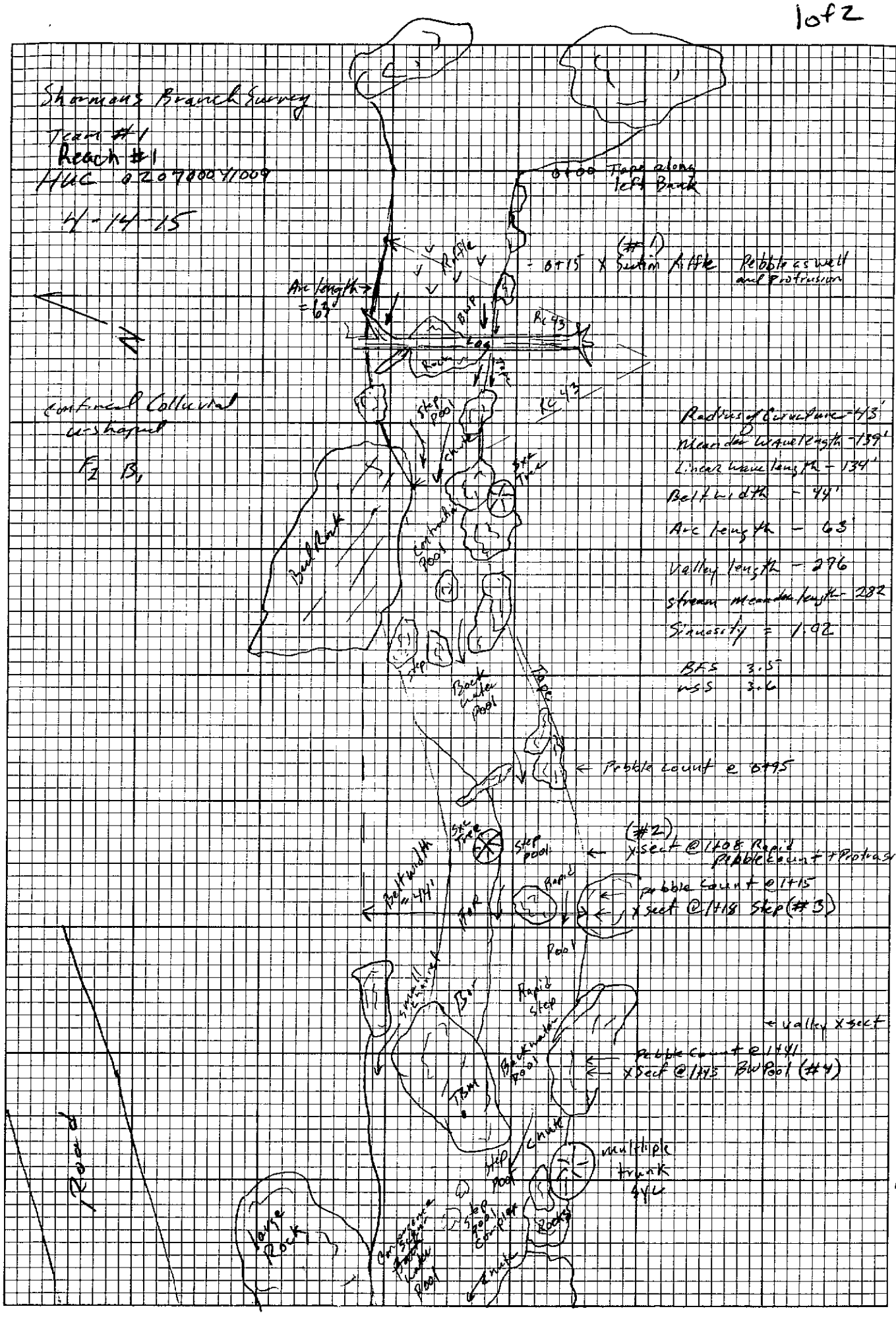
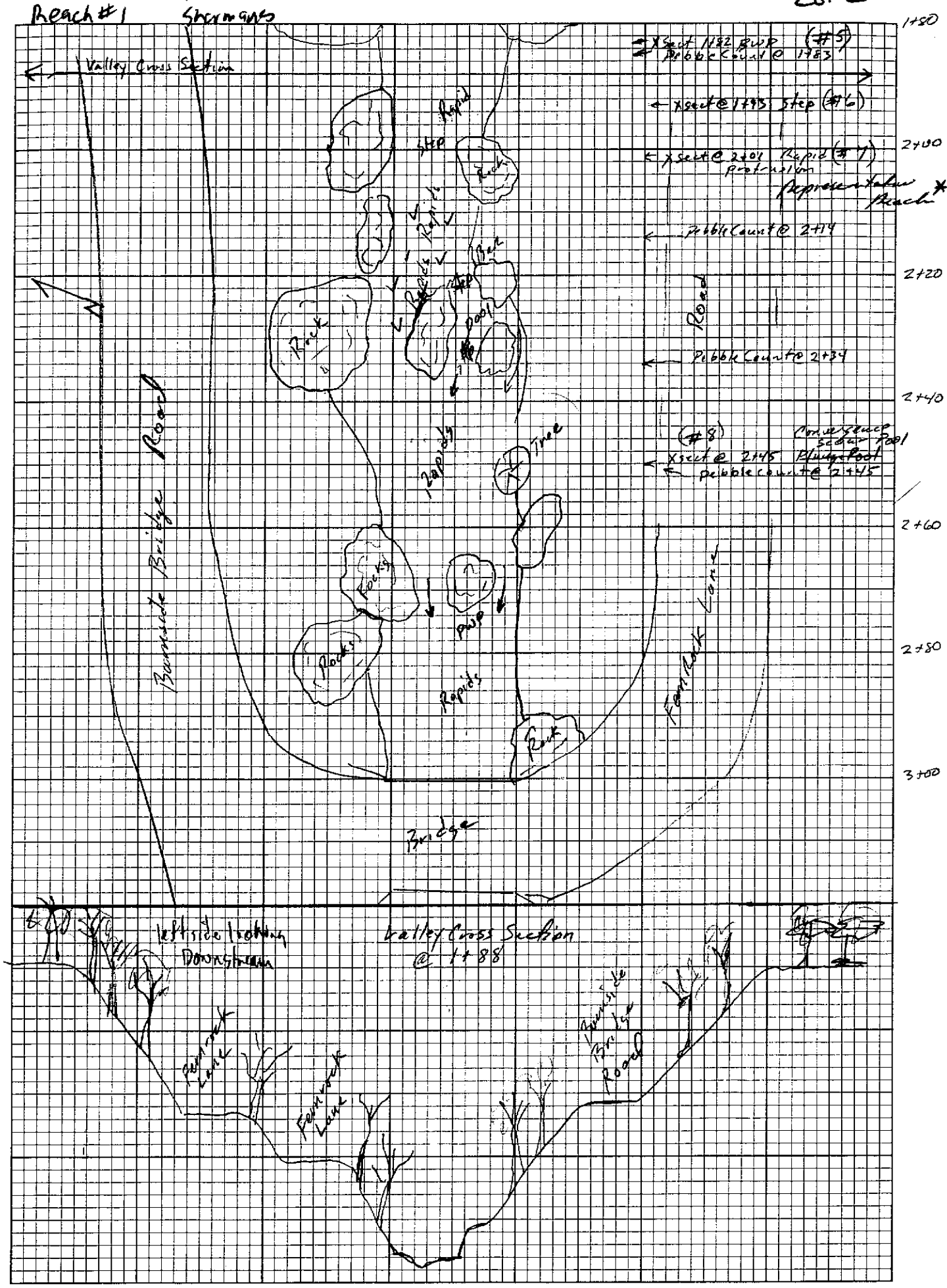

Shormans Branch Survey
Team #1
Reach #1
HUC 02070004/1009
4-14-15
N
Confined Colluvial
u-shaped
F2 B1
0+00 Tape along left Bank
0+15 X Section Riffle (#1) Pebble as well and Protrusion
Arc length = 63'
Riffle
BWP
Log
Rock
Tape
RC 43
Step pool
Chute
Sxc Tree
Bed Rock
Contraction Pool
Step
Back water Pool
Tape
Radius of Curvature - 43'
Meander Wavelength - 139'
Linear Wavelength - 134'
Belt width - 44'
Arc length - 63'
Valley length - 276
stream meander length - 282
Sinuosity = 1.02
BFS 3.5
WSS 3.6
← Pebble count @ 0+95
Sxc Tree
Step pool
(#2) X sect @ 1+08 Rapid Pebble count + Protrusion
Belt width = 44'
Rapid
Bar
pebble count @ 1+15
X sect @ 1+18 Step (#3)
Pool
Small channel
Bar
Rapid Step
← valley X sect
Backwater Pool
Pebble Count @ 1+41
X Sect @ 1+45 BW Pool (#4)
TBM
Chute
Step Pool
multiple trunk sys
Road
Large Rock
Convergence Scour Back water Pool
Step pool complex
Rocks
Chute
0+00
0+20
0+40
0+60
0+80
1+00
1+20
1+40
1+60
1+80

Team #1 4/14/15

Reach #1 Stormgates

2 of 2



4/14/15 Riffle X Section @ 15.5 #1

Sharman Branch

Team 1

Reach 1

ST @ 15.5

BF area = 60.97 ENT = 1.7

Δ ws elev to BF elev. = 2.0

$\bar{X}$ depth = 1.92

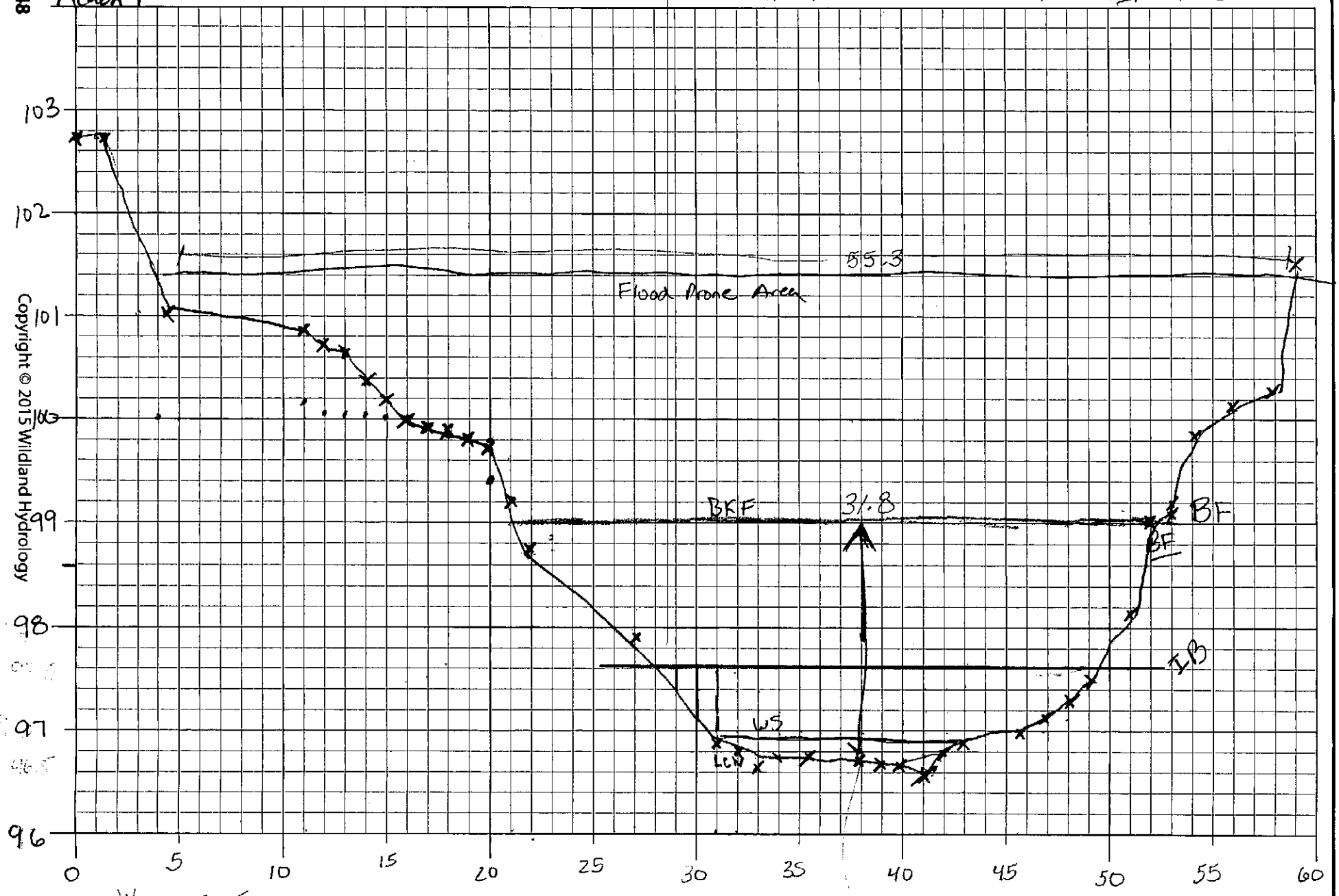
BF width = 31.8

dmax = 2.68

FPA = 55.3 ft

w/D = 16.6

2.68 / 1.92 = 1.4




$W_{ibp}$ = 21.5

$D_{ibp}$ = .68

[illegible] = 14.5

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Rapid Xsection (@ 108.1)

#2

BF area / BF width

X=depth (1.8)

Δ ws elev to BF elev = 1.9 ft.

dmax = 2.68

BF area = 59.5 ft²

BF width = 33.0

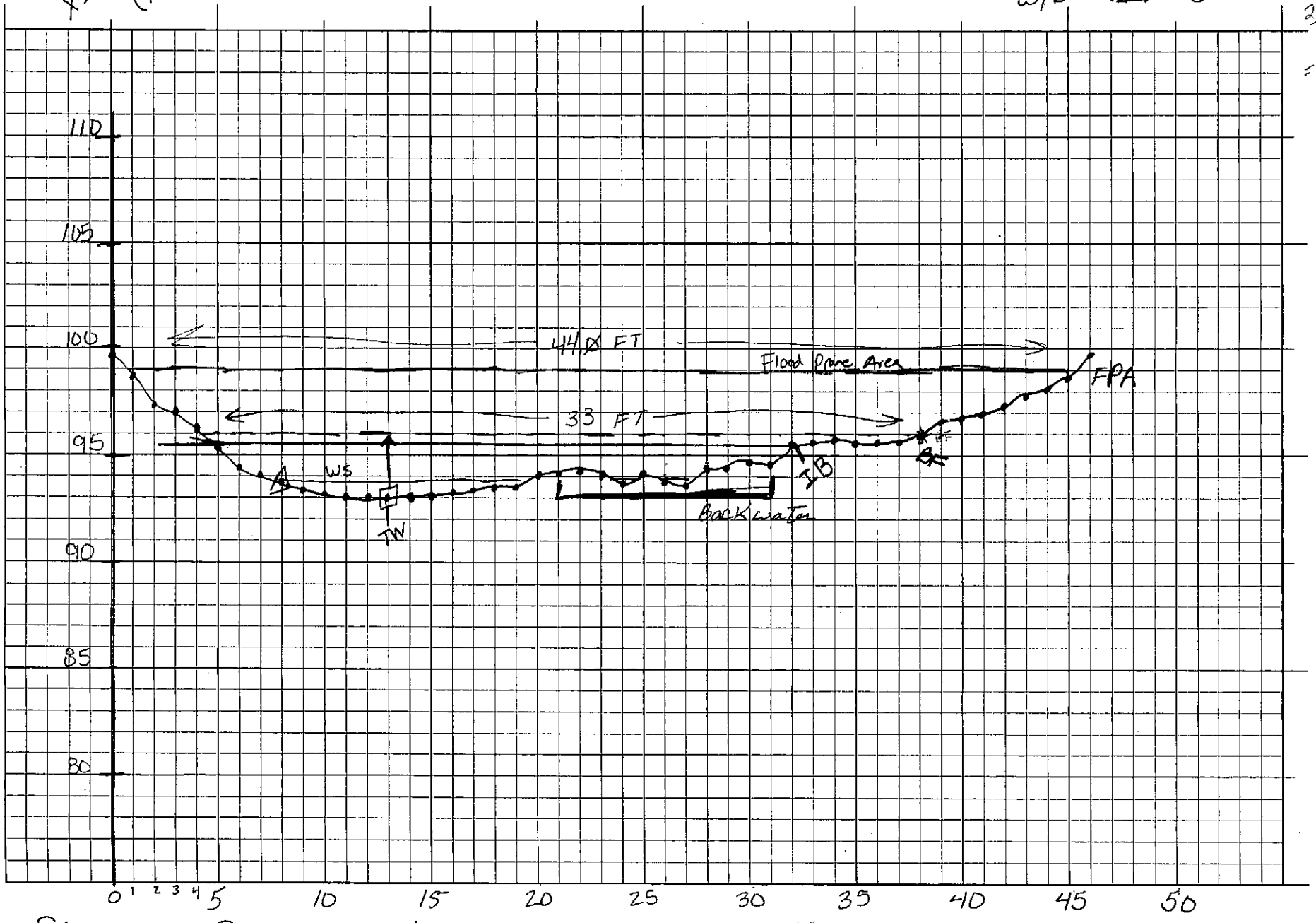
FPW = 44.0

ENT. = 1.3

W/D = 18.3

F-channel?

2.68 / 1.8 = 1.49




Shannon Bramen 4/14/15

Team 1

Reach 1

$W_{bp}$ = 27.0

$D_{bp}$ = .4

$A_{bp}$ = 10.8

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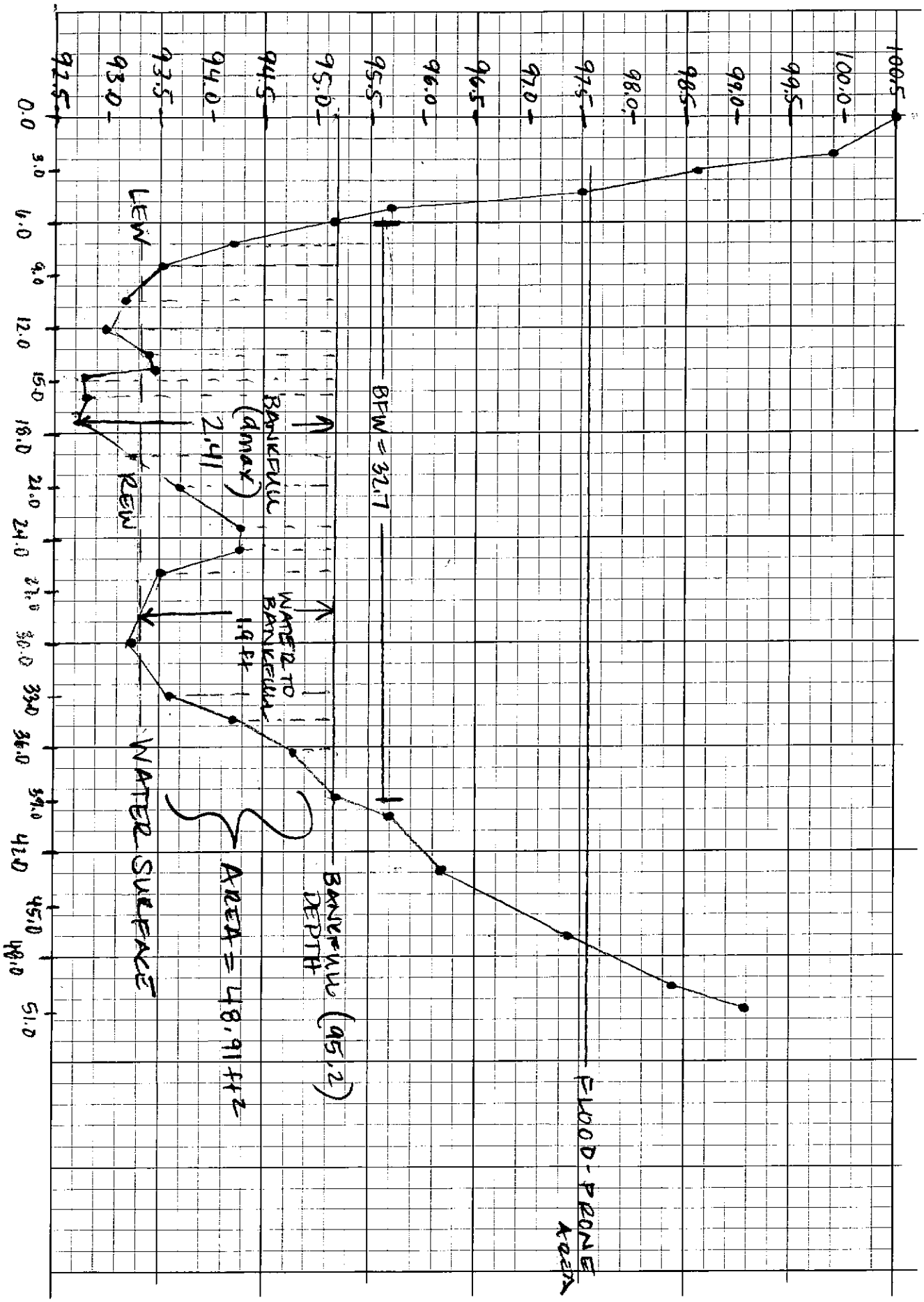
Sharman Branch 4/14/15

Team 1 Reach 1

Station 1+18 - Step Pool / Cross - Section #3




W/D ratio = 21.9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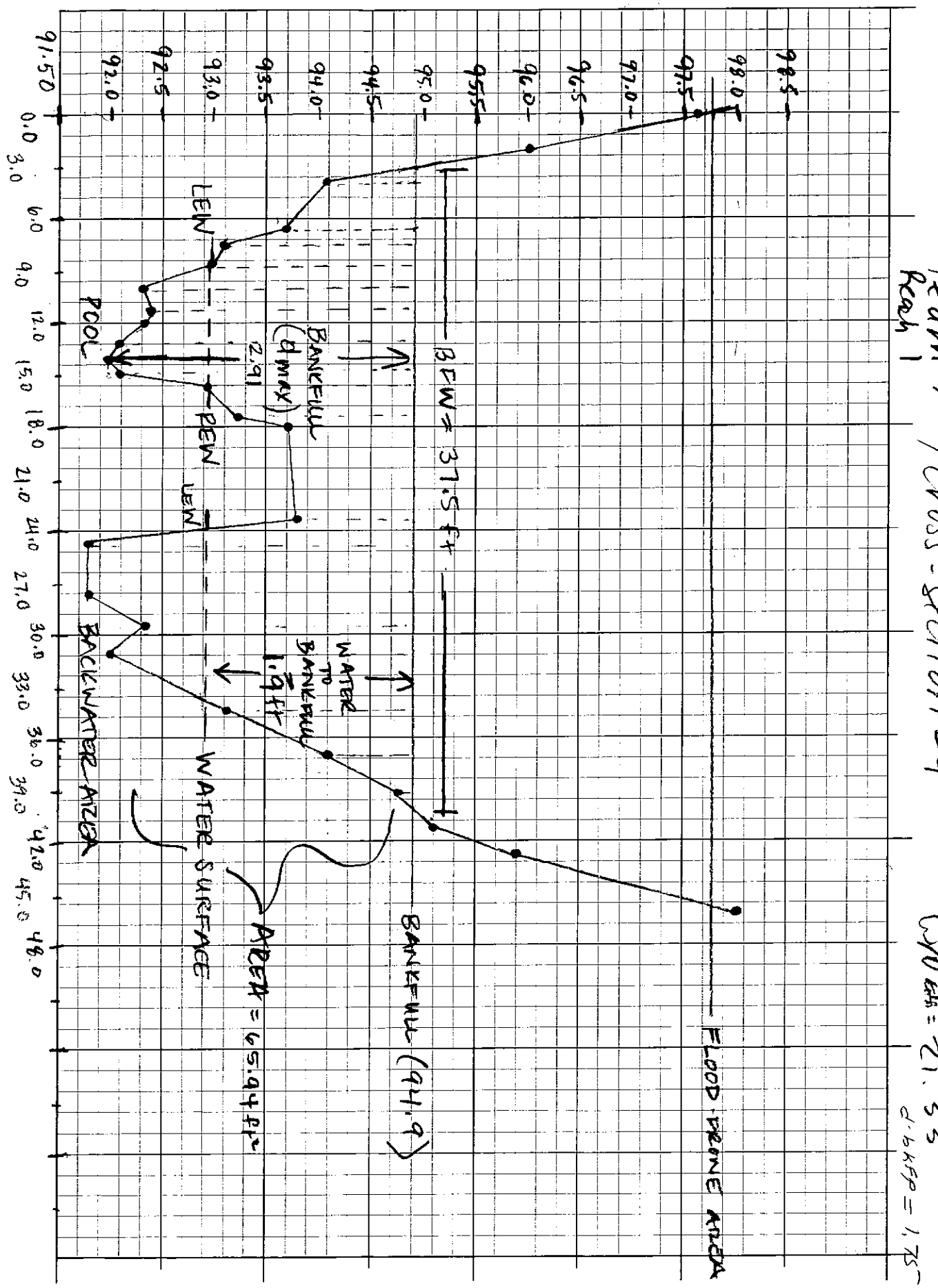



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Cross-Section 5

Sharman Branch 4/14/15 Team 1 Reach #1

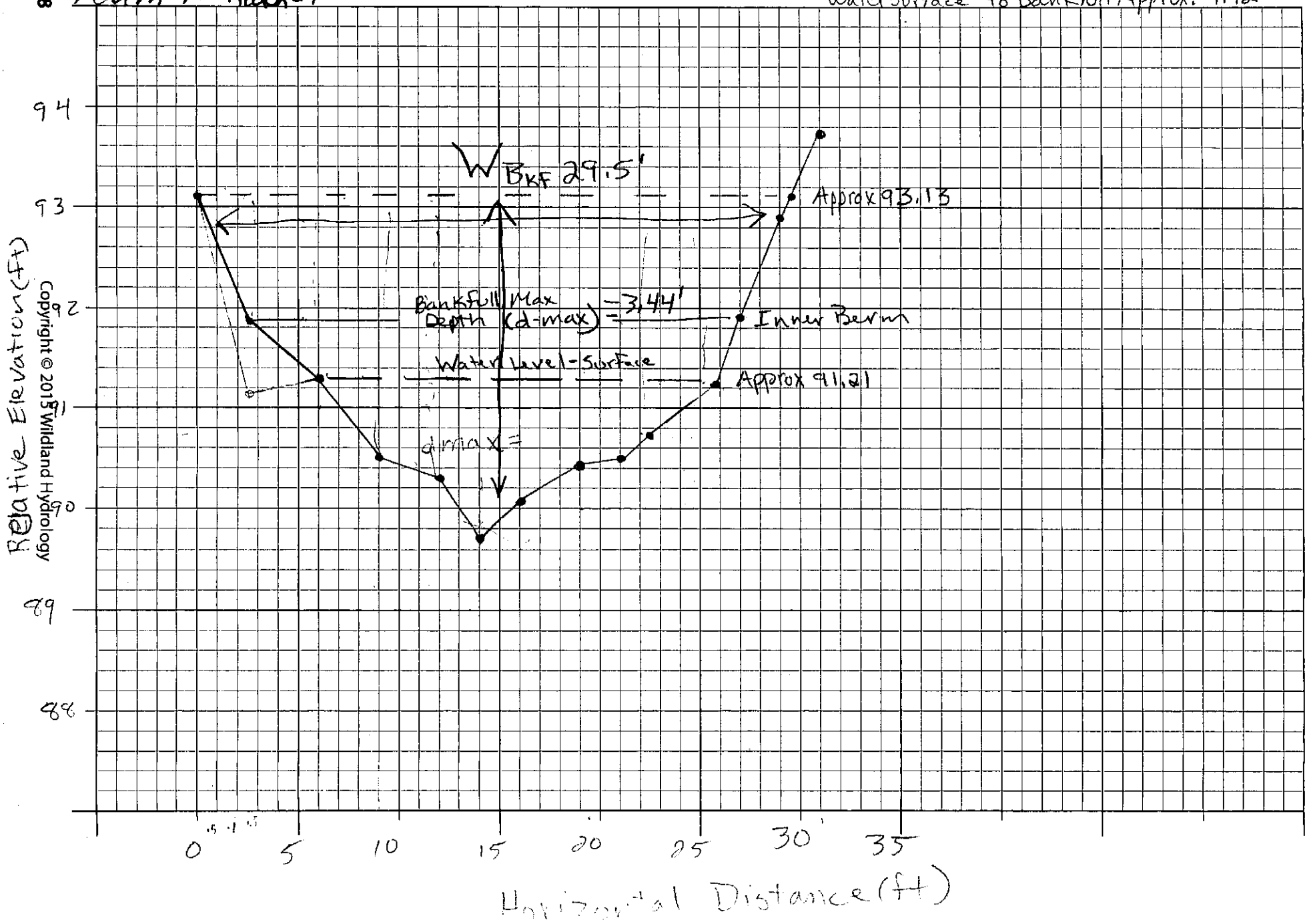
~~Backwater~~ Convergence Pool Cross-section

W/D Ration - 13.8

Cross-sectional Area = 62.634

Station 1+82

Water surface to Bankfull Approx. - 1.92

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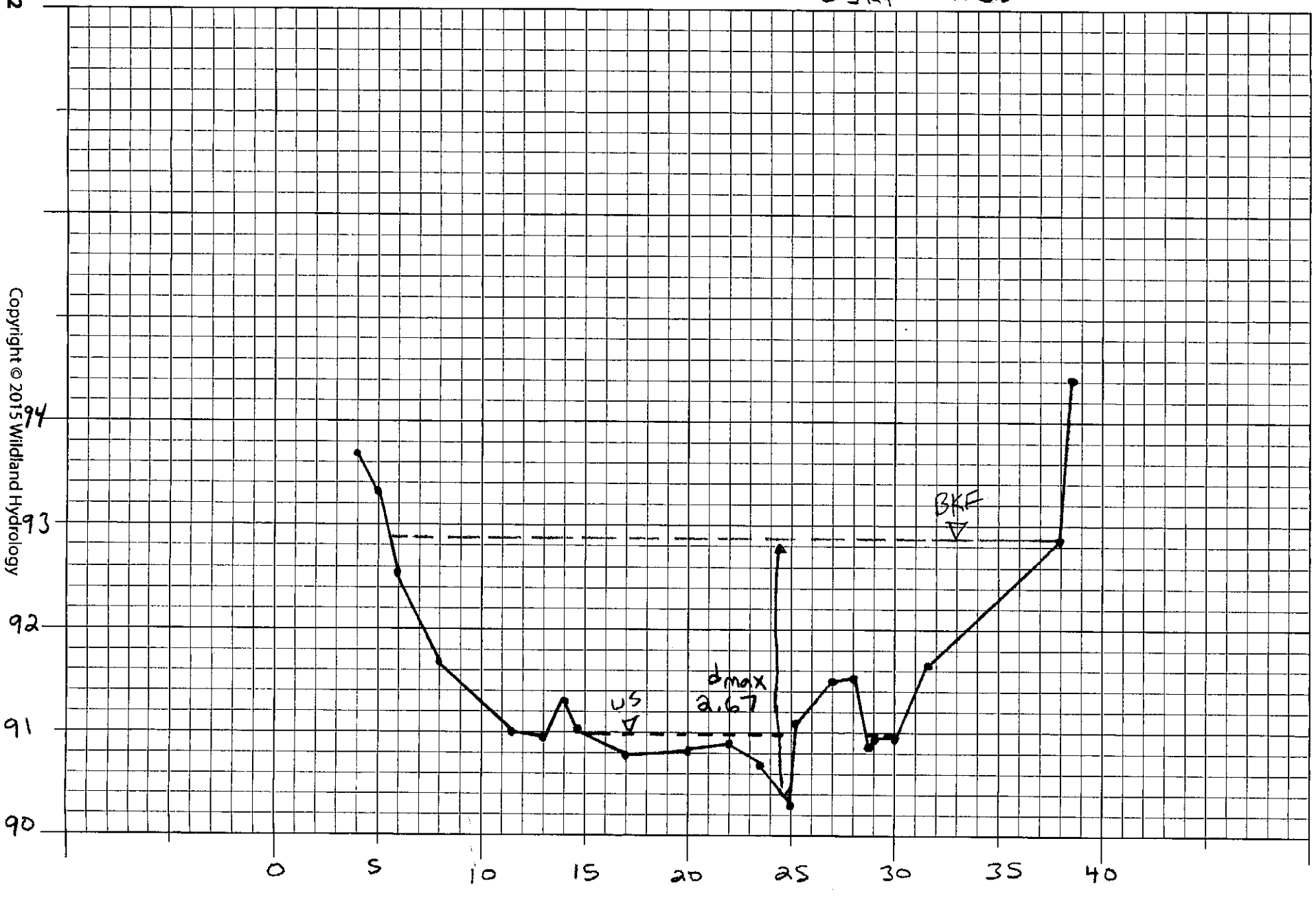
April 14, 2015
Team 1 Reach 1
Sharmans Branch

Cross-Section 6
Step
Station 193

$W_{bkf} = 30.5$
$A_{bkf} = 48.15$
$d_{bkf} = 1.58$

$W/d = 19.30$




Bankfull (92.82) − WSE (90.95) = 1.87

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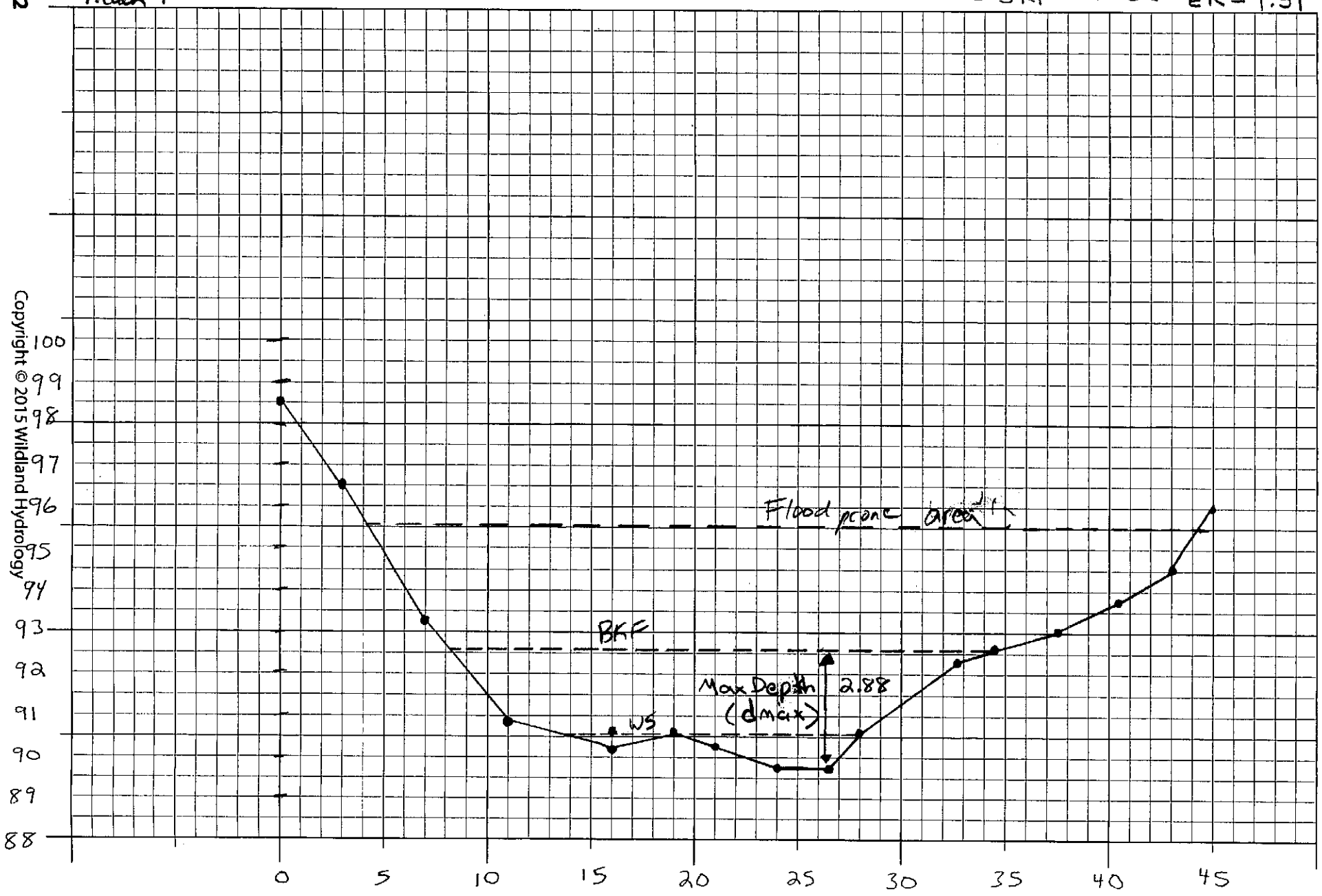
April 14, 2015
Team 1
Sharmans Branch
Reach 1

Cross Section 7 Rapid/Riffle
Station 202

$W_{bkf}$ = 26.60 W/d = 14.78
$A_{bkf}$ = 47.87 Flood-Prone Width 40.2'
$d_{bkf}$ = 1.80 ER = 1.51

2.88 / 1.80 = 1.6




Bankfull (92.65') - Water Surface (90.61) = 2.04

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Sharman Branch 4/14/15

Cross-section 8 ~~Plunge~~ convergence Pool

Station 2145

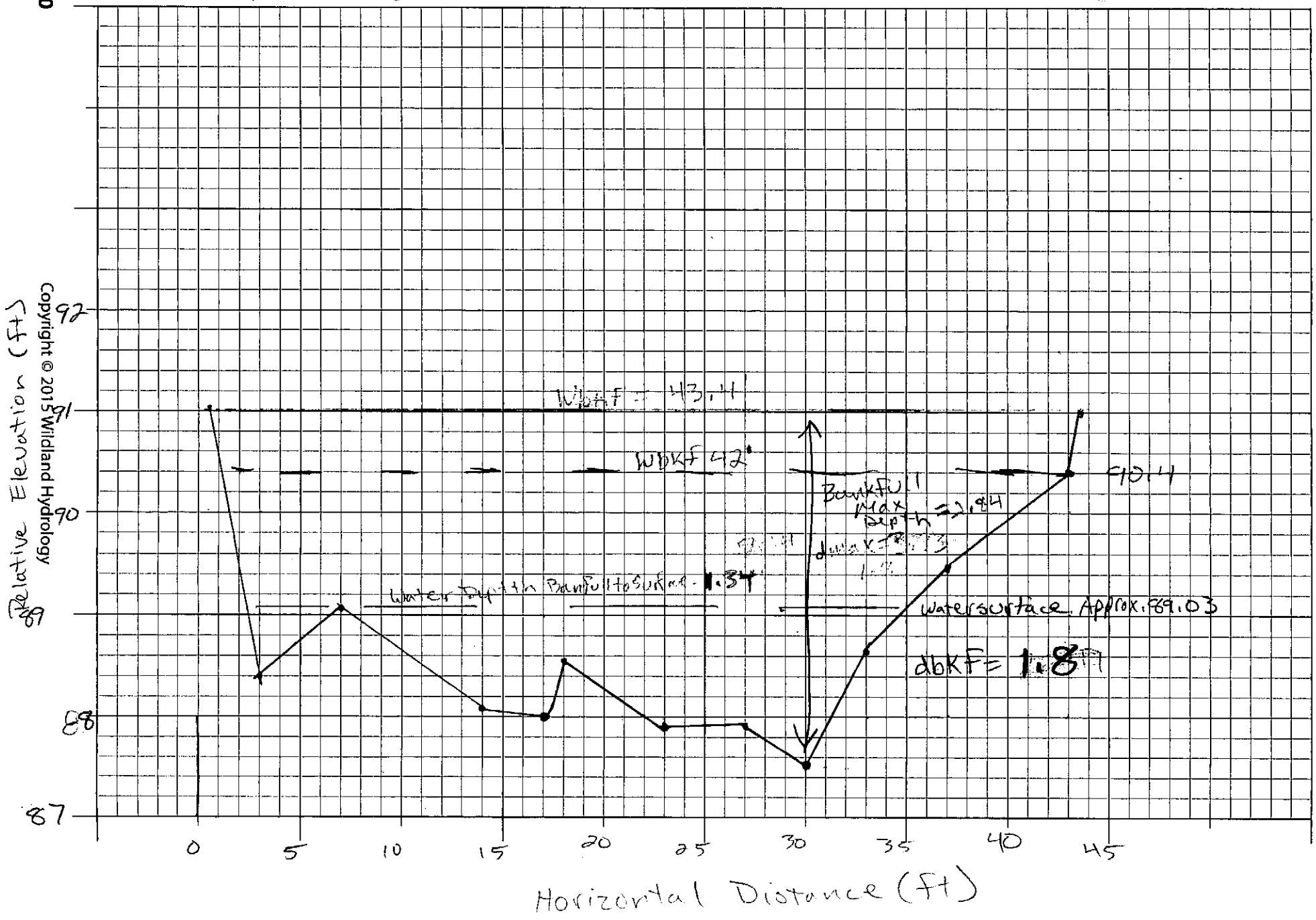
Team 1 Reach 1

W/D Ratio = 23.3

cross-sectional area = 15.83

Water surface Elevation to Bankfull = 1.37

Team 1 4-14-15 Sharmans Br.

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Team 1 Reach 1 4/14/15 Cross-section 2



**SURVEY DATA** ⟶ **CROSS - SECTION** 2

**SITE:** ST 108.1 Rapid. Date: 4-14-15

| Item | STATION ft | BS ft | HI ft | FS ft | Elevation ft | NOTES / COMMENTS / REMARKS |
|---|---|---|---|---|---|---|
| 29 | | | ~~105.19~~ | | | |
| 30 | | | 102.02 | | | |
| 31 | | | | | | |
| 32 | 0.0 | | | 2.49 | 99.53 | |
| 33 | 1.0 | | | 3.13 | 98.89 | |
| 34 | 2.0 | | | 4.71 | 97.31 | |
| 35 | 3.0 | | | 5.00 | 97.02 | |
| 36 | 4.0 | | | 5.74 | ~~97.28~~ 96.28 | |
| 37 | 5.0 | | | 6.82 | 95.2 | |
| 38 | 6.0 | | | 7.30 | 94.72 | |
| 39 | 7.0 | | | 7.70 | 94.32 | |
| 40 | 8.3 | | | 8.04 | 93.98 | LEW |
| 41 | 9.0 | | | 8.48 | 93.54 | Channel (Rapid) |
| 42 | 10.0 | | | 8.77 | 93.25 | ↓ |
| 43 | 11.0 | | | 8.90 | 93.12 | |
| 44 | 12.0 | | | 8.95 | 93.07 | |
| 45 | 13.0 | | | 9.00 | 93.02 | Thalweg |
| 46 | 14.0 | | | 8.81 | 93.21 | Channel (Rapid) |
| 47 | 15.0 | | | 8.73 | 93.29 | ↓ |
| 48 | 16.0 | | | 8.83 | 93.19 | |
| 49 | 17.0 | | | 8.81 | 93.21 | |
| 50 | 18.0 | | | 8.67 | 93.35 | |
| 51 | 19.0 | | | 8.34 | 93.68 | |
| 52 | 20.0 | | | 8.00 | 94.02 | Edge |
| 53 | 21.0 | | | 8.01 | 94.01 | Backwater |
| 54 | 22.0 | | | 8.00 | 94.02 | ↓ |
| 55 | 23.0 | | | 8.13 | 93.89 | |
| 56 | 24.0 | | | 8.23 | 93.79 | |
| 57 | 25.0 | | | 7.99 | ~~94.01~~ 94.03 | |
| 58 | 26.0 | | | 8.05 | 93.97 | |
| 59 | 27.0 | | | 8.18 | 93.84 | |

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Team 1 Reach 1 4-14-15 Cross-section 2 continued.
Sharmon Cr



**SURVEY DATA** → **CROSS - SECTION 4**

**SITE:** Sharmon Reach 1 Date: 4/14/15

| Item | STATION ft | BS ft | HI ft | FS ft | Elevation ft | NOTES COMMENTS REMARKS |
|---|---|---|---|---|---|---|
| 29 | 28.0 | | 7.90 | | 94.12 | Rt cow |
| 30 | 29.0 | | 7.56 | | ~~94.12~~ | Rt Bank 94.46 |
| 31 | 30.0 | | 7.43 | | 94.59 | |
| 32 | 31.0 | | 7.22 | | 94.80 | |
| 33 | 32.0 | | 6.57 | | 95.45 | |
| 34 | 33.0 | | 6.50 | | 95.52 | |
| 35 | 34 | | 6.40 | | 95.62 | |
| 36 | 35 | | 6.80 | | 95.22 | |
| 37 | 36 | | 6.66 | | 95.36 | |
| 38 | 37 | | 6.43 | | 95.59 | |
| 39 | 38 | | 6.08 | | 95.94 | BF |
| 40 | 39 | | 5.55 | | 96.47 | Tw = 9.0 |
| 41 | 40 | | 5.41 | | 96.61 | dmax = 2.92 |
| 42 | 41 | | 4.90 | | 97.12 | EPA = 5.84 |
| 43 | 42 | | 4.70 | | 97.32 | |
| 44 | 43 | | 4.20 | | 97.82 | |
| 45 | 44 | | 3.73 | | 98.29 | |
| 46 | 45 | | 3.25 | | 98.77 | |
| 47 | 46 | | 2.73 | | 99.29 | |
| 48 | | | | | | |
| 49 | | | | | | |
| 50 | | | | | | |
| 51 | | | | | | 2.92 |
| 52 | | | | | | |
| 53 | | | | | | |
| 54 | | | | | | |
| 55 | | | | | | |
| 56 | | | | | | |
| 57 | | | | | | |
| 58 | | | | | | |
| 59 | | | | | | |

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Team 1



**SURVEY DATA** ⟹ **CROSS - SECTION** 1

**SITE:** Sharman Reach 1 Date: 4/14/15

Location: 00-15.5, Rep R.F. Cross-Section #1

Party / Notes: 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 | | | 104.55 | | | |
| 2 | | | | | | |
| 3 | 0 | | | 1.81 | 102.74 | |
| 4 | 1.7 | | | 2.28 | 102.74 | |
| 5 | 4.7 | | | 3.31 | 101.24 | |
| 6 | 11.0 | | | 3.74 | 100.81 | |
| 7 | 12.0 | | | 3.80 | 100.75 | |
| 8 | 13.0 | | | 3.90 | 100.65 | |
| 9 | 14.0 | | | 4.10 | 100.45 | |
| 10 | 15.0 | | | 4.19 | 100.36 | |
| 11 | 16.0 | | | 4.45 | 100.1 | |
| 12 | 17.0 | | | 4.65 | 99.9 | |
| 13 | 18.0 | | | 4.71 | 99.84 | |
| 14 | 19.0 | | | 4.80 | 99.75 | |
| 15 | 20.0 | | | 5.11 | 99.44 | |
| 16 | 21.0 | | | 5.32 | 99.23 | 2.68 - dmax (5.36) |
| 17 | 22.0 | | | 5.78 | 98.77 | 3. |
| 18 | 27.3 | | | 6.68 | 97.87 | |
| 19 | 30.4 | | | 7.70 | 96.85 | LWE |
| 20 | 32.1 | | | 7.92 | 96.63 | channel |
| 21 | 33.0 | | | 8.32 | 96.23 | ch |
| 22 | 35.7 | | | 8.23 | 96.32 | ch |
| 23 | 38.0 | | | 8.16 | 96.39 | ch - TW |
| 24 | 39.0 | | | 8.17 | 96.38 | |
| 25 | 40.0 | | | 8.17 | 96.38 | |
| 26 | 41 | | | 8.13 | 96.42 | |
| 27 | | | | | | |
| 28 | LPIN | | | 0.49 | | |

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Team 1
Reach 1

Sharman Cr
4-14-15

Cross-Section #1



**SURVEY DATA** ⟹ **CROSS - SECTION** ~~2~~ 1 continued

**SITE:** ST 15.5 Riffle **Date:**

| Item | STATION ft | BS ft | HI ft | FS ft | Elevation ft | NOTES / COMMENTS / REMARKS |
|---|---|---|---|---|---|---|
| 29 | 42.1 | | 104.55 | 7.86 | 96.69 | ch |
| 30 | 43.0 | | | 7.66 | 96.89 | ch |
| 31 | 45.4 | | | 7.48 | 97.07 | REW |
| 32 | 46.4 | | | 7.41 | 97.14 | Rt BK |
| 33 | 47.4 | | | 7.36 | 97.19 | |
| 34 | 48.4 | | | 7.10 | 97.45 | |
| 35 | 49.4 | | | 6.88 | 97.67 | |
| 36 | 50.4 | | | 6.79 | 97.77 | |
| 37 | 51.4 | | | 6.25 | 98.3 | |
| 38 | 52.6 | | | 5.48 | 99.07 | ~~BK~~ BF |
| 39 | 53.8 | | | 5.15 | 99.4 | RT Bank |
| 40 | | | | ~~5.1~~ 5.15 | | |
| 41 | 54.8 | | | 4.78 | 99.77 | |
| 42 | 56.0 | | | 4.44 | 100.11 | |
| 43 | 57.0 | | | 4.15 | 100.4 | |
| 44 | 59.3 | | | 3.03 | 101.52 | |
| 45 | | | | | | |
| 46 | | | | | | |
| 47 | | | | | | |
| 48 | | | | | | |
| 49 | | | | | | |
| 50 | | | | | | |
| 51 | | | | | | |
| 52 | | | | | | |
| 53 | | | | | | |
| 54 | | | | | | |
| 55 | | | | | | |
| 56 | | | | | | |
| 57 | | | | | | |
| 58 | | | | | | |
| 59 | | | | | | |

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**SURVEY DATA** ⟹ *CROSS - SECTION* #

**SITE:** Sharman Creek Date: 4/14/15

Location: 118 - Step Pool ; Cross-Section #3

Party / Notes: Team 1 Reach 1 HUC: 0 2 0 7 0 0 0 4 1 0 0 9

| 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 | | 2.02 | 102.02 | | | |
| 2 | 0.0 | | | 1.50 | 100.52 | |
| 3 | 2.0 | | | 2.51 | 99.51 | |
| 4 | 3.0 | | | 3.40 | 98.62 | |
| 5 | 4.0 | | | 4.52 | 97.50 | |
| 6 | 5.0 | | | 6.31 | 95.71 | |
| 7 | 7.0 | | | 7.78 | 94.24 | |
| 8 | 8.5 | | | 8.45 | 93.57 | |
| 9 | 10.2 | | | 8.77 | 93.25 | Left Edge of Water (9.5) |
| 10 | 12.0 | | | 8.94 | 93.08 | |
| 11 | 13.3 | | | 8.57 | 93.45 | |
| 12 | 14.0 | | | 8.54 | 93.48 | |
| 13 | 14.9 | | | 9.21 | 92.81 | |
| 14 | 16.0 | | | 9.20 | 92.82 | |
| 15 | 17.8 | | | 9.23 | 92.79 | Thalweg |
| 16 | 19.3 | | | 8.70 | 93.32 | Right Edge of Water |
| 17 | 21.0 | | | 8.28 | 93.74 | |
| 18 | 23.3 | | | 7.67 | 94.35 | Depositional Area |
| 19 | 24.7 | | | 7.72 | 94.30 | |
| 20 | 26.0 | | | 8.51 | 93.51 | Backwater Area |
| 21 | 29.8 | | | 8.71 | 93.31 | ↓ |
| 22 | 33.0 | | | 8.42 | 93.60 | Upland |
| 23 | 34.0 | | | 7.75 | 94.27 | |
| 24 | 36.5 | | | 7.18 | 94.84 | |
| 25 | 38.7 | | | 6.77 | 95.25 | Bankfull |
| 26 | 40.7 | | | 6.29 | 95.73 | |
| 27 | 43.0 | | | 5.74 | 96.28 | |
| 28 | 47.0 | | | 4.59 | 97.43 | |
| | 49.5 | | | 3.59 | 98.43 | |
| | 51.0 | | | 2.92 | 99.10 | |

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Sharman Creek 4/14/15
St. 118 - Step pool Cross-Section #3
Team 1 Reach 1



**SURVEY DATA** ⟹ **CROSS - SECTION 5**

**SITE:** Date:

| Item | STATION ft | ~~Elev~~ ~~BS~~ ft | Depth ~~HI~~ ft | all w. FS ft | Avg. depth Elevation ft | NOTES / COMMENTS / REMARKS |
|---|---|---|---|---|---|---|
| 29 | 6.0 | 95.2 | 0.0 | | | |
| 30 | 7.0 | 94.24 | 0.96 | 1 | (0.96)/2 = 0.48 × 1 = 0.48 | |
| 31 | 8.5 | 93.57 | 1.63 | 1.5 | (96+1.63)/2 = 1.295 × 1.5 = 1.9425 | |
| 32 | 10.2 | 93.25 | 1.95 | 1.7 | (1.63+1.95)/2 = 1.79 × 1.7 = 3.043 | |
| 33 | 12.0 | 93.08 | 2.12 | 1.8 | (1.95+2.12)/2 = 2.035 × 1.8 = 3.663 | |
| 34 | 13.3 | 93.45 | 1.75 | 1.3 | (2.12+1.75)/2 = 1.935 × 1.3 = 2.5155 | |
| 35 | 14.0 | 93.48 | 1.72 | 0.7 | (1.75+1.72)/2 = 1.735 × 0.7 = 1.2145 | |
| 36 | 14.9 | 92.81 | 2.39 | 0.9 | (1.72+2.39)/2 = 2.055 × 0.9 = 1.8495 | |
| 37 | 16.0 | 92.82 | 2.38 | 1.1 | (2.39+2.38)/2 = 2.385 × 1.1 = 2.6235 | |
| 38 | 17.8 | 92.79 | 2.41 | 1.8 | (2.38+2.41)/2 = 2.395 × 1.8 = 4.311 | |
| 39 | 19.3 | 93.32 | 1.88 | 1.5 | (2.41+1.88)/2 = 2.145 × 1.5 = 3.2175 | |
| 40 | 21.0 | 93.74 | 1.46 | 1.7 | (1.88+1.46)/2 = 1.67 × 1.7 = 2.839 | |
| 41 | 23.3 | 94.35 | 0.85 | 2.3 | (1.46+0.85)/2 = 1.155 × 2.3 = 2.6565 | |
| 42 | 24.7 | 94.30 | 0.90 | 1.4 | (0.85+.90)/2 = 0.875 × 1.4 = 1.225 | |
| 43 | 26.0 | 93.51 | 1.69 | 1.3 | (0.90+1.69)/2 = 1.295 × 1.3 = 1.6835 | |
| 44 | 29.8 | 93.31 | 1.89 | 3.8 | (1.69+1.89)/2 = 1.79 × 3.8 = 6.802 | |
| 45 | 33.0 | 93.60 | 1.60 | 3.2 | (1.89+1.60)/2 = 1.745 × 3.2 = 5.584 | |
| 46 | 34.0 | 94.27 | 0.93 | 1.0 | (1.60+0.93)/2 = 1.25 × 1 = 1.25 | |
| 47 | 36.5 | 94.84 | 0.36 | 2.5 | (0.93+0.36)/2 = 0.645 × 2.5 = 1.6125 | |
| 48 | 38.7 | 95.2 | 0.0 | 2.2 | (0.36+0)/2 = 0.18 × 2.2 = 0.396 | |
| 49 | | | | | | |
| 50 | | | | | | Area = 48.9085 ft² |
| 51 | | | | | | |
| 52 | | | | | | |
| 53 | | | | | | |
| 54 | | | | | | $\bar{d}$ = 48.9085/32.7 |
| 55 | | | | | | |
| 56 | | | | | | $\bar{d}$ = 1.49 |
| 57 | | | | | | |
| 58 | | | | | | W/d = 32.7/1.49 = 21.9 |
| 59 | | | | | | |

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**SURVEY DATA** ⟹ **CROSS - SECTION** 1

**SITE:** Sharman Creek Date: 4/14/15

Location: St. 143 - Pool (Backwater) Cross - Section #4

Party / Notes: Team 1 Reach 1 HUC: 0 2 0 7 0 0 0 4 1 0 0 9

| 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 | | | 102.02 | | | |
| 2 | 0.0 | | | 4.37 | 97.65 | |
| 3 | 1.7 | | | 6.01 | 96.01 | |
| 4 | 4.3 | | | 7.87 | 94.15 | |
| 5 | 6.4 | | | 8.32 | 93.70 | |
| 6 | 7.4 | | | 8.90 | 93.12 | |
| 7 | 8.6 | | | 9.04 | 92.98 | Left Edge of Water |
| 8 | 10.3 | | | 9.67 | 92.35 | |
| 9 | 11.0 | | | 9.58 | 92.44 | |
| 10 | 12.0 | | | 9.61 | 92.41 | |
| 11 | 13.0 | | | 9.87 | 92.15 | |
| 12 | 14.0 | | | 10.03 | 91.99 | Thalweg (2.91 ft) |
| 13 | 15.0 | | | 9.87 | 92.15 | |
| 14 | 16.0 | | | 9.00 | 93.02 | Right Edge of water (pool end) |
| 15 | 17.0 | | | 8.64 | 93.38 | Large Rock |
| 16 | 18.0 | | | 8.29 | 93.73 | ↓ |
| 17 | 23.0 | | | 8.31 | 93.71 | |
| 18 | 25.0 | | | 10.21 | 91.81 | Backwater eddy |
| 19 | 27.0 | | | 10.19 | 91.83 | ↓ |
| 20 | 29.0 | | | 9.60 | 92.42 | |
| 21 | 31.0 | | | 9.77 | 92.25 | |
| 22 | 34.0 | | | 8.69 | 93.33 | Upland |
| 23 | 37.0 | | | 7.87 | 94.15 | Bankfull |
| 24 | 39.0 | | | 7.17 | 94.85 | |
| 25 | 41.0 | | | 6.91 | 95.11 | |
| 26 | 43.0 | | | 6.14 | 95.88 | |
| 27 | 46.3 | | | 4.09 | 97.93 | |
| 28 | | | | | | |

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Team 1 Reach 1



**SURVEY DATA** ⟹ **CROSS - SECTION 2**

Cross-section #4

**SITE:** Sharman Creek, St. 143 - Backwater Pool **Date:** 4/14/15

| Item | STATION ft | Elev. ~~BS~~ ft | Depth ~~HI~~ ft | cell w ~~FS~~ ft | Avg. Depth Elevation ft | NOTES / COMMENTS / REMARKS |
|---|---|---|---|---|---|---|
| 29 | 3.0 | 94.9 | 0.0 | | | |
| 30 | 4.3 | 94.15 | 0.75 | 1-0=1 | (0+.75)/2 = 0.375 × 1 = 0.375 | |
| 31 | 6.4 | 93.70 | 1.20 | 2.1 | (.75+1.20)/2 = 0.975 × 2.1 = 2.0475 | |
| 32 | 7.4 | 93.12 | 1.78 | 1.0 | (1.20+1.78)/2 = 1.49 × 1 = 1.49 | |
| 33 | 8.6 | 92.98 | 1.92 | 1.2 | (1.78+1.92)/2 = 1.85 × 1.2 = 2.22 | |
| 34 | 10.3 | 92.35 | 2.55 | 1.7 | (1.92+2.55)/2 = 2.235 × 1.7 = 3.799 | |
| 35 | 11.0 | 92.44 | 2.46 | 0.7 | (2.55+2.46)/2 = 2.505 × 0.7 = 1.75 | |
| 36 | 12.0 | 92.41 | 2.49 | 1.0 | (2.46+2.49)/2 = 2.475 × 1 = 2.475 | |
| 37 | 13.0 | 92.15 | 2.75 | 1.0 | (2.49+2.75)/2 = 2.62 × 1 = 2.62 | |
| 38 | 14.0 | 91.99 | 2.91 | 1.0 | (2.75+2.91)/2 = 2.83 × 1 = 2.83 | |
| 39 | 15.0 | 92.15 | 2.75 | 1.0 | (2.91+2.75)/2 = 2.83 × 1 = 2.83 | |
| 40 | 16.0 | 93.02 | 1.88 | 1.0 | (2.75+1.88)/2 = 2.315 × 1 = 2.315 | |
| 41 | 17.0 | 93.38 | 1.52 | 1.0 | (1.88+1.52)/2 = 1.7 × 1 = 1.7 | |
| 42 | 18.0 | 93.73 | 1.17 | 1.0 | (1.52+1.17)/2 = 1.345 × 1 = 1.345 | |
| 43 | 23.0 | 93.71 | 1.19 | 5.0 | (1.17+1.19)/2 = 1.18 × 5 = 5.9 | |
| 44 | 25.0 | 91.81 | 3.09 | 2.0 | (1.19+3.09)/2 = 2.14 × 2 = 4.28 | |
| 45 | 27.0 | 91.83 | 3.07 | 2.0 | (3.09+3.07)/2 = 3.08 × 2 = 6.16 | |
| 46 | 29.0 | 92.42 | 2.48 | 2.0 | (3.07+2.48)/2 = 2.775 × 2 = 5.55 | |
| 47 | 31.0 | 92.25 | 2.65 | 2.0 | (2.48+2.65)/2 = 2.56 × 2 = 5.13 | |
| 48 | 34.0 | 93.33 | 1.57 | 3.0 | (2.65+1.57)/2 = 2.11 × 3 = 6.33 | |
| 49 | 37.0 | 94.15 | 0.75 | 3.0 | (1.57+0.75)/2 = 1.16 × 3 = 3.48 | |
| 50 | 40.5 | 94.9 | 0.0 | 3.5 | (0.75+0)/2 = 0.375 × 3.5 = 1.312 | |
| 51 | | | | | | |
| 52 | | | | | | |
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| 58 | | | | | | |
| 59 | | | | | | |

$\boxed{\text{Area} = 65.94 \text{ ft}^2}$

$\bar{d} = 65.94 / 37.5 = 1.758$

$w/D = 37.5 / 1.758 = 21.33$

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Team 1 Reach 1 Sherman Br. 4/14/15



## SURVEY DATA ⟹ CROSS - SECTION

**SITE:** 5 Backwater Pool Station 182 **Date:** 4/14/15

| Item | STATION ft | BS ft | HI ft | FS ft | Elevation ft | NOTES / COMMENTS / REMARKS |
|---|---|---|---|---|---|---|
| 29 | 1+82 | | | | | [illegible] |
| 30 | | | [illegible] | | | [illegible] |
| 31 | TB172 | [illegible] | | | 94.01 | [illegible] |
| 32 | | [illegible] | | | | |
| 33 | | | [illegible] | | | |
| 34 | [illegible] | | | [illegible] | 93.13 | [illegible] -LBKF |
| 35 | [illegible] | | | [illegible] | 91.61 | |
| 36 | [illegible] | | | [illegible] | 91.27 | |
| 37 | [illegible] | | | [illegible] | 90.47 | |
| 38 | [illegible] | | | [illegible] | 90.27 | |
| 39 | [illegible] | | | [illegible] | 89.69 | [illegible] |
| 40 | [illegible] | | | [illegible] | 90.11 | |
| 41 | [illegible] | | | | 90.41 | |
| 42 | [illegible] | | | | 90.51 | |
| 43 | | | | | 90.79 | |
| 44 | [illegible] | | | [illegible] | 91.21 | [illegible] |
| 45 | [illegible] | | | [illegible] | 91.91 | [illegible] |
| 46 | [illegible] | | | [illegible] | 92.89 | |
| 47 | [illegible] | | | [illegible] | 93.77 | |
| 48 | | | | | | |
| 49 | [illegible] | | | [illegible] | | [illegible] |
| 50 | [illegible] | | | [illegible] | | |
| 51 | [illegible] | | | [illegible] | | |
| 52 | [illegible] | | | [illegible] | | [illegible] |
| 53 | [illegible] | | | [illegible] | | |
| 54 | [illegible] | | | [illegible] | | |
| 55 | [illegible] | | | [illegible] | | |
| 56 | [illegible] | | | [illegible] | | |
| 57 | [illegible] | | | [illegible] | | |
| 58 | [illegible] | | | [illegible] | | |
| 59 | [illegible] | | | [illegible] | | [illegible] |

93.13
-89.69

91.27
-89.69

moved to next data sheet

step

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| | | | | | |
|---|---|---|---|---|---|
| 0 | 93.13 | 0 | ~~width~~ width | Avg cell Depth | Incremental Area |
| 2.2 | 91.81 | 1.32 | 2.2-0 = 2.2 | 0+0c+1.32/2 = 0.66 | 2.2x.66 = 1.452 |
| 6 | 91.27 | 1.83 | 3.8 | 1.32+1.83/2 = 1.575 | 3.8x1.575 = 5.985 |
| 9 | 90.47 | 2.66 | 3 | 2.245 | 6.735 |
| 12 | 90.27 | 2.86 | 3 | 2.76 | 8.28 |
| 14 | 89.69 | 3.44 | 2 | 3.15 | 6.3 |
| 16 | 90.11 | 3.02 | 2 | 3.23 | 6.46 |
| 19 | 90.41 | 2.72 | 3 | 2.87 | 8.61 |
| 21 | 90.51 | 2.62 | 2 | 2.67 | 5.34 |
| 22.2 | 90.79 | 2.34 | 1.2 | 2.48 | 2.976 |
| 25.7 | 91.21 | 1.92 | 3.5 | 2.13 | 7.455 |
| 27.2 | 91.91 | 1.22 | 1.5 | 1.57 | 2.355 |
| 29 | 92.89 | 0.24 | 0.98 | 0.73 | 0.7154 |
| 31 | 93.27 | | | | |
| | | | | | 62.6634 |

Team 1 Reach 1 Sharman Bc. 4/14/16



**SURVEY DATA** → **CROSS - SECTION** 6

**SITE:** X - 6 - step Station 193 Date: 4-14-16

| Item | STATION ft | BS ft | HI ft | FS ft | Elevation ft | NOTES COMMENTS REMARKS |
|---|---|---|---|---|---|---|
| 29 | 0+04 | | 97.75 | 4.08 | 93.67 | 1+93 - step |
| 30 | 0+05 | | | 4.56 | 93.17 | Bankfull - LBKF |
| 31 | 0+06 | | | 5.28 | 92.47 | |
| 32 | 0+08 | | | 6.12 | 91.63 | |
| 33 | 0+11.5 | | | 6.72 | 91.03 | LEW |
| 34 | 0+13 | | | 6.76 | 90.99 | |
| 35 | 0+14 | | | 6.42 | 91.33 | |
| 36 | 0+14.8 | | | 6.66 | 91.09 | |
| 37 | 0+17 | | | 6.96 | 90.79 | |
| 38 | 0+20 | | | 6.94 | 90.81 | |
| 39 | 0+22 | | | 6.81 | 90.91 | |
| 40 | 0+22.6 | | | 7.41 | 90.34 | |
| 41 | 0+25 | | | 7.6 | 90.15 | Thalweg |
| 42 | 0+25.3 | | | 6.76 | 91.49 | |
| 43 | 0+27 | | | 6.3 | 91.45 | |
| 44 | 0+27.6 | | | 6.7 | 91.55 | |
| 45 | 0+28 | | | 6.93 | 90.83 | |
| 46 | 0+29 | | | 6.84 | 90.91 | |
| 47 | 0+30 | | | 6.8 | 90.95 | REW |
| 48 | 0+32.6 | | | 6.12 | 91.63 | |
| 49 | 0+35.6 | | | 4.79 | 92.82 | Bankfull |
| 50 | 0+37.4 | | | 5.51 | 94.41 | |
| 51 | | | | | | |
| 52 | | | | | | |
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**SURVEY DATA** ⟹ **CROSS - SECTION** 6

**SITE:** Date:

| Item | STATION ft | B S ft | ~~Ht~~ depth ft | ~~FS~~ cell width ft | Elevation Avg depth ft | Inc Area NOTES COMMENTS REMARKS |
|---|---|---|---|---|---|---|
| 29 | | | | | | |
| 30 | 5.1 | 92.82 | 0 | | | |
| 31 | 6 | 92.47 | .35 | .9 | .175 | 0.16 |
| 32 | 8 | 91.63 | 1.19 | 2 | .945 | 1.90 |
| 33 | 11.5 | 91.03 | 1.79 | 3.5 | 1.49 | 5.21 |
| 34 | 13 | 90.99 | 1.83 | 1.5 | 1.81 | 2.72 |
| 35 | 14 | 91.33 | 1.49 | 1 | 1.66 | 1.66 |
| 36 | 14.8 | 91.09 | 1.73 | .8 | 1.61 | 1.29 |
| 37 | 17 | 90.79 | 2.03 | 2.2 | 1.88 | 4.14 |
| 38 | 20 | 90.81 | 2.01 | 3 | 2.02 | 6.06 |
| 39 | 22 | 90.91 | 1.91 | 2 | 1.96 | 3.92 |
| 40 | 23.6 | 90.34 | 2.48 | 1.6 | 2.16 | 3.46 |
| 41 | 25 | 90.15 | 2.67 | 1.4 | 2.575 | 3.61 |
| 42 | 25.3 | 91.49 | 1.33 | .3 | 2 | .6 |
| 43 | 27 | 91.45 | 1.37 | 1.7 | 1.35 | 2.30 |
| 44 | 27.6 | 91.55 | 1.27 | .6 | 1.32 | 0.79 |
| 45 | 27.8 | 90.83 | 1.99 | .2 | 1.63 | 0.33 |
| 46 | 29 | 90.91 | 1.91 | 1.2 | 1.95 | 2.34 |
| 47 | 30 | 90.95 | 1.87 | 1 | 1.89 | 1.89 |
| 48 | 32.6 | 91.63 | 1.19 | 2.6 | 1.53 | 3.98 |
| 49 | 35.6 | 92.82 | 0 | 3 | .595 | 1.79 |
| 50 | | | | | | 48.15 |
| 51 | | | | | | |
| 52 | | | | | | |
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## SURVEY DATA → CROSS - SECTION

7

**SITE:** Team 1 - XSect 7 - Riffle Station 202 **Date:** 4-14-15

| Item | STATION ft | BS ft | HI ft | FS ft | Elevation ft | NOTES COMMENTS REMARKS |
|---|---|---|---|---|---|---|
| 29 | 0+00 | | 104.00 | 5.50 | 98.5 | |
| 30 | 0+03 | | | 7.49 | 96.51 | |
| 31 | 0+07 | | | 10.75 | 93.25 | Bank full? |
| 32 | 0+16.5 | | | 13.39 | 90.61 | WSE |
| 33 | 0+11 | | | 13.01 | 90.99 | |
| 34 | 0+16 | | | 13.72 | 90.28 | LWE |
| 35 | 0+19 | | | 13.40 | 90.6 | |
| 36 | 0+21 | | | 13.68 | 90.32 | |
| 37 | 0+24 | | | 14.18 | 89.82 | Thalweg |
| 38 | 0+26.5 | | | 14.23 | 89.77 | ↓ |
| 39 | 0+28 | | | 13.40 | 90.6 | RB WSE Boulder (large) |
| 40 | 0+32.8 | | | 11.64 | 92.36 | |
| 41 | | | | ~~11.30~~ | | |
| 42 | 0+34.6 | | | 11.35 | 92.65 | Bank full? at the high |
| 43 | 0+37.5 | | | 10.99 | 93.01 | |
| 44 | 0+40.4 | | | 10.18 | 93.82 | |
| 45 | 0+43 | | | 9.53 | 94.47 | |
| 46 | 0+45 | | | 7.99 | 96.01 | |
| 47 | | | | | | |
| 48 | | | | | | |
| 49 | | | | | | |
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94.01
- 9.99
104.00

13.39
10.75
= 2.64

13.40
11.35
=

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Reach 1 Team 1 Sharman Cr 4-14-15 Station 2+02 Rapid Riffle x-sectional Area calc



**SURVEY DATA** ⟹ **CROSS - SECTION**

**SITE:** Date:

| | Item | STATION ft | B S ft | ~~HT~~ Depth ft | ~~FS~~ Cel Width ft | ~~Elevation~~ Avg depth ft | NOTES COMMENTS REMARKS Incremental Area |
|---|---|---|---|---|---|---|---|
| | 29 | ~~0~~ | ~~98.5~~ | | | | |
| 1 | 30 | ~~3~~ | ~~96.51~~ | | | | |
| 2 | 31 | 8 | 92.65 | 50 | | | |
| 3 | 32 | 11 | 90.99 | 1.66 | 3 | .83 | 2.49 |
| 4 | 33 | 16 | 90.28 | 2.37 | 5 | 2.01 | 10.05 |
| 5 | 34 | 19 | 90.6 | 2.05 | 3 | 2.21 | 6.63 |
| 6 | 35 | 21 | 90.32 | 2.33 | 2 | 2.19 | 4.38 |
| 7 | 36 | 24 | 89.82 | 2.83 | 3 | 2.53 | 7.59 |
| 8 | 37 | 26.5 | 89.77 | 2.88 | 2.5 | 2.85 | 7.13 |
| 9 | 38 | 28 | 90.6 | 2.05 | 1.5 | 2.47 | 3.71 |
| 10 | 39 | 32.8 | 92.36 | .29 | 4.8 | 1.17 | 5.62 |
| 11 | 40 | 34.6 | 92.65 | 0 | 1.8 | 0.15 | .27 |
| ~~12~~ | ~~41~~ | ~~37.5~~ | ~~93.01~~ | | ~~2.9~~ | | 47.87 |
| ~~13~~ | ~~42~~ | ~~40.4~~ | ~~93.82~~ | | ~~2.9~~ | | |
| ~~14~~ | ~~43~~ | ~~43~~ | ~~94.47~~ | | ~~2.6~~ | | |
| ~~15~~ | ~~44~~ | ~~45~~ | ~~96.01~~ | | ~~2~~ | | |
| | 45 | | | | | | |
| | 46 | | | | | | |
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Team 1 Reach 1
Sharman Cr
4-14-15



**SURVEY DATA** → **CROSS - SECTION** ~~7~~ 8

**SITE:** Station 2+45 Plunge Pool **Date:**

| Item | STATION ft | B S ft | H I ft | F S ft | Elevation ft | NOTES COMMENTS REMARKS |
|---|---|---|---|---|---|---|
| 29 | | 6.28 | 100.29 | | | |
| 30 | 0+08 | | | 11.26 | 89.03 | WSE LB |
| 31 | 0+00.5 | | | 9.26 | 91.03 | ~~Bankfull~~ ☆ |
| 32 | 0+03 | | | 11.89 | 88.4 | |
| 33 | 0+14 | | | 12.18 | 88.11 | |
| 34 | 0+17 | | | 12.28 | 88.01 | |
| 35 | 0+18 | | | 11.71 | 88.58 | |
| 36 | 0+23 | | | 12.42 | 87.87 | |
| 37 | 0+27 | | | 12.48 | 87.81 | |
| 38 | 0+30 | | | 12.72 | 87.57 | |
| 39 | 0+33 | | | 11.65 | 88.64 | WSE RB |
| 40 | 0+37 | | | 10.84 | 89.45 | |
| 41 | 0+43 | | | 9.88 | 90.41 | ~~Bankfull~~ BKF |
| 42 | 0+43.4 | | | 9.26 | 91.03 | ~~Bankfull~~ |
| 43 | | | | | | |
| 44 | | | | | | |
| 45 | | | | | | |
| 46 | | | | | | |
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| 58 | | | | | | |
| 59 | | | | | | |

90.41
87.57

94.01
6.28
100.29

11.26
11.9
11.26
9.82
11.26
9.54
.72

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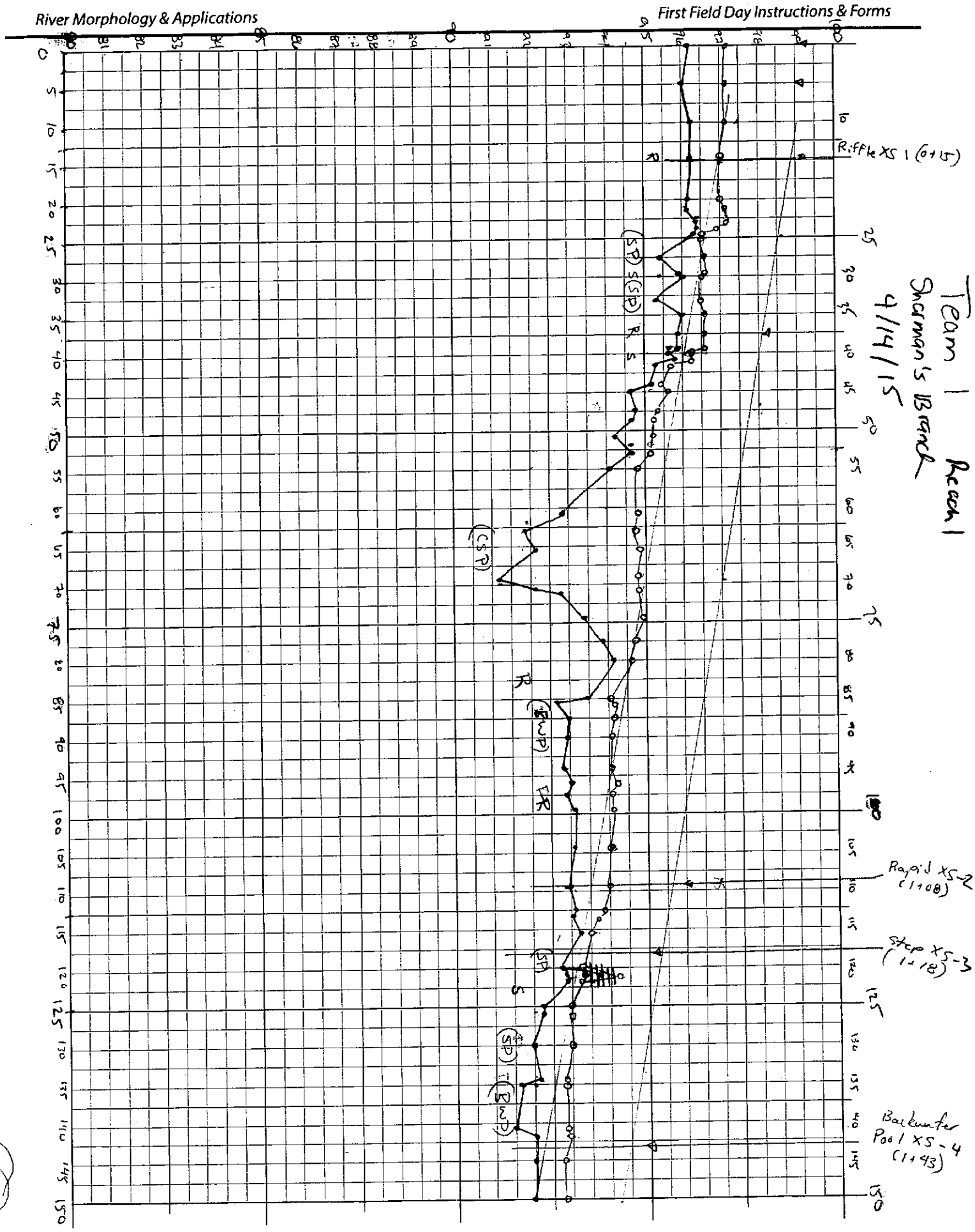
| | | | | | |
|---|---|---|---|---|---|
| 0+03 | 88.41 | 2.63 | 1.35 | 2.95 | 3.88 |
| 0+08 | 89.03 | 2 | 2.315 | 5 | 11.58 |
| 0+14 | 88.11 | 2.92 | 2.46 | 6 | 14.76 |
| 0+17 | 88.01 | 3.02 | 2.97 | 3 | 8.91 |
| 0+18 | 88.58 | 2.45 | 2.735 | 1 | 2.735 |
| 0+23 | 87.87 | 3.46 | 2.8025 | 5 | 14.03 |
| 0+27 | 87.81 | 3.22 | 3.19 | 4 | 12.76 |
| 0+30 | 87.57 | 3.46 | 3.34 | 3 | 10 |
| 0+33 | 88.64 | 2.39 | 2.875 | 3 | 8.775 |
| 0+37 | 89.45 | 1.58 | 1.985 | 4 | 7.94 |
| 43 | 90.41 | 0.62 | 1.1 | 6 | 6.6 |
| 43.4 | 91.03 | 0 | | 1.1 | |

101.97

| | | | | | |
|---|---|---|---|---|---|
| 0+03 | 88.41 | 2 | 2.95 | 1 | 2.99 |
| 0+08 | 89.03 | 1.37 | 5 | 1.685 | 8.425 |
| 0+14 | 88.11 | 2.59 | 6 | 1.85 | 10.96 |
| 0+17 | 88.01 | 2.59 | 3 | 2.311 | 7.02 |
| 0+18 | 88.58 | 1.82 | 1 | 2.105 | 2.105 |
| 0+23 | 87.87 | 2.53 | 5 | 2.175 | 10.875 |
| 0+27 | 87.81 | 2.59 | 4 | 2.56 | 10.24 |
| 0+30 | 87.57 | 2.63 | 3 | 2.71 | 8.13 |
| 0+33 | 88.64 | 1.76 | 3 | 2.245 | 6.855 |
| 0+37 | 89.45 | .94 | 4 | 1.35 | 5.4 |
| 43 | 90.41 | 0 | 6 | .47 | 2.82 |

75.83




1 of 2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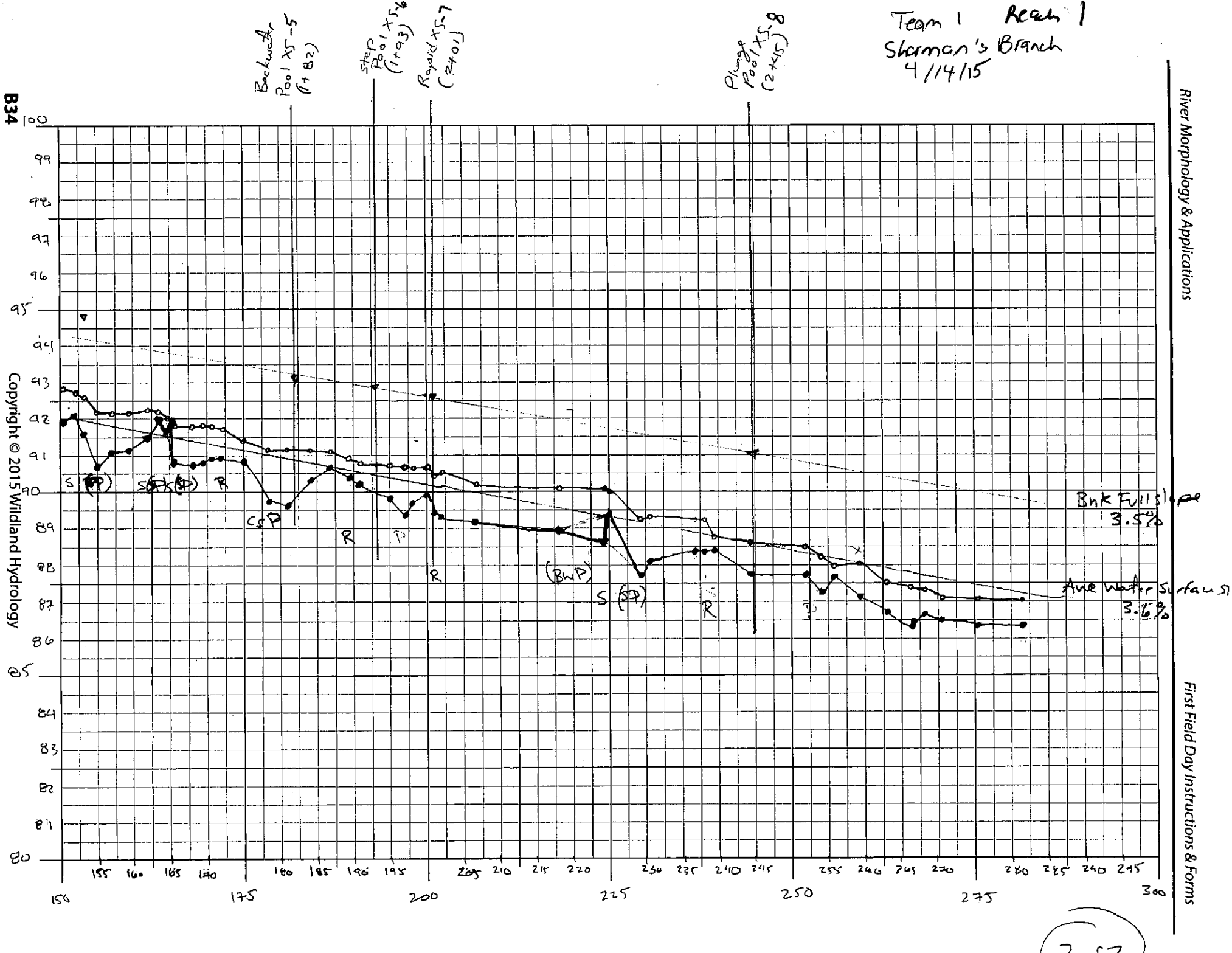
Team 1 Reach 1
Sherman's Branch
4/14/15

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**SURVEY DATA** ⟹ ~~CROSS-SECTION~~ 1

**SITE:** Sharman's Branch Date: 4/14/15

Location: ~~Site 1~~ Reach 1 Team 1

Party / Notes: Group 1 HUC:

| Item | Distance, Point, or STATION ft | Back-Sight BS ft | Height of Instrument HI ft | Fore-Sight FS ft | Elevation ft | NOTES / COMMENTS / REMARKS |
|---|---|---|---|---|---|---|
| 1 | ~~BM~~ | ~~4.62~~ | ~~104.62~~ | | | |
| 2 | BM | 4.55 | 104.55 | | | |
| 3 | 0 | | | 8.45 | 96.1 | D1.0 97.10 TW |
| 4 | 0 | | | 5.48 | 99.07 | BF |
| 5 | 5 | | | 8.54 | 96.01 | D1.08 97.09 TW |
| 6 | 10 | | | 8.35 | 96.20 | D0.94 97.14 TW |
| 7 | 14 | | | 8.29 | 96.26 | D0.82 97.08 TW CS#1 Riffle 97.08 |
| 8 | 20 | | | 8.43 | 96.12 | D0.90 97.02 TW Run |
| 9 | 22 | | | 8.51 | 96.04 | D1.0 97.04 TW Pool |
| 10 | 23 | | | 8.09 | 96.46 | D0.59 97.05 TW Head step |
| 11 | 23.5 | | | 8.11 | 96.44 | D0.48 96.92 TW Mid step |
| 12 | 24 | | | 8.21 | 96.34 | TW Bottom step |
| 13 | 24 | | | 8.00 | 96.55 | $\boxed{WS}$ |
| 14 | 25 | | | 8.41 | 96.14 | TW Pool ? |
| 15 | 25 | | | 8.02 | 96.53 | $\boxed{WS}$ P |
| 16 | 5 | | | 5.53 | 99.02 | BF #2 |
| 17 | 14 | | | 5.48 | 99.07 | BF |
| 18 | 27 | | | 9.11 | 95.44 | 96.64 TW D1.20 Pool @ log |
| 19 | 29 | | | 8.62 | 95.93 | TW 0.7 96.63 Step |
| 20 | 30 | | | 8.53 | 96.02 | 96.52 TW 0.5 Bottom step |
| 21 | 33 | | | 9.19 | 95.36 | 96.56 TW 1.2 Pool |
| 22 | 35 | | | 8.55 | 96.00 | 96.59 Head Rapid 0.59 |
| 23 | 38 | | | 8.63 | 95.92 | 96.57 0.65 mid rapid |
| 24 | 40 | | | 8.92 | 95.63 | 96.38 0.75 Pool |
| 25 | 41 | | | 8.81 | 95.74 | 96.39 0.65 head step |
| 26 | 43 | | | 9.30 | 95.25 | 0.35 95.60 mid step |
| 27 | 44 | | | 9.35 | 95.20 | 95.35 .15 Bot step |
| 28 | 44.1 | | | 9.72 | 94.63 | 0.75 95.38 Pool |

3.76%

97.14 @ 10.0
87.44 @ 26.8

97

5.58

riffle

SP

7.48

97.09

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**SURVEY DATA** ⟹ ~~CROSS-SECTION~~ 2

**SITE:** Sharman's Branch Group 1 Reach/Date: 4/14/15

| Item | STATION ft | BS ft | HI ft | FS ft | Elevation ft | NOTES / COMMENTS / REMARKS | |
|---|---|---|---|---|---|---|---|
| 29 | 48 | | 104.55 | 9.79 | 94.76 | 95.41 0.65 TW Top Step | |
| 30 | 49 | | | 9.94 | 94.61 | 95.21 0.6 TW mid step | |
| 31 | 52 | | | 10.37 | 94.18 | 95.23 1.05 TW Pool | |
| 32 | 53 | | | 10.20 | 94.35 | 95.15 0.8 TW Top Step | Short |
| 33 | 55 | | | 10.50 | 94.05 | 94.85 0.8 mid step | |
| 34 | 61 | | | 11.72 | 92.83 | 94.83 2.0 Bot step | |
| 35 | 63 | | | 12.56 | 91.97 | 94.77 2.8 Top Pool | |
| 36 | 66 | | | 12.52 | 92.03 | 94.88 2.85 Pool | |
| 37 | 69 | | | 13.24 | 91.31 | 94.86 3.55 Pool | CSP |
| 38 | 71 | | | 12.93 | 92.07 | 94.87 2.8 Pool | |
| 39 | 72 | | | 11.80 | 92.75 | 94.85 2.1 Pool | |
| 40 | 74 | | | 11.13 | 93.42 | 94.92 1.5 Pool | |
| 41 | 79 | | | 10.70 | 93.85 | 94.75 0.9 Top step | Short |
| 42 | 80 | | | 10.12 | 94.13 | 94.68 0.55 mid step TW | |
| 43 | 85 | | | 11.09 | 93.46 | 94.06 0.6 Bot step TW | |
| 44 | 86 | | | 11.35 | 92.60 | 94.10 1.5 Pool TW | |
| 45 | 88 | | | 11.60 | 92.95 | 94.15 1.2 Pool TW | |
| 46 | 90 | | | 11.62 | 92.93 | 94.13 1.2 Pool TW | Bump |
| 47 | 94 | | | 11.74 | 92.81 | 94.11 1.3 Pool TW | |
| 96 48 | ~~TGRJR~~ | | | 11.49 | 93.06 | 94.20 1.14 Pool TW | |
| 107 49 | Top link | 9.93 | 102.02 | 7.90 | | | |
| 50 | Bm #2 | | | 8.01 | 94.01 | | |
| 51 | 98 | | | 9.04 | 92.98 | 94.13 1.15 TW | |
| 52 | 99 | | | 8.82 | 93.20 | 94.11 0.91 TW Top Riffle | |
| 53 | 104 | | | 8.89 | 93.13 | 94.03 0.90 TW Riffle | |
| 54 | 108 | | | 9.03 | 92.99 | 94.0 1.01 TW Riffle CS #2 | 94 |
| 55 | ~~108~~ | | | ~~5.10~~ | ~~96.33~~ | ~~BF CS#2~~ | |
| 56 | 108 | | | 6.08 | 95.94 | BF @ CS#2 | |
| 57 | 112 | | | 8.90 | 93.12 | 93.97 0.85 TW Top step | Chute |
| 58 | 113 | | | 9.00 | 93.02 | 93.76 0.74 mid step TW | |
| 59 | 116 | | | 8.85 | 93.17 | 93.57 0.40 mid step TW | |

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**SURVEY DATA** ⟹ **LONGITUDINAL PROFILE 3**

**SITE:** Sherman's Branch Date: 4/14/15

Location: Site 1 Reach 1

Party / Notes: Group 1 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 | 120 | | 102.02 | 9.30 | 92.72 | | 93.39 | | | | | 0.67 Bottom Pool | |
| 56 | 120.5 | | | 9.25 | 93.77 | | 94.28 | | | | | 0.51 Top step | |
| 57 | 121 | | | 9.10 | 92.92 | | 93.29 | | | | | 0.37 Mid step | SP |
| 58 | 125 | ~~Blocked~~ | | 9.75 | 92.27 | | 93.02 | | | | | 0.75 Bottom pool | |
| 59 | 126 | | | 9.67 | 92.35 | | 93 | | | | | 0.65 top rapid | |
| 60 | 130 | | | 10.05 | 91.97 | | 92.97 | | | | | 1.00 Shoot | |
| 61 | 134 | | | 9.84 | 92.18 | | 92.88 | | | | | 0.70 | |
| 62 | 135 | | | 9.95 | 92.07 | | 92.91 | | | | | 0.84 small step | |
| 63 | 136 | | | 10.37 | 91.65 | | 92.93 | | | | | 1.28 ES Pool | Bypass |
| 64 | 141 | | | 10.50 | 91.52 | | 92.92 | | | | | 1.40 ~~ESP~~ | |
| 65 | 142 | | | 9.95 | 92.07 | | 92.92 | | | | | 0.85 ~~ESP~~ End | |
| 66 | 147 | | | 9.92 | 92.1 | | 92.85 | | | | | 0.75 Lit ~~Top~~ step | |
| 67 | 151 | | | 10.12 | 91.9 | | 92.87 | | | | | 0.97 Lit pool | |
| 68 | 152 | | | 9.89 | 92.13 | | 92.73 | | | | | 0.60 top step | |
| 69 | 153 | | | 10.42 | 91.6 | | 92.62 | | | | | 1.02 mid step | |
| 70 | 155 | | | 11.31 | 90.71 | | 92.21 | | | | | 1.50 SP | |
| 71 | 157 | | | 11.00 | 91.02 | | 92.24 | | | | | 1.22 END SP | |
| 72 | 159 | | | 10.88 | 91.14 | | 92.27 | | | | | 1.13 | |
| 73 | 162 | | | 10.53 | 91.49 | | 92.33 | | | | | 0.81 | |
| 74 | 163 | | | 10.03 | 91.99 | | 92.24 | | | | | 0.25 Top Step | |
| 75 | 164 | | | 10.42 | 91.6 | | 92.04 | | | | | 0.44 lit pool | |
| 76 | 165 | | | 10.17 | 91.85 | | 92 | | | | | 0.15 mid step | |
| 77 | 166 | | | 11.26 | 90.76 | | 91.87 | | | | | 1.11 | |
| 78 | 168 | | | 11.47 | 90.55 | | 91.81 | | | | | 1.31 | |
| 79 | 169 | | | 11.32 | 90.7 | | 91.85 | | | | | 1.15 | |
| 80 | 171 | | | 11.22 | 90.8 | | 91.8 | | | | | 1.00 Top Shoot | |
| 81 | 172 | | | 11.21 | 90.8 | | 91.75 | | | | | 0.94 chute | |


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**SURVEY DATA** ⟶ **LONGITUDINAL PROFILE 4**

**SITE:** Sherman's Branch Date: 4/14/15

Location: Site 1 Reach 1 Team 1

Party / Notes: Group 1 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 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 82 | 175 | | 102.02 | 11.17 | 90.85 | | 91.48 | | | | | 0.63 | mid chute |
| 83 | 178 | | | 12.28 | 89.74 | | 91.18 | | | | | 1.44 | CSP |
| 84 | 181 | | | 12.32 | 89.7 | | 91.28 | | | | | 1.58 | CSP |
| 85 | 184 | | | 11.68 | 90.34 | | 91.24 | | | | | 0.90 | Top Rapid |
| 86 | 187 | | | 11.34 | 90.68 | | 91.21 | | | | | 0.53 | Mid Rapid |
| 87 | 189 | | | 11.67 | 90.35 | | 90.89 | | | | | 0.54 | Top step |
| 88 | 191 | | | 11.82 | 90.2 | | 90.75 | | | | | 0.55 | |
| 89 | 195 | | | 12.22 | 89.8 | | 90.7 | | | | | 0.90 | ~~CSP~~ |
| 90 | 197 | | | 12.60 | 89.42 | | 90.71 | | | | | 1.29 | |
| 91 | 198 | | | 12.35 | 89.67 | | 90.72 | | | | | 1.05 | rapids |
| 92 | 200 | | | 12.08 | 89.94 | | 90.73 | | | | | 0.79 | step |
| 93 | 207 | | | 12.57 | 89.45 | | 90.47 | | | | | 1.02 | |
| 94 | 202 | | | 12.66 | 89.36 | | 90.53 | | | | | 1.17 | CSP |
| 95 | 207 | | | 12.71 | 89.31 | | 90.26 | | | | | 0.95 | rapids |
| 96 | 217 | | | 13.05 | 88.97 | | 90.17 | | | | | 1.20 | |
| 97 | 224 | | | 13.35 | 88.67 | | 90.09 | | | | | 1.42 | Pool |
| 98 | 225 | | | 12.58 | 89.44 | | 90.01 | | | | | 0.57 | step |
| 99 | 229 | | | 14.35 | 87.63 | | 89.33 | | | | | 1.70 | Pool ~~CSP~~ CSP |
| 100 | 231 | | | 13.88 | 88.14 | | 89.41 | | | | | 1.27 | Pool |
| 101 | 238 | | | 13.54 | 88.48 | | 89.25 | | | | | 0.77 | top step |
| 102 | 239 | | | 13.53 | 88.49 | | 88.69 | | | | | 0.20 | |
| 103 | 246 | | | 14.21 | 87.81 | | 88.61 | | | | | 0.8 | |
| 104 | 252 | | | 14.26 | 87.76 | | 88.49 | | | | | 0.73 | rapid |
| 105 | 254 | | | 14.75 | 87.27 | | 88.22 | | | | | 0.95 | |
| 106 | 256 | | | 14.40 | 87.62 | | 87.92 | | | | | 0.30 | |
| 107 | ~~258~~ | | | | | | | | | | | | |
| 108 | 153 | | | 7.14 | 94.88 | | | | | | | | |

38 3.60

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**SURVEY DATA** ⟹ **LONGITUDINAL PROFILE** ~~1~~ 5

**SITE:** Sharman's Branch Date: 4/14/15

Location: Site 1 Reach 1 Team 1

Party / Notes: Group 1 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 | ~~[illegible]~~ | | | ~~[illegible]~~ | | | | | | | | ~~[illegible]~~ |
| 94.01 2 | BM#2 | 2.88 | 96.89 | | | | | | | | | |
| 3 | 259 | | | 9.75 | 87.14 | 8.77 | 88.12 | | | | | mid Step |
| 4 | 263 ~~259~~ | | | 10.22 | 86.67 | 9.39 | 87.50 | | | | | Pool |
| 5 | 266 | | | 10.57 | 86.32 | | 87.47 | | | | | 1.15 |
| 6 | 268 | | | 10.25 | 86.64 | | 87.44 | | | | | 0.80 |
| 7 | 271 | | | 10.37 | 86.52 | 9.70 | 87.19 | | | | | |
| 8 | 276 | | | 10.51 | 86.38 | 9.72 | 87.17 | | | | | |
| 9 | 282 | | | 10.44 | 86.45 | 9.79 | 87.10 | | | | | |
| 10 | | | | | | | | | | | | |
| 11 | | | | | | | | | | | | |
| 12 | | | | | | | | | | | | |
| 13 | | | | | | | | | | | | |
| 14 | | | | | | | | | | | | |
| 15 | | | | | | | | | | | | |
| 16 | | | | | | | | | | | | |
| 17 | | | | | | | | | | | | |
| 18 | | | | | | | | | | | | |
| 19 | | | | | | | | | | | | |
| 20 | | | | | | | | | | | | |
| 21 | | | | | | | | | | | | |
| 22 | | | | | | | | | | | | |
| 23 | | | | | | | | | | | | |
| 24 | | | | | | | | | | | | |
| 25 | | | | | | | | | | | | |
| 26 | | | | | | | | | | | | |
| 27 | | | | | | | | | | | | |

)SP RAPIDS


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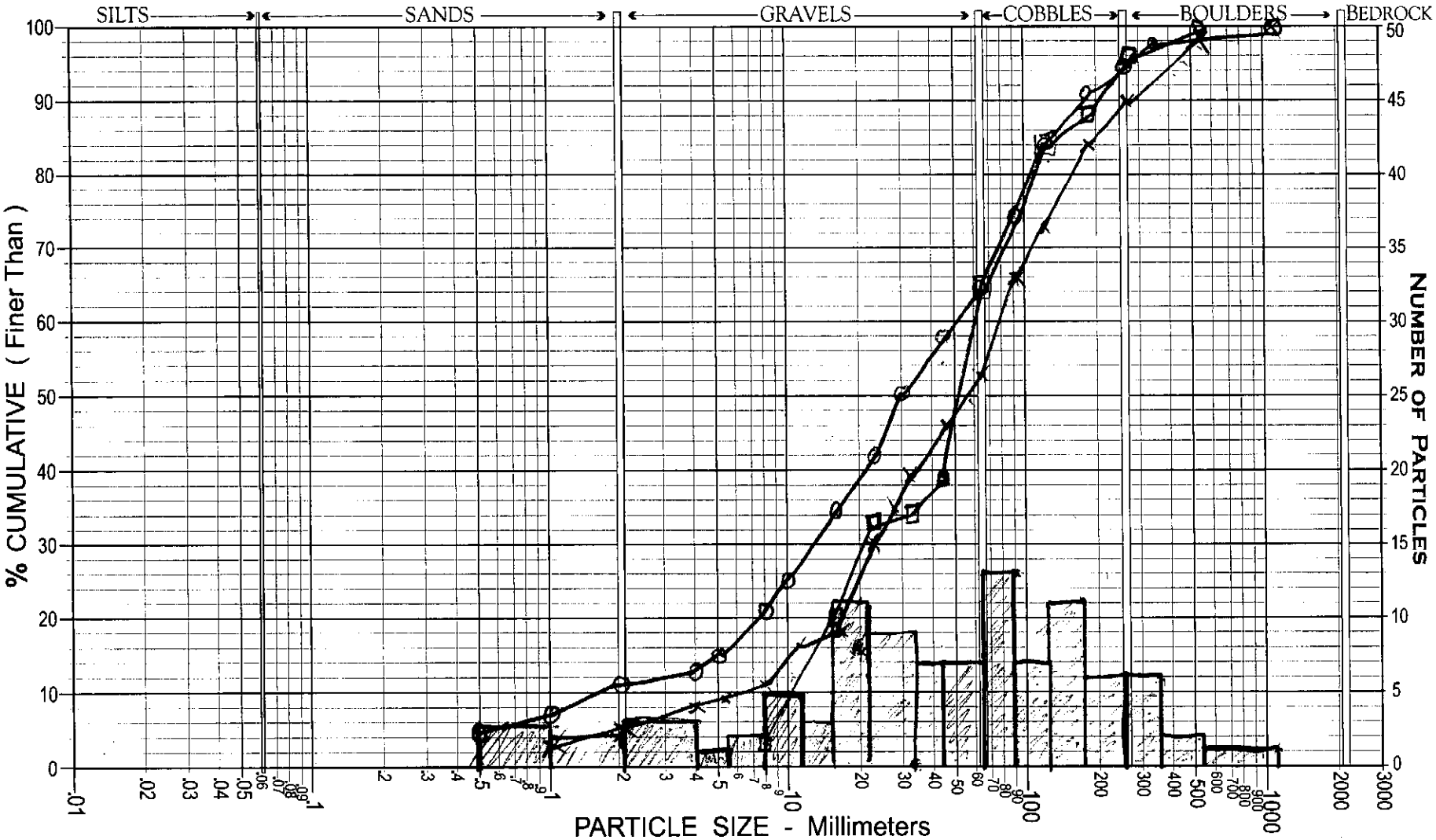
$d_{16} = 25mm$ $d_{35} = 28mm$ $d_{50} = 58mm$ $d_{84} = 195$ $d_{95} = 450$ $d_{100} = 1020$

# PEBBLE COUNT DATA

LOCATION: Sharmans Branch Date: 4/14/15

REACH: Composite PARTY: Team 2 Reach 1

Stream Type: F2b/1 Valley Type: Confined Colluvial U shaped HUC:

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$D_{16} = 60$ $D_{50} = 175$ $D_{95} = 950$

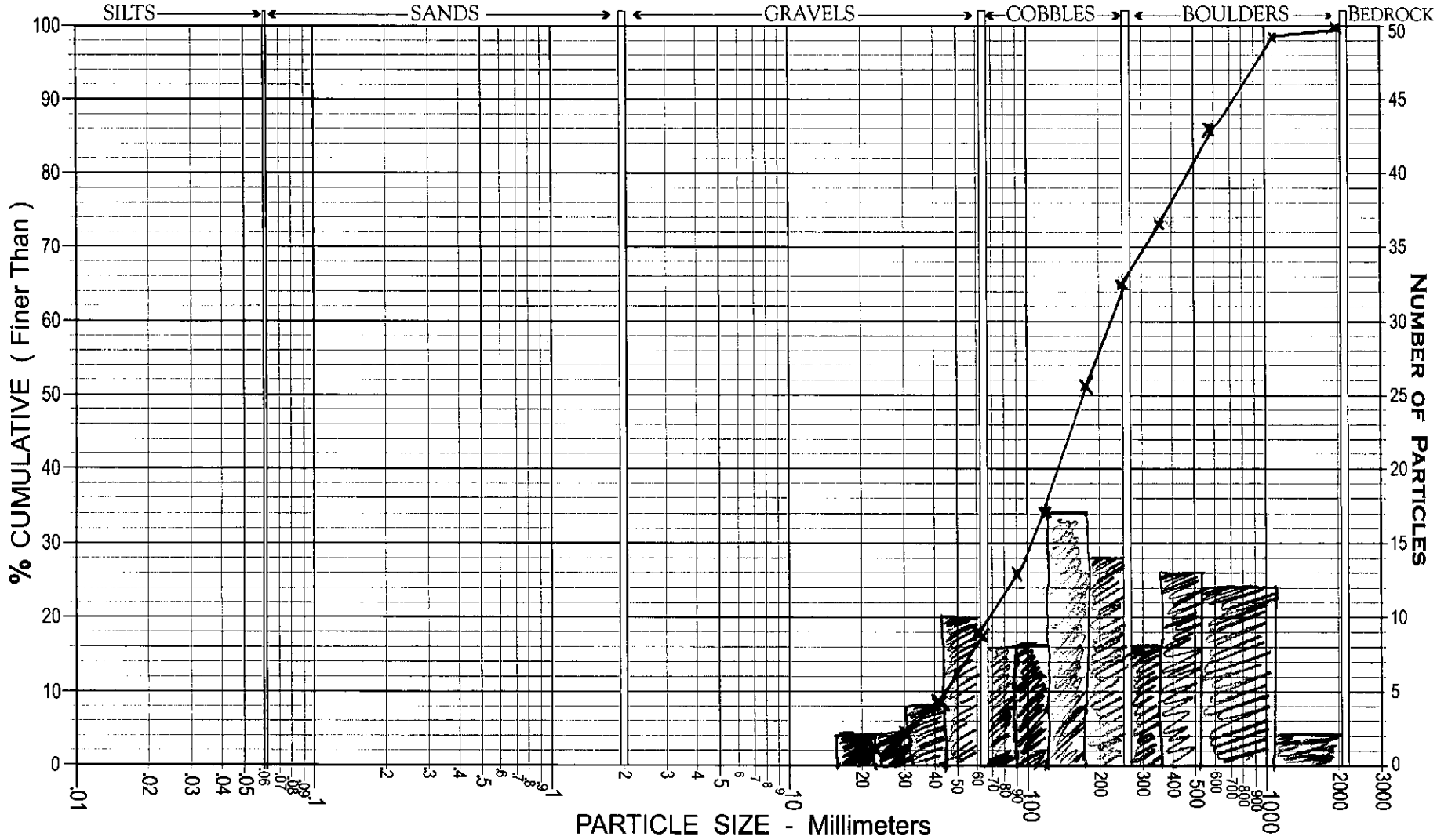
$D_{35} = 130$ $D_{84} = 550$ $D_{100} = 2000$

# PEBBLE COUNT DATA

LOCATION: Sherman's Branch Date: 4/14/15

REACH: 02+02 Protrusion PARTY: Group 1 Reach 1

Stream Type: F2b/1 Valley Type: Confined Colluvial U shaped HUC: 02070004 1009

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Pebble Count





Site: Sherman's Branch Date: 4/14/15

Location: Composite HUC: 02 07 00 04 10 09

Party: Group 1 Reach 1

| 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 | | | | | | | | 3 | 4.3 | 4.3 | 3 | 3 | 3 |
| .04 - .08 | Very Coarse | 1.0 - 2 | | | | | | | | 2 | 2.9 | 7.2 | 2 | 2 | 5 |
| .08 - .16 | Very Fine | 2 - 4 | GRAVEL | | | | | | | 3 | 4.3 | 11.5 | 3 | 3 | 8 |
| .16 - .22 | Fine | 4 - 5.7 | | | | | | | | 1 | 1.4 | 12.9 | 1 | 1 | 9 |
| .22 - .31 | Fine | 5.7 - 8 | | | | | | | | 2 | 2.9 | 15.8 | 2 | 2 | 11 |
| .31 - .44 | Medium | 8 - 11.3 | | | | | 1 | 3.3 | 33 | 4 | 5.7 | 21.5 | 5 | 5 | 16 |
| .44 - .63 | Medium | 11.3 - 16 | | | | | | | | 3 | 4.3 | 25.8 | 3 | 3 | 19 |
| .63 - .89 | Coarse | 16 - 22.6 | | | | | 5 | 16.7 | 20.0 | 6 | 8.6 | 34.4 | 11 | 11 | 30 |
| .89 - 1.3 | Coarse | 22.6 - 32 | | | | | 4 | 13.3 | 33.3 | 5 | 7.1 | 41.5 | 9 | 9 | 39 |
| 1.3 - 1.8 | Very Coarse | 32 - 45 | | | | | 1 | 3.3 | 36.6 | 6 | 8.6 | 50.1 | 7 | 7 | 46 |
| 1.8 - 2.5 | Very Coarse | 45 - 64 | | | | | 1 | 3.3 | 39.9 | 6 | 8.6 | 58.7 | 7 | 7 | 53 |
| 2.5 - 3.5 | Small | 64 - 90 | COBBLE | | | | 7 | 23.3 | 63.2 | 6 | 8.6 | 67.3 | 13 | 13 | 66 |
| 3.5 - 5.0 | Small | 90 - 128 | | | | | 2 | 6.7 | 69.9 | 5 | 7.1 | 74.4 | 7 | 7 | 73 |
| 5.0 - 7.1 | Large | 128 - 180 | | | | | 4 | 13.3 | 83.2 | 7 | 10.0 | 84.4 | 11 | 11 | 84 |
| 7.1 - 10.1 | Large | 180 - 256 | | | | | 2 | 6.7 | 89.9 | 4 | 5.7 | 90.1 | 6 | 6 | 90 |
| 10.1 - 14.3 | Small | 256 - 362 | BOULDER | | | | 2 | 6.7 | 96.6 | 4 | 5.7 | 95.8 | 6 | 6 | 96 |
| 14.3 - 20 | Small | 362 - 512 | | | | | | | | 2 | 2.9 | 98.7 | 2 | 2 | 98 |
| 20 - 40 | Medium | 512 - 1024 | | | | | 1 | 3.3 | 99.9 | | | | 1 | 1 | 99 |
| 40 - 80 | Large-Vry Large | 1024 - 2048 | | | | | | | | 1 | 1.4 | 100.1 | 1 | 1 | 100 |
| | Bedrock | | BDRK | | | | | | | | | | | | |
| Stream Type: | | Valley Type: | | | | TOTAL→ | 30 | 101.5 | 99.5 | 70 | 100.1 | 100.1 | 100 | 100 | 100 |

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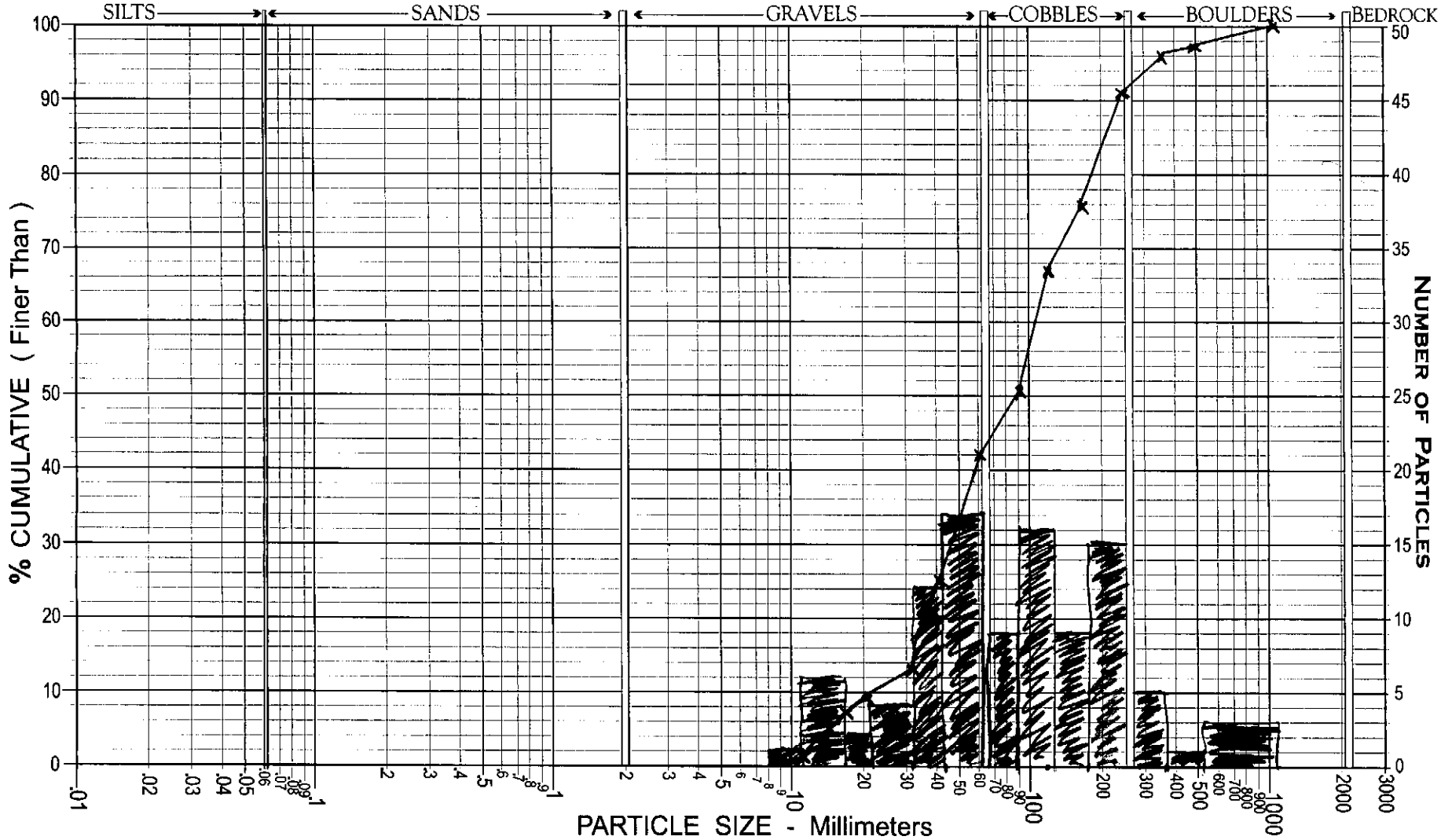
$D_{16} = 32$ $D_{50} = 90$ $D_{95} = 358$

$D_{35} = 54$ $D_{84} = 205$ $D_{100} = 1024$

# PEBBLE COUNT DATA

LOCATION: Sharman's Branch
REACH: 01+08 Protrusion
PARTY: Group 1 Reach 1
Date: 4/14/15
Stream Type:
Valley Type:
HUC: 02070004010 9

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Protrusion #1 @ riffle → K100'

Site: Sharmans Branch 1009 Date: 4/14/15

Location: HUC: 02 07 00 04 10 09 9

Party: Group 1 Reach 1

| Inches | PARTICLE | Millimeters | | Dot Count for RIFFLE 1 | POOL 2 | COMP. 3 | RIFFLE (1) Reach: 00+15 Date: 4/14/15 TOT # | ITEM % | % CUM | POOL (2) Reach: Date: TOT # | ITEM % | % CUM | COMPOSITE (3) Reach: Date: TOT # | ITEM % | % CUM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Silt / Clay | < .062 | S/C | | | | | | | | | | | | |
| | Very Fine | .062 - .125 | SAND | | | | | | | | | | | | |
| | Fine | .125 - .25 | SAND | | | | | | | | | | | | |
| | Medium | .25 - .50 | SAND | | | | | | | | | | | | |
| | Coarse | .50 - 1.0 | SAND | | | | | | | | | | | | |
| .04 - .08 | Very Coarse | 1.0 - 2 | SAND | | | | | | | | | | | | |
| .08 - .16 | Very Fine | 2 - 4 | GRAVEL | | | | 1 | 1 | 1 | | | | | | |
| .16 - .22 | Fine | 4 - 5.7 | GRAVEL | | | | | | | | | | | | |
| .22 - .31 | Fine | 5.7 - 8 | GRAVEL | | | | | | | | | | | | |
| .31 - .44 | Medium | 8 - 11.3 | GRAVEL | | | | 1 | 1 | 2 | | | | | | |
| .44 - .63 | Medium | 11.3 - 16 | GRAVEL | | | | 1 | 1 | 3 | | | | | | |
| .63 - .89 | Coarse | 16 - 22.6 | GRAVEL | | | | 4 | 4 | 7 | | | | | | |
| .89 - 1.3 | Coarse | 22.6 - 32 | GRAVEL | | | | 12 | 12 | 19 | | | | | | |
| 1.3 - 1.8 | Very Coarse | 32 - 45 | GRAVEL | | | | 12 | 12 | 31 | | | | | | |
| 1.8 - 2.5 | Very Coarse | 45 - 64 | GRAVEL | | | | 19 | 19 | 50 | | | | | | |
| 2.5 - 3.5 | Small | 64 - 90 | COBBLE | | | | 19 | 19 | 69 | | | | | | |
| 3.5 - 5.0 | Small | 90 - 128 | COBBLE | | | | 14 | 14 | 83 | | | | | | |
| 5.0 - 7.1 | Large | 128 - 180 | COBBLE | | | | 4 | 4 | 87 | | | | | | |
| 7.1 - 10.1 | Large | 180 - 256 | COBBLE | | | | 5 | 5 | 92 | | | | | | |
| 10.1 - 14.3 | Small | 256 - 362 | BOULDER | | | | 4 | 4 | 96 | | | | | | |
| 14.3 - 20 | Small | 362 - 512 | BOULDER | | | | 3 | 3 | 99 | | | | | | |
| 20 - 40 | Medium | 512 - 1024 | BOULDER | | | | 1 | 1 | 100 | | | | | | |
| 40 - 80 | Large-Vry Large | 1024 - 2048 | BOULDER | | | | | | | | | | | | |
| | Bedrock | | BDRK | | | | | | | | | | | | |
| **Stream Type:** | | | **Valley Type:** | | | TOTAL→ | 100 | 100 | 100 | | | | | | |

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$D_{16}$ = 286 - 32 $D_{50}$ = 45 - 64 $D_{95}$ = 350 362

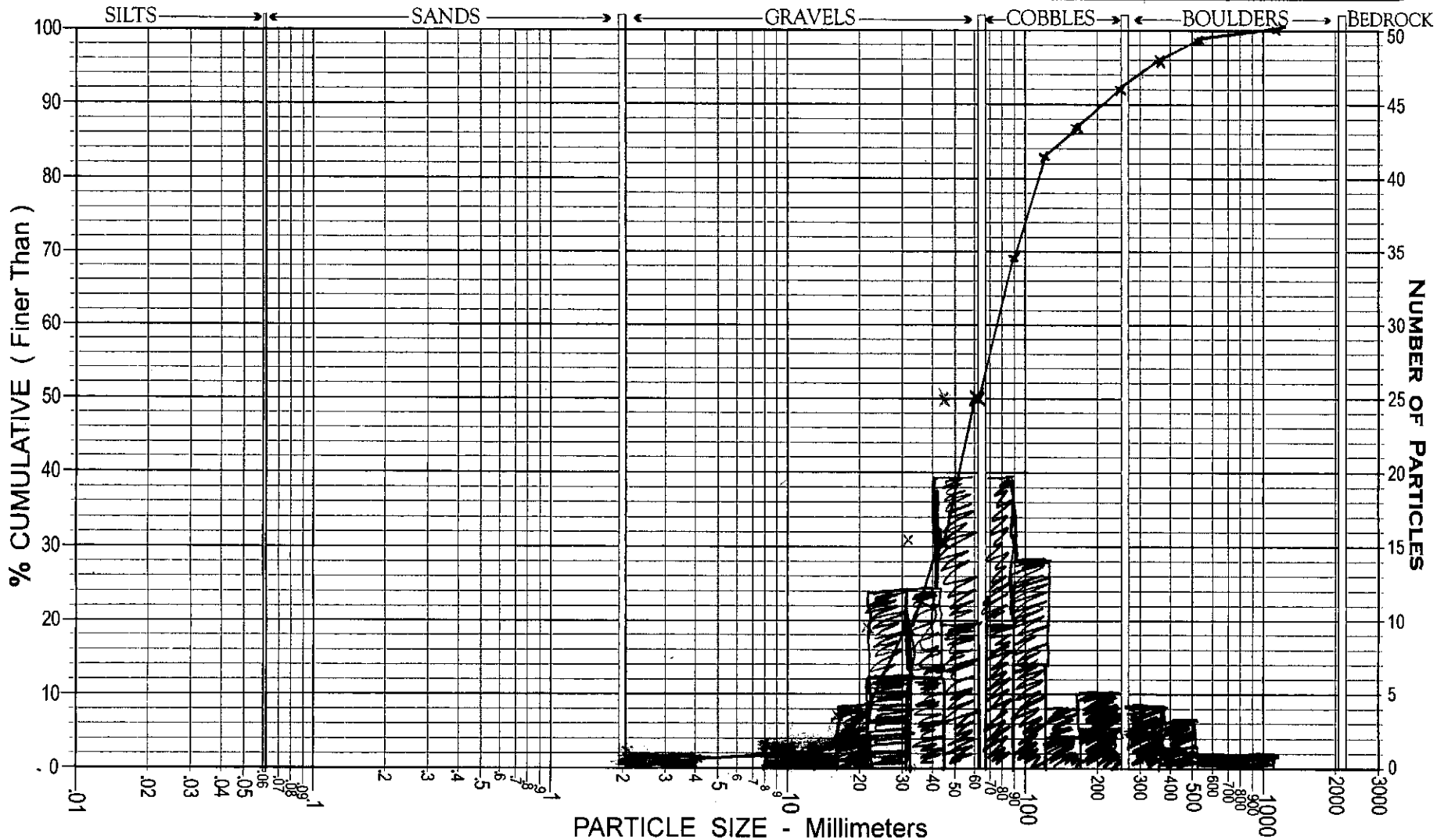
$D_{35}$ = 448 - 64 $D_{84}$ = 145 180 $D_{100}$ = 1024 - 2048

## PEBBLE COUNT DATA

LOCATION: Sharman's Branch Date: 4/14/15

REACH: 00+15 Protrusion PARTY: Group 1 Reach 1

Stream Type: Valley Type: HUC: 02 07 00 04 10 09

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

## Bankfull VELOCITY & DISCHARGE Estimates

| | | | |
|---|---|---|---|
| Stream: | Sharmans Branch #1 | Location: | Burnside Bridge Rd, Washington, MD |
| Date: | 4/14 | Stream Type: | |
| Valley Type: | | | |
| Observers: | Team 1 Reach 1 | HUC: | |

| INPUT VARIABLES | | | OUTPUT VARIABLES | | | |
|---|---|---|---|---|---|---|
| Bankfull Riffle Cross-Sectional AREA | 47.87 | $A_{bkf}$ (ft²) | Bankfull Riffle Mean DEPTH | 1.8 | $d_{bkf}$ (ft) | |
| Bankfull Riffle WIDTH | 26.60 | $W_{bkf}$ (ft) | Wetted PERIMETER ~ (2 * $d_{bkf}$) + $W_{bkf}$ | 30.2 | $W_p$ (ft) | * $D_{50}$ |
| $D_{84}$ at Riffle | 550 | Dia. (mm) | $D_{84}$ (mm) / 304.8 | 1.8 | $D_{84}$ (ft) | Ø.57 |
| Bankfull SLOPE | 0.035 | $S_{bkf}$ (ft / ft) | Hydraulic RADIUS $A_{bkf}$ / $W_p$ | 1.59 | R (ft) | 1.59 |
| Gravitational Acceleration | 32.2 | g (ft / sec²) | Relative Roughness R(ft) / $D_{84}$ (ft) | 0.88 | R / $D_{84}$ | 2.79 |
| Drainage Area | 3.6 | DA (mi²) | Shear Velocity u* = (gRS)½ | 1.34 | u* (ft/sec) | 1.34 |

| ESTIMATION METHODS | Bankfull VELOCITY | | Bankfull DISCHARGE | | * $D_{50}$ |
|---|---|---|---|---|---|
| 1. Friction Factor / Relative Roughness $\bar{u} = [\,2.83 + 5.66 * \mathrm{Log}\{R / D_{84}\}\,]\,u^*$ | 3.37 | ft / sec | 161.32 | cfs | 3.99 ft/s \| 191 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 = 0.088 | 4.3 | ft / sec | 206 | 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 = 0.077 | 4.93 | ft / sec | 236 | cfs | |
| 2. Roughness Coefficient: c) Manning's *n* from Jarrett (USGS): $\bar{u} = 1.49 * R^{2/3} * S^{1/2} / n$ $n = 0.39 * S^{0.38} * R^{-0.16}$ n = 0.101 Note: This equation is applicable to steep, step/pool, high boundary roughness, cobble- and boulder-dominated stream systems; i.e., for Stream Types A1, A2, A3, B1, B2, B3, C2 & E3 | 3.76 | ft / sec | 180 | 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 Discharge Q = 2003 year | | ft / sec | 120 | cfs | |
| 4. Continuity Equations: b) Regional Curves $\bar{u} = Q / A$ | | ft / sec | 100 | 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 **"protrustion 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-1.** Field Form for Level II Stream Classification (*First Field Day*).

| | |
|---|---|
| Stream: Sharmins CK., Reach 1 Team 1 | 4/14 |
| Basin: Potomac Drainage Area: 2304 acres | 3.60 $mi^2$ |
| Location: Burnside Bridge Rd, Washington CO, MD | |
| Twp.&Rge: Sec.&Qtr.: | |
| Cross-Section Monuments (Lat./Long.): | Date: 4/14/15 |
| Observers: | Valley Type: |

| | | |
|---|---|---|
| **Bankfull WIDTH ($W_{bkf}$)**<br>WIDTH of the stream channel at bankfull stage elevation, in a riffle section. | 26.6 | ft |
| **Bankfull DEPTH ($d_{bkf}$)**<br>Mean DEPTH of the stream channel cross-section, at bankfull stage elevation, in a riffle section ($d_{bkf} = A_{bkf} / W_{bkf}$). | 1.8 | ft |
| **Bankfull X-Section AREA ($A_{bkf}$)**<br>AREA of the stream channel cross-section, at bankfull stage elevation, in a riffle section. | 47.87 | $ft^2$ |
| **Width/Depth Ratio ($W_{bkf} / d_{bkf}$)**<br>Bankfull WIDTH divided by bankfull mean DEPTH, in a riffle section. | 14.78 | ft/ft |
| **Maximum DEPTH ($d_{max}$)**<br>Maximum depth of the bankfull channel cross-section, or distance between the bankfull stage and Thalweg elevations, in a riffle section. | 2.88 | ft |
| **WIDTH of Flood-Prone Area ($W_{fpa}$)**<br>Twice maximum DEPTH, or ($2 \times d_{mbkf}$) = the stage/elevation at which flood-prone area WIDTH is determined in a riffle section. | 40.2 | ft |
| **Entrenchment Ratio (ER)**<br>The ratio of flood-prone area WIDTH divided by bankfull channel WIDTH ($W_{fpa} / W_{bkf}$) (riffle section). | 1.51 | ft/ft |
| **Channel Materials (Particle Size Index ) $D_{50}$**<br>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. | 175 | mm |
| **Water Surface SLOPE (S)**<br>Channel slope = "rise over run" for a reach approximately 20–30 bankfull channel widths in length, with the "riffle-to-riffle" water surface slope representing the gradient at bankfull stage. | 0.036 | ft/ft |
| **Channel SINUOSITY (k)**<br>Sinuosity is an index of channel pattern, determined from a ratio of stream length divided by valley length (SL / VL); or estimated from a ratio of valley slope divided by channel slope ($S_{val} / S$). | 1.02 | |

***Stream Type*** F2b/1 **See Classification Key (Figure B-2)**


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

Stream: Sharmin Creek, Reach 1 Location: Confined

Observers: Team 1 Reach 1 Date: 4/14/15 Valley Type: Colluvial U Stream Type: F2b-1

**River Reach Summary Data.....2** w/ BR influence

**Hydraulics**

| | | | | | |
|---|---|---|---|---|---|
| Streamflow: Estimated Mean Velocity at Bankfull Stage ($\bar{u}_{bkf}$) | 3.76 | ft/sec | Estimation Method | Jarrett | |
| Streamflow: Estimated Discharge at Bankfull Stage ($Q_{bkf}$) | 180 | cfs | Drainage Area | 3.6 | mi² |

**Channel Pattern**

| Geometry | Mean | Min | Max | | Dimensionless Geometry Ratios | Mean | Min | Max |
|---|---|---|---|---|---|---|---|---|
| Linear Wavelength ($\lambda$) | 134 | | | ft | Linear Wavelength to Riffle Width ($\lambda$ / $W_{bkf}$) | 5.04 | | |
| Stream Meander Length ($L_m$) | 139 | | | ft | Stream Meander Length Ratio ($L_m$ / $W_{bkf}$) | 5.23 | | |
| Radius of Curvature ($R_c$) | 43 | | | ft | Radius of Curvature to Riffle Width ($R_c$ / $W_{bkf}$) | 1.62 | | |
| Belt Width ($W_{blt}$) | 44 | | | ft | Meander Width Ratio ($W_{blt}$ / $W_{bkf}$) | 1.65 | | |
| Arc Length ($L_a$) | 63 | | | ft | Arc Length to Riffle Width ($L_a$ / $W_{bkf}$) | 2.37 | | |
| Riffle Length ($L_r$) | 13.1 | 5 | 35 | ft | Riffle Length to Riffle Width ($L_r$ / $W_{bkf}$) | 0.49 | 0.19 | 1.32 |
| Individual Pool Length ($L_p$) | 8 | 2 | 27 | ft | Individual Pool Length to Riffle Width ($L_p$ / $W_{bkf}$) | 0.30 | 0.08 | 1.02 |
| Pool to Pool Spacing ($P_s$) | 23.8 | 7.5 | 37 | ft | Pool to Pool Spacing to Riffle Width ($P_s$ / $W_{bkf}$) | 0.89 | 0.28 | 1.39 |

26.6

**Channel Profile**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Valley Slope ($S_{val}$) | 3.67% | ft/ft | Average Water Surface Slope (S) | 3.6% | ft/ft | Sinuosity ($S_{val}$ / S) | 1.02 |
| Stream Length (SL) | 283 | ft | Valley Length (VL) | 267 | ft | Sinuosity (SL / VL) | 1.02 |
| Low Bank Height (LBH) N/A | start / end | ft / ft | Max Depth ($d_{max}$) | start 2.05 / end 3.3 | ft / ft | Bank-Height Ratio (BHR) (LBH / $d_{max}$) N/A | start / end |

3.6%

| Facet Slopes | Mean | Min | Max | | Dimensionless Facet Slope Ratios | Mean | Min | Max |
|---|---|---|---|---|---|---|---|---|
| Riffle Slope ($S_{rif}$) | 6.2% | 3.8 | 13 | ft/ft | Riffle Slope to Average Water Surface Slope ($S_{rif}$ / S) | 1.72 | 1.06 | 3.6 |
| Run Slope ($S_{run}$) N/A | | | | ft/ft | Run Slope to Average Water Surface Slope ($S_{run}$ / S) | | | |
| Pool Slope ($S_p$) | 0.5% | Ø | 1% | ft/ft | Pool Slope to Average Water Surface Slope ($S_p$ / S) | .14 | Ø | .28 |
| Glide Slope ($S_g$) N/A | | | | ft/ft | Glide Slope to Average Water Surface Slope ($S_g$ / S) | | | |
| Step Slope ($S_s$) | 10% | 5% | 20% | ft/ft | Step Slope to Average Water Surface Slope ($S_s$ / S) | 2.8 | 1.4 | 5.6 |

| Max Depths[a] | Mean | Min | Max | | Dimensionless Depth Ratios | Mean | Min | Max |
|---|---|---|---|---|---|---|---|---|
| Max Riffle Depth ($d_{maxrif}$) | 2.73 | 2.3 | 3.3 | ft | Max Riffle Depth to Mean Riffle Depth ($d_{maxrif}$ / $d_{bkf}$) | 1.52 | 1.28 | 1.83 |
| Max Run Depth ($d_{maxrun}$) N/A | | | | ft | Max Run Depth to Mean Riffle Depth ($d_{maxrun}$ / $d_{bkf}$) | | | |
| Max Pool Depth ($d_{maxp}$) | 3.69 | 3.0 | 5.8 | ft | Max Pool Depth to Mean Riffle Depth ($d_{maxp}$ / $d_{bkf}$) | 2.05 | 1.7 | 3.2 |
| Max Glide Depth ($d_{maxg}$) N/A | | | | ft | Max Glide Depth to Mean Riffle Depth ($d_{maxg}$ / $d_{bkf}$) | | | |
| Max Step Depth ($d_{maxs}$) | 2.3 | 1.9 | 2.5 | ft | Max Step Depth to Mean Riffle Depth ($d_{maxs}$ / $d_{bkf}$) | 1.28 | 1.06 | 1.38 |

1.8 ft

**Channel Materials**

| | Reach[b] | Riffle[c] | Bar | | Reach[b] | Riffle[c] | Bar | Protrusion Height[d] | |
|---|---|---|---|---|---|---|---|---|---|
| % Silt/Clay | 0 | | | $D_{16}$ | 2.5 | | | 60 | mm |
| % Sand | 5 | | | $D_{35}$ | 28 | | | 130 | mm |
| % Gravel | 48 | | | $D_{50}$ | 58 | | | 175 | mm |
| % Cobble | 37 | | | $D_{84}$ | 195 | | | 550 | mm |
| % Boulder | 10 | | | $D_{95}$ | 458 | | | 950 | mm |
| % Bedrock | 0 | | | $D_{100}$ | 1020 | | | 2000 | mm |

[a] Min, max & mean depths are measured from Thalweg to bankfull at mid-point of feature for riffles, runs & steps, the deepest part of pools, & 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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Reach 1, Sharmins * = ◯ = XS-7 (classification riffle)



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

Stream: Location:

Observers: Date: Valley Type: Stream Type:

**River Reach Dimension Summary Data.....1**

| | Riffle Dimensions | Mean | Min | Max | | Riffle Dimensions & Dimensionless Ratios | Mean | Min | Max |
|---|---|---|---|---|---|---|---|---|---|
| Riffle Dimensions*, **, *** | Riffle Width ($W_{bkf}$) | 30.47 | 26.60 | 33 | ft | Riffle Cross-Sectional Area ($A_{bkf}$) ($ft^2$) | 56.1 | 47.87 | 60.97 |
| | Riffle Mean Depth ($d_{bkf}$) | 1.84 | 1.80 | 1.92 | ft | Riffle Width/Depth Ratio ($W_{bkf}$ / $d_{bkf}$) | 16.56 | 14.78 | 18.3 |
| | Riffle Maximum Depth ($d_{max}$) | 2.75 | 2.68 | 2.88 | ft | Riffle Max Depth to Riffle Mean Depth ($d_{max}$ / $d_{bkf}$) | 1.5 | 1.4 | 1.6 |
| | Width of Flood-Prone Area ($W_{fpa}$) | 46.5 | 40.2 | 55.3 | ft | Entrenchment Ratio ($W_{fpa}$ / $W_{bkf}$) | 1.51 | 1.5 | 1.3 1.7 |
| | Riffle Inner Berm Width ($W_{ib}$) | | | | ft | Riffle Inner Berm Width to Riffle Width ($W_{ib}$ / $W_{bkf}$) | | | |
| | Riffle Inner Berm Depth ($d_{ib}$) | | | | ft | Riffle Inner Berm Depth to Mean Depth ($d_{ib}$ / $d_{bkf}$) | | | |
| | Riffle Inner Berm Area ($A_{ib}$) | | | | $ft^2$ | Riffle Inner Berm Area to Riffle Area ($A_{ib}$ / $A_{bkf}$) | | | |
| | Riffle Inner Berm W/D Ratio ($W_{ib}$ / $d_{ib}$) | | | | | | | | |

| | Pool Dimensions | Mean | Min | Max | | Pool Dimensions & Dimensionless Ratios | Mean | Min | Max |
|---|---|---|---|---|---|---|---|---|---|
| Pool Dimensions*, **, *** | Pool Width ($W_{bkfp}$) | 33.5 | 29.5 | 38.5 | ft | Pool Width to Riffle Width ($W_{bkfp}$ / $W_{bkf}$) | .91 | | |
| | Pool Mean Depth ($d_{bkfp}$) | 1.94 | 1.75 | 2.123 | ft | Pool Mean Depth to Riffle Mean Depth ($d_{bkfp}$ / $d_{bkf}$) | 1.05 | | |
| | Pool Cross-Sectional Area ($A_{bkfp}$) | 64.29 | 62.64 | 65.94 | ft | Pool Area to Riffle Area ($A_{bkfp}$ / $A_{bkf}$) | 1.15 | | |
| | Pool Maximum Depth ($d_{maxp}$) | 3.18 | 2.51 | 3.44 | ft | Pool Max Depth to Riffle Mean Depth ($d_{maxp}$ / $d_{bkf}$) | 1.726 | | |
| | 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 Dimensions & Ratios | Mean | Min | Max |
|---|---|---|---|---|---|---|---|---|---|
| Run Dimensions* | 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 Dimensions* | 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 Dimensions & Ratios | Mean | Min | Max |
|---|---|---|---|---|---|---|---|---|---|
| Step** | Step Width ($W_{bkfs}$) | 31.6 | 30.7 | 32.7 | ft | Step Width to Riffle Width ($W_{bkfs}$ / $W_{bkf}$) | 1.19 | 1.15 | 1.23 |
| | Step Mean Depth ($d_{bkfs}$) | 1.53 | 1.49 | 1.57 | ft | Step Mean Depth to Riffle Mean Depth ($d_{bkfs}$ / $d_{bkf}$) | 0.85 | 0.83 | 0.87 |
| | Step Cross-Sectional Area ($A_{bkfs}$) | 48.53 | 48.15 | 48.91 | ft | Step Area to Riffle Area ($A_{bkfs}$ / $A_{bkf}$) | 1.01 | 1.01 | 1.02 |
| | Step Maximum Depth ($d_{maxs}$) | 2.54 | 2.41 | 2.67 | ft | Step Max Depth to Riffle Mean Depth ($d_{maxs}$ / $d_{bkf}$) | 1.14 | 1.34 | 1.48 |
| | Step Width/Depth Ratio ($W_{bkfs}$ / $d_{bkfs}$) | 20.6 | 19.30 | 21.9 | | | | | |

*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.

2.88 / 1.80

26.6 / 1.8 / 47.9



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

Stream: Sharmen's Branch Location:

Observers: Team 1 Stream Type: F2b/1 Valley Type: Confined Colluvial U shaped Date: 4/14/15

| Pool Type | | Dimensional Values: Pool Length ($L_p$) | Pool Max Depth ($d_{maxp}$) | Pool Slope ($S_p$) | | Dimensionless Ratios: Pool Length to Riffle Width ($L_p$ / $W_{bkf}$) | Pool Max Depth to Riffle Mean Depth ($d_{maxp}/d_{bkf}$) | Pool Slope to Average Slope ($S_p$ / S) |
|---|---|---|---|---|---|---|---|---|
| 1. Lateral Scour Pool (LSP) | Mean | | | | Mean | 26.6 $W_{bkf}$ | 1.80 $d_{bkf}$ | 3.6 S |
| N/A | Min. | | | | Min. | | | |
| | Max. | | | | Max. | | | |
| 2. Contraction Scour Pool (CSP) | Mean | 14.5 | 4.7 | 0.05 | Mean | 0.55 | 2.61 | 0.01 |
| | Min. | 9.0 | 3.65 | 0.9 | Min. | 0.34 | 2.03 | 0.25 |
| 52.5 | Max. | 20.0 | 5.75 | 0.0% | Max. | 0.75 | 3.42 | Ø |
| 3. Step/Pool (SP) | Mean | 8.25 | 2.5 | 0.75 | Mean | 0.31 | 1.39 | 0.21 |
| | Min. | 7.5 | 2.15 | Ø | Min. | 0.28 | 1.19 | Ø |
| | Max. | 9 | 2.9 | 1.5 | Max. | 0.34 | 1.61 | 0.42 |
| 4. Backwater Pool (BWP) | Mean | 20.00 | 3.0 | 1.05 | Mean | 0.75 | 1.67 | 0.29 |
| | Min. | 18.0 | 3.0 | 1.4% | Min. | 0.68 | 1.67 | 0.39 |
| | Max. | 22.0 | 3.0 | 0.7% | Max. | 0.83 | 1.67 | 0.19 |
| 5. Plunge Pool (PP) | Mean | | | | Mean | | | |
| N/A | Min. | | | | Min. | | | |
| | Max. | | | | Max. | | | |
| 6. Pocket Water Pool (PWP) | Mean | | | | Mean | | | |
| N/A | Min. | | | | Min. | | | |
| | Max. | | | | Max. | | | |
| 7. Lateral Protrusion Pool (LPP) | Mean | | | | Mean | | | |
| N/A | Min. | | | | Min. | | | |
| | Max. | | | | Max. | | | |
| 8. Straight Dissipator Pool (SDP) | Mean | | | | Mean | | | |
| N/A | Min. | | | | Min. | | | |
| | Max. | | | | Max. | | | |
| 9. Converging Confluence Pool (CCP) | Mean | | | | Mean | | | |
| N/A | Min. | | | | Min. | | | |
| | Max. | | | | Max. | | | |
| 10. Compound Pool (CP) | Mean | | | | Mean | | | |
| N/A | Min. | | | | Min. | | | |
| | Max. | | | | Max. | | | |

$\frac{S_p}{3.6}$


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Reach 1 Team 1 4/14
Sharmin
Potomac

**Table B-1.** List of morphological relations and variables to estimate for the ***First Field Day***.

| Estimate the Following Morphological Relations and Variables | | | |
|---|---|---|---|
| 1. Bankfull Riffle Width ($W_{bkf}$) (ft) | 26.6 | 2. Bankfull Riffle Mean Depth ($d_{bkf}$) | 1.8 |
| 3. Width/Depth Ratio ($W_{bkf}$ / $d_{bkf}$) | 14.78 | 4. Bankfull Riffle Cross-Sectional Area ($A_{bkf}$) | 47.87 |
| 5. Width of Flood-Prone Area ($W_{fpa}$) | 40.2 | 6. Entrenchment Ratio (ER) ($W_{fpa}$ / $W_{bkf}$) | 1.51 |
| 7. Sinuosity (k) | 1.02 | 8. Average Water Surface Slope (S) | .0036 |
| 9. $D_{50}$ Particle Size for Reach | 1.75 | 10. Bankfull Discharge ($Q_{bkf}$) | 180 Jarrett |
| 11. Valley Type | C-CO-US F→B | 12. Stream Type | F2b/1 |

**Table B-2.** List of morphological relations and variables to estimate for the ***Second Field Day***.

| Estimate the Following Morphological Relations and Variables | | | |
|---|---|---|---|
| 1. Bankfull Riffle Width ($W_{bkf}$) (ft) | | 2. Bankfull Riffle Mean Depth ($d_{bkf}$) | |
| 3. Width/Depth Ratio ($W_{bkf}$ / $d_{bkf}$) | | 4. Bankfull Riffle Cross-Sectional Area ($A_{bkf}$) | |
| 5. Width of Flood-Prone Area ($W_{fpa}$) | | 6. Entrenchment Ratio (ER) ($W_{fpa}$ / $W_{bkf}$) | |
| 7. Sinuosity (k) | | 8. Average Water Surface Slope (S) | |
| 9. $D_{50}$ Particle Size for Reach | | 10. Bankfull Discharge ($Q_{bkf}$) | |
| 11. Valley Type | | 12. Stream Type | |

D84 - 550mm

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