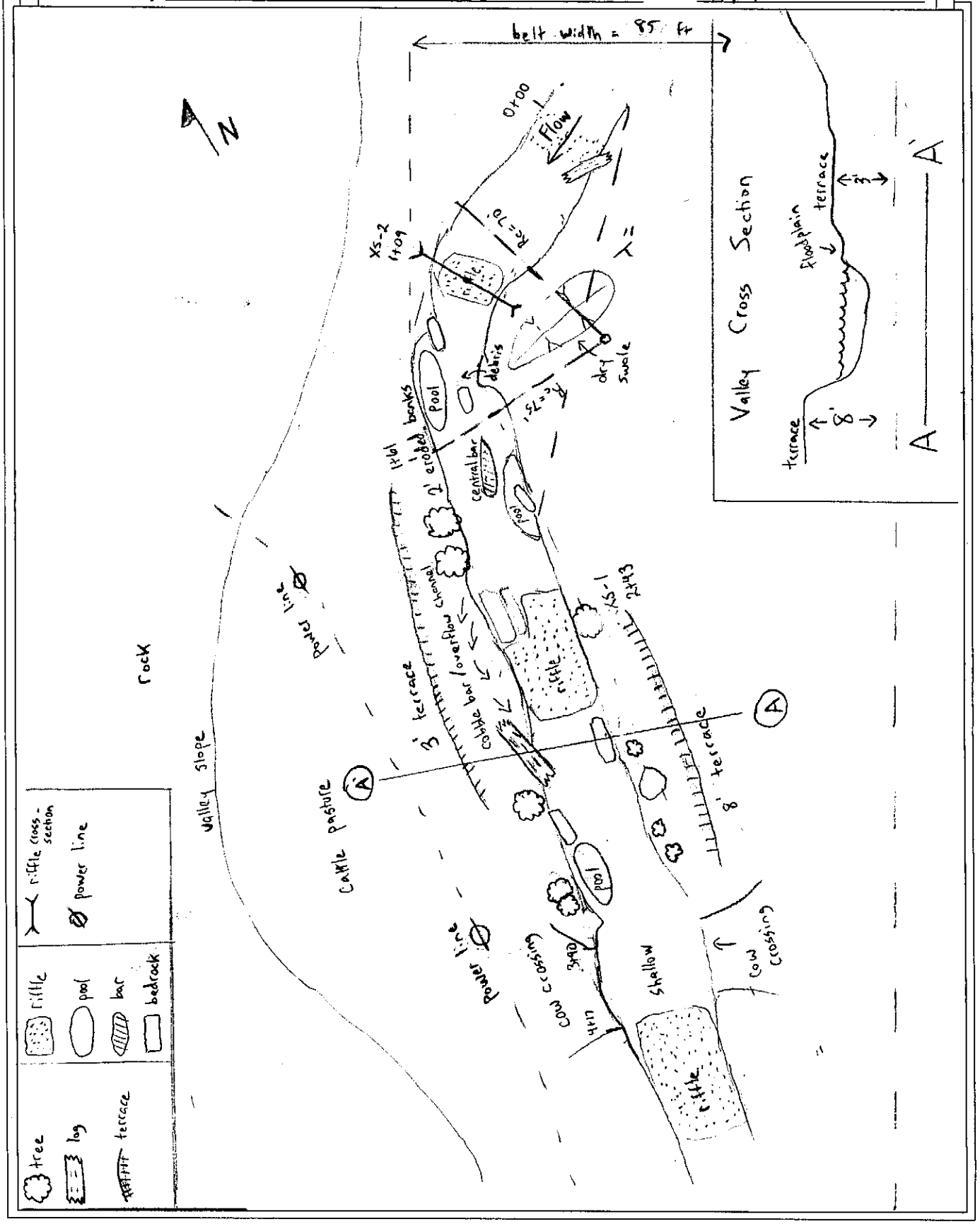
AREA-SITE LOCATION....REACH MAP

Stream/Drainage: Little Conococheague Creek Site/Reach: 3

Drawn By: Team 3 Date: April 12 2016



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SURVEY DATA → CROSS-SECTION 1

SITE: Little Conochacheague Creek Date: 4/12/2016

Location: REACH 3

Party / Notes: 109' 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		6.2	[illegible]	100		
2	0			3.81	102.39	[illegible]
3	6.2			4.35	101.85	TOP [illegible]
4	13.2			4.70	101.5	LBF
5	16.7			5.78	100.43	
6	21.0			6.41	99.79	
7	23.1			6.82	99.38	LEW
8	24.5			6.90	99.30	
9	25.5			7.20	99.00	
10	27.0			7.33	98.87	
11	28.0			7.38	98.82	
12	29.0			7.61	98.59	
13	30.5			7.63	98.57	THALWAG
14	31.3			7.62	98.58	
15	32.0			7.55	98.65	
16	33.4			7.55	98.65	
17	34.0			7.30	98.9	
18	35.5			7.18	99.02	
19	36.8			6.84	99.36	REW
20	37.5			6.20	100.0	
21	40.3			5.71	100.49	
22	41.9			4.70	101.5	RBF
23	43.0			4.18	102.02	
24	44.0			3.92	102.28	TOP OF BANK
25	45.0			3.79	102.41	
26	81.0			.04	106.16	~~R (2x BF)~~
27						R (2 · BF) at 62'
28						

BF DEPTH 2.93'

2xBF 5.86'

~~L (2xBF) -35.0~~ .04

~~106.16~~

L (2 · BF) at -19'

BF WIDTH 28.7'

FLOOD PRONE WIDTH ~~[illegible]~~ 80.3

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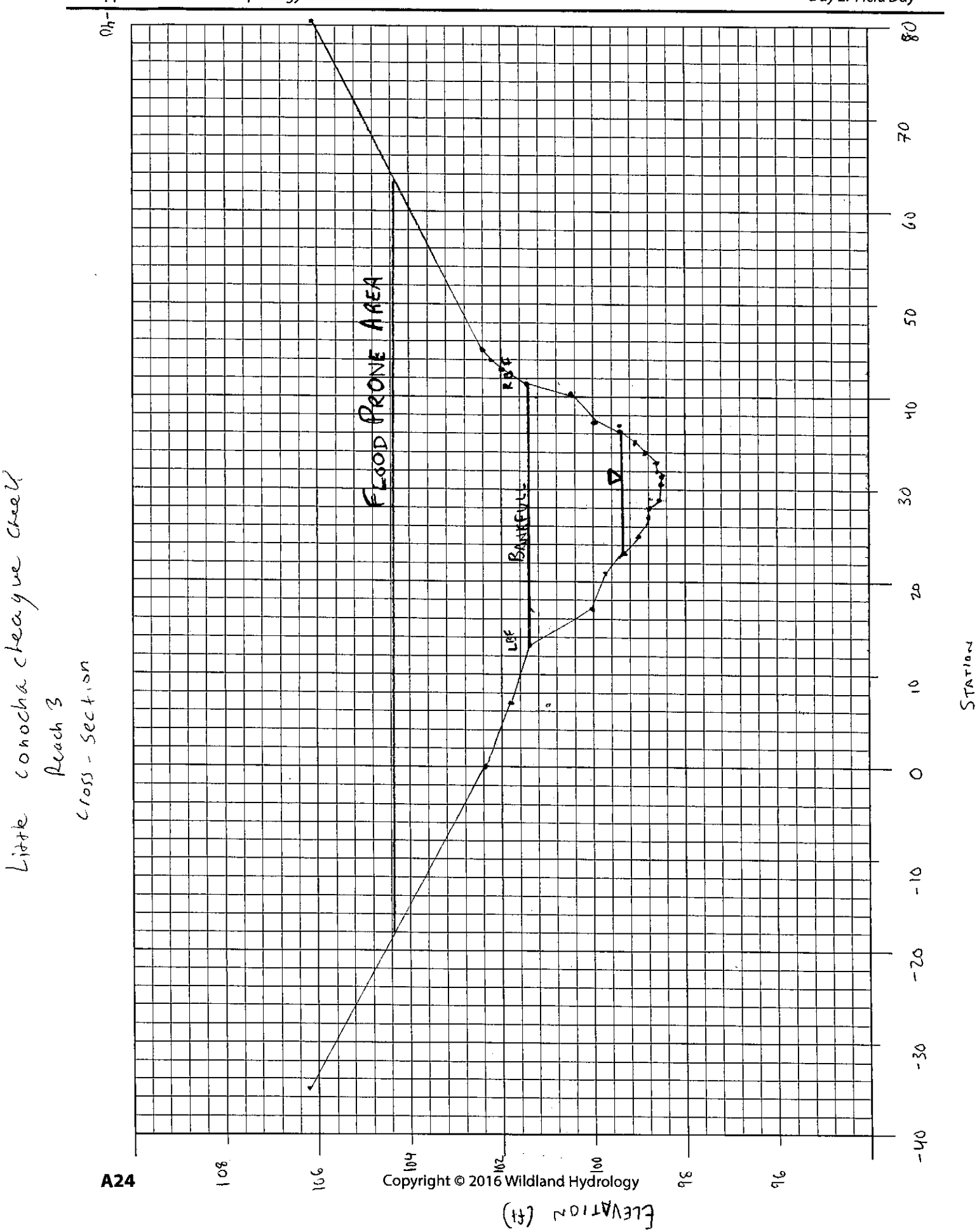
SUSIE, DAVE, MICHAEL

Elevation (ft)



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SURVEY DATA ⟹ **LONGITUDINAL PROFILE 1**

SITE: Little Coconacheague Creek Date: 4-12-16

Location: Reach 3

Party / Notes: Wendy Brian Elle HUC:

.364%

6.53
4.65
7.88

NOTE BF FLAG CONFIDENCE INT 1 HIGH 3 low

upstream

	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
253 BM 1		6.2	~~106.3~~									R
2	3			7.44	98.76	6.53	99.67					Riffle top
3	10.5					6.52	99.68	4.65	101.55			Rt Bank BF (1)
4	20.6			7.61	98.59	6.55	99.65					Bottom Riff
.82 Flag 5	26.0			8.03	98.17	6.54	99.66	4.72	101.48			Run
6	29.0			8.02	98.18	6.55	99.65					Pool top
7	35.0			8.33	97.87	6.52	99.68					Pool max
8	49.			7.92	98.28	6.54	99.66					Left Bank end of Pool / top Glide
Flag BF 1.7 9	61.			7.54	98.66	6.55	99.65	4.85	101.35	3.64		Rt Bnk BF / Glide / Low Bank terrace
10	65			7.17	99.03	6.58	99.62					Riffle
11	75			7.18	99.02	6.56	99.64					mid Riffle
12	98			7.58	98.62	6.8	99.40					~~end~~ Riffle
13	109			7.68	98.52	6.79	99.41	get BF from Cross Section (101.5)				Compare to Cross Section
14	121	Bed Rock Feature U/S Rt Bnk to mid Chan D/S										
15	130			7.97	98.23	6.85	99.35					end of Riffle
FLAG BF (3) 1.76 16	143			8.68	97.52	6.92	99.28	5.32	100.88			BF L Bank / TOP OF POOL
17	155			9.68	96.52	6.89	99.31					POOL
18	160			9.84	96.36	6.91	99.29					MAX POOL
BF and Pool Bank 177 19	177			8.54	97.66	6.91	99.29	5.284	100.96			BF (3)
xverse bar 20	185			7.36	98.84	6.91	99.29					in tail of xverse Riffle
21	191			8.31	97.89	1.36 6.95	99.25					Pool
22	207			8.63	97.57	1.69 6.94	99.26					max Pool
23	221			8.27	97.93	1.30 6.97	99.23					start of glide
24	236			7.73	98.47	6.97	99.23	~~5.26~~				top of "Riffle" bedrock
BF(1) 25	243			7.73	98.47	7.04	99.16	5.26	100.94			Bank Rt bedrock
26	261			8.02	98.18	7.31	98.89					middle Riffle
27	306			8.94	97.26	7.98	98.22					Begin Run
	355			9.24	96.96							BKF(1) in Run
	412			8.48	97.72	8.00	98.2	6.24	99.96			
						8.08	98.18					FORD top of Riffle

Reshoot @ end 6.2

more bedrock

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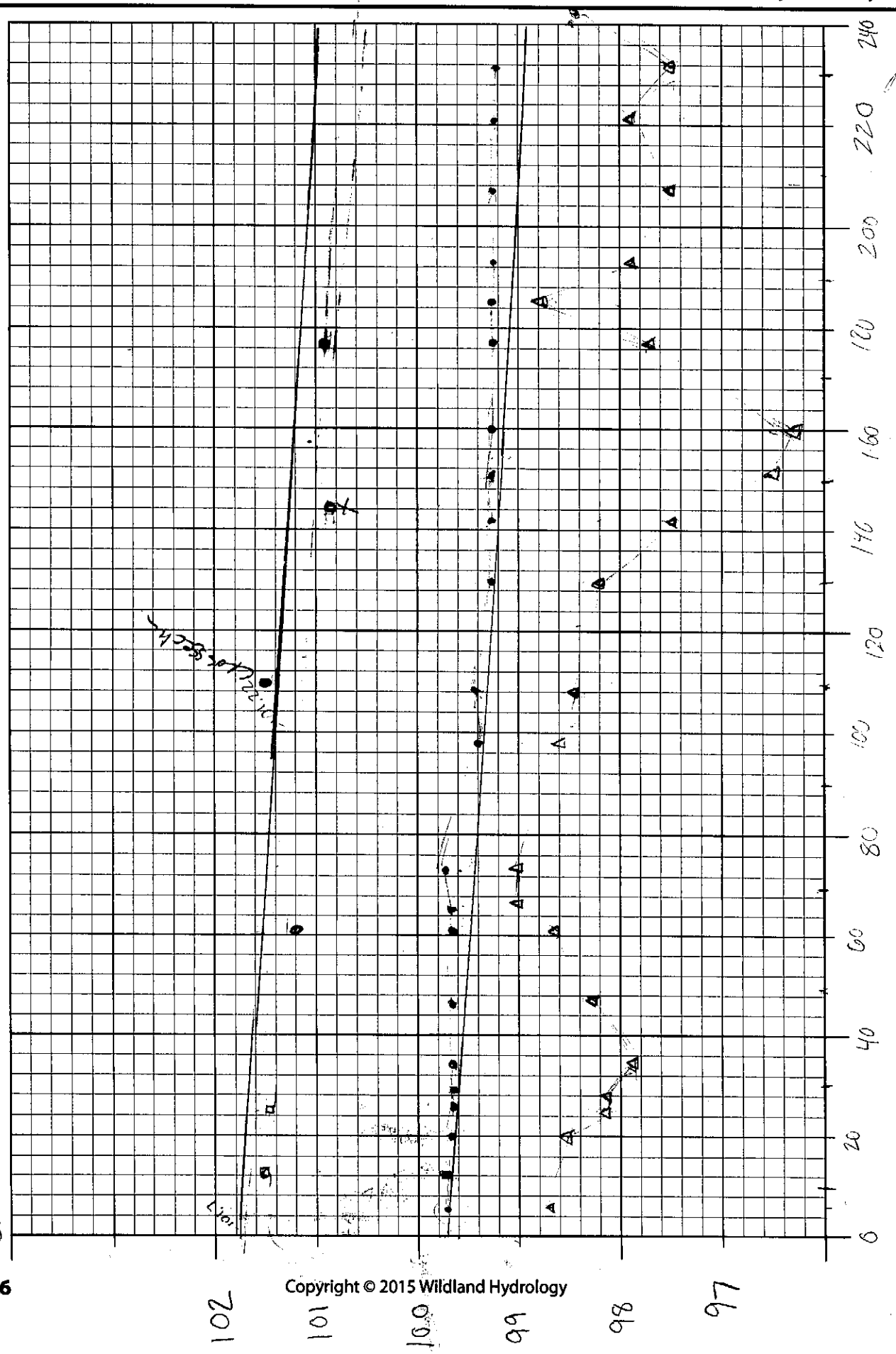

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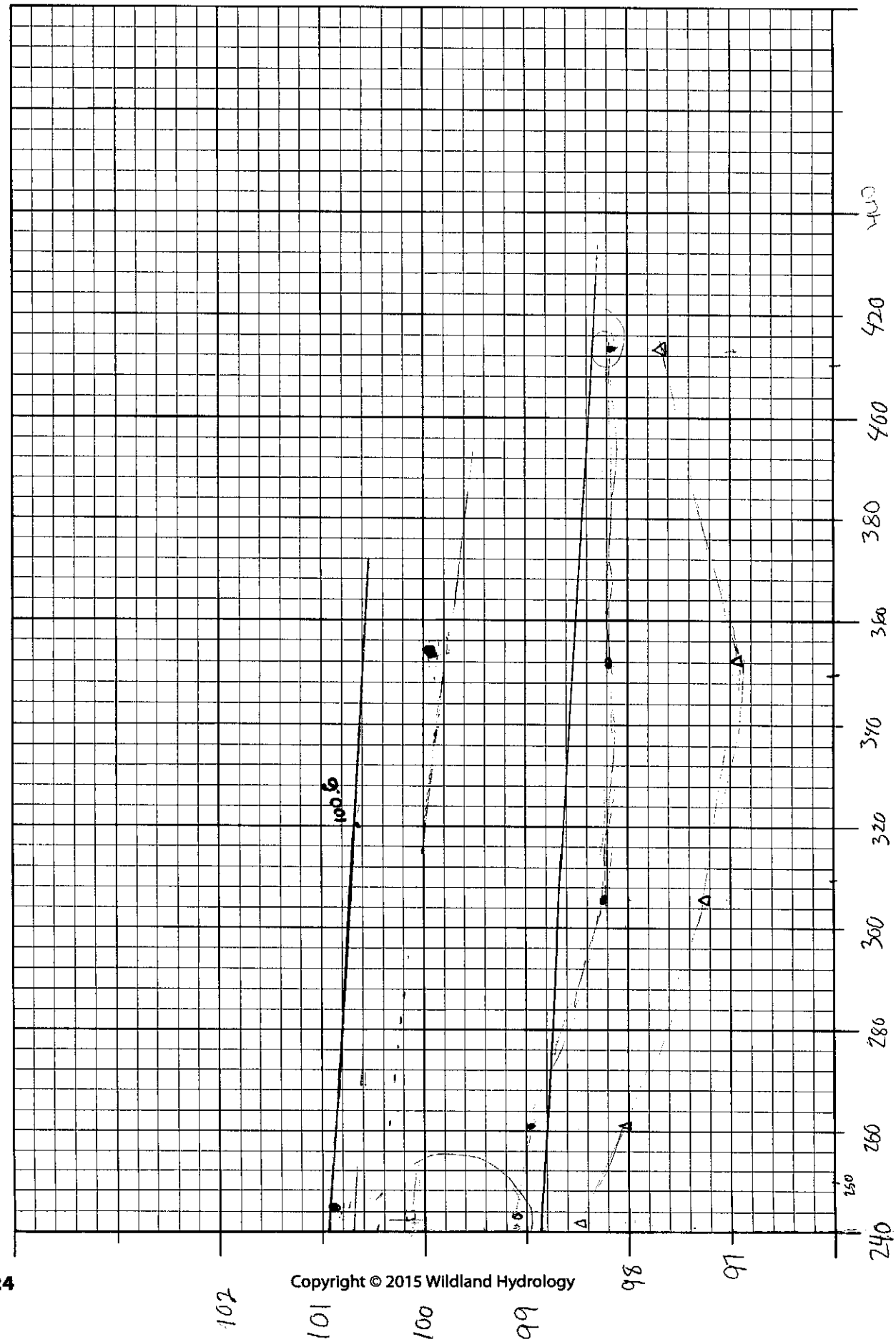

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Site: Little Co Ochacheague Creek Date: April 12 16
Location: Representative HUC:
Party: Group 3

Inches	PARTICLE	Millimeters		Dot Count for RIFFLE 1	POOL 2	COMP. 3	RIFFLE (1) Reach: 3 Date: 4-12-16 TOT #	ITEM %	% CUM	POOL (2) Reach: 3 Date: 4.12.16 TOT #	ITEM %	% CUM	COMPOSITE (3) Reach: 3 Date: 4.12.16 TOT #	ITEM %	% CUM
	Silt / Clay	< .062	S/C	I	卌	5	1	3.3	3.3	4	5.4	5.4	5	4.8	4.8
	Very Fine	.062 - .125	SAND										–	–	–
	Fine	.125 - .25	SAND		I	1				1	1.3	6.7	1 6	.9	5.7
	Medium	.25 - .50	SAND										–	–	–
	Coarse	.50 - 1.0	SAND										–	–	–
.04 - .08	Very Coarse	1.0 - 2	SAND		I	1				1	1.3	8	1 7	.9	6.6
.08 - .16	Very Fine	2 - 4	GRAVEL		II	2				2	2.6	10.6	2 9	1.9	8.5
.16 - .22	Fine	4 - 5.7	GRAVEL	I	I	2	1	3.3	6.6	1	1.3	11.9	2 11	1.9	10.4
.22 - .31	Fine	5.7 - 8	GRAVEL										–	–	–
.31 - .44	Medium	8 - 11.3	GRAVEL	I	III	4	1	3.3	9.9	3	4.1	16	4 15	3.9	14.3
.44 - .63	Medium	11.3 - 16	GRAVEL	I	卌 I	7	1	3.3	13.2	6	8.2	24.2	7 22	6.8	21.1
.63 - .89	Coarse	16 - 22.6	GRAVEL	III	卌 I	9	3	10	23.2	6	8.2	32.4	9 31	8.7	29.8
.89 - 1.3	Coarse	22.6 - 32	GRAVEL	IIII	卌 卌 II	16	4	13.3	36.5	12	16.4	48.8	16 47	15.5	45.3
1.3 - 1.8	Very Coarse	32 - 45	GRAVEL	卌 I	卌 III	14	6	20	56.5	8	10.9	59.7	14 61	13.6	58.9
1.8 - 2.5	Very Coarse	45 - 64	GRAVEL	卌 I	卌 II	13	6	20	76.5	7	9.5	69.2	13 74	12.6	71.5
2.5 - 3.5	Small	64 - 90	COBBLE	II	卌 I	8	2	6.6	83.1	6	8.2	77.4	8 82	7.7	79.2
3.5 - 5.0	Small	90 - 128	COBBLE		卌	5				5	6.8	84.2	5 87	4.8	84
5.0 - 7.1	Large	128 - 180	COBBLE	I	III	4	1	3.3	86.4	3	4.1	88.3	4 91	3.9	87.9
7.1 - 10.1	Large	180 - 256	COBBLE		I	1				1	1.3	89.6	1 92	.9	88.8
10.1 - 14.3	Small	256 - 362	BOULDER										–	–	–
14.3 - 20	Small	362 - 512	BOULDER										–	–	–
20 - 40	Medium	512 - 1024	BOULDER	I	III	4	1	3.3	89.7	3	4.1	93.7	4 96	3.9	92.7
40 - 80	Large-Vry Large	1024 - 2048	BOULDER										–	–	–
.5 .2 .15	Bedrock		BDRK	卌 III 30	III 73	7	3	10	99.7	4	5.4	99.1	7 103	6.8	99.5
Stream Type:			Valley Type:			TOTAL→	30	—	99.7	73	—	99.1	103	—	99.5

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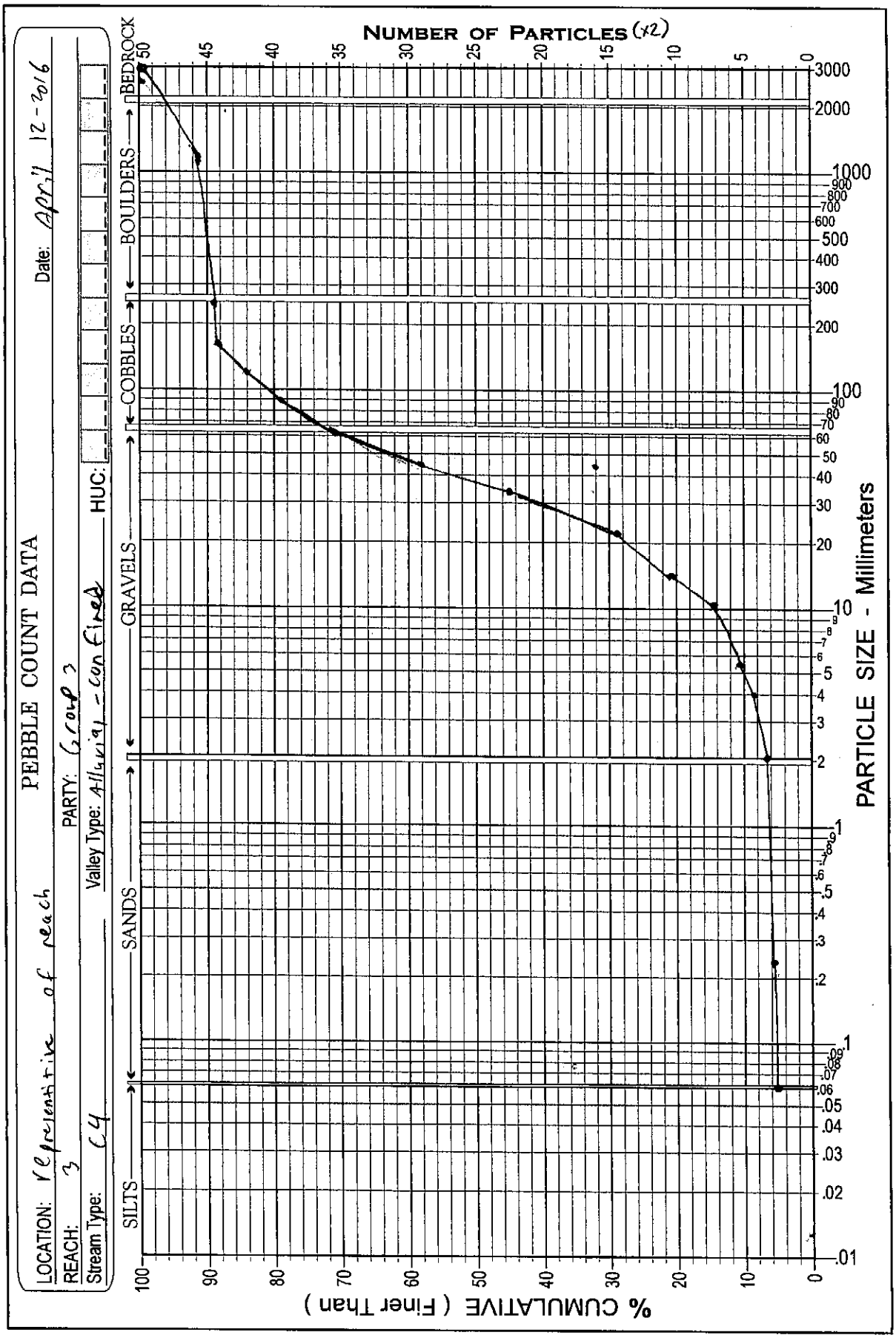

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Site: Little Cocoosha Creek Date: 4-12-16

Location: Active Bed HUC:

Party: Team 3

Dot Count for

Inches	PARTICLE	Millimeters		RIFFLE 1	~~POOL~~ 2 BDR.	COMP. 3	RIFFLE (1) TOT #	RIFFLE (1) ITEM %	RIFFLE (1) % CUM	~~POOL~~ BEDROCK (2) TOT #	(2) ITEM %	(2) % CUM	COMPOSITE (3) TOT #	COMPOSITE (3) ITEM %	COMPOSITE (3) % CUM
							Reach: 3			Reach: 3			Reach: 3		
							Date: 4-12-16			Date: 4-12-16			Date: 4-12-16		
	Silt / Clay	< .062	S/C	II			2	2	2				2	2	2
	Very Fine	.062 - .125	SAND					0							
	Fine	.125 - .25						0							
	Medium	.25 - .50						0							
	Coarse	.50 - 1.0						0							
.04 - .08	Very Coarse	1.0 - 2						0							
.08 - .16	Very Fine	2 - 4	GRAVEL		I			0		I					
.16 - .22	Fine	4 - 5.7						0							
.22 - .31	Fine	5.7 - 8						0							
.31 - .44	Medium	8 - 11.3		III	IIII		3	3	5	4	28.6	28.6	7	7	9
.44 - .63	Medium	11.3 - 16		III	~~IIII~~		3	3	8	5	35.7	64.3	8	8	17
.63 - .89	Coarse	16 - 22.6		III	III		3	3	11	3	21.4	85.7	6	6	23
.89 - 1.3	Coarse	22.6 - 32		IIII IIII I	II		11	11	22	2	14.3	100	13	13	36
1.3 - 1.8	Very Coarse	32 - 45		IIII IIII III			13	13	35				13	13	49
1.8 - 2.5	Very Coarse	45 - 64		IIII IIII IIII II			17	17	52				17	17	66
2.5 - 3.5	Small	64 - 90	COBBLE	IIII IIII IIII IIII			20	20	72				20	20	86
3.5 - 5.0	Small	90 - 128		IIII			5	5	77				5	5	91
5.0 - 7.1	Large	128 - 180		IIII II			7	7	84				7	7	98
7.1 - 10.1	Large	180 - 256		I			1	1	85				1	1	99
10.1 - 14.3	Small	256 - 362	BOULDER					0							
14.3 - 20	Small	362 - 512						0							
20 - 40	Medium	512 - 1024		I			1	1	86				1	1	100
40 - 80	Large-Vry Large	1024 - 2048					—	0							
	Bedrock		BDRK	IIII IIII IIII			14	14	100	14	100				
Stream Type:			**Valley Type:**			TOTAL→	100			14	100	100	100		100

.6, 0.25, 0.15, .65, 6, 6, .55, .45, 0.4, 0.8, 0.4, 0.35, 0.2, 0.15

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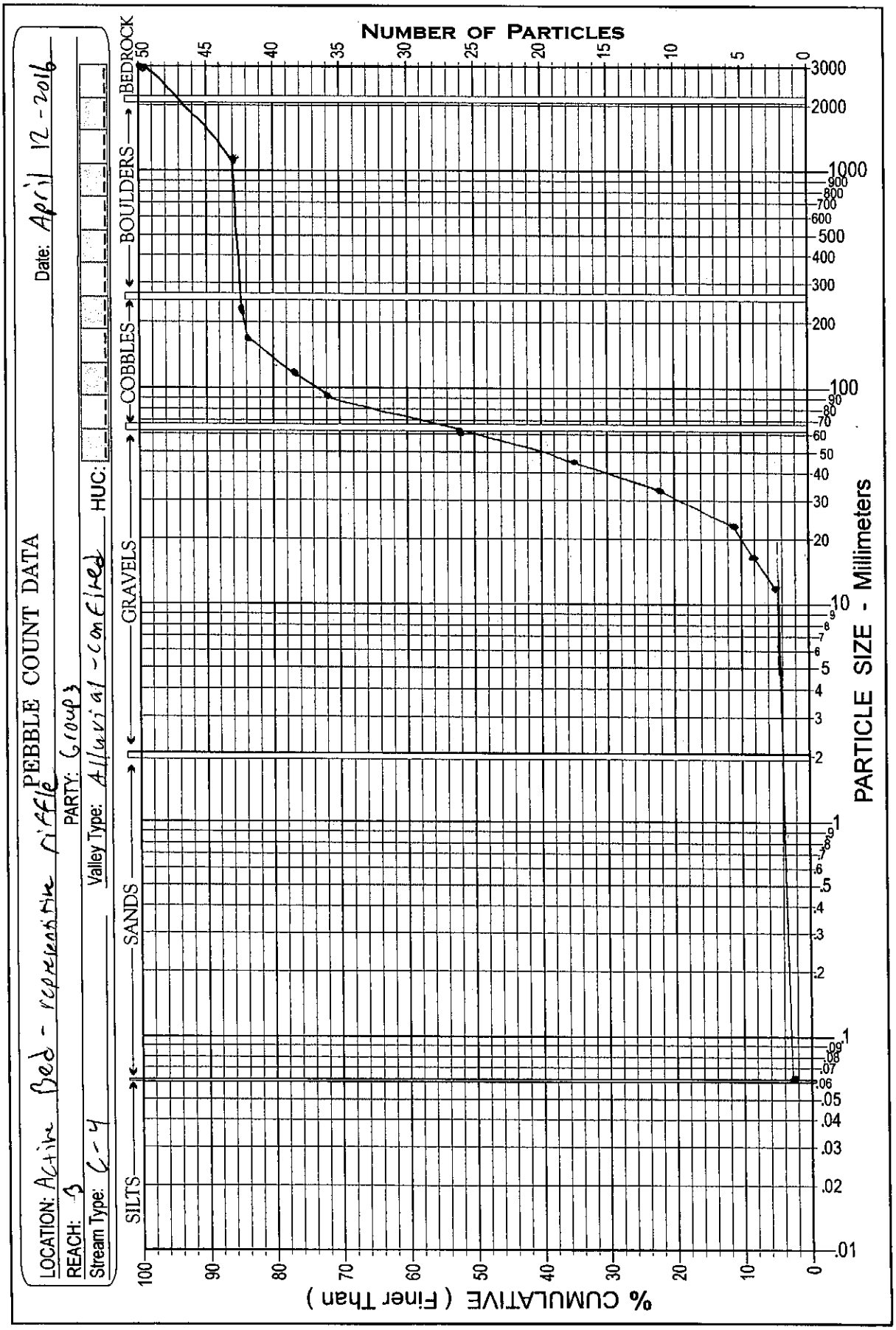

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Worksheet A-1. Field Form for Level II Stream Classification.

Stream: Little cono chacheague creek			
Basin:	Drainage Area:	acres	12 mi^2
Location:			
Twp.&Rge:	Sec.&Qtr.:		
Cross-Section Monuments (Lat./Long.):		Date: 4-12-2016	
Observers: Team 3		Landscape Type: Confined Alluvial	

Bankfull Width (W_{bkf}) The surface width of the stream at bankfull stage elevation, in a riffle section.	28.7	ft
Bankfull Mean Depth (d_{bkf}) Mean depth of the stream channel cross-section, at bankfull stage elevation, in a riffle section ($d_{bkf} = A_{bkf} / W_{bkf}$).	1.75	ft
Bankfull Cross-Sectional Area (A_{bkf}) Area of the stream channel cross-section, at bankfull stage elevation, in a riffle section.	50.32	ft^2
Width/Depth Ratio (W_{bkf} / d_{bkf}) *Bankfull Width* divided by *Bankfull Mean Depth*, in a riffle section.	16.4	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.	2.93	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.	80.3	ft
Entrenchment Ratio (ER) The *Flood-Prone Area Width* divided by *Bankfull Width* (W_{fpa} / W_{bkf}), in a riffle section.	2.8	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.	38	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.	.0036	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).	1.46	ft/ft

Stream Type C4/1 **See Classification Key (Figure A-2)**

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Worksheet A-2. Computations of velocity and discharge using various methods.

Bankfull VELOCITY & DISCHARGE Estimates

Stream:	Little Conococheague Creek	Location:	Reach 3
Date:	April 12, 2016	Stream Type:	C-4
Landscape Type:	Alluvial - confined		
Observers:	Team 3	HUC:	

INPUT VARIABLES			OUTPUT VARIABLES		
Bankfull Riffle Cross-Sectional Area	50.32	A_{bkf} (ft^2)	Bankfull Riffle Mean Depth	1.75	d_{bkf} (ft)
Bankfull Riffle Width	28.7'	W_{bkf} (ft)	Wetted Perimeter $\approx (2 * d_{bkf}) + W_{bkf}$	32.2'	W_p (ft)
D_{84} Particle Size at Riffle	180 mm	D_{84} (mm)	D_{84} Particle Size in Feet D_{84} (mm) / 304.8	0.59'	D_{84} (ft)
Bankfull Slope	0.0037	S_{bkf} (ft / ft)	Hydraulic Radius A_{bkf} / W_p	1.56	R (ft)
Gravitational Acceleration	32.2	g (ft / sec^2)	Relative Roughness R (ft) / D_{84} (ft)	2.64	R / D_{84} (ft / ft)
Drainage Area	12	DA (mi^2)	Shear Velocity $u^* = (gRS)^{1/2}$	0.43	u^* (ft / sec)

ESTIMATION METHODS	Bankfull VELOCITY		Bankfull DISCHARGE	
1. Friction Factor / Relative Roughness $\bar{u} = [2.83 + 5.66 * Log\{R / D_{84}\}] u^*$	3.85	ft / sec	193.2	cfs
2. Roughness Coefficient: a) Manning's *n* from Friction Factor/Relative Roughness (Figs. A-28, A-29) $\bar{u} = 1.49*R^{2/3}*S^{1/2}/n$ $n =$ 0.03	4.06	ft / sec	204.5	cfs
2. Roughness Coefficient: b) Manning's *n* from Stream Type (Fig. A-30) $\bar{u} = 1.49*R^{2/3}*S^{1/2}/n$ $n =$ 0.037	3.93	ft / sec	197.7	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 $n =$ N/A	N/A	ft / sec	N/A	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 $\bar{u} = Q / A$	3.97	ft / sec	200	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 A-3. Summary of Morphological Variables.

Stream: Little Conococheague Creek		**Location:** Reach 3	
Team: Team 3		**Date:** April 12, 2016	**Drainage Area:**

Riffle Channel Dimensions

1. Bankfull Width (W_{bkf}) (ft)	28.7	2. Bankfull Mean Depth (d_{bkf}) (ft)	1.75
3. Width/Depth Ratio (W_{bkf} / d_{bkf})	9.79	4. Bankfull Cross-Sectional Area (A_{bkf}) (ft^2)	50.32
5. Bankfull Maximum Depth (d_{max}) (ft)	2.93	6. Width of Flood-Prone Area (W_{fpa}) (ft)	86.3
7. Entrenchment Ratio (ER) (W_{fpa} / W_{bkf})	2.8		

Channel Pattern / *Dimensionless Ratios*

8. Belt Width (W_{blt}) (ft)	Mean	[illegible]85	9. Meander Width Ratio (MWR) (W_{blt} / W_{bkf})	Mean	12.945
	Min	[illegible]		Min	—
	Max	350		Max	—
10. Stream Meander Length (L_m) (ft)	Mean	[illegible]250	11. Meander Length Ratio (MLR) (L_m / W_{bkf})	Mean	8.5
	Min	[illegible]		Min	
	Max	[illegible]		Max	
12. Linear Wavelength (λ) (ft)	Mean	[illegible]163	13. Linear Wavelength to Bankfull Width (λ / W_{bkf})	Mean	5.613
	Min	6.00		Min	
	Max	[illegible]		Max	
14. Radius of Curvature (R_c) (ft)	Mean	75	15. Radius of Curvature to Bankfull Width (R_c / W_{bkf})	Mean	2.61
	Min	70		Min	
	Max	80		Max	

Channel Particles

Representative Pebble Count

16. D_{16} (mm)	12 mm	17. D_{35} (mm)	25 mm	18. D_{50} (mm)	38 mm
19. D_{84} (mm)	120 mm	20. D_{95} (mm)	1800 mm	21. D_{100} (mm)	3000 mm

Active Bed Riffle Pebble Count

22. D_{16} (mm)	25 mm	23. D_{35} (mm)	35 mm	24. D_{50} (mm)	48 mm
25. D_{84} (mm)	180 mm	26. D_{95} (mm)	2000 mm	27. D_{100} (mm)	3000 mm

Classification

28. Sinuosity (k)	1.46	29. Average Water Surface Slope (S)	0.0037
30. Stream Type	C4/1	31. Landscape Type	Confined Alluvial

Velocity & Discharge

32. Friction Factor ($\bar{u}$ / u*)	3.85	33. Relative Roughness (R / D_{84})	2.64
34. Manning's 'n' from Friction Factor / Relative Roughness	0.03	35. Manning's 'n' from Stream Type	0.031
36. Estimated Bankfull Mean Velocity ($\bar{u}_{bkf}$) (ft/sec)	4.06	37. Estimated Bankfull Discharge (cfs)	204.5
38. Estimation Method Selected for Velocity & Discharge	using mannings n from friction factor / relative		

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