APPENDIX A:
FIELD COLLECTED DATA POINTS
(DIGITAL GIS FILES)

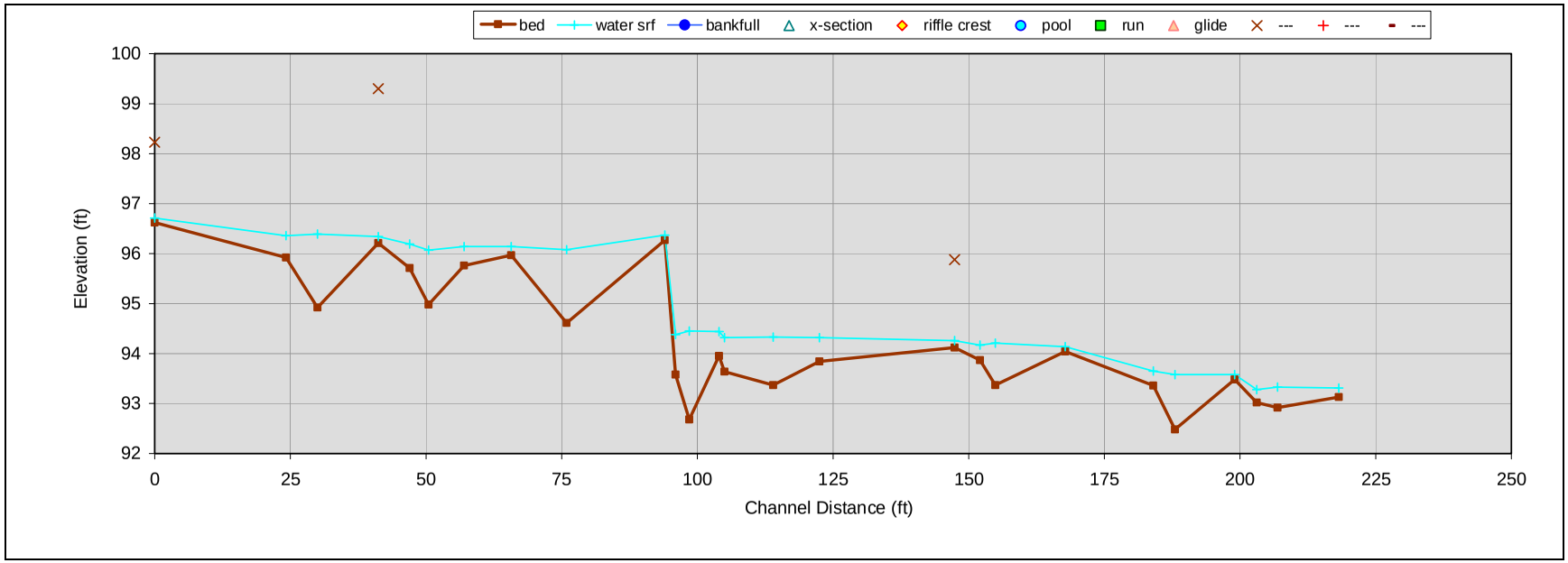
CD of GIS Digital Data to be Provided Later

APPENDIX B:
REFERENCE REACH SPREADSHEETS

APPENDIX B.1:
LONGITUDAL PROFILES

Appendix B.1: Longitudal Profiles

Lower Gunpowder Watershed Assessment
Drainage Area 1: Wiffle Tree Profile



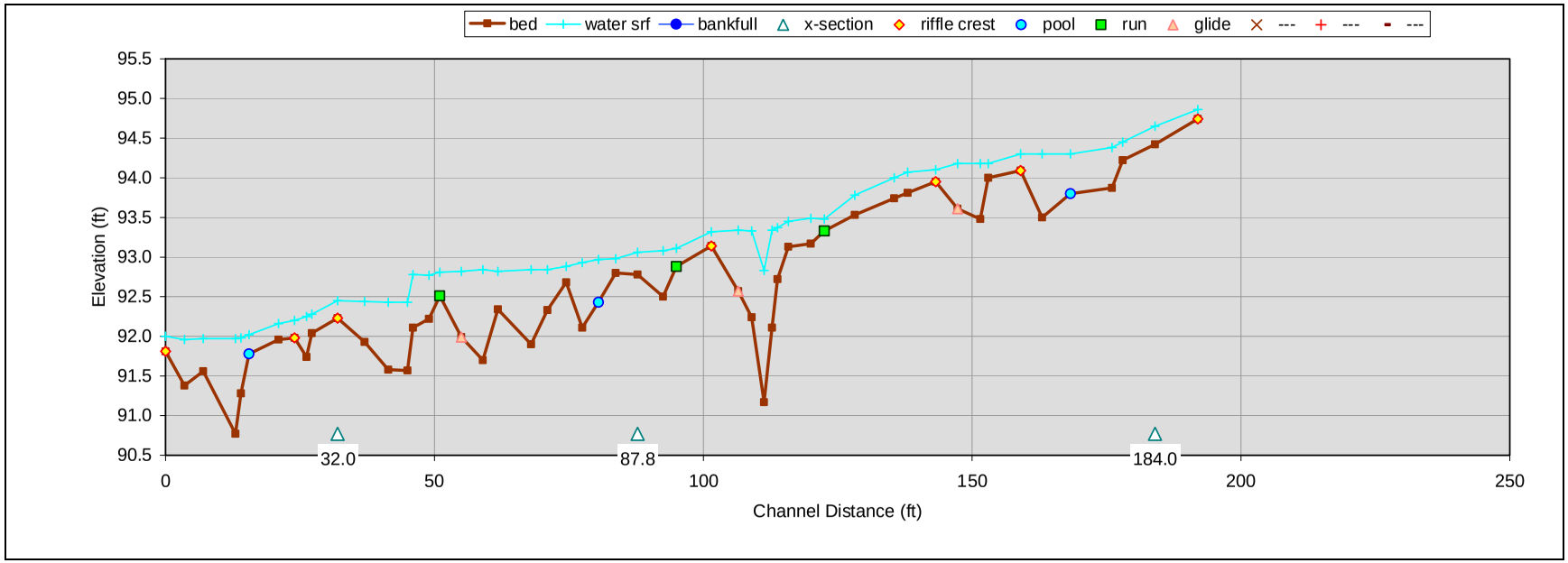
Appendix B.1: Longitudal Profiles

Lower Gunpowder Watershed Assessment
Drainage Area 1: Wiffle Tree Profile (continued)

notes	cross section ID	bed feature	continuous data station	station	Benchmark Elevation 100 Turning Points BS	HI	FS	FS bed	depth water	FS	ELEV bed	ELEV water srl	ELEV —
back sight to benchmark					5.35	105.35							
head of riffle			0			105.35		8.73	0.09	7.12	96.62	96.71	98.23
bottom of riffle			24.2			105.35		9.43	0.44		95.92	96.36	
dmax			30			105.35		10.43	1.47		94.92	96.39	
head of riffle			41.2			105.35		9.14	0.13	6.05	96.21	96.34	99.3
bottom of riffle			47			105.35		9.64	0.48		95.71	96.19	
dmax			50.5			105.35		10.37	1.09		94.98	96.07	
streambed			57			105.35		9.59	0.38		95.76	96.14	
streambed			65.7			105.35		9.38	0.17		95.97	96.14	
dmax			75.9			105.35		10.74	1.47		94.61	96.08	
top of debris jam			94			105.35		9.08	0.1		96.27	96.37	
bottom of debris jam			96			105.35		11.77	0.8		93.58	94.38	
dmax			98.5			105.35		12.67	1.77		92.68	94.45	
top of debris jam			104			105.35		11.4	0.49		93.95	94.44	
bottom of debris jam			105			105.35		11.71	0.68		93.64	94.32	
dmax			114			105.35		11.98	0.96		93.37	94.33	
top of riffle			122.5			105.35		11.51	0.48		93.84	94.32	
top of riffle			147.4			105.35		11.23	0.14	9.47	94.12	94.26	95.88
bottom of riffle			152.1			105.35		11.48	0.3		93.87	94.17	
dmax			154.9			105.35		11.98	0.84		93.37	94.21	
top of riffle			167.8			105.35		11.31	0.1		94.04	94.14	
bottom of riffle			184			105.35		11.99	0.29		93.36	93.65	
dmax			188			105.35		12.87	1.1		92.48	93.58	
top of riffle			199			105.35		11.87	0.1		93.48	93.58	
bottom of riffle			203.1			105.35		12.33	0.26		93.02	93.28	
dmax			206.9			105.35		12.43	0.41		92.92	93.33	
top of riffle			218.2			105.35		12.22	0.18		93.13	93.31	

Appendix B.1: Longitudal Profiles

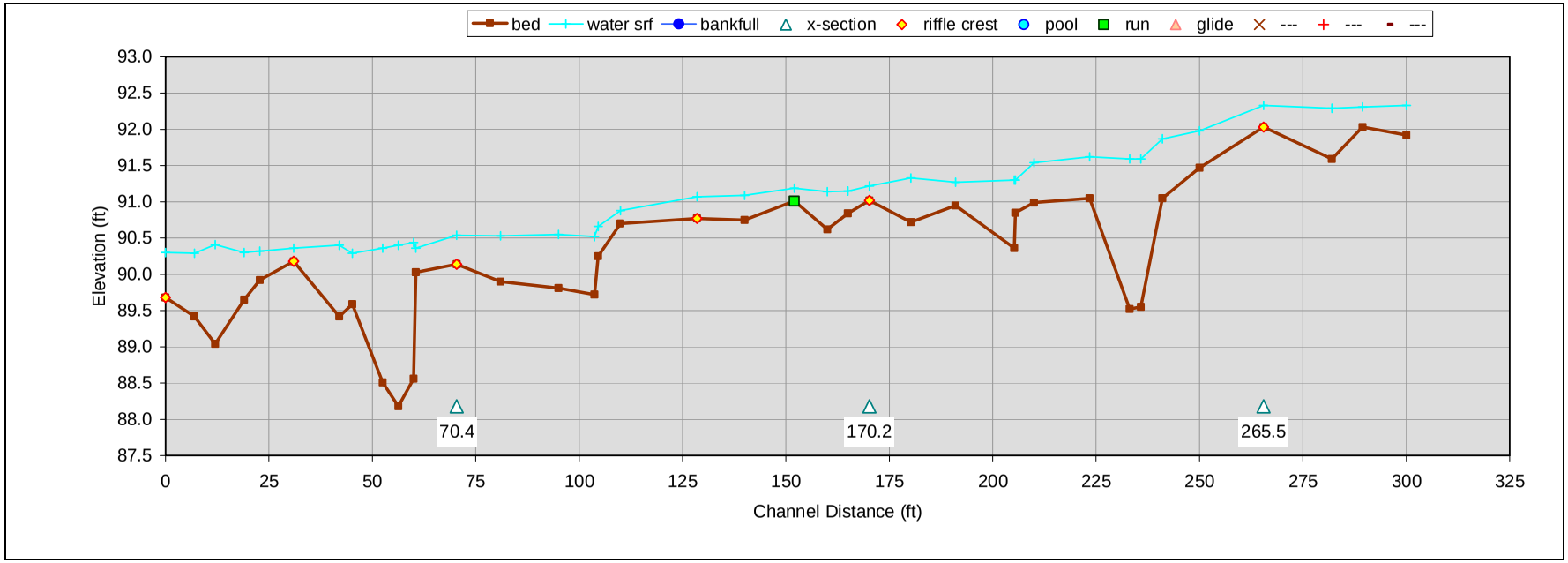
Lower Gunpowder Watershed Assessment
Drainage Area 2: SpringTowne Profile



Lower Gunpowder Watershed Assessment
Drainage Area 2: SpringTowne Profile (continued)

notes	cross section ID	bed feature	continuous data station	station	Benchmark Elevation 100 Turning Points BS	HI	FS	FS bed	depth water	ELEV bed	ELEV water sr
back sight to benchmark						100					
TORif		R	0			100		8.19	0.19	91.81	92
Glide			3.5			100		8.62	0.58	91.38	91.96
BOP			7			100		8.44	0.41	91.56	91.97
Pool Dmax			13			100		9.23	1.2	90.77	91.97
Pool			14			100		8.72	0.7	91.28	91.98
BoRif/TOP		P	15.5			100		8.22	0.24	91.78	92.02
MoRif			21			100		8.04	0.2	91.96	92.16
TORif		R	24			100		8.02	0.22	91.98	92.2
Small Pool			26.2			100		8.26	0.51	91.74	92.25
Borif			27.2			100		7.96	0.24	92.04	92.28
TORif	1	R	32			100		7.77	0.22	92.23	92.45
Glide			37			100		8.07	0.51	91.93	92.44
Pool			41.4			100		8.42	0.85	91.58	92.43
Bot Log Step			45			100		8.43	0.86	91.57	92.43
US Side Log Step			46			100		7.89	0.67	92.11	92.78
Run			49			100		7.78	0.55	92.22	92.77
TORun/BOG		N	51			100		7.49	0.3	92.51	92.81
BOP/TOGlide		G	55			100		8.01	0.83	91.99	92.82
Pool			59			100		8.3	1.14	91.7	92.84
Pool			61.8			100		7.66	0.48	92.34	92.82
Pool			68			100		8.1	0.94	91.9	92.84
Run			71			100		7.67	0.51	92.33	92.84
Rif			74.5			100		7.32	0.2	92.68	92.88
Pool			77.5			100		7.89	0.82	92.11	92.93
TOPool		P	80.5			100		7.57	0.54	92.43	92.97
BORif			83.7			100		7.2	0.18	92.8	92.98
Rif	2		87.8			100		7.22	0.28	92.78	93.06
Run			92.5			100		7.5	0.58	92.5	93.08
BoRif/TopRun		N	95			100		7.12	0.23	92.88	93.11
TopRif		R	101.5			100		6.86	0.18	93.14	93.32
TopGlide		G	106.5			100		7.43	0.77	92.57	93.34
Pool			109			100		7.76	1.09	92.24	93.33
Pool/Dmax			111.3			100		8.83	1.66	91.17	92.83
Pool/Step Below Debris			112.8			100		7.89	1.23	92.11	93.34
Run/Debris			113.8			100		7.28	0.65	92.72	93.37
Run			115.8			100		6.87	0.32	93.13	93.45
Run			120			100		6.83	0.32	93.17	93.49
BotRif/TopRun		N	122.5			100		6.67	0.15	93.33	93.48
Rif			128.2			100		6.47	0.25	93.53	93.78
Rif			135.5			100		6.26	0.26	93.74	94
Rif			138			100		6.19	0.26	93.81	94.07
FS to BM						100	1.06				
BS to BM					1.75	100.69					
TopRif		R	143.2			100.69		6.74	0.15	93.95	94.1
BotPool/TopGlide		G	147.3			100.69		7.08	0.57	93.61	94.18
Pool			151.5			100.69		7.21	0.7	93.48	94.18
BotRif			153			100.69		6.69	0.18	94	94.18
TopRif		R	159			100.69		6.6	0.21	94.09	94.3
Pool			163			100.69		7.19	0.8	93.5	94.3
BotRun/TopPool		P	168.3			100.69		6.89	0.5	93.8	94.3
Run			176			100.69		6.82	0.51	93.87	94.38
Run			178			100.69		6.47	0.23	94.22	94.45
BotRif	3		184			100.69		6.27	0.23	94.42	94.65
TopRif		R	192			100.69		5.95	0.12	94.74	94.86

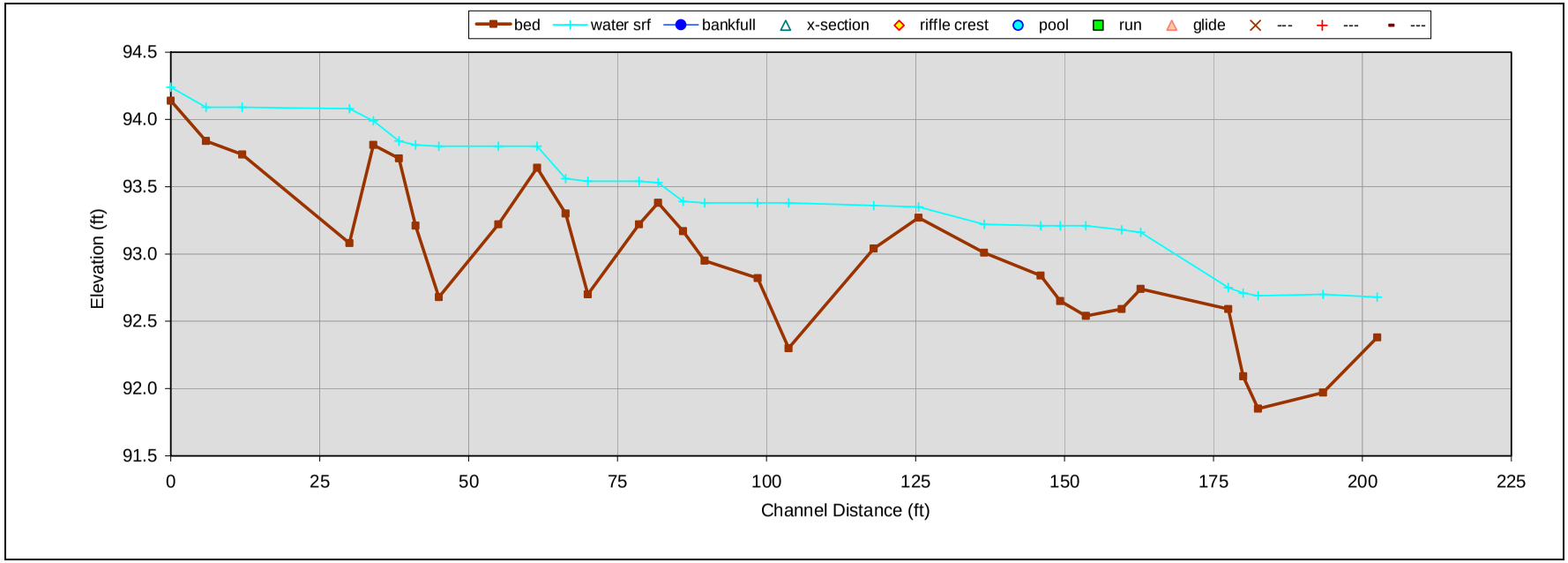
Lower Gunpowder Watershed Assessment
Drainage Area 4: Seven Oaks Hines Profile



Lower Gunpowder Watershed Assessment
Drainage Area 4: Seven Oaks Hines Profile (continued)

notes	cross section ID	bed feature	continuous data station	station	Benchmark Elevation 100 Turning Points BS	HI	FS	FS bed	depth water	ELEV bed	ELEV water sr
back sight to benchmark						100					
BOG/TORif		R	0			100		10.32	0.62	89.68	90.3
TOG			7			100		10.58	0.87	89.42	90.29
Pool			12			100		10.96	1.37	89.04	90.41
BORun/TOP			19			100		10.35	0.65	89.65	90.3
BORif			22.8			100		10.08	0.4	89.92	90.32
TORif		R	31			100		9.82	0.18	90.18	90.36
Glide			42			100		10.58	0.98	89.42	90.4
Glide			45.2			100		10.41	0.7	89.59	90.29
Pool			52.5			100		11.49	1.85	88.51	90.36
Pool Below Debris			56.3			100		11.82	2.22	88.18	90.4
Bottom of Drop			60			100		11.44	1.88	88.56	90.44
Top of Drop/BORif			60.5			100		9.97	0.33	90.03	90.36
ToRif	1	R	70.4			100		9.86	0.4	90.14	90.54
Glide			81			100		10.1	0.63	89.9	90.53
Pool			95			100		10.19	0.74	89.81	90.55
Bottom of Log Step			103.7			100		10.28	0.8	89.72	90.52
Top Log Step in front of log			104.6			100		9.75	0.41	90.25	90.66
Mid Riffle			110			100		9.3	0.18	90.7	90.88
TORif/BORun		R	128.5			100		9.23	0.3	90.77	91.07
Run			140			100		9.25	0.34	90.75	91.09
BOG/TORun		N	152			100		8.99	0.18	91.01	91.19
			160			100		9.38	0.52	90.62	91.14
BoRif			165			100		9.16	0.31	90.84	91.15
TORif/BOG	2	R	170.2			100		8.98	0.2	91.02	91.22
Pool			180.2			100		9.28	0.61	90.72	91.33
Cross Over			191			100		9.05	0.32	90.95	91.27
Bottom Log Drop			205.2			100		9.64	0.94	90.36	91.3
Top of Log Step			205.5			100		9.15	0.45	90.85	91.3
Manhole Setup 1						100	3.88				
Manhole Setup 2					4.91	101.03					
Run Below Bar			210			101.03		10.04	0.55	90.99	91.54
Bot Scour Pool/Start Dep			223.4			101.03		9.98	0.57	91.05	91.62
Scour Below Blockage			233.1			101.03		11.51	2.07	89.52	91.59
Bottom of Drop/Blockage			235.8			101.03		11.48	2.04	89.55	91.59
Immed US Blockage			241			101.03		9.98	0.82	91.05	91.87
Mid Rif			250			101.03		9.56	0.51	91.47	91.98
TORif	3	R	265.5			101.03		9	0.3	92.03	92.33
Run			282			101.03		9.44	0.7	91.59	92.29
Rif/Run			289.4			101.03		9	0.28	92.03	92.31
Rif/Run			300			101.03		9.11	0.41	91.92	92.33

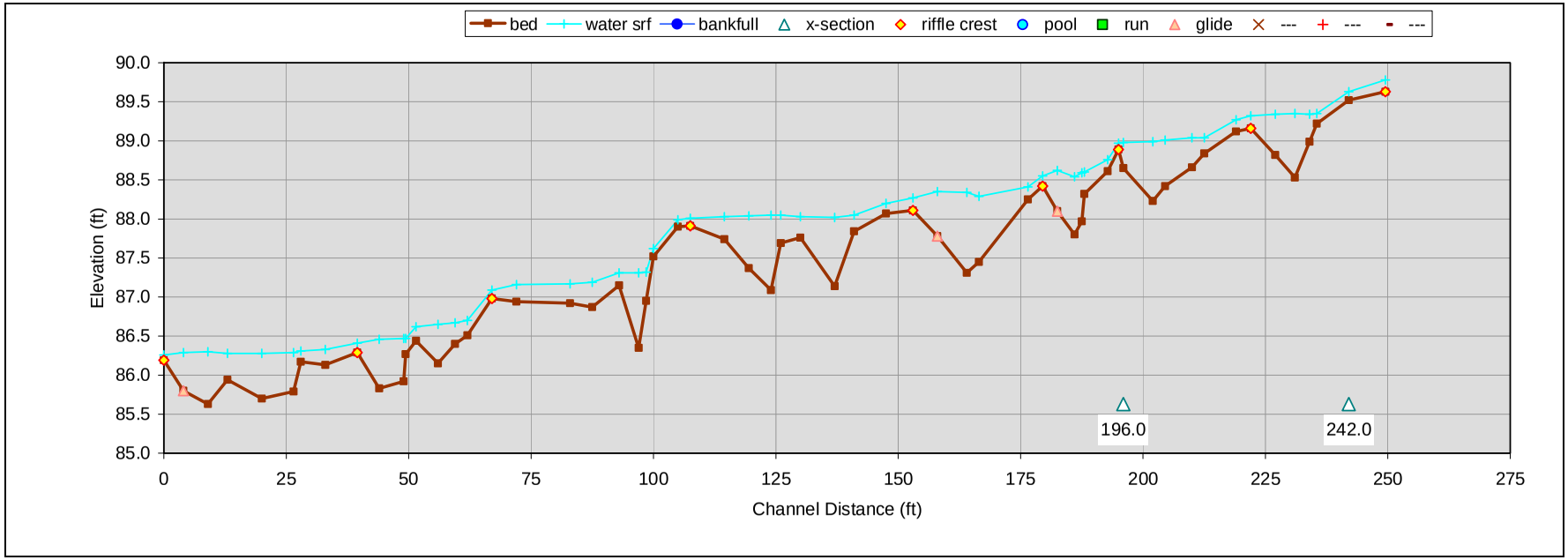
Lower Gunpowder Watershed Assessment
Drainage Area 4: Lincolnshire Profile



Lower Gunpowder Watershed Assessment
Drainage Area 4: Lincolnshire Profile (continued)

	continuous data		Benchmark Elevation 100				depth		
			Turning Points			FS		ELEV	ELEV
notes	station	station	BS	HI	FS	bed	water	bed	water sr
back sight to benchmark			0.74	100.74					
riffle	0			100.74		6.6	0.1	94.14	94.24
	5.9			100.74		6.9	0.25	93.84	94.09
run	12			100.74		7	0.35	93.74	94.09
pool	30			100.74		7.66	1	93.08	94.08
riffle	34			100.74		6.93	0.18	93.81	93.99
run	38.3			100.74		7.03	0.13	93.71	93.84
pool	41.1			100.74		7.53	0.6	93.21	93.81
dmax	45			100.74		8.06	1.12	92.68	93.8
glide	55			100.74		7.52	0.58	93.22	93.8
riffle	61.5			100.74		7.1	0.16	93.64	93.8
run	66.3			100.74		7.44	0.26	93.3	93.56
pool dmax	70			100.74		8.04	0.84	92.7	93.54
glide	78.6			100.74		7.52	0.32	93.22	93.54
riffle	81.8			100.74		7.36	0.15	93.38	93.53
run	86			100.74		7.57	0.22	93.17	93.39
	89.6			100.74		7.79	0.43	92.95	93.38
pool	98.5			100.74		7.92	0.56	92.82	93.38
dmax	103.7			100.74		8.44	1.08	92.3	93.38
glide	118			100.74		7.7	0.32	93.04	93.36
riffle	125.5			100.74		7.47	0.08	93.27	93.35
run	136.5			100.74		7.73	0.21	93.01	93.22
pool	146			100.74		7.9	0.37	92.84	93.21
	149.3			100.74		8.09	0.56	92.65	93.21
dmax	153.6			100.74		8.2	0.67	92.54	93.21
	159.6			100.74		8.15	0.59	92.59	93.18
riffle in debris jam	162.8			100.74		8	0.42	92.74	93.16
riffle	177.5			100.74		8.15	0.16	92.59	92.75
	180			100.74		8.65	0.62	92.09	92.71
dmax	182.5			100.74		8.89	0.84	91.85	92.69
	193.4			100.74		8.77	0.73	91.97	92.7
riffle	202.5			100.74		8.36	0.3	92.38	92.68

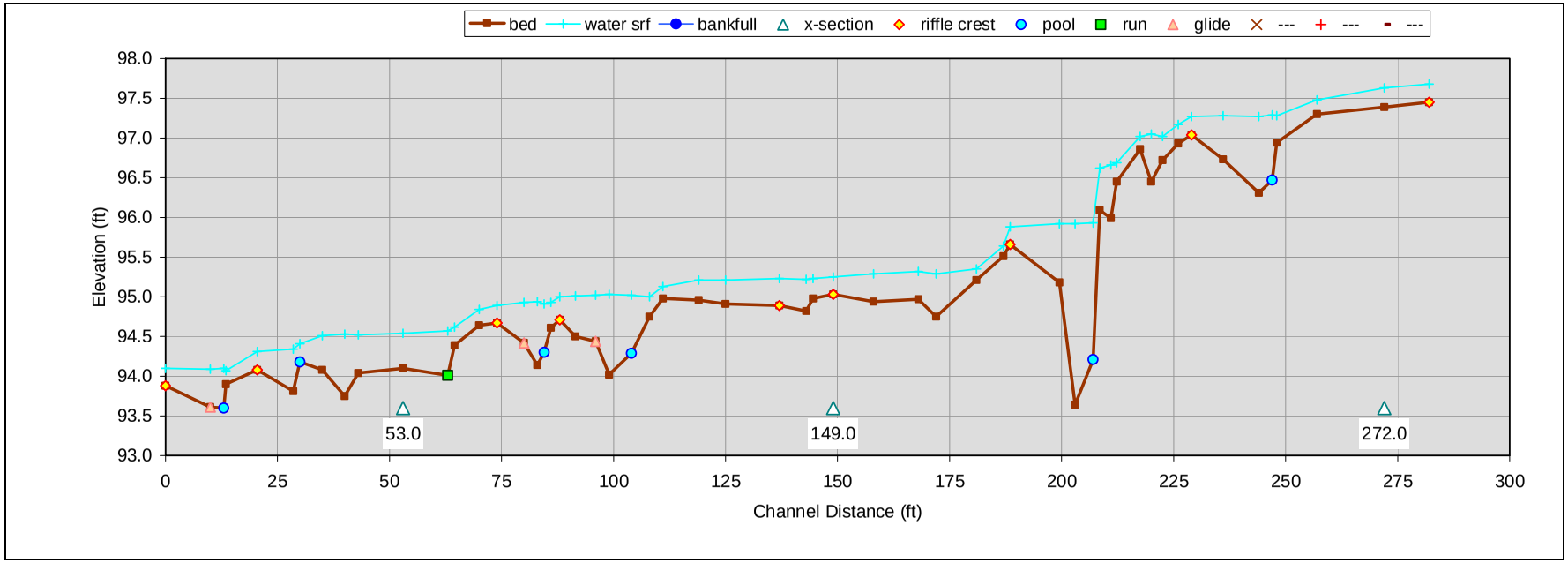
Lower Gunpowder Watershed Assessment
Drainage Area 5: Hinesleigh Profile



Lower Gunpowder Watershed Assessment
Drainage Area 5: Hinesleigh Profile (continued)

notes	cross section ID	bed feature	continuous data station	station	Benchmark Elevation 100 Turning Points BS	HI	FS	FS bed	depth water	ELEV bed	ELEV water sr
back sight to benchmark						100					
Top of Rif		R	0			100		13.81	0.07	86.19	86.26
TopGlide		G	4			100		14.2	0.49	85.8	86.29
Pool			9			100		14.37	0.67	85.63	86.3
Run			13			100		14.06	0.34	85.94	86.28
Run			20			100		14.3	0.58	85.7	86.28
Run			26.5			100		14.21	0.5	85.79	86.29
BotRif			28			100		13.83	0.14	86.17	86.31
MidRif			33			100		13.87	0.2	86.13	86.33
TopRif		R	39.5			100		13.71	0.12	86.29	86.41
Pool/Debris			44			100		14.17	0.63	85.83	86.46
Pool			49			100		14.08	0.55	85.92	86.47
BotRif			49.4			100		13.73	0.2	86.27	86.47
Run			51.5			100		13.56	0.18	86.44	86.62
Run			56			100		13.85	0.5	86.15	86.65
Run			59.5			100		13.6	0.27	86.4	86.67
BotRif			62			100		13.49	0.19	86.51	86.7
TopRif		R	67			100		13.02	0.11	86.98	87.09
Glide			72			100		13.06	0.22	86.94	87.16
Glide			83			100		13.08	0.25	86.92	87.17
Glide			87.5			100		13.13	0.32	86.87	87.19
Debris w/Deposition			93			100		12.85	0.16	87.15	87.31
Scour Pool Below Debris			97			100		13.65	0.96	86.35	87.31
Bot Debris Drop			98.5			100		13.05	0.37	86.95	87.32
US Debris			100			100		12.48	0.1	87.52	87.62
Rif			105			100		12.1	0.09	87.9	87.99
Top Rif		R	107.5			100		12.09	0.1	87.91	88.01
Glide			114.5			100		12.26	0.29	87.74	88.03
Pool			119.5			100		12.63	0.67	87.37	88.04
Pool			124			100		12.91	0.96	87.09	88.05
Run			126			100		12.31	0.36	87.69	88.05
Run			130			100		12.24	0.27	87.76	88.03
Run			137			100		12.86	0.88	87.14	88.02
BotRif			141			100		12.16	0.21	87.84	88.05
MidRif			147.5			100		11.93	0.13	88.07	88.2
TopRif		R	153			100		11.89	0.16	88.11	88.27
TopGlide		G	158			100		12.22	0.57	87.78	88.35
TP Manhole on Left Bank						100	4.2				
TP from station 2					5.25	101.05					
Pool			164			101.05		13.74	1.03	87.31	88.34
Pool			166.5			101.05		13.6	0.84	87.45	88.29
BotRif			176.5			101.05		12.8	0.16	88.25	88.41
TopRif		R	179.5			101.05		12.63	0.13	88.42	88.55
TopGlide		G	182.5			101.05		12.95	0.52	88.1	88.62
Small Scour/Debris			186			101.05		13.25	0.74	87.8	88.54
DS Debris Drop			187.5			101.05		13.08	0.62	87.97	88.59
US Debris Drop			188			101.05		12.73	0.28	88.32	88.6
Bot Debris Drop			192.8			101.05		12.44	0.15	88.61	88.76
TopRif		R	195			101.05		12.16	0.08	88.89	88.97
Glide	2		196			101.05		12.4	0.33	88.65	88.98
Pool			202			101.05		12.82	0.76	88.23	88.99
Pool			204.5			101.05		12.63	0.59	88.42	89.01
Run			210			101.05		12.39	0.38	88.66	89.04
BotRif			212.5			101.05		12.21	0.2	88.84	89.04
MidRif			219			101.05		11.93	0.15	89.12	89.27
TopRif		R	222			101.05		11.89	0.16	89.16	89.32
Pool			227			101.05		12.23	0.52	88.82	89.34
Run			231			101.05		12.52	0.82	88.53	89.35
Run			234			101.05		12.06	0.35	88.99	89.34
BotRif			235.5			101.05		11.83	0.13	89.22	89.35
MidRif	3		242			101.05		11.53	0.11	89.52	89.63
TopRif		R	249.5			101.05		11.42	0.15	89.63	89.78

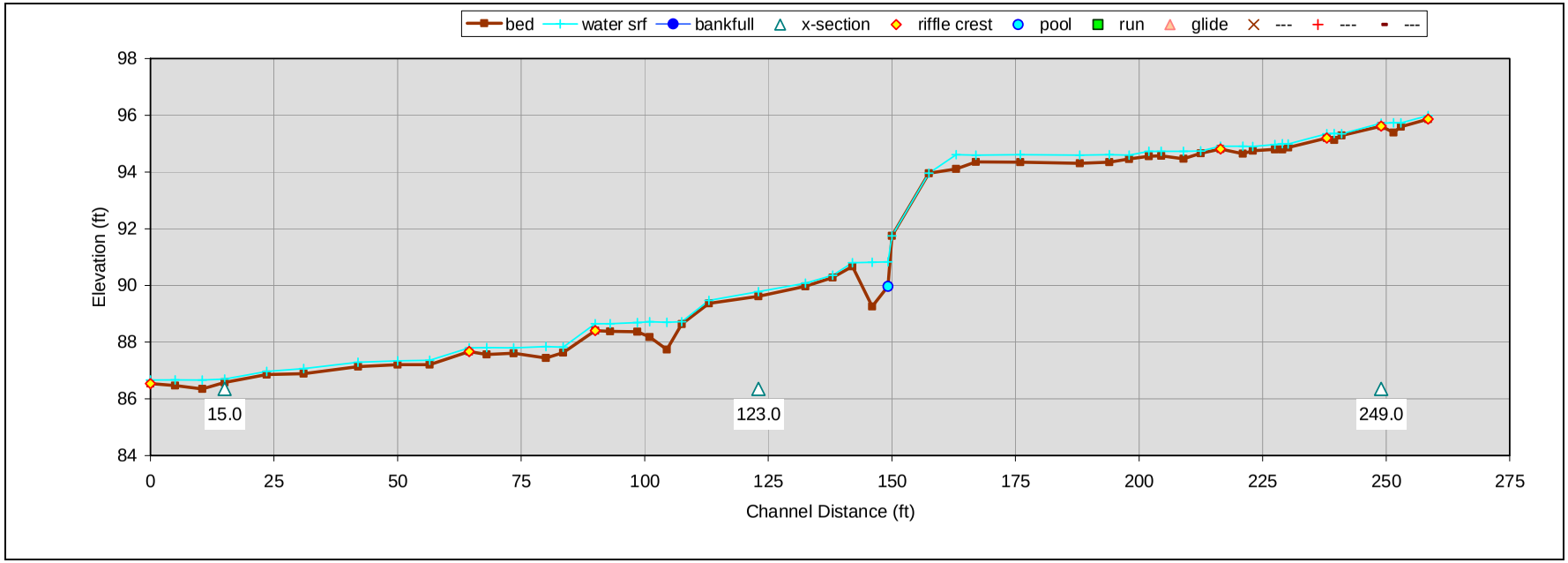
Lower Gunpowder Watershed Lower Gunpowder Watershed Assessment
Drainage Area 5: Seven Oaks Simms Profile



Lower Gunpowder Watershed Assessment
Drainage Area 5: Seven Oaks Simms Profile

notes	cross section ID	bed feature	continuous data station	station	Benchmark Elevation 100 Turning Points BS	HI	FS	FS bed	depth water	ELEV bed	ELEV water sr
back sight to benchmark						100					
ToRif		R	0			100		6.12	0.22	93.88	94.1
Glide		G	10			100		6.39	0.48	93.61	94.09
ToPool		P	13			100		6.4	0.5	93.6	94.1
BoRif			13.5			100		6.1	0.17	93.9	94.07
ToRif		R	20.5			100		5.92	0.23	94.08	94.31
Pool			28.5			100		6.19	0.53	93.81	94.34
ToPool/BoRun		P	30			100		5.82	0.23	94.18	94.41
Run			35			100		5.92	0.43	94.08	94.51
Pool			40			100		6.25	0.78	93.75	94.53
ToPool/BoRun			43			100		5.96	0.48	94.04	94.52
Run	1		53			100		5.9	0.44	94.1	94.54
ToRun		N	63			100		5.99	0.56	94.01	94.57
BoRif			64.5			100		5.61	0.23	94.39	94.62
Rif			70			100		5.36	0.2	94.64	94.84
ToRif		R	74			100		5.33	0.22	94.67	94.89
BoPool/ToGlide		G	80			100		5.58	0.51	94.42	94.93
Pool			83			100		5.86	0.8	94.14	94.94
ToPool		P	84.5			100		5.7	0.61	94.3	94.91
BoRif			86			100		5.39	0.32	94.61	94.93
ToRif		R	88			100		5.29	0.29	94.71	95
Run			91.5			100		5.5	0.51	94.5	95.01
BoPool/ToGlide		G	96			100		5.56	0.58	94.44	95.02
Dmax			99			100		5.98	1.01	94.02	95.03
BoRun/ToPool		P	104			100		5.71	0.73	94.29	95.02
Run			108			100		5.25	0.25	94.75	95
BoRif			111			100		5.02	0.15	94.98	95.13
MiRif			119			100		5.04	0.25	94.96	95.21
Rif			125			100		5.09	0.3	94.91	95.21
ToRif		R	137			100		5.11	0.34	94.89	95.23
Run			143			100		5.18	0.4	94.82	95.22
Rif			144.5			100		5.02	0.25	94.98	95.23
ToRif	2	R	149			100		4.97	0.22	95.03	95.25
Glide			158			100		5.06	0.35	94.94	95.29
Glide/Run			168			100		5.03	0.35	94.97	95.32
Glide			172			100		5.25	0.54	94.75	95.29
BoRif			181			100		4.79	0.14	95.21	95.35
MiRif			187			100		4.49	0.13	95.51	95.64
ToRif		R	188.5			100		4.34	0.22	95.66	95.88
Glide/BoPool			199.5			100		4.82	0.74	95.18	95.92
ScourPool/Debris			203			100		6.36	2.28	93.64	95.92
ToPool/BotLogDrop		P	207			100		5.79	1.72	94.21	95.93
TP1 FS (CMP)						100	3.39				
TP1 BS					8.82	105.43					
TopDebrisLog			208.5			105.43		9.34	0.53	96.09	96.62
SmallDebrisScour			211			105.43		9.44	0.67	95.99	96.66
TopScourPool			212.3			105.43		8.98	0.24	96.45	96.69
Rif			217.5			105.43		8.57	0.16	96.86	97.02
PocketScour			220			105.43		8.98	0.6	96.45	97.05
Run			222.5			105.43		8.71	0.3	96.72	97.02
BoRif			226			105.43		8.5	0.24	96.93	97.17
ToRif		R	229			105.43		8.39	0.23	97.04	97.27
Glide			236			105.43		8.7	0.55	96.73	97.28
Pool			244			105.43		9.12	0.96	96.31	97.27
ToPool		P	247			105.43		8.96	0.82	96.47	97.29
BoRif			248			105.43		8.49	0.34	96.94	97.28
MiRif			257			105.43		8.13	0.18	97.3	97.48
Rif	3		272			105.43		8.04	0.24	97.39	97.63
ToRif		R	282			105.43		7.98	0.23	97.45	97.68

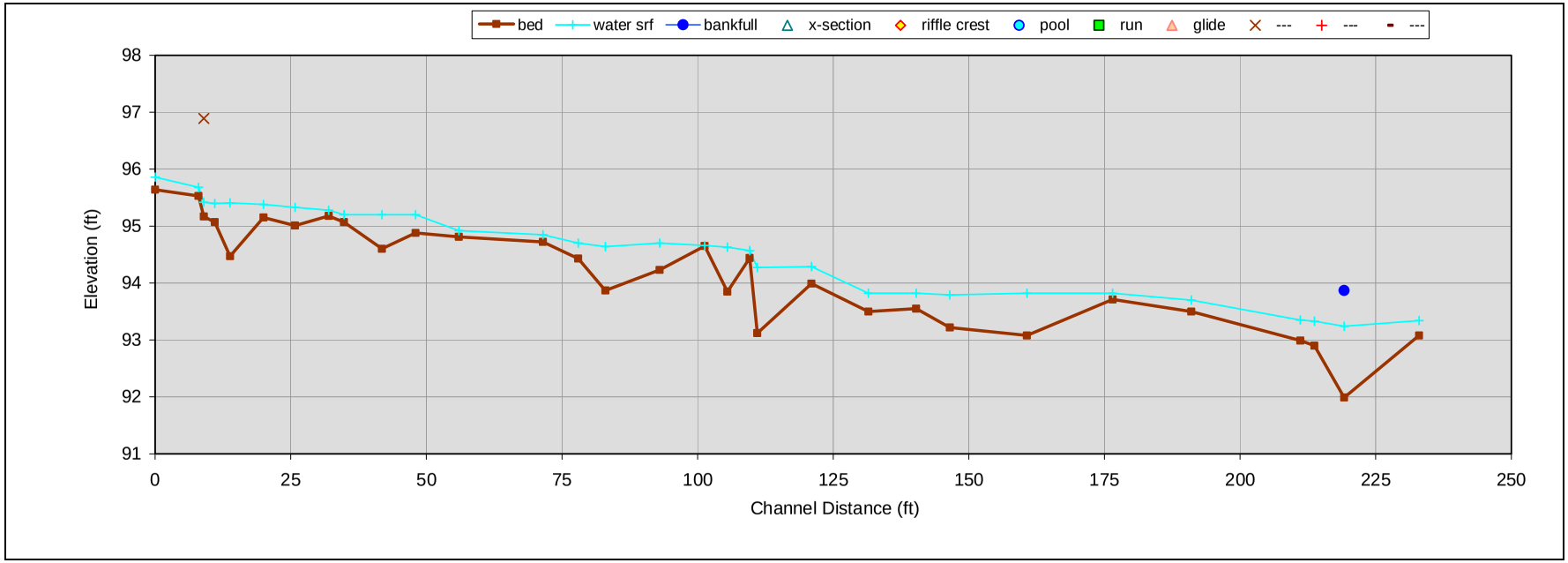
Lower Gunpowder Watershed Assessment
Drainage Area 7: Upstream Simms Profile



Lower Gunpowder Watershed Assessment
Drainage Area 7: Upstream Simms Profile (continued)

notes	cross section ID	bed feature	continuous data station	continuous data station	Benchmark Elevation 100 Turning Points BS	HI	FS	FS bed	depth water	ELEV bed	ELEV water sr
back sight to benchmark						100					
Top Rif		R	0			100		13.46	0.12	86.54	86.66
Glide			5			100		13.53	0.2	86.47	86.67
Run			10.5			100		13.65	0.31	86.35	86.66
BotRif	1		15			100		13.42	0.12	86.58	86.7
MidRif			23.5			100		13.14	0.11	86.86	86.97
MidRif			31			100		13.11	0.18	86.89	87.07
MidRif			42			100		12.86	0.15	87.14	87.29
MidRif			50			100		12.79	0.13	87.21	87.34
MidRif			56.5			100		12.79	0.15	87.21	87.36
TopRif		R	64.5			100		12.33	0.13	87.67	87.8
Glide			68			100		12.43	0.24	87.57	87.81
Glide			73.5			100		12.39	0.19	87.61	87.8
Run			80			100		12.56	0.4	87.44	87.84
BotRipRap/Rif			83.5			100		12.37	0.19	87.63	87.82
TopRif		R	90			100		11.59	0.24	88.41	88.65
Glide			93			100		11.62	0.27	88.38	88.65
Run			98.5			100		11.63	0.32	88.37	88.69
Pool			101			100		11.82	0.54	88.18	88.72
Pool/Scour hole at BR			104.5			100		12.26	0.96	87.74	88.7
Bottom of BR Cascade			107.5			100		11.36	0.08	88.64	88.72
BedrockCascade			113			100		10.63	0.1	89.37	89.47
Rif	2		123			100		10.38	0.16	89.62	89.78
Rif			132.5			100		10.03	0.11	89.97	90.08
Rif			138			100		9.72	0.08	90.28	90.36
Bottom Scour Pool			142			100		9.33	0.13	90.67	90.8
Pool Dmax			146			100		10.74	1.56	89.26	90.82
TopofPool		P	149.2			100		10.03	0.86	89.97	90.83
Gabion			150			100		8.25	0	91.75	91.75
Confluence with outfall channel			157.5			100		6.04	0	93.96	93.96
US Edge Gabion, not on gabion			163			100		5.89	0.5	94.11	94.61
Glide			167			100		5.64	0.24	94.36	94.6
Run			176			100		5.65	0.26	94.35	94.61
Run			188			100		5.69	0.29	94.31	94.6
Run			194			100		5.65	0.26	94.35	94.61
BotRif			198			100		5.54	0.14	94.46	94.6
Rif			202			100		5.44	0.17	94.56	94.73
Rif			204.5			100		5.43	0.16	94.57	94.73
Run			209			100		5.53	0.26	94.47	94.73
BotRuf			212.5			100		5.34	0.08	94.66	94.74
TopRif		R	216.5			100		5.19	0.1	94.81	94.91
Run			221			100		5.35	0.26	94.65	94.91
Rif			223			100		5.25	0.15	94.75	94.9
Run			227.5			100		5.2	0.17	94.8	94.97
Run			229			100		5.2	0.2	94.8	95
BotRif			230.2			100		5.13	0.12	94.87	94.99
TopRif		R	238			100		4.8	0.15	95.2	95.35
Run			239.5			100		4.87	0.23	95.13	95.36
BotRif			241			100		4.71	0.06	95.29	95.35
TopRif	3	R	249			100		4.38	0.1	95.62	95.72
Run			251.5			100		4.61	0.35	95.39	95.74
BotRif			253			100		4.4	0.13	95.6	95.73
TopRif		R	258.5			100		4.13	0.12	95.87	95.99

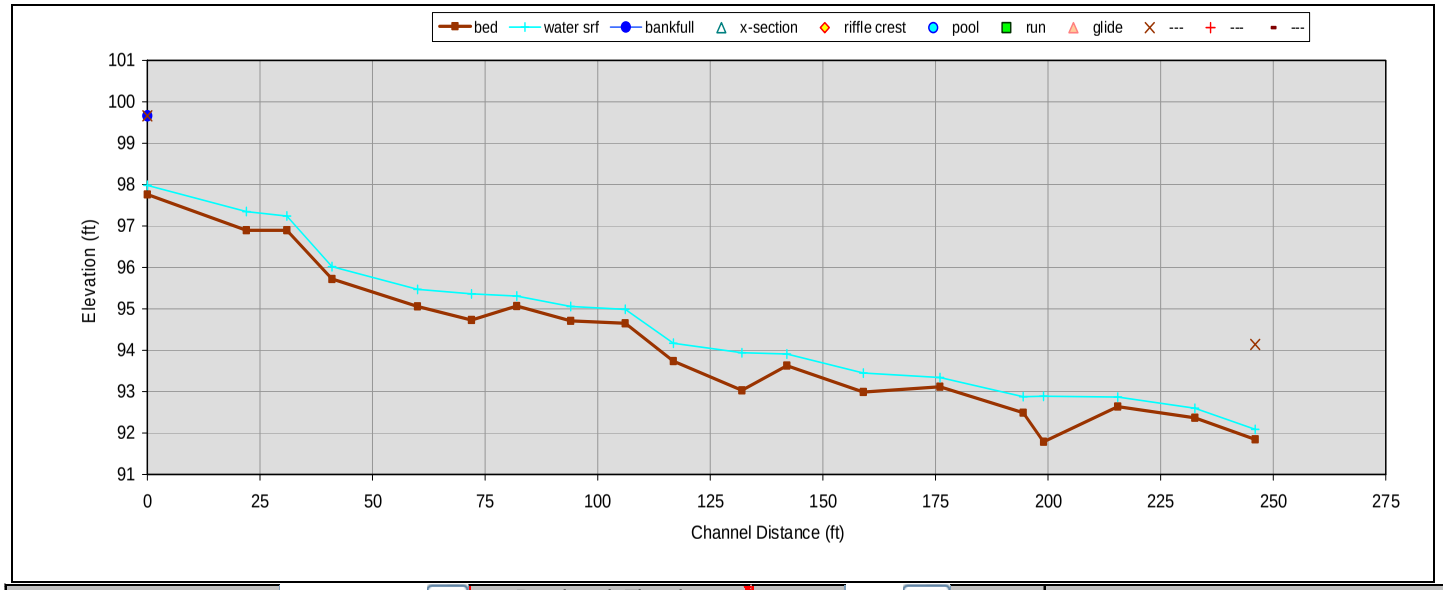
Lower Gunpowder Watershed Assessment
Drainage Area 8: Seven Courts Profile



Lower Gunpowder Watershed Assessment
Drainage Area 8: Seven Courts Profile (continued)

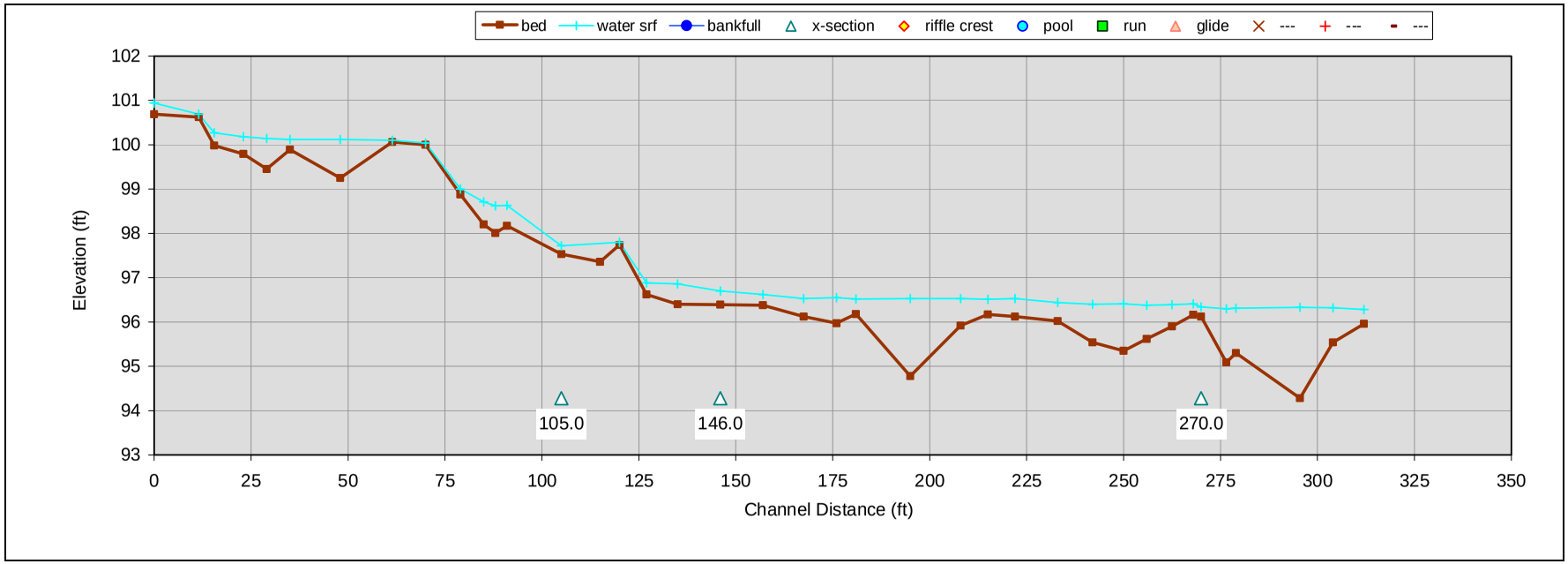
notes	cross section ID	bed feature	continuous data station	station	Benchmark Elevation 100 Turning Points BS	HI	FS	FS bed	depth water	FS bankfull	FS	ELEV bed	ELEV water sr	ELEV bankfull	ELEV —
back sight to benchmark					5.66	105.66									
Head of Riffle			0			105.66		10.02	0.22			95.64	95.86		
			8			105.66		10.13	0.15			95.53	95.68		
			9			105.66		10.49	0.25		8.77	95.17	95.42		96.89
			11			105.66		10.59	0.33			95.07	95.4		
D Max			13.8			105.66		11.19	0.94			94.47	95.41		
Head of Riffle			20			105.66		10.51	0.23			95.15	95.38		
Streambed			25.8			105.66		10.65	0.32			95.01	95.33		
			32			105.66		10.48	0.1			95.18	95.28		
			34.8			105.66		10.59	0.13			95.07	95.2		
D Max			41.8			105.66		11.06	0.6			94.6	95.2		
Head of Riffle			48			105.66		10.78	0.32			94.88	95.2		
Streambed			56			105.66		10.85	0.11			94.81	94.92		
Streambed			71.5			105.66		10.94	0.13			94.72	94.85		
Run			78			105.66		11.23	0.27			94.43	94.7		
D Max			83			105.66		11.79	0.77			93.87	94.64		
			93			105.66		11.43	0.47			94.23	94.7		
Head of Root Jam			101.3			105.66		11.01	0.01			94.65	94.66		
D Max in Jam			105.5			105.66		11.81	0.78			93.85	94.63		
End of Roots			109.6			105.66		11.22	0.13			94.44	94.57		
Scour Below Roots			111			105.66		12.54	1.15			93.12	94.27		
Head of Riffle @Right of midchannel bar			121			105.66		11.67	0.3			93.99	94.29		
Bottom of Riffle - Right trib at 138.0			131.5			105.66		12.16	0.32			93.5	93.82		
Streambed			140.3			105.66		12.11	0.27			93.55	93.82		
Streambed			146.5			105.66		12.44	0.57			93.22	93.79		
D Max			160.7			105.66		12.58	0.74			93.08	93.82		
Head of Riffle			176.5			105.66		11.95	0.11			93.71	93.82		
Streambed			191			105.66		12.16	0.2			93.5	93.7		
End of Riffle			211.1			105.66		12.67	0.36			92.99	93.35		
Streambed			213.7			105.66		12.76	0.43			92.9	93.33		
D Max			219.2			105.66		13.67	1.25	11.79		91.99	93.24	93.87	
Head of Riffle			233			105.66		12.58	0.26			93.08	93.34		

Lower Gunpowder Watershed Assessment
Drainage Area 9: Birchbrook Profile



notes	continuous data station	station	Benchmark Elevation 100 Turning Points BS	HI	FS	FS bed	depth water	FS bankfull	FS	ELEV bed	ELEV water srf	ELEV bankfull	ELEV —
back sight to benchmark			3.73	103.73									
riffle top	0			103.73		5.97	0.22	4.07	4.07	97.76	97.98	99.66	99.66
riffle	22			103.73		6.83	0.45			96.9	97.35		
break at sewer crossing	31			103.73		6.83	0.34			96.9	97.24		
below sewer crossing	41			103.73		8.01	0.3			95.72	96.02		
on bedrock	60			103.73		8.67	0.41			95.06	95.47		
	72			103.73		9	0.63			94.73	95.36		
	82			103.73		8.66	0.24			95.07	95.31		
	94			103.73		9.02	0.35			94.71	95.06		
	106.1			103.73		9.08	0.34			94.65	94.99		
riffle	116.8			103.73		9.99	0.43			93.74	94.17		
dmax	132			103.73		10.7	0.91			93.03	93.94		
riffle	142			103.73		10.1	0.28			93.63	93.91		
	159			103.73		10.74	0.46			92.99	93.45		
	176			103.73		10.61	0.22			93.12	93.34		
	194.5			103.73		11.24	0.39			92.49	92.88		
	199			103.73		11.94	1.1			91.79	92.89		
	215.5			103.73		11.09	0.23			92.64	92.87		
	232.6			103.73		11.36	0.23			92.37	92.6		
riffle bottom	246			103.73		11.88	0.24		9.59	91.85	92.09		94.14

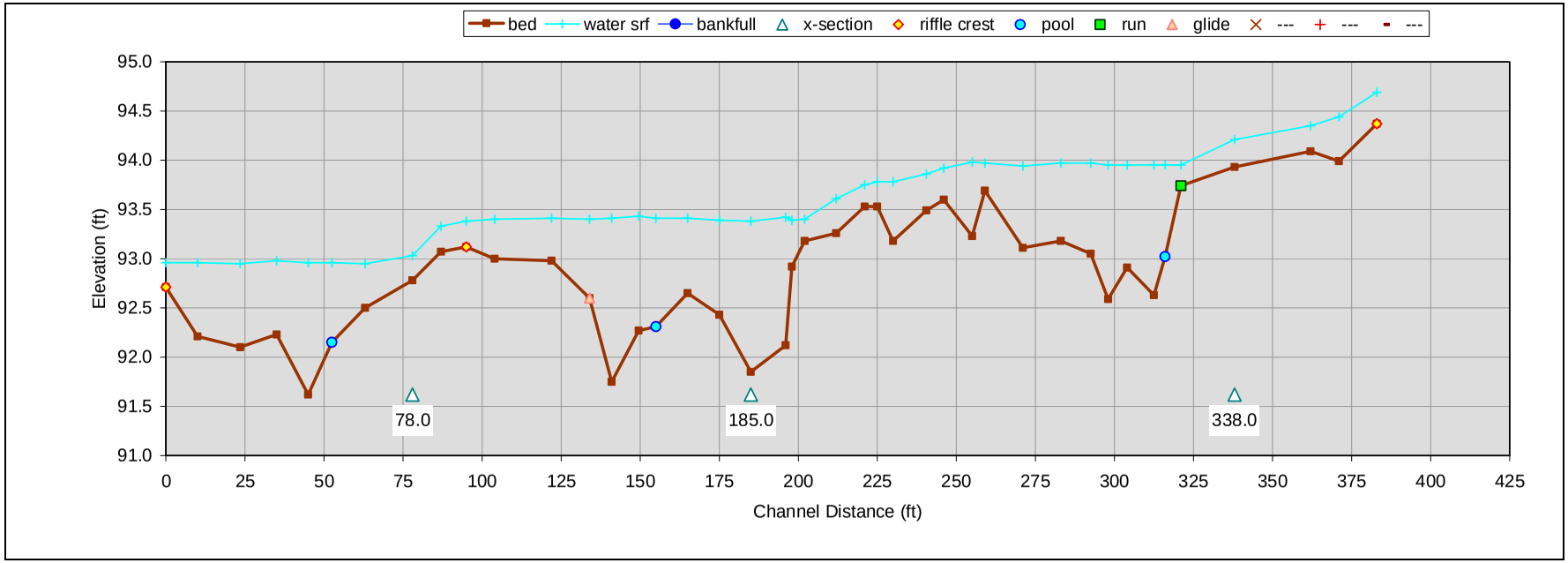
Lower Gunpowder Watershed Assessment
Drainage Area 10: Weis Plaza Profile



Lower Gunpowder Watershed Assessment
Drainage Area 10: Weis Plaza Profile (continued)

notes	cross section ID	bed feature	continuous data station	continuous data station	Benchmark Elevation 100 Turning Points BS	HI	FS	FS bed	depth water	ELEV bed	ELEV water sr
back sight to benchmark					4.77	104.77					
			0			104.77		4.08	0.25	100.69	100.94
			11.5			104.77		4.15	0.07	100.62	100.69
			15.5			104.77		4.79	0.29	99.98	100.27
			23			104.77		4.98	0.39	99.79	100.18
			29			104.77		5.32	0.69	99.45	100.14
			35			104.77		4.88	0.23	99.89	100.12
			48			104.77		5.52	0.87	99.25	100.12
			61.4			104.77		4.71	0.04	100.06	100.1
			70			104.77		4.77	0.04	100	100.04
			79			104.77		5.89	0.12	98.88	99
			85			104.77		6.57	0.51	98.2	98.71
			88			104.77		6.76	0.61	98.01	98.62
			91			104.77		6.6	0.46	98.17	98.63
	1		105			104.77		7.24	0.19	97.53	97.72
			115			104.77		7.41		97.36	
			120			104.77		7.03	0.06	97.74	97.8
			127			104.77		8.15	0.26	96.62	96.88
			135			104.77		8.37	0.46	96.4	96.86
	2		146			104.77		8.38	0.31	96.39	96.7
			157			104.77		8.39	0.24	96.38	96.62
			167.5			104.77		8.65	0.41	96.12	96.53
			176			104.77		8.8	0.58	95.97	96.55
			181			104.77		8.59	0.34	96.18	96.52
			195			104.77		9.99	1.75	94.78	96.53
			208			104.77		8.85	0.61	95.92	96.53
			215			104.77		8.6	0.34	96.17	96.51
			222			104.77		8.65	0.41	96.12	96.53
			233			104.77		8.75	0.42	96.02	96.44
			242			104.77		9.23	0.86	95.54	96.4
			250			104.77		9.42	1.06	95.35	96.41
			256			104.77		9.15	0.76	95.62	96.38
			262.5			104.77		8.87	0.49	95.9	96.39
			268			104.77		8.61	0.25	96.16	96.41
	3		270			104.77		8.65	0.22	96.12	96.34
			276.5			104.77		9.68	1.21	95.09	96.3
			279			104.77		9.47	1.01	95.3	96.31
			295.5			104.77		10.49	2.05	94.28	96.33
			304			104.77		9.23	0.78	95.54	96.32
			312			104.77		8.81	0.32	95.96	96.28

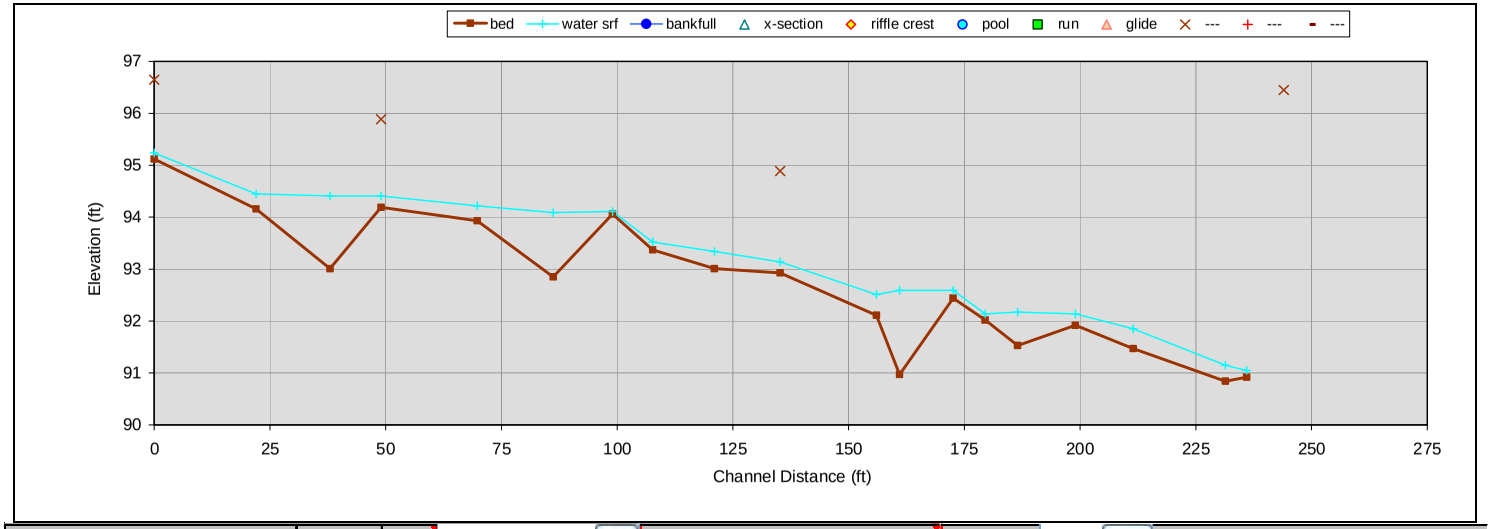
Lower Gunpowder Watershed Assessment
Drainage Area 11: Cedar Chip Profile



Lower Gunpowder Watershed Assessment
Drainage Area 11: Cedar Chip Profile (continued)

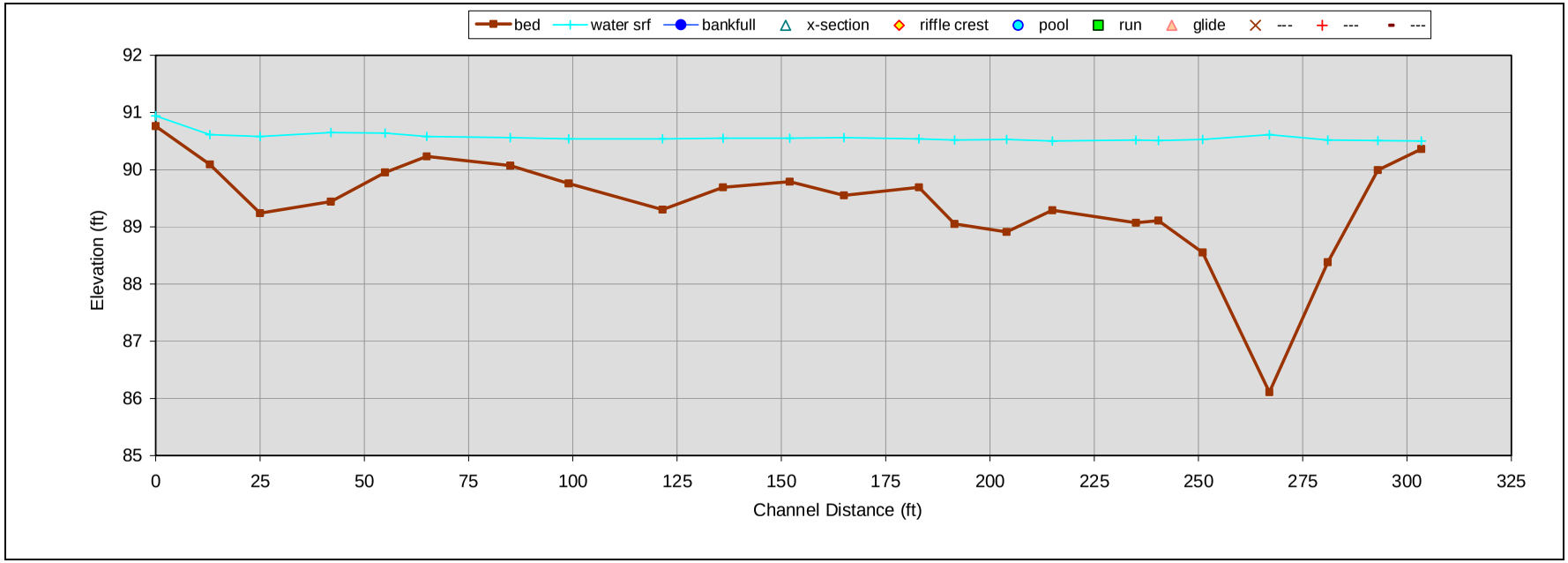
notes	cross section ID	bed feature	continuous data station	station	Benchmark Elevation 100 Turning Points BS	HI	FS	FS bed	depth water	ELEV bed	ELEV water sr
back sight to benchmark						100					
Top Rif		R	0			100		7.29	0.25	92.71	92.96
Glide			10			100		7.79	0.75	92.21	92.96
Pool			23.5			100		7.9	0.85	92.1	92.95
Pool			35			100		7.77	0.75	92.23	92.98
Pool			45			100		8.38	1.34	91.62	92.96
BOtRun/TopPool		P	52.5			100		7.85	0.81	92.15	92.96
Run			63			100		7.5	0.45	92.5	92.95
BotRif	1		78			100		7.22	0.25	92.78	93.03
MidRif			87			100		6.93	0.26	93.07	93.33
Top Rif		R	95			100		6.88	0.26	93.12	93.38
Glide			104			100		7	0.4	93	93.4
Glide			122			100		7.02	0.43	92.98	93.41
BotPool/TopGlide		G	134			100		7.4	0.8	92.6	93.4
Pool			141			100		8.25	1.66	91.75	93.41
Pool			149.5			100		7.73	1.16	92.27	93.43
TopPool/BotRun		P	155			100		7.69	1.1	92.31	93.41
Run			165			100		7.35	0.76	92.65	93.41
Run			175			100		7.57	0.96	92.43	93.39
Run	2		185			100		8.15	1.53	91.85	93.38
FS to US Rocks						100	5.64				
BS to US Rocks					4.01	98.37					
Bot Rif			196			98.37		6.25	1.3	92.12	93.42
Run			198			98.37		5.45	0.47	92.92	93.39
Bot Rif			202			98.37		5.19	0.22	93.18	93.4
Rif			212			98.37		5.11	0.35	93.26	93.61
Rif			221			98.37		4.84	0.22	93.53	93.75
Rif			225			98.37		4.84	0.25	93.53	93.78
Run			230			98.37		5.19	0.6	93.18	93.78
BotRif			240.5			98.37		4.88	0.37	93.49	93.86
Rif			246			98.37		4.77	0.32	93.6	93.92
Run			255			98.37		5.14	0.75	93.23	93.98
Run			259			98.37		4.68	0.28	93.69	93.97
Run			271			98.37		5.26	0.83	93.11	93.94
Pool			283			98.37		5.19	0.79	93.18	93.97
Run			292.5			98.37		5.32	0.92	93.05	93.97
Run			298			98.37		5.78	1.36	92.59	93.95
Pool			304			98.37		5.46	1.04	92.91	93.95
Pool			312.5			98.37		5.74	1.32	92.63	93.95
TopPool/BotRun		P	316			98.37		5.35	0.93	93.02	93.95
BotRif/TopRun		N	321			98.37		4.63	0.21	93.74	93.95
MidRif	3		338			98.37		4.44	0.28	93.93	94.21
Rif			362			98.37		4.28	0.26	94.09	94.35
Rif			371			98.37		4.38	0.45	93.99	94.44
TopRif		R	383			98.37		4	0.32	94.37	94.69

Lower Gunpowder Watershed Assessment
Drainage Area 13: Pinedale



notes	cross section ID	bed feature	continuous data station	station	Benchmark Elevation 100 Turning Points BS	HI	FS	FS bed	depth water	FS	ELEV bed	ELEV water srf	ELEV ---
back sight to benchmark					5.71	105.71							
riffle top			0			105.71		10.59	0.12	9.06	95.12	95.24	96.65
riffle bot			22			105.71		11.55	0.29		94.16	94.45	
dmax			38			105.71		12.7	1.4		93.01	94.41	
riffle top			49			105.71		11.52	0.22	9.82	94.19	94.41	95.89
riffle bot			69.8			105.71		11.78	0.29		93.93	94.22	
dmax			86.2			105.71		12.86	1.24		92.85	94.09	
riffle top before debris jam			99			105.71		11.65	0.05		94.06	94.11	
below debris jam			107.7			105.71		12.34	0.15		93.37	93.52	
tight meander			121			105.71		12.7	0.33		93.01	93.34	
riffle			135.2			105.71		12.78	0.21	10.82	92.93	93.14	94.89
riffle bot			156			105.71		13.6	0.4		92.11	92.51	
dmax			161			105.71		14.74	1.62		90.97	92.59	
riffle top			172.6			105.71		13.27	0.15		92.44	92.59	
riffle			179.5			105.71		13.69	0.12		92.02	92.14	
dmax			186.5			105.71		14.18	0.64		91.53	92.17	
riffle top			199			105.71		13.79	0.22		91.92	92.14	
riffle			211.5			105.71		14.24	0.38		91.47	91.85	
riffle bot			231.4			105.71		14.87	0.31		90.84	91.15	
pipe invert at old road 36"			236			105.71		14.79	0.13		90.92	91.05	
top of road bed			244			105.71				9.26			96.45

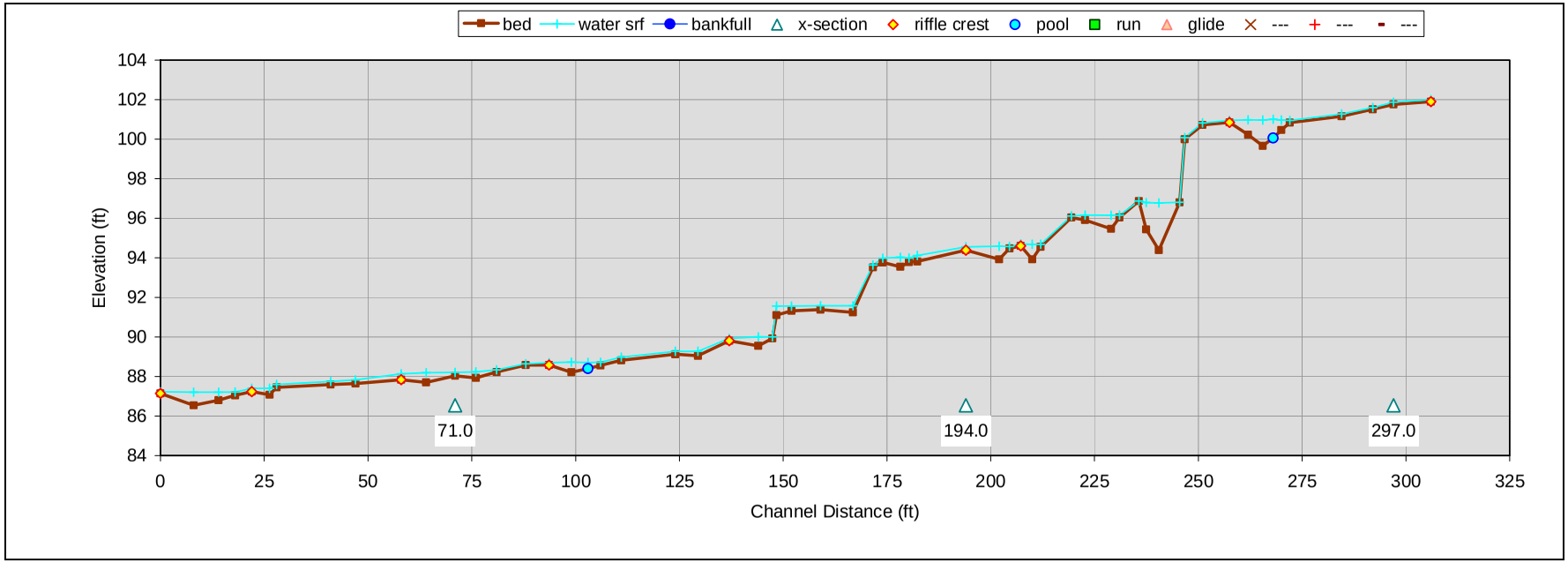
Lower Gunpowder Watershed Assessment
Drainage Area 15: Oak White Profile



Lower Gunpowder Watershed Assessment
Drainage Area 15: Oak White Profile (continued)

notes	cross section ID	bed feature	continuous data station	station	Benchmark Elevation 100 Turning Points BS	HI	FS	FS bed	depth water	ELEV bed	ELEV water sr
back sight to benchmark					0	100					
rifle			0			100		9.24	0.18	90.76	90.94
end r			13			100		9.91	0.52	90.09	90.61
dmax			25			100		10.76	1.34	89.24	90.58
			42			100		10.56	1.21	89.44	90.65
			55			100		10.05	0.69	89.95	90.64
rifle			65			100		9.77	0.35	90.23	90.58
			85			100		9.93	0.49	90.07	90.56
			99			100		10.24	0.78	89.76	90.54
dmax			121.5			100		10.7	1.24	89.3	90.54
			136			100		10.31	0.86	89.69	90.55
			152			100		10.21	0.76	89.79	90.55
			165			100		10.45	1.01	89.55	90.56
			183			100		10.31	0.85	89.69	90.54
log bridge			191.5			100		10.95	1.47	89.05	90.52
			204			100		11.09	1.62	88.91	90.53
			215			100		10.71	1.21	89.29	90.5
			235			100		10.93	1.45	89.07	90.52
sw trb rt bnk			240.4			100		10.89	1.4	89.11	90.51
			251			100		11.45	1.98	88.55	90.53
dmax			267			100		13.89	4.5	86.11	90.61
			281			100		11.62	2.14	88.38	90.52
			293			100		10.01	0.52	89.99	90.51
riffle top			303.4			100		9.64	0.14	90.36	90.5

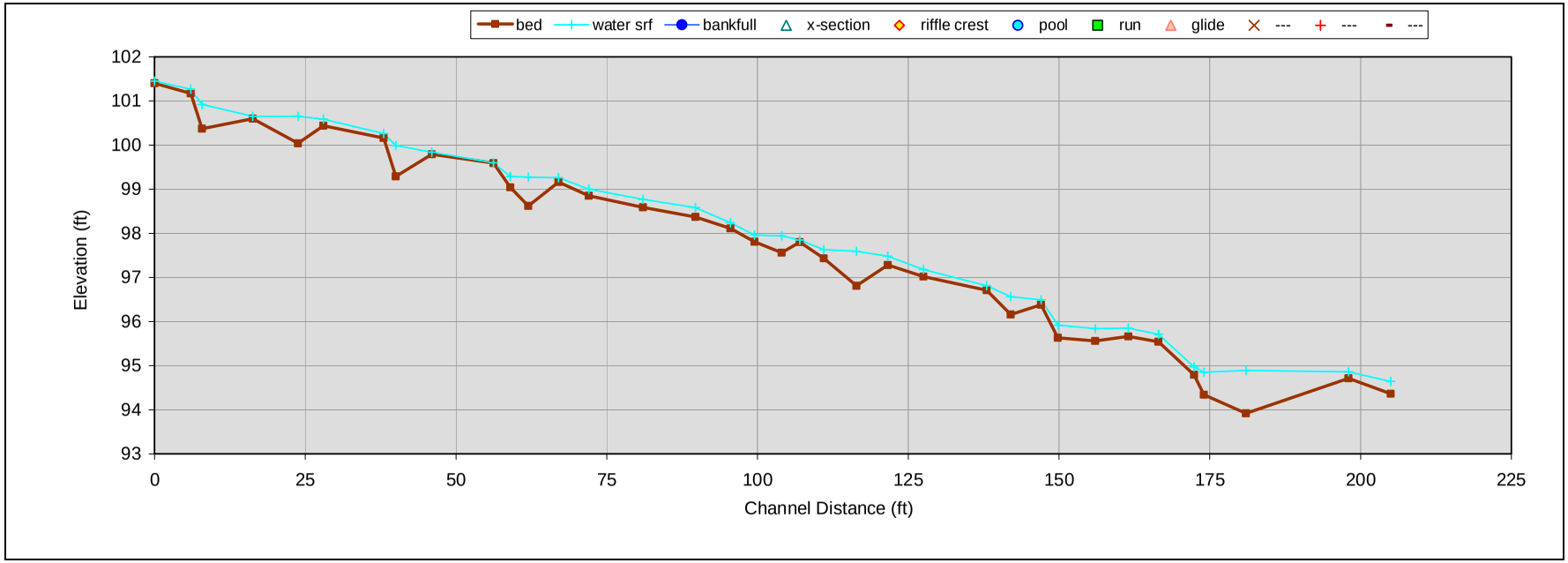
Lower Gunpowder Watershed Assessment
Drainage Area 16: Cedarbrooke Profile



Lower Gunpowder Watershed Assessment
Drainage Area 16: Cedarbrooke Profile (continued)

notes	cross section ID	bed feature	continuous data station	station	Benchmark Elevation 100 Turning Points BS	HI	FS	FS bed	depth water	ELEV bed	ELEV water sr
back sight to benchmark					0.61	100.61					
Top Rif/US Confluence		R	0			100.61		13.46	0.08	87.15	87.23
Pool			8			100.61		14.07	0.67	86.54	87.21
Bot Run/TopPool			14			100.61		13.81	0.41	86.8	87.21
Bot Rif			18			100.61		13.56	0.17	87.05	87.22
TopRif		R	22			100.61		13.37	0.16	87.24	87.4
Below small debris drop			26.3			100.61		13.53	0.32	87.08	87.4
Rif w/debris			28			100.61		13.16	0.15	87.45	87.6
Rif w/debris			41			100.61		13.02	0.16	87.59	87.75
Rif/Debris			47			100.61		12.97	0.19	87.64	87.83
Top of Debris/Rif		R	58			100.61		12.77	0.3	87.84	88.14
Run			64			100.61		12.91	0.5	87.7	88.2
Run	1		71			100.61		12.57	0.17	88.04	88.21
Run			76			100.61		12.68	0.31	87.93	88.24
Bot Rif			81			100.61		12.38	0.1	88.23	88.33
Mid Rif			88			100.61		12.03	0.06	88.58	88.64
Top Rif		R	93.6			100.61		12.03	0.12	88.58	88.7
Pool			99			100.61		12.39	0.51	88.22	88.73
Bot Run/TopPool		P	103			100.61		12.21	0.31	88.4	88.71
BotRif			106			100.61		12.05	0.16	88.56	88.72
BotRif			111			100.61		11.79	0.16	88.82	88.98
RifMidRif/18"CMP			124			100.61		11.48	0.14	89.13	89.27
BR/Rif			129.5			100.61		11.56	0.22	89.05	89.27
TopRif/BR		R	137			100.61		10.8	0.12	89.81	89.93
Small Scour Pool			144			100.61		11.06	0.46	89.55	90.01
Base Debris Dam			147.4			100.61		10.68	0.08	89.93	90.01
Top Debris Dam			148.4			100.61		9.5	0.45	91.11	91.56
Run			152			100.61		9.29	0.24	91.32	91.56
Run			159			100.61		9.23	0.2	91.38	91.58
Base Debris Dam			166.8			100.61		9.37	0.34	91.24	91.58
Top Debris			171.6			100.61		7.09	0.12	93.52	93.64
Debris			174			100.61		6.84	0.22	93.77	93.99
Debris			178.2			100.61		7.06	0.48	93.55	94.03
Debris			180.3			100.61		6.82	0.21	93.79	94
Below Debris			182.3			100.61		6.79	0.3	93.82	94.12
Top Debris Riffle	2	R	194			100.61		6.22	0.17	94.39	94.56
Pool			202			100.61		6.68	0.66	93.93	94.59
Bot Rif			204.5			100.61		6.13	0.1	94.48	94.58
Top Rif		R	207.2			100.61		6	0.1	94.61	94.71
Scour Pool in BR			210			100.61		6.68	0.76	93.93	94.69
Base BR Cascade			212			100.61		6.05	0.13	94.56	94.69
Top Cascade			219.4			100.61		4.57	0.08	96.04	96.12
Debris			222.7			100.61		4.7	0.25	95.91	96.16
Debris			229			100.61		5.14	0.68	95.47	96.15
Bottom Debris			231			100.61		4.57	0.12	96.04	96.16
FS to headwall from station 1						100.61	0.61				
BS to headwall from Station 2					9.39	109.39					
Debris/Top Jam			235.7			109.39		12.52	0	96.87	96.87
Scour Pool			237.4			109.39		13.95	1.36	95.44	96.8
Scour Pool			240.5			109.39		15	2.39	94.39	96.78
Bot Drop			245.5			109.39		12.58	0.01	96.81	96.82
Top Debris			246.7			109.39		9.39	0.08	100	100.08
Mid Rif			251			109.39		8.67	0.1	100.72	100.82
Top Rif		R	257.5			109.39		8.54	0.1	100.85	100.95
Bot Pool/TopPool			262			109.39		9.16	0.75	100.23	100.98
Pool			265.5			109.39		9.72	1.3	99.67	100.97
BotRun/TopPool		P	268			109.39		9.33	0.95	100.06	101.01
Run			270			109.39		8.92	0.5	100.47	100.97
BotRif			272			109.39		8.55	0.11	100.84	100.95
Rif			284.5			109.39		8.23	0.12	101.16	101.28
Rif			292			109.39		7.87	0.09	101.52	101.61
Rif	3		297			109.39		7.63	0.11	101.76	101.87
TopRif		R	306			109.39		7.49	0.1	101.9	102

Lower Gunpowder Watershed Assessment
Drainage Area 18: Hallbrook Profile



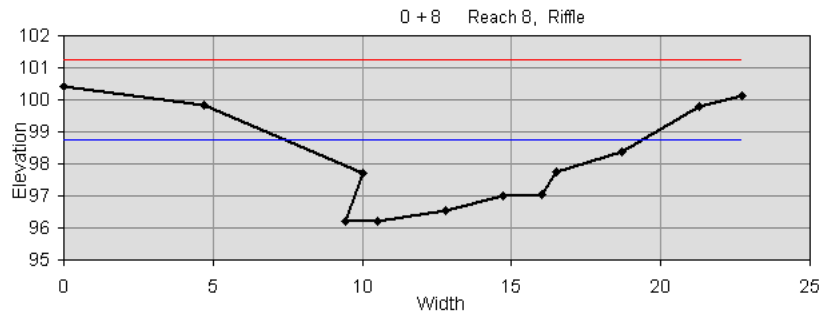
Lower Gunpowder Watershed Assessment
Drainage Area 18: Hallbrook Profile (continued)

notes	cross section ID	bed feature	continuous data station	continuous data station	Benchmark Elevation 100 Turning Points BS	HI	FS	FS bed	depth water	ELEV bed	ELEV water sr
back sight to benchmark					8.81	108.81					
riffle			0			108.81		7.41	0.05	101.4	101.45
			6			108.81		7.64	0.1	101.17	101.27
			7.9			108.81		8.44	0.55	100.37	100.92
			16.3			108.81		8.21	0.05	100.6	100.65
			23.8			108.81		8.77	0.61	100.04	100.65
riffle			28			108.81		8.37	0.15	100.44	100.59
			38			108.81		8.65	0.1	100.16	100.26
pool			40			108.81		9.52	0.7	99.29	99.99
riffle			46			108.81		9.02	0.05	99.79	99.84
			56.2			108.81		9.22	0.01	99.59	99.6
run			59			108.81		9.77	0.25	99.04	99.29
pool			62			108.81		10.19	0.65	98.62	99.27
pool			67			108.81		9.65	0.1	99.16	99.26
			72			108.81		9.96	0.15	98.85	99
			81			108.81		10.22	0.18	98.59	98.77
			89.7			108.81		10.44	0.21	98.37	98.58
			95.5			108.81		10.7	0.13	98.11	98.24
run			99.5			108.81		11	0.15	97.81	97.96
pool			104			108.81		11.25	0.38	97.56	97.94
bedrock riffle			107			108.81		11.01	0.05	97.8	97.85
			111			108.81		11.38	0.2	97.43	97.63
			116.4			108.81		12	0.78	96.81	97.59
			121.6			108.81		11.53	0.2	97.28	97.48
			127.5			108.81		11.79	0.16	97.02	97.18
			138			108.81		12.1	0.1	96.71	96.81
			142			108.81		12.65	0.4	96.16	96.56
			147			108.81		12.43	0.11	96.38	96.49
			149.8			108.81		13.18	0.29	95.63	95.92
pool			156			108.81		13.25	0.28	95.56	95.84
riffle			161.5			108.81		13.15	0.19	95.66	95.85
			166.5			108.81		13.27	0.17	95.54	95.71
run			172.4			108.81		14.02	0.18	94.79	94.97
pool			174			108.81		14.47	0.51	94.34	94.85
			181			108.81		14.89	0.97	93.92	94.89
			198			108.81		14.1	0.15	94.71	94.86
			205			108.81		14.45	0.28	94.36	94.64

APPENDIX B.2:
CROSS SECTIONS

Lower Gunpowder Watershed Assessment
Drainage Area 1 Wiffle Tree: XS-1

Cross Section 1



Bankfull Dimensions	
16.6	x-section area (ft.sq.)
11.9	width (ft)
1.4	mean depth (ft)
2.5	max depth (ft)
14.9	wetted parimeter (ft)
1.1	hyd radi (ft)
8.5	width-depth ratio

Flood Dimensions	
---	W flood prone area (ft)
---	entrenchment ratio
---	low bank height (ft)
---	low bank height ratio

Materials	
12	D50 Bed (mm)
29	D84 Bed (mm)
55	threshold grain size (mm):

Bankfull Flow	
7.3	velocity (ft/s)
122.3	discharge rate (cfs)
1.22	Froude number

Flow Resistance	
0.028	Manning's roughness
0.09	D'Arcy-Weisbach fric.
9.7	resistance factor u/u*
14.7	relative roughness

Forces & Power	
1.6	channel slope (%)
1.12	shear stress (lb/sq.ft.)
0.76	shear velocity (ft/s)
10.3	unit strm power (lb/ft/s)

Cross Section

	Riffle	
reference ID	1	
instrument height	105.35	---
longitudinal station	8	---

Bankfull Stage

FS		---
elevation	98.73	---

Low Bank Height

FS		---
elevation		

Flood Prone Area

width fpa		22.7

Channel Slope

percent slope		1.6

Flow Resistance

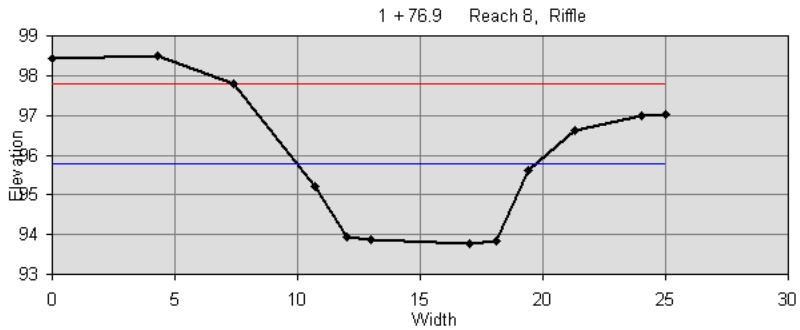
Manning's "n"		0.028
D'Arcy - Weisbach "f"		0.09

Note:

Distance (ft)	BS (ft)	HI (ft)	FS (ft)	Elevation (ft)	Omit Bkf	Notes
0		105.35	4.95	100.4	☐	
4.7		105.35	5.52	99.83	☐	LTOB
10		105.35	7.65	97.7	☐	
9.45		105.35	9.15	96.2	☐	
10.5		105.35	9.15	96.2	☐	
12.8		105.35	8.81	96.54	☐	REW
14.7		105.35	8.36	96.99	☐	
16		105.35	8.31	97.04	☐	
16.5		105.35	7.61	97.74	☐	
18.7		105.35	6.97	98.38	☐	
21.3		105.35	5.55	99.8	☐	RTOB
22.7		105.35	5.24	100.11	☐	

Lower Gunpowder Watershed Assessment
Drainage Area 1 Wiffle Tree: XS-2

Cross Section 2



Bankfull Dimensions	
15.1	x-section area (ft.sq.)
9.7	width (ft)
1.6	mean depth (ft)
2.0	max depth (ft)
11.4	wetted parimeter (ft)
1.3	hyd radi (ft)
6.2	width-depth ratio

Flood Dimensions	
---	W flood prone area (ft)
---	entrenchment ratio
---	low bank height (ft)
---	low bank height ratio

Materials	
12	D50 Bed (mm)
29	D84 Bed (mm)
65	threshold grain size (mm):

Bankfull Flow	
8.1	velocity (ft/s)
122.3	discharge rate (cfs)
1.24	Froude number

Flow Resistance	
0.028	Manning's roughness
0.08	D'Arcy-Weisbach fric.
9.8	resistance factor u/u*
16.3	relative roughness

Forces & Power	
1.6	channel slope (%)
1.32	shear stress (lb/sq.ft.)
0.83	shear velocity (ft/s)
12.6	unit strm power (lb/ft/s)

Cross Section

Riffle

reference ID	2	
instrument height	105.35	---
longitudinal station	176.9	---

Bankfull Stage

FS		---
elevation	95.78	---

Low Bank Height

FS		---
elevation		

Flood Prone Area

width fpa		17.6

Channel Slope

percent slope		1.6

Flow Resistance

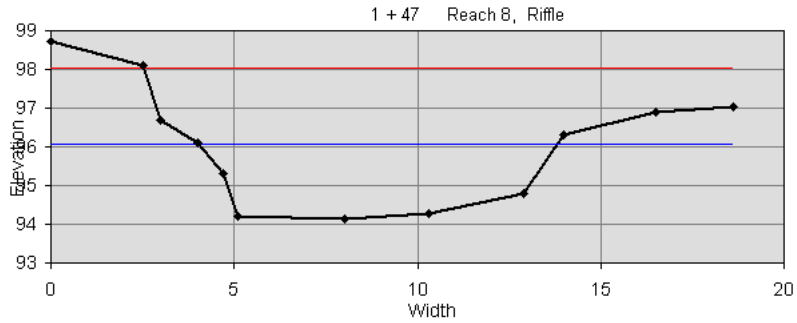
Manning's "n"		0.028
D'Arcy - Weisbach "f"		0.08

Note:

Distance (ft)	BS (ft)	HI (ft)	FS (ft)	Elevation (ft)	Omit Bkf	Notes
0		105.35	6.93	98.42	☐	
4.3		105.35	6.85	98.5	☐	
7.4		105.35	7.55	97.8	☐	LTOB
10.7		105.35	10.13	95.22	☐	
12		105.35	11.42	93.93	☐	
13		105.35	11.49	93.86	☐	LEW
17		105.35	11.59	93.76	☐	Thalweg
18.1		105.35	11.52	93.83	☐	Right Toe of
19.4		105.35	9.73	95.62	☐	
21.3		105.35	8.72	96.63	☐	
24		105.35	8.37	96.98	☐	
25		105.35	8.32	97.03	☐	

Lower Gunpowder Watershed Assessment
Drainage Area 1 Wiffle Tree: XS-3

Cross Section 3



Bankfull Dimensions	
15.2	x-section area (ft.sq.)
9.8	width (ft)
1.6	mean depth (ft)
2.0	max depth (ft)
11.6	wetted parimeter (ft)
1.3	hyd radi (ft)
6.3	width-depth ratio

Flood Dimensions	
---	W flood prone area (ft)
---	entrenchment ratio
---	low bank height (ft)
---	low bank height ratio

Materials	
12	D50 Bed (mm)
29	D84 Bed (mm)
64	threshold grain size (mm):

Bankfull Flow	
8.0	velocity (ft/s)
122.1	discharge rate (cfs)
1.23	Froude number

Flow Resistance	
0.028	Manning's roughness
0.08	D'Arcy-Weisbach fric.
9.7	resistance factor u/u*
16.4	relative roughness

Forces & Power	
1.6	channel slope (%)
1.31	shear stress (lb/sq.ft.)
0.82	shear velocity (ft/s)
12.4	unit strm power (lb/ft/s)

Cross Section

	Riffle	
reference ID	3	
instrument height	105.35	---
longitudinal station	147	---

Bankfull Stage

FS		---
elevation	96.08	---

Low Bank Height

FS		---
elevation		

Flood Prone Area

width fpa		16.1

Channel Slope

percent slope		1.6

Flow Resistance

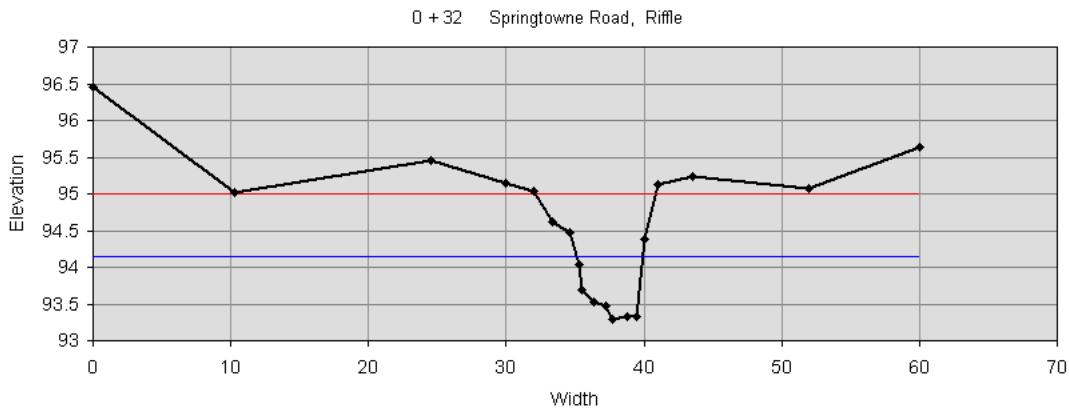
Manning's "n"		0.028
D'Arcy - Weisbach "f"		0.08

Note:

Distance (ft)	BS (ft)	HI (ft)	FS (ft)	Elevation (ft)	Omit Bkf	Notes
0		105.35	6.64	98.71	☐	
2.5		105.35	7.24	98.11	☐	LIOB
3		105.35	8.67	96.68	☐	
4		105.35	9.23	96.12	☐	
4.7		105.35	10.04	95.31	☐	
5.1		105.35	11.13	94.22	☐	LEW
8		105.35	11.22	94.13	☐	Thalweg
10.3		105.35	11.08	94.27	☐	REW
12.9		105.35	10.55	94.8	☐	
14		105.35	9.04	96.31	☐	
16.5		105.35	8.44	96.91	☐	
18.6		105.35	8.33	97.02	☐	

Lower Gunpowder Watershed Assessment
Drainage Area 2 Springtowne: XS-1

Cross Section 1



Bankfull Dimensions	
3.1	x-section area (ft.sq.)
4.8	width (ft)
0.7	mean depth (ft)
0.9	max depth (ft)
5.6	wetted parimeter (ft)
0.6	hyd radi (ft)
7.3	width-depth ratio

Flood Dimensions	
8.7	W flood prone area (ft)
1.8	entrenchment ratio
---	low bank height (ft)
---	low bank height ratio

Materials	
11	D50 Riffle (mm)
19	D84 Riffle (mm)
26	threshold grain size (mm):

Bankfull Flow	
4.5	velocity (ft/s)
14.1	discharge rate (cfs)
1.07	Froude number

Flow Resistance	
0.027	Manning's roughness
0.11	D'Arcy-Weisbach fric.
8.7	resistance factor u/u*
10.5	relative roughness

Forces & Power	
1.5	channel slope (%)
0.52	shear stress (lb/sq.ft.)
0.52	shear velocity (ft/s)
2.8	unit strm power (lb/ft/s)

Cross Section

	Riffle	
reference ID	1	
instrument height	100.27	100
longitudinal station	32	32.0

Bankfull Stage

FS		---
elevation	94.15	---

Low Bank Height

FS		---
elevation		

Flood Prone Area

width fpa		8.7

Channel Slope

percent slope		1.5

Flow Resistance

Manning's "n"		0.027
D'Arcy - Weisbach "f"		0.11

Note:

Distance (ft)	BS (ft)	HI (ft)	FS (ft)	Elevation (ft)	Omit Bkf	Notes
0		100.27	3.82	96.45	☐	Valley Slope
10.3		100.27	5.25	95.02	☐	Toe Valley S
24.5		100.27	4.81	95.46	☐	
30		100.27	5.12	95.15	☐	
32		100.27	5.24	95.03	☐	TOB
33.4		100.27	5.65	94.62	☐	
34.6		100.27	5.79	94.48	☐	
35.3		100.27	6.24	94.03	☐	
35.5		100.27	6.58	93.69	☐	BOB/Edge E
36.4		100.27	6.74	93.53	☐	Gray Bar
37.2		100.27	6.8	93.47	☐	EW/WS
37.7		100.27	6.97	93.3	☐	
38.8		100.27	6.95	93.32	☐	
39.5		100.27	6.95	93.32	☐	
40		100.27	5.88	94.39	☐	
41		100.27	5.15	95.12	☐	TOB
43.5		100.27	5.04	95.23	☐	
52		100.27	5.2	95.07	☐	Toe Valley S
60		100.27	4.63	95.64	☐	Valley Slope
					☐	
					☐	
					☐	
					☐	
					☐	
					☐	
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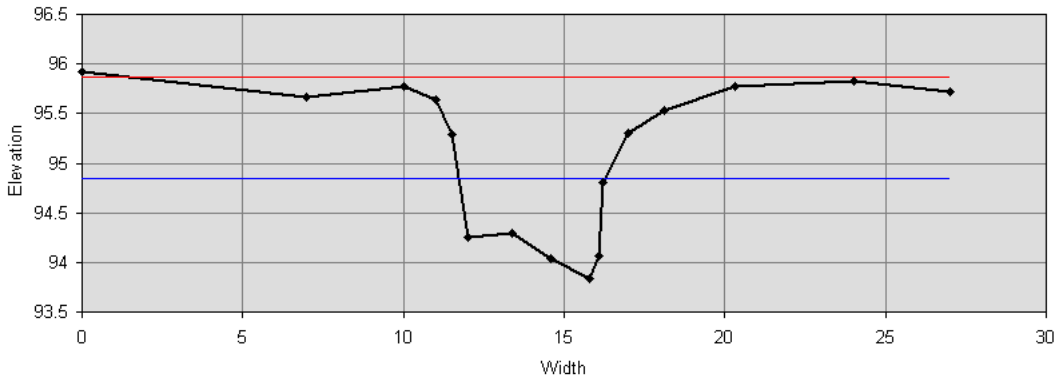
					☐	

Lower Gunpowder Watershed Assessment
Drainage Area 2 Springtowne: XS-2

Cross Section 2

0 + 88 Springtowne Road, Riffle



Bankfull Dimensions	
3.1	x-section area (ft.sq.)
4.6	width (ft)
0.7	mean depth (ft)
1.0	max depth (ft)
5.7	wetted parimeter (ft)
0.5	hyd radi (ft)
6.7	width-depth ratio

Flood Dimensions	
---	W flood prone area (ft)
---	entrenchment ratio
---	low bank height (ft)
---	low bank height ratio

Materials	
11	D50 Riffle (mm)
19	D84 Riffle (mm)
25	threshold grain size (mm):

Bankfull Flow	
4.5	velocity (ft/s)
14.2	discharge rate (cfs)
1.08	Froude number

Flow Resistance	
0.027	Manning's roughness
0.10	D'Arcy-Weisbach fric.
8.8	resistance factor u/u*
11.0	relative roughness

Forces & Power	
1.5	channel slope (%)
0.51	shear stress (lb/sq.ft.)
0.51	shear velocity (ft/s)
2.9	unit strm power (lb/ft/s)

Cross Section

	Riffle	
reference ID	2	
instrument height	101.04	100
longitudinal station	88	87.8

Bankfull Stage

FS		---
elevation	94.85	---

Low Bank Height

FS		---
elevation		

Flood Prone Area

width fpa		25.6

Channel Slope

percent slope		1.5

Flow Resistance

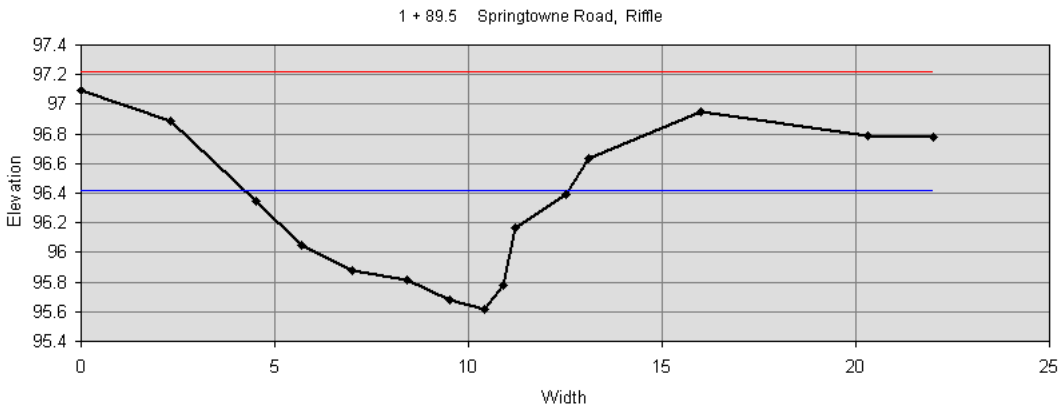
Manning's "n"		0.027
D'Arcy - Weisbach "f"		0.10

Note:

Distance (ft)	BS (ft)	HI (ft)	FS (ft)	Elevation (ft)	Omit Bkf	Notes
0		101.04	5.12	95.92	☐	Floodplain
7		101.04	5.37	95.67	☐	
10		101.04	5.26	95.78	☐	
11		101.04	5.4	95.64	☐	TOB
11.5		101.04	5.75	95.29	☐	
12		101.04	6.79	94.25	☐	BOB/EdgeG
13.4		101.04	6.75	94.29	☐	Top Bar
14.6		101.04	7	94.04	☐	EW
15.8		101.04	7.21	93.83	☐	THW (0.27' D
16.1		101.04	6.97	94.07	☐	BOB/EdgeG
16.2		101.04	6.24	94.8	☐	
17		101.04	5.74	95.3	☐	
18.1		101.04	5.51	95.53	☐	TOB
20.3		101.04	5.27	95.77	☐	
24		101.04	5.21	95.83	☐	
27		101.04	5.32	95.72	☐	Floodplain

Lower Gunpowder Watershed Assessment
Drainage Area 2 Springtowne: XS-3

Cross Section 3



Bankfull Dimensions	
3.8	x-section area (ft.sq.)
8.4	width (ft)
0.5	mean depth (ft)
0.8	max depth (ft)
8.7	wetted parimeter (ft)
0.4	hyd radi (ft)
18.5	width-depth ratio

Flood Dimensions	
---	W flood prone area (ft)
---	entrenchment ratio
---	low bank height (ft)
---	low bank height ratio

Materials	
11	D50 Riffle (mm)
19	D84 Riffle (mm)
20	threshold grain size (mm):

Bankfull Flow	
3.8	velocity (ft/s)
14.3	discharge rate (cfs)
1.01	Froude number

Flow Resistance	
0.028	Manning's roughness
0.12	D'Arcy-Weisbach fric.
8.2	resistance factor u/u*
7.3	relative roughness

Forces & Power	
1.5	channel slope (%)
0.41	shear stress (lb/sq.ft.)
0.46	shear velocity (ft/s)
1.6	unit strm power (lb/ft/s)

Cross Section

	Riffle	
reference ID	3	
instrument height	102.25	100.69
longitudinal station	189.5	184.0

Bankfull Stage

FS		---
elevation	96.42	---

Low Bank Height

FS		---
elevation		

Flood Prone Area

width fpa		22.0

Channel Slope

percent slope		1.5

Flow Resistance

Manning's "n"		0.028
D'Arcy - Weisbach "f"		0.12

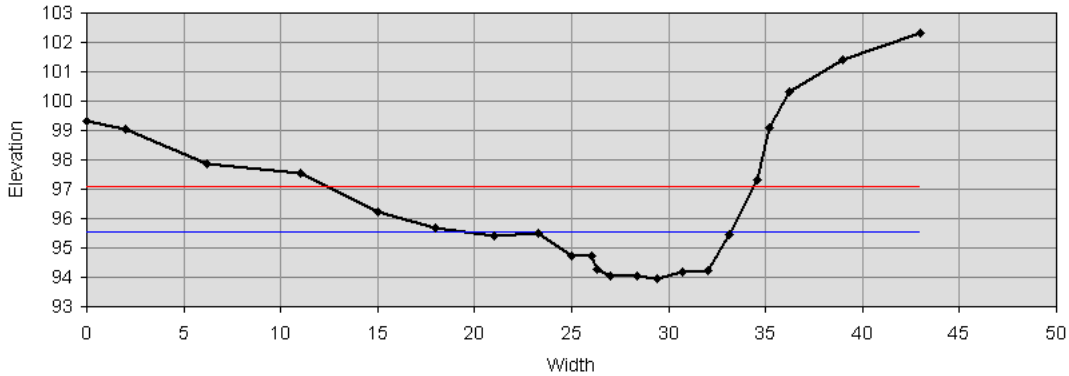
Note:

Distance (ft)	BS (ft)	HI (ft)	FS (ft)	Elevation (ft)	Omit Bkf	Notes
0		102.25	5.16	97.09	☐	TOB/Floodpl
2.3		102.25	5.36	96.89	☐	
4.5		102.25	5.9	96.35	☐	
5.7		102.25	6.2	96.05	☐	Edge Graw/S
7		102.25	6.37	95.88	☐	Bar
8.4		102.25	6.44	95.81	☐	EW/WS
9.5		102.25	6.57	95.68	☐	
10.4		102.25	6.63	95.62	☐	THW
10.9		102.25	6.47	95.78	☐	BOB/EW
11.2		102.25	6.08	96.17	☐	
12.5		102.25	5.86	96.39	☐	
13.1		102.25	5.62	96.63	☐	
16		102.25	5.3	96.95	☐	TORB
20.3		102.25	5.46	96.79	☐	
22		102.25	5.47	96.78	☐	Floodplain
					☐	
					☐	
					☐	
					☐	
					☐	
					☐	
					☑	
					☐	
					☐	
					☐	
					☐	
					☐	

Lower Gunpowder Watershed Assessment
Drainage Area 4 Seven Oaks Hines: XS-1

Cross Section 1

0 + 68.5 Seven Oaks-Hines, Riffle



Bankfull Dimensions	
11.1	x-section area (ft.sq.)
13.6	width (ft)
0.8	mean depth (ft)
1.6	max depth (ft)
14.6	wetted parimeter (ft)
0.8	hyd radi (ft)
16.7	width-depth ratio

Flood Dimensions	
22.1	W flood prone area (ft)
1.6	entrenchment ratio
---	low bank height (ft)
---	low bank height ratio

Materials	
5.5	D50 Riffle (mm)
19	D84 Riffle (mm)
16	threshold grain size (mm):

Bankfull Flow	
4.0	velocity (ft/s)
43.9	discharge rate (cfs)
0.80	Froude number

Flow Resistance	
0.026	Manning's roughness
0.09	D'Arcy-Weisbach fric.
9.7	resistance factor u/u*
13.1	relative roughness

Forces & Power	
0.68	channel slope (%)
0.32	shear stress (lb/sq.ft.)
0.41	shear velocity (ft/s)
1.37	unit strm power (lb/ft/s)

Cross Section

	Riffle	
reference ID	1	
instrument height	103.43	100
longitudinal station	68.5	70.4

Bankfull Stage

FS		---
elevation	95.54	---

Low Bank Height

FS		---
elevation		

Flood Prone Area

width fpa		22.1

Channel Slope

percent slope		0.68

Flow Resistance

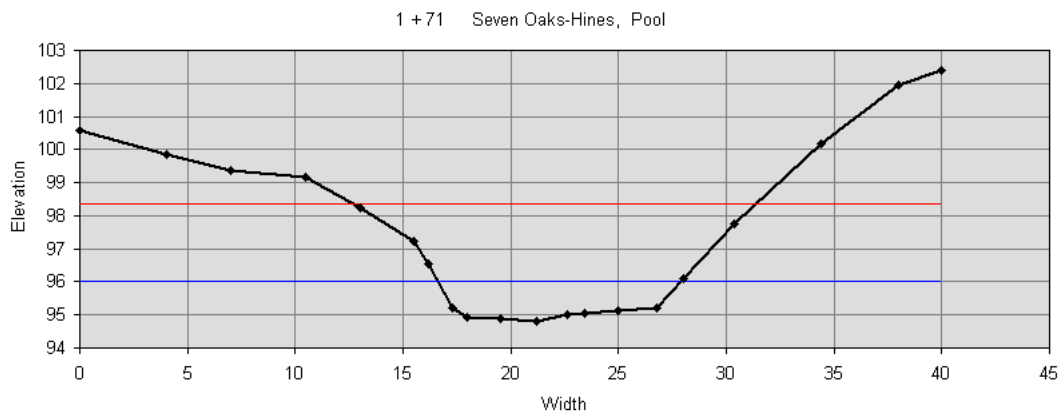
Manning's "n"		0.026
D'Arcy - Weisbach "f"		0.09

Note:

Distance (ft)	BS (ft)	HI (ft)	FS (ft)	Elevation (ft)	Omit Bkf	Notes
0		103.43	4.12	99.31	☐	Top of Back
2		103.43	4.38	99.05	☐	
6.2		103.43	5.57	97.86	☐	
11		103.43	5.89	97.54	☐	Top of Bank
15		103.43	7.22	96.21	☐	
18		103.43	7.74	95.69	☐	Edge of Terr
21		103.43	8.03	95.4	☐	
23.3		103.43	7.95	95.48	☐	Top of Low b
25		103.43	8.68	94.75	☐	
26		103.43	8.7	94.73	☐	
26.3		103.43	9.16	94.27	☐	Edge of wate
27		103.43	9.38	94.05	☐	
28.4		103.43	9.37	94.06	☐	
29.4		103.43	9.46	93.97	☐	TW
30.7		103.43	9.25	94.18	☐	
32		103.43	9.18	94.25	☐	Bottom of B
33.1		103.43	7.96	95.47	☐	
34.6		103.43	6.11	97.32	☐	Mid Bank
35.2		103.43	4.36	99.07	☐	
36.2		103.43	3.1	100.33	☐	
39		103.43	2.02	101.41	☐	
43		103.43	1.1	102.33	☐	Edge of She
					☐	
					☐	
					☐	
					☐	
					☐	
					☐	

Lower Gunpowder Watershed Assessment
Drainage Area 4 Seven Oaks Hines: XS-2

Cross Section 2



Bankfull Dimensions	
10.4	x-section area (ft.sq.)
11.2	width (ft)
0.9	mean depth (ft)
1.2	max depth (ft)
12.0	wetted parimeter (ft)
0.9	hyd radi (ft)
12.2	width-depth ratio

Flood Dimensions	
18.7	W flood prone area (ft)
1.7	entrenchment ratio
---	low bank height (ft)
---	low bank height ratio

Materials	
5.5	D50 Riffle (mm)
19	D84 Riffle (mm)
18	threshold grain size (mm):

Bankfull Flow	
4.2	velocity (ft/s)
43.9	discharge rate (cfs)
0.80	Froude number

Flow Resistance	
0.026	Manning's roughness
0.08	D'Arcy-Weisbach fric.
9.7	resistance factor u/u*
14.8	relative roughness

Forces & Power	
0.68	channel slope (%)
0.37	shear stress (lb/sq.ft.)
0.44	shear velocity (ft/s)
1.66	unit strm power (lb/ft/s)

Cross Section

	Pool	
reference ID	2	
instrument height	104.54	100
longitudinal station	171	170.2

Bankfull Stage

FS		---
elevation	96.02	---

Low Bank Height

FS		---
elevation		

Flood Prone Area

width fpa		18.7

Channel Slope

percent slope		0.68

Flow Resistance

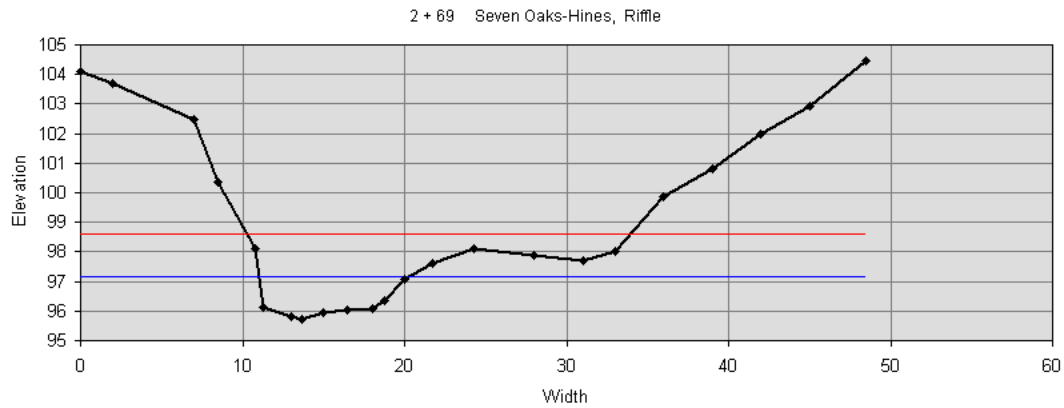
Manning's "n"		0.026
D'Arcy - Weisbach "f"		0.08

Note:

Distance (ft)	BS (ft)	HI (ft)	FS (ft)	Elevation (ft)	Omit Bkf	Notes
0		104.54	3.95	100.59	☐	Top of Berm
4		104.54	4.7	99.84	☐	
7		104.54	5.16	99.38	☐	
10.5		104.54	5.36	99.18	☐	Top of Bank
13		104.54	6.29	98.25	☐	
15.5		104.54	7.33	97.21	☐	
16.2		104.54	7.99	96.55	☐	
17.3		104.54	9.32	95.22	☐	
18		104.54	9.62	94.92	☐	LEOW
19.5		104.54	9.64	94.9	☐	
21.2		104.54	9.74	94.8	☐	TW
22.6		104.54	9.55	94.99	☐	
23.4		104.54	9.49	95.05	☐	REOW/WS
25		104.54	9.4	95.14	☐	Small Bar
26.8		104.54	9.31	95.23	☐	Bottom of B
28		104.54	8.43	96.11	☐	
30.4		104.54	6.77	97.77	☐	
34.4		104.54	4.36	100.18	☐	
38		104.54	2.6	101.94	☐	
40		104.54	2.16	102.38	☐	Top of Bank
					☐	
					☐	
					☐	
					☐	
					☐	
					☐	
					☐	
					☐	

Lower Gunpowder Watershed Assessment
Drainage Area 4 Seven Oaks Hines: XS-3

Cross Section 3



Bankfull Dimensions	
9.8	x-section area (ft.sq.)
9.3	width (ft)
1.0	mean depth (ft)
1.4	max depth (ft)
10.5	wetted parimeter (ft)
0.9	hyd radi (ft)
8.9	width-depth ratio

Flood Dimensions	
23.7	W flood prone area (ft)
2.5	entrenchment ratio
---	low bank height (ft)
---	low bank height ratio

Materials	
5.5	D50 Riffle (mm)
19	D84 Riffle (mm)
19	threshold grain size (mm):

Bankfull Flow	
4.5	velocity (ft/s)
44.2	discharge rate (cfs)
0.82	Froude number

Flow Resistance	
0.026	Manning's roughness
0.08	D'Arcy-Weisbach fric.
10.0	resistance factor u/u*
16.8	relative roughness

Forces & Power	
0.68	channel slope (%)
0.40	shear stress (lb/sq.ft.)
0.45	shear velocity (ft/s)
2	unit strm power (lb/ft/s)

Cross Section

	Riffle	
reference ID	3	
instrument height	108.46	101.03
longitudinal station	269	265.5

Bankfull Stage

FS		---
elevation	97.18	---

Low Bank Height

FS		---
elevation		

Flood Prone Area

width fpa		23.7

Channel Slope

percent slope		0.68

Flow Resistance

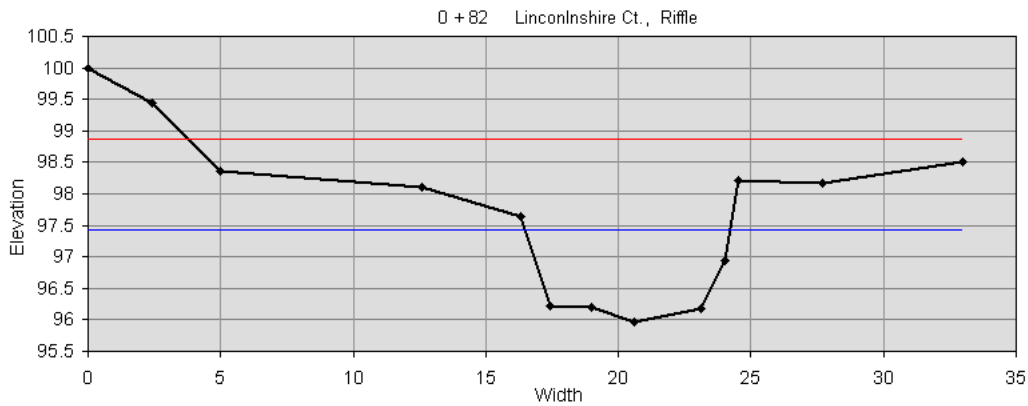
Manning's "n"		0.026
D'Arcy - Weisbach "f"		0.08

Note:

Distance (ft)	BS (ft)	HI (ft)	FS (ft)	Elevation (ft)	Omit Bkf	Notes
0		108.46	4.34	104.12	☐	Top of Bank
2		108.46	4.78	103.68	☐	
7		108.46	6	102.46	☐	
8.5		108.46	8.12	100.34	☐	
10.8		108.46	10.33	98.13	☐	
11.3		108.46	12.34	96.12	☐	Bottom of Ba
13		108.46	12.64	95.82	☐	
13.7		108.46	12.72	95.74	☐	TW
15		108.46	12.52	95.94	☐	
16.5		108.46	12.42	96.04	☐	
18		108.46	12.4	96.06	☐	
18.8		108.46	12.12	96.34	☐	EOW/WS
20		108.46	11.4	97.06	☐	
21.7		108.46	10.84	97.62	☐	Backwater E
24.3		108.46	10.33	98.13	☐	Backwater E
28		108.46	10.59	97.87	☐	Backwater E
31		108.46	10.76	97.7	☐	Backwater E
33		108.46	10.44	98.02	☐	Edge of Bar,
36		108.46	8.6	99.86	☐	
39		108.46	7.65	100.81	☐	
42		108.46	6.48	101.98	☐	
45		108.46	5.53	102.93	☐	
48.5		108.46	3.98	104.48	☐	
					☐	
					☐	
					☐	
					☐	
					☐	

Lower Gunpowder Watershed Assessment
Drainage Area 4 Lincolnshire: XS-1

Cross Section 1



Bankfull Dimensions	
8.8	x-section area (ft.sq.)
7.7	width (ft)
1.1	mean depth (ft)
1.5	max depth (ft)
8.9	wetted parimeter (ft)
1.0	hyd radi (ft)
6.7	width-depth ratio

Flood Dimensions	
---	W flood prone area (ft)
---	entrenchment ratio
---	low bank height (ft)
---	low bank height ratio

Materials	
5.7	D50 Bed (mm)
16	D84 Bed (mm)
23	threshold grain size (mm):

Bankfull Flow	
5.2	velocity (ft/s)
46.0	discharge rate (cfs)
0.92	Froude number

Flow Resistance	
0.025	Manning's roughness
0.07	D'Arcy-Weisbach fric.
10.5	resistance factor u/u*
21.8	relative roughness

Forces & Power	
0.77	channel slope (%)
0.48	shear stress (lb/sq.ft.)
0.50	shear velocity (ft/s)
2.9	unit strm power (lb/ft/s)

Cross Section

	Riffle	
reference ID	1	
instrument height	103.51	---
longitudinal station	82	---

Bankfull Stage

FS		---
elevation	97.42	---

Low Bank Height

FS		---
elevation		

Flood Prone Area

width fpa		29.2

Channel Slope

percent slope		0.77

Flow Resistance

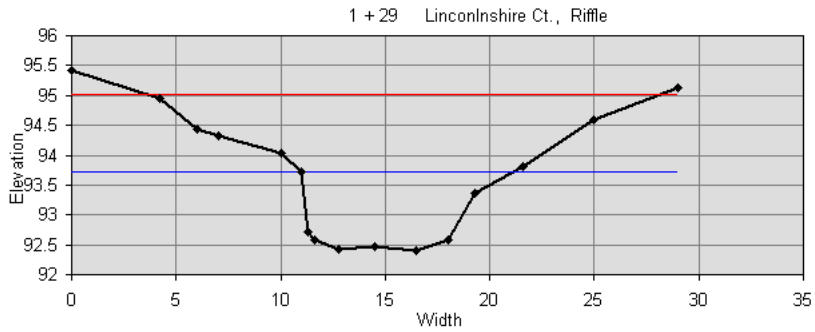
Manning's "n"		0.025
D'Arcy - Weisbach "f"		0.07

Note:

Distance (ft)	BS (ft)	HI (ft)	FS (ft)	Elevation (ft)	Omit Bkf	Notes
0		103.51	3.51	100	☐	lepog
2.4		103.51	4.06	99.45	☐	
5		103.51	5.14	98.37	☐	
12.6		103.51	5.41	98.1	☐	
16.3		103.51	5.88	97.63	☐	tob
17.4		103.51	7.29	96.22	☐	LEW
19		103.51	7.32	96.19	☐	
20.6		103.51	7.54	95.97	☐	th
23.1		103.51	7.34	96.17	☐	REW
24		103.51	6.56	96.95	☐	fos
24.5		103.51	5.29	98.22	☐	tob
27.7		103.51	5.33	98.18	☐	
33		103.51	5.01	98.5	☐	

Lower Gunpowder Watershed Assessment
Drainage Area 4 Lincolnshire: XS-2

Cross Section 2



Bankfull Dimensions	
9.7	x-section area (ft.sq.)
10.1	width (ft)
1.0	mean depth (ft)
1.3	max depth (ft)
11.2	wetted parimeter (ft)
0.9	hyd radi (ft)
10.6	width-depth ratio

Flood Dimensions	
24.6	W flood prone area (ft)
2.4	entrenchment ratio
---	low bank height (ft)
---	low bank height ratio

Materials	
5.7	D50 Bed (mm)
16	D84 Bed (mm)
21	threshold grain size (mm):

Bankfull Flow	
4.7	velocity (ft/s)
45.9	discharge rate (cfs)
0.90	Froude number

Flow Resistance	
0.025	Manning's roughness
0.08	D'Arcy-Weisbach fric.
10.2	resistance factor u/u*
18.2	relative roughness

Forces & Power	
0.77	channel slope (%)
0.42	shear stress (lb/sq.ft.)
0.46	shear velocity (ft/s)
2.2	unit strm power (lb/ft/s)

Cross Section

	Riffle	
reference ID	2	
instrument height	100	---
longitudinal station	129	---

Bankfull Stage

FS		---
elevation	93.71	---

Low Bank Height

FS		---
elevation		

Flood Prone Area

width fpa		24.6

Channel Slope

percent slope		0.77

Flow Resistance

Manning's "n"		0.025
D'Arcy - Weisbach "f"		0.08

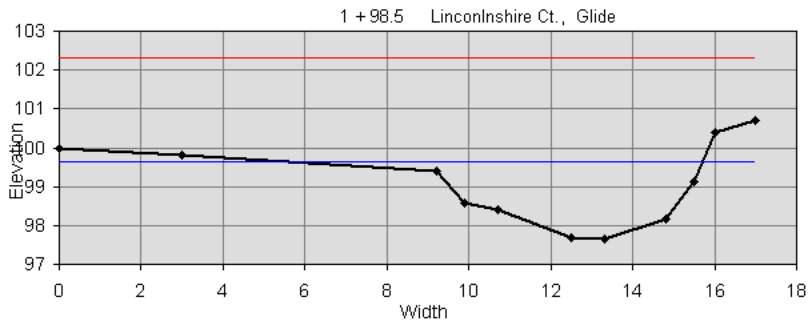
Note:

Class Riffle

Distance (ft)	BS (ft)	HI (ft)	FS (ft)	Elevation (ft)	Omit Bkf	Notes
0		100	4.59	95.41	☐	lepog
4.2		100	5.04	94.96	☐	
6		100	5.57	94.43	☐	
7		100	5.67	94.33	☐	
10		100	5.96	94.04	☐	
11		100	6.29	93.71	☐	tob
11.3		100	7.28	92.72	☐	
11.6		100	7.43	92.57	☐	LEW
12.8		100	7.57	92.43	☐	
14.5		100	7.53	92.47	☐	
16.5		100	7.6	92.4	☐	
18		100	7.41	92.59	☐	REW
19.3		100	6.63	93.37	☐	tob
21.6		100	6.2	93.8	☐	
25		100	5.4	94.6	☐	
29		100	4.88	95.12	☐	

Lower Gunpowder Watershed Assessment
Drainage Area 4 Lincolnshire: XS-3

Cross Section 3



Bankfull Dimensions	
9.7	x-section area (ft.sq.)
10.3	width (ft)
0.9	mean depth (ft)
2.0	max depth (ft)
11.8	wetted parimeter (ft)
0.8	hyd radi (ft)
10.9	width-depth ratio

Flood Dimensions	
---	W flood prone area (ft)
---	entrenchment ratio
---	low bank height (ft)
---	low bank height ratio

Materials	
5.7	D50 Bed (mm)
16	D84 Bed (mm)
19	threshold grain size (mm):

Bankfull Flow	
4.7	velocity (ft/s)
46.0	discharge rate (cfs)
0.92	Froude number

Flow Resistance	
0.024	Manning's roughness
0.07	D'Arcy-Weisbach fric.
10.5	resistance factor u/u*
18.0	relative roughness

Forces & Power	
0.77	channel slope (%)
0.40	shear stress (lb/sq.ft.)
0.45	shear velocity (ft/s)
2.1	unit strm power (lb/ft/s)

Cross Section

Glide

reference ID	3	
instrument height	106.5	---
longitudinal station	198.5	---

Bankfull Stage

FS		---
elevation	99.65	---

Low Bank Height

FS		---
elevation		

Flood Prone Area

width fpa		17.0

Channel Slope

percent slope		0.77

Flow Resistance

Manning's "n"		0.024
D'Arcy - Weisbach "f"		0.07

Note:

Distance (ft)	BS (ft)	HI (ft)	FS (ft)	Elevation (ft)	Omit Bkf	Notes
0		106.5	6.5	100	☐	lepog
3		106.5	6.69	99.81	☐	
9.2		106.5	7.1	99.4	☐	tob
9.9		106.5	7.93	98.57	☐	tos
10.7		106.5	8.09	98.41	☐	LEW
12.5		106.5	8.82	97.68	☐	
13.3		106.5	8.86	97.64	☐	
14.8		106.5	8.32	98.18	☐	REW
15.5		106.5	7.38	99.12	☐	fos
16		106.5	6.09	100.41	☐	tob
17		106.5	5.79	100.71	☐	

Lower Gunpowder Watershed Assessment
Drainage Area 4 Hinesleigh: XS-1

Cross Section 1

Bankfull Dimensions	
8.8	x-section area (ft.sq.)
11.6	width (ft)
0.8	mean depth (ft)
1.0	max depth (ft)
12.4	wetted parimeter (ft)
0.7	hyd radi (ft)
15.3	width-depth ratio

Flood Dimensions	
13.0	W flood prone area (ft)
1.1	entrenchment ratio
---	low bank height (ft)
---	low bank height ratio

Materials	
13	D50 Riffle (mm)
22	D84 Riffle (mm)
30	threshold grain size (mm):

Bankfull Flow	
5.0	velocity (ft/s)
44.2	discharge rate (cfs)
1.05	Froude number

Flow Resistance	
0.028	Manning's roughness
0.10	D'Arcy-Weisbach fric.
8.9	resistance factor u/u*
10.5	relative roughness

Forces & Power	
1.4	channel slope (%)
0.62	shear stress (lb/sq.ft.)
0.57	shear velocity (ft/s)
3.3	unit strm power (lb/ft/s)

Cross Section

	Riffle	
reference ID	1	
instrument height	104.12	---
longitudinal station		---

Bankfull Stage

FS		---
elevation	91.08	---

Low Bank Height

FS		---
elevation		

Flood Prone Area

width fpa		13.0

Channel Slope

percent slope		1.4

Flow Resistance

Manning's "n"		0.028
D'Arcy - Weisbach "f"		0.10

Note:

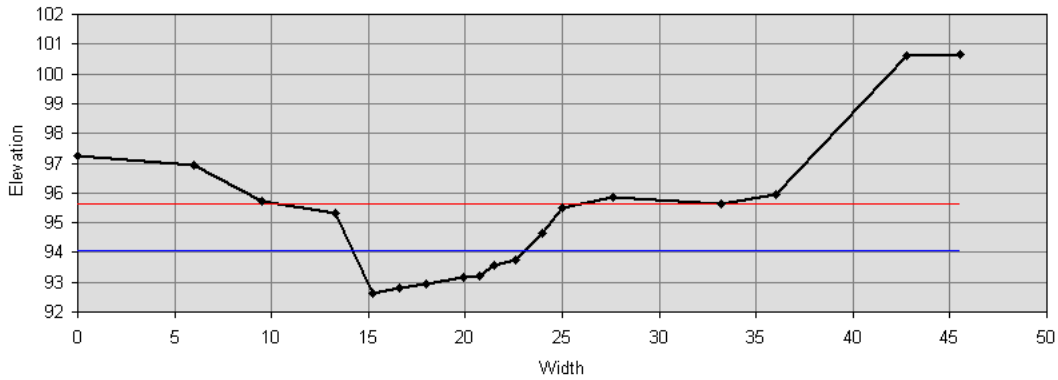
Profile Station Missing

Distance (ft)	BS (ft)	HI (ft)	FS (ft)	Elevation (ft)	Omit Bkf	Notes
0		104.12	8.93	95.19	☐	TOB/Floodpl
5		104.12	10.95	93.17	☐	
7.3		104.12	11.96	92.16	☐	
7.7		104.12	13.82	90.3	☐	BOLB
8.8		104.12	13.83	90.29	☐	LEW
10.2		104.12	14.06	90.06	☐	
11.6		104.12	13.89	90.23	☐	
13.8		104.12	13.85	90.27	☐	
15.5		104.12	13.84	90.28	☐	Depth 0.18
16.9		104.12	13.74	90.38	☐	REW
18.6		104.12	13.46	90.66	☐	BORB
20.2		104.12	12.19	91.93	☐	
26		104.12	5.45	98.67	☐	TORB
29		104.12	3.47	100.65	☐	

Lower Gunpowder Watershed Assessment
Drainage Area 4 Hinesleigh: XS-2

Cross Section 2

1 + 97 Hinesleigh Court, Glide



Bankfull Dimensions	
7.9	x-section area (ft.sq.)
8.9	width (ft)
0.9	mean depth (ft)
1.4	max depth (ft)
9.9	wetted parimeter (ft)
0.8	hyd radi (ft)
10.0	width-depth ratio

Flood Dimensions	
16.8	W flood prone area (ft)
1.9	entrenchment ratio
---	low bank height (ft)
---	low bank height ratio

Materials	
13	D50 Riffle (mm)
22	D84 Riffle (mm)
35	threshold grain size (mm):

Bankfull Flow	
5.6	velocity (ft/s)
44.7	discharge rate (cfs)
1.11	Froude number

Flow Resistance	
0.027	Manning's roughness
0.09	D'Arcy-Weisbach fric.
9.3	resistance factor u/u*
12.3	relative roughness

Forces & Power	
1.4	channel slope (%)
0.70	shear stress (lb/sq.ft.)
0.60	shear velocity (ft/s)
4.4	unit strm power (lb/ft/s)

Cross Section

Glide

reference ID	2	
instrument height	105.71	101.05
longitudinal station	197	196.0

Bankfull Stage

FS		---
elevation	94.06	---

Low Bank Height

FS		---
elevation		

Flood Prone Area

width fpa		16.8

Channel Slope

percent slope		1.4

Flow Resistance

Manning's "n"		0.027
D'Arcy - Weisbach "f"		0.09

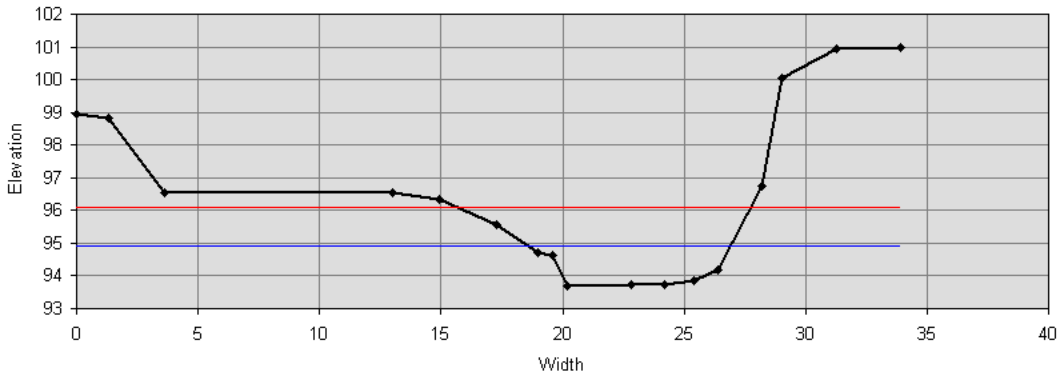
Note:

Distance (ft)	BS (ft)	HI (ft)	FS (ft)	Elevation (ft)	Omit Bkf	Notes
0		105.71	8.47	97.24	☐	
6		105.71	8.76	96.95	☐	
9.5		105.71	10	95.71	☐	
13.3		105.71	10.4	95.31	☐	
15.2		105.71	13.06	92.65	☐	LEW (WD0.5
16.6		105.71	12.9	92.81	☐	
18		105.71	12.77	92.94	☐	
19.9		105.71	12.55	93.16	☐	REW
20.7		105.71	12.5	93.21	☐	
21.5		105.71	12.16	93.55	☐	
22.6		105.71	11.98	93.73	☐	
24		105.71	11.08	94.63	☐	
25		105.71	10.23	95.48	☐	Terrace
27.6		105.71	9.85	95.86	☐	Terrace
33.2		105.71	10.1	95.61	☐	Terrace
36		105.71	9.75	95.96	☐	BORB
42.8		105.71	5.08	100.63	☐	TORB
45.5		105.71	5.06	100.65	☐	

Lower Gunpowder Watershed Assessment
Drainage Area 4 Hinesleigh: XS-3

Cross Section 3

2 + 41 Hinesleigh Court, Riffle



Bankfull Dimensions	
7.7	x-section area (ft.sq.)
8.2	width (ft)
0.9	mean depth (ft)
1.2	max depth (ft)
9.2	wetted parimeter (ft)
0.8	hyd radi (ft)
8.8	width-depth ratio

Flood Dimensions	
12.2	W flood prone area (ft)
1.5	entrenchment ratio
---	low bank height (ft)
---	low bank height ratio

Materials	
13	D50 Riffle (mm)
22	D84 Riffle (mm)
36	threshold grain size (mm):

Bankfull Flow	
5.7	velocity (ft/s)
44.1	discharge rate (cfs)
1.10	Froude number

Flow Resistance	
0.027	Manning's roughness
0.09	D'Arcy-Weisbach fric.
9.3	resistance factor u/u*
13.0	relative roughness

Forces & Power	
1.4	channel slope (%)
0.73	shear stress (lb/sq.ft.)
0.61	shear velocity (ft/s)
4.7	unit strm power (lb/ft/s)

Cross Section

Riffle

reference ID	3	
instrument height	105.25	101.05
longitudinal station	241	242.0

Bankfull Stage

FS		---
elevation	94.9	---

Low Bank Height

FS		---
elevation		

Flood Prone Area

width fpa		12.2

Channel Slope

percent slope		1.4

Flow Resistance

Manning's "n"		0.027
D'Arcy - Weisbach "f"		0.09

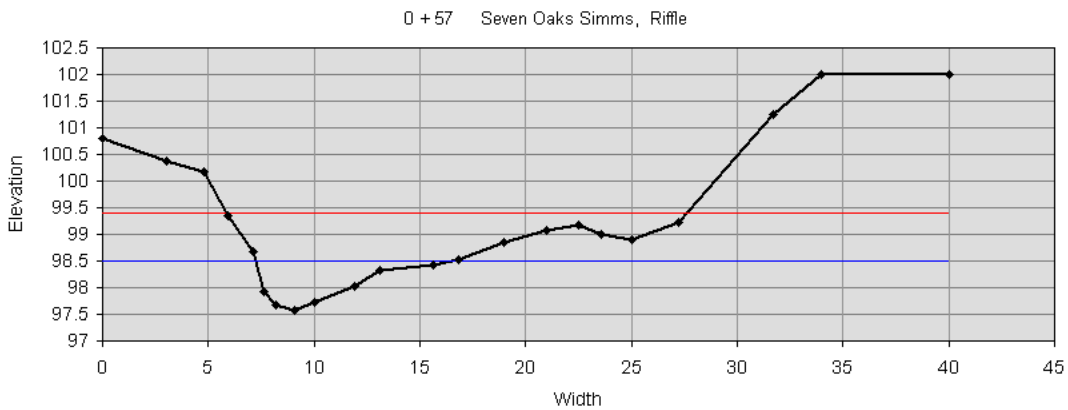
Note:

Mid Riffle

Distance (ft)	BS (ft)	HI (ft)	FS (ft)	Elevation (ft)	Omit Bkf	Notes
0		105.25	6.31	98.94	☐	TOLB
1.3		105.25	6.43	98.82	☐	
3.6		105.25	8.7	96.55	☐	Terrace
13		105.25	8.72	96.53	☐	
14.9		105.25	8.93	96.32	☐	
17.3		105.25	9.67	95.58	☐	
19		105.25	10.52	94.73	☐	
19.6		105.25	10.64	94.61	☐	
20.2		105.25	11.56	93.69	☐	LEW
22.8		105.25	11.53	93.72	☐	
24.2		105.25	11.51	93.74	☐	
25.4		105.25	11.38	93.87	☐	REW/WS
26.4		105.25	11.05	94.2	☐	
28.2		105.25	8.51	96.74	☐	
29		105.25	5.19	100.06	☐	
31.3		105.25	4.31	100.94	☐	
33.9		105.25	4.28	100.97	☐	

Lower Gunpowder Watershed Assessment
Drainage Area 5 Seven Oaks Simms: XS-1

Cross Section 1



Bankfull Dimensions	
3.9	x-section area (ft.sq.)
9.2	width (ft)
0.4	mean depth (ft)
0.9	max depth (ft)
9.6	wetted parimeter (ft)
0.4	hyd radi (ft)
21.6	width-depth ratio

Flood Dimensions	
21.8	W flood prone area (ft)
2.4	entrenchment ratio
---	low bank height (ft)
---	low bank height ratio

Materials	
12	D50 Riffle (mm)
19	D84 Riffle (mm)
27	threshold grain size (mm):

Bankfull Flow	
4.4	velocity (ft/s)
17.1	discharge rate (cfs)
1.21	Froude number

Flow Resistance	
0.028	Manning's roughness
0.12	D'Arcy-Weisbach fric.
8.2	resistance factor u/u*
6.8	relative roughness

Forces & Power	
2.18	channel slope (%)
0.55	shear stress (lb/sq.ft.)
0.53	shear velocity (ft/s)
2.5	unit strm power (lb/ft/s)

Cross Section

Riffle

reference ID	1	
instrument height	107.08	100
longitudinal station	57	53.0

Bankfull Stage

FS		---
elevation	98.49	---

Low Bank Height

FS		---
elevation		

Flood Prone Area

width fpa		21.8

Channel Slope

percent slope	2.18	1.3

Flow Resistance

Manning's "n"		0.028
D'Arcy - Weisbach "f"		0.12

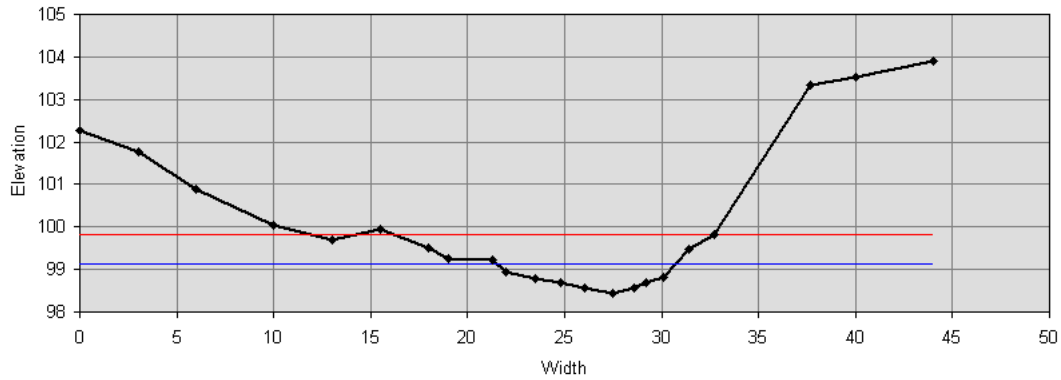
Note:

Distance (ft)	BS (ft)	HI (ft)	FS (ft)	Elevation (ft)	Omit Bkf	Notes
0		107.08	6.27	100.81	☐	Fence Line
3		107.08	6.7	100.38	☐	
4.8		107.08	6.9	100.18	☐	TopStoneRe
5.9		107.08	7.74	99.34	☐	
7.1		107.08	8.41	98.67	☐	
7.6		107.08	9.16	97.92	☐	EW/BaseSt
8.2		107.08	9.41	97.67	☐	
9.1		107.08	9.5	97.58	☐	THW
10		107.08	9.36	97.72	☐	
11.9		107.08	9.05	98.03	☐	EW/WS/Ed
13.1		107.08	8.75	98.33	☐	GravBar
15.6		107.08	8.65	98.43	☐	GravBar
16.8		107.08	8.56	98.52	☐	GravBar
19		107.08	8.24	98.84	☐	GravBar
21		107.08	8	99.08	☐	GravBar
22.5		107.08	7.9	99.18	☐	TopBar/Edg
23.6		107.08	8.07	99.01	☐	Silt/Sand/Ve
25		107.08	8.18	98.9	☐	Silt/Sand/Ve
27.2		107.08	7.85	99.23	☐	Toe
31.7		107.08	5.84	101.24	☐	
34		107.08	5.07	102.01	☐	
40		107.08	5.08	102	☐	
					☐	
					☐	
					☐	
					☐	
					☐	
					☐	

Lower Gunpowder Watershed Assessment
Drainage Area 5 Seven Oaks Simms: XS-2

Cross Section 2

1 + 49 Seven Oaks Simms, Riffle



Bankfull Dimensions	
3.9	x-section area (ft.sq.)
9.2	width (ft)
0.4	mean depth (ft)
0.7	max depth (ft)
9.4	wetted parimeter (ft)
0.4	hyd radi (ft)
21.4	width-depth ratio

Flood Dimensions	
18.5	W flood prone area (ft)
2.0	entrenchment ratio
---	low bank height (ft)
---	low bank height ratio

Materials	
12	D50 Riffle (mm)
19	D84 Riffle (mm)
28	threshold grain size (mm):

Bankfull Flow	
4.4	velocity (ft/s)
17.2	discharge rate (cfs)
1.19	Froude number

Flow Resistance	
0.028	Manning's roughness
0.12	D'Arcy-Weisbach fric.
8.0	resistance factor u/u*
6.9	relative roughness

Forces & Power	
2.18	channel slope (%)
0.57	shear stress (lb/sq.ft.)
0.54	shear velocity (ft/s)
2.5	unit strm power (lb/ft/s)

Cross Section

	Riffle	
reference ID	2	
instrument height	108.72	100
longitudinal station	149	149.0

Bankfull Stage

FS		---
elevation	99.13	---

Low Bank Height

FS		---
elevation		

Flood Prone Area

width fpa		18.5

Channel Slope

percent slope	2.18	1.3

Flow Resistance

Manning's "n"		0.028
D'Arcy - Weisbach "f"		0.12

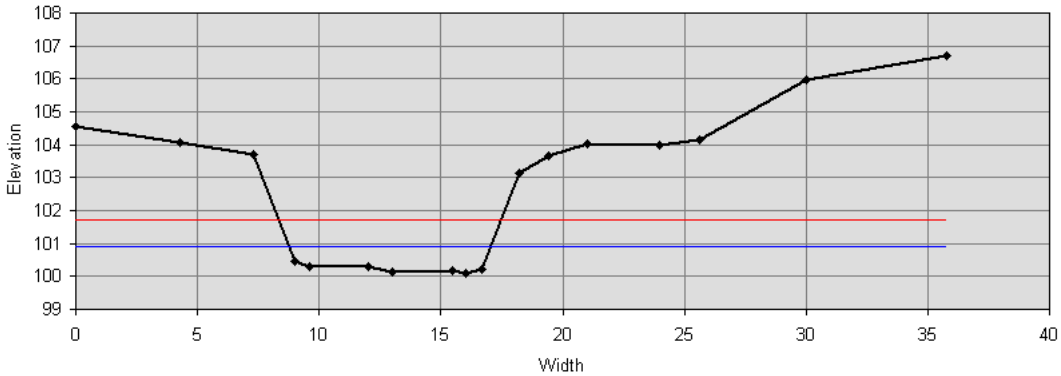
Note:

Distance (ft)	BS (ft)	HI (ft)	FS (ft)	Elevation (ft)	Omit Bkf	Notes
0		108.72	6.45	102.27	☐	Terrace
3		108.72	6.96	101.76	☐	Terrace
6		108.72	7.83	100.89	☐	Terrace
10		108.72	8.68	100.04	☐	Terrace
13		108.72	9.03	99.69	☐	Terrace
15.5		108.72	8.77	99.95	☐	Terrace
18		108.72	9.2	99.52	☐	TopBar/Fine
19		108.72	9.47	99.25	☐	Edge of Fine
21.3		108.72	9.5	99.22	☐	Bar
22		108.72	9.79	98.93	☐	Bar Small G
23.5		108.72	9.93	98.79	☐	
24.8		108.72	10.04	98.68	☐	EOW/WS
26		108.72	10.15	98.57	☐	Grav
27.5		108.72	10.27	98.45	☐	THW
28.6		108.72	10.17	98.55	☐	Grav
29.2		108.72	10.03	98.69	☐	
30.1		108.72	9.9	98.82	☐	Bob
31.4		108.72	9.23	99.49	☐	Bank
32.7		108.72	8.9	99.82	☐	
37.7		108.72	5.38	103.34	☐	TOB
40		108.72	5.19	103.53	☐	Mowed Yard
44		108.72	4.83	103.89	☐	Mowed Yard
					☐	
					☐	
					☐	
					☐	
					☐	
					☐	

Lower Gunpowder Watershed Assessment
Drainage Area 5 Seven Oaks Simms: XS-3

Cross Section 3

2 + 68.5 Seven Oaks Simms, Riffle



Bankfull Dimensions	
5.5	x-section area (ft.sq.)
8.3	width (ft)
0.7	mean depth (ft)
0.8	max depth (ft)
9.0	wetted parimeter (ft)
0.6	hyd radi (ft)
12.5	width-depth ratio

Flood Dimensions	
9.1	W flood prone area (ft)
1.1	entrenchment ratio
---	low bank height (ft)
---	low bank height ratio

Materials	
12	D50 Riffle (mm)
19	D84 Riffle (mm)
12	threshold grain size (mm):

Bankfull Flow	
3.1	velocity (ft/s)
17.2	discharge rate (cfs)
0.71	Froude number

Flow Resistance	
0.027	Manning's roughness
0.10	D'Arcy-Weisbach fric.
8.8	resistance factor u/u*
10.6	relative roughness

Forces & Power	
0.65	channel slope (%)
0.25	shear stress (lb/sq.ft.)
0.36	shear velocity (ft/s)
0.84	unit strm power (lb/ft/s)

Cross Section

	Riffle	
reference ID	3	
instrument height	112.43	105.43
longitudinal station	268.5	272.0

Bankfull Stage

FS		---
elevation	100.91	---

Low Bank Height

FS		---
elevation		

Flood Prone Area

width fpa		9.1

Channel Slope

percent slope	0.65	1.3

Flow Resistance

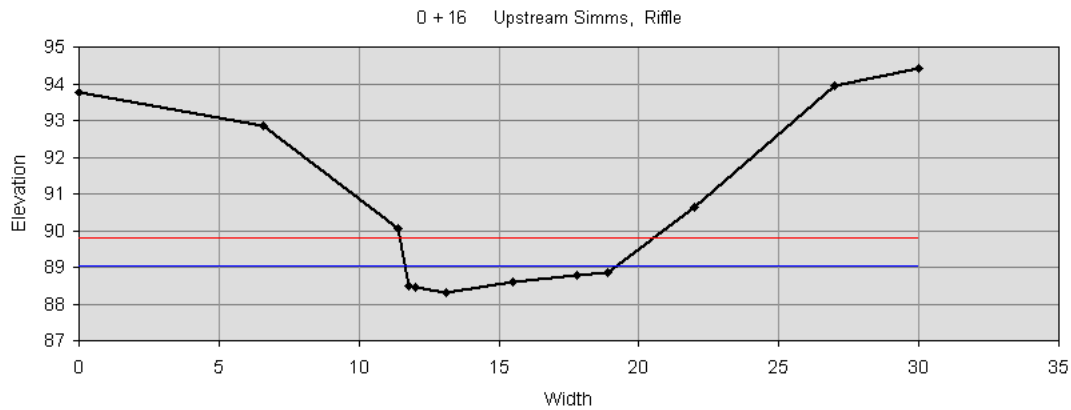
Manning's "n"		0.027
D'Arcy - Weisbach "f"		0.10

Note:

Distance (ft)	BS (ft)	HI (ft)	FS (ft)	Elevation (ft)	Omit Bkf	Notes
0		112.43	7.89	104.54	☐	Multiflora Ro
4.3		112.43	8.38	104.05	☐	
7.3		112.43	8.72	103.71	☐	TOLB
9		112.43	11.96	100.47	☐	BOLB
9.6		112.43	12.14	100.29	☐	
12		112.43	12.13	100.3	☐	
13		112.43	12.3	100.13	☐	
15.5		112.43	12.26	100.17	☐	
16		112.43	12.34	100.09	☐	THW(0.21De
16.7		112.43	12.23	100.2	☐	BORB
18.2		112.43	9.28	103.15	☐	
19.4		112.43	8.76	103.67	☐	
21		112.43	8.41	104.02	☐	
24		112.43	8.45	103.98	☐	
25.6		112.43	8.3	104.13	☐	
30		112.43	6.45	105.98	☐	
35.8		112.43	5.74	106.69	☐	

Lower Gunpowder Watershed Assessment
Drainage Area 7 Upstream Simms: XS-1

Cross Section 1



Bankfull Dimensions		Flood Dimensions		Materials	
3.5	x-section area (ft.sq.)	9.1	W flood prone area (ft)	7.8	D50 Riffle (mm)
7.6	width (ft)	1.2	entrenchment ratio	17	D84 Riffle (mm)
0.5	mean depth (ft)	---	low bank height (ft)	25	threshold grain size (mm):
0.8	max depth (ft)	---	low bank height ratio		
8.1	wetted parimeter (ft)				
0.4	hyd radi (ft)				
16.7	width-depth ratio				

Bankfull Flow		Flow Resistance		Forces & Power	
4.3	velocity (ft/s)	0.027	Manning's roughness	1.89	channel slope (%)
14.9	discharge rate (cfs)	0.11	D'Arcy-Weisbach fric.	0.50	shear stress (lb/sq.ft.)
1.16	Froude number	8.4	resistance factor u/u*	0.51	shear velocity (ft/s)
		8.2	relative roughness	2.3	unit strm power (lb/ft/s)

Cross Section

	Riffle	
reference ID	1	
instrument height	100.55	100
longitudinal station	16	15.0

Bankfull Stage

FS		---
elevation	89.05	---

Low Bank Height

FS		---
elevation		

Flood Prone Area

width fpa		9.1

Channel Slope

percent slope	1.89	3.6

Flow Resistance

Manning's "n"		0.027
D'Arcy - Weisbach "f"		0.11

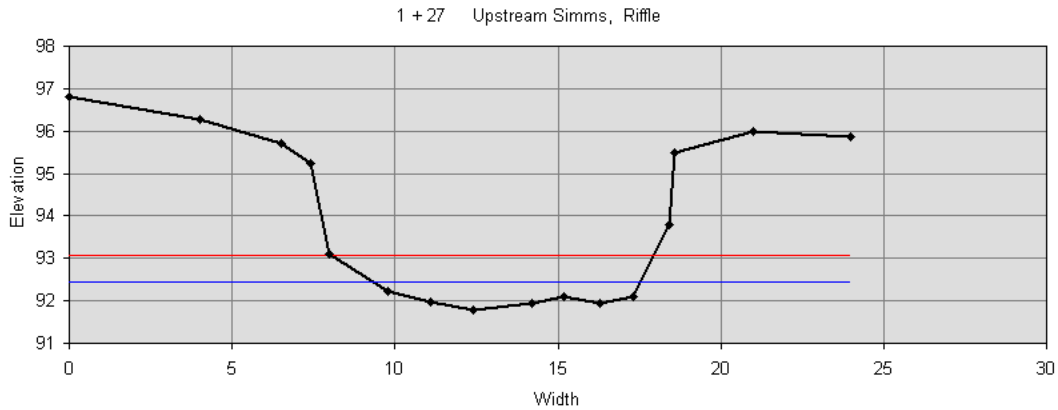
Note:

Turn Point for XS 1, BS to Outfall=7.34, FS to Turn Point=8.36, BS to Turn Point=1.57, 7.34-8.36=-1.02,1.57-1.02=0.55

Distance (ft)	BS (ft)	HI (ft)	FS (ft)	Elevation (ft)	Omit Bkf	Notes
0		100.55	6.78	93.77	☐	
6.6		100.55	7.7	92.85	☐	TOLB
11.4		100.55	10.5	90.05	☐	
11.8		100.55	12.05	88.5	☐	BOLB
12		100.55	12.1	88.45	☐	LEW
13.1		100.55	12.25	88.3	☐	Depth 0.21
15.51		100.55	11.96	88.59	☐	REW/EdgeS
17.8		100.55	11.76	88.79	☐	End Gravel E
18.9		100.55	11.71	88.84	☐	BORB
22		100.55	9.93	90.62	☐	
27		100.55	6.62	93.93	☐	TORB
30		100.55	6.13	94.42	☐	

Lower Gunpowder Watershed Assessment
Drainage Area 7 Upstream Simms: XS-2

Cross Section 2



Bankfull Dimensions		Flood Dimensions		Materials	
3.6	x-section area (ft.sq.)	9.9	W flood prone area (ft)	7.8	D50 Riffle (mm)
8.2	width (ft)	1.2	entrenchment ratio	17	D84 Riffle (mm)
0.4	mean depth (ft)	---	low bank height (ft)	24	threshold grain size (mm):
0.6	max depth (ft)	---	low bank height ratio		
8.5	wetted parimeter (ft)				
0.4	hyd radi (ft)				
18.6	width-depth ratio				

Bankfull Flow		Flow Resistance		Forces & Power	
4.2	velocity (ft/s)	0.028	Manning's roughness	1.89	channel slope (%)
15.0	discharge rate (cfs)	0.12	D'Arcy-Weisbach fric.	0.50	shear stress (lb/sq.ft.)
1.14	Froude number	8.3	resistance factor u/u*	0.51	shear velocity (ft/s)
		7.9	relative roughness	2.2	unit strm power (lb/ft/s)

Cross Section

	Riffle	
reference ID	2	
instrument height	101.9	100
longitudinal station	127	123.0

Bankfull Stage

FS		---
elevation	92.44	---

Low Bank Height

FS		---
elevation		

Flood Prone Area

width fpa		9.9

Channel Slope

percent slope	1.89	3.6

Flow Resistance

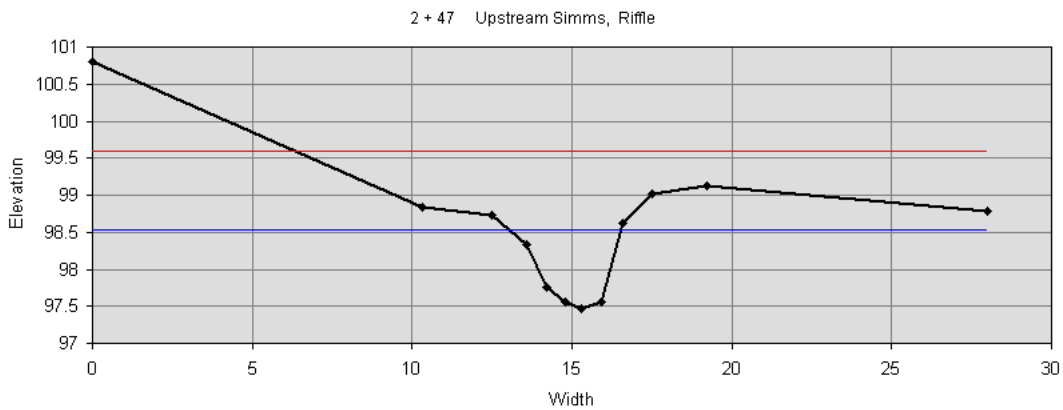
Manning's "n"		0.028
D'Arcy - Weisbach "f"		0.12

Note:

Distance (ft)	BS (ft)	HI (ft)	FS (ft)	Elevation (ft)	Omit Bkf	Notes
0		101.9	5.08	96.82	☐	
4		101.9	5.64	96.26	☐	TOLB
6.5		101.9	6.2	95.7	☐	
7.4		101.9	6.65	95.25	☐	
8		101.9	8.8	93.1	☐	
9.8		101.9	9.67	92.23	☐	BOLB
11.1		101.9	9.92	91.98	☐	LEW/WS
12.4		101.9	10.1	91.8	☐	
14.2		101.9	9.95	91.95	☐	REW
15.2		101.9	9.81	92.09	☐	
16.3		101.9	9.97	91.93	☐	
17.3		101.9	9.81	92.09	☐	BORB
18.4		101.9	8.1	93.8	☐	
18.6		101.9	6.42	95.48	☐	BankUnderc
21		101.9	5.92	95.98	☐	
24		101.9	6.02	95.88	☐	

Lower Gunpowder Watershed Assessment
Drainage Area 7 Upstream Simms: XS-3

Cross Section 3



Bankfull Dimensions		Flood Dimensions		Materials	
2.3	x-section area (ft.sq.)	---	W flood prone area (ft)	7.8	D50 Riffle (mm)
3.5	width (ft)	---	entrenchment ratio	17	D84 Riffle (mm)
0.7	mean depth (ft)	---	low bank height (ft)	49	threshold grain size (mm):
1.1	max depth (ft)	---	low bank height ratio		
4.3	wetted parimeter (ft)				
0.5	hyd radi (ft)				
5.3	width-depth ratio				

Bankfull Flow		Flow Resistance		Forces & Power	
6.5	velocity (ft/s)	0.026	Manning's roughness	3	channel slope (%)
15.1	discharge rate (cfs)	0.10	D'Arcy-Weisbach fric.	1.00	shear stress (lb/sq.ft.)
1.57	Froude number	9.1	resistance factor u/u*	0.72	shear velocity (ft/s)
		11.9	relative roughness	8.1	unit strm power (lb/ft/s)

Cross Section

	Riffle	
reference ID	3	
instrument height	104.22	100
longitudinal station	247	249.0

Bankfull Stage

FS		---
elevation	98.53	---

Low Bank Height

FS		---
elevation		

Flood Prone Area

width fpa		21.7

Channel Slope

percent slope	3	3.6

Flow Resistance

Manning's "n"		0.026
D'Arcy - Weisbach "f"		0.10

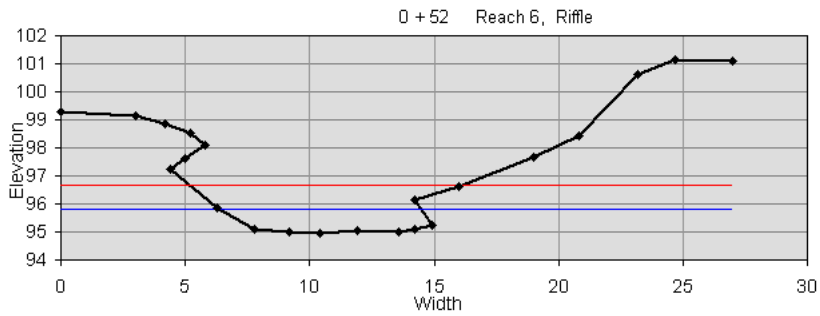
Note:

Floodplain and both banks mowed grass

Distance (ft)	BS (ft)	HI (ft)	FS (ft)	Elevation (ft)	Omit Bkf	Notes
0		104.22	3.41	100.81	☐	
10.3		104.22	5.39	98.83	☐	
12.5		104.22	5.49	98.73	☐	TOLB
13.6		104.22	5.89	98.33	☐	
14.2		104.22	6.47	97.75	☐	
14.8		104.22	6.67	97.55	☐	LEW
15.3		104.22	6.76	97.46	☐	THW 0.12'D
15.9		104.22	6.66	97.56	☐	REW/BORB
16.6		104.22	5.6	98.62	☐	
17.5		104.22	5.21	99.01	☐	TORB
19.2		104.22	5.1	99.12	☐	
28		104.22	5.43	98.79	☐	

Lower Gunpowder Watershed Assessment
Drainage Area 8 Seven Courts: XS-1

Cross Section 1



Bankfull Dimensions	
5.8	x-section area (ft.sq.)
8.0	width (ft)
0.7	mean depth (ft)
0.9	max depth (ft)
9.4	wetted parimeter (ft)
0.6	hyd radi (ft)
11.0	width-depth ratio

Flood Dimensions	
10.9	W flood prone area (ft)
1.4	entrenchment ratio
---	low bank height (ft)
---	low bank height ratio

Materials	
15	D50 Bed (mm)
56	D84 Bed (mm)
21	threshold grain size (mm):

Bankfull Flow	
2.9	velocity (ft/s)
17.0	discharge rate (cfs)
0.65	Froude number

Flow Resistance	
0.039	Manning's roughness
0.21	D'Arcy-Weisbach fric.
6.2	resistance factor u/u*
4.0	relative roughness

Forces & Power	
1.1	channel slope (%)
0.43	shear stress (lb/sq.ft.)
0.47	shear velocity (ft/s)
1.45	unit strm power (lb/ft/s)

Cross Section

	Riffle	
reference ID	1	
instrument height	105.66	---
longitudinal station	52	---

Bankfull Stage

FS		---
elevation	95.8	---

Low Bank Height

FS		---
elevation		

Flood Prone Area

width fpa		10.9

Channel Slope

percent slope		1.1

Flow Resistance

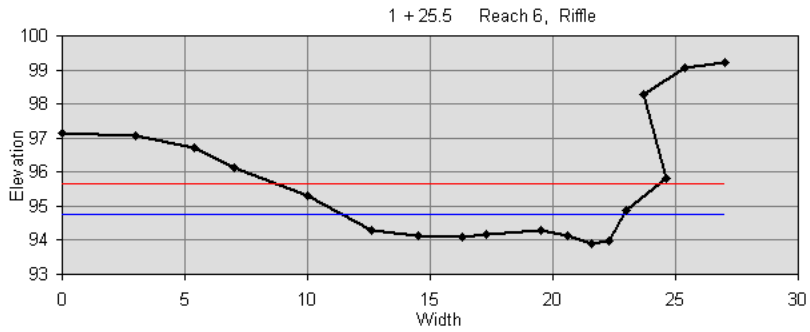
Manning's "n"		0.039
D'Arcy - Weisbach "f"		0.21

Note:

Distance (ft)	BS (ft)	HI (ft)	FS (ft)	Elevation (ft)	Omit Bkf	Notes
0		105.66	6.38	99.28	☐	
3		105.66	6.54	99.12	☐	
4.2		105.66	6.81	98.85	☐	
5.2		105.66	7.12	98.54	☐	LTOB
5.8		105.66	7.55	98.11	☐	
5		105.66	8.05	97.61	☐	
4.4		105.66	8.4	97.26	☐	
6.3		105.66	9.8	95.86	☐	
7.8		105.66	10.56	95.1	☐	LEW
9.2		105.66	10.67	94.99	☐	
10.4		105.66	10.71	94.95	☐	Thalweg
11.9		105.66	10.62	95.04	☐	
13.6		105.66	10.66	95	☐	
14.2		105.66	10.58	95.08	☐	
14.9		105.66	10.43	95.23	☐	REW
14.2		105.66	9.54	96.12	☐	
16		105.66	9.04	96.62	☐	
19		105.66	8	97.66	☐	
20.8		105.66	7.22	98.44	☐	
23.2		105.66	5.03	100.63	☐	RTOB
24.7		105.66	4.5	101.16	☐	
27		105.66	4.56	101.1	☐	
					☐	
					☐	
					☐	
					☐	
					☐	
					☐	

Lower Gunpowder Watershed Assessment
Drainage Area 8 Seven Courts: XS-2

Cross Section 2



Bankfull Dimensions	
6.6	x-section area (ft.sq.)
11.6	width (ft)
0.6	mean depth (ft)
0.9	max depth (ft)
12.1	wetted parimeter (ft)
0.5	hyd radi (ft)
20.4	width-depth ratio

Flood Dimensions	
15.6	W flood prone area (ft)
1.3	entrenchment ratio
---	low bank height (ft)
---	low bank height ratio

Materials	
15	D50 Bed (mm)
56	D84 Bed (mm)
18	threshold grain size (mm):

Bankfull Flow	
2.6	velocity (ft/s)
17.1	discharge rate (cfs)
0.63	Froude number

Flow Resistance	
0.040	Manning's roughness
0.23	D'Arcy-Weisbach fric.
6.0	resistance factor u/u*
3.1	relative roughness

Forces & Power	
1.1	channel slope (%)
0.37	shear stress (lb/sq.ft.)
0.44	shear velocity (ft/s)
1.02	unit strm power (lb/ft/s)

Cross Section

Riffle

reference ID	2	
instrument height	105.66	---
longitudinal station	125.5	---

Bankfull Stage

FS		---
elevation	94.77	---

Low Bank Height

FS		---
elevation		

Flood Prone Area

width fpa		15.6

Channel Slope

percent slope		1.1

Flow Resistance

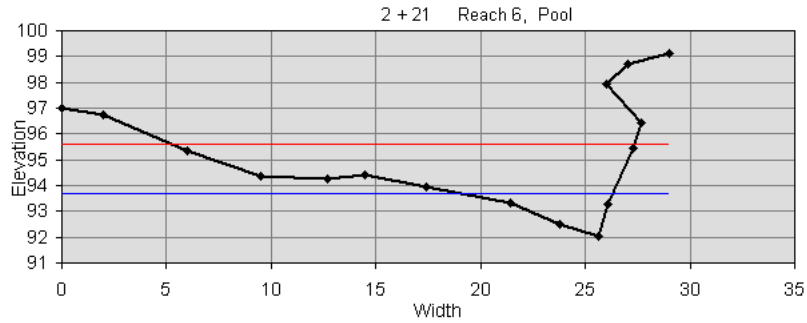
Manning's "n"		0.040
D'Arcy - Weisbach "f"		0.23

Note:

Distance (ft)	BS (ft)	HI (ft)	FS (ft)	Elevation (ft)	Omit Bkf	Notes
0		105.66	8.5	97.16	☐	
3		105.66	8.58	97.08	☐	
5.4		105.66	8.93	96.73	☐	LTOB
7		105.66	9.53	96.13	☐	
10		105.66	10.37	95.29	☐	
12.6		105.66	11.37	94.29	☐	LEW
14.5		105.66	11.54	94.12	☐	
16.3		105.66	11.55	94.11	☐	
17.3		105.66	11.49	94.17	☐	REW
19.5		105.66	11.36	94.3	☐	Midchannel I
20.6		105.66	11.53	94.13	☐	LEW
21.6		105.66	11.77	93.89	☐	Thalweg
22.3		105.66	11.67	93.99	☐	Toe of Slope
23		105.66	10.79	94.87	☐	Slope
24.6		105.66	9.84	95.82	☐	
23.7		105.66	7.4	98.26	☐	RTOB
25.4		105.66	6.61	99.05	☐	
27		105.66	6.46	99.2	☐	

Lower Gunpowder Watershed Assessment
Drainage Area 8 Seven Courts: XS-3

Cross Section 3



Bankfull Dimensions	
5.4	x-section area (ft.sq.)
7.3	width (ft)
0.7	mean depth (ft)
1.7	max depth (ft)
8.6	wetted parimeter (ft)
0.6	hyd radi (ft)
9.9	width-depth ratio

Flood Dimensions	
22.0	W flood prone area (ft)
3.0	entrenchment ratio
---	low bank height (ft)
---	low bank height ratio

Materials	
15	D50 Bed (mm)
56	D84 Bed (mm)
21	threshold grain size (mm):

Bankfull Flow	
3.2	velocity (ft/s)
17.2	discharge rate (cfs)
0.70	Froude number

Flow Resistance	
0.036	Manning's roughness
0.18	D'Arcy-Weisbach fric.
6.7	resistance factor u/u*
4.0	relative roughness

Forces & Power	
1.1	channel slope (%)
0.43	shear stress (lb/sq.ft.)
0.47	shear velocity (ft/s)
1.61	unit strm power (lb/ft/s)

Cross Section

	Pool	
reference ID	3	
instrument height	105.66	---
longitudinal station	221	---

Bankfull Stage

FS		---
elevation	93.69	---

Low Bank Height

FS		---
elevation		

Flood Prone Area

width fpa		22.0

Channel Slope

percent slope		1.1

Flow Resistance

Manning's "n"		0.036
D'Arcy - Weisbach "f"		0.18

Note:

Distance (ft)	BS (ft)	HI (ft)	FS (ft)	Elevation (ft)	Omit Bkf	Notes
0		105.66	8.68	96.98	☐	
2		105.66	8.91	96.75	☐	LTOB
6		105.66	10.29	95.37	☐	
9.5		105.66	11.32	94.34	☐	
12.7		105.66	11.42	94.24	☑	
14.5		105.66	11.25	94.41	☑	
17.4		105.66	11.72	93.94	☐	
21.4		105.66	12.34	93.32	☐	LEW
23.8		105.66	13.14	92.52	☐	
25.6		105.66	13.64	92.02	☐	
26.1		105.66	12.4	93.26	☐	REW
27.3		105.66	10.2	95.46	☐	
27.7		105.66	9.25	96.41	☐	
26		105.66	7.74	97.92	☐	
27		105.66	6.94	98.72	☐	RTOB
29		105.66	6.55	99.11	☐	
					☐	
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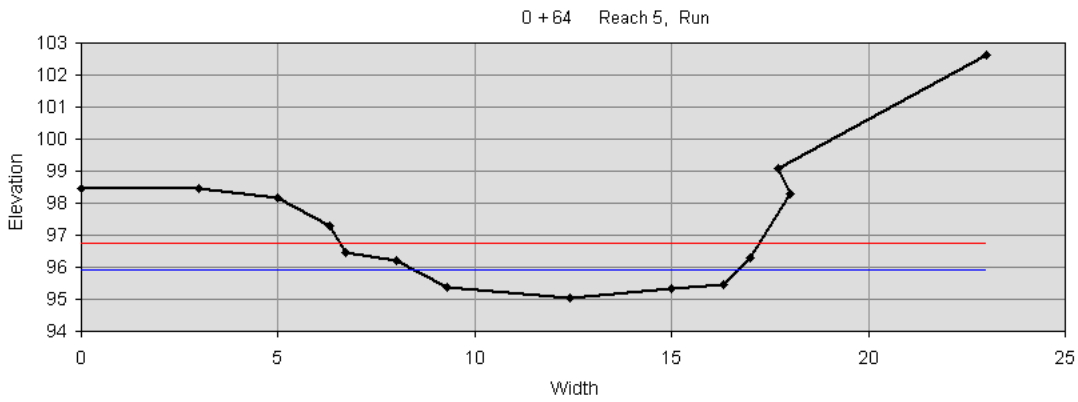
Lower Gunpowder Watershed Assessment
Drainage Area 9 Birchbrook: XS-1

Cross Section 1



Bankfull Dimensions	
5.0	x-section area (ft.sq.)
8.2	width (ft)
0.6	mean depth (ft)
0.9	max depth (ft)
8.6	wetted parimeter (ft)
0.6	hyd radi (ft)
13.5	width-depth ratio

Flood Dimensions	
10.7	W flood prone area (ft)
1.3	entrenchment ratio
---	low bank height (ft)
---	low bank height ratio

Materials	
27	D50 Bed (mm)
58	D84 Bed (mm)
43	threshold grain size (mm):

Bankfull Flow	
4.0	velocity (ft/s)
20.1	discharge rate (cfs)
0.93	Froude number

Flow Resistance	
0.040	Manning's roughness
0.22	D'Arcy-Weisbach fric.
6.0	resistance factor u/u*
3.2	relative roughness

Forces & Power	
2.4	channel slope (%)
0.87	shear stress (lb/sq.ft.)
0.67	shear velocity (ft/s)
3.7	unit strm power (lb/ft/s)

Cross Section

	Run	
reference ID	1	
instrument height	103.73	---
longitudinal station	64	---

Bankfull Stage

FS		---
elevation	95.91	---

Low Bank Height

FS		---
elevation		

Flood Prone Area

width fpa		10.7

Channel Slope

percent slope		2.4

Flow Resistance

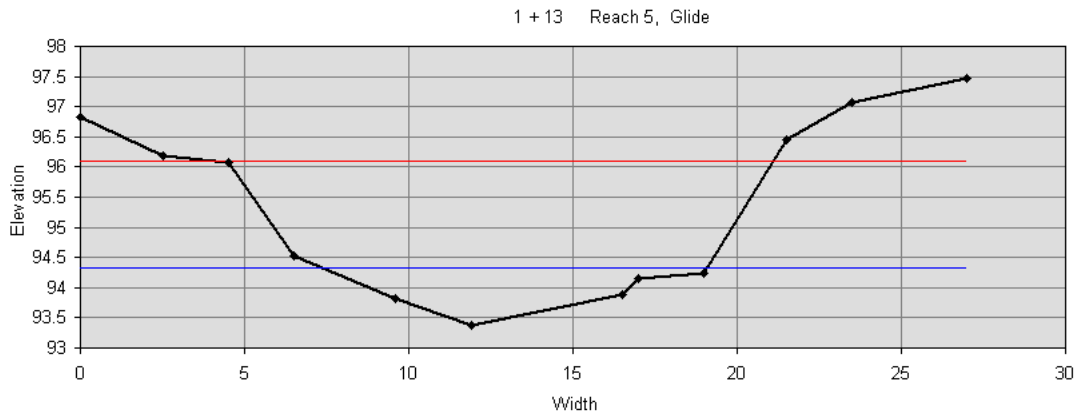
Manning's "n"		0.040
D'Arcy - Weisbach "f"		0.22

Note:

Distance (ft)	BS (ft)	HI (ft)	FS (ft)	Elevation (ft)	Omit Bkf	Notes
0		103.73	5.28	98.45	☐	toe vslly sl0p
3		103.73	5.29	98.44	☐	fp
5		103.73	5.58	98.15	☐	fp
6.3		103.73	6.44	97.29	☐	lrob bkf
6.7		103.73	7.27	96.46	☐	
8		103.73	7.53	96.2	☐	
9.3		103.73	8.35	95.38	☐	lew
12.4		103.73	8.68	95.05	☐	sb tw
15		103.73	8.4	95.33	☐	rew
16.3		103.73	8.29	95.44	☐	rtob
17		103.73	7.42	96.31	☐	og
18		103.73	5.42	98.31	☐	
17.7		103.73	4.66	99.07	☐	
23		103.73	1.12	102.61	☐	

Lower Gunpowder Watershed Assessment
Drainage Area 9 Birchbrook: XS-2

Cross Section 2



Bankfull Dimensions	
5.8	x-section area (ft.sq.)
11.7	width (ft)
0.5	mean depth (ft)
0.9	max depth (ft)
11.9	wetted parimeter (ft)
0.5	hyd radi (ft)
23.6	width-depth ratio

Flood Dimensions	
17.1	W flood prone area (ft)
1.5	entrenchment ratio
---	low bank height (ft)
---	low bank height ratio

Materials	
27	D50 Bed (mm)
58	D84 Bed (mm)
36	threshold grain size (mm):

Bankfull Flow	
3.5	velocity (ft/s)
20.5	discharge rate (cfs)
0.89	Froude number

Flow Resistance	
0.040	Manning's roughness
0.24	D'Arcy-Weisbach fric.
5.8	resistance factor u/u*
2.6	relative roughness

Forces & Power	
2.4	channel slope (%)
0.73	shear stress (lb/sq.ft.)
0.61	shear velocity (ft/s)
2.6	unit strm power (lb/ft/s)

Cross Section

Glide

reference ID	2	
instrument height	103.73	---
longitudinal station	113	---

Bankfull Stage

FS		---
elevation	94.32	---

Low Bank Height

FS		---
elevation		

Flood Prone Area

width fpa		17.1

Channel Slope

percent slope		2.4

Flow Resistance

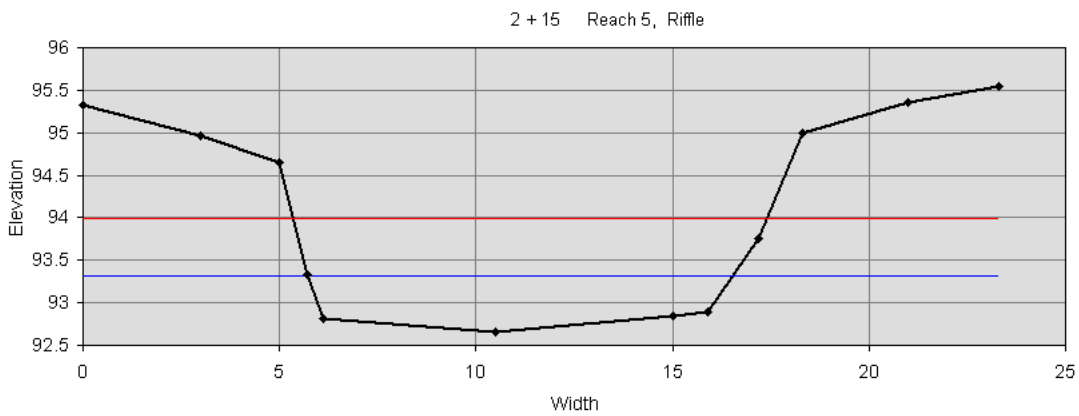
Manning's "n"		0.040
D'Arcy - Weisbach "f"		0.24

Note:

Distance (ft)	BS (ft)	HI (ft)	FS (ft)	Elevation (ft)	Omit Bkf	Notes
0		103.73	6.91	96.82	☐	fp
2.5		103.73	7.54	96.19	☐	fp
4.5		103.73	7.66	96.07	☐	tob
6.5		103.73	9.21	94.52	☐	toe
9.6		103.73	9.91	93.82	☐	lew
11.9		103.73	10.36	93.37	☐	tw
16.5		103.73	9.85	93.88	☐	rew
17		103.73	9.57	94.16	☐	
19		103.73	9.49	94.24	☐	toe
21.5		103.73	7.28	96.45	☐	tob
23.5		103.73	6.66	97.07	☐	fp
27		103.73	6.27	97.46	☐	

Lower Gunpowder Watershed Assessment
Drainage Area 9 Birchbrook: XS-3

Cross Section 3



Bankfull Dimensions	
5.8	x-section area (ft.sq.)
10.8	width (ft)
0.5	mean depth (ft)
0.7	max depth (ft)
11.2	wetted parimeter (ft)
0.5	hyd radi (ft)
20.3	width-depth ratio

Flood Dimensions	
12.1	W flood prone area (ft)
1.1	entrenchment ratio
---	low bank height (ft)
---	low bank height ratio

Materials	
27	D50 Bed (mm)
58	D84 Bed (mm)
38	threshold grain size (mm):

Bankfull Flow	
3.5	velocity (ft/s)
20.4	discharge rate (cfs)
0.86	Froude number

Flow Resistance	
0.042	Manning's roughness
0.26	D'Arcy-Weisbach fric.
5.6	resistance factor u/u*
2.8	relative roughness

Forces & Power	
2.4	channel slope (%)
0.77	shear stress (lb/sq.ft.)
0.63	shear velocity (ft/s)
2.8	unit strm power (lb/ft/s)

Cross Section

	Riffle	
reference ID	3	
instrument height	103.73	---
longitudinal station	215	---

Bankfull Stage

FS		---
elevation	93.32	---

Low Bank Height

FS		---
elevation		

Flood Prone Area

width fpa		12.1

Channel Slope

percent slope		2.4

Flow Resistance

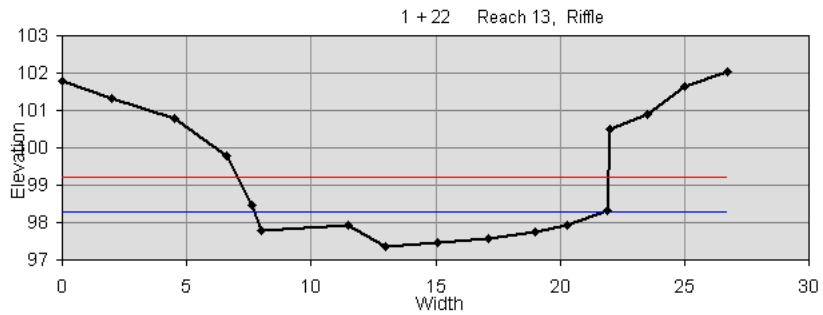
Manning's "n"		0.042
D'Arcy - Weisbach "f"		0.26

Note:

Distance (ft)	BS (ft)	HI (ft)	FS (ft)	Elevation (ft)	Omit Bkf	Notes
0		103.73	8.4	95.33	☐	fp
3		103.73	8.77	94.96	☐	
5		103.73	9.08	94.65	☐	tob
5.7		103.73	10.4	93.33	☐	toe
6.1		103.73	10.91	92.82	☐	lew
10.5		103.73	11.08	92.65	☐	tw
15		103.73	10.88	92.85	☐	rew
15.9		103.73	10.84	92.89	☐	toe
17.2		103.73	9.97	93.76	☐	
18.3		103.73	8.74	94.99	☐	tob
21		103.73	8.38	95.35	☐	fp
23.3		103.73	8.19	95.54	☐	

Lower Gunpowder Watershed Assessment
Drainage Area 10 Weis Plaza: XS-1

Cross Section 1



Bankfull Dimensions	
7.7	x-section area (ft.sq.)
14.0	width (ft)
0.6	mean depth (ft)
0.9	max depth (ft)
14.4	wetted parimeter (ft)
0.5	hyd radi (ft)
25.2	width-depth ratio

Flood Dimensions	
14.9	W flood prone area (ft)
1.1	entrenchment ratio
---	low bank height (ft)
---	low bank height ratio

Materials	
9.1	D50 Bed (mm)
24	D84 Bed (mm)
53	threshold grain size (mm):

Bankfull Flow	
6.0	velocity (ft/s)
46.7	discharge rate (cfs)
1.45	Froude number

Flow Resistance	
0.029	Manning's roughness
0.12	D'Arcy-Weisbach fric.
8.1	resistance factor u/u*
7.0	relative roughness

Forces & Power	
3.2	channel slope (%)
1.07	shear stress (lb/sq.ft.)
0.74	shear velocity (ft/s)
6.7	unit strm power (lb/ft/s)

Cross Section

Riffle

reference ID	1	
instrument height	104.77	104.77
longitudinal station	122	105.0

Bankfull Stage

FS		---
elevation	98.27	---

Low Bank Height

FS		---
elevation		

Flood Prone Area

width fpa		14.9

Channel Slope

percent slope	3.2	1.5

Flow Resistance

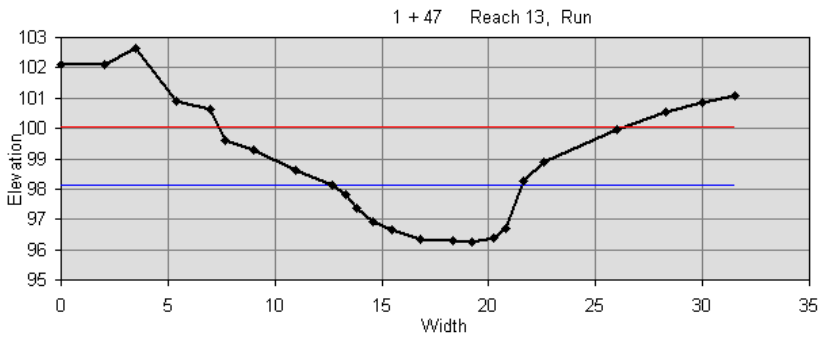
Manning's "n"		0.029
D'Arcy - Weisbach "f"		0.12

Note:

Distance (ft)	BS (ft)	HI (ft)	FS (ft)	Elevation (ft)	Omit Bkf	Notes
0		104.77	2.99	101.78	☐	
2		104.77	3.46	101.31	☐	
4.5		104.77	3.97	100.8	☐	
6.6		104.77	4.97	99.8	☐	
7.6		104.77	6.29	98.48	☐	
8		104.77	6.97	97.8	☐	LEW
11.5		104.77	6.85	97.92	☐	
13		104.77	7.43	97.34	☐	
15.1		104.77	7.32	97.45	☐	
17.1		104.77	7.19	97.58	☐	
19		104.77	7.02	97.75	☐	REW
20.3		104.77	6.83	97.94	☐	
21.9		104.77	6.45	98.32	☐	
22		104.77	4.26	100.51	☐	
23.5		104.77	3.86	100.91	☐	
25		104.77	3.12	101.65	☐	
26.7		104.77	2.74	102.03	☐	

Lower Gunpowder Watershed Assessment
Drainage Area 10 Weis Plaza: XS-2

Cross Section 2



Bankfull Dimensions	
12.4	x-section area (ft.sq.)
9.0	width (ft)
1.4	mean depth (ft)
1.9	max depth (ft)
10.4	wetted parimeter (ft)
1.2	hyd radi (ft)
6.5	width-depth ratio

Flood Dimensions	
18.9	W flood prone area (ft)
2.1	entrenchment ratio
---	low bank height (ft)
---	low bank height ratio

Materials	
9.1	D50 Bed (mm)
24	D84 Bed (mm)
13	threshold grain size (mm):

Bankfull Flow	
3.7	velocity (ft/s)
46.0	discharge rate (cfs)
0.60	Froude number

Flow Resistance	
0.027	Manning's roughness
0.08	D'Arcy-Weisbach fric.
10.0	resistance factor u/u*
17.5	relative roughness

Forces & Power	
0.36	channel slope (%)
0.27	shear stress (lb/sq.ft.)
0.37	shear velocity (ft/s)
1.15	unit strm power (lb/ft/s)

Cross Section

Run

reference ID	2	
instrument height	104.77	104.77
longitudinal station	147	146.0

Bankfull Stage

FS		---
elevation	98.15	---

Low Bank Height

FS		---
elevation		

Flood Prone Area

width fpa		18.9

Channel Slope

percent slope	0.36	1.5

Flow Resistance

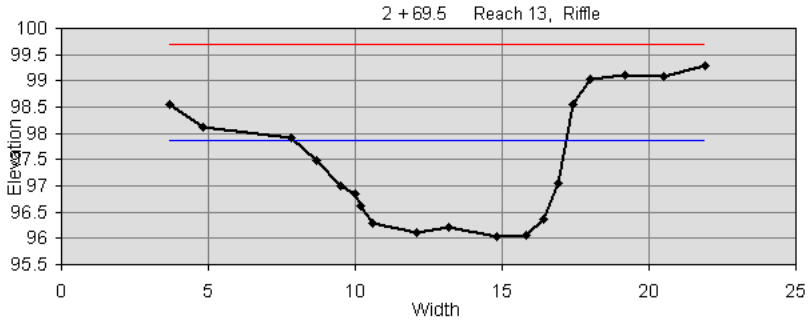
Manning's "n"		0.027
D'Arcy - Weisbach "f"		0.08

Note:

Distance (ft)	BS (ft)	HI (ft)	FS (ft)	Elevation (ft)	Omit Bkf	Notes
0		104.77	2.66	102.11	☐	lepog
2		104.77	2.68	102.09	☐	
3.5		104.77	2.13	102.64	☐	
5.4		104.77	3.87	100.9	☐	
7		104.77	4.16	100.61	☐	
7.7		104.77	5.15	99.62	☐	
9		104.77	5.46	99.31	☐	
11		104.77	6.17	98.6	☐	
12.7		104.77	6.66	98.11	☐	
13.3		104.77	6.97	97.8	☐	
13.8		104.77	7.42	97.35	☐	
14.6		104.77	7.83	96.94	☐	
15.5		104.77	8.11	96.66	☐	LEW ws
16.8		104.77	8.45	96.32	☐	
18.3		104.77	8.46	96.31	☐	
19.2		104.77	8.52	96.25	☐	
20.2		104.77	8.38	96.39	☐	
20.8		104.77	8.08	96.69	☐	REW
21.6		104.77	6.5	98.27	☐	
22.6		104.77	5.86	98.91	☐	
26		104.77	4.8	99.97	☐	
28.3		104.77	4.22	100.55	☐	
30		104.77	3.9	100.87	☐	
31.5		104.77	3.71	101.06	☐	
					☐	
					☐	
					☐	

Lower Gunpowder Watershed Assessment
Drainage Area 10 Weis Plaza: XS-3

Cross Section 3



Bankfull Dimensions	
12.6	x-section area (ft.sq.)
9.3	width (ft)
1.4	mean depth (ft)
1.8	max depth (ft)
10.8	wetted parimeter (ft)
1.2	hyd radi (ft)
6.8	width-depth ratio

Flood Dimensions	
---	W flood prone area (ft)
---	entrenchment ratio
---	low bank height (ft)
---	low bank height ratio

Materials	
9.1	D50 Bed (mm)
24	D84 Bed (mm)
13	threshold grain size (mm):

Bankfull Flow	
3.7	velocity (ft/s)
46.3	discharge rate (cfs)
0.60	Froude number

Flow Resistance	
0.027	Manning's roughness
0.08	D'Arcy-Weisbach fric.
10.0	resistance factor u/u*
17.3	relative roughness

Forces & Power	
0.36	channel slope (%)
0.26	shear stress (lb/sq.ft.)
0.37	shear velocity (ft/s)
1.12	unit strm power (lb/ft/s)

Cross Section

Riffle

reference ID	3	
instrument height	104.77	104.77
longitudinal station	269.5	270.0

Bankfull Stage

FS		---
elevation	97.87	---

Low Bank Height

FS		---
elevation		

Flood Prone Area

width fpa		18.2

Channel Slope

percent slope	0.36	1.5

Flow Resistance

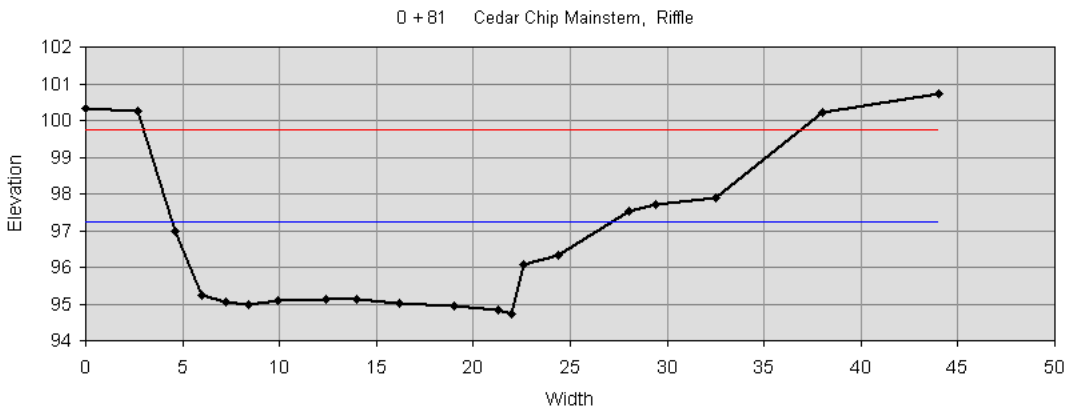
Manning's "n"		0.027
D'Arcy - Weisbach "f"		0.08

Note:

Distance (ft)	BS (ft)	HI (ft)	FS (ft)	Elevation (ft)	Omit Bkf	Notes
3.7		104.77	6.21	98.56	☐	lepog
4.8		104.77	6.65	98.12	☐	
7.8		104.77	6.85	97.92	☐	
8.7		104.77	7.28	97.49	☐	
9.5		104.77	7.76	97.01	☐	
10		104.77	7.91	96.86	☐	
10.2		104.77	8.15	96.62	☐	
10.6		104.77	8.48	96.29	☐	LEW
12.1		104.77	8.67	96.1	☐	
13.2		104.77	8.56	96.21	☐	
14.8		104.77	8.73	96.04	☐	thalweg
15.8		104.77	8.7	96.07	☐	
16.4		104.77	8.41	96.36	☐	REW
16.9		104.77	7.72	97.05	☐	
17.4		104.77	6.23	98.54	☐	
18		104.77	5.73	99.04	☐	
19.2		104.77	5.66	99.11	☐	
20.5		104.77	5.68	99.09	☐	
21.9		104.77	5.49	99.28	☐	

Lower Gunpowder Watershed Assessment
Drainage Area 11 Cedar Chip: XS-1

Cross Section 1



Bankfull Dimensions	
41.0	x-section area (ft.sq.)
22.6	width (ft)
1.8	mean depth (ft)
2.5	max depth (ft)
24.7	wetted parimeter (ft)
1.7	hyd radi (ft)
12.5	width-depth ratio

Flood Dimensions	
33.9	W flood prone area (ft)
1.5	entrenchment ratio
---	low bank height (ft)
---	low bank height ratio

Materials	
14	D50 Riffle (mm)
29	D84 Riffle (mm)
23	threshold grain size (mm):

Bankfull Flow	
5.1	velocity (ft/s)
207.6	discharge rate (cfs)
0.69	Froude number

Flow Resistance	
0.028	Manning's roughness
0.08	D'Arcy-Weisbach fric.
10.3	resistance factor u/u*
19.0	relative roughness

Forces & Power	
0.45	channel slope (%)
0.47	shear stress (lb/sq.ft.)
0.49	shear velocity (ft/s)
2.6	unit strm power (lb/ft/s)

Cross Section

	Riffle	
reference ID	1	
instrument height	105.78	100
longitudinal station	81	78.0

Bankfull Stage

FS		---
elevation	97.23	---

Low Bank Height

FS		---
elevation		

Flood Prone Area

width fpa		33.9

Channel Slope

percent slope		0.45

Flow Resistance

Manning's "n"		0.028
D'Arcy - Weisbach "f"		0.08

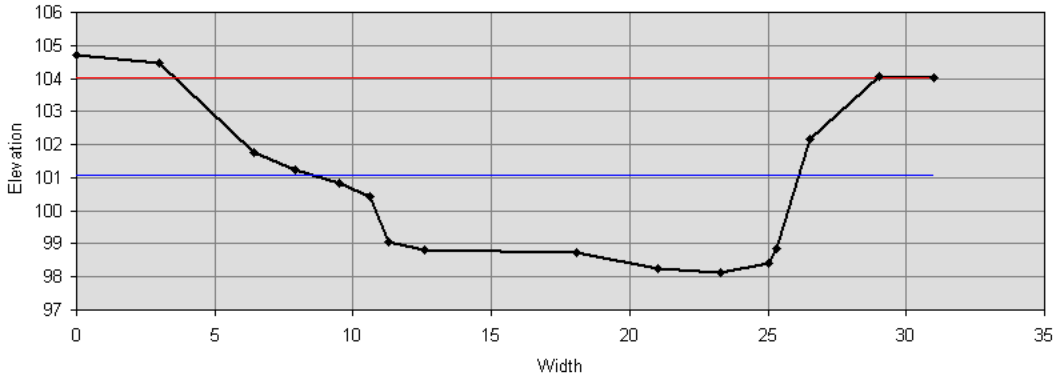
Note:

Distance (ft)	BS (ft)	HI (ft)	FS (ft)	Elevation (ft)	Omit Bkf	Notes
0		105.78	5.45	100.33	☐	
2.7		105.78	5.53	100.25	☐	
4.6		105.78	8.78	97	☐	
6		105.78	10.54	95.24	☐	Toe
7.2		105.78	10.73	95.05	☐	
8.4		105.78	10.8	94.98	☐	Depth 0.09
9.9		105.78	10.69	95.09	☐	Split Flow Rl
12.4		105.78	10.64	95.14	☐	Med ChanGr
14		105.78	10.66	95.12	☐	LEWDomina
16.2		105.78	10.75	95.03	☐	
19		105.78	10.83	94.95	☐	
21.3		105.78	10.95	94.83	☐	Depth 0.17
22		105.78	11.05	94.73	☐	
22.6		105.78	9.69	96.09	☐	Terrace
24.4		105.78	9.47	96.31	☐	Terrace
28		105.78	8.25	97.53	☐	Terrace
29.4		105.78	8.06	97.72	☐	Terrace
32.5		105.78	7.9	97.88	☐	Terrace
38		105.78	5.58	100.2	☐	TORB
44		105.78	5.05	100.73	☐	

Lower Gunpowder Watershed Assessment
Drainage Area 11 Cedar Chip: XS-2

Cross Section 2

1 + 81 Cedar Chip Mainstem, Riffle



Bankfull Dimensions	
37.8	x-section area (ft.sq.)
17.7	width (ft)
2.1	mean depth (ft)
3.0	max depth (ft)
20.5	wetted parimeter (ft)
1.8	hyd radi (ft)
8.3	width-depth ratio

Flood Dimensions	
25.4	W flood prone area (ft)
1.4	entrenchment ratio
---	low bank height (ft)
---	low bank height ratio

Materials	
14	D50 Riffle (mm)
29	D84 Riffle (mm)
25	threshold grain size (mm):

Bankfull Flow	
5.5	velocity (ft/s)
207.7	discharge rate (cfs)
0.71	Froude number

Flow Resistance	
0.027	Manning's roughness
0.07	D'Arcy-Weisbach fric.
10.7	resistance factor u/u*
22.5	relative roughness

Forces & Power	
0.45	channel slope (%)
0.52	shear stress (lb/sq.ft.)
0.52	shear velocity (ft/s)
3.3	unit strm power (lb/ft/s)

Cross Section

Riffle

reference ID	2	
instrument height	107.5	100
longitudinal station	181	185.0

Bankfull Stage

FS		---
elevation	101.09	---

Low Bank Height

FS		---
elevation		

Flood Prone Area

width fpa		25.4

Channel Slope

percent slope		0.45

Flow Resistance

Manning's "n"		0.027
D'Arcy - Weisbach "f"		0.07

Note:

Distance (ft)	BS (ft)	HI (ft)	FS (ft)	Elevation (ft)	Omit Bkf	Notes
0		107.5	2.78	104.72		
3		107.5	3.03	104.47		TOLB
6.4		107.5	5.74	101.76		
7.9		107.5	6.27	101.23		Terrace
9.5		107.5	6.68	100.82		Terrace
10.6		107.5	7.07	100.43		Terrace
11.3		107.5	8.43	99.07		BOLB/EW
12.6		107.5	8.7	98.8		
18.1		107.5	8.75	98.75		
21		107.5	9.26	98.24		0.96 depth
23.3		107.5	9.36	98.14		1.02 depth
25		107.5	9.1	98.4		
25.3		107.5	8.64	98.86		
26.5		107.5	5.33	102.17		REW
29		107.5	3.44	104.06		TORB
31		107.5	3.46	104.04		

Lower Gunpowder Watershed Assessment
Drainage Area 11 Cedar Chip: XS-3

Cross Section 3

Bankfull Dimensions	
42.8	x-section area (ft.sq.)
25.4	width (ft)
1.7	mean depth (ft)
2.4	max depth (ft)
27.5	wetted parimeter (ft)
1.6	hyd radi (ft)
15.0	width-depth ratio

Flood Dimensions	
31.2	W flood prone area (ft)
1.2	entrenchment ratio
---	low bank height (ft)
---	low bank height ratio

Materials	
14	D50 Riffle (mm)
29	D84 Riffle (mm)
21	threshold grain size (mm):

Bankfull Flow	
4.8	velocity (ft/s)
207.4	discharge rate (cfs)
0.68	Froude number

Flow Resistance	
0.028	Manning's roughness
0.08	D'Arcy-Weisbach fric.
10.2	resistance factor u/u*
17.7	relative roughness

Forces & Power	
0.45	channel slope (%)
0.44	shear stress (lb/sq.ft.)
0.47	shear velocity (ft/s)
2.3	unit strm power (lb/ft/s)

Cross Section

	Riffle	
reference ID	3	
instrument height	110.79	98.37
longitudinal station	346	338.0

Bankfull Stage

FS		---
elevation	101.73	---

Low Bank Height

FS		---
elevation		

Flood Prone Area

width fpa		31.2

Channel Slope

percent slope		0.45

Flow Resistance

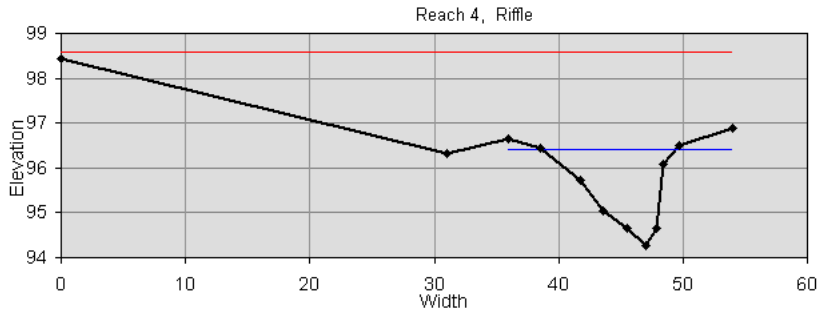
Manning's "n"		0.028
D'Arcy - Weisbach "f"		0.08

Note:

Distance (ft)	BS (ft)	HI (ft)	FS (ft)	Elevation (ft)	Omit Bkf	Notes
0		110.79	5.35	105.44	☐	
4		110.79	5.84	104.95	☐	
7		110.79	6.64	104.15	☐	
9		110.79	7	103.79	☐	TOB
11.2		110.79	9.49	101.3	☐	
12.2		110.79	10.05	100.74	☐	
12.5		110.79	11.37	99.42	☐	BOB Elevati
14		110.79	11.46	99.33	☐	Depth 0.35 u
15.6		110.79	11.4	99.39	☐	
16.9		110.79	10.91	99.88	☐	Mid Channel
20.3		110.79	10.76	100.03	☐	
21.6		110.79	10.62	100.17	☐	
23.7		110.79	10.54	100.25	☐	
27.3		110.79	10.68	100.11	☐	
28.2		110.79	10.85	99.94	☐	LOWWS
30.8		110.79	11.04	99.75	☐	
32.3		110.79	11.21	99.58	☐	
33.8		110.79	10.82	99.97	☐	EOW
37.1		110.79	8.41	102.38	☐	
39		110.79	5.65	105.14	☐	
42		110.79	5.21	105.58	☐	
44		110.79	5.15	105.64	☐	
					☐	
					☐	
					☐	
					☐	
					☐	
					☐	

Lower Gunpowder Watershed Assessment
Drainage Area 13 Pinedale: XS-1

Cross Section 1



Bankfull Dimensions	
11.4	x-section area (ft.sq.)
10.8	width (ft)
1.0	mean depth (ft)
2.2	max depth (ft)
12.3	wetted parimeter (ft)
0.9	hyd radi (ft)
10.3	width-depth ratio

Flood Dimensions	
---	W flood prone area (ft)
---	entrenchment ratio
---	low bank height (ft)
---	low bank height ratio

Materials	
23	D50 Bed (mm)
58	D84 Bed (mm)
54	threshold grain size (mm):

Bankfull Flow	
5.6	velocity (ft/s)
64.2	discharge rate (cfs)
1.03	Froude number

Flow Resistance	
0.035	Manning's roughness
0.14	D'Arcy-Weisbach fric.
7.5	resistance factor u/u*
5.5	relative roughness

Forces & Power	
1.9	channel slope (%)
1.10	shear stress (lb/sq.ft.)
0.75	shear velocity (ft/s)
7	unit strm power (lb/ft/s)

Cross Section

	Riffle	
reference ID	1	
instrument height	105.71	---
longitudinal station		---

Bankfull Stage

FS		---
elevation	96.42	---

Low Bank Height

FS		---
elevation		

Flood Prone Area

width fpa		54.0

Channel Slope

percent slope	1.9	---

Flow Resistance

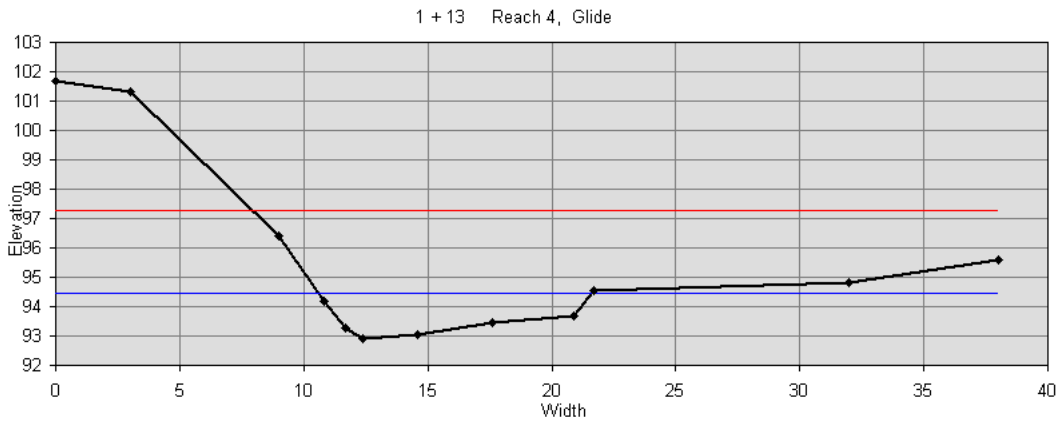
Manning's "n"		0.035
D'Arcy - Weisbach "f"		0.14

Note:

Distance (ft)	BS (ft)	HI (ft)	FS (ft)	Elevation (ft)	Omit Bkf	Notes
0		105.71	7.28	98.43	☑	toe vslly slOp
31		105.71	9.38	96.33	☑	fp
36		105.71	9.07	96.64	☐	fp
38.5		105.71	9.26	96.45	☐	lrob bkf
41.8		105.71	9.97	95.74	☐	
43.6		105.71	10.68	95.03	☐	
45.5		105.71	11.06	94.65	☐	lew
47.01		105.71	11.45	94.26	☐	sb tw
47.9		105.71	11.07	94.64	☐	rew
48.4		105.71	9.63	96.08	☐	rtob
49.7		105.71	9.22	96.49	☐	og
54		105.71	8.83	96.88	☐	

Lower Gunpowder Watershed Assessment
Drainage Area 13 Pinedale: XS-2

Cross Section 2



Bankfull Dimensions	
11.5	x-section area (ft.sq.)
11.0	width (ft)
1.0	mean depth (ft)
1.5	max depth (ft)
12.0	wetted parimeter (ft)
1.0	hyd radi (ft)
10.5	width-depth ratio

Flood Dimensions	
---	W flood prone area (ft)
---	entrenchment ratio
---	low bank height (ft)
---	low bank height ratio

Materials	
23	D50 Bed (mm)
58	D84 Bed (mm)
56	threshold grain size (mm):

Bankfull Flow	
5.6	velocity (ft/s)
64.3	discharge rate (cfs)
1.01	Froude number

Flow Resistance	
0.036	Manning's roughness
0.15	D'Arcy-Weisbach fric.
7.3	resistance factor u/u*
5.5	relative roughness

Forces & Power	
1.9	channel slope (%)
1.14	shear stress (lb/sq.ft.)
0.77	shear velocity (ft/s)
6.9	unit strm power (lb/ft/s)

Cross Section

	Glide	
reference ID	2	
instrument height	105.71	---
longitudinal station	113	---

Bankfull Stage

FS		---
elevation	94.44	---

Low Bank Height

FS		---
elevation		

Flood Prone Area

width fpa		30.1

Channel Slope

percent slope	1.9	---

Flow Resistance

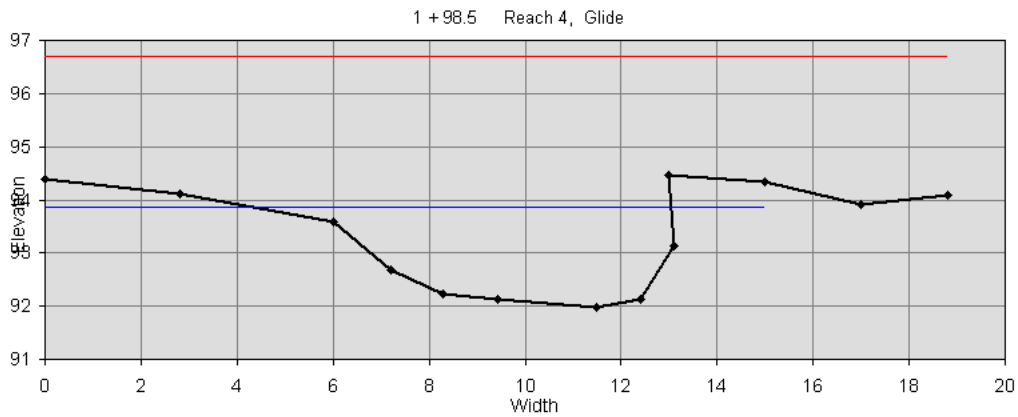
Manning's "n"		0.036
D'Arcy - Weisbach "f"		0.15

Note:

Distance (ft)	BS (ft)	HI (ft)	FS (ft)	Elevation (ft)	Omit Bkf	Notes
0		105.71	4.04	101.67	☐	
3		105.71	4.39	101.32	☐	LTOB
9		105.71	9.28	96.43	☐	
10.8		105.71	11.51	94.2	☐	
11.7		105.71	12.45	93.26	☐	LEW
12.4		105.71	12.81	92.9	☐	Streambed
14.6		105.71	12.66	93.05	☐	Streambed
17.6		105.71	12.25	93.46	☐	REW
20.9		105.71	12.01	93.7	☐	Toe of Bank/
21.7		105.71	11.16	94.55	☐	RTOB
32		105.71	10.9	94.81	☐	Floodplain S
38		105.71	10.1	95.61	☐	

Lower Gunpowder Watershed Assessment
Drainage Area 13 Pinedale: XS-3

Cross Section 3



Bankfull Dimensions	
10.7	x-section area (ft.sq.)
8.6	width (ft)
1.2	mean depth (ft)
1.9	max depth (ft)
10.4	wetted parimeter (ft)
1.0	hyd radi (ft)
7.0	width-depth ratio

Flood Dimensions	
---	W flood prone area (ft)
---	entrenchment ratio
---	low bank height (ft)
---	low bank height ratio

Materials	
23	D50 Bed (mm)
58	D84 Bed (mm)
60	threshold grain size (mm):

Bankfull Flow	
6.0	velocity (ft/s)
64.0	discharge rate (cfs)
1.04	Froude number

Flow Resistance	
0.035	Manning's roughness
0.14	D'Arcy-Weisbach fric.
7.6	resistance factor u/u*
6.5	relative roughness

Forces & Power	
1.9	channel slope (%)
1.22	shear stress (lb/sq.ft.)
0.79	shear velocity (ft/s)
8.8	unit strm power (lb/ft/s)

Cross Section

Glide

reference ID	3	
instrument height	105.71	---
longitudinal station	198.5	---

Bankfull Stage

FS		---
elevation	93.85	---

Low Bank Height

FS		---
elevation		

Flood Prone Area

width fpa		18.8

Channel Slope

percent slope	1.9	---

Flow Resistance

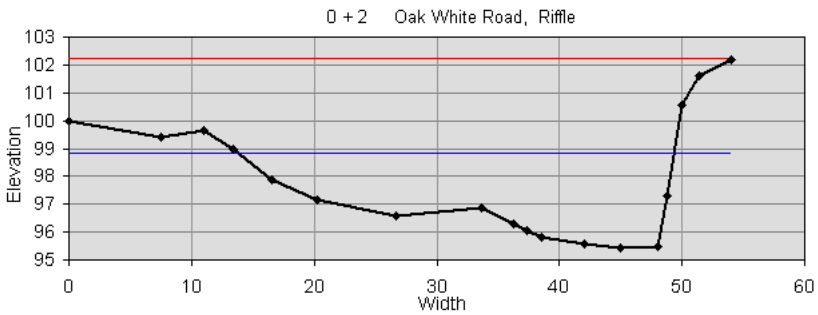
Manning's "n"		0.035
D'Arcy - Weisbach "f"		0.14

Note:

Distance (ft)	BS (ft)	HI (ft)	FS (ft)	Elevation (ft)	Omit Bkf	Notes
0		105.71	11.33	94.38	☐	
2.8		105.71	11.59	94.12	☐	
6		105.71	12.13	93.58	☐	LTOB
7.2		105.71	13.03	92.68	☐	
8.3		105.71	13.47	92.24	☐	Toe of Slope
9.43		105.71	13.58	92.13	☐	LEW
11.5		105.71	13.74	91.97	☐	Thalweg
12.4		105.71	13.57	92.14	☐	REW
13.1		105.71	12.57	93.14	☐	Toe at
13		105.71	11.25	94.46	☐	RTOB
15		105.71	11.37	94.34	☐	
17		105.71	11.8	93.91	☑	
18.8		105.71	11.63	94.08	☑	

Lower Gunpowder Watershed Assessment
Drainage Area 15 Oak White: XS-1

Cross Section 1



Bankfull Dimensions	
78.2	x-section area (ft.sq.)
35.4	width (ft)
2.2	mean depth (ft)
3.4	max depth (ft)
38.1	wetted parimeter (ft)
2.1	hyd radi (ft)
16.1	width-depth ratio

Flood Dimensions	
---	W flood prone area (ft)
---	entrenchment ratio
---	low bank height (ft)
---	low bank height ratio

Materials	
14	D50 Bed (mm)
27	D84 Bed (mm)
9	threshold grain size (mm):

Bankfull Flow	
3.5	velocity (ft/s)
274.3	discharge rate (cfs)
0.43	Froude number

Flow Resistance	
0.027	Manning's roughness
0.06	D'Arcy-Weisbach fric.
11.1	resistance factor u/u*
24.9	relative roughness

Forces & Power	
0.15	channel slope (%)
0.19	shear stress (lb/sq.ft.)
0.32	shear velocity (ft/s)
0.72	unit strm power (lb/ft/s)

Cross Section

	Riffle	
reference ID	1	
instrument height	104.99	---
longitudinal station	2	---

Bankfull Stage

FS		---
elevation	98.81	---

Low Bank Height

FS		---
elevation		

Flood Prone Area

width fpa		54.0

Channel Slope

percent slope		0.15

Flow Resistance

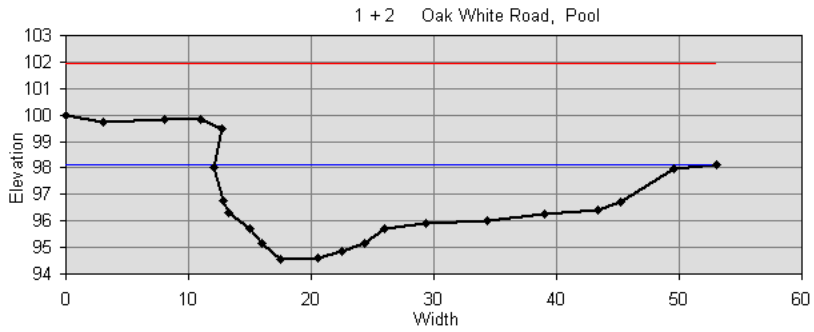
Manning's "n"		0.027
D'Arcy - Weisbach "f"		0.06

Note:

Distance (ft)	BS (ft)	HI (ft)	FS (ft)	Elevation (ft)	Omit Bkf	Notes
0		104.99	4.99	100	☐	lepog
7.5		104.99	5.58	99.41	☐	
11		104.99	5.35	99.64	☐	
13.4		104.99	5.99	99	☐	
16.5		104.99	7.13	97.86	☐	start gravel b
20.3		104.99	7.82	97.17	☐	
26.7		104.99	8.41	96.58	☐	
33.6		104.99	8.11	96.88	☐	
36.3		104.99	8.68	96.31	☐	
37.3		104.99	8.96	96.03	☐	
38.6		104.99	9.18	95.81	☐	LEW
42		104.99	9.42	95.57	☐	
45		104.99	9.58	95.41	☐	
48		104.99	9.5	95.49	☐	REW
48.8		104.99	7.67	97.32	☐	
50		104.99	4.45	100.54	☐	tob
51.4		104.99	3.38	101.61	☐	
54		104.99	2.81	102.18	☐	

Lower Gunpowder Watershed Assessment
Drainage Area 15 Oak White: XS-2

Cross Section 2



Bankfull Dimensions	
81.9	x-section area (ft.sq.)
40.9	width (ft)
2.0	mean depth (ft)
3.6	max depth (ft)
42.6	wetted parimeter (ft)
1.9	hyd radi (ft)
20.4	width-depth ratio

Flood Dimensions	
---	W flood prone area (ft)
---	entrenchment ratio
---	low bank height (ft)
---	low bank height ratio

Materials	
14	D50 Bed (mm)
27	D84 Bed (mm)
9	threshold grain size (mm):

Bankfull Flow	
3.4	velocity (ft/s)
275.6	discharge rate (cfs)
0.43	Froude number

Flow Resistance	
0.027	Manning's roughness
0.07	D'Arcy-Weisbach fric.
11.0	resistance factor u/u*
22.6	relative roughness

Forces & Power	
0.15	channel slope (%)
0.18	shear stress (lb/sq.ft.)
0.30	shear velocity (ft/s)
0.63	unit strm power (lb/ft/s)

Cross Section

Pool

reference ID	2	
instrument height	104.64	---
longitudinal station	102	---

Bankfull Stage

FS		---
elevation	98.11	---

Low Bank Height

FS		---
elevation		

Flood Prone Area

width fpa		53.0

Channel Slope

percent slope		0.15

Flow Resistance

Manning's "n"		0.026
D'Arcy - Weisbach "f"		0.07

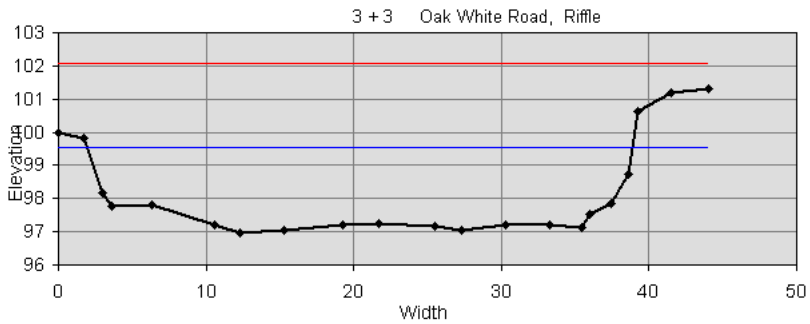
Note:

Run/Pool

Distance (ft)	BS (ft)	HI (ft)	FS (ft)	Elevation (ft)	Omit Bkf	Notes
0		104.64	4.64	100	☐	lepog
3		104.64	4.9	99.74	☐	
8		104.64	4.81	99.83	☐	
11		104.64	4.79	99.85	☐	
12.7		104.64	5.17	99.47	☐	tob
12.1		104.64	6.6	98.04	☐	
12.85		104.64	7.85	96.79	☐	
13.3		104.64	8.35	96.29	☐	
15		104.64	8.93	95.71	☐	
16		104.64	9.48	95.16	☐	LEW
17.5		104.64	10.08	94.56	☐	th
20.5		104.64	10.02	94.62	☐	
22.5		104.64	9.81	94.83	☐	
24.3		104.64	9.46	95.18	☐	REW
26		104.64	8.95	95.69	☐	
29.4		104.64	8.75	95.89	☐	
34.3		104.64	8.61	96.03	☐	
39		104.64	8.4	96.24	☐	
43.4		104.64	8.24	96.4	☐	
45.2		104.64	7.93	96.71	☐	end gravel b
49.6		104.64	6.68	97.96	☐	
53		104.64	6.54	98.1	☐	
					☐	
					☐	
					☐	
					☐	
					☐	
					☐	

Lower Gunpowder Watershed Assessment
Drainage Area 15 Oak White: XS-3

Cross Section 3



Bankfull Dimensions	
79.8	x-section area (ft.sq.)
36.9	width (ft)
2.2	mean depth (ft)
2.6	max depth (ft)
38.8	wetted parimeter (ft)
2.1	hyd radi (ft)
17.1	width-depth ratio

Flood Dimensions	
---	W flood prone area (ft)
---	entrenchment ratio
---	low bank height (ft)
---	low bank height ratio

Materials	
14	D50 Bed (mm)
27	D84 Bed (mm)
9	threshold grain size (mm):

Bankfull Flow	
3.4	velocity (ft/s)
274.5	discharge rate (cfs)
0.42	Froude number

Flow Resistance	
0.027	Manning's roughness
0.07	D'Arcy-Weisbach fric.
10.9	resistance factor u/u*
24.4	relative roughness

Forces & Power	
0.15	channel slope (%)
0.19	shear stress (lb/sq.ft.)
0.32	shear velocity (ft/s)
0.7	unit strm power (lb/ft/s)

Cross Section

Riffle

reference ID	3	
instrument height	106.78	---
longitudinal station	303	---

Bankfull Stage

FS		---
elevation	99.53	---

Low Bank Height

FS		---
elevation		

Flood Prone Area

width fpa		44.0

Channel Slope

percent slope		0.15

Flow Resistance

Manning's "n"		0.027
D'Arcy - Weisbach "f"		0.07

Note:

Class Riffle

Distance (ft)	BS (ft)	HI (ft)	FS (ft)	Elevation (ft)	Omit Bkf	Notes
0		106.78	6.78	100	☐	lepog
1.7		106.78	6.95	99.83	☐	
3		106.78	8.61	98.17	☐	
3.6		106.78	9.02	97.76	☐	
6.3		106.78	8.98	97.8	☐	
10.6		106.78	9.57	97.21	☐	LEW
12.3		106.78	9.81	96.97	☐	
15.3		106.78	9.74	97.04	☐	
19.3		106.78	9.58	97.2	☐	
21.7		106.78	9.53	97.25	☐	
25.5		106.78	9.63	97.15	☐	
27.3		106.78	9.72	97.06	☐	
30.3		106.78	9.59	97.19	☐	
33.3		106.78	9.56	97.22	☐	
35.4		106.78	9.64	97.14	☐	REW
36		106.78	9.27	97.51	☐	
37.4		106.78	8.94	97.84	☐	
38.6		106.78	8.04	98.74	☐	
39.2		106.78	6.15	100.63	☐	tob
41.5		106.78	5.58	101.2	☐	
44		106.78	5.48	101.3	☐	
					☐	
					☐	
					☐	
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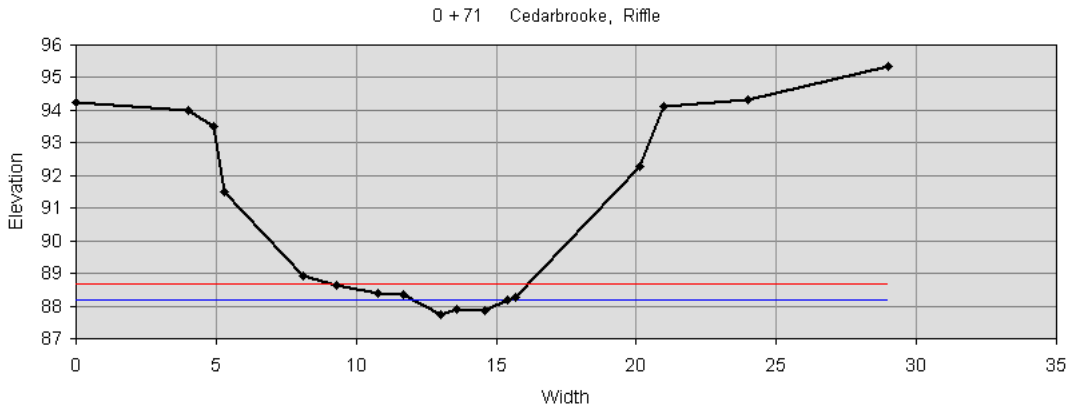
					☐	
					☐	
					☐	

Lower Gunpowder Watershed Assessment
Drainage Area 16 Cedarbrooke: XS-1

Cross Section 1



Bankfull Dimensions	
0.9	x-section area (ft.sq.)
3.5	width (ft)
0.3	mean depth (ft)
0.5	max depth (ft)
3.7	wetted parimeter (ft)
0.2	hyd radi (ft)
13.3	width-depth ratio

Flood Dimensions	
7.1	W flood prone area (ft)
2.0	entrenchment ratio
---	low bank height (ft)
---	low bank height ratio

Materials	
14	D50 Riffle (mm)
29	D84 Riffle (mm)
14	threshold grain size (mm):

Bankfull Flow	
2.3	velocity (ft/s)
2.1	discharge rate (cfs)
0.80	Froude number

Flow Resistance	
0.036	Manning's roughness
0.24	D'Arcy-Weisbach fric.
5.8	resistance factor u/u*
2.8	relative roughness

Forces & Power	
1.89	channel slope (%)
0.29	shear stress (lb/sq.ft.)
0.39	shear velocity (ft/s)
0.7	unit strm power (lb/ft/s)

Cross Section

	Riffle	
reference ID	1	
instrument height	100.12	100.61
longitudinal station	71	71.0

Bankfull Stage

FS		---
elevation	88.2	---

Low Bank Height

FS		---
elevation		

Flood Prone Area

width fpa		7.1

Channel Slope

percent slope	1.89	4.8

Flow Resistance

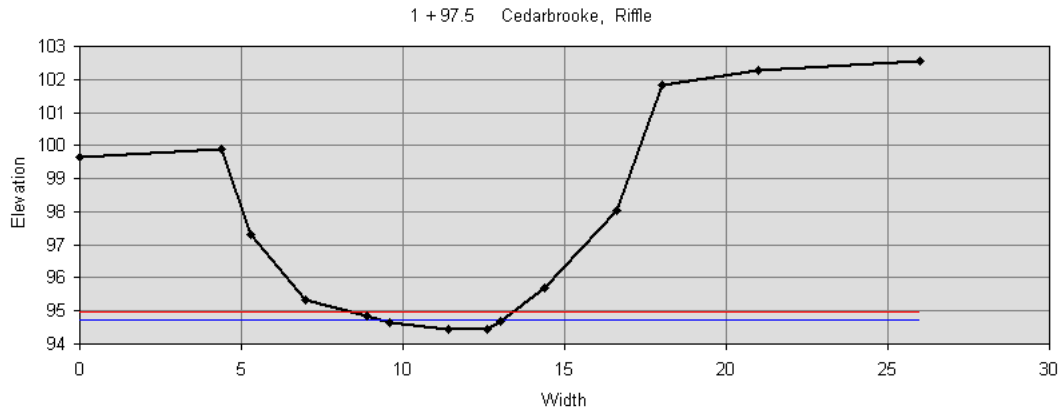
Manning's "n"		0.036
D'Arcy - Weisbach "f"		0.24

Note:

Distance (ft)	BS (ft)	HI (ft)	FS (ft)	Elevation (ft)	Omit Bkf	Notes
0		100.12	5.86	94.26	☐	
4		100.12	6.12	94	☐	TOB
4.9		100.12	6.62	93.5	☐	
5.3		100.12	8.64	91.48	☐	Bank Shot
8.1		100.12	11.2	88.92	☐	
9.3		100.12	11.5	88.62	☐	BOLB
10.8		100.12	11.73	88.39	☐	
11.7		100.12	11.77	88.35	☐	EW
13		100.12	12.4	87.72	☐	
13.6		100.12	12.2	87.92	☐	
14.6		100.12	12.25	87.87	☐	Depth 0.28
15.4		100.12	11.94	88.18	☐	EW
15.7		100.12	11.87	88.25	☐	BORB
20.1		100.12	7.86	92.26	☐	
21		100.12	6	94.12	☐	TORB
24		100.12	5.78	94.34	☐	
29		100.12	4.77	95.35	☐	

Lower Gunpowder Watershed Assessment
Drainage Area 16 Cedarbrooke: XS-2

Cross Section 2



Bankfull Dimensions	
0.7	x-section area (ft.sq.)
3.6	width (ft)
0.2	mean depth (ft)
0.3	max depth (ft)
3.7	wetted parimeter (ft)
0.2	hyd radi (ft)
20.3	width-depth ratio

Flood Dimensions	
5.0	W flood prone area (ft)
1.4	entrenchment ratio
---	low bank height (ft)
---	low bank height ratio

Materials	
14	D50 Riffle (mm)
29	D84 Riffle (mm)
41	threshold grain size (mm):

Bankfull Flow	
3.1	velocity (ft/s)
2.0	discharge rate (cfs)
1.31	Froude number

Flow Resistance	
0.041	Manning's roughness
0.36	D'Arcy-Weisbach fric.
4.7	resistance factor u/u*
1.9	relative roughness

Forces & Power	
7.55	channel slope (%)
0.83	shear stress (lb/sq.ft.)
0.65	shear velocity (ft/s)
2.6	unit strm power (lb/ft/s)

Cross Section

	Riffle	
reference ID	2	
instrument height	107.92	100.61
longitudinal station	197.5	194.0

Bankfull Stage

FS		---
elevation	94.71	---

Low Bank Height

FS		---
elevation		

Flood Prone Area

width fpa		5.0

Channel Slope

percent slope	7.55	4.8

Flow Resistance

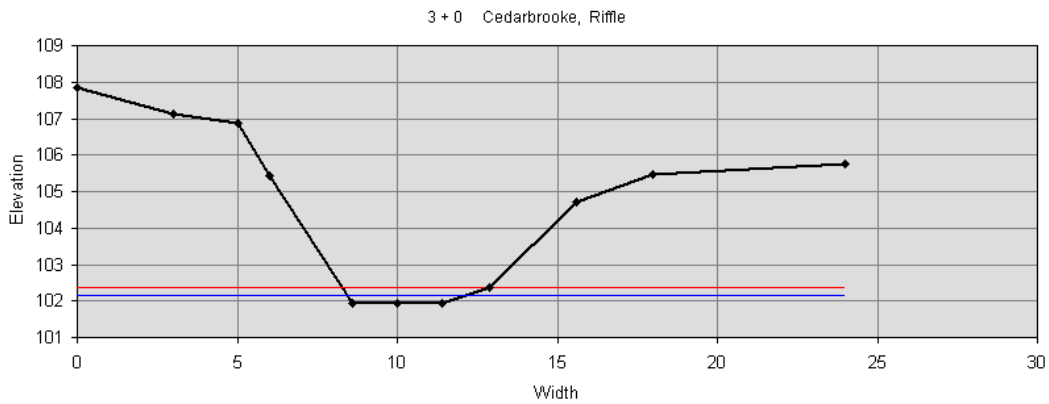
Manning's "n"		0.041
D'Arcy - Weisbach "f"		0.36

Note:

Distance (ft)	BS (ft)	HI (ft)	FS (ft)	Elevation (ft)	Omit Bkf	Notes
0		107.92	8.26	99.66		
4.4		107.92	8.01	99.91		TOLB
5.3		107.92	10.61	97.31		Bank Shot
7		107.92	12.57	95.35		
8.9		107.92	13.08	94.84		
9.6		107.92	13.27	94.65		EW
11.4		107.92	13.46	94.46		Depth 0.21
12.6		107.92	13.48	94.44		
13		107.92	13.23	94.69		
14.4		107.92	12.21	95.71		
16.6		107.92	9.9	98.02		
18		107.92	6.09	101.83		TOB
21		107.92	5.63	102.29		
26		107.92	5.36	102.56		

Lower Gunpowder Watershed Assessment
Drainage Area 16 Cedarbrooke: XS-3

Cross Section 3



Bankfull Dimensions	
0.7	x-section area (ft.sq.)
3.6	width (ft)
0.2	mean depth (ft)
0.2	max depth (ft)
3.8	wetted parimeter (ft)
0.2	hyd radi (ft)
19.5	width-depth ratio

Flood Dimensions	
4.6	W flood prone area (ft)
1.3	entrenchment ratio
---	low bank height (ft)
---	low bank height ratio

Materials	
14	D50 Riffle (mm)
29	D84 Riffle (mm)
42	threshold grain size (mm):

Bankfull Flow	
3.1	velocity (ft/s)
2.1	discharge rate (cfs)
1.27	Froude number

Flow Resistance	
0.043	Manning's roughness
0.37	D'Arcy-Weisbach fric.
4.6	resistance factor u/u*
2.0	relative roughness

Forces & Power	
7.55	channel slope (%)
0.85	shear stress (lb/sq.ft.)
0.66	shear velocity (ft/s)
2.7	unit strm power (lb/ft/s)

Cross Section

	Riffle	
reference ID	3	
instrument height	110.91	109.39
longitudinal station	300	297.0

Bankfull Stage

FS		---
elevation	102.14	---

Low Bank Height

FS		---
elevation		

Flood Prone Area

width fpa		4.6

Channel Slope

percent slope	7.55	4.8

Flow Resistance

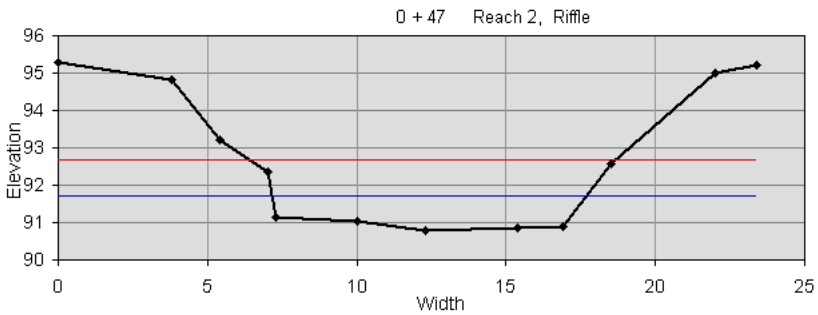
Manning's "n"		0.043
D'Arcy - Weisbach "f"		0.37

Note:

Distance (ft)	BS (ft)	HI (ft)	FS (ft)	Elevation (ft)	Omit Bkf	Notes
0		110.91	3.06	107.85	☐	
3		110.91	3.78	107.13	☐	
5		110.91	4.03	106.88	☐	
6		110.91	5.49	105.42	☐	
8.6		110.91	8.98	101.93	☐	BOLB/EW
10		110.91	8.99	101.92	☐	Depth 0.11
11.4		110.91	8.97	101.94	☐	EW
12.9		110.91	8.53	102.38	☐	BORB
15.6		110.91	6.19	104.72	☐	
18		110.91	5.43	105.48	☐	
24		110.91	5.17	105.74	☐	

Lower Gunpowder Watershed Assessment
Drainage Area 18 Hallbrook: XS-1

Cross Section 1



Bankfull Dimensions	
8.2	x-section area (ft.sq.)
10.5	width (ft)
0.8	mean depth (ft)
1.0	max depth (ft)
11.4	wetted parimeter (ft)
0.7	hyd radi (ft)
13.6	width-depth ratio

Flood Dimensions	
12.3	W flood prone area (ft)
1.2	entrenchment ratio
---	low bank height (ft)
---	low bank height ratio

Materials	
18	D50 Bed (mm)
60	D84 Bed (mm)
73	threshold grain size (mm):

Bankfull Flow	
5.5	velocity (ft/s)
45.4	discharge rate (cfs)
1.15	Froude number

Flow Resistance	
0.039	Manning's roughness
0.20	D'Arcy-Weisbach fric.
6.3	resistance factor u/u*
3.9	relative roughness

Forces & Power	
3.3	channel slope (%)
1.48	shear stress (lb/sq.ft.)
0.87	shear velocity (ft/s)
8.9	unit strm power (lb/ft/s)

Cross Section

Riffle

reference ID	1	
instrument height	100	---
longitudinal station	47	---

Bankfull Stage

FS		---
elevation	91.73	---

Low Bank Height

FS		---
elevation		

Flood Prone Area

width fpa		12.3

Channel Slope

percent slope		3.3

Flow Resistance

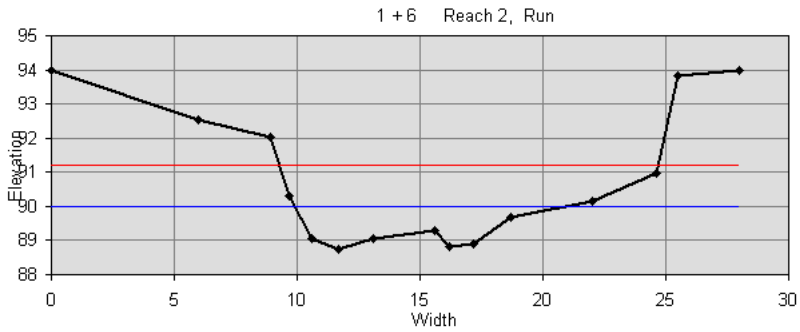
Manning's "n"		0.039
D'Arcy - Weisbach "f"		0.20

Note:

Distance (ft)	BS (ft)	HI (ft)	FS (ft)	Elevation (ft)	Omit Bkf	Notes
0		100	4.73	95.27	☐	lepog
3.8		100	5.18	94.82	☐	tob
5.4		100	6.8	93.2	☐	
7		100	7.66	92.34	☐	
7.3		100	8.86	91.14	☐	LEW
10		100	8.98	91.02	☐	
12.3		100	9.23	90.77	☐	
15.4		100	9.15	90.85	☐	
16.9		100	9.1	90.9	☐	tos
18.5		100	7.44	92.56	☐	
22		100	5.01	94.99	☐	tob
23.4		100	4.8	95.2	☐	

Lower Gunpowder Watershed Assessment
Drainage Area 18 Hallbrook: XS-2

Cross Section 2



Bankfull Dimensions	
8.1	x-section area (ft.sq.)
10.8	width (ft)
0.7	mean depth (ft)
1.2	max depth (ft)
11.7	wetted parimeter (ft)
0.7	hyd radi (ft)
14.4	width-depth ratio

Flood Dimensions	
15.4	W flood prone area (ft)
1.4	entrenchment ratio
---	low bank height (ft)
---	low bank height ratio

Materials	
18	D50 Bed (mm)
60	D84 Bed (mm)
70	threshold grain size (mm):

Bankfull Flow	
5.5	velocity (ft/s)
45.0	discharge rate (cfs)
1.18	Froude number

Flow Resistance	
0.038	Manning's roughness
0.19	D'Arcy-Weisbach fric.
6.5	resistance factor u/u*
3.8	relative roughness

Forces & Power	
3.3	channel slope (%)
1.42	shear stress (lb/sq.ft.)
0.86	shear velocity (ft/s)
8.6	unit strm power (lb/ft/s)

Cross Section

	Run	
reference ID	2	
instrument height	100	---
longitudinal station	106	---

Bankfull Stage

FS		---
elevation	89.98	---

Low Bank Height

FS		---
elevation		

Flood Prone Area

width fpa		15.4

Channel Slope

percent slope		3.3

Flow Resistance

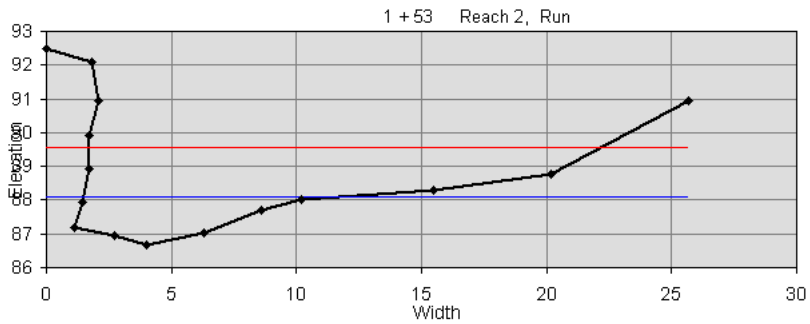
Manning's "n"		0.038
D'Arcy - Weisbach "f"		0.19

Note:

Distance (ft)	BS (ft)	HI (ft)	FS (ft)	Elevation (ft)	Omit Bkf	Notes
0		100	6.03	93.97	☐	repog
6		100	7.45	92.55	☐	
8.9		100	7.99	92.01	☐	tob
9.7		100	9.71	90.29	☐	
10.6		100	10.94	89.06	☐	tos
11.7		100	11.26	88.74	☐	thalweg
13.1		100	10.95	89.05	☐	REW
15.6		100	10.72	89.28	☐	
16.2		100	11.17	88.83	☐	
17.2		100	11.12	88.88	☐	
18.7		100	10.33	89.67	☐	
22		100	9.83	90.17	☐	
24.6		100	9.04	90.96	☐	
25.5		100	6.17	93.83	☐	tob
28		100	6	94	☐	

Lower Gunpowder Watershed Assessment
Drainage Area 18 Hallbrook: XS-3

Cross Section 3



Bankfull Dimensions	
8.2	x-section area (ft.sq.)
10.6	width (ft)
0.8	mean depth (ft)
1.4	max depth (ft)
12.2	wetted parimeter (ft)
0.7	hyd radi (ft)
13.7	width-depth ratio

Flood Dimensions	
20.5	W flood prone area (ft)
1.9	entrenchment ratio
---	low bank height (ft)
---	low bank height ratio

Materials	
18	D50 Bed (mm)
60	D84 Bed (mm)
68	threshold grain size (mm):

Bankfull Flow	
5.5	velocity (ft/s)
45.4	discharge rate (cfs)
1.19	Froude number

Flow Resistance	
0.038	Manning's roughness
0.19	D'Arcy-Weisbach fric.
6.5	resistance factor u/u*
3.9	relative roughness

Forces & Power	
3.3	channel slope (%)
1.39	shear stress (lb/sq.ft.)
0.85	shear velocity (ft/s)
8.8	unit strm power (lb/ft/s)

Cross Section

	Run	
reference ID	3	
instrument height	100	---
longitudinal station	153	---

Bankfull Stage

FS		---
elevation	88.1	---

Low Bank Height

FS		---
elevation		

Flood Prone Area

width fpa		20.5

Channel Slope

percent slope		3.3

Flow Resistance

Manning's "n"		0.038
D'Arcy - Weisbach "f"		0.19

Note:

Distance (ft)	BS (ft)	HI (ft)	FS (ft)	Elevation (ft)	Omit Bkf	Notes
0		100	7.52	92.48	☐	lepog
1.8		100	7.91	92.09	☐	tob
2.1		100	9.07	90.93	☐	
1.7		100	10.07	89.93	☐	
1.7		100	11.07	88.93	☐	
1.45		100	12.07	87.93	☐	
1.1		100	12.82	87.18	☐	LEW
2.7		100	13.07	86.93	☐	
4		100	13.34	86.66	☐	thalweg
6.3		100	12.97	87.03	☐	REW
8.6		100	12.28	87.72	☐	
10.2		100	12	88	☐	
15.5		100	11.72	88.28	☐	
20.2		100	11.25	88.75	☐	
25.7		100	9.05	90.95	☐	

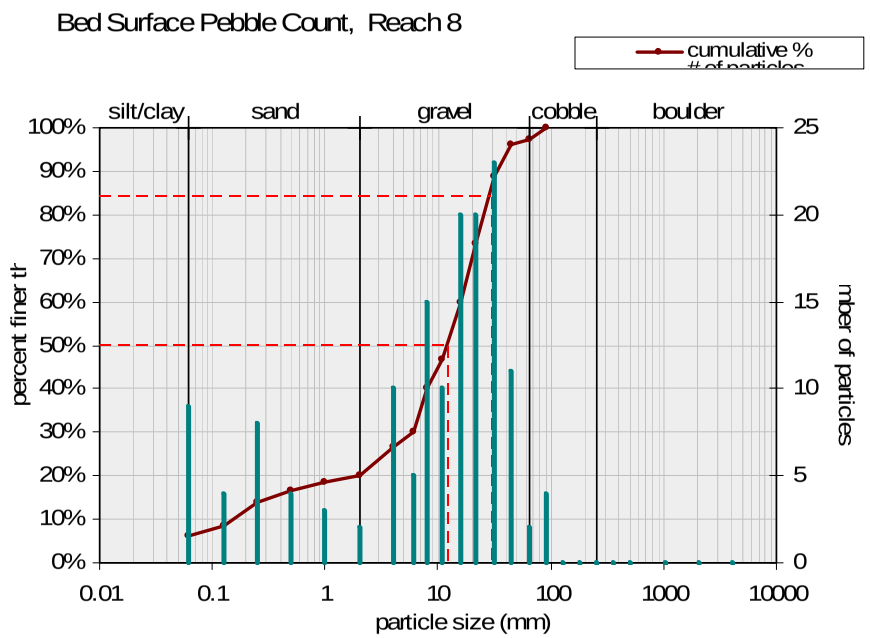
APPENDIX B.3:
SEDIMENT DATA

Lower Gunpowder Watershed Assessment
Drainage Area 1: Wiffle Tree Pebble Count

Bed Surface

Material	Size Range (mm)	Count
silt/clay	0 - 0.062	9
very fine sand	0.062 - 0.125	4
fine sand	0.125 - 0.25	8
medium sand	0.25 - 0.5	4
coarse sand	0.5 - 1	3
very coarse sand	1 - 2	2
very fine gravel	2 - 4	10
fine gravel	4 - 6	5
fine gravel	6 - 8	15
medium gravel	8 - 11	10
medium gravel	11 - 16	20
coarse gravel	16 - 22	20
coarse gravel	22 - 32	23
very coarse gravel	32 - 45	11
very coarse gravel	45 - 64	2
small cobble	64 - 90	4
medium cobble	90 - 128	0
large cobble	128 - 180	0
very large cobble	180 - 256	0
small boulder	256 - 362	0
small boulder	362 - 512	0
medium boulder	512 - 1024	0
large boulder	1024 - 2048	0
very large boulder	2048 - 4096	0
total particle count:		150
bedrock	----------	
clay hardpan	----------	
detritus/wood	----------	
artificial	----------	
total count:		150

Note:



Size (mm)	
D16	0.42
D35	6.9
D50	12
D65	18
D84	29
D95	43

Size Distribution	
mean	3.5
dispersion	15.5
skewness	-0.40

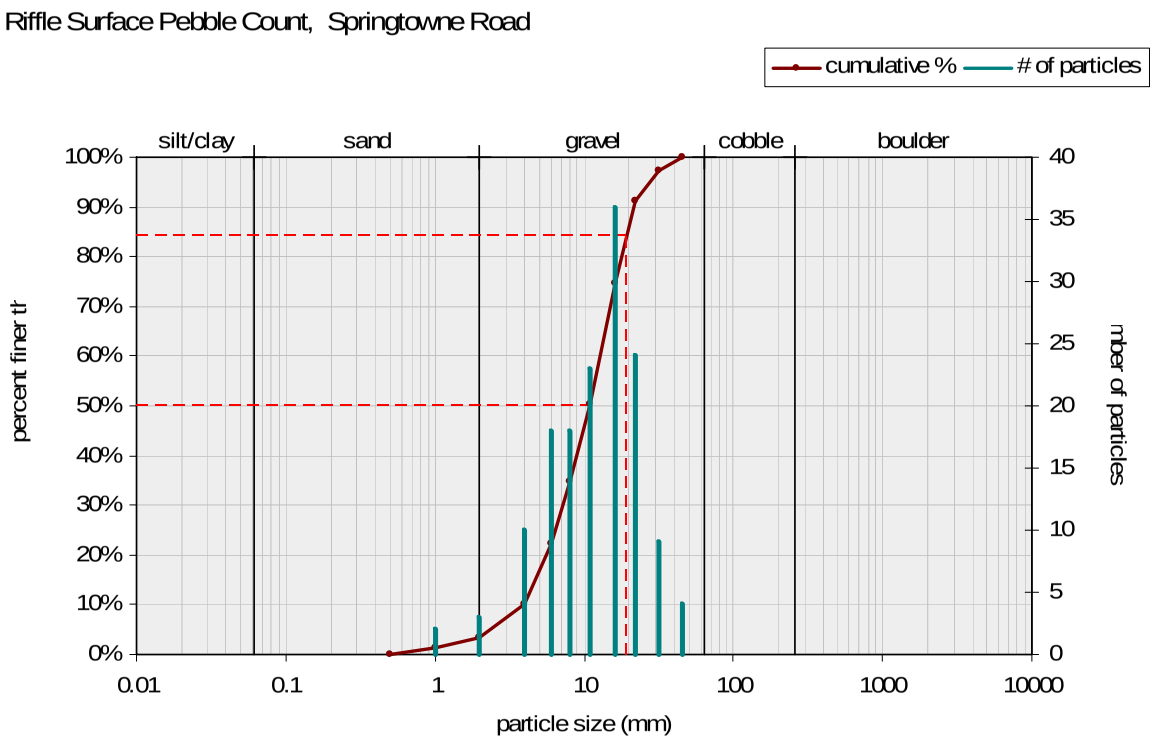
Type	
silt/clay	6%
sand	14%
gravel	77%
cobble	3%
boulder	0%

Lower Gunpowder Watershed Assessment
Drainage Area 2: SpringTowne Pebble Count

Riffle Surface

Material	Size Range (mm)	Count
silt/clay	0 - 0.062	
very fine sand	0.062 - 0.125	
fine sand	0.125 - 0.25	
medium sand	0.25 - 0.5	
coarse sand	0.5 - 1	2
very coarse sand	1 - 2	3
very fine gravel	2 - 4	10
fine gravel	4 - 6	18
fine gravel	6 - 8	18
medium gravel	8 - 11	23
medium gravel	11 - 16	36
coarse gravel	16 - 22	24
coarse gravel	22 - 32	9
very coarse gravel	32 - 45	4
very coarse gravel	45 - 64	
small cobble	64 - 90	
medium cobble	90 - 128	
large cobble	128 - 180	
very large cobble	180 - 256	
small boulder	256 - 362	
small boulder	362 - 512	
medium boulder	512 - 1024	
large boulder	1024 - 2048	
very large boulder	2048 - 4096	
total particle count:		147
bedrock	----------	
clay hardpan	----------	
detritus/wood	----------	
artificial	----------	
total count:		147

Note:



Size (mm)	
D16	4.8
D35	8.1
D50	11
D65	14
D84	19
D95	28

Size Distribution	
mean	9.5
dispersion	2.0
skewness	-0.08

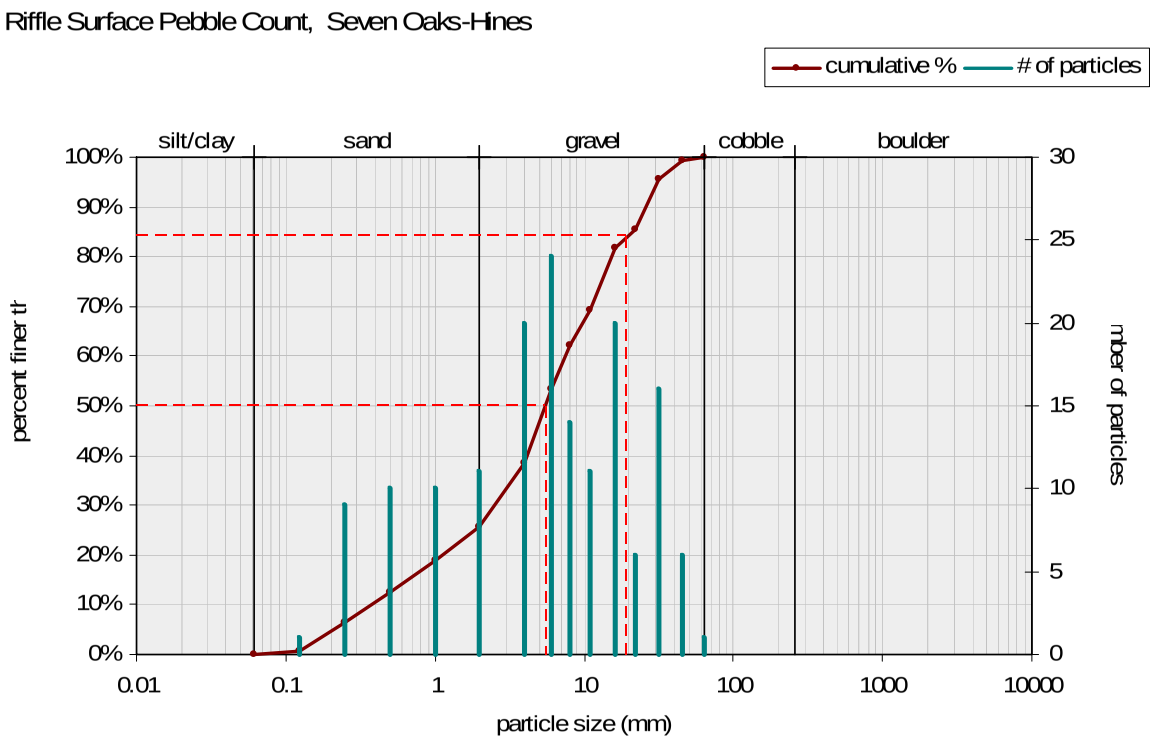
Type	
silt/clay	0%
sand	3%
gravel	97%
cobble	0%
boulder	0%

Lower Gunpowder Watershed Assessment
Drainage Area 4: Seven Oaks Hines Pebble Count

Riffle Surface

Material	Size Range (mm)	Count
silt/clay	0 - 0.062	
very fine sand	0.062 - 0.125	1
fine sand	0.125 - 0.25	9
medium sand	0.25 - 0.5	10
coarse sand	0.5 - 1	10
very coarse sand	1 - 2	11
very fine gravel	2 - 4	20
fine gravel	4 - 6	24
fine gravel	6 - 8	14
medium gravel	8 - 11	11
medium gravel	11 - 16	20
coarse gravel	16 - 22	6
coarse gravel	22 - 32	16
very coarse gravel	32 - 45	6
very coarse gravel	45 - 64	1
small cobble	64 - 90	
medium cobble	90 - 128	
large cobble	128 - 180	
very large cobble	180 - 256	
small boulder	256 - 362	
small boulder	362 - 512	
medium boulder	512 - 1024	
large boulder	1024 - 2048	
very large boulder	2048 - 4096	
total particle count:		159
bedrock	----------	
clay hardpan	----------	
detritus/wood	----------	
artificial	----------	
total count:		159

Note:



Size (mm)	
D16	0.73
D35	3.3
D50	5.5
D65	9.1
D84	19
D95	31

Size Distribution	
mean	3.7
dispersion	5.5
skewness	-0.14

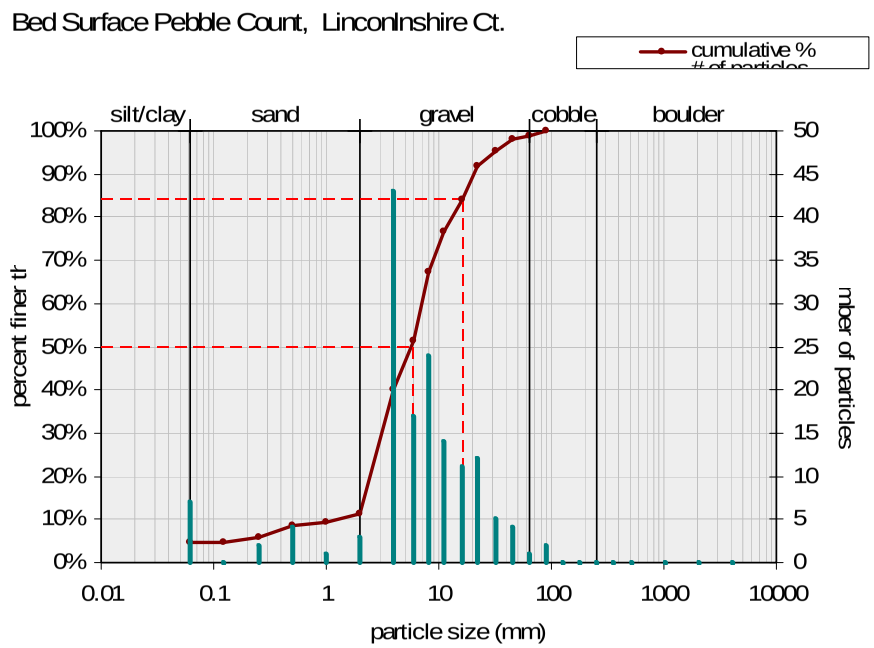
Type	
silt/clay	0%
sand	26%
gravel	74%
cobble	0%
boulder	0%

Lower Gunpowder Watershed Assessment
Drainage Area 4: Lincolnshire Pebble Count

Bed Surface

Material	Size Range (mm)	Count
silt/clay	0 - 0.062	7
very fine sand	0.062 - 0.125	0
fine sand	0.125 - 0.25	2
medium sand	0.25 - 0.5	4
coarse sand	0.5 - 1	1
very coarse sand	1 - 2	3
very fine gravel	2 - 4	43
fine gravel	4 - 6	17
fine gravel	6 - 8	24
medium gravel	8 - 11	14
medium gravel	11 - 16	11
coarse gravel	16 - 22	12
coarse gravel	22 - 32	5
very coarse gravel	32 - 45	4
very coarse gravel	45 - 64	1
small cobble	64 - 90	2
medium cobble	90 - 128	0
large cobble	128 - 180	0
very large cobble	180 - 256	0
small boulder	256 - 362	0
small boulder	362 - 512	0
medium boulder	512 - 1024	0
large boulder	1024 - 2048	0
very large boulder	2048 - 4096	0
total particle count:		150
bedrock	----------	
clay hardpan	----------	
detritus/wood	----------	
artificial	----------	
total count:		150

Note:



Size (mm)	
D16	2.2
D35	3.5
D50	5.7
D65	7.7
D84	16
D95	31

Size Distribution	
mean	5.9
dispersion	2.7
skewness	0.02

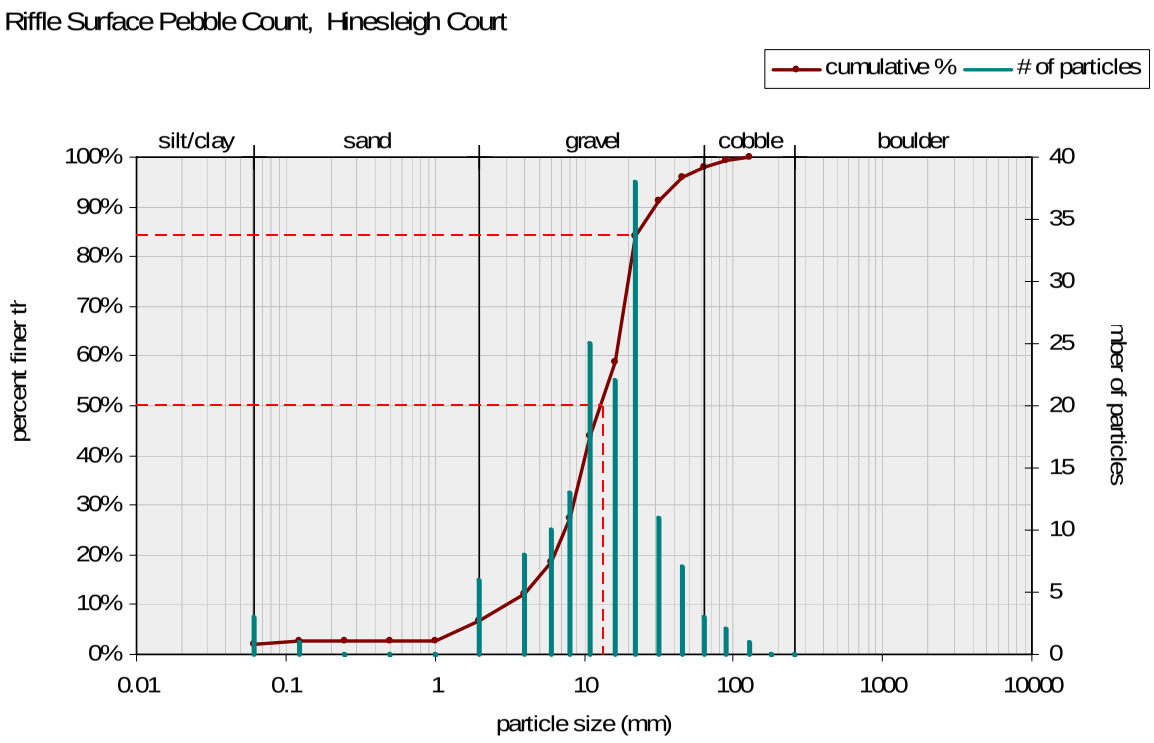
Type	
silt/clay	5%
sand	7%
gravel	87%
cobble	1%
boulder	0%

Lower Gunpowder Watershed Assessment
Drainage Area 5: Hinesleigh Pebble Count

Riffle Surface

Material	Size Range (mm	Count
silt/clay	0 - 0.062	3
very fine sand	0.062 - 0.125	1
fine sand	0.125 - 0.25	0
medium sand	0.25 - 0.5	0
coarse sand	0.5 - 1	0
very coarse sand	1 - 2	6
very fine gravel	2 - 4	8
fine gravel	4 - 6	10
fine gravel	6 - 8	13
medium gravel	8 - 11	25
medium gravel	11 - 16	22
coarse gravel	16 - 22	38
coarse gravel	22 - 32	11
very coarse gravel	32 - 45	7
very coarse gravel	45 - 64	3
small cobble	64 - 90	2
medium cobble	90 - 128	1
large cobble	128 - 180	0
very large cobble	180 - 256	0
small boulder	256 - 362	
small boulder	362 - 512	
medium boulder	512 - 1024	
large boulder	1024 - 2048	
very large boulder	2048 - 4096	
total particle count:		150
bedrock		
clay hardpan		
detritus/wood		
artificial		
total count:		150

Note:



Size (mm)	
D16	5.1
D35	9.3
D50	13
D65	17
D84	22
D95	42

Size Distribution	
mean	10.6
dispersion	2.1
skewness	-0.11

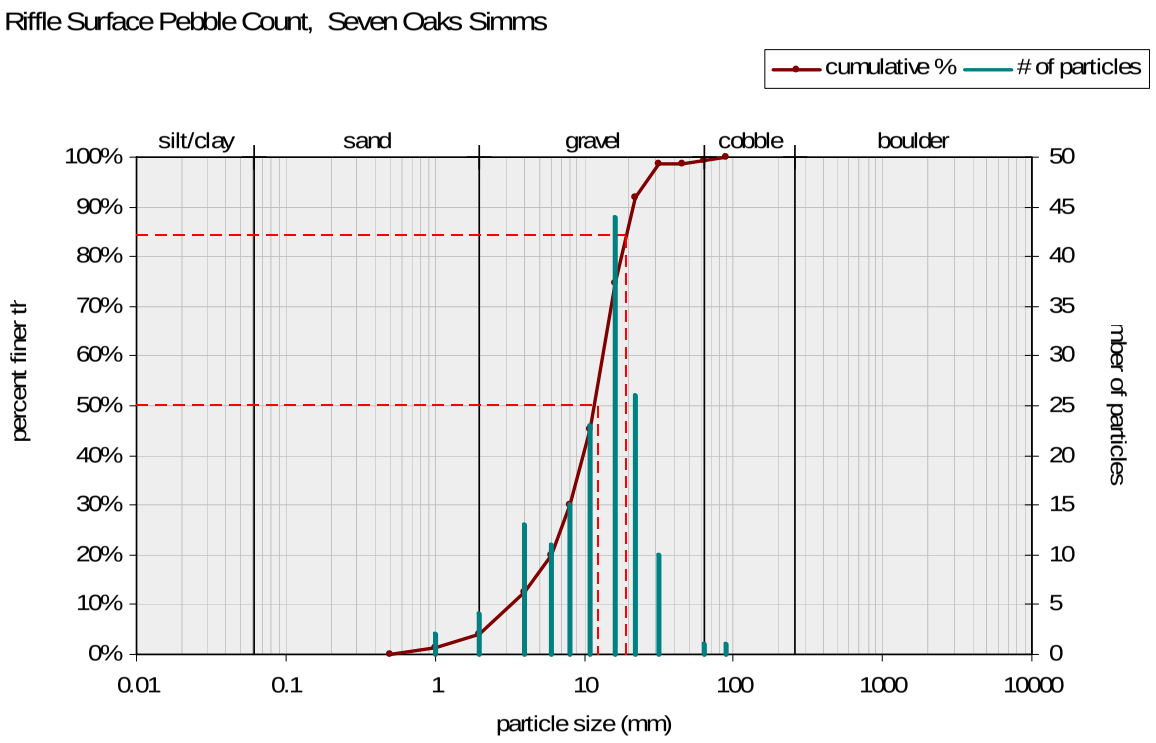
Type	
silt/clay	2%
sand	5%
gravel	91%
cobble	2%
boulder	0%

Lower Gunpowder Watershed Assessment
Drainage Area 5: Seven Oaks Simms Pebble Count

Riffle Surface

Material	Size Range (mm)	Count
silt/clay	0 - 0.062	
very fine sand	0.062 - 0.125	
fine sand	0.125 - 0.25	
medium sand	0.25 - 0.5	
coarse sand	0.5 - 1	2
very coarse sand	1 - 2	4
very fine gravel	2 - 4	13
fine gravel	4 - 6	11
fine gravel	6 - 8	15
medium gravel	8 - 11	23
medium gravel	11 - 16	44
coarse gravel	16 - 22	26
coarse gravel	22 - 32	10
very coarse gravel	32 - 45	
very coarse gravel	45 - 64	1
small cobble	64 - 90	1
medium cobble	90 - 128	
large cobble	128 - 180	
very large cobble	180 - 256	
small boulder	256 - 362	
small boulder	362 - 512	
medium boulder	512 - 1024	
large boulder	1024 - 2048	
very large boulder	2048 - 4096	
total particle count:		150
bedrock	----------	
clay hardpan	----------	
detritus/wood	----------	
artificial	----------	
total count:		150

Note:



Size (mm)	
D16	4.8
D35	8.9
D50	12
D65	14
D84	19
D95	26

Size Distribution	
mean	9.5
dispersion	2.0
skewness	-0.13

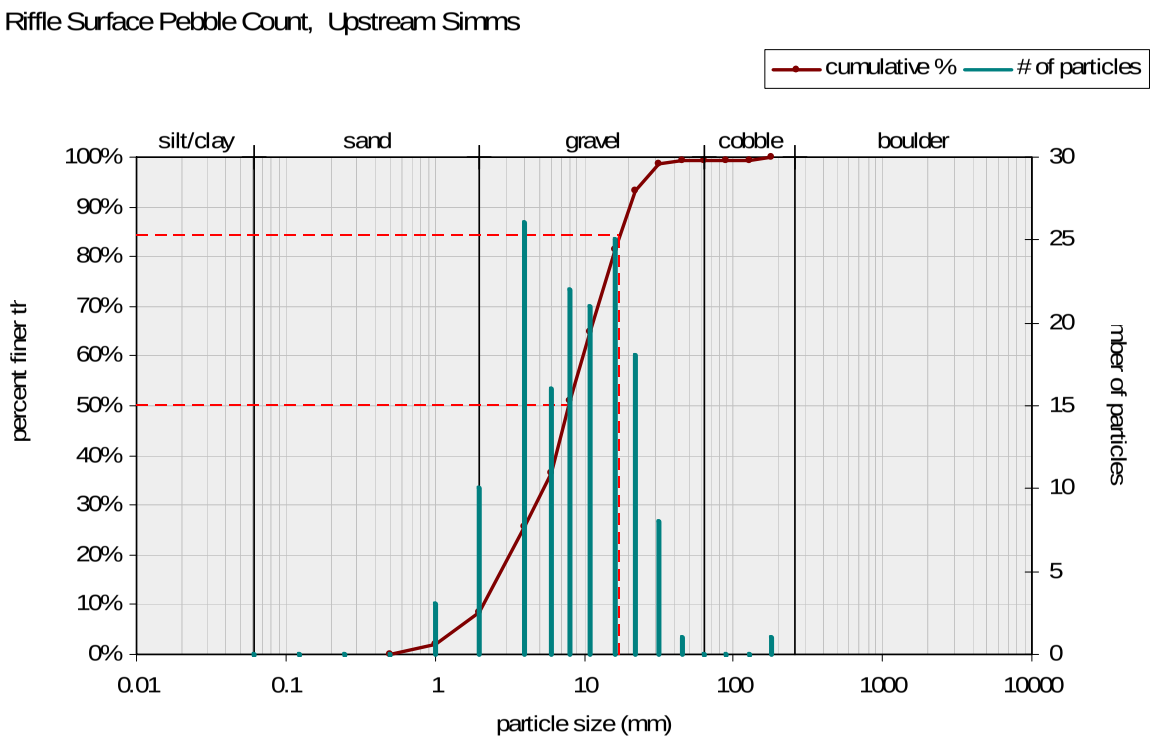
Type	
silt/clay	0%
sand	4%
gravel	95%
cobble	1%
boulder	0%

Lower Gunpowder Watershed Assessment
Drainage Area 7: Upstream Simms Pebble Count

Riffle Surface

Material	Size Range (mm)	Count
silt/clay	0 - 0.062	0
very fine sand	0.062 - 0.125	0
fine sand	0.125 - 0.25	0
medium sand	0.25 - 0.5	0
coarse sand	0.5 - 1	3
very coarse sand	1 - 2	10
very fine gravel	2 - 4	26
fine gravel	4 - 6	16
fine gravel	6 - 8	22
medium gravel	8 - 11	21
medium gravel	11 - 16	25
coarse gravel	16 - 22	18
coarse gravel	22 - 32	8
very coarse gravel	32 - 45	1
very coarse gravel	45 - 64	0
small cobble	64 - 90	0
medium cobble	90 - 128	0
large cobble	128 - 180	1
very large cobble	180 - 256	
small boulder	256 - 362	
small boulder	362 - 512	
medium boulder	512 - 1024	
large boulder	1024 - 2048	
very large boulder	2048 - 4096	
total particle count:		151
bedrock	----------	
clay hardpan	----------	
detritus/wood	----------	
artificial	----------	
total count:		151

Note:



Size (mm)	
D16	2.7
D35	5.7
D50	7.8
D65	11
D84	17
D95	25

Size Distribution	
mean	6.8
dispersion	2.5
skewness	-0.07

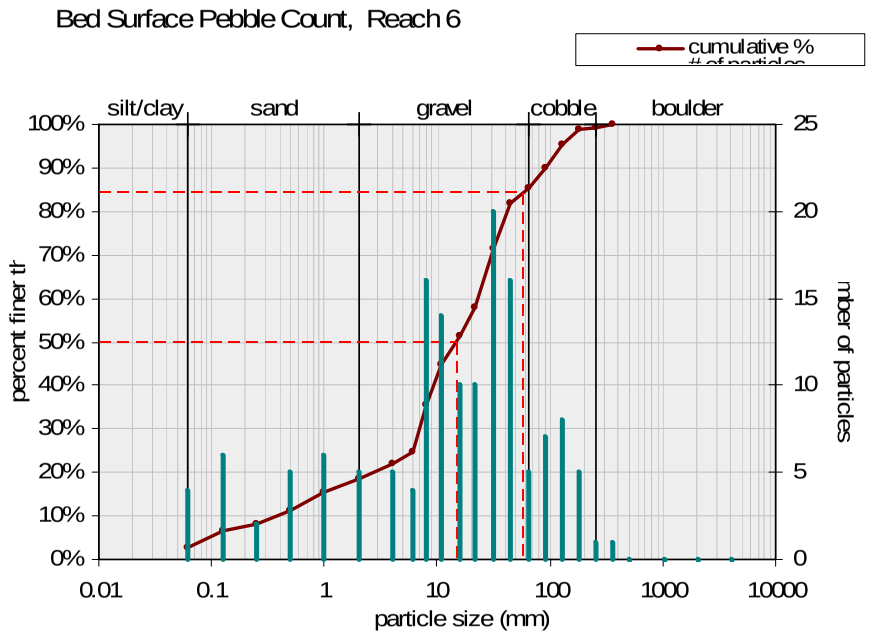
Type	
silt/clay	0%
sand	9%
gravel	91%
cobble	1%
boulder	0%

Lower Gunpowder Watershed Assessment
Drainage Area 8: Seven Courts Pebble Count

Bed Surface

Material	Size Range (mm)	Count
silt/clay	0 - 0.062	4
very fine sand	0.062 - 0.125	6
fine sand	0.125 - 0.25	2
medium sand	0.25 - 0.5	5
coarse sand	0.5 - 1	6
very coarse sand	1 - 2	5
very fine gravel	2 - 4	5
fine gravel	4 - 6	4
fine gravel	6 - 8	16
medium gravel	8 - 11	14
medium gravel	11 - 16	10
coarse gravel	16 - 22	10
coarse gravel	22 - 32	20
very coarse gravel	32 - 45	16
very coarse gravel	45 - 64	5
small cobble	64 - 90	7
medium cobble	90 - 128	8
large cobble	128 - 180	5
very large cobble	180 - 256	1
small boulder	256 - 362	1
small boulder	362 - 512	0
medium boulder	512 - 1024	0
large boulder	1024 - 2048	0
very large boulder	2048 - 4096	0
total particle count:		150
bedrock		
clay hardpan		
detritus/wood		
artificial		
total count:		150

Note:



Size (mm)	
D16	1.1
D35	7.9
D50	15
D65	27
D84	56
D95	130

Size Distribution	
mean	7.8
dispersion	8.7
skewness	-0.22

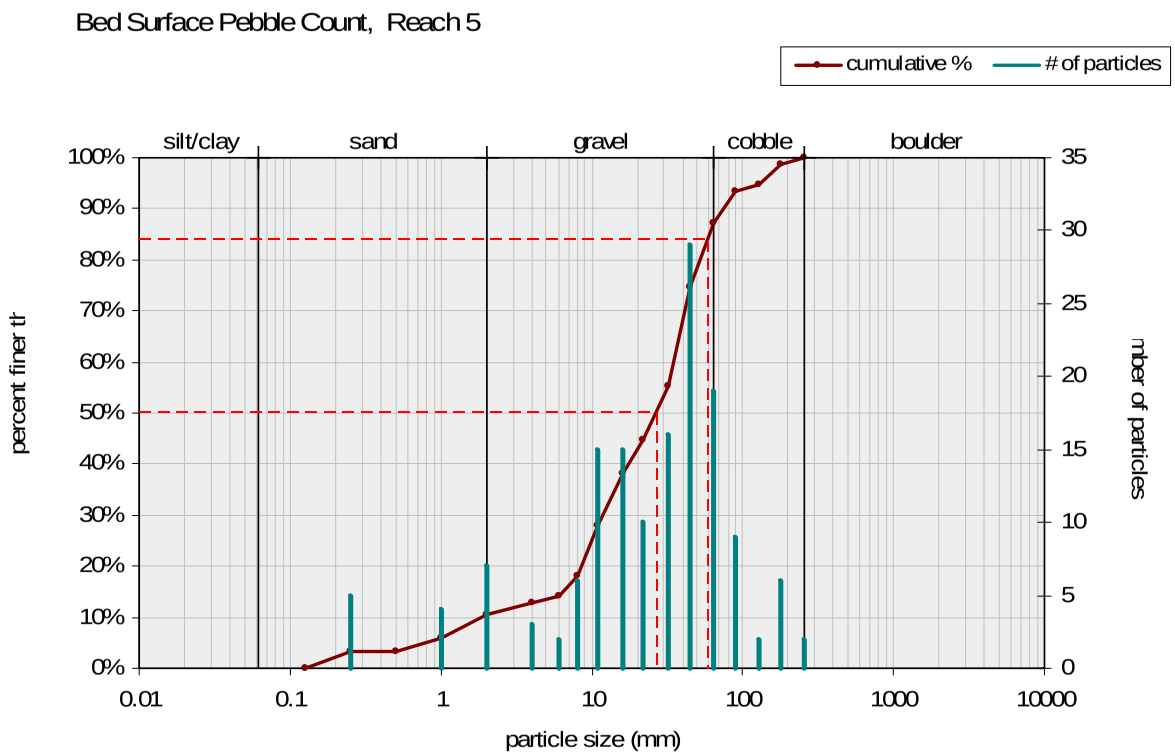
Type	
silt/clay	3%
sand	16%
gravel	67%
cobble	14%
boulder	1%

Lower Gunpowder Watershed Assessment
Drainage Area 9: Birchbrook Pebble Count

Bed Surface

Material	Size Range (mm)	Count
silt/clay	0 - 0.062	
very fine sand	0.062 - 0.125	
fine sand	0.125 - 0.25	5
medium sand	0.25 - 0.5	
coarse sand	0.5 - 1	4
very coarse sand	1 - 2	7
very fine gravel	2 - 4	3
fine gravel	4 - 6	2
fine gravel	6 - 8	6
medium gravel	8 - 11	15
medium gravel	11 - 16	15
coarse gravel	16 - 22	10
coarse gravel	22 - 32	16
very coarse gravel	32 - 45	29
very coarse gravel	45 - 64	19
small cobble	64 - 90	9
medium cobble	90 - 128	2
large cobble	128 - 180	6
very large cobble	180 - 256	2
small boulder	256 - 362	
small boulder	362 - 512	
medium boulder	512 - 1024	
large boulder	1024 - 2048	
very large boulder	2048 - 4096	
total particle count:		150
bedrock	----------	
clay hardpan	----------	
detritus/wood	----------	
artificial	----------	
total count:		150

Note:



Size (mm)	
D16	6.9
D35	14
D50	27
D65	38
D84	58
D95	130

Size Distribution	
mean	20.0
dispersion	3.0
skewness	-0.14

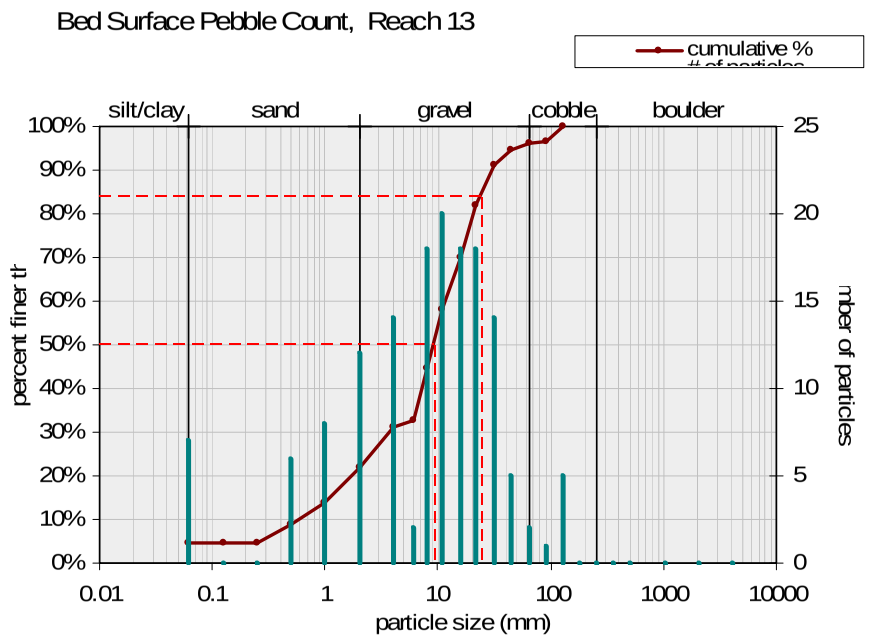
Type	
silt/clay	0%
sand	11%
gravel	77%
cobble	13%
boulder	0%

Lower Gunpowder Watershed Assessment
Drainage Area 10: Weis Plaza Pebble Count

Bed Surface

Material	Size Range (mm	Count
silt/clay	0 - 0.062	7
very fine sand	0.062 - 0.125	0
fine sand	0.125 - 0.25	0
medium sand	0.25 - 0.5	6
coarse sand	0.5 - 1	8
very coarse sand	1 - 2	12
very fine gravel	2 - 4	14
fine gravel	4 - 6	2
fine gravel	6 - 8	18
medium gravel	8 - 11	20
medium gravel	11 - 16	18
coarse gravel	16 - 22	18
coarse gravel	22 - 32	14
very coarse gravel	32 - 45	5
very coarse gravel	45 - 64	2
small cobble	64 - 90	1
medium cobble	90 - 128	5
large cobble	128 - 180	0
very large cobble	180 - 256	0
small boulder	256 - 362	0
small boulder	362 - 512	0
medium boulder	512 - 1024	0
large boulder	1024 - 2048	0
very large boulder	2048 - 4096	0
total particle count:		150
bedrock		
clay hardpan		
detritus/wood		
artificial		
total count:		150

Note:



Size (mm)	
D16	1.2
D35	6.3
D50	9.1
D65	14
D84	24
D95	49

Size Distribution	
mean	5.4
dispersion	5.1
skewness	-0.20

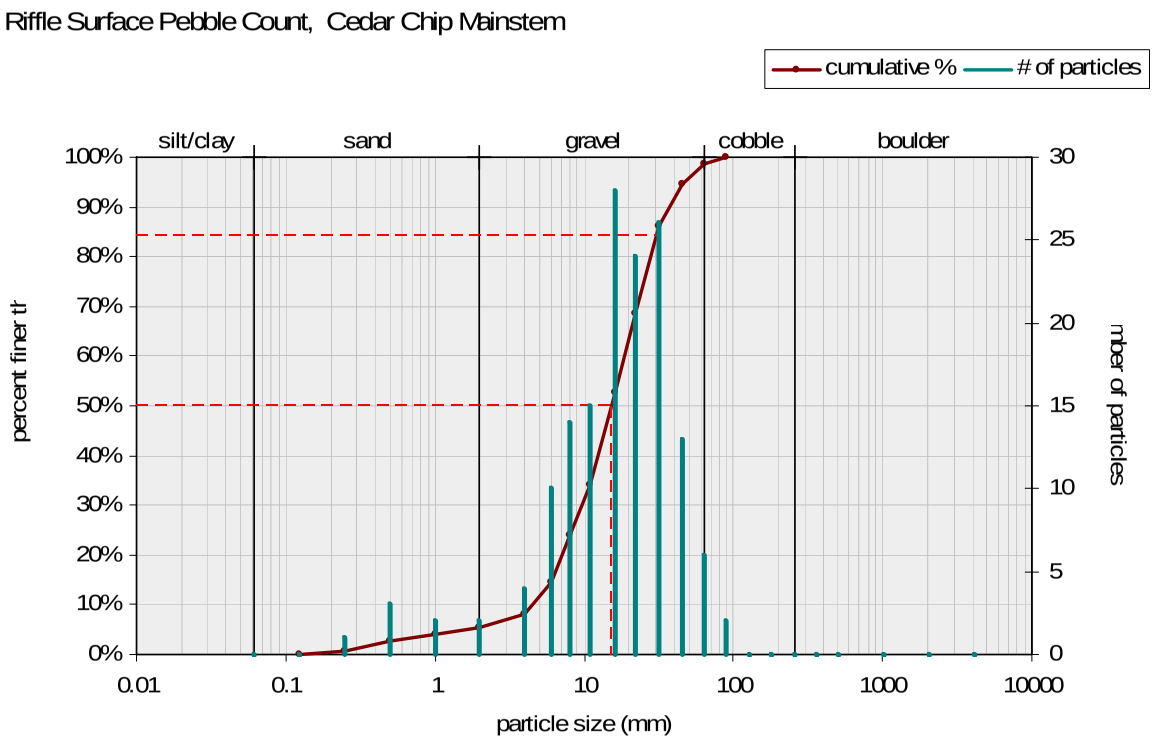
Type	
silt/clay	5%
sand	17%
gravel	74%
cobble	4%
boulder	0%

Lower Gunpowder Watershed Assessment
Drainage Area 11: Cedar Chip Pebble Count

Riffle Surface

Material	Size Range (mm)	Count
silt/clay	0 - 0.062	0
very fine sand	0.062 - 0.125	0
fine sand	0.125 - 0.25	1
medium sand	0.25 - 0.5	3
coarse sand	0.5 - 1	2
very coarse sand	1 - 2	2
very fine gravel	2 - 4	4
fine gravel	4 - 6	10
fine gravel	6 - 8	14
medium gravel	8 - 11	15
medium gravel	11 - 16	28
coarse gravel	16 - 22	24
coarse gravel	22 - 32	26
very coarse gravel	32 - 45	13
very coarse gravel	45 - 64	6
small cobble	64 - 90	2
medium cobble	90 - 128	0
large cobble	128 - 180	0
very large cobble	180 - 256	0
small boulder	256 - 362	0
small boulder	362 - 512	0
medium boulder	512 - 1024	0
large boulder	1024 - 2048	0
very large boulder	2048 - 4096	0
total particle count:		150
bedrock	----------	
clay hardpan	----------	
detritus/wood	----------	
artificial	----------	
total count:		150

Note:



Size (mm)	
D16	6.3
D35	11
D50	15
D65	20
D84	31
D95	46

Size Distribution	
mean	14.0
dispersion	2.2
skewness	-0.04

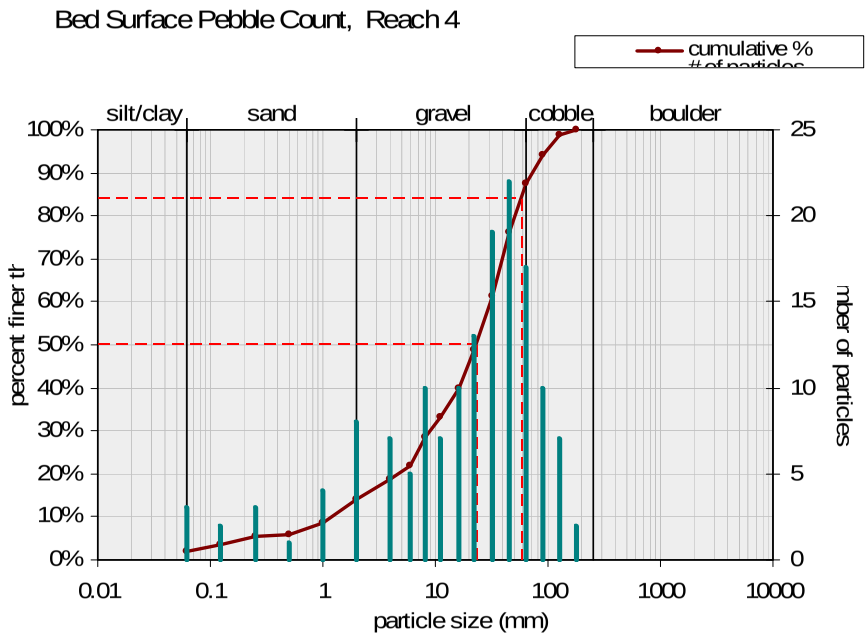
Type	
silt/clay	0%
sand	5%
gravel	93%
cobble	1%
boulder	0%

Lower Gunpowder Watershed Assessment
Drainage Area 13: Pinedale Pebble Count

Bed Surface

Material	Size Range (mm)	Count
silt/clay	0 - 0.062	3
very fine sand	0.062 - 0.125	2
fine sand	0.125 - 0.25	3
medium sand	0.25 - 0.5	1
coarse sand	0.5 - 1	4
very coarse sand	1 - 2	8
very fine gravel	2 - 4	7
fine gravel	4 - 6	5
fine gravel	6 - 8	10
medium gravel	8 - 11	7
medium gravel	11 - 16	10
coarse gravel	16 - 22	13
coarse gravel	22 - 32	19
very coarse gravel	32 - 45	22
very coarse gravel	45 - 64	17
small cobble	64 - 90	10
medium cobble	90 - 128	7
large cobble	128 - 180	2
very large cobble	180 - 256	
small boulder	256 - 362	
small boulder	362 - 512	
medium boulder	512 - 1024	
large boulder	1024 - 2048	
very large boulder	2048 - 4096	
total particle count:		150
bedrock	----------	
clay hardpan	----------	
detritus/wood	----------	
artificial	----------	
total count:		150

Note:



Size (mm)	
D16	2.7
D35	12
D50	23
D65	35
D84	58
D95	97

Size Distribution	
mean	12.5
dispersion	5.5
skewness	-0.23

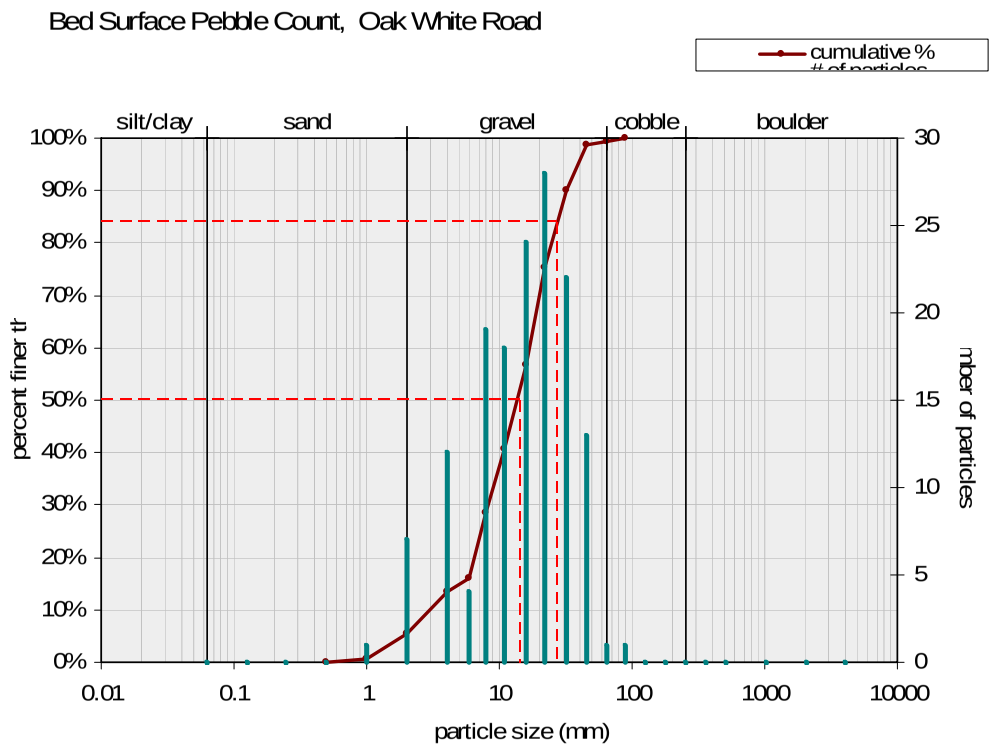
Type	
silt/clay	2%
sand	12%
gravel	73%
cobble	13%
boulder	0%

Lower Gunpowder Watershed Assessment
Drainage Area 15: Oak White Pebble Count

Bed Surface

Material	Size Range (mm	Count
silt/clay	0 - 0.062	0
very fine sand	0.062 - 0.125	0
fine sand	0.125 - 0.25	0
medium sand	0.25 - 0.5	0
coarse sand	0.5 - 1	1
very coarse sand	1 - 2	7
very fine gravel	2 - 4	12
fine gravel	4 - 6	4
fine gravel	6 - 8	19
medium gravel	8 - 11	18
medium gravel	11 - 16	24
coarse gravel	16 - 22	28
coarse gravel	22 - 32	22
very coarse gravel	32 - 45	13
very coarse gravel	45 - 64	1
small cobble	64 - 90	1
medium cobble	90 - 128	0
large cobble	128 - 180	0
very large cobble	180 - 256	0
small boulder	256 - 362	0
small boulder	362 - 512	0
medium boulder	512 - 1024	0
large boulder	1024 - 2048	0
very large boulder	2048 - 4096	0
total particle count:		150
bedrock		
clay hardpan		
detritus/wood		
artificial		
total count:		150

Note:



Size (mm)	
D16	6
D35	9.5
D50	14
D65	18
D84	27
D95	39

Size Distribution	
mean	12.7
dispersion	2.1
skewness	-0.05

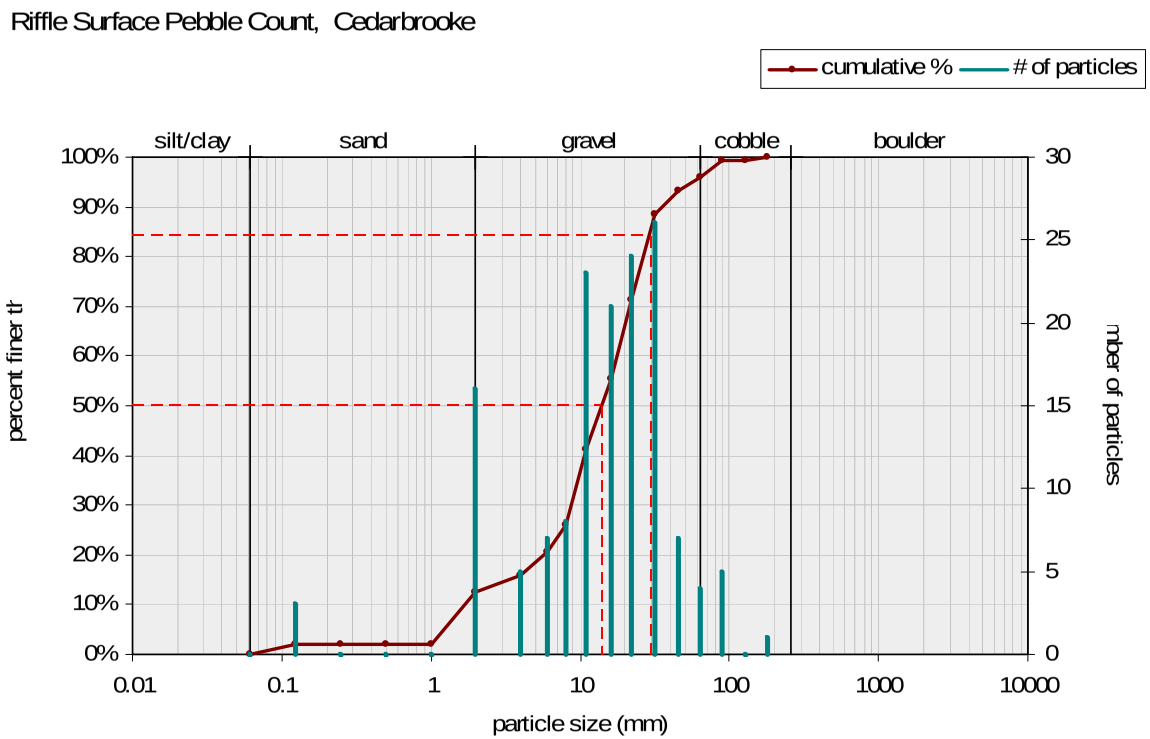
Type	
silt/clay	0%
sand	5%
gravel	94%
cobble	1%
boulder	0%

Lower Gunpowder Watershed Assessment
Drainage Area 16: Cedarbrooke Pebble Count

Riffle Surface

Material	Size Range (mm)	Count
silt/clay	0 - 0.062	0
very fine sand	0.062 - 0.125	3
fine sand	0.125 - 0.25	0
medium sand	0.25 - 0.5	0
coarse sand	0.5 - 1	0
very coarse sand	1 - 2	16
very fine gravel	2 - 4	5
fine gravel	4 - 6	7
fine gravel	6 - 8	8
medium gravel	8 - 11	23
medium gravel	11 - 16	21
coarse gravel	16 - 22	24
coarse gravel	22 - 32	26
very coarse gravel	32 - 45	7
very coarse gravel	45 - 64	4
small cobble	64 - 90	5
medium cobble	90 - 128	0
large cobble	128 - 180	1
very large cobble	180 - 256	
small boulder	256 - 362	
small boulder	362 - 512	
medium boulder	512 - 1024	
large boulder	1024 - 2048	
very large boulder	2048 - 4096	
total particle count:		150
bedrock		
clay hardpan		
detritus/wood		
artificial		
total count:		150

Note:



Size (mm)	
D16	4
D35	9.6
D50	14
D65	19
D84	29
D95	56

Size Distribution	
mean	10.8
dispersion	2.8
skewness	-0.12

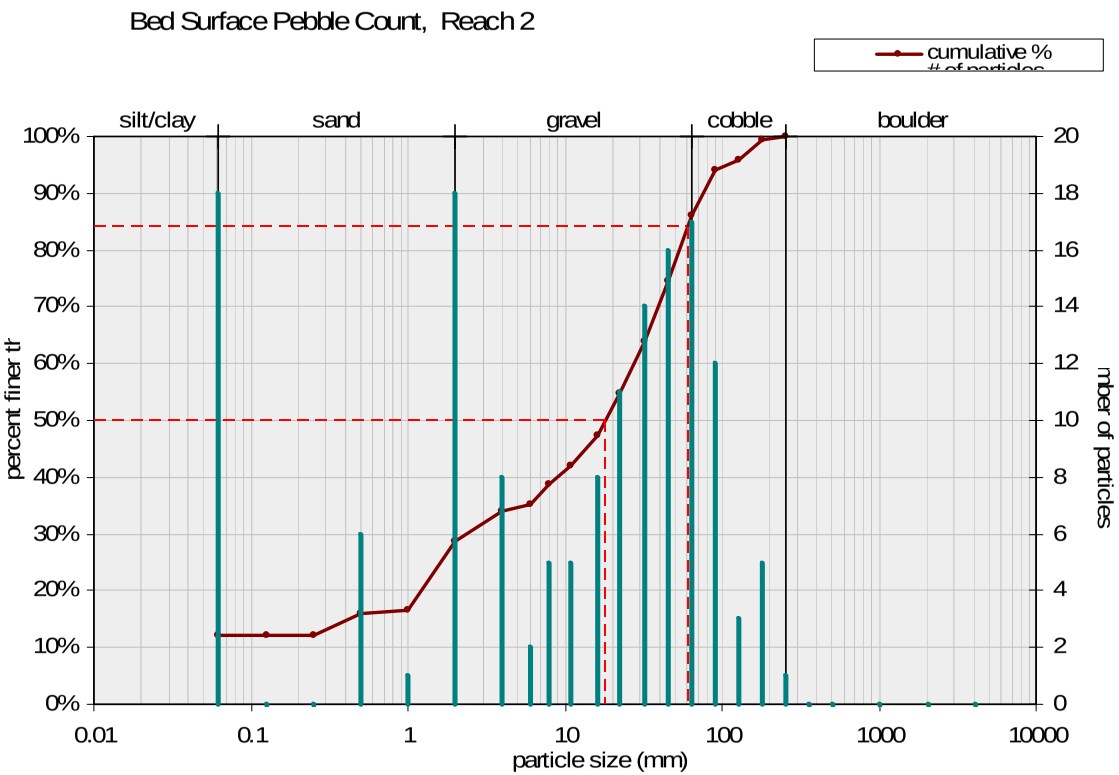
Type	
silt/clay	0%
sand	13%
gravel	83%
cobble	4%
boulder	0%

Lower Gunpowder Watershed Assessment
Drainage Area 18: Hallbrook Pebble Count

Bed Surface

Material	Size Range (mm)	Count
silt/clay	0 - 0.062	18
very fine sand	0.062 - 0.125	0
fine sand	0.125 - 0.25	0
medium sand	0.25 - 0.5	6
coarse sand	0.5 - 1	1
very coarse sand	1 - 2	18
very fine gravel	2 - 4	8
fine gravel	4 - 6	2
fine gravel	6 - 8	5
medium gravel	8 - 11	5
medium gravel	11 - 16	8
coarse gravel	16 - 22	11
coarse gravel	22 - 32	14
very coarse gravel	32 - 45	16
very coarse gravel	45 - 64	17
small cobble	64 - 90	12
medium cobble	90 - 128	3
large cobble	128 - 180	5
very large cobble	180 - 256	1
small boulder	256 - 362	0
small boulder	362 - 512	0
medium boulder	512 - 1024	0
large boulder	1024 - 2048	0
very large boulder	2048 - 4096	0
total particle count:		150
bedrock		
clay hardpan		
detritus/wood		
artificial		
total count:		150

Note:

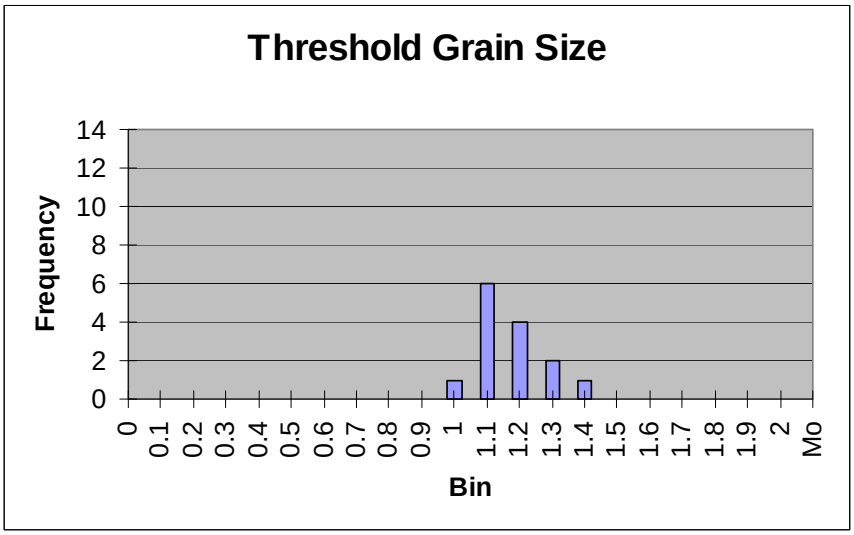


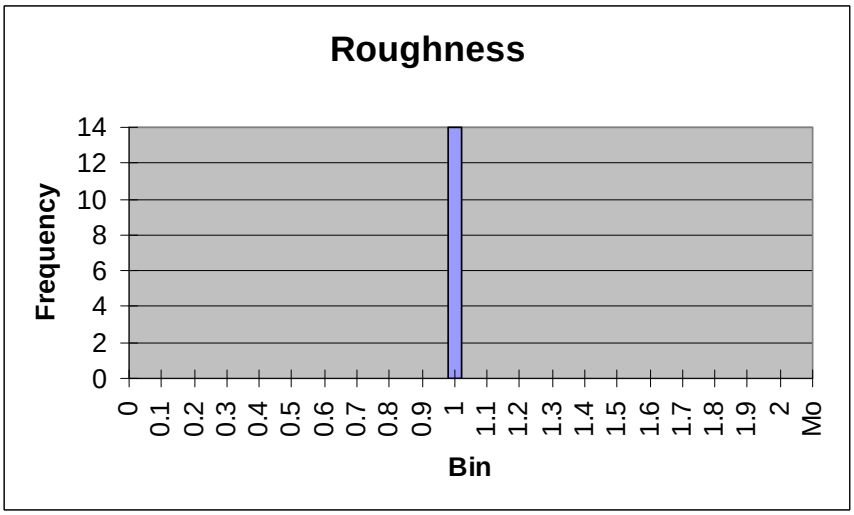
Size (mm)	
D16	0.5
D35	5.4
D50	18
D65	33
D84	60
D95	110

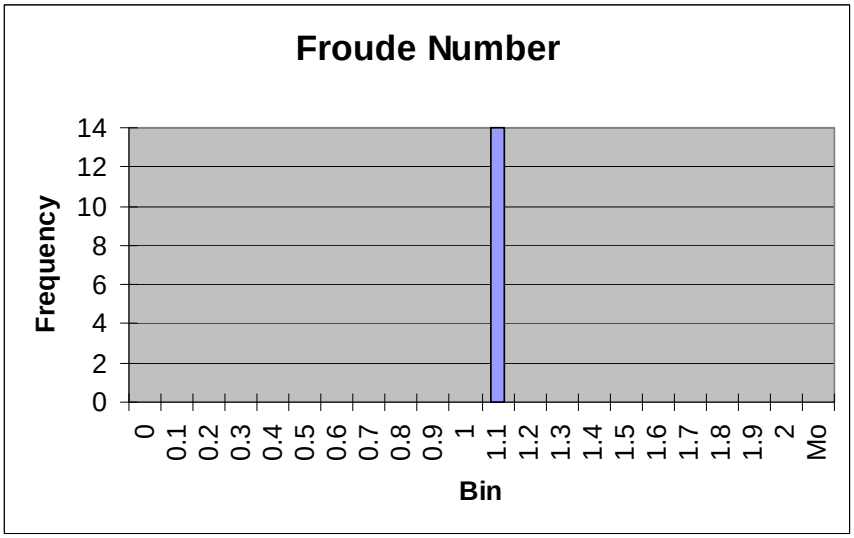
Size Distribution	
mean	5.5
dispersion	19.7
skewness	-0.36

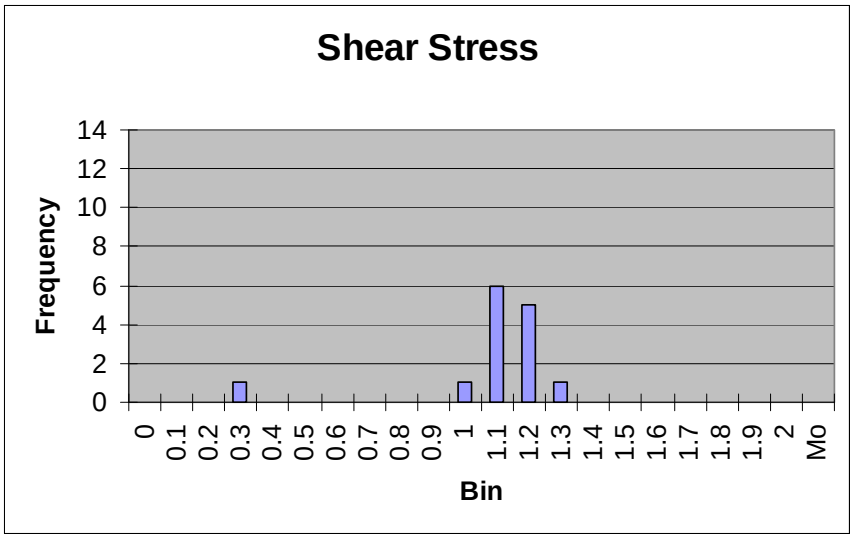
Type	
silt/clay	12%
sand	17%
gravel	57%
cobble	14%
boulder	0%

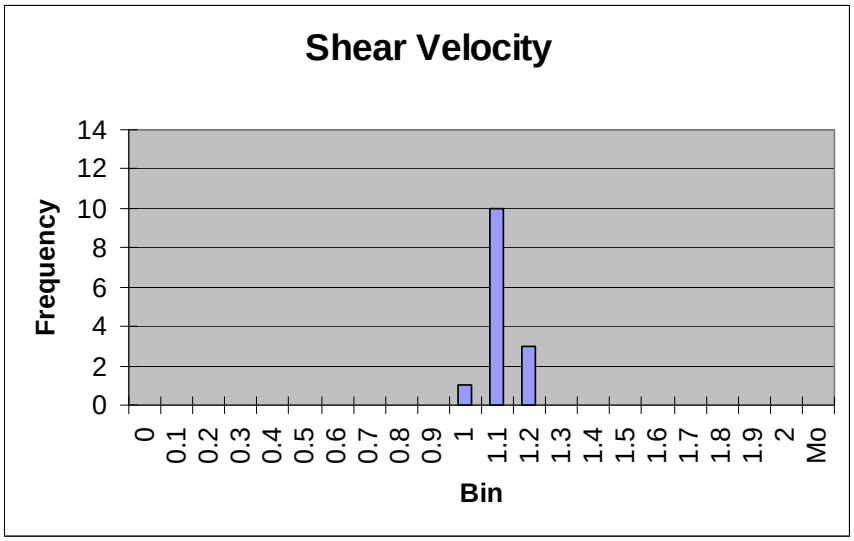
APPENDIX C:
HISTOGRAM EVALUATION

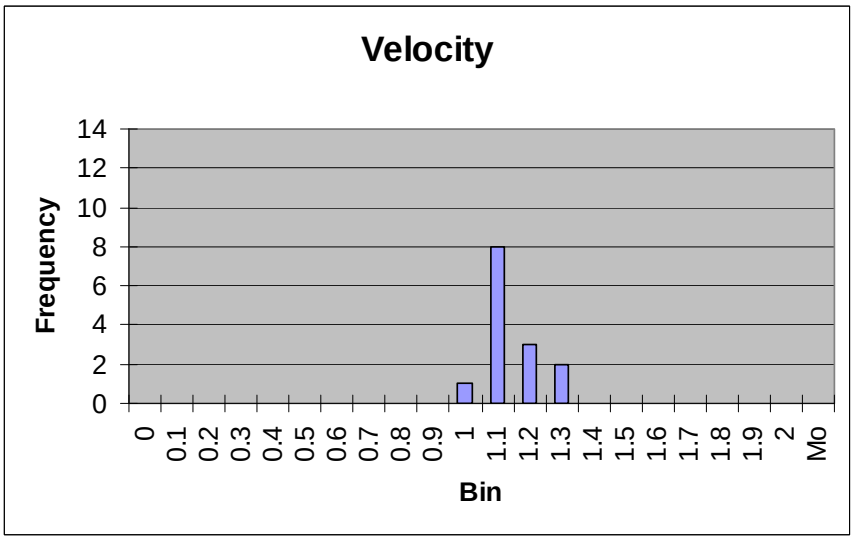

Threshold Grain Size
Frequency
14
12
10
8
6
4
2
0
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
1.1
1.2
1.3
1.4
1.5
1.6
1.7
1.8
1.9
2
Mo
Bin

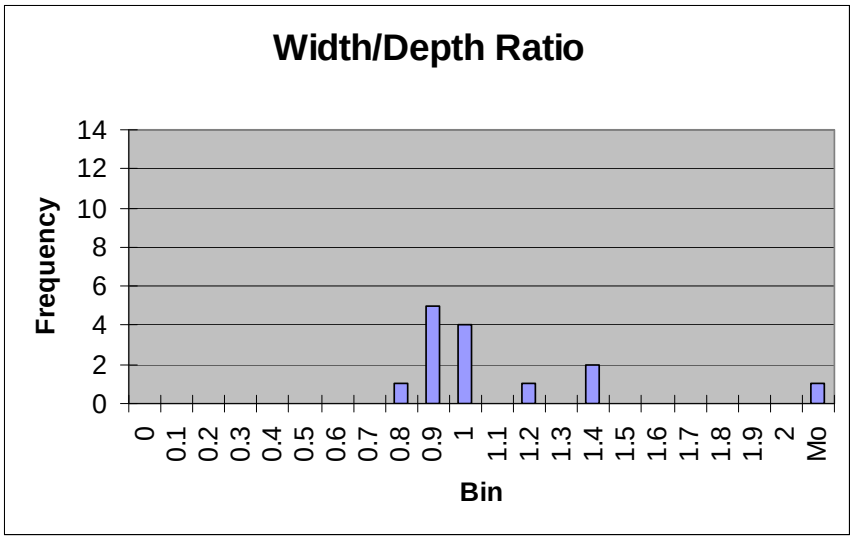

Roughness
Frequency
14
12
10
8
6
4
2
0
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
1.1
1.2
1.3
1.4
1.5
1.6
1.7
1.8
1.9
2
Mo
Bin

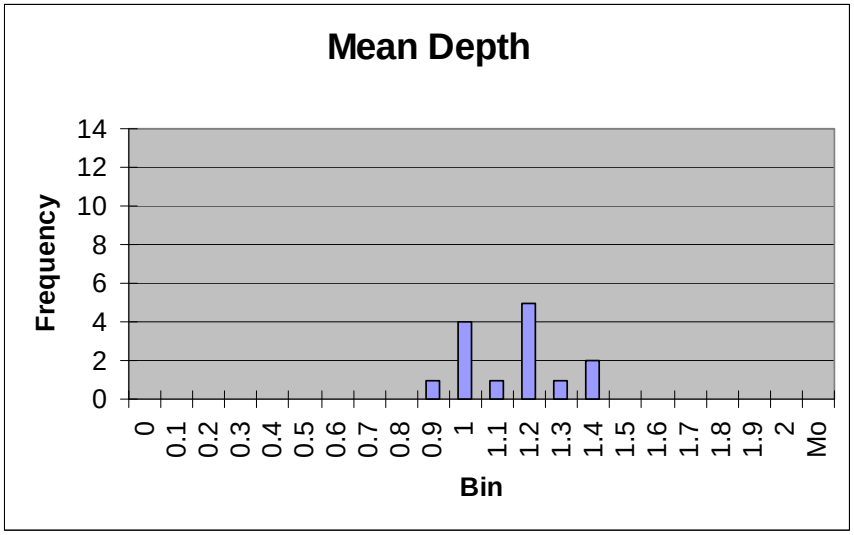

Froude Number
Frequency
14
12
10
8
6
4
2
0
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
1.1
1.2
1.3
1.4
1.5
1.6
1.7
1.8
1.9
2
Mo
Bin

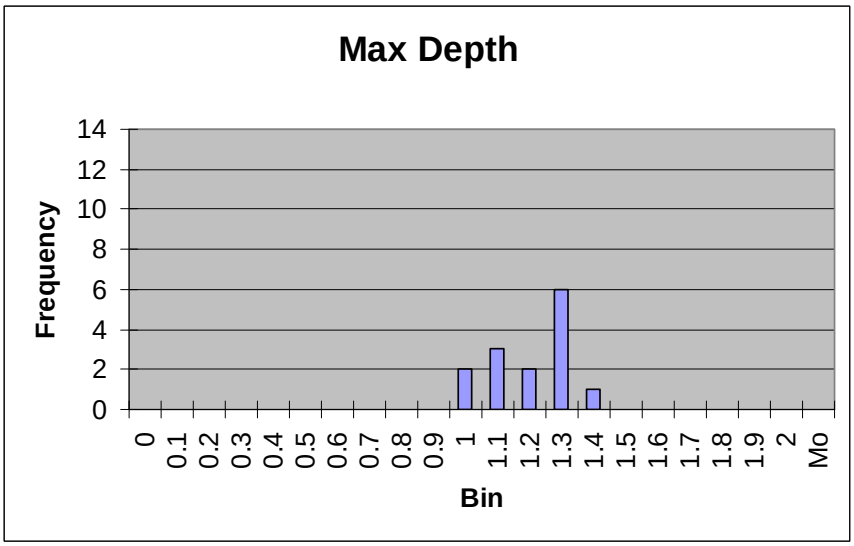

Shear Stress
Frequency
14
12
10
8
6
4
2
0
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
1.1
1.2
1.3
1.4
1.5
1.6
1.7
1.8
1.9
2
Mo
Bin

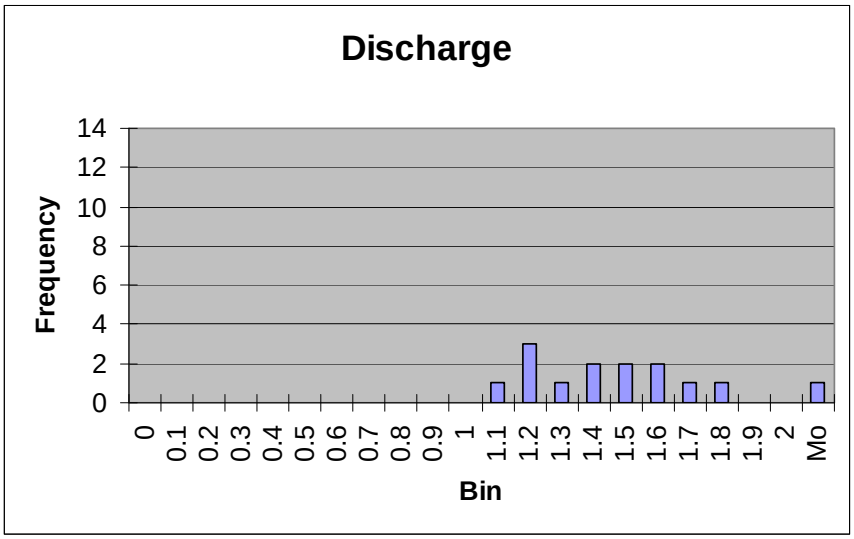

Shear Velocity
Frequency
14
12
10
8
6
4
2
0
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
1.1
1.2
1.3
1.4
1.5
1.6
1.7
1.8
1.9
2
Mo
Bin

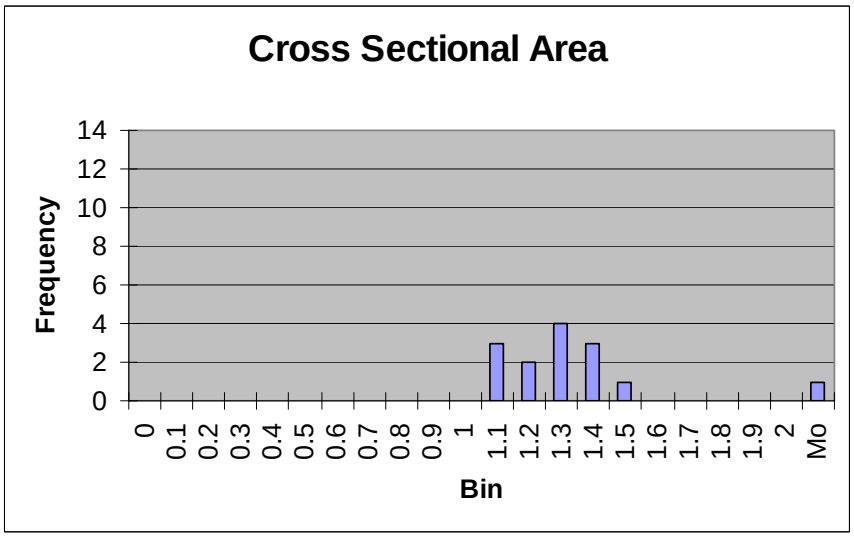

Velocity
Frequency
14
12
10
8
6
4
2
0
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
1.1
1.2
1.3
1.4
1.5
1.6
1.7
1.8
1.9
2
Mo
Bin

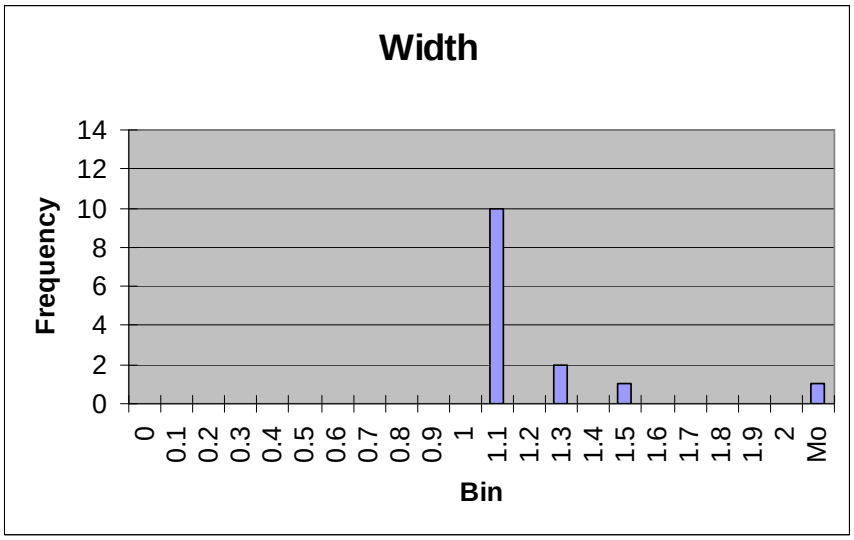

Width/Depth Ratio
Frequency
14
12
10
8
6
4
2
0
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
1.1
1.2
1.3
1.4
1.5
1.6
1.7
1.8
1.9
2
Mo
Bin


Mean Depth
Frequency
14
12
10
8
6
4
2
0
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
1.1
1.2
1.3
1.4
1.5
1.6
1.7
1.8
1.9
2
Mo
Bin


Max Depth
Frequency
14
12
10
8
6
4
2
0
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
1.1
1.2
1.3
1.4
1.5
1.6
1.7
1.8
1.9
2
Mo
Bin


Discharge
Frequency
14
12
10
8
6
4
2
0
0 0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1 1.1 1.2 1.3 1.4 1.5 1.6 1.7 1.8 1.9 2 Mo
Bin


Cross Sectional Area
Frequency
14
12
10
8
6
4
2
0
0 0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1 1.1 1.2 1.3 1.4 1.5 1.6 1.7 1.8 1.9 2 Mo
Bin


Width
Frequency
14
12
10
8
6
4
2
0
0 0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1 1.1 1.2 1.3 1.4 1.5 1.6 1.7 1.8 1.9 2 Mo
Bin