MEMO: Tuesday, 15 April 2014
TO: Greg Murtough, Productivity Commission
FOR: INQUIRY INTO PUBLIC INFRASTRUCTURE
RE: **FOLLOW UP TO YESTERDAY'S Q&A SESSION IN SYDNEY UNDER CHAIRMAN PETER HARRIS, IN CONJUNCTION WITH ASSOCIATE COMMISSIONER PAUL LINDWALL**

Dear Greg

I am sending this note as an Addendum to our submission, in order to further respond to questioning of us at yesterday's hearing in Sydney. Could you please make this information available to Messrs Harris & Lindwall.

DISCOUNT RATES

I wanted to clarify my incomplete response to Mr Lindwall regarding the context of lower discount rates in Cost Benefit Analysis for longer term project analysis.

The UK now uses 3% pa as a longer term discount rate (beyond 30 years) and 3.5% pa in the shorter term (up to year 30) - source: Douglas Economics (NZ).

Australia could adopt a similar tiered structure, perhaps slightly higher, anchored partly between the current term structure of interest rates and what that structure has been over relevant recent periods, Thus 4% pa, used in the HSR Phase Two study, may be relevant.

However, the only point of doing this (but this IS the main motivation) is to adopt the approach that risk factors are removed from the discount rate and embodied instead directly in the economic and financial appraisals on a specific risk modelling basis (the old concept of 'what if' scenarios). This is a non-stochastic approach to what John Goldberg was trying to achieve with his Monte Carlo risk modelling, but would not preclude probabilistic modelling. It would leave the discount rate as a risk free rate appropriate to Commonwealth Government or State Government credit, as the case may be.

The reason for this is demonstrated in the following table, which examines for each of a time period of 10, then 30, then 50 and finally 100 years:

- firstly what is the compound interest factor (the value of $1 accumulating at the real interest rate for the time period) - this is the inverse of the discount factor for that time period;
- secondly, what is the ratio of the compounding factors for each time period to the compound factor at the base interest rate of 4% pa.

To interpret this, consider that if the higher real discount rate is intended to reflect riskiness on a relative scale to the base, then the ratio of the factors is a measure of the extra degree of riskiness that is being implied. That is to say, net cash flows of the project (or net economic benefits for that year, as the case may be) are being deflated by that extra riskiness to establish the investment hurdle or BCR. The higher the compounding factor the more the implied riskiness which the analysis is trying to remove from the relevant time period, in order to produce results which can be relied upon for investment purposes.

PERIOD (YEARS)	REAL DISCOUNT RATE	COMPOUND INTEREST FACTOR (INVERSE OF DISCOUNT FACTOR)	RATIO OF COMPOUNDING FACTOR TO BASE 4% REAL FACTOR
10	4%	1.480	
10	7%	1.967	1.33
10	10%	2.594	1.75
30	4%	3.243	
30	7%	7.612	2.35
30	10%	17.449	5.38
50	4%	7.107	
50	7%	29.457	4.14
50	10%	117.391	16.52
100	4%	50.505	
100	7%	867.716	17.18
100	10%	13,780.612	272.86

As can readily be seen, the implied degree of riskiness being removed is very high indeed for the longer time periods, and the higher discount rates. We submit that this can give quite different outcomes for long horizon projects than if the risk factors are specifically modelled in the cash flow or economic benefit/cost profile.

Would an estimate now of cash flows or economic benefits 100 years out be as much as 273 times riskier than they are in today's terms? If you think they are, then go ahead and use that riskiness factor, but we say don't do it implicitly and blindly, rather do it in full knowledge of what you mean.

That brings me to Chairman Harris' approach - ie, make sure one looks at a series of interest rates. We say that is effective, and advisable, in relation to a reasonably expected band of interest rates (eg 3%, 4%, 5%), but we caution against its effectiveness if the interest rate used is effectively a statistical outlier in terms of historical interest rate term structures. We say model the risks explicitly, and spend more time on consideration of what the long term risks might be, than simply doing extra DCF or Monte Carlo computations. As Leo Economides said, it is useful to set up a matrix of risk parameters and have the computer model output a matrix of results on that basis for viewing.

Best Regards

IAN F BELL,FIAA, Director