ArupWater

431-439 King William Street
Adelaide SA 5000
Tel +61 (0)8 8212 5580
Fax +61 (0)8 8212 5590
john-e.smith@arup.com.au

www.arup.com

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BY EMAIL AND POST

Mr Neil Palmer
United Utilitiies Australia Pty Ltd
Level 10
115 Grenfell Street
ADELAIDE SA 5000

ARUP

Dear Neil

Esperance - Kalgoorlie Water Supply Proposal
Assessment of Costs for GAWS

As discussed in our initial conversation and as expounded upon during our joint meeting with ERA and Water Corporation on Friday 22 July 2005, you have requested that Arup provide independent comment on the validity of the following statement included on page 22 of the Draft report "Inquiry into the Cost of Supplying Bulk Potable Water to Kalgoorlie-Boulder", WA Economic Regulation Authority 30 June 2005:

> "…that the presumption of the ability to make incremental extensions without significant cost penalties is also observed in other pipelines, including gas pipelines."

By "incremental extension" Water Corporation refers to the process, over time, of:

- refurbishing sections of pipeline to lower the friction headloss for that section, typically by repairing the lining or relining the pipe;
- replacing sections of pipe, either to increase the pressure rating or lower the headloss by increasing the pipe diameter, and in most cases both;
- upgrading existing pumping stations to cope the changing flow and head requirements; and
- installing new pumping stations downstream of existing pumping station, where upgrading the existing pumping station would lead to pressures being generated within the pipes in excess of the pipe pressure rating.

Water Corporation espouses the view that "incremental extension" has the advantage of only incurring the minimum of capital expenditure when demand requirements dictate that capacity be increased. This compared with constructing new infrastructure to cope with the expected future demand, which would lead to a large upfront capital expenditure well in advance of the capacity being required.

While "incremental extension" is a valid method of augmenting the capacity of the GAWS pipeline and will delay capital expenditure until the latest possible time, there is some conjecture as to whether it is without cost penalty, as it inherently trades off minimum incremental capital costs against increased pumping heads and therefore power costs.

To resolve this Arup has focussed on the augmentation of GAWS zone 6 alone. If the "incremental extension" of this zone, from Dedari Pump station to Kalgoorlie, can be achieved without "cost penalty", then it would be reasonable to assume that this principle could be applied to the other zones as well.

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Details of zone 6 pipeline were taken from the diagram "Zone 6 - G & AWS Main Conduit - Computer Simulation of Scheme – Diagrammatic Layout for "Watsys" Programme – Dedari to Kalgoorlie", provided by Peter Speers (Water Corporation), a copy of which is attached.

An excel spreadsheet model of the pipeline was constructed. The model assumes that all water pumped at Dedari reaches Kalgoorlie (i.e. ignores all intervening offtakes) to simplify the analysis. The hydraulic grade line (HGL) in m AHD, pipe rating envelope in m AHD and pipeline elevation in m AHD were plotted against pipe chainage for flows of 45 ML/d.

Modifications were made to the model to permit flows of 60, 75 and 90 ML/d. The modification for 60 ML/d were as per the proposed changes on the Water Corporation diagram referred to above. Modifications to achieve 75 and 90 ML/d assume that the modifications made at the smaller capacity were carried over to the higher capacity. Where an additional pumping station was required it was assumed to be located near the Coolgardie offtake.

In addition to the models looking at the effect of "incremental extension", a separate model assuming that a new main with a capacity to 90 ML/d is constructed in 2010 was developed. This allows a comparison of "incremental extension" versus the major redevelopment option.

Costs for pipe and pumping stations used the same costs basis as the previous GAWS comparator scheme prepared by Arup.

Power costs were calculated assuming a power cost of $0.10/kWh. Power supply capital costs to service upgraded and new pumping stations have been ignored.

Maintenance costs were assumed to be $500,000 for existing infrastructure plus 1.25% of capital costs for new infrastructure.

The summary of the models for each capacity increment is attached.

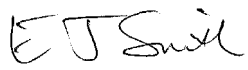
From the summary it is apparent that the notional capital cost per incremental increase in capacity (in kL/d) decreases the larger the capacity increment. Conversely, the summary also indicates that increasing capacity is accompanied by increasing unit costs of water delivered, this irrespective of how capacity is increased.

While increasing the capacity of GAWS zone 6 by "incremental extension" is cheaper than any major reconstruction (new main) that provides capacity well ahead of demand, it does not avoid significant increases in unit costs of water delivered, both in terms of unit capital and unit power costs.

While "incremental extension can be achieved without significant cost penalty" can be reasonably applied when comparing "incremental extension" of the GAWS to any new main replacement, "incremental extension" does come with the penalty of increasing unit costs as capacity increases. This point needs to be recognised in any evaluation of future costs or avoided future costs for the GAWS.

Should you wish to discuss the above conclusion, please contact the undersigned on ph 8212 5580.

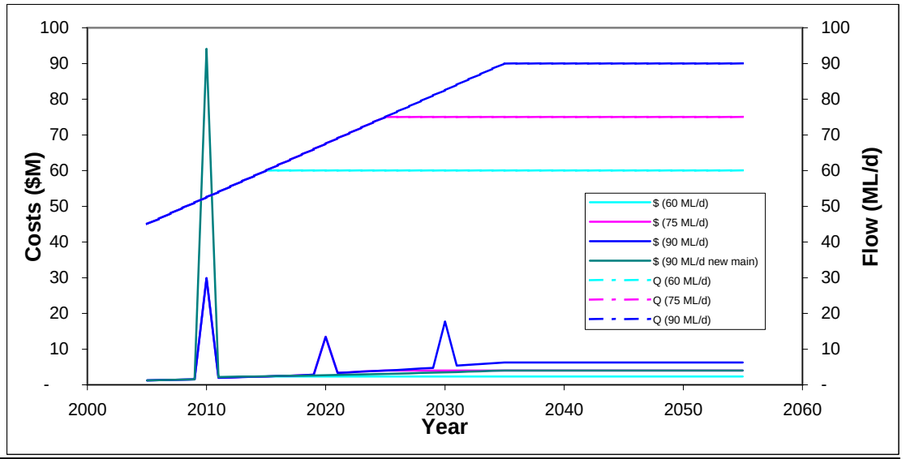
Yours sincerely



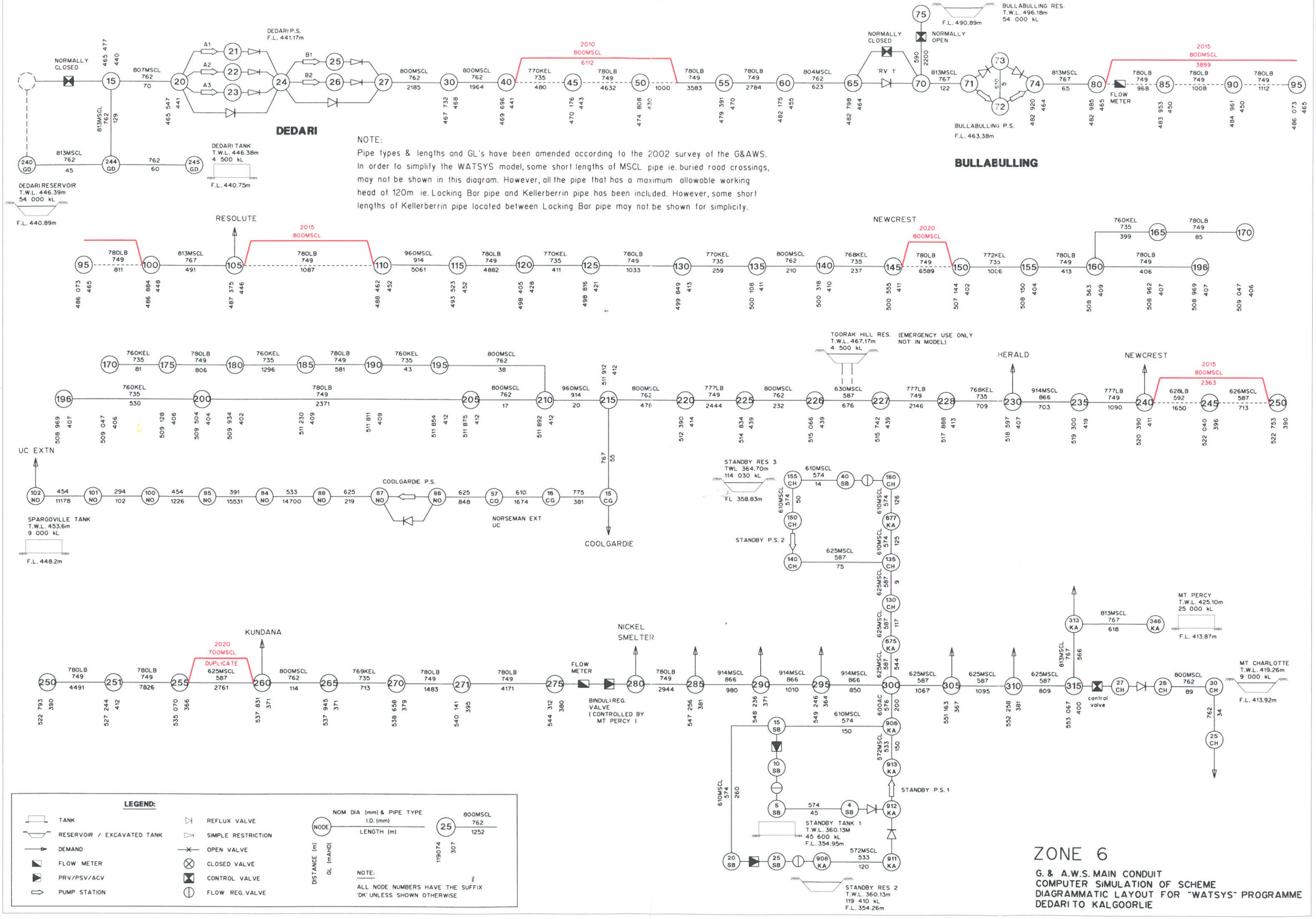
E John Smith
Associate

Esperance Kalgoorlie Pipeline
Review of Unit Costs for GAWS Zone 6

		MINIMUM PIPE SCENARIOS Incremental Extension			New Main	
Daily capacity	ML/d	60	75	90	90	
Annual volume	ML/a	19,710	24,638	29,565	29,565	
Pipe replaced or duplicated with 914 MSCL	m	-	-	-	81,953	
Pipe replaced or duplicated with 800 MSCL	m	20,050	23,170	35,713	-	
Pipe replaced or duplicated with 700 MSCL	m	2,761	2,761	2,761	-	
PS No 1 lift	m	110	140	165	110	
PS No 2 lift	m	85	75	110	95	
PS No 3 lift	m	-	100	170	-	
PS No 1 power	kW	1,071	1,703	2,409	1,606	
PS No 2 power	kW	827	912	1,606	1,387	
PS No 3 power	kW	-	1,217	2,482	-	
Capital Costs						
Pipeline costs	$k	11,673	13,296	19,820	50,835	assumes $620/m for 914 MSCL, $520/m for 800 MSCL, $451/m for 700 MSCL
Fittings	$k	1,167	1,330	1,982	5,084	10% of pipe capital
PS No 1	$k	3,853	4,474	5,165	4,378	see cost spreadsheet
PS No 2	$k	3,615	3,698	4,378	4,164	
PS No 3	$k	-	3,997	5,237	-	
Base Construction Cost	$k	20,308	26,795	36,582	64,461	
Contractors o'heads & profits	$k	3,000	4,000	5,000	10,000	15% of Base Construction Cost
Total Construction Cost	$k	23,308	30,795	41,582	74,461	
Project delivery	$k	2,000	3,000	4,000	7,000	10% of Total Construction Cost
Contingency	$k	3,000	5,000	6,000	11,000	15% of Total Construction Cost
Total Capital Cost	$k	28,308	38,795	51,582	92,461	
Notional Capital Cost per KL/d increment	$/KL/d	1,887	1,293	1,146	2,055	
Annual Operating Costs						
Annual pumping cost @ full capacity	$k	1,496	3,021	5,122	2,359	assumes 90% utilisation, 70% efficiency & $0.10/kWh
Annual maintenance cost	$k	854	985	1,145	1,656	assumes $500,000 for existing plus 1.25% capital for new works
Total Annual Operating Cost	$k	2,350	4,006	6,267	4,015	
PV Costs						50 years & 6%
Capital Costs	$k	26,706	36,039	46,775	87,227	Assumes expenditures in years 2010 (to 60 ML/d), 2020 (to 75 ML/d) & 2030 (to 90ML/d), except new main which is constructed in 2010
Pumping cost	$k	20,089	28,961	35,066	18,844	
Maintenance cost	$k	11,764	12,511	12,961	20,502	
Total PV Cost	$k	51,808	65,557	74,922	104,528	
Unit Costs						
Unit capital cost	$/ML	92.1	112.8	140.0	261.0	
Unit power cost	$/ML	69.3	90.6	104.9	56.4	
Unit maintenance cost	$/ML	40.6	39.2	38.8	61.3	
Total Unit Costs	$/ML	178.7	205.2	224.2	312.8	



Arup Project No: 83771
Prepared By: John Smith
Date: 9/08/2005
File: GAWS Zone 6(b).xls



ZONE 6

G. & A.W.S. MAIN CONDUIT
COMPUTER SIMULATION OF SCHEME
DIAGRAMMATIC LAYOUT FOR "WATSYS" PROGRAMME
DEDARI TO KALGOORLIE