SunWater Price Regulation

REVIEW OF SELECTED ANNUITY VALUES FOR REFURBISHMENT AND REPLACEMENT ITEMS - ADDENDUM

- Final
- 3 April 2012

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SINCLAIR KNIGHT MERZ

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SINCLAIR KNIGHT MERZ

Limitation Statement

The sole purpose of this report and the associated services performed by Sinclair Knight Merz Pty Ltd (SKM) is to assist the Queensland Competition Authority (the Authority) in its review of renewable expenditure of SunWater Corporation (SunWater) in accordance with the scope of services set out in the contract between SKM and the Authority. That scope of services, as described in this report, was developed with the Authority.

In preparing this report, SKM has relied upon, and presumed accurate, any information (or confirmation of the absence thereof) provided by the Authority, SunWater and/or from other sources. Except as otherwise stated in the report, SKM has not attempted to verify the accuracy or completeness of any such information. If the information is subsequently determined to be false, inaccurate or incomplete then it is possible that our observations and conclusions as expressed in this report may change.

SKM derived the data in this report from information sourced from the Authority, SunWater and/or available in the public domain at the time or times outlined in this report. The passage of time, manifestation of latent conditions or impacts of future events may require further examination of the project and subsequent data analysis, and re-evaluation of the data, findings, observations and conclusions expressed in this report. SKM has prepared this report in accordance with the usual care and thoroughness of the consulting profession, for the sole purpose described above and by reference to applicable standards, guidelines, procedures and practices at the date of issue of this report. For the reasons outlined above, however, no other warranty or guarantee, whether expressed or implied, is made as to the data, observations and findings expressed in this report, to the extent permitted by law.

This report should be read in full and no excerpts are to be taken as representative of the findings. No responsibility is accepted by SKM for use of any part of this report in any other context.

This report has been prepared within the time restraints imposed by the project program. These time restraints have imposed constraints on SKM's ability to obtain and review information from the Entities.

This report has been prepared on behalf of, and for the exclusive use of, the Authority, and is subject to, and issued in accordance with, the provisions of the agreement between SKM and the Authority. SKM accepts no liability or responsibility whatsoever for, or in respect of, any use of, or reliance upon, this report by any third party.

1. Introduction and Background

SunWater is a Queensland Government owned corporation that owns and manages a regional network of bulk water infrastructure throughout Queensland to support around 5,000 customers across the resources, energy, urban and irrigation infrastructures. SunWater has an asset base of 19 dams and 63 weirs and barrages, 80 major pump stations, more than 2500 km of pipelines and open channels and 730 km of drains.

These assets are divided into 23 water supply schemes across Queensland which are subdivided into 40 Service contracts consisting of the following service types:

- 23 Bulk Supply Contracts
- 8 Irrigation Distribution and Drainage Contracts
- 6 Commercial Pipeline Contracts
- 2 Potable water treatment and distribution networks
- 1 Hydroelectric generator

The water supply schemes are supported by four regional operation centres and SunWater's head office located in Brisbane.

A map showing the extent of the coverage of SunWater's infrastructure in Queensland is provided in **Figure 1**.

The existing pricing mechanisms that apply to the 22 water supply schemes of SunWater are due to expire on the 30th June 2012. Prices for customers are established, in part, by an annuity mechanism. Under this mechanism the cost of replacing and or refurbishing assets that are deemed to require refurbishment and or replacement in each water supply scheme is determined for the duration of the next annuity period being 25 years from 2012 to 2037. The costs for replacement and refurbishment of the assets are brought forward to present day terms through a discounting mechanism to create an annuity value for each scheme. This annuity value is then used as an input to establish the prices for customers serviced by that scheme for the next price reset period, being five years.

This report is an addendum to the initial report completed by SKM, SunWater Price Regulation: Review of Selected Annuity Values for Refurbishment and Replacement Items, V2 Final dated 6th October 2011, and as such should be read in conjunction it.

The Queensland Competition Authority (the Authority) commissioned SKM to assess the prudency and efficiency of an additional sample of SunWater's renewals expenditure for 2006-11 and a sample of forecast capital expenditure (renewals and major refurbishments) for 2012 to 2037.

SKM would like to take the opportunity to sate that it appreciates the support provided by SunWater and SunWater's staff and their responsiveness to queries for information in providing the necessary detailed background information to allow SKM to undertake this assignment. SKM worked partly out of SunWater's offices and were provided full access SunWater's SAP Works Management System (WMS), and asset condition and risk assessment policy and procedures as well as to the planning engineers, their management and to refurbishment and enhancement engineers out in the field. Without this working arrangement and comprehensive support provided by SunWater, SKM would not have been able to complete this assignment to the level of detail required by SunWater.

The list of past renewal annuity items[1] reviewed by us is provided in **Table 1**, the list of future renewal annuity items reviewed by us is provided in **Table 2** and other renewal annuity items reviewed by us is provided in **Table 3**. A short sub-report on each future annuity item reviewed is provided in **Appendix B** and a short sub-report on each past annuity item reviewed is provided in **Appendix C** of this report and a short sub-report on each operational item reviewed is provided in **Appendix D** of this report.

- **Table 1 List of Past Renewal Annuity Items Reviewed**

Annuity Item	Annuity Value ($2011)
Boondooma Dam Spillway flood damage	1,000,497
Flood Damage Repair at Ben Anderson Dam	728,417
Repair Ch1 levee Banks Gibber Gunyah	464,987
Mareeba-Dimbulah distribution - Install & Refurbish as per Inter (Past item)	625,787
Mareeba-Dimbulah WSS - SCADA	409,625
Bundaberg Distribution - Installation of PLC controls at the Isis Pump Station	413,994

- **Table 2 List of Future Renewal Items Reviewed**

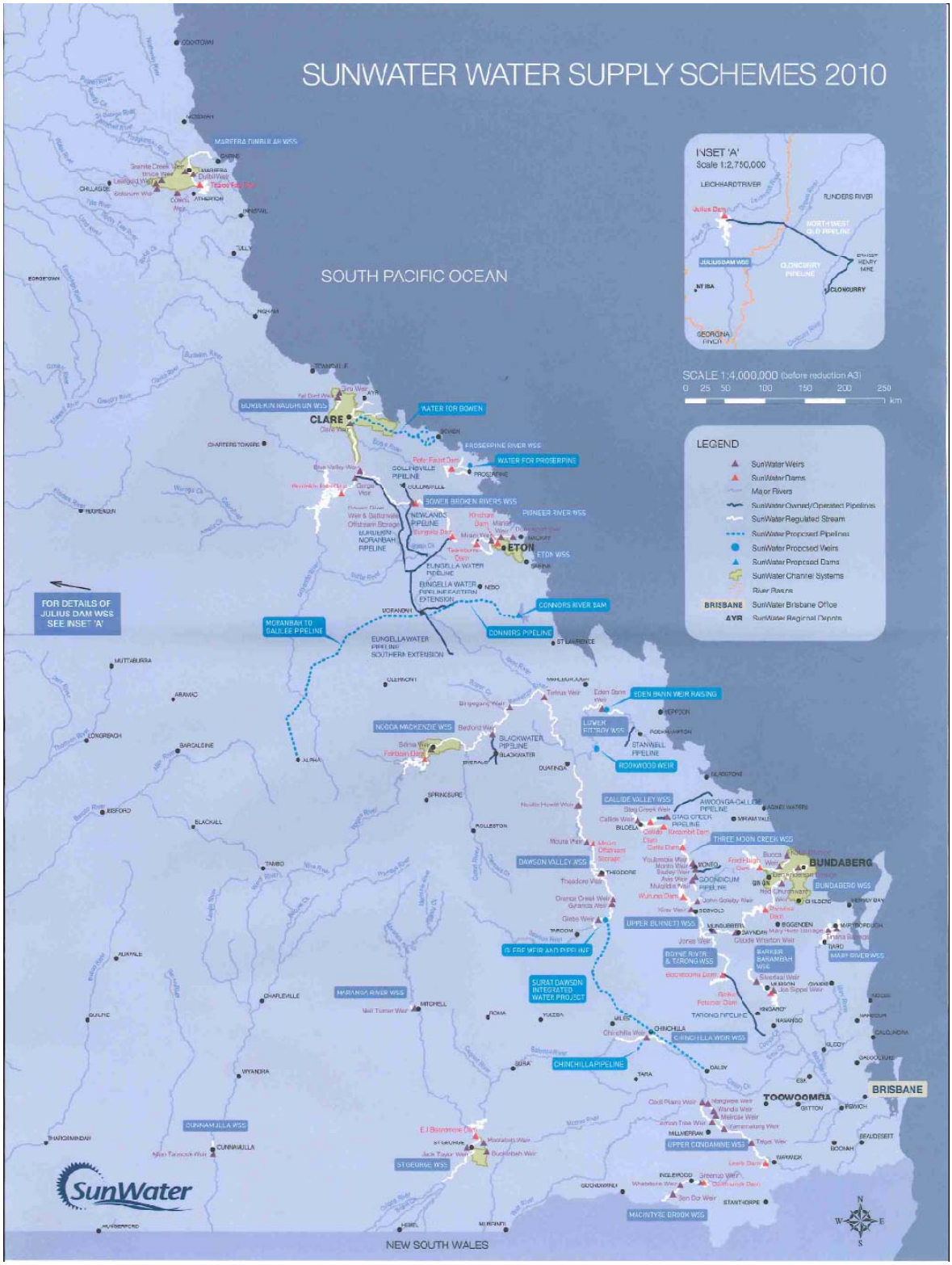
Annuity Item	Year	Annuity Value ($2010)
Lower Mary Distribution - Replace Cable at Walker Point Pump Station	2023	977,000
Lower Mary Distribution - Replace Pump at Walker Point Pump station	2031, 2033	287,000
Bundaberg Distribution - Bingera Distribution lining	2033, 2035	4,560,000
St George Distribution - St George Pump Station	2013	4,000,000
Mareeba Distribution - South Pipe Distribution - Replace Pipe	Various	4,200,000

[1] By annuity item we mean a discrete infrastructure asset that SunWater has initiated replacement/upgrade or refurbishment in respect of past annuity items or that SunWater plans to replace/upgrade or refurbish classed as a future annuity item.

Annuity Item	Year	Annuity Value ($2010)
Bundaberg Distribution - Replace Air Valves	Various	3,700,000
Bundaberg Distribution - Replace Common Control at the Woongarra Pump Station	2032	2,600,000
Pioneer River WSS - Palm Tree Creek Valve		770,000
Boyne and Tarong - Boondooma Dam Refurbishment after flood.		15,600,000
St George WSS - St George WSS Renewals Projects from 2016	2017 - 2032	1,290,000
Eton Distribution System - Oakendon Main Channel Distribution - Replace Avis Gate	2034	681,000
St George Distribution - Multiple Replacements of Structure, 600mm Meter Outlet	Various	511,000
Theodore Distribution System - Replace Submersible Pump, Flight at the Gibber Gunyah Pump Station	2019	359,000

- **Table 3 List of Operating Expenditure Future Renewal Annuity Items Reviewed**

Annuity Item	Annuity Value ($2011)
Dawson Valley WSS and Theodore Distribution - External local contractors versus SunWater labour for renewals and operating activities	NA
Eton WSS - Preventive and Corrective Maintenance Costs	NA



- **Figure 1 Area of coverage of SunWater's operations**

1.1. Application of Overheads to Future Annuity Item Budgets

During the course of this assignment, SKM was asked to clarify the process by which SunWater allocates corporate overheads to future annuity item budget estimates. This process was in part covered in SKM's main report (to which this is an addendum). The following provides further clarification. For future annuity items, SunWater has two approaches for calculating costs:

1. **Using the Bill of Materials in SAP WMS.** These bills of materials are based on 1997 prices, to which an indirect cost is applied (typically 30 to 35%) and then a multiplier (which is BOM asset type dependent) developed by Cardno, to bring to 2008 money terms (full details are provide in SKM's main 2011 report). The indirect cost uplift is intended to cover design, project management and local cost factors i.e. the costs uplift (if any) of undertaking a project at a particular site over, say undertaking the project in SEQ. This indirect cost does not include corporate overheads. SunWater typically uses this approach for annuity items that are to be replaced more than five years from the time of assessment (but sometimes it is used for assets to be replaced within 5 years of the assessment date, particularly if the value of the annuity item is not considered material or if no special planning activities are required for the annuity item);

2. **By development of a Planning Order.** This process is typically used for assets to be replaced within 5 years of the assessment date but not always and on occasions (eg the Bundaberg Wonagarra PS SCADA replacement) it is used for annuity items to be replaced more than 5 years hence – but rarely. In the development of a planning order, the costs are broken down into materials, contractors, plant and equipment, SunWater labour and overheads – including design and project management and corporate overheads. The equipment and contractor costs are either drawn from budget quotes from suppliers, from costs for similar projects undertaken recently (say within two years of the planning order development) or from the Bill of Material cost items without in indirect cost uplift (which is the case for the Wonagarra pump station). Typically contractor costs (i.e. installation costs) are set as equal to material costs where the BOM values have been used).

As such, unless a planning order has been developed (which SKM flags up in its reports as this is visible in SAP WMS), then the costs estimates (and our bench mark costs) don't include corporate overheads. If a planning order is in place for an annuity item replacement, the corporate overhead costs are included in the annuity value (and in our bench mark estimate). SKM endeavours to make this clear in our estimates when a Planning order is used and hence whether our costs include corporate overheads. On this basis, it may be concluded that the value of future annuity items submitted by SunWater for which a planning order has not been developed are underestimated by an amount equivalent to the corporate overhead uplift that SunWater applies to all projects.

2. Summary and Conclusions

2.1. Future Renewals

Details of SKM's evaluation of future annuity items are provided in **Appendix B**. A summary of SKM's conclusions on prudency and efficiency evaluation for the future renewals reviewed is provided in **Table 4** below:

- **Table 4 Summary Table of Assessment of Prudency and Efficiency of Future Annuity Items Reviewed**

Annuity Item	Year	Annuity Value (2010$)	Prudent	Efficient	SKM Estimate ($2010)*
Lower Mary Distribution - Replace Cable at Walker Point Pump Station	2023	977,000	Yes	Yes	1,120,000
Lower Mary Distribution - Replace Pump at Walker Point Pump station	2031, 2033	287,000	Yes	Yes	156,000
Bundaberg Distribution - Bingera Distribution lining	2033, 2035	4,560,000	In part	No	1,177,816
St George Distribution - St George Pump Station	2013	4,000,000	Yes	No	2,860,000
Mareeba Distribution - South Pipe Distribution - Replace Pipe	Various	4,200,000	Yes	Yes	5,300,000
Bundaberg Distribution - Replace Air Valves	Various	3,700,000	Yes	No	1,410,000
Bundaberg Distribution - Replace Common Control at the Woongarra Pump Station	2032	2,600,000	Yes	No	1,400,000
Pioneer River WSS - Palm Tree Creek Valve		770,000	Yes	Yes	743,000
Boyne and Tarong - Boondooma Dam Refurbishment after flood.		15,600,000	Yes	Yes	14,748,000
St George WSS - St George WSS Renewals Projects from 2016	2017 - 2032	1,290,000	Yes	Yes	1,290,000
Eton Distribution System - Oakendon Main Channel Distribution - Replace Avis Gate	2034	681,000	Yes	Yes	750,600
St George Distribution - Multiple Replacements of Structure, 600mm Meter Outlet	Various	511,000	No	N/A	N/A
Theodore Distribution System - Replace Submersible Pump, Flygt at the Gibber Gunyah Pump Station	2019	359,000	Yes	No	$150,000

* Unless otherwise specified.

2.2. Past Renewals

Details of SKM's evaluation of future annuity items are provided in **Appendix C**. A summary of SKM's conclusions on prudency and efficiency evaluation for the future renewals reviewed is provided in **Table 5** below:

- **Table 5 Summary Table of Assessment of Prudency and Efficiency of Past Annuity Items Reviewed**

Annuity Item	Annuity Value ($2010)	Prudent	Efficient	SKM Estimate ($2010)*
Boondooma Dam Spillway flood damage	1,000,497	Yes	Yes	1,544,270
Flood Damage Repair at Ben Anderson Dam	728,417	Yes	Yes	N/A
Repair Ch1 levee Banks Gibber Gunyah	464,987	Yes	Yes	546,000 ($2011)
Mareeba-Dimbulah distribution - Install & Refurbish as per Inter (Past item)	625,787	Yes	Yes	N/A
Mareeba-Dimbulah WSS - SCADA	409,625	Yes	Yes	450,000
Bundaberg Distribution - Installation of PLC controls at the Isis Pump Station	413,994	Yes	No	239,496

* Unless otherwise specified.

2.3. Operational Expenditure

Details of SKM's evaluation of future operational expenditure items are provided in Appendix D. A summary of SKM's conclusions on prudency and efficiency evaluation for the operational items reviewed is provided in Table 6 below:

- **Table 6 Operational Items**

Operational Expenditure Item	Prudent	Efficient
Dawson Valley WSS and Theodore Distribution – External local contractors versus SunWater labour for renewals and operating activities	Yes	Yes
Eton WSS – Preventative and Corrective Maintenance Costs	Yes	Yes

Appendix A Terms of Reference

Terms of Reference

SunWater Irrigation Prices 2012-17

Assessment of Renewals Capital Expenditure

24 February 2012

1. Project Background

Queensland Competition Authority

The Queensland Competition Authority (the Authority) is an independent statutory body responsible for assisting with the implementation of competition policy for government owned business entities in Queensland.

SunWater

As a Queensland Government-owned Corporation (GOC), SunWater provides a range of services including infrastructure ownership, water delivery, operation and maintenance of infrastructure and engineering consultancy services. Over the last 80 years, SunWater has built and now owns and operates a regional network of water supply infrastructure throughout Queensland which supports irrigated agriculture, mining, power generation, industrial and urban development.

SunWater's water storage and distribution infrastructure includes 19 major dams, 63 weirs and barrages, 80 major pumping stations, and more than 2500 kilometres of pipelines and open channels. The existing price paths that apply to the 22 water supply schemes (WSSs) are due to expire on 30 June 2012.

The water supply schemes are supported by four regional operation centres and SunWater's head office located in Brisbane. On 1 July 2008, a number of water supply schemes were transferred to SEQWater.

Ministerial Direction

The Treasurer and the Minister for Finance and the Arts (the Ministers) have directed the Authority to develop irrigation prices to apply to 22 SunWater WSSs from 1 July 2012 to 30 June 2017. A copy of the amended Ministers' Referral Notice (the Notice) is available at http://www.qca.org.au/water/Sun-Irrig-Price/index.php

The Ministers' Referral Notice requires that bulk water supply and channel prices/tariff structures are set so as to provide a revenue stream that allows SunWater to recover:

(a) efficient operational, maintenance and administrative costs to ensure the continuing delivery of water services;

(b) prudent and efficient expenditure on renewing and rehabilitating existing assets through a renewals annuity;

(c) costs are to exclude any rate of return on existing rural irrigation assets (as at 30 June 2012) unless current prices are already above the level required to recover (i) and (ii), in which case prices are to be maintained in real terms based on an appropriate measure of inflation as recommended by the authority; and

(d) a commercial rate of return of, and on, prudent capital expenditure for augmentation commissioned after 30 June 2012.

2. Purpose/Outline of Consultancy

The objective of this consultancy is review further renewal items prudency and efficiency and to respond to stakeholder comments. The Authority requires that the identified items will be reviewed to the same level of detail as SKM presented in their previously completed report.

As for the previous consultancy, SKM should specify the benchmark unit rates to be adopted. If no proprietary unit rates are available recourse should be made to the Queensland Engineering Construction Activity Implicit Price Deflator (derived from the relevant periods of quarterly ABS data).

For the sampled items, SKM is required to review SunWater's application of its asset management planning methodology and cost estimates and provide comment on:

(a) the timing of asset replacement or refurbishment. For each asset, SKM is required to comment on the standard run-to-failure asset life, and risk-adjusted asset life determined or proposed by SunWater. Any material variations in expected asset lives should be explained where possible;

(b) condition assessment – including frequency of assessments and results of most recent assessments. Where possible, SKM should comment on any reasons for revised condition assessments. Reference can be made to photographic evidence where available;

(c) the proposed refurbishment/ replacement cost. SKM should review SunWater's Bill of Materials (BOM), and specifically details of item specification (scope and scale), volumes/quantities of key inputs (materials etc), unit rates for inputs, and identify the level of indirect cost allowances. This should take into account technological change and process redundancy as well as costs associated with improving general business performance; and

(d) options analysis – where options analysis has been performed by SunWater, for example for renewals over the period 2006-11 and for assets due to be refurbished or replaced over the next 12 months, SKM should review the options proposed and procedures used by SunWater for determining the least cost or preferred option. SKM is required to advise whether SunWater's approach is appropriate.

SKM is required to recommend whether the capex is considered to be prudent and efficient taking account of the above review. For clarity, the definitions of prudency and efficiency are provided below.

Capital expenditure is prudent if it is required as a result of a legal obligation, growth in demand, renewal of existing infrastructure that is currently used and useful, or it achieves an increase in the reliability or the quality of supply that is explicitly endorsed or desired by the WGM. In most cases, SunWater's capital expenditure relates to renewal or compliance.

Capital expenditure is efficient if:

(a) the scope of the works (which reflects the general characteristics of the capital item) is the best means of achieving the desired outcomes after having regard to the options available, including the substitution possibilities between capex and opex;

(b) the standard of the works conforms with technical, design and construction requirements in legislation, industry and other standards, codes and manuals. Compatibility with existing and adjacent infrastructure is relevant as is consideration of modern engineering equivalents and technologies; and

(c) the cost of the defined scope and standard of works is consistent with conditions prevailing in the markets for engineering, equipment supply and construction. SKM must substantiate its view with reference to relevant interstate and international benchmarks and information sources. For example, the source of comparable unit costs and indexes must be given and the efficiency of costs justified. SKM should identify the reasons for any costs higher than normal commercial levels.

SKM must clearly identify the nature and value of any proposed renewals expenditure considered not prudent or efficient. Where SKM considers that the projected timing and/or cost of an expenditure item is not efficient, SKM is required to recommend an alternative estimated timing or cost estimate.

In this consultancy it is not intended that SKM undertake a physical (i.e. site) assessment of assets; rather, the emphasis for SKM is to review SunWater's processes for determining the timing and cost of capital expenditure.

It is anticipated SKM will work in conjunction with qualified SunWater and QCA staff in SunWater offices. The Authority will monitor progress to ensure that the review of capex items is providing meaningful results and may cease the consultancy if satisfactory results are not being achieved.

The renewal items to be reviewed are attached. The Authority may add to this list should further renewal items be raised by stakeholders.

3. Resources/Data Provided

The Authority will make available to SKM relevant documents, including SunWater's Network Service Plans and associated supporting materials, Treasury's approved list of bulk water storage assets to be valued, and the Authority's technical issues papers, as appropriate.

The Authority's consultants' reports (Halcrow, ARUP, Aurecon and GHD) will also be available as an initial input to the exercise.

SKM will be required to liaise with SunWater, the Authority, and other agencies and stakeholders as appropriate to source further relevant information if needed.

The Authority expects that SKM will be familiar with the following information sources:

(a) SunWater's submission to the Authority;

(b) SunWater, 2006, Irrigation Price Paths 2006/07-2010/11 Final Report http://www.sunwater.com.au/irrigationpricing/SunWater_Irrigation_Price_Paths_Final_Report.pdf

(c) Queensland Competition Authority (QCA), 2000, Statement of Regulatory Pricing Principles for the Water Sector, December 2000. http://www.qca.org.au/files/PricingPrinciples.pdf

(d) SunWater, SAP-based asset and financial management system, and financial statements;

(e) QCA, July 2010, Final Report – SEQ Interim Price Monitoring Information Requirements for 2010/11. http://www.qca.org.au/files/W-2010SEQretail-price-SEQIntReq-0710.pdf

(f) QCA, April 2010, Final Report – SEQ Interim Price Monitoring Framework http://www.qca.org.au/files/W-SEQinterim-price-QCA-FinalReport-PriceFramWork-0410.pdf

(g) Additional information relevant to this consultancy may also be found in the Authority's publications, available from the Authority or for downloading from its website at www.qca.org.au

4. Project Time Frame

The consultancy will commence in late January 2012 with a completion date of 2 March 2012.

5. Specifications and Fees

Total payment will be made within 28 days of receiving an invoice at the conclusion of the consultancy.

6. Contractual Arrangements

This consultancy will be offered in accordance with the Authority's standard contractual agreement.

This agreement can be viewed at http://www.qca.org.au/about/consultancyagreement.php

7. Reporting

SKM will be required to provide the Authority reports on each renewals item as they are completed. If necessary, SKM should advise at earliest opportunity any critical issues that may impede progress of the consultancy.

SKM will also provide detailed data for each renewals project, including subcategories under the headings of direct and indirect/overhead costs. An excel spreadsheet is required, documenting the costs of each renewals project. All entries must be referenced to the primary source material.

SKM is required to report on a weekly basis the hours and costs incurred by team members on the project.

An electronic version of the final report is also required, saved in Microsoft© Word with any numeric data in Microsoft© Excel.

8. Confidentiality

Under no circumstance is the selected consultant to divulge any information obtained from SunWater or the Authority for the purposes of this consultancy to any party other than with the express permission of SunWater and the Authority.

9. Conflicts of Interest

SKM has advised that Tim Saxby (Project Director) is currently working on a project for SunWater in undertaking the preparation of a recycled water management plan. SKM do not consider this a conflict of interest and SunWater have indicated to the Authority that they have no objection to the appointment of SKM.

10. Insurance

The consultant must hold all necessary workcover and professional indemnity insurance.

11. Quality Assurance

The consultant is required to include details of quality assurance procedures to be applied to all information and outputs provided to the Authority.

Appendix B Future Renewals Projects

This appendix contains the sub-reports on the future annuity renewal/refurbishment items reviewed.

B.1 Walker Point Pumping Station Cables

This sub-report should be read in conjunction with SKM's main report entitled: SunWater Price Regulation: : Review of Selected Annuity Values for Refurbishment and Replacement Items, V2 Final dated 6th October 2011.

This sub-report is also subject to the limitation statement provided in the above mentioned report.

B.1.1 Introduction

The annuity item for which an annuity value has been submitted to the Queensland Competition Authority (Authority) is for the cable replacement at Walker Point Pumping Station.

B.1.2 Available Information

This sub-report has been prepared by accessing and viewing SunWater's SAP Works Management System (WMS), and asset condition and risk assessment policy and procedures. Please refer to the body of the main report for a more detailed description of these information sources.

In particular, we have drawn on the following Annuity Item specific replacement/refurbishment report produced by SunWater for this review:

- **Table 7 Documentation Reviewed Specific to Walker Point Pumping Station**

Document No.	Document Name	Document Title	Date
#1170573	QCA	Replace Cable at Walker Point	-
#1172227	Whole of Life	Maintenance Strategy	-

B.1.3 Prudency Review

Asset Replacement/Refurbishment Date Determination

The process by which SunWater determines a replacement date for an annuity item is described and discussed in the main body of this report.

In our review of the data in SAP and the information contained in the SunWater report specified above, we consider that SunWater has largely followed the policies and procedures that it has in place to determine annuity item replacement/ dates and costs for such. Where we have found exceptions to this, and or data entry errors, we have highlighted these below together with other observations on the data provided.

The standard object type (asset type) for this infrastructure is CALVAG – LV above ground cable. For this asset SunWater has allocated a standard run to failure asset life of 35 years and a condition inspection frequency of 5 years. We consider the standard run to failure asset life to be towards the low end of what may be expected for above ground LV cable. For example, most electrical distribution utilities in Australia would apply an asset life of 45 to 60 years for above ground LV

cables depending on whether it is operated in wet (tropical) or dry conditions respectively. We consider the condition assessment frequency (5 years) applied to this asset type to be reasonable.

We have viewed the WMS record for this asset and confirmed that the asset has been in service since 1987. SunWater has applied its risk evaluation method to this asset and determined the risk, during the most recent risk assessment in 2008. This risk assessment yields a highest risk score of Low.

SunWater's method for determining asset replacement/refurbishment timing is to modify the risk-adjusted run to failure asset life according to the variance of the condition score of the asset, at the time the last condition assessment was undertaken, with the condition that the standard asset condition decay curve predicts at that time.

The last condition assessment was undertaken in 2008 which is within SunWater's stated maximum condition inspection periods for this asset type. This condition assessment indicates that the highest condition score allocated was a 2 (Minor defects only). This was a high level assessment with no condition scores being applied to the different condition assessment criteria for this asset.

SunWater has applied its risk evaluation method to this asset and determined that it has a production/operations risk criterion consequence rank of 8 (minor). This, together with a probability (likelihood of occurrence) score of 3 results in an overall risk score of 24 which places this asset in a low risk category. For this asset type, an overall risk category of low and with a consequence score of less than or equal to 8, will mean that the replacement age will not change from the standard run to failure replacement age based on the risk score.

We have evaluated the projected run to failure asset life using SunWater's modelling tool. Inputting a Low business risk and worst case condition score in 2008 of 2 for this asset with a standard run to failure life of 35 years into SunWater's planning tool results in a projected required replacement year of 2107. We conclude that the modelling tool is more reliable in projecting life reduction due to condition than life extension, particularly where the condition score in early years is better than the curve would predict, as it tends to exaggerate run to failure life extension potential, and we have therefore ignored this analysis in this case.

SunWater has therefore assumed a standard run to failure asset life for this asset and scheduled replacement at the end of that life, ie 1987 installed date plus 35 years standard life gives a 2022 replacement date. SunWater has in fact scheduled replacement for 2023. We consider this replacement date to be in keeping with SunWater's systems, albeit we consider that a standard replacement age of 35 years is some 5 years shorter than industry norms for wet (tropical)

conditions. That said, if a 40 year life was adopted, the projected run to failure replacement date would still fall within the annuity period (ie replacement would be required prior to 2035.

There has been a suggestion from irrigators that it may be possible for the peak flows to be managed by a roster system, thereby reducing the cost of the annuity replacement. SKM has reviewed the annual quantities of water flow pumped at this pumping station over a 6 year period from 2002/3 (refer Table 8).

Table 8 Annual Water Flows at Walker Point Pumping Station

Year	Annual Flow (ML)
2002/3	2,758
2003/4	661
2004/5	2,303
2005/6	1,403
2006/7	3,527
2007/8	916

We have concluded there is no consistent demand profile upon which to base any predictions regarding future requirements out to 2022, including an upper limit on flows, particularly given the spot nature of the loads which do not follow a typical urban style growth path. That is the quantity supplied is very dependent on availability of water, the demand at the time which is very dependent on weather patterns and the timing of rain fall with respect to the growing season. We also note that SunWater is obliged to design to its water allocation obligations and that in 2006/7, SunWater delivered close to its full allocation obligation of 3,849 ML. On this basis we therefore cannot confirm that a reduced capacity asset replacement could be used. A full capacity replacement is therefore recommended.

We consider the applied run to failure asset life period for this asset to be reasonable and largely in keeping with good industry practice. We therefore consider that this annuity item is prudent.

Options Evaluation

The proposed replacement programme for Walker Point Pumping Station is appropriate for this asset and no options evaluation is required.

Timing of Renewal

The replacement of the cables is scheduled for 2023, which remains at their original design life, 35 years from their original installation.

Conclusion on Prudency Evaluation

On the understanding that SunWater's policies for adjusting refurbishment periods and assessing asset condition have been followed, we conclude that the need for refurbishment of this annuity asset has been demonstrated at or around the time selected, and certainly within the 25 year annuity period under consideration. As such the inclusion of this annuity item in the annuity value is prudent.

B.1.4 Efficiency Evaluation

The processes used by SunWater to establish future annuity item replacement/refurbishment costs are detailed in the main body of this report. SunWater's planning team applies a unit rate against bill of materials quantities for the asset in question should the replacement be scheduled more than 5 years hence from the planning date. Given the volume of annuity items that SunWater's Planning Team are engaged with at any point in time, this approach is considered reasonable and is in accordance with good industry practice, where the management of a large portfolio of assets is concerned.

Renewal/Replacement Project Cost Evaluation

We have reviewed SunWater's calculation for determining a replacement cost and confirm that it has applied the Indirect Cost multiplier contained in the BOM for this asset item in its SAP WMS of 38.67. We have reviewed the location of Walker Point pump station and consider that the indirect cost multiplier (location cost uplift) to be reasonable.

We have calculated a 2008 replacement value for this asset based on the standard 1997 to 2008 multiplier of 2.13 for electrical assets as determined by Cardno which yields a replacement value of approximately $876,340, which is the annuity item value submitted by SunWater to the authority.

We have benchmarked the annuity item replacement costs proposed by SunWater as submitted to the Authority against our database costs for a modern equivalent electrical asset. Our estimate is based on our modern equivalent asset unit rate database as a class 4 estimate, having an accuracy of +30%/-20%.

We have compared our cost estimate against SunWater's cost estimate in Table 9 below:

Table 9 Walker Point - Comparison of SunWater and SKM Cost Estimates

SunWater Estimate $2010	SKM Estimate $2010	Variance
876,348	1,120,000	+28%

The annuity value submitted by SunWater for replacement of this annuity item is within the estimating range of our estimated cost for a modern equivalent replacement asset. As such we consider the SunWater proposed annuity item value of $876,348 to be efficient.

Conclusion on Efficiency Evaluation

The value submitted for this annuity item is efficient, based on available information.

B.1.5 Summary and Conclusions

We are satisfied that SunWater's procedures for determining the timing of replacement of this annuity item have been followed and hence that the timing and need for refurbishment of this annuity item is prudent for replacement in 2023.

We consider the cost of the refurbishment to be efficient at $876,348, being lower than SKM's estimate at $1,120,000.

B.2 Lower Mary Distribution - Replacement of pumps at the Walker Point Pump Station

This sub-report should be read in conjunction with SKM's main report entitled: SunWater Price Regulation: Review of Selected Annuity Values for Refurbishment and Replacement Items, V2 Final dated 6th October 2011.

This sub-report is also subject to the limitation statement provided in the above mentioned report.

B.2.1 Introduction

The annuity item for which an annuity value has been submitted to the Queensland Competition Authority (Authority) is for the replacement of the two pumps at Walker Point Pump Station in 2031 and 2033.

During a prior review of this annuity item replacement for the 2010-2035 annuity period price review, Aurecon noted that SunWater's renewal program assumes a like for like replacement but that the current demand at this pump station is *"far less"* than the capacity. Additionally, during the 'Round 3' consultation process, irrigators submitted that they would prefer a roster system rather than continue to pay for the current level of capacity. SKM has therefore been asked to review the capacity required to meet the current demand and to meet the likely future demand to determine whether a like for like replacement is prudent or whether a lower capacity replacement would be appropriate and or, whether the current and potential future demand could be met with a lower capacity pumping system with the allocation transitioned from the current 'on demand' allocation to an allocated 'time of day' allocation.

B.2.2 Available Information

This sub-report has been prepared by accessing and viewing SunWater's SAP Works Management System (WMS), and asset condition and risk assessment policy and procedures. Please refer to the body of the main report for a more detailed description of these information sources.

In particular, SKM has drawn on the following Annuity Item specific replacement/refurbishment report produced by SunWater for this review and on SunWater's modernisation plan for the Lower Mary Water Supply Scheme from which historic flow rates have been obtained:

- **Table 10 Documentation Reviewed Specific to Walker Point Pumping Station**

Document No.	Document Name	Document Title	Date
	QCA – Line item 6 – Walker Point PSTN – replace pump.doc	QCA – Line item 6 – Walker Point PSTN – replace pump	9th February 2012
#858683	Lower Mary Irrigation Modernisation Plan	Lower Marry Irrigation Modernisation Plan Final Report Issue 2	February 2010

There are two assets for which annuity item replacement values have been submitted as follows:

- **Table 11 Walker Point Pump Station Pump Specification**

Unit No	Attribute	Pump Specification
1	Size	
1	Make	ITT FLGYT Australia
1	Model	3311
1	Type	Submersible
1	Static Head	23.5 m
1	Dynamic Head	
1	Flow rate	75 ML/d
1	In Operation From Date	31.10.1987
1	Planned Replacement Date	2031
1	Motor size	230 kW
3	Size	
3	Make	ITT FLGYT Australia
3	Model	3311
3	Type	Submersible
3	Static Head	23.5 m
3	Dynamic Head	
3	Flow rate	75 ML/d
3	Installation Date	1987
3	Planned Replacement Date	2033
3	Motor Size	230 kW

Note that SunWater originally designed the pump station to be capable of housing 3 pumps however pump # 2 was never installed.

Each of these annuity items Pump #1 and Pump #3 are assessed separately in each of the sections relating to prudency and efficiency below:

B.2.3 Prudency Review

Asset Replacement/Refurbishment Date Determination

The process by which SunWater determines a replacement date for an annuity item is described and discussed in the main body of this report.

In our review of the data in SAP and the information contained in the SunWater report specified above, we consider that SunWater has largely followed the policies and procedures that it has in place to determine annuity item replacement/ dates and costs for such. Where we have found exceptions to this, and or data entry errors, we have highlighted these below together with other observations on the data provided.

The standard object type (asset type) for pump 1 and pump 3 is PUSUBM – submersible pump. For this asset type SunWater has allocated a standard run to failure asset life of 30 years and a condition inspection frequency of 2 years. SKM considers the standard run to failure asset life and the condition assessment frequency applied to this asset type to be reasonable and in keeping with good industry practice.

SKM has viewed the SAP WMS record for this asset current at the time the 2010 Network Service Plans (NSPs) were prepared and confirmed that both pumps have been in service since 1987.

Pump # 1

SunWater has applied its risk evaluation method to pump #1 and determined the risk of asset failure, during the most recent risk assessment in 2005. The business related risk assessment for this asset has been assessed as having a production/operations risk criterion consequence rank of 18 (Moderate) and a probability (likelihood of occurrence) score of 10 resulting in an overall risk score of 180 which places this asset in a low risk category. For this asset type, an overall risk category of Low and with a consequence score greater than 8, should result in a risk related adjustment to the standard run to failure replacement age in that the asset. In accordance with SunWater asset planning system this asset should not be allowed to deteriorate beyond an asset condition score of 5 (Major deterioration such that the asset is virtually inoperable).

SunWater's method for determining asset replacement/refurbishment timing is to modify the risk-adjusted run to failure asset life according to the variance of the condition score of the asset, at the time the last condition assessment was undertaken, with the condition that the standard asset condition decay curve predicts at that time. As mentioned, under SunWater's asset planning system, assets with a business risk score of low to medium and with a concomitant consequence score greater than 8 are required to have their standard asset life adjusted below a run to failure life.

According to the version of SAP extant at the time of development of the 2010 NSPs, the last condition assessment was undertaken in 2010 which is within SunWater's stated maximum condition inspection periods for this asset type. This condition assessment indicates that the highest condition score allocated was a 2 (Minor defects only). This was a field assessment and hence represents a visual inspection.

We have evaluated the projected run to failure asset life using SunWater's modelling tool. Inputting a Low business risk and worst case condition score in 2010 of 2 for this asset with a standard run to failure life of 30 years into SunWater's planning tool results in a projected run to failure life of 120 years and a calculated replacement year of 2090 based on the risk assessment. We conclude that the modelling tool is more reliable in projecting life reduction due to condition than life extension, particularly where the condition score in early years is better than the curve

would predict, as it tends to exaggerate run to failure life extension potential, and we have therefore ignored this analysis in this case.

At the time of submission of the NSPs SunWater had planned to replace this asset in 2031, ie some 14 years beyond the standard run to failure for this asset life. Given the asset condition, SKM considers this later replacement date to be in keeping with SunWater's systems and that the asset should be captured in the current price setting annuity period as the more recent condition assessed replacement date is within the annuity period (ie prior to 2035).

SKM considers the proposed replacement date for pump # 1 to be reasonable and largely in keeping with good industry practice.

Pump #2

SunWater has applied its risk evaluation method to pump #3 and determined the risk of asset failure, during the most recent risk assessment in 2005. The business related risk assessment for this asset has been assessed as having a production/operations risk criterion consequence rank of 18 (Moderate) and a probability (likelihood of occurrence) score of 10 resulting in an overall risk score of 180 which places this asset in a low risk category. For this asset type, an overall risk category of Low and with a consequence score greater than 8, should result in a risk related adjustment to the standard run to failure replacement age in that the asset. In accordance with SunWater asset planning system this asset should not be allowed to deteriorate beyond an asset condition score of 5 (Major deterioration such that the asset is virtually inoperable).

SunWater's method for determining asset replacement/refurbishment timing is to modify the risk-adjusted run to failure asset life according to the variance of the condition score of the asset, at the time the last condition assessment was undertaken, with the condition that the standard asset condition decay curve predicts at that time. As mentioned, under SunWater's asset planning system, assets with a business risk score of low to medium and with a concomitant consequence score greater than 8 are required to have their standard asset life adjusted below a run to failure life.

According to the version of SAP extant at the time of development of the 2010 NSPs, the last condition assessment was undertaken in 2010 which is within SunWater's stated maximum condition inspection periods for this asset type. This condition assessment indicates that the highest condition score allocated was a 6 (Asset has failed and is not operable) for the external coating category, the assessor noting that there was severe corrosion. This was a field assessment and hence represents a visual inspection. SKM notes that the inspector commented that at the time of the inspection, the pump was being overhauled in the workshop. Hence it is considered that the score applies to the motor casing rather than the pump casing (we note that a score of 5 was given to insulation resistance). An earlier condition inspection in 2007 (which is still within SunWater's inspection period for this asset), yielded a worst case condition score of 4 (Significant deterioration

with substantial refurbishment required to ensuring on-going reliable operation) for flow and discharge pressure compared to rated values. SKM therefore understands that it is this condition score which prompted SunWater to refurbish the pump in 2010. Given that the pump has been refurbished, and hence the condition scores in SAP are not representative of the condition in 2010, SKM has assumed an overall condition score of 2 in keeping with the condition score applied to pump #1 which was installed concurrently with pump # 3.

As mentioned in the paragraphs above relating to pump # 1, SKM understands that SunWater's asset life adjustment planning tool is not as reliable projecting life extensions (particularly where the asset condition is significantly superior to that which the standard asset condition decay curve predicts at the time of inspection. SKM has therefore used engineering judgement when assessing the planned replacement date.

At the time of submission of the NSPs SunWater had planned to replace this asset in 2033, ie some 16 years beyond the standard run to failure for this asset life. Given the asset condition, and the fact that the pump was refurbished in 2010, SKM considers this later replacement date to be in keeping with SunWater's systems and that the asset should be captured in the current price setting annuity period as the more recent condition assessed replacement date is within the annuity period (ie prior to 2035).

SKM considers the proposed replacement date for pump #3 to be appropriate and in keeping with good industry practice.

Options Evaluation and Demand Assessment

There has been a suggestion from irrigators that it may be possible for the peak flows to be managed by a roster system, thereby reducing the cost of the annuity replacement. SKM has reviewed the annual quantities of water flow pumped at this pumping station over a 6 year period from 2002/3 (refer Table 12).

- **Table 12 Annual Water Flows at Walker Point Pumping Station**

Financial Year	Annual Flow (ML)	Peak Demand ML/d
2002/3	2,758	137
2003/4	661	71
2004/5	2,303	143
2005/6	1,403	129
2006/7	3,527	136
2007/8	917	84
2009/10	3247	150
2010/11	495	60
2011/12 (July to Dec only)	696	116

From this historic demand profile, SKM has concluded there is no consistent demand profile or trend upon which to base any predictions regarding future requirements out to 2022, including an upper limit on flows, particularly given the spot nature of the loads which do not follow a typical urban style growth path. That is the quantity supplied is very dependent on availability of water, the demand at the time which is very dependent on weather patterns and the timing of rain fall with respect to the growing season. SKM also note that SunWater is obliged to design to its water allocation obligations and that in 2006/7, SunWater delivered close to its full allocation obligation of 3,849 ML and in both 2004/5 and 2009/10 the peak demand equalled or came close to the capacity of the pump station. SKM further notes that currently, the irrigators' requirements are, met on demand, it is difficult to envisage how a system of time of day allocations could be put in to deliver the demands shown above given that the pumping station peak demand and overall flow capacity has been called upon within as late as 2009/10.

Finally, SKM notes that sugar prices are currently high, which may prompt greater investment in this area, thereby increasing demand.

On this basis SKM cannot confirm that a reduced capacity asset replacement could be used. A full capacity replacement is therefore considered prudent.

Timing of Renewal Pump #1 and Pump #3

The timing of replacement of pump #1 and #3 at Walker Point pump station is considered appropriate as, given the assessed asset condition, SKM considers it reasonable for SunWater to extend the operating life by 14 years and 16 years beyond the standard asset run to failure life.

Conclusion on Prudency Evaluation

SKM concludes that the need for replacement of this annuity asset has been demonstrated at or around the time selected, and within the 25 year annuity period under consideration. As such the inclusion of this annuity item in the annuity value is prudent.

B.2.4 Efficiency Evaluation

The processes used by SunWater to establish future annuity item replacement/refurbishment costs are detailed in the main body of this report. SunWater's planning team applies a unit rate against bill of materials quantities for the asset in question should the replacement be scheduled more than 5 years hence from the planning date. Given the volume of annuity items that SunWater's Planning Team are engaged with at any point in time, this approach is considered reasonable and is in accordance with good industry practice, where the management of a large portfolio of assets is concerned.

Renewal/Replacement Project Cost Evaluation

The 1997 cost in BOM for the pump is $86,076.99 comprising an equipment cost of $57,033, an installation cost of $5,000 and an indirect cost (locational uplift) of 38.76%. SKM has reviewed the location of Walker Point pump station and consider that the indirect cost multiplier (location cost uplift) to be reasonable and in line with that applied to other assets in the area. SKM has calculated a 2008 replacement value for this asset based on the standard 1997 to 2008 multiplier of 1.5 for pump assets as determined by Cardno which yields a replacement cost of $129,115 for each pump is consistent with the annuity item replacement cost submitted by SunWater in its 2010 NSPs.

SKM has benchmarked the annuity item replacement costs proposed by SunWater as submitted to the Authority by obtaining budget prices from the pump manufacturer Flygt for a modern equivalent replacement and against our cost databases for installation works of this type. The SKM estimate is based on a modern equivalent replacement as a class 4 estimate, having an accuracy of +30%/-20%. SKM has compared our cost estimate against SunWater's cost estimate in Table 13 below:

- **Table 13 Walker Point - Comparison of SunWater and SKM Cost Estimates**

	SunWater Estimate $2010 – 2010 NSP	SKM Estimate $2010	Variance against 2010 NSP
Pump # 1	129,115	$156,024	+21%

	SunWater Estimate $2010 – 2010 NSP	SKM Estimate $2010	Variance against 2010 NSP
Pump # 2	129,115	$156,024	+21%

SKMs cost estimate breakdown is shown in Table 14 below based on a modern equivalent pump with specification as provided in Table 15:

- **Table 14 Walker Point Pump Station Pump #1 replacement - SKM Cost Estimate**

Item	Cost ($2010)	Comment
Pump and Motor	$116,494	Based on supplier budget price adjusted to 2010 money terms (assumed inflation rate 3%)
Installation	$8,325	Based on SunWater's 1997 costs adjusted for wage inflation to 2010 costs (assumed 4% p.a.)
Design, project management and administration	$31,206	Estimated at 25% of direct costs
Total	$156,024	

- **Table 15 Walker Point Pump Station Pump number 1 replacement specification**

Attribute	Pump Specification
Size	1040 – 660 mm
Make	ITT FLYGT Australia (70ml)
Model	CP3531/805
Type	Submersible
Head	13 m TDH
Flow rate	67ML/d
Motor Size	125 kW

The annuity value submitted by SunWater for replacement of this annuity item is within the estimating range of our estimated cost for a modern equivalent replacement asset albeit SKM's estimate is some 21% higher than SunWater's. As such SKM considers the SunWater proposed annuity item value of $129,115 for each pump replacement to be an underestimate and that an efficient value would be $156,000.

Conclusion on Efficiency Evaluation

The value submitted for this annuity item is efficient, based on available information.

B.2.5 Summary and Conclusions

SKM is satisfied that SunWater's procedures for determining the timing of replacement of these annuity items (pump #1 and pump #3) have been followed. SKM has also evaluated the recent demand for water as supplied by these pumps and consider that the current capacity is appropriate to the levels of demand observed. As such SKM considers that the timing and need for replacement of these items is prudent and that the timing of their replacement (in 2031 and 2031 respectively) is also prudent.

SKM considers the efficient cost of the replacement of these items to be $156,000 for each pump.

B.3 Bingera Main Channel – Concrete Lining Replacement

This sub-report should be read in conjunction with SKM's main report entitled: SunWater Price Regulation: Review of Selected Annuity Values for Refurbishment and Replacement Items, V2 Final dated 6th October 2011.

This sub-report is also subject to the limitation statement provided in the above mentioned report.

B.3.1 Introduction

The annuity item for which an annuity value has been submitted to the Queensland Competition Authority (Authority) is for the replacement of the concrete lining of the Bingera Main Channel in 2033 at a projected cost of $4,560,000.

SunWater advised that the asset was constructed in 1983 as part of the original construction of the distribution system.

The standard object type (asset type) for this infrastructure is recorded as Concrete Works (CTWK) which SunWater has allocated a standard run to failure asset life of 80 years and a refurbishment period of 40 years. SKM considers that the appropriate object type for this infrastructure is concrete lined irrigation channel (CHCONCL) which SunWater has allocated a standard run to failure asset life of 80 years and a refurbishment period of 20 years. SKM considers both the run to failure asset life and refurbishment period for CHCONCL to be more appropriate and in line with industry practice for this asset type than Concrete Works (CTWK).

B.3.2 Available Information

This sub-report has been prepared by accessing and viewing SunWater's SAP Works Management System (WMS), and asset condition and risk assessment policy and procedures. Please refer to the body of the main report for a more detailed description of these information sources.

In particular, SKM has drawn on the following Annuity Item specific replacement/refurbishment report produced by SunWater:

- **Table 16 Documentation Reviewed Specific to Bingera Main Channel Concrete Lining Replacement**

Document No.	Document Name	Document Title	Date
1169557	PRODUCTION-#1169557-v1-Task_7_QCA_SKM_Phase_2_review_Bingera_MC_Concrete_Lining_QCA_Response.DOC	Replace Bingera Main Channel Concrete Lining - $4.556M in 2033 – 2035	13 February 2012

B.3.3 Prudency Review

Asset Replacement/Refurbishment Date Determination

The processes by which SunWater determines a replacement/refurbishment date for an annuity item is described and discussed in the main body of this report.

In our review of the data in SAP and the information contained in the SunWater report specified above, SKM considers that SunWater has generally followed the policies and procedures that it has in place to determine annuity item replacement/refurbishment dates and costs as such. Where SKM has found exceptions to SunWater's procedure, and or data entry errors, SKM has highlighted these below together with other observations on data provided.

SKM considers the applied run to failure asset life and refurbishment period for this asset to be reasonable, based on a classification of CHCONCL and in keeping with good industry practice.

The Bingera Main Channel has been divided into 13 sections. Each section of channel has a unique asset identifier recorded within SAP WMS, with an associated asset condition record and risk evaluation.

SKM has viewed the SAP WMS record for these assets and confirmed that the assets have been in service since 1983.

SunWater has applied its risk evaluation method to these assets. From SunWater's SAP WMS system we note that for all but one section (BIA-BING-BMC-CL-CL08-CLC) it has an environmental, financial and stakeholder relations risk criterion with a consequence rating of minor (score 8). This, together with a probability (likelihood of occurrence) score of 3 results in an overall risk score of 24 which places these assets in a low risk category. Under SunWater's asset management method, for this asset type, an overall risk category of low and with a consequence score of less or equal to 8 determines that the asset is replaced on a run to failure basis. Where an asset is assessed as having a low overall risk but consequence of failure greater than 8, the asset is not allowed to run to failure but is planned to be replaced at a condition score of 5 rather than 6 (run to failure). The commentary within SAP WMS indicates that failure would cause localised flooding and third party damage. SKM considers the risk associated with these comments to be in line with the risk associated with the environmental, financial and stakeholder relations risk consequence score of 8. SKM therefore considers the risk related run to failure asset life to be reasonable.

The Bingera Distribution channel consists of 13 individual segments as noted above. Each of these segments is grouped in its own asset classification and is subject to the WMS assessments for future works. For each of these assets there are conditions scores which range from 2 (Minor defects only) to 5 (Major deterioration such that asset is virtually inoperable). The latest asset

condition assessments conducted ranges from 2004 to 2010; however SKM notes that the following two sections have no asset condition assessment recorded: BIA-BING-BMC-CL-CL02-CLC and BIA-BING-BMC-CL-CL12-CLC.

All condition assessments for each of the sections of channel have been conducted within the last 10 years which is consistent with SunWater's policy and procedures. SKM therefore considers that the information available on condition does not demonstrate justification to replace/ refurbish all the sections of channel.

SKM individually assessed each section of the Bingera Distribution channel to determine whether SunWater has followed their policies and procedures in determining the time of replacement.

Using the data recorded within the SAP WMS and making use of the SunWater decay curve the expected year of replacement for each channel section were determine. SKM determined that several of the sections of the channel are not in need of replacement within this annuity period (up to 2035). From the asset condition assessments SKM noted that it was evident that maintenance works had been conducted on a selection of the channels. For the sections that had maintenance conducted to them the asset condition assessments do not reflect the new/ refurbished asset condition rating contained in SAP as the recorded condition had not been updated to take into consideration the improvement in condition arising from the maintenance work undertaken.SKM calculated the replacement year for each section using data from within the WMS and the SunWater decay curve. Both the identified and predicted replacement years are outlined below.

- **Table 17 Predicted Replacement years**

Functional Location	Identified replacement	Replacement date according to degradation curve as calculated by SKM
BIA-BING-BMC-CL-CL01-CLC	2033	2039
BIA-BING-BMC-CL-CL02-CLC	2033	-*
BIA-BING-BMC-CL-CL03-CLC	2033	2012[1]
BIA-BING-BMC-CL-CL04-CLC	2033	2039
BIA-BING-BMC-CL-CL05-CLC	2033	2039
BIA-BING-BMC-CL-CL06-CLC	2033	2103
BIA-BING-BMC-CL-CL07-CLC	2033	2039
BIA-BING-BMC-CL-CL08-CLC	2035	2021[1]

BIA-BING-BMC-CL-CL09-CLC	2033	2039
BIA-BING-BMC-CL-CL10-CLC	2033	2120
BIA-BING-BMC-CL-CL11-CLC	2035	2042
BIA-BING-BMC-CL-CL12-CLC	2033	-*
BIA-BING-BMC-CL-CL13-CLC	2033	2039

* No data available for these sections of channel

[1] These two sections are the only two that falls within the annuity period

Options Evaluation

SunWater has included a preliminary options evaluation. The preliminary options evaluation investigated two options:

- Replacing like for like, and
- Installing an HDPE Liner

The default SunWater replacement option is replacing "like for like" in accordance with SunWater's method for determining replacement costs for annuity asset items which are to be replaced more than five years from the current planning date. The information supplied in the SunWater report specified above highlights the technical and financial challenges of installing a HDPE liner. It is difficult to establish the impact of each of the challenges at the preliminary options stage. . SKM therefore considers the options investigated reasonable and in keeping with good industry practice.

SKM investigated both the options above and found that replacement of the concrete liner like for like is the most cost effective option as discussed below.

Timing of Renewal/Refurbishment

Applying SunWater's risk and condition based method for determining run to failure asset life and hence projecting asset replacement timing, a risk score of low with a consequence score of less or equal to 8 determines that the asset will be replaced at the time of failure (asset condition score of 6).

As the Bingera channel is made up of thirteen sections, each is subject to its own condition assessment. Results indicated that the asset had typically deteriorated at a greater rate than the expected standard asset condition decay curve had predicted to that point. However, following the policies and procedures in place, only two of the sections of the Bingera channel require refurbishment within this annuity period according to the information available. The individual years of replacement can be seen in table 1: predicted replacement years, which indicate that

sections BIA-BING-BMC-CL-CL03-CLC and BIA-BING-BMC-CL-CL08-CLC need to be replaced in years 2012 and 2021 respectively. SKM considers that only the two sections of the channel are to be replaced in accordance to SunWater's policies and procedures within this annuity period.

Conclusion on Prudency Evaluation

SKM considers that SunWater's policies for adjusting replacement periods and assessing asset condition have not been followed. Although the assessment dates have not exceeded the maximum recommended value of 10 years, the asset category and hence standard run to failure life applied to the asset is incorrect in SAP. Applying the correct asset category and run to failure asset life and adjusting this for condition and risk results in projected replacement dates different to the indicated 2033 replacement year for each section.

From the information available, SKM concludes that the need for refurbishment of the two sections only of channel identified above has been demonstrated. As such, inclusion of two sections only of the proposed annuity item in the annuity value is considered prudent and due for replacement during the annuity period, ie in 2012 and 2021 respectively.

B.3.4 Efficiency Evaluation

The process used by SunWater to establish future annuity item replacements/refurbishments costs is detailed in the main body of this report.

For major works such as the replacement of the main channel concrete lining, SunWater's planning team applies a unit rate against a bill of materials quantities for the asset in question. Given the volume of annuity items that SunWater's Planning Team are engaged with at any point in time, this approach is considered reasonable and in accordance with good industry practice.

Renewal/Replacement Project Cost Evaluation

SKM has sighted as built drawings for the main channel and, as such, SKM has been able to develop a bench mark cost for replacing the main channel lining and find that SunWater's prices are within 30% of SKM's estimate which is in keeping with SKM's reviews of cost estimation for other concrete structures developed by SunWater.

On SKM applying SunWater's policy and procedures, it was found that only two of the thirteen sections within the Bingera Distribution Network are required to be replaced within this annuity period. Table 18 below indicates the predicted replacement years and the replacement cost as listed in WMS.

- **Table 18 Predicted Replacement years**

Functional Location	Identified replacement	Replacement date according to degradation curve as calculated by SKM	Cost for Replacement (BOM)
BIA-BING-BMC-CL-CL03-CLC	2033	2012	$74,090
BIA-BING-BMC-CL-CL08-CLC	2035	2021	$1,029,636
Total			$1,103,726

SKM evaluated both a like for like and an HDPE liner replacement option. Investigations were undertaken into the feasibility of an HDPE liner with results indicating that there would be extensive rework required due to the flow rate in the channel exceeding the maximum recommended for HDPE. SunWater has indicated that there is a higher potential cost incurred with installing an HDPE liner compared with a concrete liner and stated:

"If HDPE were to be used to replace concrete lining then there would be numerous other costs due to the differing hydraulic characteristics of the two materials. Concrete lining is able to tolerate higher velocities than HDPE. If HDPE were to be used to replace concrete then it may be necessary to enlarge the channel cross section. This would involve additional earthworks. The enlarged cross section may not fit within the existing channel reserve so it may be necessary to purchase additional land. A larger cross section may also require that channel structures are replaced and metered off takes relocated. Other services such as telecommunication and power utilities may have to be relocated. Farm infrastructure may also need to be relocated. Road crossings may also need to be enlarged."

SKM has viewed Drawing No. 61337 Rev F that indicates that the design velocity is 0.642 m/s. This flow velocity exceeds the allowable flow velocity 0.45 m/s for an HDPE liner and therefore replacement with an HDPE liner would necessitate the widening of the existing channel. SKM therefore agrees with SunWater's conclusion and supports the statement that additional earthworks and channel width will be required. As indicated by SunWater, HDPE cannot tolerate the same flow velocities as concrete due to its susceptibility to become damaged through higher flows lifting the material off its foundation base and reducing its integrity. In support of this, hydraulic calculations were undertaken by SKM to determine how significant the earthworks would need to be to halve the flow velocity. SKM determined that in order to halve the flow velocity, the channel width would need to be widened to the order of 50% to 100% of the original channel width. SKM's finding supports SunWater's statement and indicates that significant earthworks would be required to ensure flow velocities that are conducive with an HDPE liner.

SKM considers the like for like option to be the most efficient option and hence agree with SunWater to put forward an annuity item to replace the concrete lined channel with a like for like.

Conclusion on Efficiency Evaluation

On the basis of the above analysis SKM considers the concrete liner option and proposed costs for such to be efficient for the two sections identified as requiring to be replaced prior to 2035.

B.3.5 Summary and Conclusions

SKM is not satisfied that SunWater's procedures for determining the timing of refurbishment of an annuity item have been followed. On applying SunWater's policies for adjusting refurbishment periods and assessing asset conditions on a section by section basis, SKM concludes that only two sections of channel identified above have been demonstrated as being in need of replacement. As such, only two sections of the proposed annuity item in the annuity value is prudent with a replacement timing of 2012 and 2021.

SKM recognised that, in line with SunWater's Asset Refurbishment Planning Guideline a detailed options investigation will not be conducted until between 1 and 5 years prior to the replacement work being undertaken. Hence at this stage of the timing of asset replacement, SunWater adopts a default 'like for like' replacement assumption and determines the value of that annuity item replacement by escalating as installed costs. Based on information made available SKM considers the replacement of the annuity item like for like to be efficient at a cost of $74,090 for the section due to be replaced in 2012 and $1,103,726 for the section to be replaced in 2021. Prudency for replacement of the other sections has not been demonstrated.

SKM also recognises that the impact of bringing forward the replacement date for two sections of the channel will have a positive impact on the annuity value as a result of the time value of money calculation used to develop the annuity value. However, in line with instructions from the Authority in respect of the Authorities Terms of Reference for SKM's assignment and with other annuity replacement item reviews, SKM has not calculated this impact.

SunWater has advised that:

"*... the annuity is calculated based on the timing and quantum of cash expenditure. Whilst you* [SKM] *have pushed a number of sections outside the annuity period, you* [SKM] *have bought forward the planned expenditure of 2 sections. The former has the impact of reducing the annuity, whilst the latter will increase the annuity. I* [SunWater] *have done a rough calculation that shows that the NPV of our* [SunWater's] *original program was approximately $900,000. Your* [SKM's] *revised program has an NPV of approximately $700,000.*

In other words the total spend has reduced from $4.56M to $1.1M but the NPV impact is much smaller. The annuity impact moves from approx $92k to $70k".

B.4 St George Distribution - Refurbishment of St George Pump Station

This sub-report should be read in conjunction with SKM's main report entitled: SunWater Price Regulation: Review of Selected Annuity Values for Refurbishment and Replacement Items, V2 Final dated 6th October 2011.

This sub-report is also subject to the limitation statement provided in the above mentioned report.

B.4.1 Introduction

The annuity item for which an annuity value has been submitted to the Queensland Competition Authority (Authority) is for the refurbishment of St George Pump Station.

The pump station was constructed in the late 1950's upstream of the Jack Taylor Weir on the Balonne River. The pump station was originally installed with three pumps with capacities of approximately 200 L/s, 425 L/s and 540 L/s. Two upgrades have been completed since the pump station was constructed. In 1998, the 425 L/s pump was replaced with an 850 L/s capacity pump. The following year, in 1999, a section of 900 mm diameter rising main was replaced with 1200 mm diameter reinforced concrete rising main.

In the last review period, a project relating to the replacement of the St George Pump Station suction pipework was assessed as prudent and not efficient as SKM deemed the annuity value submitted to the Authority to include the replacement of the pump station.

SKM understands that SunWater submitted an annuity item for a combined cost of approximately $4M in its Network Service Plan.

The "St George PSTN – Design phase of pump station replacement" project scope definition document identifies the construction of a new submersible pump station over two stages as the preferred option to proceed with. This recommendation is supported by the "Analysis of Options for Replacement of St George Pump Station, St George Irrigation Scheme" report (2005) which analyses options with the view of eliminating the workplace health and safety issue of confined space rather than managing the issue through policies and procedures (which the "Business Case for St George Pump Station" does and reaches the preferred option of *"construct a new intake now and install new pumps and motors in the existing pump station now"*).

B.4.2 Available Information

This sub-report has been prepared by accessing and viewing SunWater's SAP Works Management System (WMS), and asset condition and risk assessment policy and procedures. Please refer to the body of the main report for a more detailed description of these information sources.

In particular, we have drawn on the following Annuity Item specific replacement/refurbishment report produced by SunWater for this review:

Table 19 Documentation Reviewed Specific to St George Pump Station

Document No.	Document Name	Document Title	Date
1116938	Doc#1116938 - Copy of Analysis Report - Analysis of Options for Replacement of St George Pump Station.PDF	Analysis of Options for Replacement of St George Pump Station, St George Irrigation Scheme	November 2005
None	W-SunWater-Sub-SunWater-AssetManagePlanMeth-1210.pdf	Review of irrigation prices: Asset Management Planning Methodology Paper	October 2010
309582	Doc#309582 - ST GEORGE PUMP STATION REDEVELOPMENT BUSINESS CASE.PDF	Business Case of St George Pump Station	June 2006
1136175	Doc#1136175 - 2012 Scoping - Replace St George PSTN Design phase.DOC	St George PSTN – Design phase of pump station replacement	04 November 2011
1159463	Doc#1159463 - Project scope 12SGA16 Dismantle and inspect pump units and valves St George PSTN.DOC	Dismantle and inspect pump units and valves	04 November 2011
329830	Doc#329830 - Asset Management Forum 2006 - 210 St George Pump Station.PPT	St George Pump Station	Not dated
1172227	Doc#1172227 - Whole of Life Maintenance Strategy_copy.xlsx	Whole of Life Maintenance Strategy	Not dated
None	St George SAP Export.MHTML	Not titled	Not dated
None	St George Pump Station Replacement	Modified Concept with Stage 1 including suction pipes to original pump well	Not dated

B.4.3 Prudency Review

Asset Replacement/Refurbishment Date Determination

The process by which SunWater determines a replacement/refurbishment date for an annuity item is described and discussed in the main body of this report.

In our review of the data in SAP and the information contained in the SunWater reports specified above, we consider that SunWater has largely followed the policies and procedures that it has in

place to determine annuity item replacement/refurbishment dates and costs for such. Where we have found exceptions to this, and/ or data entry errors, we have highlighted these below together with other observations on the data provided.

The *"Review of irrigation prices: Asset Management Planning Methodology Paper"* (2010) states that:

> *"The following functional requirements are considered when undertaking a risk assessment of an asset within SunWater:*
>
> - *maintenance of technical functionality to achieve required service performance outcomes – consider all relevant technical failure modes*
> - *achievement of required service performance in the event of natural events such as flood, storm, lightning, bush fire, earthquake*
> - *ability to meet dam safety requirements*
> - *ability to meet ROP compliance requirements*
> - *ability to comply with workplace health and safety (WH&S) including public safety and regulatory requirements*
> - *ability to comply with environmental management and regulatory requirements"*

A condition and risk assessment of the St George Pump Station structure undertaken on the 7th September 2005 noted that the access ladder was noncompliant and for the WH&S category received a score of 100 with a critical consequence rating. The "Business Case of St George Pump Station" document (June 2006) states:

> *"In most circumstances the refurbishment of an aging pump station would be considered the most viable option, however, the upgrading of the St George structure to meet Workplace, Health and Safety Standards weighed against the options."*

On the assumption that SunWater's procedures for condition assessment have been followed, based on this condition and risk assessment score and given that the existing structure does not comply with workplace health and safety requirements, we consider that this annuity item (refurbishment) is prudent.

Options Evaluation

Both the "Analysis of Options for Replacement of St George Pump Station, St George Irrigation Scheme" document (November 2005) and the "Business Case of St George Pump Station" document (June 2006) detail options considered. These are:

- A "Do nothing" option

- Construct a new intake now and install new pumps and motors in the existing pump station in five years time
- Construct a new intake and refurbish new pumps and motors now
- Construct a new intake and install new pumps and motors in the existing pump station now
- Construct a new intake now and construct a new submersible pump station in five years time
- Replace the existing pump station with a new submersible pump station now

The preferred option was to construct a new intake now and install new pumps and motors in the existing pump station in five years time. This is supported by the project from last year to refurbish the inlet pipes. However, as further explained in the efficiency evaluation section of this report, SKM has reviewed the NPV calculation and considers the most efficient option to be the option to replace the existing pump station with a new submersible pump station as one project rather than as a two phase project as SunWater is currently planning. SKM understands that it is the two phase project implementation option that SunWater submitted in its Network Service Plan for a combined cost of approximately $4M.

It should be noted that the latest project information states that a replacement submersible pump station is to be constructed, which agrees with the outcome of the "Analysis of Options for Replacement of St George Pump Station, St George Irrigation Scheme" report (from November 2005) which states that the preferred option will include *"(a) new inlet works and pump well ... in a concrete box structure located on the storage bank"*. The report also states:

> *"The concrete structure would comprise of four equal bays, one for each submersible pump and a bay for a Balonne Shire Councils pump. Each bay would be fronted by an inlet structure comprising baulk slots and a trash screen."*

Excluding the contradictory information as to SunWater's selected preferred option, for which the determination of the reasons for this conflicting information is outside the scope of this review, SKM considers the options evaluated to be appropriate.

Timing of Renewal/Refurbishment

As stated above, the lack of data prevents a complete review; however, the WMS data demonstrates that the assets are at or passed their predicted asset lives. As the pump station access has a WH&S condition score of six, the timing of the refurbishment is considered inappropriate as this should be addressed promptly.

Conclusion on Prudency Evaluation

On the understanding that SunWater's policies for adjusting refurbishment periods and assessing asset condition have been followed, we conclude that the need for refurbishment of this annuity asset has been demonstrated, due mainly to the poor condition of the suction lines, the overall age of the existing pump station and generally time expired assets and on WHS grounds to address the confined space WHS issue. We also agree with SunWater that replacement with a submersible pump station, rather than a like for like option is a technically superior option.

As such the inclusion of this annuity item in the annuity value is considered prudent.

B.4.4 Efficiency Evaluation

The process used by SunWater to establish future annuity item replacements/refurbishments costs is detailed in the main body of this report.

For major works such as installation of a new pump station and inlet works, SunWater's planning team applies a unit rate against a bill of materials quantities for the asset in question. Given the volume of annuity items that SunWater's Planning Team are engaged with at any point in time, this approach is considered reasonable and in accordance with good industry practice.

Renewal/Replacement Project Cost Evaluation

SunWater has undertaken an NPV calculation for 5 options within the Business Case of St George Pump Station document as referenced above. The recommended option from the NPV calculation conducted by SunWater was to replace the inlet structure now and refurbish / replace the components of the existing pump station within 5 years. However, SKM has reviewed the NPV calculation and consider the most efficient option (albeit only marginally) to be constructing a new submersible pump station now. The NPV as calculated by SKM for the submersible pump station now is $2,714,575 compared with the NPV of$2,730,679 for replacing the inlet pipe now and refurbishing / replacing the pump station within 5 years.

SKM has reviewed the SunWater document "Analysis of options for Replacement of St George Pump Station". This document includes a breakdown of the proposed expenditure (as at 2005) for the selected submersible pump station option. Based on the drawings provided in the "Business Case of St George Pump Station" document (June 2006), SKM has conducted a 'bottom up' cost estimate associated with the installation of a new submersible pump station inclusive of inlet works and a valve pit. The cost comparisons between SunWater's proposed expenditure for the submersible pump station, per the 2005 report which contemplated undertaking the works in a single phase and SKM's estimated costs inclusive of design and supervision are outlined below in **Table 20**.This includes SunWater costs corrected to 2010 values at an assumed annual CPI of 3%.

- **Table 20 Summary of SunWater expenses (SKM recommended option)**

Item	SunWater Estimate 2005 ($)	SunWater Corrected to 2010 ($)	SKM Estimate 2010 ($)	Difference (%)
Civil Works including design and supervision	955,938	1,127,285	996,702	13
Mechanical and Electrical	596,250	703,124	524,000	34
Mechanical and Electrical design and supervision	89,438	105,469	200,000	52
Demolish and remove the old suction pipelines and support structures	100,000	118,000	118,000	0
Replace switchboard and Control Equipment	85,000	100,000	150,000	66
Total estimated cost	1,826,626	2,153,878	1,988,702	8

SKM understands that removal of the old suction lines will be necessary as they currently represent a safety hazard. This item has therefore been included in the estimate. SKM was able to effectively estimate the cost for civil works using drawings provided by SunWater and a selection of rates from both Rawlinson's 2011 and other construction rates sourced from projects within SKM's database. Pricing for mechanical and electrical works has been based upon SKM internal database costs, and also upon similar SunWater projects for which price validation has already been completed. SKM considers that SunWater's cost for the works, as set out in the 2005 report is efficient as there is only an 8% variance between the cost estimates, which is within an acceptable 30 % range.

As noted in the Options Evaluation section of this report, two recommendations have been made by SunWater which are apparently contradictory. Therefore, while the costs in Table 20 represent those for the complete pump station replacement, SKM has also evaluated in Table 21 the costs for the SunWater selected preferred option as submitted in its Network Service Plan (replace the inlet structure now and refurbish / replace the components of the existing pump station within 5 years).

For the SunWater preferred option as submitted in the Network Service Plan, the project would involve two stages; Stage 1 would involve construction of a new intake structure, including suction pipes to the original pump well. Stage 2 would involve the installation of new pumps and switchgear in the existing submersible pump station. SunWater has provided a detailed breakdown of the cost estimate for this option, based upon Stage 1 being completed in 2013, and Stage 2 being completed in 2017.

SKM has reviewed these costs, and a summary comparison is shown in Table 21.

- **Table 21 Cost Estimate (SunWater preferred option)**

Item	SunWater Estimate Stage 1 ($)	SunWater Estimate Stage 2 ($)	SunWater Estimate Total ($)	SKM Estimate ($)	Difference (%)
Control Building	0	150,000	150,000	150,000	0%
Earthworks and Retaining Wall	280,000	0	280,000	280,000	0%
Pumps (3 off)	0	690,000	690,000	450,000	53%
Pump Well	1,000,000	0	1,000,000	570,000	75%
Flow meters	0	150,000	150,000	60,000	150%
Rising Main	200,000	300,000	500,000	500,000	0%
Switchboard and SCADA	0	560,000	560,000	250,000	124%
Design/Legal/Environmental	200,000	0	200,000	200,000	0%
Subtotal	1,680,000	1,850,000	3,530,000	2,460,000	43%
Contingency 10%	168,000	185,000	353,000	246,000	43%
Removal of existing intake pipes	0	150,000	150,000	150,000	0%
Total estimated cost	1,826,626	2,283,281	4,109,907	$2,856,000	44%

Note:

1) this estimate includes an allowance for the replacement of the rising main, which was not included in the costs for the complete new submersible pump station in Table 20. However, SKM understands a significant section of this rising main has already been replaced in 1999 as such and although we have accepted SunWater's costs for undertaking this work, as we have not sited a condition report following the 1999 works; it is possible that the allowed $500k to replace the rising mains is an overestimate.
2) SKM believes the existing intake pipes will require removal for safety reasons, and has included their removal costs in the estimate.

SKM believes the overall SunWater cost estimate for this option ($4.11M) is not efficient, the SKM estimate being overall 44% at variance with SunWater.

Given these assumptions, SKM considers a construction cost of $2.15M for the replacement submersible pump station to be efficient. SKM also understands that SunWater has allowed some flexibility for the timing of the second stage of the pump replacement option. By deferring this stage beyond the planned date of 2017 this option would become more attractive (on a discounted cash flow basis). When considering the discounted cash flow implications, construction of the pump station in two phases becomes the preferred option.

Conclusion on Efficiency Evaluation

The annuity value submitted by SunWater for the complete project is higher than SKM's estimation for the installation of a new submersible pump station by more than the order of magnitude estimating margin of SKM's estimate (±30%). As such SKM considers only $2.15M of the SunWater proposed annuity item value to be efficient (being SunWater's original estimate in the 2005 option study, stated in 2010 money terms).

Summary and Conclusions

We are satisfied that SunWater's procedures for determining the timing of refurbishment of an annuity item have been followed and hence that the timing and need for refurbishment of this annuity item is prudent.

SKM considers the annuity item cost submitted by SunWater in its Network Service Plan not to be efficient. SKM considers only $ 2.15M of the annuity to be efficient. However, if SunWater is able to demonstrate that it is necessary to implement the works in two phases (or that on a discounted cash flow basis, a two phase construction is comparable in cost (in 2010 money terms) to a single phase construction) and that the rising main does require to be replaced then we consider the efficient costs to be $2.86M.

B.5 Mareeba Distribution- South Pipe Distribution – Replace Pipe

This sub-report should be read in conjunction with SKM's main report entitled: SunWater Price Regulation: Review of Selected Annuity Values for Refurbishment and Replacement Items

This sub-report is also subject to the limitation statement provided in the above mentioned report.

B.5.1 Introduction

The annuity item for which an annuity value has been submitted to the Queensland competition Authority (Authority) is for the refurbishment of the Mareeba Pipeline for Fiscal years 2018 through to 2033. The total Cost of Refurbishment has been estimated to cost $4.2M for 26 different sections of the Pipeline.

According to SunWater's SAP Works Management System (WMS), the asset has been in operation since 1963. Sections of the pipeline are identified in SunWater's WMS as being in need of replacement within the current annuity period.

B.5.2 Available Information

This sub-report has been prepared by accessing and viewing SunWater's SAP Works Management System (WMS), and asset condition and risk assessment policy and procedures. Please refer to the body of the main report for a more detailed description of these information sources.

In particular, we have drawn on the following Annuity Item specific replacement/refurbishment report produced by SunWater for this review:

- **Table 22 Documentation Reviewed Specific to the Replacement of Pipe in the South Pipe Distribution – Mareeba Distribution**

Document No.	Document Name	Document Title	Date
1170972	PRODUCTION-#1170972-v1-QCA__SKM_Phase_2_Review_#9_Justification_Mareeba_Pipelines_Replacement.DOC	Mareeba Pipelines Replacement QCA Response	22/02/2012
	Cardno	Asset Valuation Report (Final)	30 June 2008

B.5.3 Prudency Review

Asset Replacement/Refurbishment Date Determination

The process by which SunWater determines a replacement/refurbishment date for an annuity item is described and discussed in the main body of this report.

In our review of the data in SAP and the information contained in the SunWater report specified above, we consider that SunWater has largely followed the policies and procedures that it has in place to determine annuity item replacement/refurbishment dates and costs for such. Where we

have found exceptions to this, and or data entry errors, we have highlighted these below together with other observations on the data provided.

We consider the applied run to failure asset life and refurbishment period for this asset to be reasonable and in keeping with good industry practice.

We have viewed the WMS record for this asset confirmed that the asset has been in service since 1963.

SunWater has applied its risk evaluation method to this asset and determined that it has a production/operations risk criterion consequence rating of 18. This, together with a probability (likelihood of occurrence) score of 3 results in an overall risk score of 54 which places this asset in a low risk category. For this asset type, an overall risk category of 'Low' but with a consequence score of greater than 8, restricts the maximum condition score that the asset is allowed to deteriorate to is condition category 5 (Major deterioration such that the asset is virtually inoperable) rather than run to failure.

A condition score of 4 was recorded in 2010 for a section of pipeline in operation since 1963. Comparing the asset condition in 2010 with the standard asset condition decay curve, it can be seen asset is deteriorating faster than the standard assumed rate for deterioration. Instead of an expected life of 80 years, the asset has been calculated to have a run to failure life of 75 years indicating a new replacement year of 2038 on a run to failure basis.

On the assumption that SunWater's procedures for condition assessment have been followed, based on this condition and risk assessment score, we consider that this annuity item (refurbishment) is prudent.

Options Evaluation

SKM has not sighted any options analysis for the refurbishment of this item. However the WMS has identified the sections of the asset which need refurbishment within this annuity period. Given that the first refurbishment is not expected to be undertaken until 2018, SKM considers the SunWater's assumption of a like for like replacement to be reasonable.

Timing of Renewal/Refurbishment

SKM analysed a range of different pipe segments and found the timing to be prudent in accordance with the WMS. Upon considering the risk assessment score of 18, which under SunWater's policies allows an asset to reach a maximum condition score of 5 then the asset decay curve indicates that the asset will reach a condition categorised by condition score 5 by 2029. As such SunWater reduces the asset replacement year to approximately 2029 in accordance with their systems. Hence, the replacement of this pipe segment in this annuity period is prudent.

This same system has been used on all sections of the pipeline. Based on respective condition scores, different segments of the pipeline have been highlighted for replacement at different times. SKM agrees with this methodology and that replacement of the selected pipelines is prudent at the timings determined by SunWater.

Conclusion on Prudency Evaluation

On the understanding that SunWater's policies for adjusting refurbishment periods and assessing asset conditions have been followed, we conclude that the need for refurbishment of this annuity asset has been demonstrated. As such the inclusion of this annuity item in the annuity value is prudent and that the timings determined by SunWater for replacement of the individual sections is appropriate.

B.5.4 Efficiency Evaluation

The processes used by SunWater to establish future annuity item replacement/refurbishment costs are detailed in the main body of this report.

For major works such as the replacement of a pipeline, SunWater's planning team applies a unit rate against a bill of materials quantities for the asset in question should the replacement be scheduled more than 5 years from the planning date. Given the volume of annuity items that SunWater's Planning team is engaged with at any point in time, this approach is considered reasonable and in accordance with good industry practise, where the management of a large portfolio of assets is concerned.

The proposed annuity replacement option of the asset considers a like for like replacement of the infrastructure. Following this procedure, the replacement would involve the replacement of reinforced concrete pipes. Current industry standards suggest the use of modern equivalent alternative materials such as PVC, Ductile Iron and MSCL are more efficient alternatives to reinforced concrete in water distribution networks. However, SKM notes that these modern equivalents are intended for potable water distribution networks that are required to operate at minimum pressure levels commensurate with fire fighting requirements, as such SKM has chosen to adopt a like for like replacement material for these assets ie reinforced concrete pipes.

Renewal/Replacement Project Cost Evaluation

SunWater has predicted that the total cost due to asset replacements will be $4.2M. SunWater has provided SKM with a sample list of the assets to be replaced which constitute a replacement cost of circa $4M. We have used this list of assets to develop benchmark costs against which to evaluate whether SunWater's costs, as submitted in its Network Service Plan are efficient.

SKM has built up benchmark cost estimates for the identified annuity item using relative unit rates from data contained in Rawlinson's (2011) for concrete pipe work on a cost per m length of installation for each diameter of pipe used and applied a 10% uplift for fittings, a standard

installation cost per m length for a rural environment and a 20% uplift for design, procurement and project management. SKM's then adjusted its cost estimate to 2010 money terms by assuming an inflation rate of 3.5% in each year from 2010 to 2012. The SKM cost estimate, being an order of magnitude estimate (± 30%) is presented in Table 23 together with the SunWater estimate per its Network Service Plan. Table 23 Cost Estimates for Refurbishment

Pipe name / Functional Location	SunWater Cost Estimate Per NSP $(2010)	SKM Estimate $(2010)
MDA-MAR-IRR-M06-P001	144000	73,873
MDA-MAR-IRR-M15_2-P002	21079	19,677
MDA-MAR-IRR-M09_2-P001	68138	55,975
MDA-MAR-IRR-M14_1-P001	112142	109,920
MDA-MAR-IRR-M09_1-P001	298798	223,145
MDA-MAR-IRR-M04_2-P001	66500	71,390
MDA-MAR-IRR-M11-P002	35463	55,410
MDA-MAR-IRR-M02-P001	283547	403,533
MDA-MAR-IRR-M09-P001	391620	615,416
MDA-MAR-IRR-M09-P003	490979	706,494
MDA-MAR-IRR-M11-P001	26833	21,902
MDA-MAR-IRR-M13-P002	20100	12,776
MDA-MAR-IRR-M14-P001	271000	317,044
MDA-MAR-IRR-M14-P002	91316	125,279
MDA-MAR-IRR-M14-P005	65500	40,691
MDA-MAR-IRR-M18-P001	49829	52,141
MDA-MAR-IRR-M18-P002	40400	72,078
MDA-MAR-IRR-M20-P001	94564	146,010
MDA-MAR-IRR-MC-P008	92938	124,137
MDA-MAR-IRR-MC-P010	232818	295,871
MDA-MAR-IRR-MC-P011	284364	450,158
MDA-MAR-IRR-MC-P012	48704	70,515
MDA-MAR-IRR-MC-P014	338516	532,862
MDA-MAR-IRR-MC-P016	8241	7,567
MDA-MAR-IRR-MC-P017	301219	475,508
MDA-MAR-IRR-MC-P024	115219	181,568
	3,993,827	**5,260,941**

From the above comparison it can be seen that the SunWater cost estimate is lower than SKM's cost estimate by approximately $1.3m and just below SKM's cost estimating band lower estimate of $4,047,000.

Conclusion on Efficiency Evaluation

The annuity value submitted by SunWater for replacement of these annuity items, based on the sample of assets assessed (representing some $4M of assets against the $4.2M annuity value) is just below SKM's estimating range for a like for like asset replacement. As such SKM considers the SunWater proposed annuity item value of $4.2M to be efficient

B.5.5 Summary and Conclusions

SKM is satisfied that SunWater's procedures for determining the timing of refurbishment of an annuity item have been followed and hence that the timing and need for refurbishment of this annuity item is prudent and that the timing of replacement of the annuity items identified by SunWater is appropriate.

SKM considers the SunWater estimate for replacement of these annuity items at $4.2M to be efficient and to be an underestimate compared to SKM's order of magnitude estimate for the sample reviewed of $5.3M.

B.6 Bundaberg Distribution - air valve replacement

This sub-report should be read in conjunction with SKM's main report entitled: SunWater Price Regulation: Review of Selected Annuity Values for Refurbishment and Replacement Items, V2 Final dated 6th October 2011.

This sub-report is also subject to the limitation statement provided in the above mentioned report.

B.6.1 Introduction

The annuity item for which an annuity value has been submitted to the Queensland Competition Authority (Authority) is for the replacement of air valves within the Bundaberg Distribution. The total cost of refurbishment has been estimated to cost $3.7 M.

B.6.2 Available Information

This sub-report has been prepared by accessing and viewing SunWater's SAP Works Management System (WMS), and asset condition and risk assessment policy and procedures. Please refer to the body of the main report for a more detailed description of these information sources.

In particular, we have drawn on the following Annuity Item specific replacement/refurbishment report produced by SunWater for this review:

- **Table 24 Documentation reviewed specific to Bundaberg Distribution Air valve replacement**

Document No.	Document Name	Document Title	Date
None	QCA - line item 10 - BIA - replace air valves.doc	QCA - line item 10 - BIA - replace air valves	None
1172227	Doc#1172227 - Whole of Life Maintenance Strategy_copy.xlsx	Whole of Life Maintenance Strategy	Not dated

B.6.3 Prudency Review

Asset Replacement/Refurbishment Date Determination

The process by which SunWater determines a replacement/refurbishment date for an annuity item is described and discussed in the main body of this report.

In our review of the data in SAP and the information contained in the SunWater reports specified above, SKM considers that SunWater has largely followed the policies and procedures that it has in place to determine annuity item replacement/refurbishment dates and costs for such. Where SKM has found exceptions to this, and or data entry errors, SKM has highlighted these below together with other observations on the data provided.

The air valves vary between nine and 35 years old throughout the Bundaberg Irrigation Area, with 92% of the units fitted up to and including 1992. SKM notes that SunWater has allocated a

standard run to failure asset life of 20 years within its 'Whole of Life Maintenance Strategy' spreadsheet for air valves (asset type VLAIRV). SKM considers the applied run to failure asset life and refurbishment period for this asset to be reasonable and in keeping with industry practice.

Based on a run to failure life of 20 years it is expected that each air valve within the Bundaberg Distribution will require replacement at least once within the review period.

On the assumption that SunWater's procedures for condition assessment have been followed, based on this condition and risk assessment score, we consider that this annuity item (refurbishment/ replacement) is prudent for replacement of all valves within the annuity period as a rolling programme of replacements (as opposed to replacing all air valves at one point in time – which isn't practicable).

Options Evaluation

SKM has not sighted any options analysis for the refurbishment of this item however, given the asset type SKM considers replacement with like for like as reasonable. It is to note that older type air valves may not have the same attributes as newer type air valves. The standard practices of air valve configuration may also have changed since the design. In light of not having reviewed any design details (which again was impracticable given the number of air valves to be replaced) SKM recommends that SunWater undertakes a replacement study to ensure that replacing the existing air valves will meet current good industry practice and to ensure that the most efficient air valve be chosen for the application. This could be undertaken on a sample basis.

Timing of Renewal/Refurbishment

SKM considers that, given the run to failure asset life of 20 years identified in the 'Whole of Life Maintenance Strategy' spreadsheet, all air valves would be expected to be replaced at least once within the annuity period.

Conclusion on Prudency Evaluation

On the understanding that SunWater's policies for adjusting refurbishment periods and assessing asset condition have been followed, we conclude that the need for refurbishment of this annuity asset has been demonstrated. As such, the inclusion of this annuity item in the annuity value is prudent.

B.6.4 Efficiency Evaluation

The processes used by SunWater to establish future annuity item replacement/refurbishment costs are detailed in the main body of this report.

For major works, SunWater's planning team applies a unit rate against a bill of materials quantities for the asset in question, should the replacement be scheduled more than five years from the planning date. Given the volume of annuity items that SunWater's Planning team is engaged with

at any point in time, this approach is considered reasonable and in accordance with good industry practise, where the management of a large portfolio of assets is concerned.

Renewal/Replacement Project Cost Evaluation

SunWater has estimated that the total cost for replacement of the 821 identified air valves to be $ 3.7 M, with the total material costs equating to $ 2.87 M. From SKM's review of SunWater's documentation SKM notes that this has been estimated on the assumption that each unit will cost approximately $ 3,500 to replace. This cost estimate is based on including the air valve, shut-off valve, new stand pipe, barricading, earthworks, flanges and labour.

SKM has reviewed SunWater's SAP WMS to determine the quantity of each size of valve in service. The distribution of valve sizes within the Bundaberg Distribution is outlined in **Table 25**.

- **Table 25 Identified Valves within the Bundaberg Irrigation Area**

Valve Type	Diameter	Quantity
VALVE-AIR 25DIA(PVC RISER)-MATLS	25	338
VALVE-AIR 25DIA-MATLS	25	2
VALVE-AIR 50DIA(PVC RISER)-MATLS	50	385
50 AIR VENT (PVC Pole) matls	50	3
VALVE-AIR 50DIA-MATLS	50	208
VALVE-AIR TWIN 50DIA-MATLS	50	6
VALVE-AIR 75DIA(PVC RISER)-matls	75	3
VALVE-AIR 75DIA-MATLS	75	48
VALVE-AIR 100DIA-MATLS	100	56
VALVE-AIR 100DIA(PVC RISER)-matls	100	1
VALVE-AIR TWIN 100mm MATLS	100	1
VALVE-AIR 150DIA-MATLS	150	17
Total		**1068**

Based on SKM's recent project experience, we obtained quotations from a number of suppliers for the different sizes of air values within the Bundaberg Distribution. The total costs for each air valve size were determined based on the material cost with a 30 % allowance on the material cost for installation and a 50 % allowance on the material cost for indirect costs. The findings are summarised below in **Table 26**.

- **Table 26 Cost estimates per air valve**

Diameter (mm)	Material cost ($)	Installation cost ($)	Indirect costs ($)	Total costs ($)
25	520	156	260	936
50	750	225	375	1,350
75	1,008	302	504	1,814

Diameter (mm)	Material cost ($)	Installation cost ($)	Indirect costs ($)	Total costs ($)
100	1,100	330	550	1,980
150	2,500	750	1,250	4,500

SKM concluded that the total cost to replace all the identified air valves is be approximately $ 1.41 M.

Typically SunWater treats air valves under the operating methodology of 'RTF' or (Run to Failure) which indicates that the air valves are only replaced upon failure.

The large variation between SKM's estimated costs and SunWater's proposed expenditure is considered to be attributed to SunWater's estimated being based on the costs associated with the full valve assemblies inclusive of; valves, standpipes, barricades, flanges, earthworks and labor.

Typically the process involved with replacing an air valve only includes the replacement of the valve itself. However, SunWater's estimate is inclusive of the replacement of flanges and the surrounding structure. Typically flanges and surrounding structures should have a life expectancy close to that of the attached pipeline. Adopting this principle, SKM has developed a price on quotes from suppliers and typical installation and indirect costs ignoring costs associated with earthworks and stand pipes.

Conclusion on Efficiency Evaluation

The annuity value submitted by SunWater for replacement of this annuity item is significantly greater than SKM's estimation for annuity works. As such SKM considers the SunWater proposed annuity item value of $3.7 M not to be efficient. SKM considers that $1.41 M to be an efficient annuity value for the replacement of the air valves.

B.6.5 Summary and Conclusions

SKM is satisfied that SunWater's procedures for determining the timing of refurbishment of an annuity item have been followed and hence that the timing and need for refurbishment of this annuity item is prudent for a program of replacements during this annuity period.

Given that SunWater has estimated the cost of replacement to be greater than the expected value calculated, SKM considers the cost of the refurbishment not to be efficient. SKM however recommends that an annuity value of $1.41 M be allowed for the replacement of the air valves.

B.7 Woongarra Pump Station Control Replacement

This sub-report should be read in conjunction with SKM's main report entitled: SunWater Price Regulation: Review of Selected Annuity Values for Refurbishment and Replacement Items, V2 Final dated 6th October 2011.

This sub-report is also subject to the limitation statement provided in the above mentioned report.

B.7.1 Introduction

The annuity item for which an annuity value has been submitted to the Queensland Competition Authority (Authority) is for the replacement of the Common Control at the Woongarra Pumping Station.

B.7.2 Available Information

This sub-report has been prepared by accessing and viewing SunWater's SAP Works Management System (WMS), and asset condition and risk assessment policy and procedures. Please refer to the body of the main report for a more detailed description of these information sources.

In particular, we have drawn on the following Annuity Item specific replacement/refurbishment report produced by SunWater for this review:

Table 27 Documentation Reviewed Specific to Woongarra Pump Station

Document No.	Document Name	Document Title	Date
#273843	Report	Woongarra Pump Station	December 2005
#306979	BUN 3029 Final Report	Woongarra PS Risk	September 2004
#515900	Complete Report Woongarra Pump Station	Motor Supply Cables Replacement	March 2007
#1065798	Report Woongarra Pump Station	Replacement Analysis	March 2011
#1128347	Project Scope for Options Analysis	Replacement of Woongarra PSTN	-

B.7.3 Prudency Review

Asset Replacement/Refurbishment Date Determination

The process by which SunWater determines a replacement date for an annuity item is described and discussed in the main body of this report.

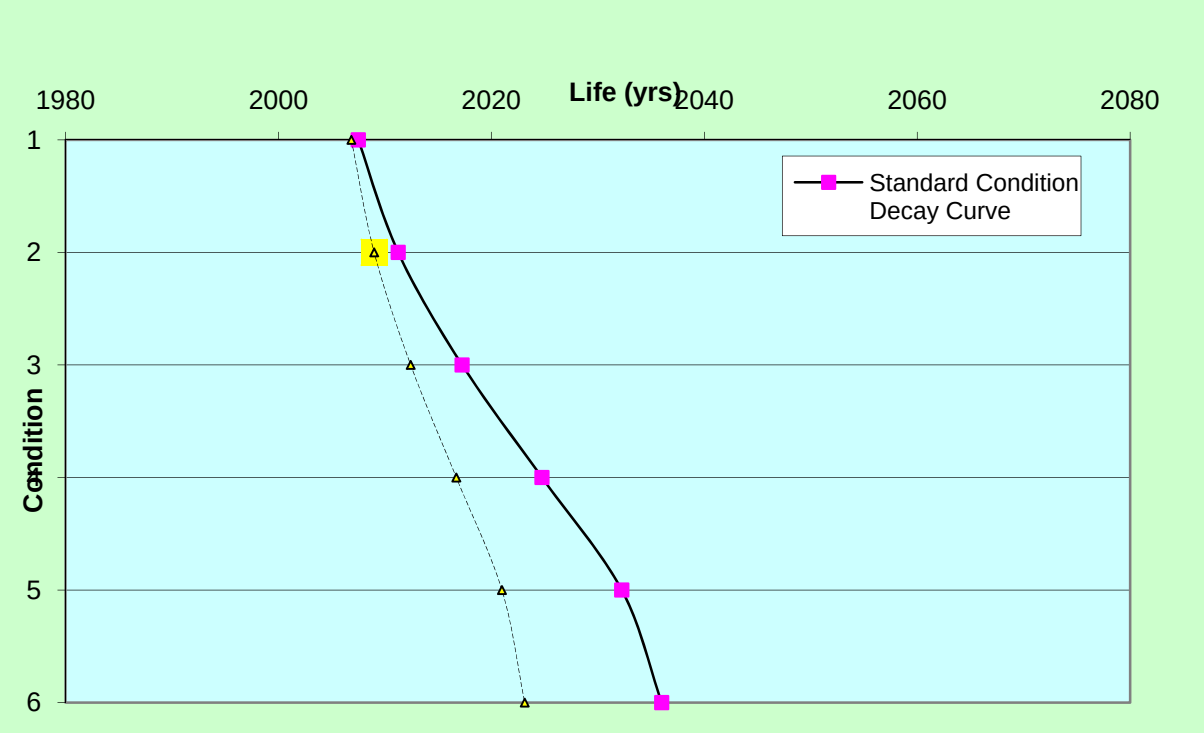
In our review of the data in SAP and the information contained in the SunWater report specified above, we consider that SunWater has largely followed the policies and procedures that it has in place to determine annuity item replacement/refurbishment dates and costs for such. Where we

have found exceptions to this, and or data entry errors, we have highlighted these below together with other observations on the data provided.

The standard object type (asset type) for this infrastructure is SCADA (Controls and SCADA). For this asset SunWater has allocated a standard run to failure asset life of 15 years and a condition inspection frequency of 5 years. We consider the condition assessment frequency (5 years) applied to this asset type to be reasonable.

We have viewed the WMS record for this asset and confirmed that the asset has been in service since 1978. SunWater has applied its risk evaluation method to this asset and determined the risk, during the most recent risk assessment in 2008. This risk assessment yields a highest consequence score of 3 with a probability of 10 resulting in an overall risk score of 30 (ie Low Risk). For this asset type, an overall risk category of low with a consequence score of less than or equal to 8 does not lead to a risk related adjustment to the replacement date for the asset. A condition assessment for the asset was undertaken in 2008 (within the required frequency). The condition assessment indicates that the highest condition score allocated was a 3 (Minor defects only). Applying the condition assessment score and risk rating to SunWater's Condition Based Replacement Life Adjustment Tool results in a forecast run to failure life of 40 years and a projected replacement date of circa 2033.

The asset (including pumps and motors) is scheduled for replacement in 2032, and has an expected life of 30 years. However, from examination of the SAP, SKM understands the common controls were last replaced in 1993. With the knowledge of the obsolescence which usually affects this type of control equipment regardless of condition, SunWater would normally assume a standard run to failure asset life for this asset and scheduled replacement at the end of that life, i.e. 1993 installed date plus 15 years standard life gives a 2008 replacement date. The run-to-failure life has therefore already been exceeded. From SAP WMS we note that SunWater has planned to reprogram the SCADA in 2012 in line with a planned pumps and motors upgrade study. SunWater has therefore decided to extend the life of the asset (common controls) in line with the run to failure life extension projected by SunWater's Condition Based Replacement Life Adjustment Tool.



Options Evaluation

The proposed replacement programme for Woongarra Pumping Station is appropriate for this asset and no options evaluation is required.

Timing of Renewal

SunWater has applied its processes to determine run to failure asset life based on risk and condition and determined that the common control asset should be replaced at the same time as SunWater plans to overhaul the pump station in 2032. This results in an almost doubling of the standard run to failure life for this type of asset. Whilst SunWater has applied its procedures, we consider that an asset of this type should generally be replaced in line with its standard run to failure asset life, regardless of condition. This is because the failure mechanism tends to be catastrophic rather than gradual, and equipment obsolescence could mean that repairs are lengthy resulting in the pump station being out of action for a significant period of time.

SKM therefore believes that it would be prudent to plan for replacement of the common control system prior to the planned replacement in 2032. SKM hence recommends that the replacement of the asset be planned for no more than 10 years from the date of the 2012 overhaul, ie in 2022. This would represent an extension of the asset life by two thirds of the standard run to failure life

beyond 2012 and which may be reasonably expected following a refurbishment/reprogramming in 2012.

Conclusion on Prudency Evaluation

SKM concludes that the need for replacement of this annuity asset has been demonstrated. As such the inclusion of this annuity item in the annuity value for replacement is prudent. SKM recommends that the replacement date be set at 2022 given the current age of the asset, the standard run to failure life of this asset class and taking into account the refurbishment in 2012. SKM understands that bringing the replacement forward from the date submitted in the NSP will impact on the annuity value given the time value of money assumed in the annuity calculation.

B.7.4 Efficiency Evaluation

The processes used by SunWater to establish future annuity item replacement/refurbishment costs are detailed in the main body of this report. For future annuity item replacements where the replacement is more than 5 years hence of the planning date, SunWater's planning team typically applies a unit rate against bill of materials quantities for the asset. However, on this occasion, SunWater has developed a planning order and developed asset replacement costs based on more current information (such as budget prices from suppliers and or information from recent projects undertaken of a similar nature). Given the volume of annuity items that SunWater's Planning Team is engaged with at any point in time, this approach is considered reasonable and is in accordance with good industry practice, where the management of a large portfolio of assets is concerned.

Renewal/Replacement Project Cost Evaluation

As mentioned, SunWater has compiled a detailed Bill of Materials list for the project as part of the planning order, which has been produced with assistance from supplier quotations. From the nature of the equipment listed in this Bill of Materials SunWater has been consistent with their approach for other annuity control systems and based their cost estimates on preferred suppliers. SKM has reviewed this Bill of Materials list and confirms that many of the costs of these materials are comparable with similar equipment with which we have had experience. However, a number of significant items reveal large variances compared with SKM's estimate based on historical costs. SKM believes these variances may be the result of errors in the Bill of Materials costs compounded by the fact that the cost of SCADA and control systems have generally declined since 1997, and will impact significantly on the overall estimate. These items are listed in

Table 28:

- **Table 28: Cost Estimate Comparison for Replacement of Controls at Woongarra Pump Station**

Item	SunWater Estimate	SKM Estimate	SKM Cost Estimate Variance over SunWater Cost Estimate
PLC Modi CPU 984 141 Processor.	$1,184	$1,500	+27%
Digital Input cards.	$5,931	$586	-90%
Digital Output Cards.	$6,089	$800	-87%

The breakdown of costs developed by SunWater for their Planning Order has been based upon the Bill of Materials for components only and, from our evaluation using 1997 Bill of Material pricing. The Indirect Uplift in the Bill of Materials in SAP WMS has not been applied, instead, SunWater's planning team has added in costs for contractors, plant and equipment and corporate overheads as is standard for SunWater Planning Orders. The breakdown is shown below in Table 29. The costs include $241,233 for total overheads, including design and project management (10% of total costs). This table includes SKM's estimate of all cost elements based upon our itemised cost variances listed in Table 28 above.

- **Table 29 SunWater Planning Order for Replacement of Controls at Woongarra Pump Station**

Item	SunWater Costs	SKM Estimate
Commercial Contractors	$837,390	$242,640
Rental & Hire – Plant and Equipment	$358,881	$358,881
Materials Non Inventory	$837,390	$242,640
Standard Rate Brisbane Overhead	$45,564	$45,564
Standard Rate Local Overhead	$93,986	$93,986
Standard Rate 5% Brisbane Overhead	$101,683	$101,683
SW Band 6 (Direct Labour)	$119,621	$119,621
Total:	**$2,394,515**	**$1,205,015**
Pump and motor refurbishment	$200,000	$200,000
Total including pump and motor refurbishment	**$2,594,515**	**$1,405,015**

SunWater has added $200,000 to cover pump and motor refurbishment bringing the total claimed annuity value to $2,600,000. By comparison, SKM's overall estimate (including the pump and

motor refurbishment), and using the same overhead values as used by SunWater, is $1,405,015. Had SKM applied the same percentage overheads (11% of direct costs) as SunWater's planning team applies then the total forecast cost, based on this estimate, would be $1,269,600.

SKM considers the annuity item value as calculated by SunWater of $2,600,000 to be higher than expected, based on current prices for control equipment. SKM recommends this estimate be reviewed by SunWater. The figure claimed is inclusive of SunWater overheads which at 10% of the overall cost is within industry norms (if not on the low side) for overheads associated with design, project management, procurement etc.

SKM therefore considers the SunWater proposed annuity item value of $2,600,000 not to be efficient and would propose an alternate annuity item value of $1,405,015, taking into account SKM's opinion that the overhead rate applied to this project by SunWater is lower than SKM would typically use for design, project management and corporate costs.

Conclusion on Efficiency Evaluation

The value submitted for this annuity item is not efficient, based on available information. SKM considers that an estimate representing an efficient cost should be of the order of $1,400,000 (±30%).

B.7.5 Summary and Conclusions

SKM is satisfied that SunWater's procedures for determining the timing of replacement of this annuity item have been followed and hence that the timing and need for replacement of this annuity item is prudent. However SKM considers that the replacement date should be set at 2022, as opposed to 2032 per the network service plan, given the current age of the asset, the standard run to failure life of this asset class and taking into account the refurbishment in 2012. SKM understands that bringing the replacement forward from the date submitted in the NSP will impact on the annuity value given the time value of money assumed in the annuity calculation.

SKM believes its findings, in respect of prudency but not necessary actual replacement date, would be valid for the common controls of other pump stations in the Bundaberg Distribution area, provided that the general equipment types, the application and the functionality are comparable.

SKM considers the cost of the replacement of the common controls for Woongarra Pump Station not to be efficient at $2,600,000 including refurbishment of the pumps and motors and SunWater overheads. SKM believes this cost is high, and recommends this cost estimate be reviewed. SKM considers that an estimate representing an efficient cost should be of the order of $1,400,000 (±30%). SKM does not think that this assessment of efficiency can necessarily be applied to SunWater's annuity replacement values for other control system replacements in the Bundaberg region. This is because it was only two items in the Bill of Materials, whose 1997 costs used were

significantly higher than our estimate for a modern equivalent replacement and these may not be common across the region.

B.8 Pioneer River WSS - Palm Tree Creek Valve

This sub-report should be read in conjunction with SKM's main report entitled: SunWater Price Regulation: Review of Selected Annuity Values for Refurbishment and Replacement Items, V2 Final dated 6th October 2011.

This sub-report is also subject to the limitation statement provided in the above mentioned report.

B.8.1 Introduction

The annuity item for which an annuity value has been submitted to the Queensland Competition Authority (the Authority) is for the installation of an isolating valve and a energy dissipation device, referred to as a "pepperpot" ported spool, at $770,000.

This project concerns the outlet regulating valve to Palm Tree Creek. Water from Saddle Dam No 2 enters a 2 km long, 1,200 mm diameter pipeline which discharges into Palm Tree Creek some 186 m below the dam. The outlet regulating valve has a history of failures since installation in 2001. This report will determine the prudency and efficiency of the proposed installation of a butterfly valve and the "pepperpot" ported spool energy dissipation device.

This sub-report should also be read in conjunction with the sub-report detailing the past renewals capital expenditure for this valve that took place between 2008 and 2010 titled Palm Tree Regulating Valve.

B.8.2 Available Information

This sub-report has been prepared by accessing and viewing SunWater's SAP Works Management System (WMS), and asset condition and risk assessment policy and procedures. Please refer to the body of the main report for a more detailed description of these information sources.

In particular, we have drawn on the following Annuity Item specific replacement/refurbishment report produced by SunWater:

Document No.	Document Name	Document Title	Date
882730	882730-v1A-Teemburra_Dam__-_Palm Tree_Creek_regulating_Valve_briefing	Briefing note for approval	7 December 2009
1007696	1007696-v5-Teemburra_Dam_-_Palm Tree_Creek_pipeline_EMK_paper_December_ 2010	Meeting of the Executive Management Committee 24 November 2010 – Palm Tree Creek outlet valve	24 November 2010
1029812	1029812	1029812 Teemburra Dam Palm	Not dated

Document No.	Document Name	Document Title	Date
		Tree Creek outlet valve presentation to CEO	
1084546	1084546-v1-Teemburra_Dam_Palm Tree_Creek_outlet_works_project_design_notes_minutes	Matters arising discussions held during Palm Tree Creek HAZOP workshop, held on the 10th August 2011	Not dated
1082788	1082788-v5-Teemburra_Dam_Palm Tree_Creek_pipeline_-_single_or_double_isolation	Minutes of Palm Tree Creek Outlet Works Project	26 May 2011
1086828	108682-v1-Teemburra_Dam_Palm Tree_Creek_meeting_notes_for_PVWC_meeting	Record of Consultation	02 June 2011
1087907	1087907- Teemburra Dam – Palm Tree Creek changes to outlet works projects	Project Scope Definition – Commercial in confidence	Not dated
1110938	1110938-v2-Teemburra_Dam_Palm Tree_Creek_Draft_recommendation_from_SKM_lead_Hazop_10_August_2011	Palm Tree Creek outlet works project – Single or Double isolation.	10 August 2011

B.8.3 Prudency Review

Asset Replacement/Refurbishment Date Determination

The processes by which SunWater determines asset condition and therefore the replacement/ refurbishment date for an annuity item is described and discussed in the main body of this report.

SunWater has undertaken two condition assessments. In 2001, the first condition assessment was undertaken. The notes from this assessment state that "*Valve under repair during inspection. Excessive vibration was a concern. Modification underway*". The maximum score for the asset was one. We suggest that as the valve was under repair at the time of the condition assessment, we would have expected to see a high score against 'Valve operation', rather than a score of 'N/A'.

In 2006 a second condition assessment was undertaken. This is in line with SunWater's policy of a minimum recommended assessment frequency for valves as 5 years. In the 2006 condition assessment, it was noted "*Regulator valve and vanes have failed in service, unable to repair, must be replaced*". The score for the asset was six, with both categories of 'Operation' and 'Function'

receiving maximum scores of six. With six representing a worst score for condition assessment of an asset indicating that the asset is unserviceable and not capable of meeting its intended function.

The recorded condition assessments support the project history as recorded above, and support the replacement of the AVK/Glenfield valve.

SunWater undertook a risk assessment of the valve in February 2009. The identified risk was "*Failure to control release from dam*". The assessment resulted in a low risk for all three asset/business risks.

No WH&S or environmental risks have been recorded for this asset.

In our review of the data in SAP, we consider that SunWater has followed the policies and procedures that it has in place.

Options Evaluation

The Executive Management Committee paper of December 2010,Hummingbird document no. 1007696, states: *"A multidisciplinary team from Infrastructure Management and Infrastructure Development undertook a detailed investigation to the cause of the failures and developed 14 possible options that would mitigate the serious risks the Glenfield valve presents"*, the 14 possible options has not been disclosed. It does however state that the options where to be reviewed.

Further documentation provided for SKM's review show that an optioneering workshop took place to determine the need for a single or double valve. The outcome of this workshop concluded that there was no need to install a double valve system.

The proposed solution is to remove the existing Glenfield 4 ported body, replace this with a new "pepperpot" ported spool that will be manually adjusted. Install a new guard valve that is specifically designed for the operating conditions. The flow rate of the proposed pepperpot will require manual adjustment. For this to take place the guard valve will be closed and the chamber will be required to be emptied. It is anticipated that the frequency of this setting will be low as it is expected that it will take approximately 8 hours to change the flow conditions.

SunWater has advised SKM that a replacement guard valve is required as the current valve is not capable of closing in an 'open pipe' situation. A re-designed pepper pot flow control unit is required to replace the temporary pepperpot following failure of the flow control valve to improve the turnaround times to adjust the level of flow to meet customer service requirements.

In consultation with the Pioneer Valley Water Co-operative (PVWC) it was noted that a minimum flow of 50 ML/day in four increments of 50 ML/d to a maximum of 200 ML/d would be acceptable to the PVWC.

We consider the options investigated reasonable and consider the approach/method followed to be in keeping with good industry practice. The next phase of this project is to go into the detailed design phase from where the supply and installation can be tested in the market.

Timing of Renewal/Refurbishment

In reviewing the past renewals component of the report it stated the following as being the current situation: *"2009 - The AVK/Glenfield valve was removed and the pepper-pot reinstalled with no internals. The flow is regulated by opening and closing the guard valve, a 900mm butterfly valve, which was not specifically designed for this operation. It is understood that this is the current operating condition."* This operating condition is still current. SKM agrees that the existing operating regime poses long term consequences should this method of operation continue and is only intended to be a temporary solution until such time that the permanent solution is implemented. This report deals with the permanent solution to be implemented and therefore SKM consider it prudent to complete the installation in a timely manner and therefore SKM has determined the timing of the permanent solution to be prudent.

Conclusion on Prudency Evaluation

On the understanding that SunWater's policies for adjusting refurbishment periods and assessing asset condition have been followed, we conclude that the need for replacement of this annuity asset has been demonstrated both on operation and safety grounds. As such the inclusion of this annuity item in the annuity value is prudent.

B.8.4 Efficiency Evaluation

The processes used by SunWater to establish future annuity item replacement/refurbishment costs are detailed in the main body of this report.

For asset works where the planned replacement date is within five years hence from the planning date, SunWater's planning team determines a detailed estimate for the proposed works. The project scoping report referenced above contains a detailed estimate to complete the project.

Renewal/Replacement Project Cost Evaluation

The cost estimate contained within SAP for this project is $769,950.25. This estimate contains various sub items and is summarised below.

- Commercial Contractor - $210,000
- Materials – Non-Inventory - $279,000
- SunWater overheads - $118,512.97
- SunWater indirect cost - $81,807.28
- Construction monitoring and design - $80,630.00

From the above it can be seen that SunWater's overheads and indirect cost is 41% of the construction (Contractor and materials) cost and that the construction monitoring and design costs are 16.5% of the Construction (Contractor and materials) cost. These percentages are within the expected limits based on the expected construction cost. SunWater does propose to go to tender for the Construction component of this project.

The past capital expenditure shows that the replacement of only the valve was awarded for $298,785 in 2007 (adjusted to $343,919.82 using the CPI from June 2007 to December 2011). Taking into consideration that the above value only includes for the replacement of the valve, it is reasonable to expect that the "pepperpot" ported spool device will cost a third of the valve to supply and install. Based on the above SKM estimates the construction (contractor and materials) to cost $458,558.61. Making use of 45% for SunWater's' overheads and indirect cost ($206,351.37) and making use of a nominal 17% for the design and construction monitoring components ($77,954.96) the total cost is estimated to be $742,864.92, or 3.5% less than the annuity value submitted. SKM does not consider this variance to be significant and therefore finds the submitted annuity value to be efficient.

Conclusion on Efficiency Evaluation

Given that the value submitted for this annuity item is within 5% of an estimate based on the replacement of only the one valve in 2007, SKM considers that the annuity value submitted is efficient.

B.8.5 Summary and Conclusions

We are satisfied that SunWater's robust procedures for determining the timing of replacement of an annuity item have been followed and hence that the timing and need for replacement of this annuity item is prudent for replacement in this annuity period as early as is practicable

We also consider the cost of the replacement to be efficient at a cost of $770,000.

B.9 Boyne and Tarong - Boondooma Dam Flood Repair

This sub-report should be read in conjunction with SKM's main report entitled: SunWater Price Regulation: Review of Selected Annuity Values for Refurbishment and Replacement Items, V2 Final dated 6th October 2011.

This sub-report is also subject to the limitation statement provided in the above mentioned report.

B.9.1 Introduction

The annuity item for which an annuity value has been submitted to the Queensland Competition Authority (Authority) is for the flood repair of the Boondooma Dam. The total cost of phase 2 and 3 of the repairs has been estimated to cost $15.0M.

SunWater advises that the asset was initially constructed in 1980 as part of the dam's outlet structure.

B.9.2 Available Information

This sub-report has been prepared by accessing and viewing SunWater's SAP Works Management System (WMS), and asset condition and risk assessment policy and procedures. Please refer to the body of the main report for a more detailed description of these information sources.

In particular, SKM has drawn on the following Annuity Item specific replacement/refurbishment report produced by SunWater for this review:

- **Table 30 Documentation Reviewed Specific to Boondooma Dam Flood Repair**

Document No.	Document Name	Document Title	Date
1177027	#1177027-v1-QCA_SKM_Phase_2_Review_#13_Boondooma_Dam_Initial_scoping_document_for_phase_1_repairs	12BYR11 – FD01 – Flood damage repair – Boondooma Dam	01/09/2011
1177028	#1177028-v1-QCA_SKM_Phase_2_Review_#13_Boondooma_Dam_Initial_advice_and_photos_of_damage	Boondooma Spillway Flood damage – initial "Heads up" Briefing	Not stated
1177029	#1177028-v1-QCA_SKM_Phase_2_Review_#13_Boondooma_Dam_Initial_report_by_senior_Geologist	Boondooma Dam – Inspection of erosion in Spillway	Not stated
1177030	#1177028-v1-QCA_SKM_Phase_2_Review_#13_Boondooma_Dam_Initial_EMT_briefing_and_approval_of_phase_1_fund	Spillway repairs to Boondooma Dam	Not stated
1177034	#1177028-v1-QCA_SKM_Phase_2_Review_#13_Boondooma_DamApproval_of_budget_variation_for_phase_1	Briefing Note – Variation to Budget – Spillway repairs to Boondooma Dam	25/10/2011
1177036	#1177028-v1-	Excel spreadsheet	Not stated

Document No.	Document Name	Document Title	Date
	QCA_SKM_Phase_2_Review_#13_Boondooma_Dam_Initial_cost_estimate_for_stage_2_&_3_works		

B.9.3 Prudency Review

Asset Replacement/Refurbishment Date Determination

The process by which SunWater determines a replacement/refurbishment date for an annuity item is described and discussed in the main body of this report.

In our review of the data in SAP and the information contained in the SunWater report specified above, we consider that SunWater has generally followed the policies and procedures that it has in place to determine annuity item replacement/refurbishment dates and costs for such. Where we have found exceptions to this, and or data entry errors, we have highlighted these below together with other observations on the data provided.

The standard object type (asset type) for this infrastructure is Spillway (SPWY) which SunWater has allocated a standard run to failure asset life of 200 years and a refurbishment period of 100 years. SKM considers both the run to failure asset life and refurbishment period to be appropriate for this asset type. The asset condition assessments have been recorded within the concrete spillway (object type: CONC) component that SunWater has allocated a standard run to failure asset life of 80 years and a refurbishment period of 40 years. SKM considers both the run to failure asset life and refurbishment period to be appropriate for this asset type. SKM considers that the existing damage has been caused to the spillway as a result of a significant wet weather event causing the dam to spill over the spillway and that the solution proposed will be allocated as a concrete object type with the associated run to failure life and refurbishment period. SKM notes that the damage caused was the result of an overtopping of the spill way of some 30% of the designed overflow for the dam. As such it is important that SunWater designs the improvement works to be capable of withstanding an overtopping event of magnitude approximately 3 times greater than the event which caused the current damage to the spillway and downstream river bed.

SKM has viewed the WMS record for this asset that confirmed that the asset has been in service since 1980.

The spilling that occurred caused major scour to the downstream slope of the rock spillway. Phase 1 of this project has been undertaken to fill the erosion holes created, also reviewed by SKM elsewhere. The timing of phases 2 and 3 of this project has been established to ensure that a fit for purpose design solution has been selected and ensure that a robust design process has been followed before implementation. It is expected that this process will take between 3 and 5 years.

SKM considers the process adopted by SunWater in this respect to be in accordance with good industry practice.

Options Evaluation

The geological investigation conducted by SunWater concluded with a recommendation that the spillway be capped with a concrete slab and that the banks be protected and that a stilling basin be constructed downstream from the erosion control structure. SKM has been advised by SunWater that the detailed design of this works has not commenced and that the cost estimate is based on engineering judgement. SunWater has verbally indicated that various solutions will be developed at concept design stage that will be refined to preferred solution that will undergo detail design and entail the development of a physical hydraulic model. SKM considers this approach to conform to industry good practice for such works. SKM agrees that, in light of the short turn-around time proposed, between the spill in 2011 and the proposed implementation in 2015, that a detailed cost estimate based on a fully developed design is not cap able of being provided at present, but rather at the detailed design stage.

Timing of Renewal/Refurbishment

SKM considers it prudent that phases 2 and 3 be undertaken in a timely manner to ensure the structural integrity of the spillway. SKM has not sighted a risk assessment to determine the order of implementation of the concrete capping of the spillway and the energy dissipation structure. SunWater has verbally indicated that the expected risk profile would indicate that the concrete capping should be undertaken first. SKM agrees with SunWater's staged implementation methodology and the proposed order of the stages.

The geological report as referenced above states:

"*The erosion that has taken place has left the unlined section of the spillway chute vulnerable to further erosion should further considerable spills occur. It is difficult to predict the rate and/or degree of any such erosion, however, if a similar spill occurred to that which was experienced in the early months of 2011, then almost certainly all of the existing erosional holes would be deepened and widened, further holes would form and there exists some potential for erosion to headwardly advance towards the spillway crest. Should this occur, the cost of repairs would be considerably increased."*

Although the report does not state the extent of erosion that could be expected, it does highlight the consequence of not undertaking the repair. Based on the information presented above, the concrete capping will protected the weather rock from eroding in future and a stilling basin will ensure that the downstream edge doesn't erode towards the spillway.

Based on the review of the available documents, SKM considers the timing of the phase 2 -and 3 refurbishment to be prudent.

Conclusion on Prudency Evaluation

On the understanding to the associated risk of failure and or cost associated for future repair SKM concludes that the need for refurbishment of this annuity asset has been demonstrated. As such, the inclusion of this annuity item in the annuity value is prudent for works to be carried out commencing in 2015 for phase 2.

B.9.4 Efficiency Evaluation

The processes used by SunWater to establish future annuity item replacement/refurbishment costs are detailed in the main body of this report.

The proposed annuity refurbishment operation of the asset considers concrete capping and the construction of a concrete stilling basin. The extent of the scope of works has not been established and SunWater has advised that the intent is to develop a full scope of works after the detailed design option has been determined. At this stage, SunWater has prepared order of magnitude cost estimates only.

Renewal/Replacement Project Cost Evaluation

SKM has undertaken a site visit to establish the extent of damage and the scope of the proposed works. SunWater has provided a cost estimate for both phase 2 and 3 that SKM has used in conjunction with the information gathered during the site visit to prepare a bottom up cost estimate.

The cost estimate that SKM has prepared is compared to the cost estimate of SunWater in Table 31 below.

Table 31 Cost estimate comparison

Description	SunWater cost estimate ($)	SKM cost estimate ($)
Phase 2 – Concrete capping of spillway	8,889,175	4,954,580
Phase 3 – Concrete stilling basin	6,730,053	8,793,414
Total	**15,619,228**	**14,747,994**

From Table 31 above it can be seen that that the cost estimates prepared by SunWater and SKM are within the order of magnitude ± 30% estimating range used to develop the cost estimates. Based the two cost estimates proximity SKM considers the annuity value submitted to be efficient at $15,619,228.

Conclusion on Efficiency Evaluation

The annuity value submitted by SunWater for refurbishment of this annuity item is within SKM's order of magnitude cost estimating range. As such SKM considers that the SunWater proposed annuity item value of $15.6M to be efficient.

B.9.5 Summary and Conclusions

SKM is satisfied that SunWater's procedures for determining the timing of refurbishment of an annuity item have been followed and hence that the timing and need for refurbishment of this annuity item is prudent and that these works should be carried out as soon as practicable following detailed engineering studies and to commence no later than the planned commencement year of 2015 for phase 2.

SKM considers the annuity value submitted for the refurbishment to be efficient at $15.6M.

B.10 St George WSS - Jack Taylor Weir and Beardmore Dam Winches

This sub-report should be read in conjunction with SKM's main report entitled: SunWater Price Regulation: : Review of Selected Annuity Values for Refurbishment and Replacement Items, V2 Final dated 6th October 2011.

This sub-report is also subject to the limitation statement provided in the above mentioned report.

B.10.1 Introduction

The annuity item for which an annuity value has been submitted to the Queensland Competition Authority (Authority) is the Jack Taylor Weir and Beardmore Dam Winches.

B.10.2 Available Information

This sub-report has been prepared by accessing and viewing SunWater's SAP Works Management System (WMS), and asset condition and risk assessment policy and procedures. Please refer to the body of the main report for a more detailed description of these information sources.

In particular, we have drawn on the following Annuity Item specific replacement reports produced by SunWater for this review:

- **Table 32 Documentation Reviewed Specific to Jack Taylor Weir and Beardmore Dam Winches**

Document No.	Document Name	Document Title	Date
1169324	1110316 – v1 QCA Review Phase 2 #14	Replacement of Winches Jack Taylor Weir and Beardmore Dam	
1170255	1170255 – v1 QCA Phase 2 # 14	Beardmore Dam and Jack Taylor gate lifting mechanism inspection	20/10/2009

B.10.3 Prudency Review

Asset Replacement/Refurbishment Date Determination

The process by which SunWater determines a replacement date for an annuity item is described and discussed in the main body of SKM's main report.

In our review of the data in SunWater's SAP Works Management System and the information contained in the SunWater reports specified above, we consider that SunWater has largely followed the policies and procedures that it has in place to determine annuity item replacement dates and costs for such. Where we have found exceptions to this, and or data entry errors, we have highlighted these below together with other observations on the data provided.

We have viewed the WMS record for this asset confirmed that the Jack Taylor Weir asset has been in service since 1959, and the Beardmore Dam asset has been in service since 1972. SunWater's SAP WMS indicates that for facilities such as Jack Taylor Weir, Beardmore Dam and other gated

water storage structures the standard run to failure life for winches is 60 years. We consider the applied run to failure asset life and refurbishment period for this asset to be reasonable and in keeping with good industry practice.

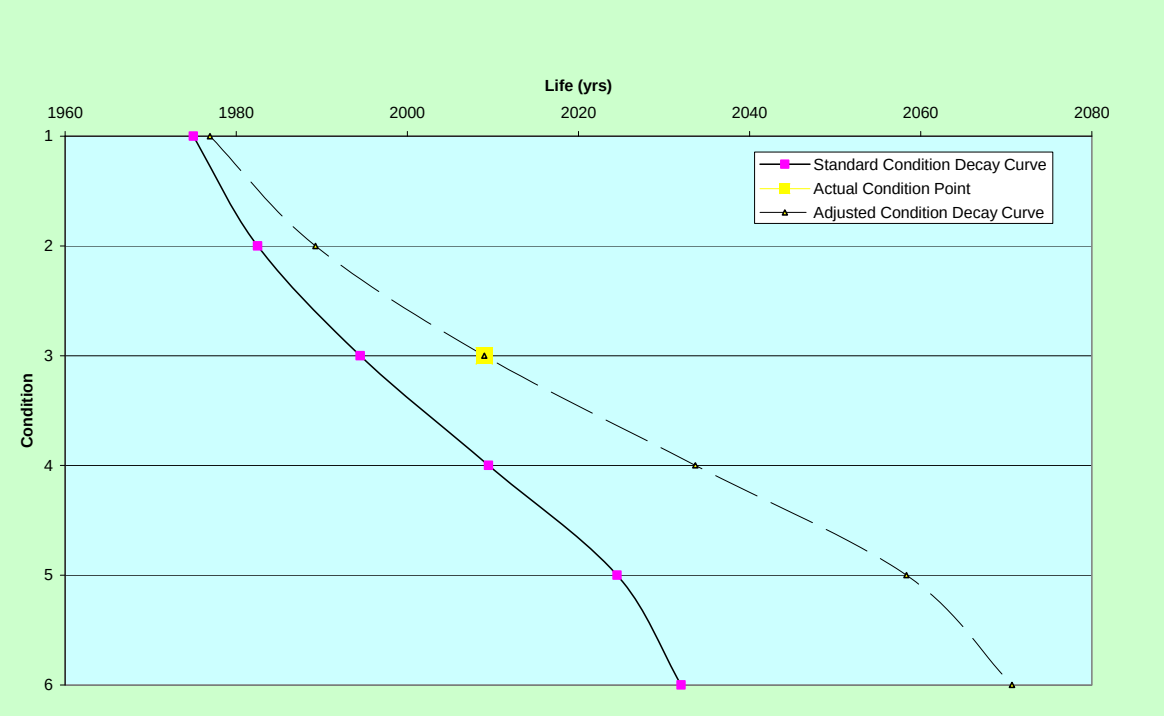
SunWater has applied its risk evaluation method to these assets. This method has determined that the winches should be placed in a high risk category. It is reasonable to expect a failure of the asset would have appreciable consequences and we therefore believe there is a need for a precautionary approach to replacement unless there is strong evidence to extend the life. There has been no change in the standard run-to-failure life applied by SunWater from the standard asset life that SunWater applies to this asset (60 years).

The last condition assessment (in 2009) revealed that the condition of the asset is better than the standard asset condition decay curve would predict, which would normally suggest that the life of the asset could be extended beyond the standard run to failure life (see Figure 2). However, as SunWater has assessed the risk of failure category as high, under SunWater's asset management systems an asset with a risk category as high is to be replaced when a condition score of 4 is reached (i.e. the asset isn't allowed to run to failure but is to be replaced prior to this).

From Figure 2, the asset will reach condition level 4 in approximately 2030 which would suggest that a replacement date of 2030 should be planned for. That said, given the criticality of the asset, and the imprecise nature of the life extension projection mechanism[2] of the condition based replacement life adjustment tool, we consider that it is appropriate for SunWater to plan for a replacement of the winches at Jack Taylor Weir at or around the standard run to failure asset life i.e. 2020.

[2] The tool is more reliable in projecting life reduction due to condition than life extension as it tends to exaggerate run to failure life extension potential.

- **Figure 2 Asset Condition Decay Curve for Winches Showing Inspection Condition**



This approach is further supported by an ANCOLD paper on Eildon Dam in Victoria which identified failure and fatigue issues on similar equipment of a similar age.

We have not sighted any underpinning documentation to support the high risk rating assigned to these winches. However, from the WMS it is noted that the rating reflects on the consequence of failure impacting on the ability to pass a major flood. For a winch failure at Beardmore Dam in particular the consequences for the townspeople of St George would be considerable.

On the assumption that SunWater's procedures for condition assessment have been followed from a pragmatic assessment, based on this condition and risk assessment score, we consider that this annuity item is prudent.

Options Evaluation

The WMS states that, although Beardmore Dam was built 13 years after Jack Taylor Weir, because of the high potential consequence resulting from failure, all the maintenance work undertaken on the winch assemblies with Jack Taylor Weir were mirrored with Beardmore Dam. These include an initial study, X-Ray analysis of ropes, and overhaul of equipment and certification for continued use (10 year).

Timing of Renewal/Refurbishment

It is anticipated that when the 2018 invasive inspection of the winch assemblies at Jack Taylor Weir are performed that a similar exercise will be undertaken on Beardmore Dam.

Conclusion on Prudency Evaluation

On the understanding that SunWater's policies for adjusting refurbishment periods and assessing asset condition have been followed, we conclude that the need for replacement of this annuity asset has been demonstrated. As such the inclusion of this annuity item in the annuity value is prudent.

B.10.4 Efficiency Evaluation

The processes used by SunWater to establish future annuity item replacement/refurbishment costs are detailed in the main body of this report. SunWater's planning team applies a unit rate against bill of materials quantities for the asset in question should the replacement be scheduled more than 5 years hence from the planning date. Given the volume of annuity items that SunWater's Planning Team are engaged with at any point in time, this approach is considered reasonable and is in accordance with good industry practice, where the management of a large portfolio of assets is concerned.

Renewal/Replacement Project Cost Evaluation

We have not sighted drawings for the winches at Jack Taylor Weir and Beardmore Dam. The Jack Taylor Weir consists of 13 vertical lift gates, each 9m x 4m. The Beardmore Dam consists of 12 vertical lift gates, each 13.1m x 6.5 m. No other detailed dimensions of the winches were available. As such, we have been unable to develop a bench mark cost for replacing the winches. An order of magnitude estimate available to SKM, however, uses $10,000 per tonne per installed gate, which would approximate to $200,000 for a 20 tonne winch (estimated weight of a gate at Jack Taylor Weir), and which compares favourably with the WMS costs.

The SunWater WMS includes 13 BOM items for Jack Taylor Weir. The cost estimate for each winch assembly has been listed as $190,550 at Jack Taylor Weir, and $383,000 at Beardmore Dam, based on 2008 costs (the Beardmore Dam gates are larger than those used at Jack Taylor Weir).

Conclusion on Efficiency Evaluation

The value submitted for this annuity item is efficient, based on available information. Given the winches at the respective sites are the same age and have been subject to the same duty we believe it is reasonable to deduce their conditions will be similar, and it is valid to extrapolate the findings to include all winches at these sites.

B.10.5 Summary and Conclusions

In summary SKM is satisfied that SunWater's procedures for determining the timing of replacement of this annuity item have been followed and hence that the timing and need for

replacement of this annuity item is prudent for replacement in this annuity period. SKM considers the cost of the replacement to be efficient.

B.11 Eaton Distribution System - Oakendon Main Channel – Replace Avis Gates

This sub-report should be read in conjunction with SKM's main report entitled: SunWater Price Regulation: Review of Selected Annuity Values for Refurbishment and Replacement Items, V2 Final dated 6th October 2011.

This sub-report is also subject to the limitation statement provided in the above mentioned report.

B.11.1 Introduction

The annuity item for which an annuity value has been submitted to the Queensland Competition Authority (Authority) is for the replacement of the eight AVIS Gates on the Oakendon Main Channel.

SunWater has submitted an annuity item value of $681,000 for refurbishment of this annuity item in 2033.

B.11.2 Available Information

This sub-report has been prepared by accessing and viewing SunWater's SAP Works Management System (WMS), and asset condition and risk assessment policy and procedures. Please refer to the body of the main report for a more detailed description of these information sources.

In particular, we have drawn on the following annuity item specific replacement/refurbishment report produced by SunWater for this review:

- **Table 33 Documentation Reviewed Specific to Oakendon Main Channel Avis Gates**

Document No.	Document Name	Document Title	Date
1169795	PRODUCTION-#1169795-v1-Task_15_QCA_SKM_Phase_2_review_OMC_AVIS_Gate_Replacement_QCA_Response.DOC	Oakendon Main Channel Replace AVIS Gates	None

B.11.3 Prudency Review

Asset Replacement/Refurbishment Date Determination

The process by which SunWater determines a replacement/ refurbishment date for an annuity item is described and discussed in the main body of this report.

In our review of the data in SAP and the information contained in the SunWater report specified above, SKM considers that SunWater has largely followed the policies and procedures that it has in place to determine annuity item replacement/ refurbishment dates and costs for such. Where SKM has found exceptions to this, and or data entry errors, SKM has highlighted these below together with other observations on the data provided.

The standard object type (asset type) allocated for this infrastructure in SAP WMS is RGAVIS – AVIS Gate.

SunWater has allocated a standard run to failure asset life of 50 years and a refurbishment period of 17 years. SKM considers both the applied run to failure asset life and refurbishment period for this asset type to be reasonable and in keeping with industry practice.

SKM has viewed the SAP WMS record for this asset and confirmed that the asset has been in service since 1983.

SunWater has applied its risk evaluation method to this asset and determined that it has a production/operations risk criterion consequence rating of eight. This, together with a probability (likelihood of occurrence) score of ten, results in an overall risk score of 80 which places this asset in a low risk category. For this asset type, a consequence rating of eight or less together with an overall risk score of 'Low' implies that according to SunWater's policies and procedures the asset will "run to fail".

SKM has not sighted any underpinning documentation to support this risk rating. However, from the SAP WMS it is noted that the Low risk rating score relates to the "*failure of (the) gate to regulate water flow*", which would result in "*bearing failure, too much/ too little water passing.*"

The maximum (worst) asset condition assessment score from the last condition assessment is a four (Significant deterioration with substantial refurbishment required to ensure ongoing reliable operation). SKM has input the asset condition score within SunWater's condition based asset life adjustment tool to determine the expected run to failure date. SKM has determined the expected run to failure date is 2028. Although this is before the original expected date of replacement of 2033, SKM supports SunWater's decision to replace the Avis gate in 2033 given the asset's low risk rating and that the asset will be re-inspected/refurbished before 2028 and that, should the condition at that time warrant it, the planned replacement date could be brought forward.

On the assumption that SunWater's procedures for condition assessment have been followed, based on this condition and risk assessment score, SKM considers that this annuity item (refurbishment) is prudent.

Options Evaluation

The options evaluation in the "Oakendon Main Channel Replace AVIS Gates" document demonstrates that other options have been considered and rejected on the grounds of the higher maintenance costs that these options will impose. SKM considers the options evaluation to be appropriate and that a planned replacement of the gate to be the most cost effective option to meet the service requirement of the asset.

SKM has not been able to interrogate the capital expenditure for each item as no AVIS gate manufacturer or supplier within Australia or abroad has been identified at this stage. SKM understands that the gates are manufactured on a 'one off' basis against existing drawings.

Modern technology that could provide the same functionality as the AVIS gates, such as flume gates, could be installed. A high-level assessment, using previous project experience, indicates that flume gates would have a similar capital expenditure to AVIS gates. SKM agrees with SunWater that modern technology may not provide the best whole life cost as stipulated within the "Oakendon Main Channel Replace AVIS Gates" document, this document states:

> "*whilst modern alternatives exist, such as electronically controlled over/ undershot gates, these gate types also typically have higher maintenance regimes and shorter service lives and may not represent better value over the life of the asset. This analysis would be undertaken as part of an options analysis leading up to the programmed asset replacement. This analysis would need to consider the cost to modify the structures and to install the supporting control system of (sic) along with its ongoing maintenance.*"

The options analysis includes a table of historical maintenance costs for the existing AVIS gates and for SCADA controlled gates. This indicates that SCADA gates have an annual maintenance expenditure of more than three times that of an AVIS gate.

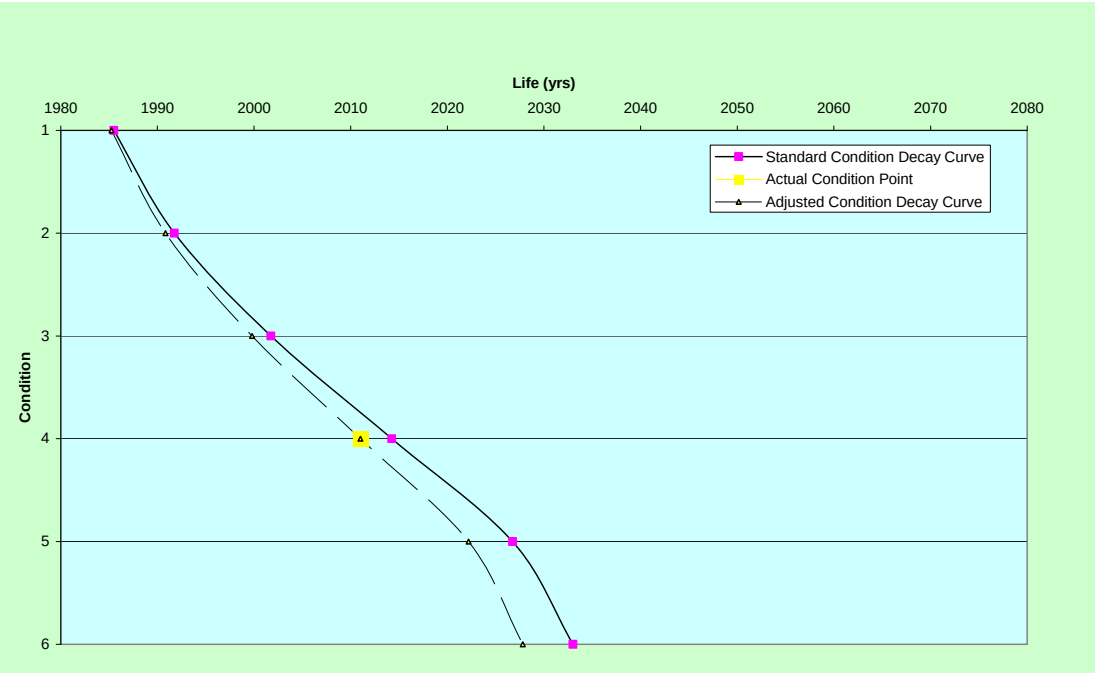
The high-level assessment of the capital expenditure indicates that the initial cost is appropriate for modern technology and hence SKM considers that the options evaluation is appropriate.

Timing of Renewal/Refurbishment

It is stated that "*the replacement is planned at the outer limit of the planning horizon*".

This is indicated in Figure 3, which is an extract from the "Oakendon Main Channel Replace AVIS Gates" document. The standard condition decay curve predicts the replacement year as 2033 and the Adjusted Condition Decay Curve predicts the replacement year as 2028.

- **Figure 3 Condition Decay Curves**



However, as mentioned, SKM supports SunWater's decision to replace the Avis gate in 2033 given the asset's low risk rating and that the asset will be re-inspected/refurbished before 2028 and that, should the condition at that time warrant it, the planned replacement date could be brought forward.

Conclusion on Prudency Evaluation

On the understanding that SunWater's policies for adjusting refurbishment periods and assessing asset condition have been followed, SKM concludes that the need for replacement/ refurbishment of this annuity asset has been demonstrated. As such the inclusion of this annuity item in the annuity value is prudent for a replacement in 2033.

B.11.4 Efficiency Evaluation

The processes used by SunWater to establish future annuity item replacement/ refurbishment costs are detailed in the main body of this report.

SunWater's planning team applies a unit rate against bill of materials quantities for the asset in question should the replacement be scheduled more than 5 years hence from the planning date. Given the volume of annuity items that SunWater's Planning Team is engaged with at any point in time, this approach is considered reasonable and is in accordance with good industry practice, where the management of a large portfolio of assets is concerned.

Renewal/Replacement Project Cost Evaluation

It is stated that "*as this project is 15 years in the future the estimated cost is the current replacement valuation*". The valuation has been based on SunWater's Bill of Materials, which lists two direct costs items against each asset as follows.

- USMS07 SUPPLY REG GATE WRC TYPE A7 (AVIS)
- USMS70 INSTALL REG GATE, WRC, ALL TYPES

The Bill of Materials has been developed from As-Built drawings and from "field verification". It is not stated where the initial cost for each item has been sourced. As stated previously, the initial costs have not been compared to manufacturer or supplier figures as no data could be obtained. However, as a high-level assessment has indicated that modern technology (flume gates) would be of a similar cost, then the costs are assessed as appropriate, but, as noted, exhibit higher maintenance costs and lower run to failure life.

An allowance of 38.69 percent for indirect costs, applied as a percentage of the direct costs, has been applied to the cost evaluation. The indirect cost percentage allows for establishment, project management and additionally allows factors in an adjustment for the site location. A multiplier of 1.5 has been applied to the cost evaluation following the review completed by Cardno in 2008 to update the costs for assets of this class.

The AVIS gate replacement cost, as provided in the "Oakendon Main Channel Replace AVIS Gates" document, are detailed in Table 34.

- **Table 34 Cost Evaluation**

Item	Direct Cost	Indirect Factor	2008 Cost Factor	Cost
USMS07 SUPPLY REG GATE WRC TYPE A7 (AVIS)	$40,000	1.3869	1.5	$83,214
USMS70 INSTALL REG GATE, WRC, ALL TYPES	$2,063	1.3869	1.5	$4,291
Total Cost	**-**	**-**	**-**	**$87,505**

SKM has undertaken a bottom up approach in compiling a cost estimate. SKM has sighted the drawings for the AVIS gates and has estimated a total of 2 tonnes of steel per gate. Details regarding the cost estimate compiled by SKM are given in Table 35below.

- **Table 35 SKM Cost Estimate**

Description	Unit	Quantity	Rate ($)	Total ($)
Steel	Tonnes	2	9,000	18,000
Manufacturing	hours	500	87	43,500
Sub-Total A				61,500

Description	Unit	Quantity	Rate ($)	Total ($)
Installation	%	10		6,150
Sub- Total B				67,650
SunWater Indirect Cost	%	38.69		26,174
Total				93,824

SKM considers that the annuity value submitted for the replacement of the AVIS gates to be efficient based on being less than the estimate prepared by SKM.

Conclusion on Efficiency Evaluation

SKM considers the value submitted for this annuity item to be efficient.

B.11.5 Summary and Conclusions

SKM is satisfied that SunWater's procedures for determining the timing of refurbishment of an annuity item has been followed and hence that the timing and need for replacement of this annuity item is prudent for a replacement in 2033.

SKM considers that the cost of the replacement is efficient at a replacement cost (2010 dollars) of $87,505 per gate, being .

B.12 St George Distribution – Replacement of Structure – 600mm outlets

This sub-report should be read in conjunction with SKM's main report entitled: SunWater Price Regulation: : Review of Selected Annuity Values for Refurbishment and Replacement Items, V2 Final dated 6th October 2011.

This sub-report is also subject to the limitation statement provided in the above mentioned report.

B.12.1 Introduction

The annuity item for which an annuity value has been submitted to the Queensland Competition Authority (Authority) is for the replacement of *"Structure, 600mm Meter Outlet"*. However it has been identified that the data in SAP WMS contains incorrect information. The 'Group' label for the planning items is recorded as 0. The planning items should have been grouped as '40'.

B.12.2 Available Information

This sub-report has been prepared by accessing and viewing SunWater's SAP Works Management System (WMS), and asset condition and risk assessment policy and procedures. Please refer to the body of the main report for a more detailed description of these information sources.

In particular, we have drawn on the following Annuity Item specific replacement/refurbishment report produced by SunWater for this review:

- **Table 36 Documentation Reviewed Specific to St George Distribution Replacement of Structure – 600mm outlets**

Document No.	Document Name	Document Title	Date
CTS 06610/11	Letter: Hon Stephen Robertson MP	Sub-Metering Cost Assessment National Framework	9th June 2011
1171692	Production - #1171692 – v1 – Task 16_-_ QCA_SKM_Phase_2_	Multiple Replacements of Structure 600mm Meter Outlet – St George Distribution 2017 – 2032	14th February 2012

B.12.3 Prudency Review

SunWater has advised in its note on this future annuity item replacement that it has identified that the data in SAP WMS contains incorrect information. The 'Group' label for the planning items is recorded as 0. The planning items should have been grouped as '40'. SKM has reviewed the SAP system and confirmed this to be the case.

SKM understands that Group '40' is the group label assigned to customer meter assets.

SKM understands that the Hon. Stephen Robertson MP has since submitted to the QCA that they should not address metering costs set out in section 5 of the NSP, "*Risks to the plan and possible*

price reset triggers"[3]. This has been done by assigning each planning item a 'Group' (since relabelled as 'Program') and then excluding the metering group from the data download.

We have reviewed the above mentioned letter and confirm that this is the case.

SunWater has acknowledged that it made an error in including these assets in the NSP due to the regulatory conditions being uncertain at the time of preparing the NSP. SunWater has hence advised that these assets are to be omitted from NSP data.

Conclusion on Prudency Evaluation

Given that there is Ministerial direction not to include the costs for replacement of these meters in the Network Service Plans (NSPs) submitted for this price review period SKM concludes that the inclusion of this annuity item replacement in this annuity period is not prudent.

B.12.4 Efficiency Evaluation

Given that SunWater has advised, and SKM's review confirms that this annuity item replacement should not have been included in the 2010 NSPs submitted for this annuity price reset period, SKM has not undertaken an evaluation of efficiency as the value to be entered should be the zero.

B.12.5 Summary and Conclusions

From the information provided to SKM, SKM is of the opinion that it is not prudent to include the annuity item in the 2010 NSP for the 2010 to 2035 annuity period price investigation. As such the annuity value of $511,000 for this item should be removed from the annuity for the St George Distribution System.

[3] *http://www.qca.org.au/files/W-HonSRobertsonMP-Sub-TreatmentMeteringCostsAssNationalFramewkNon-urbanWaterMetering-0911.pdf.*

B.13 Theodore Distribution System - Replacement of submersible pump at the Gibber Gunyah Pumping Station

This sub-report should be read in conjunction with SKM's main report entitled: SunWater Price Regulation: Review of Selected Annuity Values for Refurbishment and Replacement Items, V2 Final dated 6th October 2011.

This sub-report is also subject to the limitation statement provided in the above mentioned report.

B.13.1 Introduction

The annuity item for which an annuity value has been submitted to the Queensland Competition Authority (Authority) is for the replacement of a submersible pump at the Gibber Gunyah Pumping Station.

B.13.2 Available Information

This sub-report has been prepared by accessing and viewing SunWater's SAP Works Management System (WMS), and asset condition and risk assessment policy and procedures. Please refer to the body of the main report for a more detailed description of these information sources.

In particular, we have drawn on the following Annuity Item specific replacement/refurbishment report produced by SunWater for this review:

- **Table 37 Documentation Reviewed Specific to Gibber Gunyah Pumping Station**

Document No.	Document Name	Document Title	Date
#1170445	Production-#1170445-v1-QCA_Item_17_-_Replace_Submersible_Pump_-_Gibber_Gunyah_PSTN	**Item 17** – Replace Submersible Pump at Gibber Gunyah Pump Station	9th February 2012

B.13.3 Prudency Review

Asset Replacement/Refurbishment Date Determination

The process by which SunWater determines a replacement date for an annuity item is described and discussed in the main body of this report.

In our review of the data in SAP and the information contained in the SunWater report specified above, we consider that SunWater has largely followed the policies and procedures that it has in place to determine annuity item replacement/ dates and costs for such. Where we have found exceptions to this, and or data entry errors, we have highlighted these below together with other observations on the data provided.

The standard object type (asset type) for this infrastructure is PUSUBM – submersible pump. For this asset SunWater has allocated a standard run to failure asset life of 30 years and a condition

inspection frequency of 2 years. We consider the standard run to failure asset life and the condition assessment frequency applied to this asset type to be reasonable and in keeping with good industry practice.

SKM has viewed the WMS record for this asset and are able to confirm from the 'frozen' WMS created at the time of preparation of the 2010 Network Service Plans (NSPs) that the asset has been in service since 1989. SunWater has applied its risk evaluation method to this asset and determined the risk, during the most recent risk assessment in 2001. The business related risk assessment for this asset has been assessed as having a production/operations risk criterion consequence rank of 3 (insignificant) and a probability (likelihood of occurrence) score of 3 resulting in an overall risk score of 9 which places this asset in a low risk category. For this asset type, an overall risk category of Low and with a consequence score of less than or equal to 8, does not result in a risk related adjustment to the standard run to failure replacement age. However the asset has been scored a risk of Moderate on WH&S grounds due to a trip hazard. A review of the risk assessment for pump 3 in the Gibber Gunyah pump station also yields a WH&S score of Moderate but on this occasion due to unguarded rotating parts. According to SunWater's Asset Management Methodology, for plant items that have a WH&S or Environment related risk score of Low to Medium and with a consequence score of >8, the issue creating that risk score should be addressed as a priority 'C' item if the rectification cost is less than $100,000 (to be used as a guide only). SKM considers that it should cost less than $100,000 to address the WH&S risk identified and that this should not impact on the planned replacement date for the asset.

SunWater's method for determining asset replacement/refurbishment timing is to modify the risk-adjusted run to failure asset life according to the variance of the condition score of the asset, at the time the last condition assessment was undertaken, with the condition that the standard asset condition decay curve predicts at that time. As mentioned, under SunWater's asset planning system, assets with a business risk score of low to medium and with a concomitant consequence score of less than or equal to 8 do not have their standard asset life adjusted below a run to failure life.

According to the version of SAP extant at the time of development of the 2010 NSPs, the last condition assessment was undertaken in 2001 which is outside SunWater's stated maximum condition inspection periods for this asset type. This condition assessment indicates that the highest condition score allocated was a 1 (Perfect as new condition). This was a high level assessment converted for the SAP system and hence does not represent a visual inspection.

SKM has evaluated the projected run to failure asset life using SunWater's modelling tool. Inputting a Low business risk and worst case condition score in 2001 of 1 for this asset with a standard run to failure life of 30 years into SunWater's planning tool results in a projected required replacement year of 2229. SKM conclude that the modelling tool is more reliable in projecting life

reduction due to condition than life extension, particularly where the condition score in early years is better than the curve would predict, as it tends to exaggerate run to failure life extension potential, and SKM has therefore ignored this analysis in this case.

At the time of submission of the NSPs SunWater had planned to replace this asset at the end of its standard run to failure asset live ie in 2019, however SKM has been advised that as a result of a more recent condition assessment which has taken place post the development of the 2010 NSPs, SunWater has re-evaluated the required replacement date and moved this out to 2029.

SKM considers this later replacement date to be in keeping with SunWater's systems and that the asset should be captured in the current price setting annuity period as the more recent condition assessed replacement date is within the annuity period (ie prior to 2035).

SKM considers the applied run to failure asset life period for this asset to be reasonable and largely in keeping with good industry practice.

Options Evaluation

The proposed replacement programme for the Gibber Gunyah pumping station pump number 1 is appropriate for this asset and no options evaluation is required.

Timing of Renewal

The replacement of the pump is currently scheduled for 2029, which constitutes a 10 year extension to the standard run to failure asset life for this asset based on condition. SKM considers this planned replacement date to be appropriate.

Conclusion on Prudency Evaluation

SKM concludes that the need for refurbishment of this annuity asset has been demonstrated at or around the time selected, and certainly within the 25 year annuity period under consideration. As such the inclusion of this annuity item in the annuity value is prudent.

B.13.4 Efficiency Evaluation

The processes used by SunWater to establish future annuity item replacement/refurbishment costs are detailed in the main body of this report. SunWater's planning team applies a unit rate against bill of materials quantities for the asset in question should the replacement be scheduled more than 5 years hence from the planning date. Given the volume of annuity items that SunWater's Planning Team are engaged with at any point in time, this approach is considered reasonable and is in accordance with good industry practice, where the management of a large portfolio of assets is concerned.

Renewal/Replacement Project Cost Evaluation

SKM has reviewed SunWater's calculation for determining a replacement cost and note that the replacement cost of $359,000 is not in keeping with the cost for replacement that SKM has developed using SunWater's bill of materials (BOM) and replacement cost determination method.

The 1987 cost in BOM for the pump is $200,957 comprising an equipment cost of $141,706, an installation cost of $5,000 and an indirect cost (locational uplift) of 36.9%. SKM has reviewed the location of Gibber Gunyah pump station and consider that the indirect cost multiplier (location cost uplift) to be reasonable.

SKM has calculated a 2008 replacement value for this asset based on the standard 1997 to 2008 multiplier of 1.5 for pump assets as determined by Cardno which yields a replacement value of approximately $301,435, which is some $57,564 lower than the annuity item value submitted by SunWater to the Authority. No explanation has been provided for this difference in SunWater's report to SKM. However, SKM notes from that report that SunWater has stated that the replacement cost for this item has been reviewed since the 2010 NSP submission and that a value of $150,000 has since been determined as the replacement cost. SKM is able to confirm, from a screen image provided by SunWater that this is the replacement cost for Gibber Gunyah pump station pump number 1 identified in the current version of SAP WMS.

SKM has benchmarked the annuity item replacement costs proposed by SunWater as submitted to the Authority against our database costs for a modern equivalent electrical asset. Our estimate is based on our modern equivalent asset unit rate database as a class 4 estimate, having an accuracy of +30%/-20%. SunWater has provided technical details of the pump to be replaced as follows:

- **Table 38 Gibber Gunyah Pump Station Pump 1 Specification**

Unit No	Attribute	Pump Specification
1	Size	600mm (520mm)
1	Make	ITT FLGYT Australia (70ml)
1	Model	CP 3530.820
1	Type	Submersible
1	Static Head	9 m
1	Dynamic Head	3 – 4 m
1	Flow rate	67ML/d
1	In Operation From	30.06.1989
1	Planned replacement date	2019 (2010 NPS) 2029 current SAP WMS
1	Motor Size	120 kW

SKM has compared our cost estimate against SunWater's cost estimate in Table 39 below:

- **Table 39 Gibber Gunyah Pump Station Pump number 1 replacement - Comparison of SunWater and SKM Cost Estimates**

SunWater Estimate $2010 – 2010 NSP	SunWater Estimate $2010 – 2012 SAP WMS	SKM Estimate $2010	Variance against 2010 NSP
359,000	150,000	$141,000	-61%

SKMs cost estimate breakdown is shown in Table 40 below based on a modern equivalent pump with specification as provided in Table 41:

Table 40 Gibber Gunyah Pump Station Pump number 1 replacement - SKM Cost Estimate

Item	Cost ($2010)	Comment
Pump and Motor	$104,474	Based on supplier budget price adjusted to 2010 money terms (assumed inflation rate 3%)
Installation	$8,325	Based on SunWater's 1997 costs adjusted for wage inflation to 2010 costs (assumed 4% p.a.)
Design, project management and administration	$28,200	Estimated at 25% of direct costs
Total	$141,000	

- **Table 41 Gibber Gunyah Pump Station Pump number 1 replacement specification**

Attribute	Pump Specification
Size	1040 – 660 mm
Make	ITT FLGYT Australia (70ml)
Model	CP3531/805
Type	Submersible
Head	13 m TDH
Flow rate	67ML/d
Motor Size	125 kW

The annuity value submitted by SunWater for the replacement of this annuity item is outside the estimating range of our estimated cost for a modern equivalent replacement asset. As such SKM considers the SunWater proposed annuity item value of $359,000 not to be efficient and recommends that the replacement value be changed to $150,000 in keeping with SunWater's current SAP WMS estimate.

Conclusion on Efficiency Evaluation

The value submitted for this annuity item is not efficient, based on available information. SKM recommends that it be adjusted to $150,000 in keeping with SunWater's current SAP WMS estimate as being within 30% of SKM's estimate.

B.13.5 Summary and Conclusions

SKM is satisfied that SunWater's procedures for determining the timing of replacement of this annuity item have been followed and hence that the timing and need for replacement of this annuity item is prudent but note that, since submission of the NSPs, SunWater had adjusted the replacement date, based on asset condition, to 2029.

SKM considers the cost of the replacement not to be efficient and recommends that the replacement cost for the annuity item be changed to $150,000 in keeping with SunWater's current SAP WMS estimate.

Appendix C Past Renewal Projects

This appendix contains the sub-reports on the past projects reviewed.

C.1 Boyne Water Supply - Flood Damage Repair at Boondooma Dam

This sub-report should be read in conjunction with SKM's main report entitled: SunWater Price Regulation: Review of Selected Annuity Values for Refurbishment and Replacement items.

This sub-report is also subject to the limitation statement provided in the above mentioned report.

C.1.1 Introduction

This project concerns the repair of the flood damage to the spillway at Boondooma Dam after spilling in January 2011 that caused extensive erosion. The erosion to the spillway was highlighted by the operators after the spill and noted within the annual dam inspection (April 2011). A subsequent geotechnical investigation was conducted making the recommendation to empty out the scoured holes to establish the extent of the scour. This review concerns the prudency and efficiency of the costs associated with the flood damage repair works carried out at Boondooma Dam.

C.1.2 Available Information

This sub-report has been prepared by accessing and viewing SunWater's SAP Works Management System (WMS), and asset condition and risk assessment policy and procedures. Please refer to the body of the main report for a more detailed description of these information sources.

In addition, the following information was available for this review:

- **Table 42 Documentation Reviewed Specific to Flood Damage Repair at Ben Anderson Dam**

Document No.	Document Name	Document Title	Date
1177027	#1177027-v1-QCA_SKM_Phase_2_Review_#13_Boondooma_Dam_Initial_scoping_document_for_phase_1_repairs	12BYR11 – FD01 – Flood damage repair – Boondooma Dam	01/09/2011
1177028	#1177028-v1-QCA_SKM_Phase_2_Review_#13_Boondooma_Dam_Initial_advice_and_photos_of_damage	Boondooma Spillway Flood damage – initial "Heads up" Briefing	
1177029	#1177028-v1-QCA_SKM_Phase_2_Review_#13_Boondooma_Dam_Initial_report_by_senior_Geologist	Boondooma Dam – Inspection of erosion in Spillway	
1177030	#1177028-v1-QCA_SKM_Phase_2_Review_#13_Boondooma_Dam_Initial_EMT_briefing_and_approval_of_phase_1_fund	Spillway repairs to Boondooma Dam	
1177034	#1177028-v1-QCA_SKM_Phase_2_Review_#13_Boondooma_DamApproval_of_bud	Briefing Note – Variation to Budget – Spillway repairs to Boondooma Dam	25/10/2011

Document No.	Document Name	Document Title	Date
	get_variation_for_phase_1		

C.1.3 Prudency Review

Project History

A brief history of the project is presented below:

- 1983 - Completion of the construction of the Boondooma Dam Spillway. Experienced the first spill in late April 1983. The spill caused considerable erosion to the spillway. A 20 metre high scarp, 180 meters downstream of the spillway crest structure was formed. An erosion control structure was installed 134 meters downstream of the spillway crest structure to limit the scour.
- December 1997 – further erosion to the spillway was caused after a spill. Twelve locations upstream from the erosion control structure were identified that have been eroded. It is reported, based on anecdotal evidence, that the areas of erosion were remediated in accordance to the recommendations developed at the time. A large cavern downstream from the erosion control structure formed and it was recommended that a geological map of the downstream area be compiled
- 1999 – A geological map was compiled for the area downstream of the erosion control structure
- January 2011 – The spillway experience its largest spill on record. It is to note that this was lower than the probable maximum flood (PMF) that the spillway is designed for by a factor of approximately 3.
- 29 April 2011 – Annual dam safety inspection was conducted. At the time of the inspection the dam was still spilling. Holes within the spillway was spotted from the viewing platform and noted within the asset condition assessment
- August 2011 – The holes within the spillway were pumped empty and an inspection was conducted to establish the extent of remedial works that was required
- August to September 2011 – The post spill inspection identify considerable further erosion both upstream and downstream of the erosion control structure
- October 2011 - The variation to the budget is approved due to scope change

Asset Replacement/Refurbishment Date Determination

The processes by which SunWater determines asset condition and therefore the replacement/ refurbishment date for an annuity item is described and discussed in the main body of this report.

The annual dam inspection conducted in April 2011 recorded that the highest asset condition score was a four (Significant deterioration with substantial refurbishment required to ensuring on-going

reliable operation). The area of concern was the foundation with a note stating: "*CONCRETE SPILLWAY SUFFERS EROSION PROBLEMS*". A further general comment stated: "*Area's of Drummy*[4] *concrete to be addressed - see report and plan of area #940071*".

It is to note that the risk assessment that was undertaken in 2005 records this structure as a low priority with a consequence score above eight. In accordance with SunWater's Policies and Procedures this implies that the asset has to degrade to an asset condition score of five (Major deterioration such that the asset is virtually inoperable) before remedial work is to be undertaken. At the time of the annual dam inspection the extent of the erosion could not be ascertained to the same degree it could be after pumping out the water within the erosion holes. The geological investigation at the time determined that should the erosion holes not be repaired the extent of remedial works required would escalate following future spill events. SunWater made a decision to act on the advice before the next rainy season to limit the extent of damage. SKM considers that should an asset condition assessment have been recorded at the time of the geological investigation that an asset condition rating have of five would have been scored and therefore that remedial work should proceed.

From the review of the data in SAP, SKM considers that SunWater has followed its policies and procedures that it has in place to determine the date of refurbishment.

Options Evaluation

The geological site visit conducted in August and September 2011 made a recommendation to remove all loose material from the eroded area, drill and anchor steel reinforcement within the base rock and fill the erosion cavity with concrete.

An internal email in October 2011 notes that a change in scope was required. The following changes were deemed necessary:

- After a risk assessment was conducted it was decided to install rock anchors to the erosion control structure to tie it back to the spillway
- A large enough concrete pump could not be sourced and therefore vehicular access to the site will be required
- The additional time to construct an access road and to tie the erosion control structure to the spillway will require additional site supervision
- Additional design and specifications will be required to install the rock anchors

[4] Drummy concrete being concrete that makes a noise like a drum(ie a hollow sound) after being struck.

A variation was approved for the above scope changes in October 2011 which, in practice, approved a temporary repair to the spillway and erosion control structure until a more permanent solution of filling the scour hole and restructuring the spill way to enable it to accommodate future spills to the dam's design capacity could be undertaken as future works. Being phases 2 and 3 of the repair/upgrade works.

SKM considers the repair method implemented conforms to current good practice and agrees that the additional changes were required to stabilise the bank for the interim. The information reviewed from SunWater addresses this repair as Phase 1 of a three phase approach to repair the flood damage.

Timing of Renewal/Refurbishment

The timing of the repair work was driven by the fact that the next rainy season was underway. The water level within the dam was close to (0.5 m below FSL) the full supply level and even a small rain event could cause the spillway to spill.

The geological report as referenced above states:

"*The erosion that has taken place has left the unlined section of the spillway chute vulnerable to further erosion should further considerable spills occur. It is difficult to predict the rate and/or degree of any such erosion, however, if a similar spill occurred to that which was experienced in the early months of 2011, then almost certainly all of the existing erosional holes would be deepened and widened, further holes would form and there exists some potential for erosion to headwardly advance towards the spillway crest. Should this occur, the cost of repairs would be considerably increased."*

Although the report does not state the extent of erosion that could be expected, it does highlight the consequence of not undertaking the repair. Based on this information SunWater made the decision to fill in the erosion holes with dental concrete to form a bridge and lock the spillway together.

Based on the review of the available documents, SKM consider the timing of the phase 1 refurbishment to be prudent.

Conclusion on Prudency Evaluation

SKM considers that the timing of the phase 1 refurbishment to the spillway was prudent. SKM further notes that the repair work undertaken in phase 1 should be viewed as a temporary solution.

C.1.4 Efficiency Evaluation

Renewal/Replacement Project Cost Evaluation

Based on the annuity value submitted to QCA, SKM understands that $1,130,059 has been spent for phase 1 works. However the information presented by SunWater did not contain a detailed

breakdown of the cost for the phase 1 works. Verbal information presented to SKM indicates that a total of 1,500 m³ of dental concrete was required to fill the erosion holes. An internal email message sited by SKM indicate that 65 rock anchors, 32 mm diameter and 25 m long, was required to tie the erosion structure back. SKM has used a bottom up approach to calculate the cost for the repair work undertaken as an order of magnitude cost estimate (±30%).

Table 43 below shows the bottom up cost estimate prepared by SKM.

Table 43 - SKM Estimate of Project Cost

No.	Description	SKM Cost Estimate ($)
1	Direct Costs	
1.1	Dental Concrete (20 MPa)	562,500
1.2	Rock Anchor (65no, 32mm dia bar@25m long)	286,000
1.3	30% Contingency	254,550
	Subtotal	1,103,050
2	SunWater Overhead	
2.1	Design Cost (5% of construction cost)	55,153
2.2	Project management (35% of construction cost)	386,068
	Sub Total	441,221
3	**Total**	**1,544,270**

SKM was not provided with any documentation about whether SunWater used contractors through a competitive bidding process for this project. However SunWater has advised verbally that they sourced sub-contractors through competitive bidding as per Sun Water's procurement process and State's purchasing policy for supply of materials, earthworks, concrete and plant and equipment hire.

Conclusion on Efficiency Evaluation

The overall expenditure by SunWater for the project to date is less than the bottom up cost estimate prepared by SKM. SKM therefore concludes that the costs associated with the phase 1 work of the repair of the flood damage to the spillway at Boondooma Dam is efficient and that the project had followed the SunWater policy and processes for establishing the contracts where required.

C.1.5 Summary and Conclusions

The SKM review of the Phase 1 flood damage repair at the Boondooma Dam Spillway considers the project to be prudent and done in a timely manner.

The project generally followed the SunWater Procedures and Policies to complete the repair work and the cost associated with the project is considered efficient at a cost of $1,000,497.

C.2 Bundaberg Water Supply- Flood Damage Repair at Ben Anderson Barrage

This sub-report should be read in conjunction with SKM's main report entitled: SunWater Price Regulation: Review of Selected Annuity Values for Refurbishment and Replacement items.

This sub-report is also subject to the limitation statement provided in the above mentioned report.

C.2.1 Introduction

This project concerns the repair of the flood damage that occurred to the Ben Anderson Barrage during the late December 2010 and January 2011. The downstream left bank embankment was severely damaged in the two flood events. The erosion to the left bank rendered the access road leading to the downstream left bank of the barrage unserviceable and prevented the access to the barrage crest, collapsible shutters and the gantry located downstream of the left bank. The flood also damaged some parts of the protection works on the right bank. This review concerns the prudency and efficiency of the costs associated with the flood damage repair works carried out at the Ben Anderson Barrage following the floods of December 2010 and January 2011.

C.2.2 Available Information

This sub-report has been prepared by accessing and viewing SunWater's SAP Works Management System (WMS), and asset condition and risk assessment policy and procedures. Please refer to the body of the main report for a more detailed description of these information sources.

In addition, the following information was available for this review:

- **Table 44 Documentation Reviewed Specific to Flood Damage Repair at Ben Anderson Dam**

Document No.	Document Name	Document Title	Date
1173532	QH10386 QCA SunWater Price Setting CAPEX Review Addendum - Rev2 (final).docx	Erosion and Access Road Repair Ben Anderson Barrage – 11BIA56	
1027404	1027404-v1-LB_Flood_Damage_Repairs_Scope	Project Scope Definition – Ben Anderson Barrage – Flood Damage Repairs to Downstream Left Bank [BIA-BURN-BARR-EMBK] – COMMERCIAL – IN - CONFIDENCE	10/02/2011
1069929	1069929-v1-Before_and_After_Photos_of_BAB_Stage_1_(Erosion_Repair).DOC	Photos of Before and After Shots on BAB Stage 1 (Erosion Repair)	
5111886	Work Method Statement – Ben Anderson Barrage Left Bank Erosion Repair - 5111886	BIA-BURN-BARR Ben Anderson Barrage Left Bank Erosion Repair (WHS10_F1, Rev:9)	06/2009
5113343	Construction Safety Plan For Ben Anderson Barrage Left Bank Access Road Repair - 5113343	Construction Safety Plan For Ben Anderson Barrage Left Bank Access Road Repair – 5113343 (WHS10_F2, Rev: 3)	
5111886	HSE PROJECT RISK ASSESSMENT FORM for Ben Anderson Barrage Left Bank	HSE PROJECT RISK ASSESSMENT FORM for Ben Anderson Barrage Left Bank	06/2009

Document No.	Document Name	Document Title	Date
	Erosion Repair - 5111886	Erosion Repair – 5111886 (WHS15_F1)	
	Memorandum- Ben Anderson Barrage Left Bank Erosion	Status Update of Ben Anderson Barrage Left bank Abutment	18/01/2011
1066938	QLeave Notification and Payment Form		04/04/2011
5113343	Contractors/ Suppliers Evaluation Scoresheet to Supply and Install Access Road on BAB Stage 1 Extension	Contractors/ Suppliers Evaluation Scoresheet	04/2011
5112733	Memorandum – BAB L/B Protection Works Repair	Ben Anderson Barrage Left bank Erosion Repair – CURRENT UPDATE	19/08/2011
1065861	Contour $ Detail Survey Erosion Area on West Bank of Burnett River – Ben Anderson Barrage (Contour $ Detail Survey Erosion Area on West Bank of Burnett River – Ben Anderson Barrage)	Contour $ Detail Survey Erosion Area on West Bank of Burnett River – Ben Anderson Barrage	03/2011
1173975	1173975-v1-Task_1b_Quote_on_Ben_Anderson_Barrage_L_Bank	Excel Spreadsheet	11/01/2011
1177343	1177343-v1-Tas1122904_Draft_Scope_for_Ben_Anderson_Barrage_Flood_Repairs_(11BIA56).DOC	Project Scope Definition – Ben Anderson Barrage – Right Bank Flood Damage Repairs – COMMERCIAL – IN - CONFIDENCE	22/09/2011

C.2.3 Prudency Review

Project History

A brief history of the project is presented below:

- 1974 - Completion of the construction of Ben Anderson Barrage on Brunett River. The Barrage was constructed using earth and rockfill core with concrete crest and shutters.
- June 2008 - The last five yearly inspection of the barrage was conducted. The report indicated that the bank protection was generally in good condition and stated that *"The concrete rockfill erosion protection .....on the left bank... is in good condition.....On the left bank downstream of the concreted rockfill, there has been some erosion.....The area should be backfilled with rockfill to prevent further erosion"*.
- December 2010 – Major flooding during late December 2010 and January 2011 eroded a part of the downstream left bank embankment. The erosion caused extensive damage to the access road leading to the downstream left bank of the barrage and prevented access to the barrage crest, collapsible shutters and the gantry located downstream on the left bank.

- January 2011 – Temporary repairs were carried out (PRODUCTION-#1173532-v1-Erosion_and_acess_road_Repair_-_Ben_Anderson_Barrage), a cost estimate prepared for this work was undertaken on 11 January 2011 – Hummingbird #1173975
- 18 January 2011 – A SunWater internal memorandum states that *"It appears that the extent of damage is increasing slowly as compared to the previous photos taken only last week. It can clearly be seen that another meter has eroded and should this continuously happen, major works will have to be done as this erosion is very close to the barrage itself"*. The memorandum contained photos showing the extent of the damage and indicated the approximate fill volumes that would be required.
- February 2011 - The report: *Project Scope Definition: Ben Anderson Barrage – Flood Damage Repairs to Downstream Left Bank [BIA-BURN-BARR-EMBK]* was prepared by SunWater. This document outlines the proposed works to repair the flood damage. The cost estimate for the above works was estimated at the time at $225,985.89. This document stated that the works should be completed within the 2010/2011 financial year.
- March 2011 – The repair of the flood damage at the Ben Anderson Barrage started.
- September 2011 – Rock erosion on the right bank downstream near the concrete drain was identified. The report "*Project Scope Project Scope Definition – Ben Anderson Barrage – Right Bank Flood Damage Repairs"* was prepared to include the repair of the flood damage to the right bank. The work included the replacement of the damaged geotextile and rock protection, shotcreting in between the rock protection to provide long term bank stability. The report also recommended monitoring the land slippage below the access road corner for possible future remediation.

Asset Replacement/Refurbishment Date Determination

The processes by which SunWater determines asset condition and therefore the replacement/ refurbishment date for an annuity item is described and discussed in the main body of this report.

SunWater has undertaken the last five yearly inspection of the Ben Anderson Barrage in June 2008 The report stated that *"The concrete rockfill erosion protection .....on the left bank... is in good condition.....On the left bank downstream of the concreted rockfill, there has been some erosion.....The area should be backfilled with rockfill to prevent further erosion"*. The report rated the repair to the left bank as critical "rating 3" ie that rectification was required within 12 months. Although no documentation was provided to SKM to indicate that this remedial work was carried out, SKM has made the assumption that the repair work was carried out to the left bank in accordance with the recommendations.

The flood events during December 2010 – January 2011 eroded part of the left bank embankment and the access road that prevented access to the barrage crest, collapsible shutters and the gantry located downstream of the left bank. A SunWater internal memorandum dated 18 January 2011 states that *"It appears that the extent of damage is increasing slowly as compared to the previous*

photos taken only last week. It can clearly be seen that another meter has eroded and should this continuously happen, major works will have to be done as this erosion is very close to the barrage itself". The memorandum contained photos showing the extent of damage.

SunWater carried out temporary emergency repairs immediately after the December 2010 flood event. A cost estimate prepared by SunWater after the December flood has been used to determine the extent of the works proposed.

SKM understands that SunWater made two scope changes to include the repair of the flood damage that were not in the original scope. The comments column in document "*1169338 - Flood Damage Projects FY 2010 - Dec 31 2011.XLS*" refers to the additional work as being the repair to the access road; and replacing the geotextile and reinstating the rock pitching to the right bank. The latter was detailed within the project scope definition dated 22/09/2011. The scope included the replacement of the damaged geotextile and placing of shotcrete between the rocks to provide long term bank stability. Details regarding SunWater's estimated cost for the additional works were not available for review. It is noted that this work was undertaken by a commercial contractor that was appointed by making use of a competitive tender process.

No WH&S or environmental risks have been recorded for this asset.

From the review of the data in SAP, SKM considers that SunWater has followed the policies and procedures that it has in place to determine the asset replacement/refurbishment date determination.

Options Evaluation

The project is related to the repair of the flood damage caused the left and right embankments of the Ben Anderson Barrage. SunWater has repaired the flood damage with a "like for like" solution. The documentation provided by SunWater did not contain any options investigation. SKM considers that the approach taken by SunWater to be an appropriate solution and that the development of an options study for this flood damage repair work was not required.

Timing of Renewal/Refurbishment

The emergency repairs undertaken after the December floods was driven by the fact that the event occurred mid rainy season and was based on limiting the impact that a future flood within the same rainy season could have on the structural integrity of the Ben Anderson Barrage.

The timing of the repair work was driven by the fact that the embankment repair work had to be completed before the next rainy season to ensure the structural integrity of the barrage was ensured and to re-establish access to the barrage crest and the gantry downstream of the barrage. The work commenced in March 2011, to complete the work within the FY 2010/11. However the additional works, as identified above, which were identified and scoped during the construction period had the knock on effect of extending the construction period to October 2011.

SKM considers the timing of this refurbishment to be prudent.

Conclusion on Prudency Evaluation

SKM considers that the SunWater has followed their policies and procedures in undertaking the flood repair to the Ben Anderson Barrage. SKM further consider that the flood repairs to the left and right embankments were prudent and undertaken in a timely manner.

C.2.4 Efficiency Evaluation

Renewal/Replacement Project Cost Evaluation

SunWater prepared a cost estimate of $178,121 after the December 2010 flood event to repair the left bank embankment. The scope of work was undertaken where SunWater acted as principal contractor and sub contracted third parties to undertake components of the work. SunWater prepared a cost estimate of $225,989 after the flood event in January 2011 to repair the left bank. The estimate prepared by SunWater did not include for their indirect cost component, nor did it allow for a contingency.

A total of $728,417 was spent to complete the project and SKM understands that this includes all the costs associated with construction. From the comments section of the "FLOOD DAMAGE PROJECTS WMS DOWNLOAD EXPENDITURE FY 2010 - DEC 31 2011", SKM notes that the works scope had changed on two occasions to include the repair of damages that had not originally been identified.

Table 45 below shows the actual construction cost and SunWater's indirect cost, deemed to include for construction monitoring.

Table 45 Project Expenditure

No.	Description	SunWater Total Expense ($)
1	SunWater Indirect Costs	
1.1	Overheads	178,969
1.2	Other Indirect costs	1,316
	Subtotal A	180,286
2	Construction Costs	
2.1	Commercial Contractors	415,845
2.2	Materials	52,741
2.3	Equipment	7,201

No.	Description	SunWater Total Expense ($)
2.4	Labour	72,343
	Sub Total B	548,131
3	**Total (Subtotal A+ Subtotal B)**	**728,416**

From the table above it can be deduced that SunWater's indirect cost component was 32.9% of the construction cost, this is slightly higher than the 30.8% that is recorded within the SAP BOM for cost estimation purposes. The slightly higher percentage of indirect cost to construction cost can be attributed to a number of factors such as the in-house design and repair works carried out post the December 2010 flood, sourcing of the material from RoadTek, re-design after no material could be sourced, additional project management time required to include and complete the right bank flood damage works and accelerated time frames to effect the repairs before another flooding event occurred during that rain.

SKM has made the assumption that Items 2.2 to 2.4 in the table above are concerned with the temporary repair undertaken after the December 2010 flood event. The extent of the temporary repair has not been able to be established.

From the review of the available documents, SKM understands that SunWater appointed a contractor making use of a competitive tender process in accordance with SunWater's procurement processes and State purchasing policy to undertake the works to repair the flood damage after the January 2011 floods. SKM therefore considers that Item 2.1, in the above table, is efficient on the basis that the contractor costs were based on market rates.

Conclusion on Efficiency Evaluation

SKM considers that SunWater undertook the temporary repair works to the Ben Anderson Barrage in a timely manner although the extent has not been established. SKM further considers the flood damage repair was undertaken in accordance to SunWater's policies and procedures for competitive procurement and therefore the contractor costs represent market rates and are hence efficient.

C.2.5 Summary and Conclusions

Based on the SKM review, the flood damage repair that was undertaken at the Ben Anderson Barrage is prudent and undertaken at the appropriate time. The project followed the SunWater Procedures and Policies to complete the repair work and cost associated with the project is considered efficient at $728,417.

C.3 Dawson Irrigation System – Repair Channel 1 Levee banks – Gibber Gunyah

This sub-report should be read in conjunction with SKM's main report entitled: SunWater Price Regulation: Review of Selected Annuity Values for Refurbishment and Replacement items.

This sub-report is also subject to the limitation statement provided in the above mentioned report.

C.3.1 Introduction

This project concerns the repair works of the flood damage to the earthworks between Ch 700m and Ch 1050m of Channel 1, the earthworks for the Levee at six sites along Drain 1/3 in the Gibber Gunyah section of the Dawson Valley Water Supply Scheme. This review concerns the repair and reinstatement of the damaged Channel 1 flood levee and banks to the original specification and specifically comments on the prudency of the project and efficiency of the costs incurred.

C.3.2 Available Information

This sub-report has been prepared by accessing and viewing SunWater's SAP Works Management System (WMS), and asset condition and risk assessment policy and procedures. Please refer to the body of the main report for a more detailed description of these information sources.

In addition, the following information was available for this review:

- **Table 46 Documentation Reviewed Specific to Flood Damage Repair at Ben Anderson Dam**

Document No.	Document Name	Document Title	Date
1173969	1173969-v1-Task_1c_-_Flood_Damage_-_Gibber_Gunyah_Ch_1_&_Levee_Repairs.DOC	Repair Flood Damaged Infrastructure in Gibber Gunyah Section - DVWSS	
1042662	1042662-v1-Project_Scope_Definition_-_LIT_IDN_IM_-_Repair_flood_damage_Gibber_Gunyah_DVWSS	PROJECT SCOPE DEFINITION Repair Flood Damaged Infrastructure in Gibber Gunyah Section - DVWSS – COMMERCIAL – IN - CONFIDENCE	3/03/2011
5111886	Work Method Statement – Ben Anderson Barrage Left Bank Erosion Repair - 5111886	BIA-BURN-BARR Ben Anderson Barrage Left Bank Erosion Repair (WHS10_F1, Rev:9)	06/2009
1171378		Construction Safety Plan for Gibber Gunyah Channel and Levee Repairs 11DVA19 / 11DVA20 (WHS10_F2, Rev:3)	
1101518		HSE Pre Construction Checklist Generic New Meter installations Central Region (CM01_F03, Rev:2)	10/2010
1171376	Project Notification QLeave#E081584		02/03/2011
1171390	Notice of appointment of a principal contractor	Notice of appointment of a principal contractor	04/2011

C.3.3 Prudency Review

Project History

A brief history of the project is presented below:

- 1927 – Completion of the construction of the Gibber Gunyah Channel, Levee and Drainage System. The channel was constructed to irrigate farming areas on the left bank of the Dawson River as well as to act as levee to protect the farmland during flood events.
- January 2001- The condition assessment of the Gibber Gunyah Channel scored 1 that is equivalent to near new condition. (Please refer to the main body of this report to understand about the process by which SunWater determines the asset condition)
- December 2010 – Severe flooding damaged the Gibber Gunyah section of the Dawson Valley Water Supply Scheme during December 2010 - January 2011. Temporary repairs were unable to prevent further inundation which occurred due to a rain event in January 2011.
- Unknown date – The report: *Project Scope Definition: Repair Flood Damaged Infrastructure in Gibber Gunyah Section - DVWSS) - COMMERCIAL IN CONFIDENCE*, prepared by SunWater. The report identified the extent of damage caused by the flooding and included a method of repair to reinstate the earthworks between Ch 700m and Ch 1050m on Channel 1, earthworks for the Levee at six sites along the Drain 1/3 and earthworks at the access crossing at Ch 370m on Channel 1/5. In addition the reinstallation of damaged meter outlets at Ch 711m, Ch 955.6m and Ch 986.5m along Channel 1 were also included in the same scope. The cost estimate for these works was $460,606. The document also provided a works schedule, showing completion of the works due in September 2011 and a baseline cash flow structure.

Asset Replacement/Refurbishment Date Determination

The processes by which SunWater determines asset condition and therefore the replacement/ refurbishment date for an annuity item is described and discussed in the main body of this report.

SunWater's SAP record state that the object type for this asset is EC-Unlined (CHEARTH) with a standard run to failure life of 150 years and a refurbishment period of 25 years. SKM considers that the applied run to failure asset life and refurbishment period to be appropriate for this asset type and in keeping with good industry practice.

SKM has sighted the WMS record that confirms that this asset has been in service since 1927. From our review of the data contained within the WMS we note that the last asset condition assessment was conducted in January 2001. The frequency of condition assessment for this type asset as per SunWater's Whole of Life maintenance Strategy is 10 years and hence the 2001 review fell within this review period at that the time of the development of the 2010 NSPs and at the time that flooding occurred.

The highest rated score recorded at the last asset condition assessment was a 1 (perfect as new condition) for the infrastructure. SKM does question the validity of a rated asset condition score of 1 since the asset has been in service for about 75 years (half life), unless any recent major refurbishments was carried out before the assessment.

The flooding that occurred in December 2010 and January 2011 has severely damaged sections and components of the Gibber Gunyah channel. The damage was caused to the earthworks between Ch 700 m and Ch 1050 m of channel 1, the earthworks for the Levee at 6 sites along Drain 1/3, the access crossing at Ch 370 m on Channel 1/5 including the three metered off takes and one channel footbridge along Channel 1. The wash outs at these locations were 6 – 8 m in depth as stated in – the Repair Flood Damaged Infrastructure in Gibber Gunyah Section - DVWSS report as referenced above. The report further states that the repair was vital *"for the delivery of 6925 megalitres of irrigation water to the Gibber Gunyah Scheme and for the protection of approximately 2500 hectares of agricultural land from future flood waters"*. From the photographs and above referenced documents, SKM understands that Channel 1 of Gibber Gunyah Section was virtually inoperable and considers that the asset hence required to be replaced or refurbished to ensure that water was delivered to the end customer.

No WH&S or environmental risks have been recorded for this asset.

In our review of the data in SAP, SKM considers that SunWater has followed its policies and procedures that it has in place for asset replacement/ refurbishment date determination

Options Evaluation

In accordance with SunWater's Policies and Procedures, the flood damaged Channel1in Gibber Gunyah section was due for immediate repair. The scope of work included the repair of the washed out sections of the canal and levee banks to restore it to the original layout and condition. SunWater repaired the canal with a "like for like" approach. SKM consider the approach taken by SunWater to be appropriate to ensure the continued operation of the infrastructure.

Timing of Renewal/Refurbishment

SKM understands that the timing of the repair work was driven by the negotiation between SunWater and its customers to ensure that the channel was able to supply irrigation water for the watering of the cotton crop in October 2011. The timing was also driven by SunWater's contractual obligation to provide 6925 mega litres of irrigation water to the Gibber Gunyah Scheme and it was also crucial to protect 2500 hectares of agricultural land from future flood event. SKM therefore consider the timing of this refurbishment to be prudent.

Conclusion on Prudency Evaluation

SKM concludes that the repair of the flood damaged Channel 1 of Gibber Guynah Section of Dawson Irrigation System to be prudent in terms of both restoration of the condition of the asset and timing of the repair work.

C.3.4 Efficiency Evaluation

Renewal/Replacement Project Cost Evaluation

Based on the annuity value submitted to QCA, SKM understands that $464,987 has been spent to date to repair and reinstate the flood damaged section of Channel 1 of Gibber Gunyah section. However SunWater's SAP record shows that a total of $456,785 has been spent to date on this project. It is to be noted that there is a cost discrepancy of $8,202 between the annuity value submitted to QCA and the cost breakdown recorded in SAP as shown in Table 47 below.

- **Table 47 - Recorded Costs for Repair of Channel 1 of Gibber Gunyah Section of DVWSS**

Description	Amount($)
Annuity value submitted to QCA	464,987
Total cost as per the breakdown recorded in SAP	456,785

The delivery strategy for this project was that SunWater would act as the principle contractor making use of sub-contractors to undertake various components such as earthworks, labour supply and survey. SunWater documents the reason for choosing this method in the document#1173969 - Repair Flood Damaged Infrastructure in Gibber Gunyah Section - DVWSS as most the most efficient delivery method due to

- *"The site specific nature of construction works;*
- *The risk of interruption of the works due to additional rainfall (work was suspended several times during the project lifecycle due to wet and dangerous conditions);*
- *The complex nature of the work to rebuild SunWater infrastructure back to original specifications*;

If the construction work had been fully contracted out, the risks outlined above would have been priced into the contractors costing. SunWater ... were assessed at being well placed .... to deliver the desired outcome".

The document referenced above also states that SunWater made use of subcontractors to supply materials, earthworks, labour, plant and equipment hire and survey of the flood damaged area and that the subcontractors were selected as per SunWater's procurement processes. The records/ documents related to the hire of subcontractors were not available to SKM for review.

In determining the efficiency of the cost spent, SKM has prepared a bottom up cost estimate. Table 48 below summarizes a comparison of the SunWater actual expenses with the bottom up cost estimate prepared by SKM.

- **Table 48 - Traditional Procurement vs. Actual cost**

No.	Description	SunWater Total Expenditure ($)	SKM Bottom Up Cost estimate ($)
1	Construction Cost		398,585
1.1	Materials	1,966	
1.2	Construction labour	42,000	
1.3	Plant & Equipment	313,118	
1.4	Commercial Contractors (Sub-Contractors)	3735	
1.5	Contractors' profit (10%)		
1.6	Contractors' Overhead (10%)		
1.7	Contractors' Preliminary item (10%)		
	Subtotal 1	**360819**	**398585**[1]
2	SunWater Indirect Cost Component (36.98 % of Construction Cost)		147,396[2]
2.1	Overhead	93,860	
2.2	Other indirect costs	2,105	
	Subtotal 2	**95965**	
3	**Total**	**456,785**	**545,981**

[1] SKM estimate is based on the quantities as defined in project scope and rates based on Rawlinsons Australian Construction Handbook 2011

[2] 36.98% of the direct cost was taken as SunWater indirect cost as recorded within SAP BOM to cover design, administration, and locational costs.

The total SunWater expended cost of the project is less than that calculated by SKM making use of a bottom up approach. SKM considers the total expenditure to be efficient based on the above.

As seen from Table 48 and subsequent discussions about the approach and costs incurred, SKM considers that the SunWater's delivery strategy to act as the principal contractor for flood damage repair of Channel 1 of Gibber Gunyah Section of the Dawson Valley Water Supply System to be appropriate and efficient.

Conclusion on Efficiency Evaluation

SKM considers that the total cost incurred to complete this project to be efficient and the procurement process followed to repair the channel complies with SunWater's Procurement processes and with the State purchasing policy.

C.3.5 Summary and Conclusions

SKM consider that the Repair of Channel 1 Levee Bank in Gibber Gunyah Section of Dawson Irrigation System to be prudent both in terms of need and timing (with the works being carried out in 2010/11).

SKM consider that the overall cost of the repair of the Channel 1 Levee Banks in Gibber Gunyah Section of Dawson Irrigation System to be efficient based on the information to our disposal at a cost of $465,785 including overheads.

C.4 Mareeba-Dimbulah Distribution – Install and Refurbish as Per Intersafe.

This sub-report should be read in conjunction with SKM's main report entitled: SunWater Price Regulation: Review of Selected Annuity Values for Refurbishment and Replacement Items, V2 Final dated 6th October 2011.

This sub-report is also subject to the limitation statement provided in the above mentioned report.

C.4.1 Introduction

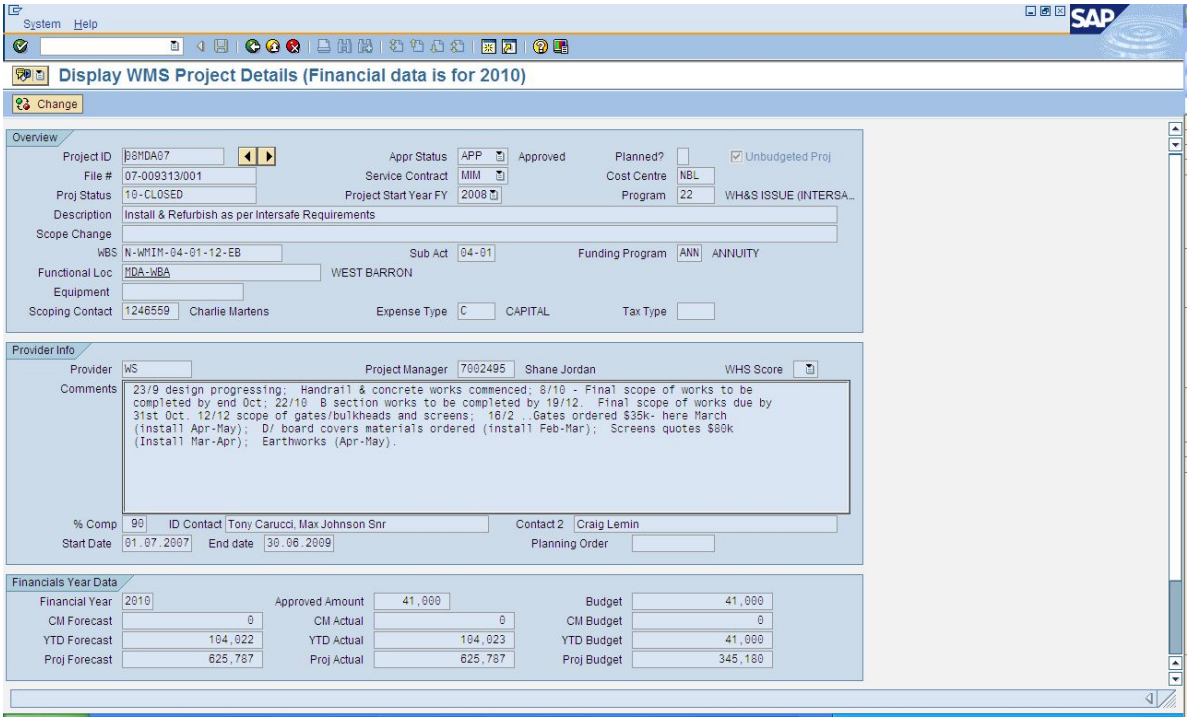
The annuity item for which an annuity value has been submitted to the Queensland Competition Authority (Authority) is for the Installation and Refurbishment of Hand Rail and Gate Structures as recommended by Intersafe in its report on safety modernisation in SunWater's distribution system.

This review has been prompted due to the fact that it was unclear to the Authority (as a result of a truncated annuity item description) whether the annuity item constituted a part of the Intersafe Safety Modernisation Program.

The value of the annuity item per SunWater's submission to the Authority is $652,787.

C.4.2 Available Information

This sub-report has been prepared by accessing and viewing SunWater's SAP Works Management System (WMS) and from screen views of these systems provided by SunWater to SKM by email. Please refer to the body of the main report for a more detailed description of these information sources.



C.4.3 Prudency Review

Asset Replacement/Refurbishment Date Determination

From the information reviewed we are satisfied that the annuity item does form a part of the Intersafe Safety Modernisation Program. We reviewed this program of works in October 2011 and found the program to be prudent, as such we conclude that this annuity item is prudent.

Options Evaluation

Options were evaluated by Intersafe in developing the recommended program of works and we are satisfied from our earlier review of this program that appropriate options have been considered and that the options proposed represent best value for money.

Timing of Renewal/Refurbishment

Given that the refurbishment is related to improving health and safety aspects of SunWater's infrastructure we consider that it is appropriate to carry out the works as early as practicable.

Conclusion on Prudency Evaluation

The inclusion of this annuity item in the annuity value is prudent.

C.4.4 Efficiency Evaluation

We evaluated the efficiency of the Intersafe Safety Modernisation Program in October 2011 and found it to be efficient.

Renewal/Replacement Project Cost Evaluation

The details of our evaluation of project costs are provided in Appendix C2 of our October 2011 report.

Conclusion on Efficiency Evaluation

As the majority of the works under this project have been implemented by contractors that have been selected through either an open invitation to tender process or through invitation to a number of selected contractors we consider that the project costs are efficient.

C.4.5 Summary and Conclusions

We satisfied that SunWater's procedures for determining the timing of refurbishment of an annuity item have been followed and, given that the works relate to improving work place health and safety we consider that the timing and need for refurbishment of this annuity item is prudent.

Given that SunWater has largely contracted for the works competitively we consider the cost of the refurbishment to be efficient.

C.5 Marreba-Dimbulah WSS - SCADA

This sub-report should be read in conjunction with SKM's main report entitled: SunWater Price Regulation: : Review of Selected Annuity Values for Refurbishment and Replacement Items, V2 Final dated 6th October 2011.

This sub-report is also subject to the limitation statement provided in the above mentioned report.

C.5.1 Introduction

The annuity item for which an annuity value has been submitted to the Queensland Competition Authority (Authority) is the Mareeba-Dimbulah Water Supply System SCADA.

This review deals with the costs incurred between 2006 and 2010. Specifically it comments on the prudency and efficiency of the costs associated with the replacement of the SCADA components.

C.5.2 Available Information

This sub-report has been prepared by accessing and viewing SunWater's SAP Works Management System (WMS), and asset condition and risk assessment policy and procedures. Please refer to the body of the main report for a more detailed description of these information sources.

In particular, we have drawn on the following Annuity Item specific replacement reports produced by SunWater for this review:

Table 49 Documentation Reviewed Specific to Mareeba-Dimbulah SCADA

Document No.	Document Name	Document Title	Date
1175266	1175266 – v1 QCA Phase 2 Review Phase #3	Justification Mareeba SCADA	-
1172227	1172227 – Whole of Life Maintenance Strategy	Whole of Life Maintenance Strategy	-

C.5.3 Prudency Review

Project History

In March 2006 SunWater was in receipt of advice from Rubicon Systems Australia Pty Ltd that system upgrades were recommended. A significant scope of work was identified and included the following:

- Upgrade communications from 900Mhz Motorola to 450Mz Trio. Replace Repeaters and radios.
- Upgrade RTU's – Current RTU's are not supported and are to be replaced with ACE RTU's.
- RTU software upgrade and audit – convert to Rubicon's latest version of Gate Control software.

- Host Software Upgrade – IMS hardware has been replaced and Ingress Database upgraded only.

The upgrade work was considered to be an important requirement in ensuring the future serviceability of the system. This formed the basis for the projects undertaken from 2007 to 2010. In 2010 a further review was undertaken by an external consultant with the findings showing that a significant amount of the equipment was regarded as obsolete. This was reflected in an increasing annual expenditure for corrective maintenance demonstrating that the equipment had exceeded its economic life.

Asset Replacement/Refurbishment Date Determination

The processes by which SunWater determines a replacement date for an annuity item is described and discussed in the main body of this report.

As discussed in the previous section, the project was considered necessary due to an increasing annual expenditure for corrective maintenance (refer Table 50)

- **Table 50 Mareeba Control System Corrective Maintenance Costs**

2004	2005	2006	2007	2008	2009	2010	2011	Total
$2,487.14	$2,431.45	$16,743.55	$110,015.20	$187,208.93	$159,768.60	$85,133.19	$39,445.68	$603,233.74

This increasing expenditure, combined with independent reporting that a significant part of the equipment was already obsolete, led to the decision to replace the SCADA system.

We have viewed the WMS record for this asset. We understand that Mareeba-Dimbulah SCADA asset was originally put into service in 1996. SunWater's SAP WMS indicates that for facilities such as this the standard run-to-failure life for equipment such as SCADA is generally 15 Years, as defined for a low risk asset in the Whole of Life Maintenance Strategy. The risk categorisation given to the assets by SunWater is not clear. However, because SunWater states that part of the justification for replacement was to minimise call-out costs, SKM has assumed the risk category would be Low Risk. On this basis a "Run to Failure" policy is considered by SKM to be appropriate. SunWater states, in support of the project, electronic components of SCADA systems have typically short service lives, becoming obsolete and unsupported in-line with technology improvement and updates. SKM agrees with this statement. In addition, SunWater presents a history of steadily increasing maintenance cost up till 2010, indicating a worsening asset condition. The decision to replace hardware components and install software upgrades is therefore considered an appropriate and cost effective management of the assets.

During Round 3 consultation, irrigators advised that the SCADA has never worked properly, and on this basis the irrigators submitted that they should not have to pay for the upgrade of something that has never worked properly or efficiently. However, the condition reports available to SKM indicate that the SCADA system has, until replacement, been essentially functional albeit subject to

increasing corrective maintenance. This is consistent with the assets having already "run-to-failure" at the end of their 15 year life, and being due for replacement.

On the assumption that SunWater's procedures for condition assessment have been followed from a pragmatic assessment, based on this condition and risk assessment score, we consider that this annuity item is prudent.

Options Evaluation

In considering whether or not the replacement SCADA system was required, SunWater states they have no irrigation schemes that are operated and controlled in exactly the same manner. Open irrigation channel systems can be controlled manually, by automatic float regulating gates, and by electronically controlled and actuated gates. The choice of control system is based on many factors. The Mareeba system employs all three methods in the control of the channel system.

SunWater has Rubicon control equipment installed in irrigation schemes in the Burdekin, Eton, and Emerald regions. The systems in these regions vary in their level of channel control from simple remote monitoring and actuation (Eton), automatic actuation against operator set parameters (Burdekin), to Total Channel Control (Emerald).

SKM is aware that some discretion was applied by SunWater to provide cost-effective solutions in assessing the various aspects of these projects. The project 10MDA05 was commenced in year 2009/10. The purpose of the project was to address the operational issues associated with shutdowns of the TFD Hydro Power Station impacting supply in the irrigation channel. The project scope was to design, specify, procure, install, and commission control equipment such that the irrigation radial gate was automatically operated, via the SCADA system when the Hydro Power Station is shutdown. However, the equipment was never installed as it was realised that changes to operational procedures and rosters could be made that provided a more cost effective solution. The work order notification shows an expense of $5,304. Because this expense was incurred in researching the project and eventually establishing its non-viability SKM believes this annuity item should remain as part of the annuity value.

The systems in place in the Burdekin and Mareeba schemes share some commonality in the software and hardware used to manage the customer interface as both schemes require customers to place orders for water and are of a similar age. The system in the Burdekin scheme faces the same obsolescence problems and is being replaced under similar projects. On this basis SKM believes it is logical to extend the same upgrade programme to cover the Mareeba scheme. By keeping with the same equipment types (which is logical from a spares and maintenance perspective), SunWater is limited to sourcing the equipment from one particular vendor: Rubicon.

Timing of Renewal/Refurbishment

As stated above, SKM considers that the asset had been allowed to run to failure. This had been confirmed by independent condition reporting which stated that the asset components were largely obsolete. On this basis the timing of the replacement is considered appropriate.

Conclusion on Prudency Evaluation

On the understanding that it is an accepted requirement for the SCADA automation to be operational, we conclude that the need for replacement of this annuity asset has been demonstrated. As such the inclusion of this annuity item in the annuity value is prudent.

C.5.4 Efficiency Evaluation

The processes used by SunWater to establish future annuity item replacement/refurbishment costs are detailed in the main body of this report. SunWater's planning team applies a unit rate against bill of materials quantities for the asset in question should the replacement be scheduled more than 5 years hence from the planning date. Given the volume of annuity items that SunWater's Planning Team are engaged with at any point in time, this approach is considered reasonable and is in accordance with good industry practice, where the management of a large portfolio of assets is concerned.

Renewal/Replacement Project Cost Evaluation

We have not sighted a detailed Bill of Materials for the SCADA replacement. It is noted the equipment installed at all field sites is similar, and equipment models were standardised with differences only apparent when particular models reached the end of their product life from original equipment manufacturers (OEM) and where hence unavailable for supply at the time of installation. SunWater has again standardised the replacement equipment for better management of spares and servicing.

SunWater has embarked on a program and strategic replacement of SCADA related assets in the Mareeba system after receiving advice from Rubicon Systems Australia Pty Ltd (channel control system specialist). The intention of the works was to ensure SCADA system functionality and reliability into the future.

The expenditure review for the upgrade projects is presented in Table 51.

Table 51 Mareeba Control System Replacement Expenditure

Sum of Value TranCurr		Year				
WBS Element	CO object name	2007	2009	2010	2011	Grand Total
N-WMBM-04-01-01-AF	07MBA03 SCHEME SCADA UPGRADE	$ 37,900				$ 37,900
N-WMBM-04-01-01-BD	10MDA05-INSTALL-SCADA INTERFACE HYD EXP				$ 5,304	$ 5,304
N-WMIM-04-01-00-AB	10MDA67 Replacement Mareeba IVR Computer				$ 46,200	$ 46,200
N-WMIM-04-01-12-EJ	09MDA11-UPGRADE- SCADA SYSTEM		$ 67,680			$ 67,680
N-WMIM-04-01-12-EN	09MDA16-INSTALL MAINS ELEC, AUTO GATES		$ 59,737	$ 19,889	$ 32,538	$ 112,164
N-WMIM-04-01-12-FC	10MDA20-UPGRADE-SCADA RADIO/PLC (S2.3) -			$ 64,989	$ 7,472	$ 72,462
N-WMIM-04-01-12-FY	IMS Upgrade & Internet water ordering				$ 42,384	$ 42,384
	SR - IMS Upgrade/Internet Water Ordering				$ 135	$ 135
Grand Total		$ 37,900	$127,417	$ 84,878	$134,034	$ 384,230

It is understood that SunWater has nominated Rubicon Systems Australia as its preferred supplier for irrigation control equipment, and that this company has been engaged to service and report on the SCADA system. This decision has been based upon the range of existing equipment installed, limited alternate suppliers and their experience with and quality of their equipment. SKM therefore understands that the SCADA replacement contract was not awarded through a competitive bidding process. Therefore we are unable to assert that the costs are efficient as a result of being market tested through a competitive tendering process.

We have not sighted a detailed Bill of Quantities on which to produce a cost estimate. However, a summary scope of work versus cost breakdown has been provided. This document includes internal overhead costs. We have therefore used this to make a general comparison of the main non-inventory and hardware costs with those from our internal database costs (we have assumed an installation cost equal to the hardware cost). The comparison is as follows in Table 52.

Table 52 Costs of Major Components

Scheme	SunWater Expenditure	SKM Estimate (hardware + installation)	Variance
07MBA03 SCADA Upgrade: 8 off CPU200 Units upgraded to CPU420	$28,698	$29,500	+3%
09MDA16 Install Power and electrical actuator to 4 gates: Install Rotork actuator.	$67,426	Unable to assess	-
09MDA11 Upgrade SCADA system: Replace 10 radios and 5 RTU's	$45,002	$55,300	+23%
10MDA20 Upgrade SCADA (Radios	$52,370	$59,000	+13%

and PLC) 8 Sites			
10MDA67 Replacement Mareeba IVR Computer	$44,000	Unable to assess	-
11MDA16 INS Upgrade and Internet Water Ordering Mareeba	$24,000	Unable to assess	-

Unable to assess: insufficient information available.

For those costs items which SKM has been able to estimate, the maximum variance from the SunWater estimate is 23%, which places our estimate within the accepted tolerance compared with SunWater.

Based on documentation provided, we understand that a total of approximately $384,000 has been spent to date since 2007 on the replacement of the SCADA system. By comparison, this is a similar amount to that having been spent on the Burdekin system.

Electronic components of SCADA systems have typically short service lives, becoming obsolete and unsupported in-line with technology improvement and updates. SKM agrees the decision to replace hardware components and install software upgrades in a timely and orderly fashion represents the most appropriate and cost effective management of the assets.

Conclusion on Efficiency Evaluation

The value submitted for this annuity item is efficient, based on available information. Given the types of asset at the respective sites are of the same age and have been subject to the same duty we believe it is reasonable to deduce their conditions will be similar, and it is valid to extrapolate the findings to other SCADA replacement projects in the Mareeba region. .

C.5.5 Summary and Conclusions

In summary we are satisfied that SunWater's procedures for determining the timing of replacement of this annuity item have been followed and hence that the timing and need for replacement of this annuity item is prudent.

We consider the cost of the replacement to be efficient at an annuity value of $409,625.

C.6 Bundaberg Distribution. Isis Pump Station replace PLC and SCADA

This sub-report should be read in conjunction with SKM's main report entitled: SunWater Price Regulation: : Review of Selected Annuity Values for Refurbishment and Replacement Items, V2 Final dated 6th October 2011.

This sub-report is also subject to the limitation statement provided in the above mentioned report.

C.6.1 Introduction

The annuity item for which an annuity value has been submitted to the Queensland Competition Authority (Authority) is the Isis Pump Station Replacement of PLC and SCADA.

This review deals with the costs incurred between 2005 and 2006 according to the documentation provided to SKM by SunWater. Specifically it comments on the prudency and efficiency of the costs associated with the replacement of the PLC and SCADA components.

C.6.2 Available Information

This sub-report has been prepared by accessing and viewing SunWater's SAP Works Management System (WMS), and asset condition and risk assessment policy and procedures. Please refer to the body of the main report for a more detailed description of these information sources.

In particular, we have drawn on the following Annuity Item specific replacement reports produced by SunWater for this review:

Table 53 Documentation Reviewed Specific to Isis Pumping Station PLC/SCADA

Document No.	Document Name	Document Title	Date
1175623	1175623 – v1 ISIS	CTRLS UPGRD Project Brief	31-3-2005
1175629	1175629 – v1 ISIS	CTRLS UPGRD Scoping Analysis	June 2004
1175628	1175628 – v1 ISIS	CTRLS UPGRD SW Capitalisation	10 6 2009
1175631	1175631 – v1 ISIS	CTRLS UPGRD	15 8 2005
1175632	1175632 – v1 ISIS	CTRLS UPGRD Mtg Minutes	15 10 2005
1175635	1175635 – v1 ISIS	CTRLS UPGRD Mtg Minutes	14 10 2005
1175638	1175638 – v1 ISIS	CTRLS UPGRD Mtg Minutes	31 10 2005
1175639	1175639 – v1 ISIS	CTRLS UPGRD Mtg Minutes	27 03 2006
1175640	1175640 – v1 ISIS	CTRLS UPGRD Quote Schneider	18 04 2006
1175641	1175641 – v1 ISIS	CTRLS UPGRD Finance Information	21 06 2007
1175643	1175643 – v1 ISIS	CTRLS UPGRD Capitalisation	23 06 2007
1175644	1175644 – v1 ISIS	CTRLS UPGRD Finance Information	15 05 2008
-	Item 4	Installation of PLC at Don Beattie Pump Station	-

C.6.3 Prudency Review

Project History

In June 2004 SunWater completed a scoping analysis on the replacement of the existing PLC network and installation of a SCADA system for the Don Beattie Pump Station. The scope of work was identified and included the following:

- Replacement of the Station PLC (1 off) and Pump PLC (3 off) with a single PLC with the appropriate I/O modules.
- Installation of a SCADA system with a dial-up facility for remote control.
- Replacement of vibration sensors and monitoring equipment.

The estimated cost was $167,143. The upgrade work was considered to be an important requirement in ensuring the future serviceability of the system. This formed the basis for the projects undertaken from 2005 to 2006.

Asset Replacement/Refurbishment Date Determination

The processes by which SunWater determines a replacement date for an annuity item is described and discussed in the main body of this report.

The system consists of 4 PLC's and data concentrators; 3 installed in 1987, with the fourth installed in 1991. The following issues have been listed:

- The hardware design is cumbersome, and the software is difficult to use, which creates maintenance and troubleshooting difficulties.
- For operation outside of the peak irrigation season the operators prefer a time-controlled mode with selectable duty pumps. This mode cannot be easily added to the existing system.
- The Givelda storage requires an additional level sensor to operate correctly. However addition of an additional sensor with the existing system would require substantial software modifications.
- There is no capability for electronic data logging.
- Any hardware modifications will require the software to be re-written, because the existing software documentation is non-existent. The cost would be expected to be large, as the software was provided 17 years ago and is no longer supported.
- The PLC hardware (17 years old) is approaching its life expectancy[5].

[5] At 17 years SKM would consider the PLC to have exceeded its economic life expectancy

SKM has viewed the condition report for this asset. As stated above we understand that the Isis Pump Station PLC asset was originally put into service between 1987 and 1991. SunWater's SAP WMS indicates that for facilities such as this the standard run-to-failure life for equipment such as SCADA is generally 15 Years, as defined for a low risk asset in the Whole of Life Maintenance Strategy. The risk categorisation given to the assets by SunWater is not clear. However, because SunWater states that part of the justification for replacement was to minimise call-out costs, SKM has assumed the risk category would be Low Risk. On this basis a "Run to Failure" policy is considered by SKM to be appropriate. A SunWater review states, by comparison with other SunWater sites with PLC equipment, the asset would have been close to its life expectancy by 2005. SKM agrees that this type of equipment has a typically short service life, quickly becoming obsolete and unsupported as technology improves. Furthermore, the supplier of the existing equipment (Honeywell) confirmed that it was their intention to phase out support for this model of equipment by 2010. The decision to replace hardware components and install software upgrades is therefore considered an appropriate and cost effective management of the assets.

Since, from SKM's assessment, SunWater's procedures for condition assessment have been followed from a pragmatic assessment, based on this condition assessment, we consider that this annuity item is prudent.

Options Evaluation

In considering whether or not the replacement PLC/SCADA system was required, SunWater has identified the existing problems as above. Assuming the existing equipment was approaching the end of its serviceable life, full replacement would appear to be the only realistic choice.

The options for replacement were confined to

- installation methods
- Addition of SCADA capability
- Component selection

The installation method chosen was for design and engineering work to be undertaken by SunWater staff. On the basis that SunWater has qualified personnel capable of performing the work; this would eliminate the costly need for preparation of Contract Documents for Tender, and would ensure the SunWater staff obtain knowledge of the system.

The addition of SCADA capacity would enable remote monitoring to be implemented, and would also enable electronic data logging. If this SCADA is to be implemented then SKM considers that the appropriate time to implement it is during a major equipment replacement.

Component selection was made to ensure commonality with other equipment on the SunWater system, so that maintenance personnel have some familiarity with it. We believe this is a prudent approach which will be cost effective in the long term.

SKM has sighted the contents page only of a document titled "SCADA Strategy, User Needs and Strategic Plan Reports, Outline Plan", which identifies the operational user needs for the SCADA. We have assumed the justification of the SCADA system implementation was initiated partly in response to the findings of this report.

Timing of Renewal/Refurbishment

As stated above, SKM considers that the asset had been allowed to run to failure. This had been confirmed by independent condition reporting which stated that the asset components were largely obsolete. On this basis the timing of the replacement is considered appropriate.

Conclusion on Prudency Evaluation

On the understanding that it is an accepted requirement for the SCADA automation to be operational, and that the addition of the SCADA functionality is required, SKM concludes that the need for replacement of this annuity asset has been demonstrated. As such the inclusion of this annuity item in the annuity value is prudent.

C.6.4 Efficiency Evaluation

The processes used by SunWater to establish future annuity item replacement costs are detailed in the main body of this report. For annuity items that require to be replaced within five years of the assessment date, SunWater's planning team updates the SAP WMS replacement cost record by either going to market for market prices, assessing the cost of recent similar projects of building a bottom up cost assessment based on detailed engineering design. It is understood that a mixture of these approaches was used to develop a budget prices for this past replacement item. This approach is considered reasonable and is in accordance with good industry practice, where the management of a large portfolio of assets is concerned.

Renewal/Replacement Project Cost Evaluation

SKM has sighted a detailed Bill of Materials for the PLC/SCADA replacement. Three PLC equipment options were considered, all based on SunWater preferred equipment (Modicon) for reasons of standardisation as explained above. The hardware pricing ranged from $37,640 to $78,591, and the cheapest option, being adequate for current and future requirements, was selected.

In addition, pricing was also obtained by SunWater for the replacement vibration sensors and monitors.

The project estimate for the PLC/SCADA replacement was prepared by SunWater staff and is presented in Table 54.

- **Table 54 Bundaberg Distribution Isis Pump Station PLC/SCADA Replacement Budget Expenditure**

Cost Estimate, Don Beattie, Design and Contruction

PLC replacement	no/units	units	$/unit	$ inc Gst	comment
I/O lists	20	hours	$ 105	$ 2,110	
design drawing drafts	80	hours	$ 105	$ 8,439	
design drawings	80	hours	$ 93	$ 7,440	ES draftsperson
purchasing supervision	20	hours	$ 105	$ 2,110	
purchasing	20	hours	$ 56	$ 1,111	
PLC software development	80	hours	$ 105	$ 8,439	
PLC software testing in Brisbane	40	hours	$ 105	$ 4,220	
PLC/Sixnet interface testing	16	hours	$ 105	$ 1,688	
PLC software description	32	hours	$ 105	$ 3,376	
SCADA software development	80	hours	$ 105	$ 8,439	
SCADA testing in Brisbane	20	hours	$ 105	$ 2,110	
Operators manual	32	hours	$ 105	$ 3,376	
installation, electrician	150	hours	$ 56	$ 8,330	
installation, apprentice	150	hours	$ 49	$ 7,299	
installation supervision (John Hazzard)	80	hours	$ 86	$ 6,846	
commisioning	40	hours	$ 105	$ 4,220	
SCADA installation and testing	16	hours	$ 105	$ 1,688	
maintenance training	8	hours	$ 105	$ 844	
SCADA remote access testing	4	hours	$ 105	$ 422	
SCADA operator training	4	hours	$ 105	$ 422	
SCADA software installation manual	32	hours	$ 105	$ 3,376	
as built drawing modifications	20	hours	$ 93	$ 1,860	ES draftsperson
travel expenses	9	days	$ 135	$ 1,217	
car hire	9	days	$ 70	$ 630	
contingencies	1		$ 10,000	$ 10,000	
sum				**$ 100,010**	

Hardware specification	120	hours	$ 105	**$ 12,659**	3 weeks

Hardware specification	120	hours	$ 105	$ 12,659	3 weeks
PLC software specification	120	hours	$ 105	$ 12,659	3 weeks
SCADA software specification	80	hours	$ 105	$ 8,439	3 weeks
Tendering	1		$ 10,000	$ 10,000	
Contract supervision	40	hours	$ 105	$ 4,220	3 weeks
sum				**$ 47,976**	

On this basis a Works Order was produced for the project to the value of $153,288, which includes SunWater engineering and installation costs (and it is assumed, some contingency). SKM understands the project was completed as planned using predominantly SunWater engineering staff, although significant external assistance was needed to complete the software development.

SunWater also obtained pricing for replacement vibration monitoring equipment. The estimated cost was $37,353 and did not include installation, for which SKM would allow a further $35,000 resulting in a total additinal cost of $72,353.

SKM has reviewed the cost estimate. The number of hours (1,163) and their hourly rate allocated to each of the design components and for installation and configuration is reasonable for a small scale project of this type. SKM would typically expect approximately 1,000 hrs would be required for such a task and the SunWater estimate for labour of $100,010 is therefore within the bounds of SKM's estimate. With regards to the hardware costs, SunWater obtained prices for three solutions options from the same preferred supplier. SKM has compared the costs of the selected option with the prices from our internal database costs. The comparison is shown in Table 55.

Table 55 Costs Estimate of PLC/SCADA Hardware Components

Item	SunWater Estimate	SKM Estimate	Variance
PLC Processor, 30.8k memory, built in comms ports.	$1,690	$1,847	+9%
Digital Input cards capacity 12.	$255	$270	+6%
Analogue Input cards	$970	$695	-29%
Digital Output cards capacity 8.	$295	$275	-7%
SCADA Computer	$3,000	$2,500	-17%
Licence	$5,000	$5,000	-0%
Total	$11,210	$10,587	6%

Note: SKM costs are in 2012 dollar terms whereas SunWater's costs are in 2010 dollar terms.

The maximum variance from the SunWater estimate is 29% with the total variance being +6%. This places the SunWater costs within the level 4 (± 30%) order of magnitude estimating which SKM uses for capital project cost benchmarking. The quoted cost for PLC and SCADA equipment from the supplier (upon which the SunWater estimate was based) was $48,139. On the basis of the benchmarking costs listed in Table 3, SKM accepts this quoted cost as reasonable.

We understand from financial information provided that the actual project cost was $167,142.97, which represents a 9% cost overrun on the budget estimate of $153,288. This is a small cost overrun which SKM believes is tolerable and within industry norms. Added to this cost is the cost of the vibration monitoring equipment, which is additional to the original scope and bill of materials for replacement of the original SCADA which SKM estimates as being $72,353.

Conclusion on Efficiency Evaluation

From the cost benchmarking undertaken by SKM, SKM concludes that a reasonable estimate for the control system is:

PLC and SCADA hardware:	$48,139
Labour:	$100,010
TOTAL	$148,149

The actual cost of $167,143 exceeds this estimate by 13%. This places the SunWater costs within the level 4 (± 30%) order of magnitude estimating which SKM uses for capital project cost benchmarking. SKM therefore considers the cost of this work to be efficient.

Added to this is the cost of the vibration monitoring equipment which is additional to the original scope for replacement of the existing SCADA system. SKM's estimate for this is $73,353. Adding this to the actual cost of the PLC and SCADA replacement ($167,143) gives a total work value of $239,496

However, SKM notes that the annuity value submitted to the QCA in SunWater's Network Service Plan is $413,994. SKM believes that this value reflects the actual project expenditure, which was expanded to include the vibration monitoring equipment and unforeseen software development costs (understood to be significant) which had not been included in the original estimate. However, we consider that the major contributor to the difference in costs between SKM's estimate (which is comparable to the scoping study estimate) and the final outturn is cost overrun on software development which was originally planned to be developed in-house by SunWater and then was subsequently outsourced. SKM considers this cost overrun not to be consistent with what may be expected of an efficient operator in this case. The $413,994 submitted by SunWater in its Network Service Plan is therefore considered not to be efficient.

C.6.5 Summary and Conclusions

In summary SKM is satisfied that SunWater's procedures for determining the timing of replacement of this annuity item have been followed and hence that the timing and need for replacement of this annuity item is prudent.

SKM considers the cost of the replacement as submitted by SunWater in its Network Service Plan at $413,994 is not efficient. However SKM considers the amount expended on the project as specified in the documentation provided to SKM is efficient at $239,496.

Appendix D Operational Expenditure Review

This appendix contains the detailed report of SKM's review of two expenditure items:

- Dawson Valley Water Supply Scheme – Use of external contractors versus SunWater labour
- Eton Water Supply Scheme – Preventative and Corrective Maintenance Costs

D.1 Dawson Valley Water Supply Scheme – Use of External Contractors

This sub-report (draft) should be read in conjunction with SKM's main report entitled: SunWater Price Regulation: : Review of Selected Annuity Values for Refurbishment and Replacement Items, V2 Final dated 6th October 2011.

This sub-report is also subject to the limitation statement provided in the above mentioned report.

D.1.1 Introduction

During Round 3 consultation for the current SunWater price review, irrigators stated that *"some maintenance work is undertaken by SunWater employees that need to travel from Bundaberg or Mackay. This requires approximately 8-10 hours of travel time and overnight accommodation for the SunWater employee to undertake a minor task. In addition, for each $1 spent on direct labour (including travel time) irrigators are charged $2 in bulk and $1.50 in the distribution system for non direct costs. Therefore, a minor job is very expensive"*.

SKM has been asked to review a sample of activities undertaken by SunWater employees from Bundaberg or Mackay. SKM has also been asked to review the activities undertaken and consider whether by a local contractor or determine whether the task is sufficiently specialised that a SunWater employee is required. Where SKM considers that a local contractor could undertake the job then SKM has been asked to calculate the total cost for each of the sampled activities (including non-direct costs).

SKM notes that the irrigators has assumed that for each maintenance activity carried out, for every $1 of direct costs (including travel time), SunWater applies $3.50 of overheads costs, making overhead costs some 77.8% of the total cost of carrying out maintenance costs.

D.1.2 Available Information

This sub-report has been prepared by accessing and viewing SunWater's SAP Works Management System (WMS). Please refer to the body of the main report for a more detailed description of these information sources.

In particular, SKM has drawn on the following reports provided by SunWater for this review:

Table 56 Documentation Reviewed Specific to Item 18

Document No.	Document Name	Document Title	Date
SunWater Doc No. 1169382	Memorandum	Use of staff from Mackay and Bundaberg to carry out work in the Dawson Valley Water Supply Scheme	13th February 2012

D.1.3 Prudency and Efficiency Review

In addition to reviewing the above report, which is discussed later in this report, SKM has interrogated SunWater's SAP WMS for works orders completed in the Dawson Valley Water Supply Scheme and the Theodore Distribution system for works orders completed between 1st January 2010 and 1st January 2012 with a actual out turn cost of less than $25,000. An upper cut off of $25,000 was applied to limit the sample size to those works orders that it would be potentially be economic to use a local contractor over SunWater staff. In that it has been assumed that the travel costs associated with activities costing more than $25,000 would be low compared to other costs associated with the activities.

This interrogation returned some 489 works orders of value less than $25,000. This list was analysed for materiality to determine the number of works orders in different cost bands as shown in Table 57

Table 57 Number of Dawson Valley Water Scheme work activities by value 2010-2012

Cost band	No	Total Value
$20k to $25k	1	$20,943
$15k to $20k	1	$19,050
$10k to $15k	8	$96,548
$5k to $10k	16	$113,616
1k to $5k	54	$132,250
$1 to $1k	136	$55,762
No charge	269	

From Table 2 SKM concludes that there are a material number of works orders (some 70) of value greater than $1,000 where it may be cost effective to use a local contractor. SKM has use a minimum work order value of $1000 on the assumption that the administrative costs of managing purchase orders to local contractors for sub $1,000 works orders would make letting of these works order to local contractors non-cost effective. Also, the low value of these works orders suggest that significant travel time has not been incurred in SunWater staff visiting site to undertake these works e.g. SunWater has advised that many small works orders are carried out when their staff are in transit "passing through the area" and or are undertaken when on site carrying out larger works order activities.

SKM has further analysed the works activities carried out by maintenance activity code. Of the maintenance activities codes used by SunWater, SKM has assessed the following as potentially being capable of being addressed by local contractors:

- **Table 58 Work Activity Codes Potentially Capable of Being Addressed by Local Contractors**

Code	Activity
14	Meter Reading
24	Water Delivery Asset Servicing
29	Weed Management - Mechanical
31	Weed Management - Mapping
32	Delivery Asset Repair
34	Non-Water Delivery Asset Repair
49	Operations One Off
50	Corrections One Off
51	Prevention One Off
A11	Distribution System Surveillance
A14	Meter Reading
B10	Component Servicing
C12	Weed Control Mechanical
C28	Repair
D18	Component Damage Repair

SKM then analysed the list of works orders by sorting against each of the above codes and determining the works orders performed and value of those works orders performed against these codes that, through appropriate training, local contractors would be able to undertake. In assessing this sample, SKM has given regard to:

- The complexity and technical difficulty of the task (eg SCADA and communications systems repairs have been omitted)
- The spare parts required to undertake the task (it has been assumed that SunWater would not wish to keep a stock of a wide range of spare parts managed by local contractors)
- The level of training that would be required and the potential limitations on local contractors having multi-skill ability (ie being able to cover mechanical, electrical, civil activities)

The results of this analysis are provided in Table 59:

- **Table 59 Identified works orders capable of being undertaken by local contractors**

Works Order No.	Description	Final Cost
Work order code: 32 water delivery asset repair		
5106269	Install safety screen to outlet	$2,000
5106727	Repair leaking access crossing pipe	$1,000
5103048	Build up section of bank	$1,000
5103027	Repair washout around off-take	$874

Works Order No.	Description	Final Cost
Work order code: 32 water delivery asset repair		
510617	Repair split in concrete structure	$255
Work order code: 34 No water delivery asset repair		
5103912	Replace lower flap gates	$3,000
5107849	De-silt drain	$3,000
5103694	Confirm operation of well flooded siren	$222

It is SKM's view that other works orders undertaken during 2010 to 2012 could have be carried out by local contractors given appropriate training and appropriate local stocking of spare parts but that the diverse technical skills required to cover a sufficient range of these works orders to make this viable would require significant and extensive training of local contractors (not just in terms of the technology being addressed but also in terms of ensuring that the work is carried out in compliance with SunWater's health and safety processes and obligations both in respect of ensuring the safety of the contractor's staff but also the public at large).

From the analysis conducted SKM concludes that, during the sample year's selected, there were insufficient value of works orders that could have been undertaken by local contractors to justify SunWater going to the expense of vetting, training and commissioning local contractors to avoid the additional cost of its staff travelling long distances to site. Additionally the value of the works orders analysed and the works activities associated with them indicates that excessive travel and overhead costs have not been allocated to the work activities. Hence there would be little cost advantage, if any, in SunWater appointing and training local contractors, particularly in areas within the employment catchment of the mining industry which would likely result in a high turnover of these contractors.

SKM also notes that SunWater employees 6 staff who are located in the Theodore depot. These staff are considered essential for the local operations of the scheme. Having made the decision that a certain number of staff resources are essential, it is then important for efficient outcomes to ensure that work is assigned to these staff to ensure they work at capacity. This further limits the work that could be allocated to local contractors to work that can't be undertaken by SunWater staff based locally.

SunWater's response

In addition to undertaking its own analysis, SKM has reviewed SunWater's response to the irrigators' suggestions. The following is a précis of that response that seems to SKM to be relevant and appropriate:

SunWater has checked all SAP work orders for the Dawson Valley Water Scheme for the 2010-11 financial year to determine if staff resources from the Bundaberg to Mackay centre were used for minor maintenance works. This check has revealed that Bundaberg mechanical staff were used on one project during this time and that SAP records do not show any use of Mackay based staff for carrying out minor maintenance.

SKM considers that SunWater's assertion as to use of staff more local to Dawson Valley Water Scheme were used in preference to staff from Bundaberg and that no Mackay staff were used is born out in our analysis of the number of work orders carried out in the lower value bands over the higher value bands, that is the majority of the works were carried out for less than $1,000. This analysis does not support the statements of the irrigators either with regards to excessive costs associated with travel or that some 78% of the total costs is allocated to overheads.

SunWater has also advised that the project on which the Bundaberg staff were used related to the overhaul and refurbishment of one of the pump units at Theodore pump station and that this work was of too complex a nature to be carried out by more local staff (or local contractors). SKM has reviewed this work order and agrees with SunWater that, given the nature of work such as working in confined work spaces (which would have required confined work space training), that it would have been inappropriate to let this work to local contractors.

SKM has also been advised that the Bundaberg staff were used for this 'one off' job because the SunWater Biloela mechanical staff had at that time recently resigned and had not been replaced.

Conclusion on Prudency and Efficiency Evaluation

SKM accepts, in principle that it can often be cost effective for a utility managing remote assets to train and use local contractors for minor works, indeed, SKM employs this approach within its renewable operation and maintenance team.

However, SKM's review of the work orders being carried out in Dawson Valley Water Supply Scheme (comprising Theodore Distribution), when taking into account the size, number, complexity, range of skills required, and training requirements associated with these works orders leads to the conclusion that it would not be cost effective for SunWater to employ local contractors for these activities.

In addition, SKM's analysis does not support the irrigators' statement that the bulk of the costs associated with carrying out these minor works activities are associated with travel costs and/or overheads.

D.2 Eton Water Supply Scheme – Preventative and Corrective Maintenance Costs

This sub-report (draft) should be read in conjunction with SKM's main report entitled: SunWater Price Regulation: : Review of Selected Annuity Values for Refurbishment and Replacement Items, V2 Final dated 6th October 2011.

This sub-report is also subject to the limitation statement provided in the above mentioned report.

D.2.1 Introduction

The Eton Water Supply Scheme comprises the bulk water storage facility of Kinchant Dam and a channel supply system that distributes water from Kinchant Dam through 35 km of open earth channels to the various sections of the scheme.

The 2010 Network Service Plan for Eton Water Supply Scheme (submission) prepared by SunWater, includes SunWater's forecast preventative and corrective maintenance cost submitted to the Queensland Competition Authority (the Authority).

During the Round 3 consultations under the SunWater Price Regulation exercise, irrigators noted that preventative maintenance increased in 2011-12 and were maintained at these increased levels for future years. The irrigators also noted that, although preventive maintenance costs were budgeted to increase, there was not a fall in corrective maintenance costs forecast for 2011-12 and subsequent years that may be expected to arise from such an increase in preventative maintenance activities. The consultancy firm ARUP had previously been commissioned by the Authority to investigate and report on (among other things) forecast preventative and corrective maintenance costs and comment on their prudency and efficiency.

In its report ARUP noted:

"Both CM and PM are increasing markedly and SunWater have not provided full justification around these though we note the increase in cost of materials associated with weed eradication.

"In forecasting for the 2012 to 2016 period, SunWater have[sic] *adjusted the 2011 budget taking into account both historical trends, likely legislative and policy changes and savings as identified in the SLIFI review and recommendations made in the PB*[6] *report on preventative maintenance."*[7]

And.

[6] Parsons Brinkerhoff, Provisions of Services for Costing SunWater's Work Instructions, Final, October 2010
[7] Queensland Competition Authority, Review of SunWater's Network, Service Plans - Cluster 4, Review of NSPs, Section 9, ARUP, Final Report, July 2011

Arup have[sic] *requested from SunWater a formal statement with regards to how the outcomes of this PM analysis undertaken by PB have been incorporated into the forecasts including details of what initiatives have been put in place or are scheduled to be put in place to incorporate the above requirements* [being the recommendations made by PB in respect of, inter alia, improved maintenance cost allocation methods and a move to reliability centred maintenance]. *Certainly we note that the forecasts are well in excess of what PB have* [sic] *proposed. Using the information provided and type of disaggregation given it is difficult to see how PB's revised forecasts are integrated into the NSP forecasts."* [8]

The inference in these statements is that in its report to SunWater on corrective and preventative maintenance costs, PB recommended changes in preventative and corrective maintenance budgets to improve the efficiency of SunWater's plant maintenance regimes. In light of the outcome of the Round 3 consultations and comments from the irrigators on the findings of ARUP's report and in respect of their expectation that if preventative maintenance costs increase, then corrective maintenance costs should decrease, the Authority has requested SKM to:

"Ascertain the preventative and corrective maintenance activities undertaken in 2010-11 and compare this with the activities and compare these with the activities undertaken in 2011-12 (or forecast to be undertaken). SKM is to conclude whether the number of activities has increased or the costs per activity have increased. SKM is to sample a number of activities and conclude whether or not the activities are prudent and efficiency. SKM is to consider total operational costs (including non-direct costs) when assessing efficiency."

D.2.2 Available Information

This sub-report has been prepared by accessing and viewing SunWater's SAP Works Management System (WMS), and asset condition and risk assessment policy and procedures. Please refer to the body of the main report for a more detailed description of these information sources.

In particular, SKM has drawn on the following reports provided by SunWater together with reports available from the Authority's web site for this review:

- **Table 60 Documentation Reviewed Specific to Eton WSS Preventative v Corrective Maintenance Costs Review**

Document No.	Document Name	Document Title	Date
SunWater Doc No. 1169382	Memorandum	QCA SKM R&E Review Ph 2	1st February 2012
SunWater Doc. No. 1169382	Spreadsheet	Eton WSS Operation and Maintenance Cost Evaluation	1st February 2012

[8] Queensland Competition Authority, Review of SunWater's Network, Service Plans - Cluster 4, Review of NSPs, Section 4, ARUP, Final Report, July 2011

Document No.	Document Name	Document Title	Date
SunWater	SAP Reports	Operation and Maintenance Records: ETON WSS 2010-11/2011-12 (to date)	7th February 2012
PB Report: No 2159373A/ SunWater Doc No. 1013614	Parsons Brinkerhoff Report	Provision of Services for Costing SunWater's Work Instructions	October 2010
ARUP Report: No 221338-00v1	Queensland Competition Authority, Review of SunWater's Network, Service Plans - Section 4, , Final Report,	Cluster 4, Review of NSPs	July 2011

D.2.3 Prudency and Efficiency Review

The maintenance budgets presented by SunWater for the Eton Water Supply Scheme in its submission to the 2012 to 2020 (preventative and corrective) have been challenged on the basis of:

1) They do not reflect the recommended future cost forecasts made by PB in its report on preventative and corrective maintenance costs (per ARUP's report to the Authority)

2) Forecast preventative maintenance costs have increased but forecast corrective maintenance costs have remained static (ignoring inflation effects)

3) It would be reasonable to assume that if additional budget is committed to preventative maintenance activities, then corrective maintenance costs should decline, thereby justifying the increased spend on preventative maintenance costs[9]

In our review of the PB report (cited in foot note 1 above), we note that PB does not recommend future budgets for preventative and corrective maintenance activities, nor does PB recommend certain levels of preventative maintenance activities over corrective maintenance activities. It is noted that PB specifically excludes from its scope of work:

"[analysis of] the CM[10] practices and associated costs of these activities to ascertain whether the balance between PM[11] and CM regimes were at an optimum level".[12]

[9] It is noted that if, in absence of increased preventative costs, the corrective maintenance costs would increase annually, e.g. because of plant and equipment being operated beyond its economic life, then there could be a situation where an increase in preventative maintenance costs do not result in a decrease in corrective maintenance costs, year on year, but merely stave off an increase in corrective maintenance costs.

SKM is therefore of the view that the interpretation placed upon the PB report by ARUP in its report to the Authority is not correct.

SKM has reviewed the past and forecast operation and maintenance costs for Eton Water Supply Scheme as provided by SunWater in its submission to the Authority and detailed in SunWater's memorandum to SKM cited above. From this, we note the following:

1) The step change (increase) in preventative maintenance costs on the bulk water storage facility between financial years 2010-11 and 2011-12 (+$161k) are compensated by an almost equal but opposite step change (decrease) in operational costs (-$145k), in the same year.

2) Following these changes, the total costs for operation and maintenance of the bulk water storage facility, as well as operation costs, corrective and preventative maintenance costs are relatively static (increases in forecast costs principally reflect inflationary pressures in future years)

3) There is a significant increase in both operations and preventative maintenance costs of the channel system from 2010 to 2011, from which point the costs remain relatively constant through to 2016. Corrective maintenance costs associated with the channel system remain relatively constant from 2009 to 2016, whereas an increase in preventative maintenance to this degree would be expected to result in a subsequent decrease in corrective maintenance costs. However, the increase in preventative maintenance costs not associated with weed control are only a small proportion of overall preventative maintenance costs and therefore are not considered to be capable of a material impact on corrective maintenance costs.

4) Through discussions with SunWater it is understood that the overall (bulk water storage facility and channel system) preventative maintenance costs' increase of approximately 30% is mainly attributed to the following:

   - adjustments to allow for increases to level of preventative maintenance in-line with recommendations outlined in PB report (PB report concluded that SunWater were spending only 50% of ideal costs for preventative maintenance).

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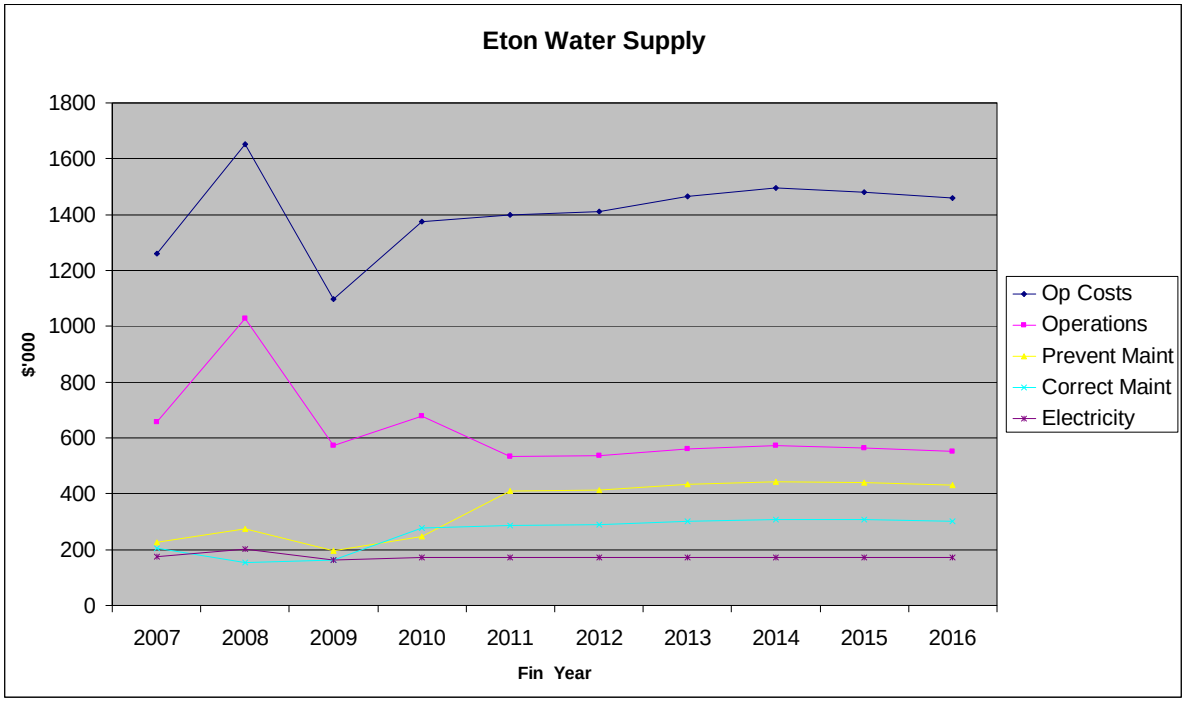
[10] CM – Corrective Maintenance

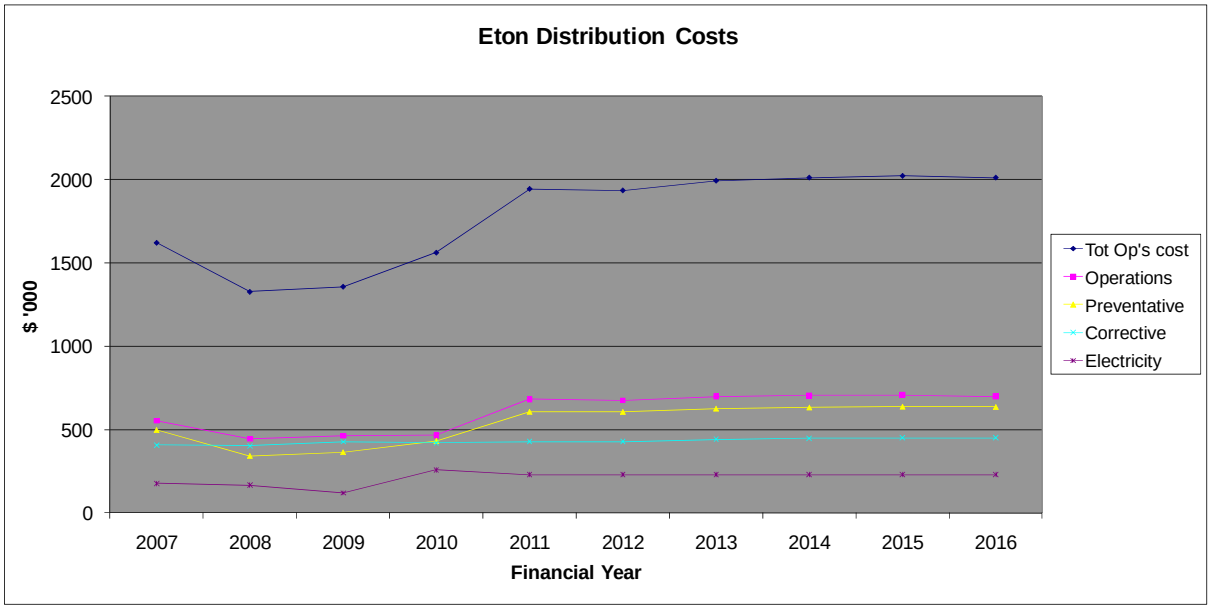
[11] PM – Preventative Maintenance

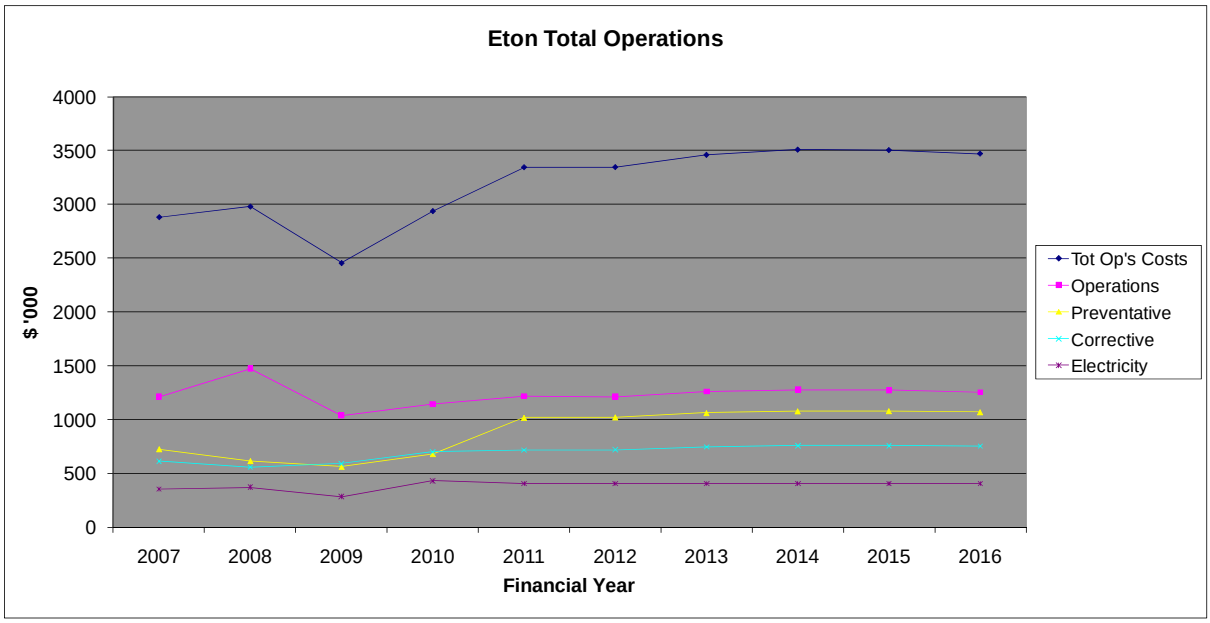
[12] Parsons Brinkerhoff, Provisions of Services for Costing SunWater's Work Instructions, Final, October 2010, page 6

- renegotiated Maintenance Contracts (including increase to mowing costs of approximately $25,000 per annum)
- acrolein injection costs (5 – 6 injections required per annum @ approx. $50,000 per injection) to meet their contracted service standards for full volume water delivery
- Year 2010/2011 was a 'low flow' year, i.e. rainfall in the region resulted in minimal requirements for water off take from EWSS and therefore resulted in lower preventive maintenance costs for weed control during that year (SunWater has advised that weed control constitutes approximately 70% of the preventive maintenance budget). Drier periods are forecast for future years which will result in need for greater acrolein injection levels in order to keep the channels free of growth. However SKM notes that years 2008/09 and 2009/10 were relatively high flow years which resulted in dosing levels comparable to those budgeted for post 2011.

The above analysis is represented graphically below:







SKM has discussed the reasons behind the changes in operating and preventative maintenance costs of the bulk water storage facility between 2010-11 and 2011-12 with SunWater and is satisfied that the changes in cost reflect a reallocation of expenditure between operation activities and preventative maintenance activities in recognition of the previous misallocation of expenditure between these two activities. This reallocation is consistent with the findings and recommendations of the above mentioned PB report:

"increases in PM expenditures in both condition monitoring and servicing activities can be related to the combined effects of the age and performance of SunWater's assets, incomplete PM activities being undertaken and inaccurate PM costs captured due to historic booking practices. This can reflect a view that historic PM costs has [sic] *been lower that would be required to complete the PM program going forward to enable the entire PM program to be completed".*

Conclusion on Prudency and Efficiency Evaluation

SKM is satisfied that the step change in preventative maintenance costs, for the bulk water storage facility, between 2010-11 and 2011-12 is as a result of a reallocation of costs previously misallocated to operational activities and that there has been no overall material increase in total operating costs (operation, preventive and corrective maintenance costs) between the two financial years.

SKM is also satisfied that the increase in preventative maintenance costs for the channel system, from 2010, is in keeping with the PB recommendations and also considers the increase in costs associated with the operation of the channel system through high demand 'low rainfall' periods to meet water volume service delivery obligations.

In addition, SKM has reviewed the operation and maintenance activities for 2010-11 and 2011-12 and find them to be reasonable and appropriate for type and age of the assets being operated and maintained.

SKM therefore conclude that the forecast preventative maintenance costs (in conjunction with the forecast operating and corrective maintenance costs) are both prudent and efficient.