Reference reach data		
Reach	RR-South of Pineflat	Downstream Proj.
Valley length (ft)	960.73	390.63
TW length (ft)	1014.01	395.26
Sinuosity	=(B4/B3)	=(D4/D3)
Elevation change	14.57	5.5856
Slope	=(B6/B4)	=(D6/D4)

Reference Reach South of Pine Flat							
Cross sections	Width	Depth	W/D	Wetted perimeter	Cross sectional area	Width 2x Bankfull	Entranchment ratio
1	54.3	3.26	=B11/C11	61.93	136.99	83.23	=G11/E11
2	66.78	5.3	=B12/C12	68.26	234.86	106.16	=G12/E12
3	66.57	3.98	=B13/C13	66.91	85.17	80	=G13/E13
4	65.6	4.95	=B14/C14	67.91	213.55	86.87	=G14/E14
5	50.1	4.07	=B15/C15	50.28	146.73	100.22	=G15/E15
6	60.01	4.35	=B16/C16	63.92	190.51	83.01	=G16/E16
7	50.56	4.89	=B17/C17	61.01	182.53	88.14	=G17/E17
8	55.18	3.51	=B18/C18	55.52	72.44	70.3	=G18/E18
9	52.72	4.04	=B19/C19	58.13	135.96	66.61	=G19/E19
10	52.11	4.25	=B20/C20	53.2	159.56	75.15	=G20/E20
	Shear Stress (τ=γRS) (lb/sq ft)	Entrainment diameter (D=152.02$\tau_c^{.7355}$) (mm) Colorado	Entrainment diameter (D=77.966$\tau_c^{1.042}$) (mm) Leopold et al.	Mean velocity (ft/sec)	Stream power ((lb*s)/ft)	Bankfull width (W=((W/D)A)(1/2)	Depth of Channel
1	=(62.4*B7*E11)	=(152.02*(B22^0.7355))	=(77.966*(B22^1.042))	=(A57/F11)	=B22*E22	=((D11*F11)^(1/2))	=F11/G22
2	=(62.4*B7*E12)	=(152.02*(B23^0.7355))	=(77.966*(B23^1.042))	=(A58/F12)	=B23*E23	=((D12*F12)^(1/2))	=F12/G23
3	=(62.4*B7*E13)	=(152.02*(B24^0.7355))	=(77.966*(B24^1.042))	=(A59/F13)	=B24*E24	=((D13*F13)^(1/2))	=F13/G24
4	=(62.4*B7*E14)	=(152.02*(B25^0.7355))	=(77.966*(B25^1.042))	=(A60/F14)	=B25*E25	=((D14*F14)^(1/2))	=F14/G25
5	=(62.4*B7*E15)	=(152.02*(B26^0.7355))	=(77.966*(B26^1.042))	=(A61/F15)	=B26*E26	=((D15*F15)^(1/2))	=F15/G26
6	=(62.4*B7*E16)	=(152.02*(B27^0.7355))	=(77.966*(B27^1.042))	=(A62/F16)	=B27*E27	=((D16*F16)^(1/2))	=F16/G27
7	=(62.4*B7*E17)	=(152.02*(B28^0.7355))	=(77.966*(B28^1.042))	=(A63/F17)	=B28*E28	=((D17*F17)^(1/2))	=F17/G28
8	=(62.4*B7*E18)	=(152.02*(B29^0.7355))	=(77.966*(B29^1.042))	=(A64/F18)	=B29*E29	=((D18*F18)^(1/2))	=F18/G29
9	=(62.4*B7*E19)	=(152.02*(B30^0.7355))	=(77.966*(B30^1.042))	=(A65/F19)	=B30*E30	=((D19*F19)^(1/2))	=F19/G30
10	=(62.4*B7*E20)	=(152.02*(B31^0.7355))	=(77.966*(B31^1.042))	=(A66/F20)	=B31*E31	=((D20*F20)^(1/2))	=F20/G31
Reference Reach South of Cave Springs							
Cross sections	Width	Depth	W/D	Wetted perimeter	Cross sectional area	Width 2x Bankfull (1)	Entranchment ratio
1	47.03	3.79	=B34/C34	46.18	121	100	=G34/E34
2	65.86	4.24	=B35/C35	65.05	181.42	100	=G35/E35
3	56.7	5.5	=B36/C36	58.33	149.03	100	=G36/E36
4	57.44	6.42	=B37/C37	62.41	244.47	100	=G37/E37
5	54.5	4.01	=B38/C38	52.53	127.05	100	=G38/E38
6	53.69	6.56	=B39/C39	56.48	194.78	100	=G39/E39
7	53.02	7.07	=B40/C40	57.18	217.44	100	=G40/E40
8	52.28	6.02	=B41/C41	54.79	240.27	73.06	=G41/E41
9	53.97	5.36	=B42/C42	56.41	173	71.44	=G42/E42
10	46.46	5.74	=B43/C43	52.7	162.2	73.95	=G43/E43
	Shear Stress (τ=γRS) (lb/sq ft)	Entrainment diameter (D=152.02$\tau_c^{.7355}$) (mm) Colorado	Entrainment diameter (D=77.966$\tau_c^{1.042}$) (mm) Leopold et al.	Mean velocity (ft/sec)	Stream power ((lb*s)/ft)	Bankfull width (W=((W/D)A)(1/2)	Depth of Channel
1	=(62.4*B7*E34)	=(152.02*(B45^0.7355))	=(77.966*(B45^1.042))	=(B57/F34)	=B45*E45	=((D34*F34)^(1/2))	=F34/G45
2	=(62.4*B7*E35)	=(152.02*(B46^0.7355))	=(77.966*(B46^1.042))	=(B58/F35)	=B46*E46	=((D35*F35)^(1/2))	=F35/G46
3	=(62.4*B7*E36)	=(152.02*(B47^0.7355))	=(77.966*(B47^1.042))	=(B59/F36)	=B47*E47	=((D36*F36)^(1/2))	=F36/G47
4	=(62.4*B7*E37)	=(152.02*(B48^0.7355))	=(77.966*(B48^1.042))	=(B60/F37)	=B48*E48	=((D37*F37)^(1/2))	=F37/G48
5	=(62.4*B7*E38)	=(152.02*(B49^0.7355))	=(77.966*(B49^1.042))	=(B61/F38)	=B49*E49	=((D38*F38)^(1/2))	=F38/G49
6	=(62.4*B7*E39)	=(152.02*(B50^0.7355))	=(77.966*(B50^1.042))	=(B62/F39)	=B50*E50	=((D39*F39)^(1/2))	=F39/G50
7	=(62.4*B7*E40)	=(152.02*(B51^0.7355))	=(77.966*(B51^1.042))	=(B63/F40)	=B51*E51	=((D40*F40)^(1/2))	=F40/G51
8	=(62.4*B7*E41)	=(152.02*(B52^0.7355))	=(77.966*(B52^1.042))	=(B64/F41)	=B52*E52	=((D41*F41)^(1/2))	=F41/G52
9	=(62.4*B7*E42)	=(152.02*(B53^0.7355))	=(77.966*(B53^1.042))	=(B65/F42)	=B53*E53	=((D42*F42)^(1/2))	=F42/G53
10	=(62.4*B7*E43)	=(152.02*(B54^0.7355))	=(77.966*(B54^1.042))	=(B66/F43)	=B54*E54	=((D43*F43)^(1/2))	=F43/G54

Reference reach averages							
Manning's Q RR-PF	Manning's Q RR-CS	Average width RR-PF	Average Depth RR-PF	W/D RR-PF	Average Wetted perimeter RR-PF	Average Cross sectional area RR-PF	Average 2x Banfull width RR-PF
=((1.49/0.05)*F11*((F11/E11)^(2/3))*(B7^(1/2)))	=((1.49/0.05)*F34*((F34/E34)	=AVERAGE(B11:B20)	=(AVERAGE(C11:C20))	=C57/D57	=AVERAGE(E11:E20)	=AVERAGE(F11:F20)	=AVERAGE(G11:G20)
=((1.49/0.05)*F12*((F12/E12)^(2/3))*(B7^(1/2)))	=((1.49/0.05)*F35*((F35/E35)	Average entrenchment ratio (E/R) RR-PF	Design (E/R) RR-PF	Average Q RR-PF	Average V Calculated RR-PF	Average V of mean V RR-PF	Average Wetted Perimeter RR-PF
=((1.49/0.05)*F13*((F13/E13)^(2/3))*(B7^(1/2)))	=((1.49/0.05)*F36*((F36/E36)						
=((1.49/0.05)*F14*((F14/E14)^(2/3))*(B7^(1/2)))	=((1.49/0.05)*F37*((F37/E37)	=AVERAGE(H11:H20)	=H57/H60	=AVERAGE(A57:A66)	=E60/G57	=AVERAGE(E22:E31)	=AVERAGE(E11:E20)
=((1.49/0.05)*F15*((F15/E15)^(2/3))*(B7^(1/2)))	=((1.49/0.05)*F38*((F38/E38)	Average width RR-CS	Average Depth RR-CS	W/D RR-CS	Average Wetted perimeter RR-CS	Average Cross sectional area RR-CS	Average 2x Banfull width RR-CS
=((1.49/0.05)*F16*((F16/E16)^(2/3))*(B7^(1/2)))	=((1.49/0.05)*F39*((F39/E39)	=AVERAGE(B34:B43)	=(AVERAGE(C34:C43))	=C62/D62	=AVERAGE(E34:E43)	=AVERAGE(F34:F43)	=AVERAGE(G34:G43)
=((1.49/0.05)*F17*((F17/E17)^(2/3))*(B7^(1/2)))	=((1.49/0.05)*F40*((F40/E40)	Average entrenchment ratio (E/R) RR-CS	Design (E/R) RR-CS	Average Q RR-CS	Average V Calculated RR-CS	Average V of mean V RR-CS	Average Wetted Perimeter RR-CS
=((1.49/0.05)*F18*((F18/E18)^(2/3))*(B7^(1/2)))	=((1.49/0.05)*F41*((F41/E41)						
=((1.49/0.05)*F19*((F19/E19)^(2/3))*(B7^(1/2)))	=((1.49/0.05)*F42*((F42/E42)	=AVERAGE(H34:H43)	=H62/H65	=AVERAGE(B57:B66)	=E65/G62	=AVERAGE(E45:E54)	=AVERAGE(E34:E43)
=((1.49/0.05)*F20*((F20/E20)^(2/3))*(B7^(1/2)))	=((1.49/0.05)*F43*((F43/E43)						

1. 2x Bankfull width at some locations are greater than the surveyed topography and will be assumed to be 100 ft.

New Channel dimensions							
Higher calculated Q	Average Width	Average W/D	Average Wetted Perimeter	Average E/R	Actual 2x Bankfull width	Actual depth	
=E65	=((C62+C57)/2)	=((E57+E62)/2)	=((F57+F62)/2)	=((D60+D65)/2)	=D72*E72	=B72/C72	