



WRC NEVADA, INC.

December 2, 1997

Mr. Bryan Sprague, P.E.
CFA
1150 Corporate Blvd.
Reno, Nevada 89502

WRC File: 3008/2

Subject: Hydraulic Analysis for Whites Creek
Branch 1 at Arrow Creek Parkway

Dear Mr. Sprague:

As you have requested, WRC has performed a revised hydraulic analysis for Whites Creek Branch 1 at Arrow Creek Parkway to reflect a modification to the design of the Con Span arch bridge structure at the Branch 1 main channel. The revised design utilizes an 11 foot rise rather than the 13 foot rise specified on the previous design drawings. The shorter span allows spacing for utilities between the top of the arch and the roadway surface.

In order to perform the analysis, WRC obtained the HEC-RAS input and output files prepared for the original design from Harding Lawson Associates (HLA). These original analyses were described in the design hydraulic report prepared by HLA in August 1997. The HEC-RAS model developed by the U.S. Army Corps of Engineers was utilized by HLA because of its ability to analyze multiple bridge and culvert openings at one location. In this instance, Arrow Creek Parkway has two sets of 48" RCP pipes, 2-8' X 10' concrete box culverts and one 42' wide Con Span arch bridge structure. HEC-RAS was used to estimate the potential impact of the roadway during a "floodplain management event" of 3,000 cfs as defined by Washoe County and to approximate the distribution of flows between the culvert structures.

In order to evaluate the relative difference between the original model results based on the greater Con Span rise of 13' and the revised design using a rise of 11', the bridge model was revised to reflect the lower structure. The revised model utilizes the following design data provided by CFA:

Elevation of Upstream top of Con Span:	4883.7
Elevation of Upstream Soffit:	4882.7
Elevation of Upstream top of Con Span:	4882.0
Elevation of Upstream Soffit:	4881.0

The results are as summarized in the attached output tables reported by HEC-RAS. The lower rise results in a slightly reduced cross sectional area below the 3,000 cfs water surface elevation. The results suggest that the bridge will convey approximately 507 cfs as compared to the previous analysis based on the original design, which indicated that the bridge would convey 520 cfs out of the 3,000 cfs. Therefore, the 13 cfs difference is now conveyed by the other culverts. This change in flow distribution results in only a 0.07' rise at the upstream face of the bridge. This minor increase would remain within the right-of-way area.

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Therefore, it is our conclusion that the change from a 13' to an 11' rise Con Span arch bridge, with the elevations indicated above, would not result in a significant increase in the water surface elevation or distribution of flows through the drainage structures as compared to the results of the previous model.

I trust that this will provide you with the supporting documentation that you need. If you have any questions, please feel free to contact me.

Sincerely,

WRC NEVADA, INC.



Mark E. Forest, P.E.
Executive Vice President



12/2/97

HEC-RAS Plan: Imported Pla Reach: 1

River Sta.	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
1	3000.00	4853.44	4856.95	4856.95	4857.77	0.026348	7.71	426.84	265.02	0.83
2	3000.00	4859.90	4861.29	4861.29	4861.81	0.029547	4.65	522.06	485.20	0.77
3	3000.00	4863.00	4864.57	4864.57	4865.21	0.025633	5.15	499.86	429.43	0.75
4	3000.00	4865.50	4867.64	4867.64	4868.27	0.031025	6.47	487.79	409.88	0.85
5	3000.00	4867.60	4869.34	4869.34	4870.00	0.024376	5.31	478.83	355.31	0.74
6.1	3000.00	4867.80	4872.41	4872.41	4874.80	0.044195	11.47	245.41	59.00	0.95
6.5	Mult Op									
6.9	3000.00	4869.80	4878.96	4874.82	4879.02	0.000579	2.10	1706.46	406.75	0.12
7	3000.00	4873.31	4879.00	4875.03	4879.04	0.000349	1.42	2058.91	549.37	0.11
8	3000.00	4877.30	4879.96	4879.96	4880.62	0.025639	6.71	476.36	351.47	0.80
9	3000.00	4882.73	4885.22	4885.22	4885.87	0.027572	6.67	466.87	350.96	0.82
10	3000.00	4886.57	4889.75	4889.75	4890.31	0.029477	7.72	514.12	430.00	0.87
11	3000.00	4888.99	4892.32	4892.32	4893.16	0.027825	8.68	415.69	251.00	0.88
12	3000.00	4894.74	4896.36	4896.36	4897.13	0.018965	4.10	449.64	275.19	0.63

HEC-RAS Plan: Imported Pla Reach: 1

River Sta.	Opening	Q Total (cfs)	Flow Area (sq ft)	E.G. Elev (ft)	W.S. Elev (ft)	Top Width Act (ft)	Vel Total (ft/s)	Crit W.S. (ft)	Left Stagn. (ft)	Right Stagn. (ft)
6.5	Bridge #1	506.69	139.33	4879.03	4878.83	44.00	3.64	4877.25	100.00	180.00
6.5	Culv Grp #1	2493.31	1563.66	4879.01	4878.97	362.86	1.59	4874.19	180.00	588.68

Whites Creek Branch 1 - With 11' Rise Con Span

