	WSDoT Elevated Structure ERP Review, E-C1 Sept. 2006 Estimate by WSDoT	Victor Gray Retrofit Concept by TY Lin Nov. 2006 Estimate by WSDoT	Victor Gray Retrofit Concept by VPG Nov. 2006 Estimate by VPG
Structural Cost per frame	$5,900,000	$2,567,538	$2,105,531
Structural Cost Estimate	1,112,618,511	792,828,977	507,679,441
Utilities Relocations + Seawall	1,091,112,525	963,859,390	641,665,530
Traffic Mitigation + Right of Way	641,776,500	482,719,500	24,413,400
Total Design/Construction Cost	**$2,845,507,536**	**$2,239,407,867**	**$1,173,758,371**

		Elevated Structure ERP Review, E-C1 Sept. 2006		Victor Gray Retrofit Concept by TY Lin Nov. 2006		Victor Gray Retrofit Concept by VPG Nov. 2006
Structural Cost per frame		$5,900,000		$2,567,538		$2,105,531
Central Area (King to Pike)						
Central Structural (x22 3-bay frames)		129,800,000		56,485,840		46,321,683
Central Viaduct demolition		16,000,000		0		0
Soil improvement		7,000,000		7,000,000		7,000,000
Other Central (drainage, lighting, ITS)		17,000,000		0		0
Central Subtotal		169,800,000		63,485,840		53,321,683
Markups	71%	120,558,000	81%	51,423,530	56%	29,860,143
Risk (contingencies) (Subtotal+Markups) x %	37%	107,432,460	37%	42,516,467	25%	20,795,457
Escalation (inflation) (Subttl+Markups+Risk)x%	35%	139,226,661	30%	47,227,751	10%	10,397,728
Central Total "Most likely Cost"		537,017,121		204,653,587		114,375,011
South (Holgate to King)						
South Structural (Retro x29 3-bay frames)		55,000,000		74,458,607		61,060,401
South Viaduct demolition		9,000,000		0		0
Soil improvement		37,000,000		37,000,000		37,000,000
Railroad track work		7,000,000		0		0
Other South (drainage, lighting, ITS)		3,000,000		0		0
South Subtotal		111,000,000		111,458,607		98,060,401
Markups	71%	78,810,000	81%	90,281,471	56%	54,913,825
Risk (contingencies) (Subtotal+Markups) x %	37%	70,229,700	37%	74,643,829	25%	38,243,556
Escalation (inflation) (Subttl+Markups+Risk)x%	35%	91,013,895	30%	82,915,172	10%	19,121,778
South Total "Most likely Cost"		351,053,595		359,299,079		210,339,560
North Area (Pike to BST)						
North Structural (30 1-bay frames)		34,000,000		34,000,000		34,000,000
North Viaduct demolition		1,000,000		1,000,000		1,000,000
Battery St. Tunnel Structural		6,000,000		6,000,000		6,000,000
Battery St. Tunnel Systems		30,000,000		30,000,000		30,000,000
North & BST Subtotal		71,000,000		71,000,000		71,000,000
Markups	71%	50,410,000	81%	57,510,000	71%	50,410,000
Risk (contingencies) (Subtotal+Markups) x %	37%	44,921,700	37%	47,548,700	37%	44,921,700
Escalation (inflation) (Subttl+Markups+Risk)x%	35%	58,216,095	30%	52,817,610	10%	16,633,170
North Total "Most likely Cost"		224,547,795		228,876,310		182,964,870
Structural Subtotal		1,112,618,511		792,828,977		507,679,441
Utilities Relocation		100,000,000		100,000,000		50,000,000
Seawall (Wash. St. to Pike)		80,000,000		80,000,000		80,000,000
Ground level Surface Restoration		25,000,000		25,000,000		25,000,000
Special conditions		130,000,000		88,000,000		88,000,000
Shifts and Overtime		10,000,000		6,000,000		6,000,000
Subtotal		345,000,000		299,000,000		249,000,000
Markups	71%	244,950,000	81%	242,190,000	71%	176,790,000
Risk (contingencies) (Subtotal+Markups) x %	37%	218,281,500	37%	200,240,300	37%	157,542,300
Escalation (inflation) (Subttl+Markups+Risk)x%	35%	282,881,025	30%	222,429,090	10%	58,333,230
Util/Seawall Subtota"		1,091,112,525		963,859,390		641,665,530
Right of Way		125,000,000		50,000,000		10,000,000
Right of Way Agency (ROW x 12%)		15,000,000		6,000,000		1,200,000
Traffic Mitigation Measures During Construction		200,000,000		200,000,000		0
Regional ITS facility		7,000,000		5,000,000		5,000,000
Subtotal		347,000,000		261,000,000		16,200,000
Risk (contingencies) (Subtotal+Markups) x %	37%	128,390,000	37%	96,570,000	37%	5,994,000
Escalation (inflation) (Subttl+Markups+Risk)x%	35%	166,386,500	35%	125,149,500	10%	2,219,400
ROW Subtotal		641,776,500		482,719,500		24,413,400
Total Design/Construction Cost		$2,845,507,536		$2,239,407,867		$1,173,758,371

Cost Comparison between Elevated Structure and Gray Retrofit

		Elevated Structure ERP Review, E-C1 September 2006		Victor Gray Retrofit Concept developed by TY Lin International November 2006
Roadway width		50 feet		40 feet
3-bay frame length		375 feet		184 feet
Structural cost per frame		$5,900,000	Additional for live load capacity	$2,400,000 $300,000
Subtotal		$5,900,000		$2,700,000
Structural cost per linear foot		$15,730		$14,700
Structural cost per square foot		$157		$183
Central Area				
Central structural		$125,000,000	King to Pike, 22 frames	$59,000,000
Central viaduct demolition		$16,000,000	(add 10% for deeper foundation)	
Soil improvement		$7,000,000		$7,000,000
Other Central (drainage, lighting, ITS)		$17,000,000		
Central subtotal		$165,000,000		$66,000,000
Markups	71%	$117,000,000	81%	$53,000,000
Risk	37%	$104,000,000	37%	$44,000,000
Escalation	35%	$135,000,000	30%	$49,000,000
Most Likely Cost		$521,000,000		$212,000,000
South				
South structural		$55,000,000	Holgate to King, 29 frames	$86,000,000
South viaduct demolition		$9,000,000		
Soil improvement		$37,000,000		$37,000,000
Railroad track work		$7,000,000		
Other South (drainage, lighting, ITS)		$3,000,000		
South subtotal		$111,000,000		$123,000,000
Markups	71%	$79,000,000	81%	$100,000,000
Risk	37%	$70,000,000	37%	$83,000,000
Escalation	35%	$91,000,000	30%	$92,000,000
Most Likely Cost		$351,000,000		$398,000,000
North				
North structural		$34,000,000	Pike to BST, 30 frames	$34,000,000
North viaduct demo		$1,000,000	(use same AWV retrofit concept)	$1,000,000
BST structural		$6,000,000		$6,000,000
BST systems		$30,000,000		$30,000,000
North and BST subtotal		$71,000,000		$71,000,000
Markups	71%	$50,000,000	81%	$58,000,000
Risk	37%	$45,000,000	37%	$48,000,000
Escalation	35%	$58,000,000	30%	$53,000,000
Most Likely Cost		$224,000,000		$230,000,000
Structural subtotal		$1,096,000,000		$840,000,000
Utilities Relocation		$100,000,000		$100,000,000
Seawall (Washington-Pike)		$60,000,000		$60,000,000
Surface Restoration		$25,000,000		$25,000,000
Special Conditions		$130,000,000	(less spoil disp., traffic maint.)	$86,000,000
Shifts and overtime		$10,000,000		$6,000,000
Subtotal		$345,000,000		$299,000,000
Markups	71%	$245,000,000	81%	$242,000,000
Risk	37%	$218,000,000	37%	$200,000,000
Escalation	35%	$283,000,000	30%	$222,000,000
Most Likely Cost		$1,091,000,000		$963,000,000
Subtotal		$1,091,000,000		$963,000,000
ROW		$125,000,000		$50,000,000
ROW Agency	12%	$15,000,000	12%	$6,000,000
Traffic Mitigation Measures During Construction		$200,000,000		$200,000,000
Regional ITS Facility	0.50%	$7,000,000	0.50%	$5,000,000
Subtotal		$347,000,000		$261,000,000
Risk	37%	$128,000,000	37%	$97,000,000
Escalation	35%	$166,000,000	30%	$107,000,000
Most Likely Cost		$641,000,000		$465,000,000
Subtotal		$641,000,000		$465,000,000
Most Likely Cost		$2,828,000,000		$2,268,000,000

Markups for the retrofit are higher than the elevated structure because design is not as advanced.
Escalation for the retrofit is lower than the elevated structure because the construction period is shorter.
Special conditions includes traffic maintenance, environmental mitigation, spoil disposal, dewatering and some of the temporary construction.

VPG differences with WSDoT Estimate relative to Frame Unit Cost

1. (Bid Item 1) Elimination of half new piles per Pile Cap. Replace with smaller dia. PT Drilled Piles
2. (Bid Item 3) Significantly increase Transverse Grade beam (to remove bending from WSDoT piles)
3. (Bid Item 5) Elimination of auxilliary steel columns and transverse steel beams
4. (Bid Item 7) Cross Bracing cost reduction of concrete fill cost
5. (Bid Item 10) Elimination of concrete barriers necessary for significant roadway closure
6. ADD column fiber wrapping Columns & Beams

VPG differences with WSDoT Estimating relative to Mark-ups, mitigation and Right of Way

1. Complete elimination of standard $200,000,000 "Traffic Mitigation" penalty because VPG requires only weekend closures
2. Reduction of Mark-up, Risk, and Escallation percentages due to less complex design and 3-year project duration
3. 50% reduction of utilities relocation due to smaller footprint, lesser piles and less disruptive construction beneath Viaduct
4. Right of Way reduction due to smaller footprint, lesser heavy construction and lesser roadway closures

Jacobs Civil
KF10 AWV - TY LIN RETRO
Ken Florentino

ESTIMATE SUMMARY - COSTS & BID PRICES

Bid#	Client# / Bid Description	Quantity	Unit	Manhours	Direct Labor	Perm Matl	Constr Matl	Equip-Ment	Sub-Contr	Direct Total	Indirect Charge	Total Cost	Total Cost / Unit Price	Markup	Balanced Bid Total	Balanced Bid Unit Price	Bid Price	Bid Total
1	1 F & I Pipe Piles	1.00	LS						546,000	546,000	109,940	655,940	655,940.36 17.4 %	114,124	770,064	770,064.00	770,064.00	770,064.00
2	2 Enlarge Existing Foundation	1.00	LS	848 848.35	42,678	70,567	17,195	5,124	195,380	330,944	66,638	397,582	397,582.02 17.4 %	69,173	466,755	466,755.24	466,755.24	466,755.24
3	3 Grade Beams	1.00	LS	282 282.70	14,238	16,226	13,282	1,516	60,045	105,307	21,204	126,512	126,511.64 17.4 %	22,011	148,523	148,522.74	148,522.74	148,522.74
4	4 Low T - Joint Retrofit	1.00	LS	704 704.00	38,435	11,212	836	10,628		61,111	12,305	73,416	73,416.31 17.4 %	12,773	86,190	86,189.63	86,189.63	86,189.63
5	5 Steel Columns & Beams	1.00	LS	168 168.00	9,426	68,141		3,107		80,677	16,245	96,921	96,921.38 17.4 %	16,863	113,784	113,784.22	113,784.22	113,784.22
6	6 Install Damper Brackets & Dampers	1.00	LS	1,024 1,024.00	56,908	204,732		17,416		279,055	56,189	335,245	335,244.63 17.4 %	58,327	393,572	393,572.09	393,572.09	393,572.09
7	7 Install Cross Bracing	1.00	LS	256 256.00	14,022	31,555		3,855		49,432	9,953	59,386	59,385.58 17.4 %	10,332	69,718	69,717.77	69,717.77	69,717.77
8	8 Top Joint Reinforcing	1.00	LS	1,678 1,678.38	90,106	1,634	11,773	23,671	11,031	138,215	27,830	166,046	166,045.55 17.4 %	28,889	194,935	194,934.95	194,934.95	194,934.95
Totals:				4,961	265,814	404,067	43,087	65,316	812,456	1,590,742	320,305	1,911,047 [1,911,048]		332,493	2,243,540		[	2,243,540.64 17.4 %]

Code between Balanced Bid & Bid Price: U=Unbalanced, F=Frozen, C=Closing Biditem (item to absorb unbalancing differences).
[bracketed numbers represent adjusted quantities]
** in front of the Biditem indicates a Non-Additive item

9	Indirects Bond from Summary Table Markup on Resource Costs						282,870			282,870	37,435			332,493				
*********	TOTAL JOB =====>			4,961	265,814	404,067	325,957	65,316	812,456	1,873,612	37,435	1,911,047		332,493	2,243,540			2,243,540.64

Spread Indirects On TOTAL COST
Bond Table: First 1,000,000 : 20.00 ;

Spread Markups On TOTAL COST
Next 1,000,000 : 15.00 ; Next 2,000,000 : 10.00 ;

Spread Addons&Bonds On TOTAL COST
Next 1,000,000 : 8.00 ; Next 1,000,000 : 3.00 ; Remainder Rate: 4.00

'tructural Cost Per 3-Bay Frame
(VPG Alternate in Bold)

	Direct Cost	+Indirect Cost	=Ttl Cost	+Mark-up	WSDoT=Bid	=VPG Bid
WSDoT Furnish & Install Pipe Piles	546,000	109,940	655,940	17.4%	$770,064	
VPG PT Drilled Piles, 1/2 Quant., 25% of WSDoT	136,500	109,940	246,440	17.4%		**$289,317**
WSDoT Enlarge Existing Footings	330,944	66,638	397,582	17.4%	$466,755	$466,755
WSDoT Grade Beams 3'x2'	105,307	21,204	126,511	17.4%	$148,522	
VPG GB 5' x 5' transverse, 3'x3' longitudinal	256,004	21,204	277,208	17.4%		**$325,438**
WSDoT Lower T Joint Retrofit	61,111	12,305	73,416	17.4%	$86,189	$86,189
WSDoT Steel Columns & Beams	80,677	16,245	96,922	17.4%	$113,785	
VPG only Edge Beam Steel, 33% of WSDoT	26,623	5,361	31,984	17.4%		**$37,549**
WSDoT Install Brackets & Dampers	279,055	56,189	335,244	17.4%	$393,571	$393,571
WSDoT Install Cross Bracing	49,432	9,953	59,385	17.4%	$69,717	
VPG Tubes w./ $500/CY Concrete	39,432	9,953	49,385	17.4%		**$57,977**
WSDoT Top Joint Reinforcing	138,215	27,830	166,045	17.4%	$194,934	$194,934
WSDoT Additional for Live Load Capacity					$300,000	
VPG Additional (subs. Asphalt, minus barriers)						$229,800
Fibre Wrapping of Columns ($100/lf x 30ft x 8=)					$24,000	$24,000
Total Structural Per 3-bay Frame					$2,567,538	$2,105,531