of consumption are less applicable to the future than they would otherwise be. Forecasts based on historical averages may be systematically biased upwards."*

As previously discussed, State Water's higher volumetric risks can be addressed through the regulatory framework by increasing the fixed component of tariffs to align with State Water's predominantly fixed operating cost structure. This would provide a stable and predictable regulated earnings stream to State Water, regardless of sale volumes. Under such assumptions, an asset beta consistent with that provided to metropolitan water businesses (i.e. around 0.37) would be appropriate.

[9] The Garnaut Climate Change Review, Final Report, 2008, Introduction. pxix.
[10] The Centre for International Economics, State Water Consumption Forecasts for the 2010 Pricing Determination.

However, bulk water customers have indicated a strong preference to retain the current 60 per cent variable charge. As such, State Water should be compensated for resultant volumetric and regulatory risk through a higher WACC.

State Water proposes to retain an equity beta of 0.9, consistent with the equity beta adopted by IPART in recent metropolitan water determinations. Rather than increasing the equity beta, State Water has assumed lower financial risk through the adoption of 30 per cent gearing assumptions. This is consistent with market practice, where companies with higher business risk generally adopt lower financial risk in order to maintain an 'average' equity risk position

State Water proposes an asset beta of 0.65, derived by de-levering the equity beta of 0.9 using State Water's proposed gearing of 30 per cent.[11] State Water's proposed asset beta of 0.65 remains below the market average of 0.7. The proposed equity beta of 0.9 is also below the market average of 1.0.

State Water's proposed equity beta of 0.9 is predicated on 30 per cent debt gearing assumptions. 'Re-levered' equity betas under alternative gearing assumptions are shown in Table 5.7.

Table 5.7: Asset and Equity Betas

Proposed Asset Beta	Debt Gearing	Re-levered Equity Beta
0.65	20%	0.81
0.65	**30%**	**0.92**
0.65	40%	1.07
0.65	50%	1.29
0.65	60%	1.60

Recommended Asset Beta: 0.65

Recommended Equity Beta: 0.92 (based on 30 per cent gearing)

Gamma

In previous determinations, IPART has adopted a range of 0.3 to 0.5 for gamma (0.4 midpoint) noting the inconclusive nature of available research. IPART has also noted in previous determinations that a market-based estimate of gamma would be close to zero.

State Water acknowledges recent regulatory debate relating to the value of gamma and the AER's recent decision to increase gamma to 0.65. State Water believes that an increase in gamma was not warranted, especially given that the AER itself acknowledged:

> *"the complexity of the issues in this area and the ongoing debate in the academic literature regarding the appropriate recognition of the value of imputation credits in the Australian regulatory context."*[12]

[11] Based on Monkhouse formula assuming debt beta of zero.
[12] Australian Energy Regulator, Review of the weighted average cost of capital (WACC) parameters, Electricity transmission and distribution network service providers, May 2009, p397

Evidence provided by the AER showed that:

- the most recent estimates of the payout ratio quoted by Australian energy regulators have ranged between 0.39 and 1.00, and
- the most recent estimates of the utilisation rate (commonly referred to as 'theta') in the finance literature and in regulatory decisions have ranged between 0 and 0.81.

The resultant range for gamma based on these estimates is between 0 and 0.81.[13] Submissions to the AER Review proposed gamma values ranging from 0.20 to 0.90. [14]

Importantly, evidence submitted to the AER from the Finance Investment Group, an affiliation of eight major investors in Australian energy transmission and distribution networks, concluded that:

> *"market practice clearly indicates that independent expert valuers do not consider it is appropriate to assign any value to imputation credits because the evidence in regard to their value is not sufficiently conclusive."*15

Given the inconclusive nature of available research, State Water does not believe that there is justification for IPART to increase gamma from the 0.3 to 0.5 range (0.4 mid-point) adopted in previous water determinations, especially given market evidence suggesting that if anything, gamma should be closer to zero.

Recommended Gamma: 0.4

Tax Rate

State Water supports the adoption of the statutory tax rate, consistent with that adopted by IPART in previous water determinations.

It is important that a consistent approach be adopted in relation to taxation, regardless of the varying tax obligations of individual operators. Given the complexities and regulatory intrusion associated with estimating actual or efficient taxation liabilities within the building block revenue requirements, it is simpler and more transparent to adopt the statutory tax rate. Whereas such an approach may overstate or understate the actual tax liability in any single regulatory period, the adoption of the statutory tax rate is appropriate given:

- Incentives to minimise taxation liabilities are reduced if building block revenue is based on actual tax liabilities,
- The carry forward tax position of many bulk water operators has resulted from accelerated tax depreciation allowances designed to encourage new infrastructure investment, not reduce regulated revenue requirements, and
- Assuming that current tax benefits associated with accelerated depreciation will reverse some time in the future, there may be intergenerational impacts associated with current customers benefiting at the expense of future customers.

Recommended Tax Rate: 30 per cent

[13] Derived by multiplying the payout ratio and utilisation rate estimates
[14] Australian Energy Regulator, Review of the weighted average cost of capital (WACC) parameters, Electricity transmission and distribution network service providers, May 2009, Table A1, pv
[15] Financial Investment Group, Submission to the AER's WACC Review – The Investor Perceptive, January 2009, p47

5.3 State Water depreciation method and asset lives

5.3.1 Depreciation method

State Water proposes to continue the straight line method of depreciating assets endorsed by IPART in the 2006 Determination. Under this method, the assets in the RAB are depreciated by an equal value in each year of their economic life, so that their real written-down value follows a straight line over time, from the initial value of the asset to zero at the end of the asset's life.

5.3.2 State Water's proposed asset lives to be applied

State Water proposes average asset lives of 83 years, compared to the 2006 Determination of 160 years for existing assets and 75 years for new assets. State Water proposes no separate depreciation allowance for short-term assets, as was included in the 2006 Determination.

State Water commissioned a detailed review of its water infrastructure and land and building assets in 2008/09. This review incorporated a re-assessment of the remaining useful lives of the assets.

In determining the remaining useful lives of the assets, State Water has taken the following factors into account:

- Expected usage of the asset. Usage is assessed by reference to the asset's expected capacity or physical output.
- Expected physical wear and tear, which depends on operational factors such as the number of shifts for which the asset is to be used and the repair and maintenance programme, and the care and maintenance of the asset while idle.
- Technical or commercial obsolescence arising from changes or improvements in production, or from a change in the market demand for the product or service output of the asset.
- Legal or similar limits on the use of the asset, such as the expiry dates of related leases.

These factors were incorporated into a rating system which was applied to each asset component. Where this rating was lower than the benchmark asset of the same age and following the typical pattern of service potential use then the following factors were considered in determining the remaining useful life of the asset:

- the probability of failure;
- the consequence of failure; and
- risk costs.

As a result of this analysis, State Water has found that average asset lives of 83 years are significantly less than the existing asset lives of 160 years adopted in the 2006 Determination. However impacts on regulatory depreciation allowances will be largely offset by longer asset lives for new assets (83 years versus 75 years) and State Water's proposal not to include a separate depreciation allowance for short-term assets. Any net increase to depreciation (return of assets) revenue requirements will be offset by future reductions in return on assets revenue requirements, as regulatory asset values will depreciate at a faster rate. Over the life of the assets, total capital returns (i.e. depreciation and return on assets) will be equivalent in net preset value terms.

6 BUILDING BLOCK REVENUE REQUIREMENTS

6.1 Total revenue requirements

Table 6.1 sets out State Water's proposed notional revenue requirements based on the efficient level of operating expenditure and efficient costs of financing capital investment outlined in previous Chapters:

Table 6.1: Total Notional Revenue ($09/10 million)

	09/10 (base)	10/11	11/12	12/13	13/14
Operating Expenditure	36.3	39.3	39.8	40.2	39.3
Depreciation	3.8	6.1	7.6	8.6	9.1
Return on Assets	27.4	40.4	49.3	55.4	58.4
Total	**67.5**	**85.9**	**96.6**	**104.1**	**106.8**

Note: Totals may not add due to rounding

Chapter 7 breaks down notional revenue requirements between user and Government shares.

6.2 Drivers of Required Revenue Increases

In real terms, notional revenue requirements increase by $39.3 million (58.1 per cent) over the 4-year regulatory period, as shown in Table 6.2.

Table 6.2: Percentage Change in Total Notional Revenue

	09/10	10/11	11/12	12/13	13/14
Notional Revenue	67.5	85.9	96.6	104.1	106.8
Annual Change	-	27.2%	12.4%	7.8%	2.6%
Cumulative Change	**-**	**27.2%**	**43.0%**	**54.2%**	**58.1%**

Table 6.3 shows a break down of the $39.3 million increase in notional revenue requirements by cost driver. Only $3.0 million of the increase relates to operating costs. The remaining $36.3 million per cent relates to higher capital costs (i.e. return on assets and depreciation) associated with State Water's proposed capital program and increases in WACC from 6.5 per cent to 7.9 per cent.

Table 6.3: Drivers of Required Revenue Increases

Cost Driver	Cumulative Increase (09/10 to 13/14) $million 09/10	Impact on Base Year Notional Revenue
Operating Costs	3.0	4.4%
Depreciation	5.3	7.8%
ROA – WACC	11.4	16.9%
ROA - Capital Expenditure	19.6	29.0%
Total Increase	**39.3**	**58.1%**

Approximately $25 million of the required increase relates directly to State Water's proposed capital expenditure program, totalling $342 million ($09/10) over the four-year regulatory period. This compares to an opening 2010/11 RAB value of $466 million and translates (after allowing for depreciation) to a projected 67 per cent real increase in the RAB value over the regulatory period. Such a large percentage increase partially reflects past regulatory decisions to establish an initial RAB value for State Water that was only a fraction of replacement cost. As new assets are added to the RAB at full replacement value, the RAB value will inevitably increase at a fast rate, placing significant upward pressure on the depreciation and return on assets building blocks.

Based on State Water's proposed user-cost share ratios, approximately 73 per cent of projected capital expenditure is allocated to the Government. As a result, required revenue increases for the Government are significantly higher than required revenue increases for bulk water users. Further details are provided in Chapter 7.

6.3 Expected Financial Outcomes

State Water believes that the proposed notional revenue requirements are the **minimum** required to maintain a sound financial position in order to meet relevant borrowing, capital and dividend requirements. Assuming full recovery of notional revenue requirements over the upcoming regulatory period, analysis based on a range of financial indicators demonstrate an ongoing deterioration in State Water's financial position, driven by high debt gearing levels relative to State Water's underlying business risk.

Projected financial statements under State Water's revenue proposal are tabled below, based on the following assumptions:-

- Full recovery of notional revenue requirements.
- Projected opening debt of $118 million and opening RAB of $466 million (translating to opening debt gearing of 25 per cent).
- 30 per cent tax expense.
- 70 per cent dividend payout of post tax profit.
- Zero per cent tax paid.

Table 6.4: Profit and Loss

Regulatory Financials Profit & Loss (nominal $million)	2011	2012	2013	2014
Sales Revenue From Customers	55.3	59.3	63.0	65.3
Sales Revenue From Government	32.8	42.2	49.1	52.6
Total Revenue	**88.1**	**101.5**	**112.2**	**117.9**
Regulated Operating Expenses	(40.3)	(41.8)	(43.3)	(43.4)
Earnings Before Interest Tax & Depn	**47.8**	**59.7**	**68.9**	**74.5**
Depreciation & Amortisation	(6.6)	(8.3)	(9.7)	(10.6)
Earnings Before Interest Tax	**41.1**	**51.4**	**59.2**	**63.9**
Interest Income	-	-	-	-
Interest Expense	(13.5)	(21.5)	(27.0)	(29.3)
Net Profit Before Tax	**27.7**	**29.8**	**32.2**	**34.6**
Income Tax Expense	(8.3)	(9.0)	(9.6)	(10.4)
Net Profit After Tax	**19.4**	**20.9**	**22.5**	**24.2**
Dividend Payable	(13.6)	(14.6)	(15.8)	(17.0)
Retained Earnings	**5.8**	**6.3**	**6.8**	**7.3**

Table 6.5: Balance Sheet

Regulatory Financials Balance Sheet (nominal $million)	2011	2012	2013	2014
Cash and Investments	-	-	-	-
Accounts Receivable	18.9	20.3	21.6	22.3
Regulated Asset Base (RAB)	618.0	735.6	824.0	859.5
TOTAL ASSETS	**636.9**	**755.9**	**845.6**	**881.9**
Loan Debt	243.6	334.3	391.4	395.0
Accounts Payable	20.4	16.5	13.4	7.5
Other	8.3	17.3	26.9	37.3
TOTAL LIABILITIES	**272.2**	**368.1**	**431.7**	**439.8**
SHAREHOLDER FUNDS	**364.7**	**387.8**	**413.9**	**442.1**

Table 6.6: Cash Flow Statement

Regulatory Financials Cash Flow (nominal $million)	2011	2012	2013	2014
Receipts from Customers	46.3	57.9	61.8	64.5
Receipts from Government	32.8	42.2	49.1	52.6
Payments to Suppliers and Employees	(32.0)	(45.6)	(46.4)	(49.3)
Cash Flow From Operating Activities	**47.1**	**54.5**	**64.4**	**67.9**
Purchase of Investments / Fixed Assets	(145.7)	(109.1)	(78.8)	(25.2)
Cash Flow From Investing Activities	**(145.7)**	**(109.1)**	**(78.8)**	**(25.2)**
Interest Received	-	-	-	-
Interest Paid	(13.5)	(21.5)	(27.0)	(29.3)
Tax Paid	-	-	-	-
Dividends Paid	(13.6)	(14.6)	(15.8)	(17.0)
Equity Injection / Repatriation	-	-	-	-
Cash Flow From Financing Activities	**(27.0)**	**(36.2)**	**(42.8)**	**(46.2)**
Net Cash Flow	**(125.6)**	**(90.8)**	**(57.1)**	**(3.6)**
Increase (Repayment) of Borrowings	125.6	90.8	57.1	3.6
Net Increase (Decrease) Cash	-	-	-	-

State Water has analysed a range of financial indicators commonly used by credit rating agencies to assess financial capacity and ability to service and repay debt. The analysis is based on the following credit ratio ranges used by NSW Treasury and Moody's that characterise credit quality characteristics of utilities with similar business risk profiles to that of State Water:[1]

Table 6.7: Credit Rating Ratio Ranges, NSW Treasury

Average Business Risk	'AA'	'A'	'BBB'	'BB'
EBIT Interest Cover (x)	> 6.0	4.0 to 6.0	2.0 to 4.0	< 2.0
FFO Interest Cover (x)	> 7.0	4.5 to 7.0	2.5 to 4.5	< 2.5
FFO to Total Debt (%)	> 35	25 to 35	15 to 25	< 15
Debt Gearing (%)	< 25	25 to 37.5	37.5 to 50	> 50

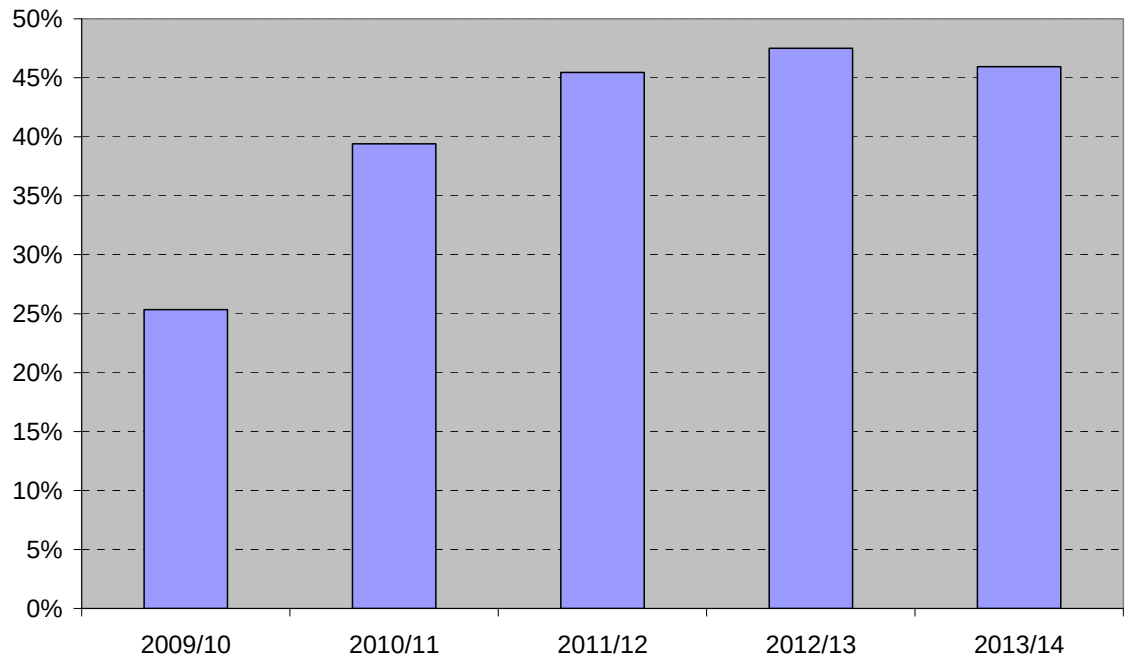
[1] NSW Treasury uses five alternative sets of credit ratio ranges depending on the underlying business profile of the business (ranging from well above average to well below average). NSW Treasury adopts an 'average' business risk profile in assessing the credit worthiness of State Water.

Table 6.8: Credit Rating Ratio Ranges, Moody's

Medium Business Risk	> BBB	'BBB'	< BBB
RCF / Average Debt (%)	> 20.0	8.0 to 20.0	< 8.0
FFO Interest Cover (x)	> 5.0	2.7 to 5.0	< 2.7
FFO / Average Debt (%)	> 25	13 to 25	< 13
Debt Gearing (%)	< 50	50 to 70	> 70

State Water's credit metrics are expected to deteriorate over the regulatory period, due to significant debt funded capital expenditure requirements. Debt gearing increases above State Water's proposed 30 per cent benchmark in 2011/12, reaching a peak of 47.5 per cent in 2012/13.

Figure 6.1: Debt Gearing (Debt / RAB)



FFO interest cover decreases from 3.5 times to 2.5 times over the regulatory period due to increased debt servicing costs. FFO to total debt decreases from 19.0 per cent to 11.5 per cent, despite funds from operations increasing strongly over the regulatory period.

The following table shows that credit rating outcomes are broadly consistent under both NSW Treasury's and Moody's models. The overall credit rating score used by NSW Treasury falls below investment grade from 2011/12. Three of the four ratios used by Moody's also fall below investment grade.

Table 6.9: Credit Rating Outcomes – Projected Gearing

CREDIT RATING INDICATORS	2011	2012	2013	2014
Regulated Revenue ($ million)	88.1	101.5	112.2	117.9
Total Debt ($ million)	243.6	334.3	391.4	395.0
RAB Value ($ million)	618.0	735.6	824.0	859.5
Ability to Service Debt				
1. FFO Interest Cover	3.5	2.8	2.5	2.5
- NSW Treasury Rating	BBB+	BBB	BBB	BBB
- Moody's Rating	BBB	BBB	BB	BB
2. EBIT Interest Cover	3.1	2.4	2.2	2.2
- NSW Treasury Rating	BBB+	BBB	BBB	BBB
Ability to Repay Debt				
3. FFO / Average Total Debt	19.0%	13.2%	11.5%	11.5%
- NSW Treasury Rating	BBB	BB+	BB+	BB+
- Moody's Rating	BBB	BBB	BB	BB
4. RCF / Average Total Debt	11.5%	8.2%	7.2%	7.2%
- Moody's Rating	BBB	BBB	BB	BB
5. Debt Gearing (Debt / RAB)	39.4%	45.4%	47.5%	46.0%
- NSW Treasury Rating	BBB+	BBB	BBB	BBB
- Moody's Rating	AA	A	A	A
NSW Treasury Overall Score & Rating				
- NSW Treasury Total Score (0-10)	4.8	3.8	3.8	3.8
- NSW Treasury Overall Rating	BBB	BB+	BB+	BB+

The above analysis demonstrates that State Water has limited capacity for debt levels substantially above the proposed 30 per cent debt gearing benchmark, even assuming full recovery of notional revenue requirement. Given considerable uncertainty surrounding State Water's consumption forecast, prudent business practice should allow for adequate financial flexibility in the target capital structure to allow for unexpected variations in key assumptions.

Table 6.10 shows credit rating outcomes assuming debt gearing remains at State Water's proposed benchmark of 30 per cent. This does not impact on regulated revenue requirements, however would require negotiation with shareholders to increase equity

funding of future capital expenditure requirements (through reduced dividends and / or equity injections).[2] The analysis demonstrates that assuming full recovery of notional revenue requirements and 30 per cent gearing, State Water retains a credit rating over the regulatory period that is consistent with the benchmark BBB to BBB+ credit rating benchmark adopted by IPART. Section 5.2 on Rate of Return demonstrates State Water's credit rating falls below investment grade at gearing levels of 40 per cent and above.

Table 6.10: Credit Rating Outcomes – 30 Per Cent Gearing

CREDIT RATING INDICATORS	2011	2012	2013	2014
Regulated Revenue ($ million)	88.1	101.5	112.2	117.9
Total Debt ($ million)	185.4	220.7	247.2	257.9
RAB Value ($ million)	618.0	735.6	824.0	859.5
Ability to Service Debt				
1. FFO Interest Cover	3.9	3.9	4.0	4.0
- NSW Treasury Rating	BBB+	BBB+	BBB+	BBB+
- Moody's Rating	BBB+	BBB+	BBB+	BBB+
2. EBIT Interest Cover	3.4	3.4	3.4	3.4
- NSW Treasury Rating	BBB+	BBB+	BBB+	BBB+
Ability to Repay Debt				
3. FFO / Average Total Debt	21.9%	22.0%	22.0%	22.0%
- NSW Treasury Rating	BBB+	BBB+	BBB+	BBB+
- Moody's Rating	BBB+	BBB+	BBB+	BBB+
4. RCF / Average Total Debt	13.2%	13.2%	13.3%	13.3%
- Moody's Rating	BBB	BBB	BBB	BBB
5. Debt Gearing (Debt / RAB)	30.0%	30.0%	30.0%	30.0%
- NSW Treasury Rating	A	A	A	A
- Moody's Rating	AA	AA	AA	AA
NSW Treasury Overall Score & Rating				
- NSW Treasury Total Score (0-10)	5.3	5.3	5.3	5.3
- NSW Treasury Overall Rating	BBB+	BBB+	BBB+	BBB+

[2] For modelling purposes, it is assumed that annual equity injections / repayments are provided to maintain debt gearing at the 30 per cent benchmark.

7 RATIOS FOR SHARING COSTS BETWEEN USERS AND THE GOVERNMENT

7.1 Objectives and Principles for Allocating Costs

In the previous Determination, IPART endorsed an 'impactor pays' approach to sharing costs between users and government. IPART found that *"future expenditure that related to current or future users (should be) allocated according to which party created the costs or the need to incur the costs"* (page 36).

This principle suggests cost allocation should be based on who creates the 'demand' for the costs. Importantly, this can diverge from the beneficiaries of the incurred cost.

State Water is generally supportive of this approach and makes some broad inferences that derive from an 'impactor pays' principle:

- Where costs are incurred to meet regular operations and maintenance, there is sound reason to allocate 100% of the costs to users.
- Where costs are incurred to meet community standards or regulatory standards, it is justifiable to share costs with government. The proportion of the share should depend on whether the demand is a joint demand with the community and users or demand driven from the community alone.

In the last Determination, IPART also applied the 'legacy principle', highlighting that legacy costs, those that were incurred prior to the 1997 'line in the sand', should be apportioned fully to government (page 36). State Water has adopted this approach in its current submission.

However, State Water notes that the translation of these principles into percentages allocated to users and Government by IPART is largely discretionary and is commonly the subject of much debate with stakeholders during each Determination. The State Water therefore believes that IPART should revisit the rationale for the allocation of cost shares.

Cost shares only apply to State Water's regulated river valleys. Cost shares do not apply to Fish River Water Supply Scheme which is fully user funded.

7.2 Cost Share Ratios Used for Submission

In allocating costs between users and Government, State Water has applied the cost shares adopted by IPART in the 2006 Determination.

It should be noted, however, that the new financial system adopted by State Water during the current regulatory period has resulted in several changes to the way in which State Water accounts for its activities. Product Codes, used previously to account for costs, have been replaced by Activity Codes. In most instances these remain consistent with the former methodology and the change does not affect user shares. As part of this process, State Water has reverted to the use of a specific code for flood operations. State Water proposes this activity attract a 50% user share, consistent with previous IPART Determinations.

In addition, State Water proposes a new activity: Corporate Systems. This activity will be used to record expenditure on corporate-wide systems that are not directly related to service delivery but are required to support service delivery. Examples include payroll and financial systems. As these costs are required for day to day operations, and are a normal cost of business, State Water proposes that they be fully allocated to users, in line with the principles outlined above.

State Water has created a further activity for water transfers (activity 15). However this is excluded from State Water's regulated operating expenditure and cost shares as it is funded separately through temporary transfer fees, which are also determined by IPART.

Finally, there is no longer an activity for Salt Interception Schemes (SIS) as these schemes are currently operated by the Office of Water and State Water therefore does not incur any expenditure relating to the SIS.

Under the new activity codes, the same codes are used for operating and capital expenditure except for routine and preventative maintenance which under accounting definitions can only apply to operating expenditure.

The proposed cost share ratios, by the former product code and new activity are provided in Table 7.1.

Table 7.1: Proposed Cost Shares

Activity Code	Activity Name	User Share	Replaces Product	Product Code
10	Customer Support	100	Customer Support	1120
11	Customer Billing	100	Billing & receipts	5220
12	Metering & Compliance	100	Metering	2180
14	Water Delivery & Other Operations	100	River Operations	2150
15	Water Transfers	100	Code not used in Determination	N/A
16	Flood Operations	50	Code not used in Determination	N/A
17	Hydrometric Monitoring	90	Hydrometric monitoring	2120
18	Water Quality Monitoring	50	Water Quality Monitoring	2130
19	Public Liability Insurances	100	Insurances	5250
30	Corrective Maintenance	100	MPM Capital Projects	3530
31	Routine Maintenance	100	Preventative Maintenance	3140
32	Asset Management Planning & Replacement	100	Asset Management Planning	3110
33	Dam Safety Compliance	0	Pre 1997 Dam Safety Compliance	3520
		50	Post 1997 Dam Safety Compliance	3525
34	Environmental Planning & Protection	50	Fish Passage	6310
			Cold Water Pollution	6320
50	Renewal and Replacement of Assets	90	MPM Capital Projects	3530
51	Structural and other enhancements	100	Structure enhancements capital projects	3540
98	Corporate Systems	100	Code not used in Determination	N/A

7.2.1 Application of Activities to Actual Expenditure

Although no changes are proposed to existing cost shares, State Water does propose a change to the cost share for the Dam Safety Upgrade of Split Rock Dam in the Namoi Valley. In the 2006 Determination, IPART allocated these costs 50/50 to users and the Government. However, information has recently come to light indicating that the dam safety issues at Split Rock Dam were identified prior to 1997. Therefore this project should be considered a legacy issue, with costs fully allocated to the Government.

During the period of the Determination, State Water sought clarification from IPART for the application of cost shares to fish passage expenditure triggered as part of the Dam Safety Upgrade Project. IPART advised that the costs should be shared 50/50 with users and Government. State Water has adopted this approach in allocating past and future expenditure on fishway installation.

State Water now also seeks IPART's clarification of the application of cost shares to the maintenance of fishways. As outlined in Chapter 3, fish passage maintenance is expected to be a driver of increased operating costs during the new Determination period. Although this expenditure is incurred on environmental assets, the nature of the expenditure is operational rather than compliance. Consequently, State Water proposes to treat these costs as routine maintenance, with a 100% user share. State Water has adopted this approach in its proposed prices.

7.3 Revenue Requirements from Users

Table 7.2 sets out user share revenue requirements based on the user-cost share ratios outlined above.

Table 7.2: Notional Revenue – User Share ($09/10 million)

User Share	09/10	10/11	11/12	12/13	13/14
Operating Expenditure	34.3	35.7	35.9	36.4	35.8
Depreciation	1.9	2.4	2.7	3.0	3.2
Return on Assets	12.3	15.8	17.8	19.1	20.2
Total	**48.4**	**54.0**	**56.4**	**58.5**	**59.1**

Note: Totals may not add due to rounding

In real terms, user share revenue requirements increase by $10.7 million, or 22.2 per cent, over the 4-year regulatory period. This compares to a 149 per cent real increase in Government share revenue requirements.

Table 7.3: Percentage Change in Notional Revenue – User Share

User Share	09/10	10/11	11/12	12/13	13/14
Notional Revenue	48.4	54.0	56.4	58.5	59.1
Annual Change	-	11.5%	4.6%	3.7%	1.0%
Cumulative Change	-	11.5%	16.6%	21.0%	22.2%

Table 7.4 shows a break down of the $10.7 million increase in user share revenue by cost driver. The majority of the increase relates to higher capital costs associated with State Water's proposed capital program and increase in WACC from 6.5 per cent to 7.9 per cent.

Table 7.4: Drivers of User Share Revenue Increases

Cost Driver	Cumulative Increase (09/10 to 13/14) $million real 09/10	Impact on Base Year User Share Revenue
Operating Costs	1.5	3.1%
Depreciation	1.3	2.7%
ROA - WACC	4.0	8.2%
ROA - Capital Expenditure	4.0	8.2%
Total Increase	**10.7**	**22.2%**

Note: Totals may not add due to rounding

7.4 Revenue Requirements from Government

Table 7.5 sets out Government share revenue requirements based on the user-Government cost share ratios previously outlined:

Table 7.5: Notional Revenue – Government Share ($09/10 million)

Government Share	09/10	10/11	11/12	12/13	13/14
Operating Expenditure	2.1	3.6	3.9	3.7	3.6
Depreciation	2.0	3.7	4.8	5.6	6.0
Return on Assets	15.1	24.6	31.5	36.3	38.2
Total	**19.2**	**32.0**	**40.2**	**45.6**	**47.7**

Note: Totals may not add due to rounding

In real terms, Government share revenue requirements increase by $28.5 million, or 149 per cent, over the 4-year regulatory period, as shown in Table 7.6.

Table 7.6: Percentage Change in Notional Revenue – Government Share

Government Share	09/10	10/11	11/12	12/13	13/14
Real (09/10 $m)	19.2	32.0	40.2	45.6	47.7
Annual Change	-	66.8%	25.7%	13.5%	4.6%
Cumulative Change	-	66.8%	109.7%	138.0%	148.9%

Table 7.7 shows a breakdown of the $28.5 million increase in Government share revenue by cost driver. Only $1.5 million of the required increase relates to operating costs. The balance of $27.0 million relates to increased capital costs (i.e. return on assets and depreciation) associated with Government share capital expenditure requirements and proposed increase in WACC. The Government share RAB increases from $272 million to $505 million (86 per cent) in real terms over the regulatory period, materially impacting on Government share revenue requirements. As previously discussed, previous regulatory decisions to write down the opening RAB to well below replacement cost has contributed to the subsequent rapid increase in RAB as new capital expenditure is added at full replacement cost.

Table 7.7: Drivers of Government Share Revenue Increases

Cost Driver	Cumulative Increase (09/10 to 13/14) $million real 09/10	Impact on Base Year Govt Revenue
Operating Costs	1.5	7.8%
Depreciation	4.0	20.8%
ROA - WACC	7.5	39.0%
ROA - Capital Expenditure	15.6	81.4%
Total Increase	**28.5**	**148.9%**

Note: Totals may not add due to rounding

Although allocating costs between users and government does not have a direct impact on State Water's revenue requirement, such decisions should be approached with caution. Government shares represent community shares. That is, a 'government share' represents a monetary transfer from the general NSW community to all beneficiaries of a well managed regulated-river system (including water users) using NSW government funds. Attempts to capture any significant revenue from other beneficiaries-e.g: boating interests, fishermen, recreational users, tour-operators swimmers - are recognised as difficult. To remain consistent with nationally accepted principles of 'user pays' and to avoid unintentional cross subsidisation, decisions to allocate costs between users and government requires careful consideration.

The application of the existing cost shares between Government and users has resulted in a shift towards the Government share of costs, as shown in the tables above with Government shares increasing by 149 per cent whilst user shares increase by just 22.2 per cent over the regulatory period. State Water believes that this is an unintended outcome based on the current allocation of costs to Government, in particular the allocation of 100 per cent of the legacy dam safety upgrades to Government. State Water strongly suggests that IPART revisit the rationale for the allocation of cost shares, taking into account the cost recovery principles of the National Water Initiative. The review should also consider the broader range of stakeholder views on cost shares.

8 PROPOSED PRICE SETTING APPROACH

8.1 Pricing Principles

NSW is a signatory to the National Water Initiative (NWI) and accordingly State Water adopted the relevant NWI pricing principles in its submission. The principles most relevant to IPART's consideration of State Water's charges are:

- full cost recovery for water services to ensure business viability and avoid monopoly rents;
- lower bound pricing and a continued move to upper bound pricing where practicable; and
- consumption based pricing.

Consistent with these principles, State Water is seeking full cost recovery of revenue requirements over the regulatory period. The revenue requirement is based on upper and lower bound costs and proposed prices include a consumption-based charge, as detailed in Chapter 10. As outlined in Chapter 2 of this submission, full cost recovery is required for State Water's ongoing financial sustainability as well as retention of an investment grade credit rating.

State Water notes that a further NWI principle is also relevant, namely transparency of operating subsidies when full cost recovery is not likely to be achieved in the long term. State Water received a transitional operating subsidy from Government over the 2006 Determination regulatory period. This operating subsidy resulted from IPART's decision to exercise their discretion not to pursue cost recovery in a number of valleys: North Coast, South Coast, Hunter and the Peel due to the impacts on customers. The prices proposed by State Water are based on full cost recovery and do not include any ongoing operating subsidy for these, or any other, valleys. The appropriate level of future operating subsidies and the ongoing provision of services in these valleys is a matter for the Tribunal.

8.2 P-Nought Adjustment and Glide Path

State Water notes that in recent Determinations, IPART has adopted a P-Nought adjustment and glide path for prices. State Water supports the use of smoothing mechanisms in order to manage customer pricing impacts. However, State Water is concerned that the glide-path approach adopted most recently in the Sydney Catchment Authority (SCA) Determination resulted in a significant under recovery of regulated revenue relative to the underlying cost 'building blocks'. This approach contrasts with the net present value (NPV) smoothing approach adopted by the majority of Australian regulators including the Australian Energy Regulator and Essential Services Commission, designed to recover the determined building block costs in NPV equivalent terms.

In making determinations the Tribunal is required by the Section 15(1) of the *IPART Act* to have regard to a range of matters, including:

- the cost of providing the services concerned;
- the appropriate rate of return on public sector assets, and
- the social impact of the determinations and recommendations.

During periods of building block cost increases, State Water recognises the difficulties associated with the achievement of these potentially conflicting objectives. If prices are immediately realigned with underlying costs, then unacceptable price shocks may result. Alternatively, if required price increases are phased in over the regulatory period,

efficient costs are under recovered. The NPV smoothing approach attempts to manage price impacts while allowing for full cost recovery over the regulatory period.

Under IPART's proposed glide-path approach in the SCA Determination, cost recovery is only achieved in the final year of the regulatory period. As a result, the cost building blocks in all other years are effectively extraneous to the revenue determination process.

The prices proposed in State Water's submission are based on 100% full cost recovery in each year of the regulatory period. State Water would be willing to consider alternative "smoothed" price paths, which minimise price shocks for customers, but it is essential for State Water's ongoing financial viability that this price path not include any NPV shortfalls.

9 CONSUMPTION FORECASTS AND ENTITLEMENT VOLUMES

9.1 Actual Water delivered 2006/07 t0 2009/10

As outlined in Chapter 2, during the 2006 Determination period, State Water expects to under recover notional user share revenue requirement by $83.1 million, including $56 million shortfall due to lower than forecast consumption. Over the regulatory period, actual extractions are expected to be only 28.7% of the amounts forecast by IPART.

Table 9.1 shows the shortfall in actual extractions compared to projections used by IPART in the 2006 Determination:

Table 9.1: Actual and Estimated Extractions relative to Projections

ML	2006/07	2007/08	2008/09	2009/10 (est)	Total
Projections	5,449,683	5,449,683	5,449,683	5,449,683	21,798,732
Actual	2,187,593	1,110,991	1,448,407	1,500,000	6,246,991
Difference	(3,262,090)	(4,338,692)	(4,001,276)	(3,949,683)	(15,551,741)

Note: 2009/10 is a forecast only.

Table 9.2 shows actual usage by Valley.

Table 9.2: Actual and Estimated Use by Valley

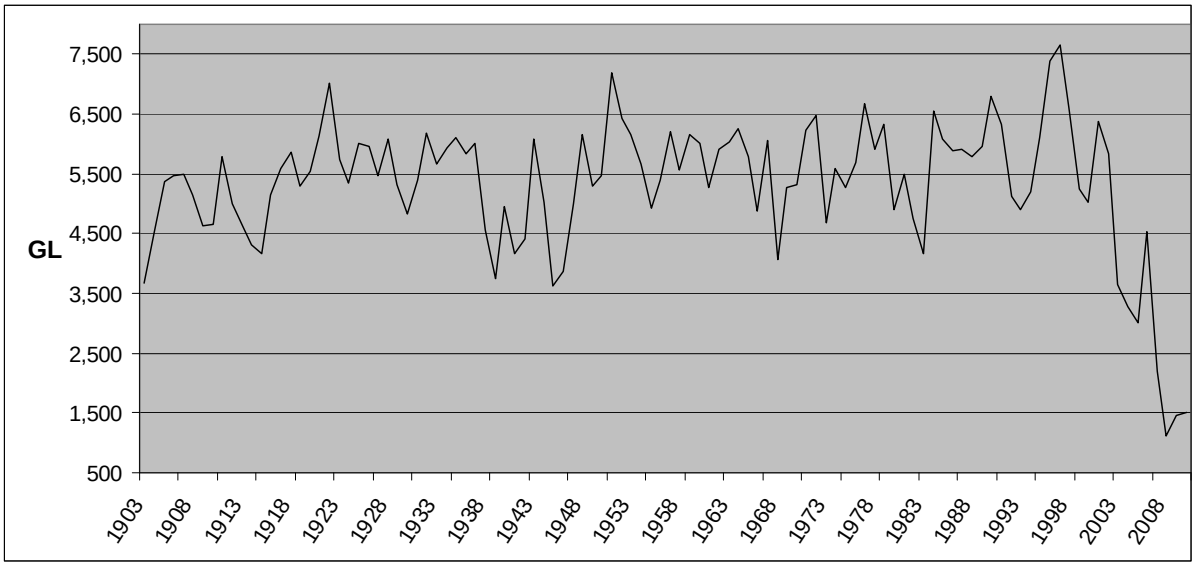
ML	2006/07 Actual	2007/08 Actual	2008/09 Actual	2009/10 Estimate
Border	131,934	112,269	117,688	149,902
Gwydir	129,467	79,132	143,199	69,595
Namoi	66,559	51,212	97,482	105,774
Peel	9,911	9,382	10,183	12,485
Lachlan	57,176	30,755	24,884	81,213
Macquarie	204,745	30,867	65,953	41,195
Murray	559,114	226,153	301,558	300,259
Murrumbidgee	920,635	458,017	568,581	588,766
North Coast	1,031	786	900	1,050
Hunter	101,200	106,795	112,014	142,253
South Coast	5,823	5,623	5,965	7,507
Total	**2,187,593**	**1,110,991**	**1,448,407**	**1,500,000**

9.2 Approach to Consumption Forecasting

Consumption forecasts in the 2006 Determination were developed using the Long Run Average (LRA) approach, based on output from the Integrated Quantity and Quality Model (IQQM) of the then DWE (now the Office of Water). The IQQM model water availability and extractions that would have occurred based on the current Water Sharing Plan rules and agricultural development.

Figure 9.1 shows annual water extractions using the modelled outcomes from the IQQM, and actual extractions from 2002/03.

Figure 9.1: Annual Water Extractions (Actual and Modelled) (GL)



The graph clearly demonstrates that the recent low extraction levels are not consistent with the IQQM modelled historical extractions.

Given the significant shortfalls in actual extractions compared to the IQQM forecasts, State Water, in conjunction with the then DWE, commissioned the Centre for International Economics (CIE) to prepare an alternative method for consumption forecasting. CIE found that use of historical long run average extractions derived from the IQQM was no longer a viable method for consumption forecasting. They found that there is strong statistic evidence to that the current low extractions reflect a structural break in patterns of water availability rather than normal climatic variability. Consequently, historical water availability is unlikely to accurately represent future extractions.

As an alternative to the LRA approach, CIE recommended a rolling 15 year average based on actual extractions. This was viewed as the best approach because:

- average actual extractions for each valley are relatively easy to identify and verify;
- stakeholders will be able to assess the future price impacts of consumption forecasts, reducing regulatory uncertainty;
- historical records adjusted for climate change and assessed through IQQM models will continue to be the basis for longer term water resource planning, however for the purposes of predicting likely revenue of the next four years (the determination period) using the dry sequence of the last 15 years will reduce the risks of under-recovery of costs in the event that the dry sequence continues;
- using a 15 year period is sufficiently long to reduce price volatility between regulatory periods due to climatic volatility; and
- the forecasting approach offers flexibility to changes in water planning and management rules, as the average could be taken over the past 15 years from IQQM estimates if changes in water planning and management rules make actual extractions unrepresentative.

The next best alternative, directly adjusting long-run averages for climate change and current low storage levels, does not greatly reduce the risk of under-recovery as climate

change models are based on much longer timeframes than the next four years (the determination period).

Although CIE recommended a rolling 15 year average, State Water notes that a shorter period is equally, if not more, valid given that the structural break in weather patterns occurred in the last eight years. However, State Water recognises that adopting a shorter period would result in greater price volatility and would result in substantial increases to usage charges in most valleys during the new regulatory period. Conversely, a number of stakeholders have argued that a longer period should be adopted. State Water maintains that a longer period would mean that the current structural shifts in climatic conditions would not be adequately reflected in the consumption forecasts. Consequently, State Water believes that the 15 year period represents a balance between price volatility and the structural shift in climatic conditions.

Table 9.3 shows proposed consumption forecasts relative to those adopted under the 2006 IPART Pricing Determination, based on the CIE Report. The CIE Consumption Forecasts Report is attached at Appendix 4.

Table 9.3: Proposed Consumption Forecasts

Valley	2006 IPART (ML)	Proposed (ML)	% change
Border	209,670	148,923	-29.0%
Gwydir	309,164	275,597	-10.9%
Namoi	237,146	170,193	-28.2%
Peel	14,675	11,422	-22.2%
Lachlan	307,149	226,554	-26.2%
Macquarie	386,311	269,989	-30.1%
Murray LD	1,934,830	1,391,796	-28.1%
Murrumbidgee	1,915,848	1,736,020	-9.4%
North Coast	992	906	-8.7%
Hunter	128,067	129,581	1.2%
South Coast	5,831	5,804	-0.5%
Total	**5,449,683**	**4,366,786**	**-19.9%**

Despite the revised forecasts, State Water still expects volatility in actual extractions due to ongoing climatic variability. In particular, it is highly likely that water availability in 2010/11 will continue to be drought affected and that total extractions are likely to be well below the revised estimate of 4,367 GL. The methodology proposed by State Water will allow any ongoing volatility to be incorporated into future consumption forecasts.

9.3 Entitlement Volumes

The expected entitlement volumes over the new regulatory period are provided in Table 9.4.

Given the present embargo on licence conversions, State Water is not anticipating that licence numbers over the new regulatory period to be materially affected by conversions.

Table 9.4: Proposed Entitlements

ML/Share	2010/11	2011/12	2012/13	2013/14
High Security Entitlements				
Border	3,125	3,125	3,125	3,125
Gwydir	21,458	21,458	21,458	21,458
Namoi	8,527	8,527	8,527	8,527
Peel	17,381	17,381	17,381	17,381
Lachlan	60,778	60,778	60,778	60,778
Macquarie	42,594	42,594	42,594	42,594
Murray	257,438	257,438	257,438	257,438
Murrumbidgee	436,928	436,928	436,928	436,928
North Coast	137	137	137	137
Hunter	70,738	70,738	70,738	70,738
South Coast	967	967	967	967
Total	**920,071**	**920,071**	**920,071**	**920,071**
General Security Entitlements				
Border	263,085	263,085	263,085	263,085
Gwydir	509,665	509,665	509,665	509,665
Namoi	255,780	255,780	255,780	255,780
Peel	30,911	30,911	30,911	30,911
Lachlan	632,946	632,946	632,946	632,946
Macquarie	631,716	631,716	631,716	631,716
Murray	2,076,223	2,076,223	2,076,223	2,076,223
Murrumbidgee	2,264,065	2,264,065	2,264,065	2,264,065
North Coast	10,193	10,193	10,193	10,193
Hunter	138,109	138,109	138,109	138,109
South Coast	14,197	14,197	14,197	14,197
Total	**6,826,889**	**6,826,889**	**6,826,889**	**6,826,889**

10 STRUCTURE OF BULK WATER PRICES

10.1 Overview of Current Bulk Water Prices

The current structure of bulk water prices remains unchanged since the 2006 Determination. There are broadly three types of licences for charging purposes – high security, general security and supplementary licences. Each of these licence types can be held for irrigation purposes. In addition, high security licences can include town water supply, major utility licences and chargeable stock and domestic licences, while general security includes conveyance licences.

Both general and high security licence charges comprise a fixed entitlement charge and all three types are charged a variable, usage based charge. High security licences pay a premium on the entitlement charge, reflecting the increased access to water available to these licence categories.

The usage charge is the same for supplementary, general and high security licences and is payable on actual metered extractions. When water is metered, it is accounted against a licence and therefore a specific category of licence.

However, when the water is originally credited to an account in each licence, it can originate from: available water determinations (AWDs) for that licence category; water allocation assignments from other category licences; or from carryover from the previous year that may have been from AWDs or water allocation assignments.

Therefore, usage is not identified against any particular high or general security credit. Consequently, it would not be feasible to charge different usage charges on high security and general security licences.

There are separate fixed and variable charges in each regulated valley, which reflect the different costs of delivering water in each valley. The valleys are broadly based on Water Sharing Plans (WSP), however in some valleys water is delivered from more than one source and therefore may have different water sharing rules and allocations for each source. A small number of valleys do not yet have WSPs and therefore remain under the *Water Act 1912.*

The table below summarises the WSP areas and water sources included in each valley for pricing purposes.

The structure of prices for Fish River differs markedly from State Water's regulated valleys and is dealt with separately under in section 10.5.

Table 10.1: Water Sharing Plans and Water Sources

Pricing Valley	Water Sharing Plan	Headwater Storages
Border	Border Rivers Regulated River (as of 1.7.09)	Pindari Dam Glen Lyon Dam
Gwydir	Gwydir River Regulated River	Copeton Dam
Namoi	Upper & Lower Namoi Regulated River (2 water sources)	Upper Namoi – Split Rock Dam Lower Namoi – Keepit Dam
Peel	N/A *Water Act 1912*	Chaffey Dam
Lachlan	Lachlan Regulated River	Wyangala Dam
	Belubula *N/A Water Act 1912*	Carcoar Dam
Macquarie	Macquarie and Cudgegong Regulated Rivers	Burrendong Dam Windamere Dam
Murray	NSW Murray – Lower Darling Regulated Rivers (2 water sources)	NSW Murray – Hume Dam Lower Darling – Menindee Lakes
Murrumbidgee	Murrumbidgee Regulated River	Burrinjuck Dam Blowering Dam
North Coast	N/A *Water Act 1912*	Toonumbar Dam
Hunter	Hunter Regulated River	Glenbawn Dam Glennies Creek Dam
	Paterson Regulated River	Lostock Dam
South Coast	N/A *Water Act 1912*	Brogo Dam

10.2 Balance between Entitlement and Usage Charges

10.2.1 Overview of Current Ratio of Entitlement and Usage Charges

In its submission to the 2006 Determination, State Water was mandated by its Operating Licence to seek to recover 40% of costs from fixed charges and 60% from variable charges by 2007/08. Accordingly, IPART adopted this treatment, with the exception of the Hunter and North Coast Valleys which have large numbers of "sleeper" and "dozer" licences will little or no usage. The current structure of revenue recovery from fixed and usage charges is summarised in Table 10.2.

Table 10.2: Current Structure of Fixed to Variable Charges

Valley	Proportion of Revenue from Fixed Charges
Border	40%
Gwydir	40%
Namoi	40%
Peel	40%
Lachlan	40%
Macquarie	40%
Murray	40%
Murrumbidgee	40%
North Coast	60%
Hunter	60%
South Coast	40%

As outlined in Chapter 2, the current structure of charges has resulted in State Water under-recovering its revenue requirements during this current Determination. This was due to drought, but was compounded by the consumption forecasts adopted by IPART to recover usage based charges. As detailed in Chapter 9, State Water is proposing to address the latter via new consumption forecasts which reflect the recent structural change in the availability of water.

State Water's new Operating Licence no longer specifies the proportion of revenue which State Water must recover from fixed and variable charges. Consequently, there is no regulatory impediment to State Water seeking an alternative tariff design.

State Water's cost base is largely fixed, meaning there is little or no reduction in expenditure when water availability is restricted. Indeed, during the drought State Water customers with a zero allocation have enjoyed our significant achievement of supplying stock and domestic water along our regulated river system. This service is resource intensive but is extremely valuable to those living and farming along our regulated rivers. Consequently, cost reflective pricing for State Water would involve a high fixed charge and relatively low variable charge.

10.2.2 Customer Preferences

State Water has consulted with the Customer Service Committees and the New South Wales Irrigator's Council regarding preferences for fixed and variable water charges. The strong consensus was that customers prefer to have a significant proportion of charges being usage based. This serves as a natural hedge for customers against periods of drought as customers pay lower State Water charges when usage, and therefore production, is low and higher charges when usage and production is high.

State Water is aware that many customers have experienced low allocations over the current regulatory period, particularly general security licences holders in almost every valley. Therefore State Water has endeavoured to develop a pricing strategy which accommodates customer preferences for a significant usage-based charge.

10.2.3 Proposed Ratio of Entitlement to Usage Charges

As outlined in Chapter 2, the current ratio of fixed to variable prices has contributed to a significant deterioration in State Water's financial position. State Water did not recover the cost of providing services, the great majority of which are fixed, or achieve an appropriate rate of return.

Retaining the 40/60 fixed to variable pricing ratio exposes State Water to significant revenue volatility. To compensate for this risk State Water is seeking an increased WACC of 7.9%, as outlined in Chapter 5. If this WACC is accepted by IPART, it will enable State Water to retain the current 40/60 ratio of revenues recovered from fixed and variable charges. This is State Water's preferred tariff design as it combined customer preferences with ongoing financial viability.

Table 10.3: Preferred Ratio of Entitlement to Usage Charges (WACC 7.9%)

Valley	Proportion of Revenue from Fixed Charges
Border	40%
Gwydir	40%
Namoi	40%
Peel	40%
Lachlan	40%
Macquarie	40%
Murray	40%
Murrumbidgee	40%
North Coast	60%
Hunter	60%
South Coast	40%

If IPART chooses not to accept State Water's argument for a higher WACC, and instead retains the same WACC parameters adopted in other recent water utility Determinations (see Chapter 2), then State Water would seek to directly reduce the risk associated with water availability volatility to levels which are comparable to those utilities. This could be achieved by increasing the level of revenues recovered from fixed charges to 90%, which will reduce State Water's revenue volatility to that of Sydney Water. The higher level of fixed charges also more closely aligns with State Water's fixed costs.

Although a higher proportion of fixed charges will result in lower prices on average, due to the assumed lower WACC reflecting the level of risk, in periods of drought with low usage, the amount paid by customers, primarily general security customers, will be higher.

Table 10.4: Alternative Ratio of Entitlement to Usage Charges (WACC < 7.9%)

Valley	Proportion of Revenue from Fixed Charges
Border	90%
Gwydir	90%
Namoi	90%
Peel	90%
Lachlan	90%
Macquarie	90%
Murray	90%
Murrumbidgee	90%
North Coast	90%
Hunter	90%
South Coast	90%

Proposed water charges using both of these tariff designs are included in Chapter 11.

10.3 Balance between high security and general security charges

10.3.1 Conversion Factors in the 2006 Determination

Under the 2006 Determination, high security licences holders pay a higher entitlement charge than general security licence holders, known as the high security premium, which

is based on the Water Sharing Plan (WSP) conversion factors. IPART found that "*high security licence holders do receive a higher standard of service……therefore……a differentiated price, including a high security premium, is appropriate for State Water.*" (p110) The higher level of service referred to the security of supply, and IPART adopted the conversion factors in the WSP as the appropriate measure of that security.

The conversion factor represents the quantity of general security units needed to secure one unit of high security water. In theory, the conversion factor incorporates an 'unders' and 'overs' system so that in dry times, high security (HS) licence holders benefit from greater water security and in wet times, HS pay more than necessary. If the conversion factor is correct, the net effect of converting from a general security (GS) licence to a HS licence should be more or less equal. If it is incorrect, this will influence licence holder behaviour. If there is a large net benefit, more licence holders will seek to convert their licences to capture the benefit. Similarly, if there is a large net cost, conversions from HS to GS licences would occur to avoid the cost.

The WSP conversion factors are calculated by DWE using two variables, the 'reliability' of water and the number of converted licences. These variables are used to simulate different combinations of conversions that can co-exist and DWE selects the combination that minimises adverse effects on third parties.

State Water contends that the current conversion factors do not accurately reflect the benefit of holding a HS licence over a GS licence. The value of gains in the current system are greater than the value of losses. In wet periods, water is plentiful and both licence types achieve close to full allocation. The value of the HS 'loss' in this scenario is the premium paid over GS holders for their allocation of water.

In dry times however, the value of HS holders 'gain' is the security of their water supply which is, on average, close to a full allocation. Since this water has greater value in times of scarcity, as demonstrated by the spot price for water, the value of the gain by HS holders is far greater than the value of the loss incurred during wet years. The unders and overs system breaks down due to the inequality in payoffs.

This net increase in benefit for HS licence holders over GS licence holders, not yet reflected in the existing conversion factors, has encouraged larger numbers of GS licence holders to convert their licences. Attempted conversions have been so numerous that DWE has been forced to place a state wide ban on all conversions to avoid adverse third party impacts. Consequently, not only have HS licence holders enjoyed supernormal gains by trading their entitlements during dry years, the embargo on conversions has locked in this gain.

The massive demand for conversions, and the subsequent embargo by the then DWE (now Office of Water), is evidence that the 'price' of converting, that is, the conversion factors, are too low and need to rise in order to restore equilibrium. In the Murrumbidgee Valley, for example, 140GL worth of licences tried to convert from GS to HS over the last regulatory period.

The current premium levied by State Water on HS licence holders is based on the WSP conversion factors. It follows that if the WSP conversion factors no longer accurately reflect the 'reliability' of supply enjoyed by HS licences then neither does the HS premium charged by State Water. Therefore, State Water contends that in the 2010 Determination, IPART should amend the HS conversion factor to more accurately reflect the altered security of supply of HS licences.

It should be noted that State Water does not seek to increase its overall revenue requirement by revising the HS premium charge, but to merely redistribute the burden of costs currently faced by HS and GS licence holders. In the current drought, many valleys received near to full HS allocations whilst GS allocations were close to zero and yet GS users were paying for the majority of the costs of running the system. Having observed this inequity amongst its customers, State Water believes it has a responsibility to highlight the problem to IPART and propose a solution.

Asking HS licence holders to pay more when the value of their entitlements are relatively high (and hence GS licence holders to pay less) addresses these equity considerations while ensuring that HS licence holders do not overpay in periods of low scarcity.

The principle of charging one market segment more than another, according to its ability to pay, has long been recognised by regulators as a legitimate means of cost recovery and is formalised in the Ramsey-Boiteux pricing model. IPART itself has sanctioned a differential pricing approach for HS and GS licences that is not necessarily cost based.

State Water has identified two ways in which problems outlined could be remedied, and the HS premium in the 2010 Determination revised; by changing the conversion factor directly in the WSP or by adding a new variable to the existing conversion factor that captures desired information. Both approaches are outlined below.

10.3.2 Changing the Existing Conversion Factor

The first best solution is to change the conversion factors in the WSP to reflect the most up to date information regarding reliability and the number of entitlements.

The principal variables that are used to derive conversion factors in the WSP, the reliability of supply and the number of HS licence holders, have both changed over the current regulatory period and these changes should ideally be reflected in the WSP.

State Water has argued in Chapter 9 that statistical evidence points to a structural break from past patterns of rainfall. This will affect on the reliability of water supply in the future and should be reflected in a changing conversion factor. Likewise, had DWE not intervened to stop individual licence holders from converting, the number of HS licence holders would sharply increase, changing the conversion factor in response to the increased demand.

In their current state, therefore, the conversion factors are unrepresentative of the reliability of supply and should be adjusted to reflect the latest information on reliability of supply. We recognise, however, that adjustments to the conversion factors are outside State Water's mandate and fall into the jurisdiction of DWE. DWE has not yet updated conversion factors and discussion with staff from DWE indicates their preference to leave current conversion factors unchanged for the foreseeable future.

10.3.3 Proposed Conversion Factors for High Security Entitlements

In the absence of updated conversion factors from DWE, State Water proposes that IPART adopt an alternative methodology which incorporates existing conversion factors, adjusted for recent changes to reliability.

State Water proposes that the high security premium in the upcoming determination incorporate two elements:

- *an access premium*, to reflect the greater security of supply enjoyed by HS license holders, which is reflected in the 2006 Determination high security premium via the WSP conversion factors.

- secondly, *a scarcity premium*, to reflect the value of this supply under changing seasonal conditions, which is not currently reflected in the 2006 Determination premium.

The *scarcity premium* component of price is intended to reflect the changing scarcity value of water. In periods of high rainfall, when GS allocations are high, the relative value of HS licenses will be reduced. Both licence groups will retain near 100% of their allocations. However, in dry periods, when GS allocations are low, the value of HS licenses will be relatively higher because their supply received priority over GS allocations. The value of HS entitlements, therefore, changes according to seasonal conditions.

State Water proposes a quantitative methodology for capturing this value.

The price equation as described above, appears as follows:

Price = Access Premium + Scarcity Premium……(1)

The first part of this equation, the *Access Premium*, is already charged. This is the current conversion factor by valley, which takes into account how many GS licences are needed to deliver the same quantity of HS water. This can be derived from the Water Sharing Plans (WSP), as IPART has done in previous determinations. State Water is not proposing any changes to the values adopted by IPART in the 2006 Determination.

The second part of the equation, the *Scarcity Premium*, is calculated by taking the inverse of announced GS allocations (in percentage terms). Thus equation (1) above appears as

$$Price = (Conversion\ factor\ from\ WSP) * (1 / rolling\ average\ GS\ allocations) \ldots\ldots (2)$$

The inverse of average GS allocations over the last 15 years provides a measure of the extent to which HS licence holders have obtained allocations relative to GS licence holders. For example if GS licence holders received 40% of their allocations on average over the last 15 year, the conversion factor form the WSP would be multiplied by 2.5, being the inverse of 0.4. The inverse figure reflects the fact that HS licence holders have been 2.5 times as likely to receive their allocation on average over the last 15 years.

State Water considered several approaches to deriving an appropriate GS allocation figure. One method considered was to use a historical average GS allocation derived from data in WSP's in each valley. Water sharing plans in most valleys, however, have only been in place since 2004. In the Border valley, for example, a WSP has only been in place since 2009. This limits the availability of historical GS allocations data to a set of four or five years in most instances. State Water considers that using only four or five years to derive an average would represent an unacceptably large price shock to HS entitlement holders, and because it would capture only drought years, it would be unrepresentative of longer term GS allocation trends.

To protect HS licence holders from excessive variability, a rolling average could be used to smooth GS allocations. A rolling average allows seasonal trends to be captured in the scalar and limits the impact of one-off events. State Water proposes a rolling average of 15 years to be consistent with the proposed time series in the consumption forecasting. A shorter timeframe could also be justified, although this would result in a larger increase in the HS premium, due to the severity of the recent drought.

The proposed *scarcity premium* would have the effect of increasing the HS premium in times of water scarcity when GS allocations are low, and decreasing HS premiums in

times of increased water availability, when GS allocations are high. GS allocations of zero can be represented as 1%.

Advantages:

- Realigns the costs and benefits of converting to HS licence.
- HS premium will only increase in scenarios when the relative value of the entitlement increases.
- HS premium will decrease when the relative value of the entitlement decreases.
- Is transparent, to the extent that both WSP conversion factors and GS allocations are publicly available every year.
- Can potentially be incorporated under ACCC's Water Charge Rules in future Determinations, which propose annual adjustments to prices for variability in water availability.

Disadvantages

- Allocations are announced annually, so to be most effective, this should be updated as allocation announcements are made. This is currently limited by the length of IPART's regulatory periods but could potentially be addressed under the ACCC Water Charge Rules.
- A 15 year rolling average smooths volatility when volatility is what is intended to be captured. This could be remedied by adopting a shorter period.
- Prices will vary more between regulatory periods under this scenario.

Attaching a scarcity premium to the existing conversion factors has the same beneficial effect of realigning the mix of costs and benefits of converting to HS licences. It also retains the relationships between the number of licences and the reliability of water embedded in the WSP. Most importantly, it will result in HS premiums rising only when the relative value of HS licences over GS licences rises. Similarly, as the relative value of HS licences to GS licences falls, the HS premium will fall.

The proposed methodology does not represent a large deviation from the status quo. State Water requests only that the changing relative value of HS entitlements be included in pricing calculations.

A comparison of the current conversion factors with State Water's proposed approach is shown in Table 10.5.

Table 10.5: Comparison of Current and Proposed Conversion Factors

Valley	Existing Ratios	15 year Average Allocation	Inverse Average Allocations	Proposed Ratio
Border	1.28	39%	2.56	3.28
Gwydir	1.81	55%	1.81	3.28
Hunter	3.0	93%	1.07	3.22
Lachlan	2.45	43%	2.34	5.73
Macquarie	1.88	36%	2.74	5.16
Murray	1.25	50%	1.99	2.49
Murrumbidgee	1.63	54%	1.85	3.01
Namoi	1.25	75%	1.34	1.67
North Coast	1.25	81%	1.23	1.54
Peel	6.73	58%	1.73	11.66
South Coast	1.7	67%	1.49	2.53

The proposed ratios would be used to derive prices in the same manner as in previous years. The conversion factor in each valley is applied to a GS base of one to determine the premium charged to HS entitlement holders.

10.3.4 Impact on Customers

Under the changes proposed by State Water, changes to the HS premium will mimic changes in the value, or 'gains' enjoyed by HS licence holders relative to GS licence holders.

HS licence holders will only pay more for their entitlement when the value of their entitlement, and hence their ability to pay, increases. There is therefore no financial penalty to HS licence holders. GS licence holders, who represent the majority of irrigators, will pay a lower entitlement charge in times of low allocations, reflecting their limited ability to pay.
Similarly, the HS premium will decrease when GS allocations are high, to reflect the fact that the value of HS licences, and hence the ability to pay of licence holders, is impaired. GS licence holders who will receive more of their allocations will pay more in line with their ability to pay.

The net effect of the proposed changes will be to more closely align the costs and benefits of holding a HS licence. Adopting the proposed changes will also more closely align the costs of HS and GS entitlements with the ability to pay of respective licence holders.

10.4 Large Customer Rebates

10.4.1 Rationale for Rebates for Irrigation Corporations

In the 2006 Determination, IPART commissioned CIE to determine the justification and quantity of any discounts to irrigation companies and districts (ICDs). In relation to State Water activities, CIE found a number of arguments in support of maintaining rebates, namely:

- Economies of scale achieved in delivering water to ICDs relating to billing and metering activities, and to a lesser extent river operations activities; and
- System-wide benefits including policing of water use and qualitatively superior monitoring of diversions resulting from real-time monitoring.

Based on CIE's finding, IPART found that a rebate to large irrigation companies and districts (ICDs) was justified due to the "*lower costs of service delivery and the system wide benefits of the services they provide"* (page 114).

Whilst the size of the rebate does not affect State Water's total revenue requirements, it will directly affect the amount of charges paid by other State Water customers. Consequently, State Water has a responsibility to outline an appropriate rebate level.

State Water does not propose any change to the rationale for wholesales discounts. However, it is appropriate to revisit the quantification of those benefits, in light of efficiencies achieved by State Water over the current determination period, leading to reduced customer costs.

10.4.2 Proposed Rebates for Irrigation Corporations

Billing, Metering and Compliance Savings
State Water has quantified the savings arising from avoided billing, metering and compliance costs using average costs per entitlement. Metering and compliance costs are combined as these are shown as the one regulated activity.

Real Time Monitoring Savings
In addition to compliance, additional systems benefits arise from large customers extracting significant quantities of water from the river (in the Murrumbidgee as much as 70% of total extractions) with real time monitoring. This reduces the need for monitoring of smaller users via telemetry. When the regulated metering project is implemented, State Water will achieve the same level of real time monitoring through the installation of telemetry on the majority of meters. Consequently, State Water has quantified the benefit per entitlement based on avoided costs, using estimates from the metering project, which comprise:

- a rate of return of 7.9% capital expenditure for telemetry installation at $3,000 per site; and
- data transfer costs of $118 per year per site, comprising data management and calls costs.

The average cost per entitlement over the next regulatory period is shown in Table 10.6.

Table 10.6: Average Cost Per Entitlement ($09/10)

Average 2011 - 2015	Lachlan	Murray	Murrumbidgee
No of Entitlements (ML/share)	693,724	2,333,661	2,700,993
Metering and Compliance ($'000)	443	703	585
Billing ($'000)	96	66	51
Telemetry installation ($'000)	39	442	603
Data transfer costs ($'000)	19	220	300
Total Cost ($'000)	**597**	**1,430**	**1,540**
Total Cost per Entitlement ($)	**0.86**	**0.61**	**0.57**

Scaling of ICD Rebates
The economies of scale benefits from the ICD accrue only if the ICD members remain part of a larger customer. The new Australian Competition and Consumer Commission (ACCC) Water Market Rules will enable ICD customers to "transform" their water entitlements, meaning that they will effectively become additional State Water customers. This will directly reduce the economies of scale currently associated with the metering and billing activities undertaken by the ICDs, with a corresponding increase in State Water's metering and billing costs.

As shareholders transform their entitlements, the ICD rebate should also reduce. It is difficult to estimate the number of ICD shareholders that are likely to transform under the market rules. Therefore it is also difficult to factor in expected reductions in the rebates. As an alternative, State Water proposes a sliding scale for rebates, whereby the rebate received in any one year depends on the volumetric entitlement held by the ICD. As ICD shareholders transform, the entitlements held by the ICD will reduce and the rebate will reduce. The forgone rebate will be used by State Water to meet the costs associated with the new customers.

Since the exact size of the rebates will be based on the entitlements held by the ICD at the beginning of each billing period, State Water can only estimate the rebate based on

the number of entitlements currently held by each ICD. The table below shows the estimated rebate for each ICD an each year of the next regulatory period. These estimates are based on the annual saving per entitlement for each valley and then applied to the entitlements currently held by each ICD.

Table 10.7: Proposed Rebates (Unchanged Entitlements) ($09/10)

	2010/11	2011/12	2012/13	2013/14
Jemalong	88,331	87,339	84,361	83,369
Murray Irrigation	940,715	925,783	910,851	895,919
Western Murray	38,590	37,978	37,365	36,753
West Corugan	50,922	50,113	49,305	48,497
Moira	24,721	24,329	23,936	23,544
Eagle Creek	10,811	10,640	10,468	10,297
Murrumbidgee Irrigation	800,165	800,165	786,369	772,573
Coleambally	354,274	354,274	348,165	342,057

Future ICD Rebates

State Water notes that there are likely to be a number of factors influencing the size of ICD rebates in future Determinations. The first is the regulated metering project. It is anticipated that most meters will be connected via telemetry. This increased availability of real time monitoring in the system will remove the systems benefit State Water receives from ICD real time data. Furthermore, State Water proposes to recover metering costs through a metering service charge. The ICDs will only pay this charge for each of the Works Approvals held, directly capturing the economies of scale benefits in metering.

In addition, as outlined above, the ACCC's Water Market Rules will also affect the economies of scale achieved by ICDs as shareholders transform, thereby reducing the rebate which should be attributed to the ICD.

10.5 Fish River Water Supply Price Structure

10.5.1 Basis of Charging in the 2006 Determination

In the 2006 Determination, State Water proposed to continue with the existing price path for the Fish River Water Supply Scheme (Fish River), plus a nominal 4% increase per year. This approach was chosen as the Fish River had only just merged with State Water and had not yet been integrated into the rest of the business. This proposal was supported by customers and accepted by IPART. Prices were structured to include an access charge, a usage charge and an excess usage charge, with separate rates for bulk raw water and treated water.

Based on a notional Regulatory Asset Base (RAB) of $46.5 million at 1 January 2005, IPART estimated that Fish River would achieve 101% full cost recovery by 2010.

State Water no longer supports a continuation of the existing price path plus a percentage increase. Over the current Determination period, Fish River has been absorbed into State Water's operations, and included in the Total Asset Management Plan. Over the 2010 regulatory period, State Water is projecting a significant increase in assets renewals, primarily pipeline replacement, as well as $6 million in drought works requested by customers. Continuation of the existing price path does not allow State

Water any certainty that the costs of these replacements will be recovered. Similarly, a flat percentage increase does not provide customers with any transparency.

10.5.2 Building Block Approach

State Water proposes to use the building block approach to determine Fish River charges, in a manner consistent with the other regulated valleys. This would involve:

- rolling forward the notional RAB from the 2006 Determination;
- treating Minimum Annual Quantities (MAQs) as entitlements;
- adopting a rolling average of 15 years for consumption forecasting to recover the usage charge; and
- potentially removing the excess charge.

Currently FRWS is managed under Operating Rules (OR) agreed to by the Customer Council. The ORs provide for trading of entitlement and allocations. The ORs also allow use of water excess to allocations, with usage above MAQ charged at a higher rate. Historically the excess charge was a demand management tool. However, provision of excess use and charges in the OR is not consistent with a market mechanism as one customer's under usage benefits the other customers, without reflecting the real value of that water.

State Water is planning to implement an allocation system in Fish River, which would work in the same way as water accounting does in the other State Water valleys. Water accounts for the four large customers will be credited with allocations as a percentage of shares based on the available resource, and carryover will be allowed. These customers will be allowed to trade in allocations from others to extract more than their allocated amounts, potentially removing the need for an excess charge, and permitting a more efficient allocation of resources. State Water notes that the excess charge should be retained for small customers as a demand management tool, as these customers will not have their accounts credited.

10.6 Charging for Adaptive Environmental Water Licences

State Water views Adaptive Environmental Water (AEW) licence holders as it does all other customers. AEW licence holders receive the same services as other customers holding the same general or high security licence, including account management and water ordering. Consequently State Water believes that these licences should be fully chargeable, in the same way as other general and high security licences are charged.

The NSW Government is currently finalising its policy on pricing for adaptive environmental water licences. State Water understands that the policy supports the charging for AEW licences.

State Water does not expect the creation of new AEW licences over the new regulatory period to materially affect licence numbers. State Water is only aware of one AEW created to date, in the Lachlan Valley, for the Lake Brewster Water Efficiency Project. This licence has been included in entitlement data used to develop water charges.

10.7 Impact of Water Entitlement and Allocation Interstate Trade

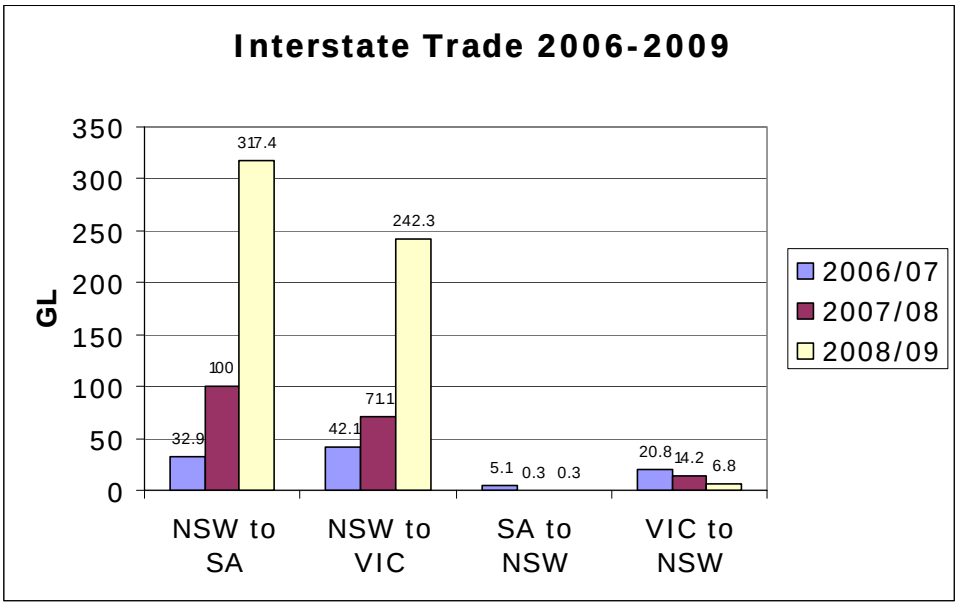
The current regulatory period has coincided with the maturation of inter and intrastate water trading, and in particular allocation, or temporary, interstate trade.

Entitlement Trade
Entitlement trade is also known as permanent trading. When water entitlements are traded interstate, a Water Access Licence (WAL) is created for the purchaser so that entitlement and usage charges can be recovered. Consequently, entitlement, or permanent, trade does not affect State Water's ability to recover revenues.

Allocation Trade
In the recent past, when water was temporarily traded between valleys and states, the fixed charge component was payable by the permanent holder of the water access licence to the NSW state utility, department or authority. The variable (or usage) charge was payable by the purchaser to the utility or authority in the state in which the water is delivered (assuming that jurisdiction has a usage charge). As a result, water traded outside the valley reduced revenue earned in that valley. If the water was traded out of the state, recovery of the usage revenue was more complex because an interstate purchaser does not hold a NSW WAL, and State Water has no direct relationship with the purchaser.

Interstate trading mainly affects the Murray, Lower Darling and Murrumbidgee Valleys where NSW has recently been a net seller of water to Victoria and South Australia. Over the last few years, the volume of water being traded to other states has increased significantly. The increase in uni-directional trade during the current regulatory period is shown in Figure 10.1.

Figure 10.1: Interstate Trade 2006 – 2009



Combined with the increased ratio of variable to fixed water charges in the 2006 Determination, State Water is now losing increasing amounts of usage revenues due to interstate trade, despite incurring all the costs of storing and delivering the water. In 2006/07, State Water lost usage revenues of less than $150,000 due to interstate trade. In 2007/08 this increased to around $330,000. In 2008/09, 7GL was traded into NSW whilst 560GL was traded out. This equate to usage revenues of over $2 million.

The volume of trade increased to such an extent that State Water has endeavoured to recover these charges from the interstate parties, namely Goulburn Murray Water, Lower Murray Water and the South Australian Department of Land, Water and Biodiversity

Conservation. State Water is currently in dispute with these parties about their obligations to pay these charges.

State Water has sought the support of the NSW Minister for Water to negotiate an interstate agreement, as envisaged by the Murray Darling Basin Agreement and the water legislation, in each state.

Pending resolution of this matter, commencing 1 July 2009, State Water has amended its billing practices. State Water intends to recover the usage charge from the seller at the point of transaction, when the purchaser does not have an account with State Water. State Water believes this is an equitable, transparent and administratively simple solution to the current loss of revenue to due interstate trading. Under this approach, allocation assignment would be deemed usage. State Water believes that these new arrangements are permitted within the current Determination. However, for the purposes of clarity, State Water requests that the new Determination explicitly allow State Water to bill usage charges at the point of transfer if the purchaser does not have an account with State Water.

It should be noted that the split between fixed and variable charges does not reflect the actual proportion of fixed and variable costs i.e. there is no corresponding reduction in State Water's costs when usage occurs in another jurisdiction. Instead, this pricing structure reflects a requirement of State Water's former Operating Licence that prices be based a 60:40 fixed to variable ratio. It also reflects customer preference for lower business costs during poor irrigation seasons.
The Australian Competition and Consumer Commission (ACCC) is currently developing water trade rules. State Water has raised these concerns in its submission to the ACCC Water Trading Rules Issues Paper, and requested that the Rules should include an explicit mechanism to allow recovery of usage charges. So far, no further details have emerged from the ACCC. Furthermore, the Rules developed by the ACCC are intended to be included in the Basin Plan, which is not scheduled to be completed until 2011.

10.8 Metering Service Charge

10.8.1 NSW Metering Scheme

The NSW Metering Scheme is one of the NSW Government's priority projects for the Commonwealth's Water for the Future Program. The Federal Government has agreed in principle to fund the NSW Metering Scheme to the amount of $221 million, including $90 million for meters on regulated rivers. The project will provide for State Water and Government owned meters on customer works funded by the Commonwealth in the Murray Darling Basin (MDB) and will result in a new regulatory regime for irrigators in NSW. The project involves moving from entitlement holder owned meters to State Water and government owned meters.

In the regulated water sources, this will involve replacing approximately 5,500 existing customer owned meters with State Water owned meters connected via telemetry. In the unregulated and groundwater systems, as well as replacing existing meters, the NSW Metering Scheme will typically involve installation of government owned meters in sites that are currently unmetered. Meters will be high accuracy, tamper proof and low maintenance and be typically a full-bore electromagnetic (commonly known as "Mag Flow" meters) which have no obstruction to flow, and minimal operation and maintenance costs The project will reduce inaccurately measured metered extractions and minimise theft.

All Australian governments have committed, through the National Water Initiative (NWI) Agreement, to the implementation of national water meter standards (NWMS). The project will enable NSW to meet its National Water Initiative commitments to implement

these new standards (involving a commitment to an accuracy standard of +/-5% in the field) within the Murray Darling Basin. To support the implementation of the metering standards, all governments have committed to develop state implementation plans detailing how the standards will be implemented in each jurisdiction. The meters installed under the metering project will be compliant with the NWMS.

The new metering scheme will be rolled out in the Murray-Darling Basin and the Hawkesbury Nepean River Basin over the next five years, with meters to be installed on the regulated rivers from mid 2010 to mid 2014. It will not be applicable to other areas where metering will continue under the existing arrangements, with meters remaining a water user responsibility. Generally the new scheme will apply to persons holding an approval for a pump, bore or other water extraction work. It will not apply to:

- Water supplied by town water supply schemes, irrigation corporations, or other rural water supply schemes to their customers downstream of bulk offtakes
- Extraction under Basic Landholder Rights
- Extraction by small diameter pumps (minimum size to be determined)
- Extraction by small volume licence holders (minimum size to be determined)
- Farm dams not on rivers.

The NSW Metering Scheme will not be applicable to coastal valleys which will continue under the existing meter arrangements. Coastal Works Approval Holders (except those in the Hawkesbury Nepean) will continue to own and maintain their own meters and not attract a charge for the provision of meters.

10.8.2 Benefits of NSW Metering Scheme

The benefits of the metering scheme for customers are summarised below.

- Ensure the integrity of the water sharing framework in the Murray Darling Basin by ensuring water users are only extracting what they are entitled to.
- Investment in water entitlements will be protected and enhanced by accurate metering and will be enhanced by strengthening water trading markets by allowing real time trading. This will also result in a positive impact on regional communities.
- Protect environmental flows including water held by environmental water licence holders in the Murray Darling Basin.
- Allow quicker and better management of licences, and entitlements in terms of water sharing, accounting, trading, billing and compliance activities by providing real time up to date information and enabling customers to make quicker management decisions.
- Reduce water theft.
- Improve water operations with the use of enhanced real time data.
- Enable more accurate revision of water sharing plans in 2014 by having accurate usage information.
- Secure existing entitlements, and therefore regional economies, by removing the unfairness and inequity of inaccurate metering, unmetered extraction and water theft.
- Ensure NSW delivers appropriate water management data to the Bureau of Meteorology without the need for additional systems or processes.
- Enable NSW to meet its National Water Initiative commitments to implement national meter standards.
- Guarantee better security for town water supply and other high security customers.
- Ensure customers are treated in the same and equitable manner to other states where their water authorities own the meters.

- Customers will potentially be able to link their water infrastructure to the meters to enable improved water management of their activities such as automatic starting and stopping of pumps based on meter readings.

There are also a number of direct benefits for customers, in particular resulting from the implementation of the new national water meter standards. These benefits are outlined below.

- Economies of scale with the purchase price of the new meters during the rollout of the metering scheme. The position State Water and the Office of Water in the market should drive the market with cheaper meter and installation costs. During the implementation of the new national meter standards interstate water authorities will be in the market for compliant meters. It is expected that the demand for meters will exceed the capacity of the manufacturers to supply the numbers required. Individual orders will more than likely expect significant lead times for delivery. The transfer of meter ownership to State Water should enable some of the problems to be overcome especially with the large numbers of meters to be ordered by State Water.
- Customers will also benefit in that they will not have to source certified meter installers required by the new national standards. It is expected that the implementation on the new national meter standards will result in a reduction of meter retailers and there will be a limited field of certified designers and installers of non urban flow meters.
- Customers will not have to pay the capital cost of the initial purchase of new meters with this being funded by the Commonwealth Government.

10.8.3 Costs of the NSW Metering Scheme

The initial capital costs for the purchase and installation of the meters and telemetry will be funded by the Commonwealth Government. State Water and the Office of Water propose that the on-going operating, maintenance and replacement costs be recovered from users through an IPART-determined Metering Service Charge (MSC).

During the life of the Determination customers will be required to fund planned maintenance, unplanned maintenance (not covered by meter warranty) remote meter reading and data information processing. These costs are independent of meter size as there are no capital replacement costs and will only apply once a meter has been installed and ownership transferred from the contractor to State Water.

During the next regulatory period meter reading costs will be rolled into the meter service change along with capital costs for meter replacement. The meter reading costs to be incorporated into the meter service charge will be net of the actual dollar savings by the reduced field meter reading costs.

Table 10.8 below summarises the estimated marginal cost for each cost activity and type of meter, based on a report prepared by Nayar Consulting for the Hawkesbury Nepean Metering Scheme.

Table 10.8: Marginal Costs of the Metering Project

Type of Meter	Annual Operating and Maintenance Costs ($/meter/annum)							Estimated Cost ($/meter/annum)
	Meter reading		Planned maintenance			Unplanned maintenance	Meter Information System - Data Processing	
	Manual	Remote	Validation	Consum-ables	Replace-ment			
Electromagnetic Meter with basic data logger	NA	0	78	20	0	60	56	214
Electromagnetic Meter with programmable data logger and mobile phone modem	NA	60	78	20	0	75	56	289
Electromagnetic Meter with programmable data logger and satellite modem	NA	360	78	20	0	90	56	604
Read – Channel meter with Mobile phone coverage*	NA	360	78	20	0	90	56	604
Remote Read – Channel meter with Satellite telemetry coverage*	NA	360	78	20	0	90	56	604

* Annualised costs for channel meters are the subject of a consultancy funded by the Commonwealth Government as part of the metering project, expected to be completed by the end of 2009. Pending completion of this consultancy, the MSC for channel meters is based on that of an Electromagnetic meter.

This submission relates only to the proposed MSC on regulated rivers. Details of the proposed MSC on unregulated and groundwater meters will be included in the Office of Water's submission to IPART. Where possible, the proposed regulated, groundwater and unregulated MSCs are consistent.

10.8.4 Proposed Metering Service Charge

The MSC is proposed to be levied on Works Approvals, with the charge designed to recover full ongoing costs (once the Commonwealth's contribution ceases), rather than incorporated into regulated operating expenditures, which is recovered from Water Access Licence holders. The MSC will be levied on irrigation corporations whose offtake measurement site will be acquired by State Water and this will result in a reduction in the wholesale discount be the equivalent of the MSC in future Determinations.

Stater Water believes that a single meter service charge is preferable to incorporating the new metering costs within regulated operating expenditure for a number of reasons.

- The MSC would be based on the size and number of meters used to measure extraction through the works approval.
- The MSC is thus higher for approval holders who have bigger meters or more meters than other approval holder.
- The MSC sends the right economic signals about efficiency ie the more meters you have the more you pay.
- A separate charge removes any cross subsidy between small and large users.
- The MSC encourages the modernising irrigation principles such as pump and layout consolidation.
- The cost of the operating and maintaining an electromagnetic meter is fixed (i.e. doesn't vary with the amount of water delivered) and hence should not be linked to a variable charge component
- A MSC would also be charged where an approval holder has no access entitlement, but still has a meter in place which is still required to be maintained.

- A MSC is also more appropriate where an irrigator has a meter and access entitlement, but subsequently trades most of the water out, but still retains the larger meter.

10.8.5 Transitional Arrangements for the 2010 Determination

During this determination the NSW Government proposes a transitional charge where only those additional costs incurred during the 2010 Determination period by State Water/DWE on the introduction of the new metering regime will be reflected in the MSC. Works Approval holders who continue to own and maintain their own meters will not attract the MSC

The metering project has so far only received in principle approval from the Commonwealth government. Final approval will be subject to a bilateral agreement being reached between the NSW and Commonwealth Governments, as well as a due diligence review of the metering project business case.

The business case for the project is still being developed. Consequently, the timeframe for the rollout of the meters, assuming that the Commonwealth approves the business case, is not expected until 2013/14, which is the last year of the new regulatory period, although in some valleys the rollout may commence earlier.

State Water proposes that IPART adopt transitional arrangements for the new regulatory period which would involve:

- Meter reading and audit costs continue to be recovered through regulated operating expenditure.
- The MSC in this determination would only cover the marginal costs incurred by installation of the new meters
- Data management and data transfer costs.
- Meter maintenance (excluding repairs that are covered by warranty)
- A Works Approval holder will incur the MSC only once the meter is installed.

In the following regulatory period, State Water anticipates that the MSC would incorporate all metering costs, with a corresponding offset in regulatory operating expenditure. Asset replacement costs are not expected to be incurred until the third regulatory period.

It is proposed to charge works approval holders the MSC commencing in the financial year after installation of a government meter. Thus for meters installed in 2009/10, it will apply from 1 July 2010; for meters installed in 2010/11, it will apply from 1 July 2011.

Under the transitional arrangements, some components of the MSC will not apply immediately. For example the cost of the repair service will not apply during the three year warranty period. How components of the MSC are to be phased in (including components beyond the duration of this price determination) is shown in Table 8.

Table 10.9: Phasing in of MSC Components

MSC fee component	Fee commencement (financial year after meter installation)		
	2010 Determination	Next	Following
Return on capital for 10% State Contribution (if required)	✓	✓	✓
Meter reading	(no fee – already covered by existing bulk water charge but may be transferred to MSC in five years time)		
Information management	✓		
Meter maintenance (excluding repairs, which are covered by warranty)	✓		
Meter maintenance - repairs component (post warranty)		✓	
Asset replacement			✓

The charge per meter installed is proposed to vary, depending on the meter size and type, as these factors will affect ongoing maintenance and replacement costs.

Table 10.10: Proposed Transitional MSC Charges for 2010 Determination

Type of Flowmeter	Charge $
Local Read -Magmeter	214
Remote Read – Magmeter with Mobile phone coverage	289
Remote Read – Magmeter with Satellite telemetry coverage	604
Remote Read – Channel meter with Mobile phone coverage	604
Remote Read – Channel meter with Satellite telemetry coverage	604

10.9 Yanco Creek System Natural Resource Management Levy

In the 2006 Determination, IPART approved a levy of $0.90/ML of entitlement for Yanco Creek irrigators to fund a works program initiated by users in that system.

State Water understands that the Yanco Creek and Tributaries Advisory Council (YACTAC) has voted to continue the collection of a Natural Resource Management levy of $0.90/ML, paid quarterly for the period 2010/11 to 2013/14. On the basis of the YACTAC endorsement to continue to levy, State Water also supports the continuation of the levy in the 2010 Determination.

11 PRICES FOR INDIVIDUAL SERVICES

11.1 Summary of Proposed Pricing for Regulated Rivers

11.1.1 Proposed Prices for Regulated Rivers based on State Water's Preferred Tariff Design

As outlined in Chapter 10, State Water's preferred tariff design is based on a 40/60 fixed to variable ratio (except for the Hunter and North Coast Valleys which remain at 60% fixed) with a WACC of 7.9%. As outlined in Chapter 7, the user share building block requirements are projected to increase by 22.2% over the regulatory period, which will result in price increases relative to 2009/10. The proposed new charges are shown in Table 11.1, with 2009/10 prices included for comparative purposes.

Table 11.1: Proposed Prices based on 40/60 Fixed/Variable Ratio and 7.9% WACC ($2009/10)

	2009/10	2010/11	2011/12	2012/13	2013/14
High Security Entitlement Charge $/ML					
Border	4.37	10.57	10.44	10.84	10.36
Gwydir	6.08	11.54	11.70	12.17	13.16
Namoi	9.31	12.37	13.53	14.01	14.68
Peel	11.50	23.72	24.22	24.34	23.37
Lachlan	7.02	17.64	17.97	19.35	19.59
Macquarie	5.78	14.62	15.12	15.67	16.50
Murray Lower Darling	2.75	4.17	4.66	4.91	4.63
Murrumbidgee	2.46	3.36	3.48	3.57	3.49
North Coast	5.60	75.10	75.89	77.70	75.51
Hunter	20.22	26.55	26.56	27.16	26.50
South Coast	10.61	46.70	46.57	47.47	46.28
General Security Entitlement Charge $/ML					
Border	3.41	3.22	3.18	3.30	3.16
Gwydir	3.37	3.52	3.57	3.71	4.01
Namoi	7.44	7.41	8.10	8.39	8.79
Peel	1.71	2.03	2.08	2.09	2.00
Lachlan	2.86	3.08	3.14	3.38	3.42
Macquarie	3.07	2.83	2.93	3.04	3.20
Murray	2.20	1.67	1.87	1.97	1.86
Murrumbidgee	1.51	1.12	1.16	1.19	1.16
North Coast	4.48	48.77	49.28	50.46	49.03
Hunter	6.74	8.25	8.25	8.43	8.23
South Coast	6.24	18.46	18.41	18.76	18.29
Usage charges $/ML					
Border	6.54	8.88	8.77	9.10	8.69
Gwydir	8.96	11.11	11.27	11.71	12.67
Namoi	12.56	17.62	19.29	19.96	20.92
Peel	25.72	62.36	63.68	64.02	61.47
Lachlan	10.83	20.01	20.38	21.94	22.22
Macquarie	8.47	13.41	13.87	14.37	15.13
Murray	4.00	4.90	5.48	5.78	5.45
Murrumbidgee	3.54	3.46	3.58	3.67	3.59
North Coast	27.84	373.67	377.45	386.16	375.62
Hunter	12.28	15.52	15.53	15.88	15.49
South Coast	24.96	79.14	78.94	80.45	78.47

The proposed price increases for the North Coast, South Coast and Peel Valleys are significant as these valleys are not yet at full cost recovery. State Water notes that IPART will need to consider the impact on customers in these valleys before approving price increases. The Hunter Valley is also not currently at full cost recovery although it is much closer than the other three valleys.

Table 11.2 shows the percentage annual increase in prices.

Table 11.2: Annual Increase in Prices on Regulated Rivers

$/ML	2010/11	2011/12	2012/13	2013/14
High Security Entitlement Charge				
Border	141.8%	-1.2%	3.8%	-4.4%
Gwydir	89.7%	1.4%	3.9%	8.2%
Namoi	32.8%	9.4%	3.5%	4.8%
Peel	106.3%	2.1%	0.5%	-4.0%
Lachlan	151.2%	1.9%	7.6%	1.3%
Macquarie	153.1%	3.4%	3.6%	5.3%
Murray	51.5%	11.9%	5.3%	-5.7%
Murrumbidgee	36.6%	3.5%	2.6%	-2.1%
North Coast	1,241.3%	1.1%	2.4%	-2.8%
Hunter	31.3%	0.1%	2.2%	-2.4%
South Coast	340.0%	-0.3%	1.9%	-2.5%
General Security Entitlement Charge				
Border	-5.5%	-1.2%	3.8%	-4.4%
Gwydir	4.5%	1.4%	3.9%	8.2%
Namoi	-0.5%	9.4%	3.5%	4.8%
Peel	18.8%	2.1%	0.5%	-4.0%
Lachlan	7.6%	1.9%	7.6%	1.3%
Macquarie	-7.7%	3.4%	3.6%	5.3%
Murray	-23.9%	11.9%	5.3%	-5.7%
Murrumbidgee	-26.1%	3.5%	2.6%	-2.1%
North Coast	987.7%	1.1%	2.4%	-2.8%
Hunter	22.4%	0.1%	2.2%	-2.4%
South Coast	195.8%	-0.3%	1.9%	-2.5%
Usage charge				
Border	35.8%	-1.2%	3.8%	-4.5%
Gwydir	24.1%	1.4%	3.9%	8.2%
Namoi	40.4%	9.4%	3.5%	4.8%
Peel	142.5%	2.1%	0.5%	-4.0%
Lachlan	84.7%	1.9%	7.6%	1.3%
Macquarie	58.3%	3.4%	3.6%	5.3%
Murray	22.6%	11.9%	5.3%	-5.7%
Murrumbidgee	-2.5%	3.5%	2.6%	-2.1%
North Coast	1,242.2%	1.0%	2.3%	-2.7%
Hunter	26.4%	0.1%	2.2%	-2.4%
South Coast	217.1%	-0.3%	1.9%	-2.5%

For those valleys which were at full cost recovery at the end of the current regulatory period, it is important to note that not all charges will increase.

High Security Entitlement Charges
Relative to 2009/10 charges, HS entitlement charges are expected to increase by between 31.3% (Hunter) and 153.1% (Macquarie) driven partly by the increases in revenue requirements, but more significantly by changes that State Water has proposed to the premium that HS licence holders pay over GS holders outlined in Chapter 10.

General Security Entitlement Charges
The proposed increase in the HS premium has resulted in lesser increases in GS entitlement charges, while in several valleys these charges have actually reduced. In all but the Peel, North Coast and South Coast Valleys, GS entitlement charges are expected to increase between 4.5% (Gwydir) and 22.4% (Hunter). Valleys which would enjoy reductions in the GS entitlement charge relative to 2009/10 charges are the Border (-5.5%), Namoi (-0.5%), Macquarie (-7.7%), Murray (-23.9%) and Murrumbidgee (-26.1%).

Usage Charges
Usage charges have increased by up to 84.7% for all valleys currently at full cost recovery except the Murrumbidgee (2.5% decrease), driven mainly by the revised consumption forecasts. Customers have a greater ability to pay usage charges than entitlement charges as usage charges are only incurred when water has been made available.

In addition, a reduction in the pass through amounts for the Government contribution to the Murray Darling Basin Authority has reduced revenue requirements in the Murray and Murrumbidgee, with a corresponding reduction in prices in those valleys. However it should be noted that this decrease is likely to be offset by a corresponding increase in the Office of Water's resource management charges.

The impact of these price increases on customer affordability is discussed in Chapter 12.

11.1.2 Alternative Prices for Regulated Rivers

State Water reserves the option to seek to directly reduce the level of volatility in user share revenues should IPART not endorse an increase in the WACC of 1.4% relative to the recent metropolitan water businesses. As outlined in Chapter 2, State Water would require 90% fixed charges to reduce revenue volatility to levels which are comparable to Sydney Water. The proposed prices using these assumptions are outlined in Table 11.3, with 2009/10 prices included for comparative purposes.

Table 11.3: Alternative Prices with 90/10 Fixed/Variable Ratio and 6.5% WACC ($2009/10)

$/ML	2009/10	2010/11	2011/12	2012/13	2013/14
High Security Entitlement Charge					
Border	4.37	23.43	23.13	24.02	22.94
Gwydir	6.08	24.87	25.17	26.06	28.02
Namoi	9.31	26.82	29.20	29.96	31.21
Peel	11.50	51.60	52.67	52.94	50.73
Lachlan	7.02	38.28	38.82	41.71	41.96
Macquarie	5.78	31.43	32.38	33.46	35.25
Murray Lower Darling	2.75	9.12	10.15	10.69	10.07
Murrumbidgee	2.46	7.27	7.52	7.71	7.52
North Coast	5.60	106.47	107.42	110.07	106.96
Hunter	20.22	38.32	38.29	39.19	38.21
South Coast	10.61	100.92	100.38	102.36	99.73
General Security Entitlement Charge					
Border	3.41	7.14	7.05	7.32	6.99
Gwydir	3.37	7.58	7.67	7.94	8.54
Namoi	7.44	16.06	17.48	17.94	18.69
Peel	1.71	4.43	4.52	4.54	4.35
Lachlan	2.86	6.68	6.78	7.28	7.32
Macquarie	3.07	6.09	6.27	6.49	6.83
Murray	2.20	3.66	4.07	4.29	4.04
Murrumbidgee	1.51	2.42	2.50	2.56	2.50
North Coast	4.48	69.13	69.75	71.47	69.45
Hunter	6.74	11.90	11.89	12.17	11.87
South Coast	6.24	39.89	39.67	40.46	39.42
Usage charges					
Border	6.54	1.46	1.44	1.49	1.43
Gwydir	8.96	1.77	1.80	1.86	2.00
Namoi	12.56	2.83	3.08	3.16	3.30
Peel	25.72	10.08	10.28	10.34	9.91
Lachlan	10.83	3.22	3.26	3.50	3.53
Macquarie	8.47	2.13	2.20	2.27	2.40
Murray	4.00	0.79	0.88	0.93	0.88
Murrumbidgee	3.54	0.55	0.57	0.59	0.57
North Coast	27.84	84.67	85.73	88.83	85.52
Hunter	12.28	3.74	3.73	3.82	3.72
South Coast	24.96	12.73	12.66	12.91	12.58

Table 11.4 shows the percentage annual increase in prices using a 90/10 fixed to variable ratio.

Table 11.4: Annual Increase in Prices with 90/10 Fixed/Variable Ratio

	2010/11	2011/12	2012/13	2013/14
High Security Entitlement Charge				
Border	435.8%	-1.3%	3.8%	-4.5%
Gwydir	308.7%	1.2%	3.5%	7.5%
Namoi	188.1%	8.9%	2.6%	4.2%
Peel	348.9%	2.1%	0.5%	-4.2%
Lachlan	445.0%	1.4%	7.4%	0.6%
Macquarie	444.1%	3.0%	3.4%	5.3%
Murray	231.5%	11.3%	5.4%	-5.8%
Murrumbidgee	195.3%	3.4%	2.5%	-2.4%
North Coast	1,801.6%	0.9%	2.5%	-2.8%
Hunter	89.5%	-0.1%	2.3%	-2.5%
South Coast	850.9%	-0.5%	2.0%	-2.6%
General Security Entitlement Charge				
Border	109.3%	-1.3%	3.8%	-4.5%
Gwydir	125.1%	1.2%	3.5%	7.5%
Namoi	115.7%	8.9%	2.6%	4.2%
Peel	158.6%	2.1%	0.5%	-4.2%
Lachlan	133.5%	1.4%	7.4%	0.6%
Macquarie	98.4%	3.0%	3.4%	5.3%
Murray	66.6%	11.3%	5.4%	-5.8%
Murrumbidgee	59.7%	3.4%	2.5%	-2.4%
North Coast	1,441.9%	0.9%	2.5%	-2.8%
Hunter	76.7%	-0.1%	2.3%	-2.5%
South Coast	539.3%	-0.5%	2.0%	-2.6%
Usage charge				
Border	-77.7%	-1.4%	3.9%	-4.5%
Gwydir	-80.2%	1.2%	3.5%	7.5%
Namoi	-77.5%	8.9%	2.6%	4.2%
Peel	-60.8%	2.1%	0.5%	-4.2%
Lachlan	-70.3%	1.4%	7.4%	0.6%
Macquarie	-74.8%	3.1%	3.3%	5.4%
Murray	-80.1%	11.3%	5.5%	-5.9%
Murrumbidgee	-84.4%	3.4%	2.5%	-2.4%
North Coast	204.2%	1.3%	3.6%	-3.7%
Hunter	-69.6%	-0.1%	2.4%	-2.6%
South Coast	-49.0%	-0.6%	2.0%	-2.6%

11.2: Summary of Proposed Pricing for Fish River Water Supply

The proposed charges for Fish River Water Supply are outlined in Table 11.5, with 2009/10 prices included for comparative purposes.

Table 11.5 Proposed Prices for Fish River Water Supply ($2009/10)

	2009/10	2010/11	2011/12	2012/13	2013/14
BULK RAW WATER					
Minimum Annual Quantity (MAQ) ($/kL)					
- Delta Electricity	0.24	0.32	0.34	0.36	0.36
- Sydney Catchment Authority	0.24	0.32	0.34	0.36	0.36
- Oberon Council	0.24	0.32	0.34	0.36	0.36
- Individual Minor Customers	0.30	0.40	0.43	0.45	0.44
Usage up to MAQ ($/kl)					
- Delta Electricity	0.27	0.36	0.39	0.40	0.40
- Sydney Catchment Authority	0.27	0.36	0.39	0.40	0.40
- Oberon Council	0.27	0.36	0.39	0.40	0.40
- Individual Minor Customers	0.54	0.71	0.77	0.81	0.80
Usage in excess of MAQ ($/kL)					
- Delta Electricity	0.51	0.68	0.73	0.76	0.75
- Sydney Catchment Authority	0.51	0.68	0.73	0.76	0.75
- Oberon Council	0.51	0.68	0.73	0.76	0.75
- Individual Minor Customers	0.84	1.11	1.20	1.26	1.24
BULK FILTERED WATER					
Minimum Annual Quantity (MAQ) ($/kL)					
- Lithgow Council	0.36	0.48	0.52	0.54	0.53
- Individual Minor Customers	0.42	0.56	0.60	0.63	0.62
Usage up to MAQ ($/kl)					
- Lithgow Council	0.39	0.52	0.56	0.58	0.58
- Individual Minor Customers	0.66	0.87	0.95	0.99	0.98
Usage in excess of MAQ ($/kL)					
- Lithgow Council	0.75	0.99	1.07	1.12	1.11
- Individual Minor Customers	1.08	1.43	1.55	1.62	1.60

11.3 Proposed Temporary Transfer Fees

In the 2006 Determination, IPART set temporary transfer fees with a fixed charge of $50 and a variable charge of $0.50/ML with a maximum charge of $150 per transfer. This fee was held constant for the period of the Determination, effectively translating to a real reduction of 9% over the regulatory period.

State Water proposes that the fee remain at the level set in the 2006 Determination, namely a fixed charge of $50 and a variable charge of $0.50/ML with a maximum charge of $150 per transfer. State Water also proposes that the fee continue to be held constant at this level over the period of the determination, resulting in a further reduction in the real level of this charge of approximately 10%.

11.4 Ancillary Charges

State Water routinely receives requests for information from customers and other parties, primarily seeking historical billing, metering, usage and allocation announcement data. State Water does not currently recover the costs of providing this information.

Although most requests can be met easily, some can take many hours or even weeks to gather. The most time consuming requests tend to come from interested third parties who are not State Water customers and therefore do not pay water charges. The lack of cost recovery also means that there is no incentive for customers to retain their own billing, metering and usage information.

State Water proposes that IPART approve a charge for the provision of information of $80.52 per hour, in line with a charge recently approved for the Hunter Water Corporation to undertake billing record searches. This charge would cover requests for information on billing, metering, usage, allocations and other historical records held by State Water.

State Water believes that the provision of current information to customers should be considered part of State Water's regulated services, which are therefore recovered from water charges. Consequently the proposed information charge should apply differently to customers and other parties, as outlined in Table 11.6.

Table 11.6: Proposed Ancillary Provision of Information Charge

	State Water customer	**Non-State Water customer**
Information from the last 2 years	No Charge	$80.52/hour, minimum charge of $40 per request.
Information older than 2 years	$80.52/hour, minimum charge of $40 per request.	$80.52/hour, minimum charge of $40 per request.

12 IMPACT ON CUSTOMERS OF PROPOSED PRICE CHANGES

12.1 Ability to Pay

State Water recognises that the higher bulk water charges outlined in Chapter 11 will lead to higher costs for farm businesses within the irrigation industry in particular.

The extent to which these higher costs impact on net income and therefore financial viability will vary for each business and will depend on:

- the level of net farm income and overall business profit
- the proportion of bulk water costs to total costs
- the availability of water and whether farms trade water and the influence of the water market
- the mix/balance between fixed and volumetric/usage charges

State Water engaged RMCG to systematically review the effect of proposed increases to the bulk water charge for regulated rivers on customers within the irrigation industry. This report is attached at Appendix 6. State Water notes that an increasing volume of licences are being purchased by Government entities who have a fundamentally different capacity to pay and who are consequently excluded from the RMCG analysis.

RMCG found:

"The gross dollar impact for each valley could be considered relatively small when considering the gross value of irrigated agricultural production in NSW is generally more than $2,500 million annually.

The total revenue derived from bulk water charges will increase by 0.55% to approximately 2.3% of the value of irrigated agricultural production. In this regard, bulk water charges could be considered inconsequential in relation to regional output." (page 37)

However, the RMCG report also cautioned that some valleys *"do face a significant impact that will influence profitability." (page 38)*

The factors taken in sum mean that although the impacts of price increases will vary for each individual irrigator, data suggests that some valleys have a higher capacity to absorb increases than others. The impact assessment undertaken by RMCG indicates that the valley regions can be generally segmented into three groups, in terms of impact level:

High - North Coast, South Coast and Peel valley

Moderate – Hunter, Namoi, Lachlan, Macquarie, Border and Gwydir

Low - Murray & Murrumbidgee

The regional impact is slightly positive for the Murrumbidgee region and very low for the Murray region, the two most significant regions for State Water in terms of water delivery and revenue. The impact for customers in the North Coast, South Coast and Peel valley is particularly significant in terms of the *cost per ML* of water delivered (based on proposed consumption forecasts).

In terms of the valleys in the low/moderate impact valleys RMCG found that bulk water costs are not a major factor in determining profitability:

"The evaluation generally indicates that for most valleys the price changes will have a relatively small impact on income and profitability…." (page 38)

Despite the high impact regions, RMCG reports:

"…analysis suggests that the change in bulk water costs as a percentage of total costs were relatively small in many regions (i.e. the low and moderate groups). As a result, the financial impact is relatively small, with the proposed change in charges bringing about a slightly positive result for many general security customers in Murray and Murrumbidgee regions." (page 38)

RMCG did, however, caution that the South Coast and Peel Valley would face potentially more significant financial impacts as a result of price increases.

The continued dry conditions have meant that for many irrigators the worst prospect, in terms of financial impact and equity, is paying large fixed charges while no water is being delivered. This would require significant cash outlays while no cash inflows are forthcoming. State Water's proposed retention of the current 40/60 fixed to variable tariff design will therefore ease the financial burden of water charges on many farming businesses during drought. Customers will only incur the full charge when water is available and released and can then also be traded in spot water markets.

12.2 Impact of Water Markets on Customer Ability to Pay

Water markets have developed swiftly and now allow irrigators an alternative source for accessing the value of their entitlements. When water allocations are low, the water market price rises and falls which allocations are high. Importantly for State Water customers, this means that if only limited water is available, a higher per ML price on the spot market is available to realise some revenue. This has been an important factor in limiting the financial impact of the drought.

High Security entitlement holders in particular have been able to benefit from access to water markets. Their entitlements allow them access close to full allocations even during dry times when the market value of that water increases dramatically.

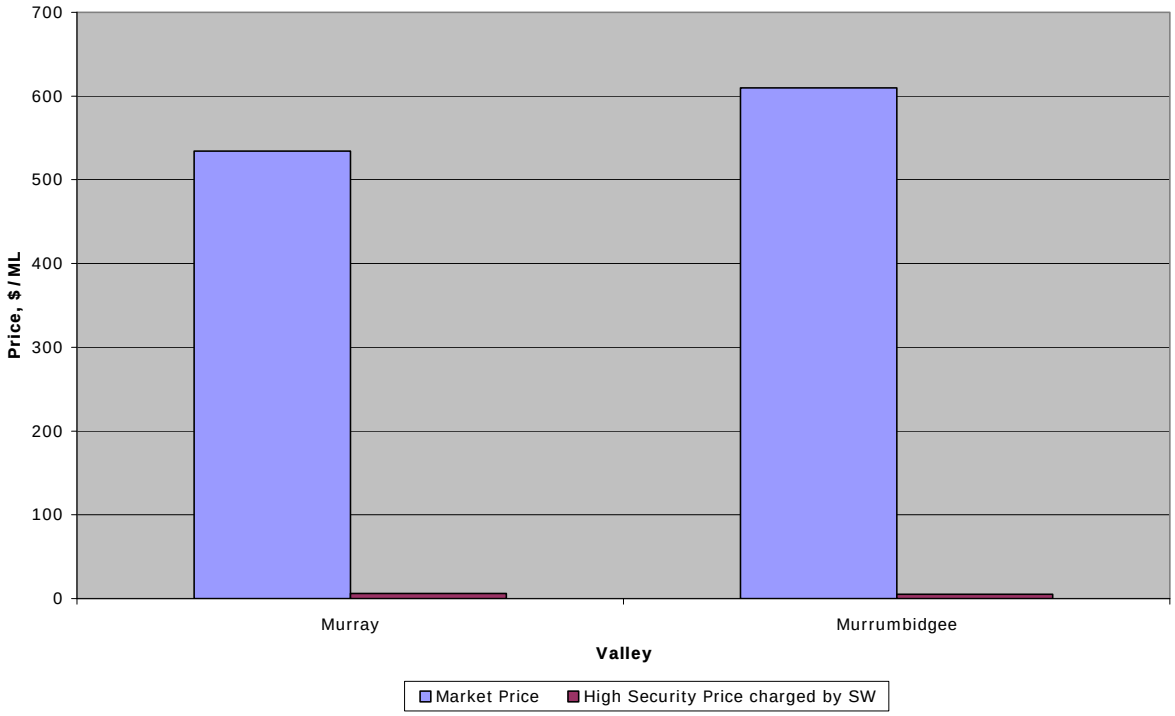
RMCG found evidence that the value of water was increasing and the development of water markets allowed entitlement holders to realise some of this value by participating in market activity:

"The value of water in the long-term is likely to vary according to seasonal conditions and water availability, although generally water resources are continuing to become more valuable as an asset. Proposed changes to bulk water charges are relatively small in this context and could ultimately be offset in most circumstances, by the increasing value of water as an asset." (page 39)

Therefore, the continued development of the water market will play an important role in limiting the financial impact on customers of State Water price increases.

State Water has undertaken additional analysis of water market prices, relative to State Water's bulk water charges. Figure 12.1 below depicts the average price per ML paid by High Security entitlement holders in the Murray and Murrumbidgee valleys, including both fixed and variable charges, along with the average spot water market price. The Murray and Murrumbidgee valleys are used because they represent 65% of State Water's customers and also have the most mature water markets of State Water's regulated valleys.

Figure 12.1: Average Water Price, Murray and Murrumbidgee, 2006-2009



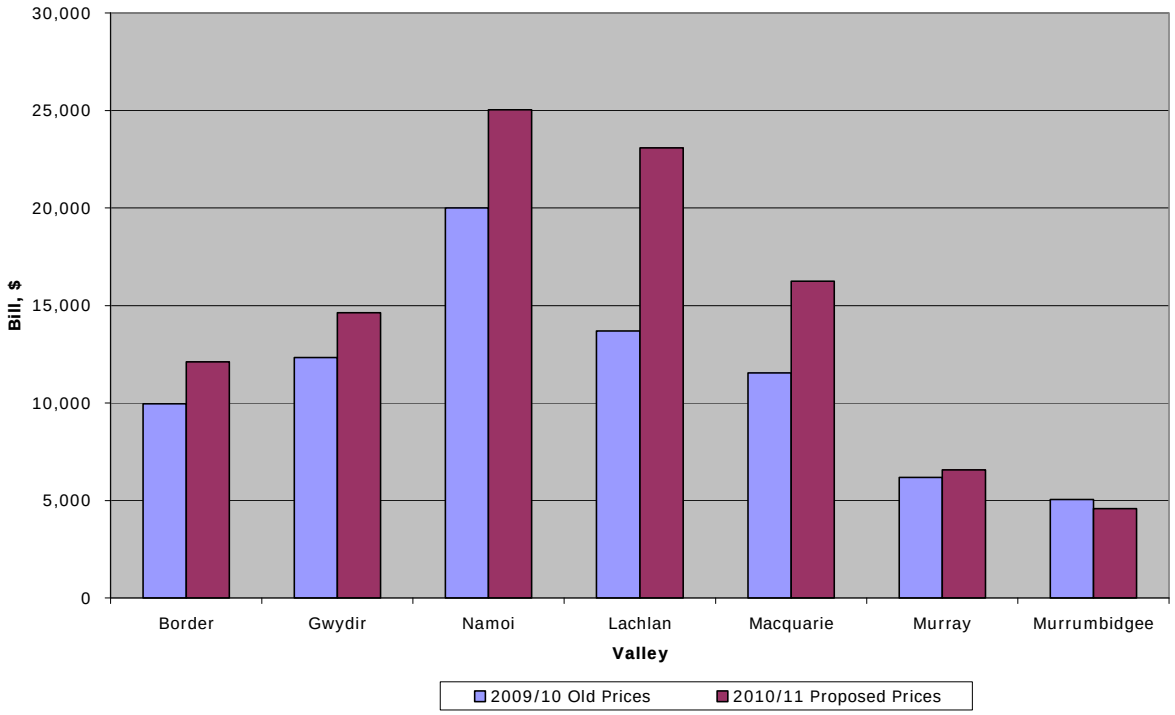
The huge difference between State Water charges and the market price for water suggests that State Water charges are immaterial relative to the market value of water. It also suggests that customers who sell water into the spot market have access to large price premiums with which to buffer cyclical downturns. The market price also reinforces State Water's argument in Chapter 10 that High Security entitlement holders should pay an additional premium to reflect the greater value of their water allocations in times of scarcity.

12.3 Billing Analysis

Entitlement data shows that the vast bulk of State Water customers hold General Security licences and therefore the average customer is likely to be a General Security licence holder rather than a High Security licence holder.

For those valleys currently at full cost recovery, Figure 12.2 shows a comparison of a total State Water bill for 2009/10 charges and proposed 2010/11 charges for a General Security licence holder who holds 1,000 ML entitlement shares, with usage based on average allocations over the last 15 years (as per Table 10.5 in Chapter 10).

Figure 12.2: Indicative Total Bills for General Security Holders in Valleys Fully Recovering Costs, 2009/10 and 2010/11 ($09/10)



As outlined in Chapter 11, the entitlement charge increases for General Security licence holders in valleys currently at cost recovery are limited due to the proposed High Security premium. Consequently, as shown in Figure 12.2 in most valleys the total bill for a GS licence holder with 1,000 ML share and average usage, will increase only marginally. In the Murrumbidgee valley, average bills will in fact *decrease* slightly for General Security entitlement holders. The valley with the largest increase is the Lachlan, which results mainly from the revised consumption forecasts.

For those smaller valleys which are not currently at full cost recovery, Figure 12.3 shows a comparison of a total State Water bill for a General Security licence holder who holds 100 ML entitlement shares, with usage based on average allocations over the last 15 years (as per Table 10.5 in Chapter 10), using each of the following charges:

1. 2009/10 IPART charges (less than full cost recovery);
2. 2009/10 charges assuming full cost recovery; and
3. proposed 2010/11 charges assuming full cost recovery.

Figure 12.3: Indicative Total Bills for General Security Holders in Valleys Under Recovering Costs, 2009 and 2010. ($09/10)

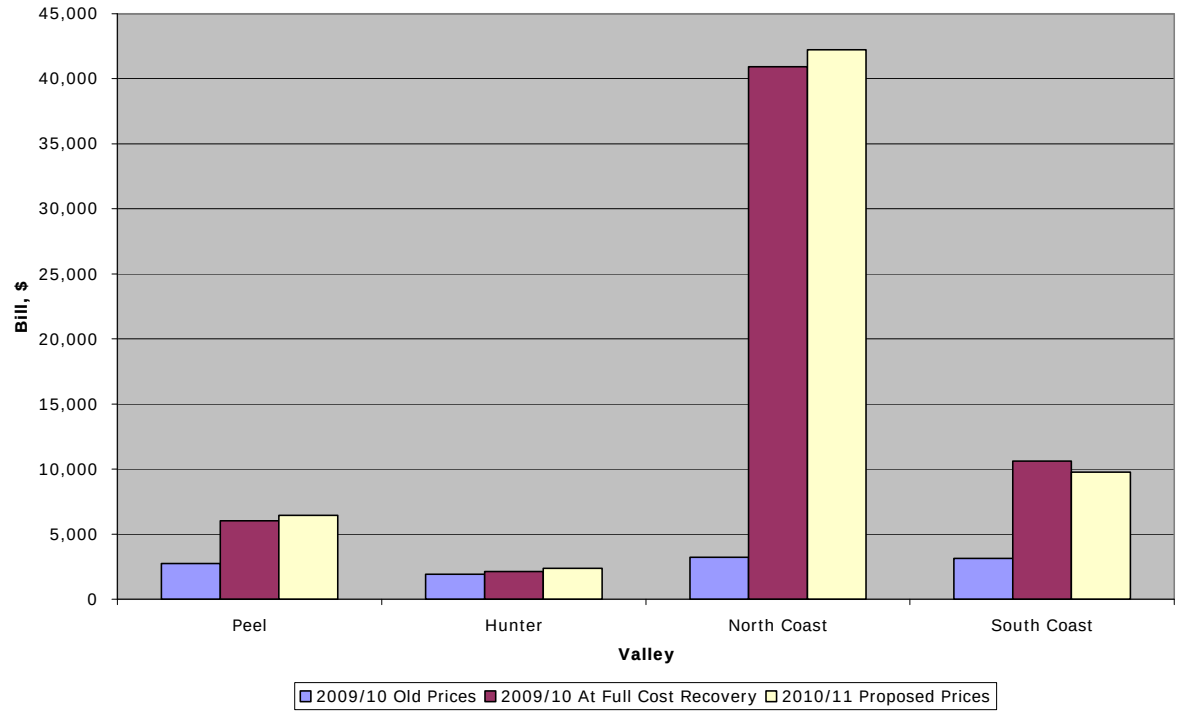
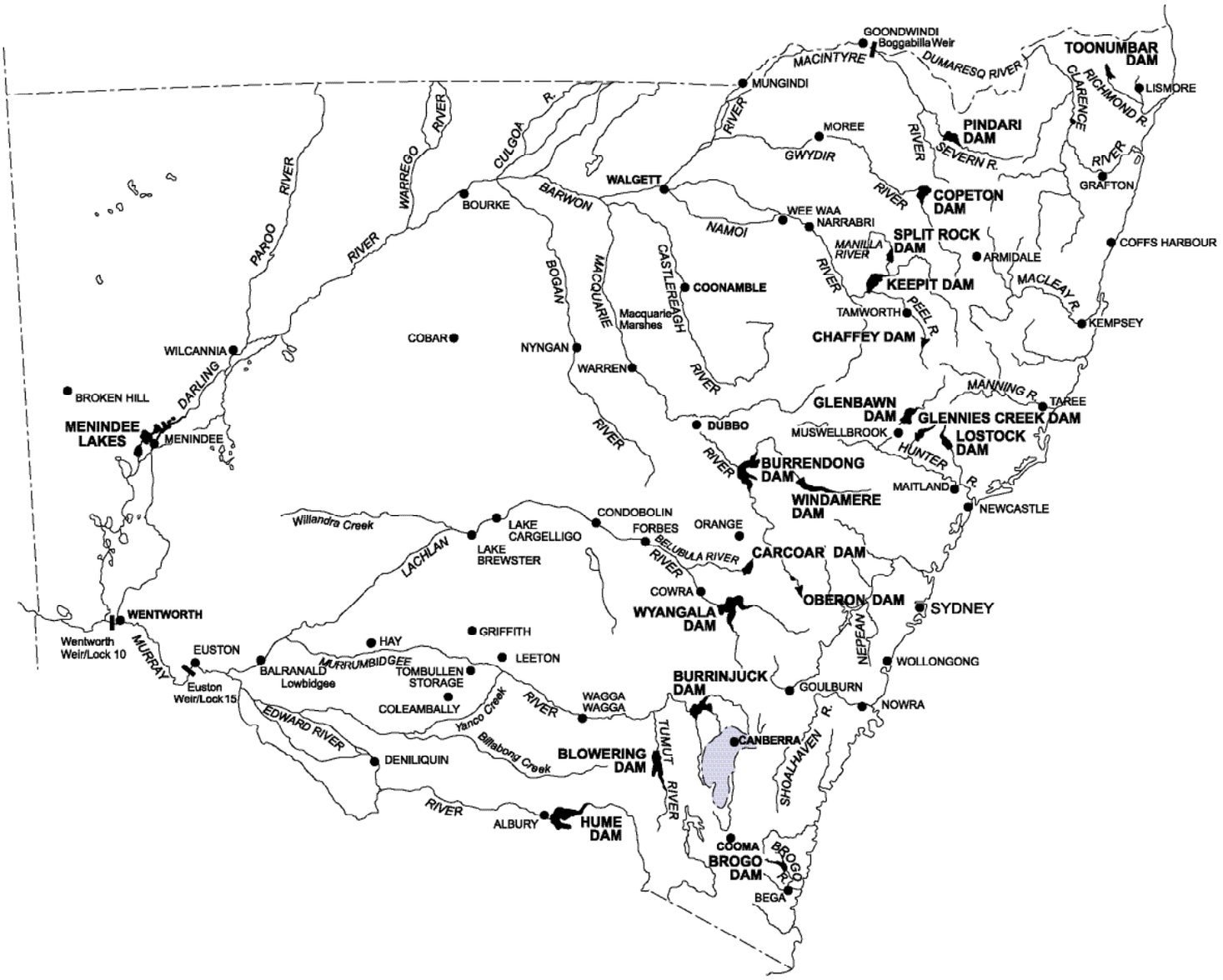
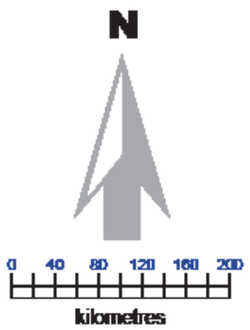


Figure 12.3 demonstrates that for the Peel, Hunter, North Coast and South Coast valleys, the majority of the proposed increase in prices is due to the fact that charges are not currently fully recovering the share of costs attributable to users. In fact, if prices for the South Coast were currently at full cost recovery, State Water's proposed 2010/11 prices and the indicative total bill would be lower than in 2009/10, due to the proposed High Security premium as well as operational efficiencies achieved over the current regulatory period.

Our Locations





LEGEND

- = Town / City
- = Weir
- = Dam

Table of State Water's directly costed activities, their outputs, outcomes and drivers

	Current/forecast State Water activity	Output(s) from activity	Outcome(s)	Driver(s) of outcome(s)	IFMS Activity recording costs of activity
A	**Strategic theme – Protect, operate and maintain water assets with increased efficiency**				
A1	Development of operations and maintenance, safety and flood emergency plans for water delivery infrastructure and their testing.	Comprehensive holistic water delivery infrastructure plans.	Reliable assets to provide delivery of water to users and the environment.	Primary objective in State Water Corporation Act. Dam Safety Committee under Dam Safety Act. Occupational Health and Safety Act. Customer Charter.	14, 16
A2	Maintenance and, as required, repairs of water infrastructure.	Operational water delivery infrastructure.	Reliable performance of infrastructure assets at optimum cost.	Operating licence S1 & 6. Customer charter. Primary objective in State Water Corporation Act. Occupational Health and Safety Act.	30, 31
A3	Inspections of in river structures.	Reduction of the risk of inoperable water infrastructure.	Reliable performance of infrastructure assets at optimum cost. Occupation health and safety risk mitigation.	Operating licence section 6. Customer charter. Primary Objective in State Water Corporation Act. Occupational Health and Safety Act.	14
A4	Development and ongoing maintenance of FMMS systems and associated processes and controls.	Knowledge of assets including information on faults, scheduling maintenance work, approval of works orders, collection of costs, facility performance data and maintenance history, criticality and risk assessments.	Reliable performance of infrastructure assets at optimum cost.	Operating licence section 6. Customer Charter. Occupational Health and Safety Act.	O'head activity

2010 Determination

	Current/forecast State Water activity	Output(s) from activity	Outcome(s)	Driver(s) of outcome(s)	IFMS Activity recording costs of activity
A5	Maintenance of FMMS data on equipment maintenance and operational information.	Appropriate FMMS data.	Improved performance of infrastructure assets at optimum cost. Occupation health and safety risk mitigation. Maximise economic benefits of water.	Primary Objective in State Water Corporation Act. Occupational Health and Safety Act. Operating licence S1.	14
A6	Surveillance of water delivery infrastructure	Surveillance information on the condition and serviceability of assets.	Safety of infrastructure. Improved performance of infrastructure assets at optimum cost.	Dam Safety Committee requirements under the Dam Safety Act – DSC 15. Occupation Health and Safety Act	14
A7	Preparation of capital investment plans, and associated capital investment proposals and investment proposals. Quarterly monitoring and reporting of expenditure and performance against the capital investment program by the Budget and Expenditure Review Panel supported to do by the Program Control Group. Post-implementation reviews of all major capital projects to evaluate both the delivery process and outcomes of the project. Liaising with other stakeholders including NSW Fisheries, Dept of Primary Industry on the impacts of the capital investment program.	Short and long-term strategic capital investment program. Governance of State Water's capital investment program. Continuous improvement process. Compliance with Government policies.	To capture store and released water in an efficient, effective, safe and financially responsible manner. Capital investment program upon which appropriate user pricing is based. Mitigation of occupational health and safety risks. Process improvement feedback loop. Optimisation of outcomes from investment. Statement of Corporate Intent. Forecasts for reporting to IPART.	Total Asset Management (TAM) requirements for updating the NSW State Infrastructure Strategy (SIS) TPP8-02. Best Practice Corporate Governance OH&S. Principal Objective in State Water Corporation Act 2004. Secondary objective in State Water Corporation Act 2004 of being a successful business. Premier's memorandum on public sector OHS and injury management. Operating licence S1, 3 & 6. MoU with DPI (fish passage and aquatic habitat). Treasury Reporting and Monitoring Policy For Government Businesses TPP 05-2.	32, o'head activity

	Current/forecast State Water activity	Output(s) from activity	Outcome(s)	Driver(s) of outcome(s)	IFMS Activity recording costs of activity
				Water Management Act S 91. Fisheries Management Act 1994 S220V. Dam Safety Act 1978. New South Wales Queensland Border Rivers Act 1947. Environmental Planning & Assessment Act 1979 s 5B & 110C. Threatened Species Conservation Act 1995. Heritage Act 1997. Local Government Act 1993. Water Act 2007 (Re MDB assets). Water Management (Water Supply Authorities) Regulation 2004. National Parks and Wildlife Act 1974. State Owned Corporations Act 1998.	
A8	Preparation, monitoring and maintenance of Total Asset Management Plan and supporting documents, asset plans for water delivery infrastructure.	Total asset management plan and associated asset plans and schematics.	To capture store and released water in an efficient, effective, safe and financially responsible manner. Occupation health and safety risk mitigation.	Total Asset Management (TAM) requirements for updating the NSW State Infrastructure Strategy (SIS) TPP8-02. Best Practice Corporate Governance OH&S.	32

2010 Determination

	Current/forecast State Water activity	Output(s) from activity	Outcome(s)	Driver(s) of outcome(s)	IFMS Activity recording costs of activity
			Improved performance of infrastructure assets at optimum cost. Maintenance of heritage assets.	Principal Objective of NSW State Water Corporation Act 2004. Secondary objective in State Water Corporation Act 2004 of being a successful business. Environmental management plan. Dams Safety Act 1978. Murray Darling Basin Agreement. Premier's memorandum on public sector OHS and injury management. Heritage Act and NSW s170 heritage register. NSW Weirs Policy Operating licence S1 & 6. Customer Charter. Environmental management plan.	
A9	Management and reporting of operational incidents.	Report to the Minister.	Report to the Minister. Risk mitigation.	Works approval as required under S 101(1)(a) and 102(1) of the Water Act. (Each works approval is unique in its requirements.) Occupational Health and Safety Act.	All activities
A10	Management of relationship and compliance with Fisheries, DPI and DECCW MoUs.	Structural and operational requirements of these stakeholders.	Compliance MoU.	Operating Licence S 2.3.	14, 17, 18, 32, 33, 34, 50

2010 Determination

	Current/forecast State Water activity	Output(s) from activity	Outcome(s)	Driver(s) of outcome(s)	IFMS Activity recording costs of activity
B	**Strategic theme – Maximise the delivered water available from each megalitre flowing into the regulated river system**				
B1	Measurement of inflows and outflows via hydrometric stations (this activity is outsourced via an SLA with DECCW).	Planned environmental water flows. Replenishment water flows. Flows subject to channel constraints. Resource assessments. Supplementary water. Water Quantity Monitoring. Provision of data to the Minister.	Maximisation of water availability for extractors and the environment. Information for extractors of water availability, supplementary water availability, drought contingency planning. Improved water quality. Protection of the natural habitat.	Works approval as required under S101(1)(a) and 102(1) of the Water Act. (Each works approval is unique in its requirements.) Water management principles of the Water Act 2000 (s5). State Water Management Outcomes Plan. Operating licence section 6.3 MoU with DWE. Water Sharing plans. NSW – Queensland Border Rivers Act 1947.	14
B2	Water delivery planning, development of procedures and testing of procedures for flood scenarios.	Skilled staff.	Minimisation of risk associated with potential flood events.	Works approval as required under S 101(1)(a) and 102(1) of the Water Act. (Each works approval is unique in its requirements.) Water management principles of the Water Act 2000 (s5). Dam Safety Committee requirements under the Dam Safety Act – DSC 15.	12,14,16,18
B3	Modeling of water release scenarios.	Options for release of water to fulfill extractor and environmental needs.	Maximisation of water availability for extractors and the environment. Information for extractors of water availability, supplementary water availability, drought contingency planning.	Works approval as required under S 101(1)(a) and 102(1) of the Water Act. (Each works approval is unique in its requirements.)	14

	Current/forecast State Water activity	Output(s) from activity	Outcome(s)	Driver(s) of outcome(s)	IFMS Activity recording costs of activity
			Minimisation of water losses.		
B4	Water delivery planning, accounting and balancing.	Water accounts for each extractor and regulated water source. Provision to stakeholders (including the Minister for Water, DECCW, DBBRC, BoM) volume information including ▪ water orders, ▪ evaporation and rainfall data, ▪ water storage ▪ volumes and releases, ▪ volumes and periods of declared access for supplementary water licences, ▪ diversion data, ▪ stream flow and river height Assessment of water availability on regulated streams in times of shortage.	Maximising water from regulated rivers for consumptive and environmental usage. Information for customers as to their water balance. Annual Compliance report. Provision of water accounting information to Customer service Committees. Preparation of monthly information for the Minister for 1 year after the drought of record inflow sequence. Provide monthly information to the Minister for each water source to enable the Minister to make available water from the water source. (As required) preparation of drought contingency measures for consideration by the Minister. (As required) within 1 working day of a significant rain event gather appropriate information and report to the Minister of data for consideration of announcing of supplementary water.	Works approval as required under S 101(1)(a) and 102(1) of the Water Act. (Each works approval is unique in its requirements.) Water management principles of the Water Act 2000 (s5). Water Management Act 2000 sections 76, 85 and 85 A. Operating licence section 6.2, 6.6 & 6.7 & schedule 1. MoU with DWE. Water sharing plans. NSW Queensland Borders River Act Clause 3.7. Water Act 2007 S126. Reporting requirements required by legislation /regulation are included in Schedule 1 of Legal Compliance Register.	12, 14
B5	Management of data of inflows and outflows.	Modeling of potential scenarios of water availability and provision of data and scenarios to DECCW IPART, MDB (cap). Provision of information to the	Maximisation of water availability for users and the environment. Information for water availability, supplementary water availability, drought contingency planning.	Works approval as required under S 101(1)(a) and 102(1) of the Water Act. (Each works approval is unique in its requirements.) Water management principles of the	12, 14

	Current/forecast State Water activity	Output(s) from activity	Outcome(s)	Driver(s) of outcome(s)	IFMS Activity recording costs of activity
		Minister regarding potential water availability and drought contingency planning.		Water Act 2000 (s5).	
C	**Strategic theme - Provide water related services that respond to the growing variety of customer needs – specifically recognising the value of water, the environment and customer service**				
C1	Taking recording and management of customer orders.	Releases of water to meet customer needs. Recording of customer and valley water balances.	Delivery of ordered water in a timely manner. Maximise economic benefits of water.	Operating licence section 6.2 Operating licence schedule 1. Customer Charter.	14
C2	Water quality testing at various locations.	Changes in water quality.	Improved water quality.	State Water Management Outcomes Plan. Water Sharing Plans. Environmental Management Plan.	18
C3	Operations of water infrastructure to release water for extractors, the environment, flood management and water transfer between storages.	Timely and efficient operations of water infrastructure.	Maximise economic benefits of water. Maximise environmental benefits. Minimisation of risk associated with potential flood events.	Works approval as required under S 101(1)(a) and 102(1) of the Water Act. (Each works approval is unique in its requirements.) Guidelines for Managing Cold Water releases from High Priority Dams. Water management principles of the Water Act 2000 (s5). State Water Management Outcomes Plan. Environmental Management Plan. Operating licence section 6.1. Water for Rivers inter-Government	14

	Current/forecast State Water activity	Output(s) from activity	Outcome(s)	Driver(s) of outcome(s)	IFMS Activity recording costs of activity
				agreement.	
C4	Communicate to users the availability of supplementary water.	Timely advice as to the availability of supplementary water.	Maximise availability of water to users.	Water management principles of the Water Act 2000 (s5). Operating licence section 6.2	10
C5	Communication of water availability to customers.	Information on long term water availability.	Maximise availability of water to users.	Water management principles of the Water Act 2000 (s5). Operating licence section 6.2. Customer Charter.	10
C6	Liaison with customers via customer service committees with specific requirements of: ▪ impacts on customers of alternative operational scenarios in times of drought ▪ valley accounting and other information ▪ development of business plans for each "valley" impacts of alternative operational scenarios in times of drought.	Feedback from extractors on valley operational, investment and maintenance plans.	Maximise economic benefits of water. Understanding by CSCs and State Water of each other requirements with regard to water extraction and management.	Operating licence section 4.2 &4.4. Pricing determination report 2006. Customer Charter.	10
C7	Receipting transacting and recording of temporary water transfers.	Processing and appropriate recording of temporary water transfers.	Maximise economic benefits of water. Security of water rights.	Water management act section 71T and 71V. Operating licence section 6.2.	15
C8	Operations of treatment systems (Fish River)	Provision of potable water to Lithgow and Blue Mountain villages. Water releases for power stations	Water for communities.	Australian Drinking Water Guidelines 2004.	

	Current/forecast State Water activity	Output(s) from activity	Outcome(s)	Driver(s) of outcome(s)	IFMS Activity recording costs of activity
		and Sydney Catchment Authority.			
C9	Research into management of cold water pollution.	Options for mitigation of cold water pollution at high risk dams.	Improved environmental outcomes via mitigation of cold water pollution	Works approval as required under S 101(1)(a) and 102(1) of the Water Act. (Each works approval is unique in its requirements.) Cold Water Inter agency Group. Water management principles of the Water Act 2000 (s5). State Water Management Outcomes Plan. Environmental management plan.	34
C10	Research into protection of native fish.	Options for protecting native fish species.	Improved habitat for native fish.	State Weirs Policy. MoU with Fisheries.	
C11	Land and vegetation management.	Management of operational land.	Improved environmental outcomes.	Water management principles of the Water Act 2000 (s5). Environmental management plan. Native Vegetation Act 1995 & 2003. Environment Protection and Biodiversity Conservation Act 1999 D1. Noxious Weeds Act 1993	14
C12	Reading of water meters of regulated customers.	Information for 1/4ly billing. Information of total water extractions.	Customer bills. Quantity of water extracted for input into the water balancing.	Secondary objective in State Water Corporation Act 2004 of being a successful business. Water Management Act S114. Operating licence section 6.5.	12

2010 Determination

	Current/forecast State Water activity	Output(s) from activity	Outcome(s)	Driver(s) of outcome(s)	IFMS Activity recording costs of activity
C13	Meter inspection for compliance with licence conditions including accuracy and calibration testing.	Identification of non-operational and/or non-compliant meters. Reporting of meter faults to extractors.	Users having meters comply with Standards set by NSW. Optimise economic and environmental benefits.	Operating licence section 6.5.	12
C14	Users compliance with works approvals.	Identification of non-operational and/or non-compliant works.	Optimise economic and environmental benefits. Compliant works.	Works approval under the Water Act S91. Unusable Water management Works under S 330 of Water Management Act. Unlawful activity under section 327 of the Water Management Act. Issuing directions to users for unlawful works under section 329 of the Water Management Act. Taking remedial measures when a person fails to comply with directions under section 354 of the Water Management Act. Environmental management plan.	12
C15	Investigation of potential breaches of licence conditions.	Identification of extractors breaching licence conditions. Identification of un-licenced water extractors.	Optimise economic and environmental benefits.	Water Act Division 1A.	12
C16	Education of water extractors and other stakeholders.	Informed extractors and stakeholders.	Optimise economic and environmental benefits.	Secondary objective in State Water Corporation Act 2004 of being a successful business.	12
C17	Management of licence	Advice to regulatory authorities of	Prosecution of licence holders breaching	Operating licence schedule 1	

	Current/forecast State Water activity	Output(s) from activity	Outcome(s)	Driver(s) of outcome(s)	IFMS Activity recording costs of activity
	breaches including reporting to regulatory authorities and (as appropriate) prosecution of offenders.	licence breaches.	licence conditions. Reduction in number of breaches of licence conditions. Optimise economic and environmental benefits		
C18	Liaison with interstate businesses and strategic water related committees in relation to water balancing.	Knowledgeable staff.	Compliance with national initiatives e.g. NWI, Basin Plan, Federal Water Act. NSW Constructing Authority for the Murray Darling Basin.	Water Act 2007	
C19	Planning and delivery of capital investment in water infrastructure.	Upgraded infrastructure.	Water infrastructure that complies with regulation/legislation. Optimise economic and environmental benefits.	Dam Safety Committee – DSC 11. State Weirs Policy. Occupational Health and Safety Act. Operating Licence. Environmental Management Plan. MoU with Fisheries. Maximise economic benefits of water. Maximise environmental benefits Minimisation of risk associated with potential flood events.	30, 32, 33, 34, 50
C20	Consultation with the community consultative committees.	Documents supporting stakeholder needs and expectations.	Maximising availability of environmental and user water. Maximising environmental outcomes.	Operating licence section 4.1 & 7. Customer Charter.	

	Current/forecast State Water activity	Output(s) from activity	Outcome(s)	Driver(s) of outcome(s)	IFMS Activity recording costs of activity
D	**Strategic theme - Improved business outcomes**				
D1	Operation of customer service centre to address customer enquires (primarily water billing).	Provision of information to customers and other stakeholders.	Improved cash flow. Maximise economic benefits of water. Efficient delivery of service.	Operating licence section 5. Secondary objective in State Water Corporation Act (efficiency of business). Customer Charter.	14
D2	Enhancement of CAIRO system.	Improved water ordering processes and customer interface.	Maximise economic benefits of water. Security of water rights.	Secondary objective in State Water Corporation Act (efficiency of business).	14
D3	Upgrading of SCADA.	Improved real-time monitoring control and telemetry system. Improved data capture.	Management of risks and improved customer service. Improved performance of infrastructure assets at optimum cost. Occupation health and safety risk mitigation. Maximising water from regulated rivers for consumptive and environmental use.	Secondary objective in State Water Corporation Act (efficiency of operational and business processes). Primary Objective in State Water Corporation Act. Occupational Health and Safety Act.	14
D4	Management and enhancement of business support systems including customer water accounting, project management, water delivery and modeling.	Improvements to business support tools.	Maximising water from regulated rivers for consumptive and environmental usage Information for customers as to their water balance. Annual Compliance report. Provision of water accounting information to Customer service Committees. Preparation of information monthly for the Minister for 1 year after the drought of record inflow sequence.	Secondary objective in State Water Corporation Act (efficiency of business).	

	Current/forecast State Water activity	Output(s) from activity	Outcome(s)	Driver(s) of outcome(s)	IFMS Activity recording costs of activity
			Provide monthly information to the minister for each water source to enable the Minister to make available water for the water source. (As required) preparation of drought contingency measures for consideration by the Minister. (As required) gather appropriate information and report to the Minister within 1 working day of data for consideration of supplementary water. Reporting of water balancing information to various stakeholders		
E	**Strategic theme – Achieve strategic objectives through capable, committed, safe and skilled workforce**				
E1	Training of staff in water delivery operations.	Skilled staff.	Improved performance of infrastructure assets at optimum cost. Occupation health and safety risk mitigation.	Primary Objective in State Water Corporation Act. Occupational Health and Safety Act. Dam Safety Committee – DSC12.	
E2	Training of staff in dam and weir surveillance.	Skilled staff.	Safety of infrastructure. Improved performance of infrastructure assets at optimum cost.	Dam Safety Committee – DSC 15.	

OPERATING EXPENDITURE 2006/07 TO 2009/10 ($ NOMINAL) **APPENDIX 3**

Activity ($'000)	Customer Support	Customer Billing	Metering & Compliance	Water delivery & Other Operations	Hydrometric Monitoring	Water Quality Monitoring	Corrective Maintenance	Routine Maintenance	Asset Management Planning	Dam Safety Compliance	Environmental Planning & Protection	Renewal & Replacement	Insurance	Flood Operations	TOTAL OPEX
2006/2007															
Border	19	9	163	479	48	57	0	470	131	333	-	-	-	0	1,709
Gwydir	38	11	406	890	547	22	0	1,539	329	477	-	-	-	20	4,279
Namoi	63	16	347	1,045	552	38	0	1,921	236	1,092	-	-	-	16	5,326
Peel	-	18	100	256	158	23	0	524	86	180	-	-	-	0	1,345
Lachlan	146	10	629	965	450	42	0	2,062	501	524	-	-	-	18	5,347
Macquarie	140	11	337	1,035	628	66	0	1,379	753	487	-	-	-	23	4,859
Murray	170	19	710	1,180	(10)	17	0	360	433	117	-	-	-	0	2,996
Murrumbidgee	63	16	433	1,757	955	11	0	2,001	564	988	-	-	-	19	6,807
North Coast	-	2	-	66	31	22	0	407	31	225	-	-	-	0	784
Hunter	5	10	549	649	426	107	0	1,287	403	646	-	-	-	14	4,096
South Coast	-	2	26	93	39	9	0	451	31	229	-	-	-	0	880
Fish River	-	1	90	526	-	-	0	1,832	475	173	-	-	-		3,097
Total	**644**	**125**	**3,790**	**8,941**	**3,824**	**414**	**-**	**14,233**	**3,973**	**5,471**	**-**	**-**	**-**	**110**	**41,525**
2007/2008															
Border	22	10	164	360	154	64	-	361	168	270	-	-	-	0	1,573
Gwydir	23	23	317	859	489	35	-	1,375	394	358	-	-	-	71	3,944
Namoi	30	21	315	809	522	42	-	1,712	297	476	-	-	-	59	4,283
Peel	1	35	72	163	130	15	-	432	107	152	-	-	-	0	1,107
Lachlan	64	14	594	770	673	84	-	1,877	570	443	-	-	-	43	5,132
Macquarie	63	15	383	1,002	587	120	-	1,105	777	461	-	-	-	46	4,559
Murray	224	21	696	1,018	96	4	-	931	516	110	-	-	-	23	3,639
Murrumbidgee	43	27	503	1,802	1,030	10	-	1,884	766	1,125	-	-	-	83	7,273
North Coast	2	2	1	81	28	18	-	563	38	148	-	-	-	48	929
Hunter	6	10	479	668	301	106	-	1,603	499	573	-	-	-	12	4,257
South Coast	2	2	28	138	44	9	-	340	38	157	-	-	-	1	759
Fish River	-	1	76	722	-	-	-	1,940	593	118	-	-	-	0	3,450
Total	**480**	**181**	**3,628**	**8,392**	**4,054**	**507**	**-**	**14,123**	**4,763**	**4,391**	**-**	**-**	**-**	**386**	**40,905**

OPERATING EXPENDITURE 2006/07 TO 2009/10 ($ NOMINAL) **APPENDIX 3**

Activity ($'000)	Customer Support	Customer Billing	Metering & Compliance	Water delivery & Other Operations	Hydrometric Monitoring	Water Quality Monitoring	Corrective Maintenance	Routine Maintenance	Asset Management Planning	Dam Safety Compliance	Environmental Planning & Protection	Renewal & Replacement	Insurance	Flood Operations	TOTAL OPEX
2008/2009															
Border	22	16	221	361	45	35	-	345	107	237	-	-	53	0	1,442
Gwydir	37	35	321	597	522	34	-	1,336	313	269	-	-	170	5	3,639
Namoi	22	71	428	691	505	41	-	1,387	224	470	-	-	123	5	3,967
Peel	-	34	98	230	165	22	-	396	83	166	-	-	46	0	1,240
Lachlan	64	28	447	815	841	45	-	1,492	347	523	-	-	157	5	4,764
Macquarie	8	31	335	862	653	73	-	1,223	501	473	-	-	239	7	4,405
Murray	143	42	729	961	5	-	-	642	408	90	-	-	246	0	3,266
Murrumbidgee	188	41	431	1,277	865	11	-	2,060	545	658	-	-	253	5	6,334
North Coast	15	4	1	63	32	3	-	367	33	143	-	-	-	0	661
Hunter	18	22	501	427	292	81	-	1,289	416	666	-	-	252	1	3,965
South Coast	2	4	41	104	32	16	-	245	31	154	-	-	-	0	629
Fish River	-	8	60	701	-	-	-	1,818	459	222	-	-	-	0	3,268
Total	**519**	**336**	**3,613**	**7,089**	**3,957**	**361**	**-**	**12,600**	**3,467**	**4,071**	**-**	**-**	**1,539**	**28**	**37,580**
2009/2010															
Border	53	18	184	180	47	99	76	196	190	116	11	-	57	-	1,227
Gwydir	37	36	229	637	540	61	343	879	358	213	43	-	181	55	3,612
Namoi	53	45	336	620	523	115	400	775	410	347	23	-	132	55	3,834
Peel	5	32	98	44	172	55	47	137	135	130	41	-	50	-	946
Lachlan	74	98	453	891	871	109	5	1,261	228	680	27	178	167	55	5,097
Macquarie	126	51	296	549	676	110	282	899	535	365	56	-	254	55	4,254
Murray	85	67	718	932	5	-	55	357	381	156	39	-	262	-	3,057
Murrumbidgee	74	52	598	1,205	896	101	110	1,315	557	491	97	99	271	55	5,921
North Coast	3	7	-	38	34	44	62	173	91	100	3	-	-	-	555
Hunter	42	25	411	551	303	170	195	853	604	380	40	-	269	-	3,843
South Coast	3	7	-	166	33	52	4	171	24	155	3	-	-	-	618
Fish River	-	2	53	37	-	-	-	2,111	432	359	47	11	117	-	3,169
Total	**555**	**440**	**3,376**	**5,850**	**4,100**	**916**	**1,579**	**9,127**	**3,945**	**3,492**	**430**	**288**	**1,760**	**275**	**36,133**

CAPITAL EXPENDITURE 2006/07 TO 2009/10 ($ NOMINAL) **APPENDIX 3**

Activity ($'000)	Asset Management Planning	Routine Maintenance	Dam Safety Compliance - Pre 1997 Construction	Dam Safety Compliance	Renewal & Replacement	Structural and Other Enhancement	Corporate Systems	Environmental Planning and Protection	Flood operations	Water Delivery and other operations	TOTAL CAPEX
2006/07											
Border	-	-	-	-	56	12	-	-	-	-	68
Gwydir	-	-	11	-	736	243	-	-	-	-	990
Namoi	-	-	75	-	(130)	95	-	-	-	-	40
Peel	-	-	226	-	(24)	-	-	-	-	-	202
Lachlan	227	-	-	-	5	(32)	-	483	-	-	683
Macquarie	-	-	64	-	673	(65)	-	31	-	-	703
Murray	-	-	-	-	385	-	-	2	-	-	387
Murrumbidgee	-	-	4,967	-	1,576	97	42	33	-	-	6,715
North Coast	-	-	-	-	274	3	-	-	-	-	277
Hunter	-	-	-	-	591	760	1	-	-	-	1,352
South Coast	-	-	-	-	81	114	-	131	-	-	326
Fish River	582	-	-	-	282	-	-	-	-	-	864
Total	**809**	**-**	**5,343**	**-**	**4,505**	**1,227**	**43**	**680**	**-**	**-**	**12,607**
2007/08											
Border	-	-	-	-	47	-	-	34	-	-	80
Gwydir	-	-	.	-	500	-	-	17	-	12	1,052
Namoi	-	-	2,714	-	259	-	-	48	-	59	3,080
Peel	-	-	1,117	-	133	-	-	259	-	(23)	1,486
Lachlan	-	-	538	-	521	-	-	2,807	-	52	3,919
Macquarie	-	-	229	-	502	-	-	-	-	44	774
Murray	-	-	-	-	2,939	-	-	85	-	-	3,024
Murrumbidgee	-	-	1,102	-	721	-	-	-	-	125	1,948
North Coast	-	-	-	-	164	-	-	-	-	355	519
Hunter	-	-	15	-	490	-	-	-	-	77	582
South Coast	-	-	-	-	26	-	-	9	-	113	148
Fish River	-	-	-	-	764	-	-	-	-	-	764
Total	**-**	**-**	**6,237**	**-**	**7,066**	**-**	**-**	**3,226**	**-**	**848**	**17,377**

CAPITAL EXPENDITURE 2006/07 TO 2009/10 ($ NOMINAL) **APPENDIX 3**

Activity ($'000)	Asset Management Planning	Routine Maintenance	Dam Safety Compliance - Pre 1997 Construction	Dam Safety Compliance	Renewal & Replacement	Structural and Other Enhancement	Corporate Systems	Environmental Planning and Protection	Flood operations	Water Delivery and other operations	TOTAL CAPEX
2008/09											
Border	-	-	-	-	93	-	-	-	-	2	95
Gwydir	-	-	1,258	-	35	-	-	100	-	46	1,439
Namoi	-	-	2,406	-	139	-	-	-	-	1	2,546
Peel	-	-	946	-	26	-	-	-	-	5	977
Lachlan	-	-	684	-	(97)	-	-	2,552	-	48	3,194
Macquarie	-	-	-	-	106	-	-	83	-	21	210
Murray	-	-	-	-	162	-	-	202	-	41	405
Murrumbidgee	-	-	4,644	-	468	-	-	-	-	99	5,211
North Coast	-	-	-	-	(21)	-	-	-	-	90	69
Hunter	-	-	6	-	230	-	-	-	-	219	455
South Coast	-	-	-	-	-	-	-	-	-	40	40
Fish River	-	-	-	-	1,182	-	-	-	-	-	1,182
Total	**-**	**-**	**9,944**	**-**	**2,323**	**-**	**-**	**2,937**	**-**	**612**	**15,823**
2009/10											
Border	-	-	-	-	135	-	-	-	-	-	135
Gwydir	-	-	5,753	-	390	-	-	55	-	23	6,221
Namoi	-	-	25,593	-	637	-	-	110	-	-	26,340
Peel	-	-	3,166	-	-	-	-		-	-	3,166
Lachlan	-	-	1,921	-	1,646	-	-	695	-	17	4,279
Macquarie	-	-	3,702	-	477	-	-	55	-	287	4,521
Murray	-	-	-	-	2,350	-	-	1,940	-	43	4,333
Murrumbidgee	-	-	19,519	-	2,320	-	-	86	-	-	21,925
North Coast	-	-	-	-	-	-	-	-	-	200	200
Hunter	-	-	-	-	503	-	-	-	-	492	995
South Coast	-	-	-	-	-	-	-		-	76	76
Fish River	-	-	-	-	1,376	-	-	-	-	-	1,376
Total	**-**	**-**	**59,654**	**-**	**9,834**	**-**	**-**	**2,941**	**-**	**1,138**	**73,567**
											119,374

OPERATING EXPENDITURE 2010/11 TO 2013/14 ($ 2009/10) **APPENDIX 4**

Activity ($'000)	Customer Support	Customer Billing	Metering & Compliance	Water delivery & Other Operations	Flood Operations	Hydrometric Monitoring	Water Quality Monitoring	Corrective Maintenance	Routine Maintenance	Asset Management Planning	Dam Safety Compliance Capital Projects pre-1997	Dam Safety Compliance	Environmental Planning & Protection	Renewal & Replacement	Insurance	TOTAL OPEX
2010/2011																
Border	54	19	188	199	-	48	101	77	232	194	-	120	61		58	1,351
Gwydir	38	37	234	671	56	559	62	321	946	365	-	220	175		185	3,869
Namoi	54	45	342	661	56	533	118	408	805	418	-	358	125		134	4,057
Peel	5	32	100	45	-	175	56	48	137	138	-	135	219		51	1,141
Lachlan	75	100	462	930	56	943	111	5	1,418	233	-	703	143		170	5,349
Macquarie	128	52	302	588	56	690	112	287	954	545	-	377	245		259	4,595
Murray	86	68	733	976	-	5	-	56	373	389	-	161	212		267	3,326
Murrumbidgee	75	53	610	1,258	56	913	103	112	1,372	595	-	507	521		276	6,451
North Coast	3	7	-	45	-	35	45	64	183	93	-	103	17		-	595
Hunter	43	26	419	580	-	309	174	198	905	616	-	393	214		274	4,151
South Coast	3	7	-	176	-	33	53	4	195	25	-	160	16		-	672
Fish River	-	2	55	44	-	19	-	-	2,209	440	-	644	253		119	3,785
Total	**564**	**448**	**3,445**	**6,173**	**280**	**4,262**	**935**	**1,580**	**9,729**	**4,051**	**-**	**3,881**	**2,201**	**-**	**1,793**	**39,342**
2011/2012																
Border	53	18	185	195	-	47	99	76	208	190		119	78		57	1,325
Gwydir	37	36	230	660	55	567	61	315	939	359		219	224		182	3,884
Namoi	53	45	336	650	55	552	116	400	985	410		356	161		132	4,251
Peel	5	32	98	44	-	172	55	47	137	135		134	280		50	1,189
Lachlan	74	98	454	914	55	926	109	5	1,361	229		699	183		167	5,274
Macquarie	126	51	296	578	55	677	110	282	973	535		375	314		255	4,627
Murray	85	67	719	959	-	5	-	55	377	382		161	272		262	3,344
Murrumbidgee	74	52	599	1,237	55	897	101	110	1,436	585		504	667		271	6,588
North Coast	3	7	-	44	-	34	44	63	189	91		103	21		-	599
Hunter	42	26	412	570	-	303	171	195	894	605		391	274		269	4,152
South Coast	3	7	-	173	-	33	52	4	184	24		159	21		-	660
Fish River	-	2	54	44	-	28	-	-	2,218	433		645	323		117	3,864
Total	**555**	**441**	**3,383**	**6,068**	**275**	**4,241**	**918**	**1,552**	**9,901**	**3,978**		**3,865**	**2,818**	**-**	**1,762**	**39,757**

OPERATING EXPENDITURE 2010/11 TO 2013/14 ($ 2009/10) **APPENDIX 4**

Activity ($'000)	Customer Support	Customer Billing	Metering & Compliance	Water delivery & Other Operations	Flood Operations	Hydrometric Monitoring	Water Quality Monitoring	Corrective Maintenance	Routine Maintenance	Asset Management Planning	Dam Safety Compliance Capital Projects pre-1997	Dam Safety Compliance	Environmental Planning & Protection	Renewal & Replacement	Insurance	TOTAL OPEX
2012/2013																
Border	51	18	179	190	-	45	96	74	294	184	-	124	68		55	1,378
Gwydir	36	35	223	640	53	550	59	306	1,013	348	-	226	194		176	3,859
Namoi	51	43	326	631	53	535	112	388	889	398	-	369	139		128	4,062
Peel	5	31	95	43	-	166	53	45	176	131	-	139	242		48	1,174
Lachlan	72	95	440	886	53	899	106	5	1,791	222	-	724	158		162	5,613
Macquarie	122	49	287	560	53	657	107	273	1,112	519	-	388	272		247	4,646
Murray	82	65	697	930	-	5	-	53	454	370	-	166	235		254	3,311
Murrumbidgee	72	51	581	1,202	53	869	98	106	1,579	568	-	522	578		263	6,542
North Coast	3	7	-	43	-	33	43	61	219	88	-	106	18		-	621
Hunter	41	25	399	608	-	294	165	189	1,037	586	-	405	238		261	4,248
South Coast	3	7	-	168	-	32	50	4	203	24	-	164	18		-	673
Fish River	-	2	52	42	-	28	-	-	2,427	419	-	674	280		114	4,038
Total	**538**	**428**	**3,279**	**5,943**	**265**	**4,113**	**889**	**1,504**	**11,194**	**3,857**	**-**	**4,007**	**2,440**	**-**	**1,708**	**40,165**
2013/2014																
Border	50	17	175	186	-	44	94	72	225	180	-	118	63		54	1,278
Gwydir	35	34	218	626	52	538	57	299	1,144	340	-	216	180		172	3,911
Namoi	50	42	319	617	52	524	110	380	929	389	-	352	129		125	4,018
Peel	5	30	93	42	-	163	52	44	148	128	-	132	225		47	1,109
Lachlan	70	93	430	867	52	881	103	5	1,602	217	-	691	147		159	5,317
Macquarie	119	48	281	549	52	642	104	267	1,424	508	-	370	253		242	4,859
Murray	80	64	682	911	-	5	-	52	413	362	-	159	219		248	3,195
Murrumbidgee	70	50	568	1,175	52	850	96	104	1,490	556	-	498	536		257	6,302
North Coast	3	7	-	42	-	32	42	59	206	86	-	102	17		-	596
Hunter	40	24	390	596	-	288	162	185	986	573	-	386	221		255	4,106
South Coast	3	7	-	164	-	31	49	4	194	23	-	157	17		-	649
Fish River	-	2	51	42	-	28	-	-	2,373	410	-	649	260		111	3,926
Total	**525**	**418**	**3,207**	**5,817**	**260**	**4,026**	**869**	**1,471**	**11,134**	**3,772**	**-**	**3,830**	**2,267**	**-**	**1,670**	**39,266**

CAPITAL EXPENDITURE 2010/11 TO 2013/14 ($2009/10) **APPENDIX 4**

Activity ($'000)	Asset Management Planning	Routine Maintenance	Dam Safety Compliance - Pre 1997 Construction	Dam Safety Compliance	Renewal & Replacement	Structural and Other Enhancement	Corporate Systems	Environmental Planning and Protection	Flood operations	Water Delivery and other operations	TOTAL CAPEX
2010/2011											
Border	-	-	-		-			-	-	164	164
Gwydir	-	-	11,189		-	30		100	80	545	11,944
Namoi	-	-	45,489		-	30		6,000	80	539	52,139
Peel	-	-	6,257		-			-	-	44	6,301
Lachlan	-	-	7,406		103			3,750	80	767	12,106
Macquarie	-	-	10,801		-			3,100	80	482	14,464
Murray	-	-	-		13,916			-	-	796	14,712
ee	-	-	18,296		200			1,770	80	1,018	21,363
North Coast	-	-	40		-			-	-	38	78
Hunter	-	-	-		-			-	-	469	469
South Coast	-	-	-		-			-	-	142	142
Fish River	-	-	-		5,173	3,030		-	-	36	8,239
Total	**-**	**-**	**99,479**	**-**	**19,392**	**3,090**	**-**	**14,720**	**400**	**5,041**	**142,122**
2011/2012											
Border	-	-	-		-			-		84	84
Gwydir	-	-	22,566		-			2,200		283	25,049
Namoi	-	-	20,039		-			6,000		279	26,318
Peel	-	-	758		-			-		20	778
Lachlan	-	-	15,059		3,071			-		394	18,524
Macquarie	-	-	13,594		-			5,500		249	19,342
Murray	-	-	-		1,817			-		412	2,229
Murrumbidg	-	-	50		79			2,350		530	3,009
North Coast	-	-	-		-			-		19	19
Hunter	-	-	50		-			-		244	294
South Coast	-	-	-		-			-		74	74
Fish River	-	-	-		5,119	3,000		-		19	8,138
Total	**-**	**-**	**72,116**	**-**	**10,086**	**3,000**	**-**	**16,050**	**-**	**2,608**	**103,860**

CAPITAL EXPENDITURE 2010/11 TO 2013/14 ($2009/10) **APPENDIX 4**

Activity ($'000)	Asset Management Planning	Routine Maintenance	Dam Safety Compliance - Pre 1997 Construction	Dam Safety Compliance	Renewal & Replacement	Structural and Other Enhancement	Corporate Systems	Environmental Planning and Protection	Flood operations	Water Delivery and other operations	TOTAL CAPEX
2012/2013											
Border	-	-	50		-			-		44	94
Gwydir	-	-	6,832		-			8,000		149	14,981
Namoi	-	-	26,195		-			11,000		147	37,342
Peel	-	-	-		123			-		10	133
Lachlan	-	-	10,182		3,506			-		206	13,894
Macquarie	-	-	-		436			2,000		130	2,566
Murray	-	-	-		-			-		216	216
ee	-	-	-		822			2,500		279	3,600
North Coast	-	-	-		-			-		10	10
Hunter	-	-	90		-			-		128	219
South Coast	-	-	40		-			-		39	79
Fish River	-	-	-		-			-		10	10
Total	**-**	**-**	**43,390**	**-**	**4,887**	**-**	**-**	**23,500**	**-**	**1,368**	**73,145**
2013/2014											
Border	-	-	-		-					42	42
Gwydir	-	-	-		-			10,000		141	10,141
Namoi	-	-	-		1,189					139	1,328
Peel	-	-	55		-					9	65
Lachlan	-	-	-		6,939					195	7,135
Macquarie	-	-	-		1,705					124	1,829
Murray	-	-	-		57					205	262
ee	-	-	83		999					265	1,347
North Coast	-	-	-		-					10	10
Hunter	-	-	-		-					122	122
South Coast	-	-	-		-					37	37
Fish River	-	-	277		224					9	510
Total	**-**	**-**	**415**	**-**	**11,113**	**-**	**-**	**10,000**	**-**	**1,298**	**22,826**

MDBA AND BRC PASS THROUGH COSTS ($2009/10)

APPENDIX 4

$'000	2010/11	2011/12	2012/13	2013/14
MBDA				
Total NSW Government contribution to MDBA	29,721	29,721	29,721	29,721
Share of contribution recovered by State Wate	**11,672**	**13,170**	**14,568**	**13,136**
User share				
Border	17	19	21	19
Gwydir	52	59	66	59
Namoi	61	69	76	68
Peel	3	4	5	5
Lachlan	-	-	-	-
Macquarie	37	42	45	41
Murray	5,158	5,819	6,437	5,805
Murrumbidgee	1,144	1,291	1,428	1,288
North Coast	-	-	-	-
Hunter	-	-	-	-
South Coast	-	-	-	-
Fish River	-	-	-	-
Total user share	**6,472**	**7,303**	**8,078**	**7,285**
BRC				
Total NSW Government contribution to BRC	1,100	1,100	1,100	1,100
Share of contribution recovered to State Wate	**693**	**694**	**718**	**715**
User share				
Border	693	694	718	715

REPORT

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State Water consumption forecasts for the 2010 pricing determination

Prepared for

State Water Corporation

Centre for International Economics
Canberra & Sydney

June 2009

The Centre for International Economics is a private economic research agency that provides professional, independent and timely analysis of international and domestic events and policies.

TheCIE's professional staff arrange, undertake and publish commissioned economic research and analysis for industry, corporations, governments, international agencies and individuals.

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Contents

Boxes, charts and tables

Acronyms

ABARE	Australian Bureau of Agricultural and Resource Economics
AEW	Adaptive Environmental Water
CIE	Centre for International Economics
DWE	New South Wales Department of Water and Energy
IPART	Independent Pricing and Regulatory Tribunal of New South Wales
IQQM	Integrated Quality Quantity Model
NSW	New South Wales
State Water	State Water Corporation

Executive summary

State Water Corporation (State Water) is a statutory state-owned corporation. Its principal objective is to supply water to licensed users, and stock and domestic users in an efficient, effective, financially and environmentally responsible manner. State Water operates major dams and other infrastructure on regulated rivers throughout NSW. Its customers include irrigators, country town water supply authorities, stock and domestic users, mines and electricity generators. It is also responsible for maintaining environmental flows on regulated rivers.

The price that State Water can charge for its bulk water services is regulated by the Independent Pricing and Regulatory Tribunal of NSW (IPART). The last price determination was completed in 2006 which established the maximum bulk water prices to apply from 1 October 2006 to 30 June 2010. IPART is scheduled to complete the next price determination for State Water so that prices can apply from 1 July 2010.

As part of the price review State Water is required to submit its pricing proposal to IPART in September 2009. This will include State Water's proposed consumption forecasts which will be used by IPART to 'convert' the determined revenue requirement into bulk water prices.

The Centre for International Economics (the CIE) has been engaged by State Water to assist in preparing revised consumption forecasts that will form part of its next submission to IPART. While the discussion in this report largely refers to State Water, it is equally applicable to the component of the bulk water charge related to the water management services provided by the Department of Water and Energy.

Previous approaches to consumption forecasting

In past regulatory determinations for bulk water, consumption forecasts have been made using long run average estimated consumption from the Department of Water and Energy's (DWE) regional hydrology models, the Integrated Quantity Quality Models (IQQM). These models use historical climatic data since the 1890s to simulate water availability and the extractions that would have occurred based on the current rules specified in the Water Sharing Plans and the current level of agricultural development.

The main advantage of using the long run average extractions from IQQM modelling is that climatic volatility can be smoothed out, with over 100 years of climatic data.

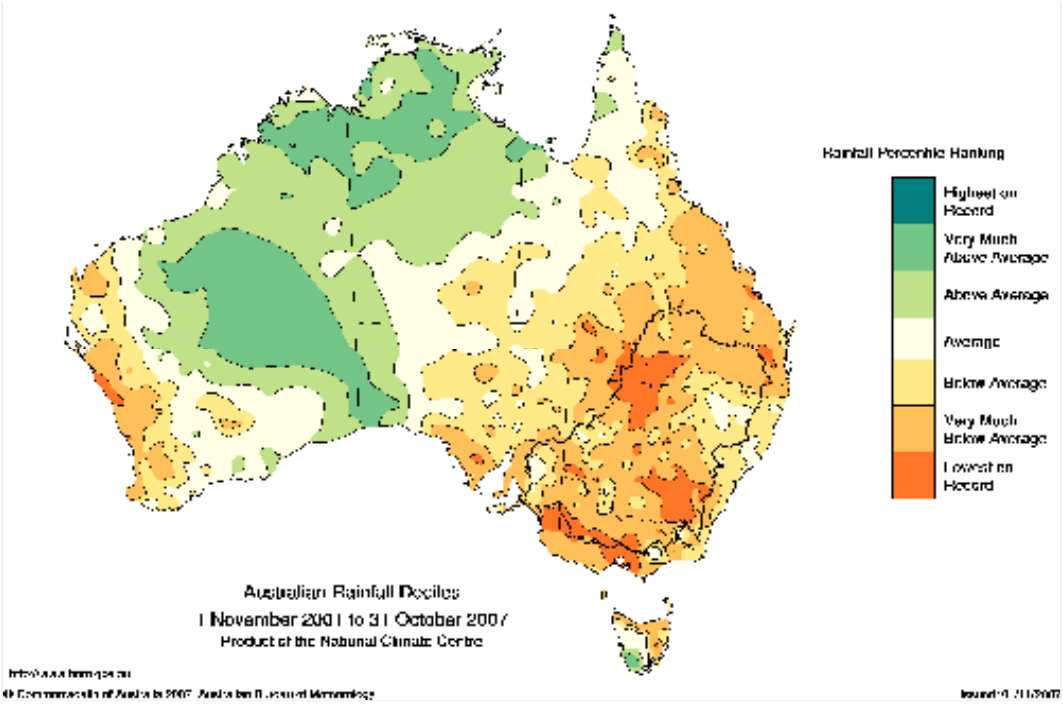
IQQM was also favoured as actual extraction data has been of low quality and there have been substantial changes in how water is allocated to users.

For this review, using the long-run average from IQQM as a forecasting method is no longer viable. There is strong statistical evidence, presented in this report, that recent climatic conditions are outside what would be expected from normal climatic volatility. Others have also noted that climate change is likely to impact on water use and availability, particularly in the South of the Murray-Darling Basin (CSIRO 2008, p. 5) where much of State Water's revenue is derived (chart 1).

Over the next regulatory period, rainfall is expected to be lower in State Water's main valleys than represented by an average over the past 100 years, which will flow-through to lower extractions. Further, the long period of low rainfall has significantly lowered the moisture content in the soil which has altered the long-standing relationship between rainfall and inflow into the rivers. This is particularly true in the southern part of NSW which has experienced low rainfall for almost 10 years. For these parts of the state, even if average rainfall is received over the next year the run-off into the rivers is likely to be significantly lower than the historical average (MDBA 2009, p. 7).

The magnitude of changes to climatic conditions remains highly uncertain, particularly at the regional level relevant for consumption of bulk water. CSIRO (2008) reports that climate change could lower average extractions by as much as 20 per cent or could increase extractions by 4 per cent by 2030. Under the median estimate, climate change would reduce extractions by 4 per cent by 2030 (CSIRO 2008).

1 **Australian rainfall, 2001 to 2007**



Data source: Australian Bureau of Meteorology (2007).

Extractions in the past three years have been substantially lower than the averages modelled in the CSIRO 2008 study. Over the first two years of the current regulatory period, actual extractions have been only 31 per cent of those allowed for by IPART in 2006 (box 2). Even over a 13 year period, actual extractions were 16 per cent lower than allowed in IPART's 2006 determination. This has meant that State Water has not been able to recover its costs.

2 Forecasts and outcomes in the 2006-10 period

For the 2006 to 2010 regulatory period, consumption was expected to be 5.4 million ML per year across State Water's regulated river valleys. This was based on the long term average from the IQQM model.

Over the first two years of the regulatory period, actual consumption across all valleys has been only 31 per cent of the forecast. As 60 per cent of State Water's revenue was expected to be recovered from usage charges by 2009-10, State Water will recover only about half of the total revenue forecast by IPART in 2006.

Even over a longer period, actual consumption is substantially below long term averages from IQQM. For 1995-96 to 2007-08, average annual consumption is 16 per cent below the forecasts used by IPART for 2006 to 2010.

River valley	*IPART forecast 2006-2010*	*Actual (2006-07 to 2007-08)*		*Actual (1995-96 to 2007-08)*	
	ML/year	ML/year	% of forecasts	ML/year	% of forecasts
Border	209 670	122 102	58.2	151 326	72.2
Gwydir	309 164	104 300	33.7	285 782	92.4
Namoi	237 146	58 885	24.8	175 787	74.1
Peel	14 675	9 647	65.7	11 517	78.5
Lachlan	307 149	43 965	14.3	242 067	78.8
Macquarie	386 311	117 806	20.3	285 684	-
Murray LD	1 934 830	392 634	20.3	1 475 661	76.3
Murrumbidgee	1 915 848	689 326	36.0	1 825 823	95.3
North Coast	992	908	91.6	908	91.6
Hunter	128 067	103 997	81.2	130 933	102.2
South Coast	5 831	5 723	98.1	5 723	98.1
Total	5 449 683	1 649 292	30.3	4 591 210	84.2

Note: For North Coast and South Coast data only covers 2004-05 to 2007-08, rather than the entire period.

Alternative approaches to forecasting consumption

Given the impact that changing climatic conditions has on water extractions and the uncertainty surrounding climate change, there is a strong justification for examining alternative approaches to forecasting consumption for the next regulatory period.

This report identifies a number of alternative plausible approaches that can be used to forecast consumption over the next regulatory period including:

- directly adjusting the long-run average from IQQM for climate change impacts and current low levels of stored water. We adopt two alternative approaches for adjusting for current storage levels — one using empirical relationships, the other by allocating the amount that storages are below average across the four years of the regulatory period;
- using a moving average of actual extractions or IQQM modelled extractions over a period of 15 years; and
- using time series methods of forecasting.

The forecasts for each valley under these alternative approaches are presented in table 3.

3 Forecasts under alternative approaches

	IQQM 1896 to 2009	*IQQM 1996 to 2009*	*Actual 1996 to 2009*	*Long run average adjusted (method 1)*	*Long run average adjusted (method 2)*	*IPART 2006 forecasts*
	GL/year	GL/year	GL/year	GL/year	GL/year	GL/year
Border	189	172	150	180	159	210
Gwydir	296	287	276	265	233	309
Namoi	231	174	170	212	167	237
Peel	16	15	11	16	16	15
Lachlan	323	257	227	262	190	307
Macquarie	377	302	270	349	322	386
Murray LD	1 859	1 698	1 392	1 667	1 680	1 935
Murrumbidgee	1 954	1 782	1 736	1 716	1 723	1 916
North Coast	.	.	1	.	.	1
Hunter	157	147	130	157	157	128
South Coast	.	.	6	.	.	6
Total	5 409	4 842	4 367	4 831	4 654	5 450

Note: Totals are calculated assuming North Coast, South Coast (and Hunter where applicable) forecasts are actual figures. No adjustment is made for storages or climate change for the Hunter. Long run average adjusted (method 1) adjusts IQQM data for climate change and storage levels. Storage level adjustments are made using empirical relationships. Long run average adjusted (method 2) adjusts IQQM data for climate change and storage levels. Storage level adjustments are made assuming that the amount by which storages are below average is allocated across the four years of the regulatory period.

Source: The CIE.

All the methodologies considered produce forecasts below those of IPART in 2006. The differences between the forecasts under each of the alternative methodologies and IPART 2006 are shown in table 4. The long run averages using IQQM from 1896 to 2009 produces results that, in aggregate, are similar to IPART's 2006 forecasts although there are significant differences at a valley level.[1]

[1] IQQM only incorporates data up to 2005-06. We have used recent actual and forecast data for 2006-07 and 2008-09 in this analysis.

The other four possible methodologies indicate that forecast extractions would be between 10 per cent and 20 per cent below those used by IPART in 2006, although there are larger differences at an individual valley level. This is a relatively small reduction given that recent outcomes have been 70 per cent below forecast by IPART in 2006.

4 **Difference from IPART 2006 under alternative approaches**

	IQQM 1896 to 2009	*IQQM 1996 to 2009*	*Actual 1996 to 2009*	*Long run average adjusted (method 1)*	*Long run average adjusted (method 2)*
	%	%	%	%	%
Border	-9.6	-18.0	-29.0	-14.0	-24.0
Gwydir	-4.2	-7.0	-10.9	-14.2	-24.7
Namoi	-2.6	-26.6	-28.2	-10.7	-29.5
Peel	7.7	5.3	-22.2	6.5	6.5
Lachlan	5.2	-16.2	-26.2	-14.8	-38.1
Macquarie	-2.5	-21.9	-30.1	-9.6	-16.7
Murray	-3.9	-12.2	-28.1	-13.8	-13.2
Murrumbidgee	2.0	-7.0	-9.4	-10.4	-10.1
North Coast	.	.	-8.7	.	.
Hunter	22.8	14.4	1.2	.	.
South Coast	.	.	-0.5	.	.
Total	-0.7	-11.2	-19.9	-11.4	-14.6

Note: Totals are calculated assuming North Coast, South Coast (and Hunter where applicable) forecasts are actual figures. No adjustment is made for storages or climate change for the Hunter.

Source: The CIE.

Conclusions

Each of the approaches considered differ in terms of their ease of implementation and verification, their ability to account for uncertain climate change, the certainty they provide to stakeholders and the extent to which they provide stability to State Water's balance sheet and prices. Table 5 sets out the advantages and disadvantages of each approach.

5 **Approaches for forecasting consumption**

Key points	*Current approach – IQQM long run average*	*Adjusting IQQM for climate change and storage levels*	*Using a moving average of actual extractions (or IQQM extractions)*	*Time series forecasting using IQQM estimates (ARIMA)*
Captures climate change	X	√	√	X
Copes with uncertainty of climate change	X	X	√	X
Minimises the risk of over or under recovery	X	X	√	X
Captures impact of current storage levels	X	√√ Quantification of impacts of storage levels is imprecise	√	√
Copes with changes to water management rules	√	√	√ Switch to IQQM if rules change significantly	X
Reduces regulatory uncertainty	√ Depends on stability of IQQM estimates	X	√√	√ Depends on use of same method for each review
Simple to implement and verify	√	X May require climate study or adjustment at each review period	√√√	√
No volatility of prices within period	√	√	√	X
Minimises volatility of prices between periods	√√√	√√√	√√	√
Cushions State Water's balance sheet	X	X	√	X

Source: The CIE.

Balancing these considerations, using a moving average of actual extractions from the past 15 years is, in our view, the best alternative for forecasting extractions for future regulatory periods. We view this as the best approach because:

- The use of a 15-year period offers a balance between reducing price volatility between regulatory periods (due to climatic volatility) and incorporating current information on changes in climatic conditions.
  - using a longer period of data (such as the 100 years of data as previously used) means that current structural shifts in climatic conditions would not be adequately reflected in the consumption forecast;

  - using a shorter time series would result in greater price volatility between regulatory periods, although it will better reflect recent shifts in climatic conditions.
- The use of actual extractions for each valley is relatively easy to identify and verify.
  - It also does not rely on having to update the IQQM at the commencement of each regulatory period. While the IQQM is periodically updated it may not coincide with the regulatory period. The current version of IQQM was last updated in 2005 and, therefore, does not incorporate changes between 2005 and 2009.
  - It provides flexibility to amend the forecasts for updated information. For example, the actual usage data reflected in this report only includes metered extractions in NSW and therefore excludes water traded interstate for which State Water cannot recover a usage-based charge. In the event that there is a change in NSW or Federal Government Policy which allows State Water to recover usage charges on all extractions then the consumption forecasts should be amended accordingly. This would primarily affect the Murray and Murrumbidgee valleys and result in a small increase in average extractions for these valleys.
  - Stakeholders will be able to better assess the future price impacts of consumption forecasts, reducing regulatory uncertainty.
- Using a moving average over a 15-year period provides some balance sheet stability for State Water as low current consumption will mean that prices will rise in the next regulatory period; and
- Using the same forecast for every year means there is no volatility from consumption forecasts within the regulatory period, providing greater certainty for users.

The next best alternative, in our view, involves directly adjusting long-run averages (derived from the IQQM) for climate change and current low storage levels. While advantageous in that it is forward looking, this approach misses many of the advantages of a much simpler approach. Most importantly, it is unclear whether climate change studies will be available in the future to make the necessary adjustments at the time of each regulatory review.

However, the use of the modelled extractions data from the IQQM may be required in the future if there have been substantial structural changes in the water management rules. In this instance, the decision to use IQQM would have to demonstrate that the potential impact of structural changes in water management rules is larger than the 'modelling error' from IQQM.

Using the preferred approach, the table below provides the preliminary consumption forecast proposed in each year of the determination period. This is based on 14 years

actual consumption data and will be need to be updated for consumption data from 2008-09 once these are known.

6 **Proposed consumption forecast for 2010 determination**

River valley	*Consumption (ML/pa)*
	ML/year
Border	148 923
Gwydir	275 597
Namoi	170 193
Peel	11 422
Lachlan	226 554
Macquarie	269 989
Murray LD	1 391 796
Murrumbidgee	1 736 020
North Coast	906
Hunter	129 581
South Coast	5 804
Total	4 366 786

Note: Includes forecasts for 2008-09.
Source: The CIE.

In regards to future determinations, we propose that a 15 year moving average approach be used. Therefore, for the 2010 determination, the consumption forecast would be based on actual extractions data for the period 1995-96 to 2008-09. Assuming the next determination extends for a four year period would mean that at the 2014 determination, consumption forecasts would be based on the period 1998-99 to 2012-13.

1 Introduction

About State Water

State Water is a statutory state-owned corporation. Its principal objective is to supply water to licensed users and stock/domestic users in an efficient, effective, financially and environmentally responsible manner.

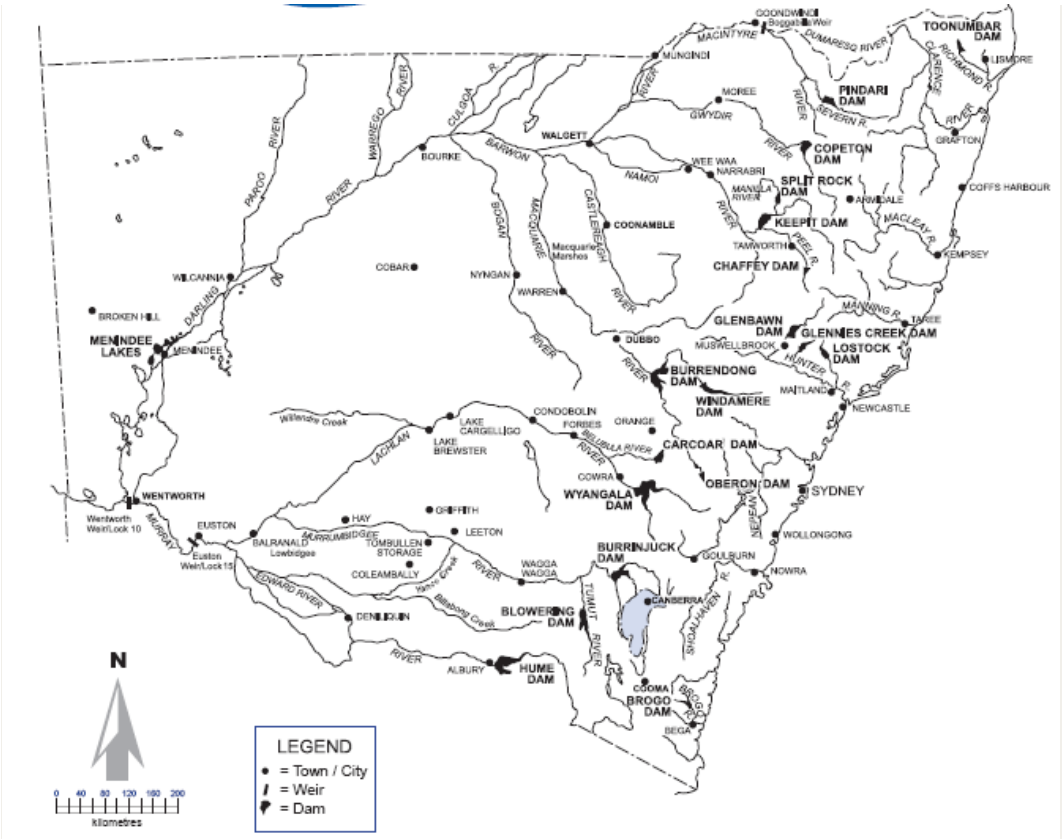
State Water operates 20 major dams, 280 weirs and regulators, and associated assets on regulated rivers. It has around 6,200 customers, including irrigation corporations, country town water supply authorities, farms, mines and electricity generators. It also meets community needs by providing water for stock and domestic users, and is responsible for maintaining environmental flows on regulated rivers.

State Water operates under a regulatory framework similar to those of Hunter Water, Sydney Water and the Sydney Catchment Authority. It is subject to:

- an Operating Licence administered by the Portfolio Minister that prescribes explicit operating conditions to ensure that it is managed efficiently and in line with Government and community expectations;
- periodic audits of its performance against the terms and conditions of this licence;
- a Statement of Corporate Intent negotiated annually with the Treasurer;
- Water Management Works Approvals issued by DNR in accordance with the *Water Management Act 2000*;
- Memoranda of Understanding negotiated with other key regulatory agencies such as the Department of Environment and Climate Change; and
- Regulation of prices by IPART.

State Water's area of operation is illustrated in the following map.

1.1 Map of State Water's Area of operations



Data source: State Water Corporation.

Role of consumption forecasts in regulatory review

The bulk water prices regulated by IPART for services provided by State Water include charges for extractions of bulk water from regulated rivers. The last price determination was completed in 2006 which established the maximum bulk water prices to apply from 1 October 2006 to 30 June 2010. IPART is scheduled to complete the next price determination for State Water so that prices can apply from 1 July 2010.

Under IPART's current approach to regulating bulk water prices it establishes a 'revenue requirement' based on the deemed efficient level of operating and capital expenditure with an appropriate return on and of capital. The revenue requirement is then 'converted' into prices using an assumption on factors such as entitlement volumes associated with licences and forecasts of consumption over the determination period.

If actual consumption is lower or higher than forecast State Water will receive less or more revenue (respectively) than forecast. For the 2006 review, 60 per cent of State Water's revenues were expected to be generated from usage by 2009-10, making consumption forecasts an important element of the regulatory process.

Actual consumption in the first two years of the current regulatory period was only 31 per cent of that allowed for in the regulatory determination, meaning that State Water has been unable to recover its costs in the regulatory period to date (box 1.2).

1.2 Actual and forecasts from the current regulatory period

For the 2006 to 2010 regulatory period, consumption was expected to be 5.4 million ML per year across State Water's regulated river valleys. This was based on the long term average from the IQQM model.

Over the first two years of the regulatory period, actual consumption across all valleys has been only 31 per cent of the forecast. As 60 per cent of State Water's revenue was expected to be recovered from usage charges by 2009-10, State Water will recover only about half of the total revenue forecast by IPART in 2006.

Even over a longer period, actual consumption is substantially below long term averages from IQQM. For 1995-96 to 2007-08, average annual consumption is 16 per cent below the forecasts used by IPART for 2006 to 2010.

River valley	*IPART forecast 2006-2010*	*Actual (2006-07 to 2007-08)*		*Actual (1995-96 to 2007-08)*	
	ML/year	ML/year	% of forecasts	ML/year	% of forecasts
Border	209 670	122 102	58.2	151 326	72.2
Gwydir	309 164	104 300	33.7	285 782	92.4
Namoi	237 146	58 885	24.8	175 787	74.1
Peel	14 675	9 647	65.7	11 517	78.5
Lachlan	307 149	43 965	14.3	242 067	78.8
Macquarie	386 311	117 806	20.3	285 684	-
Murray LD	1 934 830	392 634	20.3	1 475 661	76.3
Murrumbidgee	1 915 848	689 326	36.0	1 825 823	95.3
North Coast	992	908	91.6	908	91.6
Hunter	128 067	103 997	81.2	130 933	102.2
South Coast	5 831	5 723	98.1	5 723	98.1
Total	5 449 683	1 649 292	30.3	4 591 210	84.2

Note: For North Coast and South Coast data only covers 2004-05 to 2007-08, rather than the entire period.

Previous approaches to consumption forecasting

In past determinations consumption forecasts were based on the hydrology model, IQQM. This is a computer simulation model developed by the then NSW Department of Land and Water Conservation, which can simulate river flow, flow routings, water allocation and water use at a catchment scale. IQQM uses historical inflow data for a period of over 100 years to simulate the extractions that would have occurred based on the current rules specified in the Water Sharing Plans and the

current level of development. A separate IQQM is available for most regulated river valleys.[2]

At the last determination, State Water argued that demand should be estimated based on the long term average forecast adjusted downward by one standard deviation. The downward adjustment was described as a risk adjustment factor. IPART, however, chose to maintain the use of the long term average consumption forecasts for price setting purposes.

In choosing an appropriate consumption forecast methodology, in the past, IPART has tended to support approaches that don't seek to forecast the exact consumption that is likely in each year. Rather, it has tended to establish consumption forecasts that achieve the revenue requirements for the whole determination period. This is intended to avoid the year on year variability in consumption forecasts, which would be translated into volatility in prices. IPART has also recognised the difficulty in exactly forecasting bulk water consumption in a year given the difficulty of accurately forecasting climatic conditions (even for the short term).

Climate change

Climate change represents a significant (and likely systematic) risk for State Water. Climate change means that historical averages of consumption are less applicable to the future than they would otherwise be. Forecasts based on historical averages may be systematically biased upwards.

The understanding of climate change is still very limited. This is particularly the case at a detailed level, such as the impacts of climate change on water availability in particular river valleys. The CSIRO has recently conducted an extensive modelling exercise that covers most of the river valleys relevant for State Water. The findings of these studies are summarised in the following chapters.

The CSIRO expects that changes in climatic conditions will result in lower water availability throughout regional NSW. Though there is considerable uncertainty depending on the climate model used, with some models predicting increases in extractions and other predicting much larger reductions. This analysis was not available at the last price determination.

This project

There are several concerns with the use of the long term average. Primary amongst these concerns is that the historical data does not take account of potential changes in future water extraction due to climate change. At the time of the last determination

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2 No IQQM is available for the North Coast and South Coast valleys.

there had been limited analysis undertaken of climate change. Further, since the 2006 review, the past two years of actual extractions and forecast for 2008/09, based on figures to end of March, are well below what could be expected based on climatic conditions over the past 110 years.

This project seeks to incorporate climate change into a more robust methodology for consumption forecasting.

Consequently, it is crucial to understand:

- whether climatic conditions have undergone a structural break and a long-run average is no longer the best forecast of future climatic conditions;
- what alternatives there are for forecasting consumption; and
- the advantages and disadvantages of these alternatives.

The Centre for International Economics (the CIE) has been engaged by State Water to assist in preparing revised consumption forecasts, supported by a robust framework, that will form part of its next submission to IPART. Separate consumption forecasts must be provided for all regulated river valleys. State Water requires:

- a review of historical data from the DWE IQQM model, climate forecasting tools and the CSIRO Sustainable Yields Reports;
- the development of a methodology for estimating water extractions over the period 2010-11 to 2020-21, as an alternative to the historical average;
- consultation with the Irrigators' Council, the Department of Environment and Climate Change (DECC) and IPART on their views on consumption forecasting;
- forecast extractions that allow full (expected) cost recovery over the four year period of the determination; and
- a range of probable water extractions and the probability associated with the recommended extractions.

Report structure

This draft report presents the CIE's preferred approach to establishing consumption forecasts for State Water that will form part of its 2010 price submission to IPART.

The remainder of the report is structured as follows:

- Chapter 2 discusses the key factors that influence the level of water extraction from regulated river systems.
- Chapter 3 provides an overview of the IQQM and discusses the any limitations of the model for the purpose of consumption forecasting.
- Chapter 4 discusses the key issues that need to be taken into account when considering an alternative approach to consumption forecasting.
- Chapter 5 sets out alternative approaches to forecasting consumption.
- Chapter 6 sets out the recommendations and conclusions from this study.

2 *Demand and supply impacts on consumption*

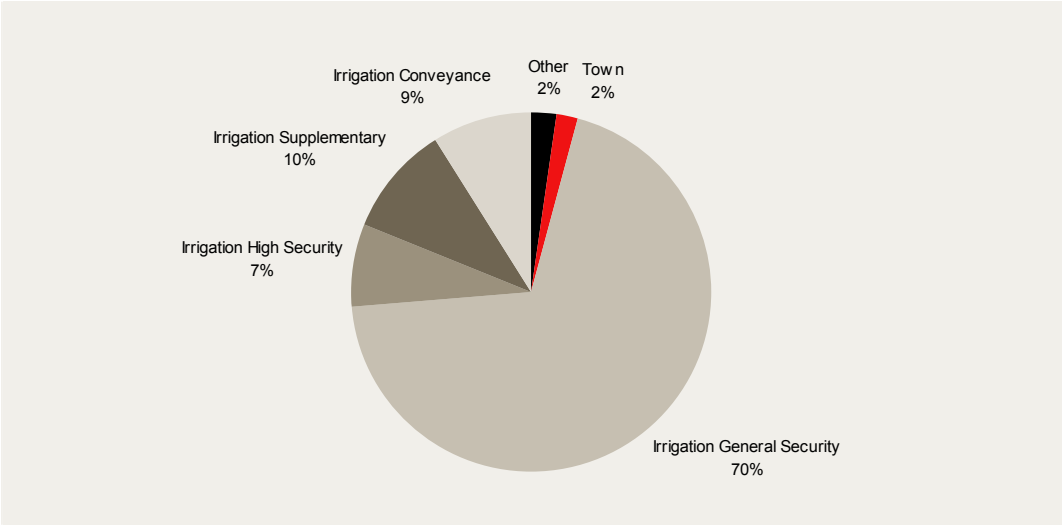
The volume of water extracted in any given year is dependent on the demand for water throughout the year and the water availability at different points in the year. This pattern of extractions varies between the different customer types, depending on the types of licences held.

This chapter provides an overview of State Water's customers and the key factors that determine the aggregate level of water extracted in each valley, focusing on irrigation customers, which are the largest extractors of water from regulated rivers.

State Water's customers

State Water's main customers are irrigators, although it also provides water to some towns and other customers (chart 2.1). [3] The vast majority of licences (96 per cent) are used for irrigation purposes.

2.1 Entitlement volumes different licence categories



a 'Other' includes stock and domestic, power supply and for a range of miscellaneous activities.
Data source: State Water billing database, 3 March.

3 The different license categories are discussed in more detail later in this chapter.

The composition of these customers differs slightly in each of the valleys (table 2.2). The key points to note are:

- High security licences (which include sub categories for town water supply, research, Aboriginal and irrigation water licences) and Local Water Utility and Domestic and Stock licenses make up only 10 per cent of entitlement volumes. The dominant licence category in all valleys (by entitlement volumes) is the General Security licenses, which are primarily used for irrigation. Supplementary water licences are also a major licence category, and are almost exclusively used for irrigation except for the Macquarie Generation licenses in the Hunter Valley.
- In the Murrumbidgee valley a relatively large proportion of entitlements are high security licences, reflecting the significant horticultural activities in the region.
- In the Gwydir and Namoi valleys, supplementary water licences represent a greater share of total entitlements compared with other valleys.
- In the Hunter, the 'other' category reflects the large entitlement volumes held by the power utility (Macquarie Generation).
- The conveyance licence entitlements relate to the large 'wholesale' customers in the region, such as Murray Irrigation Limited and Murrumbidgee Irrigation Limited.

2.2 Distribution of licence volumes across valleys

	General Security	*High Security*	*Supplementary*	*Conveyance*	*Town*	*Other*
	%	%	%	%	%	%
Gwydir	65.8	1.9	22.9	0.0	0.5	8.9
Hunter	53.5	8.5	19.1	0.0	4.2	14.7
Lachlan	88.7	4.1	0.0	2.7	2.4	2.2
Macquarie	87.2	1.9	6.9	0.0	2.6	1.4
Murray	66.9	7.5	9.9	13.0	1.9	0.8
Murrumbidgee	65.8	11.8	6.7	12.9	1.5	1.3
Namoi	67.4	0.9	30.4	0.0	0.6	0.7

Note: These relate to those valleys with Water Management Act licences.

Source: State Water billing database (accessed 3 March 2009).

The water use of the different customer types are driven by different factors. For example, in regards to town water, the amount of water consumed in each year is likely to be influenced by factors such as population growth and local climatic conditions which impact on the volume of outdoor water use by households. Given that extractions from town water suppliers constitutes a relatively small share of total water use in each region we focus on the key factors that impact on irrigation activities.

Factors impacting on irrigation water extractions

The demand for irrigation water depends on the potential economic return that can be achieved from the water. This is influenced by a range of factors such as the prevailing prices for agricultural outputs and the availability of water which is a key input to production. Given the prevailing economic conditions, the amount of water demanded for irrigated crops depends on a range of physical factors such as irrigated area, crop type, soil type, topography, climate and water application rate (Productivity Commission 2006).

The choice of irrigation technology is also a factor that influences the volume of on-farm water use — for example, surface water irrigation methods tend to use more water per irrigated area compared with other technologies that require additional investment (such as drip irrigation systems).

Agricultural activity

The relative importance of each of the factors discussed above depends on the type of agricultural activity being undertaken in each valley. The Australian Bureau of Agricultural and Resource Economics (ABARE) has recently completed a profile of irrigation activities in the major valleys in the Murray Darling Basin (ABARE 2008). Table 2.3 summarises the key irrigation activities in each area and the water used in 2006-07.

2.3 **Irrigation water entitlements and use[a], region by industry 2006-07**

Region	*Industry*	*Water used in 2006-07*	*Water use as a percentage of entitlement*
		ML/farm	%
Border Rivers	All irrigators	316	22
Namoi	All irrigators	847	53
Macquarie-Castlereagh	Broadacre	603	32
Macquarie-Castlereagh	Horticulture	132	52
Lachlan	All irrigators	314	34
Murrumbidgee[a]	Dairy	581	125
Murrumbidgee	Broadacre	502	29
Murrumbidgee	Horticulture	205	55
Murray	Dairy	624	80
Murray	Broadacre	336	41
Murray	Horticulture	221	80

[a] Includes temporary water purchases and reused water.

Source: ABARE (2008).

In table 2.3 the volume of water used includes extraction from unregulated rivers and groundwater sources as well as regulated rivers. Therefore, where possible, irrigators can substitute between different sources of water for irrigation purposes.

Of note in the table above is that in the majority of cases irrigators used only a small proportion of their entitlements in 2006-07, reflecting reduced allocations due to drought. Dairy farmers in the Murrumbidgee valley, however, used more water than their entitlements as they purchase water through trading activities.

Land area irrigated

Table 2.4 outlines the area setup for irrigated activities in each valley (per farm) and the amount of irrigation undertaken in 2006-07 based on a recent survey undertaken by ABARE.

2.4 Land area irrigated (per farm)

	Area setup for irrigation 2006-07	***Area irrigated in 2006-07***
	ha/farm	ha/farm
Border	147	67
Namoi — cotton	337	238
Macquarie — broadacre	420	142
Macquarie — horticulture	67	67
Lachlan — mixed farms	276	84
Murrumbidgee — dairy	184	128
Murrumbidgee — broadacre	511	121
Murrumbidgee — horticulture	44	43
Murray — dairy	187	69
Murray — broadacre	490	153
Murray — horticulture	46	33

Source: ABARE (2008).

The key points to note are that irrigators have made substantial investments in establishing irrigation infrastructure on their properties. In 2006-07 the majority of irrigators did not utilise their full land area due to the low water allocations. This situation has continued, as water allocations have continued to fall in most valleys since 2006-07.

In the longer term it is possible that the area irrigated will expand above the current levels. However, this would be dependent on the availability of water - more than two-thirds of irrigators in the MDB indicated that the uncertainty of water allocations was a major constraint to expanding the area irrigated (ABARE 2008, p. 15).

Global commodity markets

The price that can be received for the output from irrigated activities influences the irrigators' decision on the scale of irrigation activities undertaken in a given year. The price received for the output is largely dependent on the global commodity market conditions. ABARE provides a quarterly update of the forecast of commodity prices in the near future. The most recent quarterly update indicates that:

- The sharp rise in commodity prices over the past five years was associated with a period of strong economic growth. The current slowdown in the global economy is likely to impact on global commodity prices.
- World prices for many commodities are expected to decline in 2009-10, although this will be partially offset by an assumed depreciation of the Australian dollar. For farm commodities, the index of unit export returns is forecast to decline by 5 per cent in 2009-10. There is currently downward price pressure for some commodities such as wool, wine and dairy products. However, the demand for grains appears to have been maintained.
- In the short term, the volatility in commodity prices is likely to continue, given the uncertainty in the world economic outlook (ABARE 2009).

At this stage, it is unknown how commodity prices are likely to move throughout the next determination period. However, based on the current economic climate it is reasonable to assume that commodity prices are not expected to rise significantly in the near future. This could imply lower demand for water, assuming all other factors remain unchanged.

Water trading

Water trading involves either the transfer of ownership of permanent water entitlements or purchase/sales of irrigation water on a temporary basis, usually within the irrigation season. ABARE (2008) estimates that 2 per cent of farms in the Murray-Darling Basin were involved in either buying or selling of permanent water entitlements in 2006-07. Approximately 25 per cent of farms traded irrigation water on a temporary basis (ABARE 2008, p. 13).

ABARE's survey also asked irrigators the reasons for not conducting additional trading:

- The most common reason indicated for not buying additional water was 'extra water was not required' — this primarily related to horticulture farms. For broadacre and dairy farms the most common reason given was that the price of traded water was too high.
- The most common reason indicated for not selling additional water was that the irrigator had 'used all water available'. The second most common reason given for not selling water was that it may have been needed for the existing crops. These surveyed responses were common across dairy, broadacre and horticulture farms.

The greater ability to trade water would mean that, in aggregate, it is more likely that all available water would be used in a given year.

Licence types and entitlement volumes

Another factor that can impact on the volume of water consumed is the types of irrigation licences issued and the entitlement volumes associated with each licence type. The entitlements reflect an irrigator's access rights to a specific quantity of water each irrigation season.

Table 2.5 summarises the entitlement volumes currently available in each valley. It should be noted that the entitlement volumes may not exactly match the entitlement volumes assumed by IPART as part of their 2006 Determination. This largely reflects the licence conversions that may have taken place in some valleys or the trading of the licences. This is particularly evident in the Murrumbidgee valley where there has been a substantial conversion of General Security to High Security licences over the past few years.

2.5 Consumption and entitlement volumes for regulated rivers

River valley	*High security entitlement*	*General security entitlement*	*Supplementary water*
	ML	ML	ML
Border	3 125	263 085	-
Gwydir	21 458	509 665	177 347
Namoi	8 527	255 780	115 469
Peel	17 381	30 911	-
Lachlan	60 778	632 946	-
Macquarie	42 594	631 716	50 043
Murray	257 438	2 076 223	252 363
Murrumbidgee	436 928	2 264 065	195 766
North Coast	137	10 193	-
Hunter	70 738	138 109	49 276
South Coast	967	14 197	-
Total	**920 071**	**6 826 889**	**840 264**

Source: State Water Corporation, email of 3 March 2009.
Note: Under the current determination a usage charge only applies for Supplementary Water licences. There are a range of other licences (not included in the table above) that are not billable under the IPART determination - in the Gwydir valley this amounts to 66 000 ML and 307 ML for the Murrumbidgee. Floodplain harvesting licences are also not included in the data above. Conveyance licences are included under 'general security' entitlements.

Entitlements are generally classified as having 'high' or 'general' supply reliability. Broadly speaking high security entitlements mean that an irrigator should receive their full entitlement except in extreme events. The volume of water that can be extracted using a general security licence depends on the water availability in a given year. The reliability of supply on general security licences can differ between the valleys.

In some valleys, water is allocated from the unregulated tributaries and dam spills after all other needs (including environmental flows and maintaining reserves) have

been met. This water is made available to irrigators with supplementary water access licences on a similar basis to seasonal allocations. [4]

Another category of licences is a conveyance licence. These licences have been issued to a number of the large Irrigation Corporations in NSW in the Murray, Murrumbidgee and Lachlan valleys. The conveyance licences include an entitlement volume that was previously based on the corporation's previous loss allowance for transporting water.[5] Under the water sharing plans a proportion of conveyance entitlement volume is allocated a status equivalent to a high security licence while a proportion is allocated a general security status.

Based on the licence types currently on issue, the volume of water that can be extracted in a given year is dependent on the amount of water that is allocated in that year. This is discussed in more detail later in this chapter.

It should be noted that there are a range of new categories of water licences, although these have not been included in the estimates of long term average extraction from regulated river valleys. These include:

- Floodplain harvesting licences. Floodplain harvesting is the collection, extraction or impoundment of water flowing across floodplains for commercial purposes, including the irrigation of crops, pastures and horticulture and water taken for industrial purposes. Floodplain harvesting occurs in regulated and unregulated river systems, and in the coastal and inland catchments. Floodplain harvesting is most significant on inland rivers of the Murray-Darling Basin, particularly in the floodplain areas in the north west of NSW.
- Access licences with Adaptive Environmental Water (AEW) conditions imposed. As circumstances allow, the Government may assign more water to the environment than the minimum levels provided for in the water sharing plans. To do this, the Minister responsible for the *Water Management Act 2000* needs to impose AEW conditions on the whole or part of the share component of the access licence. AEW conditions may be imposed on licences that have been purchased from existing licensees, sourced from water savings, or provided by licence holders on a dedicated basis. As noted above, water saved through improved investment in more efficient irrigation technology may be converted into AEWs. At this stage, purchased AEWs are chargeable, but other sources of AEW licences may not be. This issue is likely to be considered further in IPART's 2010 determination.

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4 Under the IPART determination these licence types are subject to a water usage charge (although no access charge applies).

5 The process of issuing a licence for conveyance losses is intended to provide incentives for these Irrigation Corporations to improve the efficiency of their transportation systems (that is, if they reduce the amount of water they lose, they are entitled to use this water or trade this saved amount).

These new licence types have the potential to reduce the volume of water extracted directly from regulated river valleys for irrigation (but may be replaced by chargeable AEW licences). The net impact of these new licence categories is not known at this stage.

Government programs that impact on the volume of licensed water

The *Water for Future* is the Australian Government's plan to provide a secure long term water supply for Australians. The Australian Government has committed $12.9 billion to the program which includes two separate programs that could significantly reduce the amount of water that is extracted from regulated rivers:

- Restoring the Balance in the Basin; and
- Sustainable Rural Water Use and Infrastructure Program.

As discussed below these programs could have an impact on the volume of entitlements that are available for consumptive use. As long as these licences are chargeable there will be no impact on the volume of billable water.

Buybacks

Buying back water to restore the environment is one of the priorities of the Commonwealth Government's *Water for the Future* program. As part of the *Restoring the Balance in the Basin* program the Australian Government has committed $3.1 billion in buying back water in the Murray-Darling basin over 10 years. The water will be used to protect and restore environmental assets such as wetlands of international importance and areas which support listed migratory and threatened species.

The program is still in its infancy and, therefore, it is difficult to assess the potential impact that this could have on longer term water use in the Murray-Darling. Recently (under this program) the Commonwealth Government announced that it had bought almost 240 gigalitres of water entitlements from nine NSW properties (owned by the Twynam Agricultural Group) along the Murrumbidgee, Lachlan, Macquarie and Gwydir river systems. On 10 June 2009 the Commonwealth Government also announced the purchase of Booligal Station on the Lachlan River which includes 472 unit shares of General Security water licences.[6]

At this stage it appears likely that irrigation licences that are purchased by the Commonwealth Government would be given back to the environment and would be converted to a new licence category (such as adaptive environmental water) that would be a billable category.

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6 http://www.environment.gov.au/minister/kelly/2009/mr20090610.html.

On-farm irrigation efficiency

There are two elements to the $5.8 billion Sustainable Rural Water Use and Infrastructure Program including:

- funding state priority projects. The Commonwealth has announced that the following projects in NSW will be funded, subject to due diligence:
  - up to $137 million for projects that reduce water loss on farms by piping stock and domestic supply systems;
  - up to $300 million for modernising the infrastructure associated with direct river diverters;
  - up to $221 million to upgrade the accuracy of water metering; and
  - a further $50 million to improve the management of water on the floodplains through modifications to floodplain structures and extractions (DEWHA 2009a); and
- funding for private irrigation infrastructure operators to modernise their irrigation infrastructure to achieve water savings and improve water use efficiencies (notional funding of $650 million) (DEWHA 2009a). The savings will be shared between the irrigators and the Commonwealth Environmental Water Holder (which is responsible for ensuring environmental water is delivered to high priority environmental sites).

The impact of such a program would be to reduce the total volume of water used in irrigation farming (DEWHA 2009a). It is anticipated that the water 'saved' from improving the efficiency of irrigation activities would be returned to the environment. This would be in the form of a licence that would be 'billable' by State Water.

Water availability

As noted above, a large volume of entitlements used for irrigation relate to general security and supplementary water licences. Seasonal inflows to major water storages, therefore, have an important bearing on the amount of water available for both irrigators and other water users.

Water storage levels in many dams — particularly in southern New South Wales — typically increase during winter and spring in line with seasonal rainfall patterns before declining through the summer months as irrigation water demands increase. For regulated rivers, the amount that can be extracted depends on current storage levels, expected rainfall and inflows into storages, evaporation and the efficiency of water delivery infrastructure.

Each month, the Minister for Water, under the *Water Management Act 2000*, announces Available Water Determinations (AWDs), more commonly referred to as 'water allocations'. These increments the amount of water in licence holders accounts

and this can then be extracted over the remainder of that year or subsequent years or traded.

Reliability of supply

The reliability of supply differs across the valleys depending largely on the rainfall/inflow characteristics as well as the storage volume available in the valley.

In NSW, the rainfall patterns vary between years and regions with significant variability in annual rainfall. Due to this variability, water storages and delivery infrastructure help to manage this variability and create a more reliable water supply. The storage capacity per unit of water consumed varies between valleys but is typically higher than other countries throughout the world. This reflects the highly variable annual river flows.

Table 2.6 provides an overview of the current storage capacity relative to long term average consumption. In the northern valleys and those in the central west, the storages can hold approximately 3 to 4 years of average supply. In the Murray and Murrumbidgee valleys the storage volumes are relatively small compared with long term average usage, reflecting the reliability of inflows.[7] However, in the Hunter and North Coast valleys storages hold substantially more water than the average annual consumption.

2.6 **Storage capacity relative to usage**

	Storage Capacity	*LT Av2009*	*Storage/ LT Average*
	GL	GL	Units
Border	566	189	3.0
Gwydir	1 361	297	4.6
Namoi	822	215	3.8
Peel	61	16	3.8
Hunter	1 053	158	6.7
Lachlan	1 256	324	3.9
Macquarie	1 601	377	4.2
Murray[a]	4 651	1 794	2.6
Murrumbidgee[a]	2 657	1 835	1.4
North Coast	11	1	11.0
South Coast	9	6	1.5

[a] The figures for the Murray and Murrumbidgee are understated as they do not include storages in the Snowy Scheme. The Murray figure uses the NSW share (50 per cent) of the storage capacity in Hume, Dartmouth, Menindee and Lake Victoria.

Note: The long term average excludes environmental flows. As a comparison, in Sydney the storage volume is 2 584 GL and assuming average drawdown from the system of 600 GL per annum results in a storage volume to usage ratio of 4.3.

Source: IQQM data, State Water Storage Reports.

As noted above the inflow characteristics also influence the volume of water that is likely to be available in a given year. The coefficient of variation (standard deviation

7 These valleys also receive inflows from the Snowy system.

divided by the average) is a useful statistic for comparing different inflow distributions in valleys with different inflow characteristics. A higher coefficient of variation is associated with a greater relative variability of inflows. A comparison of the mean and median results also provides an indication of the skewness of the distribution.

The results are presented in table 2.7. The table indicates that the Macquarie and Namoi systems experience the most volatile inflow patterns. This reduces the reliability of supply in the valleys. The southern valleys have less volatile inflow patterns. A graphical illustration of the volatility of inflows in each of the valleys is presented in appendix B.

2.7 Summary of distribution of inflows

Valley	*Average*	*Median*	*Coefficient of variation*
	ML	ML	units
Border	774 413	512 905	0.90
Gwydir	743 381	656 686	0.70
Namoi	734 712	489 901	0.90
Peel	52 738	39 204	0.79
Lachlan	735 469	576 390	0.82
Macquarie	1 287 572	905 439	1.05
Murrumbidgee	4 209 821	3 812 400	0.43
Murray[a]	4 034 599	3 388 918	0.51

[a] In the Murray valley the data relates to inflows only to the Hume Dam.

Note: For some valleys the data relates to inflows into the major storage, which for others it relates to inflows at a gauging station downstream of the dam.

Sources: DWE; CIE calculations.

Timing of water availability

The timing of inflows and water allocations is critical for irrigated crops, and greatly influences the business decisions made by farmers; for example, irrigators that are highly dependent on lower security allocations — such as cotton or rice growers — are likely to respond to low water levels by delaying plantings until they get a more accurate indication of seasonal water availability.

Consequently, it would be expected that plantings would be lower than normal if water allocations were low at the beginning of the season, although this will depend on the volume of water in water accounts that has been carried over from the previous year (ABARE 2006, p. 6).

In the northern valleys, where summer rains dominate, the volume of water available at the commencement of the irrigation season is a less important factor in determining the extent of irrigation activity throughout the year. This is due to the fact that (based on historical patterns) rainfall is also often received throughout the summer irrigation season. Further, there is a greater level of development of on-farm

storages in the northern valleys which allow irrigators to benefit from opportunistic inflows during the irrigation season. The northern valleys also tend to have continuous accounting rules which allow irrigators to carry-over water for several seasons into the future.

Key points

Irrigators are by far State Water's largest customers (by volume of water extracted). Therefore, the volume of water extracted from rivers in any given year is likely to be dependent on factors that impact on the irrigation community.

There are a wide range of potential factors that impact on the amount of water extracted from regulated river systems in a given year by irrigators. The relative importance of each of these factors is likely to differ in the short term (within the period of the next price determination) and the longer term (over 10 years).

In the longer term there are likely to be more significant changes in the total water extracted from regulated rivers due to factors such as through the Commonwealth Government programs to buyback licences and the uptake of new water efficiency technologies with water savings being 'surrendered' for environmental use.

However, in the short term the key factor that is likely to determine total water use by the irrigation community is the availability of water in a given year. This view is supported by farm surveys undertaken by ABARE as well as in discussions with agronomists in irrigation areas in NSW (ABARE 2006, appendix A).

Given this, for the purposes of determining the most likely forecast, or the most appropriate approach to determining the likely water extraction over the next determination period, our approach is to focus on the supply side factors (as has been undertaken in previous years).

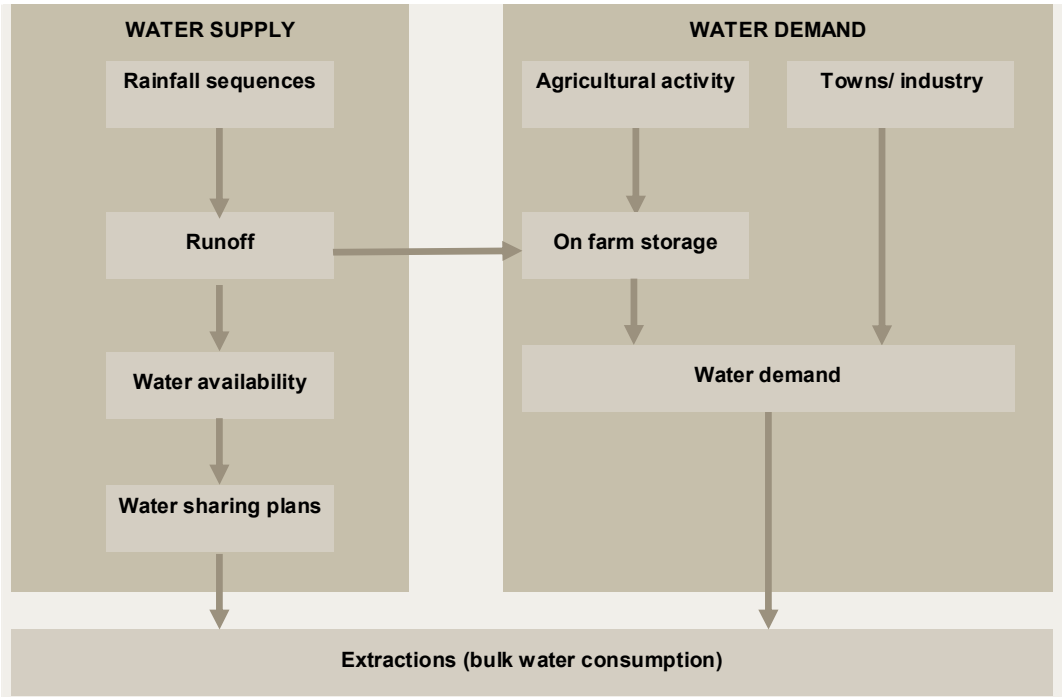
3 The IQQM model

In the past the IQQM model has been used as a tool to generate predictions of long run average water consumption. This chapter outlines the model, the reasons for its past use as a forecasting tool and its strengths and weaknesses.

What is the IQQM model?

The IQQM model is a hydrological model that, for the purposes of this review, captures the linkages between rainfall and extractions (chart 3.1). It models the storage volumes of State Water, demand for water, on-farm storages, amount of rainfall transpired by vegetation, environmental allowances and the movement of water down the river.

3.1 **Inputs and outputs of the IQQM model**



Data source: The CIE.

The IQQM modelling for most valleys used in this analysis is based on that reported by CSIRO in its sustainable yields project (CSIRO 2009). The assumptions underpinning the modelling are outlined in detail in the CSIRO project documentation.

Based on the IQQM structure, inputs (rainfall patterns) are converted into extraction levels for the periods shown in table 3.2, using the water management rules incorporated into IQQM. IQQM models are available for all regulated river valleys except the small valleys of the North Coast and South Coast.

3.2 **Period covered by IQQM modelled extraction data**

River valley	*IQQM start date*	*IQQM finish date*
Border	1895	2006
Gwydir	1895	2006
Namoi	1895	2006
Peel	1895	2006
Lachlan	1895	2006
Macquarie	1895	2006
Murray	1895	2006
Murrumbidgee	1897	2006
North Coast	NA	NA
Hunter	1892	2007
South Coast	N/A	N/A

Source: The CIE.

The use of IQQM

IQQM was developed as a water management tool rather than a consumption forecasting tool. It does not actually forecast consumption, but instead considers water availability in a system. This enables estimation of extraction levels that could have occurred over a series of years if the data inputs and scenario definitions were applied in the past.

Essentially, the model predicts how a system would have behaved given stream inflows, climatic conditions, water management rules and water user behaviour. The long term data inputs include rainfall, evaporation and stream flow. Snap shots of the level of development (irrigation and urban extraction drivers) and extraction regulation are imposed on these inputs as a scenario.

IQQM has allowed the NSW Government to consider the impact of changes to the water management rules, such as the amount of allocation to different sorts of users and the environment. It has also provided a framework to consider the rate at which general security entitlements could be exchanged for high security entitlements, particularly for the Murrumbidgee.

The use of IQQM as a forecasting tool

Unlike most consumption forecasts considered by IPART, bulk water consumption is largely supply driven (rather than demand driven). In energy markets and transport markets, the population and their income is an important driver of forecasts of

demand. For water, these issues are far less important — the amount of consumption is largely driven by supply and will equal the amount of water that State Water can make available.

The drivers of supply have been outlined in the last chapter. The most significant driver is the amount of rainfall. The baseline IQQM model results are calculated using rainfall outcomes from the late 1896 to 2006.

The use of IQQM for past regulatory reviews has reflected two factors (CIE 2006, pp. 5-6):

- reliable actual consumption data has not been available for a long period of time; and
- there have been substantial changes to the water management rules and water users over the period for which consumption data are available.

As the CIE (2006, p. 6) notes:

> In the future, actual extraction data may become the preferred data for developing forecasts. However, the case for such a change, in part, relies on the stability of water management rules through time into the future.

Current estimated IQQM extractions

The IQQM long run average extractions data provided by the Department of Water and Energy are shown in table 3.3. Alongside them is the data presented from the 2006 review and IPART's forecasts (which are approximately equal to the IQQM data from the 2006 review).

3.3 IQQM long run average extractions

River valley	*IQQM for 2009*		*IQQM for 2006 review*		*IPART forecasts*
	Average	*Std. dev.*	*Average*	*Std. dev.*	*Average*
	GL/year	GL/year	GL/year	GL/year	GL/year
Border	191	54	208	49	210
Gwydir	301	168	314	124	309
Namoi	235	70	238	63	237
Peel	16	4	15	2	15
Hunter	158	32	128	22	128
Lachlan	331	120	305	106	307
Macquarie	384	174	392	178	386
Murray	1 899	394	1 962	384	1 935
Murrumbidgee	1 989	291	1 925	258	1 916
Total	5 504		5 486		

Note: Current IQQM average is up to 2006 (2007 for Hunter). IPART 2006 review was to 2003 or earlier.
Sources: DWE; IPART (2006, p. 96); CIE calculations.

There have been substantial changes to the long run average extractions generated by IQQM for many of the valleys, despite minimal changes to the water management rules.

Other characteristics of the IQQM data have also changed markedly. For instance, the volatility of extractions in the Gwydir under current rules is much greater than under the rules relevant for the 2006 review.

The differences between the IQQM estimates for 2006 and 2009 are summarised in table 3.4. The first two columns report the differences between all IQQM data used for the 2006 review and all IQQM data available now, while the last three columns use only the years for which there are IQQM estimates available in both 2006 and 2009.

In aggregate the IQQM forecasts average about the same as for the 2006 review. The deviations between the estimates of long run extractions for the individual valleys are larger, with averages increasing by over 5 per cent for the Hunter, Peel and Lachlan valleys and falling by more than 5 per cent for the Border.

Other characteristics of estimated extractions have also changed markedly. The estimated standard deviation of extractions has risen in nearly all valleys.

3.4 Differences between IQQM estimates from 2006 and 2009

River valley	*Different time period*		*Same time period*		
	Average	*Std. dev.*	*Average*	*Std. dev.*	*Correl.*
	% deviation	% deviation	% deviation	% deviation	Unit.
Border	-8.2	9.4	-8.1	8.5	0.76
Gwydir	-4.2	35.9	-2.4	36.7	0.73
Namoi	-1.4	10.1	0.0	7.7	0.85
Peel	9.0	138.2	8.4	145.0	0.71
Hunter	23.6	46.0	24.3	48.4	0.49
Lachlan	8.6	13.3	11.5	5.2	0.96
Macquarie	-2.1	-2.4	1.8	-1.7	0.96
Murray	-3.2	2.6	-2.4	2.1	0.92
Murrumbidgee	3.3	13.2	3.8	11.0	0.93
Total	0.3		1.4		

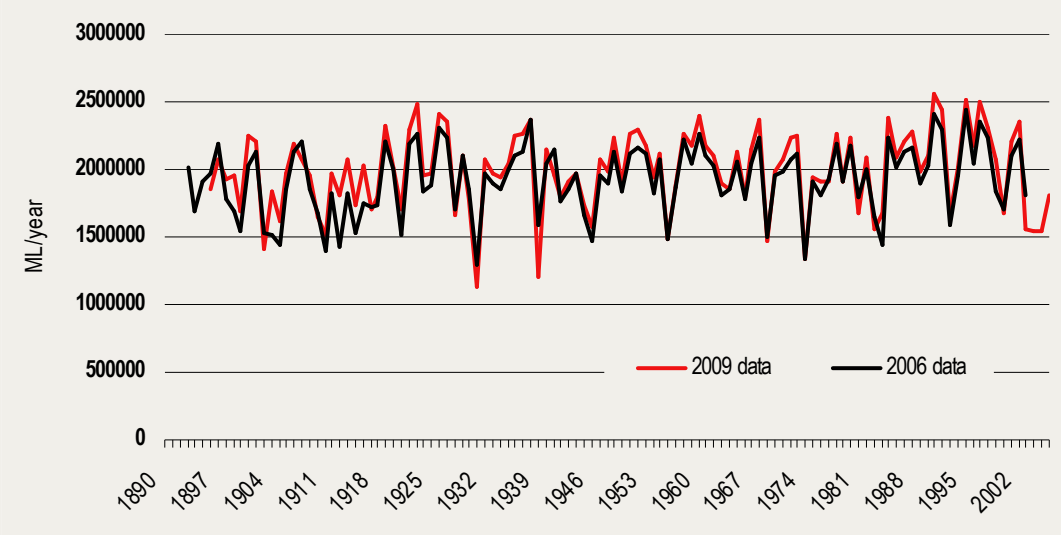
Note: Period of overlap is typically 1896 to 2001.

Source: The CIE.

The IQQM data from 2006 and current would also be expected to be reasonably correlated over the period for which they overlap (which is over 100 years). The correlation of the extractions for each valley is reported in the last column of table 3.4. For many of the valleys the correlation of 2006 and 2009 data is quite good, although this is less true for the Northern valleys.

Chart 3.5 highlights some of the changes for the Murrumbidgee. The peaks and troughs tend to be higher and lower respectively in the 2009 estimates, while there is a fairly close correlation between the 2006 and 2009 results.

3.5 **Murrumbidgee IQQM estimated extractions**



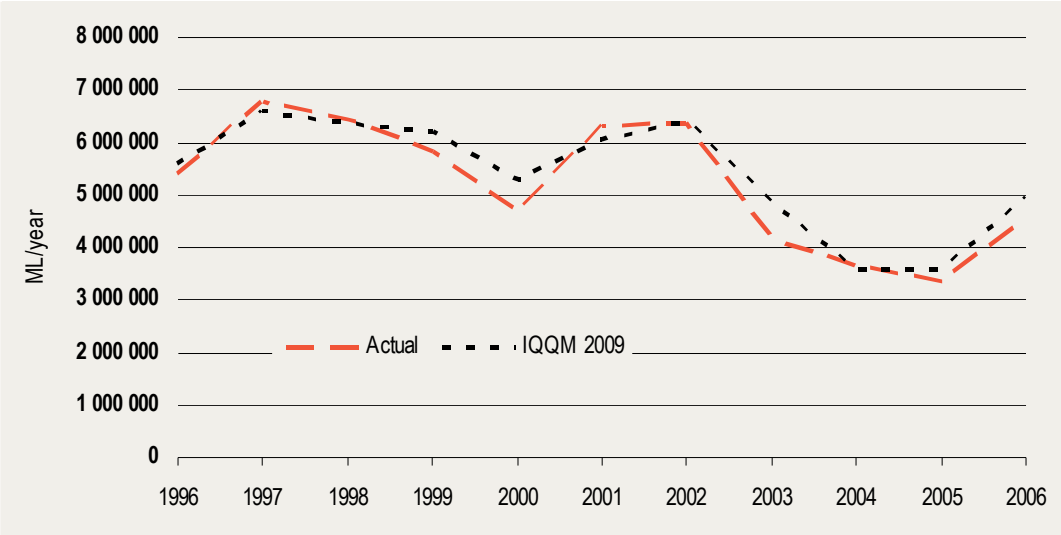
Data source: The CIE.

IQQM extractions and actual extractions

IQQM models are calibrated against actual outcomes over some period. Most of the valleys were calibrated against actual extractions for 1985 to 19995, although some have been calibrated against actual extractions to 2003. IQQM model behaviour is tested annually to check the original calibration and the need for recalibration. IQQM would be expected to be different from actual extractions due to changed water management and on-farm infrastructure development and a residual element of model error.

IQQM and actual extractions match reasonably well from 1995-96 to 2005-06, summed across all State Water's rivers (chart 3.6).

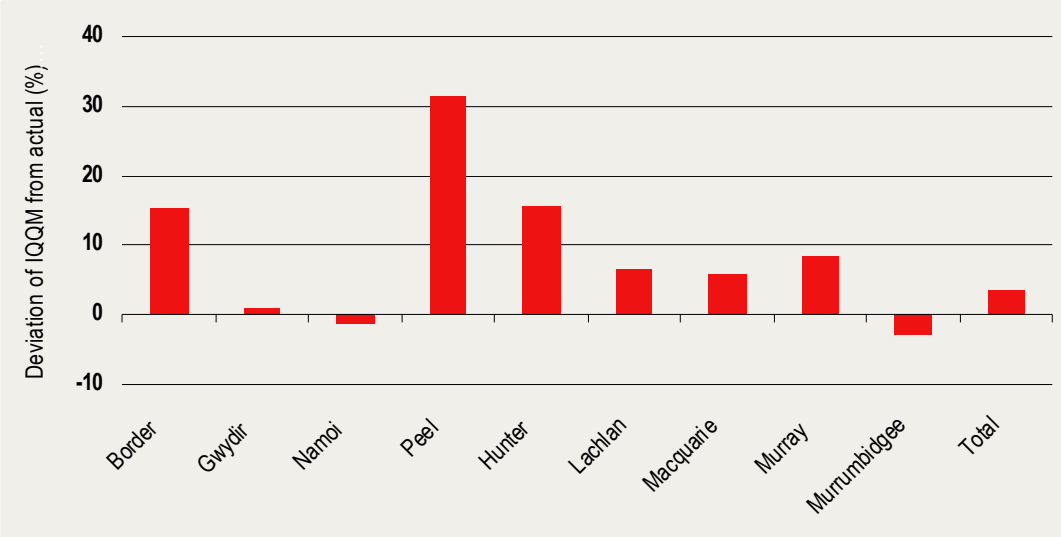
3.6 IQQM and actual extractions across the regulated rivers



[a] Excludes North Coast and South Coast for which there is no IQQM data. IQQM is the 2009 data.
Data sources: DNR and State Water.

On a valley by valley basis, there are differences between IQQM and actual extractions (chart 3.7). IQQM predicts extractions 10 per cent greater than actual extractions for the Border, Peel, Hunter and Murray valleys. Across all valleys, IQQM predicted extractions are 3.4 per cent above actual extractions for 1996 to 2006.

3.7 Deviation of IQQM (2009) from actual (1996 to 2006)



Data source: The CIE.

The IQQM estimated extractions do not include data for the most recent years. Given the historical low extractions in these years, these would have to be 'tacked on' to IQQM to provide a more complete time series.

Variability of total extractions

The variability of bulk water extractions is substantial, largely reflecting climatic variability. Averaged across the river valleys, the standard deviation of annual extractions is one quarter of average extractions.

For State Water's revenue, the volatility that matters is volatility of combined extractions across all valleys. To the extent that some valleys will continue to have water when others do not, total extractions are less variable than extractions within each river valley. For a regulatory period of four years, we are also only concerned with volatility over a four year period.

Using the IQQM data, table 3.8 shows the variability of total inflows over four year periods, with actual data included for 2006-07 and 2007-08 and forecast extractions for 2008-09. The minimum extractions for four year periods from 1898 to 2009 were from 2006 to 2009, where total estimated extractions were about 2500 GL/year. This is less than 50 per cent of the median extractions. A quarter of the periods had extractions levels more than 5 per cent below the median and a quarter had extraction levels more than 9 per cent above the median.

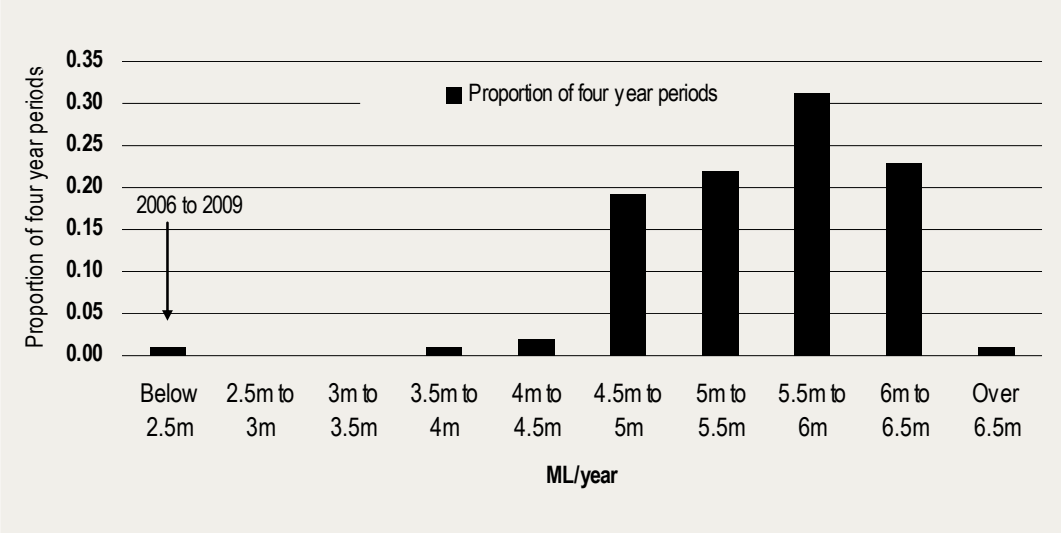
3.8 **Distribution of four yearly extractions from 1896 to 2009**

Item	*Extractions*	*As a share of median*
	Average GL/year for four year period	%
Minimum	2 454	47.1
1st quartile	4 947	94.8
Median	5 216	100.0
3rd quartile	5 715	109.6
Maximum	6 606	126.6

Note: On a rolling basis from 1896 to 2009.
Source: The CIE.

The distribution of extractions across the periods is also shown in chart 3.9. The significantly negative result from the past four years stands out, suggesting that it may be a result of structural change rather than normal climatic variation within the valleys operated by State Water.

3.9 **Distribution of four yearly extractions**



[a] For 1896 to 2006 on a rolling four year basis, 2006 to 2009 separately included.
Data source: The CIE.

The average extractions for the past two years are even more starkly below the IQQM long run average than the data averaged on a four yearly basis.

Strengths and weakness of IQQM

The use of the IQQM model has both strengths and weaknesses. On one hand, it allows the expected impacts of a large set of historical rainfall events to be considered. This is useful to the extent that a longer period of history provides a better indication of expected future rainfall. (The IQQM long run average can be adjusted for expectations of future rainfall, as was done by CSIRO).

IQQM also allows for the impact of changes in water management rules to be considered. This has been particularly important in the past, when water management rules were undergoing substantial changes. Large changes in rules are not expected before 2014 when most Water Sharing Plans end.

On the other hand, using the long-run average from IQQM also has a number of weaknesses. If climate change is occurring, then it is likely to overstate consumption. Adjustments could be made, such as through CSIRO work, or a shorter period of data could be used, rather than the 110 years for which data is available. Further, IQQM estimated extractions are available only to 2005-06, which does not include the most recent extractions, which are likely to be the most relevant in considering future extractions.

In addition, IQQM presents model based extractions, which will always incorporate some element of model error. Actual extractions would be preferable if there had been minimal changes in water management rules and behaviour as they represent the amount of water billed by State Water and DWE.

Key points

The long-run average consumption estimates from IQQM are fairly similar to their level in 2006, in aggregate across the valleys regulated by IPART. On a valley by valley basis, there are variations between the 2006 and 2009 estimates of average historical extractions from IQQM, likely reflecting changes in the starting point for the modelling. The consumption estimates made in 2009 using IQQM are also substantially more volatile than those made in 2006.

The most recent IQQM estimates are above actual extraction outcomes over the period 1995-96 to 2005-06 in most valleys. In three of the nine valleys, IQQM estimated extractions are more than 10 per cent higher than actual extractions.

The IQQM model provides a useful tool to analyse the impact of changes in water management rules on water availability. If there is considerable structural change then it can also provide the best available estimates of how future rainfall patterns will impact on water use.

But IQQM also has a number of weaknesses as a tool for forecasting bulk water extractions. IQQM data is available to 2006, which misses the most recent extractions that may better represent future extractions. If IQQM were to be used to forecast future consumption then recent actual extractions data would have to be incorporated. Furthermore, the IQQM data available for this review does not incorporate a starting point for storage levels that aligns with the current low storage.

Finally, IQQM provides model based estimates of extractions. In the absence of significant changes to water management rules, there would be no reason to use IQQM estimates over the actual numbers.

4 Key issues

In considering alternative approaches to establishing consumption forecasts over the period 2010 to 2015 there are a range of important factors that need to be considered:

- climate change — to what extent has the climate changed from its long run average and to what extent will it continue to change by 2015;
- current storage levels — many of State Water's storage facilities have little water in them at the moment, with dam levels at about a quarter of capacity. Lower dam levels will make it more likely that consumption levels are low over the next regulatory period; and
- differences between forecasts and actual extractions in the previous regulatory period — in the first two years of the current regulatory period, actual consumption was 31 per cent of that forecast by IPART. This has left State Water's balance sheet in a more vulnerable position than for the last regulatory period. Some mechanisms for forecasting consumption would provide automatic stabilisers for State Water's balance sheet.

Climate change CSIRO modelling

The CSIRO Murray-Darling Basin Sustainable Yields Project resulted from the Summit on the Southern Murray-Darling Basin. The aim of the project is to provide governments with a robust, basin-wide estimate of water availability on an individual catchment and aquifer basis, taking into account climate change and other risks.

The project involved the following steps assembling data on surface water and groundwater interactions and usage in the catchments of 18 reporting regions across the Murray-Darling Basin.[8] The CSIRO then assessed current and potential future water availability under four scenarios:

- historical climate and current development, the baseline against which other scenarios are compared;
- recent climate and current development, to examine the situation of the previous 10 years were to continue;

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8 The North Coast, South Coast and Hunter valleys were not included in the CSIRO's analysis.

- future climate and current development, which evaluates three global warming scenarios using 15 global climate models to provide a spectrum of possible climates for 2030. Three variants are reported: median or 'best estimate'; wet variant and dry variant; and
- future climate and future development, which considers the effects of the 2030 climate as well as the expansion of farm dams, commercial plantation forestry and growth in groundwater extraction assuming current policy settings continue (DEWHA 2009a).

The scenarios most relevant for this report are the historical climate and current development (or the IQQM long-run average extractions) and the climate change and current development (median, wet and dry). Although it is also of interest that extractions under the 1997 to 2006 climate are 12 per cent below the longer term average and extractions in more recent years are lower still.

CSIRO found that across the Murray-Darling Basin, by 2030, water availability, to users and the environment, would, under a median climate scenario, be about 10 per cent lower because of climate change (relative to the historical climate). However, the impact on water availability is different across the valleys, as highlighted in table 4.1. Further, it is important to understand who bears the losses in water availability. According to the CSIRO modelling, the environment bears most of the reduced water availability, with billable water extractions falling by about 4 per cent under the median of the climate change models by 2030 (CSIRO 2008, p. 5).

4.1 Impact of climate change on water availability — CSIRO studies

Regulated river valley	*Current average surface water availability*	*Percent of available water that is extracted*	*Impact of median climate change on water availability by 2030*		*Impact of median climate change on water diversions by 2030*	
			GL/year	%	GL/year	%
Border	1 208	34	-116	-9.6	-8.6	-2.1
Gwydir	782	41	-79	-10.1	-25.5	-8.1
Lachlan	1 139	28	-127	-11.2	-23.6	-8.1
Macquarie	1 567	24	-117	-7.5	-15.2	-3.9
Murray	11 162	36	-597	-11.5	-174.4	-4.1
Murrumbidgee	4 270	53	-389	-9.1	-54.2	-2.4
Namoi/Peel	965	37	-50	-5.2	-3.7	-1.4
Total	21 093	38	-1 475	-9.7	-305.2	-3.7

Sources: CSIRO (2008, p. 35); CIE calculations.

Some of the key points from the CSIRO studies that are relevant for this project include:

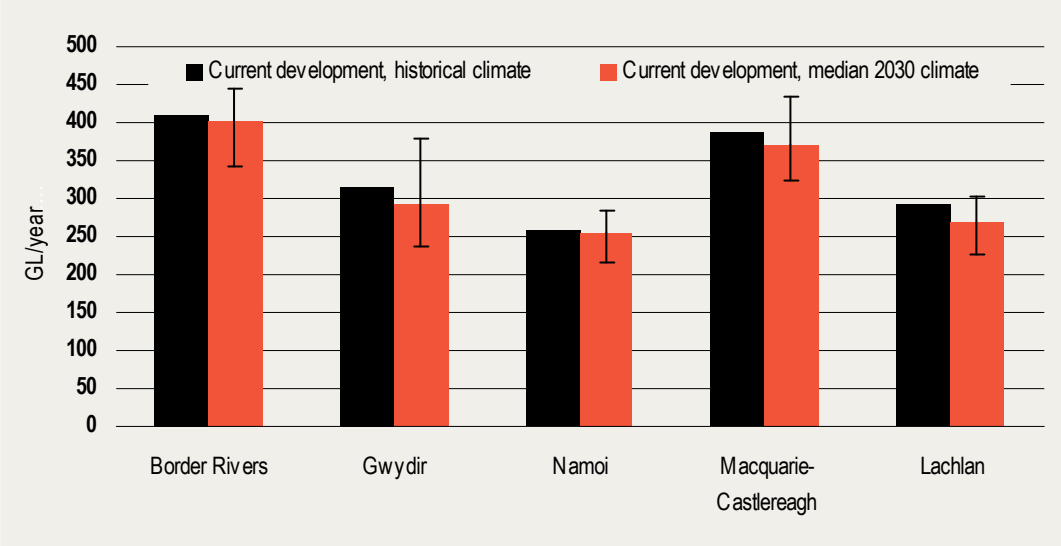
- the extent to which extractions in particular valleys are impacted depends chiefly on who bears the burden of reduced water availability. In some valleys (such as the Border), extractive users do not appear to bear the brunt of reduced water availability, while in others (such as the Gwydir) they do;

- the median of the climate change models would lower extractions in the valleys relevant for State Water and DWE by 4 per cent relative to historical climate by 2030. The wettest of the models predicts an *increase* in extractions by 4 per cent relative to the historical climate, while the driest of the models predicts that extractions would fall by 20 per cent by 2030; and
- diversions in the driest years would fall further than on average if there is climate change. Under the median 2030 climate and current water sharing plans, diversions in the driest years would fall by 10 per cent in most of NSW and by 20 per cent in the Murrumbidgee and Murray regions. Under the dry extreme 2030 climate and current water sharing plans, diversions in the driest years would fall by around 40-50 per cent in most of NSW and by over 70 per cent in the Murray region.

CSIRO models climate change as beginning in 1990, in extrapolating 2030 results to 2070 (CSIRO 2008, p. 26). For the purposes of the regulation of State Water and DWE for 2010 to 2014, this would mean that about half of the climate impacts of 2030 may have occurred by the time of the regulatory period.

The CSIRO analysis as detailed in the table above is based on the median estimate of global warming. However, the wet and dry scenarios of global warming could have significantly different impacts on water availability in the region. The red lines in Charts 4.2 and 4.3 indicate the uncertainty inherent in the climate change projections and illustrate the range of water availability outcomes that could occur. The driest of the predictions is much further below the mean than the wettest is above it, indicating considerable skew in the predictions of the different models.

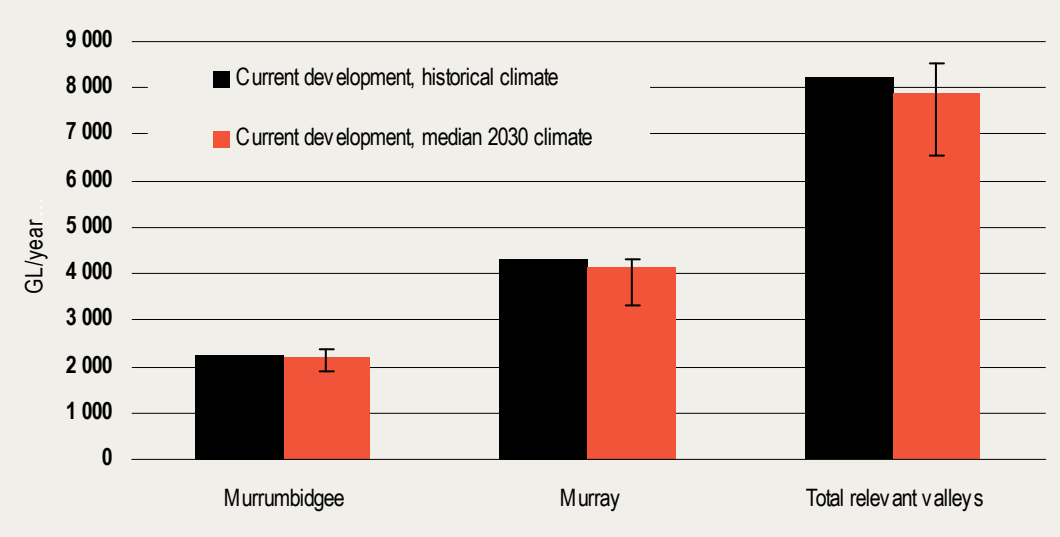
4.2 Currently and potential future surface water use (smaller valleys)



[a] Includes water use outside of NSW where applicable.

Data source: CSIRO (2008).

4.3 **Currently and potential future surface water use (larger valleys)**



[a] Includes water use outside of NSW where applicable.

Data source: CSIRO (2008).

The CSIRO project provides the best information currently available about the impact of climate change on the amount of water available through the regulated rivers. However, it does have some serious limitations, which is unsurprising given the degree of uncertainty in our understanding of climate change.

CSIRO (2008) models climate change as a reduction in the amount of rainfall, rather than changing other characteristics of rainfall sequences. Potentially, climate change could also make rainfall outcomes more persistent — extended periods of low rainfall or high rainfall are more likely — or more volatile. This has two impacts on the amount of water available to State Water, which work in opposite directions.

- If rainfall is more persistent (that is, longer droughts and wets) or more volatile, then there may be more spills through the system in high rain periods, which reduces the amount of water that State Water can provide.
- If there is a threshold level of rainfall required for rainfall to translate into stream flows, then more volatile rainfall is likely to increase runoff. In this case lower but more volatile rainfall would mean that the inflows into State Water's storages are unchanged.

Climate change may also change the pattern of rainfall (for example, from spring and summer in the southern valleys) which could alter the volume of water used.

Climate change and evidence of structural change in extractions

Climate change represents a significant risk to forecasts of bulk water consumption. The impacts of climate change can be split into two segments:

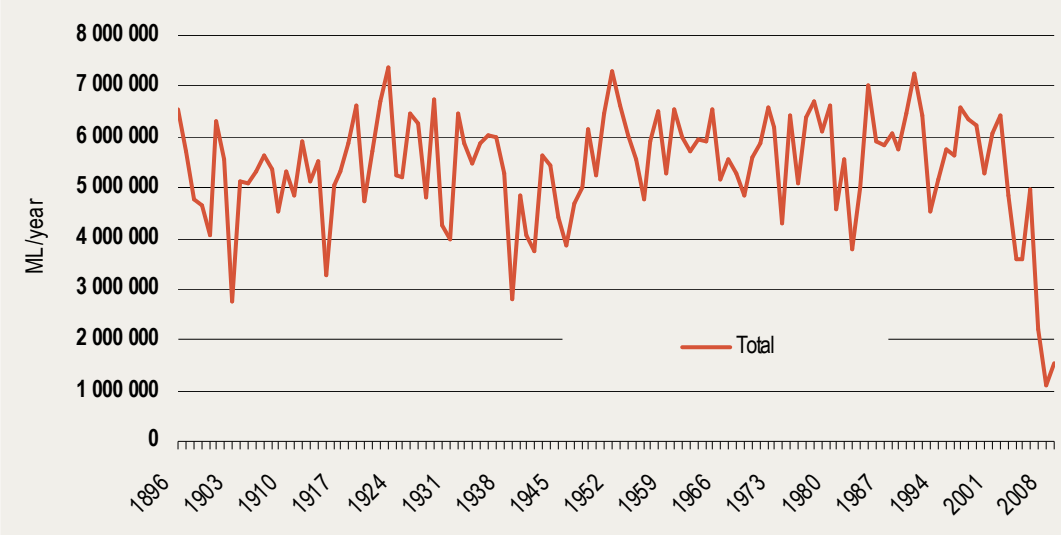
- expected bulk water consumption is likely to be lower than captured by historical estimates of bulk water consumption (such as from IQQM); and
- the risk to forecasts of water consumption are greater than represented by historical climate scenarios, as there is uncertainty about the degree to which the climate has and will continue to change. Climate change could lead to more volatile inflow patterns and could lead to more persistent patterns of weather (such as long periods of dry weather).

The first point means that the IQQM long run average forecasts are likely biased upwards. The second point means that State Water's revenue is likely to be more volatile, and, given that climate change could be a systematic risk, the weighted average cost of capital for State Water may be higher than used in the past.

Additional evidence of climate changes can be gathered by looking at estimated extractions in the regulated river valleys over the past 110 years, from IQQM for 1896 to 2006, actual extractions for 2007 and 2008 and forecast extractions for 2009.[9]

Total actual extractions for 2007-08 are below those estimated by IQQM for any previous year (chart 4.4). Forecast extractions for 2008-09 are below extractions estimated in any previous year except 2007-08.

4.4 Total estimated extractions from IQQM



Note: IQQM estimated extractions for 1995/96 to 2005/06, actual extractions for 2006/07 and 2007/08 and State Water forecast for 2008/09 incorporating actual extractions to end of March.

Data source: The CIE.

Recent low extractions could reflect 'bad luck' (natural variability) or they could reflect structural change, such as climate change. Using statistical methods, we can

9 Forecasts used are the average of State Water's forecasts of the minimum and maximum possible extractions for 2008-09 made as of May 2009. For the regulatory review, actual extractions for 2008-09 will be known.

test whether the data outcomes suggest that there has been a structural break in extractions or whether recent outcomes are within the bounds of normal variation in climatic conditions.

The statistical approach adopted is to use least squares regression of:

$$X_t = \alpha + \beta.D_t + \varepsilon_t$$

Where:

X_t is the level of extractions

D_t is a dummy variable taking the value of 0 or 1;

ε_t is an error term; and

α and β are estimated coefficients, with β measuring the extent of structural change.

The dummy variable is used to specify the period for which we are testing for structural change. For instance, to test for structural change in 2004 to 2009, the dummy variable would be zero for all years up to 2004 and take a value of 1 for each year of 2004 to 2009.

The t-statistic on the coefficient β or the F-statistic for the regression are measures of the likelihood that there has not been structural change.[10] The higher the statistic, the more likely that structural change has occurred.[11] If extractions were normally distributed, an F-statistic of 10 would be equivalent to a probability that structural change had not occurred of 0.2 per cent and an F-statistic of 40 would be equivalent to a probability that structural change had not occurred of one in 186 million.

In testing for structural change, we are interested in whether structural change would have been predicted at any time in the past, as well as for the recent period. We therefore run two tests:

- we allow the dummy variable to capture the last ten years of the regression and adjust the regression period to end in 1900, gradually increasing by one year until it ends in 2009; and

---

10 The t-statistic is associated with a t distribution to find the probability and the F-statistic with an F distribution.

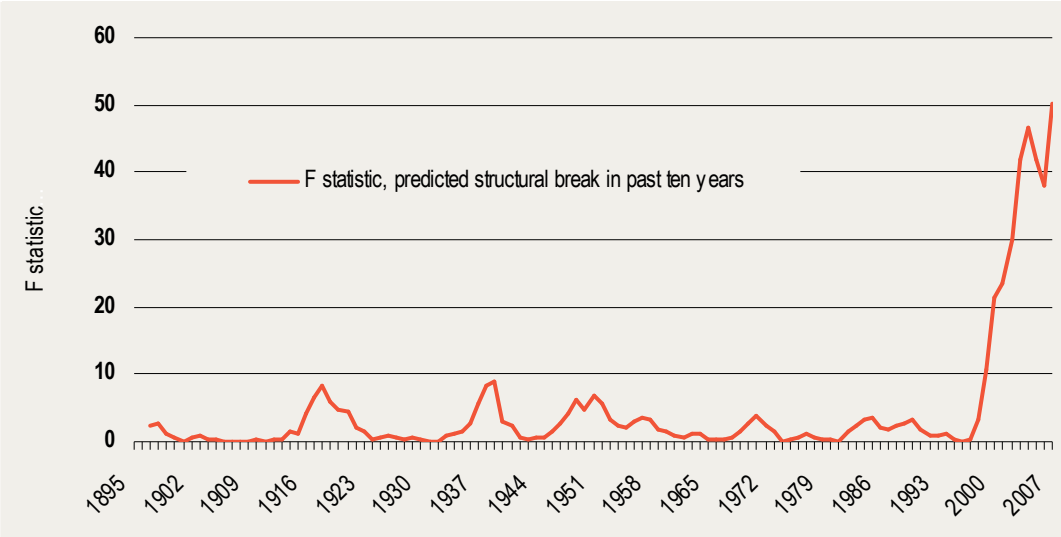
11 The actual probabilities calculated from the t-statistics and F-statistics are likely to be mildly incorrect as they rely on extractions (or more specifically the residuals after allowing for structural breaks) being normally distributed. Testing of the residuals from a regression with a structural break from 2005 to 2009 gives ambiguous results as to normality. Shapiro-Wilk and skewness/kurtosis tests indicate that normality could be rejected at a 10 per cent significance level but not at a 5 per cent level, which is the typical cut-off point. Normality cannot be rejected with a Kolmogorov-Smirnov tests.

- we allow the dummy variable to capture five consecutive years, for anywhere within the regression period 1896 to 2009.

The results are reported in charts 4.5 and 4.6.

In the past, there have been periods where rainfall outcomes were different from average and for which structural change may have been supposed. In 1928 and 1949, extractions for the previous ten years were different enough from previous extractions that the F statistic was over 9 (chart 4.5). For the recent period in comparison, the F statistic is over 40. The statistical evidence for structural change has never been as conclusive over the past 100 years as it is now.

4.5 Predicting a structural break over the history of estimated extractions

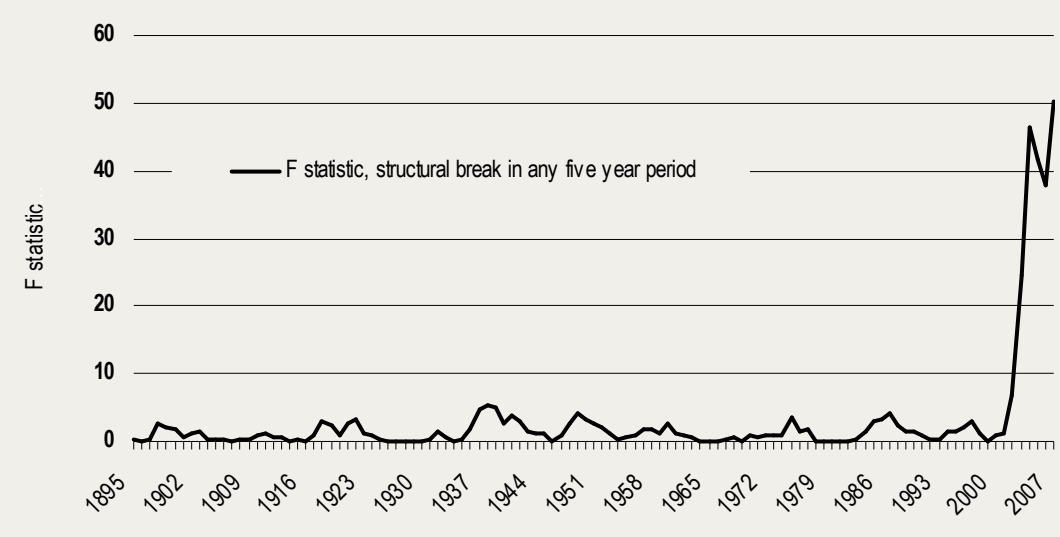


[a] The year is the beginning year for the ten year period. The regression is for the period from 1896 to year+10.
Data source: The CIE.

If we pick out five year windows from extractions from 1896 to 2008, we can see a similar result (chart 4.6). The F-statistic for the most recent five years is over 40, while its highest point in the rest of the more than hundred year history is well below 10.[12]

12 In work not reported, tests for where the data would optimally place one or two structural breaks within the 115 years of extractions data were run. These indicated that a single break would be placed in the last five to ten years, while a second structural break was not required in the data.

4.6 Structural break in any five year period



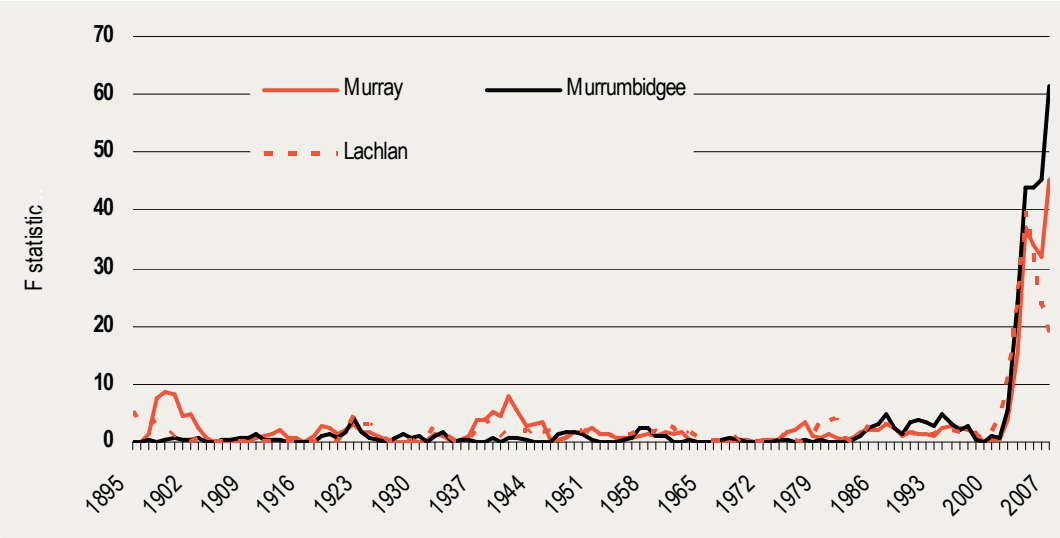
[a] The year is the beginning year for the five year period. The regression is for the period 1896 to 2009.

Data source: The CIE.

Statistical evidence is given added meaning as it is aligned with scientific work on climate change.

We can also consider the valleys in which structural change is most likely to have occurred, using five year periods as in chart 4.6. It is likely that structural change in extractions has occurred in the southern river valleys over the past five years (chart 4.7). In the northern and central valleys, there is less evidence of structural changes in extractions, although the F statistic for the Namoi is very high in for the recent period (chart 4.8).

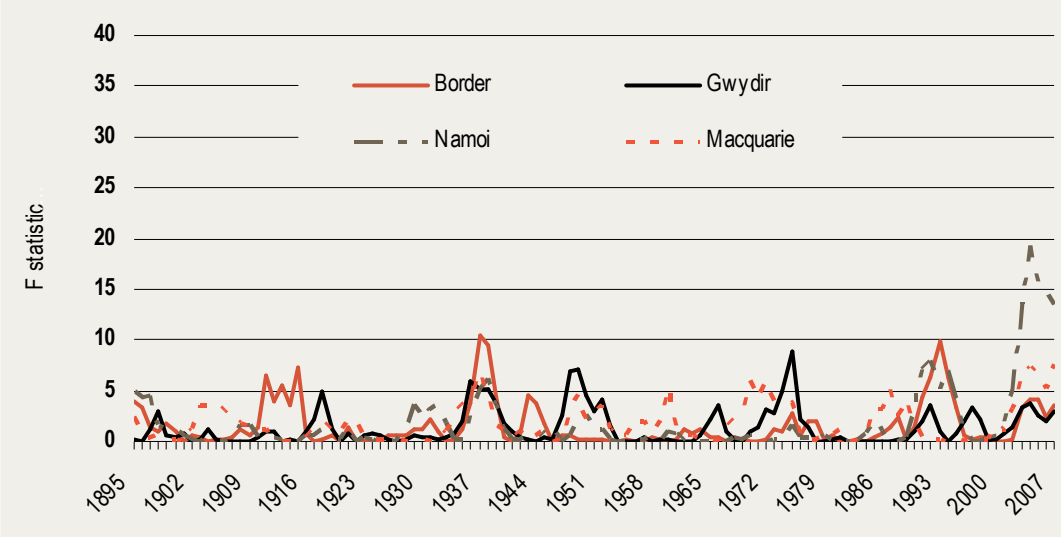
4.7 Structural change in southern river valleys



[a] The year is the beginning year for the five year period. The regression is for the period 1896 to 2009.

Data source: The CIE.

4.8 **Structural change in northern and central river valleys**



[a] The year is the beginning year for the five year period. The regression is for the period 1896 to 2009.
Data source: The CIE.

The analysis above tests for shifts in average extractions. Climate change may also change the volatility of extractions or the persistence of extractions. It is too early to draw inferences from the data in these areas.

The conclusion from the analysis of climate change by both CSIRO and presented above is that long-run average extractions are unlikely to correctly capture expected extractions in the future. Continuing to use long-run average extractions would leave State Water and DWE exposed to systematic revenue under-recovery.

Low initial storage levels

After a number of years of low rainfall in the catchments for the regulated rivers, State Water's storage levels are low (table 4.9). This will likely lower water availability for the next regulatory period. The extent to which current storage levels will reduce water availability will depend on the relative importance of storage in the catchment and the difference between current storage levels and long-term average storage. It will also depend on rainfall outcomes between now and the start of the next regulatory period.

4.9 Storage volumes (percent of storage capacity)

Valley	*Storage*	*Capacity*	*Average over period*	*Current (23 Feb 2009)*	*Data availability (start year)*
		ML	%	%	unit
Border	Pindari	312	30	31	1969
Border	Glenlyon	254	59	26	1995
Gwydir	Copetoun	1 361	41	12	1976
Namoi	Keepit	425	44	35	1995
Namoi	Split Rock	397	42	5	1989
Peel	Chaffey	61	72	98	1979
Hunter	Glenbawn	750	71	66	1992
Hunter	Glennies Creek	283	68	71	1990
Hunter	Lostock	20	98	101	1987
Lachlan	Wyangala	1 220	60	8	1990
Lachlan	Carcoar	36	66	9	1970
Macquarie	Burrendong	1 188	47	23	1992
Macquarie	Windamere	368	60	24	1985
Murray	Hume	3 038	58	13	1969
Murray	Dartmouth	3 908	N/A	20	N/A
Murray	Lake Victoria	677	N/A	14	N/A
Murrumbidgee	Burrinjuck	1 026	60	50	1913
Murrumbidgee	Blowering	1 631	58	33	1975
North	Brogo	9	92	28	1976
North	Toonumbar	11	88	101	1976

Note: Data was not available for all storages for sufficient timeframe.
Source: DWE Pinneena database Version 9.2.

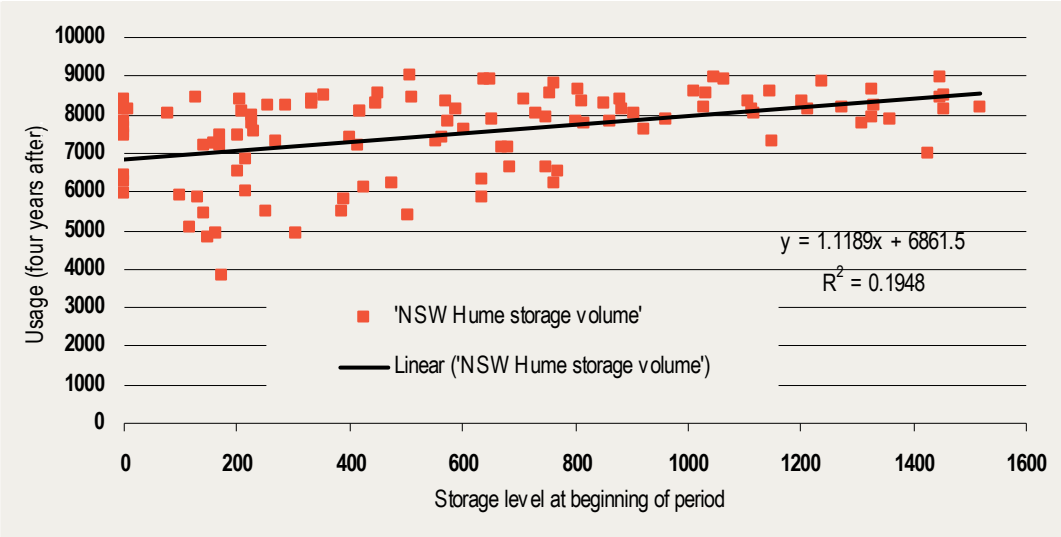
It is possible to run IQQM with current storage levels and a number of different climatic sequences. However, given the time frames for this review this has not been undertaken.

Two simpler approaches considered in this report are:

- assessing the relationship between storage levels and future extractions within the IQQM sequences that are available; and
- assessing the impact of current storage levels based on water allocation rules in the regulated river valleys.

From IQQM modelling and resource allocation decision frameworks it is clear that the initial storage level is a driver of extractions in some valleys. For example, for the Murray, an extra GL of water in storage at the start of a four year period increases water use over the four year period by one GL, on average (chart 4.10). There is a lot of variability, as there are many other factors that influence extractions, such as inflows over the period.

4.10 **Initial storage and subsequent five year total extractions**

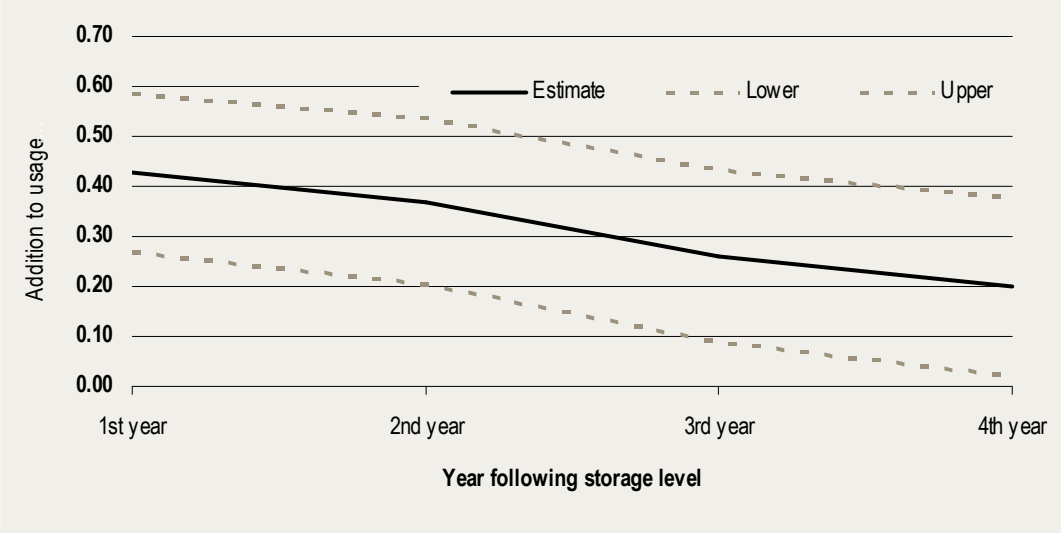


[a] Based on IQQM estimates.

Data source: The CIE.

We can trace out the impact of the additional unit of water on extractions in each of the subsequent years individually. Most of the additional stored water is used in the first year and less and less through the period (chart 4.11). The coefficient estimates are always positive and significant for consumption in each of the four years following the reported storage level.

4.11 **Storage and extractions for the Murray (yearly)**



[a] Upper and lower are two standard error bounds. The addition to usage is the ML additional usage in year X from a ML of additional storage at the start of the period.

Data source: The CIE.

The relationship between storages and future extractions from IQQM is not as strong in some of the other valleys as it is in the Murray, but still indicates that current storages impact on extractions over the next four years. An extra GL in storage is

worth only 230 ML of extra consumption over the next four years in the Border valley, compared with the full GL for the Murray (table 4.12). The relationship between storages and future extractions is statistically significant in all valleys, although marginally so in the Border.

Based on the estimated relationships, current low storage levels could reduce consumption across the valleys for which data is available by 8.3 per cent (table 4.12).

4.12 Impact of storage on future usage

River valley	*IQQM average storage*	*Current storage*	*Impact of storage on future extractions (five years)*		*Impact of storages on usage*	
	%	%	Coef	t-stat	GL	%
Border	48	28	0.23	2.82	-6	-3.2
Gwydir	30	14	0.42	3.99	-23	-7.8
Namoi	51	22	0.27	4.02	-17	-7.2
Lachlan	48	9	0.40	5.07	-48	-14.6
Macquarie	38	25	0.45	4.53	-22	-5.8
Murray	48	19	1.12	5.24	-123	-6.6
Murrumbidgee	69	40	1.03	7.48	-200	-10.2
Total					-438	-8.3

Note: The coefficients and t-statistics are from a regression of extraction from time t to t+3 against storage levels at time t-1.

Source: The CIE.

There is reason to expect that the relationship between storages and extractions may be stronger than represented in IQQM estimates over the past 100 years. Discussions with State Water have indicated that resource allocation decisions are based on current storage, minimum expected inflows and expected requirements for high security water over a number of years in the future (this varies depending on the valley). Under this sort of methodology, low storages now, as well as the recent lowest ever inflow sequences, would directly translate into lower water availability in the future. Demand impacts could alter this relationship through customers carrying over water and using on-farm storages.

The maximum impact that could be supposed would be that an extra GL of storage is allocated within the four year regulatory period. This is equivalent to assuming coefficients of 1.0 in table 4.12 above. In this case, current low storage levels could translate into a 12 per cent fall in extractions over the next four years (in the valleys for which we have data), relative to the long term average.

4.13 **Maximum impact of current storage levels on future usage**

River valley	*IQQM average storage*	*Current storage*	*Impact of storages on usage*	
	%	%	GL	%
Border	48	28	-27	-14.3
Gwydir	30	14	-55	-18.7
Namoi	51	22	-61	-26.5
Lachlan	48	9	-120	-36.7
Macquarie	40	25	-49	-13.1
Murray	48	19	-110	-5.9
Murrumbidgee	69	40	-193	-9.8
Total			-616	-11.7

Source: The CIE.

Automatic stabilisation of State Water's balance sheet

In the first two years of the current regulatory period, consumption of bulk water has been only 30 per cent of the forecast from which prices were calculated, reflecting an extended period of low rainfall. State Water has had to take on debt in order to fund its operations, given that a large share (60 per cent) of its revenues was expected to be generated from usage charges by the end of the regulatory period. Continued forecasting errors would further drain State Water's balance sheet.

There is a case for limiting the balance sheet risks to State Water from changes in average consumption. Neither State Water nor the buyers of water can impact on climate change. Both can manage the risks of climate change in particular ways, such as through increasing storages or changes in the activities for which water is used.

The balance sheet risks to State Water could be limited directly through inter-temporal adjustments in revenue, such as an overs and unders account system that operates for some other regulated activities. However, IPART may only wish to limit balance sheet risks from changes in climatic conditions, in which case this could be done through the forecasting mechanism. Approaches that would do this, while minimising the volatility of prices, are discussed in the next chapter.

Key points

The forecasts of consumption for State Water are subject to a number of factors that undermine the usefulness of the existing approach to consumption forecasting. In particular:

- the median expected decline in water diversions from climate change by 2030 is 4 per cent and probably about half that much for the 2010 to 2014 regulatory period;

- but climate change impacts are highly uncertain and could lead to declines in water diversions of as much as 20 per cent by 2030 or could even increase diversions by 4 per cent;
- statistical analysis of extractions indicates that it is likely that current low extractions reflect structural change rather than normal climatic variability, indicating that the long term average from IQQM no longer provides a useful indication of future extractions;
- State Water's dams are only at 25 per cent of capacity, which is likely to lower extractions by 8 per cent to 12 per cent per year relative to starting at average dam levels; and
- State Water's balance sheet has deteriorated due to low rainfall in the current regulatory period — billed consumption in the first two years of the current regulatory period was 30 per cent of the level forecast by IQQM in 2006 and extractions in 2008-09 are likely to be low as well.

5 Approaches to consumption forecasting

There are a number of approaches to consumption forecasting that could be used to take account of climate change and other risks for the next regulatory period. In this section we discuss the features of different possible approaches to forecasting, including:

- long-run average from IQQM;
- adjusting long-run averages from IQQM for specific issues identified in chapter 5;
- forecasting based on a moving average of past actual extractions data; and
- time series forecasting methods.

IQQM long-run average

The IQQM long-run average has been used to forecast consumption in previous IPART regulatory reviews. The advantage of IQQM is that, in the absence of structural change in climatic conditions, it allows short-term volatility in climatic conditions to be smoothed out and is best able to account for structural change in water management practices.

However, given the strong evidence for climate change, it is difficult to support continuing this approach. Of all approaches, it is most likely to have systematic errors leading to under-recovery by State Water. For the next regulatory period, the structural changes in climate, which are not accounted for by IQQM, are likely to be more important than structural change in water management practices. If there is structural change in water management practices then a better approach would be to use IQQM modelling for a shorter period, say the last 15 years.

The IQQM long-run average approach would not capture extractions from recent years (2006-07 to 2008-09), which may be more indicative of future climatic conditions that extractions based on climatic conditions over a 110 year period.

Further, IQQM data, as currently available, does not account for how the system could evolve from current conditions, such as storage levels and hydrology.

Adjusting long-run averages

The IQQM long-run average could be adjusted to consider climate change and current storages, making it a less biased tool for predicting the level of extractions.

Climate change

Adjustments for climate change could be made in two ways.

1. Based on one-off studies such as CSIRO (2008)
2. Using a shorter time period for IQQM data, such as 15 years

The first approach will be difficult to implement on an ongoing basis, as studies of the impact of climate change are expensive and unlikely to be undertaken for the purpose of forecasting extractions relevant for State Water. For this review, some evidence is available from CSIRO (2008). But even this data requires considerable interpretation to arrive at forecasts useful for the regulatory process. Finally, the understanding of climate change is very weak, particularly at a regional level which is relevant for each of the river valleys regulated by IPART.

If the first approach were to be adopted, the climate change forecasts from CSIRO (2008) for 2030 would have to be adjusted downward to reflect the current regulatory period. Then an approach would be required to arrive at a mean forecast for each river valley, as CSIRO (2008) reports only an extreme wet, extreme dry and median (the mean is the relevant forecast for use in regulatory decisions as costs can then be recovered in expectation).

The regulatory period is likely to be from 2010 to 2013, which is just after half-way between the 1990 period from which CSIRO models that climate change begins and the 2030 period for which it reports data. The IQQM could therefore be adjusted by half of the estimates from CSIRO (2008).

To adjust the median, extreme wet and extreme dry to forecast a mean, we note that under most distributions the mean will be between the average of the extreme wet and extreme dry and the median. A point mid-way between these points could thus be chosen to reflect the mean.

The second approach, of using a shorter time period, is in many ways preferable. A shorter time period would mean that the impact of climate change is still incorporated with a lag, but a much shorter lag than from using a 110 year average. It would account for actual climate change, which is advantageous given the large uncertainty about the implications of climate change for extractions in each of the regulated river valleys. This method relies on actual outcomes, avoiding the difficulties of understanding climate change and its implications for each of State Water's river valleys, or of interpreting climate change studies whose principal aim was not price regulation.

In addition, using a period of 15 years would not lead to excessive fluctuations in consumption from climate volatility (rather than climate change).

Storage levels

The second adjustment to be made is for current storage levels. At present, these are substantially below average, which is likely to mean that State Water will not be able to deliver the same amount of water in the future, as it would if storage levels were higher.

The previous section outlined two methods of adjusting for storage levels. The first was based on a statistical analysis of relationships within the IQQM model and the second on a model where all storages would be allocated within four years, providing a maximum impact. These methods indicate that the current low levels could reduce total consumption by between 8 per cent and 12 per cent over the next regulatory period.

Using a moving average of past actual extractions

Actual extractions have not been used to forecast consumption in the past because of the lack of good quality data for a long historical period and the substantial structural changes in water management practices. As the CIE noted in 2006, using actual extractions could be preferable in the absence of these issues.

For this review, 14 years of reasonable quality actual data will be available under fairly similar water management rules (1995-96 to 2008-09) (see appendix D for the limitations of actual data over a longer period). This is long enough to provide a basis for using actual data, rather than IQQM data.

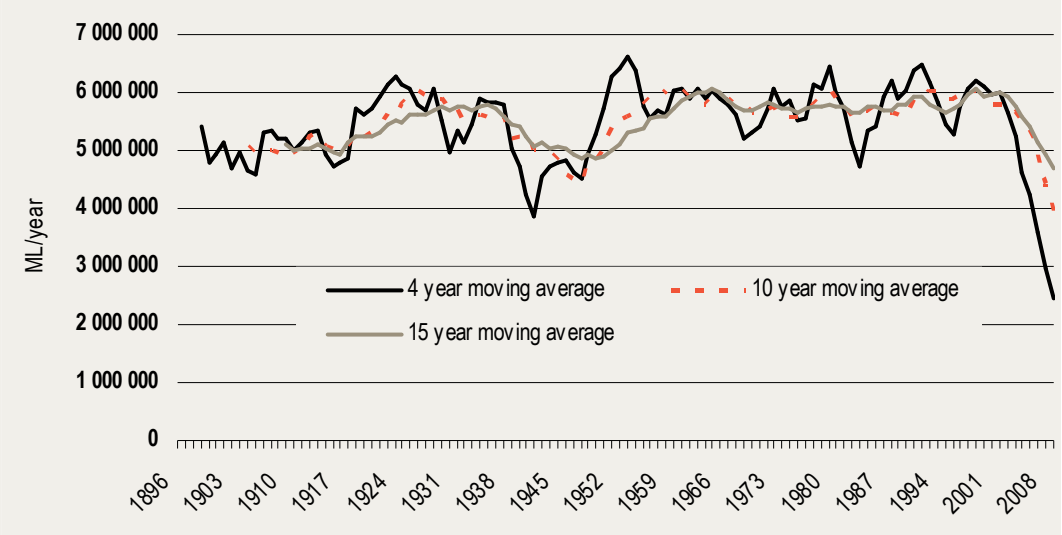
But the main advantage of using actual data is that it captures a shorter time period, rather than because it is actual data. By using a shorter time period, estimates of future extractions will better account for changing climatic conditions. This is similar to the argument above for using a shorter time period of IQQM estimates to account for climate change.

Using only a certain length of actual extractions, such as 15 years, for each regulatory review has added advantages (only 14 years will be available for this price review). The balance sheet of State Water will be automatically stabilised to some extent from volatility in rainfall (over which State Water has no control), as low rainfall during the regulatory period would increase prices in future regulatory periods. To this extent, the risks to State Water from regulatory errors in forecasting climatic conditions will be reduced.

The choice of the period of past extractions to use as a forecast of future extractions will reflect a trade-off between minimising price volatility from climate volatility and allowing for climate change and balance sheet stabilisation. Chart 5.1 plots 4-year, 10-year and 15-year moving averages of total extractions across State Water's valleys from IQQM estimates (and actual and forecast extractions for 2006-07 onwards). Under a 15 year moving average there is little volatility in prices from normal

climatic conditions, while still allowing a short enough time frame to account for structural changes in climatic conditions. Using a shorter period would make prices more volatile, but would more quickly incorporate structural change.

5.1 **Moving averages of IQQM estimated total extractions**



[a] The moving average is the past 4, 10 or 15 years from the year reported in the x axis.

Data source: The CIE.

Using actual data rather is preferable to using IQQM estimates while there has been little change in water management rules. This is because it represents what has actually happened rather than a model interpretation of extractions. But if there is 'enough' change in water management rules, then IQQM would provide an alternative to using actual extractions. The decision to use IQQM would have to prove that the potential impact of structural changes in water management is larger than the modelling error from IQQM.

Time series forecasting (ARIMA)

Time series forecasting uses patterns in the past data through time and interpolates these into the future. For instance, if there was a trend decline in the past, time series methods would forecast a continued decline. Similarly, if there was persistence, so that low consumption in one year meant that there was more likely that consumption would be low in the following year, then time series methods would also pick that up.

For the 2006 review, the CIE conducted an assessment of time series methods for IPART, focusing on the auto regressive integrated moving average method (ARIMA). The results of the study are shown in box 5.2. The CIE identified small advantages to using time series forecasting methods.

5.2 ARIMA forecasting

ARIMA (auto regressive integrated moving average) is a statistical method of discerning patterns in data through time. The patterns include whether higher than average rainfall is persistent, whether there are trends in the data and whether past errors in forecasting influence future errors.

The ARIMA approach statistically categorises these relationships. Forecasting using ARIMA presumes that these relationships will persist in the future.

In its review for IPART of State Water's consumption forecasts for the regulatory period beginning in 2006, CIE assessed the accuracy of an ARIMA forecasting method relative to the long-run average used in previous reviews. They found:

- ARIMA forecasting was slightly more accurate than the long-run average for the period 1998 to 2002;
- ARIMA better utilised the information from the IQQM data series; but
- the advantages of using ARIMA over the long-run average may be limited.

The technical details involved in ARIMA modelling are contained in appendix A.

Time series methods may account for structural change, as long as structural change does not change the time series relationships. For climate change, it may be better to directly adjust for climate change rather than using indirect methods, particularly if climate change influences the statistical properties of the series, such as its stationarity (tendency to return to mean).

Forecasts under alternative approaches

The forecasts for each valley under the main approaches identified above are shown in table 5.3. All methodologies produce forecasts below those of IPART 2006.

5.3 Forecasts under alternative approaches

	IQQM 1896 to 2009	*IQQM 1996 to 2009*	*Actual 1996 to 2009*	*Long run average adjusted (method 1)*	*Long run average adjusted (method 2)*	*IPART 2006 forecasts*
	GL/year	GL/year	GL/year	GL/year	GL/year	GL/year
Border	189	172	149	180	159	210
Gwydir	296	287	276	265	233	309
Namoi	231	174	170	212	167	237
Peel	16	15	11	16	16	15
Lachlan	323	257	227	262	190	307
Macquarie	377	302	270	349	322	386
Murray LD	1 859	1 698	1 392	1 667	1 680	1 935

(Continued on next page)

5.3 **Forecasts under alternative approaches** (continued)

	IQQM 1896 to 2009	*IQQM 1996 to 2009*	*Actual 1996 to 2009*	*Long run average adjusted (method 1)*	*Long run average adjusted (method 2)*	*IPART 2006 forecasts*
	GL/year	GL/year	GL/year	GL/year	GL/year	GL/year
Murrum.	1 954	1 782	1 736	1 716	1 723	1 916
North Coast	.	.	1	.	.	1
Hunter	157	147	130	157	157	128
South Coast	.	.	6	.	.	6
Total	5 409	4 842	4 367	4 831	4 654	5 450

Note: Totals are calculated assuming North Coast, South Coast (and Hunter where applicable) forecasts are actual figures. No adjustment is made for storages or climate change for the Hunter. Long run average adjusted (method 1) adjusts IQQM data for climate change and storage levels. Storage level adjustments are made using empirical relationships. Long run average adjusted (method 2) adjusts IQQM data for climate change and storage levels. Storage level adjustments are made assuming that the amount by which storages are below average is allocated across the four years of the regulatory period.

Source: The CIE.

The differences between the forecasts under each of the alternative methodologies and IPART 2006 are shown in table 5.4. The smallest deviation from using IQQM long run averages from 2009 data (including recent actual and forecast data for 2006-07 to 2008-09). In this case, forecasts for the next regulatory period are similar to the previous regulatory period.

But continuing to use the IQQM long run average is not a viable alternative given the analysis included in this report. All four possible methodologies indicate that forecast extractions would be between 10 per cent and 20 per cent below those used by IPART in 2006. This is a relatively small reduction given that recent outcomes have been 70 per cent below forecast by IPART in 2006.

5.4 **Difference from IPART 2006 under alternative approaches**

	IQQM 1896 to 2009	*IQQM 1996 to 2009*	*Actual 1996 to 2009*	*Long run average adjusted (method 1)*	*Long run average adjusted (method 2)*
	%	%	%	%	%
Border	-9.6	-18.0	-29.0	-14.0	-24.0
Gwydir	-4.2	-7.0	-10.9	-14.2	-24.7
Namoi	-2.6	-26.6	-28.2	-10.7	-29.5
Peel	7.7	5.3	-22.2	6.5	6.5
Lachlan	5.2	-16.2	-26.2	-14.8	-38.1
Macquarie	-2.5	-21.9	-30.1	-9.6	-16.7
Murray	-3.9	-12.2	-28.1	-13.8	-13.2
Murrumbidgee	2.0	-7.0	-9.4	-10.4	-10.1
North Coast	.	.	-8.7	.	.
Hunter	22.8	14.4	1.2	.	.
South Coast	.	.	-0.5	.	.
Total	-0.7	-11.2	-19.9	-11.4	-14.6

Note: Totals are calculated assuming North Coast, South Coast (and Hunter where applicable) forecasts are actual figures. No adjustment is made for storages or climate change for the Hunter. Long run average adjusted (method 1) adjusts IQQM data for climate change and storage levels. Storage level adjustments are made using empirical relationships. Long run average adjusted (method 2) adjusts IQQM data for climate change and storage levels. Storage level adjustments are made assuming that the amount by which storages are below average is allocated across the four years of the regulatory period.

Source: The CIE.

Distribution around forecasts

The forecasts presented above are expected consumption outcomes. In actuality, consumption may be higher or lower depending mainly on climatic conditions over the next four years.

The extent of the variation around the forecasts presented above is highly uncertain at present as there is 'normal' variation in rainfall, as well as uncertainty around the implications of climate change. While there is no right answer about the probability of different levels of extractions over the next four years, estimates can be made based around available data. There are two methods that can be used to identify the scale of the risk to extractions.

1. Adding 'normal' climate volatility as represented by IQQM over the past 100 years to uncertainty from climate change as represented by CSIRO 2008 modelling of extreme wet and extreme dry scenarios. Appendix C contains additional information on how this was achieved.
2. Assessing the volatility of extractions over the past 14 years, which is considerably greater for total extractions than it has been in the past. The greater volatility of total extractions from State Water reflects both an increase in volatility in many of the valleys and a greater correlation of extractions between the valleys. That is, many of the valleys have experienced low extractions at the same time.

The results of this exercise are shown in table 5.5. Volatility is presented as relative to average annual extractions over a four year period to align with the regulatory period proposed by State Water.

These distributions are highly illustrative given the uncertainty over climate change and the distributional assumptions made for this analysis. But they do highlight some interesting points. Even under the forecasts proposed for the next regulatory period, current water availability is considered extreme. The total water sold by State Water over the past four years (2005-06 to 2008-09) is likely to be at the lower end of the 95 per cent confidence for both methods

The distribution around the forecasts highlights the risks facing State Water from climatic conditions. The lower bound of the confidence interval is 40 per cent to 65 per cent of forecasts across all valleys. If this level of consumption was to occur, and under current variable pricing arrangements, State Water would recover only about 65 per cent to 80 per cent of the revenue required to cover its costs.

5.5 Uncertainty around forecasts over a four year period

	Actual	*Adding normal and climate change uncertainty*		*Using past 14 years of actual extractions*	
	1996 to 2009	*Lower*	*Upper*	*Lower*	*Upper*
	GL/year	GL/year	GL/year	GL/year	GL/year
Border	149	78	222	88	210
Gwydir	276	55	518	50	502
Namoi	170	76	267	32	308
Peel	11	6	16	5	17
Lachlan	227	50	399	0	502
Macquarie	270	45	501	20	520
Murray	1 392	809	2 051	568	2 216
Murrumbidgee	1 736	1 267	2 149	885	2 587
North Coast	1	.	.	.	.
Hunter	130	.	.	103	153
South Coast	6	.	.	.	.
Total	4 367	2 828	5 898	1 928	7 002
Predicted consumption 2006-09	2 260				

Note: Lower and upper have been calculated to represent a 95 per cent confidence interval for average consumption over a four year period. The standard deviation of actual extractions is calculated using a moving average of four year periods.

Source: The CIE.

Key points

Both direct adjustment of IQQM long run averages for specific factors and using a 15-year moving average of actual extractions have advantages over the current approach. In terms of a process that can be set in place for future reviews, using a moving average is clearly the better approach as it does not rely on the existence of current studies on climate change on regulated river valleys and that can be adapted to the purposes of the regulatory review. The moving average approach also offers advantages in cushioning State Water's balance sheet from climatic volatility, while not imposing excessive volatility in prices from period to period.

Reflecting these arguments, our preferred method of forecasting consumption would be to use the past 15 years of actual extractions data for each valley (from 1995/96 to 2008/09 for the next regulatory period, given data quality constraints prior to 1995/96). If there has been considerable structural change within particular valleys, then this approach could be adjusted to the past 15 years of IQQM estimated data (with IQQM parameters updated to reflect the structural changes).

The preliminary consumption forecasts are shown in table 5.6. These incorporate forecasts for consumption in 2008-09, which should be adjusted at the end of the financial year.

An adjustment to the historical consumption figures would also be required in the event that there is a change in NSW or Federal Government Policy which allows State Water to recover usage charges on all extractions then the consumption forecasts should be amended accordingly. This would primarily affect the Murray and Murrumbidgee valleys and result in a small increase in average extractions for these valleys.

Historical consumption figures would also need to be adjusted if there is a change in policy regarding the ability to charge those licences that have been recently purchased by the Commonwealth Government and NSW Government. This issue will form part of IPART's deliberations for the 2010 bulk water price determination.

5.6 Preliminary proposed consumption forecasts for next determination

Regulated river valley	*Consumption (ML/pa)*
	ML/year
Border	148 923
Gwydir	275 597
Namoi	170 193
Peel	11 422
Lachlan	226 554
Macquarie	269 989
Murray LD	1 391 796
Murrumbidgee	1 736 020
North Coast	906
Hunter	129 581
South Coast	5 804
Total	4 366 786

Source: The CIE.

6 Recommendations and conclusions

There is strong evidence that structural change in climatic conditions has occurred in the regulated river valleys for which State Water is responsible. On a purely statistical level, the pattern of extractions over past years has been unlike anything that would have been generated by rainfall patterns over the past 110 years. Statistical tests indicate a close to zero likelihood that recent extractions have the same average as extractions over the past 110 years, particularly in the Southern river valleys such as the Murray and Murrumbidgee, which generate the most of State Water's revenue. The statistical findings align with the broader body of work indicating that climate change is occurring and will likely negatively impact on water extractions, although the size of these impacts is subject to considerable uncertainty.

In the presence of structural change in climatic conditions, it is no longer sensible to continue to forecast State Water's extractions using the past 110 years of rainfall data. The long-run average from IQQM modelling has to be discarded as the best way to generate forecasts for regulatory purposes.

Recent climatic conditions have not only strengthened the evidence for structural change, they have also had substantial impacts on State Water. The actual extraction outcomes for the regulatory period to date are less than one third of forecast for the 2006 regulation determination and State Water's storages are now well below average. With 60 per cent of State Water's revenues expected to come from usage charges on water, State Water has not been recovering enough revenue to even cover efficient operating costs.

Given these considerations, a new approach is needed to forecast consumption of bulk water for the regulated river valleys. The approach should better reflect climate change, be simple to implement, provide certainty to stakeholders and minimise the impact of climatic conditions on State Water's balance sheet. But in doing this, the approach should not generate inappropriate volatility in prices between years or even between regulatory periods.

These criteria point clearly towards using a shorter history of extractions than the 110 years available from IQQM.

Choosing the length of the period involves a choice between incorporating structural change quickly or slowly and introducing more or less volatility into prices from normal climatic variability. Using a 15 year period limits price volatility from climatic conditions, while still accounting for structural change within a time period relevant

to State Water. This means that State Water would bear the risk of climatic volatility but have limited exposure to climatic change. The sequence of reasonable quality historical data will cover a period of 14 years by the time of the regulatory determination, which allows such an approach to be taken using actual data.

While the length of the period is the most important element in any future pricing determination, a decision will also have to be taken to use actual extractions or IQQM extractions. Actual extractions should be used unless it can be shown that changes in water management plans would have had a larger impact on extractions than the modelling error incorporated into IQQM.

On balance, we view that using the past 15 years of actual extractions data at the time of each regulatory review best fits the criteria for a robust approach to demand forecasting. Other possible mechanisms have been considered, including directly adjusting IQQM for climate change and current storage levels. While offering advantages, they are complex and costly to implement for each regulatory review, and rely heavily on uncertain predictions about the impact of climate change on regulated rivers.

Appendices

A ARIMA modelling

Time series models such as ARIMA are used for forecasting future values of variables of interest when only historical data on these variables is available, and there are no structural models available that can explain the behaviour of such variables in terms of that of other underlying variables. In other words, time series econometrics is concerned with the estimation of difference equations containing stochastic components. Uncovering the dynamic path of the variable of interest — its time series — improves forecasts since the predictable components of the series can be extrapolated into the future.

In the case of forecasting consumption, using a time series approach can be thought of as a process driven ultimately by annual changes in weather conditions. It utilises statistical techniques to extract additional information from the available data series on modelled water usage to improve the forecast of future water usage.

The autoregressive integrated moving average (ARIMA) is one alternative method to forecast consumption. This approach discerns some pattern in consumption from the modelled historical data, and postulates that the pattern is based on some statistical correlation (relationship) between current and past consumption. The premise of the ARIMA model is distinct from the LRA, which assumes that consumption in any given year is independent of the last.

To understand what an ARIMA model is, it is helpful to first understand two classes of simpler time series models, the AR models and the MA models.

AR and MA time series models

Time series models have autoregressive and/or moving average components. Autoregressive (AR) time series models consist of past observations of the dependent variable (ie the variable of interest) in the forecast of future observations. For example, the simplest AR model, the AR(1) model, includes one lag of the dependent variable:

$$y_t = a\, y_{t-1} + e_t,$$

where y is the dependent variable, a is a parameter, and e_t is the random error or white noise term. We can think of e_t as the forecast error.

Moving average (MA) models include past observations of the white-noise process (that is, past forecast errors) in the forecast of future observations of the dependent variable. Technically speaking, a sequence $\{e_t\}$ is a white-noise process if each value in the sequence has a mean of zero, a constant variance, and is uncorrelated with all other realisations in the sequence. The MA(1) model includes one lagged observation of the white-noise process:

$$y_t = b\, e_{t-1} + e_t,$$

where e_{t-1} is the lagged observation of the noise process.

Autoregressive Moving Average (ARMA) models comprise both past observations of the dependent variable and past observations of the innovations noise process in the forecast of future observations of the dependent variable of interest. For example, the ARMA (2,1) model may be represented as:

$$y_t = a_1\, y_{t-1} + a_2\, y_{t-1} + b_1\, e_{t-1} + e_t.$$

The generic ARMA (p, q) model contains p number of past observations of the dependent variable and q number of past observations of the white-noise process.

By definition, an ARMA model is covariance stationary in that it has a finite and time-invariant mean and covariances. Shocks to a stationary time series are necessarily temporary; over time, the effects of the shocks will dissipate and the series will revert to its long run mean level. When the time series is not stationary, it may be necessary to remove the trend by repeated differencing. For example, the d-th difference of a generic Autoregressive Integrated Moving Average ARIMA (p, d, q) model is stationary. That is, an ARMA model is an ARIMA model which is stationary.

Implementing an ARIMA model

Operationalising the ARIMA model involves finding suitable values for the p, d and q parameters. The Box-Jenkins (1976) strategy is commonly used to identify the most appropriate specification for the ARIMA model. The strategy consists of 3 stages, and can be implemented in many of the econometrics (regression) software packages available.

The following details the three-stage process.

Stage 1: Model identification

The first step is for the researcher to visually examine the time plot of the historical data series, the autocorrelation function, and the partial correlation function. Plotting the time path provides useful information concerning outliers, missing values and structural breaks in the data. The autocorrelation function (ACF) is a correlation

sequence of a random time series with itself, while the partial correlation function (PCF) is a correlation sequence estimated by fitting successive order autoregressive models to a random time series by least squares. The rates of decay of the ACF and PCF will give an indication of the stationarity of the model and inform the statistician whether further differencing is necessary. If the model appears stationary, plausible values for p and q in the ARIMA (p, d, q) model can be inferred from the patterns found in plots of the ACF and PCF.

Stage 2: Model estimation

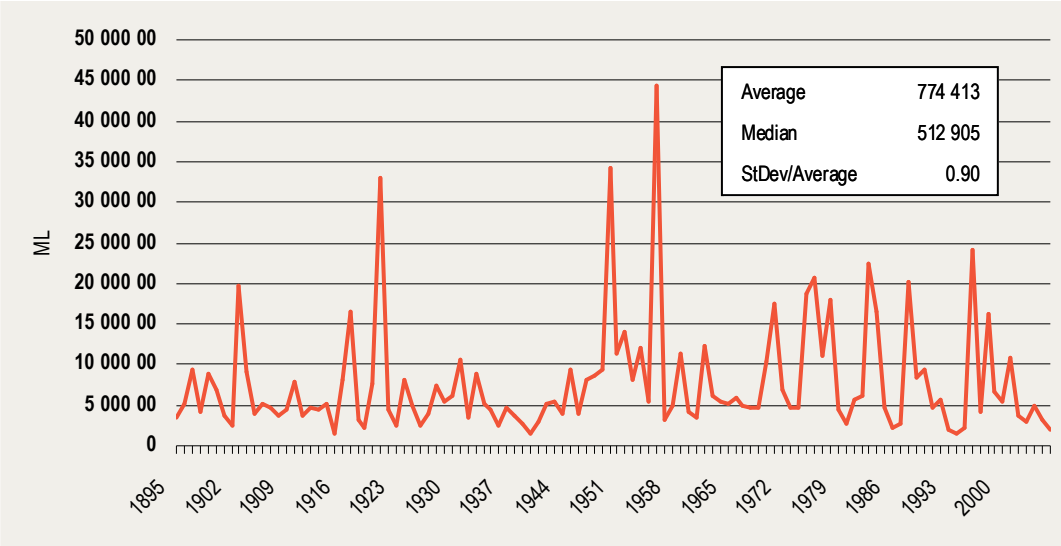
In this stage, each of the tentative or plausible models is fitted and the various a_i and b_i coefficients examined. Box and Jenkins believe that parsimonious models (those with small values for p and q) produce better forecasts than overparameterised models. The aim is to approximate the true data-generating process but not to overparameterise based on the vagaries of history. Two of the more commonly used model selection criteria are the Akaike Information Criterion (AIC) and the Schwartz Bayesian Criterion (SBC). Ideally, the AIC and SBC should be as small as possible. In addition, the t-statistics for all the a_i and b_i coefficients should also be statistically significant and the adjusted R^2 statistic for the fitted regression reasonably high. (Sometimes, human judgement based on experience is required when there is trade-off between the various criteria when choosing between two candidate models.) Further diagnostic checking can also be implemented, such as plotting the residuals of outliers and looking for evidence of periods in which the model does not fit the data well.

Stage 3: Forecasting

In STATA, the forecasting procedure is made operational by using the model parameter estimates and the estimate of the error variance from the estimation stage. If a moving average component is present then estimated residuals also enter the forecast. Consequently, a sequence of one-step ahead prediction errors is computed to the end of the sample period (including back-forecasting of pre-sample residuals). Point forecasts are calculated recursively from the difference-equation form of the process.

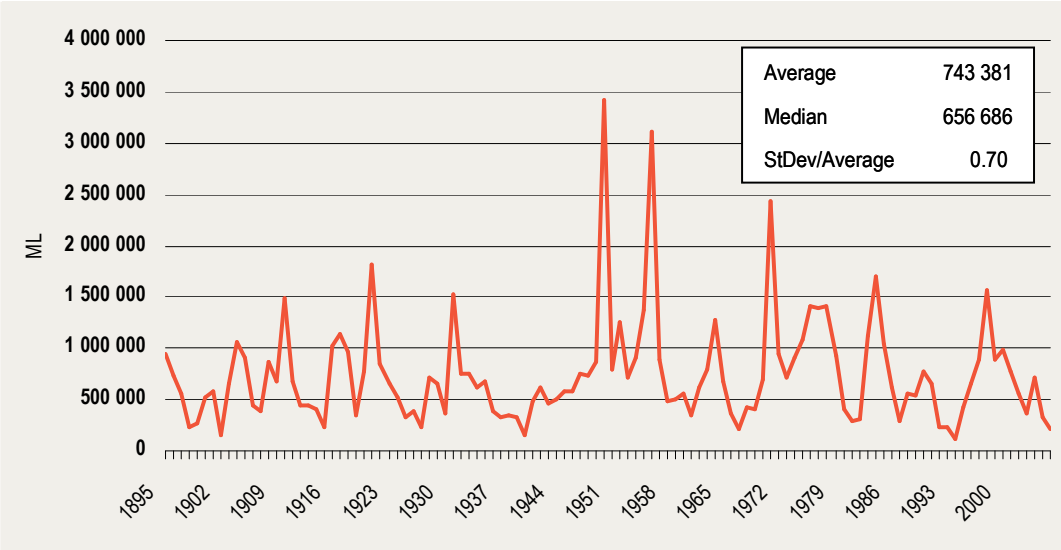
B Volatility of inflows

B.1 Border valley — inflows (ML/annum)



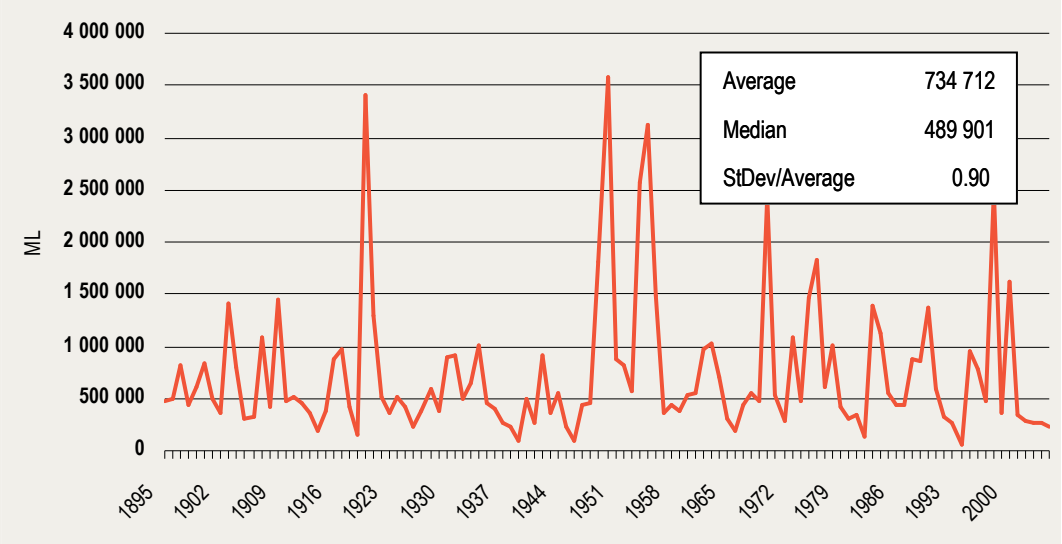
Data source: IQQM. Point of measurement at Goondiwindi.

B.2 Gwydir valley — inflows (ML/annum)



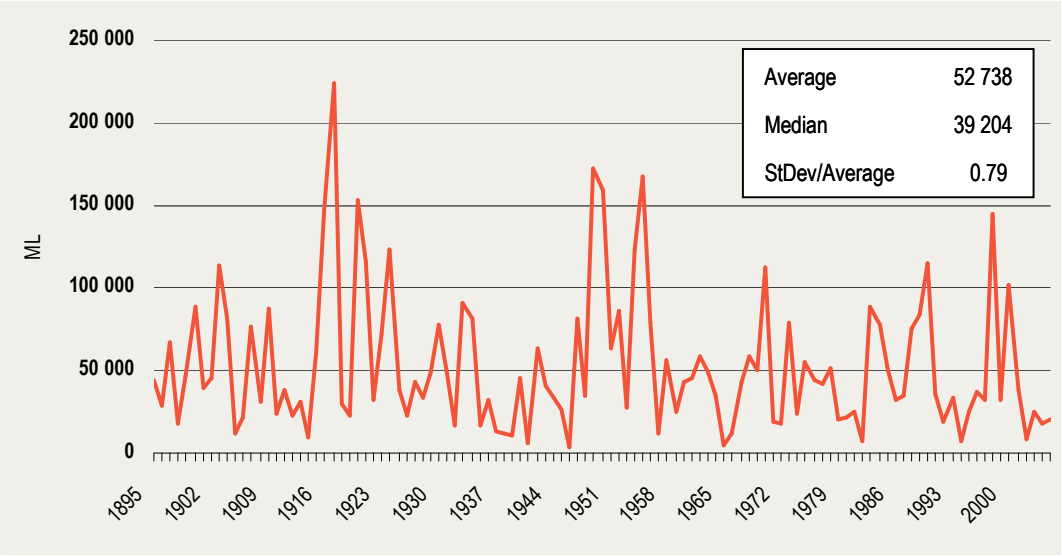
Data source: IQQM. Point of measurement at Pallamallawa.

B.3 Namoi valley — inflows (ML/annum)



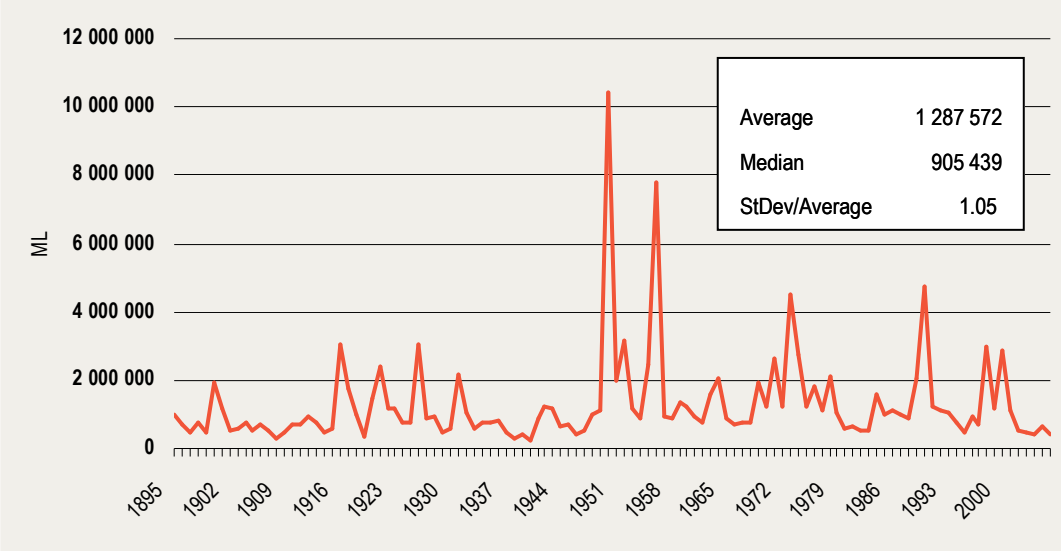
Data source: IQQM, modelled inflows at Gunnedah.

B.4 Peel valley — inflows (ML/annum)



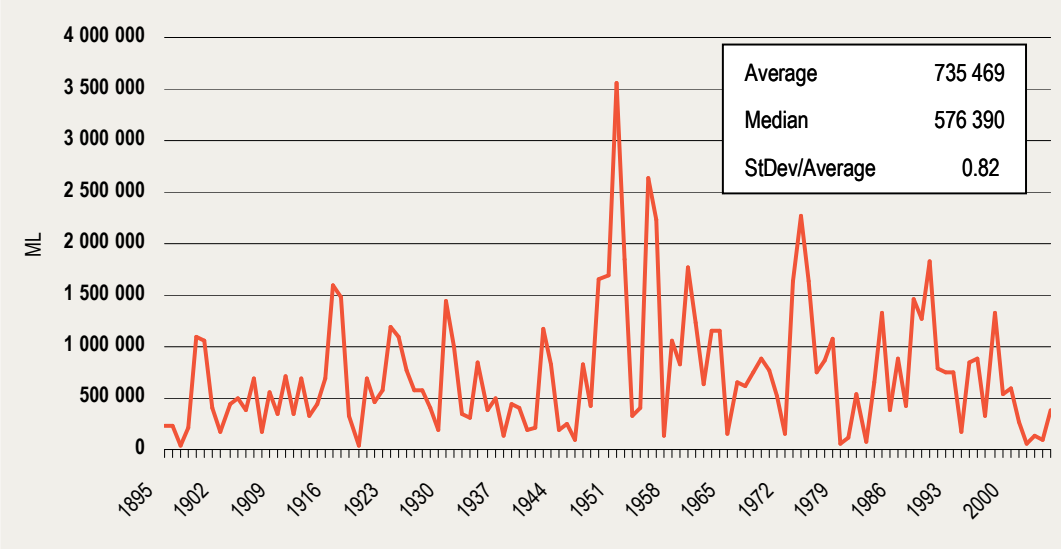
Data source: IQQM. Inflows into Chaffey Dam.

B.5 Macquarie valley — inflows (ML/annum)



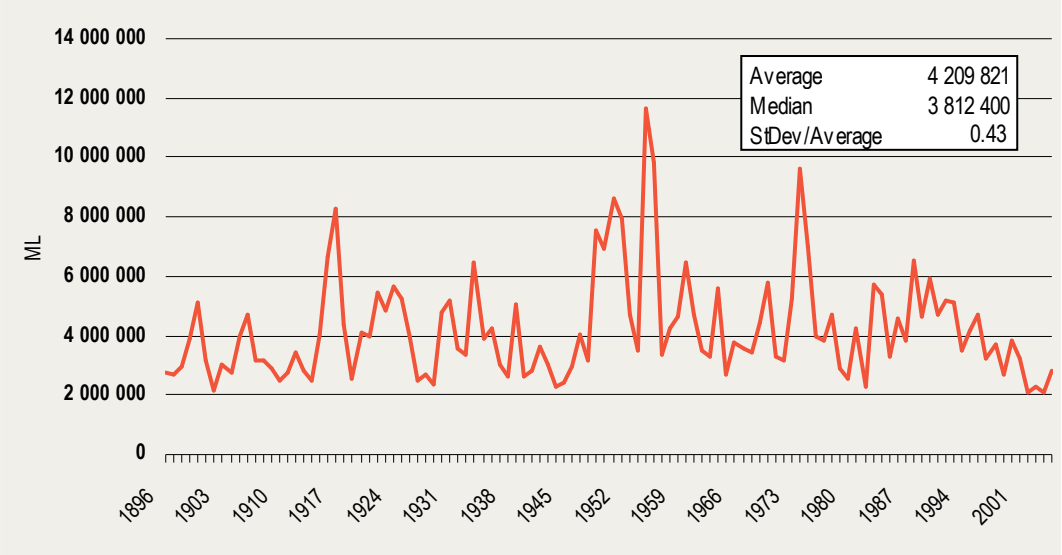
Data source: IQQM, modelled inflows at Narromine.

B.6 Lachlan valley — inflows (ML/annum)



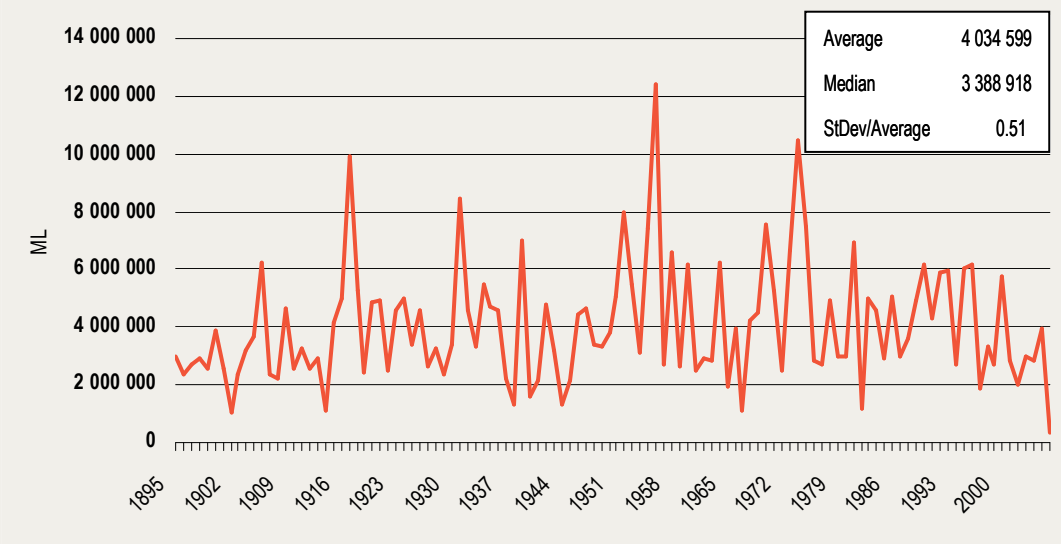
Data source: IQQM, Inflows into Wyangala Dam.

B.7 Murrumbidgee valley — inflows (ML/annum)



Data source: IQQM, modelled inflows at Wagga Wagga.

B.8 Murray valley — inflows (ML/annum)



Data source: IQQM, modelled inflows into Hume Dam.

C Variability in future extractions

The variability in future extractions for State Water is highly uncertain at the moment. There has been a period of extremely low rainfall and water availability, below anything that has been experienced in the past 100 years. As discussed in the body of this report, this is likely to reflect structural change in climatic conditions.

The two sorts of variability (or uncertainty) that characterise future extractions in the rivers managed by State Water are normal variation from climatic volatility and uncertainty about the degree of structural change that has occurred or will occur through the regulatory period.

Under some strong assumptions, we can characterise the extent of normal variation and uncertainty due to structural change, and 'add' them together to form an overall opinion of the distribution of average extractions over a four year period.

The process that we have used to do this is set out below.

- Normal variability was calculated for each valley based on all available IQQM data. Normal variability was captured through the standard deviation of extractions over four year periods to align with State Water's proposed regulatory period. This imposes the assumption that climate change will not lead to a systematic change in volatility, which is unlikely to hold in practice.
- Climate change uncertainty was captured through CSIRO 2008 extreme wet and extreme dry scenarios. The standard deviation of climate change uncertainty was estimated as (extreme wet less extreme dry), divided by four. This imposes the assumption that CSIRO 2008 captured a 95 per cent confidence interval of climatic uncertainty. The uncertainty was then halved to reflect the different time frame for the regulatory period versus the 2030 time frame considered by CSIRO.
- The standard deviations of climate change uncertainty and normal volatility were added together. This imposes the assumption that normal volatility is independent of climate change.
- The 95 per cent confidence interval around the proposed forecasts was constructed as two standard deviations above and below expected consumption. This range was then adjusted to reflect the skewness between wet and dry in CSIRO 2008 analysis.

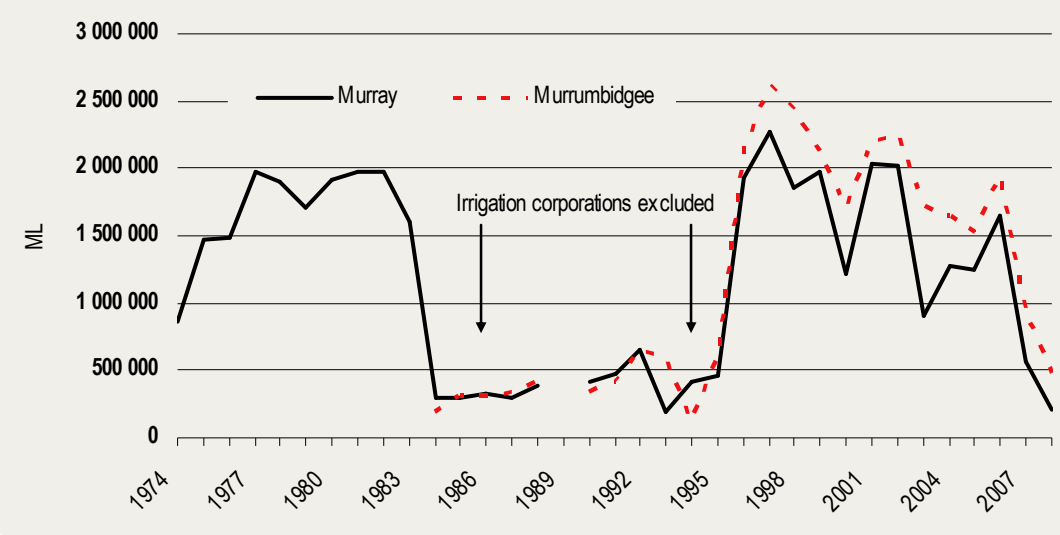
D Actual extraction data from 1973-74

There is extractions data going back longer than 1995-96 to 1973-74. However, this data has not been collected on a consistent basis, often excluding significant components of billable water. The sources for the data, where it is available, are:

- 1973-74 to 1982-83 — from Annual Reports;
- 1984-85 to 1994-95 — from Water Ordering (WOU); and
- 1995-96 to 2007-08 — from Water Availability System (WAS.

The Water Ordering data excludes irrigation corporations, giving discrepancies as shown in chart D.1. No Annual Report data is available for the Murrumbidgee and there are also periods of missing WOU data for both the Murray and Murrumbidgee.

D.1 **Actual extractions for the Murrumbidgee and Murray**



Data source: State Water.

The way data was reported also changes in other valleys, such as the Hunter and Lachlan.

The lack of consistent reporting of data over this longer period means that only data from 1995-96 should be considered as relevant in considering billable consumption in the future.

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State Water Corporation

‘Ability to Pay’
State Water Customers

Final Report

August 2009

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Table of Contents

1 Introduction

This report has been prepared in response to the consultancy brief released in July 2009, titled *The 'Ability to Pay' of State Water Customers.*

As New South Wales rural bulk water delivery corporation, prices charged by State Water are regulated by the Independent Pricing and Regulatory Tribunal (IPART). The tribunal determines the maximum prices that may be charged for bulk water services. IPART are currently reviewing bulk water pricing arrangement and State Water is required to complete a pricing submission and propose a revenue requirement, that will underpin its proposed bulk water charges across the various valleys in New South Wales.

The project brief emphasised that one key consideration when making pricing determinations is to *'protect consumers by monitoring the quality and reliability of regulated services and by considering the social impacts of its decisions'*. The purpose of this project is to analyse the ability of State Water customers to absorb higher bulk water charges.

Increased bulk water charges for irrigators will ultimately lead to higher costs and will therefore lower net incomes and influence profitability (unless these costs can be offset by productivity/efficiency gains). The ability of customers to absorb these higher costs will depend on a number of factors, including the financial viability of the customer, the contribution of bulk water costs to total costs and the mix of volumetric and fixed charges.

2 Background

The purpose of this project is to complete a comprehensive analysis and provide a detailed report on the ability of State Water customers (i.e. irrigation farms in the major regulated river valleys in New South Wales), to absorb higher bulk water charges.

Ultimately increased bulk water charges will lead to higher costs for farm businesses within the irrigation industry. The extent to which these higher costs impact on net income and therefore farm profit will vary for each business and will depend will on:

- the level of net farm income and overall business profit
- the proportion of bulk water costs to total costs
- the availability of water and whether farms trade water & the influence of the water market
- the mix/balance between fixed and volumetric/usage charges

This comprehensive report helps to address a number of issues in regard:

- The financial viability of various classes of customer. With consideration for the dominant crop under production in the region.
- The extent to which irrigators have pursued operational efficiencies in response to water scarcity.
- The role of tradable water rights in times of water scarcity, i.e. whether access to the market (as buyer and/or a seller) for these rights can affect financial viability.
- The proportion of total costs represented by State Water's bulk water charge.
- Whether customers can absorb increases in the bulk water charge.
- How movements in the bulk water charge affects high security compared to general security entitlement holders, based primarily on their dominant crop type.
- Where appropriate, the impact of the above factors on average, small and large customers.
- Whether there are differences between valleys in regard to the above factors.

The outcomes of the study and findings from the analysis will be used to support State Water's submission to IPART in September 2009.

3 Methodology

3.1 General Approach

Introduction

As highlighted previously, the key objective of this project is to evaluate 'the ability of State Water customers to absorb higher bulk water charges'. The current situation has been reviewed, to consider the profile of customers and existing bulk water charges.

This baseline analysis is then followed by a detailed regional and enterprise evaluation, to provide context at a number of levels (i.e. industry, valley/region and enterprise level). The information helps to provide a more thorough understanding of irrigation businesses across the regulated river system of NSW (that make up the bulk of State Water customers).

The situation analysis and regional/enterprise evaluation provides a foundation, helping to build a comprehensive impact assessment to specially consider the direct customer impact to the proposed changes to bulk water charges (to be implemented by State Water). The assessment outlines the direct customer impact by considering a number of important indicators that are directly influenced by bulk water charges (e.g. cost per business, return on capital, relative to total costs).

The discussion to follow considers the more specific approach/methodology used for each of these components of the study.

Situation Analysis & Regional/Enterprise Analysis

To provide baseline information, it was important build a picture of the existing situation for customers and have a clear understanding of bulk water charges. In order to consider the impact of price changes, it is crucial to first understand the existing 'state of play'. This initial situation analysis considered:

- River valleys/regions (part of the regulated irrigation system)
- Customer profile (numbers & type)
- Consumption forecasts
- Cost components and pricing principles

A detailed regional and enterprise analysis was completed to provide further context at a regional, industry and enterprise level. The analysis considers general trends and has identified the major enterprise groups that are critical to each river valley.

A number of key financial indicators where included for each enterprise group, to provide an understanding of business viability. The most recent financial survey data collected and analysed by ABARE (for irrigated production) is for the 2006-07 financial year. ABARE data was collected for the 2004-05 season and was also considered in the impact assessment (Section 6).

More recent financial survey data has not yet been made available and given the continued period of drought and restricted water allocations, these financial indicators for 2006-07 are reflective of more recent financial performance across the irrigation industry.

Business Impact Assessment

A range of industry/enterprise data and information (documented in Section 4 & 5) has been used to develop and complete a detailed impact assessment, to consider the direct impact on State Water customers as a result of changes to bulk water charges. The assessment was completed to consider:

- River valley/regional comparison
- Business size/scale
- Enterprise comparison

A number of important indicators were considered, that are directly influenced by bulk water charges (e.g. cost per business, return on capital, relative to total costs). The outcomes of the analysis can be used to determine the customer impact and the implications for business viability.

The analysis considers the bulk water costs for businesses both outside and within the very significant irrigation corporation areas across NSW. IPART do not determine retail charges within the irrigation corporation areas.

State Water bulk water charges are only approximately 20% of the total bulk water costs within the irrigation corporation areas. While facing higher charges, bulk water customers within these areas have a significant relative advantage, with limited energy costs for water delivery (i.e. associated pumping costs).

The proposed bulk water price estimates used in this analysis are indicative draft prices for the four-year term i.e. 2011-2014, provided by State Water.

In previous studies (IPART 2006), the impact analysis used a narrow approach that focused ‘a typical 1000ML entitlement business’. This impact assessment has used a more thorough/appropriate methodology, which considers the typical average and range of businesses within each valley.

It should be noted that the assessment does not consider bulk water costs in relation to the level of service.

Other Issues

The report also considers some general trends in relation to irrigation infrastructure and on-farm investment in response to water scarcity (Appendix 1).

3.2 Data Collection & Analysis

An extensive amount of existing data has been analysed to consider:

i. National industry trends

ii. Regional characteristics (river valleys, NRM regions)

iii. Enterprise (dairy, horticulture, mixed/broadacre)

iv. Business size/scale (irrigated area, licence entitlement)

v. Water costs & trading (trends and Issues)

ABARE/ABS data collection has been adapted in recent years to more readily suit this type of analysis (i.e. specific to the irrigation industry), however it should be noted that there is a limited amount of historical data available that considers regional/industry characteristics, specific to the irrigation industry.

Data has also been provided by State Water including figures on water usage, entitlements and allocations for each of the valley regions. Proposed bulk price estimates were also provided for a four-year term i.e. 2011-2014.

3.3 Geographic Areas

ABS data has been analysed to consider regional boundaries or geographic areas. In preliminary data analysis, Statistical Division (SD), Natural Resource Management (NRM) and River Basin regions were reviewed. A Statistical Division (SD) is an Australian Standard Geographical Classification defined area, which represents a large, general purpose, regional type geographic area.

More recently, in a response to the demand for more tailored, regional-based output, estimates from the Natural Resource Management (NRM) framework have been produced at the Australian, State and Natural Heritage Trust level. For the 2006 Agricultural Census, the location of agricultural businesses was geo-coded (latitude and longitude) to provide estimates for additional regions, such as Natural Resource Management (NRM) regions, River Basins and Drainage Divisions.

Based on the geographic location and area, it was determined that NRM level would be the most appropriate category and would align closely with River Valley regions for New South Wales. State Water has identified the valleys being considered

include Border, Gwydir, Namoi, Peel, Lachlan, Macquarie, Murray, Murrumbidgee, North Coast, Hunter and South Coast.

4 Situation Analysis

4.1 Introduction

State Water's core water delivery business provides services to about 6,200 customers who purchase water sourced from the regulated river system across New South Wales.

The regulated river basins managed by State Water and to be considered in this study include the Border, Gwydir, Namoi, Peel, Lachlan, Macquarie, Murray, Murrumbidgee, North Coast, Hunter and South Coast.

This chapter of the report will provide an overview of the current situation for customers across NSW (i.e. confirm the baseline) and consider the potential impact of proposed price changes to be determined by IPART over the coming months.

4.2 Customer Numbers & Coverage

NSW Irrigation Businesses

ABS data has been aggregated to provide a regional snapshot, outlining the number of irrigation businesses and irrigation area, across the NRM regions of New South Wales.

The regional analysis based on NRM regions is not perfect, however the regions do align with the identified valleys and provide a comparison of the relative size and magnitude at a regional level that is appropriate for the purposes of this study. The analysis is somewhat limited as the data is not differentiated between regulated irrigation systems and unregulated systems.

Table 4-1 Business Number & Area, Estimates for NRM Regions

NRM region	Businesses Irrigating No.			Area Irrigated 000 ha		
	2005-06	2006-07	2007-08	2005-06	2006-07	2007-08
Border Rivers/Gwydir	331	245	250	93	59	62
Central West	724	845	829	45	46	45
Hunter/Central Rivers	1,469	1,424	1,242	40	40	40
Lachlan	628	614	483	60	60	73
Lower Murray/Darling	485	484	396	18	18	11
Murray	1,715	1,277	622	307	147	58
Murrumbidgee	2,025	1,854	1,638	281	198	120
Namoi	701	595	571	94	66	72

Northern Rivers	-	1,332	1,098	-	21	13
Southern Rivers	348	371	282	9	9	9

Source: ABS Water Use on Australian Farms 2005-06 to 2007-08

The figures outlined in Table 4-1 give some order of magnitude to the number of businesses affected by bulk water charges and the proportion of farmers across the major irrigation regions of NSW.

Based on the data the most significant irrigation regions (i.e. in terms of area irrigated) in 2007-08 include the Murrumbidgee, Lachlan, Namoi and Border Rivers/Gwydir regions. The data also suggests a substantial difference in scale, with an average area irrigated of 248 hectares in the Border Rivers/Gwydir region, compared to 32 hectares in the Hunter/Central Rivers region.

Other Customers

While the majority of State Water's customer base is made up of irrigation farms, other customers also include irrigation corporations, country water supply authorities, mines and electricity generators. State Water also provides water for stock and domestic users and are responsible for delivering environmental flows.

It is generally accepted that irrigation farms will ultimately face the most significant impact as a result of changes to bulk water charges and this study will focus on this potential impact.

4.3 Customer Type

All water users on the regulated rivers of NSW (i.e. State Water customers) hold a licensed water entitlement, providing exclusive access to a share of water from a specified consumptive pool as defined in the relevant water plan. The entitlement is defined as either general security or high security or a component of both, depending on the type of use.

High security and *general security* are two distinct categories of water access license in New South Wales, which have a share component expressed in unit shares. The reliability of full allocation per unit share for high security access licences is assured in all but severe periods of drought and has priority over general security and supplementary water categories. General security is less assured and is much more variable between river systems.

Bulk water charges consist of fixed and variable components. The fixed charge is based on irrigators' licensed entitlements and is independent of use, whereas the variable component is based on the volume of irrigation water actually extracted. A clear price differential exists between the fixed charges for high security and general security entitlements.

With a continuing focus on cost reflective pricing, in accordance with COAG objectives, prices will be adjusted to better reflect costs in each valley. Despite a commitment to this objective, it must be balanced against the impacts on customers. In the past (IPART 2006), it has been accepted that full cost recovery may not be achieved in some valleys.

4.4 Customer Profile & Service Delivery

Water Entitlements

The water shares for each of the river valleys accountable to State Water are documented in Table 4-2. These figure compare the proportion of high security versus general security shares and shows the significance of the Murray and Murrumbidgee, in terms of the number of shares held.

Table 4-2 Water Entitlements or Shares

Valley	Entitlement/Shares	
	High Security	General Security
Border	3,125	263,085
Gwydir	21,458	509,665
Peel	17,381	30,911
Macquarie	42,594	631,716
Hunter	70,738	138,109
Lachlan	60,778	632,946
Murray	*257,006*	*2,029,068*
Murrumbidgee	*436,928*	*2,264,065*
Namoi	8,527	255,780
North Coast	137	10,193
South Coast	967	14,197

Source: State Water data 2009

It is interesting to note that approximately 20% of irrigation businesses hold/control approximately 65% of all general security shares in both the Murray and Murrumbidgee regions, highlighting the significance of large entitlement holders.

Business Number & Size Profile

Approximate business numbers have been determined, based on the ownership of high security and general security entitlements for each valley - a number of businesses own both high security and general security entitlement.

The figures (outlined in Table 4-3) clearly show that the Murrumbidgee has the most significant proportion of high security entitlement holders. The Border, Gwydir, Peel,

Namoi, North Coast and South Coast valleys have a very small number of businesses with high security entitlements.

The overall businesses numbers will be overestimated to some degree, given amalgamations and buy-outs that are difficult/impossible to identify. The analysis excludes entitlement holders with less than 50 entitlements, as many of these owners will be hobby/lifestyle/part-time properties that are not reliant on income from irrigated farming.

Table 4-3 Approximate Business Numbers

Valley	Business Numbers	
	High Security	General Security
Border	11	57
Gwydir	10	262
Peel	10	149
Macquarie	64	521
Hunter	43	697
Lachlan	68	637
Murray	*319*	*829*
Murrumbidgee	*78*	*692*
Namoi	5	388
North Coast	2	51
South Coast	3	53
Total	**613**	**4,342**

Source: State Water data 2009, excludes businesses with less than 50ML entitlement.

The data provided by State Water has been analysed with regard to business size (Table 4-4), with a profile developed for each valley according to number of general entitlements held.

It must be emphasised that these business numbers are approximate only, however they do provide a reference and help to highlight the number of irrigation businesses that will face a change in bulk water charges.

Table 4-4 Approximate Size Profile

Valley	Small		Medium		Large	
	No.	*Average ML*		*Average ML*		*Average ML*
Border	15	*80*	25	*1,388*	17	*12,484*
Gwydir	66	*208*	127	*1,250*	69	*7,454*
Peel	41	*77*	67	*147*	41	*414*

Valley	Small		Medium		Large	
	No.	*Average ML*		*Average ML*		*Average ML*
Macquarie	132	*87*	258	*289*	131	*4,864*
Hunter	175	*63*	344	*139*	178	*468*
Lachlan	173	*95*	304	*397*	160	*3,039*
Murray	209	*74*	412	*223*	208	*658*
Murrumbidgee	174	*88*	339	*399*	179	*1,565*
Namoi	97	*91*	190	*512*	101	*2,873*
North Coast	15	*69*	23	*168*	13	*445*
South Coast	13	*76*	27	*221*	13	*507*
Total	**1,110**	***89***	**2,116**	***368***	**1,110**	***2,336***

Source: State Water data 2009, excludes businesses with less than 50ML entitlement.

The size profile was determined by considering the number of entitlements held and identifying the group of significant entitlement holders (businesses that hold the top 25% of total entitlements), as opposed to small businesses (those that hold the bottom 25% of total entitlements).

The figures outlined in Table 4-4 document the approximate number of entitlements held by the large irrigation businesses (average of 2,336), compared to small businesses (average of 89). The analysis also clearly indicates that businesses are considerably larger in the Border, Gwydir, Macquarie, Lachlan and Namoi valleys.

Regional Water Usage

Total water deliveries of 1,111GL in 2007-08 were about 20% of long-term average sales and the lowest since the development of major storages in NSW.

Table 4-5 Actual consumption (ML)

Valley	2005-06	2006-07	2007-08	2008-09
	ML	ML	ML	ML
Border	134,417	131,934	112,269	117,688
Gwydir	218,762	129,467	79,132	143,199
Namoi	141,280	66,559	51,212	97,482
Peel	-	9,911	9,382	10,183
Lachlan	109,732	57,176	30,755	24,884
Macquarie	179,663	204,745	30,867	65,953
Murrumbidgee	1,942,845	920,635	458,017	568,581
Murray	1,603,284	559,114	226,153	301,558
North Coast	-	1,031	786	900
Hunter	156,409	101,200	106,795	112,014

Valley	2005-06	2006-07	2007-08	2008-09
	ML	ML	ML	ML
South Coast	-	5,823	5,623	5,965
Total	4,486,392	2,187,593	1,110,991	1,448,407

Source: State Water Data 2009

In any given year, State Water derives half its revenue from water charges from the Murray-Lower Darling and Murrumbidgee valleys. Irrigators in these two valleys alone can account for 65% of water deliveries. This is critical and highlights the need to closely consider the impact on these two regions/valleys.

4.5 Water Allocations & Consumption Forecasts

Annual allocation levels and therefore the volume of water actually extracted will obviously influence the variable component of bulk water charges and therefore overall revenue levels for State Water Corporation. It is difficult to predict future allocation levels, particularly given the increasing uncertainty and historically low allocations of more recent years.

Proposed consumption forecasts have been used as a basis for this evaluation, effectively the expected allocation used by State Water for planning purposes (i.e. to determine revenue and cost estimates). Refer to Table 4-6.

Table 4-6 Proposed Consumption Forecasts

Valley	2006 IPART (ML)	Proposed (ML)	Change
Border	209,670	148,923	- 29.0%
Gwydir	309,164	275,597	- 10.9%
Namoi	237,146	170,193	- 28.2%
Peel	14,675	11,422	- 22.2%
Lachlan	307,149	226,554	- 26.2%
Macquarie	386,311	269,989	- 30.1%
Murrumbidgee	1,934,830	1,391,796	- 28.1%
Murray	1,915,848	1,736,020	- 9.4%
North Coast	992	906	- 8.7%
Hunter	128,067	129,581	1.2%
South Coast	5,831	5,804	- 0.5%
Total	5,449,683	4,366,786	- 19.9%

Source: State Water 2009

4.6 Current Bulk Water Charges

Bulk water charges for irrigators extracting water from regulated river systems are shown in Table 4-7. These charges consist of a fixed charge and a usage charge. This summary outlines the maximum prices for a range of bulk water services provided by the State Water Corporation.

Table 4-7 Bulk water charges on regulated rivers for 2006-07 and 2009-10

Valley	Entitlement charges ($/ML)				Usage charges ($/ML)	
	High security		General security		High and general	
	2006-07	*2009-10*	2006-07	*2009-10*	2006-07	*2009-10*
Border	4.48	*4.37*	3.13	*3.41*	4.34	*6.54*
Gwydir	5.16	*6.08*	3.23	*3.37*	5.15	*8.96*
Namoi	9.14	*9.31*	6.44	*7.44*	8.70	*12.56*
Peel	12.60	*11.50*	4.61	*1.71*	14.57	*25.72*
Lachlan	6.68	*7.02*	3.95	*2.86*	6.59	*10.83*
Macquarie	4.59	*5.78*	3.14	*3.07*	5.43	*8.47*
Murray	4.39	*2.75*	3.90	*2.20*	1.99	*4.00*
Murrumbidgee	3.36	*2.46*	2.97	*1.51*	1.64	*3.54*
North Coast	10.23	*5.60*	7.90	*4.48*	12.05	*27.84*
Hunter	10.95	*20.22*	5.71	*6.74*	7.21	*12.28*
South Coast	11.60	*10.61*	8.40	*6.24*	11.28	*24.96*

Source: State Water 2009

These prices were determined by IPART (issues in 2006) and are based on efficient costs for services, cost sharing between customers and government, and the affordability for customers. These price changes moved toward full-cost recovery, decreasing the government operating subsidy and helped to achieve a balance between the level of service provided and the customers 'ability to pay'.

4.7 Component Costs

The estimates outlined in Table 4-8 are based on historical charges and since this analysis there has been a significant reduction in revenue from fixed entitlement charges.

The statewide ratio of fixed and usage charges decreases from 70% to 40% over the four-year term to 2009-10. This means that in years of low water usage, the water charges will also be lower than under the current ratio.

ABARE estimates provide some background to consider the bulk water charge component of total irrigation water costs for each farm. The annual charges were applied to survey farms located within irrigation corporation districts, based on the

assumption that any discounted charges are entirely passed on to individual irrigators within those regions.

Table 4-8 Components of bulk water charges – ABARE estimates

Valley	Average Year	
	Entitlement	Usage
	%	%
Namoi	56	44
Peel	55	45
Lachlan	40	60
Murray (mixed)	70	30
Murray (dairy)	63	37
Murrumbidgee (mixed)	72	28
Murrumbidgee (grapes)	50	50
Hunter	55	45
Bega	65	35

Source: ABARE Impact of bulk water prices on farm profitability 2006

The continued dry conditions have meant that for many irrigators, the fixed component of the bulk water charge has continued to account for a major part of total water costs because allocations (and consequently water extractions) were significantly lower than average.

4.8 Preferred Price Estimates

Table 4-9 outlines the preferred price estimates for the coming four year term, that are due to be determined/confirmed by IPART in the coming months. The figures suggest significant price increases across a number of river valleys, particularly in relation to high security entitlement and usage charges.

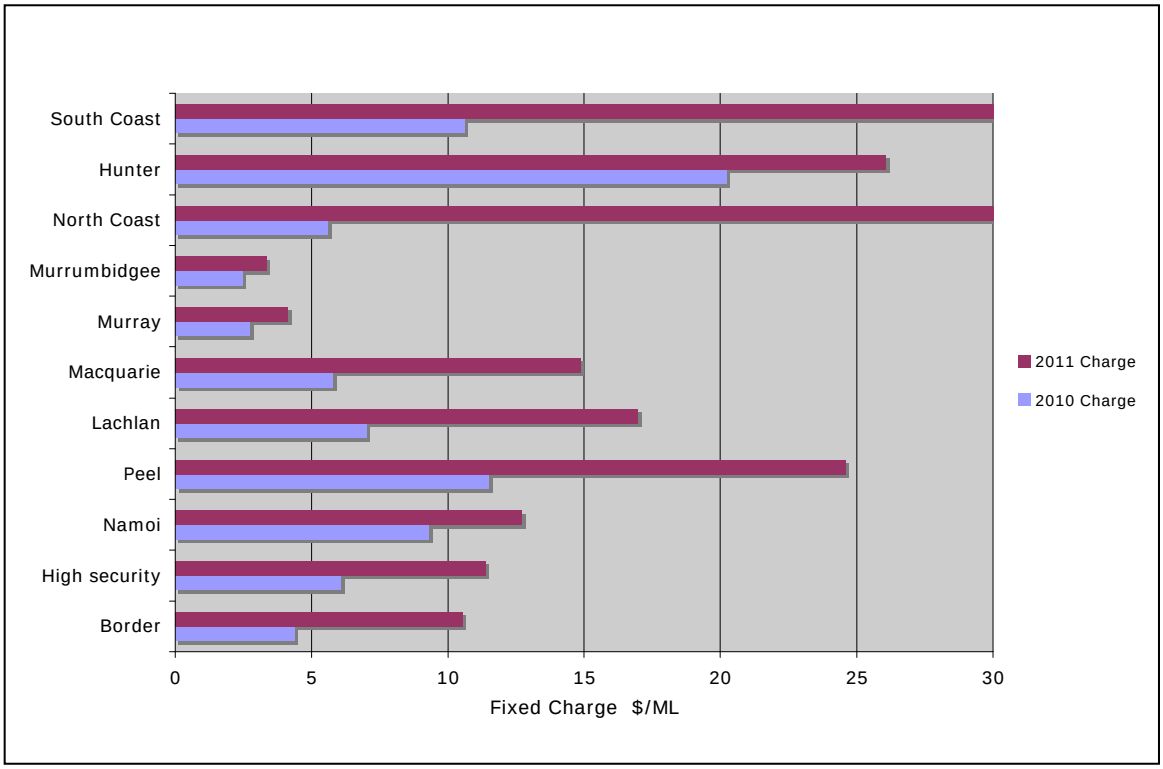
Clearly the price changes are not uniform and vary significantly across the different regions. It appears that general entitlement holds will be faced with limited increases in fixed charges (some decreased charges), in areas apart from the Hunter valley, North Coast and South Coast regions.

Reduced fixed charges for general security entitlement holders (i.e. in the Murray, Murrumbidgee), will reduce the burden on customers faced with severe limitations in water availability and under increasing financial pressure.

Table 4-9 Proposed bulk water charges, State Water Corporation

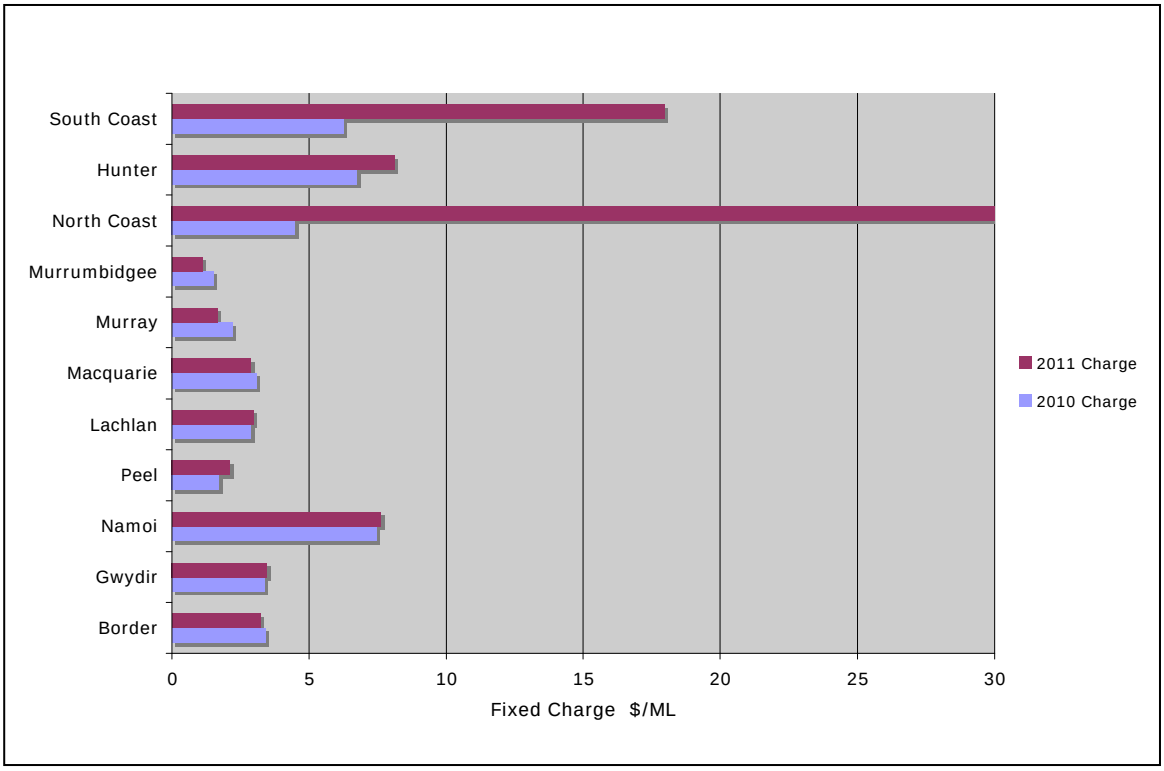
Proposed Water Charges on Regulated Rivers		2009/10	2010/12	2011/12	2012/13	2013/14
High Security Entitlement Charge						
Border	$/ML	4.37	10.57	10.44	10.84	10.36
Gwydir	$/ML	6.08	11.54	11.70	12.17	13.16
Namoi	$/ML	9.31	12.37	13.53	14.01	14.68
Peel	$/ML	11.50	23.72	24.22	24.34	23.37
Lachlan	$/ML	7.02	17.64	17.97	19.35	19.59
Macquarie	$/ML	5.78	14.62	15.12	15.67	16.50
Murray Lower Darling	$/ML	2.75	4.17	4.66	4.91	4.63
Murrumbidgee	$/ML	2.46	3.36	3.48	3.57	3.49
North Coast	$/ML	5.60	75.10	75.89	77.70	75.51
Hunter	$/ML	20.22	26.55	26.56	27.16	26.50
South Coast	$/ML	10.61	46.70	46.57	47.47	46.28
General Security Entitlement Charge						
Border	$/ML	3.41	3.22	3.18	3.30	3.16
Gwydir	$/ML	3.37	3.52	3.57	3.71	4.01
Namoi	$/ML	7.44	7.41	8.10	8.39	8.79
Peel	$/ML	1.71	2.03	2.08	2.09	2.00
Lachlan	$/ML	2.86	3.08	3.14	3.38	3.42
Macquarie	$/ML	3.07	2.83	2.93	3.04	3.20
Murray	$/ML	2.20	1.67	1.87	1.97	1.86
Murrumbidgee	$/ML	1.51	1.12	1.16	1.19	1.16
North Coast	$/ML	4.48	48.77	49.28	50.46	49.03
Hunter	$/ML	6.74	8.25	8.25	8.43	8.23
South Coast	$/ML	6.24	18.46	18.41	18.76	18.29
Usage charges						
Border	$/ML	6.54	8.88	8.77	9.10	8.69
Gwydir	$/ML	8.96	11.11	11.27	11.71	12.67
Namoi	$/ML	12.56	17.62	19.29	19.96	20.92
Peel	$/ML	25.72	62.36	63.68	64.02	61.47
Lachlan	$/ML	10.83	20.01	20.38	21.94	22.22
Macquarie	$/ML	8.47	13.41	13.87	14.37	15.13
Murray	$/ML	4.00	4.90	5.48	5.78	5.45
Murrumbidgee	$/ML	3.54	3.46	3.58	3.67	3.59
North Coast	$/ML	27.84	373.67	377.45	386.16	375.62
Hunter	$/ML	12.28	15.52	15.53	15.88	15.49
South Coast	$/ML	24.96	79.14	78.94	80.45	78.47

Figure 4-1 High Security Entitlement Charge



Source: Data provided by State Water 2009

Figure 4-2 General Security Entitlement Charge



Source: Data provided by State Water 2009

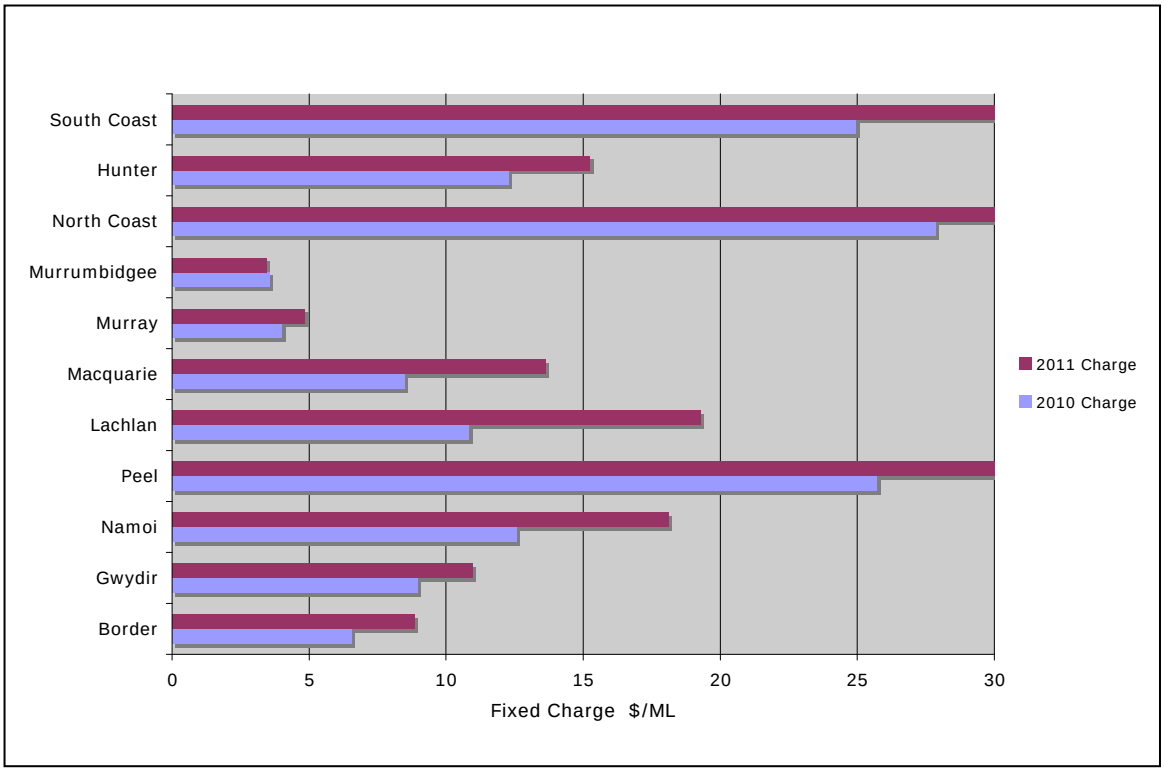


Figure 4-3 Usage Charge

Source: Data provided by State Water 2009

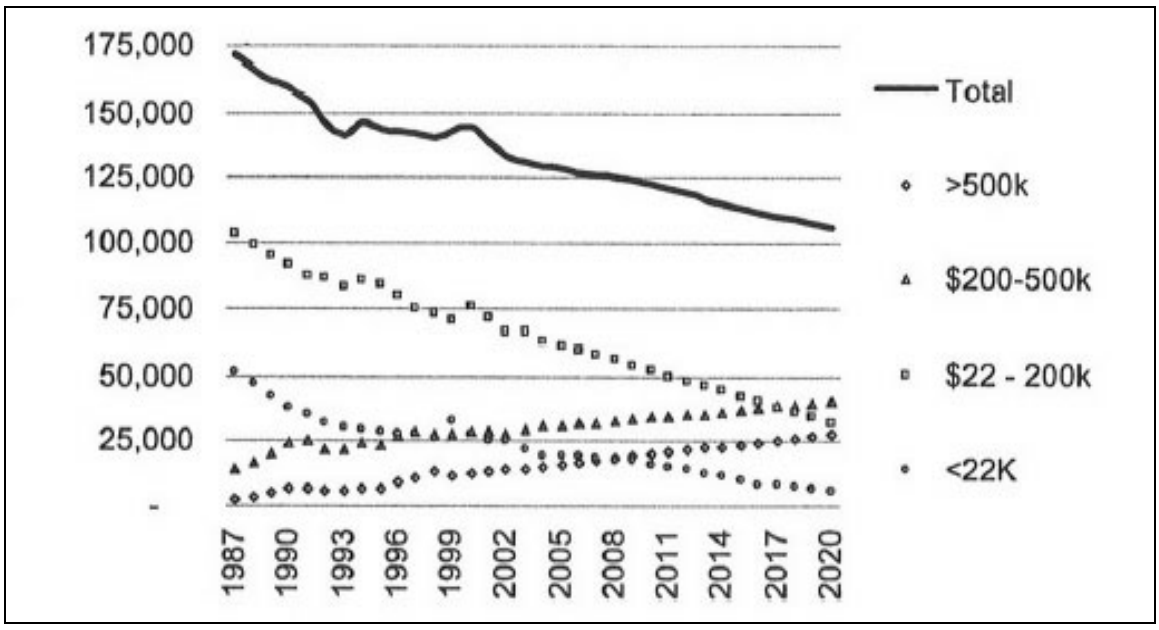
5 Regional & Enterprise Evaluation

5.1 Industry Context

Farm Numbers and Viability

At a national scale the number of farm businesses are in decline. Over the past 15 years the nation has lost around 30,000 farms, refer to Figure 5-1.

Figure 5-1 Farm Numbers by turnover bands



Source: Neil Clarke & Associates, ABS

Based on ABS census data, in 2004 there were approximately 130,000 farm businesses, over 10% fewer than in 1994. If this data is extrapolated out to 2020, there will only be about 100,000 farms remaining in Australia. The data clearly indicates that farms with lower turnover are disappearing, while farms with a turnover of greater than $100,000 are increasing in number.

There are a number of factors driving this consolidation of farm numbers. Some families are facing financial pressures, the optimal size for a farm is increasing and there are also significant entry costs for those wanting to enter into farming.

To survive, some farmers have turned to alternative income sources, such as off farm income (around 45% of farms now generate around 30% of their income off farm – NAB 2005). Many farmers, particularly the larger and smarter operators, have continued to lift productivity. One of the key strategies to increase productivity

is to increase the size of the farm, so that fixed and overhead costs can be spread over a greater level of production.

The trends facing the agriculture industry at a national level (e.g. declining farm numbers, increased turnover, productivity gains) are the same as those facing irrigation businesses across New South Wales.

Irrigation Industry Perspective

The irrigation industry is not isolated from this trend towards the consolidation of farm numbers, a trend that has been enhanced in recent years because of drought and water trading reform.

Previous reports highlight that for 2002-03, '30% of irrigating establishments reported a gross value of agricultural production of less than $25,000. At the other end of the scale, 4% of irrigators reported gross value of irrigated production of $1m or more.'

While these overall industry trends are not directly related to bulk water charges, they do provide some context, drawing attention to some of the changes already occurring in agriculture and more specifically the irrigation sector.

5.2 Water Use & Application Rates

The figures outlined below suggest that overall water use in New South Wales has continued to decrease significantly over the 3-year period of analysis from 2005-06 to 2007-08.

Table 5-1 Water Use & Application Rate, Estimates for NRM Regions

NRM region	Volume Applied ML			Application Rate ML/ha		
	2005-06	2006-07	2007-08	2005-06	2006-07	2007-08
Border Rivers/Gwydir	526,254	292,128	185,435	5.7	5.0	3.0
Central West	209,274	229,846	144,715	4.7	5.0	3.2
Hunter/Central Rivers	124,340	99,894	102,921	3.1	2.5	2.5
Lachlan	221,952	233,713	242,943	3.7	3.9	3.3
Lower Murray/Darling	109,252	85,379	68,138	6.1	4.7	6.1
Murray	1,192,592	366,480	152,066	3.9	2.5	2.6
Murrumbidgee	1,499,684	847,528	453,229	5.3	4.3	3.8
Namoi	434,137	296,223	199,968	4.6	4.5	2.8
Northern Rivers	45,812	46,814	28,604	-	2.3	2.1
Southern Rivers	27,943	31,830	22,037	3.1	3.4	2.4
NSW Total	*4,533,325*	*2,605,019*	*1,677,083*	*4.6*	*3.8*	*3.2*
Australia	*10,737,364*	*7,636,194*	*6,284,799*	*4.2*	*4.0*	*3.4*

Source: ABS Water Use on Australian Farms 2005-06 to 2007-08

Water availability and use has declined significantly over the last couple of years, with allocations reaching historical lows, due to the dry seasonal conditions. These conditions have influenced regional production.

Thus regional productivity is directly related to water use and as a result the impact of price increases have an added impact, as fixed costs/charges remain when usage falls and productivity/profitability will also reduce.

In fact the biggest impact on profitability in periods of reduced water availability (i.e. low allocations) is reduced water use and when put into context, the impact of bulk water charge increases is relatively small. These issues will be explored in more detail in Section 6.

The remaining sections of this chapter go beyond the regional analysis and consider production, water use and profitability at an enterprise level, to help put the change in bulk water charges into perspective.

5.3 Enterprise Analysis

5.3.1 Irrigated Crop Production

The most recent financial survey data collected and analysed by ABARE (for irrigated production) is for the 2006-07 financial year and therefore ABS irrigated crop production statistics have been analysed for the equivalent year, so the data will align and allow appraisal.

Table 5-2 Water Use & Application Rate, Estimates for NRM Regions

NRM region	Dairy		Mixed		Horticulture		Cotton/Rice	
	000 ha	ML	000 ha	ML	000 ha	ML	000 ha	ML
State Water Regions								
Border Rivers/Gwydir	-	-	13	33,038	-	-	44	255,185
Central West	1	5,243	24	85,423	10	20,765	13	116,734
Hunter/Central Rivers	6	20,124	24	57,622	10	21,236	-	-
Lachlan	1	3,881	45	160,361	11	32,875	3	36,423
Lower Murray/Darling	-	-	3	8,914	12	66,515	-	-
Murray	22	78,663	114	222,533	5	27,596	4	37,689
Murrumbidgee	2	8,912	142	435,661	34	169,544	20	233,410
Namoi	-	-	32	86,816	-	-	32	204,688
Northern Rivers	-	-	9	13,958	5	13,924	-	-
Southern Rivers	6	22,757	2	5,856	-	-	-	-
NSW Total	38	139,580	408	1,110,182	87	352,455	116	884,129

Source: ABS Water Use on Australian Farms 2006-07

The analysis above indicates that each crop production categories (dairy, mixed, horticulture, cotton/rice) are all significant in terms of the irrigated production and water use. It should be emphasized that rice plantings and production were at extremely low levels during this period.

Mixed farms include businesses with an emphasis on pasture and crop production systems, generally broadacre irrigation businesses.

Table 5-3 Water Use & Application Rate, Estimates for NRM Regions

Water Use	Dairy	Mixed	Horticulture	Cotton/Rice
Application rate ML/ha	3.67 (3.1 – 4.6)	2.72 (0.9 – 6.2)	4.05 (0.6 – 8.6)	7.62 (5.8–12.5)

Source: ABS Water Use on Australian Farms 2006-07

These enterprise groups will be the focus of analysis, to determine the financial position at both an industry and regional level.

The table below outlines the dominant enterprise groups for each of the river basin/valley regions. These enterprise groups will be examined in relation to the impact assessment in Section 6 of the report.

Table 5-4 Dominant Enterprise Groups

Valley	Dairy	Mixed	Horticulture	Cotton/Rice
Border		✓		✓✓ C
Gwydir		✓		✓✓ C
Namoi		✓✓		✓✓ C
Peel	✓	✓	✓	
Lachlan	✓	✓✓	✓	
Macquarie	✓	✓	✓	
Murrumbidgee	✓	✓✓	✓✓	✓✓ R
Murray	✓✓	✓✓	✓✓	✓✓ R
North Coast		✓	✓	
Hunter	✓	✓	✓	
South Coast	✓	✓		

5.3.2 Financial Performance

General Indicators

It is important to consider some of the key financial indicators for enterprise groups across the major irrigation regions of NSW, to provide an understanding of the business viability at a regional and enterprise level. This financial information will help to provide some perspective, when considering the impact of changes to bulk water charges.

The most recent financial survey data collected and analysed by ABARE (for irrigated production) is for the 2006-07 financial year, with the key financial indicators outlined in tables to follow. ABARE data was collected for the 2004-05 season and was also considered in the impact assessment (Section 6).

The financial performance of all enterprise groups was restricted by severe drought conditions and reduced water allocations across most of southern Australia, leading to a significant reduction in production levels and farm income – this was particularly evident in the 2006-07 financial year.

More recent financial survey data has not yet been made available and given the continued period of drought and restricted water allocations, these financial indicators for 2006-07 are reflective of more recent financial performance across the irrigation industry.

Table 5-5 Financial performance, irrigated broadacre farms 2006-07

Region	Income $	Profit $	ROC %
Murray	38,970	(45,070)	- 0.2
Murrumbidgee	68,400	(32,980)	0.7
Macquarie-Castlereagh	60,500	(55,690)	1.2
Murray-Darling Basin	*62,690*	*(36,390)*	*0.5*

Source: ABARE Irrigation in the MDB, Financial performance in 2006-07

The performance of broadacre farms fell sharply in 2006-07 as severe drought led to a significant reduction in farm production and incomes. As seasonal conditions deteriorated throughout the season, there were widespread crop failures and many grain producers realised below average yields.

Dairy farmers' incomes also fell substantially because of the drought and consequently lower milk production, higher fodder costs, and slightly lower farm-gate milk prices.

Table 5-6 Financial performance, irrigated dairy farms 2006-07

Region	Income $	Profit $	ROC %
Murray	69,080	(32,340)	0.7
Murrumbidgee	15,250	(62,870)	0.3
Murray-Darling Basin	*33,640*	*(55,170)*	*- 0.3*

Source: ABARE Irrigation in the MDB, Financial performance in 2006-07

Results from the Australian dairy industry survey show that dairy farmers have responded to the drought conditions in a variety of ways, such as increasing their use of purchased feeds to replace pasture, and reducing herd sizes. As a result of lower cash receipts and higher cash costs, farm cash income for Australian dairy farmers is estimated to have declined by 60 per cent to average around $33,730 in 2006-07 (Mackinnon 2008).

Like dairy and broadacre producers, incomes for horticulture producers were also affected by drought, reduced water allocations, and frost in some regions. There was a wide variability in financial performance across horticulture farms in regions in 2006-07.

Table 5-7 Financial performance, irrigated horticulture farms 2006-07

Region	Income $	Profit $	ROC %
Murray	50,070	(1,940)	2.3
Murrumbidgee	36,860	(15,150)	0.9
Macquarie-Castlereagh	(61,680)	(126,800)	- 2.2
Murray-Darling Basin	*54,760*	*(1,920)*	*1.8*

Source: ABARE Irrigation in the MDB, Financial performance in 2006-07

It is also useful to consider the average financial performance across some of the main irrigation regions of NSW (refer to Table 5-8). These figures help to provide a regional overview that is not specific to enterprise groups.

Table 5-8 Financial performance, average irrigation farms 2006-07

Region	Income $	Profit $	ROC %	Equity %
Murray	69,286	(1,002)	1.8	82

Murrumbidgee	60,284	(27,780)	0.8	82
Lachlan	(105,592)	(93,737)	- 0.6	85
Macquarie-Castlereagh	(24,509)	(129,150)	- 1.0	87
Namoi	181,160	104,914	3.5	83
Border Rivers	207,186	112,504	5.1	64

Source: ABARE Irrigation in the MDB, Financial performance in 2006-07

Although more recent financial data for irrigation farms in the Murray-Darling Basin are not yet available, it is more than likely overall farm financial performance would have remained weak. The irrigation industry has been affected by some of the driest seasons on record. In most regions (serviced by State Water), irrigation water allocations were lower in 2007-08 than in 2006-07, with many licence holders in many regions receiving record low allocations (depending on the source of water supply and type of licence).

Although individual businesses each respond differently, generally in more normal years (with closer to average water allocations and improved seasonal conditions), productivity would be substantially higher with increased income levels and improved profitability across all enterprise groups.

The results indicate that income levels are particularly low in the Lachlan and Macquarie regions and generally profitability is weak in all regions apart from the Border Rivers and Namoi region.

Business Income/Equity Levels

To gain a greater insight into the financial performance of irrigation farms in each region it is important to income and equity levels, with farms allocated to one of four groups, based on income and equity level.

Table 5-9 Percentage of irrigation farms by income/equity group, 2006-07

Region	low income/ low equity	low income/ high equity	high income/ low equity	high income/ high equity
	%	%	%	%
Murray	32	33	15	21
Murrumbidgee	24	28	21	26
Lachlan	26	22	37	15
Macquarie-Castlereagh	23	27	18	32
Namoi	33	42	14	12
Border Rivers	28	18	20	34
Murray-Darling Basin	*28*	*33*	*17*	*23*

Source: ABARE Irrigation in the MDB, A Farm Level Analysis 2006-07

Generally, farms in the low income/low equity group are likely to be facing the greatest financial pressures, often because of large farm business debts and poor debt servicing ability. The report also highlights that 'many of these farm businesses were supported by off-farm income in 2006-07'.

Farms in the high income/high equity group had strong cash flows and relatively high profits and rates of return in 2006-07. Many producers in each group made significant investments in new capital during 2006-07, including land purchases and new irrigation infrastructure.

The analysis helps to identify the proportion of farms that would be facing the greatest financial pressure, it is these farms that could be most effected by increasing bulk water charges.

Water Cost Component

The figures below (Table 5-10) consider water costs as a proportion of total cash costs, an important component in the consideration of bulk water charges. These figures explore total water costs, which incorporate the bulk water charges, temporary water purchases and additional water charges levied by the regional irrigation corporation.

This information has been gathered from financial survey data, collected by ABARE that has been aggregated at both a regional and industry level.

Table 5-10 Water cost estimates, 2006-07

Region	Water costs/total costs (%)		
	Dairy	Broadacre	Horticulture
Macquarie-Castlereagh		5	< 1
Murrumbidgee	11.5	14.5	4
Murray	10.5	7.5	10.5

Source: ABARE An economic survey of Irrigation Farms in the Murray-Darling Basin 2008

Irrigation water costs for the Murray and Murrumbidgee comprised around 10-15 per cent of total cash costs. Although a large proportion of customers in both of these regions are part of the regional irrigation corporation, therefore water costs include the additional water related charges levied by the corporation on irrigators. This would partly explain the relatively high water costs in the Murray and Murrumbidgee valleys.

Table 5-11 Water cost estimates, 2006-07

Region	Water costs/total costs (%)
	All industries
Border Rivers	4
Namoi	1

Lachlan	2.5

Source: ABARE An economic survey of Irrigation Farms in the Murray-Darling Basin 2008

It should be stressed that these costs estimates could be misleading and should be interpreted with care, as the analysis does not exclude dryland enterprise included within the farm system.

It is important to consider the magnitude and impact of these costs on farm income and profitability, and to explore how they might be influenced by a changes in bulk water charges.

5.3.3 Water Trading

Regional comparisons of selected farm performance estimates for net buyers, net sellers and non-traders are shown in Table 5-12. There is limited information available on water trading, for other regions – apart from the Murray and Murrumbidgee.

Reflecting their larger irrigation areas, net buyers in all regions applied much larger total volumes of water to crops and pasture than non-traders and net sellers. Based on figures outlined in 'ABARE Farms trading temporary water 2006-07', net buyers in the Murray and Murrumbidgee recorded the highest average total cash receipts and cash costs, while net sellers had the lowest cash receipts and costs. However for farm business profit, the net sellers group recorded the highest values.

It is important to consider some of the characteristics of temporary water traders, to explore any key trends and examine the role of the water market and its influence on financial viability.

Table 5-12 Temporary Water Traders 2006-07

Region	Net volume	Area irrigated	Water applied	Application rate	Entitlement held
	ML	ha	ML	ML/ha	ML
Net water buyers					
Murrumbidgee	460	311	1,163	3.7	1,970
Murray	240	98	512	5.2	588
Net water sellers					
Murrumbidgee	-92	39	204	5.2	489
Murray	-82	43	190	4.3	465
Non-water traders					
Murrumbidgee	N/A	116	425	3.7	1,355

Murray	N/A	75	253	3.4	413

Source: ABARE Farms trading temporary water 2006-07

6 Business Impact Assessment

6.1 Introduction

The impact assessment outlines the direct customer impact by considering a number of important indicators that are directly influenced by bulk water charges. There are a number of different ways that bulk water charges can be considered, these outlined and explained below:

Gross cost per valley ($) and *Cost per ML ($ML)* – provides an understanding of the magnitude of any increase/decrease at an industry and regional level.

Gross cost per business ($/business) – provides an understanding of the magnitude of any increase/decrease and therefore an indication the impact at the farm level, i.e. could it be considered serious or just pocket money.

Relative to water charges – how important are bulk water charges as a component of total water charges. However there is a need to consider all costs associated with water, which can be difficult to do with accuracy.

Return on capital – is generally a ratio that indicates the efficiency and profitability of a business, the impact therefore considers the potential threat to the viability of the business.

Relative to other cost increases – is the increase in cost out of proportion with other cost increases or is it simply in line with other cost increases over time (e.g. consider CPI comparison).

Other industry influences – are there more important considerations for these businesses e.g. severe drought condition that will overshadow these impacts.

Value of water – is the resource becoming more valuable as an asset and the change is a relatively small offset i.e. how does the water trading fit into this.

It is important to consider these factors and avail of the best possible information to allow appropriate:

- Regional/valley comparison
- Scale and size of business
- Enterprise comparison

The analysis provides valuable information to be considered in the determination of future bulk water charges and allows an insight into the impact on State Water customers.

6.2 Regional Comparison

6.2.1 Overall Impact

The section to follow outlines the overall regional impact, by considering the *gross cost per valley* and the *dollar cost per ML of water usage* (based on proposed consumption forecasts). The figures documented in Table 6-1 provide an estimate of the overall impact at a regional level. The analysis has been based on proposed consumption forecasts provided from State Water Corporation.

The table shows the gross revenue to be derived from each valley, along with the gross dollar impact of the proposed price changes. The cost per ML has been determined, based on the approximate business numbers for each region.

Table 6-1 Regional impact of change to bulk water charges

Valley	Gross $ revenue	Gross $ impact	Increase	Total cost/ML usage	Cost/ML usage impact
	$/region	$/region	%	$/ML	$/ML
Border	$2,184,399	$500,589	23%	$12.2 - $18.3	$2.8 – $4.2
Gwydir	$5,251,711	$1,506,222	29%	$15.9 - $23.8	$4.6 - $6.8
Namoi	$5,623,823	$1,962,471	35%	$27.5 - $41.3	$9.6 - $14.4
Peel	$1,279,728	$743,930	58%	$93.4 - $140.1	$54.2 - $81.4
Macquarie	$6,448,638	$2,393,947	37%	$19.9 - $29.9	$7.4 – $11.1
Hunter	$4,940,869	$1,710,588	35%	$31.8 - $47.66	$11.0 - $16.5
Lachlan	$7,621,323	$3,087,050	41%	$28.0 – $42.1	$11.4 – 17.0
Murrumbidgee	$10,293,369	$513,700	-5%	$4.9 - $7.4	$0.25 – $0.37
Murray	$12,398,973	$1,023,266	8%	$7.4 - $11.1	$0.61 – $0.92
North Coast	$800,189	$718,354	90%	$736 - $1,104	$661 – $991
South Coast	$739,914	$520,301	70%	$159 - $106	$75 – $112
Total	$57,582,935	$13,653,018	24%	$11.0 - $16.5	$2.6 – $3.9

Source: State Water 2009, Based on proposed consumption forecasts

The analysis highlights the gross dollar impact for each valley and could be considered relatively small, when considering the gross value of irrigated agricultural production in NSW is generally more than $2,500 million annually.

Based on these figures the total revenue derived from bulk water charges will increase by 0.55% to approximately 2.3% of the value of irrigated agricultural production. In this regard, the proposed change in bulk water charges could be considered inconsequential in relation to regional output.

However the increase represents a significant annual increase in bulk water charges and the implications vary significantly between valleys and for individual customers.

The figures suggest that the proposed increase in bulk water charges would translate to an annual increase in revenue of approximately 24% in total, a substantial annual change in comparison to average inflation rates (i.e. 3.2% inflation on average, over the past 20-years).

From a regional perspective the analysis indicates the impact is slightly positive for the Murrumbidgee region and very low for the Murray region, the two most significant regions for State Water in terms of water delivery and revenue. The impact for customers in the North Coast, South Coast and Peel valley is particularly significant in terms of the *cost per ML* of water delivered (based on proposed consumption forecasts).

The data clearly shows that the regions that have low annual water deliveries (refer to Section 4, Table 4-5) will experience the most significant increase in bulk water charges, based on the proposed changes. This relationship (i.e. between water deliveries and change in bulk water charges) is generally reflected across all valleys, with the most significant regions in terms of water delivered to face the smallest increase in bulk charges.

The variation between the different valley regions both in terms of *percentage change to bulk charges* and the *cost per ML of usage* is significant. In regard to the *cost per ML of water usage*, the figures are influenced by the proposed consumption forecasts (that are at historically low levels).

The analysis indicates that the valley regions can be generally segmented into three groups, in terms of the level of impact (i.e. high, moderate and low).

- **High** - North Coast, South Coast and Peel valley (> 50% increase in bulk charges, $/ML cost of over $80/ML)
- **Moderate** – Hunter, Namoi, Lachlan, Macquarie, Border & Gwydir (approx 20-40% increase in bulk charges, $/ML cost of between $10 and $50)
- **Low** - Murray & Murrumbidgee (< 10% increase in bulk charges, along with low $/ML cost of less than $15/ML)

These groups will be explored further in the analysis that follows.

6.2.2 Financial Analysis & Impact

The financial evaluation outlined in Table 6-2 & Table 6-3 considers the impact that proposed changes to bulk water charges will have on:

- gross cost per business
- bulk water charges as a proportion of total water costs

– return on capital

The *gross cost per business* (Table 6-2) helps to provide comparison between the financial impact across each region (i.e. in term of gross dollars). These estimates are based on data provided by State Water data and estimates of approximate business numbers within each region. It should be emphasised that a limited amount of data was available to allow verification of the number of irrigation businesses at a regional level.

The analysis considers the average costs to businesses both outside and within the very significant irrigation corporation areas across NSW. IPART do not determine retail charges within the irrigation corporation areas and State Water bulk water charges are only approximately 20% of the total bulk water costs within the irrigation corporation areas.

While facing higher charges, bulk water customers within these areas have a significant relative advantage, with limited energy costs for water delivery (i.e. associated pumping costs).

Table 6-2 Financial impact of change to bulk water charges

Valley & Impact	Gross average cost/business	Average cost/ business impact	Average size
	$/business	$/business	Entitlement (ML)
Low impact			
Murrumbidgee	10,500 – 18,000	↓ 500 – 1,000	622
Murray	8,250 – 14,000	↑ 750 – 1,250	295
Moderate impact			
Hunter	5,500 – 9,000	↑ 2,000 – 3,250	204
Macquarie	9,000 – 15,000	↑ 3,250 – 5,500	1,388
Lachlan	8,500 – 15,000	↑ 3,500 – 6,000	979
Gwydir	15,500 – 26,000*	↑ 4,500 – 7,500	2,621
Namoi	18,000 – 30,000	↑ 6,000 – 10,500	1,021
Border	25,000 – 45,000*	↑ 6,000 – 10,500	4,353
High impact			
Peel	6,500 – 11,000	↑ 4,000 – 6,500	201
South Coast	10,500 – 18,000	↑ 7,500 – 12,500	256
North Coast	12,000 – 20,000	↑ 11,500 – 19,250	209
Total	9,500 – 16,000	↑ 2,250 – 3,750	800

Source: State Water 2009, Estimated figures based on entitlements.

Note: *The values determined for the Border and Gwydir regions are influenced by a small number of very large irrigation businesses. The estimates of *average business size* have been calculated with consideration for general security holders only and provide a guide only.

When taking these values into consideration (i.e. Table 6-2, *gross cost per business*) is important to consider the variation in business size between the different valleys. Business size has been highlighted in terms of entitlement size (these figures are estimates only and provide a guide only, although do provide an understanding relative size between regions).

The table has been segmented according to the level of impact (i.e. high, moderate and low), as discussed in the previous section. The *gross cost per business* is relatively high for a number of regions/valleys that are identified within the moderate impact segment (i.e. Gwydir, Namoi and Border valleys), however these figures are influenced by the average size of businesses in these regions.

A number of financial indicators outlined in Table 6-3, provide comparison between the financial impact across most valleys and provides some perspective of this impact (i.e. in term of return on capital). These estimates are based on ABARE/ABS data, however the Border, Gwydir and North Coast regions could not be analysed due to limited available financial data.

The analysis is based on the average price data over a four-year term (i.e. 2007-2010 based on actual IPART charges, 2011-2014 based on indicative prices received from State Water). The regions have been categorised in terms of the level/significance of the financial impact (i.e. high, medium, low), according to *change in return on capital*.

The *total water charges as a percentage of total costs,* provides some understanding of the variation in relative costs between regions. However water charges are difficult to analyse with accuracy and costs would be underestimated in some regions (e.g. South Coast).

Table 6-3 Financial impact of change to bulk water charges

Valley & Impact	Total water charges/ total cash costs	△ Bulk charges /total cash cost	△ Return on capital (ROC)
	%	%	%
Low			
Murrumbidgee	4.1% – 11.3%	↑ 0.11% - 0.22%	↓ 0.01% - 0.03%
Murray	10.1% – 16.3%	↑ 0.11% - 0.22%	↓ 0.02% - 0.02%
Moderate			
Lachlan	2.2%	↑ 0.09%	↓ 0.01%
Hunter	2.9%	↑ 0.78%	↓ 0.11%
Macquarie	5.9%	↑ 0.79%	↓ 0.10%

Namoi	5.8%	↑ **2.51%**	↓ **0.32%**
High			
South Coast	3.8%	↑ **2.05%**	↓ **0.48%**
Peel	8.3%	↑ **4.95%**	↓ **0.55%**

Source: Based on ABARE, ABS data & industry estimates, RMCG 2009

Note: Due to limited ABARE data, a financial profile could not be established for the Border, Gwydir and North Coast regions.

The analysis suggests that the *change in bulk water costs as a percentage of total costs* were relatively small in many regions (i.e. the low and moderate groups). As a result, the financial impact is relatively small, with the proposed change in charges bringing about a slightly positive result for many general security customers in Murray and Murrumbidgee regions.

In terms of the valleys in the low/moderate segments (i.e. apart from the Namoi valley, with a 0.32% change in ROC), the analysis demonstrates that bulk water costs are not a major factor in determining profitability. The evaluation generally indicates that for most valleys the price changes will have a relatively small impact on income and profitability, however it should be emphasised that a small proportion of customers in these regions could be faced with a significant cost increase.

However it should be highlighted that the South Coast and Peel valleys do face a significant impact that will influence profitability (i.e. change in return on capital of approximately 0.5%). It is interesting to consider that for many businesses a 0.5% change in return on capital, might be equivalent to a 0.5% change in interest rates to the farmer.

It could also be assumed that businesses in the North Coast region would face a significant financial impact, that would be more severe than both the South Coast and Peel valleys (based on the likely business profile for the region and the price increase proposed).

The assessment also indicates that businesses in the Namoi valley could face a reduction in return on capital of 0.32% (somewhat more significant than other valleys within the moderate impact group), this shift in profitability is influenced by the scale of businesses in the region and level of water use.

The exact impact on any one customer will depend on the customer's extraction rate relative to the valley average, and on the extent to which the customer responds to the price signals provided through the increased reliance on usage charges. The impact on customers' bills varies between valleys because of existing differences between the proportion of revenue collected by the fixed charge versus the variable usage charge, because of differences in valley extraction rates, and because of differences in the cost of service delivery between valleys.

The regions facing the most significant impact due to the proposed price changes are relatively small in terms of business numbers and total water usage. These high impact regions (i.e. North Coast, South Coast and Peel valleys), will face a significant increase in the cost of water should full cost recovery be implemented.

It should be noted that in the past IPART (2006 Water Report), has 'balanced the requirement to move prices towards cost reflective levels against the impacts on customers'. The Tribunal found that in 'some valleys full cost recovery could not be achieved without substantial increases in tariffs that would have a damaging impact on users'. In these cases the Tribunal has decided to limit increases. In some instances (i.e. North Coast, South Coast and Peel), the Tribunal considers that cost reflectivity will never be achieved.

6.3 Business Size

Additional analysis has been undertaken to examine the impact of changes to bulk water charges, with regard for business size/scale (Table 6-4). The high impact valleys (i.e. South Coast, Peel and North Coast) were considered in this analysis, along with the Namoi region (included due to the significant change in return on capital of 0.32%).

Table 6-4 Impact of change to bulk water charges

Valley	Small Farms bottom 25%	Average cost per business	Large Farms top 25%
Namoi			
Business numbers	**90-100**	**180-200**	**90-100**
Cost per business	< 1,000	6,000 – 10,500	> 24,000
South Coast			
Business numbers	**10-15**	**20-30**	**10-15**
Cost per business	< 3,500	6,000 – 10,000	> 18,000
Peel			
Business numbers	**35-40**	**70-80**	**35-40**
Cost per business	<1,500	4,000 – 6,500	> 9,500
North Coast			
Business numbers	**10-15**	**20-30**	**10-15**
Cost per business	< 5,750	11,500 – 19,250	> 30,000

Source: State Water 2009, Based on proposed consumption forecasts

Due to limited data availability, the evaluation to consider business scale/size has proved difficult and the results should be viewed with caution. It is difficult to accurately determine the number of bulk water users in each region, particularly in relative scale/size categories (i.e. small, medium, large).

The analysis has been completed to consider the *average cost per business*, for small, medium and large farms in the Namoi, South Coast, Peel and North Coast regions (i.e. the valleys faced with the most significant financial impact).

The financial impact on customers is relative to business size. This particular analysis (Table 6-4) is focused on the *cost per business* and highlights the variation in relation to business scale/size. However the limited amount of financial data has made it impossible to accurately determine the impact *relative to costs* and *return on capital* (i.e. in relation to business size/scale).

The assessment highlights that a relatively small proportion of customers will be faced significant price increases that ultimately will a financial impact on the business (i.e. increasing costs and reducing return on capital).

6.4 Enterprise Comparison

Table 6-5 outlines the impact assessment for the major enterprise groups. The analysis was based on the same data and price assumptions as used in the regional evaluation.

Table 6-5 Financial impact of change to bulk water charges

Enterprise	Total water charges/ total cash costs	△ Bulk charges /total cash cost	△ Return on capital (ROC)
	%	%	%
Dairy	2.9% - 11.3%	↑ 2.05% - 0.03%	↓ 0.48% - 0.01%
Mixed	2.2% - 16.3%	↑ 4.95% - 0.22%	↓ 0.55% – 0.03%
Horticulture	4.1% - 10.8%	↑ 0.23% - 0.11%	↓ 0.04% - 0.01%
Cotton	3.4% - 5.8%	↑ 2.51% - 1.08%	↓ 0.32% - 0.14%
Rice	10.6% - 13.4%	↓ 0.11% - 0.66%	↑ 0.01% - 0.09%

Source: Based on ABARE, ABS data & industry estimates, RMCG 2009

The results of the enterprise analysis (Table 6-5) must be considered with some care, as the results are influenced by the regional price changes.

The impact from an enterprise perspective will be generally small, with the customer impact influenced by the regional location and price change, rather than any direct association with enterprise type. The analysis shows that the financial indicators vary within each enterprise group, with no obvious trends that are unique to a particular enterprise group.

It terms of direct enterprise/industry impact, it should be highlighted that there is high concentration of dairy producers in the South Coast region, where customers will face significant increases in bulk water charges that will influence profitability, should full cost recovery be implemented.

6.5 Potential Impacts to Customers

As a result of these proposed price changes, bulk water costs will increase for most State Water customers and for many bulk water users the proposed prices represent a significant increase in bulk water costs.

The impact on individual customers will vary due to:

- Price change, based on the specific region/valley
- Type of water entitlement (high security or general security)
- Level of water usage

The proposed prices allow a shift in the fixed to variable price ratio and in most valleys, a larger proportion of revenue will be derived from the variable component charge (given the assumed consumption forecasts provided by State Water, that influence the revenue derived from usage charges).

There is the potential that customers will respond to price signals i.e. through the increased variable charge, although in most cases it is unlikely that the magnitude of the change will stimulate such a response. While it is unlikely that such a change would translate to reduced consumption, it may encourage slightly more efficient practices.

Fixed Charge

The impact of increasing the fixed component of bulk water charges will be a reduction in farm income, equivalent to the increased charge multiplied by the water entitlement. These charges apply irrespective of actual allocations received or water used.

Volumetric/Usage Charge

In areas where there is excess demand for water and allocations can be freely traded, the impact of an increase in the volumetric/usage component of the bulk water charge will depend on water allocations and the ability to trade in the water market.

The impact on businesses that do not trade water will be a reduction in farm income equivalent to the increased charge multiplied by the volume of water used. The impact on irrigators who regularly trade water is a little more complex (*Impact of bulk water prices on farm profitability*, ABARE Report 2006.

Buyers

- Increasing charges will be reflected in increased costs for water used as part of their allocation, but they will have no impact on the total cost of water they purchase in the market.
- There will be no change in the total cost of water purchased because the higher bulk water charge will be offset by a corresponding reduction in the price of temporary allocations (Beare and Heaney 2002).

Sellers

- The impact of increasing charges will be twofold. First, there will be an increase in costs for that component of their allocation that they use, and second, there will be a reduction in income due to the lower price received for water they sell.

Water trading is an important issue for individual customers and higher bulk water costs may influence the decision making process, in terms of whether irrigators trade water. However from a broader perspective, ultimately the additional costs associated with increased bulk charges will be incurred within the industry/region.

While the overall financial impacts for the majority of customers will be relatively small, there are significant differences across river valleys and industries, and across individual farms within each region.

6.6 Other Influences

Drought Impact

Water availability and usage has declined significantly over the last couple of years, with allocations reaching historical lows, as dry seasonal conditions continue. These conditions have influenced regional production and profitability.

Overall regional productivity is directly related to water use and as a result the impact of further price increases will have an added effect, as fixed costs/charges remain when usage falls and productivity/profitability is reduced.

In fact the biggest impact on profitability in periods of reduced water availability (i.e. low allocations) is reduced water use and when put into context, the impact of bulk water charge increases is relatively small. However for some businesses that are already facing financial pressure, these proposed price increases could have a significant impact and provide an additional burden, in an already difficult period.

Value of Water

Although the value of water in the long-term is likely to vary according to seasonal conditions and water availability, generally water resources are continuing to become more valuable as an asset. Proposed changes to bulk water charges are relatively small in this context and could ultimately be offset in most circumstances, by the increasing value of water as an asset.

Although difficult/impossible to measure, it can also be argued that with improved differentiation, along with a more consistent, robust and defined pricing system, the value of the underlying asset as a tradable commodity with increase. However for individual customers, this value may be difficult to realise or even recognise.

7 Key Findings

Overall Impact

Industry Significance

The gross dollar impact for each valley could be considered relatively small, when considering the gross value of irrigated agricultural production in NSW is generally more than $2,500 million annually.

The total revenue derived from bulk water charges will increase by 0.55% to approximately 2.3% of the value of irrigated agricultural production. In this regard, bulk water charges could be considered inconsequential in relation to regional output.

However the proposed price change represents a significant annual increase in bulk water charges, that translate to an annual increase in revenue of over 20% in total, a substantial annual change in comparison to average inflation rates (i.e. 3.2% inflation on average, over the past 20-years).

Regional Comparison

The impact assessment indicates that the valley regions can be generally segmented into three groups, in terms of impact level (i.e. high, moderate and low).

- **High** - North Coast, South Coast and Peel valley
- **Moderate** – Hunter, Namoi, Lachlan, Macquarie, Border & Gwydir
- **Low** - Murray & Murrumbidgee

The regional impact is slightly positive for the Murrumbidgee region and very low for the Murray region, the two most significant regions for State Water in terms of water delivery and revenue. The impact for customers in the North Coast, South Coast and Peel valley is particularly significant in terms of the *cost per ML* of water delivered (based on proposed consumption forecasts).

The variation between the different valley regions both in terms of *percentage change to bulk charges* and the *cost per ML of usage* is significant.

Financial Impact

Cost Impacts

The valley regions are again segmented according to the level of impact (i.e. high, moderate and low), as discussed in the previous section. The *gross cost per business* is relatively high for a number of regions/valleys that are identified within

the moderate impact segment (i.e. Gwydir, Namoi and Border valleys), however these figures are influenced by the average size of businesses in these regions.

The *total water charges as a percentage of total costs,* provides some understanding of the variation in relative costs between regions. However water charges are difficult to analyse with accuracy and costs would be underestimated in some regions.

The analysis suggests that the *change in bulk water costs as a percentage of total costs* were relatively small in many regions (i.e. the low and moderate groups). As a result, the financial impact is relatively small, with the proposed change in charges bringing about a slightly positive result for many general security customers in Murray and Murrumbidgee regions.

Profitability, Return on Capital

The assessment highlights that in most regions, bulk water costs are not a major factor in determining profitability. The evaluation generally indicates that for most valleys the price changes will have a relatively small impact on income and profitability, however it should be emphasised that a small proportion of customers in these regions could be faced with a significant cost increase.

However it must be emphasised that the South Coast and Peel valleys do face a significant impact that will influence profitability. It can also be assumed that businesses in the North Coast region will face a significant financial impact.

The assessment also indicates that businesses in the Namoi valley could face a reduction in return on capital of 0.32% (somewhat more significant than other valleys within the moderate impact group), this shift in profitability is influenced by the scale of businesses in the region and level of water use.

Business Size

The range of impacts on customers, are relative to business size. The evaluation has been completed to consider the *average cost per business*, for small, medium and large farms in the Namoi, South Coast, Peel and North Coast regions (i.e. the valleys faced with the most significant financial impact).

The financial impact on customers is relative to business size. The analysis highlights the variation in terms of *cost per business* in relation to business scale/size. However the limited amount of financial data has made it impossible to accurately determine the impact of size in relation to other financial indicators (e.g. *relative to total costs* or *return on capital*).

The assessment highlights that a relatively small proportion of customers will be faced significant price increases that ultimately will have a financial impact on the business (i.e. increasing costs and reducing return on capital).

Enterprise Comparison

The impact from an enterprise perspective will be generally small, with the customer impact influenced by the regional location and price change, rather than any direct association with enterprise type. The analysis shows that the financial indicators vary within each enterprise group, with no obvious trends that are unique to a particular enterprise group.

It terms of direct enterprise/industry impact, it should be highlighted that there is high concentration of dairy producers in the South Coast region, where customers will face significant increases in bulk water charges that will influence profitability, should full cost recovery be implemented.

Other Relevant Issues

Water Markets

Water trading is an important issue for individual customers and higher bulk water costs may influence the decision making process, in terms of whether irrigators trade water. However from a broader perspective, ultimately the additional costs associated with increased bulk charges will be incurred within the industry/region.

Drought Impact

Overall regional productivity is directly related to water use and as a result the impact of further price increases will have an added effect, as fixed costs/charges remain when usage falls and productivity/profitability is reduced.

In fact the biggest impact on profitability in periods of reduced water availability, is reduced water use and when put into context, the impact of bulk water charge increases is relatively small. However for some businesses that are already facing financial pressure, these proposed price increases could have a significant impact and provide an additional burden, in an already difficult period.

Value of Water

The value of water in the long-term is likely to vary according to seasonal conditions and water availability, although generally water resources are continuing to become more valuable as an asset. Proposed changes to bulk water charges are relatively small in this context and could ultimately be offset in most circumstances, by the increasing value of water as an asset.

Although difficult/impossible to measure, it can also be argued that with improved differentiation, along with a more consistent, robust and defined pricing system, the value of the underlying asset as a tradable commodity with increase. However for individual customers, this value may be difficult to realise or even recognise.

General Conclusions

The regions facing the most significant impact due to the proposed price changes are relatively small in terms of business numbers and total water usage. These high impact regions (i.e. North Coast, South Coast and Peel valleys), will face a significant increase in the cost/affordability of water should full cost recovery be implemented.

A relatively small proportion of customers will be faced significant price increases that ultimately will have a financial impact on the business (i.e. increasing costs and reducing profitability). Reduced profitability will reduce on-farm investment, i.e. not only reduced irrigation investment, but also business expansion.

While the overall financial impacts for the majority of customers will be relatively small and is part of the strategy of cost recovery, there are significant differences across river valleys and industries, and across individual farms within each region.

There is the potential that customers will respond to price signals i.e. through the increased variable charge, although in most cases it is unlikely that the magnitude of the change will stimulate such a response. While it is unlikely that such a change would translate to reduced consumption, it may encourage slightly more efficient practices.

Appendix 1 Irrigation Infrastructure

Technology Use

Choice of technology is largely determined by crop requirement, source of water (e.g. groundwater or surface water), infrastructure costs and expected returns. Table 1 and 2 do indicate the extent to which irrigators have pursued operational efficiencies in response to water scarcity.

Broad scale enterprises, such as rice, cotton, and pasture, require technology that will apply large volumes of water across relatively large areas. Such application methods include flood/furrow, overhead fixed sprinklers, low throw fixed sprinklers, travelling irrigators and moveable spray lines.

Intensive enterprises, such as most horticultural applications, allow technologies which apply water to specific points, such as plant root zone, over relatively small areas. Such application methods include microjet fixed sprinklers, or drip/trickle systems, although broad scale technologies may also be used for horticultural enterprises.

In 2006-07, an estimated 69% of irrigation water used in the Murray-Darling Basin was applied using flood/furrow systems, with a further 13% of water applied using drip/ trickle systems (Table 1).

Table 1 Percentage of water applied, application method by industry

Region	Dairy	Broadacre	Horticulture	Murray-Darling Basin
	%	%	%	%
Flood/furrow	89	93	9	69
Overhead sprinkler	2	-	8	3
Low throw sprinkler	-	1	24	7
Microjet sprinkler	-	-	5	1
Drip/trickle	-	1	46	13
Travelling irrigators	5	5	5	5
Moveable spray lines	2	1	1	1
Other	2	0	1	1

Source: ABARE Irrigation in the MDB, A Farm Level Analysis 2006-07

Table 2 Business investment plans

Change - next three years	Dairy	Broadacre	Horticulture	Murray Darling
	%	%	%	%
Install reuse system	10	7	1	4

△ Application method	17	8	25	18
No change	28	40	40	38

Source: ABARE Irrigation in the MDB, An Economic Survey 2006-07

On-farm Investment

Despite relatively low average incomes, an estimated ten per cent of irrigation farms in the Murray-Darling Basin made capital investments during 2006-07.

Based on the analysis by ABARE, the dominant strategy for broadacre farms (and to a lesser extent dairy farms), was expansion in the scale by purchasing additional land. For horticulture producers, the dominant strategy appears to have been investment in improving on-farm irrigation infrastructure. Relatively high profitability in the horticulture industry and high security water allocations, appear to have been important factors influencing this investment pattern.

A farmer's motivation for investment is influenced by factors which affect net returns from the alternative options available to improve productivity. In making investment choices, a farmer would most likely invest in those activities which offer the greatest capacity to contribute to productivity improvements and, hence, farm profitability.

Some irrigation investments, such as installing drip irrigation systems, involve large and irreversible capital investments where the returns are generated over many years. However, uncertainty regarding the returns or benefits arising from such investments, can be significant.

Changes in irrigation management practices, such as monitoring water needs and scheduling watering, can also lead to gains in water use efficiency. Implementing such changes is often cheaper than making investments in irrigation infrastructure. As a consequence, some businesses implement changes to management practices before making large infrastructure investments.