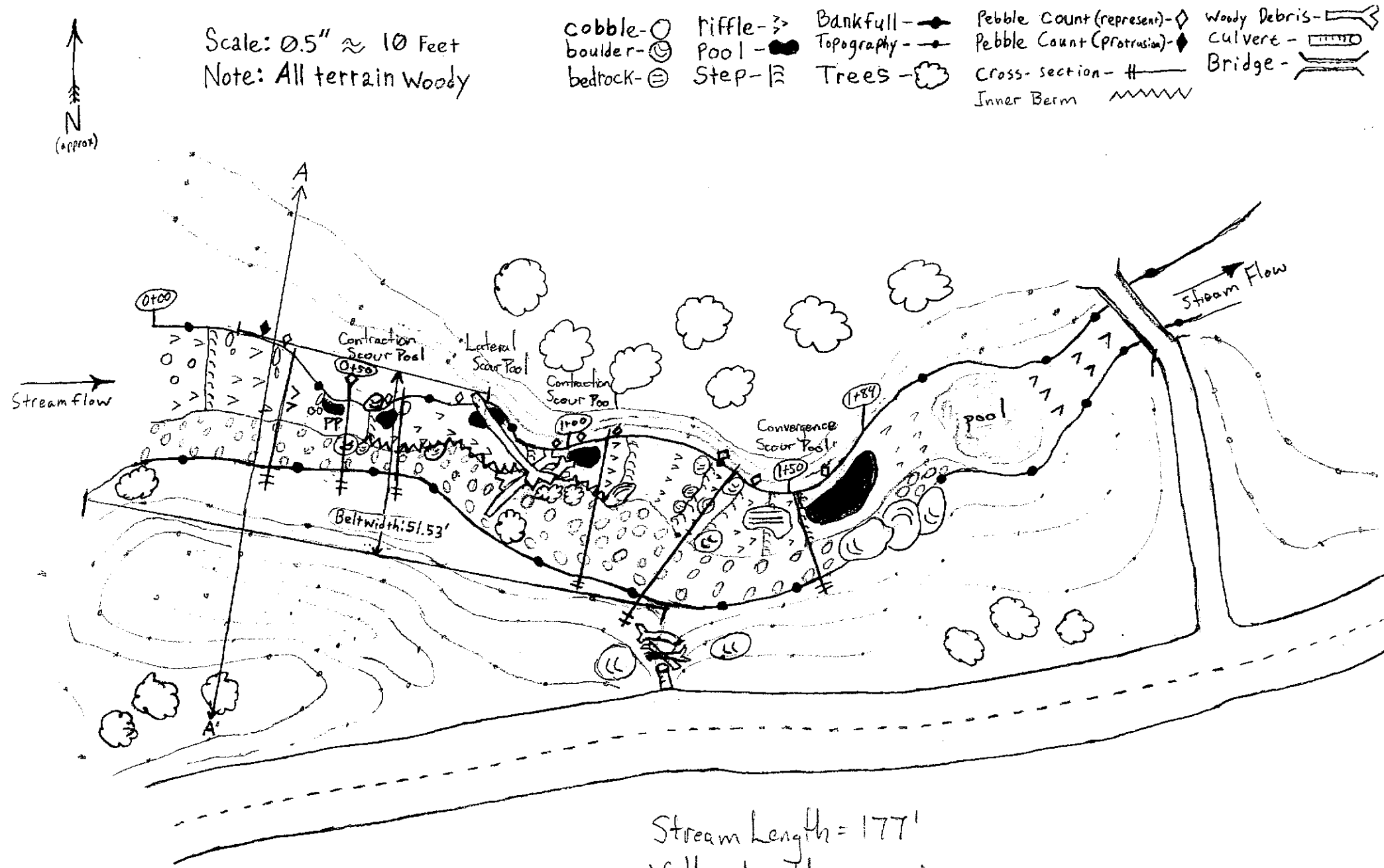
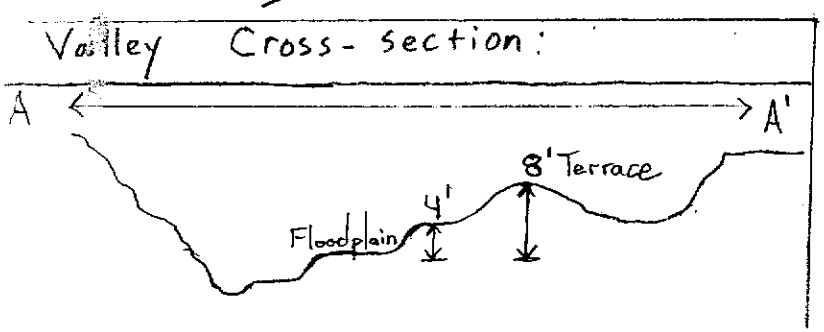
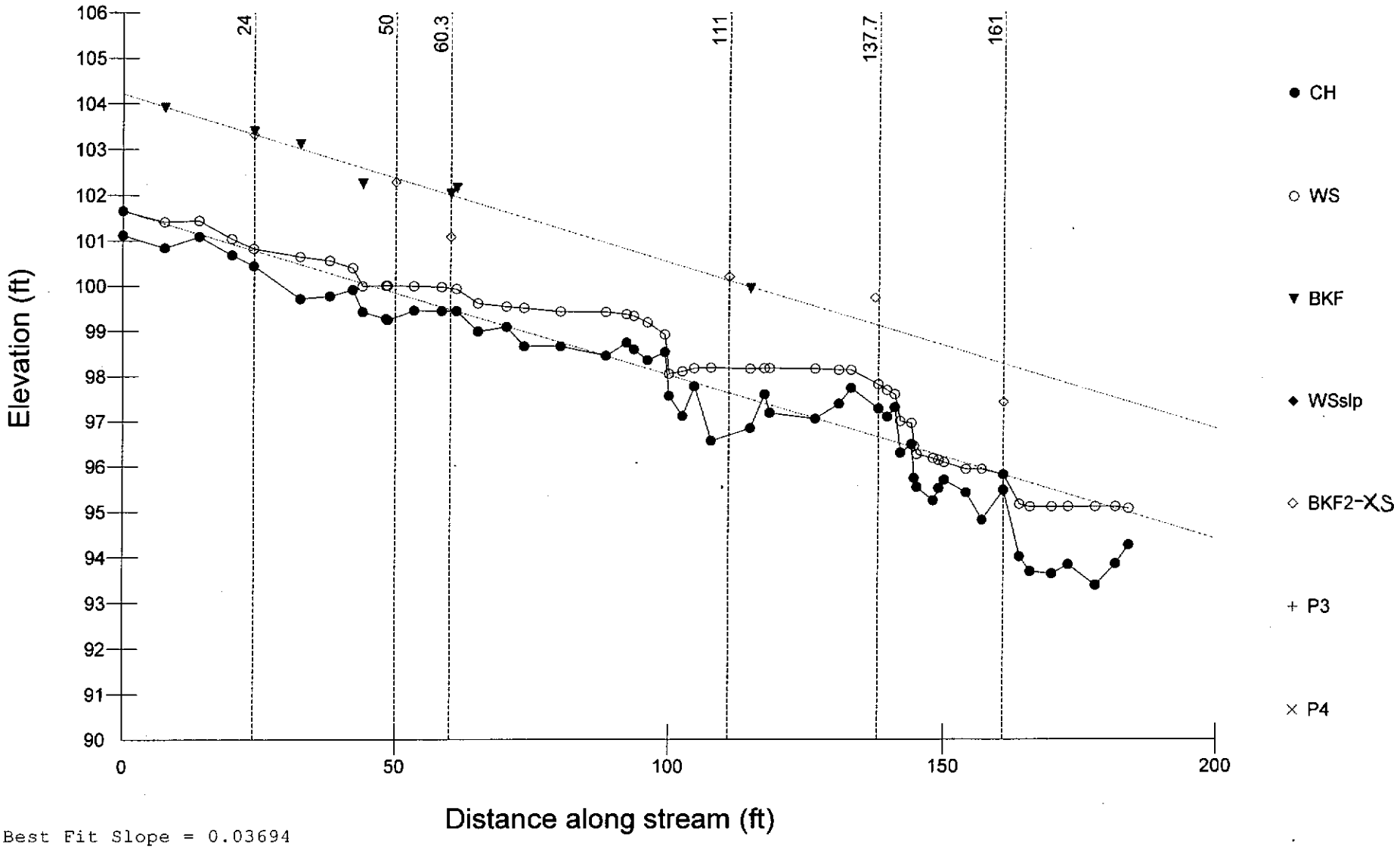




Stream Length = 177'
Valley Length = 166'
Sinuosity = 1.06

Sharman's branch
Washington, County, MD.
April - 19 - 2016
Team 3

Sharmans Branch LP Team 3 2016



BKF Best Fit Slope = 0.03694
WSslp Best Fit Slope = 0.03627

SURVEY DATA ⟹ **CROSS - SECTION** 4

SITE: 1+11 POOL (Site Level) Date:

	Item	STATION ft	B S ft	H I ft	F S ft	Elevation ft	NOTES COMMENTS REMARKS
	1	BM	3.49				
	2	-6.0			1.45	102.04	
	3	-4.5			1.78	101.71	
3.00	4	-3.0			2.19	101.30	
4.00	5	-2.0			2.52	100.97	
5.00	6	-1.0			2.86	100.63	
6.00	7	0.0			3.29	100.20	BKF
	8	0.5			5.54	97.95	EOW Left
	9	1.5			5.74	97.75	
	10	2.9			6.04	97.45	
	11	3.3			6.51	96.98	
	12	4.6			6.85	96.64	Thalweg
	13	6.2			6.62	96.87	
	14	7.9			5.39	98.10	EOW Right
	15	10.4			4.49	99	
	16	13.0			3.76	99.73	
	17	16.0			4.46	99.03	
	18	20.0			4.23	99.26	
	19	23.1			3.92	99.57	
	20	25.9			4.24	99.25	
	21	30.5			5.04	98.45	
	22	34.4			4.10	99.39	
	23	36.0			3.77	99.72	
	24	41.0			3.54	99.95	
	25	44.2			4.00	99.49	
	26	49.7			0.90	102.59	
	27						
	28						
	29						
	30						
	31						

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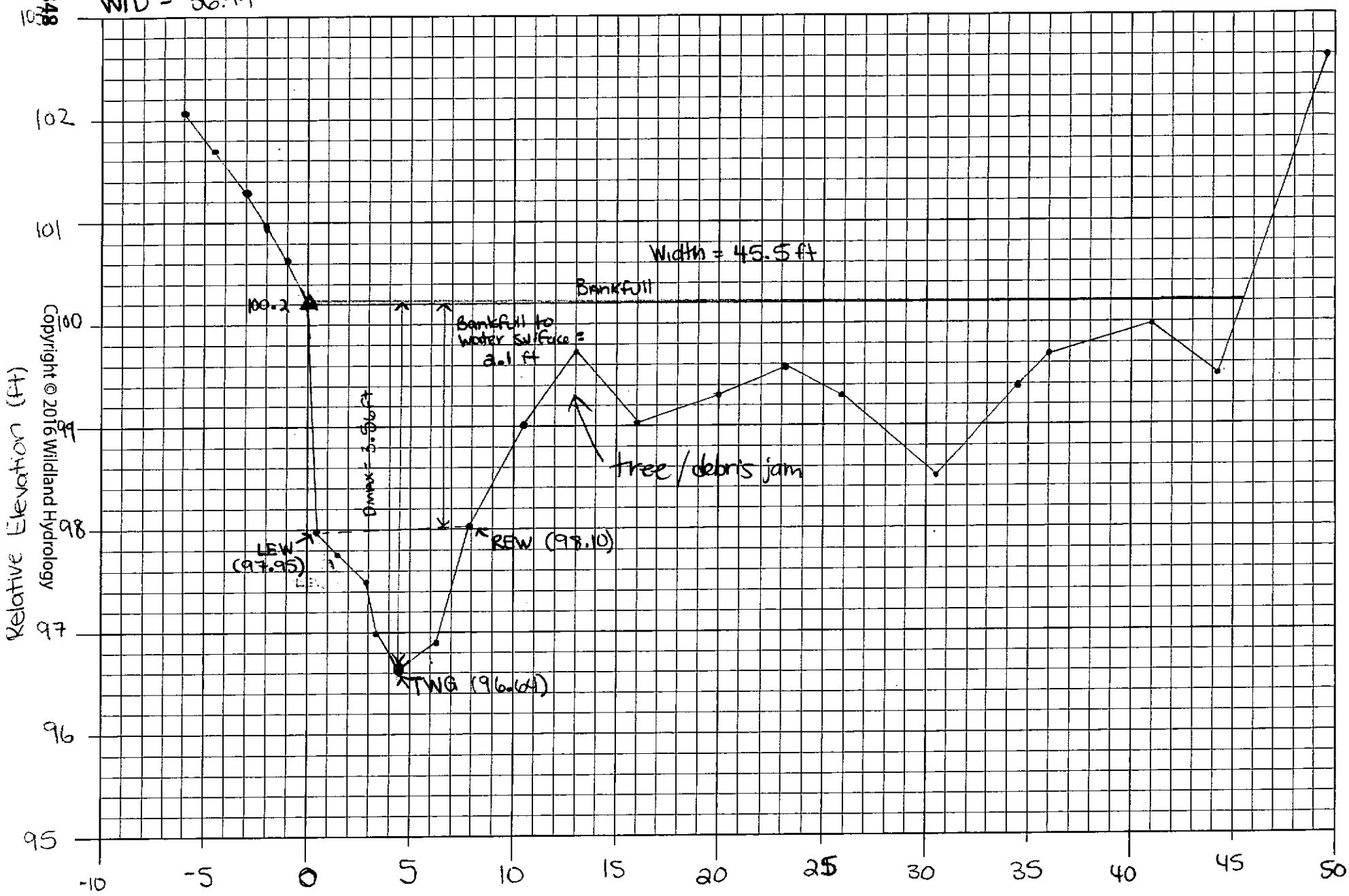
Cross-sectional Area = 55.9 ft²
Mean Depth = 1.23 ft
W/D = 36.99

XS-04. STA 111 ft
Pool

SHARMAN'S BRANCH
19 April 2016
Team 3

• Points Collected
Δ Bankfull
O TWG



Step/Pool

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1+11 Pool

SURVEY DATA ⟹ **CROSS - SECTION** 5

SITE: 1+37.3 Rapid (site level) **Date:**

Item	STATION ft	B S ft	H I ft	F S ft	Elevation ft	NOTES COMMENTS REMARKS
1	BM	3.35				
2	0			2.53	100.82	
3	6.9			2.65	100.70	Slope change
4	9.0			2.99	100.36	"
5	12.0			3.51	99.84	" ~~(BKF)~~
6	13.0			5.24	98.11	"
7	17.7			5.79	97.56	EOW Left 5.91-0.12=5.79
8	19.9			6.27	97.08	Thalweg
9	22.7			6.45	96.9	slope change
10	26.0			6.35	97.0	" "
11	28.2			6.13	97.22	Inner Berm?
12	31.00			6.17	97.18	EOW Right 6.32-0.15=6.17
13	33.00			5.42	97.93	Slope change
14	35.6			6.08	97.27	thalweg of secondary channel.
15	37.7			5.47	97.88	change in slope
16	40.4			3.62	99.73	" BKF
17	41.7			3.23	100.12	"
18	47.1			3.26	100.09	" from here on don't include in cross-sectional
19	51.0			4.70	98.65	" area because there
20	53.7			4.38	98.97	" was a culvert
21	56.9			4.19	99.16	" that
22	60.1			3.41	99.94	"
23	64.1			2.86	100.49	"
24	66.3			1.81	101.54	"
25						
26						
27						
28						
29						
30						
31						

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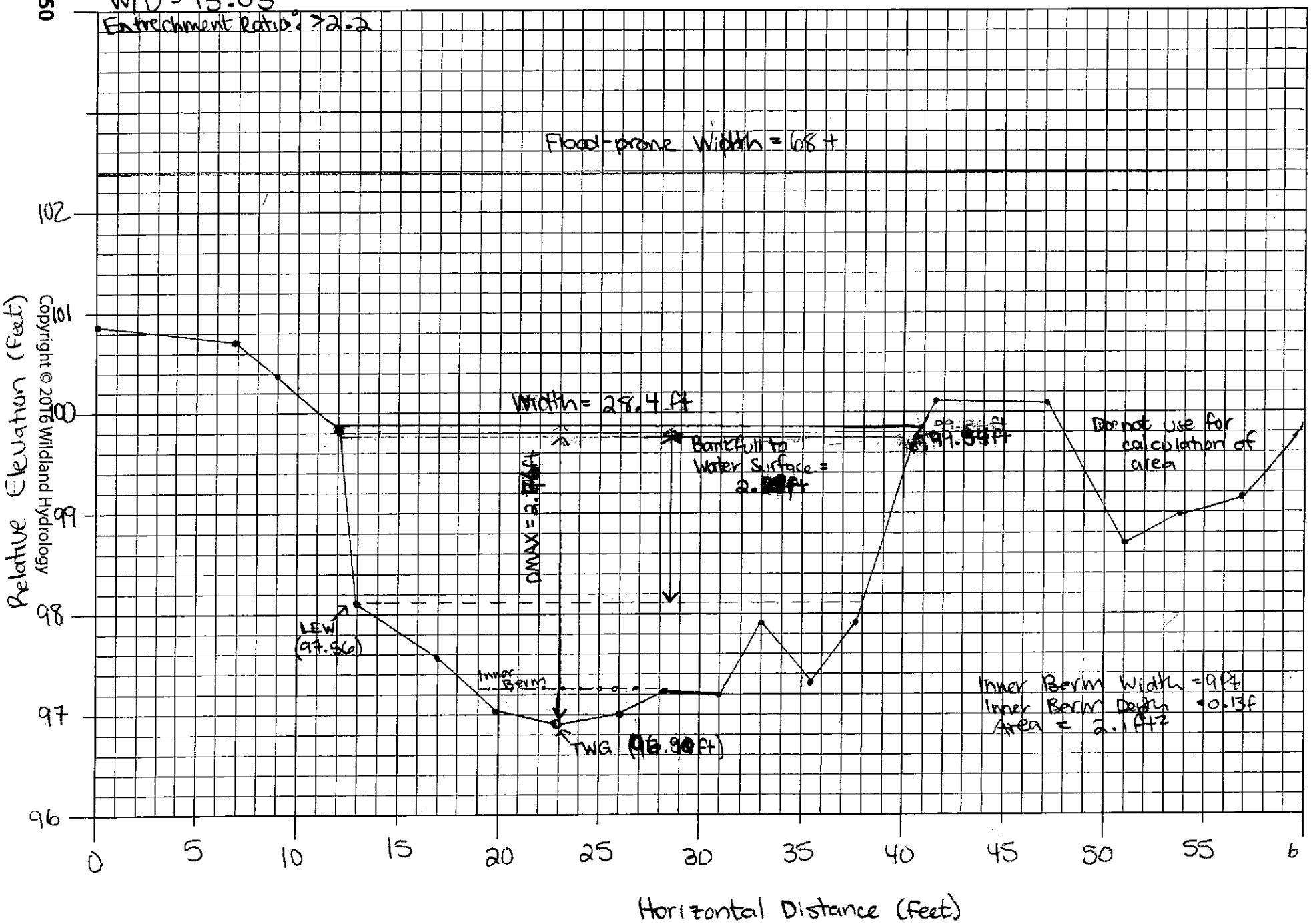
Cross-Sectional Data = 61.7
Mean Depth = 2.18
W/D = 13.03
Entrechment Ratio: >2.2

XS-05 STA 137.7 ft
Rapid

SHARMAN'S BRANCH
19 APRIL 2016
TEAM3



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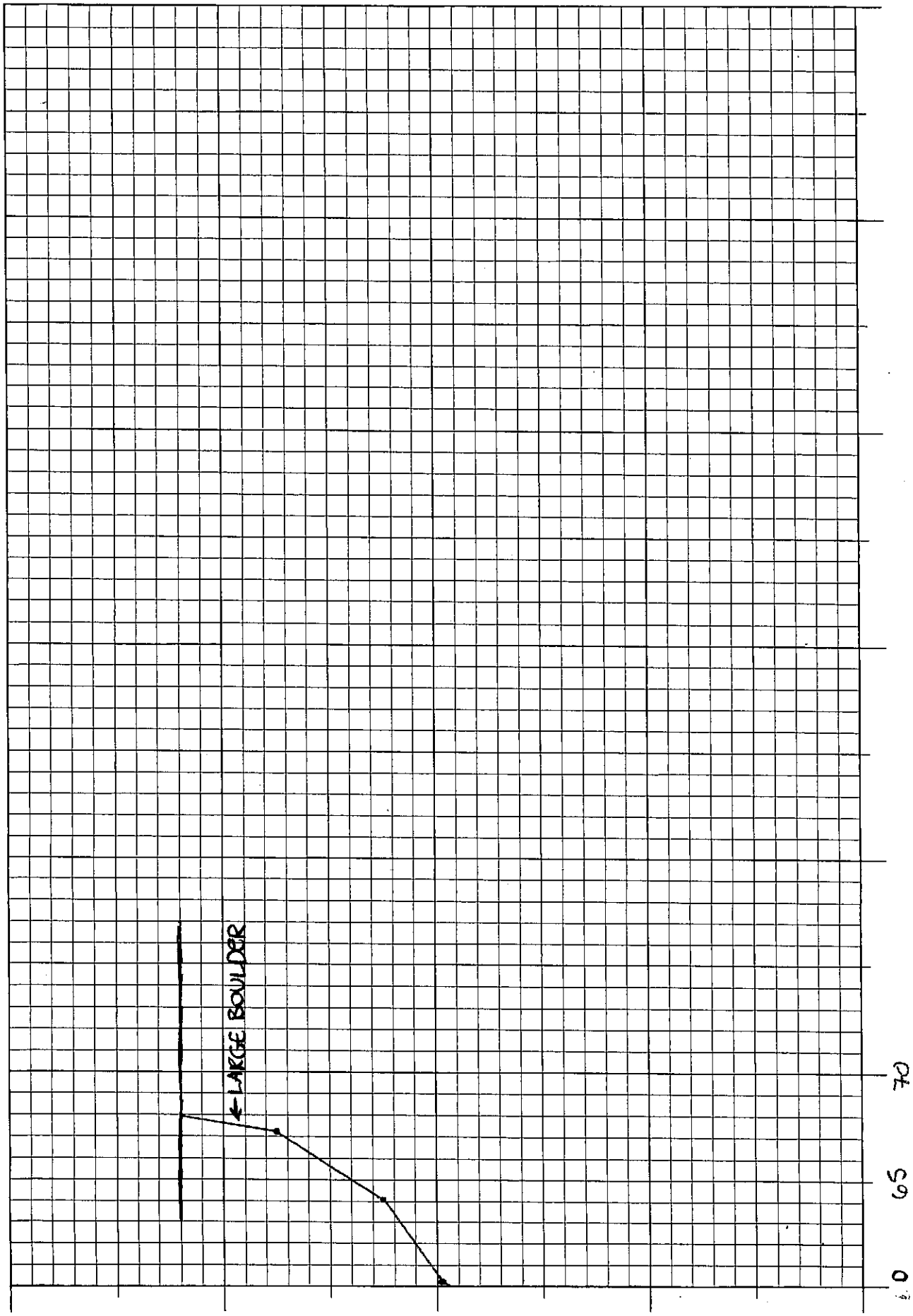

• Points Collected
Δ BankFull
O TWG

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SURVEY DATA ⟹ *CROSS - SECTION* 1

SITE: Date:

Location: XS - Riffle STA 24

Observers: HUC:

XS1 - Riffle - STA 24

Item	Distance, Point, or STATION ft	Back-Sight BS ft	Height of Instrument HI ft	Fore-Sight FS ft	Elevation ft	REMARKS / COMMENTS / NOTES
1	BM	8.5				
2	0+00			6.82	100.68	Start Point
3	~~0.5~~			7.78	100.72	WL → Left Edge of water *Lower than REW
4	1.6			8.26	100.24	Slope change
5	3.4			8.29	100.21*	Slope change -TWG
6	6.5			8.06	100.44	Slope change -
7	8.0			8.12	100.38	Slope change
8	13.5			7.60	100.9	slope change → Inner Berm
9	20.1			7.31	101.2	Right Edge of water *Higher than LEW
10	21.4			7.18	101.32	Slope change
11	23.0			7.28	101.22	Slope change
12	24.4			7.14	101.36	Slope change
13	24.5			6.16	102.34	Slope change
14	25.3			5.98	102.52	Slope change
15	26.7			5.58	102.92	Slope change
16	29.0			5.18	103.32	BKF
17	36.0			4.68	103.82	End of tape
18	47.5			4.06	104.44	Slope
19	51.4			4.16	104.34	Slope change
20	55.5			3.4	105.1	Slope change
21	61.0			1.38	107.12	Slope change
22	27.0			5.55	102.95	BKF ?
23	28.0			5.39	103.11	BKF?
24	-3.0			4.81	103.69	Slope change
25	-5.0			2.88	105.62	Slope change
26	~~BM~~	~~8.52~~				
27	~~27.0~~			~~5.55~~		
28	~~28.0~~			~~5.37~~		
	~~29.00~~			~~5.18~~		

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SURVEY DATA ⟹ **CROSS - SECTION** #2

SITE: 50 ~~Riffle~~ Pool (Site level) Date:

Item	STATION ft	BS ft	HI ft	FS ft	Elevation ft	NOTES COMMENTS REMARKS
1	BM	4.04	104.04		100.00	
2	~~50~~ 0			2.09	101.95	
3	1.9			3.05	100.99	Δ slope (BKF?)
4	4.0			4.21	99.83	Δ slope
5	5.2			~~4.15~~ ~~4.22~~ 4.05	99.99	LEW use this (4.20 - .15 cut = WS)
6	7.5			4.78	99.26	Δ slope
7	10.0			4.47	99.57	
8	12.0			4.21	99.83	
9	14.5			4.70	99.34	Thalweg
10	17.3			~~3.93~~ 4.05	99.99	REW use this (4.15 - 0.10 cut = WS)
11	21.3			3.37	100.67	Δ slope
12	25.3			~~2.8~~ 2.77	101.27	Δ slope
13	27.6			1.76	102.28	(BKF?)
14	28.6			1.70	102.34	
15	42.3			0.54	103.50	
16	47.8			0.25	104.79	
17						
18						
19						
20						
21						
22						
23						
24						
25						
26						
27						
28						
29						
30						
31						

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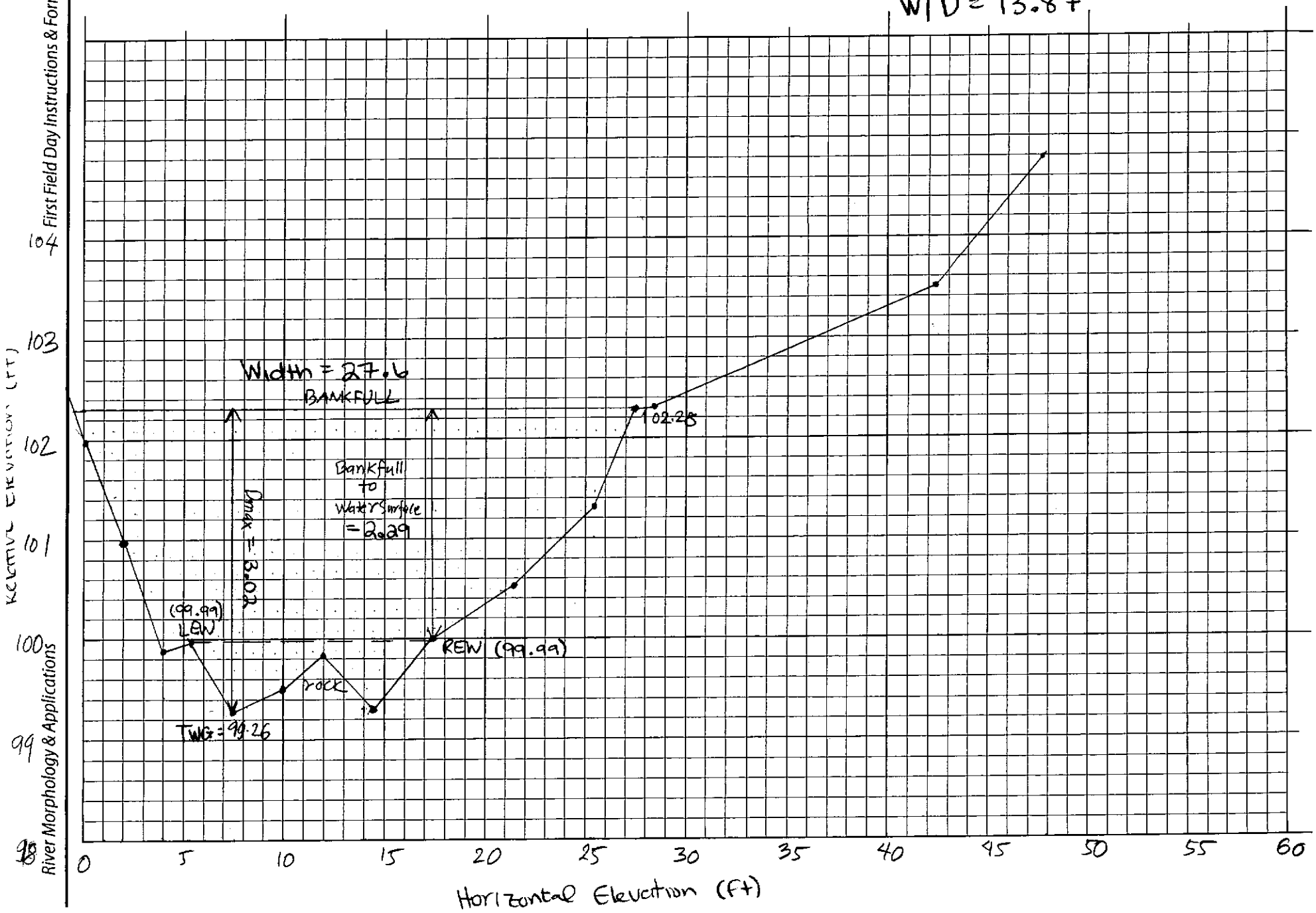
XS -02 STA 50 FT
POOL

SHARMAN'S BRANCH
19, APRIL 2016
Team 3

Cross-sectional Area = 55 ft2
~~Mean~~ Depth = 1.99 ft
W/D = 13.87



Area = 265 ft²

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SURVEY DATA ⟹ **CROSS - SECTION** 3

SITE: Sharman Branch King Laser **Date:** 4-19-2016

Location: LP Station # 60.3 (Step) → (Laser level)

Observers: **HUC:**

Item	Distance, Point, or STATION ft	Back-Sight BS ft	Height of Instrument HI ft	Fore-Sight FS ft	Elevation ft	REMARKS / COMMENTS / NOTES
1		7.92	107.92			
2	0.9			6.55	101.37	Boulder face
3	3.0			6.55	101.37	Boulder face
4	4.0			6.59	101.33	Boulder face
5	4.5			7.95	99.97	drop onto boulder face
6	6.0			7.90	100.02	Boulder face
7	7.5			8.4	99.52	Boulder face
8	10.0			7.65	100.27	Boulder face
9	10.6			8.01	99.88	LEW Left Edge Water
10	10.7			8.57	99.35	Thalweg
11	11.3			8.44	99.48	
12	12.6			8.10	99.82	Stream bottom
13	13.5			8.31	99.61	Stream bottom
14	14.9			8.03	99.89	Stream bottom
15	15.6			8.03	99.89	Right Edge Water REW
16	16.9			7.64	100.28	Top of bank drop
17	18.0			7.46	100.46	Deposition
18	19.4			7.14	100.78	Top of Deposition (slope break
19	19.7			7.12	100.80	Top of Deposition
20	26			5.89	102.03	Top of slope break - ~~Bankfull~~
21	28.5			5.63	102.29	
22	30.2			5.42	102.5	
23	33			5.08	102.84	
24	36.3			4.80	103.12	
25	19.7			7.12	100.80	
26	23.2			6.84	101.08	Bankful
27	27.1			5.83	102.09	Deposition - flat
28						(flat from 26 to 27.1

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SHARMAN'S BRANCH XS-03 STA 60.3 FT

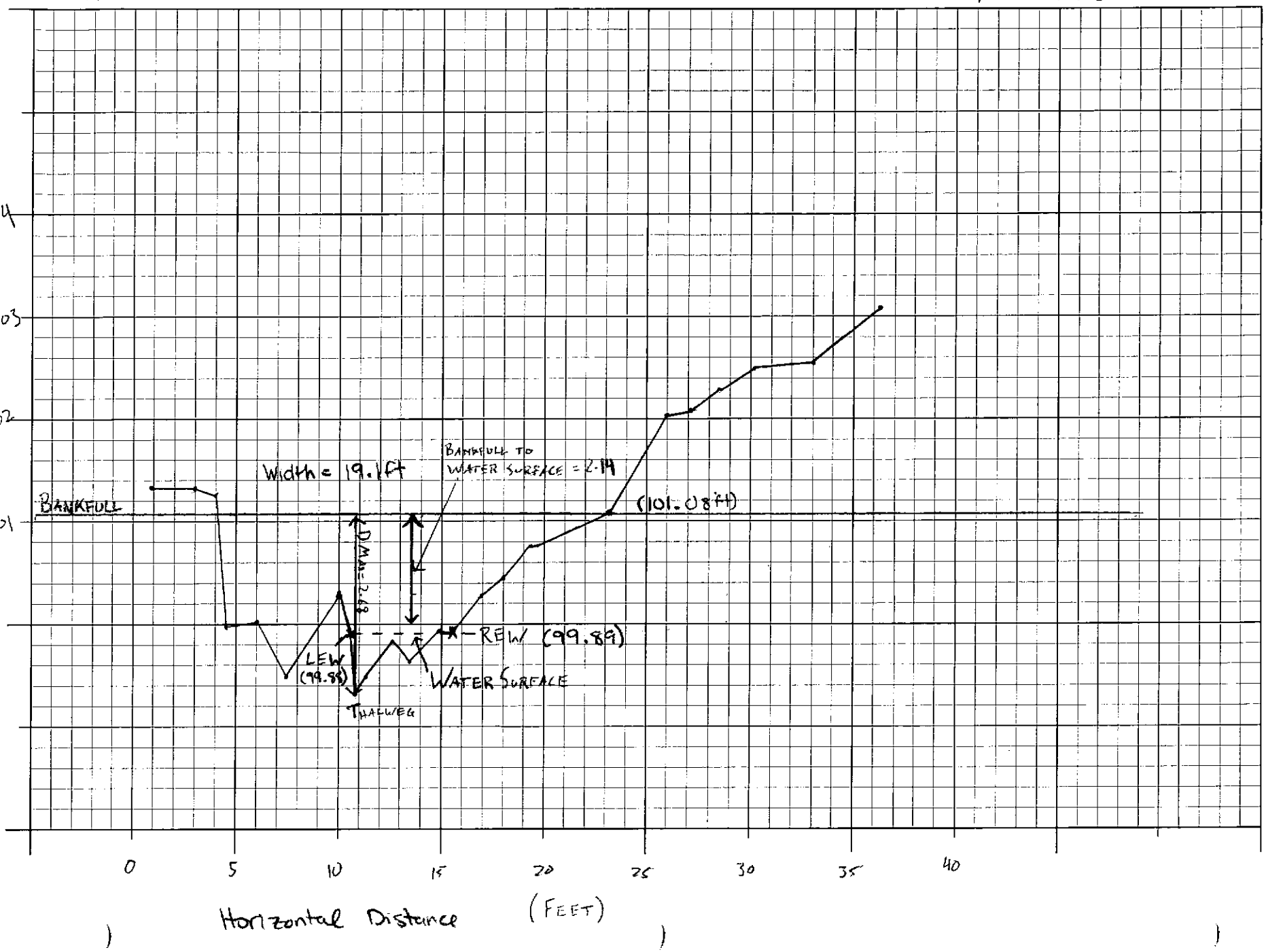
19 APRIL 2016 LP STATION 60.3 ft STEP

TEAM 3 STEP

Cross-sectional Area = 39.2 ft²

Mean Depth = 1.56

W/D = 12.24



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SURVEY DATA ⟹ **CROSS - SECTION** 06

SITE: Sharman Branch - using laser **Date:** 4-19-2016

Item	STATION ft	BS ft	HI ft	FS ft	Elevation ft	NOTES COMMENTS REMARKS
1		7.92	107.92			LP Station 161 ft (Step)
2	0			8.17	99.75	
3	1.2			8.41	99.51	Top of Break / Slope change
4	3.9			9.57	98.35	Bottom of Slope
5	8.2			9.96	97.96	Top of Point / Break in Slope
6	9.6			10.31	97.61	Point on Slope Break
7	10.6			10.89	97.03	Point on Slope Break
8	11.8			11.29	96.63	Point on Slope Break
9	12.3			11.64	96.28	Bottom of Slope
10	13.5			12.50	95.42	LEW
11	15.0			12.70	95.22	Channel Point
12	16.3			12.60	95.32	channel point - cobble
13	18.1			12.10	95.82	Channel point cobble
14	19.2			12.60	95.32	Change in Slope
15	20.6			11.96	95.96	Boulder in channel
16	23.0			12.71	95.21	Thalweg
17	23.7			12.64	95.28	Flat point in channel
18	25.4			12.70	95.22	Flat point in channel
19	26.2			12.15	95.77	REW / Transverse Riff
20	28.0			11.75	96.17	Jumped up on boulders
21	29.0			10.34	97.58	Top of boulder
22	32.1			10.97	96.95	Slopes down from boulder face
23	35.0			10.98	96.94	Cobble and mix - Clay
24	37.6			10.43	97.49	Start upslope
25	39.1			10.00	97.92	Slope flattens
26	41.4			9.78	98.14	Slope face
27	43.00			9.52	98.40	Slope face
28	44			6.57	101.35	Boulder
29	10.3			10.50	97.42	Bankfull - Left *
30						
31						

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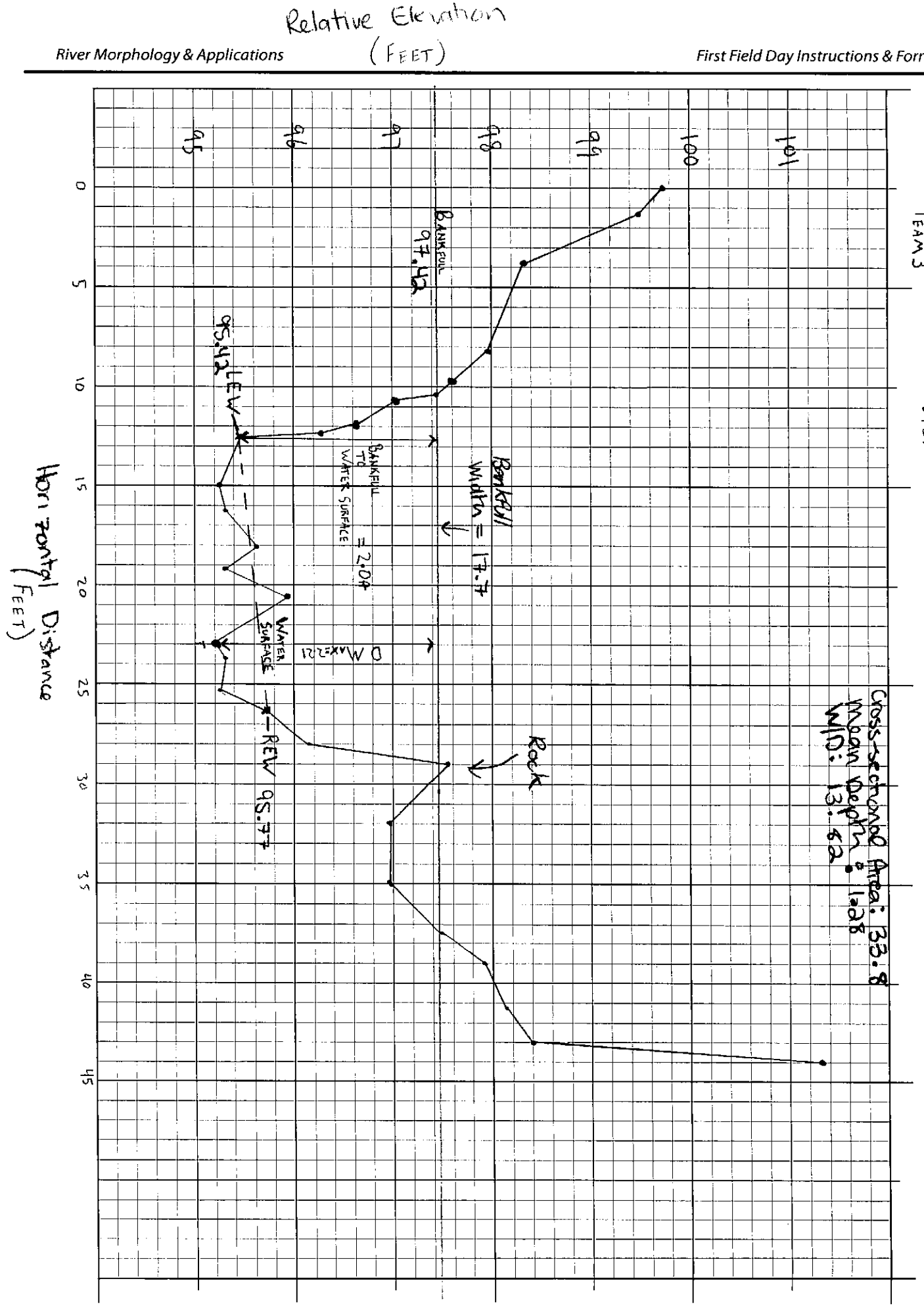

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SURVEY DATA → LONGITUDINAL PROFILE 1

SITE: Sharman Creek **Date:** 4/19/2015

Location: Team 3

Observers: Beth, Emily, Preston **HUC:**

	Distance, Point, or STATION ft	Back-Sight BS ft	Height of Instrument HI ft	Thalweg Fore-Sight FS ft	Thalweg Elevation Elev. ft	Water Surface Fore-Sight FS ft	Water Surface Elevation Elev. ft	Bankfull Fore-Sight FS ft	Bankfull Elevation Elev. ft	Low Bank HI Fore-Sight FS ft	Low Bank HI Elevation Elev. ft	NOTES e.g. Riffle Run Pool Glide	
1		7.93	107.93										WS/BF
2	0			6.81	101.12	6.28	101.65					t. rapid	
3	7.7			7.09	100.84	6.52	101.41	4.02?	103.91			rapid	2.5
4	14			6.84	101.09	6.49	101.44					rapid.	
5	20			7.25	100.68	6.89	101.04					rapid	
6	24			7.49	100.44	7.11	100.82	4.54	103.39			rapid	1 XS; transverse bar 2.57
7	32.5			8.22	99.71	7.29	100.64	4.82	103.11			rapid	2.47 rapid
8	38			8.16	99.77	7.38	100.55					rapid	
9	42.2			8.02	99.91	7.54	100.39					rapid	
10	44			8.51	99.42	7.94	99.99					bot. rap	
11	48.3			8.66	99.27	[illegible]	100.3	5.68	102.25			pool?	2.25 STN 50 POOL; sandy says no!
12	48.6			8.69	99.24	7.93	100					mid-pool	dave says yes!
13	53.4			8.48	99.45	7.94	99.99					rapid?	
14	58.4			8.49	99.44	7.96	99.97					rapid	
15	61.1			8.49	[illegible]	8.00	99.93	5.77	102.16			rapid	2.33
16	65			8.94	98.99	8.32	99.61					rapid w side pool	★ start of debris jam influence start to lose bkf
17	70.2			8.84	99.09	8.39	99.54					r	
18	73.4			9.27	98.66	8.42	99.51					r	
19	80			9.27	98.66	8.50	99.43					lateral scour pool	
20	88.3			9.48	98.45	8.51	99.42					Pool	
21	92.1			9.18	98.74	8.56	99.37					top of R	
22	93.5			9.34	98.59	8.60	99.33					R	
23	96			9.58	98.35	8.74	99.19					R	
24	99.2			9.40	98.53	9.01	98.92					Top of step	
25	100			10.37	97.56	9.88? → plunge pool / white water						bm of step	
26	102.5			10.82	97.11	9.83	98.1					plunge pool	
27	104.7			10.16	97.77	9.76	98.17					top of pool	

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Stn 0+24

SURVEY DATA → LONGITUDINAL PROFILE 2

SITE: Sharman Creek **Date:** 4/19/16

Location:

Observers: Team 3 Preston, Beth, Emily **HUC:**

	Distance, Point, or STATION (ft)	Back-Sight BS (ft)	Height of Instrument HI (ft)	Thalweg Fore-Sight FS (ft)	Thalweg Elevation Elev. (ft)	Water Surface Fore-Sight FS (ft)	Water Surface Elevation Elev. (ft)	Bankfull Fore-Sight FS (ft)	Bankfull Elevation Elev. (ft)	Low Bank HI Fore-Sight FS (ft)	Low Bank HI Elevation Elev. (ft)	NOTES e.g. Riffle Run Pool Glide
28	107.8		107.93	11.37	96.56	9.75	98.18					Pool
29	114.8		11	11.09	96.84	9.77	98.16	7.99	99.94			flagged BKF pool
30	117.4			10.34	97.59	9.76	98.17					pool
31	118.3			10.75	97.18	9.76	98.17					pool
32	126.5			10.88		9.77						pool
33	130.8			10.55		9.80						g?
34	133			10.20		9.80						end of p top of r
35	138			10.66		10.12						r
36	139.6			10.84		10.25						r
37	141			10.63		10.34						top of step
38	142			11.64		10.94						bot step
39	144			11.45		10.98						r
40	144.5			12.2		11.49						r
41	145			12.4		11.67						r
42	148			12.69		11.76						p?
43	149			12.42		11.8						p?
44	150.8			12.24		11.85						
45	154			12.52		12.00						
46	157			13.12		12.00						
47	161			12.46		12.12						riffle
48	164			13.92		12.77						pool
49	166			14.25		12.83						poo
50	170			14.3		12.83						pool
51	178			14.1		12.83						pool
52	178.8			14.55		12.83						pool
53	181.6			14.08		12.83						pool
54	184			13.67		12.87						b. of pool

BKF to water 5 1.78

XS3 Stn 111 POOL

Stn 161 step XS

XS

flow splits here

Rapid w/ pools?

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SURVEY DATA ⟶ **LONGITUDINAL PROFILE 3**

SITE: Sharmans Team 3 Date:

Location:

Observers: HUC:

	Distance, Point, or STATION ft	Back-Sight BS ft	Height of Instrument HI ft	Thalweg Fore-Sight FS ft	Thalweg Elevation Elev. ft	Water Surface Fore-Sight FS ft	Water Surface Elevation Elev. ft	Bankfull Fore-Sight FS ft	Bankfull Elevation Elev. ft	Low Bank HI Fore-Sight FS ft	Low Bank HI Elevation Elev. ft	NOTES e.g. Riffle Run Pool Glide	
55	28					6.75		4.76					WS-BF 1.99
56	43.8					7.83		5.63					2.21
XS 57	60.4					8.07		5.65					2.42
58	114					9.75		7.23					2.02
59													
60													
61													
62													
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80													
81													

137.3

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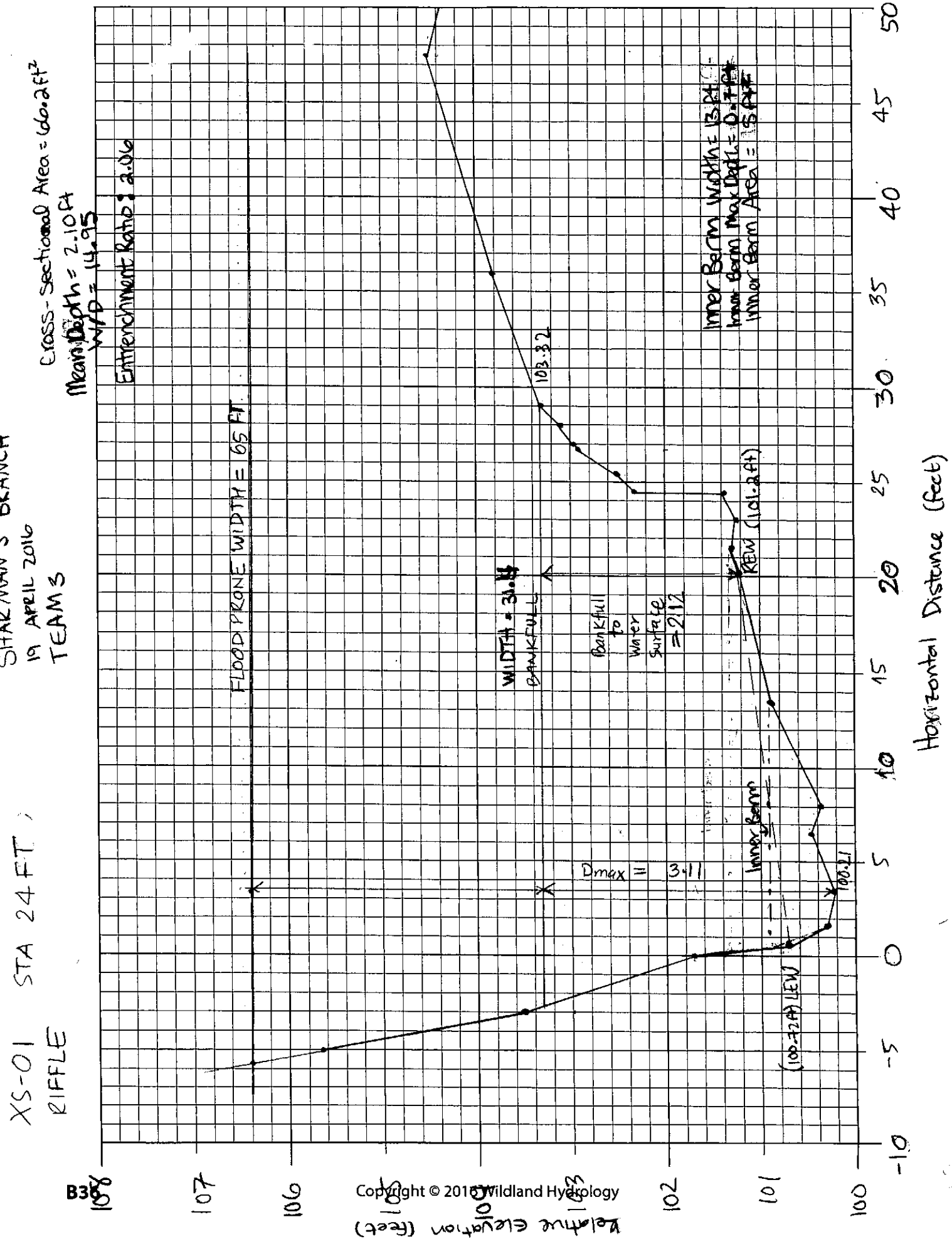

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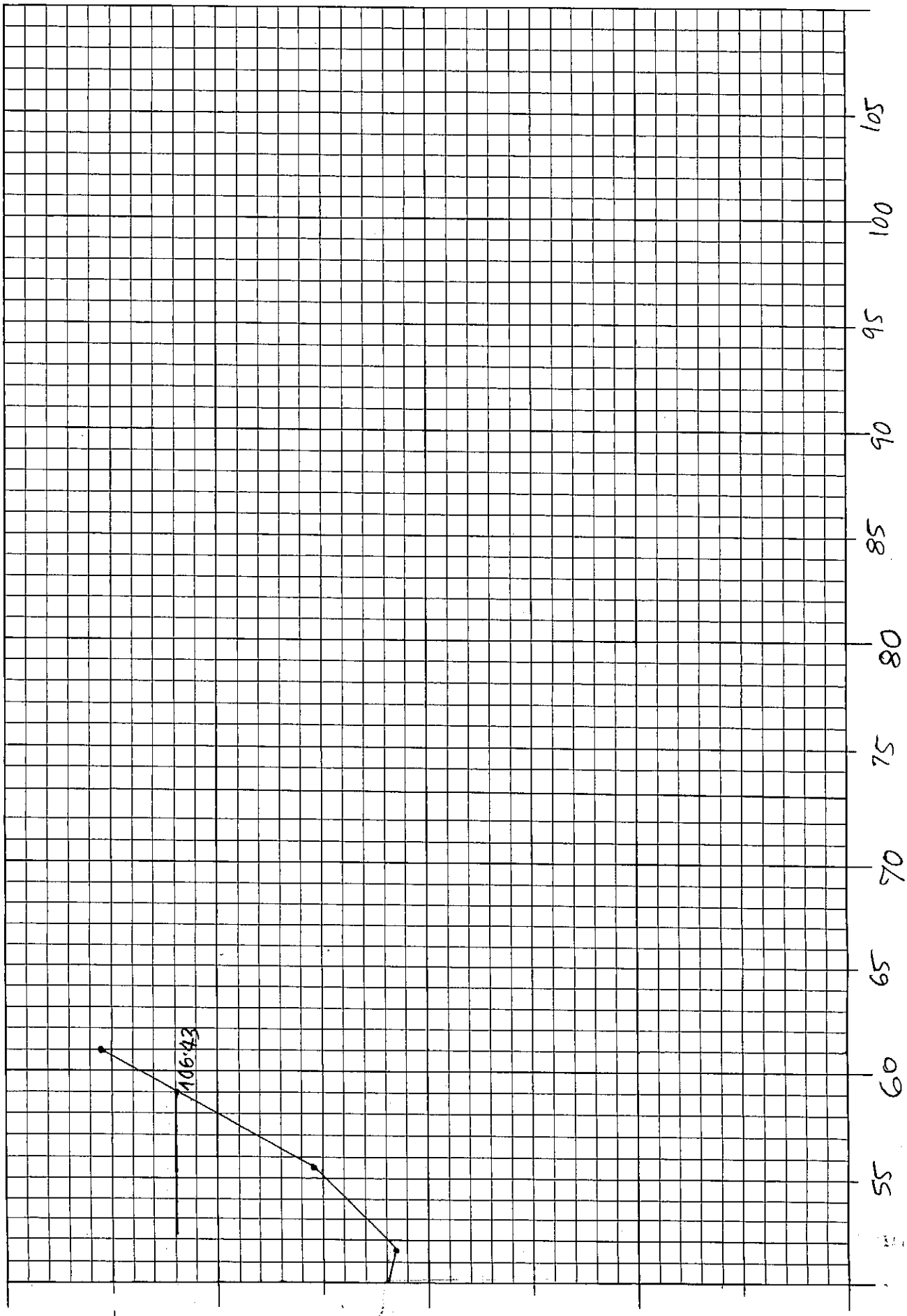

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Site: Sharman Creek

Location: X-Sect 24' HUC:

Observers: TEAM 3

Inches	PARTICLE	Millimeters		Dot Count for RIFFLE 1	POOL 2	COMP. 3	RIFFLE (1) TOT #	ITEM %	% CUM	POOL (2) TOT #	ITEM %	% CUM	COMPOSITE (3) TOT #	ITEM %	% CUM
							Reach:			Reach:			Reach:		
							Date:			Date:			Date:		
	Silt / Clay	< .062	S/C												
	Very Fine	.062 - .125	SAND												
	Fine	.125 - .25													
	Medium	.25 - .50													
	Coarse	.50 - 1.0													
.04 - .08	Very Coarse	1.0 - 2													
.08 - .16	Very Fine	2 - 4	GRAVEL												
.16 - .22	Fine	4 - 5.7													
.22 - .31	Fine	5.7 - 8													
.31 - .44	Medium	8 - 11.3													
.44 - .63	Medium	11.3 - 16													
.63 - .89	Coarse	16 - 22.6													
.89 - 1.3	Coarse	22.6 - 32													
1.3 - 1.8	Very Coarse	32 - 45					1	.01	.01						
1.8 - 2.5	Very Coarse	45 - 64					7	.07	.08						
2.5 - 3.5	Small	64 - 90	COBBLE				19	.19	.27						
3.5 - 5.0	Small	90 - 128					23	.23	.5						
5.0 - 7.1	Large	128 - 180					21	.21	.71						
7.1 - 10.1	Large	180 - 256					19	.19	.90						
10.1 - 14.3	Small	256 - 362	BOULDER				10	.1	100						
14.3 - 20	Small	362 - 512													
20 - 40	Medium	512 - 1024													
40 - 80	Large-Vry Large	1024 - 2048													
	Bedrock		BDRK												
						TOTAL→	100								

Stream Type: **Landscape Type:**

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Site: Sherman Creek

Location: X-Sect Sta 137 HUC:

Observers: Team 3

Inches	PARTICLE	Millimeters		Dot Count for RIFFLE 1	POOL 2	COMP. 3	RIFFLE (1) TOT #	ITEM %	% CUM	POOL (2) TOT #	ITEM %	% CUM	COMPOSITE (3) TOT #	ITEM %	% CUM
							Reach:			Reach:			Reach:		
							Date:			Date:			Date:		
	Silt / Clay	< .062	S/C												
	Very Fine	.062 - .125	SAND												
	Fine	.125 - .25													
	Medium	.25 - .50													
	Coarse	.50 - 1.0													
.04 - .08	Very Coarse	1.0 - 2													
.08 - .16	Very Fine	2 - 4	GRAVEL												
.16 - .22	Fine	4 - 5.7													
.22 - .31	Fine	5.7 - 8													
.31 - .44	Medium	8 - 11.3													
.44 - .63	Medium	11.3 - 16													
.63 - .89	Coarse	16 - 22.6													
.89 - 1.3	Coarse	22.6 - 32													
1.3 - 1.8	Very Coarse	32 - 45													
1.8 - 2.5	Very Coarse	45 - 64					4	.05	.05						
2.5 - 3.5	Small	64 - 90	COBBLE				6	.07	.12						
3.5 - 5.0	Small	90 - 128					11	.13	.25						
5.0 - 7.1	Large	128 - 180					25	.30	.55						
7.1 - 10.1	Large	180 - 256					14	.17	.72						
10.1 - 14.3	Small	256 - 362	BOULDER				14	.20	.92						
14.3 - 20	Small	362 - 512					3	.04	.96						
20 - 40	Medium	512 - 1024					3	.04	1.00						
40 - 80	Large-Vry Large	1024 - 2048													
	Bedrock		BDRK												
Stream Type:			**Landscape Type:**			TOTAL→	82		100						

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Site: Representative Pebble Count

Location: Sherman's Branch HUC:

Observers: AJ. & Alan Team 3

Inches	PARTICLE	Millimeters		Dot Count for RIFFLE 1	POOL 2	COMP. 3	RIFFLE (1) TOT #	ITEM %	% CUM	POOL (2) TOT #	ITEM %	% CUM	COMPOSITE (3) TOT #	ITEM %	% CUM
				Reach:			Reach:			Reach:			Reach:		
				Date: 4/19/16			Date: 4/19/16			Date: 4/19/16					
	Silt / Clay	< .062	S/C	11	1	3	2	2.8%	2.8	1	3.4%	3.4	3	3%	3
	Very Fine	.062 - .125	SAND				0	0	2.8	0	0	3.4	0	0	3
	Fine	.125 - .25					0	0	2.8	0	0	3.4	0	0	3
	Medium	.25 - .50					0	0	2.8	0	0	3.4	0	0	3
	Coarse	.50 - 1.0					0	0	2.8	0	0	3.4	0	0	3
.04 - .08	Very Coarse	1.0 - 2		1		1	1	1.4	4.2	0	0	3.4	1	1	4
.08 - .16	Very Fine	2 - 4	GRAVEL		11	2	0	0	4.2	2	6.9	10.3	2	2	6
.16 - .22	Fine	4 - 5.7		11	111	5	2	2.8	7.0	3	10.3	20.6	5	5	11
.22 - .31	Fine	5.7 - 8		1	1	2	1	1.4	8.4	1	3.4	24.0	2	2	13
.31 - .44	Medium	8 - 11.3		11111	1	8	7	10.0	18.4	1	3.4	27.4	8	8	21
.44 - .63	Medium	11.3 - 16		1111	11	6	4	5.6	24.0	2	6.9	34.3	6	6	27
.63 - .89	Coarse	16 - 22.6		11	11	4	2	2.8	26.8	2	6.9	41.2	4	4	31
.89 - 1.3	Coarse	22.6 - 32		1	1	2	1	1.4	28.2	1	3.4	44.6	2	2	33
1.3 - 1.8	Very Coarse	32 - 45		11111 11111	11	12	10	14.1	42.3	2	6.9	51.5	12	12	45
1.8 - 2.5	Very Coarse	45 - 64		11111 11111 11	11	14	12	16.9	59.2	2	6.9	58.4	14	14	59
2.5 - 3.5	Small	64 - 90	COBBLE	11111 11111 1	1111	15	11	15.5	74.7	4	13.8	72.2	15	15	74
3.5 - 5.0	Small	90 - 128		1111	1111	9	5	7.0	81.7	4	13.8	86.0	9	9	83
5.0 - 7.1	Large	128 - 180		1111	11	6	4	5.6	87.3	2	6.9	92.9	6	6	89
7.1 - 10.1	Large	180 - 256		1		1	1	1.4	88.7	0	0	92.9	1	1	90
10.1 - 14.3	Small	256 - 362	BOULDER	1		1	1	1.4	90.1	0	0	92.9	1	1	91
14.3 - 20	Small	362 - 512		1		1	1	1.4	91.5	0	0	92.9	1	1	92
20 - 40	Medium	512 - 1024		11		2	2	2.8	94.3	0	0	92.9	2	2	94
40 - 80	Large-Vry Large	1024 - 2048		11		2	2	2.8	97.1	0	0	92.9	2	2	96
	Bedrock		BDRK	11	11	4	2	2.8	99.9	2	6.9	99.8	4	4	100
Stream Type:			**Landscape Type:**			TOTAL→	71			29			100		

STA 24 B
50
76
98
129 B
138 B
30

STA 67 B
111 B
155

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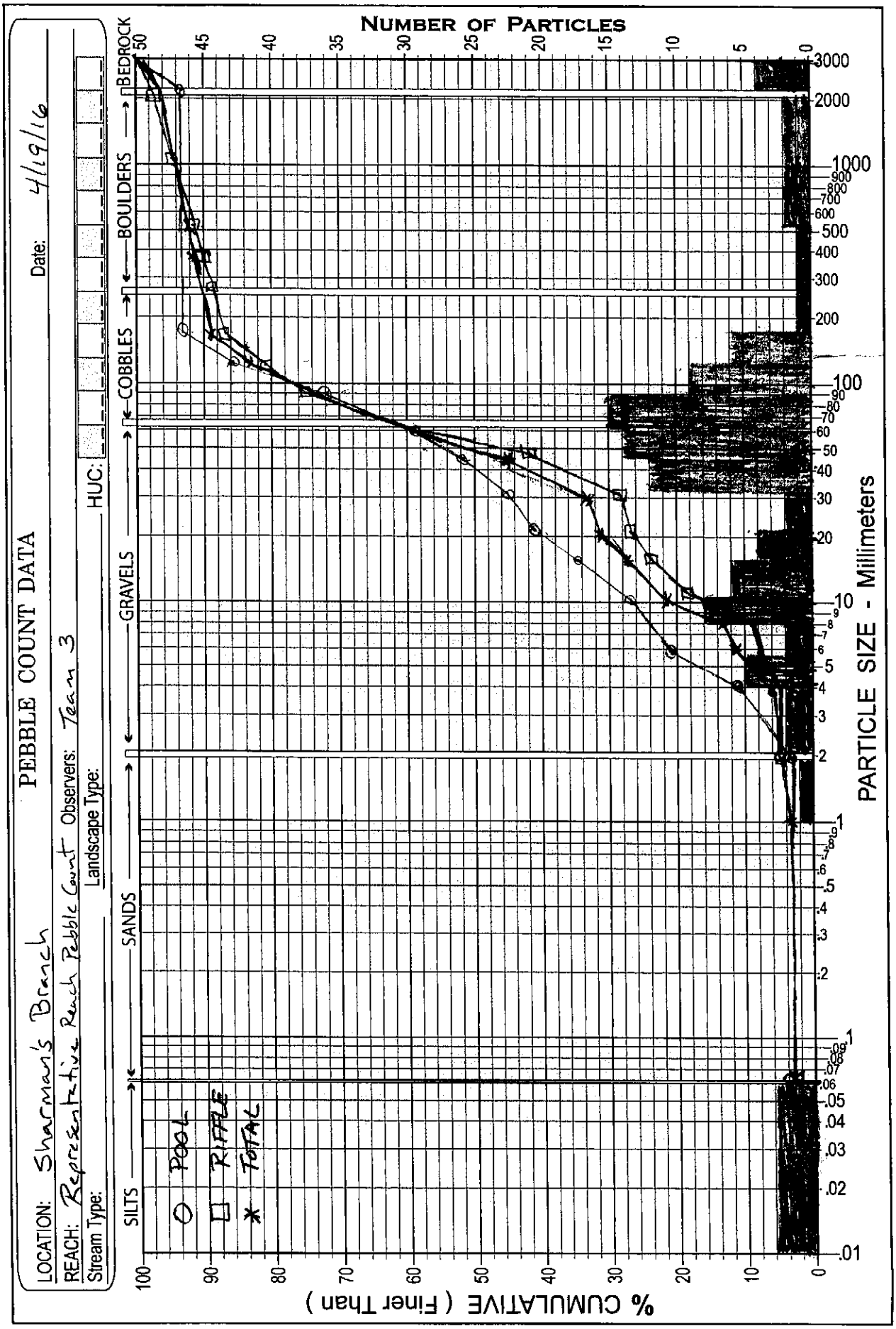

$D_{84} = 150$
$D_{50} = 48$

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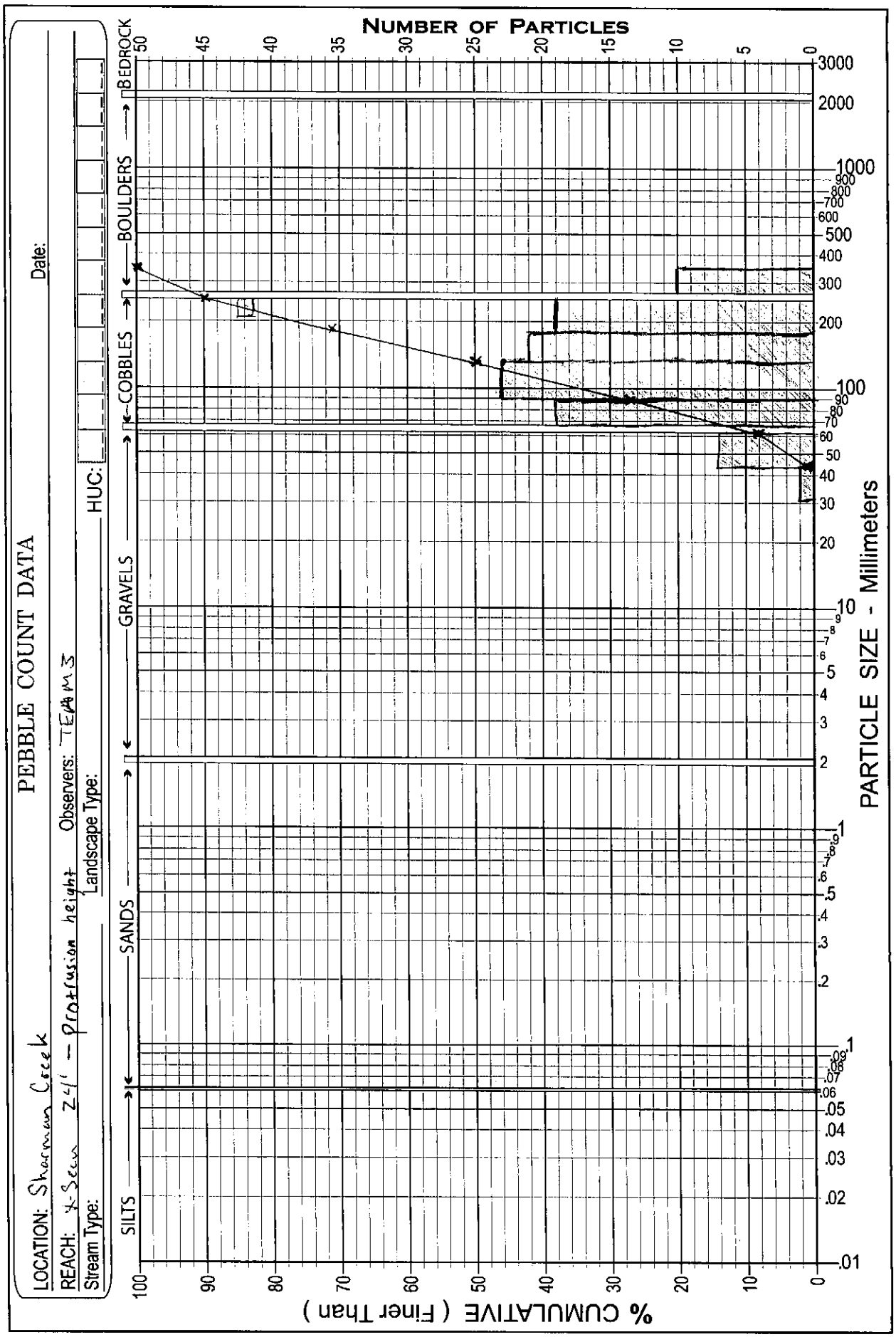
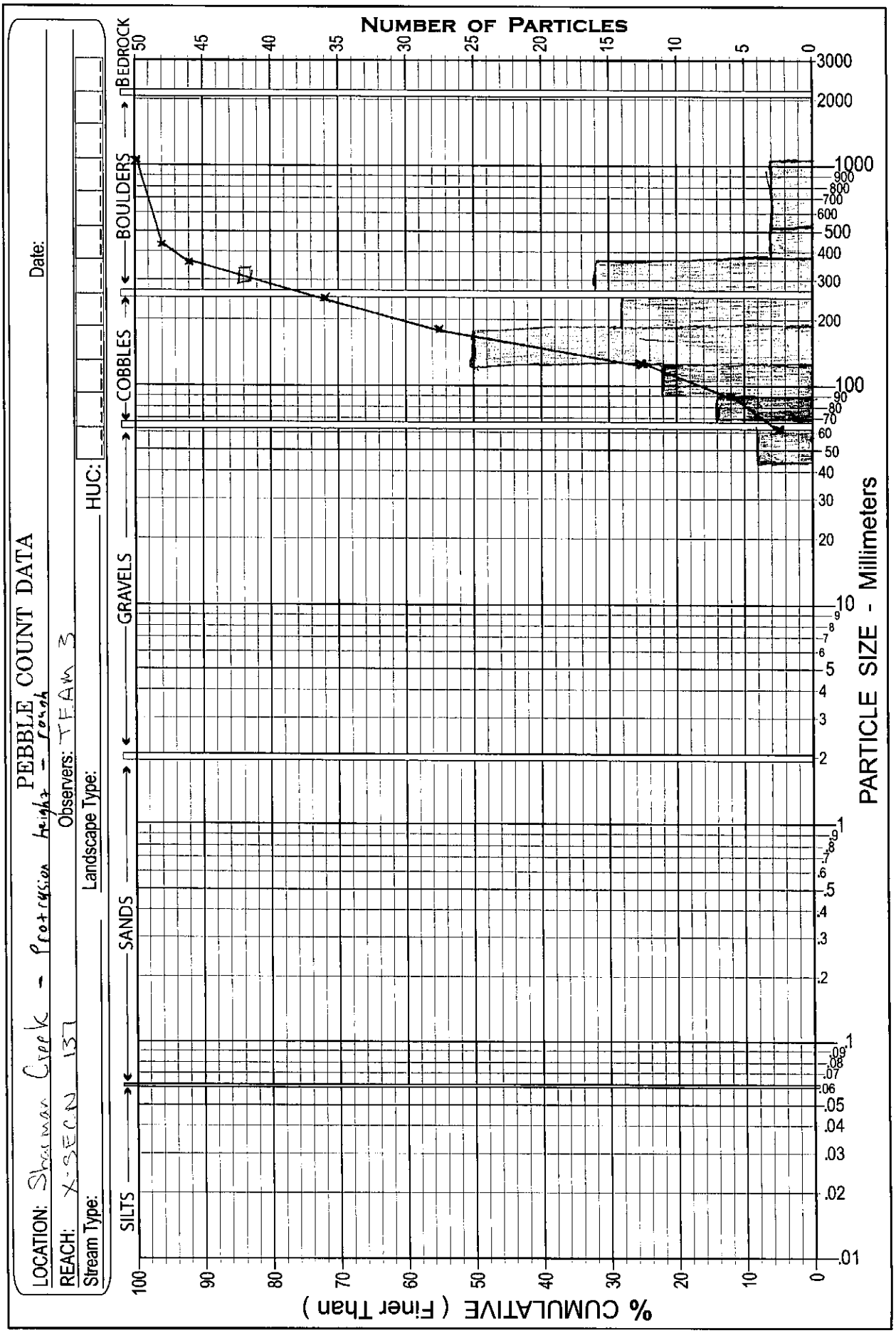

PEBBLE COUNT DATA
LOCATION: Sharman Creek
REACH: X-Secn 24' - Protrusion height
Stream Type:
Observers: TEAM 3
Landscape Type:
HUC:
Date:
NUMBER OF PARTICLES
BEDROCK
BOULDERS
COBBLES
GRAVELS
SANDS
SILTS
PARTICLE SIZE - Millimeters
% CUMULATIVE (Finer Than)

V_{50} = 128 mm



D_{84} 320
D_{50} = 170 mm

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Worksheet B-1. Field Form for Level II Stream Classification (*First Field Day*).

Stream: Sharman's Branch		
Basin:	Drainage Area: 3.6 acres	3.6 mi²
Location:		
Twp.&Rge:	Sec.&Qtr.:	
Cross-Section Monuments (Lat./Long.):		Date: 4/19/26
Observers: Team 3		Landscape Type:

Bankfull Width (W_{bkf}) The surface width of the stream at bankfull stage elevation, in a riffle section.	31.4	ft
Bankfull Mean Depth (d_{bkf}) Mean depth of the stream channel cross-section, at bankfull stage elevation, in a riffle section ($d_{bkf} = A_{bkf} / W_{bkf}$).	2.1	ft
Bankfull Cross-Sectional Area (A_{bkf}) Area of the stream channel cross-section, at bankfull stage elevation, in a riffle section.	66.2	ft²
Width/Depth Ratio (W_{bkf} / d_{bkf}) *Bankfull Width* divided by *Bankfull Mean Depth*, in a riffle section.	14.95	ft/ft
Bankfull Maximum Depth (d_{max}) Maximum depth of the bankfull channel cross-section, or distance between the bankfull stage and Thalweg elevations, in a riffle section.	3.11	ft
Flood-Prone Area Width (W_{fpa}) Width of the channel at an elevation that is twice the *Bankfull Maximum Depth*, measured perpendicular to the fall line of the valley in a riffle section.	65	ft
Entrenchment Ratio (ER) The *Flood-Prone Area Width* divided by *Bankfull Width* (W_{fpa} / W_{bkf}), in a riffle section.	2.06	ft/ft
Channel Materials (Particle Size Index D_{50}) The D_{50} particle size index represents the median or dominant diameter of channel materials, as sampled proportionately from the channel surface between the bankfull stage and Thalweg elevations.	48	mm
Average Water Surface Slope (S) The elevation difference of water surface measurements over the stream length between two similar bed features (e.g., start of riffle to start of last riffle) for several riffle–pool or step–pool sequences, representing channel gradient.	.036	ft/ft
Channel Sinuosity (k) An index of channel pattern determined from stream length divided by valley length (SL / VL), or from valley slope divided by average water surface slope (S_{val} / S).	1.06	ft/ft

Stream Type ~~B4/2~~ **See Classification Key (Figure B-2)**

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Worksheet B-2. Computations of velocity and discharge using various methods (*First Field Day*).

Bankfull VELOCITY & DISCHARGE Estimates

Stream:	Sharman's Branch	Location:	XS 0+24
Date:		Stream Type:	
Landscape Type:			
Observers:		HUC:	

INPUT VARIABLES			OUTPUT VARIABLES		
Bankfull Riffle Cross-Sectional Area	66.2	A_{bkf} (ft^2)	Bankfull Riffle Mean Depth	2.11	d_{bkf} (ft)
Bankfull Riffle Width	31.4	W_{bkf} (ft)	Wetted Perimeter $\approx (2 * d_{bkf}) + W_{bkf}$	35.62	W_p (ft)
D_{84} Particle Size at Riffle	250	D_{84} (mm)	D_{84} Particle Size in Feet D_{84} (mm) / 304.8	.82	D_{84} (ft)
Bankfull Slope	.036	S_{bkf} (ft / ft)	Hydraulic Radius A_{bkf} / W_p	1.86	R (ft)
Gravitational Acceleration	32.2	g (ft / sec^2)	Relative Roughness R (ft) / D_{84} (ft)	2.27	R / D_{84} (ft / ft)
Drainage Area	3.6	DA (mi^2)	Shear Velocity $u^* = (gRS)^{½}$	1.47	u^* (ft / sec)

Should have used D95

ESTIMATION METHODS	Bankfull VELOCITY		Bankfull DISCHARGE	
1. Friction Factor / Relative Roughness $\bar{u} = [2.83 + 5.66 * Log\{R / D_{84}\}] u^*$	7.12	ft / sec		cfs
2. Roughness Coefficient: a) Manning's *n* from Friction Factor/Relative Roughness (Figs. B-34, B-35) $\bar{u} = 1.49*R^{2/3}*S^{1/2}/n$ $n =$ .0475	9	ft / sec		cfs
2. Roughness Coefficient: b) Manning's *n* from Stream Type (Fig. B-36) $\bar{u} = 1.49*R^{2/3}*S^{1/2}/n$ $n =$ .05	7.77	ft / sec		cfs
2. Roughness Coefficient: c) Manning's *n* from Jarrett (USGS): $\bar{u} = 1.49*R^{2/3}*S^{1/2}/n$ $n = 0.39*S^{0.38}*R^{-0.16}$ Note: This equation is applicable to steep, step/pool, high boundary roughness, cobble- and boulder-dominated stream systems; i.e., for $n =$ .23	1.86	ft / sec	125	cfs
3. Other Methods (Hey, Darcy-Weisbach, Chezy C, etc.)		ft / sec		cfs
3. Other Methods (Hey, Darcy-Weisbach, Chezy C, etc.)		ft / sec		cfs
4. Continuity Equations: a) USGS Gage Data $\bar{u} = Q / A$ Return Period for Bankfull Q Q = ____ year		ft / sec		cfs
4. Continuity Equations: b) Regional Curves $\bar{u} = Q / A$		ft / sec		cfs

Protrusion Height Options for the D_{84} Term in the Relative Roughness Relation (R/D_{84}) – Estimation Method 1

Option 1.	For **sand-bed** channels: Measure 100 **"protrusion heights"** of sand dunes from the downstream side of feature to the top of feature. Substitute the D_{84} sand dune protrusion height in ft for the D_{84} term in method 1.
Option 2.	For **boulder-dominated** channels: Measure 100 **"protrusion heights"** of boulders on the sides from the bed elevation to the top of the rock on that side. Substitute the D_{84} boulder protrusion height in ft for the D_{84} term in method 1.
Option 3.	For **bedrock-dominated** channels: Measure 100 **"protrusion heights"** of rock separations, steps, joints or uplifted surfaces above channel bed elevation. Substitute the D_{84} bedrock protrusion height in ft for the D_{84} term in method 1.
Option 4.	For **log-influenced** channels: Measure **"protrusion heights"** proportionate to channel width of log diameters or the height of the log on upstream side if embedded. Substitute the D_{84} protrusion height in ft for the D_{84} term in method 1.

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Worksheet B-3a. Morphological relations, including dimensionless ratios (*First Field Day*).

Stream: Sharman's Branch Location:

Observers: Date: Landscape Type: Stream Type:

River Reach Dimension Summary Data.....1

Riffle Dimensions*, **, ***	Mean	Min.	Max.		Riffle Dimensions & Dimensionless Ratios****	Mean	Min.	Max.
Riffle Width (W_{bkf})	29.9	28.4	31.4	ft	Riffle Cross-Sectional Area (A_{bkf}) (ft^2)	63.95	61.1	66.2
Riffle Mean Depth (d_{bkf})	2.14	2.10	2.18	ft	Riffle Width/Depth Ratio (W_{bkf} / d_{bkf})	14.24	13.52	14.95
Riffle Maximum Depth (d_{max})	2.97	2.76	3.11	ft	Riffle Max Depth to Riffle Mean Depth (d_{max} / d_{bkf})	1.40	1.39	1.48
Width of Flood-Prone Area (W_{fpa})	66.5	65.0	68.0	ft	Entrenchment Ratio (W_{fpa} / W_{bkf})	2.12	2.07	2.17
Riffle Inner Berm Width (W_{ib})	11.0	9.0	13.0	ft	Riffle Inner Berm Width to Riffle Width (W_{ib} / W_{bkf})	0.35	0.29	0.41
Riffle Inner Berm Depth (d_{ib})	0.415	0.13	0.70	ft	Riffle Inner Berm Depth to Mean Depth (d_{ib} / d_{bkf})	0.20	0.06	0.33
Riffle Inner Berm Area (A_{ib})	3.55	2.10	5.00	ft^2	Riffle Inner Berm Area to Riffle Area (A_{ib} / A_{bkf})	0.06	0.03	0.08
Riffle Inner Berm W/d Ratio (W_{ib} / d_{ib})	83.7	69.2	92.4					

Pool Dimensions*, **, ***	Mean	Min.	Max.		Pool Dimensions & Dimensionless Ratios****	Mean	Min.	Max.
Pool Width (W_{bkfp})	36.55	27.6	45.5	ft	Pool Width to Riffle Width (W_{bkfp} / W_{bkf})	1.17	0.88	1.45
Pool Mean Depth (d_{bkfp})	1.61	1.23	1.99	ft	Pool Mean Depth to Riffle Mean Depth (d_{bkfp} / d_{bkf})	3.71	3.33	4.09
Pool Cross-Sectional Area (A_{bkfp})	55.5	55	55.9	ft	Pool Area to Riffle Area (A_{bkfp} / A_{bkf})	0.835	0.83	0.84
Pool Maximum Depth (d_{maxp})	3.29	3.02	3.56	ft	Pool Max Depth to Riffle Mean Depth (d_{maxp} / d_{bkf})	1.57	1.43	1.70
Pool Inner Berm Width (W_{ibp})				ft	Pool Inner Berm Width to Pool Width (W_{ibp} / W_{bkfp})			
Pool Inner Berm Depth (d_{ibp})				ft	Pool Inner Berm Depth to Pool Depth (d_{ibp} / d_{bkfp})			
Pool Inner Berm Area (A_{ibp})				ft^2	Pool Inner Berm Area to Pool Area (A_{ibp} / A_{bkfp})			
Point Bar Slope (S_{pb})				ft/ft	Pool Inner Berm Width/Depth Ratio (W_{ibp} / d_{ibp})			

Run Dimensions*	Mean	Min.	Max.		Run Dimensionless Ratios****	Mean	Min.	Max.
Run Width (W_{bkfr})				ft	Run Width to Riffle Width (W_{bkfr} / W_{bkf})			
Run Mean Depth (d_{bkfr})				ft	Run Mean Depth to Riffle Mean Depth (d_{bkfr} / d_{bkf})			
Run Cross-Sectional Area (A_{bkfr})				ft	Run Area to Riffle Area (A_{bkfr} / A_{bkf})			
Run Maximum Depth (d_{maxr})				ft	Run Max Depth to Riffle Mean Depth (d_{maxr} / d_{bkf})			
Run Width/Depth Ratio (W_{bkfr} / d_{bkfr})				ft				

Glide Dimensions*	Mean	Min.	Max.		Glide Dimensions & Dimensionless Ratios****	Mean	Min.	Max.
Glide Width (W_{bkfg})				ft	Glide Width to Riffle Width (W_{bkfg} / W_{bkf})			
Glide Mean Depth (d_{bkfg})				ft	Glide Mean Depth to Riffle Mean Depth (d_{bkfg} / d_{bkf})			
Glide Cross-Sectional Area (A_{bkfg})				ft	Glide Area to Riffle Area (A_{bkfg} / A_{bkf})			
Glide Maximum Depth (d_{maxg})				ft	Glide Max Depth to Riffle Mean Depth (d_{maxg} / d_{bkf})			
Glide Width/Depth Ratio (W_{bkfg} / d_{bkfg})				ft/ft	Glide Inner Berm Width/Depth Ratio (W_{ibg} / d_{ibg})			
Glide Inner Berm Width (W_{ibg})				ft	Glide Inner Berm Width to Glide Width (W_{ibg}/W_{bkfg})			
Glide Inner Berm Depth (d_{ibg})				ft	Glide Inner Berm Depth to Glide Depth (d_{ibg} / d_{bkfg})			
Glide Inner Berm Area (A_{ibg})				ft^2	Glide Inner Berm Area to Glide Area (A_{ibg} / A_{bkfg})			

Step Dimensions**	Mean	Min.	Max.		Step Dimensionless Ratios****	Mean	Min.	Max.
Step Width (W_{bkfs})	18.4	17.7	19.1	ft	Step Width to Riffle Width (W_{bkfs} / W_{bkf})	0.59	0.56	0.61
Step Mean Depth (d_{bkfs})	1.42	1.28	1.56	ft	Step Mean Depth to Riffle Mean Depth (d_{bkfs} / d_{bkf})	0.68	0.61	0.74
Step Cross-Sectional Area (A_{bkfs})	36.59	33.8	39.2	ft	Step Area to Riffle Area (A_{bkfs} / A_{bkf})	0.55	0.51	0.59
Step Maximum Depth (d_{maxs})	2.44	2.21	2.68	ft	Step Max Depth to Riffle Mean Depth (d_{maxs} / d_{bkf})	1.17	1.05	1.26
Step Width/Depth Ratio (W_{bkfs} / d_{bkfs})	8.77	8.43	9.10	ft/ft				

*Riffle–Pool system (i.e., C, E, F stream types) bed features include riffles, runs, pools, and glides.

**Step–Pool system (i.e., A, B, G stream types) bed features include riffles, rapids, chutes, pools, and steps (note: include rapids and chutes in riffle category).

***Convergence-Divergence system (i.e., D stream types) bed features include riffles and pools; cross-sections taken at riffles for classification purposes.

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Worksheet B-3b. Morphological relations, including dimensionless ratios (*First Field Day*).

Stream: Sharmons Branch Location: Washington County, MD

Observers: Team 3 Date: April 19, 2015 Landscape Type: Confined colluvial Stream Type: B-3

River Reach Summary Data.....2

Hydraulics

Streamflow: Estimated Mean Velocity at Bankfull Stage ($\bar{u}_{bkf}$)	1.86	ft/sec	Estimation Method	Jarrett
Streamflow: Estimated Discharge at Bankfull Stage (Q_{bkf})	123	cfs	Drainage Area	3.6 mi²

Channel Pattern

Geometry	Mean	Min.	Max.		Dimensionless Geometry Ratios	Mean	Min.	Max.
Linear Wavelength (λ)	N/A	—	—	ft	Linear Wavelength to Riffle Width (λ / W_{bkf})	N/A	—	—
Stream Meander Length (L_m)	177'	177	177	ft	Stream Meander Length Ratio (L_m / W_{bkf})	5.64	5.64	5.64
Radius of Curvature (R_c)	N/A	—	—	ft	Radius of Curvature to Riffle Width (R_c / W_{bkf})	N/A	—	—
Belt Width (W_{blt})	51.53	51.53	51.53	ft	Meander Width Ratio (W_{blt} / W_{bkf})	1.64	1.64	1.64
Arc Length (L_a)	N/A	—	—	ft	Arc Length to Riffle Width (L_a / W_{bkf})	N/A	—	—
Riffle Length (L_r)	11	7.7	36.3	ft	Riffle Length to Riffle Width (L_r / W_{bkf})	0.35	0.25	1.16
Individual Pool Length (L_p)	19.53	9.40	30.50	ft	Individual Pool Length to Riffle Width (L_p / W_{bkf})	6.62	0.30	0.97
Pool-to-Pool Spacing (P_s)	34.53	34.05	35.00	ft	Pool-to-Pool Spacing to Riffle Width (P_s / W_{bkf})	1.10	1.08	1.11

Channel Profile

Valley Slope (S_{val})	0.038	ft/ft	Average Water Surface Slope (S)	0.036	ft/ft	Sinuosity (S_{val} / S)	1.06	
Stream Length (SL)	177'	ft	Valley Length (VL)	166.9'	ft	Sinuosity (SL / VL)	1.06	
Low Bank Height (LBH)	start 3.7	ft	Bankfull Max Depth (d_{max})	start 3.2	ft	Bank-Height Ratio (BHR) (LBH / d_{max})	start 1	
	end 3.7	ft		end 3.2	ft		end 1	

Facet Slopes	Mean	Min.	Max.		Dimensionless Facet Slope Ratios	Mean	Min.	Max.
Riffle Slope (S_{rif})	0.038	0.046	0.078	ft/ft	Riffle Slope to Average Water Surface Slope (S_{rif} / S)	2.03	1.28	2.17
Run Slope (S_{run})	NA	NA	NA	ft/ft	Run Slope to Average Water Surface Slope (S_{run} / S)	NA	NA	NA
Pool Slope (S_p)	0.004	0.002	0.01	ft/ft	Pool Slope to Average Water Surface Slope (S_p / S)	0.11	0.56	0.28
Glide Slope (S_g)	NA	NA	NA	ft/ft	Glide Slope to Average Water Surface Slope (S_g / S)	NA	NA	NA
Step Slope (S_s)	0.46	0.32	0.60	ft/ft	Step Slope to Average Water Surface Slope (S_s / S)	12.8	8.9	16.7

Max Depths[a]	Mean	Min.	Max.		Dimensionless Depth Ratios	Mean	Min.	Max.
Max Riffle Depth (d_{max})	2.43	1.4	3	ft	Max Riffle Depth to Mean Riffle Depth (d_{max} / d_{bkf})	1.16	0.67	1.43 (?)
Max Run Depth (d_{maxr})	NA	NA	NA	ft	Max Run Depth to Mean Riffle Depth (d_{maxr} / d_{bkf})	NA	NA	NA
Max Pool Depth (d_{maxp})	3.2	2.7	3.7	ft	Max Pool Depth to Mean Riffle Depth (d_{maxp} / d_{bkf})	1.52	1.29	1.76
Max Glide Depth (d_{maxg})	NA	NA	NA	ft	Max Glide Depth to Mean Riffle Depth (d_{maxg} / d_{bkf})	NA	NA	NA
Max Step Depth (d_{maxs})	2.7	2.7	2.7	ft	Max Step Depth to Mean Riffle Depth (d_{maxs} / d_{bkf})	1.29	1.29	1.29

Channel Materials

	Reach[b]	Riffle[c]	Bar		Reach[b]	Riffle[c]	Bar	Protrusion Height[d]	
% Silt/Clay	3	2.8	—	D_{16}	8	11	—	70	mm
% Sand	1	1.4	—	D_{35}	31	37	—	100	mm
% Gravel	55	54.8	—	D_{50}	48	54	—	128	mm
% Cobble	31	29	—	D_{84}	150	160	—	250	mm
% Boulder	6	9	—	D_{95}	1200	1200	—	300	mm
% Bedrock	4	3	—	D_{100}	3000	3000	—	350	mm

[a] *Mean*, *Min.*, and *Max.* depths are measured from Thalweg to bankfull at mid-point of feature for riffles, runs, and steps, the deepest part of pools, and at the tail-out of glides.
[b] Composite sample of riffles and pools within the designated reach. [c] Active bed of a riffle. [d] Height of roughness feature above bed.

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Worksheet B-4. Dimensionless ratios of the ten pool types (*First Field Day*).

Stream: Sharman's Branch Location:

Observers: Team 3 Stream Type: B4/2 Landscape Type: Date: 4/19/16

		Dimensional Values			Dimensionless Ratios			
1. Lateral Scour Pool (LSP)	Mean	8.3	2.5	0.001	Mean	0.26	1.19	0.027
	Min.				Min.			
	Max.				Max.			
2. Contraction Scour Pool (CSP)	Mean	5.1	3.0	0.002	Mean	0.16	1.42	0.05
	Min.				Min.			
	Max.				Max.			
3. Step/Pool (SP)	Mean	4.7	3.25	0.01	Mean	0.015	1.55	0.027
	Min.				Min.			
	Max.				Max.			
4. Backwater Pool (BWP)	Mean				Mean			
	Min.				Min.			
	Max.				Max.			
5. Plunge Pool (PP)	Mean				Mean			
	Min.				Min.			
	Max.				Max.			
6. Pocket Water Pool (PWP)	Mean				Mean			
	Min.				Min.			
	Max.				Max.			
7. Lateral Protrusion Pool (LPP)	Mean	8			Mean			
	Min.				Min.			
	Max.				Max.			
8. Straight Dissipator Pool (SDP)	Mean				Mean			
	Min.				Min.			
	Max.				Max.			
9. Converging Confluence Pool (CCP)	Mean				Mean			
	Min.				Min.			
	Max.				Max.			
10. Compound Pool (CP)	Mean				Mean			
	Min.				Min.			
	Max.				Max.			

Lateral Restrictive Pool?

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