STRATECON INC.

To: Jeffrey Michael

From: Rodney T. Smith

RE: Impact of the Annual Yield of the Twin Tunnels Project on the Cost of Project Water

Date: August 30, 2016

This memorandum responds to your inquiry for an update of my analysis on the above matter I originally published in September 2013. As with any long-term project, expectations about the future are critical for project assessment. There are no guarantees. We can identify the implications of a range of possible outcomes.

Structure of Project Commitment

Like any infrastructure project, the Twin Tunnels requires significant investments up front, with a significant delay between the timing of financial commitments and start of project operations. With the design and construction period currently anticipated to last fifteen years before the start of project operations, a meaningful economic valuation of project costs must address the timing issue.[1]

The Annual Cost of Twin Tunnels Water

The table below shows how the annual cost (2014$) varies with average annual yield of incremental water supplies from the project.[2] Use your own expectation about the future water supply situation with and without the tunnels. Go down the first column until you reach your estimate of the annual (incremental) yield of the tunnels. Go across the row for the annualized cost estimate that is consistent with your project risk assessment. If you believe that project risk (other than hydrology) is as sound as a U.S. Treasury Note or Bond, then stop at the estimated water cost for the risk premium of 0%. Keep going if you think that there are material project risks.

California water utilities earn risk premium 150 basis points (1.5%) above the yield on U.S. Treasury Notes. A risk premium of this magnitude seems reasonable given the well-known financial risks of "mega infrastructure projects" and the legendary environmental risks confronting the State Water Project. Therefore, the annual cost of project water would fall within the amounts given in the last two columns in the table.

[1] To address the timing issue, the annualized cost of water is estimated by dividing the present value of project costs (design, construction, land acquisition, mitigation, commissioning and operations and maintenance) by the present value of water anticipated water deliveries using an inflation-adjusted interest rate. The resulting annual cost represents the financial equivalent of the project value of project costs by paying the estimated annual cost at the time of project deliveries.

[2] See attachment for discussion of assumptions.

The annual cost of project water must be considered within the context of water quality (untreated), location (Tracy) and reliability (non-firm supply).

Annualized Cost of Twin Tunnels Water (2014$)
by Incremental Yield of Tunnels

Annual Yield (acre feet)	Risk Premium		
	0%	1%	2%
100,000	$9,590	$12,817	$16,926
200,000	$4,795	$6,408	$8,463
300,000	$3,197	$4,272	$5,642
400,000	$2,397	$3,204	$4,231
500,000	$1,918	$2,563	$3,385
600,000	$1,598	$2,136	$2,821
700,000	$1,370	$1,831	$2,418
800,000	$1,199	$1,602	$2,116
900,000	$1,066	$1,424	$1,881
1,000,000	$959	$1,282	$1,693
1,100,000	$872	$1,165	$1,539
1,200,000	$799	$1,068	$1,410
1,300,000	$738	$986	$1,302
1,400,000	$685	$915	$1,209

Annual Yield (acre feet)	Risk Premium		
	0%	1%	2%
1,500,000	$639	$854	$1,128
1,600,000	$599	$801	$1,058
1,700,000	$564	$754	$996
1,800,000	$533	$712	$940
1,900,000	$505	$675	$891
2,000,000	$479	$641	$846

Assumptions of Analysis

Item	*Assumption*	*Comment*
Design and Construction Costs	$14.9 billion (2014$)	Program Budget[3]
Mitigation Costs	$796 million (2014$)	California WaterFix Mitigation Cost Estimate[4]
Operations & Maintenance Cost	$25.1 million for 5 years and $38.1 million thereafter (2014$)	2012 BDCP estimate
Timing of Design and Construction Costs	Pro-rated over periods identified in DCE Program Schedule[5]	
Timing of Mitigation Costs	Prorated over construction period	
Project Cost Increases	Real cost of design and construction increase at 1% annually	Based on historical record of Bureau of Reclamation indexes increasing by 1.1% faster than inflation since 2000
Mid-year adjustment for calculation of present value	Costs incurred throughout the year	
Debt Service Reserve	50% of annual debt service	Valuation considers earned

[3] AGREEMENT REGARDING CONSTRUCTION OF CONVEYANCE PROJECT BETWEEN THE DEPARTMENT OF WATER RESOURCES AND THE CONVEYANCE PROJECT COORDINATION AGENCY , Budget | Exhibit E | V. 4

[4] *Ibid*

[5] *Ibid*

Item	*Assumption*	*Comment*
		interest and terminal value of debt reserve at the end of project financing
Real Interest Rate	2.275%	Based on DWR's estimate of interest rate and inflation