Appendix A: Cross-section Surveys, Pebble Counts, and Habitat Field Data

**Gary K is scanning in an additional 13 pages

SITE: Chama blw Chama Mt G&F Date: 981019

Location:

Party / Notes:

Item	Distance; Point; or STATION Ft.	~~Elevation~~ Back-Sight BS Ft.	Height of Instrument HI Ft.	Fore-Sight FS Ft.	Height; Depth; or Elevation Ft.	NOTES COMMENT REMARKS
36		7.27	11.92			
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GPS File N101912OB

BF = 2.74

ENTRENCHMENT

- Thalwag
- Bankfull

= Entrenchment Elevation

L803

L-3

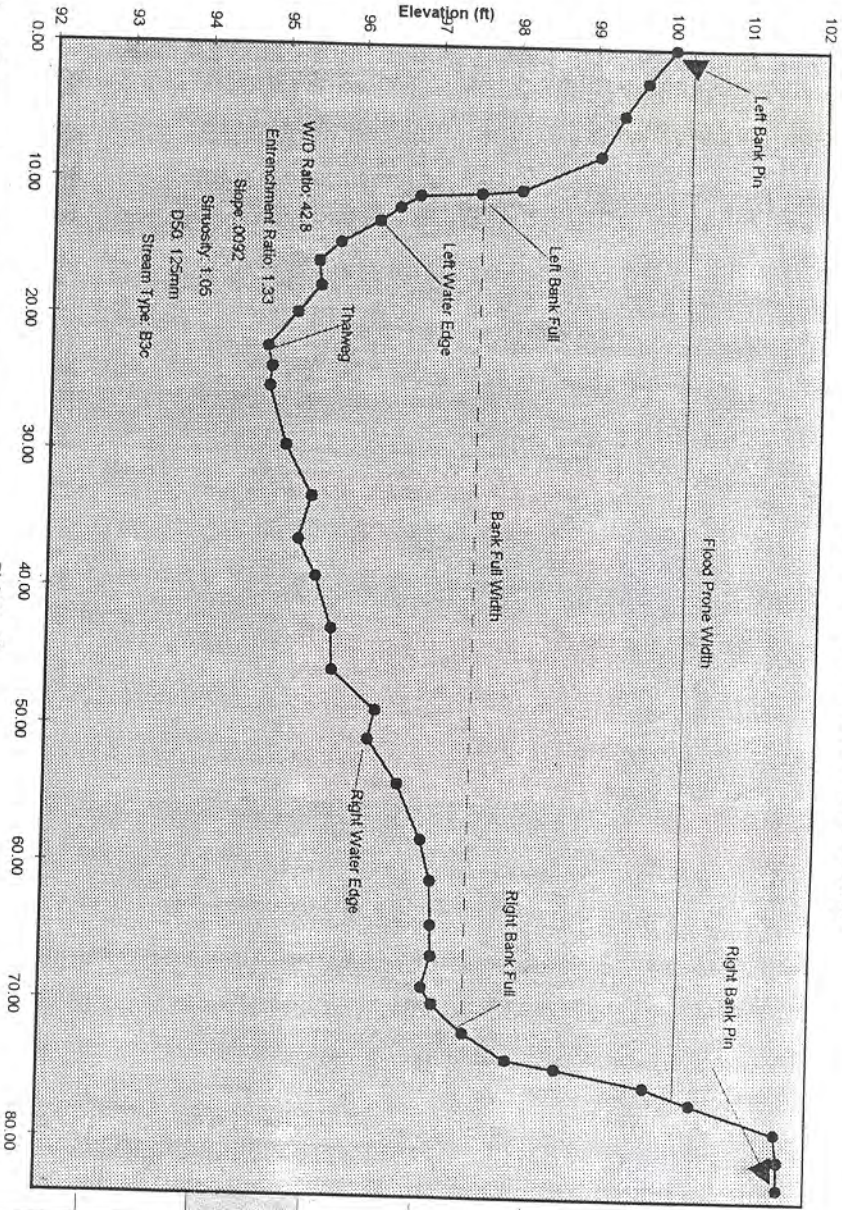
Adjusted Distance	Height	Adjusted Height	Notes
0.0	3.27	100.00	LBP
2.5	3.62	99.65	
5.0	3.92	99.35	
8.0	4.22	99.05	
10.6	5.23	98.04	Bank Edge
10.9	5.75	97.52	LBF
11.1	6.55	96.72	
12.0	6.80	96.47	
13.0	7.06	96.21	LWE
14.6	7.56	95.71	
16.0	7.84	95.43	
17.8	7.81	95.46	
19.8	8.11	95.16	
22.3	8.49	94.78	Thalwag
23.8	8.43	94.84	Thalwag
25.2	8.46	94.81	Thalwag
29.5	8.23	95.04	
33.2	7.88	95.39	
36.3	8.04	95.23	
39.0	7.81	95.46	
42.8	7.59	95.68	
45.8	7.57	95.70	
48.7	6.99	96.28	
50.8	7.08	96.19	RWE
54.0	6.68	96.59	
58.0	6.36	96.91	
61.0	6.22	97.05	
64.2	6.20	97.07	
66.5	6.19	97.08	
68.8	6.30	96.97	
70.0	6.16	97.11	
72.1	5.75	97.52	RBF
74.0	5.19	98.08	
74.6	4.55	98.72	
75.8	3.38	99.89	
77.0	2.78	100.49	
79.0	2.21	101.60	
81.0	1.62	101.65	
83.0	1.62	101.65	RBP

3	71.9	6.55			0.8
4	72.1	5.75			0
5	72.4	5.23			

$\bar{Y} = 1.43$

SURVEY DATA ⇒ CROSS - SECTION

SITE: Date: Part



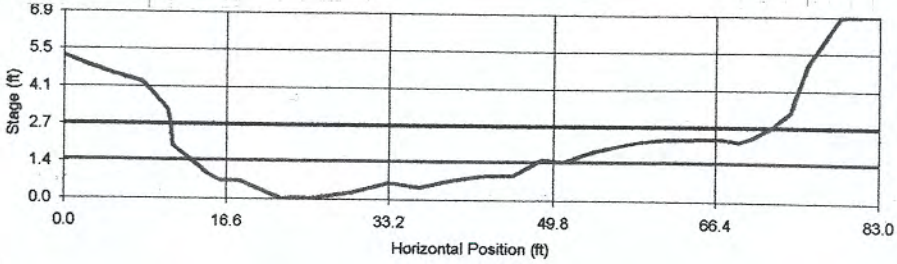
Chama at Game & Fish Cross-section 10/19/98

WINXSPRO results

Resistance method: Thorne and Zevenbergen
DS4: 195.000 ac

STAGE (ft)	#SEC	AREA (sq ft)	PERIM (ft)	WIDTH (ft)	R (ft)	DHYD (ft)	SLOPE (ft/ft)	n	VAVG (ft/s)	Q (cfs)	SHEAR (psf)
1.42	T	30.24	35.54	35.30	0.85	0.86	0.009	0.065	1.94	58.61	0.48
1.44	T	30.95	36.41	36.16	0.85	0.86	0.009	0.065	1.94	60.12	0.48
1.46	T	31.69	37.28	37.02	0.85	0.86	0.009	0.065	1.95	61.69	0.48
1.48	T	32.43	38.15	37.89	0.85	0.86	0.009	0.065	1.95	63.33	0.48
1.50	T	33.20	39.02	38.75	0.85	0.86	0.009	0.065	1.96	65.05	0.48
1.52	T	33.98	39.26	38.99	0.87	0.87	0.009	0.064	2.00	67.79	0.49
1.54	T	34.76	39.51	39.23	0.88	0.89	0.009	0.064	2.03	70.60	0.49
1.56	T	35.55	39.75	39.46	0.89	0.90	0.009	0.064	2.07	73.46	0.50
1.58	T	36.34	39.99	39.70	0.91	0.92	0.009	0.063	2.10	76.37	0.51
1.60	T	37.13	40.23	39.94	0.92	0.93	0.009	0.063	2.14	79.35	0.52
1.62	T	37.94	40.47	40.18	0.94	0.94	0.009	0.062	2.17	82.38	0.53
1.64	T	38.74	40.71	40.42	0.95	0.96	0.009	0.062	2.21	85.47	0.53
1.66	T	39.55	40.96	40.65	0.97	0.97	0.009	0.062	2.24	88.62	0.54
1.68	T	40.37	41.20	40.89	0.98	0.99	0.009	0.061	2.27	91.82	0.55
1.70	T	41.19	41.44	41.13	0.99	1.00	0.009	0.061	2.31	95.09	0.56
1.72	T	42.01	41.68	41.37	1.01	1.02	0.009	0.061	2.34	98.41	0.57
1.74	T	42.84	41.92	41.60	1.02	1.03	0.009	0.060	2.38	101.80	0.57
1.76	T	43.68	42.16	41.84	1.04	1.04	0.009	0.060	2.41	105.24	0.58
1.78	T	44.51	42.40	42.07	1.05	1.06	0.009	0.060	2.44	108.74	0.59
1.80	T	45.36	42.64	42.31	1.06	1.07	0.009	0.060	2.48	112.30	0.60
1.82	T	46.21	42.92	42.59	1.08	1.08	0.009	0.059	2.51	115.82	0.60
1.84	T	47.06	43.25	42.91	1.09	1.10	0.009	0.059	2.53	119.30	0.61
1.86	T	47.92	43.57	43.23	1.10	1.11	0.009	0.059	2.56	122.83	0.62
1.88	T	48.79	43.90	43.55	1.11	1.12	0.009	0.059	2.59	126.43	0.62
1.90	T	49.67	44.22	43.88	1.12	1.13	0.009	0.058	2.62	130.09	0.63
1.92	T	50.55	44.55	44.20	1.13	1.14	0.009	0.058	2.65	133.80	0.64
1.94	T	51.43	44.87	44.52	1.15	1.16	0.009	0.058	2.67	137.58	0.64
1.96	T	52.33	45.15	44.78	1.16	1.17	0.009	0.058	2.71	141.56	0.65
1.98	T	53.22	45.42	45.03	1.17	1.18	0.009	0.057	2.74	145.59	0.66
2.00	T	54.13	45.69	45.29	1.18	1.20	0.009	0.057	2.77	149.69	0.67
2.02	T	55.03	45.96	45.54	1.20	1.21	0.009	0.057	2.80	153.85	0.67
2.04	T	55.95	46.23	45.80	1.21	1.22	0.009	0.057	2.83	158.07	0.68
2.06	T	56.87	46.50	46.05	1.22	1.23	0.009	0.057	2.85	162.34	0.69
2.08	T	57.79	46.77	46.31	1.24	1.25	0.009	0.056	2.88	166.68	0.69
2.10	T	58.72	47.05	46.56	1.25	1.26	0.009	0.056	2.91	171.08	0.70
2.12	T	59.65	47.32	46.82	1.26	1.27	0.009	0.056	2.94	175.54	0.71
2.14	T	60.59	47.68	47.16	1.27	1.28	0.009	0.056	2.97	179.79	0.71
2.16	T	61.54	48.13	47.59	1.28	1.29	0.009	0.056	2.99	183.81	0.72
2.18	T	62.49	48.58	48.03	1.29	1.30	0.009	0.056	3.01	187.90	0.72
2.20	T	63.46	49.32	48.75	1.29	1.30	0.009	0.056	3.01	191.10	0.72
2.22	T	64.45	50.36	49.77	1.28	1.29	0.009	0.056	3.00	193.45	0.72
2.24	T	65.45	51.40	50.80	1.27	1.29	0.009	0.055	2.99	195.92	0.72
2.26	T	66.48	52.44	51.82	1.27	1.28	0.009	0.055	2.99	198.52	0.71
2.28	T	67.53	54.84	54.21	1.23	1.25	0.009	0.056	2.92	197.05	0.69
2.30	T	68.66	59.34	58.69	1.16	1.17	0.009	0.056	2.77	190.31	0.65
2.32	T	69.83	59.58	58.90	1.17	1.19	0.009	0.056	2.81	196.00	0.66
2.34	T	71.01	59.74	59.05	1.19	1.20	0.009	0.056	2.84	201.98	0.67
2.36	T	72.19	59.86	59.15	1.21	1.22	0.009	0.056	2.88	206.13	0.68
2.38	T	73.38	59.99	59.26	1.22	1.24	0.009	0.055	2.92	214.37	0.69
2.40	T	74.56	60.11	59.37	1.24	1.26	0.009	0.055	2.96	220.69	0.70
2.42	T	75.75	60.24	59.48	1.26	1.27	0.009	0.055	3.00	227.09	0.71
2.44	T	76.94	60.36	59.58	1.27	1.29	0.009	0.055	3.04	233.58	0.72
2.46	T	78.13	60.49	59.69	1.29	1.31	0.009	0.055	3.07	240.15	0.73
2.48	T	79.33	60.61	59.80	1.31	1.33	0.009	0.054	3.11	246.80	0.74
2.50	T	80.53	60.74	59.91	1.33	1.34	0.009	0.054	3.15	253.53	0.74
2.52	T	81.72	60.86	60.01	1.34	1.36	0.009	0.054	3.19	260.34	0.75
2.54	T	82.93	60.99	60.12	1.36	1.38	0.009	0.054	3.22	267.24	0.76
2.56	T	84.13	61.11	60.23	1.38	1.40	0.009	0.054	3.26	274.22	0.77
2.58	T	85.33	61.24	60.34	1.39	1.41	0.009	0.054	3.30	281.27	0.78
2.60	T	86.54	61.36	60.44	1.41	1.43	0.009	0.053	3.33	288.41	0.79
2.62	T	87.75	61.49	60.55	1.43	1.45	0.009	0.053	3.37	295.63	0.80
2.64	T	88.96	61.61	60.66	1.44	1.47	0.009	0.053	3.41	302.93	0.81
2.66	T	90.18	61.73	60.76	1.46	1.48	0.009	0.053	3.44	310.31	0.82
2.68	T	91.39	61.86	60.87	1.48	1.50	0.009	0.053	3.48	317.77	0.83
2.70	T	92.61	61.98	60.98	1.49	1.52	0.009	0.053	3.51	325.31	0.84
2.72	T	93.83	62.11	61.09	1.51	1.54	0.009	0.052	3.55	332.93	0.85
2.74	T	95.05	62.23	61.19	1.53	1.55	0.009	0.052	3.58	340.63	n a

STAGE	ALPHA	FROUDE
1.42	1.00	0.37
1.44	1.00	0.37
1.46	1.00	0.37
1.48	1.00	0.37
1.50	1.00	0.37
2.64	1.00	0.50
2.66	1.00	0.50
2.68	1.00	0.50
2.70	1.00	0.50
2.72	1.00	0.50
2.74	1.00	0.51



SURVEY DATA ⟹ CROSS - SECTION Part I

GAGE: No:

Location: Chaveys CK @ 512 bridge Date: 6/10/02

Party / Notes: L Stevens, S Stringer, J Isaacs

Distance; Point; or STATION	Back-Sight BS	Height of Instrument HI	Fore-Sight FS	Height; Depth; or Elevation	NOTES COMMENT REMARKS
Ft.	Ft.	Ft.	Ft.	Ft.	
1	10.59				RBF
2.5	10.83				slope break
4.3	10.95				slope break
6.8	11.72				Right Edge of active channel
14.0	11.92				Right Wetted Edge
20.2	12.14				Thalweg
~~35.2~~	~~11.66~~				Left wetted Edge
23.6	11.92				" " "
26.3	11.55				slope break
33.5	11.32				slope break
36.0	10.86				Slope Break
~~36.2~~	~~9.58~~				~~LBF~~
36.2	10.58				LBF
	11.94				16.4' upstream of tape
	12.24				16.4' downstream of tape

Slope = $\frac{0.30 \text{ ft}}{32.8 \text{ ft}} = 0.009$

$= 0.9\%$

SURVEY DATA ⟹ CROSS - SECTION Part II

GAGE: No: Date:

Item	STATION Ft.	BS Ft.	HI Ft.	FS Ft.	Elevation Ft.	NOTES COMMENT REMARKS
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**********WinXSPRO**********

chavez.out
Input File: C:\MYDOCU~1\WXSPRO20\CHAVEZ.DAT
Run Date: 10/30/02
Analysis Procedure: Hydraulics & Regression
Cross Section Number: 1
Survey Date: 6/10/02

Subsections/Dividing stations
A / 36.19/ @

Resistance Method: Thorne and Zevenbergen
D84: 84.000 mm

STAGE (ft)	#SEC	AREA (sq ft)	PERIM (ft)	WIDTH (ft)	R (ft)	DHYD (ft)	SLOPE (ft/ft)	n	VAVG (ft/s)	Q (cfs)
0.10	T	0.22	4.46	4.45	0.05	0.05	0.009	0.116	0.16	0.04
0.20	T	0.89	8.92	8.91	0.10	0.10	0.009	0.096	0.32	0.28
0.30	T	2.02	13.66	13.65	0.15	0.15	0.009	0.086	0.46	0.92
0.40	T	3.62	18.48	18.46	0.20	0.20	0.009	0.080	0.59	2.15
0.50	T	5.60	20.69	20.66	0.27	0.27	0.009	0.070	0.85	4.75
0.60	T	7.75	22.36	22.30	0.35	0.35	0.009	0.058	1.20	9.31
0.70	T	10.11	24.96	24.89	0.40	0.41	0.009	0.054	1.43	14.45
0.80	T	12.72	27.56	27.47	0.46	0.46	0.009	0.051	1.64	20.92
0.90	T	15.54	28.79	28.68	0.54	0.54	0.009	0.049	1.92	29.81
1.00	T	18.46	29.69	29.55	0.62	0.62	0.009	0.047	2.19	40.46
1.10	T	21.45	30.58	30.42	0.70	0.71	0.009	0.045	2.45	52.63
1.20	T	24.54	31.59	31.40	0.78	0.78	0.009	0.044	2.69	66.11
1.30	T	27.78	33.56	33.35	0.83	0.83	0.009	0.044	2.86	79.54
1.40	T	31.16	34.40	34.13	0.91	0.91	0.009	0.043	3.10	96.63
1.50	T	34.61	35.15	34.83	0.98	0.99	0.009	0.042	3.34	115.43
1.56	T	36.71	35.55	35.19	1.03	1.04	0.009	0.042	3.48	127.60 *

STAGE	ALPHA	FROUDE
0.10	1.00	0.13
0.20	1.00	0.18
0.30	1.00	0.21
0.40	1.00	0.24
0.50	1.00	0.29
0.60	1.00	0.36
0.70	1.00	0.40
0.80	1.00	0.43
0.90	1.00	0.46
1.00	1.00	0.49
1.10	1.00	0.51
1.20	1.00	0.54
1.30	1.00	0.55
1.40	1.00	0.57
1.50	1.00	0.59
1.56	1.00	0.60

Q = aR^b a=138.796295 b=2.659834 r^2=0.996922 n=16
Q = aZ^b a=37.388386 b=3.004 r^2=0.998462 n=16

**********WinXSPRO**********

C:\WXSPRO20\TEMPLET.OUT
Input File: C:\WXSPRO20\SAMPLE.DAT
Run Date: 06/17/02
Analysis Procedure: Hydraulics
Cross Section Number: 1
Survey Date: 08/17/00

Subsections/Dividing stations
A / 121.00/ @

Resistance Method: Thorne and Zevenbergen
D84: 300.000 mm

STAGE (ft)	#SEC	AREA (sq ft)	PERIM (ft)	WIDTH (ft)	R (ft)	DHYD (ft)	SLOPE (ft/ft)	n	VAVG (ft/s)	Q (cfs)
0.10	T	0.10	2.02	2.00	0.05	0.05	0.012	0.447	0.05	0.00
0.20	T	0.40	4.03	4.00	0.10	0.10	0.012	0.292	0.12	0.05
0.30	T	1.03	8.59	8.55	0.12	0.12	0.012	0.184	0.22	0.22
0.40	T	2.11	13.16	13.10	0.16	0.16	0.012	0.155	0.31	0.66
0.50	T	3.49	14.53	14.45	0.24	0.24	0.012	0.150	0.42	1.48
0.60	T	5.00	15.90	15.81	0.31	0.32	0.012	0.138	0.55	2.76
0.70	T	6.65	17.27	17.16	0.38	0.39	0.012	0.126	0.69	4.61
0.80	T	8.43	18.65	18.52	0.45	0.46	0.012	0.115	0.84	7.12
0.90	T	10.35	20.02	19.87	0.52	0.52	0.012	0.106	1.00	10.40
1.00	T	12.41	21.39	21.23	0.58	0.58	0.012	0.098	1.17	14.53
1.10	T	14.60	22.76	22.58	0.64	0.65	0.012	0.091	1.34	19.63
1.20	T	16.92	24.13	23.94	0.70	0.71	0.012	0.086	1.52	25.80
1.30	T	19.38	25.51	25.29	0.76	0.77	0.012	0.081	1.71	33.14
1.40	T	21.98	26.88	26.64	0.82	0.82	0.012	0.076	1.90	41.77
1.50	T	24.71	28.25	28.00	0.87	0.88	0.012	0.073	2.10	51.79
1.60	T	27.85	35.09	34.83	0.79	0.80	0.012	0.083	1.72	48.05
1.70	T	31.43	36.93	36.66	0.85	0.86	0.013	0.079	1.89	59.43
1.80	T	35.19	38.78	38.50	0.91	0.91	0.013	0.076	2.06	72.48
1.90	T	39.13	40.62	40.33	0.96	0.97	0.013	0.073	2.23	87.33
2.00	T	43.25	42.47	42.16	1.02	1.03	0.013	0.077	2.20	95.04
2.10	T	47.56	44.31	44.00	1.07	1.08	0.013	0.075	2.34	111.35
2.20	T	52.01	45.22	44.88	1.15	1.16	0.013	0.073	2.53	131.58
2.30	T	56.54	46.13	45.77	1.23	1.24	0.013	0.071	2.71	153.50
2.40	T	61.16	47.03	46.65	1.30	1.31	0.013	0.069	2.90	177.11
2.50	T	65.87	47.94	47.54	1.37	1.39	0.013	0.068	3.07	202.43
2.60	T	70.66	48.64	48.21	1.45	1.47	0.013	0.066	3.26	230.29
2.70	T	75.51	49.34	48.88	1.53	1.54	0.013	0.065	3.44	259.91
2.80	T	80.43	50.04	49.55	1.61	1.62	0.013	0.064	3.62	291.30
2.90	T	85.42	50.74	50.22	1.68	1.70	0.013	0.063	3.80	324.46
3.00	T	90.47	51.44	50.89	1.76	1.78	0.013	0.062	3.97	359.39
3.10	T	95.60	52.14	51.56	1.83	1.85	0.013	0.061	4.14	396.11
3.20	T	100.79	52.84	52.23	1.91	1.93	0.013	0.061	4.31	434.63

STAGE	ALPHA	FROUDE
0.10	1.00	0.04
0.20	1.00	0.07
0.30	1.00	0.11
0.40	1.00	0.14
0.50	1.00	0.15
0.60	1.00	0.17
0.70	1.00	0.20
0.80	1.00	0.22
0.90	1.00	0.25
1.00	1.00	0.27
1.10	1.00	0.29
1.20	1.00	0.32
1.30	1.00	0.34
1.40	1.00	0.37
1.50	1.00	0.39
1.60	1.00	0.34
1.70	1.00	0.36
1.80	1.00	0.38
1.90	1.00	0.40
2.00	1.00	0.38
2.10	1.00	0.40
2.20	1.00	0.41
2.30	1.00	0.43
2.40	1.00	0.45
2.50	1.00	0.46
2.60	1.00	0.47
2.70	1.00	0.49
2.80	1.00	0.50
2.90	1.00	0.51
3.00	1.00	0.52
3.10	1.00	0.54
3.20	1.00	0.55

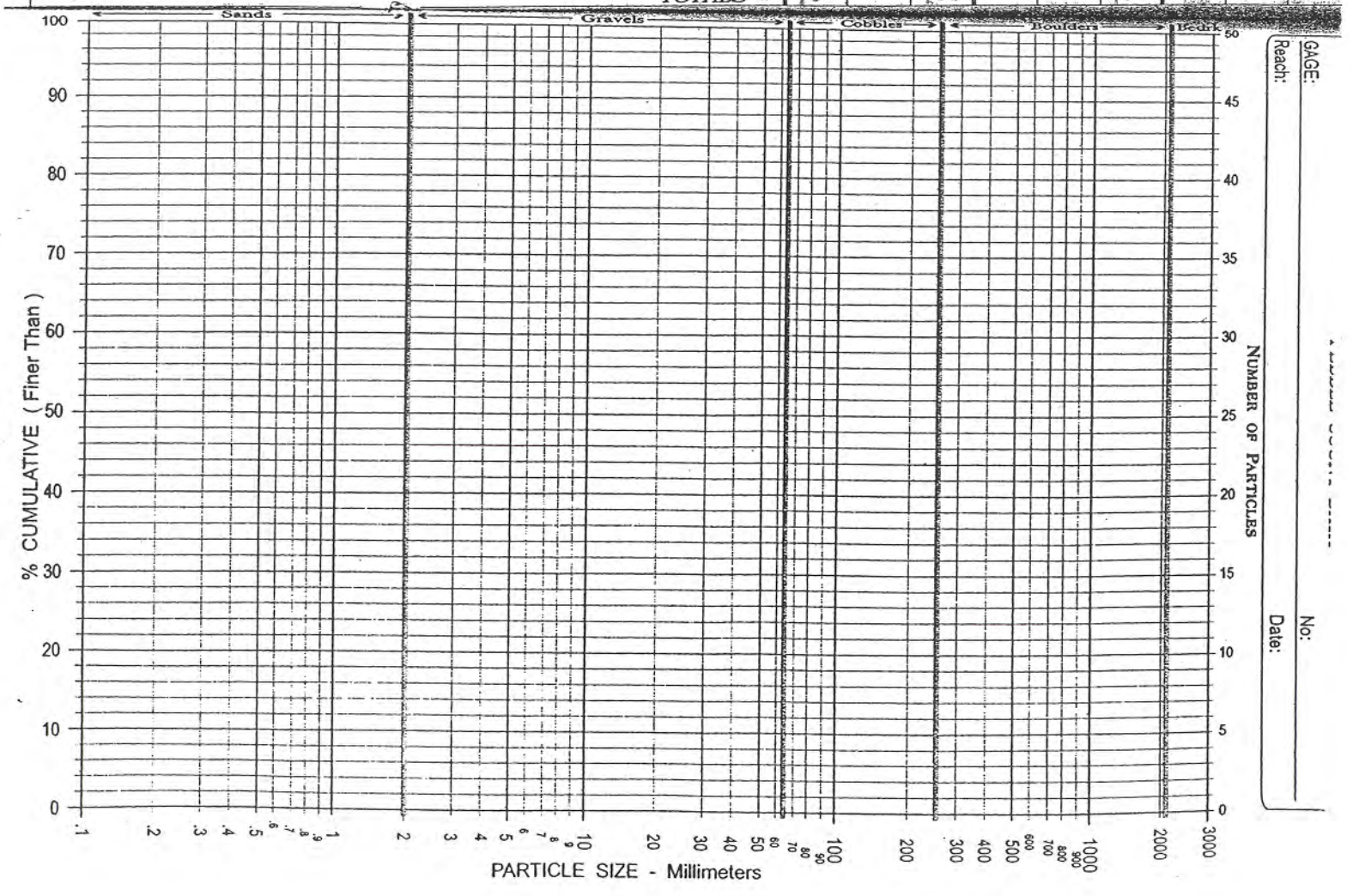
Site: Rito TA marilla
Party: L. Smolka L. Stevens

Reach: ~100 yds U/S of Conf W/ Chama
Date: 10/22/01 1045

Reach: U/S of HWY
Date: 10/22/01

Reach: 112
Date:

Inches	PARTICLE	Millimeters		PARTICLE COUNT (1 2 3)	TOT #	ITEM %	% CUM	TOT #	ITEM %	% CUM	TOT #	ITEM %	% CUM
	Silt / Clay	< .062	SAND		59		59	73		73			
	Very Fine	.062 - .125	SAND		1		60						
	Fine	.125 - .25	SAND										
	Medium	.25 - .50	SAND										
	Coarse	.50 - 1.0	SAND										
.04 - .08	Very Coarse	1.0 - 2	SAND					1		74			
.08 - .16	Very Fine	2 - 4	GRAVEL		1		61						
.16 - .22	Fine	4 - 5.7	GRAVEL		2		63						
.22 - .31	Fine	5.7 - 8	GRAVEL		2		65						
.31 - .44	Medium	8 - 11.3	GRAVEL		1		66						
.44 - .63	Medium	11.3 - 16	GRAVEL										
.63 - .89	Coarse	16 - 22.6	GRAVEL		1		67						
.89 - 1.26	Coarse	22.6 - 32	GRAVEL		2		69	3		77			
1.26 - 1.77	Very Coarse	32 - 45	GRAVEL		5		74	3		80			
1.77 - 2.5	Very Coarse	45 - 64	GRAVEL		5		79	7		87			
2.5 - 3.5	Small	64 - 90	COBBLE		6		85	6		93			
3.5 - 5.0	Small	90 - 128	COBBLE		3		88	4		97			
5.0 - 7.1	Large	128 - 180	COBBLE		4		92	2		99			
7.1 - 10.1	Large	180 - 256	COBBLE		2		94	1		100			
10.1 - 14.3	Small	256 - 362	BOULDER		3		97						
14.3 - 20	Small	362 - 512	BOULDER		3		100						
20 - 40	Medium	512 - 1024	BOULDER										
40 - 80	Large-Vry Large	1024 - 2048	BOULDER										
	Bedrock		BEDROCK										
				TOTALS →	100		100			100			

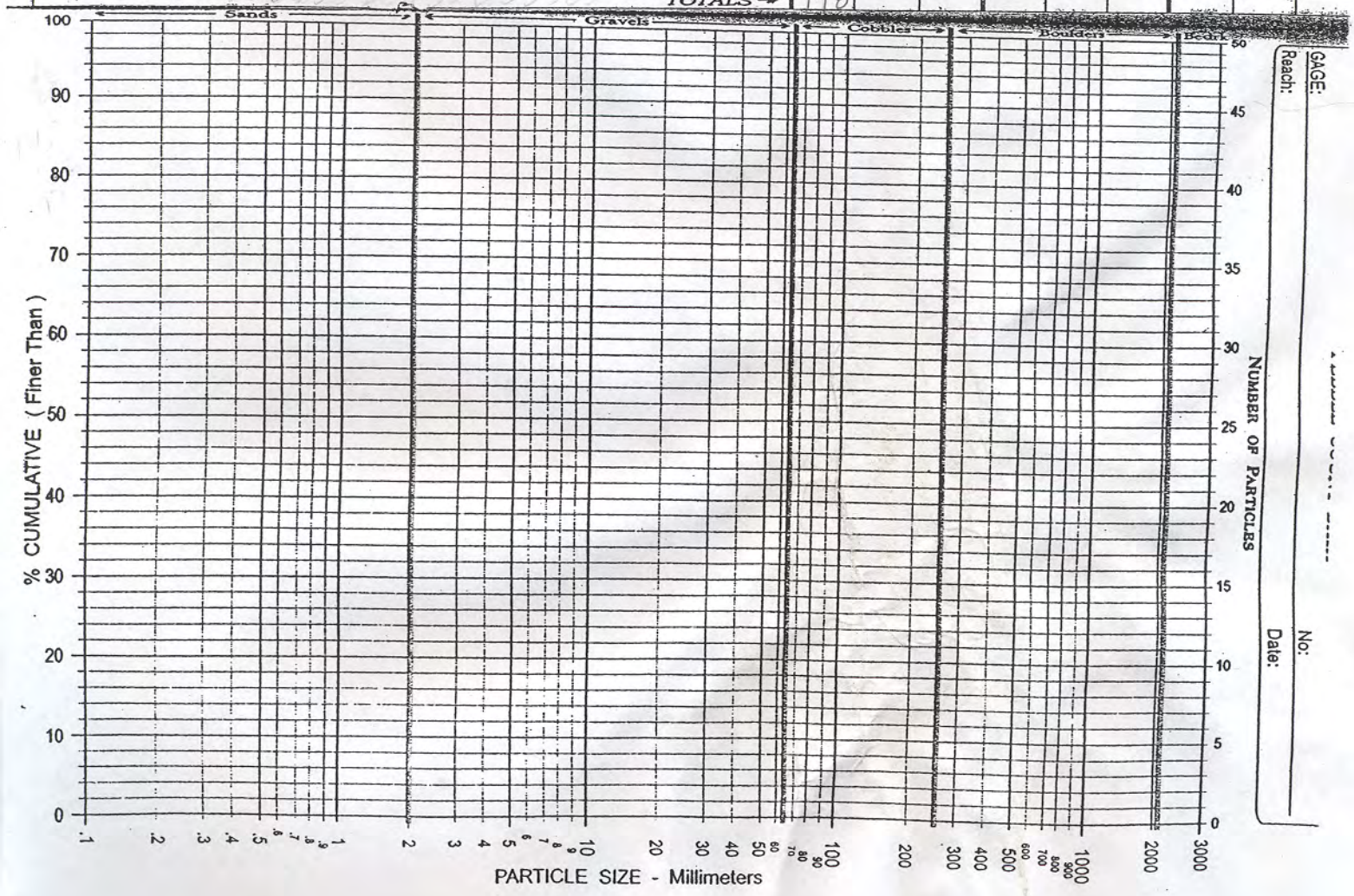


Site: RTierra Amarilla Reach: @ HWY 64

Party: LS, JT, SS, [illegible] Date: 6/11/02 1130

Inches	PARTICLE	Millimeters		PARTICLE COUNT 1 2 3	TOT #	ITEM %	% CUM	Reach: Date: TOT #	ITEM %	% CUM	Reach: Date: TOT #	ITEM %	% CUM
	Silt / Clay	< .062	SAND		21								
	Very Fine	.062 - .125	SAND										
	Fine	.125 - .25	SAND										
	Medium	.25 - .50	SAND		1								
	Coarse	.50 - 1.0	SAND										
.04 - .08	Very Coarse	1.0 - 2	SAND		4								
.08 - .16	Very Fine	2 - 3	GRAVEL										
.16 - .22	Fine	4 - 5.7 5.6	GRAVEL		1								
.22 - .31	Fine	5.7 - 8 7	GRAVEL		4								
.31 - .44	Medium	8 - 11.3	GRAVEL		5								
.44 - .63	Medium	11.3 - 16 15	GRAVEL		7								
.63 - .89	Coarse	16 - 22.6	GRAVEL		7								
.89 - 1.26	Coarse	22.6 - 32 31	GRAVEL		9								
1.26 - 1.77	Very Coarse	32 - 45 44	GRAVEL		11								
1.77 - 2.5	Very Coarse	45 - 64 63	GRAVEL		23								
2.5 - 3.5	Small	64 - 90 89	COBBLE		28								
3.5 - 5.0	Small	90 - 128 127	COBBLE		20								
5.0 - 7.1	Large	128 - 180 179	COBBLE		24								
7.1 - 10.1	Large	180 - 256 253	COBBLE		14								
10.1 - 14.3	Small	256 - 362 361	BOULDER		10								
14.3 - 20	Small	362 - 512 511	BOULDER		9								
20 - 40	Medium	512 - 1024 [illegible]	BOULDER										
40 - 80	Large-Vry Large	1024 - 2048	BOULDER										
	Bedrock		BDRK										
				TOTALS →	198								

- Alders, willows, shrubs



HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (FRONT)

STREAM NAME Rita T Amarillo	LOCATION ~100 y u/s y confl w/ Chama
STATION # _____ RIVERMILE _____	STREAM CLASS
LAT _____ LONG _____	RIVER BASIN
STORET #	AGENCY SWQB / NMED
INVESTIGATORS L. Smolka, L. Stevens	
FORM COMPLETED BY L. Stevens / L. Smolka	DATE 10/22/01 TIME 1100 (AM) PM
	REASON FOR SURVEY

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 50% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	30-50% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	10-30% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 10% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE	20 19 18 17 16	15 14 13 12 11	(10) 9 8 7 6	5 4 3 2 1 0
2. Pool Substrate Characterization	Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mixture of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.	All mud or clay or sand bottom; little or no root mat; no submerged vegetation.	Hard-pan clay or bedrock; no root mat or vegetation.
SCORE	20 19 18 17 16	15 14 13 12 11	(10) 9 8 7 6	5 4 3 2 1 0
3. Pool Variability	Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.	Majority of pools large-deep; very few shallow.	Shallow pools much more prevalent than deep pools.	Majority of pools small-shallow or pools absent.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	(5) 4 3 2 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than <20% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 20-50% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 80% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 (7) 6	5 4 3 2 1 0
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	20 19 18 17 16	15 (14) 13 12 11	10 9 8 7 6	5 4 3 2 1 0

HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (BACK)

Habitat Parameter	Condition Category			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
6. Channel Alteration * u/s breached earthen dam	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	20 19 (18) 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Channel Sinuosity	The bends in the stream increase the stream length 3 to 4 times longer than if it was in a straight line. (Note - channel braiding is considered normal in coastal plains and other low-lying areas. This parameter is not easily rated in these areas.)	The bends in the stream increase the stream length 2 to 3 times longer than if it was in a straight line.	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	Channel straight; waterway has been channelized for a long distance.
SCORE	20 19 18 17 16	15 14 13 12 11	(10) 9 8 7 6	5 4 3 2 1 0
8. Bank Stability (score each bank)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE ___ (LB)	Left Bank 10 9	8 7 (6)	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 9	8 7 (6)	5 4 3	2 1 0
9. Vegetative Protection (score each bank) Note: determine left or right side by facing downstream. * u/s outside lands are contributing	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE ___ (LB)	Left Bank 10 (9)	(8) 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 9 9	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE ___ (LB)	Left Bank (10) 9	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 (9)	8 7 6	5 4 3	2 1 0

Total Score _____

0 = RTA ~100 y u/s of Channa = 121/200

1 = RTA @ 112 = 99/200

↑ Cattle grazin (FP mostly R. brush)

10/21/1998

Note: Chamita & Sexto Creek = 148/200

Chamita ab WWTP = 136/200

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME	LOCATION R 170 TA @ 64	
STATION #_____ RIVERMILE_____	STREAM CLASS	
LAT _____ LONG _____	RIVER BASIN	
STORET #	AGENCY	
INVESTIGATORS		
FORM COMPLETED BY SMOLKA	DATE 981020 TIME _____ AM PM	REASON FOR SURVEY

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category: Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/ depth regime (usually slow-deep).
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% (<20% for low-gradient streams) of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% (20-50% for low-gradient) of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% (50-80% for low-gradient) of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% (80% for low-gradient) of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (BACK)

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category: Optimal	Suboptimal	Marginal	Poor
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Frequency of Riffles (or bends)	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
8. Bank Stability (score each bank) Note: determine left or right side by facing downstream.	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE ___(LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE ___(RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE ___(LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE ___(RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE ___(LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE ___(RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0

Total Score 179

*use topo for LB topo alt. (RB = meadow)

THE REFERENCE REACH FIELD BOOK

SURVEY DATA ⟹ CROSS - SECTION Part I

GAGE: Rito de Tierra Amarilla No:

Location: @ HWY 112 ~60 yds u/s of bridge Date: 7/24/02

Party / Notes: LS, JT, MM

Distance; Point; or STATION Ft.	Back-Sight BS Ft.	Height of Instrument HI Ft.	Fore-Sight FS Ft.	Height; Depth; or Elevation Ft.	NOTES COMMENT REMARKS
0				5.79	Left Pin
2.0				6.24	
4.4				6.78	LBNK FULL
5.85				8.13	LEW
7.30				8.26	thalweg
10.0				7.85	mid bar
12.0				8.05	
13.55				8.10	REW
15.3				7.81	
17.0				7.71	
19.0				7.67	
21.65				7.59	
23.55				6.92	R BNK FULL
23.75				6.44	
24.5				5.76	
26.0				5.23	
28.0				5.1	Right Pin
			u/s		
			slope ⟹ LEW elev = 8.20		
				d/s LEW elev = 8.52	
				Dist = 90 ft.	
				Slope = 0.32/90ft = 0.0036	
Q = 2					left (trickle) at time of msmt.
				ELEV = 7152 ft	

THE REFERENCE REACH FIELD BOOK 161

SURVEY DATA ⟹ CROSS - SECTION Part II

GAGE: No: Date:

Item	STATION Ft.	BS Ft.	HI Ft.	FS Ft.	Elevation Ft.	NOTES COMMENT REMARKS
36						
37						
38						
39						
40						
41						
42						
43						
44						
45						
46						
47						
48						
49						
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69						
70						
71						
72						

**********WinXSPRO**********

rta_112.out
Input File: C:\MYDOCU~1\WXSPRO20\RTA_112.DAT
Run Date: 10/30/02
Analysis Procedure: Hydraulics & Regression
Cross Section Number: 1
Survey Date: 7/24/02

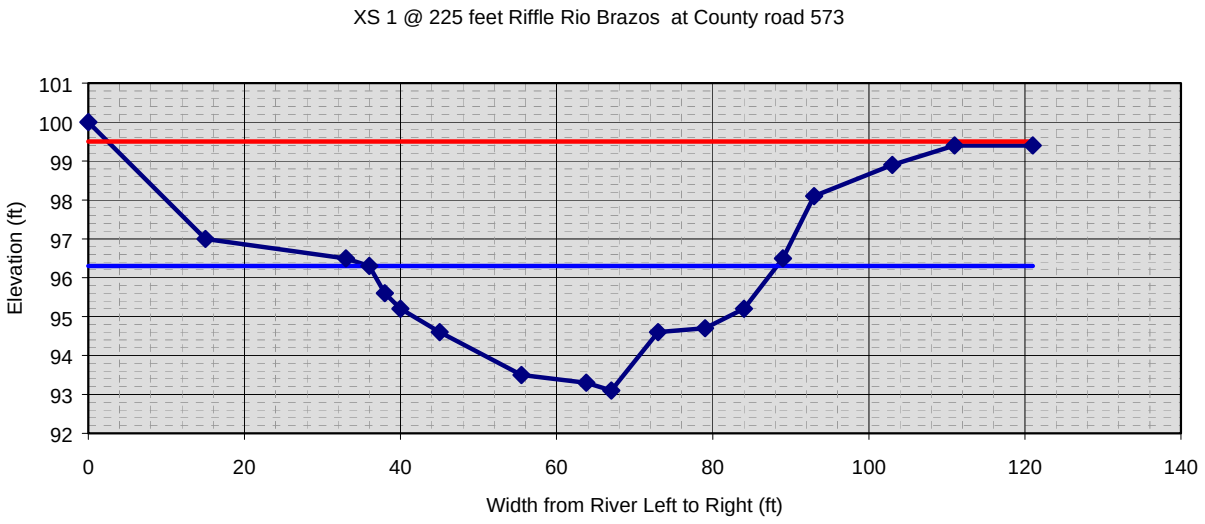
Subsections/Dividing stations
A / 27.98/ @

Resistance Method: Thorne and Zevenbergen
D84: 55.000 mm

STAGE (ft)	#SEC	AREA (sq ft)	PERIM (ft)	WIDTH (ft)	R (ft)	DHYD (ft)	SLOPE (ft/ft)	n	VAVG (ft/s)	Q (cfs)	
0.10	T	0.09	1.75	1.73	0.05	0.05	0.004	0.123	0.10	0.01	
0.20	T	0.35	4.36	4.31	0.08	0.08	0.004	0.087	0.20	0.07	
0.30	T	0.92	6.99	6.88	0.13	0.13	0.004	0.068	0.36	0.33	
0.40	T	1.73	9.41	9.24	0.18	0.19	0.004	0.057	0.53	0.92	
0.50	T	2.72	10.87	10.65	0.25	0.25	0.004	0.050	0.74	2.02	
0.60	T	3.91	14.21	13.95	0.28	0.28	0.004	0.048	0.84	3.28	
0.70	T	5.47	16.81	16.51	0.33	0.33	0.004	0.045	0.99	5.42	
0.80	T	7.14	17.26	16.90	0.41	0.42	0.004	0.042	1.23	8.81	
0.90	T	8.85	17.71	17.30	0.50	0.51	0.004	0.041	1.46	12.91	
1.00	T	10.60	18.16	17.69	0.58	0.60	0.004	0.039	1.67	17.70	
1.10	T	12.39	18.61	18.09	0.67	0.68	0.004	0.038	1.87	23.16	
1.20	T	14.22	19.06	18.48	0.75	0.77	0.004	0.038	2.06	29.27	
1.30	T	16.08	19.51	18.87	0.82	0.85	0.004	0.037	2.24	36.01	
1.40	T	17.99	19.84	19.12	0.91	0.94	0.004	0.036	2.42	43.55	
1.50	T	19.91	20.16	19.34	0.99	1.03	0.004	0.036	2.60	51.70	
1.60	T	21.87	20.73	19.83	1.05	1.10	0.004	0.036	2.74	59.99	
1.70	T	23.87	21.29	20.31	1.12	1.18	0.004	0.035	2.88	68.87	
1.80	T	25.93	21.85	20.80	1.19	1.25	0.004	0.035	3.02	78.35	
1.90	T	28.03	22.43	21.31	1.25	1.32	0.004	0.035	3.15	88.39	
2.00	T	30.19	23.01	21.83	1.31	1.38	0.004	0.034	3.28	99.03	
2.10	T	32.40	23.59	22.35	1.37	1.45	0.004	0.034	3.40	110.28	
2.20	T	34.66	24.17	22.86	1.43	1.52	0.004	0.034	3.52	122.16	
2.30	T	36.97	24.75	23.38	1.49	1.58	0.004	0.034	3.64	134.66	
2.40	T	39.34	25.33	23.90	1.55	1.65	0.004	0.034	3.76	147.80	
2.50	T	41.75	25.80	24.28	1.62	1.72	0.004	0.033	3.88	162.03	*
2.60	T	44.19	26.23	24.61	1.68	1.80	0.004	0.033	4.00	177.00	*
2.70	T	46.67	26.67	24.93	1.75	1.87	0.004	0.033	4.13	192.56	*
2.80	T	49.18	27.11	25.25	1.81	1.95	0.004	0.033	4.24	208.71	*
2.90	T	51.72	27.54	25.57	1.88	2.02	0.004	0.033	4.36	225.45	*
3.00	T	54.29	27.98	25.89	1.94	2.10	0.004	0.033	4.47	242.78	*
3.10	T	56.93	29.26	27.06	1.95	2.10	0.004	0.033	4.49	255.75	*
3.16	T	58.58	30.24	27.98	1.94	2.09	0.004	0.033	4.49	262.78	*

STAGE	ALPHA	FROUDE
0.10	1.00	0.08
0.20	1.00	0.13
0.30	1.00	0.17
0.40	1.00	0.22
0.50	1.00	0.26
0.60	1.00	0.28
0.70	1.00	0.30
0.80	1.00	0.33
0.90	1.00	0.36
1.00	1.00	0.38
1.10	1.00	0.40
1.20	1.00	0.41
1.30	1.00	0.43
1.40	1.00	0.44
1.50	1.00	0.45
1.60	1.00	0.46
1.70	1.00	0.47
1.80	1.00	0.48
1.90	1.00	0.48
2.00	1.00	0.49
2.10	1.00	0.50
2.20	1.00	0.50
2.30	1.00	0.51
2.40	1.00	0.52
2.50	1.00	0.52
2.60	1.00	0.53
2.70	1.00	0.53
2.80	1.00	0.54
2.90	1.00	0.54
3.00	1.00	0.54
3.10	1.00	0.55

Cross Section



section:	**XS 1 @ 225 feet** Riffle
stream:	Rio Brazos at County road 573
location:	132 square miles
description:	Moody et al 06/16/1999
height of instrument (ft):	**100.00**

notes	omit pt.	distance (ft)	FS (ft)	elevation
	☐	**0**	**0**	100
	☐	**15**	**3**	97
	☐	**33**	**3.5**	96.5
LBF	☐	**36**	**3.7**	96.3
	☐	**38**	**4.4**	95.6
	☐	**40**	**4.8**	95.2
	☐	**45**	**5.4**	94.6
	☐	**55.5**	**6.5**	93.5
	☐	**63.8**	**6.7**	93.3
TW	☐	**67**	**6.9**	93.1
	#☐#	**73**	**5.4**	94.6
	#☐#	**79**	**5.3**	94.7
RBF?	#☐#	**84**	**4.8**	95.2
	#☐#	**89**	**3.5**	96.5
	#☐#	**93**	**1.9**	98.1
	#☐#	**103**	**1.1**	98.9
	#☐#	**111**	**0.6**	99.4
	#☐#	**121**	**0.6**	99.4
	#☐#			
	#☐#			
	#☐#			
	#☐#			
	☐			
	☐			

FS bankfull	FS top of bank	W fpa (ft)	channel slope (%)	Manning's "n"
3.7	**3.5**	**200.0**	**1.25**	**0.065**
96.3	96.5			

dimensions			
100.8	x-section area	1.9	d mean
52.2	width	52.8	wet P
3.2	d max	1.9	hyd radi
3.4	bank ht	27.1	w/d ratio
200.0	W flood prone area	3.8	ent ratio

hydraulics	
3.9	velocity (ft/sec)
396.2	discharge rate, Q (cfs)
1.49	shear stress ((lbs/ft sq)
0.88	shear velocity (ft/sec)
5.917	unit stream power (lbs/ft/sec)
0.25	Froude number
4.5	friction factor u/u*
~~157.3~~	threshold grain size (mm)

check from channel material			
300	measured D84 (mm)		
2.0	relative roughness	4.5	fric. factor
0.065	Manning's n from channel material		

Cross Section

section: Riffle

stream: Rito de Tierra Amarilla

location: at HWY 112 Watershed size 66 sq miles

description: taken 7/24/02 appox 60 m u/s of bridge

height of instrument (ft): 100.00

notes	omit pt.	distance (ft)	FS (ft)	elevation
Left pin	☑	0	5.79	94.21
	☑	2	6.24	93.76
LBF	☐	4.4	6.78	93.22
LEW	☐	5.85	8.13	91.87
thalweg	☐	7.3	8.26	91.74
mid bar	☐	10	7.85	92.15
	☐	12	8.05	91.95
REW	☐	13.55	8.1	91.9
	☐	15.3	7.81	92.19
	☐	17	7.71	92.29
	☐	19	7.67	92.33
	☐	21.65	7.59	92.41
RBF	☐	23.55	6.92	93.08
	☑	23.75	6.44	93.56
	☑	24.3	5.76	94.24
	☑	26	5.23	94.77
Right bin	☑	28	5.1	94.9
	☐			
	☐			
	☐			
	☐			
	☐			
	☐			
	☐			
	☐			

FS bankfull	FS top of bank	W fpa (ft)	channel slope (%)	Manning's "n"
6.85		26.0	0.36	0.037
93.15	---			

dimensions			
18.2	x-section area	1.0	d mean
19.1	width	19.8	wet P
1.4	d max	0.9	hyd radi
0.0	bank ht	20.0	w/d ratio
26.0	W flood prone area	1.4	ent ratio

hydraulics	
2.3	velocity (ft/sec)
41.4	discharge rate, Q (cfs)
0.21	shear stress ((lbs/ft sq)
0.33	shear velocity (ft/sec)
0.488	unit stream power (lbs/ft/sec)
0.17	Froude number
7.0	friction factor u/u*
11.9	threshold grain size (mm)

check from channel material			
55	measured D84 (mm)		
5.3	relative roughness	7.0	fric. factor
0.037	Manning's n from channel material		