11

WATER CORPORATION

United Utilities

Office of Water Regulation

A NEW WATER SUPPLY TO THE GOLDFIELDS

REVIEW OF THE VIABILITY OF A DESALINATED SEAWATER PIPELINE

FROM ESPERANCE TO KALGOORLIE/BOULDER

FINAL REPORT

For the

WESTERN AUSTRALIAN GOVERNMENT'S WATER TASKFORCE

August 2003

1. INTRODUCTION

In February 2001, the Government called for expression of interest for the provision of a sustainable water supply to the Goldfields/ Esperance region. This process lead to the development of a Draft Goldfields-Esperance Water Supply Strategy.

The draft strategy assessed five main supply alternatives based on a range of expected demands and finally concluded that *"...there is no immediate imperative to begin development of an alternative water supply to the existing Goldfields and Agricultural Water Supply (G&AWS)".*

However, the Government remained keen to assess the viability of a project to pipe desalinated seawater from Esperance to the Goldfields, and a commitment was given in the State Water Strategy (released on 10 February 2003) that *"The Water Corporation and the Office of Water Regulation will enter into discussions with United Utilities Limited, to ascertain if a cost effective* (pipeline) *solution is possible".*

A Steering Committee was established: with the following membership:

Dr Jim Gill	Managing Director of the Water Corporation (Chairman)
Dr Brian Martin	Office of Water Regulation
Mr Graham Dooley	Managing Director, United Utilities Australia Pty Ltd (UUA)

A joint working group, drawn from Water Corporation and UUA, was established to progress the work under the direction of the Steering Committee.

This report summarises the conclusions drawn from the review.

2. TERMS OF REFERENCE

The Terms of Reference of the Joint Feasibility Study were developed directly from the State Water Strategy:

"....One of the proposals the Government received was to pipe desalinated seawater from Esperance to the Goldfields. The Government is now keen to determine whether this project is feasible and economically viable (and) has asked the Water Corporation, Office of Water Regulation and United Utilities Australia to enter into discussions to ascertain if a cost-effective new water supply to the Goldfields is possible."

3. STAKEHOLDER MANAGEMENT

To complete this review, there was a requirement for the review team to liaise closely with the mining industry in the assessment of demand and the verification of cost benefits associated with a new fresh water source. Because of this presence on the ground, the

10

review team determined that there was a need to contact key stakeholders and appraise them of the objectives.

The review team adopted an approach based on one-on-one discussions and divided the stakeholders into four categories - Influential Community Groups / Mining Management / Mining Operatives and Contract Miners/Suppliers.

A list of stakeholders is attached at Attachment 1.

4. DEMAND

4.1 Mining

The identified demand for fresh water within the mining industry surveyed was lower than might have been expected given the forecasts contained in the 'Goldfields Esperance Water Supply' report dated January 2003.

This is in part reflective of the fact that the review relied upon existing mines as the basis for assessing short-term demand and that these mines have higher transition costs and existing processes that would require piloting and modification before commitments to new water sources would be considered.

The demand assessment also reflects the reality that there is unlikely to be a 100% substitution for water currently sourced from tailings returns, mine de-watering and self supply opportunities from private borefields and/or on–site water harvesting initiatives. The existing mines have a heavy investment in mature infrastructure, plant, processes and expertise in the use of hypersaline water in their process circuits. This potentially creates a disincentive to substitute fresh water for hypersaline water.

The key motivation for substitution is likely to be reduction of process cost. For this reason, the review focussed considerable attention on working with the industry to establish the real 'value' of using fresh water to reduce the cost base of existing gold mines. This approach has established that the impact of hypersaline water use within the industry is wide-ranging and , includes:

- reduced infrastructure life including fixed and mobile plant;
- increased maintenance and safety requirements to deal with such aggressive water;
- pH correction and consequent reagent use.

Through the course of the study, existing gold mines have made various estimates of the costs of using hypersaline water which have ranged from about $1.30 cents/kL to $3.50/kL. In order to establish a basis for the study, mines and suppliers have provided more detailed estimates, although these are not in any sense definitive.

The data collected during the study indicates a range of costs of the following order:

Table 1

Cost line	From A$/kL	To A$/kL
Reagents	0.75	2.30
Borefield operations	0.20	0.35
Mine operations	0.40	0.50
Water harvesting incl. Capex	0.40	0.40
Additional mining vehicle wear and tear	0.35	0.35
Total	**2.10**	**3.90**

Note: this data compares the notional cost of using 100% hypersaline water in a process with using 100% fresh water. It is a composite of estimates from mines and others working in the industry. The real value is likely to fall within this range but individual verification by mines may produce a figure that lies outside it.

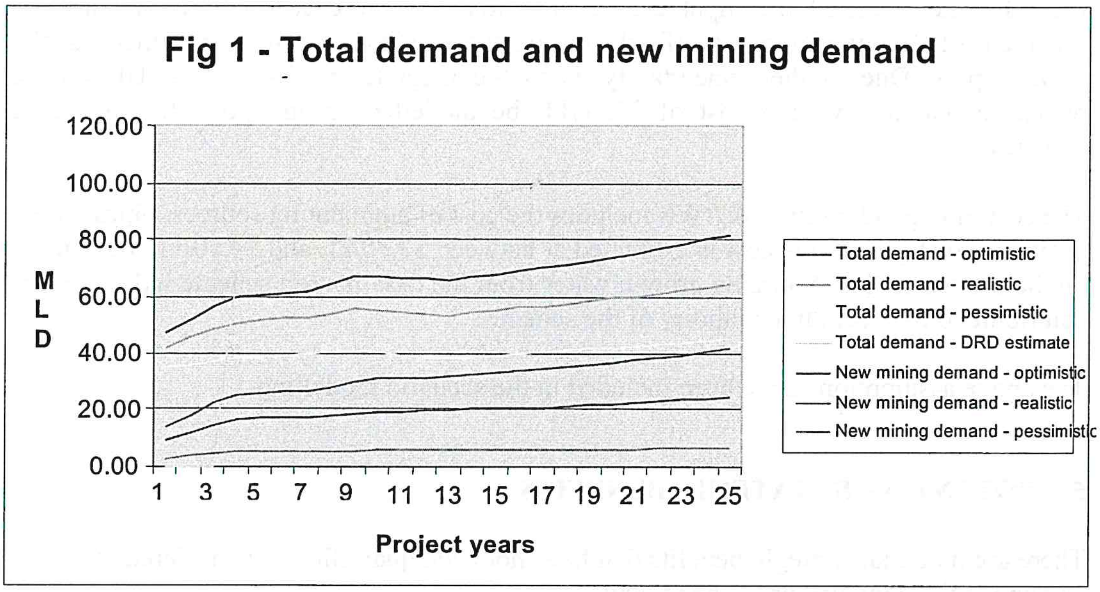
The study determined that the value of switching from the current reliance on hypersaline water to a 100% fresh water supply varied according to location and circumstance but was in the range $2.10 to $3.90 per kL. The real value may sit in a lower range than this because both 100% substitution and the avoidance of hypersaline water in the operating environment are unlikely to be achieved in in the short term.

The value proposition accepted by some gold mines is that the additional cost of using hypersaline water represents the potential value of switching to a fresh water supply. However the final, detailed judgement must be made by the individual mines. Some mines also accepted that the reduced risks, added convenience, and increased safety of fresh water would also be a consideration.

As it was not appropriate to discuss indicative pricing with potential customers, there is no qualitative assessment of price sensitivity at this time.

The demand projections made by the review team make some provision for demand from nickel mines and other greenfield mining (and other) projects as well as an allowance for growth within the existing industries.

The demand data has been modelled into scenarios reflecting different levels of confidence about the future of mining in the Esperance-Kalgoorlie area, and are represented by the 'Optimistic', 'Realistic' and 'Pessimistic' projections shown below in **Fig 1.**



Note: the total demand lines are the sum of new mining demand and municipal demand

4.2 G&AWS

The study has assumed that for a period of time (in the range 5-10 years depending upon demand), potable and industrial water supplied to Kalgoorlie and area by the G&AWS would be supplied instead from the Goldfields-Esperance pipeline. All scenarios have been modeled on this assumption.

The viability of the transfer of demand from the G&AWS to the Goldfields-Esperance pipeline will be determined by the avoidable cost of the G&AWS, the marginal cost of the desalinated supply and the existence of spare capacity in the new pipeline. Therefore, there will be a requirement that transfer pricing be considered. The avoidable cost is the maximum price the Water Corporation could pay for water if the current level of Community Service Obligation (CSO) was not to be increased.

The cost of operating a fully loaded 70ML/day desalination scheme is around $2.90/kL. The variable cost of operating the desalination scheme is around $1.35/kL.

Substituting water currently sourced from the G&AWS will contribute to the economic viability of the Goldfields-Esperance pipeline if the long-term avoidable cost of the G&AWS scheme is greater than $2.90/kL. A short-term contribution can be made if there is spare capacity in the Esperance scheme and the avoidable cost is greater than $1.35/kL.

The Water Corporation's estimate of the potential cost saving (avoidable cost) by substituting desalinated water for the existing G&AWS supply is in the range of $1.07/kL-$1.34/kL, depending on whether or not the existing scheme is terminated at

Southern Cross. ACIL's estimate for the same costs in the Goldfields Esperance Water Supply Study (2002) were $1.30/kL-$1.57/kL respectively. (see Attachment 2).

UUA has not verified the input cost assumptions for these calculations and a clear statement of the avoidable cost of substituting the existing demand is not made in the ACIL report. Due to their uncertainty as to the magnitude of this cost, UUA have requested that an avoided cost of $2.00/kL be modelled as an optimistic, best case scenario.

The cost of expanding the G&AWS includes the cost of augmenting sources, pipes, pump stations and storage. This cost is estimated at between $3.60/kL and $4.20/kL, depending on the cost of capital. Sourcing growth water from the desalination scheme will therefore contribute to the economic viability of the scheme.

The above assumptions have been included in the scenario modelling.

5. POTENTIAL STRATEGIC BENEFITS

There are potential strategic benefits that have not been quantified or considered in arriving at the conclusions of the review.

These may include:

- reduction in the extraction and use of hypersaline water;
- reduced demand on west coast fresh water resources;
- increased regional water security with a climate independent source;
- increased regional economic development; and
- increased utilisation of gas transmission and generating capacity at Esperance.

6. PRICING

The relatively low levels of launch demand identified mean that any pipeline solution must necessarily be positioned at the low end of the capacity spectrum. Economies of scale that might be available with a high capacity scheme in the order of 130ML/day cannot be captured in a scheme with a capacity of 70ML/day.

The economies of scale associated with higher capacity options that are fully loaded is illustrated in the **Table 2** below:

Table 2

Project Description	Indicative volumetric charge
70 MLD capacity project, fully loaded	$2.90/kL
100 MLD capacity project, fully loaded	$2.75/kL
130 MLD capacity project, fully loaded	$2.49/kL

The demand assessments made through this review have determined that any project would necessarily be based on a pipeline capacity of 70MLD or less.

Table 2 above assumes 100% loading. There is an erosion of viability where this condition can not be met. **Table 3** below provides indicative volumetric charges based on a 70MLD pipeline loaded under the three demand scenarios outlined above.

Table 3

Demand Scenario	Indicative Volumetric Charge
Optimistic	$3.79 to $5.10 plus CPI
Realistic	$4.23 to $7.30 plus CPI
Pessimistic	$21.50 to $22.58 plus CPI

These indicative charges are higher than the charges currently applied to water from the G&AWS - mining companies resist buying fresh water at these prices.

7. GOVERNMENT ASSISTANCE

Although the review team was unable to test the level of market interest under a range of pricing scenarios, there is ample anecdotal evidence that the industry would probably not be interested in purchasing substantial volumes of water that is priced above $3.00 per kilolitre. This is supported by the cost verification work carried out by the review team that suggested that the 'Value' of a freshwater supply over a hypersaline supply was in the range $2.10/kL to $3.90/kL..

As an indication of the level of Government assistance that might be required to support a project of this nature, the review team modelled each of the demand scenarios with the price to industry capped at $2.95. The level of additional government subsidy is shown in **Table 4** below.

Table 4

Demand Scenario	Additional Government Subsidy to make the Project Viable	
	NPV - $m over 25 years	Average annual subsidy excl inflation and incl 9% discount rate
Optimistic	$155m to $226m	$10m to $16m
Realistic	$222m to $293m	$18m to $24m
Pessimistic	$301m to $372m	$26m to $32m

8. INDICATIVE SUBSIDY PROFILE

Under all scenarios there is a need for a subsidy from Government during the first 20 years. The nominal subsidies as modelled for different demand scenarios and different transfer prices (avoidable costs) are indicated below.

Year	1	2	3	4	5	10	15	20	25
Best Case - Avoidable Cost - $2/kL									
Scenario									
Optimistic	$24m	$22m	$19m	$17m	$16m	$13m	$10m	$5m	-$5m
Avoidable Cost $1.15/kL									
Scenario									
Optimistic	$31m	$29m	$26m	$24m	$23m	$19m	$16m	$10m	$1m
Realistic	$34m	$32m	$30m	$29m	$28m	$26m	$23m	$20m	$17m
Pessimistic	$38m	$37m	$36m	$36m	$35m	$34m	$32m	$30m	$28m
Avoidable Cost $1.55/kL									
Scenario									
Optimistic	$28m	$25m	$23m	$21m	$20m	$16m	$13m	$8m	-$2m
Realistic	$31m	$29m	$27m	$26m	$25m	$23m	$20m	$18m	$14m
Pessimistic	$35m	$34m	$33m	$33m	$32m	$31m	$29m	$27m	$25m

9. CONCLUSIONS

A project to desalinate seawater at Esperance and pipe it to the Goldfields is not viable as a completely stand-alone project at the currently-identified demands and prices;

However, the project becomes viable as a commercial project if:

- government is prepared to consider an annual subsidy in the region of $10 million to $32 million, taking into consideration strategic factors beyond the remit of this review; and
- the mining industry is prepared to make a commitment to water volumes and prices.

ATTACHMENT 1

Stakeholder Contact List

KEY COMMUNITY STAKEHOLDERS		
ENTITY	**PRINCIPAL CONTACT**	**DATE**
Goldfields Esperance Development Commission	Chief Executive Officer	April 2003
Kalgoorlie Chamber Of Commerce	Chief Executive Officer	April 2003
City of Kalgoorlie Boulder	Chief Executive Officer	April 2003
School of Mines	Director	April 2003
Shire of Dundas	Chief Executive Officer	April 2003
Shire of Esperance	Chief Executive Officer	April 2003
Esperance Port Authority	Chief Executive Officer	April 2003
Chamber of Minerals and Energy	Director Policy and External Relations	April 2003
Chamber of Minerals and Energy – Eastern Regional Council	President	May 2003
Esperance Chamber of Commerce	President	April 2003

MINE MANAGEMENT		
ENTITY	**PRINCIPAL CONTACT**	**DATE**
Heron Resources	Managing Director	April 2003
Croesus Mining	General Manager Operations	April 2003
KCGM	General Manager	April 2003
Placer Dome Asia Pacific	Commercial Manager	April 2003
Goldfields (St Ives Gold Mining)	General Manager	April 2003
Goldfields	Head of Operations – Australia	May 2003
Bulong	Managing Director	April 2003
Cawse	Director (Resident Engineer)	May 2003
Barrick Gold	General Manager Evaluations	April 2003
Newmont	Senior Metallurgical Consultant	July 2003
Mincor	Resident Manager	May 2003

MINE OPERATIVES		
ENTITY	**PRINCIPAL CONTACT**	**DATE**
Croesus Mining	Group Metallurgist	April 2003 May 2003 July 2003
Goldfields (St Ives Gold Mining)	Manager Metallurgy	July 2003
KCGM	Manager Engineering	April 2003 July 2003
Placer Dome Asia Pacific	Senior Metallugist	May 2003 July 2003
Sons of Gwalia	Manager Metallurgy	May 2003

MINING SERVICES		
ENTITY	**PRINCIPAL CONTACT**	**DATE**
Byrnecote (Contract miner)	General Manager	May 2003
Barminco (Contract miner)	General Manager	May 2003
GBF Underground Mining (Contract miner)	Engineering Manager	July 2003
Maggoteaux (Milling supplies)	Sales Manager	July 2003

6

ATTACHMENT 2
Cost of G&AWS Water

There are a number different ways to measure the cost of providing water to Kalgoorlie. Each is valid for different purposes, but result in a great deal of confusion about the "true" cost of supply.

ACIL Consulting, in the background papers to the Goldfields Esperance Water Supply (2002), concluded that *"the true cost of supplying water to Kalgoorlie lies between $3.07 and $4.91 per kL, dependant on the assumptions included within the cost model, with a somewhat lower avoidable cost of $2.72/kL were the Corporation to cease supply to the Goldfields."*[1]

ACIL recommended the use of a cost of $4.46/kL as the true cost for "most purposes", but that the avoidable cost estimate would be most appropriate for considering an alternative source of supply.

ACIL's avoidable cost of $2.72/kL represents an average of the cost savings from:

- closing the existing scheme at Southern Cross and supplying the current 12GL per annum from an alternative supply; and
- the future cost of augmentation required to meet growth over the next 50 years.

In the view of the Water Corporation the cost savings from closing the scheme are much less than the cost of augmentation as the cost of existing pipes and pump stations are "sunk", and are not avoided by closing the scheme.

The avoided cost for the existing 12GL is important in establishing the economic viability of the project as it establishes the maximum price the Water Corporation could pay without increasing the CSO cost to Government. This cost has been a point of contention as the ACIL cost calculation is not readily broken down into existing and future costs, and appears to contain a significant flaw. The Water Corporation has obtained independent advice from PricewaterhouseCoopers that supports its avoidable cost calculation.

The following table provides a breakdown of the avoidable costs assumptions made by the Water Corporation if the G&AWS pipeline is terminated at Southern Cross.

Avoidable Cost of Replacing the Existing 12GL to Kalgoorlie and terminating the G&AWS at Southern Cross		
	ACIL Adjusted	**Water Corporation**
Operations and Maintenance	$0.50	$0.37
Capital Costs – Replacement	$0.27	$0.37
Capital Cost - Future Growth	$0.00	$0.00
Bulk Water	$0.80	$0.60
Total	**$1.57**	**$1.34**

[1] The True Cost of Supplying Water to Kalgoorlie and the Goldfields Via the G&AWS, Executive Summary page vii.

The following table gives the same calculation if the pipeline between Southern Cross and Kalgoorlie is maintained to meet summer peak demand and add to the security of supply.

Avoidable Cost of Replacing Existing Base Load of 9GL and continuing G&AWS for peak supply to Kalgoorlie		
	ACIL Adjusted	**Water Corporation**
Operations and Maintenance	$0.50	$0.37
Capital Costs – Replacement	$0.00	$0.10
Capital Cost - Future Growth	$0.00	$0.00
Bulk Water	$0.80	$0.60
Total	**$1.30**	**$1.07**

Scenarios that shut down the G&AWS for ten years while there is spare capacity in the Goldfields-Esperance pipeline were examined. Refurbishment expenditure of around $1.7m per annum could be deferred until year 10. This results in an additional saving of 5c/kL on the above figures while the pipeline is closed.

The key difference is the value of bulk water. The ACIL assumption of 80c/kL as the avoidable cost of bulk water is valid as a drought response when compared to climate independent solutions such as the South West Yarragadee scheme.

If the current drought induced demand/supply balance is restored, the cost savings from an additional 12GL will include a comparison with cheaper alternative sources and include the carrying time of some spare capacity.

It should be noted that the cost of modifying the G&AWS to deal with water quality issues associated with reduced flow in the eastern part of the scheme have not been included in the figures above, and would reduce the avoidable cost. Estimates of the cost of this work range from $12m to 30m. Detailed engineering to refine this cost would be undertaken if the project proceeds to a feasibility study.

UUA provided an assessment in their EOI *that the marginal cost of spare capacity in a 70ML/day desalination scheme is around $1.35/kL. Therefore, for any avoidable cost of less than $1.35/kLit will be more economical to continue to supply existing demand from the G&AWS.*

To account for the range of assumptions described above, the modelling has been undertaken using a range of avoidable costs of between $1.15/kL and $1.55/kL.

UUA has not verified the input cost assumptions for the above costs and a clear statement of the avoidable cost of substituting the existing demand is not made in the ACIL report. Due to their uncertainty, UUA requested that an avoided cost of $2.00 also be modelled as an optimistic, best case scenario.