Mailing Address:
Water Resources Data System
University of Wyoming, Dept 3943
1000 E University Avenue
Laramie, WY 82071

Physical Address:
Wyoming Hall, Room 249
University of Wyoming
Laramie, WY 82071

Phone: (307) 766-6651
Fax: (307) 766-3785

Funding for WRDS and the creation of this electronic document was provided by the Wyoming Water Development Commission (http://wwdc.state.wy.us)

SHELL VALLEY

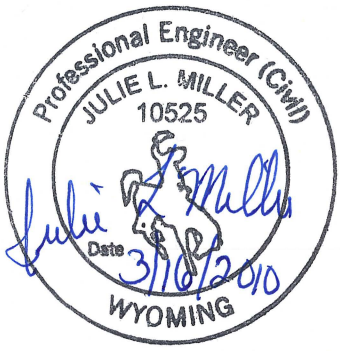
Watershed Plan
Level I Study

Submitted by:

ENGINEERING ASSOCIATES
130 NORTH BENT STREET
POWELL WY 82435

GEOMATRIX CONSULTANTS
1824 NORTH LAST CHANCE GULCH
PO BOX 7118
HELENA MT 59601

WESTECH ENVIRONMENTAL SERVICES
PO BOX 6045
HELENA MT 59604



APPENDICES

March 2010

LIST OF APPENDICES

APPENDIX A

- Range Condition by Cluster Data
- Site Parameters and Canopy Cover by Species

TABLE Range Condition by Cluster Data
USFS Vegetation Sample Cluster Data by Survey Year
Shell Creek Watershed

Vegetation Sample Cluster #	Survey Year	Condition Class[1]	Apparent Trend[2]
Granite Creek Allotment			
1	61	P-	
	78	G+	
	89	G	Stable
3	77	G+	
	85	G+	
	89	F+	Down
4	83	G+	
	89	F+	Down
6	80	G	
	83	G	
	89	G	Stable
Hunt Mountain Allotment			
1	61	P-	
	66	P-	
	75	P-	
	86	F	Up
2	66	F	
	75	P	Up
Red Canyon C&H Allotment			
2	61	F	
	66	F	
	79	G	
	81	G	Up
Salt Creek Allotment			
1	77	G-	
	82	G	
	86	G	Stable
2	77	F+	
	81	F+	
	86	F+	Stable
4	81	G -	
	86	G	Up
5	81	F +	
	86	G	Up
6	81	F	
	86	F +	Up
7	81	F +	
	86	F +	Stable

TABLE Range Condition by Cluster Data
USFS Vegetation Sample Cluster Data by Survey Year
Shell Creek Watershed

Vegetation Sample Cluster #	Survey Year	Condition Class[1]	Apparent Trend[2]
Shell Basin Allotment			
1	77	F+	
	85	E	Up
2	77	F+	
	85	G+	Up
3	77	G-	
	85	G	Up
Shell Creek Allotment			
1 (Exclosure)	55	G -	
	60	P	
	64	P	
	89	F -	Stable to Up
2	55	F +	
	60	P +	
	64	F -	
	88	F	Stable to Up
3	55	P -	
	60	F -	
	64	F -	Stable
4	59	P	
	64	F +	Up
Sunlight Mesa Allotment			
1	61	G	
	66	G	
	81	E	
	84	E	Up
2	61	G	
	66	G	
	81	G	
	85	G	
	05	F	Down
3	61	F	
	66	F	
	81	G	
	85	G	Up
4	82	G	
	85	E	
	05	F	Down

[1] Condition Class was determined from a review and synthesis of Parker 3-Step data and Permanent Cluster Transect Summaries contained at the Big Horn National Forest – Medicine Wheel/Pain Rock District Office. In most cases Condition Classes were depicted on the survey forms. In a few cases Condition Classes were calculated based on data contained on the Summary forms and methodologies obtained from the USFS in the Range Analysis and Management Handbook (R-2 FSH 3/85 Amend 15).
[2] Trend was determined from a qualitative review of Condition Class within Cluster Transects among years.

Appendix I
Site Parameters and Canopy Cover by Species. Potential Reservoir Sites. Shell Creek Watershed. 2007.

	HighLine Reservoir Expansion		Collingwood Draw - Upper					Bratsky Draw					Red Canyon			Leavitt Reservoir Expansion		Trapper Creek			Coyote Basin			
	U1	U2	U1	U2	U3	U5	U6	U1	U1a	U2	U3	U4	U1	U2	U3	U1	U2	U1	U2	U3	U1	U2	U3	U10
SITE PARAMETERS																								
Slope (percent)	15	24	4	008	20	8	3	7	016	3-4	009	11	3	048	039	11	13	004	30	30-55	2-3	11	5	13-20
Aspect (degrees)	083	230	347	242	022	45	004	195	336	328	147	330	204	260	100	112	003	018	266	102	215	170	160	106
Topography	Mid	Upper	Drainage	Bench	Mid	Mid	Lower	Lower	Ridge	Bench	Upper	Bench	Bench	Lower	Lower	Ridge	Ridge	Lower	Mid	Lower	Bench	Ridge	Ter	Lower
Configuration	S	S	V	S	X	Und	S	Und	X	V	S	Und	S	Und	Und	Und	X	Und	Und	X	X	X	V	Und
Surface Soil Texture	L	RSaL	L	L	fLS	ClL	ClL	SCl	RSaL	LSa	LSa	LSa	SiClL	SiL	RSaL	SaL	GrSaL	FiSL	FiSL	FiSL		GrClL	SaL	SiC
GROUND COVER																								
Bare Ground	76	48	68	46	74	44	75	30	36	77	59	27	73	76	43	64	47	65	85	85	52	62	55	60
Rock	3	28	2	0.3	1	44	0.3	0.3	18	0.3	0.3	0.3		6	34	1	28	2	3	0.3		35	1	8
Litter	17	17	25	7	19	10	20	28	33	15	10	20	24	17	21	30	22	81	8	7	45	3	39	9
Lichens	2	4	2	45	3	1	3	40	10	1	20	35			0.3	3	1	8	2	6			2	20
Moss										4	9	15						2	0.3					
Basal Vegetation	2	3	3	2	3	1	2	2	3	3	2	3	3	1	2	2	2	2	2	2	3	0.3	3	3
VEGETATION STRUCTURE (nonstratified cover)																								
Total Vegetation	33	27	50	25	40	30	33	47	48	42	54	54	67	22	30	37	35	48	18	15	54	14	42	25
Perennial Graminoids	21	11	12	0.3	12	0.3	18		28	13	3	5	8	0.3	12	21	18	12	3	6	16	3	18	9
Annual Graminoids	8	4	10	0.3	2	0.3	1	42	0.3	0.3	35	0.3			3	2	1	16	1		4		13	4
Perennial Forbs	2	3	6	12	11	0.3	5	3	4	15	11	3			2	2	6	2	9	3	1	8	0.3	1
Annual/Biennial Forbs	1	2	6	1	0.3	1			0.3	7	4	5	26	5	5	1	0.3	0.3	0.3	0.3	10	0.3	2	0.3
Shrubs	3	8	22	12	18	28	10	1	20	12	6	44	49	17	9	16	12	26	9	8	29	3	17	11
CLASS\SPECIES																								
NATIVE PERENNIAL GRAMINOIDS (Cool Season)																								
Agropyron spicatum	2	1			3				24						7	3	10	5		1				
Koeleria cristata									0.3															
Oryzopsis hymenoides		6	0.3		1										0.3		1	1		0.3			0.3	
Poa sandbergii	2	3	11	0.3	4	0.3	18		5	10	3	5		0.3	5	18	7	3	3	3	3	0.3	4	2
Sitanion hystrix			0.3			0.3			0.3							0.3			0.3					
Stipa comata	1				4					1								3		2			0.3	
TOTAL NPG(C)	**5.0**	**10.0**	**11.6**	**0.3**	**12.0**	**0.6**	**18.0**	**0.0**	**29.6**	**11.0**	**3.0**	**5.0**	**0.0**	**0.3**	**12.3**	**21.3**	**18.0**	**12.0**	**3.3**	**6.3**	**3.0**	**0.3**	**4.6**	**2.0**
NATIVE PERENNIAL GRAMINOIDS (Warm Season)																								
Bouteloua gracilis										3														
Calamovilfa longifolia																							1	
Distichlis stricta													1								1			
Schedonnardus paniculatus																	0.3							
Sporobolus airoides			1										7								12	3	14	7
Sporobolus cryptandrus		2	0.3																					
TOTAL NPG(W)	**0.0**	**2.0**	**1.3**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**3.0**	**0.0**	**0.0**	**8.0**	**0.0**	**0.0**	**0.0**	**0.3**	**0.0**	**0.0**	**0.0**	**13.0**	**3.0**	**15.0**	**7.0**
INTRODUCED PERENNIAL GRAMINOIDS																								
Agropyron cristatum	17																							
TOTAL IPG	**17.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
NATIVE ANNUAL GRAMINOIDS																								
Festuca octoflora					1																1			
TOTAL NAG	**0.0**	**0.0**	**0.0**	**0.0**	**1.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**1.0**	**0.0**	**0.0**	**0.0**
INTRODUCED ANNUAL GRAMINOIDS																								
Agropyron triticeum			2	0.3		0.3	1	42			16	0.3												
Bromus japonicus	7	3														0.3			1				5	

Appendix I
Site Parameters and Canopy Cover by Species. Potential Reservoir Sites. Shell Creek Watershed. 2007.

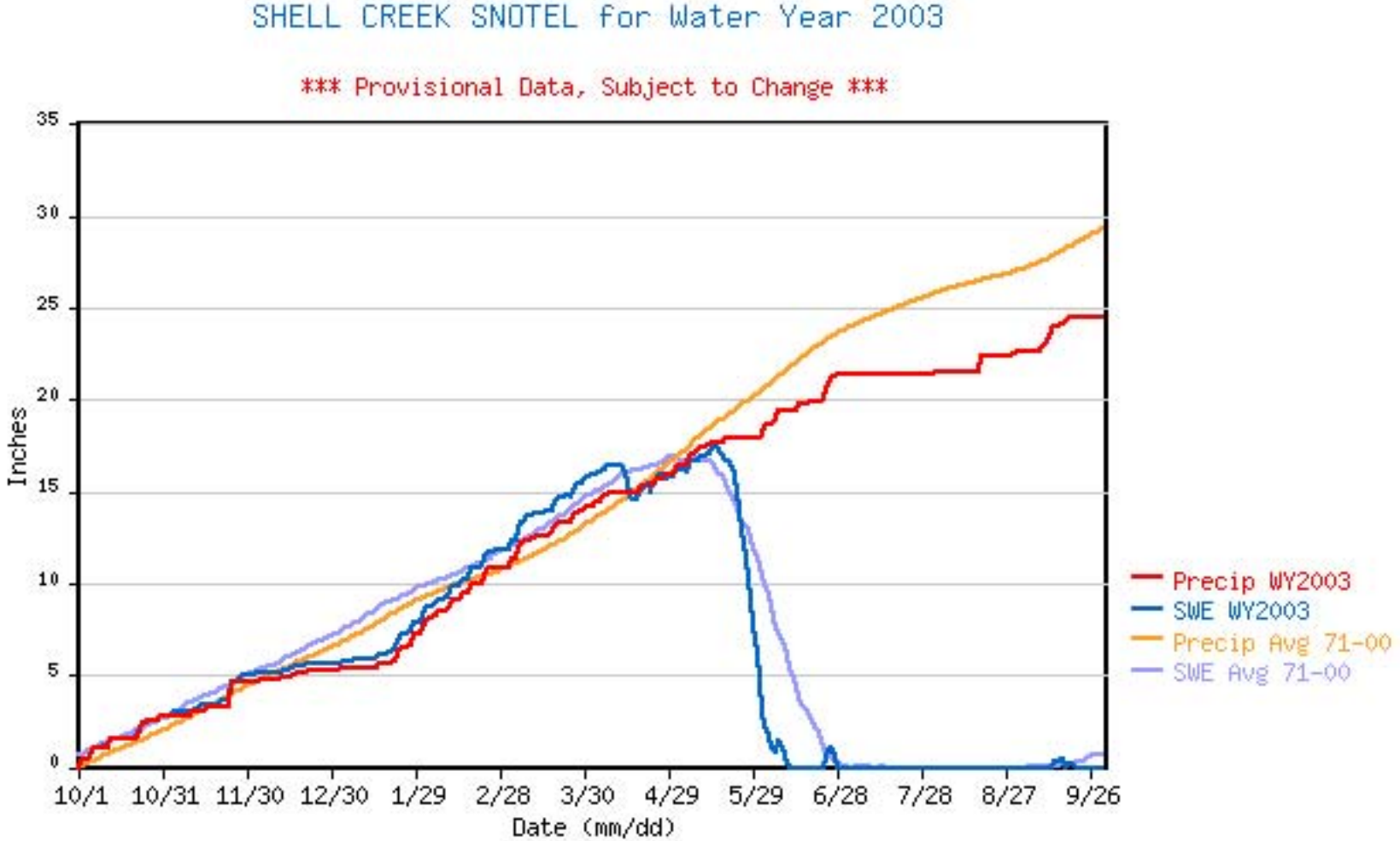
	HighLine Reservoir Expansion		Collingwood Draw - Upper					Bratsky Draw					Red Canyon			Leavitt Reservoir Expansion		Trapper Creek			Coyote Basin			
	U1	U2	U1	U2	U3	U5	U6	U1	U1a	U2	U3	U4	U1	U2	U3	U1	U2	U1	U2	U3	U1	U2	U3	U10
Bromus tectorum	1	1	8		1		0.3	0.3	0.3	0.3	20	0.3			3	2	1	16			3		9	4
TOTAL IAG	**8.0**	**4.0**	**10.0**	**0.3**	**1.0**	**0.3**	**1.3**	**42.3**	**0.3**	**0.3**	**36.0**	**0.6**	**0.0**	**0.0**	**3.0**	**2.3**	**1.0**	**16.0**	**1.0**	**0.0**	**3.0**	**0.0**	**14.0**	**4.0**
NATIVE PERENNIAL FORBS																								
Allium textile						0.3										0.3	0.3	0.3						
Arenaria congesta																								
Arenaria hookeri					6												2							
Calochortus nuttallii	0.3								0.3							0.3								
Chenopodium glacum						0.3	0.3																	
Erigeron pumilus										2	2						0.3							
Gutierrezia sarothrae					0.3												2	0.3		2			0.3	
Haplopappus spinulosus																				0.3				
Helianthus nuttallii													0.3									0.3		
Machaeranthera grindelioides			4	10	1													0.3		0.3				
Musineon divaricatum																						3		
Opuntia polyacantha	1	3	2	2	3		3	3	2	12	11	3			1	2	0.3	2	2		1		0.3	1
Penstemon albidus																	0.3							
Phacelia hastata																				0.3				
Phlox hoodii	1				1				2								1							
Platyschkuhria integrifolia															1							5		
Sphaeralcea coccinea	0.3	0.3																		0.3				
Yucca glauca																					0.3		0.3	
Zigadenus venenosus										1														
TOTAL NPF	**2.6**	**3.3**	**6.0**	**12.0**	**11.3**	**0.6**	**3.3**	**3.0**	**4.3**	**15.0**	**13.0**	**3.0**	**0.3**	**0.0**	**2.0**	**2.6**	**6.2**	**2.9**	**2.0**	**3.2**	**1.3**	**8.3**	**0.9**	**1.0**
NATIVE ANNUAL/BIENNIAL FORBS																								
Crypantha celsiodes																								
Descurainia pinnata													0.3											
Descurainia richardsonii			4	0.3	1				0.3	6	1	2	8		1	0.3	0.3		0.3				0.3	
Euphorbia glyptosperma		0.3																						
Lappula redowskii	1	0.3	0.3		0.3	0.3			0.3	1		0.3			0.3			0.3						
Lepidium densiflorum			0.3	0.3	0.3	1			0.3	0.3	0.3	1				0.3	0.3				3		1	
Machaeranthera tanacetifolia						0.3				2	2													
Monolepis nuttalliana						0.3																		
Plantago patagonica	0.3	0.3							0.3		1	0.3									0.3		0.3	
Salix kali		0.3																						
Sueada depressa												1	4											
TOTAL NAF	**1.3**	**1.2**	**4.6**	**0.6**	**1.6**	**1.9**	**0.0**	**0.0**	**1.2**	**9.3**	**4.3**	**4.6**	**12.3**	**0.0**	**1.3**	**0.6**	**0.6**	**0.3**	**0.3**	**0.0**	**3.3**	**0.0**	**1.6**	**0.0**
INTRODUCED ANNUAL/BIENNIAL FORBS																								
Camelina microcarpa		0.3																						
Chorispora tenella		0.3																						
Descurainia sophia						0.3															7			
Halogeton glomeratus	0.3	0.3	2	0.3			5	0.3		0.3		0.3		5	4	1			7	0.3				
Kochia scoparia				0.3									15											
Lepidium perfoliatum						0.3					0.3	0.3	1					0.3				0.3	1	0.3
Malcolmia africana																		0.3						
Sisymbrium altissimum		0.3	0.3																					
Sisymbrium loeselii													8											
Tragopogon dubius		0.3													0.3								0.3	
TOTAL IAF	**0.3**	**1.5**	**2.3**	**0.6**	**0.0**	**0.6**	**5.0**	**0.3**	**0.0**	**0.3**	**0.3**	**0.6**	**24.0**	**5.0**	**4.3**	**1.0**	**0.0**	**0.6**	**7.0**	**0.3**	**7.0**	**0.3**	**1.3**	**0.3**
SHRUBS																								
Artemisia arbuscula																								
Artemisia spinescens									0.3							1	0.3							
Artemisia tridentata ssp. wyominsis	3	6			16				18					1	3			26		3	9		8	4
Artemisia tridentata ssp. tridentata			20							7	1					9	3							

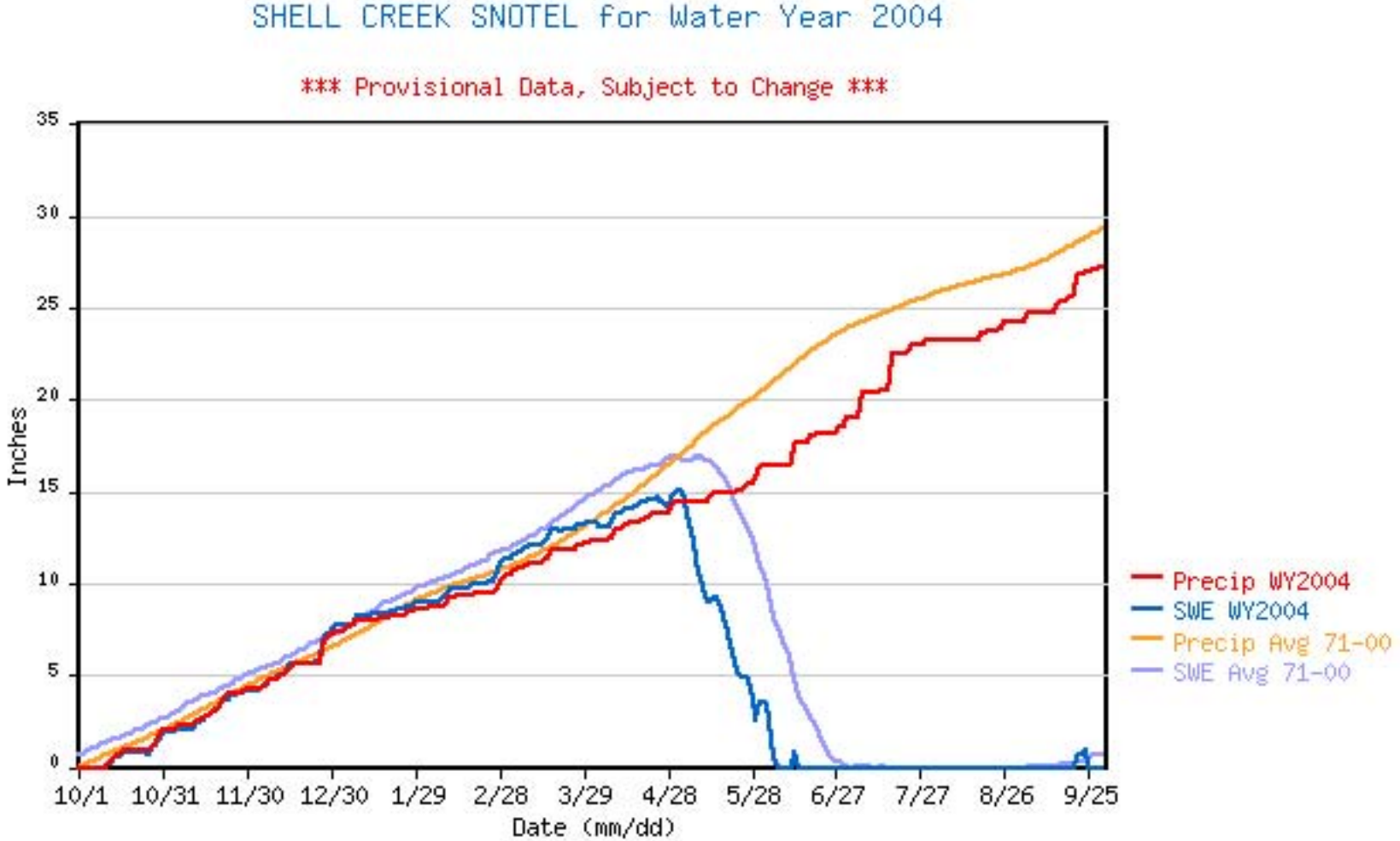
Appendix I
Site Parameters and Canopy Cover by Species. Potential Reservoir Sites. Shell Creek Watershed. 2007.

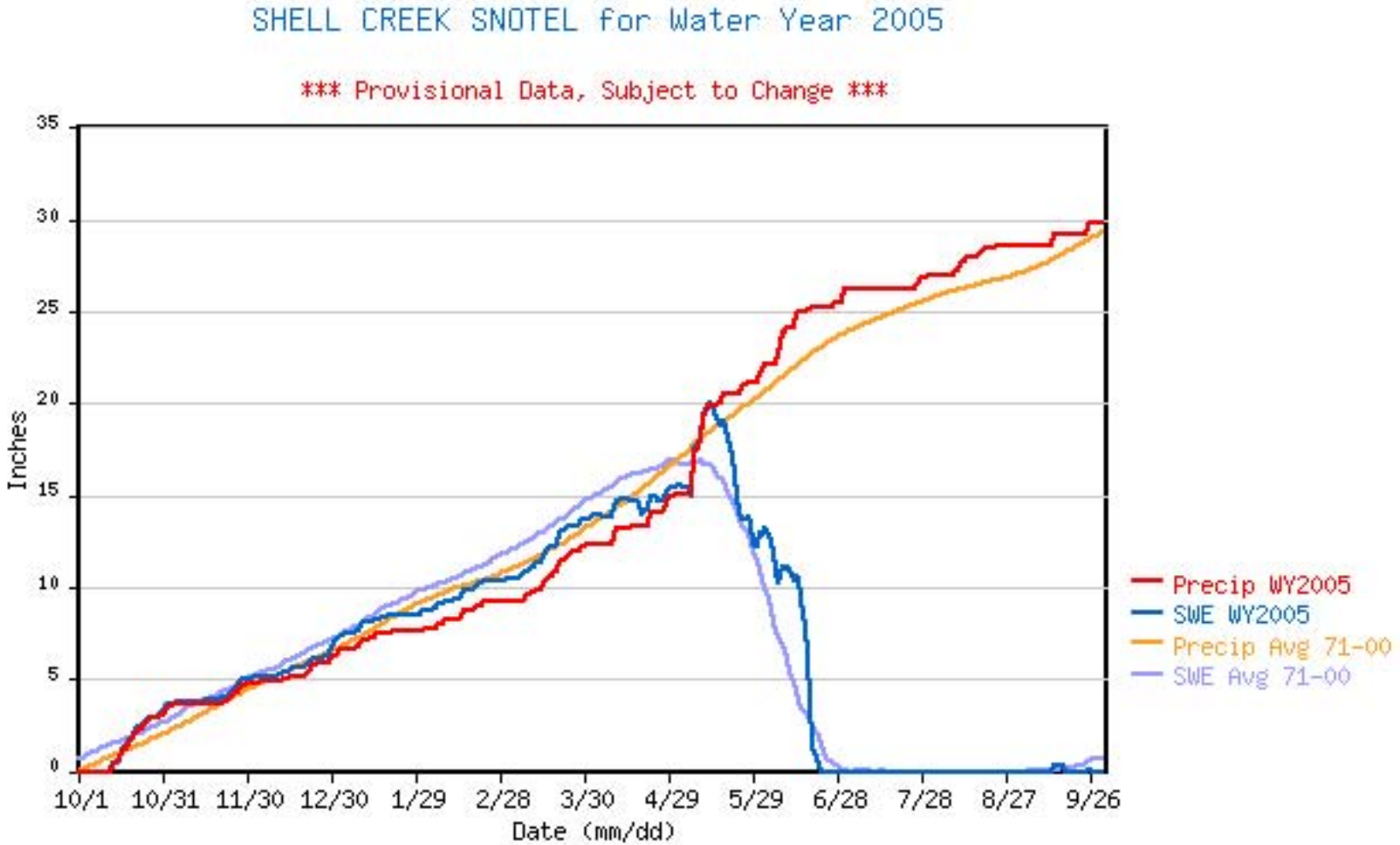
	HighLine Reservoir Expansion		Collingwood Draw - Upper					Bratsky Draw					Red Canyon			Leavitt Reservoir Expansion		Trapper Creek			Coyote Basin			
	U1	U2	U1	U2	U3	U5	U6	U1	U1a	U2	U3	U4	U1	U2	U3	U1	U2	U1	U2	U3	U1	U2	U3	U10
Atriplex confertifolia		2	0.3		1				2	1					5		7	0.3	8	1		3		
Atriplex gardneri			2	12	1	28	10	1	0.3		5	3		16	1	6	2					0.3		6
Ceratoides lanata		0.3																	0.3	3				
Chrysothamnus nauseosus						0.3						0.3	5				0.3		1	1	21		6	
Sarcobatus vermiculatus								0.3		4		42	44					0.3				0.3	3	1
Tamarix chinensis																							0.3	
TOTAL SHRUBS	**3.0**	**8.3**	**22.3**	**12.0**	**18.0**	**28.3**	**10.0**	**1.3**	**20.6**	**12.0**	**6.0**	**45.3**	**49.0**	**17.0**	**9.0**	**16.0**	**12.6**	**26.6**	**9.3**	**8.0**	**30.0**	**3.6**	**17.3**	**11.0**
TOTAL VEGETATION (Stratified)	**37.2**	**30.3**	**58.1**	**25.8**	**44.9**	**32.3**	**37.6**	**46.9**	**56.0**	**50.9**	**62.6**	**59.1**	**93.6**	**22.3**	**31.9**	**43.8**	**38.7**	**58.4**	**22.9**	**17.8**	**61.6**	**15.5**	**54.7**	**25.3**

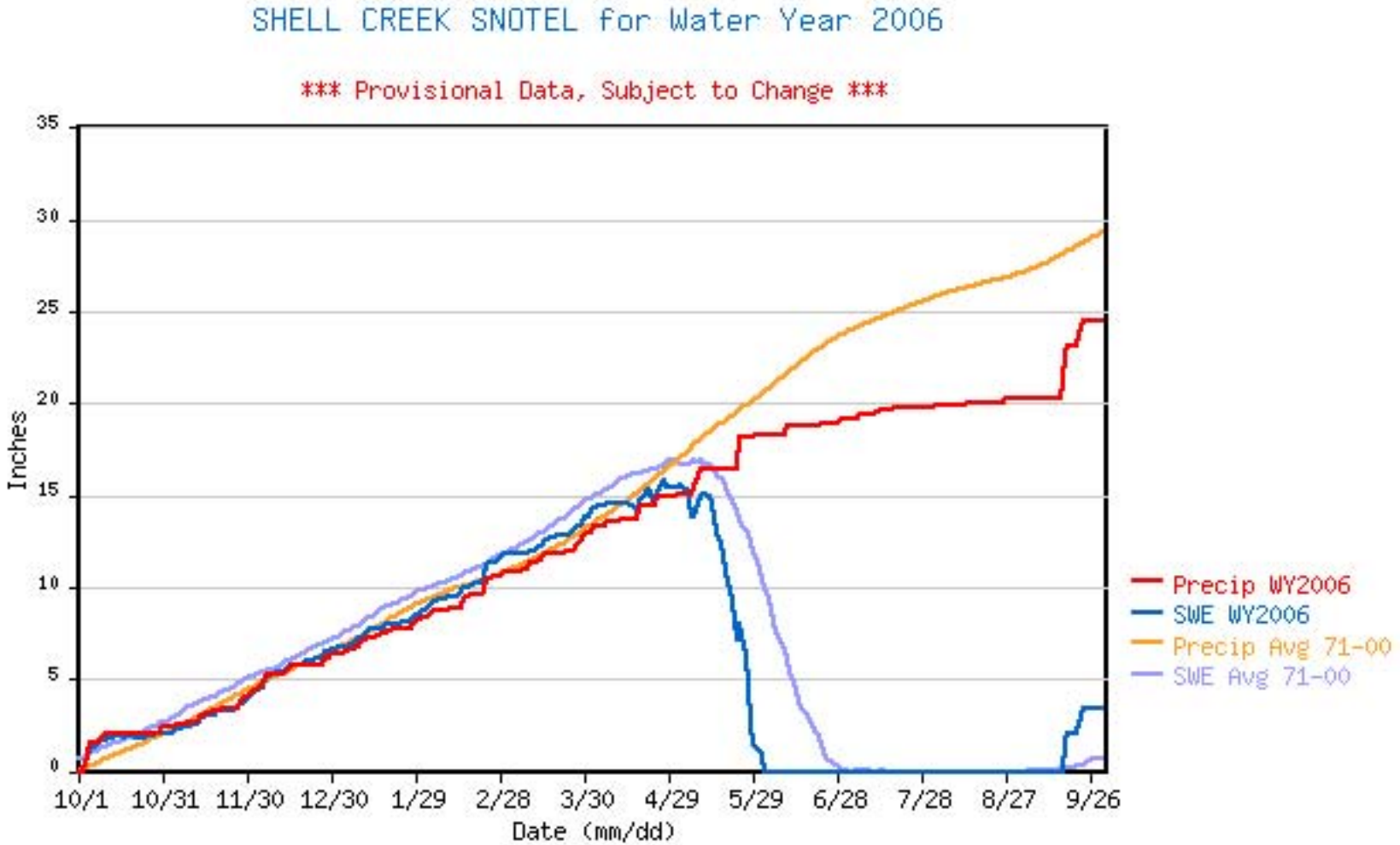
APPENDIX B

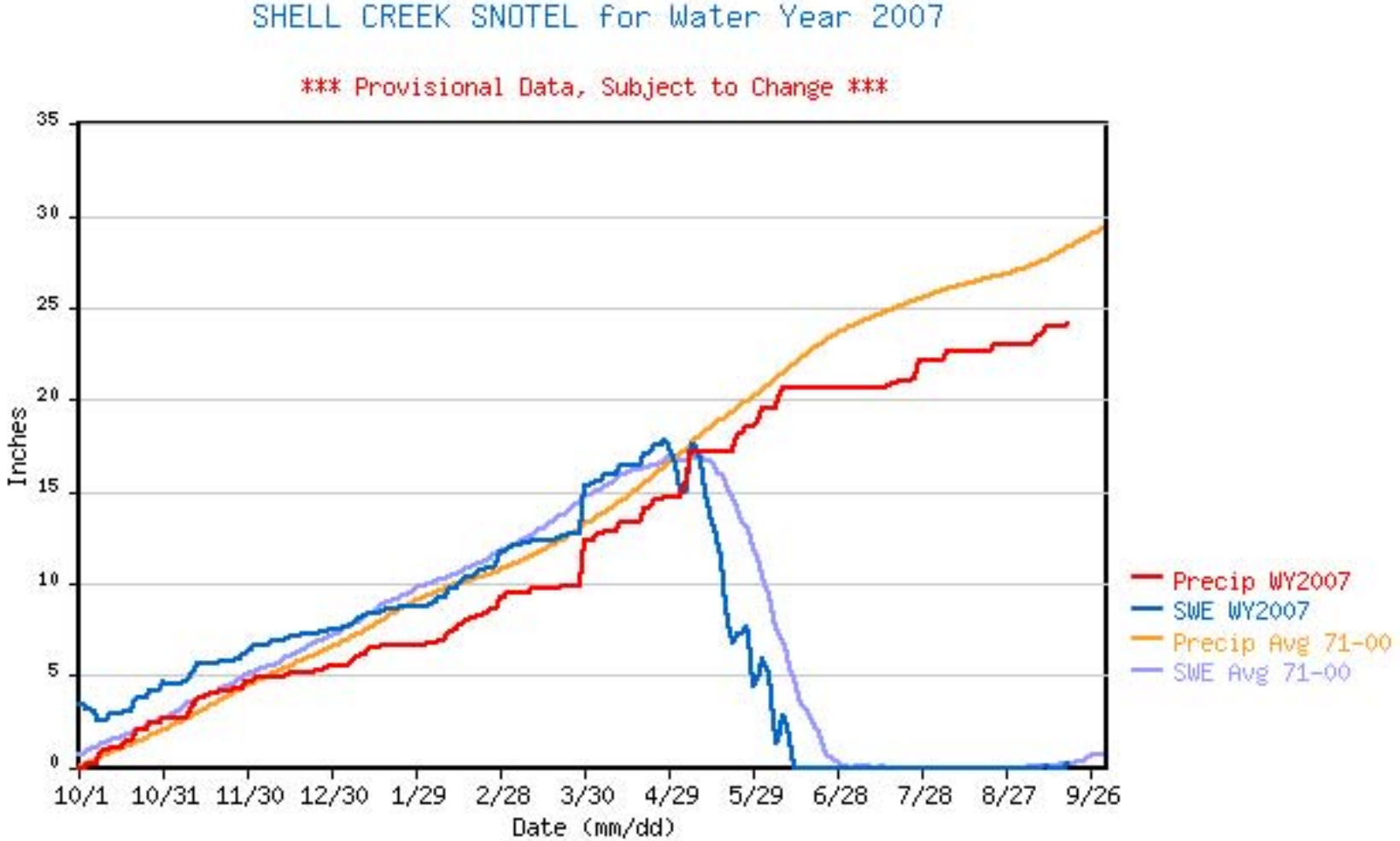
- Shell Creek Snotel Station No. 751 Graphs


SHELL CREEK SNOTEL for Water Year 2003
*** Provisional Data, Subject to Change ***
Inches
35
30
25
20
15
10
5
0
10/1
10/31
11/30
12/30
1/29
2/28
3/30
4/29
5/29
6/28
7/28
8/27
9/26
Date (mm/dd)
Precip WY2003
SWE WY2003
Precip Avg 71-00
SWE Avg 71-00


SHELL CREEK SNOTEL for Water Year 2004
*** Provisional Data, Subject to Change ***
Inches
35
30
25
20
15
10
5
0
10/1
10/31
11/30
12/30
1/29
2/28
3/29
4/28
5/28
6/27
7/27
8/26
9/25
Date (mm/dd)
Precip WY2004
SWE WY2004
Precip Avg 71-00
SWE Avg 71-00


SHELL CREEK SNOTEL for Water Year 2005
*** Provisional Data, Subject to Change ***
Inches
35
30
25
20
15
10
5
0
10/1
10/31
11/30
12/30
1/29
2/28
3/30
4/29
5/29
6/28
7/28
8/27
9/26
Date (mm/dd)
Precip WY2005
SWE WY2005
Precip Avg 71-00
SWE Avg 71-00


SHELL CREEK SNOTEL for Water Year 2006
*** Provisional Data, Subject to Change ***
Inches
35
30
25
20
15
10
5
0
10/1
10/31
11/30
12/30
1/29
2/28
3/30
4/29
5/29
6/28
7/28
8/27
9/26
Date (mm/dd)
Precip WY2006
SWE WY2006
Precip Avg 71-00
SWE Avg 71-00


SHELL CREEK SNOTEL for Water Year 2007
*** Provisional Data, Subject to Change ***
Inches
35
30
25
20
15
10
5
0
10/1
10/31
11/30
12/30
1/29
2/28
3/30
4/29
5/29
6/28
7/28
8/27
9/26
Date (mm/dd)
Precip WY2007
SWE WY2007
Precip Avg 71-00
SWE Avg 71-00

APPENDIX C

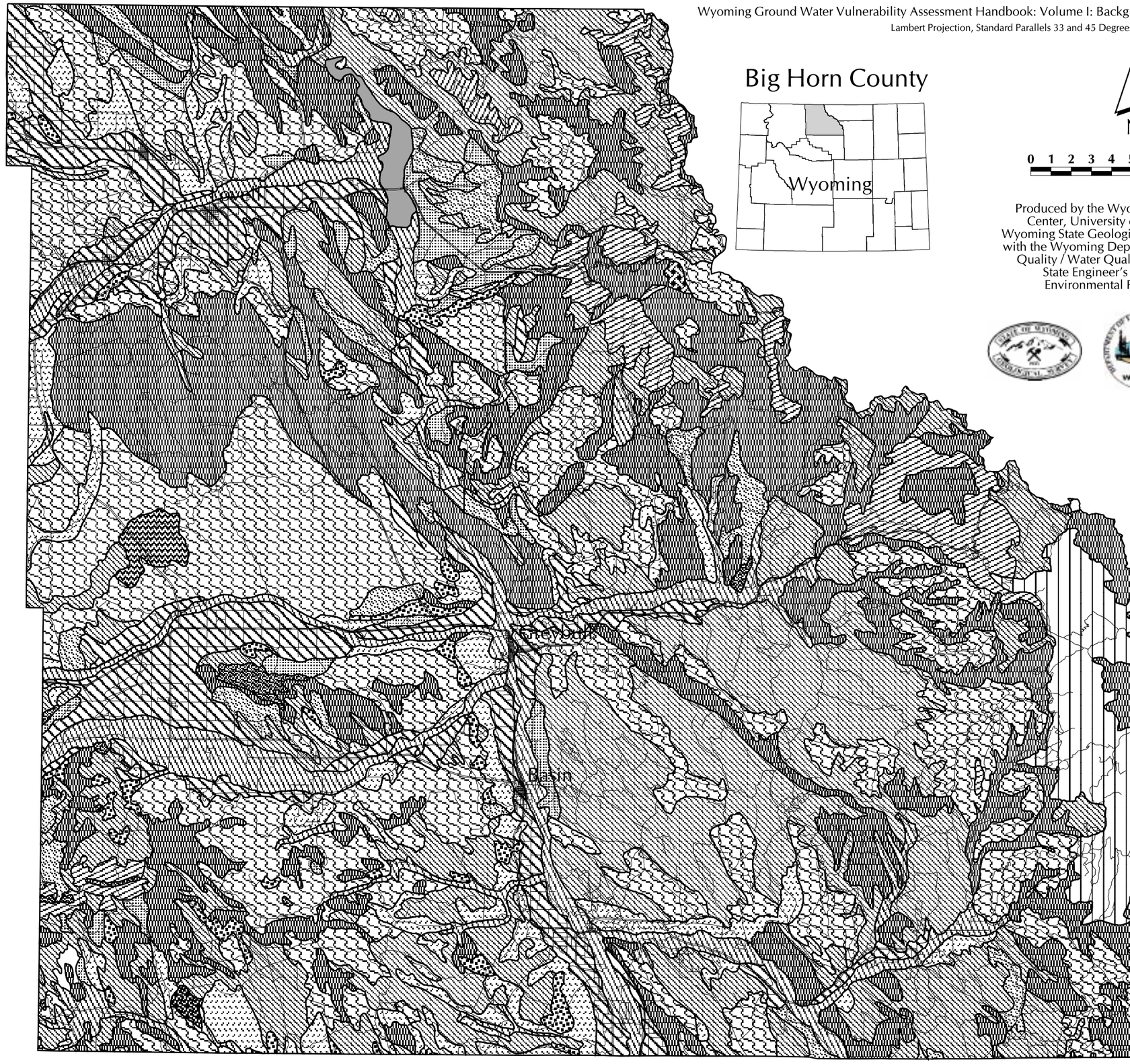
- Big Horn County Surficial Geology
- Surficial Geology Terms
- Big Horn County bedrock Geology
- Bedrock Geology Terms
- Big Horn County Soil Map
- Soil Terms
- Big Horn County Depth to Initial Ground Water
- Big Horn County Ground Water Wells

Wyoming Ground Water Vulnerability Assessment Handbook: Volume I: Background, Model Development, and Aquifer Sensitivity Analysis, SDVC 98-01-1

Lambert Projection, Standard Parallels 33 and 45 Degrees North, Central Meridian 107.5 Degrees West

Map I-E7-3

Surficial Geology



Distributed by:

Spatial Data and Visualization Center
P.O. Box 4008
University of Wyoming
Laramie, WY 82071
(307) 766-2735
http://www.sdvc.uwyo.edu

7. Surficial Geology Terms

Ai Old alluvial plain with scattered deposits of eolian, residuum, and slopewash

ai Alluvium with scattered deposits of terrace, slopewash, eolian, residuum, grus and glacial

aR Shallow Alluvium mixed with scattered bedrock outcrops

bi Bench including eolian, slopewash, outwash, and bench and/or mesa

bdi Dissected bench with scattered deposits of residuum, slopewash, landslide, and eolian

tdi Dissected terrace deposits mixing with alluvium, residuum, eolian, and slopewash

ti Terrace deposits mixed with scattered deposits of alluvium, residuum, eolian, slopewash, and outwash

tre Shallow terrace deposits mixed with scattered deposits of eolian and residuum

fi Alluvial fan and gradational fan deposits mixed with scattered deposits of slopewash, residuum, and eolian

fdi Dissected alluvial fan and gradational fan deposits mixed with scattered deposits of slopewash and residuum

mi Mesa including scattered deposits of residuum and eolian

ei Eolian mixed with scattered deposits of residuum, alluvium, and slopewash

oai Glacial outwash and alluvium mixed with scattered deposits of glacial, terrace, hot spring, bedrock outcrops, residuum, slopewash and grus

gi Glacial deposits mixed with scattered deposits of slopewash, residuum, grus, alluvium, colluvium, landslide, and/or bedrock outcrops

li Landslide mixed with scattered deposits of slopewash, residuum, Tertiary landslides, and bedrock outcrops; landslides too small and numerous to show separately

pea Playa deposits mixed with scattered deposits of alluvium, eolian, and r; playa deposits too small to show separately

sci Slopewash and colluvium mixed with scattered deposits of slopewash, residuum, grus, glacial, periglacial, alluvium, eolian, and/or bedrock outcrops

ri Residuum mixed with alluvium, eolian, slopewash, grus, and/or bedrock outcrops

ui Grus mixed with alluvium, eolian, slopewash, grus, and/or bedrock outcrops

Ri Bedrock and glaciated bedrock including hot spring deposits and volcanic necks; mixed with scattered shallow deposits of eolian, grus, slopewash, colluvium, residuum, glacial, and alluvium.

Mi Mined areas mixed with scattered deposits of residuum, slopewash, and/or bedrock outcrops

Ki Karst areas mixed with scattered deposits of residuum, slopewash, alluvium and/or bedrock outcrops

ki Clinker mixed with scattered deposits of residuum, slopewash, alluvium and/or bedrock outcrops

xi Truncated bedrock mixed with scattered shallow deposits of eolian, terrace, residuum, alluvium, old alluvial plain, bench, and slopewash

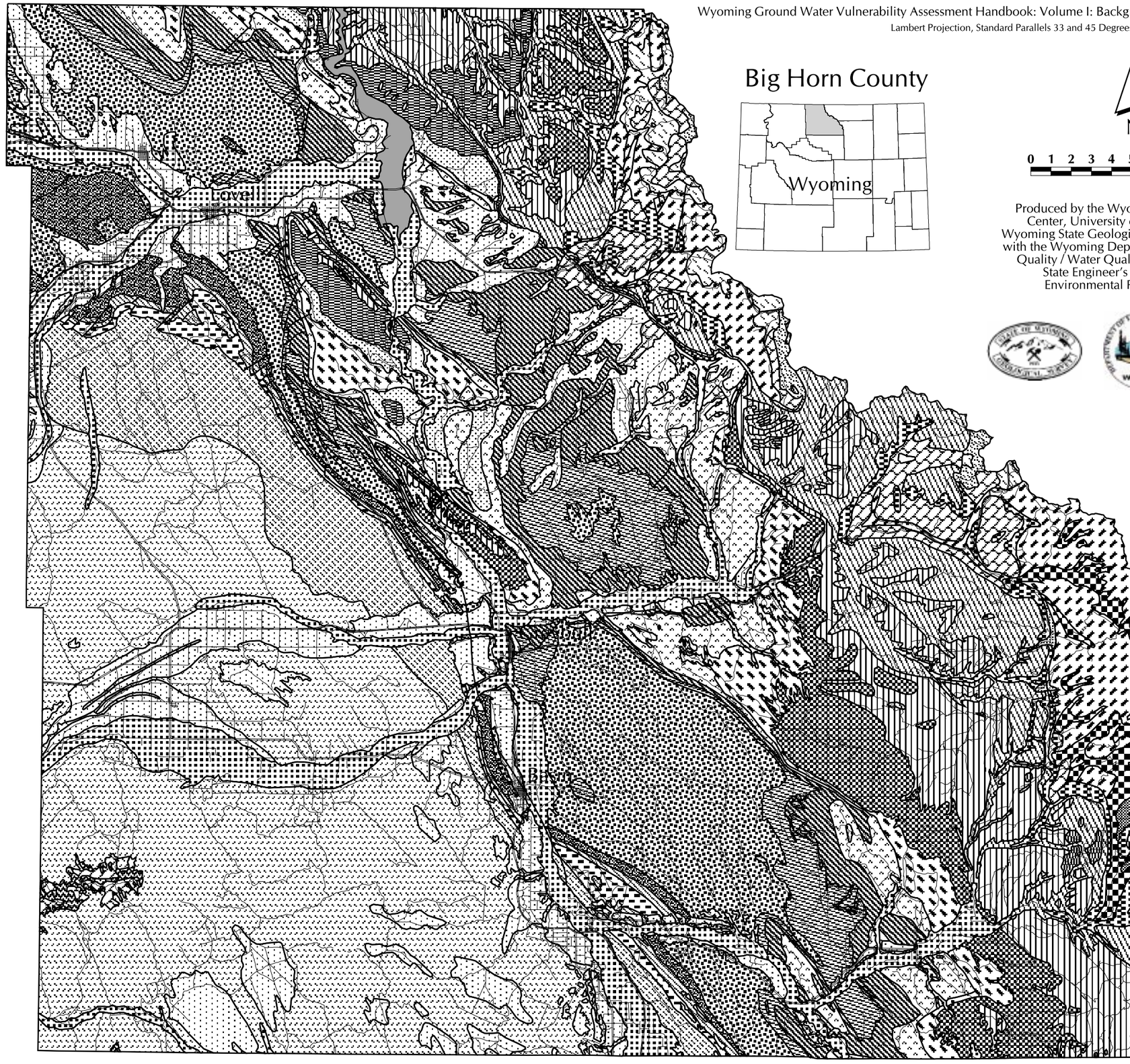
Ti Structural terrace including and/or mixed with deposits of alluvium, eolian, residuum, slopewash, and terrace.

Wyoming Ground Water Vulnerability Assessment Handbook: Volume I: Background, Model Development, and Aquifer Sensitivity Analysis, SDVC 98-01-1

Lambert Projection, Standard Parallels 33 and 45 Degrees North, Central Meridian 107.5 Degrees West

Map I-E7-2

Bedrock Geology



Big Horn County

N

0 1 2 3 4 5 6 7 8 9 10 Miles

Produced by the Wyoming Water Resources Center, University of Wyoming, and the Wyoming State Geological Survey in cooperation with the Wyoming Department of Environmental Quality / Water Quality Division, Wyoming State Engineer's Office and the US Environmental Protection Agency

- @Pcg
- @Pg
- @c
- H2O
- Jsg
- KJ
- KJg
- Kc
- Kf
- Kl
- Km
- Kmt
- Kmv
- MD
- Mm
- O
- Ob
- PM
- QTg
- Qa
- Qg
- Qls
- Qt
- Tfu
- Tta
- Twl
- Twr
- Ugn
- WVg
- _r

Distributed by:

Spatial Data and Visualization Center
P.O. Box 4008
University of Wyoming
Laramie, WY 82071
(307) 766-2735
http://www.sdvc.uwyo.edu

BEDROCK GEOLOGY TERMS

(from: Wyoming Ground Water Vulnerability Assessment Handbook (Hamerlinck and Arneson 1998)

@Pcg – Chugwater and Goose Egg formations

@Pg – Goose Egg formation

@c – Chugwater formation or group

Jsg – Sundance and Gypsum Spring Formations

KJ – Cloverly and Morrison formations

KJg – Cloverly, Morrison, Sundance, and Gypsum Spring formations

Kc – Cody shale

Kf – Frontier formation

Kl – Lance formation

Km – Meeteetse formation

Kmt – Mowry and Thermopolis shales

Kmv – Mesaverde group

MD – Madison limestone and Darby formation

Mm – Madison limestone or group

O_ - Bighorn dolomite, Gallatin limestone, Gros Ventre formation, and Flathead sandstone

Ob – Bighorn dolomite

PM – Tensleep sandstone and Amsden formation

QTg – Terrace gravel

Qa – Alluvium and colluvium

Qg – Glacial deposits

Qls – Landslide deposits

Qt – Gravel, pediment, and fan deposits

Tfu – Fort Union formation

Tta – Tatman formation

Twl – Intrusive igneous rocks: Thorofare Creek group – Wiggins formation

Twr – White River formation

Ugn – Oldest Gneiss complex

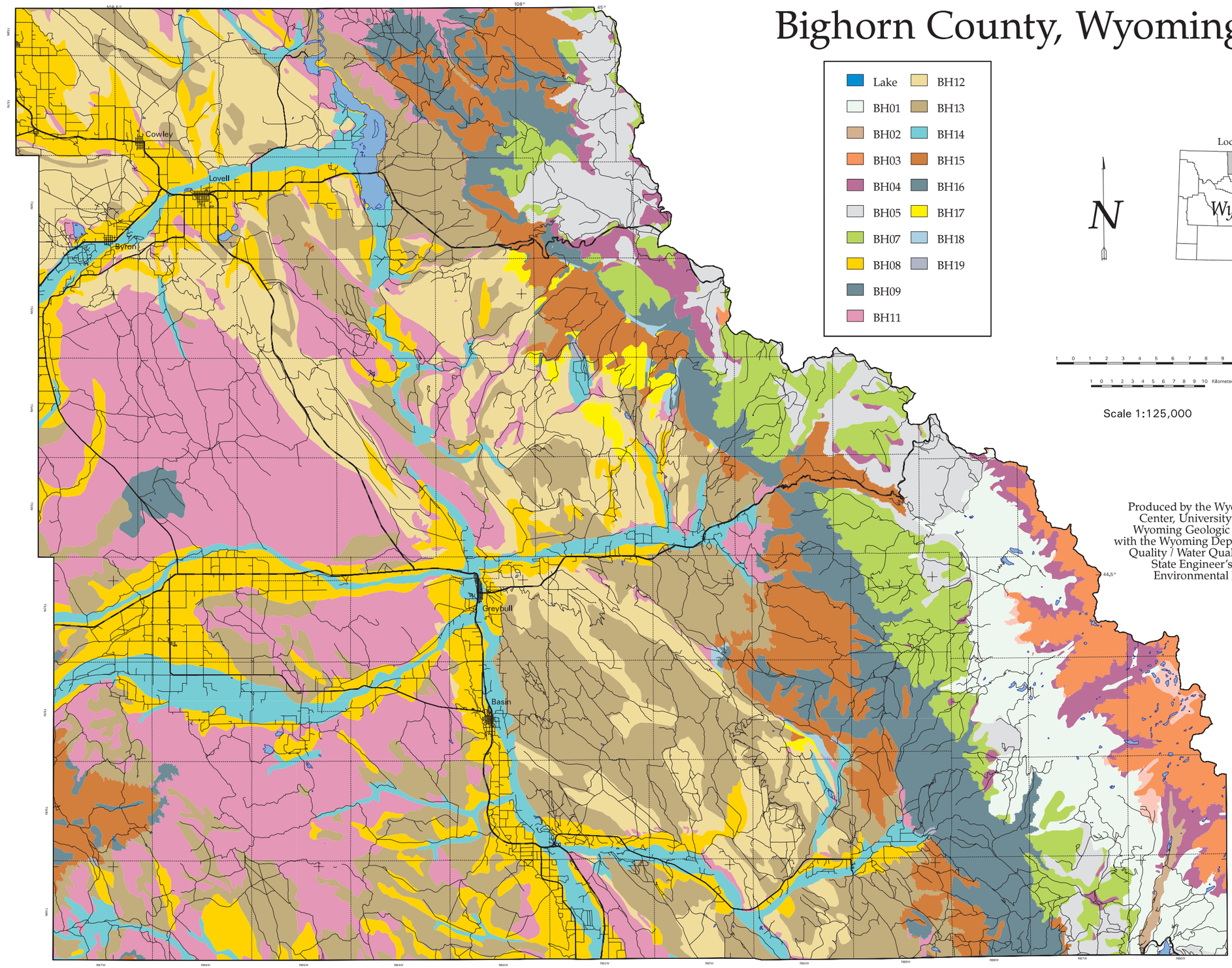
WVg – Plutonic rocks

_r – Gallatin limestone, Gros Ventre formation, and Flathead sandstone

For further information on the specific data layers portrayed on this map please refer to publication number SDVC-98-01, Wyoming Ground Water Vulnerability Assessment Handbook

Wyoming Ground Water Vulnerability Mapping Project
Soils

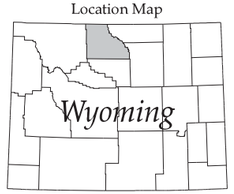
Bighorn County, Wyoming



- Lake
- BH01
- BH02
- BH03
- BH04
- BH05
- BH07
- BH08
- BH09
- BH11
- BH12
- BH13
- BH14
- BH15
- BH16
- BH17
- BH18
- BH19

N

Location Map



1 0 1 2 3 4 5 6 7 8 9 10 Miles

1 0 1 2 3 4 5 6 7 8 9 10 Kilometers

Scale 1:125,000

Produced by the Wyoming Water Resources Center, University of Wyoming and the Wyoming Geologic Survey in cooperation with the Wyoming Department of Environmental Quality / Water Quality Division, Wyoming State Engineer's Office and the US Environmental Protection Agency

Information presented on this map is derivative in nature. The spatial accuracy of the data presented is a function of source data accuracy and some degree of error propagation inherent in the aquifer sensitivity/ground-water vulnerability modeling process. As a result, this map portrays general spatial patterns and is not intended for site specific investigations.

April 1999

Wyoming Water Resources Center

Map production, handbook, and data distribution by:

Spatial Data and Visualization Center

PO Box 4008
University of Wyoming
Laramie, WY 82071
(307) 766-2532
http://www.sdvc.uwyo.edu

Note: The scale of this map has been reduced to meet plotter hardware constraints.

Lambert Projection, Standard Parallels 33° and 45°, Central Meridian 107.5°, Projection Origin 41°, NAD27

7.

Soil Terms

Big Horn County: Mountains and high plateau. Glaciated, Pre- Cambraian Rocks. Mountains. Cryic, udic and aquic.

BHO1: Typic Dystrocryepts, loamy- skeletal, mixe- Typic Haplocryalfs, loamy-skeletal, mixed- Histic Cryaquepts, fine- loamy over sandy or sandy-skeletal, mixed. Under continuous coniferous forest (Lodgepole Pine, Englemann Spruce, Subalpine Fir, and Douglas Fir) soils on geologic parent materials and surfaces that are older than Pinedale are typically Haplocryalfs. The mountains were heavily glaciated during the Pinedale (Wisconsin) glaciation and most surfaces are of Late Pinedale or Holocene age. On these younger parent materials and/or surfaces, the dominant soils are Dystrocrepts. Cryaquepts occur in riparian areas. Inclusions may include Cryofluvents along small channels and Cryofibrists in depressions in Pinedale moraines and along low gradient segments of streams. Cryoborolls and Cryumbrepts may occur in small openings in the forest.

BHO2: Fluventic Haplocryolls, fine-loamy, mixed and Histic Cryaquepts, fine-loamy over sandy or sandy-skeletal, mixed. Haplocryolls occur in mountain meadows which are predominately on south and west facing slopes, and are often on finer textured parent materials than surrounding forest soils. Cryaquepts occur along riparian areas.

BHO3: Rock Outcrop, Lithic Cryorthents and Histic Dystrocryepts, loamy-skeletal, mixed and Histic Cryaquepts, fine-loamy over sandy or sandy-skeletal, mixed. Topography for this high elevation unit is irregular, with Histic Dystrocryepts occurring under grass or grass with scattered trees on small benches and low gradient segments of the slope. The Cryorthents are on very steep slopes and around the base of rock outcrops. The Cryaquepts occur along small riparian areas.

BHO4: Lithic Cryorthents, loamy-skeletal; Rock Outcrop; and Typic Cryaquepts, fine-loamy over sandy or sandy-skeletal. Thin Cryorthents and bedrock outcrops dominate this landscape. In narrow riparian areas between steep slopes, Cryaquepts have developed in accumulations of fine materials weathered from the surrounding uplands.

BHO5: Typic Haplocryalfs, Typic Haplocryolls, and Typic Dystrocryepts, loamy-skeletal, mixed and Histic Cryaquepts, fine-loamy over sandy or sandy-skeletal, mixed. On stable slopes which are older than Pinedale (Late Wisconsin), the predominate soils are Haplocryalfs. Haplocryolls occur under mountain meadow vegetation and are most common on south facing slopes and on convex interfluves. Dystrocryepts occur on slopes greater than 40%, and on Pinedale and younger surfaces (Pinedale tills and Holocene surfaces). Cryaquepts are found along narrow riparian areas.

BHO7: Rock outcrop, Typic Lithic Dystrocryepts and Lithic Cryorthents, loamy-skeletal, mixed. These residual landscapes present a rugged appearance with 50 to 60% of the area covered by rock outcrop. The thin Dystrocryepts and Cryorthents occur intermingled with the bedrock.

BH10: HisticCryaquepts fine-loamy over sandy or sandy-skeletal, mixed and Histic Dystrocryepts, loamy-skeletal, mixed. Like BH03 except less rock outcrop.

Big Horn County: Bighorn Basin. Intermountain Basin. Mesic, aridic.

BHO8: Typic Haplargids and Typic Haplocalcids, fine-loamy over sandy or sandy-skeletal, mixed, mesic and Torriorthents, fine-loamy and coarse-loamy, mixed, mesic.

BH09: Typic Torripsaments, mesic. These soils are on stabilized dunes. They show little horizon development; thin A horizons are the most apparent change from the parent material (stabilized dune sand).

BH11: Typic Torriorthents, loamy, mixed, mesic and Rock Outcrop. These soils form in a variety of sedimentary parent materials which are exposed along the perimeter of the basin. Soils are shallow or moderately deep.

BH12: Typic Torriorthents, fine, smectitic, mesic and Rock Outcrop. These soils form over fine textured Cretaceous bedrock. Outcrops of shale occur as small badlands; outcrops of coarser textured rock support long, narrow ridges with finer textured soils along the flanks.

BH13: Typic Haplargids and Typic Natrargids, fine-loamy or coarse- loamy, mixed, mesic. These soils occur on low gradient colluvial slopes (less than 15%) and reflect the texture of the underlying bedrock as well as the effects of slope processes.

BH14: Typic Torrifluvents, sandy-skeletal, mixed, mesic and Typic Haplocambids, fine-loamy over sandy or sandy-skeletal, mixed, mesic. These soils occur on Holocene age terraces and slopes along small streams. The Torrifluvents occupy the first and second terraces above the modern channel.

Big Horn County: Foothills. Frigid, ustic.

BH15: Typic Haplustolls and Typic Haplustalfs, loamy-skeletal, mixed, frigid. These soils occur in the foothills along the flank of the higher mountains and represent a transition from the basins to the higher mountains. Haploborolls are common on south and west facing slopes; Haploboralfs predominate on north facing slopes and on both canyon walls of narrow canyons.

BH16: Aridic Argiustolls, fine-loamy and fine-loamy over sandy or sandy-skeletal, mixed, frigid and Ustic Haplocambids, fine-loamy, mixed, frigid. These soils have developed along strean channels and on local alluvium in lower slope positions. The Haplocambids are are on younger or less stable landscape segments.

BH17: Aridic Argiustolls, fine-loamy, mixed and Ustic Haplocambids, fine, smectitic, frigid. These soils have developed on shales, claystones or fine textured alluvium.

BH18: Ustic Haplocalcids, Lithic Ustorthents and Typic Calciustolls, loamy-skeletal, frigid. These soils occur along dissected canyons on clacareous parent materials. The Calciustolls are on landscape segments where available soil water is enhanced; the Ustorthents are on steep slopes.

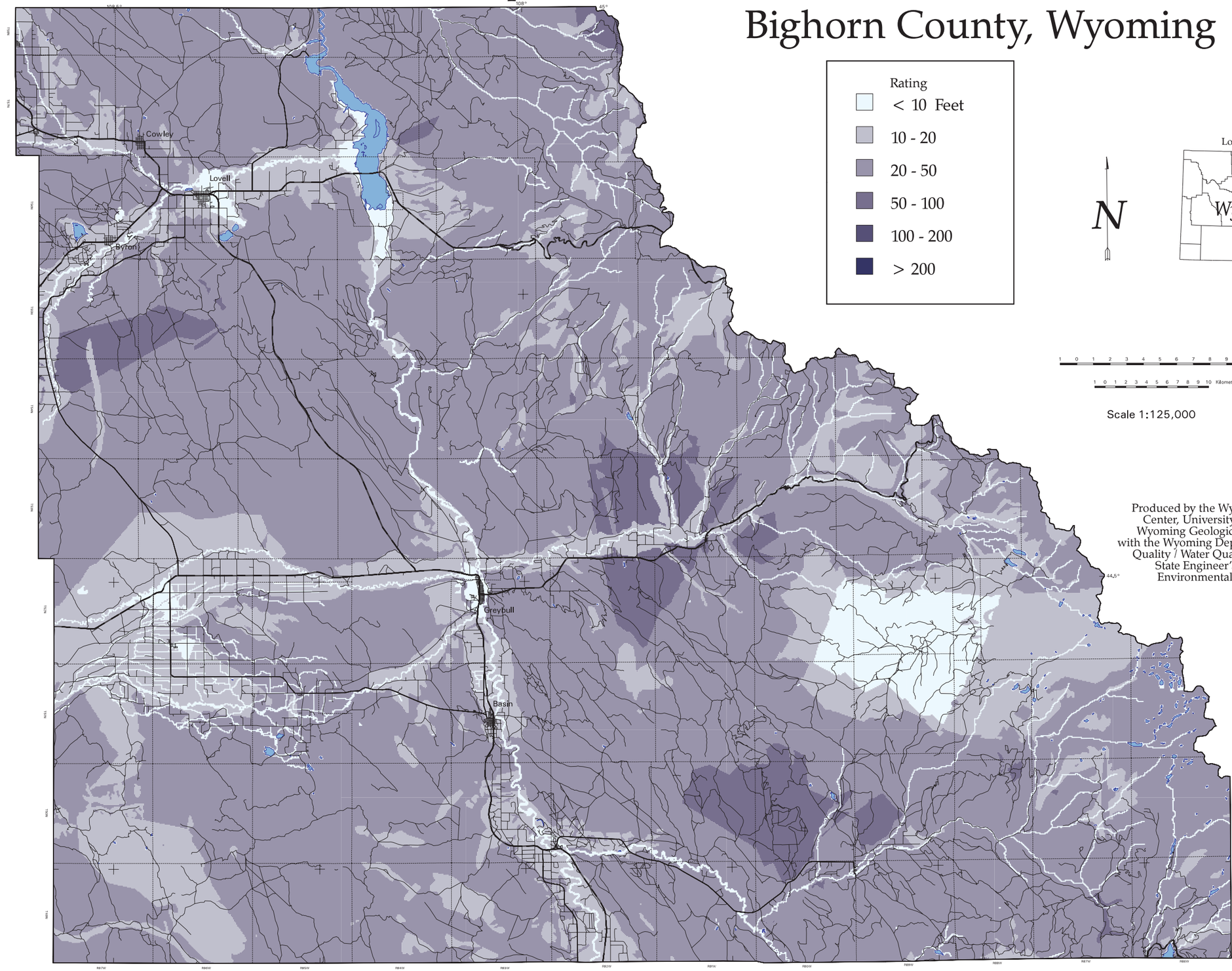
BH06: Fluventic Haplaquolls and Torrifluvents, fine-loamy over sandy or sandy-skeletal, frigid. These soils occur along small alluvial channels.

For further information on the specific data layers portrayed on this map please refer to publication number SDVC-98-01, Wyoming Ground-Water Vulnerability Assessment Handbook

Wyoming Ground Water Vulnerability Mapping Project

Depth to Initial Ground Water

Bighorn County, Wyoming



Rating

- < 10 Feet
- 10 - 20
- 20 - 50
- 50 - 100
- 100 - 200
- > 200

N

Location Map

1 0 1 2 3 4 5 6 7 8 9 10 Miles

1 0 1 2 3 4 5 6 7 8 9 10 Kilometers

Scale 1:125,000

Produced by the Wyoming Water Resources Center, University of Wyoming and the Wyoming Geologic Survey in cooperation with the Wyoming Department of Environmental Quality / Water Quality Division, Wyoming State Engineer's Office and the US Environmental Protection Agency

Information presented on this map is derivative in nature. The spatial accuracy of the data presented is a function of source data accuracy and some degree of error propagation inherent in the aquifer sensitivity/ground water vulnerability modeling process. As a result, this map portrays general spatial patterns and is not intended for site specific investigations.

June 1998

Wyoming Water Resources Center

Map production, handbook, and data distribution by:

Spatial Data and Visualization Center
PO Box 4008
University of Wyoming
Laramie, WY 82071
(307) 766-2532
http://www.sdvc.uwyo.edu

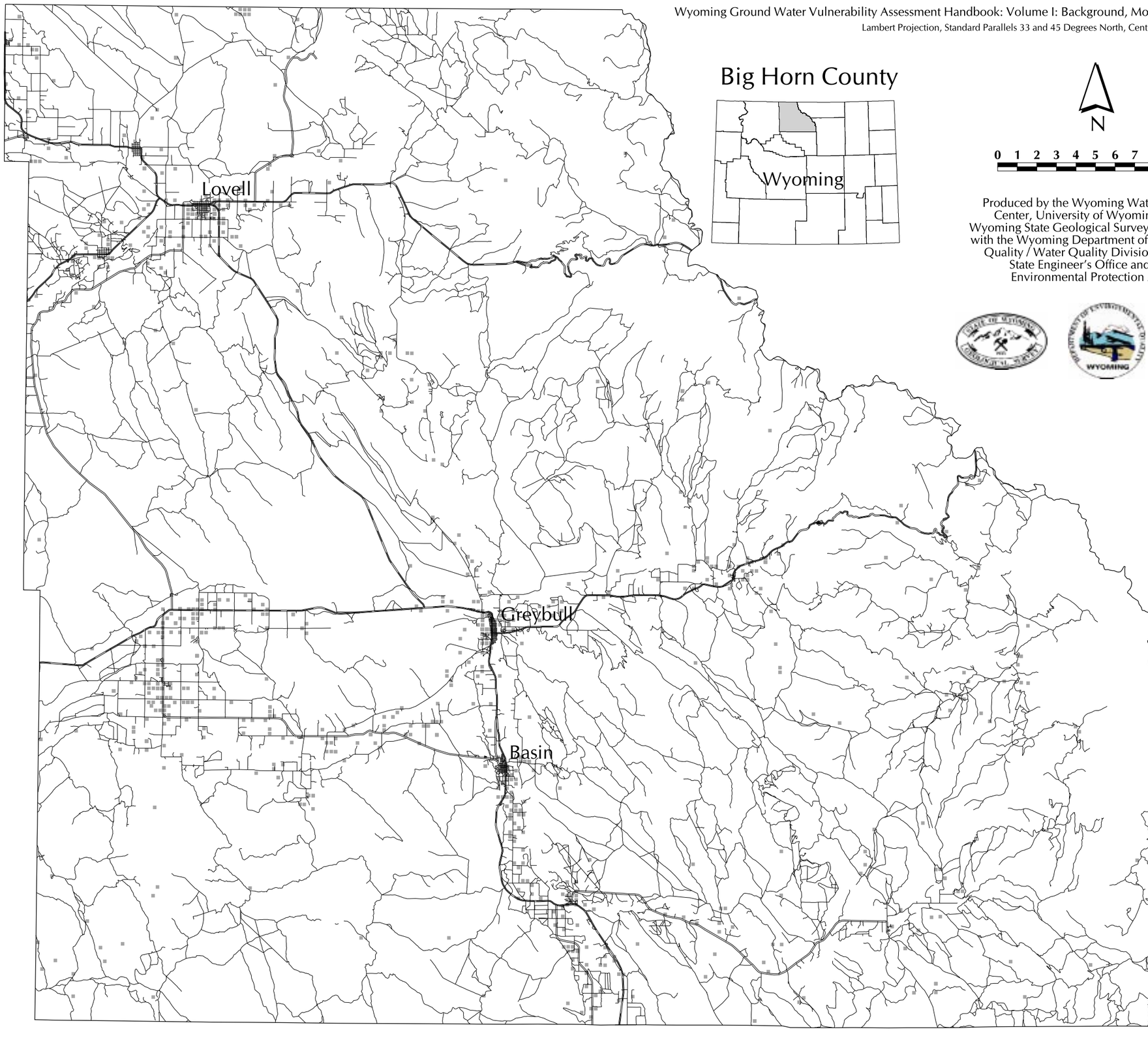
Note: The scale of this map has been reduced to meet plotter hardware constraints.
Lambert Projection, Standard Parallels 33° and 45°, Central Meridian 107.5°, Projection Origin 41°, NAD27

Wyoming Ground Water Vulnerability Assessment Handbook: Volume I: Background, Model Development, and Aquifer Sensitivity Analysis, SDVC 98-01-1

Lambert Projection, Standard Parallels 33 and 45 Degrees North, Central Meridian 107.5 Degrees West

Map I-E7-4

Ground Water Wells



Big Horn County

N

0 1 2 3 4 5 6 7 8 9 10 Miles

Produced by the Wyoming Water Resources Center, University of Wyoming, and the Wyoming State Geological Survey in cooperation with the Wyoming Department of Environmental Quality / Water Quality Division, Wyoming State Engineer's Office and the US Environmental Protection Agency

Distributed by:

Spatial Data and Visualization Center
P.O. Box 4008
University of Wyoming
Laramie, WY 82071
(307) 766-2735
http://www.sdvc.uwyo.edu

APPENDIX D

- Earthquakes and Active Faults in Wyoming

Additional information on earthquakes, earthquake preparedness, and earthquake response can be obtained from:

Wyoming State Geological Survey
P.O. Box 3008
Laramie, WY 82071-3008
Phone: (307) 766-2286
Fax: (307) 766-2605
Email: wsgs@wsgs.uwyo.edu
jcase@wsgs.uwyo.edu
Agency Web: http://wsgsweb.uwyo.edu
Earthquake Web: http://www.wrds.uwyo.edu

Wyoming Emergency Management Agency
5500 Bishop Blvd.
Cheyenne, WY 82009-3320
Phone: (307) 777-4900
Fax: (307) 635-6017
Email: wema@wy-arng.ngb.army.mil
Agency Web: http://132.133.10.9
FEMA Web: http://www.fema.gov

Publications of interest:

Draft directory of earthquake-related human resources for Wyoming – Wyoming State Geological Survey Preliminary Hazards Report PHR 95-1.

Earthquake epicenters and suspected active faults with surficial expression in Wyoming – Wyoming State Geological Survey Preliminary Hazards Report PHR 97-1.

Earthquakes and active faults in Wyoming – Wyoming State Geological Survey Preliminary Hazards Report PHR 97-2.

How to make your Wyoming home more earthquake resistant – Wyoming State Geological Survey Information Pamphlet 5.

Wyoming Geo-notes – Wyoming State Geological Survey quarterly publication contains general and specific articles about Wyoming earthquakes.

Interpreting the landscapes of Grand Teton and Yellowstone National Parks – Recent and ongoing geology, by J.M. Good and K.L. Pierce, 1996: published by Grand Teton Natural History Association.

Windows into the Earth – The geologic story of Yellowstone and Teton National Parks, by R.B. Smith and L.J. Siegel, in preparation: Oxford University Press.

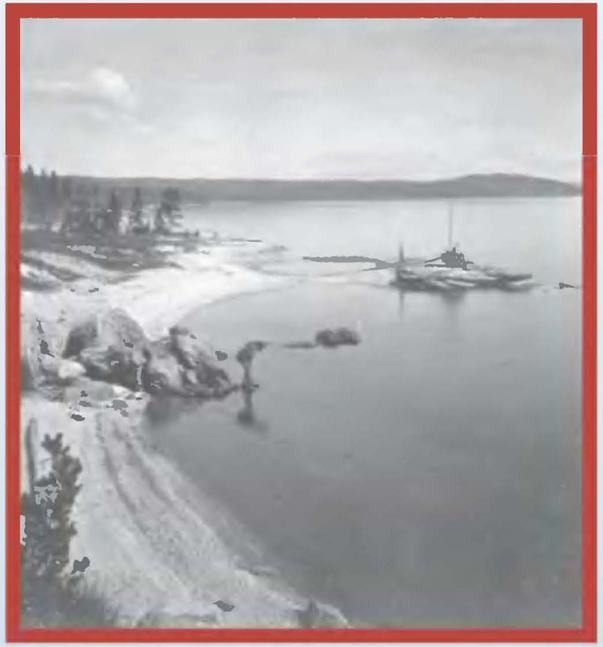
Traveler's guide to the Geology of Wyoming, by D.L. Blackstone, Jr., 1988, Wyoming State Geological Survey Bulletin 67.

Snoke, A.W., Steidtmann, J.R., and Roberts, S.M., editors, 1993, Geology of Wyoming: Wyoming State Geological Survey Memoir 5, 937 p., 2 volumes, map pocket.

Cover photograph: "Cresent Beach on Yellowstone Lake," from a stereographic negative by Joshua Crissman of Bozeman, Montana, originally published by W.I. Marshall of Fitchburg, Massachusetts as stereopair #55. Stereo photographs taken by Crissman are the first publically available images of Yellowstone. Crissman photographs were taken during the Hayden survey of the Yellowstone area. This photograph was taken between July 15 and August 8, 1871, probably within days of the first reported earthquake in Wyoming (Territory). Photograph from the personal collection of Lance Cook.

WYOMING STATE GEOLOGICAL SURVEY
Lance Cook, State Geologist

EARTHQUAKES IN WYOMING



by

James C. Case and J. Annette Green

Prepared for the Wyoming Earthquake Program with funding from the Federal Emergency Management Agency and the Wyoming Emergency Management Agency.

Information Pamphlet 6

LARAMIE, WYOMING
2000

Introduction

Earthquakes are common in Wyoming. Historically, earthquakes have occurred in every county in Wyoming over the past 120 years, with some causing significant damage. Figure 1 shows the generalized distribution of historical earthquakes in Wyoming.

The first recorded earthquake in the state occurred in the area now known as Yellowstone National Park on July 20, 1871. During the early geologic investigations of Yellowstone, Ferdinand V. Hayden of the U.S. Geological Survey reported that "on the night of the 20th of July, we experienced several severe shocks of an earthquake, and these were felt by two other parties, fifteen or twenty-five miles distant, on different sides of the lake." Yellowstone National Park is now known as one of the more seismically active areas in the United States.

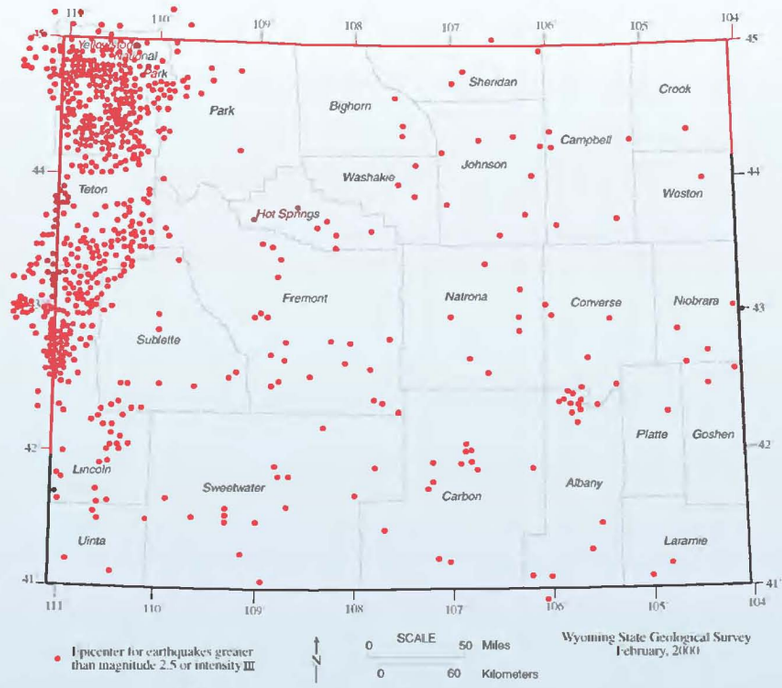


Figure 1. Generalized historical earthquake epicenter map for Wyoming

Causes of Earthquakes

Earthquakes in Wyoming occur because of movements on existing or newly created faults, movements of (or in) the magma chamber beneath Yellowstone National Park, and from man-made events such as blasting at mines, mine collapses, or explosions. Most historical earthquakes have occurred as a result of movements on faults not exposed at the surface. These deeply buried faults, which are not expected to generate earthquakes with magnitudes greater than 6.5, have not been studied in detail. A series of faults exposed at the surface in Wyoming, however, have activated and generated earthquakes from hundreds to thousands of years ago. Future earthquakes with magnitudes from 6.75 to 7.5 are expected to occur along those exposed faults. Known active faults, which are present in western and central Wyoming, are shown in red on Figure 2 . The suspected active faults shown in green are those for which activity has not been confirmed during the Quaternary (within the last 1.65 million years).

Earthquakes can originate at various depths, usually depending on the depth and orientation of faults. The initial zone of rupture on a fault that results in the generation of seismic waves is called the earthquake hypocenter or focus . The point on the ground surface directly above the hypocenter is the epicenter . Earthquakes can be associated with faults that rupture near the surface as well as those that are many miles deep.

Earthquake Measurements

There are many ways to describe the size and strength of an earthquake and its associated ground shaking. The most familiar classifications are the Richter Magnitude Scale, developed in 1935, and the Modified Mercalli Intensity Scale, developed in 1931.

Magnitude is an instrumentally determined measure of the size of an earthquake and the total energy released. Each one step increase in magnitude equates to a 32 times increase in associated seismic energy. In other words, a magnitude 7.5 earthquake releases approximately one thousand times more energy than a magnitude 5.5 earthquake. A magnitude 7.5 earthquake releases about as much energy as a one Megaton hydrogen bomb, and a magnitude 6.5 earthquake releases about as much energy as a Hiroshima-type atomic bomb.

Intensity is a qualitative measure of the degree of shaking an earthquake imparts on people, structures, and the ground. For a single earthquake, intensities can vary depending upon the distance from the hypocenter and epicenter. A much simplified twelve level intensity scale is shown below.

Modified Mercalli Intensity Scale

I Not felt except by very few.

II Felt only by a few persons at rest.

III Felt noticeably indoors. Vibration like passing of truck.

IV Felt indoors by many. Sensation like heavy truck striking building.

V Felt by nearly everyone. Some dishes and windows broken. Cracked plaster in a few places. Pendulum clocks stop.

VI Felt by all, many frightened and run outdoors. A few instances of fallen plaster and damaged chimneys.

VII Everybody runs outdoors. Damage negligible in well-designed and well-built structures, slight to moderate damage in well-built ordinary structures, considerable damage in poorly built structures.

VIII Damage slight in specially designed structures, considerable in ordinary buildings with partial collapse, great in poorly built structures.

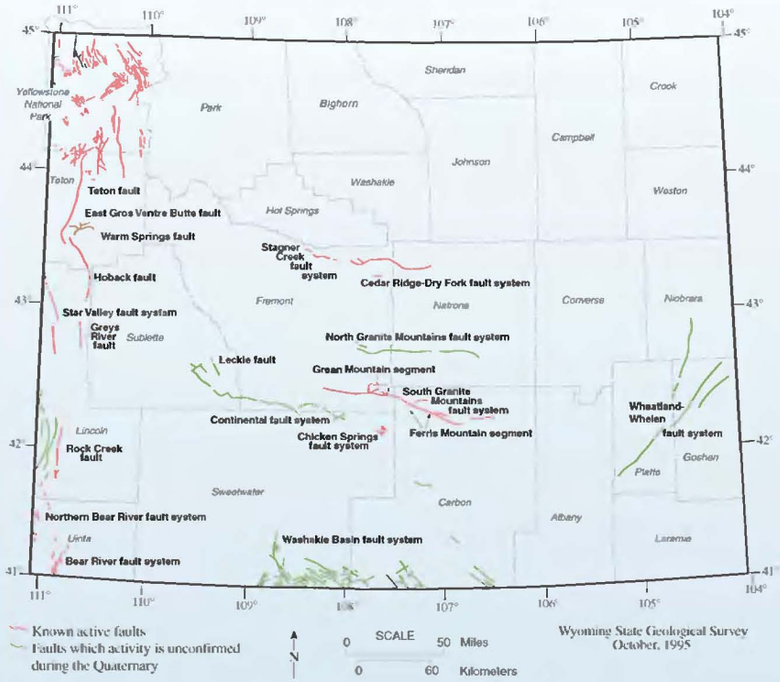


Figure 2. Known and suspected active faults in Wyoming.

IX Damage considerable in specially designed structures, and great in substantial buildings, with partial collapse. Buildings shifted off foundations. Underground pipes broken.

X Some well-built wooden structures and most masonry and frame structures destroyed. Ground badly cracked. Rails bent. Landslides.

XI Few structures remain standing. Bridges destroyed. Broad fissures in ground.

XII Damage total.

Top Ten Earthquakes in Wyoming

There have been a number of earthquakes that have caused damage or concern among Wyoming residents. The top ten earthquakes that have occurred in or near Wyoming are described below in chronological order. The list is rather subjective, and does not include some earthquakes that have caused damage. Detailed information an all Wyoming earthquakes can be obtained from the Wyoming State Geological Survey.

November 7, 1882 . A magnitude 6.2 to 6.5, intensity VII event occurred between Laramie and Estes Park, Colorado. It was felt throughout the southern half of Wyoming, in northeastern Utah, and over most of Colorado. Plaster was cracked in Laramie.

November 14, 1897 . An intensity VI to VII event occurred near Casper and was one of the largest events recorded in central and eastern Wyoming. The Grand Central Hotel in Casper was considerably damaged by the earthquake.

June 12, 1930 . An estimated magnitude 5.8, intensity VI event occurred near Grover in the Star Valley of western Wyoming. A brick building, swimming pool, and numerous plaster walls in homes were cracked. Numerous aftershocks occurred.

March 26, 1932 . An intensity VI event in the Jackson area broke the plaster on walls and cracked the foundations in several local homes and businesses. There were a number of aftershocks.

August 17, 1959 . A magnitude 7.5, intensity X event occurred just outside of Yellowstone National Park, near Hebgen Lake in Montana. The event triggered a landslide that dammed the Madison River, eventually creating Earthquake Lake. Twenty-eight people lost their lives; most of them were buried in the campground located directly beneath the landslide. Numerous aftershocks, with some as large as magnitude 6.5, occurred within or near Yellowstone National Park.

June 30, 1975 . A magnitude 6.4, intensity VII event occurred in the central part of Yellowstone National Park. Landslides closed 12 miles of road between Norris Junction and Madison Junction. Cracks in the ground 3 to 4 feet deep, and 15 to 20 feet long were found in the Virginia Cascades area.

October 18, 1984 . A magnitude 5.5, intensity VI event occurred approximately 4 miles west-northwest of Toltec in northern Albany County. The earthquake was felt in Wyoming, South Dakota, Nebraska, Colorado, Utah, Montana, and Kansas. It cracked buildings in Douglas and Medicine Bow and cracked chimneys in Casper, Douglas, Guernsey, Lusk, and Rock River.

November 3, 1984 . A magnitude 5.1, intensity VI event occurred 10 miles northwest of Atlantic City. The earthquake cracked foundations, walls, and windows in Lander and Atlantic City. It was also felt in Casper and Dubois.

February 3, 1994 . A magnitude 5.9, intensity VII event occurred at Draney Peak, Idaho, near Wyoming's Auburn Fish Hatchery in the Star Valley. The earthquake damaged the fish hatchery, and a home near Auburn had cracks in the foundation and ceiling. It was felt in Rock Springs, Salt Lake City, Utah, and Grand Junction, Colorado. There were hundreds of aftershocks, with the largest being a magnitude 5.3, intensity VI event on February 11, 1994.

February 3, 1995 . A magnitude 5.3, intensity V event occurred near Little America. The earthquake was associated with the collapse of a 3000-foot-wide by 7000-foot-long portion of a trona mine. One miner lost his life as a result of the collapse. Although the earthquake was felt as far away as Rock Springs and Salt Lake City, only minor damage was reported to buildings in Green River and Little America.

It is important to remember that earthquakes occurring outside the boundaries of Wyoming can also cause damage within the state. Examples include the Hebgen Lake, Montana event in 1959 and the Draney Peak, Idaho event in 1994.

Wyoming's Earthquake Potential

In general, earthquakes do not result in ground surface rupture unless the magnitude of the event is greater than magnitude 6.5. Because of this, areas of the state that do not have active faults exposed at the surface are thought to be capable of having earthquakes with magnitudes up to 6.5. The historical record in and around Wyoming supports the fact that earthquakes that large can occur. Most of Wyoming, therefore, can have a magnitude 6.5 earthquake, which can cause significant damage. Even though such events occur infrequently, residents should be prepared for such an event.

The earthquake potential is quite different in areas where active faults are exposed at the surface. A series of faults in western Wyoming (Figure 2) are capable of magnitude 7.2 to 7.5, intensity X earthquakes. These include the Teton fault, at the base of the Teton Range; the Star Valley fault, bounding the east side of the Star Valley; the Greys River fault in northeastern Lincoln County; the Rock Creek fault in southwestern Lincoln County; and the Bear River fault system, southeast of Evanston. Based upon recent studies, many of these fault systems are thought to be overdue for activation. It is not known, however, when any of these systems may activate.

There are a number of active faults exposed in Yellowstone National Park (Figure 2). Many of those faults are related to volcanic eruptions, volcanic explosions, and caldera-forming collapses that helped to form the present day Park. Much of the present and future earthquake activity in the Park is still related to the underlying magma chamber, although large earthquakes related to other regional factors are possible. Based upon recent studies and the seismic history of the Park, earthquakes in the magnitude 6.5 to 7.5 range are possible, and should be expected in the future.

There are a series of active faults along the northern and southern margins of the Wind River Basin. The Stagner Creek fault system, near Boysen Reservoir in northern Fremont County is capable of generating a magnitude 6.75 earthquake. The South Granite Mountains fault system, in southeastern Fremont County and northwestern Carbon County, is composed of a number of segments that are each capable of generating a magnitude 6.75 earthquake. In addition, the exposed Chicken Springs fault system in northeastern Sweetwater County is thought to be capable of generating a magnitude 6.5 earthquake.

What to Do During an Earthquake

If you are outside, do the following:

- *Stay outside.*
- *Stay away from buildings, chimneys, fences, trees, and power lines.*
- *If you are in a car, stay in it. Pull over and stop, away from high structures, power lines, overpasses, and trees.*

If you are inside, do the following:

- *Stay inside, unless conditions warrant otherwise.*
- *Duck, cover, and hold. Duck under a sturdy table or desk, sit with your back against a strong inside wall, or stand under a doorway.*
- *Stay away from windows and glass doors.*
- *Stay away from heavy standing objects such as bookcases.*

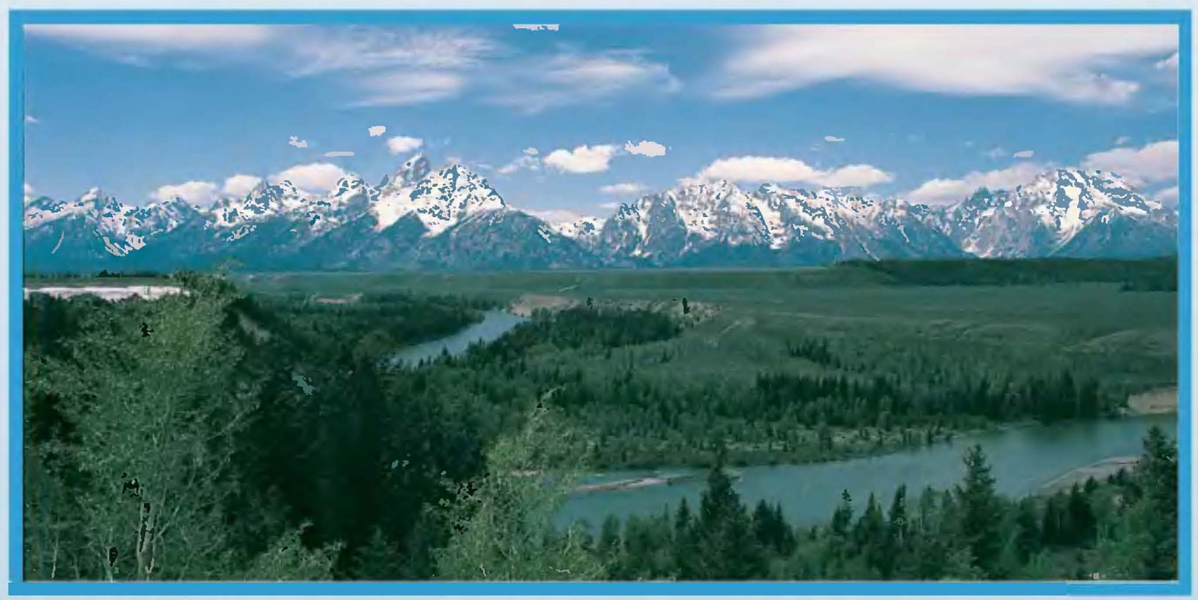
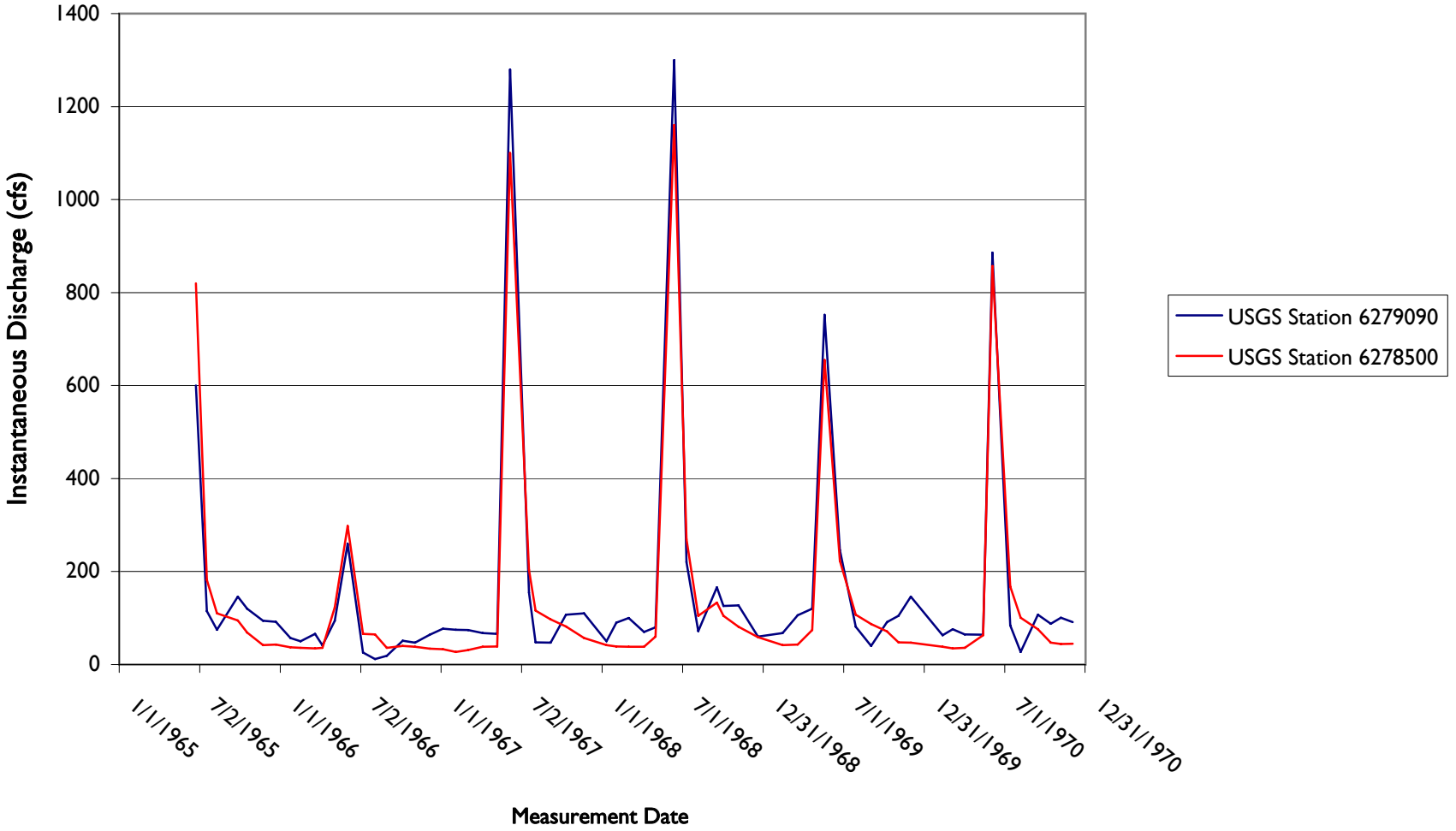


Figure 3. The spectacular eastern front of the Teton Range rises abruptly from the floor of Jackson Hole. The Teton Range formed as a result of movement on an active fault, the Teton fault, which is present at the base of the Range in this picture. View southwest from Snake River Overlook. Photograph by RW. Jones, June, 1979

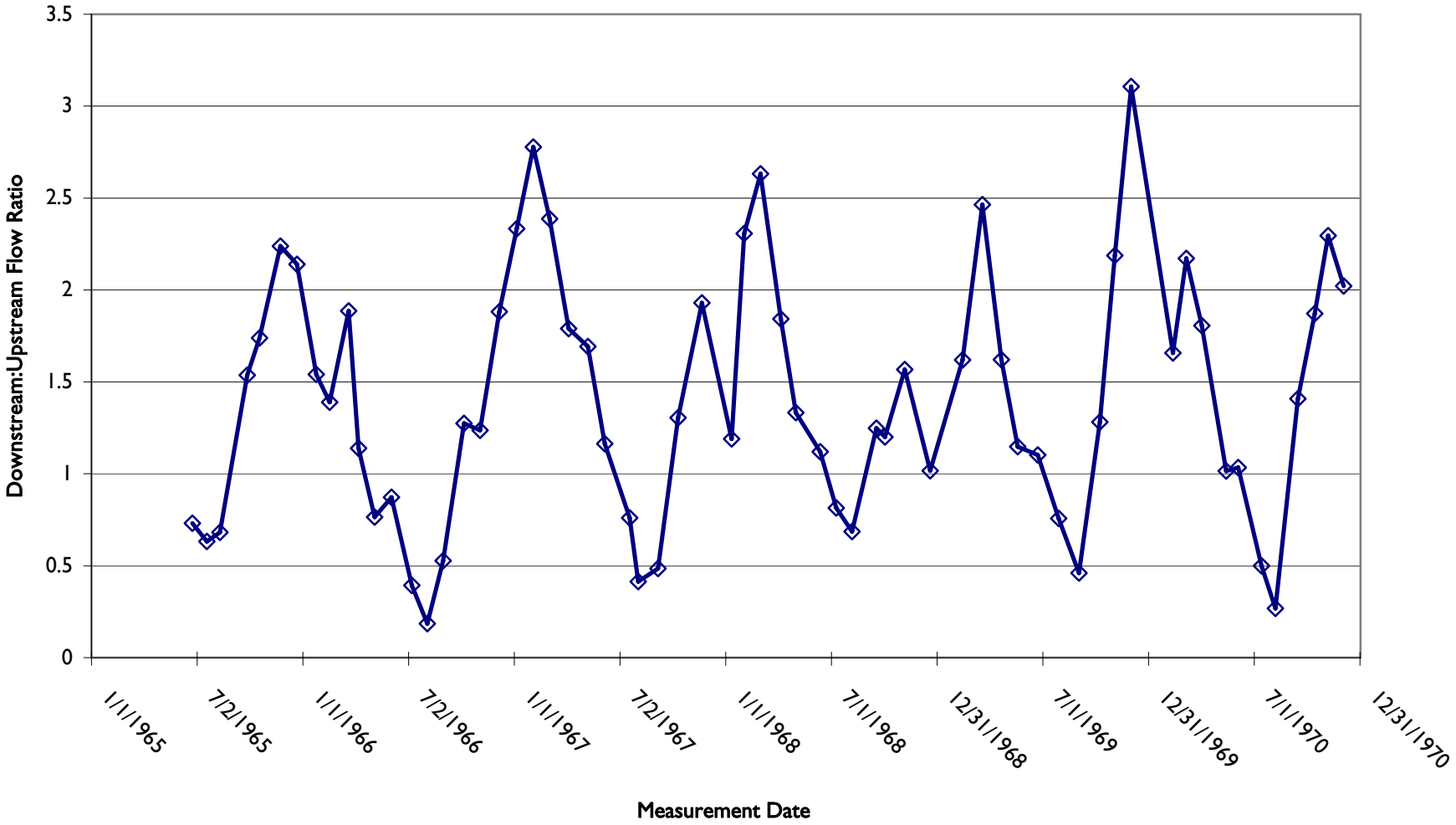
APPENDIX E

- Discharge for Shell Creek Station
- Ratio of Shell Creek Flow
- Water-Data Report 2006 For Shell Creek above Shell Reservoir by USGS
- Water-Data Report 2006 For Shell Creek Near Shell by USGS
- USGS Surface-Water Annual Statistics for the Nation
    - Shell Creek Above Shell Creek Reservoir, WY
- USGS Surface-Water Monthly Statistics for the Nation
    - Shell Creek Above Shell Creek Reservoir, WY
- USGS Surface-Water Annual Statistics for the Nation
    - Shell Creek near Shell, WY
- USGS Surface-Water Monthly Statistics for the Nation
    - Shell Creek near Shell, WY

Discharge for Shell Creek Station 06278500 (Upper) and Station 06279090 (Lower)
(1965 through 1970 USGS Data)



Ratio of Shell Creek Flow at Station 0627090 (Lower) to Flow at Station 06278500 (Upper)
(1965 through 1970 USGS Data)



06278300 SHELL CREEK ABOVE SHELL RESERVOIR, WY

Big Horn Basin
Big Horn Lake Subbasin

LOCATION.--Lat 44°30′29″, long 107°24′11″ referenced to North American Datum of 1927, in sec.1, T.52 N., R.88 W., Big Horn County, WY, Hydrologic Unit 10080010, Bighorn National Forest, on right bank 0.2 mi upstream from Shell Reservoir, 1.1 mi downstream from Buckley Creek, 6.0 mi southeast of Shell Creek ranger station, and 19 mi east of Shell.

DRAINAGE AREA.--23.1 mi^2.

SURFACE-WATER RECORDS

PERIOD OF RECORD.--October 1956 to current year. Prior to October 1969, published as Shell Creek above Shell Creek Reservoir.

REVISED RECORDS.--WSP 1629: 1958. WSP 1709: Drainage area.

GAGE.--Water-stage recorder. Elevation of gage is 9,050 ft above NGVD of 1929, from topographic map. U.S. Geological Survey data collection platform with satellite telemetry at station.

REMARKS.--Records good except those for estimated daily discharges, which are poor. No diversions upstream from station.

06278300 SHELL CREEK ABOVE SHELL RESERVOIR, WY—Continued

DISCHARGE, CUBIC FEET PER SECOND
WATER YEAR OCTOBER 2005 TO SEPTEMBER 2006
DAILY MEAN VALUES

[e, estimated]

Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1	3.7	e4.0	4.0	3.3	2.7	2.2	2.4	e14	72	17	4.4	2.6
2	3.5	3.8	4.0	3.0	2.7	2.2	2.2	e16	103	17	4.8	2.6
3	5.6	3.5	3.9	3.0	2.7	2.1	2.2	e15	146	17	4.3	2.6
4	6.2	e3.4	3.8	3.0	2.8	2.1	2.2	e15	170	16	3.9	2.5
5	5.6	e3.5	3.7	e3.0	2.7	2.1	2.4	e18	167	15	3.8	2.4
6	e5.6	e3.6	3.8	e3.0	2.7	2.1	2.7	e22	135	14	3.7	2.4
7	e5.6	3.9	3.9	3.0	2.6	2.1	3.0	e23	127	13	3.6	2.4
8	5.6	3.5	3.8	3.0	2.4	2.1	3.3	e20	137	13	3.3	2.4
9	6.3	e3.5	4.0	3.1	2.3	2.1	3.7	e21	148	12	3.2	2.4
10	e5.6	3.6	4.0	3.0	2.2	2.1	4.3	e23	120	12	3.0	2.4
11	5.4	3.8	3.9	2.9	2.2	2.0	4.3	e20	82	11	2.9	2.4
12	5.4	3.7	3.9	2.9	2.1	2.0	7.8	e20	70	10	2.9	2.3
13	5.1	3.7	3.8	2.9	2.2	e2.0	8.3	e22	66	9.8	3.0	2.2
14	5.0	3.9	3.9	3.0	2.2	2.1	8.5	e30	59	9.0	2.9	2.1
15	5.1	3.8	3.9	2.9	2.2	2.1	e10	e50	52	8.5	2.7	2.5
16	5.1	4.1	3.9	2.9	2.3	2.1	e15	110	43	8.0	2.9	5.5
17	5.0	4.1	3.8	2.8	2.2	2.1	e17	178	38	7.5	2.8	5.1
18	4.9	3.9	3.6	2.8	2.1	2.1	e13	234	34	7.1	2.6	4.9
19	4.8	3.9	3.4	2.8	2.0	2.1	e12	291	31	6.8	2.5	5.3
20	4.8	3.8	3.5	2.7	2.0	2.1	e12	361	30	6.6	2.5	5.9
21	4.7	3.7	3.5	2.6	2.0	2.1	e12	403	27	6.6	2.4	6.5
22	e4.4	3.6	3.5	2.6	2.0	2.1	e12	349	27	6.1	2.3	6.8
23	e4.3	3.5	3.5	2.6	2.0	2.1	e16	410	24	5.7	2.2	6.5
24	e4.2	3.4	3.5	2.5	2.1	2.2	e14	305	23	5.6	2.1	6.8
25	e4.1	3.3	3.5	2.5	2.2	2.2	e13	261	21	5.6	2.2	7.2
26	4.0	3.6	3.5	2.5	2.2	2.2	e12	296	20	5.6	2.7	7.8
27	3.9	3.9	3.6	2.5	2.2	2.3	e12	333	19	5.2	4.6	8.2
28	3.9	4.1	3.5	2.6	2.2	2.3	e12	254	20	4.8	3.2	8.2
29	4.1	4.1	3.4	2.6	---	2.3	e13	129	19	4.5	3.0	9.6
30	e4.0	4.0	3.5	2.7	---	2.2	e14	88	17	4.4	2.8	11
31	e3.4	---	3.4	2.7	---	2.3	---	70	---	4.2	2.7	---
Total	148.9	112.2	114.9	87.4	64.2	66.2	266.3	4,401	2,047	288.6	95.9	141.5
Mean	4.80	3.74	3.71	2.82	2.29	2.14	8.88	142	68.2	9.31	3.09	4.72
Max	6.3	4.1	4.0	3.3	2.8	2.3	17	410	170	17	4.8	11
Min	3.4	3.3	3.4	2.5	2.0	2.0	2.2	14	17	4.2	2.1	2.1
Ac-ft	295	223	228	173	127	131	528	8,730	4,060	572	190	281

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1957 - 2006, BY WATER YEAR (WY)

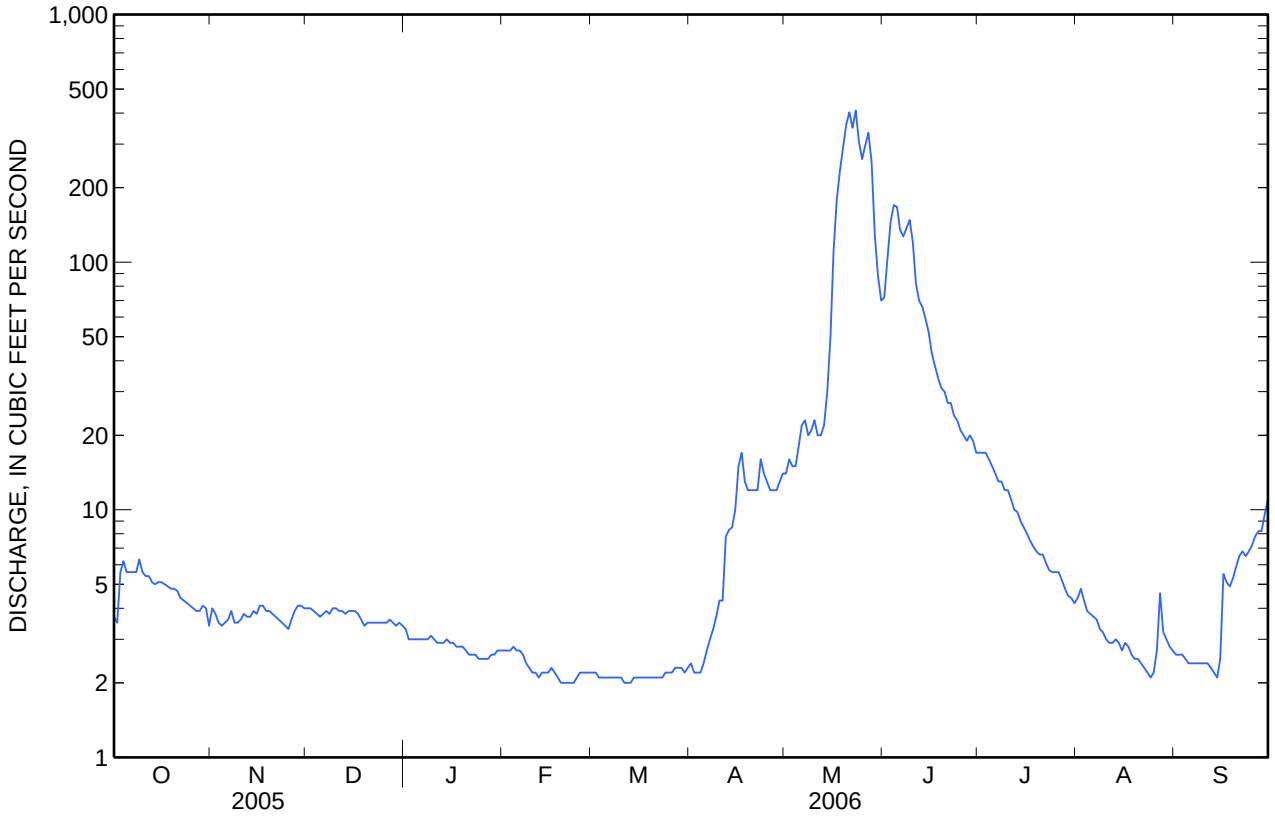
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Mean	8.27	5.74	3.81	2.72	2.25	2.15	5.79	105	195	45.8	12.5	9.40
Max	17.6	11.2	7.18	4.50	3.68	3.76	28.4	289	353	188	45.6	44.9
(WY)	(1962)	(1962)	(1995)	(1995)	(1998)	(1999)	(1987)	(1958)	(1968)	(1975)	(1968)	(1968)
Min	3.10	2.91	1.95	1.55	1.09	1.14	1.23	15.2	48.9	9.31	3.09	2.77
(WY)	(1989)	(1976)	(1970)	(1980)	(1980)	(1961)	(1970)	(1975)	(1994)	(2006)	(2006)	(1988)

06278300 SHELL CREEK ABOVE SHELL RESERVOIR, WY—Continued

SUMMARY STATISTICS

	Calendar Year 2005		Water Year 2006		Water Years 1957 - 2006	
Annual total	12,371.1		7,834.1			
Annual mean	33.9		21.5		33.2	
Highest annual mean					50.2	1968
Lowest annual mean					17.9	2001
Highest daily mean	606	Jun 17	410	May 23	1,010	Jun 15, 1963
Lowest daily mean	2.0	Mar 1 [a]	2.0	Feb 19 [a]	0.60	Mar 7, 1967
Annual seven-day minimum	2.0	Feb 27	2.0	Feb 18	0.90	Jan 27, 1980
Maximum peak flow			579	May 21	[b]1,870	Jun 15, 1963
Maximum peak stage			5.15	May 21	[c]7.84	Jun 15, 1963
Annual runoff (ac-ft)	24,540		15,540		24,070	
10 percent exceeds	99		30		92	
50 percent exceeds	4.0		3.9		5.6	
90 percent exceeds	2.3		2.2		2.0	

[a] Several days.
[b] From rating curve extended above 725 ft³/s on basis of velocity-area study.
[c] From floodmarks.



06278300 SHELL CREEK ABOVE SHELL RESERVOIR, WY

LOCATION.--Lat 44°30'29", long 107°24'11" (NAD 27), in sec.1, T.52 N., R.88 W., Big Horn County, Hydrologic Unit 10080010, Bighorn National Forest, on right bank 0.2 mi upstream from Shell Reservoir, 1.1 mi downstream from Buckley Creek, 6.0 mi southeast of Shell Creek ranger station, and 19 mi east of Shell.

DRAINAGE AREA.--23.1 mi^2.

PERIOD OF RECORD.--October 1956 to current year. Prior to October 1969, published as Shell Creek above Shell Creek Reservoir.

REVISED RECORD.--WSP 1629: 1958. WSP 1709: Drainage area.

GAGE.--Water-stage recorder. Elevation of gage is 9,050 ft above NGVD of 1929, from topographic map. U.S. Geological Survey data collection platform with satellite telemetry at station.

REMARKS.--Records good except those for estimated daily discharges, which are poor. No diversions upstream from station.

DISCHARGE, CUBIC FEET PER SECOND
WATER YEAR OCTOBER 2004 TO SEPTEMBER 2005
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	12	e8.0	e7.4	e3.5	e2.8	2.0	2.0	8.6	68	100	13	4.9
2	12	e8.5	e7.4	e3.5	2.8	2.1	2.2	7.8	67	99	12	4.8
3	12	e9.0	e7.3	e3.5	2.8	2.0	2.2	7.2	80	93	12	4.6
4	11	e8.5	e7.3	3.8	2.7	2.0	2.1	7.4	104	76	11	4.4
5	11	e8.0	7.3	3.6	2.7	2.0	2.1	e8.0	143	67	11	4.4
6	11	e7.8	6.9	3.4	2.8	2.1	2.2	e12	261	61	9.9	4.2
7	10	e7.8	6.6	3.4	2.7	2.2	3.0	e17	262	57	9.5	4.1
8	10	e7.7	6.5	3.5	2.7	2.2	3.2	19	136	53	8.9	3.9
9	10	e7.8	6.4	e3.4	2.6	2.3	2.9	e21	105	50	9.3	3.8
10	9.6	e7.8	6.3	e3.5	2.5	2.2	2.9	e25	87	46	9.0	3.5
11	9.3	e7.0	6.4	3.5	2.5	2.1	2.7	e23	88	43	9.5	3.5
12	9.4	e6.8	6.3	3.4	2.5	2.1	2.7	22	114	38	10	3.9
13	9.7	e6.8	5.9	3.3	2.5	2.2	2.9	21	139	36	9.3	4.7
14	10	e6.5	5.7	3.4	2.5	2.2	3.1	22	133	33	8.7	4.6
15	e10	e5.9	5.6	3.2	e2.5	2.3	2.6	e25	191	32	8.0	4.3
16	e10	e6.2	5.3	3.2	2.5	2.3	2.7	40	370	30	7.5	4.0
17	11	6.8	5.1	3.3	2.4	2.3	e3.0	73	606	27	8.1	3.8
18	e10	6.5	4.7	3.2	2.4	2.3	e5.0	e90	586	25	8.4	3.8
19	e11	e6.4	4.6	3.2	2.4	2.3	e8.0	e130	469	24	9.2	3.8
20	11	e6.4	4.5	3.2	2.4	2.2	e6.0	e300	454	21	7.9	3.6
21	12	e6.5	4.5	3.1	2.4	e2.1	e5.4	e500	342	e19	7.2	3.6
22	11	e6.3	4.4	3.0	2.4	e2.1	e5.0	388	295	18	7.0	4.1
23	e11	e6.1	4.1	2.9	2.3	e2.2	e6.0	480	276	17	7.3	3.8
24	e11	e6.0	3.9	2.9	2.2	e2.2	e7.0	432	261	16	7.1	4.8
25	e10	e5.8	4.0	2.8	2.1	2.2	e12	233	181	17	6.4	5.1
26	e9.5	e6.5	3.8	2.8	2.1	2.1	e11	128	165	20	6.3	4.6
27	9.5	e7.0	3.7	2.9	2.1	2.1	e10	96	141	17	5.9	4.2
28	9.7	e7.0	3.6	2.9	2.1	2.2	e9.8	109	118	16	5.7	4.1
29	9.8	e7.5	3.5	2.9	---	2.2	e9.5	119	152	15	5.5	3.9
30	e9.5	e7.4	3.6	2.9	---	2.1	e9.0	83	121	15	5.2	3.8
31	e9.0	---	e3.5	e2.9	---	2.1	---	69	---	13	5.1	---
TOTAL	322.0	212.3	166.1	100.0	69.4	67.0	148.2	3,516.0	6,515	1,194	260.9	124.6
MEAN	10.4	7.08	5.36	3.23	2.48	2.16	4.94	113	217	38.5	8.42	4.15
MAX	12	9.0	7.4	3.8	2.8	2.3	12	500	606	100	13	5.1
MIN	9.0	5.8	3.5	2.8	2.1	2.0	2.0	7.2	67	13	5.1	3.5
AC-FT	639	421	329	198	138	133	294	6,970	12,920	2,370	517	247

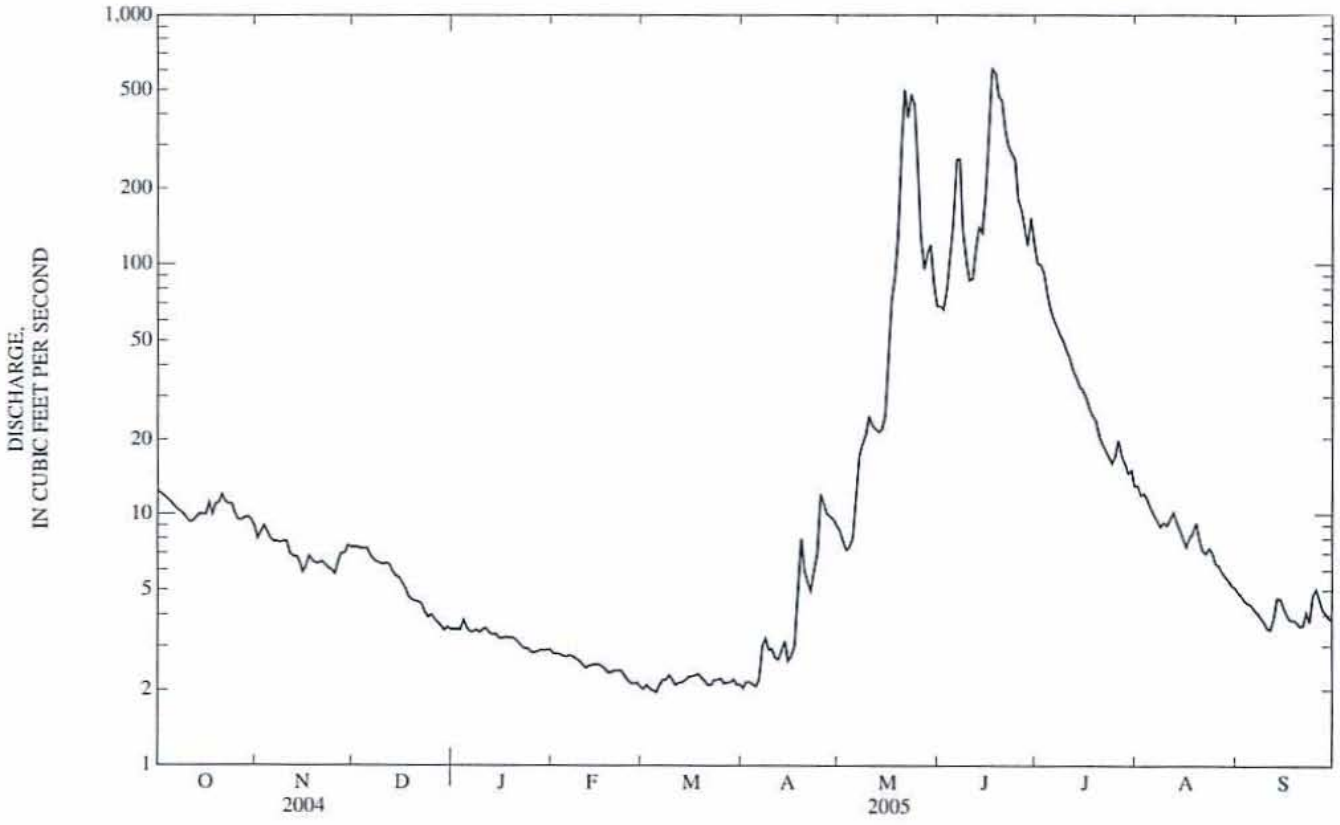
STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1957 - 2005, BY WATER YEAR (WY)

MEAN	8.34	5.78	3.82	2.72	2.25	2.15	5.72	104	198	46.6	12.7	9.50
MAX	17.6	11.2	7.18	4.50	3.68	3.76	28.4	289	353	188	45.6	44.9
(WY)	(1962)	(1962)	(1995)	(1995)	(1998)	(1999)	(1987)	(1958)	(1968)	(1975)	(1968)	(1968)
MIN	3.10	2.91	1.95	1.55	1.09	1.14	1.23	15.2	48.9	11.5	3.66	2.77
(WY)	(1989)	(1976)	(1970)	(1980)	(1980)	(1961)	(1970)	(1975)	(1994)	(2001)	(2001)	(1988)

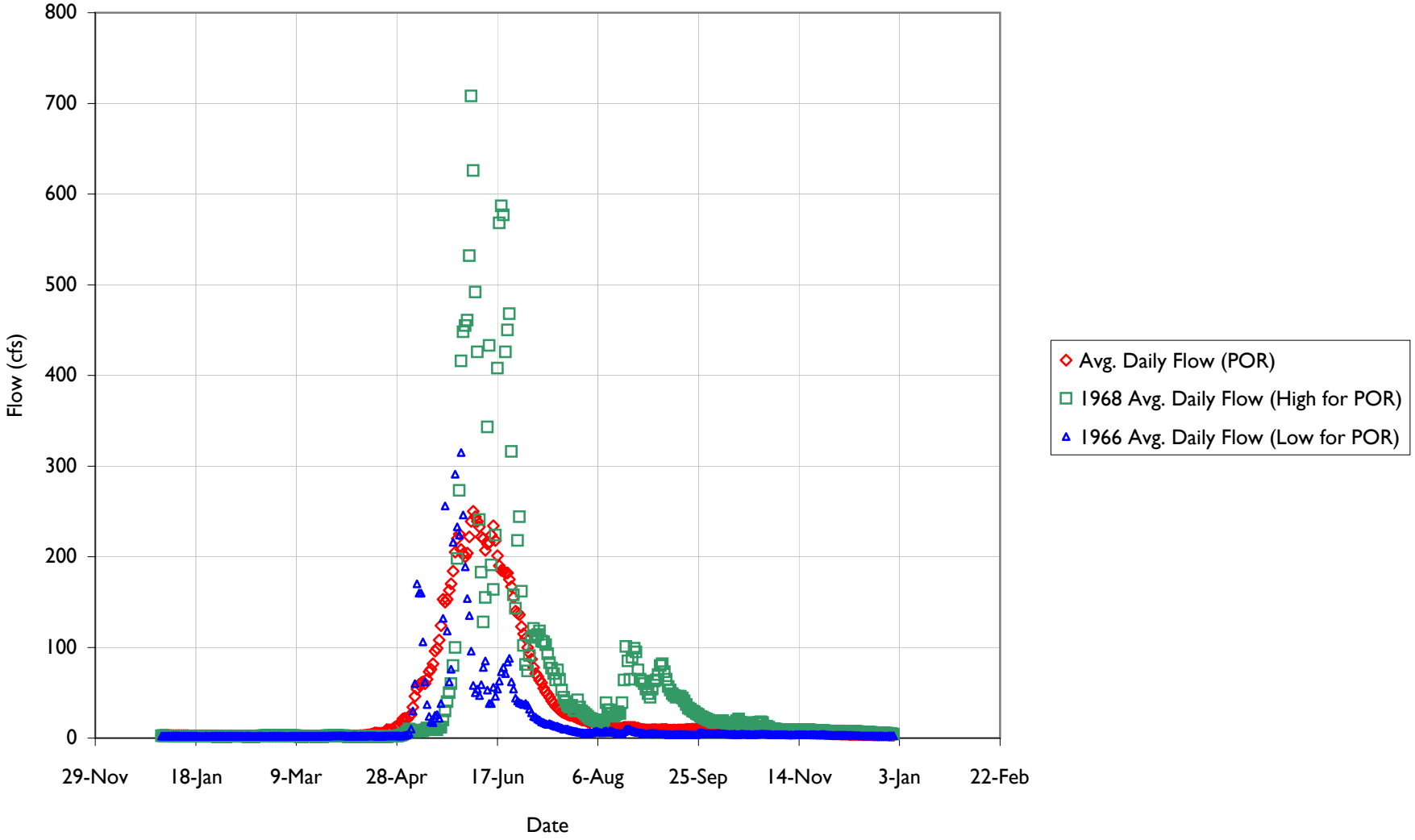
06278300 SHELL CREEK ABOVE SHELL RESERVOIR, WY—Continued

SUMMARY STATISTICS	FOR 2004 CALENDAR YEAR		FOR 2005 WATER YEAR		WATER YEARS 1957 - 2005	
ANNUAL TOTAL	8,374.4		12,695.5		--	
ANNUAL MEAN	22.9		34.8		33.5	
HIGHEST ANNUAL MEAN	--		--		50.2	1968
LOWEST ANNUAL MEAN	--		--		17.9	2001
HIGHEST DAILY MEAN	243	Jun 6	606	Jun 17	1,010	Jun 15, 1963
LOWEST DAILY MEAN	2.5	Feb 22-25	2.0	Several days	0.60	Mar 7, 1967
ANNUAL SEVEN-DAY MINIMUM	2.6	Feb 20	2.0	Feb 27	0.90	Jan 27, 1980
MAXIMUM PEAK FLOW	--		1,060	Jun 17	1,870 [a]	Jun 15, 1963
MAXIMUM PEAK STAGE	--		6.65	Jun 17	7.84[b]	Jun 15, 1963
ANNUAL RUNOFF (AC-FT)	16,610		25,180		24,240	
10 PERCENT EXCEEDS	65		99		93	
50 PERCENT EXCEEDS	8.5		6.5		5.7	
90 PERCENT EXCEEDS	2.8		2.3		2.0	

a From rating curve extended above 725 ft^3/s on basis of velocity-area study.
b From floodmarks.
e Estimated.



Shell Creek Historic Flow at USGS Station 06278300 (above Shell Reservoir)



06278500 SHELL CREEK NEAR SHELL, WY

Big Horn Basin
Big Horn Lake Subbasin

LOCATION.--Lat 44°33′54″, long 107°42′44″ referenced to North American Datum of 1927, in SE ¼ SW ¼ sec.17, T.53 N., R.90 W., Big Horn County, WY, Hydrologic Unit 10080010, on right bank 0.9 mi upstream from White Creek and 5.0 mi northeast of Shell.

DRAINAGE AREA.--145 mi^2.

SURFACE-WATER RECORDS

PERIOD OF RECORD.--October 1940 to current year (no winter records since 1971). Prior to December 1940, monthly discharge only, published in WSP 1309.

REVISED RECORDS.--WSP 1239: 1941, 1945(M). WSP 1709: Drainage area.

GAGE.--Water-stage recorder. Elevation of gage is 4,370.05 ft above NGVD of 1929. Wyoming State Engineer's data collection platform with satellite telemetry at station.

COOPERATION.--Station operated and record provided by the Wyoming State Engineer's Office; record reviewed by U.S. Geological Survey.

REMARKS.--Records good. Some regulation by two small reservoirs, capacity, 3,650 acre-ft. Diversions upstream from station for irrigation of about 80 acres downstream from station.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 3,020 ft^3/s, June 24, 1945, gage height, 7.49 ft, from rating curve extended above 1,600 ft^3/s; minimum daily discharge, 13 ft^3/s, April 10, 1989.

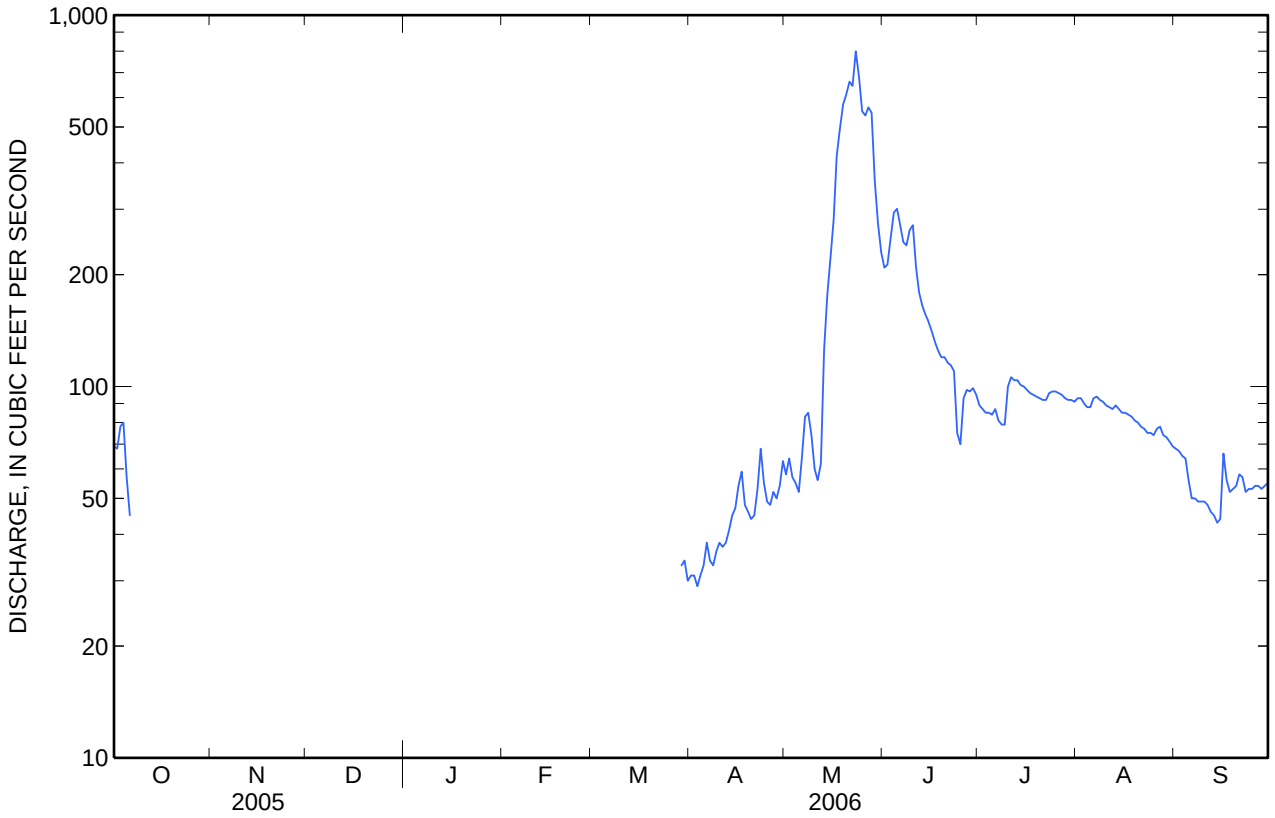
EXTREMES FOR CURRENT YEAR.--Maximum discharge, 1,020 ft^3/s, May 23, gage height, 4.77 ft; minimum daily discharge, 29 ft^3/s, April 3.

06278500 SHELL CREEK NEAR SHELL, WY—Continued

DISCHARGE, CUBIC FEET PER SECOND
WATER YEAR OCTOBER 2005 TO SEPTEMBER 2006
DAILY MEAN VALUES

Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1	69	---	---	---	---	---	31	58	209	89	93	68
2	68	---	---	---	---	---	31	64	213	87	93	67
3	78	---	---	---	---	---	29	57	251	85	90	65
4	80	---	---	---	---	---	31	55	294	85	88	64
5	57	---	---	---	---	---	33	52	301	84	88	56
6	45	---	---	---	---	---	38	64	272	87	93	50
7	---	---	---	---	---	---	34	83	245	81	94	50
8	---	---	---	---	---	---	33	85	240	79	92	49
9	---	---	---	---	---	---	36	74	264	79	91	49
10	---	---	---	---	---	---	38	60	272	100	89	49
11	---	---	---	---	---	---	37	56	209	106	88	48
12	---	---	---	---	---	---	38	62	179	104	87	46
13	---	---	---	---	---	---	41	125	165	104	89	45
14	---	---	---	---	---	---	45	176	156	101	87	43
15	---	---	---	---	---	---	47	222	149	100	85	44
16	---	---	---	---	---	---	54	282	140	98	85	66
17	---	---	---	---	---	---	59	418	132	96	84	56
18	---	---	---	---	---	---	48	495	125	95	83	52
19	---	---	---	---	---	---	46	575	120	94	81	53
20	---	---	---	---	---	---	44	613	120	93	80	54
21	---	---	---	---	---	---	45	662	116	92	78	58
22	---	---	---	---	---	---	53	645	114	92	77	57
23	---	---	---	---	---	---	68	799	110	96	75	52
24	---	---	---	---	---	---	55	684	75	97	75	53
25	---	---	---	---	---	---	49	551	70	97	74	53
26	---	---	---	---	---	---	48	537	93	96	77	54
27	---	---	---	---	---	---	52	565	98	95	78	54
28	---	---	---	---	---	---	50	546	97	93	74	53
29	---	---	---	---	---	33	54	357	99	92	73	54
30	---	---	---	---	---	34	63	275	95	92	71	55
31	---	---	---	---	---	30	---	230	---	91	69	---
Total	---	---	---	---	---	---	1,330	9,527	5,023	2,880	2,581	1,617
Mean	---	---	---	---	---	---	44.3	307	167	92.9	83.3	53.9
Max	---	---	---	---	---	---	68	799	301	106	94	68
Min	---	---	---	---	---	---	29	52	70	79	69	43
Ac-ft	---	---	---	---	---	---	2,640	18,900	9,960	5,710	5,120	3,210

06278500 SHELL CREEK NEAR SHELL, WY—Continued



06278500 SHELL CREEK NEAR SHELL, WY

LOCATION.--Lat 44°33'54", long 107°42'44" (NAD 27), in SE¼ SW¼ sec.17, T.53 N., R.90 W., Big Horn County, Hydrologic Unit 10080010, on right bank 0.9 mi upstream from White Creek and 5.0 mi northeast of Shell.

DRAINAGE AREA.--145 mi^2.

PERIOD OF RECORD.--October 1940 to current year (no winter records since 1971). Prior to December 1940, monthly discharge only, published in WSP 1309.

REVISED RECORDS.--WSP 1239: 1941, 1945(M). WSP 1709: Drainage area.

GAGE.--Water-stage recorder. Elevation of gage is 4,370.05 ft above NGVD of 1929. Wyoming State Engineer's data collection platform with satellite telemetry at station.

REMARKS.--Records good. Some regulation by two small reservoirs, capacity, 3,650 acre-ft. Diversions upstream from station for irrigation of about 80 acres downstream from station. Results of discharge measurements, in cubic feet per second, made during the periods when station was not in operation, are given below:

Oct. 6 . . . 49.9

Mar. 30 . . . 23.7

COOPERATION.--Station operated and record provided by the Wyoming State Engineer's Office; record reviewed by U.S. Geological Survey.

DISCHARGE, CUBIC FEET PER SECOND
WATER YEAR OCTOBER 2004 TO SEPTEMBER 2005
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	51	---	---	---	---	---	22	56	274	285	128	94
2	51	---	---	---	---	---	23	56	268	263	116	93
3	51	---	---	---	---	---	23	56	272	251	116	91
4	50	---	---	---	---	---	24	59	325	229	114	91
5	49	---	---	---	---	---	24	68	348	209	111	89
6	49	---	---	---	---	---	24	105	506	195	108	88
7	49	---	---	---	---	---	26	126	640	183	107	87
8	49	---	---	---	---	---	31	99	432	174	105	86
9	48	---	---	---	---	---	36	95	372	164	105	85
10	48	---	---	---	---	---	28	142	327	159	104	85
11	48	---	---	---	---	---	25	133	313	161	111	85
12	48	---	---	---	---	---	26	104	335	147	114	87
13	50	---	---	---	---	---	27	93	428	139	115	90
14	50	---	---	---	---	---	32	102	382	132	113	88
15	55	---	---	---	---	---	28	125	453	127	109	84
16	45	---	---	---	---	---	27	174	648	120	107	83
17	36	---	---	---	---	---	32	273	911	99	111	80
18	37	---	---	---	---	---	74	235	1,040	106	113	78
19	33	---	---	---	---	---	96	339	860	105	118	77
20	34	---	---	---	---	---	79	611	855	101	109	76
21	40	---	---	---	---	---	68	1,180	731	96	105	75
22	---	---	---	---	---	---	63	921	613	93	103	75
23	---	---	---	---	---	---	64	957	568	90	104	75
24	---	---	---	---	---	---	75	970	528	87	103	78
25	---	---	---	---	---	---	86	639	448	86	101	80
26	---	---	---	---	---	---	75	414	402	97	100	77
27	---	---	---	---	---	---	67	336	376	119	99	74
28	---	---	---	---	---	---	62	356	322	120	98	73
29	---	---	---	---	---	---	59	370	360	118	97	72
30	---	---	---	---	---	---	58	309	341	117	95	71
31	---	---	---	---	---		---	271	---	116	95	---
TOTAL	---	---	---	---	---	---	1,384	9,774	14,678	4,488	3,334	2,467
MEAN	---	---	---	---	---	---	46.1	315	489	145	108	82.2
MAX	---	---	---	---	---	---	96	1,180	1,040	285	128	94
MIN	---	---	---	---	---	---	22	56	268	86	95	71
AC-FT	---	---	---	---	---	---	2,750	19,390	29,110	8,900	6,610	4,890

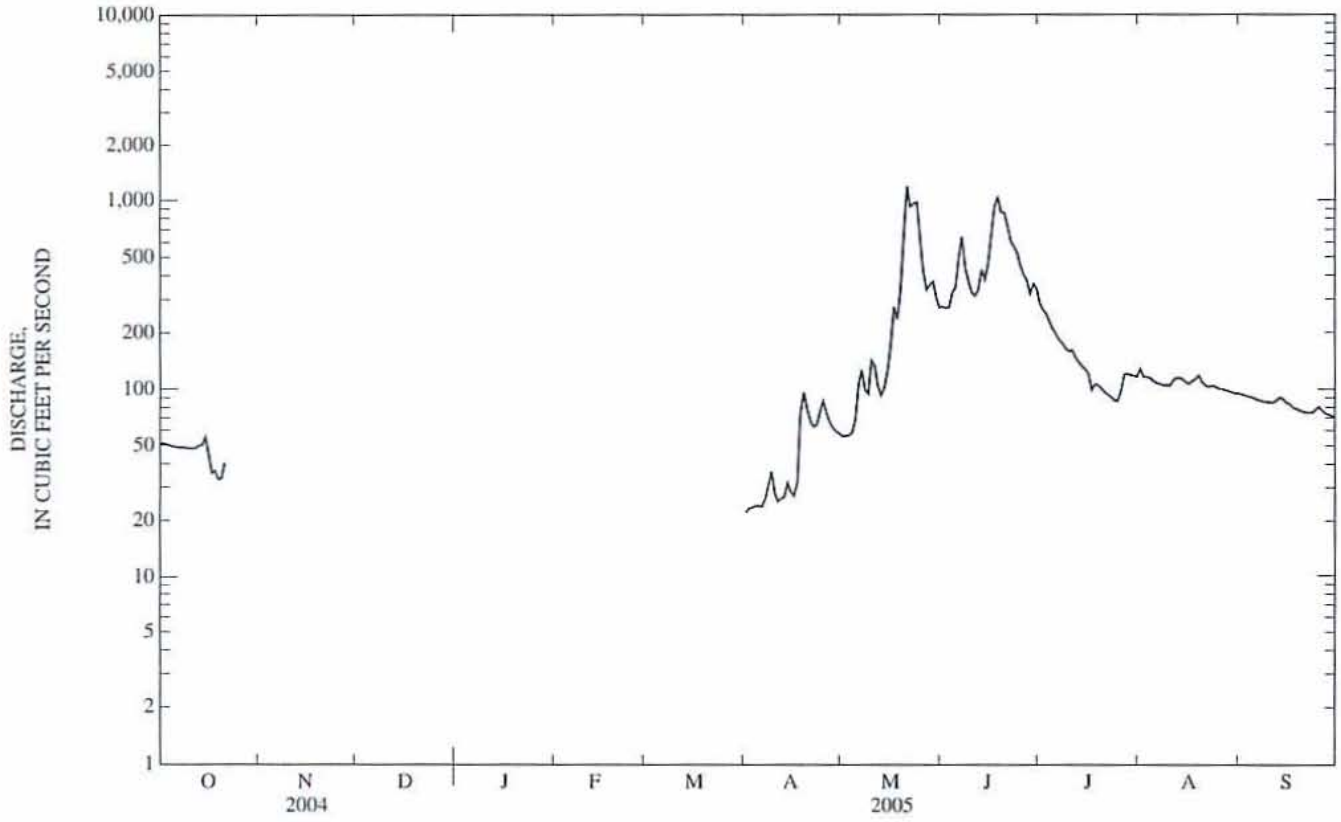
STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1941 - 2005, BY WATER YEAR (WY)*

MEAN	57.0	47.2	41.5	36.9	35.2	35.1	49.8	271	489	166	98.9	77.5
MAX	95.2	76.4	60.4	48.7	44.6	48.0	138	553	990	473	158	134
(WY)	(1942)	(1969)	(1969)	(1948)	(1947)	(1946)	(1946)	(1988)	(1968)	(1975)	(1979)	(1968)
MIN	35.3	31.5	30.0	28.3	26.9	25.9	29.0	80.4	116	69.2	57.7	36.0
(WY)	(1955)	(1955)	(1941)	(1967)	(1961)	(1961)	(1961)	(1995)	(2001)	(1961)	(1966)	(1954)

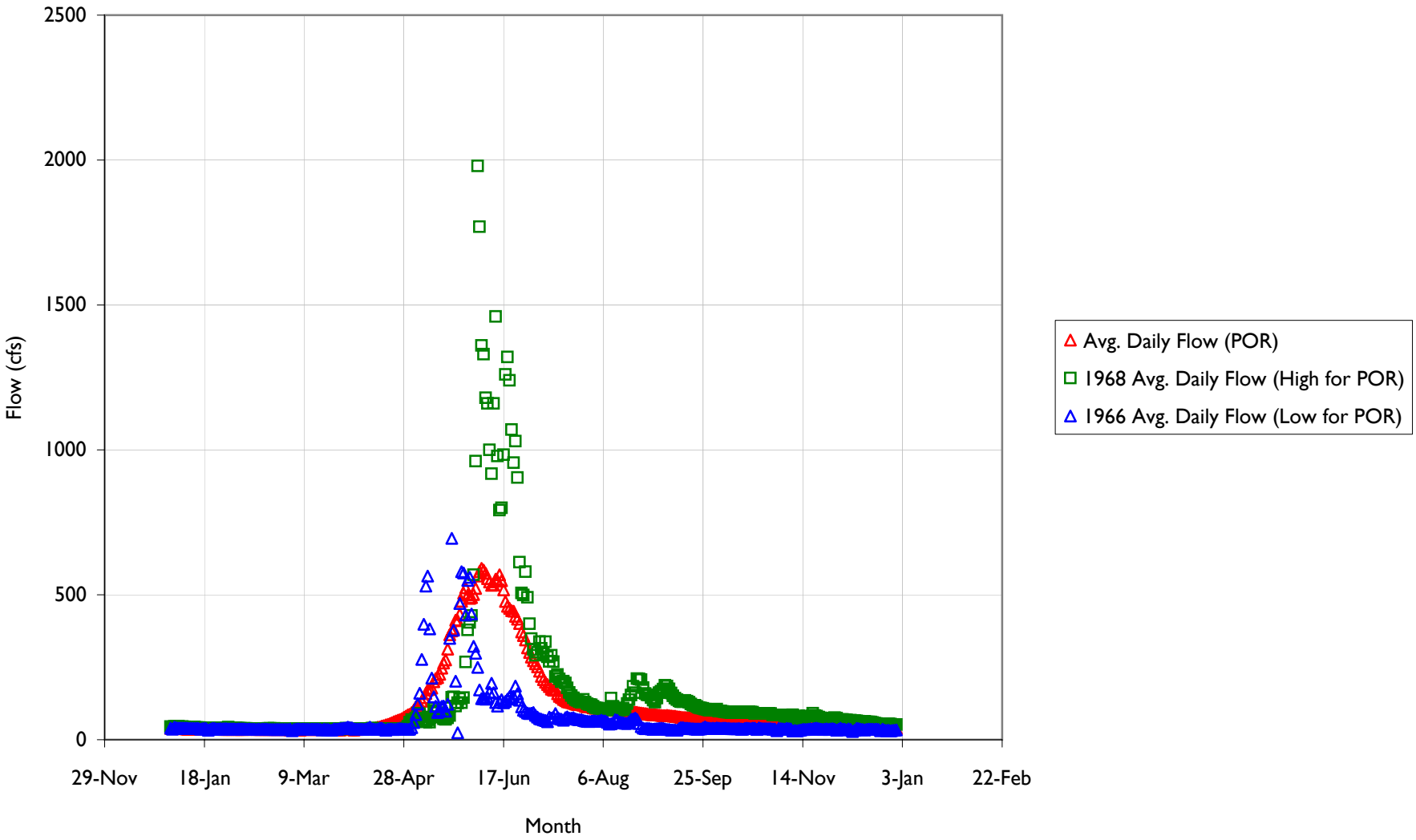
06278500 SHELL CREEK NEAR SHELL, WY—Continued

SUMMARY STATISTICS	FOR 2005 WATER YEAR*		WATER YEARS 1941 - 2005*	
ANNUAL MEAN	--		119	
HIGHEST ANNUAL MEAN	--		160	1968
LOWEST ANNUAL MEAN	--		77.3	1966
HIGHEST DAILY MEAN	920	May 30	1,980	Jun 4, 1968
LOWEST DAILY MEAN	23	Apr 2,3	13	Apr 10, 1989
MAXIMUM PEAK FLOW	1420	Jun 18	3,020 [a]	Jun 24, 1945
MAXIMUM PEAK STAGE	5.38	Jun 18	7.49	Jun 24, 1945
ANNUAL RUNOFF (AC-FT)	--		85,900	

* For period of operation.
a From rating curve extended above 1,600 ft^3/s.



Shell Creek Historic Flow Data for 06278500 (near town of Shell)



Water Resources

National Water Information System: Web Interface

Data Category: Surface Water | Geographic Area: United States | GO

USGS Surface-Water Annual Statistics for the Nation

The statistics generated from this site are based on approved daily-mean data and may not match those published by the USGS in official publications. The user is responsible for assessment and use of statistics from this site. For more details on why the statistics may not match, click here.

USGS 06278300 SHELL CREEK ABOVE SHELL CREEK RESERVOIR, WY

Available data for this site | Time-series: Annual statistics | GO

Big Horn County, Wyoming Hydrologic Unit Code 10080010 Latitude 44°30'29", Longitude 107°24'11" NAD27 Drainage area 23.1 square miles Gage datum 9,050 feet above sea level NGVD29	**Output formats** HTML table of all data Tab-separated data Reselect output format

Water Year	00060, Discharge, cubic feet per second (Calculation Period: 1957-10-01 -> 2006-09-30) Calculation period restricted by USGS staff due to special conditions at/near site
1957	33.3
1958	41.6
1959	29.8
1960	26.0
1961	24.6
1962	38.7
1963	45.6
1964	42.7
1965	41.0
1966	18.6
1967	47.8
1968	50.2
1969	40.7
1970	37.2
1971	36.6
1972	36.4
1973	34.2

1974	35.6
1975	39.8
1976	35.9
1977	31.3
1978	48.0
1979	33.2
1980	27.5
1981	29.8
1982	34.3
1983	33.8
1984	40.5
1985	24.5
1986	32.5
1987	27.8
1988	28.7
1989	27.5
1990	38.7
1991	35.3
1992	32.9
1993	31.5
1994	21.2
1995	45.1
1996	35.2
1997	33.8
1998	28.5
1999	35.0
2000	27.6
2001	17.9
2002	18.1
2003	26.4
2004	22.2
2005	34.8
2006	21.5
** No Incomplete Data is used for Statistical Calculation	

Water Resources

National Water Information System: Web Interface

Data Category: Surface Water | Geographic Area: United States | GO

USGS Surface-Water Monthly Statistics for the Nation

The statistics generated from this site are based on approved daily-mean data and may not match those published by the USGS in official publications. The user is responsible for assessment and use of statistics from this site. For more details on why the statistics may not match, click here.

USGS 06278300 SHELL CREEK ABOVE SHELL CREEK RESERVOIR, WY

Available data for this site | Time-series: Monthly statistics | GO

Big Horn County, Wyoming
Hydrologic Unit Code 10080010
Latitude 44°30'29", Longitude 107°24'11" NAD27
Drainage area 23.1 square miles
Gage datum 9,050 feet above sea level NGVD29

Output formats

HTML table of all data | Tab-separated data | Reselect output format

00060, Discharge, cubic feet per second,												
YEAR	Monthly mean in cfs (Calculation Period: 1956-10-01 -> 2006-09-30)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1956										6.25	4.50	4.00
1957	3.00	3.00	3.00	4.00	41.5	261.2	49.8	9.52	11.5	9.11	7.65	6.40
1958	4.27	3.50	3.00	2.50	289.1	99.4	39.9	21.7	7.28	5.88	5.98	4.50
1959	3.50	3.00	2.50	2.50	31.0	253.4	33.8	8.21	5.31	5.25	4.10	4.00
1960	3.15	3.10	3.69	7.33	86.8	162.2	20.2	7.61	5.50	4.33	4.12	3.00
1961	1.66	1.51	1.14	1.92	143.1	109.3	11.7	4.08	8.40	17.6	11.2	5.55
1962	3.45	3.26	3.40	17.6	75.0	257.0	48.4	14.6	8.85	6.29	4.46	3.55
1963	2.21	1.83	1.62	1.97	211.4	283.7	19.5	4.82	5.11	3.99	3.76	2.74
1964	1.69	1.52	1.64	2.14	115.3	266.5	88.1	12.4	13.4	7.37	5.10	3.39
1965	3.42	2.29	2.27	3.38	62.7	302.2	82.5	12.1	6.54	8.24	4.62	3.01
1966	2.29	2.21	2.36	2.48	101.6	68.7	15.3	6.72	4.54	4.45	3.87	2.79
1967	2.14	1.54	1.38	3.22	144.1	299.3	86.8	12.4	10.9	14.7	7.36	3.35
1968	1.96	1.97	2.05	1.70	60.9	353.0	68.8	45.6	44.9	16.1	8.75	6.45
1969	3.21	2.48	2.24	7.97	255.6	102.3	61.3	10.8	6.52	6.69	4.98	1.95
1970	1.74	1.55	1.34	1.23	85.9	280.3	46.9	9.74	5.48	4.42	3.96	2.31
1971	1.65	1.43	1.25	1.85	94.2	271.9	39.4	12.4	5.74	6.20	3.96	3.23
1972	2.14	1.58	1.53	2.44	90.0	236.0	44.8	29.0	17.9	11.8	8.19	4.38
1973	2.64	1.56	1.38	2.18	70.9	242.5	33.5	12.7	19.6	8.61	5.33	4.29

1974	2.67	2.17	2.46	6.00	74.6	261.8	40.9	11.9	7.49	5.09	4.49	3.13
1975	2.58	2.06	1.48	1.38	15.2	236.9	187.5	13.1	4.32	3.56	2.91	2.38
1976	1.72	1.39	1.31	1.69	91.2	243.1	61.3	13.0	9.03	9.95	5.12	2.74
1977	2.10	1.66	1.60	13.6	121.5	178.2	19.2	9.75	9.67	11.6	7.35	4.34
1978	3.55	2.36	2.71	3.76	57.0	318.6	119.8	24.8	20.3	15.2	7.09	5.31
1979	3.08	2.67	2.52	3.01	111.8	173.2	40.7	20.5	11.8	6.38	4.19	2.44
1980	1.55	1.09	1.55	5.42	115.2	143.5	23.8	8.93	16.5	14.8	7.45	3.35
1981	2.15	1.61	1.47	8.46	113.0	169.0	22.9	7.97	5.23	6.55	4.23	2.76
1982	2.17	1.50	1.48	2.37	60.7	233.9	70.9	14.5	10.6	13.5	7.32	4.25
1983	3.18	2.88	3.09	3.96	31.3	267.8	54.6	8.62	6.49	9.42	8.35	5.63
1984	3.90	2.42	2.15	3.49	103.5	268.0	58.4	14.0	7.82	10.9	7.69	4.91
1985	2.33	1.50	1.87	20.6	122.6	84.6	19.8	8.70	6.64	7.62	5.70	3.64
1986	2.92	2.22	2.30	4.55	85.3	223.8	32.4	9.11	11.0	11.3	7.33	4.63
1987	2.73	2.79	2.61	28.4	136.0	77.2	26.7	16.9	15.0	9.07	6.86	4.19
1988	2.28	2.02	1.80	4.65	177.6	114.5	12.5	4.29	2.77	3.10	3.61	3.46
1989	2.38	1.66	1.55	9.40	100.2	144.1	41.2	11.4	7.04	7.21	5.37	2.47
1990	2.05	1.72	1.84	8.00	58.8	288.4	59.1	21.2	10.2	7.67	5.06	2.54
1991	2.93	2.94	2.23	3.47	141.6	209.3	23.1	10.2	12.7	9.11	5.02	3.01
1992	2.22	2.74	2.38	5.55	150.9	130.2	58.5	13.6	9.68	7.95	6.37	3.65
1993	2.61	2.33	2.39	2.63	132.3	120.9	62.1	21.7	10.6	8.47	4.33	3.38
1994	2.98	2.17	2.33	17.3	131.5	48.9	16.1	9.15	6.10	11.7	9.28	7.18
1995	4.50	2.85	2.43	2.42	29.9	326.4	125.7	12.7	6.94	7.29	7.43	5.13
1996	3.98	2.33	2.09	3.86	53.5	297.6	29.1	8.49	5.46	6.65	5.09	3.57
1997	3.45	3.26	2.37	3.08	76.9	239.0	42.8	14.3	6.25	5.92	5.37	4.22
1998	3.65	3.67	3.26	4.01	101.0	117.6	48.2	28.4	14.6	13.9	9.27	4.01
1999	3.79	3.45	3.76	5.90	100.3	220.0	38.2	9.00	8.39	6.09	3.78	3.21
2000	2.96	2.46	2.00	4.52	139.6	130.5	24.5	6.79	4.41	5.75	3.20	2.49
2001	1.98	1.92	2.04	6.64	120.2	49.5	11.5	3.66	3.83	4.25	4.66	3.32
2002	2.00	1.53	1.26	2.63	61.9	111.7	13.5	4.98	5.62	5.62	5.12	2.96
2003	2.16	2.44	2.28	10.5	130.6	116.7	24.0	6.67	6.43	5.41	5.38	4.47
2004	3.45	2.68	2.96	7.84	80.6	88.3	43.3	11.2	10.9	10.4	7.08	5.36
2005	3.23	2.48	2.16	4.94	113.4	217.2	38.5	8.42	4.15	4.80	3.74	3.71
2006	2.82	2.29	2.14	8.88	142.0	68.2	9.31	3.09	4.72			
Mean of monthly Discharge	2.7	2.3	2.2	5.8	105	195	46	13	9.4	8.3	5.7	3.8

** No Incomplete Data is used for Statistical Calculation

Water Resources

National Water Information System: Web Interface

Data Category: Surface Water | Geographic Area: United States | GO

USGS Surface-Water Annual Statistics for the Nation

The statistics generated from this site are based on approved daily-mean data and may not match those published by the USGS in official publications. The user is responsible for assessment and use of statistics from this site. For more details on why the statistics may not match, click here.

USGS 06278500 SHELL CREEK NEAR SHELL, WY

Available data for this site | Time-series: Annual statistics | GO

Big Horn County, Wyoming
Hydrologic Unit Code 10080010
Latitude 44°33'54", Longitude 107°42'44" NAD27
Drainage area 145 square miles
Gage datum 4,370.05 feet above sea level NGVD29

Output formats

HTML table of all data | Tab-separated data | Reselect output format

Calendar Year	00060, Discharge, cubic feet per second (Calculation Period: 1941-01-01 -> 1970-12-31) Calculation period restricted by USGS staff due to special conditions at/near site
1941	97.8
1942	106.5
1943	132.3
1944	138.1
1945	136.5
1946	142.8
1947	141.5
1948	106.0
1949	119.4
1950	112.8
1951	113.2
1952	117.2
1953	111.8
1954	89.4
1955	117.1
1956	102.8
1957	105.7

1958	100.0
1959	103.9
1960	76.2
1961	83.2
1962	131.2
1963	123.3
1964	148.1
1965	151.9
1966	73.1
1967	150.6
1968	163.8
1969	123.1
1970	129.5
** No Incomplete Data is used for Statistical Calculation	

Questions about sites/data?
Feedback on this web site
Top
Explanation of terms

Surface Water data for USA: USGS Surface-Water Annual Statistics
http://waterdata.usgs.gov/nwis/annual?

Retrieved on 2007-07-26 16:23:07 EDT
Department of the Interior, U.S. Geological Survey

Water Resources

National Water Information System: Web Interface

Data Category: Surface Water | Geographic Area: United States | GO

USGS Surface-Water Monthly Statistics for the Nation

The statistics generated from this site are based on approved daily-mean data and may not match those published by the USGS in official publications. The user is responsible for assessment and use of statistics from this site. For more details on why the statistics may not match, click here.

USGS 06278500 SHELL CREEK NEAR SHELL, WY

Available data for this site | Time-series: Monthly statistics | GO

Big Horn County, Wyoming
Hydrologic Unit Code 10080010
Latitude 44°33'54", Longitude 107°42'44" NAD27
Drainage area 145 square miles
Gage datum 4,370.05 feet above sea level NGVD29

Output formats

HTML table of all data | Tab-separated data | Reselect output format

00060, Discharge, cubic feet per second,												
YEAR	Monthly mean in cfs (Calculation Period: 1940-10-01 -> 2006-09-30)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1940										60.0	40.0	30.0
1941	30.1	30.1	31.0	35.0	352.7	230.5	82.2	76.6	101.7	95.2	59.0	44.5
1942	40.2	34.5	32.5	123.7	269.0	378.1	126.1	78.7	55.6	49.7	46.0	43.3
1943	38.7	37.1	37.8	68.9	214.6	693.9	211.4	85.3	70.2	49.2	45.3	36.8
1944	35.1	34.3	34.2	37.3	352.3	638.9	224.2	84.7	75.2	54.9	48.0	39.4
1945	37.9	36.6	34.5	35.2	196.7	599.5	308.1	106.7	104.9	71.1	55.9	49.2
1946	42.7	42.1	48.0	138.2	288.0	611.0	162.8	86.3	98.0	79.7	64.3	53.2
1947	45.1	44.6	40.8	47.0	354.6	540.5	254.5	99.7	83.8	66.9	60.8	55.6
1948	48.7	41.9	39.9	43.8	384.2	309.2	124.7	86.9	53.4	48.9	45.5	42.3
1949	37.1	33.3	33.4	53.2	392.7	489.0	122.2	73.3	64.5	50.0	43.8	37.4
1950	34.8	33.5	30.8	44.0	164.5	540.9	173.4	97.3	75.3	68.4	51.0	41.0
1951	33.2	32.3	32.8	39.5	320.3	363.2	204.2	115.4	70.0	55.0	46.0	41.0
1952	38.9	35.2	33.2	91.7	374.3	391.5	163.0	94.4	58.6	46.3	40.0	37.5
1953	38.2	36.5	36.1	35.2	92.7	689.6	140.7	89.0	60.3	43.5	42.3	41.9
1954	38.3	35.6	33.7	41.1	328.5	284.8	103.5	68.4	36.0	35.3	31.5	32.6
1955	29.3	31.3	32.9	38.2	288.1	577.6	156.4	78.3	49.5	42.4	40.9	39.2
1956	36.9	39.4	38.5	43.1	394.4	371.0	92.0	63.9	44.5	37.3	36.7	34.0
1957	30.4	30.4	31.1	33.6	161.8	534.9	154.6	93.5	66.6	50.1	43.2	38.9

1958	34.2	33.0	34.0	33.6	399.1	241.1	122.2	102.7	69.5	44.9	41.1	38.3
1959	35.3	31.7	32.2	37.9	114.0	571.6	126.9	97.7	71.2	52.5	40.3	38.3
1960	31.9	32.2	29.2	42.4	182.0	279.1	80.8	76.6	48.1	46.7	33.9	32.2
1961	28.8	26.9	25.9	29.0	294.6	260.8	69.2	67.6	50.3	52.9	48.8	40.3
1962	32.9	33.5	32.6	90.9	319.3	582.4	172.4	88.8	70.6	55.0	51.6	43.3
1963	35.0	35.1	33.1	39.7	273.4	670.0	123.2	84.7	58.6	46.8	44.0	37.6
1964	35.4	33.7	33.8	33.9	236.8	755.4	284.7	114.5	88.3	67.2	49.7	46.8
1965	41.9	37.3	35.4	43.7	130.5	916.0	257.6	112.8	92.9	68.6	48.0	42.6
1966	38.4	35.8	36.1	36.9	284.2	163.0	73.4	57.7	38.2	38.6	35.8	34.6
1967	28.3	28.0	32.2	34.5	218.3	809.7	281.3	93.6	92.0	80.6	60.5	48.5
1968	41.5	38.3	36.8	37.4	116.3	989.9	216.5	134.7	134.2	93.7	76.4	60.4
1969	46.5	41.7	41.5	91.4	437.8	271.3	208.8	101.2	71.5	62.1	50.4	44.3
1970	39.2	38.3	35.6	36.8	226.7	693.5	176.5	100.5	74.5	49.8	42.7	41.2
1971	38.8	36.6	35.8	40.5	280.1	638.1	141.5	112.2	69.6	60.4		
1972			42.6	46.3	260.1	648.6	174.5	124.6	89.8			
1973			41.1	42.2	330.9	608.9	137.9	94.7	76.9			
1974				53.9	293.3	643.0	162.0	113.5	85.7			
1975				36.1	93.6	714.5	472.8	126.4	97.5			
1976				45.8	290.1	668.6	190.5	121.8	86.2			
1977				71.0	312.4	288.1	99.4	78.7	55.2			
1978				43.5	219.7	778.9	332.0	139.9	116.4			
1979				54.0	353.0	465.4	176.4	157.9	118.7			
1980				55.1	293.2	371.8	128.2	93.4	74.9			
1981				71.2	343.5	426.9	127.2	97.3	64.6			
1982				32.8	192.1	605.3	245.2	93.4	92.6			
1983				39.8	137.5	605.5	203.7	108.8	80.9			
1984				38.5	253.2	640.9	193.9	107.4	84.4			
1985				56.4	329.6	192.2	84.8	72.7	59.6			
1986				41.4	272.8	727.4	135.4	109.4	92.8			
1987				120.4	290.4	210.3	104.4	94.2	81.6			
1988				61.8	552.6	297.9	100.1	74.7	55.8			
1989				38.2	252.7	318.5	122.5	85.9	72.9			
1990				62.1	200.3	666.2	186.1	105.7	65.7			
1991				35.4	308.4	489.2	124.2	114.2	87.5			
1992				46.6	376.1	353.8	232.9	129.9	97.5			
1993				41.3	356.7	310.2	206.7	144.7	105.8			
1994				84.3	375.0	149.3	112.9	96.8	61.4			
1995				36.9	80.4	759.2	294.9	119.7	102.9			
1996				42.8	180.1	608.4	140.3	115.3	81.8			
1997				35.4	231.2	614.7	182.1	111.8	108.1			

1998				37.0	235.5	307.5	172.1	122.5	100.7			
1999				53.0	291.5	608.3	168.9	117.4	94.8			
2000				49.6	319.5	315.9	118.7	104.2	80.0			
2001				38.2	257.1	116.4	88.9	68.1				
2002				29.1	127.2	248.7	82.1	77.4	61.8			
2003				42.8	271.3	295.5	106.8	91.8	70.1			
2004				33.5	161.9	162.6	109.4	85.2	75.8			
2005				46.1	315.3	489.3	144.8	107.5	82.2			
2006				44.3	307.3	167.4	92.9	83.3	53.9			
Mean of monthly Discharge	37	35	35	50.	271	484	165	99	77	57	47	41

** No Incomplete Data is used for Statistical Calculation

Questions about sites/data?
Feedback on this web site
Top
Explanation of terms

Surface Water data for USA: USGS Surface-Water Monthly Statistics
http://waterdata.usgs.gov/nwis/monthly?

Retrieved on 2007-07-26 16:24:33 EDT
Department of the Interior, U.S. Geological Survey

APPENDIX F

WWDC Stream Discharge Calculations (2006 – 2007)

- Beaver Creek Station
  - BC-2
  - BC-4
  - BC-5
- Shell Creek Station
  - SC-2
  - SC-5
  - SC-6
  - SC-7
  - SC-8
- Surface Water Discharge Calculation Sheet for:
  - SC-5
  - SC-8
  - SC-100
  - BC-3
  - BC-5
  - HC-1
  - RCC-1
  - TC-1
  - SCG-1
  - SHG-1
  - GC-1

Beaver Creek Station BC-2
Stream Discharge Calculations
Shell Valley Watershed Plan

Date:	5/10/2006					
Dist. From Start	Width (ft)	Observation Depth (ft)	Depth (ft)	Velocity (ft/sec)	Area (ft^2)	Discharge (ft^3/sec)
0.0	1.6	0.00	0.46	0.00	0.76	0.00
3.3	3.3	0.92	1.01	0.02	3.32	0.07
6.6	3.3	1.10	0.99	0.03	3.26	0.10
9.9	3.3	0.88	0.54	0.02	1.78	0.04
13.2	1.6	0.20	0.10	0.02	0.16	0.00
Stream width	13.2			Total Discharge		0.20

Date:	5/15/2006					
Dist. From Start	Width (ft)	Observation Depth (ft)	Depth (ft)	Velocity (ft/sec)	Area (ft^2)	Discharge (ft^3/sec)
0.0	1.0	2.90	2.85	0.73	2.95	2.15
2.1	2.1	2.80	2.30	0.74	4.76	3.53
4.1	2.1	1.80	1.70	0.63	3.52	2.22
6.2	2.1	1.60	1.40	0.54	2.90	1.57
8.3	2.1	1.20	1.13	0.64	2.33	1.49
10.4	2.1	1.05	0.73	0.33	1.50	0.50
12.4	2.1	0.40	0.20	0.03	0.41	0.01
14.5	1.0	0.00	0.00	0.00	0.00	0.00
Stream width	14.5			Total Discharge		11.46

Date:	5/30/2006					
Dist. From Start	Width (ft)	Observation Depth (ft)	Depth (ft)	Velocity (ft/sec)	Area (ft^2)	Discharge (ft^3/sec)
0.0	0.5	0.20	1.00	0.00	0.51	0.00
1.0	1.0	1.80	1.80	0.58	1.84	1.07
2.0	1.0	1.80	1.80	0.58	1.84	1.07
3.1	1.0	1.80	1.80	0.78	1.84	1.44
4.1	1.0	1.80	1.80	0.90	1.84	1.66

Beaver Creek Station BC-2
Stream Discharge Calculations
Shell Valley Watershed Plan

5.1	1.0	1.80	1.85	1.07	1.89	2.02
6.1	1.0	1.90	1.90	1.11	1.94	2.16
7.2	1.0	1.90	1.90	1.22	1.94	2.37
8.2	1.0	1.90	1.95	1.17	1.99	2.33
9.2	1.0	2.00	2.05	1.17	2.10	2.45
10.2	1.0	2.10	2.10	1.08	2.15	2.32
11.2	1.0	2.10	1.95	0.90	1.99	1.79
12.3	1.0	1.80	1.30	0.95	1.33	1.26
13.3	1.0	0.80	3.90	0.76	3.99	3.03
14.3	1.0	7.00	3.50	0.10	3.58	0.36
15.3	0.5	0.00	0.00	0.00	0.00	0.00
Stream width	15.3			**Total Discharge**		**25.32**

Date:	**8/3/2006**					
Dist. From Start	**Width (ft)**	**Observation Depth (ft)**	**Depth (ft)**	**Velocity (ft/sec)**	**Area (ft^2)**	**Discharge (ft^3/sec)**
0.0	0.5	0.80	0.90	0.00	0.42	0.00
0.9	0.9	1.00	1.05	0.00	0.98	0.00
1.9	0.9	1.10	1.10	0.00	1.03	0.00
2.8	0.9	1.10	1.10	0.02	1.03	0.02
3.7	0.9	1.10	1.10	0.08	1.03	0.08
4.7	0.9	1.10	1.10	0.15	1.03	0.15
5.6	0.9	1.10	1.10	0.12	1.03	0.12
6.5	0.9	1.10	1.10	0.20	1.03	0.21
7.5	0.9	1.10	1.10	0.08	1.03	0.08
8.4	0.9	1.10	1.15	0.21	1.07	0.23
9.3	0.9	1.20	1.25	0.13	1.17	0.15
10.3	0.9	1.30	1.30	0.07	1.21	0.08
11.2	0.9	1.30	1.35	0.06	1.26	0.08
12.1	0.9	1.40	1.40	0.13	1.31	0.17
13.1	0.9	1.40	1.35	0.14	1.26	0.18
14.0	0.5	1.30	0.65	0.11	0.30	0.03
Stream width	14.0			**Total Discharge**		**1.58**

Date:	**9/18/2006**					

Beaver Creek Station BC-2
Stream Discharge Calculations
Shell Valley Watershed Plan

Dist. From Start	Width (ft)	Observation Depth (ft)	Depth (ft)	Velocity (ft/sec)	Area (ft^2)	Discharge (ft^3/sec)
0.0	0.6	1.10	1.20	0.00	0.74	0.00
1.2	1.2	1.30	1.35	0.00	1.66	0.00
2.5	1.2	1.40	1.45	0.00	1.78	0.00
3.7	1.2	1.50	1.45	0.09	1.78	0.16
4.9	1.2	1.40	1.40	0.21	1.72	0.36
6.1	1.2	1.40	1.45	0.32	1.78	0.57
7.4	1.2	1.50	1.55	0.35	1.91	0.67
8.6	1.2	1.60	1.60	0.38	1.97	0.75
9.8	1.2	1.60	1.65	0.33	2.03	0.67
11.1	1.2	1.70	1.75	0.26	2.15	0.56
12.3	1.2	1.80	1.45	0.24	1.78	0.43
13.5	1.2	1.10	0.75	0.04	0.92	0.04
14.75	0.6	0.40	0.20	0.00	0.12	0.00
Stream width	14.8			**Total Discharge**		**4.20**

Date:	**9/27/2006**					
Dist. From Start	**Width (ft)**	**Observation Depth (ft)**	**Depth (ft)**	**Velocity (ft/sec)**	**Area (ft^2)**	**Discharge (ft^3/sec)**
0.0	0.6	0.70	0.90	0.00	0.52	0.00
1.2	1.2	1.10	1.25	0.00	1.44	0.00
2.3	1.2	1.40	1.35	0.00	1.56	0.00
3.5	1.2	1.30	1.65	0.00	1.90	0.00
4.6	1.2	2.00	1.70	0.09	1.96	0.18
5.8	1.2	1.40	1.40	0.16	1.62	0.26
6.9	1.2	1.40	1.45	0.26	1.67	0.44
8.1	1.2	1.50	1.50	0.27	1.73	0.47
9.2	1.2	1.50	1.55	0.28	1.79	0.50
10.4	1.2	1.60	1.60	0.28	1.85	0.52
11.5	1.2	1.60	1.65	0.30	1.90	0.57
12.7	1.2	1.70	1.50	0.11	1.73	0.19
13.85	1.2	1.30	1.30	0.00	1.50	0.00
15	0.6	1.30	0.65	0.00	0.38	0.00
Stream width	15.0			**Total Discharge**		**3.12**

Date:	**10/4/2006**					

Beaver Creek Station BC-2
Stream Discharge Calculations
Shell Valley Watershed Plan

Dist. From Start	Width (ft)	Observation Depth (ft)	Depth (ft)	Velocity (ft/sec)	Area (ft^2)	Discharge (ft^3/sec)
0.0	0.7	1.40	1.50	0.00	1.02	0.00
1.4	1.4	1.60	1.65	0.00	2.25	0.00
2.7	1.4	1.70	1.70	0.18	2.32	0.42
4.1	1.4	1.70	1.70	0.37	2.32	0.86
5.5	1.4	1.70	1.75	0.60	2.39	1.43
6.8	1.4	1.80	1.80	0.74	2.45	1.82
8.2	1.4	1.80	1.80	0.80	2.45	1.96
9.5	1.4	1.80	1.80	0.73	2.45	1.79
10.9	1.4	1.80	1.90	0.60	2.59	1.55
12.3	1.4	2.00	1.85	0.48	2.52	1.21
13.6	1.4	1.70	1.40	0.31	1.91	0.59
15.0	0.7	1.10	0.55	0.04	0.38	0.02
Stream width	15.0			**Total Discharge**		**11.65**

Date:	**10/13/2006**					
Dist. From Start	Width (ft)	Observation Depth (ft)	Depth (ft)	Velocity (ft/sec)	Area (ft^2)	Discharge (ft^3/sec)
0.0	0.5	0.70	0.95	0	0.46	0.00
1.0	1.0	1.20	1.30	0.96875	1.26	1.22
1.9	1.0	1.40	1.50	1.9375	1.45	2.82
2.9	1.0	1.60	1.60	2.90625	1.55	4.50
3.9	1.0	1.60	1.60	3.875	1.55	6.01
4.8	1.0	1.60	1.60	4.84375	1.55	7.51
5.8	1.0	1.60	1.65	5.8125	1.60	9.29
6.8	1.0	1.70	1.70	6.78125	1.65	11.17
7.8	1.0	1.70	1.70	7.75	1.65	12.76
8.7	1.0	1.70	1.75	8.71875	1.70	14.78
9.7	1.0	1.80	1.80	9.6875	1.74	16.89
10.7	1.0	1.80	1.85	10.65625	1.79	19.10
11.6	1.0	1.90	1.90	11.625	1.84	21.40
12.6	1.0	1.90	1.90	12.59375	1.84	23.18
13.6	1.0	1.90	1.45	13.5625	1.40	19.05
14.5	1.0	1.00	0.95	14.53125	0.92	13.37
15.5	0.5	0.90	0.45	15.5	0.22	3.38

Beaver Creek Station BC-2
Stream Discharge Calculations
Shell Valley Watershed Plan

Stream width	15.5			**Total Discharge**		**186.43**

Date:	**10/19/2006**					
Dist. From Start	**Width (ft)**	**Observation Depth (ft)**	**Depth (ft)**	**Velocity (ft/sec)**	**Area (ft^2)**	**Discharge (ft^3/sec)**
0.0	0.6	0.80	1.05	0.00	0.58	0.00
1.1	1.1	1.30	1.40	0.00	1.55	0.00
2.2	1.1	1.50	1.55	0.00	1.72	0.00
3.3	1.1	1.60	1.60	0.04	1.77	0.07
4.4	1.1	1.60	1.60	0.17	1.77	0.30
5.5	1.1	1.60	1.65	0.39	1.83	0.71
6.6	1.1	1.70	1.70	0.54	1.88	1.02
7.8	1.1	1.70	1.70	0.62	1.88	1.17
8.9	1.1	1.70	1.75	0.71	1.94	1.38
10.0	1.1	1.80	1.85	0.64	2.05	1.31
11.1	1.1	1.90	1.95	0.53	2.16	1.14
12.2	1.1	2.00	1.95	0.34	2.16	0.73
13.3	1.1	1.90	1.65	0.30	1.83	0.55
14.4	1.1	1.40	1.15	0.01	1.27	0.01
15.5	0.6	0.90	0.45	0.00	0.25	0.00
Stream width	15.5			**Total Discharge**		**8.39**

Date:	**3/27/2007**					
Dist. From Start	**Width (ft)**	**Observation Depth (ft)**	**Depth (ft)**	**Velocity (ft/sec)**	**Area (ft^2)**	**Discharge (ft^3/sec)**
0.0	0.6	0.20	0.30	0.00	0.17	0.00
1.1	1.1	0.40	0.45	0.00	0.50	0.00
2.2	1.1	0.50	0.50	0.00	0.55	0.00
3.3	1.1	0.50	0.50	0.00	0.55	0.00
4.4	1.1	0.50	0.55	0.00	0.61	0.00
5.5	1.1	0.60	0.70	0.01	0.78	0.01
6.6	1.1	0.80	0.80	0.06	0.89	0.05
7.8	1.1	0.80	0.80	0.18	0.89	0.16
8.9	1.1	0.80	0.85	0.19	0.94	0.18

Beaver Creek Station BC-2
Stream Discharge Calculations
Shell Valley Watershed Plan

10.0	1.1	0.90	0.90	0.17	1.00	0.17
11.1	1.1	0.90	0.95	0.18	1.05	0.19
12.2	1.1	1.00	1.00	0.18	1.11	0.20
13.3	1.1	1.00	1.00	0.20	1.11	0.22
14.4	1.1	1.00	0.80	0.10	0.89	0.09
15.5	0.6	0.60	0.30	0.00	0.17	0.00
Stream width	15.5			**Total Discharge**		**1.27**

Date:	**4/1/2007**					
Dist. From Start	Width (ft)	Observation Depth (ft)	Depth (ft)	Velocity (ft/sec)	Area (ft^2)	Discharge (ft^3/sec)
0.0	0.5	0.80	0.85	0.00	0.43	0.00
1.0	1.0	0.90	0.90	0.00	0.91	0.00
2.0	1.0	0.90	0.90	0.02	0.91	0.02
3.0	1.0	0.90	1.00	0.10	1.01	0.10
4.0	1.0	1.10	1.10	0.12	1.11	0.13
5.1	1.0	1.10	1.15	0.23	1.16	0.27
6.1	1.0	1.20	1.20	0.26	1.21	0.32
7.1	1.0	1.20	1.25	0.35	1.26	0.44
8.1	1.0	1.30	1.35	0.37	1.36	0.50
9.1	1.0	1.40	1.40	0.29	1.41	0.41
10.1	1.0	1.40	1.50	0.31	1.52	0.47
11.1	1.0	1.60	1.55	0.26	1.57	0.41
12.1	1.0	1.50	1.55	0.24	1.57	0.38
13.1	1.0	1.60	1.50	0.20	1.52	0.30
14.1	1.0	1.40	0.95	0.26	0.96	0.25
15.2	1.0	0.50	0.45	0.18	0.45	0.08
16.2	0.5	0.40	0.20	0.00	0.10	0.00
Stream width	**16.2**			**Total Discharge**		**4.08**

Date:	**4/10/2007**					
Dist. From Start	Width (ft)	Observation Depth (ft)	Depth (ft)	Velocity (ft/sec)	Area (ft^2)	Discharge (ft^3/sec)
0.0	0.6	0.50	0.55	0.00	0.33	0.00

Beaver Creek Station BC-2

Stream Discharge Calculations

Shell Valley Watershed Plan

1.2	1.2	0.60	0.70	0.04	0.83	0.03
2.4	1.2	0.80	0.80	0.00	0.95	0.00
3.6	1.2	0.80	0.85	0.09	1.01	0.09
4.7	1.2	0.90	0.95	0.12	1.13	0.14
5.9	1.2	1.00	1.00	0.22	1.19	0.26
7.1	1.2	1.00	1.00	0.28	1.19	0.33
8.3	1.2	1.00	1.05	0.31	1.25	0.39
9.5	1.2	1.10	1.15	0.29	1.36	0.40
10.7	1.2	1.20	1.25	0.32	1.48	0.47
11.9	1.2	1.30	1.35	0.22	1.60	0.35
13.0	1.2	1.40	1.30	0.15	1.54	0.23
14.2	1.2	1.20	1.05	0.24	1.25	0.30
15.4	0.6	0.90	0.45	0.00	0.27	0.00
Stream width	**15.4**			**Total Discharge**		**2.99**

Beaver Creek Station BC-4

Stream Discharge Calculations

Shell Valley Watershed

Date:	5/10/2006					
Dist. From Start	Width (ft)	Observation Depth (ft)	Depth (ft)	Velocity (ft/sec)	Area (ft^2)	Discharge (ft^3/sec)
0	1.7	1.88	1.89	0.00	3.26	0.00
3.45	3.5	1.90	1.70	0.00	5.87	0.00
6.9	3.5	1.50	1.25	0.40	4.31	1.73
10.35	3.5	1.00	0.80	0.90	2.76	2.48
13.8	3.5	0.60	0.45	0.31	1.55	0.48
17.25	1.7	0.30	0.15	0.28	0.26	0.07
Stream width	17.3			Total Discharge		4.76

Date:	5/15/2006					
Dist. From Start	Width (ft)	Observation Depth (ft)	Depth (ft)	Velocity (ft/sec)	Area (ft^2)	Discharge (ft^3/sec)
0.0	0.5	1.70	1.85	1.06	0.99	1.05
1.1	1.1	2.00	2.05	1.32	2.20	2.91
2.1	1.1	2.10	2.05	1.86	2.20	4.10
3.2	1.1	2.00	1.85	1.80	1.99	3.58
4.3	1.1	1.70	1.65	1.52	1.77	2.69
5.4	1.1	1.60	1.73	0.87	1.85	1.61
6.4	1.1	1.85	1.73	0.52	1.85	0.96
7.5	1.1	1.60	0.90	0.54	0.97	0.52
8.6	1.1	0.20	0.10	0.50	0.11	0.05
9.7	0.5	0.00	0.00	0.00	0.00	0.00
Stream width	9.7			Total Discharge		17.48

Date:	5/22/2006					
Dist. From Start	Width (ft)	Observation Depth (ft)	Depth (ft)	Velocity (ft/sec)	Area (ft^2)	Discharge (ft^3/sec)
0.0	0.7	0.10	0.30	0.00	0.20	0.00
1.3	1.3	0.50	0.60	0.00	0.79	0.00
2.6	1.3	0.70	1.05	0.46	1.38	0.64

Beaver Creek Station BC-4

Stream Discharge Calculations

Shell Valley Watershed

4.0	1.3	1.40	1.60	0.56	2.11	1.18
5.3	1.3	1.80	1.80	1.18	2.37	2.80
6.6	1.3	1.80	1.80	1.82	2.37	4.31
7.9	1.3	1.80	1.80	2.27	2.37	5.38
9.2	1.3	1.80	1.80	2.75	2.37	6.52
10.5	1.3	1.80	1.75	2.75	2.30	6.34
11.9	1.3	1.70	1.60	2.65	2.11	5.58
13.2	1.3	1.50	1.50	2.52	1.98	4.98
14.5	1.3	1.50	1.45	2.24	1.91	4.28
15.8	1.3	1.40	1.10	1.90	1.45	2.75
17.1	1.3	0.80	0.55	1.20	0.72	0.87
18.4	1.3	0.30	0.15	0.16	0.20	0.03
19.8	0.7	0.00	0.00	0.00	0.00	0.00
Stream width	19.8			**Total Discharge**		**45.65**

Date:	**5/30/2006**					
Dist. From Start	**Width (ft)**	**Observation Depth (ft)**	**Depth (ft)**	**Velocity (ft/sec)**	**Area (ft^2)**	**Discharge (ft^3/sec)**
0.0	0.5	0.00	0.15	0.00	0.08	0.00
1.1	1.1	0.30	0.45	0.01	0.48	0.00
2.1	1.1	0.60	0.60	0.09	0.64	0.06
3.2	1.1	0.60	0.90	0.46	0.96	0.44
4.3	1.1	1.20	1.20	1.46	1.28	1.86
5.3	1.1	1.20	1.20	1.83	1.28	2.33
6.4	1.1	1.20	1.20	1.74	1.28	2.22
7.4	1.1	1.20	1.10	1.90	1.17	2.22
8.5	1.1	1.00	1.00	1.91	1.06	2.03
9.6	1.1	1.00	0.90	1.92	0.96	1.84
10.6	1.1	0.80	0.80	1.82	0.85	1.55
11.7	1.1	0.80	0.70	1.70	0.74	1.26
12.8	1.1	0.60	0.60	1.58	0.64	1.01
13.8	1.1	0.60	0.55	1.47	0.58	0.86
14.9	1.1	0.50	0.35	1.31	0.37	0.49
15.9	1.1	0.20	0.10	1.05	0.11	0.11
17.0	0.5	0.00	0.00	0.00	0.00	0.00
Stream width	17.0			**Total Discharge**		**18.28**

Beaver Creek Station BC-4

Stream Discharge Calculations

Shell Valley Watershed

Date:	8/3/2006					
Dist. From Start	Width (ft)	Observation Depth (ft)	Depth (ft)	Velocity (ft/sec)	Area (ft^2)	Discharge (ft^3/sec)
0	0.3	0.20	0.30	0.00	0.09	0.00
0.6	0.6	0.40	0.35	0.00	0.21	0.00
1.2	0.6	0.30	0.40	0.18	0.24	0.04
1.8	0.6	0.50	0.55	0.52	0.33	0.17
2.4	0.6	0.60	0.55	1.57	0.33	0.52
3	0.6	0.50	0.45	2.22	0.27	0.60
3.6	0.6	0.40	0.40	2.60	0.24	0.62
4.2	0.6	0.40	0.35	1.56	0.21	0.33
4.8	0.6	0.30	0.30	1.92	0.18	0.35
5.4	0.6	0.30	0.30	2.22	0.18	0.40
6	0.6	0.30	0.25	1.99	0.15	0.30
6.6	0.6	0.20	0.20	1.43	0.12	0.17
7.2	0.6	0.20	0.15	0.96	0.09	0.09
7.8	0.6	0.10	0.10	0.59	0.06	0.04
8.4	0.6	0.10	0.10	0.45	0.06	0.03
9	0.3	0.10	0.05	0.00	0.02	0.00
Stream width	9.0			Total Discharge		3.65

Date:	9/18/2006					
Dist. From Start	Width (ft)	Observation Depth (ft)	Depth (ft)	Velocity (ft/sec)	Area (ft^2)	Discharge (ft^3/sec)
0.0	0.4	0.20	0.25	0.03	0.10	0.00
0.8	0.8	0.30	0.30	0.22	0.25	0.05
1.6	0.8	0.30	0.35	0.42	0.29	0.12
2.5	0.8	0.40	0.40	0.61	0.33	0.20
3.3	0.8	0.40	0.40	1.50	0.33	0.49
4.1	0.8	0.40	0.45	1.68	0.37	0.62
4.9	0.8	0.50	0.50	2.38	0.41	0.97
5.7	0.8	0.50	0.40	2.11	0.33	0.69
6.5	0.8	0.30	0.30	2.19	0.25	0.54
7.4	0.8	0.30	0.20	1.74	0.16	0.28
8.2	0.8	0.10	0.10	1.81	0.08	0.15

Beaver Creek Station BC-4

Stream Discharge Calculations

Shell Valley Watershed

9.0	0.4	0.10	0.05	0.34	0.02	0.01
Stream width	9.0			**Total Discharge**		**4.13**

Date:	**9/27/2006**					
Dist. From Start	**Width (ft)**	**Observation Depth (ft)**	**Depth (ft)**	**Velocity (ft/sec)**	**Area (ft^2)**	**Discharge (ft^3/sec)**
0.0	0.3	0.10	0.20	0.04	0.06	0.00
0.6	0.6	0.30	0.35	0.19	0.22	0.04
1.2	0.6	0.40	0.45	0.39	0.28	0.11
1.8	0.6	0.50	0.50	0.07	0.31	0.02
2.5	0.6	0.50	0.50	0.76	0.31	0.23
3.1	0.6	0.50	0.45	2.06	0.28	0.57
3.7	0.6	0.40	0.35	2.08	0.22	0.45
4.3	0.6	0.30	0.30	1.86	0.18	0.34
4.9	0.6	0.30	0.25	2.19	0.15	0.34
5.5	0.6	0.20	0.20	2.43	0.12	0.30
6.2	0.6	0.20	0.15	1.41	0.09	0.13
6.8	0.6	0.10	0.10	1.12	0.06	0.07
7.4	0.6	0.10	7.55	0.38	4.65	1.77
8.0	0.3	15	7.50	0.21	2.31	0.48
Stream width	8.0			**Total Discharge**		**4.85**

Date:	**10/4/2006**					
Dist. From Start	**Width (ft)**	**Observation Depth (ft)**	**Depth (ft)**	**Velocity (ft/sec)**	**Area (ft^2)**	**Discharge (ft^3/sec)**
0.0	0.3	0.20	0.25	0.00	0.07	0.00
0.6	0.6	0.30	0.40	0.00	0.23	0.00
1.1	0.6	0.50	0.50	0.11	0.29	0.03
1.7	0.6	0.50	0.55	0.74	0.31	0.23
2.3	0.6	0.60	0.60	0.83	0.34	0.28
2.9	0.6	0.60	0.60	1.16	0.34	0.40
3.4	0.6	0.60	0.55	1.81	0.31	0.57
4.0	0.6	0.50	0.45	2.95	0.26	0.76
4.6	0.6	0.40	0.40	2.48	0.23	0.57

Beaver Creek Station BC-4

Stream Discharge Calculations

Shell Valley Watershed

5.1	0.6	0.40	0.40	2.43	0.23	0.56
5.7	0.6	0.40	0.30	1.95	0.17	0.33
6.3	0.6	0.20	0.20	1.16	0.11	0.13
6.9	0.6	0.20	0.15	1.37	0.09	0.12
7.4	0.6	0.10	0.10	1.11	0.06	0.06
8.0	0.3	0.10	0.05	0.65	0.01	0.01
Stream width	8.0			**Total Discharge**		**4.05**

Date:	**10/13/2006**					
Dist. From Start	**Width (ft)**	**Observation Depth (ft)**	**Depth (ft)**	**Velocity (ft/sec)**	**Area (ft^2)**	**Discharge (ft^3/sec)**
0.0	0.5	0.30	0.35	0.00	0.17	0.00
1.0	1.0	0.40	0.55	0.11	0.53	0.06
1.9	1.0	0.70	0.70	1.15	0.67	0.77
2.9	1.0	0.70	0.70	1.45	0.67	0.97
3.8	1.0	0.70	0.70	1.64	0.67	1.10
4.8	1.0	0.70	0.65	2.29	0.62	1.43
5.8	1.0	0.60	0.60	2.33	0.58	1.34
6.7	1.0	0.60	0.50	2.54	0.48	1.22
7.7	1.0	0.40	0.40	2.53	0.38	0.97
8.6	1.0	0.40	0.35	2.17	0.34	0.73
9.6	1.0	0.30	0.25	2.15	0.24	0.52
10.5	1.0	0.20	0.15	1.54	0.14	0.22
11.5	0.5	0.10	0.05	0.43	0.02	0.01
Stream width	11.5			**Total Discharge**		**9.33**

Date:	**10/19/2006**					
Dist. From Start	**Width (ft)**	**Observation Depth (ft)**	**Depth (ft)**	**Velocity (ft/sec)**	**Area (ft^2)**	**Discharge (ft^3/sec)**
0.0	0.5	0.40	0.45	0.00	0.22	0.00
1.0	1.0	0.50	0.65	0.00	0.62	0.00
1.9	1.0	0.80	0.80	1.13	0.77	0.87
2.9	1.0	0.80	0.75	1.41	0.72	1.01
3.8	1.0	0.70	0.70	1.49	0.67	1.00
4.8	1.0	0.70	0.65	2.38	0.62	1.48

Beaver Creek Station BC-4

Stream Discharge Calculations

Shell Valley Watershed

5.8	1.0	0.60	0.60	2.03	0.58	1.17
6.7	1.0	0.60	0.55	2.75	0.53	1.45
7.7	1.0	0.50	0.40	1.78	0.38	0.68
8.6	1.0	0.30	0.25	1.79	0.24	0.43
9.6	1.0	0.20	0.15	1.92	0.14	0.28
10.5	1.0	0.10	0.10	0.41	0.10	0.04
11.5	0.5	0.10	0.05	0.13	0.02	0.00
Stream width	11.5			**Total Discharge**		**8.41**

Date:	**3/27/2007**					
Dist. From Start	**Width (ft)**	**Observation Depth (ft)**	**Depth (ft)**	**Velocity (ft/sec)**	**Area (ft^2)**	**Discharge (ft^3/sec)**
0.0	0.5	0.20	0.25	0.00	0.13	0.00
1.0	1.0	0.30	0.40	0.26	0.41	0.11
2.0	1.0	0.50	0.50	0.47	0.51	0.24
3.0	1.0	0.50	0.50	0.52	0.51	0.26
4.1	1.0	0.50	0.50	0.58	0.51	0.29
5.1	1.0	0.50	0.45	0.50	0.46	0.23
6.1	1.0	0.40	0.40	0.57	0.41	0.23
7.1	1.0	0.40	0.35	0.42	0.36	0.15
8.1	1.0	0.30	0.25	0.60	0.25	0.15
9.1	1.0	0.20	0.15	0.37	0.15	0.06
10.2	1.0	0.10	0.10	0.06	0.10	0.01
11.2	0.5	0.10	0.05	0.01	0.03	0.00
Stream width	11.2			**Total Discharge**		**1.73**

Date:	**4/1/2007**					
Dist. From Start	**Width (ft)**	**Observation Depth (ft)**	**Depth (ft)**	**Velocity (ft/sec)**	**Area (ft^2)**	**Discharge (ft^3/sec)**
0.0	0.4	0.20	0.25	0.01	0.11	0.00
0.9	0.9	0.30	0.35	0.35	0.31	0.11
1.8	0.9	0.40	0.50	0.69	0.44	0.30
2.6	0.9	0.60	0.60	0.69	0.53	0.36
3.5	0.9	0.60	0.60	0.89	0.53	0.47

Beaver Creek Station BC-4

Stream Discharge Calculations

Shell Valley Watershed

4.4	0.9	0.60	0.60	0.82	0.53	0.43
5.3	0.9	0.60	0.60	0.90	0.53	0.47
6.1	0.9	0.60	0.60	0.96	0.53	0.50
7.0	0.9	0.60	0.50	1.02	0.44	0.45
7.9	0.9	0.40	0.35	0.82	0.31	0.25
8.8	0.9	0.30	0.25	0.84	0.22	0.18
9.6	0.9	0.20	0.20	0.81	0.18	0.14
10.5	0.9	0.20	0.15	0.49	0.13	0.06
11.4	0.9	0.10	0.10	0.36	0.09	0.03
12.3	0.9	0.10	0.10	0.25	0.09	0.02
13.1	0.9	0.10	0.10	0.05	0.09	0.00
14.0	0.4	0.10	0.05	0.00	0.02	0.00
Stream width	14.0			**Total Discharge**		**3.79**

Date:	**4/10/2007**					
Dist. From Start	**Width (ft)**	**Observation Depth (ft)**	**Depth (ft)**	**Velocity (ft/sec)**	**Area (ft^2)**	**Discharge (ft^3/sec)**
0	0.6	0.20	0.30	0.11	0.18	0.02
1.19697	1.2	0.40	0.45	0.55	0.54	0.30
2.39394	1.2	0.50	0.55	0.29	0.66	0.19
3.59091	1.2	0.60	0.60	0.76	0.72	0.55
4.78788	1.2	0.60	0.55	0.78	0.66	0.51
5.98485	1.2	0.50	0.45	0.80	0.54	0.43
7.18182	1.2	0.40	0.35	0.71	0.42	0.30
8.37879	1.2	0.30	0.25	0.74	0.30	0.22
9.57576	1.2	0.20	0.20	0.66	0.24	0.16
10.77273	1.2	0.20	0.15	0.54	0.18	0.10
11.9697	1.2	0.10	0.10	0.00	0.12	0.00
13.16667	0.6	0.10	0.05	0.00	0.03	0.00
Stream width	13.2			**Total Discharge**		**2.77**

Beaver Creek Station BC-5

Stream Discharge Calculations

Shell Valley Watershed Plan

Date:	5/10/2006					
Dist. From Start	Width (ft)	Observation Depth (ft)	Depth (ft)	Velocity (ft/sec)	Area (ft^2)	Discharge (ft^3/sec)
0.0	0.7	0.01	0.05	0.00	0.03	0.00
1.4	1.4	0.08	0.04	0.05	0.06	0.00
2.8	1.4	0.00	0.06	0.00	0.08	0.00
4.2	1.4	0.12	0.20	0.50	0.28	0.14
5.6	1.4	0.28	0.36	0.23	0.51	0.12
7.0	1.4	0.44	0.42	0.40	0.59	0.24
8.4	1.4	0.40	0.20	0.35	0.28	0.10
9.8	0.7	0.00	0.00	0.00	0.00	0.00
Stream width	9.8			Total Discharge		0.59

Date:	5/15/2006					
Dist. From Start	Width (ft)	Observation Depth (ft)	Depth (ft)	Velocity (ft/sec)	Area (ft^2)	Discharge (ft^3/sec)
0.0	0.5	0.38	0.59	0.00	0.30	0.00
1.0	1.0	0.80	0.99	0.45	1.01	0.45
2.0	1.0	1.18	1.19	1.02	1.21	1.24
3.1	1.0	1.20	1.15	1.49	1.17	1.75
4.1	1.0	1.10	1.15	1.60	1.17	1.88
5.1	1.0	1.20	1.28	1.70	1.30	2.21
6.1	1.0	1.35	1.38	1.75	1.40	2.45
7.1	1.0	1.40	1.40	1.96	1.43	2.80
8.2	1.0	1.40	1.40	0.92	1.43	1.31
9.2	1.0	1.40	1.20	0.55	1.22	0.67
10.2	1.0	1.00	0.80	0.06	0.82	0.05
11.2	1.0	0.60	0.40	0.01	0.41	0.00
12.2	1.0	0.20	0.10	0.01	0.10	0.00
13.3	0.5	0.00	0.00	0.00	0.00	0.00
Stream width	13.3			Total Discharge		14.81

Date:	5/30/2006					

Beaver Creek Station BC-5

Stream Discharge Calculations

Shell Valley Watershed Plan

Dist. From Start	Width (ft)	Observation Depth (ft)	Depth (ft)	Velocity (ft/sec)	Area (ft^2)	Discharge (ft^3/sec)
0.0	0.5	0.10	1.00	0.00	0.54	**0.00**
1.1	1.1	1.90	1.95	0.05	2.09	**0.10**
2.1	1.1	2.00	2.00	0.49	2.14	**1.05**
3.2	1.1	2.00	2.00	1.04	2.14	**2.23**
4.3	1.1	2.00	2.00	1.64	2.14	**3.51**
5.4	1.1	2.00	2.05	1.81	2.20	**3.98**
6.4	1.1	2.10	2.10	1.81	2.25	**4.07**
7.5	1.1	2.10	2.05	1.61	2.20	**3.54**
8.6	1.1	2.00	1.90	1.44	2.04	**2.93**
9.6	1.1	1.80	1.65	0.70	1.77	**1.24**
10.7	1.1	1.50	1.20	0.11	1.29	**0.14**
11.8	1.1	0.90	0.70	0.01	0.75	**0.01**
12.9	1.1	0.50	0.25	0.08	0.27	**0.02**
13.9	1.1	0.00	0.00	0.00	0.00	**0.00**
15.0	0.5	0.00	0.00	0.00	0.00	**0.00**
Stream width	15.0			**Total Discharge**		**22.82**

Date:	**8/3/2006**					
Dist. From Start	**Width (ft)**	**Observation Depth (ft)**	**Depth (ft)**	**Velocity (ft/sec)**	**Area (ft^2)**	**Discharge (ft^3/sec)**
0.0	0.5	0.30	0.40	0.00	0.21	0.00
1.1	1.1	0.50	0.60	0.09	0.63	0.06
2.1	1.1	0.70	0.65	0.44	0.68	0.30
3.2	1.1	0.60	0.60	0.54	0.63	0.34
4.2	1.1	0.60	0.60	0.56	0.63	0.35
5.3	1.1	0.60	0.60	0.50	0.63	0.32
6.3	1.1	0.60	0.60	0.63	0.63	0.40
7.4	1.1	0.60	0.60	0.74	0.63	0.47
8.4	1.1	0.60	0.55	0.58	0.58	0.33
9.5	1.1	0.50	0.40	0.10	0.42	0.04
10.5	0.5	0.30	0.15	0.18	0.08	0.01
Stream width	10.5			**Total Discharge**		**2.62**

Beaver Creek Station BC-5

Stream Discharge Calculations

Shell Valley Watershed Plan

Date:	9/18/2006					
Dist. From Start	Width (ft)	Observation Depth (ft)	Depth (ft)	Velocity (ft/sec)	Area (ft^2)	Discharge (ft^3/sec)
0.0	0.5	0.40	0.70	0.00	0.36	**0.00**
1.0	1.0	1.00	1.15	0.08	1.18	**0.09**
2.1	1.0	1.30	1.35	0.32	1.39	**0.45**
3.1	1.0	1.40	1.30	0.39	1.34	**0.52**
4.1	1.0	1.20	1.15	0.40	1.18	**0.47**
5.2	1.0	1.10	1.05	0.34	1.08	**0.37**
6.2	1.0	1.00	0.95	0.30	0.98	**0.29**
7.2	1.0	0.90	0.85	0.14	0.88	**0.12**
8.2	1.0	0.80	0.75	0.06	0.77	**0.05**
9.3	1.0	0.70	0.60	0.00	0.62	**0.00**
10.3	1.0	0.50	0.30	0.00	0.31	**0.00**
11.3	0.5	0.10	0.05	0.00	0.03	**0.00**
Stream width	11.3			**Total Discharge**		**2.37**

Date:	9/27/2006					
Dist. From Start	Width (ft)	Observation Depth (ft)	Depth (ft)	Velocity (ft/sec)	Area (ft^2)	Discharge (ft^3/sec)
0.0	0.7	0.40	0.55	0.00	0.37	0.00
1.3	1.3	0.70	0.80	0.22	1.07	0.23
2.7	1.3	0.90	1.05	0.44	1.40	0.62
4.0	1.3	1.20	1.20	0.71	1.60	1.14
5.3	1.3	1.20	1.10	0.86	1.47	1.26
6.7	1.3	1.00	0.80	0.94	1.07	1.00
8.0	1.3	0.60	0.55	0.46	0.73	0.34
9.3	1.3	0.50	0.40	0.10	0.53	0.05
10.7	1.3	0.30	0.20	0.01	0.27	0.00
12.0	0.7	0.10	0.05	0.00	0.03	0.00
Stream width	12.0			**Total Discharge**		**4.64**

Date:	10/4/2006					

Beaver Creek Station BC-5

Stream Discharge Calculations

Shell Valley Watershed Plan

Dist. From Start	Width (ft)	Observation Depth (ft)	Depth (ft)	Velocity (ft/sec)	Area (ft^2)	Discharge (ft^3/sec)
0.0	0.4	0.10	0.20	0.03	0.09	0.00
0.9	0.9	0.30	0.35	1.76	0.30	0.52
1.7	0.9	0.40	0.45	1.93	0.38	0.74
2.6	0.9	0.50	0.50	1.26	0.43	0.54
3.4	0.9	0.50	0.55	2.13	0.47	1.00
4.3	0.9	0.60	0.75	2.34	0.64	1.49
5.1	0.9	0.90	0.90	1.94	0.77	1.48
6.0	0.9	0.90	0.90	2.17	0.77	1.66
6.8	0.9	0.90	0.85	2.19	0.72	1.58
7.7	0.9	0.80	0.80	1.64	0.68	1.12
8.5	0.4	0.80	0.40	0.00	0.17	0.00
Stream width	8.5			**Total Discharge**		**10.13**

Date:	**10/13/2006**					
Dist. From Start	**Width (ft)**	**Observation Depth (ft)**	**Depth (ft)**	**Velocity (ft/sec)**	**Area (ft^2)**	**Discharge (ft^3/sec)**
0.0	0.4	0.20	0.40	0.54	0.18	0.10
0.9	0.9	0.60	0.60	1.10	0.53	0.59
1.8	0.9	0.60	0.60	1.08	0.53	0.58
2.7	0.9	0.60	0.70	1.07	0.62	0.67
3.6	0.9	0.80	0.80	1.28	0.71	0.91
4.4	0.9	0.80	0.95	1.32	0.84	1.11
5.3	0.9	1.10	1.20	1.21	1.07	1.29
6.2	0.9	1.30	1.20	1.26	1.07	1.34
7.1	0.9	1.10	1.15	1.35	1.02	1.38
8.0	0.4	1.20	0.60	0.48	0.27	0.13
Stream width	8.0			**Total Discharge**		**8.09**

Date:	**10/19/2006**					
Dist. From Start	**Width (ft)**	**Observation Depth (ft)**	**Depth (ft)**	**Velocity (ft/sec)**	**Area (ft^2)**	**Discharge (ft^3/sec)**
0.0	0.5	0.10	0.25	0.08	0.12	0.01
1.0	1.0	0.40	0.40	0.01	0.39	0.004

Beaver Creek Station BC-5

Stream Discharge Calculations

Shell Valley Watershed Plan

1.9	1.0	0.40	0.45	1.48	0.44	0.644
2.9	1.0	0.50	0.60	1.08	0.58	0.626
3.9	1.0	0.70	0.80	1.07	0.77	0.827
4.8	1.0	0.90	0.95	1.48	0.92	1.359
5.8	1.0	1.00	1.05	2.42	1.02	2.456
6.8	1.0	1.10	1.15	1.82	1.11	2.023
7.7	1.0	1.20	1.06	1.76	1.02	1.795
8.7	1.0	0.91	0.81	0.31	0.78	0.241
9.7	0.5	0.70	0.35	0.00	0.17	0.000
Stream width	9.7			**Total Discharge**		**9.99**

Date:	**3/27/2007**					
Dist. From Start	**Width (ft)**	**Observation Depth (ft)**	**Depth (ft)**	**Velocity (ft/sec)**	**Area (ft^2)**	**Discharge (ft^3/sec)**
0.0	0.4	0.30	0.45	0.06	0.17	0.01
0.8	0.8	0.60	0.70	0.04	0.54	0.02
1.5	0.8	0.80	0.80	0.18	0.62	0.11
2.3	0.8	0.80	0.80	0.13	0.62	0.08
3.1	0.8	0.80	0.85	0.21	0.65	0.14
3.8	0.8	0.90	1.00	0.24	0.77	0.18
4.6	0.8	1.10	1.10	0.16	0.85	0.14
5.4	0.8	1.10	1.20	0.18	0.92	0.17
6.2	0.8	1.30	1.30	0.21	1.00	0.21
6.9	0.8	1.30	1.35	0.18	1.04	0.19
7.7	0.8	1.40	1.40	0.13	1.08	0.14
8.5	0.8	1.40	1.30	0.17	1.00	0.17
9.2	0.8	1.20	1.15	0.00	0.88	0.00
10.0	0.4	1.10	0.55	0.00	0.21	0.00
Stream width	10.0			**Total Discharge**		**1.55**

Date:	**4/10/2007**					
Dist. From Start	**Width (ft)**	**Observation Depth (ft)**	**Depth (ft)**	**Velocity (ft/sec)**	**Area (ft^2)**	**Discharge (ft^3/sec)**
0.0	0.4	0.20	0.30	0.05	0.12	**0.01**
0.8	0.8	0.40	0.55	0.07	0.44	**0.03**

Beaver Creek Station BC-5

Stream Discharge Calculations

Shell Valley Watershed Plan

1.6	0.8	0.70	0.75	0.35	0.59	**0.21**
2.4	0.8	0.80	0.85	0.20	0.67	**0.13**
3.2	0.8	0.90	0.95	0.23	0.75	**0.17**
4.0	0.8	1.00	1.00	0.55	0.79	**0.44**
4.8	0.8	1.00	1.10	0.54	0.87	**0.47**
5.5	0.8	1.20	1.30	0.49	1.03	**0.50**
6.3	0.8	1.40	1.45	0.33	1.15	**0.38**
7.1	0.8	1.50	1.50	0.40	1.19	**0.48**
7.9	0.8	1.50	1.40	0.19	1.11	**0.21**
8.7	0.8	1.30	1.05	0.28	0.83	**0.23**
9.5	0.4	0.80	0.40	0.00	0.16	**0.00**
Stream width	9.5			**Total Discharge**		**3.26**

Shell Creek Station SC-2
Stream Discharge Calculations
Shell Creek Watershed Plan

Date:	5/4/2006					
Dist. From Start	Width (ft)	Observation Depth (ft)	Depth (ft)	Velocity (ft/sec)	Area (ft^2)	Discharge (ft^3/sec)
0.0	1.6	0.00	0.19	0.00	0.31	0.00
3.2	3.2	0.38	0.49	0.37	1.58	0.58
6.4	3.2	0.60	0.71	0.79	2.29	1.81
9.7	3.2	0.82	0.72	1.17	2.32	2.71
12.9	3.2	0.62	0.57	0.69	1.84	1.27
16.1	3.2	0.52	0.47	0.61	1.51	0.92
19.3	3.2	0.42	0.35	0.50	1.13	0.56
22.6	3.2	0.28	0.26	0.38	0.84	0.32
25.8	3.2	0.24	0.12	0.22	0.39	0.09
29.0	1.6	0.00	0.00	0.00	0.00	0.00
Stream width	29.0			Total Discharge		**8.26**

Date:	5/10/2006					
Dist. From Start	Width (ft)	Observation Depth (ft)	Depth (ft)	Velocity (ft/sec)	Area (ft^2)	Discharge (ft^3/sec)
0.0	1.9	0.00	0.19	0.00	0.36	0.00
3.7	3.7	0.38	0.44	0.38	1.65	0.63
7.5	3.7	0.50	0.43	0.82	1.61	1.32
11.2	3.7	0.36	0.38	1.11	1.42	1.58
15.0	3.7	0.40	0.31	0.44	1.16	0.51
18.7	3.7	0.22	0.36	0.48	1.35	0.65
22.4	3.7	0.50	0.46	0.21	1.72	0.36
26.2	3.7	0.42	0.26	0.37	0.97	0.36
29.9	1.9	0.10	0.05	0.00	0.09	0.00
Stream width	29.9			Total Discharge		**5.40**

Date:	5/15/2006					
Dist. From Start	Width (ft)	Observation Depth (ft)	Depth (ft)	Velocity (ft/sec)	Area (ft^2)	Discharge (ft^3/sec)
0.0	1.0	0.00	0.10	0.00	0.10	0.00

Shell Creek Station SC-2

Stream Discharge Calculations

Shell Creek Watershed Plan

2.0	2.0	0.20	0.20	0.38	0.39	0.15
3.9	2.0	0.20	0.25	0.21	0.49	0.10
5.9	2.0	0.30	0.30	0.62	0.59	0.36
7.8	2.0	0.30	0.50	0.31	0.98	0.30
9.8	2.0	0.70	0.70	1.41	1.37	1.93
11.7	2.0	0.70	0.80	2.26	1.57	3.54
13.7	2.0	0.90	1.00	2.61	1.96	5.11
15.7	2.0	1.10	1.15	3.07	2.25	6.91
17.6	2.0	1.20	1.25	2.85	2.45	6.97
19.6	2.0	1.30	1.40	3.44	2.74	9.42
21.5	2.0	1.50	1.60	3.22	3.13	10.08
23.5	2.0	1.70	1.70	3.14	3.33	10.44
25.4	2.0	1.70	1.70	2.92	3.33	9.71
27.4	2.0	1.70	1.65	3.25	3.23	10.49
29.3	2.0	1.60	1.45	3.28	2.84	9.31
31.3	2.0	1.30	1.40	3.70	2.74	10.13
33.3	2.0	1.50	1.45	3.48	2.84	9.87
35.2	2.0	1.40	1.40	3.05	2.74	8.35
37.2	2.0	1.40	1.35	2.42	2.64	6.39
39.1	2.0	1.30	1.20	2.33	2.35	5.47
41.1	2.0	1.10	0.80	2.25	1.57	3.52
43.0	2.0	0.50	0.25	0.65	0.49	0.32
45.0	1.0	0.00	0.00	0.00	0.00	0.00
Stream width	45.0			**Total Discharge**		**128.89**

Date:	**8/3/2006**					
Dist. From Start	**Width (ft)**	**Observation Depth (ft)**	**Depth (ft)**	**Velocity (ft/sec)**	**Area (ft^2)**	**Discharge (ft^3/sec)**
0.0	1.3	0.10	0.15	0.26	0.20	0.05
2.6	2.6	0.20	0.30	0.13	0.79	0.10
5.3	2.6	0.40	0.55	1.03	1.45	1.49
7.9	2.6	0.70	0.65	1.19	1.71	2.04
10.5	2.6	0.60	0.55	1.14	1.45	1.65
13.2	2.6	0.50	0.45	1.33	1.19	1.58
15.8	2.6	0.40	0.35	1.37	0.92	1.26
18.5	2.6	0.30	0.30	0.65	0.79	0.51
21.1	2.6	0.30	0.30	0.52	0.79	0.41
23.7	2.6	0.30	0.20	0.08	0.53	0.04
26.4	2.6	0.10	0.10	0.34	0.26	0.09

Shell Creek Station SC-2
Stream Discharge Calculations
Shell Creek Watershed Plan

29.0	1.3	0.10	0.05	0.31	0.07	0.02
Stream width	29.0			**Total Discharge**		**9.26**

Date:	**9/18/2006**					
Dist. From Start	**Width (ft)**	**Observation Depth (ft)**	**Depth (ft)**	**Velocity (ft/sec)**	**Area (ft^2)**	**Discharge (ft^3/sec)**
0.0	1.3	0.30	0.35	0.58	0.47	**0.27**
2.7	2.7	0.40	0.55	1.49	1.46	**2.18**
5.3	2.7	0.70	0.75	2.12	2.00	**4.23**
8.0	2.7	0.80	0.95	1.99	2.53	**5.03**
10.6	2.7	1.10	1.15	2.14	3.06	**6.55**
13.3	2.7	1.20	1.20	2.19	3.19	**6.99**
16.0	2.7	1.20	1.05	2.04	2.79	**5.70**
18.6	2.7	0.90	0.90	2.87	2.39	**6.87**
21.3	2.7	0.90	0.90	2.87	2.39	**6.87**
23.9	2.7	0.90	0.85	2.62	2.26	**5.92**
26.6	2.7	0.80	0.80	2.56	2.13	**5.45**
29.3	2.7	0.80	0.75	1.95	2.00	**3.89**
31.9	2.7	0.70	0.70	1.63	1.86	**3.04**
34.6	1.3	0.70	0.35	1.32	0.47	**0.61**
Stream width	34.6			**Total Discharge**		**63.60**

Date:	**9/27/2006**					
Dist. From Start	**Width (ft)**	**Observation Depth (ft)**	**Depth (ft)**	**Velocity (ft/sec)**	**Area (ft^2)**	**Discharge (ft^3/sec)**
0.0	1.3	0.30	0.35	0.48	0.46	0.22
2.6	2.6	0.40	0.45	1.44	1.18	1.69
5.2	2.6	0.50	0.65	1.64	1.70	2.79
7.8	2.6	0.80	0.90	1.76	2.35	4.14
10.5	2.6	1.00	1.00	1.68	2.62	4.39
13.1	2.6	1.00	1.05	1.84	2.75	5.05
15.7	2.6	1.10	1.00	2.27	2.62	5.94
18.3	2.6	0.90	0.80	2.09	2.09	4.37
20.9	2.6	0.70	0.65	2.46	1.70	4.18
23.5	2.6	0.60	0.60	2.17	1.57	3.41

Shell Creek Station SC-2

Stream Discharge Calculations

Shell Creek Watershed Plan

26.2	2.6	0.60	0.60	1.95	1.57	3.06
28.8	2.6	0.60	0.55	1.11	1.44	1.60
31.4	2.6	0.50	0.40	1.79	1.05	1.87
34.0	1.3	0.30	0.15	0.01	0.20	0.00
Stream width	34.0			**Total Discharge**		**42.72**

Date:	**10/4/2006**					
Dist. From Start	**Width (ft)**	**Observation Depth (ft)**	**Depth (ft)**	**Velocity (ft/sec)**	**Area (ft^2)**	**Discharge (ft^3/sec)**
0.0	1.2	0.20	0.30	0.25	0.36	0.09
2.4	2.4	0.40	0.45	0.95	1.09	1.04
4.9	2.4	0.50	0.55	1.36	1.34	1.82
7.3	2.4	0.60	0.70	1.94	1.70	3.30
9.7	2.4	0.80	0.90	1.95	2.19	4.26
12.1	2.4	1.00	1.00	1.43	2.43	3.47
14.6	2.4	1.00	1.05	1.91	2.55	4.87
17.0	2.4	1.10	1.00	2.27	2.43	5.51
19.4	2.4	0.90	0.80	2.56	1.94	4.97
21.9	2.4	0.70	0.70	2.65	1.70	4.51
24.3	2.4	0.70	0.60	2.11	1.46	3.07
26.7	2.4	0.50	0.55	2.38	1.34	3.18
29.1	2.4	0.60	0.60	1.07	1.46	1.56
31.6	2.4	0.60	0.55	1.51	1.34	2.02
34.0	1.2	0.50	0.25	0.15	0.30	0.05
Stream width	34.0			**Total Discharge**		**43.72**

Date:	**10/13/2006**					
Dist. From Start	**Width (ft)**	**Observation Depth (ft)**	**Depth (ft)**	**Velocity (ft/sec)**	**Area (ft^2)**	**Discharge (ft^3/sec)**
0.0	1.3	0.50	0.55	0.64	0.74	0.47
2.7	2.7	0.60	0.60	1.75	1.62	2.83
5.4	2.7	0.60	0.65	1.89	1.75	3.31
8.1	2.7	0.70	0.90	2.10	2.42	5.09
10.8	2.7	1.10	1.20	2.15	3.23	6.95
13.5	2.7	1.30	1.30	1.76	3.50	6.16

Shell Creek Station SC-2
Stream Discharge Calculations
Shell Creek Watershed Plan

16.2	2.7	1.30	1.30	1.33	3.50	4.66
18.8	2.7	1.30	1.15	2.51	3.10	7.77
21.5	2.7	1.00	0.95	2.71	2.56	6.93
24.2	2.7	0.90	0.80	2.65	2.15	5.71
26.9	2.7	0.70	0.70	2.81	1.88	5.30
29.6	2.7	0.70	0.70	2.28	1.88	4.30
32.3	2.7	0.70	0.55	2.31	1.48	3.42
35.0	1.3	0.40	0.20	0.29	0.27	0.08
Stream width	35.0			**Total Discharge**		**62.96**

Date:	**10/20/2006**					
Dist. From Start	**Width (ft)**	**Observation Depth (ft)**	**Depth (ft)**	**Velocity (ft/sec)**	**Area (ft^2)**	**Discharge (ft^3/sec)**
0.0	1.3	0.30	0.40	0.44	0.52	0.23
2.6	2.6	0.50	0.60	1.31	1.57	2.06
5.2	2.6	0.70	0.75	1.72	1.96	3.37
7.8	2.6	0.80	0.90	2.01	2.35	4.73
10.5	2.6	1.00	1.05	2.17	2.75	5.96
13.1	2.6	1.10	1.40	2.31	3.66	8.46
15.7	2.6	1.70	1.40	2.14	3.66	7.84
18.3	2.6	1.10	1.00	2.45	2.62	6.41
20.9	2.6	0.90	0.90	2.27	2.35	5.34
23.5	2.6	0.90	0.75	2.64	1.96	5.18
26.2	2.6	0.60	0.60	2.71	1.57	4.25
28.8	2.6	0.60	0.65	1.46	1.70	2.48
31.4	2.6	0.70	0.55	2.01	1.44	2.89
34.0	1.3	0.40	0.20	0.20	0.26	0.05
Stream width	34.0			**Total Discharge**		**59.25**

Date:	**3/27/2007**					
Dist. From Start	**Width (ft)**	**Observation Depth (ft)**	**Depth (ft)**	**Velocity (ft/sec)**	**Area (ft^2)**	**Discharge (ft^3/sec)**
0.0	1.3	0.40	0.50	0.62	0.66	0.41
2.6	2.6	0.60	0.65	1.55	1.72	2.66
5.3	2.6	0.70	0.70	2.05	1.85	3.79

Shell Creek Station SC-2

Stream Discharge Calculations

Shell Creek Watershed Plan

7.9	2.6	0.70	0.80	1.82	2.11	3.85
10.6	2.6	0.90	1.05	2.31	2.77	6.41
13.2	2.6	1.20	1.20	2.09	3.17	6.62
15.8	2.6	1.20	1.30	2.34	3.43	8.03
18.5	2.6	1.40	1.25	2.43	3.30	8.02
21.1	2.6	1.10	1.05	2.62	2.77	7.27
23.8	2.6	1.00	0.90	3.18	2.38	7.56
26.4	2.6	0.80	0.70	3.20	1.85	5.92
29.1	2.6	0.60	0.65	2.26	1.72	3.88
31.7	2.6	0.70	0.70	2.30	1.85	4.25
34.3	1.3	0.70	0.35	1.79	0.46	0.83
Stream width	34.3			**Total Discharge**		**69.49**

Date:	**4/1/2007**					
Dist. From Start	**Width (ft)**	**Observation Depth (ft)**	**Depth (ft)**	**Velocity (ft/sec)**	**Area (ft^2)**	**Discharge (ft^3/sec)**
0.0	1.3	0.40	0.50	1.25	0.66	0.83
2.7	2.7	0.60	0.65	1.69	1.73	2.92
5.3	2.7	0.70	0.80	2.10	2.12	4.46
8.0	2.7	0.90	1.05	2.27	2.79	6.33
10.6	2.7	1.20	1.30	2.28	3.45	7.87
13.3	2.7	1.40	1.40	2.19	3.72	8.14
15.9	2.7	1.40	1.30	2.28	3.45	7.87
18.6	2.7	1.20	1.10	2.35	2.92	6.86
21.2	2.7	1.00	0.95	2.57	2.52	6.48
23.9	2.7	0.90	0.90	2.89	2.39	6.90
26.5	2.7	0.90	0.85	2.36	2.26	5.32
29.2	2.7	0.80	0.80	1.88	2.12	3.99
31.8	2.7	0.80	0.65	1.84	1.73	3.17
34.5	1.3	0.50	0.25	0.69	0.33	0.23
Stream width	34.5			**Total Discharge**		**71.36**

Date:	**4/10/2007**					
Dist. From Start	**Width (ft)**	**Observation Depth (ft)**	**Depth (ft)**	**Velocity (ft/sec)**	**Area (ft^2)**	**Discharge (ft^3/sec)**

Shell Creek Station SC-2

Stream Discharge Calculations

Shell Creek Watershed Plan

0.0	1.4	0.20	0.30	0.06	0.43	0.03
2.9	2.9	0.40	0.50	0.62	1.44	0.90
5.8	2.9	0.60	0.70	1.65	2.02	3.34
8.7	2.9	0.80	0.85	1.88	2.46	4.62
11.6	2.9	0.90	0.95	2.34	2.74	6.42
14.4	2.9	1.00	1.15	2.09	3.32	6.94
17.3	2.9	1.30	1.15	2.24	3.32	7.44
20.2	2.9	1.00	0.95	3.02	2.74	8.29
23.1	2.9	0.90	0.85	2.89	2.46	7.10
26.0	2.9	0.80	0.65	1.86	1.88	3.49
28.9	2.9	0.50	0.60	0.72	1.73	1.25
31.8	2.9	0.70	0.65	2.08	1.88	3.91
34.7	1.4	0.60	0.30	1.68	0.43	0.73
Stream width	34.7			**Total Discharge**		**54.44**

Shell Creek Station SC-5
Stream Discharge Calculations
Shell Creek Watershed Plan

Date:	5/10/2006					
Dist. From Start	Width (ft)	Observation Depth (ft)	Depth (ft)	Velocity (ft/sec)	Area (ft^2)	Discharge (ft^3/sec)
0.0	2.2	0.00	0.21	0.00	0.47	0.00
4.4	4.4	0.42	0.26	1.14	1.15	1.32
8.9	4.4	0.10	0.36	0.01	1.60	0.02
13.3	4.4	0.62	0.71	0.06	3.15	0.19
17.8	4.4	0.80	0.85	0.03	3.77	0.11
22.2	4.4	0.90	0.71	0.05	3.15	0.16
26.6	4.4	0.52	0.32	0.07	1.42	0.10
31.1	4.4	0.12	0.11	0.53	0.49	0.26
35.5	4.4	0.10	0.13	0.26	0.58	0.15
39.9	4.4	0.16	0.21	0.14	0.93	0.13
44.4	4.4	0.26	0.22	0.28	0.98	0.27
48.8	4.4	0.18	0.09	0.49	0.40	0.20
53.3	2.2	0.00	0.00	0.00	0.00	0.00
Stream width	53.3			**Total Discharge**		**2.90**

Date:	5/15/2006					
Dist. From Start	Width (ft)	Observation Depth (ft)	Depth (ft)	Velocity (ft/sec)	Area (ft^2)	Discharge (ft^3/sec)
0.0	1.0	1.00	1.10	1.88	1.06	1.98
1.9	1.9	1.20	1.00	4.55	1.92	8.73
3.8	1.9	0.80	0.75	1.56	1.44	2.25
5.8	1.9	0.70	0.55	1.55	1.06	1.64
7.7	1.9	0.40	0.35	1.33	0.67	0.89
9.6	1.9	0.30	0.30	0.74	0.58	0.43
11.5	1.9	0.30	0.30	0.28	0.58	0.16
13.4	1.9	0.30	0.40	0.05	0.77	0.04
15.4	1.9	0.50	0.60	0.05	1.15	0.06
17.3	1.9	0.70	0.80	0.07	1.54	0.11
19.2	1.9	0.90	0.85	0.48	1.63	0.78
21.1	1.9	0.80	0.85	0.42	1.63	0.69
23.0	1.9	0.90	0.95	0.97	1.82	1.77
25.0	1.9	1.00	1.00	1.58	1.92	3.03
26.9	1.9	1.00	0.95	1.57	1.82	2.86
28.8	1.9	0.90	0.90	2.14	1.73	3.70

Shell Creek Station SC-5
Stream Discharge Calculations
Shell Creek Watershed Plan

30.7	1.9	0.90	0.85	1.68	1.63	2.74
32.6	1.9	0.80	0.80	2.25	1.54	3.45
34.5	1.9	0.80	0.75	2.68	1.44	3.86
36.5	1.9	0.70	0.75	2.59	1.44	3.73
38.4	1.9	0.80	0.80	2.48	1.54	3.81
40.3	1.9	0.80	0.80	2.57	1.54	3.95
42.2	1.9	0.80	0.90	2.68	1.73	4.63
44.1	1.9	1.00	0.95	2.33	1.82	4.25
46.1	1.9	0.90	0.85	1.19	1.63	1.94
48.0	1.9	0.80	0.85	2.30	1.63	3.75
49.9	1.9	0.90	0.80	2.39	1.54	3.67
51.8	1.9	0.70	0.70	2.18	1.34	2.93
53.7	1.9	0.70	0.65	1.24	1.25	1.55
55.7	1.9	0.60	0.52	1.25	0.99	1.24
57.6	1.9	0.43	0.27	0.47	0.51	0.24
59.5	1.0	0.10	0.05	0.00	0.05	0.00
Stream width	59.5			**Total Discharge**		**74.84**

Date:	**8/3/2006**					
Dist. From Start	**Width (ft)**	**Observation Depth (ft)**	**Depth (ft)**	**Velocity (ft/sec)**	**Area (ft^2)**	**Discharge (ft^3/sec)**
0.0	1.1	1.00	1.10	1.88	1.19	2.24
2.2	2.2	1.20	1.00	4.55	2.17	9.86
4.3	2.2	0.80	0.75	1.56	1.63	2.54
6.5	2.2	0.70	0.55	1.55	1.19	1.85
8.7	2.2	0.40	0.35	1.33	0.76	1.01
10.8	2.2	0.30	0.30	0.74	0.65	0.48
13.0	2.2	0.30	0.30	0.28	0.65	0.18
15.2	2.2	0.30	0.40	0.05	0.87	0.04
17.3	2.2	0.50	0.60	0.05	1.30	0.07
19.5	2.2	0.70	0.80	0.07	1.73	0.12
21.7	2.2	0.90	0.85	0.48	1.84	0.88
23.8	2.2	0.80	0.85	0.42	1.84	0.77
26.0	1.1	0.90	0.45	0.97	0.49	0.47
Stream width	26.0			**Total Discharge**		**20.51**

Date:	**9/18/2006**					

Shell Creek Station SC-5
Stream Discharge Calculations
Shell Creek Watershed Plan

Dist. From Start	Width (ft)	Observation Depth (ft)	Depth (ft)	Velocity (ft/sec)	Area (ft^2)	Discharge (ft^3/sec)
0.0	1.5	0.10	0.10	0.00	0.15	0.00
3.1	3.1	0.10	0.15	0.96	0.46	0.44
6.2	3.1	0.20	0.25	0.64	0.77	0.49
9.2	3.1	0.30	0.35	1.02	1.08	1.10
12.3	3.1	0.40	0.50	1.95	1.54	3.00
15.4	3.1	0.60	0.55	2.36	1.69	3.99
18.5	3.1	0.50	0.55	3.07	1.69	5.20
21.5	3.1	0.60	0.60	2.56	1.85	4.73
24.6	3.1	0.60	0.70	2.30	2.15	4.95
27.7	3.1	0.80	0.75	2.35	2.31	5.42
30.8	3.1	0.70	0.60	2.24	1.85	4.14
33.8	3.1	0.50	0.45	2.30	1.38	3.18
36.9	3.1	0.40	0.35	1.85	1.08	1.99
40.0	1.5	0.30	0.15	0.57	0.23	0.13
Stream width	40.0			**Total Discharge**		**38.77**

Date:	**9/27/2006**					
Dist. From Start	Width (ft)	Observation Depth (ft)	Depth (ft)	Velocity (ft/sec)	Area (ft^2)	Discharge (ft^3/sec)
0.0	1.3	0.10	0.10	0.00	0.13	**0.00**
2.7	2.7	0.10	0.20	0.24	0.53	**0.13**
5.3	2.7	0.30	0.30	0.60	0.80	**0.48**
8.0	2.7	0.30	0.25	0.97	0.67	**0.65**
10.7	2.7	0.20	0.25	1.37	0.67	**0.91**
13.3	2.7	0.30	0.35	2.05	0.93	**1.91**
16.0	2.7	0.40	0.45	0.84	1.20	**1.01**
18.7	2.7	0.50	0.45	1.03	1.20	**1.24**
21.3	2.7	0.40	0.35	1.41	0.93	**1.32**
24.0	2.7	0.30	0.25	1.32	0.67	**0.88**
26.7	2.7	0.20	0.15	0.71	0.40	**0.28**
29.3	2.7	0.10	0.10	0.24	0.27	**0.06**
32.0	1.3	0.10	0.05	0.00	0.07	**0.00**
Stream width	32.0			**Total Discharge**		**8.87**

Shell Creek Station SC-5
Stream Discharge Calculations
Shell Creek Watershed Plan

Date:	10/4/2006					
Dist. From Start	Width (ft)	Observation Depth (ft)	Depth (ft)	Velocity (ft/sec)	Area (ft^2)	Discharge (ft^3/sec)
0.0	1.3	0.10	0.15	0.09	0.19	0.02
2.5	2.5	0.20	0.20	0.00	0.51	0.00
5.1	2.5	0.20	0.25	1.05	0.63	0.67
7.6	2.5	0.30	0.40	1.20	1.02	1.22
10.2	2.5	0.50	0.50	1.22	1.27	1.55
12.7	2.5	0.50	0.45	0.99	1.14	1.13
15.2	2.5	0.40	0.30	0.76	0.76	0.58
17.8	2.5	0.20	0.20	0.98	0.51	0.50
20.3	2.5	0.20	0.20	2.02	0.51	1.03
22.8	2.5	0.20	0.30	1.36	0.76	1.04
25.4	2.5	0.40	0.35	0.76	0.89	0.68
27.9	2.5	0.30	0.20	0.71	0.51	0.36
30.5	2.5	0.10	0.10	0.36	0.25	0.09
33.0	1.3	0.10	0.05	0.20	0.06	0.01
Stream width	33.0			Total Discharge		**8.86**

Date:	10/13/2006					
Dist. From Start	Width (ft)	Observation Depth (ft)	Depth (ft)	Velocity (ft/sec)	Area (ft^2)	Discharge (ft^3/sec)
0.0	1.2	0.20	0.25	0.26	0.29	0.08
2.3	2.3	0.30	0.30	0.86	0.70	0.60
4.7	2.3	0.30	0.35	1.19	0.82	0.97
7.0	2.3	0.40	0.45	1.73	1.05	1.82
9.3	2.3	0.50	0.60	1.61	1.40	2.25
11.7	2.3	0.70	0.65	1.65	1.52	2.50
14.0	2.3	0.60	0.60	1.38	1.40	1.93
16.3	2.3	0.60	0.55	2.50	1.28	3.21
18.7	2.3	0.50	0.45	2.27	1.05	2.38
21.0	2.3	0.40	0.40	2.16	0.93	2.02
23.3	2.3	0.40	0.40	2.39	0.93	2.23
25.7	2.3	0.40	0.40	1.65	0.93	1.54
28.0	2.3	0.40	0.30	1.19	0.70	0.83
30.3	2.3	0.20	0.20	1.07	0.47	0.50

Shell Creek Station SC-5
Stream Discharge Calculations
Shell Creek Watershed Plan

32.7	2.3	0.20	0.15	0.41	0.35	0.14
35.0	1.2	0.10	0.05	0.00	0.06	0.00
Stream width	35.0			**Total Discharge**		**22.37**

Date:	**10/19/2006**					
Dist. From Start	**Width (ft)**	**Observation Depth (ft)**	**Depth (ft)**	**Velocity (ft/sec)**	**Area (ft^2)**	**Discharge (ft^3/sec)**
0.0	1.4	0.10	0.15	0.00	0.21	0.00
2.8	2.8	0.20	0.20	0.29	0.55	0.16
5.5	2.8	0.20	0.25	0.96	0.69	0.66
8.3	2.8	0.30	0.35	1.51	0.96	1.45
11.0	2.8	0.40	0.45	1.67	1.24	2.07
13.8	2.8	0.50	0.40	1.34	1.10	1.47
16.5	2.8	0.30	0.25	0.92	0.69	0.63
19.3	2.8	0.20	0.20	0.10	0.55	0.06
22.0	2.8	0.20	0.20	0.65	0.55	0.36
24.8	2.8	0.20	0.20	0.78	0.55	0.43
27.5	2.8	0.20	0.25	1.24	0.69	0.85
30.3	2.8	0.30	0.20	0.18	0.55	0.10
33.0	1.4	0.10	0.05	0.31	0.07	0.02
Stream width	33.0			**Total Discharge**		**8.26**

Date:	**3/27/2007**					
Dist. From Start	**Width (ft)**	**Observation Depth (ft)**	**Depth (ft)**	**Velocity (ft/sec)**	**Area (ft^2)**	**Discharge (ft^3/sec)**
0.0	1.8	0.20	0.30	0.92	0.54	0.49
3.6	3.6	0.40	0.40	0.95	1.43	1.36
7.1	3.6	0.40	0.45	1.53	1.61	2.46
10.7	3.6	0.50	0.55	1.40	1.96	2.75
14.3	3.6	0.60	0.60	1.36	2.14	2.91
17.9	3.6	0.60	0.65	2.06	2.32	4.78
21.4	3.6	0.70	0.80	2.37	2.86	6.77
25.0	3.6	0.90	0.85	2.65	3.04	8.04
28.6	3.6	0.80	0.80	2.32	2.86	6.63
32.1	3.6	0.80	0.75	2.39	2.68	6.40

Shell Creek Station SC-5
Stream Discharge Calculations
Shell Creek Watershed Plan

35.7	3.6	0.70	0.70	1.84	2.50	4.60
39.3	3.6	0.70	0.75	1.27	2.68	3.40
42.9	3.6	0.80	0.75	0.88	2.68	2.36
46.4	3.6	0.70	0.55	0.41	1.96	0.81
50.0	1.8	0.40	0.20	0.32	0.36	0.11
Stream width	50.0			**Total Discharge**		**53.88**

Date:	**4/1/2007**					
Dist. From Start	**Width (ft)**	**Observation Depth (ft)**	**Depth (ft)**	**Velocity (ft/sec)**	**Area (ft^2)**	**Discharge (ft^3/sec)**
0.0	1.9	0.80	0.65	1.55	1.21	**1.87**
3.7	3.7	0.50	0.50	1.38	1.86	**2.57**
7.4	3.7	0.50	0.60	2.45	2.23	**5.47**
11.2	3.7	0.70	0.75	1.89	2.79	**5.27**
14.9	3.7	0.80	0.70	2.25	2.60	**5.86**
18.6	3.7	0.60	0.60	2.57	2.23	**5.73**
22.3	3.7	0.60	0.65	2.84	2.42	**6.86**
26.0	3.7	0.70	0.70	3.18	2.60	**8.28**
29.7	3.7	0.70	0.60	2.41	2.23	**5.38**
33.5	3.7	0.50	0.45	2.01	1.67	**3.36**
37.2	3.7	0.40	0.30	1.74	1.12	**1.94**
40.9	3.7	0.20	0.20	1.14	0.74	**0.85**
44.6	3.7	0.20	0.15	0.51	0.56	**0.28**
48.3	1.9	0.10	0.05	0.23	0.09	**0.02**
Stream width	48.3			**Total Discharge**		**53.74**

Date:	**4/10/2007**					
Dist. From Start	**Width (ft)**	**Observation Depth (ft)**	**Depth (ft)**	**Velocity (ft/sec)**	**Area (ft^2)**	**Discharge (ft^3/sec)**
0.0	1.9	0.40	0.50	1.26	0.93	1.17
3.7	3.7	0.60	0.50	0.73	1.85	1.35
7.4	3.7	0.40	0.45	1.82	1.67	3.03
11.1	3.7	0.50	0.65	2.08	2.41	5.01
14.8	3.7	0.80	0.75	1.99	2.78	5.53
18.5	3.7	0.70	0.65	2.65	2.41	6.38

Shell Creek Station SC-5

Stream Discharge Calculations

Shell Creek Watershed Plan

22.2	3.7	0.60	0.65	3.04	2.41	7.32
25.9	3.7	0.70	0.75	3.17	2.78	8.81
29.6	3.7	0.80	0.60	3.04	2.22	6.76
33.3	3.7	0.40	0.40	1.90	1.48	2.82
37.1	3.7	0.40	0.35	1.21	1.30	1.57
40.8	3.7	0.30	0.25	0.12	0.93	0.11
44.5	3.7	0.20	0.15	0.05	0.56	0.03
48.2	1.9	0.10	0.05	0.13	0.09	0.01
Stream width	**48.2**			**Total Discharge**		**49.90**

Shell Creek Station SC-6
Stream Discharge Calculations
Shell Valley Watershed Plan

Date:	5/10/2006					
Dist. From Start	Width (ft)	Observation Depth (ft)	Depth (ft)	Velocity (ft/sec)	Area (ft^2)	Discharge (ft^3/sec)
0.0	1.8	0.50	0.95	0.39	1.73	0.67
3.6	3.6	1.40	0.78	1.90	2.84	5.40
7.3	3.6	0.16	0.08	1.76	0.29	0.51
10.9	3.6	0.00	0.00	0.00	0.00	0.00
14.6	3.6	0.00	0.09	0.00	0.33	0.00
18.2	3.6	0.18	0.15	0.15	0.55	0.08
21.9	3.6	0.12	0.21	0.15	0.76	0.11
25.5	3.6	0.30	0.23	0.20	0.84	0.17
29.1	3.6	0.16	0.08	0.24	0.29	0.07
32.8	3.6	0.00	0.00	0.00	0.00	0.00
36.4	1.8	0.00	0.00	0.00	0.00	0.00
Stream width	36.4			**Total Discharge**		**7.02**

Date:	5/15/2006					
Dist. From Start	Width (ft)	Observation Depth (ft)	Depth (ft)	Velocity (ft/sec)	Area (ft^2)	Discharge (ft^3/sec)
0	0.2	0.00	0.10	0.00	0.02	0.00
0.383838485	0.4	0.20	0.25	0.13	0.10	0.01
0.76767697	0.4	0.30	0.40	0.51	0.15	0.08
1.151515455	0.4	0.50	0.50	0.09	0.19	0.02
1.535353939	0.4	0.50	0.40	0.63	0.15	0.10
1.919192424	0.4	0.30	0.25	0.24	0.10	0.02
2.303030909	0.4	0.20	0.25	0.42	0.10	0.04
2.686869394	0.4	0.30	0.30	0.66	0.12	0.08
3.070707879	0.4	0.30	0.35	0.75	0.13	0.10
3.454546364	0.4	0.40	0.40	1.41	0.15	0.22
3.838384848	0.4	0.40	0.40	1.10	0.15	0.17
4.222223333	0.4	0.40	0.45	1.42	0.17	0.25
4.606061818	0.4	0.50	0.55	1.75	0.21	0.37
4.989900303	0.4	0.60	0.60	1.81	0.23	0.42
5.373738788	0.4	0.60	0.65	1.32	0.25	0.33
5.757577273	0.4	0.70	0.68	1.47	0.26	0.38
6.141415758	0.4	0.65	0.68	1.67	0.26	0.43
6.525254242	0.4	0.70	0.70	2.03	0.27	0.55

Shell Creek Station SC-6

Stream Discharge Calculations

Shell Valley Watershed Plan

6.909092727	0.4	0.70	0.80	2.05	0.31	0.63
7.292931212	0.4	0.90	0.95	2.19	0.36	0.80
7.676769697	0.4	1.00	1.05	2.21	0.40	0.89
8.060608182	0.4	1.10	1.00	2.09	0.38	0.80
8.444446667	0.4	0.90	0.80	2.50	0.31	0.77
8.828285152	0.4	0.70	0.65	2.19	0.25	0.55
9.212123636	0.4	0.60	0.45	2.61	0.17	0.45
9.595962121	0.4	0.30	0.50	0.48	0.19	0.09
9.979800606	0.4	0.70	0.75	2.96	0.29	0.85
10.36363909	0.4	0.80	0.80	3.21	0.31	0.99
10.74747758	0.4	0.80	1.00	4.05	0.38	1.55
11.13131606	0.4	1.20	1.45	3.34	0.56	1.86
11.51515455	0.4	1.70	1.90	3.42	0.73	2.49
11.89899303	0.4	2.10	2.35	3.56	0.90	3.21
12.28283152	0.4	2.60	2.80	2.43	1.07	2.61
12.66667	0.2	3.00	1.50	2.38	0.29	0.69
Stream width	12.7			**Total Discharge**		**22.78**

Date:	**8/3/2006**					
Dist. From Start	**Width (ft)**	**Observation Depth (ft)**	**Depth (ft)**	**Velocity (ft/sec)**	**Area (ft^2)**	**Discharge (ft^3/sec)**
0	1.5	1.20	1.20	1.22	1.80	2.20
3	3.0	1.20	1.10	1.30	3.30	4.29
6	3.0	1.00	0.80	1.08	2.40	2.59
9	3.0	0.60	0.60	0.82	1.80	1.48
12	3.0	0.60	0.70	0.37	2.10	0.78
15	3.0	0.80	0.85	0.27	2.55	0.69
18	3.0	0.90	0.80	0.09	2.40	0.22
21	3.0	0.70	0.55	0.00	1.65	0.00
24	3.0	0.40	0.35	0.00	1.05	0.00
27	1.5	0.30	0.15	0.00	0.23	0.00
Stream width	27.0			**Total Discharge**		**12.24**

Date:	**9/18/2006**					

Shell Creek Station SC-6

Stream Discharge Calculations

Shell Valley Watershed Plan

Dist. From Start	Width (ft)	Observation Depth (ft)	Depth (ft)	Velocity (ft/sec)	Area (ft^2)	Discharge (ft^3/sec)
0.0	1.3	0.20	0.25	0.00	0.33	0.00
2.6	2.6	0.30	0.35	0.00	0.92	0.00
5.2	2.6	0.40	0.50	0.31	1.31	0.41
7.8	2.6	0.60	0.70	0.36	1.83	0.66
10.5	2.6	0.80	0.85	0.52	2.22	1.16
13.1	2.6	0.90	0.90	0.75	2.35	1.77
15.7	2.6	0.90	0.80	0.86	2.09	1.80
18.3	2.6	0.70	0.65	1.17	1.70	1.99
20.9	2.6	0.60	0.65	1.35	1.70	2.30
23.5	2.6	0.70	0.90	1.63	2.35	3.84
26.2	2.6	1.10	1.20	2.02	3.14	6.34
28.8	2.6	1.30	1.25	2.61	3.27	8.53
31.4	2.6	1.20	0.90	2.82	2.35	6.64
34.0	1.3	0.60	0.30	0.00	0.39	0.00
Stream width	34.0			**Total Discharge**		**35.42**

Date:	**9/27/2006**					
Dist. From Start	**Width (ft)**	**Observation Depth (ft)**	**Depth (ft)**	**Velocity (ft/sec)**	**Area (ft^2)**	**Discharge (ft^3/sec)**
0	1.0	1.00	1.00	0.22	1.00	0.22
2	2.0	1.00	1.00	1.50	2.00	3.00
4	2.0	1.00	0.95	1.23	1.90	2.34
6	2.0	0.90	0.80	1.04	1.60	1.66
8	2.0	0.70	0.65	0.63	1.30	0.82
10	2.0	0.60	0.55	0.75	1.10	0.83
12	2.0	0.50	0.45	0.92	0.90	0.83
14	2.0	0.40	0.55	0.59	1.10	0.65
16	2.0	0.70	0.75	0.54	1.50	0.81
18	2.0	0.80	0.80	0.25	1.60	0.40
20	2.0	0.80	0.75	0.33	1.50	0.50
22	2.0	0.70	0.55	0.00	1.10	0.00
24	2.0	0.40	0.30	0.00	0.60	0.00
26	1.0	0.20	0.10	0.00	0.10	0.00
Stream width	26.0			**Total Discharge**		**12.05**

Shell Creek Station SC-6
Stream Discharge Calculations
Shell Valley Watershed Plan

Date:	10/4/2006					
Dist. From Start	Width (ft)	Observation Depth (ft)	Depth (ft)	Velocity (ft/sec)	Area (ft^2)	Discharge (ft^3/sec)
0.0	0.8	1.20	1.15	1.34	0.89	1.20
1.6	1.6	1.10	1.10	2.06	1.71	3.52
3.1	1.6	1.10	1.05	2.02	1.63	3.29
4.7	1.6	1.00	0.90	1.80	1.40	2.52
6.2	1.6	0.80	0.70	1.66	1.09	1.80
7.8	1.6	0.60	0.50	1.49	0.78	1.16
9.3	1.6	0.40	0.40	1.56	0.62	0.97
10.9	1.6	0.40	0.35	1.63	0.54	0.89
12.4	1.6	0.30	0.35	1.24	0.54	0.67
14.0	1.6	0.40	0.45	0.72	0.70	0.50
15.5	1.6	0.50	0.55	0.48	0.85	0.41
17.1	1.6	0.60	0.60	0.47	0.93	0.44
18.6	1.6	0.60	0.60	0.55	0.93	0.51
20.2	1.6	0.60	0.60	0.19	0.93	0.18
21.7	1.6	0.60	0.50	0.02	0.78	0.02
23.3	1.6	0.40	0.35	0.00	0.54	0.00
24.8	1.6	0.30	0.30	0.00	0.47	0.00
26.4	1.6	0.30	0.20	0.00	0.31	0.00
27.9	1.6	0.10	0.10	0.00	0.16	0.00
29.5	0.8	0.10	0.05	0.00	0.04	0.00
Stream width	29.5			Total Discharge		18.07

Date:	10/13/2006					
Dist. From Start	Width (ft)	Observation Depth (ft)	Depth (ft)	Velocity (ft/sec)	Area (ft^2)	Discharge (ft^3/sec)
0.0	1.3	1.30	1.30	1.40	1.65	2.31
2.5	2.5	1.30	1.25	1.93	3.17	6.12
5.1	2.5	1.20	1.10	1.43	2.79	3.99
7.6	2.5	1.00	0.90	1.22	2.28	2.79
10.2	2.5	0.80	0.80	0.87	2.03	1.77
12.7	2.5	0.80	0.90	0.97	2.28	2.22
15.2	2.5	1.00	1.10	1.03	2.79	2.88
17.8	2.5	1.20	1.10	0.75	2.79	2.09
20.3	2.5	1.00	0.90	0.43	2.28	0.98

Shell Creek Station SC-6
Stream Discharge Calculations
Shell Valley Watershed Plan

22.8	2.5	0.80	0.65	0.25	1.65	0.41
25.4	2.5	0.50	0.35	0.02	0.89	0.02
27.9	2.5	0.20	0.20	0.00	0.51	0.00
30.5	2.5	0.20	0.20	0.00	0.51	0.00
33.0	1.3	0.20	0.10	0.00	0.13	0.00
Stream width	33.0			**Total Discharge**		**25.58**

Date:	**10/19/2006**					
Dist. From Start	**Width (ft)**	**Observation Depth (ft)**	**Depth (ft)**	**Velocity (ft/sec)**	**Area (ft^2)**	**Discharge (ft^3/sec)**
0.0	0.9	1.20	1.15	0.18	1.05	0.19
1.8	1.8	1.10	1.15	1.51	2.11	3.18
3.7	1.8	1.20	1.10	1.45	2.02	2.92
5.5	1.8	1.00	0.95	1.19	1.74	2.07
7.3	1.8	0.90	0.80	1.12	1.47	1.64
9.2	1.8	0.70	0.70	1.08	1.28	1.39
11.0	1.8	0.70	0.70	0.79	1.28	1.01
12.8	1.8	0.70	0.75	0.54	1.38	0.74
14.7	1.8	0.80	0.85	0.33	1.56	0.51
16.5	1.8	0.90	0.95	0.64	1.74	1.11
18.3	1.8	1.00	1.00	0.37	1.83	0.68
20.2	1.8	1.00	0.95	0.58	1.74	1.01
22.0	1.8	0.90	0.75	0.45	1.38	0.62
23.8	1.8	0.60	0.45	0.09	0.82	0.07
25.7	1.8	0.30	0.25	0.04	0.46	0.02
27.5	0.9	0.20	0.10	0.00	0.09	0.00
Stream width	27.5			**Total Discharge**		**17.18**

** - Both 4/1/07 and 3/27/07 data sets contain 1 less velocity measurement than depth; flow calculations were not performed for these dates.

Date:	**4/10/2007**					
Dist. From Start	**Width (ft)**	**Observation Depth (ft)**	**Depth (ft)**	**Velocity (ft/sec)**	**Area (ft^2)**	**Discharge (ft^3/sec)**

Shell Creek Station SC-6

Stream Discharge Calculations

Shell Valley Watershed Plan

0.0	1.5	1.00	1.05	1.92	1.62	3.11
3.1	3.1	1.10	1.25	1.75	3.85	6.74
6.2	3.1	1.40	1.20	2.49	3.70	9.21
9.3	3.1	1.00	1.00	1.88	3.08	5.80
12.3	3.1	1.00	1.05	1.87	3.24	6.05
15.4	3.1	1.10	1.15	1.80	3.55	6.38
18.5	3.1	1.20	1.15	1.74	3.55	6.17
21.6	3.1	1.10	0.95	1.79	2.93	5.24
24.7	3.1	0.80	0.65	2.89	2.00	5.79
27.8	3.1	0.50	0.40	2.01	1.23	2.48
30.8	3.1	0.30	0.25	1.10	0.77	0.85
33.9	3.1	0.20	0.15	0.03	0.46	0.01
37.0	1.5	0.10	0.05	0.14	0.08	0.01
Stream width	37.0			**Total Discharge**		**57.86**

Shell Creek Station SC-7
Stream Discharge Calculations
Shell Valley Watershed Plan

Date:	5/10/2006					
Dist. From Start	Width (ft)	Observation Depth (ft)	Depth (ft)	Velocity (ft/sec)	Area (ft^2)	Discharge (ft^3/sec)
0.0	1.6	0.00	0.07	0.00	0.11	0.00
3.3	3.3	0.13	0.17	0.17	0.54	0.09
6.6	3.3	0.20	0.25	0.26	0.82	0.21
9.8	3.3	0.30	0.25	0.12	0.82	0.10
13.1	3.3	0.20	0.20	0.26	0.66	0.17
16.4	3.3	0.20	0.26	0.15	0.85	0.13
19.7	3.3	0.32	0.32	0.12	1.05	0.13
22.9	3.3	0.32	0.36	0.25	1.18	0.29
26.2	3.3	0.40	0.35	0.22	1.15	0.25
29.5	3.3	0.30	0.25	0.08	0.82	0.07
32.8	3.3	0.20	0.23	3.00	0.75	2.26
36.0	3.3	0.26	0.14	0.15	0.46	0.07
39.3	3.3	0.02	0.04	0.00	0.13	0.00
42.6	1.6	0.06	0.03	0.00	0.05	0.00
Stream width	42.6		Total Discharge			3.77

Date:	5/15/2006					
Dist. From Start	Width (ft)	Observation Depth (ft)	Depth (ft)	Velocity (ft/sec)	Area (ft^2)	Discharge (ft^3/sec)
0.0	1.0	0.00	0.05	0.00	0.05	0.00
1.9	1.9	0.10	0.25	0.30	0.48	0.15
3.9	1.9	0.40	0.45	0.70	0.87	0.61
5.8	1.9	0.50	0.60	1.01	1.16	1.17
7.7	1.9	0.70	0.75	1.24	1.45	1.80
9.7	1.9	0.80	0.90	1.16	1.74	2.02
11.6	1.9	1.00	0.95	1.31	1.84	2.41
13.5	1.9	0.90	1.00	1.57	1.94	3.04
15.5	1.9	1.10	1.05	1.02	2.03	2.07
17.4	1.9	1.00	0.95	1.39	1.84	2.56
19.4	1.9	0.90	0.95	1.63	1.84	3.00
21.3	1.9	1.00	1.00	1.63	1.94	3.15
23.2	1.9	1.00	1.05	1.60	2.03	3.25
25.2	1.9	1.10	1.10	1.52	2.13	3.24
27.1	1.9	1.10	1.00	1.89	1.94	3.66

Shell Creek Station SC-7
Stream Discharge Calculations
Shell Valley Watershed Plan

29.0	1.9	0.90	0.95	1.47	1.84	2.70
31.0	1.9	1.00	1.05	1.56	2.03	3.17
32.9	1.9	1.10	1.05	1.35	2.03	2.74
34.8	1.9	1.00	1.05	1.45	2.03	2.95
36.8	1.9	1.10	1.05	1.18	2.03	2.40
38.7	1.9	1.00	0.95	1.25	1.84	2.30
40.6	1.9	0.90	1.00	1.49	1.94	2.88
42.6	1.9	1.10	0.95	1.30	1.84	2.39
44.5	1.9	0.80	0.80	1.37	1.55	2.12
46.5	1.9	0.80	0.80	1.20	1.55	1.86
48.4	1.9	0.80	0.75	1.14	1.45	1.65
50.3	1.9	0.70	0.65	1.02	1.26	1.28
52.3	1.9	0.60	0.60	1.26	1.16	1.46
54.2	1.9	0.60	0.50	1.15	0.97	1.11
56.1	1.9	0.40	0.35	1.26	0.68	0.85
58.1	1.9	0.30	0.15	0.96	0.29	0.28
60.0	1.0	0.00	0.00	0.00	0.00	0.00
Stream width	60.0		**Total Discharge**			**64.28**

Date:	**5/22/2006**					
Dist. From Start	**Width (ft)**	**Observation Depth (ft)**	**Depth (ft)**	**Velocity (ft/sec)**	**Area (ft^2)**	**Discharge (ft^3/sec)**
0.0	3.0	1.90	1.80	4.61	5.37	24.77
6.0	6.0	1.70	1.60	3.11	9.55	29.71
11.9	6.0	1.50	1.45	2.06	8.66	17.83
17.9	6.0	1.40	1.40	1.39	8.36	11.62
23.9	6.0	1.40	1.40	0.91	8.36	7.61
29.8	6.0	1.40	1.25	0.67	7.46	5.00
35.8	6.0	1.10	0.95	0.72	5.67	4.08
41.8	6.0	0.80	0.70	0.21	4.18	0.88
47.8	6.0	0.60	0.45	0.01	2.69	0.03
53.7	6.0	0.30	0.20	0.00	1.19	0.00
59.7	6.0	0.10	0.05	0.00	0.30	0.00
65.7	3.0	0.00	0.00	0.00	0.00	0.00
Stream width	65.7		**Total Discharge**			**101.51**

Date:	**5/30/2007**					

Shell Creek Station SC-7

Stream Discharge Calculations

Shell Valley Watershed Plan

Dist. From Start	Width (ft)	Observation Depth (ft)	Depth (ft)	Velocity (ft/sec)	Area (ft^2)	Discharge (ft^3/sec)
0.0	0.9	0.00	0.05	0.00	0.04	0.00
1.8	1.8	0.10	0.20	0.19	0.35	0.07
3.5	1.8	0.30	0.45	0.72	0.80	0.57
5.3	1.8	0.60	0.65	0.92	1.15	1.06
7.1	1.8	0.70	0.75	1.65	1.33	2.19
8.9	1.8	0.80	0.80	1.96	1.42	2.78
10.6	1.8	0.80	0.95	2.21	1.68	3.72
12.4	1.8	1.10	1.15	2.61	2.04	5.32
14.2	1.8	1.20	1.20	3.08	2.13	6.55
15.9	1.8	1.20	1.20	3.10	2.13	6.59
17.7	1.8	1.20	1.25	3.46	2.21	7.66
19.5	1.8	1.30	1.35	3.84	2.39	9.18
21.3	1.8	1.40	1.40	4.46	2.48	11.06
23.0	1.8	1.40	1.55	4.41	2.75	12.11
24.8	1.8	1.70	1.80	4.27	3.19	13.62
26.6	1.8	1.90	1.90	4.05	3.37	13.63
28.3	1.8	1.90	1.80	3.84	3.19	12.24
30.1	1.8	1.70	1.65	3.68	2.92	10.76
31.9	1.8	1.60	1.60	3.98	2.83	11.28
33.7	1.8	1.60	1.55	3.74	2.75	10.27
35.4	1.8	1.50	1.50	3.88	2.66	10.31
37.2	1.8	1.50	1.50	4.06	2.66	10.79
39.0	1.8	1.50	1.55	3.82	2.75	10.49
40.7	1.8	1.60	1.45	3.81	2.57	9.79
42.5	1.8	1.30	1.20	3.34	2.13	7.10
44.3	1.8	1.10	1.10	4.05	1.95	7.89
46.1	1.8	1.10	1.05	2.91	1.86	5.41
47.8	1.8	1.00	0.90	2.01	1.59	3.20
49.6	1.8	0.80	0.90	2.02	1.59	3.22
51.4	1.8	1.00	0.95	1.75	1.68	2.95
53.1	1.8	0.90	0.85	1.85	1.51	2.79
54.9	1.8	0.80	0.70	0.38	1.24	0.47
56.7	1.8	0.60	0.50	0.93	0.89	0.82
58.5	1.8	0.40	0.30	0.75	0.53	0.40
60.2	1.8	0.20	0.10	0.28	0.18	0.05
62.0	0.9	0.00	0.00	0.00	0.00	0.00
Stream width	62.0		**Total Discharge**			**216.33**

Shell Creek Station SC-7
Stream Discharge Calculations
Shell Valley Watershed Plan

Date:	8/3/2006					
Dist. From Start	Width (ft)	Observation Depth (ft)	Depth (ft)	Velocity (ft/sec)	Area (ft^2)	Discharge (ft^3/sec)
0.0	1.6	0.10	0.25	0.00	0.41	**0.00**
3.3	3.3	0.40	0.40	0.50	1.31	**0.65**
6.5	3.3	0.40	0.50	0.58	1.63	**0.95**
9.8	3.3	0.60	0.80	1.09	2.61	**2.85**
13.1	3.3	1.00	1.05	0.93	3.43	**3.19**
16.3	3.3	1.10	1.00	1.13	3.26	**3.69**
19.6	3.3	0.90	0.90	1.18	2.94	**3.47**
22.8	3.3	0.90	0.90	0.89	2.94	**2.61**
26.1	3.3	0.90	0.80	0.66	2.61	**1.72**
29.4	3.3	0.70	0.70	0.75	2.28	**1.71**
32.6	3.3	0.70	0.50	0.78	1.63	**1.27**
35.9	3.3	0.30	0.25	0.14	0.82	**0.11**
39.2	3.3	0.20	0.20	0.00	0.65	**0.00**
42.4	1.6	0.20	0.10	0.00	0.16	**0.00**
Stream width	42.4		**Total Discharge**			**22.22**

Date:	9/18/2006					
Dist. From Start	Width (ft)	Observation Depth (ft)	Depth (ft)	Velocity (ft/sec)	Area (ft^2)	Discharge (ft^3/sec)
0	1.0	0.10	0.15	0.00	0.15	0.00
2	2.0	0.20	0.30	0.08	0.60	0.05
4	2.0	0.40	0.40	0.18	0.80	0.14
6	2.0	0.40	0.45	0.68	0.90	0.61
8	2.0	0.50	0.50	1.06	1.00	1.06
10	2.0	0.50	0.65	1.18	1.30	1.53
12	2.0	0.80	0.75	1.44	1.50	2.16
14	2.0	0.70	0.85	1.51	1.70	2.57
16	2.0	1.00	1.00	1.28	2.00	2.56
18	2.0	1.00	1.00	1.45	2.00	2.90
20	2.0	1.00	1.00	1.29	2.00	2.58
22	2.0	1.00	0.95	1.21	1.90	2.30
24	2.0	0.90	0.85	1.14	1.70	1.94
26	2.0	0.80	0.80	1.39	1.60	2.22

Shell Creek Station SC-7

Stream Discharge Calculations

Shell Valley Watershed Plan

28	2.0	0.80	0.80	1.05	1.60	1.68
30	2.0	0.80	0.70	1.01	1.40	1.41
32	2.0	0.60	0.60	0.99	1.20	1.19
34	2.0	0.60	0.50	0.84	1.00	0.84
36	2.0	0.40	0.35	0.25	0.70	0.18
38	2.0	0.30	0.25	0.43	0.50	0.22
40	2.0	0.20	0.20	0.00	0.40	0.00
42	2.0	0.20	0.20	0.28	0.40	0.11
44	2.0	0.20	0.10	0.14	0.20	0.03
46	1.0	0.00	0.00	0.00	0.00	0.00
Stream width	46.0		Total Discharge			**28.28**

Date:	**9/27/2006**					
Dist. From Start	**Width (ft)**	**Observation Depth (ft)**	**Depth (ft)**	**Velocity (ft/sec)**	**Area (ft^2)**	**Discharge (ft^3/sec)**
0.0	0.9	0.20	0.20	0.00	0.19	0.00
1.9	1.9	0.20	0.20	0.02	0.38	0.01
3.8	1.9	0.20	0.20	0.07	0.38	0.03
5.7	1.9	0.20	0.30	0.11	0.57	0.06
7.6	1.9	0.40	0.40	0.31	0.76	0.23
9.4	1.9	0.40	0.45	0.62	0.85	0.53
11.3	1.9	0.50	0.60	0.75	1.13	0.85
13.2	1.9	0.70	0.70	0.88	1.32	1.16
15.1	1.9	0.70	0.65	0.92	1.23	1.13
17.0	1.9	0.60	0.55	0.72	1.04	0.75
18.9	1.9	0.50	0.50	0.64	0.94	0.60
20.8	1.9	0.50	0.50	0.29	0.94	0.27
22.7	1.9	0.50	0.50	0.56	0.94	0.53
24.6	1.9	0.50	0.50	0.50	0.94	0.47
26.4	1.9	0.50	0.50	0.42	0.94	0.40
28.3	1.9	0.50	0.45	0.53	0.85	0.45
30.2	1.9	0.40	0.35	0.16	0.66	0.11
32.1	1.9	0.30	0.30	0.13	0.57	0.07
34.0	0.9	0.30	0.15	0.00	0.14	0.00
Stream width	34.0		Total Discharge			**7.65**

Date:	**10/4/2006**					

Shell Creek Station SC-7
Stream Discharge Calculations
Shell Valley Watershed Plan

Dist. From Start	Width (ft)	Observation Depth (ft)	Depth (ft)	Velocity (ft/sec)	Area (ft^2)	Discharge (ft^3/sec)
0.0	1.3	0.20	0.20	0.01	0.26	0.00
2.6	2.6	0.20	0.30	0.16	0.78	0.13
5.2	2.6	0.40	0.50	0.28	1.31	0.37
7.8	2.6	0.60	0.65	0.54	1.70	0.92
10.5	2.6	0.70	0.75	0.77	1.96	1.51
13.1	2.6	0.80	0.70	0.70	1.83	1.28
15.7	2.6	0.60	0.60	0.57	1.57	0.89
18.3	2.6	0.60	0.60	0.69	1.57	1.08
20.9	2.6	0.60	0.65	0.60	1.70	1.02
23.5	2.6	0.70	0.60	0.43	1.57	0.67
26.2	2.6	0.50	0.45	0.33	1.18	0.39
28.8	2.6	0.40	0.35	0.39	0.92	0.36
31.4	2.6	0.30	0.20	0.28	0.52	0.15
34.0	1.3	0.10	0.05	0.00	0.07	0.00
Stream width	34.0		Total Discharge			**8.77**

Date:	10/13/2006					
Dist. From Start	Width (ft)	Observation Depth (ft)	Depth (ft)	Velocity (ft/sec)	Area (ft^2)	Discharge (ft^3/sec)
0.0	1.3	0.10	0.10	0.00	0.13	**0.00**
2.6	2.6	0.10	0.25	0.12	0.64	**0.08**
5.1	2.6	0.40	0.40	0.44	1.03	**0.45**
7.7	2.6	0.40	0.50	0.75	1.28	**0.96**
10.3	2.6	0.60	0.70	0.01	1.79	**0.02**
12.8	2.6	0.80	0.90	1.27	2.31	**2.93**
15.4	2.6	1.00	1.00	1.32	2.56	**3.38**
17.9	2.6	1.00	0.95	1.18	2.43	**2.87**
20.5	2.6	0.90	0.85	0.64	2.18	**1.39**
23.1	2.6	0.80	0.85	1.03	2.18	**2.24**
25.6	2.6	0.90	0.85	1.01	2.18	**2.20**
28.2	2.6	0.80	0.70	1.07	1.79	**1.92**
30.8	2.6	0.60	0.60	1.00	1.54	**1.54**
33.3	2.6	0.60	0.50	0.57	1.28	**0.73**
35.9	2.6	0.40	0.35	0.20	0.90	**0.18**
38.4	2.6	0.30	0.25	0.00	0.64	**0.00**

Shell Creek Station SC-7
Stream Discharge Calculations
Shell Valley Watershed Plan

41.0	1.3	0.20	0.10	0.01	0.13	**0.00**
Stream width	41.0		**Total Discharge**			**20.90**

Date:	**10/19/2006**					
Dist. From Start	**Width (ft)**	**Observation Depth (ft)**	**Depth (ft)**	**Velocity (ft/sec)**	**Area (ft^2)**	**Discharge (ft^3/sec)**
0.0	1.4	0.30	0.30	0.05	0.41	0.02
2.7	2.7	0.30	0.30	0.01	0.81	0.01
5.4	2.7	0.30	0.40	0.40	1.09	0.43
8.1	2.7	0.50	0.60	0.58	1.63	0.94
10.9	2.7	0.70	0.75	0.86	2.04	1.75
13.6	2.7	0.80	0.80	0.90	2.17	1.95
16.3	2.7	0.80	0.80	0.69	2.17	1.50
19.0	2.7	0.80	0.70	0.64	1.90	1.22
21.7	2.7	0.60	0.65	0.29	1.76	0.51
24.4	2.7	0.70	0.65	0.44	1.76	0.78
27.1	2.7	0.60	0.60	0.55	1.63	0.90
29.9	2.7	0.60	0.55	0.55	1.49	0.82
32.6	2.7	0.50	0.45	0.41	1.22	0.50
35.3	2.7	0.40	0.25	0.01	0.68	0.01
38.0	1.4	0.10	0.05	0.01	0.07	0.00
Stream width	38.0		**Total Discharge**			**11.34**

Date:	**3/27/2007**					
Dist. From Start	**Width (ft)**	**Observation Depth (ft)**	**Depth (ft)**	**Velocity (ft/sec)**	**Area (ft^2)**	**Discharge (ft^3/sec)**
0.0	1.8	0.10	0.20	0.09	0.36	0.03
3.6	3.6	0.30	0.45	0.05	1.61	0.08
7.1	3.6	0.60	0.65	1.52	2.32	3.53
10.7	3.6	0.70	0.85	1.62	3.04	4.92
14.3	3.6	1.00	1.15	2.03	4.11	8.34
17.9	3.6	1.30	1.20	1.82	4.29	7.80
21.4	3.6	1.10	1.05	1.86	3.75	6.98
25.0	3.6	1.00	1.05	1.56	3.75	5.85
28.6	3.6	1.10	1.05	1.75	3.75	6.56

Shell Creek Station SC-7
Stream Discharge Calculations
Shell Valley Watershed Plan

32.1	3.6	1.00	0.90	1.33	3.21	4.28
35.7	3.6	0.80	0.60	0.45	2.14	0.96
39.3	3.6	0.40	0.35	0.05	1.25	0.06
42.9	3.6	0.30	0.25	0.24	0.89	0.21
46.4	3.6	0.20	0.20	0.00	0.71	0.00
50.0	1.8	0.20	0.10	0.00	0.18	0.00
Stream width	50.0		Total Discharge			**49.60**

Date:	**4/1/2007**					
Dist. From Start	**Width (ft)**	**Observation Depth (ft)**	**Depth (ft)**	**Velocity (ft/sec)**	**Area (ft^2)**	**Discharge (ft^3/sec)**
0	2.5	0.10	0.30	0.07	0.75	0.05
5	5.0	0.50	0.55	0.75	2.75	2.06
10	5.0	0.60	0.80	1.58	4.00	6.32
15	5.0	1.00	1.15	1.74	5.75	10.01
20	5.0	1.30	1.20	1.75	6.00	10.50
25	5.0	1.10	1.10	1.48	5.50	8.14
30	5.0	1.10	1.00	1.58	5.00	7.90
35	5.0	0.90	0.75	1.61	3.75	6.04
40	5.0	0.60	0.45	1.02	2.25	2.30
45	5.0	0.30	0.20	0.30	1.00	0.30
50	2.5	0.10	0.05	0.00	0.13	0.00
Stream width	50.0		Total Discharge			**53.61**

Date:	**4/10/2007**					
Dist. From Start	**Width (ft)**	**Observation Depth (ft)**	**Depth (ft)**	**Velocity (ft/sec)**	**Area (ft^2)**	**Discharge (ft^3/sec)**
0.0	1.4	0.10	0.20	0.14	0.27	0.04
2.7	2.7	0.30	0.35	0.68	0.96	0.65
5.5	2.7	0.40	0.50	0.68	1.37	0.93
8.2	2.7	0.60	0.65	1.09	1.78	1.95
11.0	2.7	0.70	0.80	1.59	2.20	3.49
13.7	2.7	0.90	0.95	1.39	2.61	3.63
16.5	2.7	1.00	1.05	1.71	2.88	4.93
19.2	2.7	1.10	1.15	1.99	3.16	6.28

Shell Creek Station SC-7

Stream Discharge Calculations

Shell Valley Watershed Plan

22.0	2.7	1.20	1.10	1.64	3.02	4.95
24.7	2.7	1.00	1.00	1.74	2.75	4.78
27.5	2.7	1.00	1.05	1.85	2.88	5.33
30.2	2.7	1.10	1.10	1.53	3.02	4.62
32.9	2.7	1.10	0.95	1.50	2.61	3.91
35.7	2.7	0.80	0.80	1.17	2.20	2.57
38.4	2.7	0.80	0.65	1.31	1.78	2.34
41.2	2.7	0.50	0.40	0.43	1.10	0.47
43.9	2.7	0.30	0.25	0.44	0.69	0.30
46.7	2.7	0.20	0.15	0.30	0.41	0.12
49.4	1.4	0.10	0.05	0.00	0.07	0.00
Stream width	49.4		**Total Discharge**			**51.30**

Shell Creek Station SC-8
Stream Discharge Calculations
Shell Valley Watershed Plan

Date:	5/10/2006					
Dist. From Start	Width (ft)	Observation Depth (ft)	Depth (ft)	Velocity (ft/sec)	Area (ft^2)	Discharge (ft^3/sec)
0.0	1.7	0.00	0.08	0.00	0.13	0.00
3.3	3.3	0.16	0.17	0.16	0.57	0.09
6.7	3.3	0.18	0.23	0.36	0.77	0.28
10.0	3.3	0.28	0.25	0.30	0.84	0.25
13.4	3.3	0.22	0.24	0.11	0.80	0.09
16.7	3.3	0.26	0.42	0.78	1.41	1.10
20.1	3.3	0.58	0.49	0.72	1.64	1.18
23.4	3.3	0.40	0.36	0.30	1.21	0.36
26.8	3.3	0.32	0.41	0.24	1.37	0.33
30.1	3.3	0.50	0.48	0.66	1.61	1.06
33.5	3.3	0.46	0.27	0.34	0.90	0.31
36.8	3.3	0.08	0.04	0.56	0.13	0.07
40.2	1.7	0.00	0.00	0.00	0.00	0.00
Stream width	40.2			Total Discharge		5.12

Date:	5/15/2006					
Dist. From Start	Width (ft)	Observation Depth (ft)	Depth (ft)	Velocity (ft/sec)	Area (ft^2)	Discharge (ft^3/sec)
0.0	0.9	0.20	0.20	0.49	0.18	0.09
1.8	1.8	0.20	0.30	1.75	0.55	0.97
3.7	1.8	0.40	0.50	1.85	0.92	1.71
5.5	1.8	0.60	0.70	2.65	1.29	3.42
7.4	1.8	0.80	0.95	1.65	1.75	2.89
9.2	1.8	1.10	0.90	1.44	1.66	2.39
11.1	1.8	0.70	0.95	3.95	1.75	6.92
12.9	1.8	1.20	1.25	2.15	2.31	4.96
14.8	1.8	1.30	1.35	2.63	2.49	6.55
16.6	1.8	1.40	1.40	3.39	2.58	8.75
18.4	1.8	1.40	1.40	3.26	2.58	8.42
20.3	1.8	1.40	1.55	3.50	2.86	10.00
22.1	1.8	1.70	1.55	2.63	2.86	7.52
24.0	1.8	1.40	1.40	3.77	2.58	9.73
25.8	1.8	1.40	1.40	3.81	2.58	9.84
27.7	1.8	1.40	1.35	3.07	2.49	7.64

Shell Creek Station SC-8
Stream Discharge Calculations
Shell Valley Watershed Plan

29.5	1.8	1.30	1.30	3.24	2.40	7.77
31.4	1.8	1.30	1.20	2.58	2.21	5.71
33.2	1.8	1.10	0.95	3.19	1.75	5.59
35.0	1.8	0.80	0.80	2.54	1.48	3.75
36.9	1.8	0.80	0.55	2.64	1.01	2.68
38.7	1.8	0.30	0.50	1.96	0.92	1.81
40.6	1.8	0.70	0.60	2.46	1.11	2.72
42.4	0.9	0.50	0.25	1.61	0.23	0.37
Stream width	42.4			**Total Discharge**		**122.19**

Date:	5/22/2006					
Dist. From Start	**Width (ft)**	**Observation Depth (ft)**	**Depth (ft)**	**Velocity (ft/sec)**	**Area (ft^2)**	**Discharge (ft^3/sec)**
0.0	4.2	2.80	2.30	4.08	9.71	39.62
8.4	8.4	1.80	1.55	2.63	13.09	34.42
16.9	8.4	1.30	1.25	2.16	10.56	22.80
25.3	8.4	1.20	0.80	1.20	6.76	8.11
33.8	8.4	0.40	0.45	0.14	3.80	0.53
42.2	8.4	0.50	0.25	0.02	2.11	0.04
50.7	4.2	0.00	0.00	0.00	0.00	0.00
Stream width	50.7			**Total Discharge**		**105.53**

Date:	**8/3/2006**					
Dist. From Start	**Width (ft)**	**Observation Depth (ft)**	**Depth (ft)**	**Velocity (ft/sec)**	**Area (ft^2)**	**Discharge (ft^3/sec)**
0	1.5	0.50	0.45	0.00	0.68	0.00
3	3.0	0.40	0.40	1.43	1.20	1.72
6	3.0	0.40	0.40	0.42	1.20	0.50
9	3.0	0.40	0.50	0.71	1.50	1.07
12	3.0	0.60	0.50	1.53	1.50	2.30
15	3.0	0.40	0.50	1.03	1.50	1.55
18	3.0	0.60	0.60	2.18	1.80	3.92
21	3.0	0.60	0.70	2.18	2.10	4.58
24	3.0	0.80	0.75	0.79	2.25	1.78
27	3.0	0.70	0.55	1.77	1.65	2.92

Shell Creek Station SC-8
Stream Discharge Calculations
Shell Valley Watershed Plan

30	3.0	0.40	0.30	1.29	0.90	1.16
33	3.0	0.20	0.15	0.24	0.45	0.11
36	1.5	0.10	0.05	0.19	0.08	0.01
Stream width	36.0			**Total Discharge**		**21.61**

Date:	**9/27/2006**					
Dist. From Start	**Width (ft)**	**Observation Depth (ft)**	**Depth (ft)**	**Velocity (ft/sec)**	**Area (ft^2)**	**Discharge (ft^3/sec)**
0.0	1.3	0.6	0.65	0.00	0.86	0.00
2.6	2.6	0.70	0.65	0.24	1.72	0.41
5.3	2.6	0.60	0.60	0.61	1.59	0.97
7.9	2.6	0.60	0.60	1.03	1.59	1.63
10.6	2.6	0.60	0.55	1.82	1.45	2.65
13.2	2.6	0.50	0.60	1.47	1.59	2.33
15.9	2.6	0.70	0.70	0.70	1.85	1.30
18.5	2.6	0.70	0.75	2.24	1.98	4.44
21.1	2.6	0.80	0.80	2.46	2.11	5.20
23.8	2.6	0.80	0.75	1.86	1.98	3.69
26.4	2.6	0.70	0.65	2.44	1.72	4.19
29.1	2.6	0.60	0.45	0.87	1.19	1.03
31.7	2.6	0.30	0.25	0.49	0.66	0.32
34.4	2.6	0.20	0.20	0.71	0.53	0.38
37.0	1.3	0.20	0.10	0.12	0.13	0.02
Stream width	37.0			**Total Discharge**		**28.55**

Date:	**10/4/2006**					
Dist. From Start	**Width (ft)**	**Observation Depth (ft)**	**Depth (ft)**	**Velocity (ft/sec)**	**Area (ft^2)**	**Discharge (ft^3/sec)**
0	1.3	0.20	0.30	0.02	0.38	0.01
2.5	2.5	0.40	0.40	0.44	1.00	0.44
5	2.5	0.40	0.45	0.46	1.13	0.52
7.5	2.5	0.50	0.50	1.07	1.25	1.34
10	2.5	0.50	0.55	1.07	1.38	1.47
12.5	2.5	0.60	0.55	1.42	1.38	1.95
15	2.5	0.50	0.55	1.55	1.38	2.13

Shell Creek Station SC-8
Stream Discharge Calculations
Shell Valley Watershed Plan

17.5	2.5	0.60	0.60	2.21	1.50	3.32
20	2.5	0.60	0.60	1.92	1.50	2.88
22.5	2.5	0.60	0.70	1.74	1.75	3.05
25	2.5	0.80	0.80	1.96	2.00	3.92
27.5	2.5	0.80	0.80	0.56	2.00	1.12
30	2.5	0.80	0.80	1.85	2.00	3.70
32.5	2.5	0.80	0.75	1.38	1.88	2.59
35	2.5	0.70	0.70	2.22	1.75	3.89
37.5	2.5	0.70	0.60	1.34	1.50	2.01
40	1.3	0.50	0.25	1.19	0.31	0.37
Stream width	40.0			**Total Discharge**		**34.69**

Date:	**10/13/2006**					
Dist. From Start	**Width (ft)**	**Observation Depth (ft)**	**Depth (ft)**	**Velocity (ft/sec)**	**Area (ft^2)**	**Discharge (ft^3/sec)**
0.0	1.7	0.40	0.40	0.10	0.67	0.07
3.3	3.3	0.40	0.45	0.72	1.50	1.08
6.7	3.3	0.50	0.55	1.32	1.83	2.42
10.0	3.3	0.60	0.55	1.26	1.83	2.31
13.3	3.3	0.50	0.60	1.55	2.00	3.10
16.7	3.3	0.70	0.80	1.73	2.67	4.61
20.0	3.3	0.90	0.80	1.65	2.67	4.40
23.3	3.3	0.70	0.65	1.99	2.17	4.31
26.7	3.3	0.60	0.65	1.84	2.17	3.99
30.0	3.3	0.70	0.70	3.14	2.33	7.33
33.3	3.3	0.70	0.65	2.71	2.17	5.87
36.7	3.3	0.60	0.40	1.23	1.33	1.64
40.0	1.7	0.20	0.10	0.20	0.17	0.03
Stream width	40.0			**Total Discharge**		**41.16**

Date:	**10/19/2006**					
Dist. From Start	**Width (ft)**	**Observation Depth (ft)**	**Depth (ft)**	**Velocity (ft/sec)**	**Area (ft^2)**	**Discharge (ft^3/sec)**
0.0	1.6	0.30	0.40	0.32	0.65	0.21
3.3	3.3	0.50	0.55	0.92	1.79	1.64

Shell Creek Station SC-8

Stream Discharge Calculations

Shell Valley Watershed Plan

6.5	3.3	0.60	0.60	0.85	1.95	1.66
9.8	3.3	0.60	0.60	1.47	1.95	2.87
13.0	3.3	0.60	0.65	1.03	2.11	2.18
16.3	3.3	0.70	0.70	1.96	2.28	4.46
19.5	3.3	0.70	0.70	1.51	2.28	3.44
22.8	3.3	0.70	0.70	0.92	2.28	2.09
26.0	3.3	0.70	0.70	2.23	2.28	5.07
29.3	3.3	0.70	0.75	3.20	2.44	7.80
32.5	3.3	0.80	0.65	2.86	2.11	6.04
35.8	3.3	0.50	0.40	1.24	1.30	1.61
39.0	1.6	0.30	0.15	0.19	0.24	0.05
Stream width	39.0			**Total Discharge**		**39.11**

Date:	**3/27/2007**					
Dist. From Start	**Width (ft)**	**Observation Depth (ft)**	**Depth (ft)**	**Velocity (ft/sec)**	**Area (ft^2)**	**Discharge (ft^3/sec)**
0.0	1.1	0.30	0.55	0.00	0.63	0.00
2.3	2.3	0.80	0.70	0.35	1.61	0.56
4.6	2.3	0.60	0.65	0.93	1.49	1.39
6.9	2.3	0.70	0.75	1.46	1.72	2.51
9.2	2.3	0.80	0.75	1.70	1.72	2.93
11.5	2.3	0.70	0.70	1.82	1.61	2.93
13.8	2.3	0.70	0.70	1.53	1.61	2.46
16.1	2.3	0.70	0.75	1.16	1.72	2.00
18.4	2.3	0.80	0.90	1.84	2.07	3.80
20.7	2.3	1.00	1.00	1.99	2.30	4.57
23.0	2.3	1.00	0.95	2.86	2.18	6.24
25.3	2.3	0.90	0.85	1.88	1.95	3.67
27.6	2.3	0.80	0.85	2.53	1.95	4.94
29.9	2.3	0.90	0.90	1.80	2.07	3.72
32.1	2.3	0.90	0.85	2.56	1.95	5.00
34.4	2.3	0.80	0.75	3.42	1.72	5.89
36.7	2.3	0.70	0.60	2.30	1.38	3.17
39.0	2.3	0.50	0.45	2.13	1.03	2.20
41.3	1.1	0.40	0.20	0.91	0.23	0.21
Stream width	41.3			**Total Discharge**		**58.18**

Shell Creek Station SC-8
Stream Discharge Calculations
Shell Valley Watershed Plan

Date:	4/1/2007					
Dist. From Start	Width (ft)	Observation Depth (ft)	Depth (ft)	Velocity (ft/sec)	Area (ft^2)	Discharge (ft^3/sec)
0.0	1.7	0.50	0.50	0.03	0.86	0.03
3.4	3.4	0.50	0.55	0.92	1.89	1.74
6.9	3.4	0.60	0.65	2.00	2.23	4.46
10.3	3.4	0.70	0.75	1.41	2.57	3.63
13.7	3.4	0.80	0.85	1.98	2.92	5.77
17.2	3.4	0.90	0.95	2.19	3.26	7.14
20.6	3.4	1.00	1.00	2.06	3.43	7.07
24.0	3.4	1.00	0.95	2.54	3.26	8.28
27.4	3.4	0.90	0.95	3.01	3.26	9.81
30.9	3.4	1.00	0.90	2.27	3.09	7.01
34.3	3.4	0.80	0.70	3.30	2.40	7.92
37.7	3.4	0.60	0.55	1.98	1.89	3.74
41.2	1.7	0.50	0.25	1.06	0.43	0.45
Stream width	41.2			Total Discharge		**67.04**

Date:	4/10/2007					
Dist. From Start	Width (ft)	Observation Depth (ft)	Depth (ft)	Velocity (ft/sec)	Area (ft^2)	Discharge (ft^3/sec)
0.0	1.9	0.30	0.55	0.00	1.04	0.00
3.8	3.8	0.80	0.70	0.35	2.64	0.92
7.5	3.8	0.60	0.65	0.93	2.45	2.28
11.3	3.8	0.70	0.75	1.46	2.83	4.13
15.1	3.8	0.80	0.75	1.70	2.83	4.81
18.9	3.8	0.70	0.70	1.82	2.64	4.81
22.6	3.8	0.70	0.70	1.53	2.64	4.04
26.4	3.8	0.70	0.75	1.16	2.83	3.28
30.2	3.8	0.80	0.90	1.84	3.40	6.25
34.0	3.8	1.00	1.00	1.99	3.77	7.51
37.7	3.8	1.00	0.95	2.86	3.58	10.25
41.5	1.9	0.90	0.45	1.88	0.85	1.60
Stream width	41.5			Total Discharge		**49.88**

Shell Valley Watershed Study

Surface Water Discharge Calculation Sheet

Site: SC-5 (Shell Creek)

Date: 6/27/2007

Dist. From Start	Width (ft)	Observation Depth (ft)	Depth (ft)	Velocity (ft/sec)	Area (ft^2)	**Discharge (ft^3/sec)**
0.0	1.5	0.05	0.38	0.50	0.56	**0.28**
3.0	3.0	0.70	0.55	1.20	1.65	**1.98**
6.0	3.0	0.40	0.50	1.82	1.50	**2.73**
9.0	3.0	0.60	0.60	2.54	1.80	**4.57**
12.0	3.0	0.60	0.60	2.07	1.80	**3.73**
15.0	3.0	0.60	0.65	2.30	1.95	**4.49**
18.0	3.0	0.70	0.75	2.77	2.25	**6.23**
21.0	3.0	0.80	0.73	2.73	2.18	**5.94**
24.0	3.0	0.65	0.70	3.58	2.10	**7.52**
27.0	3.0	0.75	0.70	3.36	2.10	**7.06**
30.0	3.0	0.65	0.63	3.41	1.88	**6.39**
33.0	3.0	0.60	0.60	3.24	1.80	**5.83**
36.0	3.0	0.60	0.60	3.20	1.80	**5.76**
39.0	3.0	0.60	0.60	3.16	1.80	**5.69**
42.0	3.0	0.60	0.60	2.92	1.80	**5.26**
45.0	3.0	0.60	0.55	2.74	1.65	**4.52**
48.0	2.5	0.50	0.35	2.28	0.88	**2.00**
50.0	1.0	0.20	0.10	1.15	0.10	**0.12**

Stream width **50** **Total Discharge** **80.08**

Shell Valley Watershed Study

Surface Water Discharge Calculation Sheet

Site: SC-8 (Shell Creek)

Date: 6/27/2007

Dist. From Start	Width (ft)	Observation Depth (ft)	Depth (ft)	Velocity (ft/sec)	Area (ft^2)	**Discharge (ft^3/sec)**
0.0	1.5	0.90	1.15	1.24	1.73	**2.14**
3.0	3.0	1.40	1.50	2.06	4.50	**9.27**
6.0	3.0	1.60	1.75	2.51	5.25	**13.18**
9.0	3.0	1.90	1.95	3.16	5.85	**18.49**
12.0	3.0	2.00	2.05	2.82	6.15	**17.34**
15.0	3.0	2.10	2.10	2.22	6.30	**13.99**
18.0	3.0	2.10	2.05	2.43	6.15	**14.94**
21.0	3.0	2.00	1.95	2.57	5.85	**15.03**
24.0	3.0	1.90	1.90	2.45	5.70	**13.97**
27.0	3.0	1.90	1.75	2.53	5.25	**13.28**
30.0	2.0	1.60	1.10	2.18	2.20	**4.80**
31.0	0.5	0.60	0.30	0.80	0.15	**0.12**
0.0	0.0	0.00	0.00	0.15	0.00	**0.00**
0.0	0.0	0.00	0.00	0.22	0.00	**0.00**
0.0	0.0	0.00	0.00	0.28	0.00	**0.00**
0.0						

Stream width **31** **Total Discharge** **136.54**

Shell Valley Watershed Study

Surface Water Discharge Calculation Sheet

Site: SC-100 (Shell Creek)

Date: 6/27/2007

Dist. From Start	Width (ft)	Observation Depth (ft)	Depth (ft)	Velocity (ft/sec)	Area (ft^2)	**Discharge (ft^3/sec)**
0.0	0.5	0.00	0.50	0.50	0.25	**0.13**
1.0	2.0	1.00	0.78	1.53	1.55	**2.37**
4.0	3.0	0.55	0.60	1.74	1.80	**3.13**
7.0	3.0	0.65	0.73	2.09	2.18	**4.55**
10.0	3.0	0.80	0.88	3.04	2.63	**7.98**
13.0	3.0	0.95	1.03	3.65	3.08	**11.22**
16.0	3.0	1.10	1.23	3.88	3.68	**14.26**
19.0	3.0	1.35	1.28	3.55	3.83	**13.58**
22.0	3.0	1.20	1.15	4.25	3.45	**14.66**
25.0	3.0	1.10	1.05	3.45	3.15	**10.87**
28.0	3.0	1.00	0.93	4.38	2.78	**12.15**
31.0	3.0	0.85	0.93	3.55	2.78	**9.85**
34.0	3.0	1.00	0.85	4.04	2.55	**10.30**
37.0	3.0	0.70	0.65	2.22	1.95	**4.33**
40.0	3.0	0.60	0.50	2.89	1.50	**4.34**
43.0	3.0	0.40	0.40	1.56	1.20	**1.87**
46.0	3.0	0.40	0.38	2.04	1.13	**2.30**
49.0	3.0	0.35	0.38	1.91	1.13	**2.15**
52.0	2.5	0.40	0.20	1.83	0.50	**0.92**
54.0	1.0	0.00	0.00	0.50	0.00	**0.00**
0.0			0			

Stream width	**54**		**Total Discharge**	**130.95**

Shell Valley Watershed Study

Surface Water Discharge Calculation Sheet

Site: BC-3 (Beaver Creek)

Date: 6/27/2007

Dist. From Start	Width (ft)	Observation Depth (ft)	Depth (ft)	Velocity (ft/sec)	Area (ft^2)	**Discharge (ft^3/sec)**
0.0	0.5	0.50	1.20	0.10	0.60	**0.06**
1.0	1.0	1.90	1.95	0.90	1.95	**1.76**
2.0	1.0	2.00	2.00	1.48	2.00	**2.96**
3.0	1.0	2.00	1.95	1.98	1.95	**3.86**
4.0	1.0	1.90	1.80	1.95	1.80	**3.51**
5.0	1.0	1.70	1.55	1.39	1.55	**2.15**
6.0	1.0	1.40	1.25	1.23	1.25	**1.54**
7.0	1.0	1.10	1.05	1.69	1.05	**1.77**
8.0	1.0	1.00	0.95	1.66	0.95	**1.58**
9.0	1.0	0.90	0.90	1.46	0.90	**1.31**
10.0	1.0	0.90	0.60	0.80	0.60	**0.48**
11.0	0.5	0.30	0.15	0.10	0.08	**0.01**
0.0	0.0	0.00	0.00	0.00	0.00	**0.00**
0.0	0.0	0.00	0.00	0.00	0.00	**0.00**
0.0	0.0	0.00	0.00	0.00	0.00	**0.00**
0.0						

Stream width **11** **Total Discharge** **20.99**

Shell Valley Watershed Study

Surface Water Discharge Calculation Sheet

Site: BC-5 (Beaver Creek)

Date: 6/27/2007

Dist. From Start	Width (ft)	Observation Depth (ft)	Depth (ft)	Velocity (ft/sec)	Area (ft^2)	**Discharge (ft^3/sec)**
0.0	1.8	2.50	2.75	1.00	4.81	**4.81**
3.5	3.5	3.00	3.00	1.00	10.50	**10.50**
7.0	2.5	3.00	2.50	1.00	6.25	**6.25**
8.5	1.5	2.00	1.75	0.50	2.63	**1.31**
10.0	0.8	1.50	1.75	0.50	1.31	**0.66**
0.0						
0.0						

Stream width **10** **Total Discharge** **23.53**

Shell Valley Watershed Study

Surface Water Discharge Calculation Sheet

Site: HC-1 (Horse Creek)

Date: 6/27/2007

Dist. From Start	Width (ft)	Observation Depth (ft)	Depth (ft)	Velocity (ft/sec)	Area (ft^2)	**Discharge (ft^3/sec)**
0.0	0.8	0.70	0.70	0.90	0.53	**0.47**
1.5	1.5	0.70	0.70	0.90	1.05	**0.95**
3.0	0.8	0.70	0.70	0.90	0.53	**0.47**
0.0						
0.0						
0.0						
0.0						

Stream width **3** **Total Discharge** **1.89**

Shell Valley Watershed Study

Surface Water Discharge Calculation Sheet

Site: RCC-1 (Red Canyon Creek)

Date: 6/27/2007

Dist. From Start	Width (ft)	Observation Depth (ft)	Depth (ft)	Velocity (ft/sec)	Area (ft^2)	**Discharge (ft^3/sec)**
0.0	0.4	1.40	1.40	1.65	0.49	**0.81**
0.7	0.7	1.40	1.40	1.65	0.98	**1.62**
1.4	0.4	1.40	1.40	1.65	0.49	**0.81**
0.0						
0.0						
0.0						
0.0						

Stream width **1.4** **Total Discharge** **3.23**

Shell Valley Watershed Study

Surface Water Discharge Calculation Sheet

Site: TC-1 (Trapper Creek)

Date: 6/27/2007

Dist. From Start	Width (ft)	Observation Depth (ft)	Depth (ft)	Velocity (ft/sec)	Area (ft^2)	**Discharge (ft^3/sec)**
0.0	1.0	0.10	0.18	0.50	0.18	**0.09**
2.0	2.0	0.25	0.28	2.21	0.55	**1.22**
4.0	2.0	0.30	0.35	2.03	0.70	**1.42**
6.0	2.0	0.40	0.38	1.48	0.75	**1.11**
8.0	2.0	0.35	0.28	1.14	0.55	**0.63**
10.0	2.0	0.20	0.30	0.83	0.60	**0.50**
12.0	2.0	0.40	0.45	1.52	0.90	**1.37**
14.0	2.0	0.50	0.65	1.72	1.30	**2.24**
16.0	2.0	0.80	0.83	1.69	1.65	**2.79**
18.0	2.0	0.85	0.85	1.19	1.70	**2.02**
20.0	1.5	0.85	0.83	1.05	1.24	**1.30**
21.0	0.5	0.80	0.40	0.65	0.20	**0.13**
0.0	0.0	0.00	0.00	0.00	0.00	**0.00**
0.0	0.0	0.00	0.00	0.00	0.00	**0.00**
0.0	0.0	0.00	0.00	0.00	0.00	**0.00**
0.0						

Stream width **21** **Total Discharge** **14.80**

Shell Valley Watershed Study

Surface Water Discharge Calculation Sheet

Site: SCG-1 (Scharen Gulch)

Date: 6/27/2007

Dist. From Start	Width (ft)	Observation Depth (ft)	Depth (ft)	Velocity (ft/sec)	Area (ft^2)	**Discharge (ft^3/sec)**
0.0	1.0	1.00	1.00	2.20	1.00	**2.20**
2.0	2.0	1.00	1.00	2.20	2.00	**4.40**
4.0	1.0	1.00	1.00	2.20	1.00	**2.20**
0.0						
0.0						
0.0						
0.0						

Stream width **4** **Total Discharge** **8.80**

Shell Valley Watershed Study

Surface Water Discharge Calculation Sheet

Site: SHG-1 (Sheldon Gulch)

Date: 6/27/2007

Dist. From Start	Width (ft)	Observation Depth (ft)	Depth (ft)	Velocity (ft/sec)	Area (ft^2)	**Discharge (ft^3/sec)**
0.0	0.6	2.20	2.00	1.80	1.25	**2.25**
1.3	1.3	2.20	2.00	1.80	2.50	**4.50**
2.5	1.3	2.00	1.90	2.10	2.38	**4.99**
3.8	1.3	1.90	1.80	2.40	2.25	**5.40**
5.0	0.6	1.90	1.80	2.40	1.13	**2.70**
0.0						
0.0						

Stream width **5** **Total Discharge** **19.84**

Shell Valley Watershed Study

Surface Water Discharge Calculation Sheet

Site: GC-1 (Granite Creek)

Date: 6/27/2007

Dist. From Start	Width (ft)	Observation Depth (ft)	Depth (ft)	Velocity (ft/sec)	Area (ft^2)	**Discharge (ft^3/sec)**
0.0	0.3	1.20	1.20	4.50	0.30	**1.35**
0.5	0.5	1.20	1.30	4.50	0.65	**2.93**
1.0	0.5	1.40	1.20	5.50	0.60	**3.30**
1.5	0.5	1.40	1.20	6.10	0.60	**3.66**
2.0	0.5	1.40	0.70	5.50	0.35	**1.93**
2.5	0.5	1.00	1.00	4.50	0.50	**2.25**
3.0	0.3	1.00	1.00	4.50	0.25	**1.13**
0.0						
0.0						

Stream width **3** **Total Discharge** **16.54**

APPENDIX G

USGS Surface Water Quality Data (1951 – 2000)

- USGS 06279000 Shell Creek at Shell, Wyoming
- USGS 06278500 Shell Creek near Shell, Wyoming
- USGS 06278300 Shell Creek above Shell Creek Reservoir (no data)
- USGS 06278400 Granite Creek near Shell Ranger Station, near Shell, Wyoming
- USGS 06279050 Shell Creek at Porter Gulch near Greybull, Wyoming
- USGS 06279090 Shell Creek near Greybull, Wyoming

USGS 06279000 SHELL CREEK AT SHELL, WY

Big Horn County, Wyoming
Hydrologic Unit Code 10080010
Latitude 44°33'00", Longitude 107°48'00" NAD27
Drainage area 256.00 square miles
Gage datum 4,200.00 feet above sea level NGVD29

Sample Datetime	Sample Medium Code	Agency Collecting Sample, Code	Temper-ature, water, deg C -10	Stream-flow (ft^3/s) -60	Instan-taneous dis-charge, cfs -61	Turbid-ity, JTU -70	Dis-solved oxygen, mg/L -300	Fecal coli-form, M-FC 0.45uMF col/ 100 mL -31616
11/29/1973 7:10	9		0	83		6	11.7	120
1/15/1974 9:10	9		0	76		8	11.3	90
2/19/1974 13:50	9		0		72	25	11.2	94

Source:
http://waterdata.usgs.gov/wy/nwis/

USGS 06278500 SHELL CREEK NEAR SHELL, WY

Big Horn County, Wyoming
Hydrologic Unit Code 10080010
Latitude 44°33'54", Longitude 107°42'44" NAD27
Drainage area 145 square miles
Gage datum 4,370.05 feet above sea level NGVD29

Sample Datetime	Sample Medium Code	Agency Collecting Sample, Code	Temperature, water, deg C -10	Temperature, air, deg C -20	Barometric pressure, mm Hg -25	Agency analyzing sample, code -28	Project number -29	Surface area, mi2 -49	Streamflow (ft^3/s) -60	Instantaneous discharge, cfs -61	Turbidity, NTU -76	Specif. conductance, wat unf uS/cm 25 degC -95	Dissolved oxygen, mg/L -300	pH, water, unfltrd field, std units -400	Bicarbonate, wat unf fixed end pt, field, mg/L -440	Bicarbonate, wat flt incrm. titr., field, mg/L -453
1951-01-15 00:00	9							145		38		274		8.1	156	
1951-02-21 00:00	9							145		34		283		8.0	162	
1951-03-22 00:00	9							145		33		294		7.9	161	
1951-04-12 00:00	9							145		34		292		7.6	168	
1951-05-24 00:00	9							145		806		135		6.9	78	
1951-06-20 00:00	9							145		420		113		6.9	63	
1951-07-13 00:00	9							145		231		125		6.8	71	
1951-08-02 00:00	9							145		123		181		7.4	106	
1951-09-07 00:00	9							145		84		193		6.9	114	
1967-06-07 11:55	9		6.1						832							
1976-09-11 00:00	9											211				
1982-05-21 09:30	9	USGSNWQL	4.5			80020				153						
1982-07-08 14:50	9	USGSNWQL	11.0	23.0		80020				310						
1982-09-13 14:50	9	USGSNWQL	8.5	10.0		80020				94						
2000-07-18 15:40	9	USGS-WRD	15.0	17.5	655	1028	14620			113	6.3	188	9.5	8.4		92

Water Quality Remark Code	Description
<	Actual value is known to be less than the value shown.

Source:
http://waterdata.usgs.gov/wy/nwis/

Hard-ness, water, mg/L as CaCO3 -900	Noncarb hard-ness, wat unf field, mg/L as CaCO3 -902	Calcium water, fltrd, mg/L -915	Magnes-ium, water, fltrd, mg/L -925	Sodium frac-tion of cations percent -932	Sodium + potas sium, water, fltrd, mg/L as Na (00933)	Chlor-ide, water, fltrd, mg/L (00940)	Sulfate water, fltrd, mg/L (00945)	Fluor-ide, water, fltrd, mg/L (00950)	Silica, water, fltrd, mg/L (00955)	Boron, water, fltrd, ug/L (01020)	Iron, water, unfltrd recover -able, ug/L (01045)	Fecal coli-form, M-FC 0.7u MF col/ 100 mL (31625)	E coli, m-TEC MF, water, col/ 100 mL (31633)	Alka-linity, wat flt inc tit field, mg/L as CaCO3 (39086)	2,4-D, water, unfltrd ug/L (39730)	2,4,5-T water, unfltrd ug/L (39740)
140	8	36.0	11.0	5	3.0	.5	12.0	.10	9.00	100	40					
140	9	40.0	10.0	4	2.3	1.0	11.0	.10	8.30	160	200					
140	9	35.0	13.0	9	6.7	.5	20.0	.10	8.00	.0	60					
150	12	38.0	13.0	8	5.8	1.0	21.0	.10	7.80	30	70					
66	2	18.0	5.10	11	3.7	.6	7.0	.10	5.40	120	20					
54	2	15.0	4.00	6	1.6	.2	5.0	.10	4.00	20	20					
61	3	16.0	5.10	8	2.5	.5	7.0	.10	6.20	10	20					
90	3	23.0	7.90	5	2.1	.3	6.0	.10	7.10	20	20					
98	5	26.0	8.00	4	1.8	.4	7.0	.10	6.80	10	20					
															< .01	< .01
															< .01	< .01
															< .01	< .01
												93	74	75		

Silvex, water, unfltrd ug/L (39760)	Purpose site visit, code (50280)	Residue on evap. at 180degC wat flt mg/L (70300)	Residue water, dis-solved, tons/d (70302)	Nitrate water, unfltrd mg/L (71850)	Sample purpose code (71999)	Alti-tude of land surface feet (72000)	Sus-pended sedi-ment concen-tration mg/L (80154)	Sus-pended sedi-ment dis-charge, tons/d (80155)	Di-chlor-prop, water, unfltrd ug/L (82183)	Sam-pling method, code (82398)	Sampler type, code (84164)	Type of sample related QA data, code (99111)
		150	.20	1.0		4370						
		164	.22	1.3		4370						
		174	.24	1.6		4370						
		184	.25	1.1		4370						
		94	.13	1.0		4370						
		64	.09	.20		4370						
		76	.10	.30		4370						
		102	.14	.80		4370						
		108	.15	.30		4370						
							89	200				
< .01									< .01			
< .01									< .01			
< .01									< .01			
	1006				15.00		7			10	3044	1

USGS 06278300 SHELL CREEK ABOVE SHELL CREEK RESERVOIR, WY

no data

USGS 06278400 GRANITE CREEK NEAR SHELL RANGER STATION, NEAR SHELL, WY

Big Horn County, Wyoming
Hydrologic Unit Code 10080010
Latitude 44°34'32", Longitude 107°32'52" NAD27
Drainage area 11.10 square miles
Gage datum 8,950 feet above sea level NGVD29

Sample Datetime	Sample Medium Code	Agency Collecting Sample, Code	Temper-ature, water, deg C -10	Temper-ature, air, deg C -20	Baro-metric pres-sure, mm Hg -25	Agency ana-lyzing sample, code -28	Project number -29	Instan-taneous dis-charge, cfs -61	Tur-bidity, NTU -76	Specif. conduc-tance, wat unf uS/cm 25 degC -95	Dis-solved oxygen, mg/L -300	pH, water, unfltrd field, std units -400
7/17/1972		USGS	8					21.6				
8/11/1972		USGS	11					13.0				
9/4/1973		USGS	7					1.5		200		
7/3/1974		USGS	10					30.5		200		
7/31/1974		USGS	9					11.1		280		
8/19/1974		USGS	9					6.44		280		
8/6/1975		USGS	13					12.6		280		
9/12/1975		USGS	6					5.82		295		
7/18/2000 12:00:00 AM	9	USGS-WRD	10	20	589	1028	14620	11.0	9.7	241	7.8	8.4

Source:
http://waterdata.usgs.gov/wy/nwis/

Bicar-bonate, wat flt incrm. titr., field, mg/L -453	Fecal coli-form, M-FC 0.7u MF col/ 100 mL -31625	E coli, m-TEC MF, water, col/ 100 mL -31633	Alka-linity, wat flt inc tit field, mg/L as CaCO3 -39086	Purpose site visit, code -50280	Sample purpose code -71999	Sus-pended sedi-ment concen-tration mg/L -80154	Sam-pling method, code -82398	Sampler type, code -84164	Type of sample related QA data, code -99111
147	1600	1200	120	1006	15	13	10	3044	1

USGS 06279050 SHELL CREEK AT PORTER GULCH NEAR GREYBULL, WY

Big Horn County, Wyoming
Hydrologic Unit Code
Latitude 44°31'25", Longitude 107°55'29" NAD27

Sample Datetime	Sample Medium Code	Agency Collecting Sample, Code	Temper-ature, water, deg C -10	Temper-ature, air, deg C -20	Agency ana-lyzing sample, code -28	Instan-taneous dis-charge, cfs -61	Selen-ium, water, fltrd, ug/L -1145	Fecal coli-form, M-FC 0.7u MF col/ 100 mL -31625	Pic-loram, water, unfltrd ug/L -39720	2,4-D, water, unfltrd ug/L -39730	2,4,5-T water, unfltrd ug/L -39740	Silvex, water, unfltrd ug/L -39760	Dicamba water, unfltrd ug/L -82052	Di-chlor-prop, water, unfltrd ug/L -82183	Sam-pling method, code -82398
6/14/1983 14:00	9	USGS-WRD	10	21.5	80020	762			< .01	< .01	< .01	< .01	< .01	< .01	
7/5/1983 14:50	9	USGS-WRD	17.5	29.5	80020	246			< .01	0.02	< .01	< .01	< .01	< .01	
9/9/1983 10:00	9	USGS-WRD	14	20	80020	7.8			0.01	0.02	< .01	< .01	0.01	< .01	
6/25/1984 16:50	9	USGS-WRD	10	34.5	80020	746			< .01	0.02	< .01	< .01	0.01	< .01	30
7/6/1984 12:45	9	USGS-WRD	16.5	31	80020	119			< .01	0.02	< .01	< .01	0.04	< .01	30
9/4/1984 11:30	9	USGS-WRD	14	24.5	80020	24			< .01	< .01	< .01	< .01	0.01	< .01	30
6/25/1985 14:30	0	USGS-WRD	13	12.5	80020	54			0.01	0.28	< .01	< .01	0.07	< .01	30
7/9/1985 12:00	9	USGS-WRD	18	26	80020	22			< .01	1.1	< .01	< .01	0.2	< .01	30
9/6/1985 15:00	9	USGS-WRD	17	27	80020	24			< .01	0.07	< .01	< .01	0.02	< .01	30
5/15/1986 14:10	9	USGS-WRD	14	17.5	80020	38			< .01	< .01	< .01	0.01	< .01	< .01	
7/14/1986 15:10	9	USGS-WRD	19	21	80020	76				0.04	< .01	< .01	0.01	< .01	30
9/30/1986 14:00	9	USGS-WRD	10	15	80020	95									30
5/1/1987 13:30	9	USGS-WRD	9	24	80020	370			< .01	< .01	< .01	< .01	< .01	< .01	30
7/6/1987 19:10	9	USGS-WRD	23	23.5	80020	20			< .01	0.34	< .01	< .01	0.05	< .01	30
9/30/1987 8:00	9	USGS-WRD	4	5	80020	59			< .01	< .01	< .01	< .01	< .01	< .01	30
5/17/1988 10:30	9	USGS-WRD	8	20	1028	950									30

7/13/1988 7:00	9	USGS-WRD	14	16.5	1028	24									30
8/11/1988 18:55	9	USGS-WRD	20.5	26	80020	20			< .01	0.04	< .01	< .01	0.02	< .01	30
9/28/1988 13:35	9	USGS-WRD	12	21	80020	35			0.01	< .01	< .01	< .01	< .01	< .01	30
6/14/1989 14:35	9	USGS-WRD	16.5	26	80020	165			< .01	< .01	< .01	< .01	< .01	< .01	30
8/23/1989 14:40	9	USGS-WRD	21	32	80020	18			< .01	< .01	< .01	< .01	< .01	< .01	30
10/6/1989 9:00	9	USGS-WRD	8	16	80020	46	1	210							10
5/24/1990 16:30	9	USGS-WRD	15	24	1028	172		E 1900							
5/31/1990 16:00	9	USGS-WRD	11	26	1028	986		1200							30
8/21/1990 13:00	9	USGS-WRD	21	31	1028	40		380							

Water Quality Remark Code	Description
<	Actual value is known to be less than the value shown.
E	Estimated value

USGS 06279090 SHELL CREEK NEAR GREYBULL, WY

Big Horn County, Wyoming
Hydrologic Unit Code 10080010
Latitude 44°30'34", Longitude 108°02'52" NAD27
Drainage area 560.00 square miles

Sample Date	Sample Medium Code	Agency Collecting Sample, Code	Temperature, water, deg C -10	Temperature, air, deg C -20	Barometric pressure, mm Hg -25	Agency analyzing sample, code -28	Project number -29	Streamflow (ft^3/s) -60	Instantaneous discharge, cfs -61	Turbidity, JTU -70	Turbidity, NTU -76	Color, water, fltrd, Pt-Co units -80	Specif. conductance, wat unf uS/cm 25 degC -95	Dissolved oxygen, mg/L -300	pH, water, unfltrd field, std units -400	pH, water, unfltrd lab, std units -403	Carbon dioxide water, unfltrd mg/L -405	ANC, wat unf fixed end pt, field, mg/L as CaCO3 -410	Bicarbonate, wat unf fixed end pt, field, mg/L -440	Carbonate, wat unf fixed end pt, field, mg/L -445	Carbonate, wat flt incrm. titr., field, mg/L -452	Bicarbonate, wat flt incrm. titr., field, mg/L -453	Nitrate water, fltrd, mg/L as N -618	Nitrite + nitrate water fltrd, mg/L as N -631	Phosphorus, water, unfltrd mg/L -665	Phosphorus, water, fltrd, mg/L -666
01/15/51	9												932		8.0			192	234								
2/21/51	9												1090		7.8			189	231								
3/22/51	9												1050		7.5			178	217								
4/12/51	9												970		7.9			171	208								
5/24/51	9												387		7.2			134	163								
6/20/51	9												388		7.1			102	124								
7/13/51	9												726		7.2			136	166								
8/2/51	9												1560		7.3			196	239								
9/7/51	9												1550		7.2			187	228								
6/24/65	9		16.1					600																			
7/19/65	9		19.4					115					913		8.0				218	.0							
8/11/65	9		8.3					75					1320		7.5				218	.0							
9/27/65	9		8.3					146				1	978		7.8				206	.0							
10/18/65	9		9.4					120					995		7.8			180	220	.0							
11/23/65	9		1.7					94					1010		7.6			189	231	.0							
12/22/65	9		.0					92				4	906		7.9			204	249	.0							
1/24/66	9							57				2	905		7.9			209	255	.0							
2/16/66	9		.0					50				2	960		7.7			212	258	.0							
3/21/66	9		5.0					66					1020		7.8			196	239	.0							
3/21/66	9		5.0					66																			
4/7/66	9							41					1300		8.3			145	177	6							
5/5/66	9							94					833		7.9			162	198	.0							
6/3/66	9		15.6					260					613		8.0			117	143	.0							
7/8/66	9		25.0					26					2050		7.8			215	262	.0							
8/4/66	9		26.7					12					2480		7.9			217	264	.0							
8/31/66	9		20.0					19					2210		7.8			233	284	.0							
10/6/66	9							51					1650		8.0			198	242	.0							
11/3/66	9		3.9					47					1930		8.0			244	298	.0							
12/6/66	9		.6					64					1220		8.3			208	254	5							
12/6/66	9		.6					64																			
1/5/67	9		.0					77					1000		7.9			200	244	.0							
2/3/67	9		.0					75					1100		8.2			214	261	.0							
3/3/67	9							74				4	1200		8.3			189	231	5							
4/5/67	9		7.2					68					1070		8.1			192	234	.0							
5/8/67	9		16.7					66					928		8.2			182	222	.0							
6-06 00:00	9							1280					423		8.2			113	138	.0							
6-06 14:25	9		14.4					1280																			
7-19 00:00	9		21.1					155					810		7.3			156	190	.0							
8-03 00:00	9		18.3					48					1400		7.7			130	159	.0							
9-06 00:00	9		21.1					47					1480		8.0			208	253	.0							
0-11 14:50	9		12.0					107					1110		8.0			177	216	.0							
1-21 10:00	9		2.0					110					940		8.2			185	225	.0							
1-11 10:00	9		.0					50					833		8.1			189	230	.0							
2-02 11:30	9		.0					90					850		8.1			192	234	.0							
3-01 14:40	9		6.0					100					1110		7.9			190	232	.0							
4-05 14:00	9		8.0					70					879		8.2			187	228	.0							
5-01 13:45	9		13.0					80					1100		8.1			190	232	.0							
6-12 17:00	9		14.0					1300					389		8.2			121	148	.0							
7-10 16:00	9							220					681		8.1			142	173	.0							
8-06 00:00	9							72					939		8.5			177	200	8							

Sample Datetime	Sample Medium Code	Agency Collecting Sample, Code	Temperature, water, deg C (00010)	Temperature, air, deg C (00020)	Barometric pressure, mm Hg (00025)	Agency analyzing sample, code (00028)	Project number (00029)	Streamflow (ft^3/s) (00060)	Instantaneous discharge, cfs (00061)	Turbidity, JTU (00070)	Turbidity, NTU (00076)	Color, water, fltrd, Pt-Co units (00080)	Specif. conductance, wat unf uS/cm 25 degC (00095)	Dissolved oxygen, mg/L (00300)	pH, water, unfltrd field, std units (00400)	pH, water, unfltrd lab, std units (00403)	Carbon dioxide water, unfltrd mg/L (00405)	ANC, wat unf fixed end pt, field, mg/L as CaCO3 (00410)	Bicarbonate, wat unf fixed end pt, field, mg/L (00440)	Carbonate, wat unf fixed end pt, field, mg/L (00445)	Carbonate, wat flt incrm. titr., field, mg/L (00452)	Bicarbonate, wat flt incrm. titr., field, mg/L (00453)	Nitrate water, fltrd, mg/L as N (00618)	Nitrite + nitrate water fltrd, mg/L as N (00631)	Phosphorus, water, unfltrd mg/L (00665)	Phosphorus, water, fltrd, mg/L (00666)
9-17 15:50	9		14.0					166					761		7.3			148	180	.0							
0-02 16:30	9		11.0					126					895		7.8			169	206	.0							
1-05 16:45	9		3.0					127					855		7.9			172	210	.0							
2-19 15:15	9		1.0					60					794		7.5			176	215	.0							
2-13 14:45	9		.0					68					796		7.9			189	230	.0							
3-19 15:00	9		6.0					106					1040		7.9			174	212	.0							
4-21 14:30	9		16.0					120					663		7.9			165	201	.0							
5-19 17:00	9		12.0					752					340		7.7			94	114	.0							
6-23 15:45	9		18.0					246					677		7.9			133	162	.0							
7-29 13:10	9		21.0					81					1120		7.9			187	228	.0							
9-02 11:00	9		19.0					40					1610		8.1			212	259	.0							
0-08 12:20	9		11.0					91					1520		7.8			216	263	.0							
1-03 15:00	9		9.5					105					1120		7.8			196	239	.0							
2-01 14:00	9		.0					146					1040		7.8			205	250	.0							
2-11 15:10	9		.0					63					897		8.0			194	236	.0							
3-06 13:00	9		5.0					76					955		8.0			194	237	.0							.010
4-02 13:15	9		5.5					65					1080		8.4			196	225	7							
5-14 14:45	9		14.0					64					1130		8.2			174	212	.0							
6-04 17:30	9							886					295		8.0			81	99	.0							
7-14 12:25	9		18.0					84					994		8.4			173	199	6							
8-07 15:30	9		27.0					27					1570		8.1			174	212	.0							
9-15 11:00	9		9.5					107					1460		8.1			222	271	.0							
0-14 15:10	9		9.5					88					1320		7.8			203	247	.0							
1-06 13:45	9		5.0					101					1060		8.0			200	244	.0							
2-03 13:00	9		4.0					91					1080		7.6			195	238	.0							
1-08 12:00	9		.0					71					898		8.0			195	238	.0							
2-03 11:00	9		.0					66					899		8.0			199	243	.0							
4-14 17:00	9		17.0					74					803		8.1			165	201	.0							
5-24 15:30	9		17.5					114					832		8.3			145	177	.0							
6-10 16:45	9		15.0					1100					306		7.7			98	119	.0							
7-15 14:10	9		23.5					44					1190		8.0			186	227	.0							
8-06 15:50	9		27.5					44					1400		8.0			192	234	.0							
9-16 12:00	9		12.0					50					1500		7.9			194	237	.0							
0-19 14:30	9		10.0					160					1230		7.8			160	195	.0							
1-05 11:00	9		3.0					105					991		8.2			187	228	.0							
2-01 14:45	9		3.0					80					933		7.9			183	223	.0							
1-06 15:05	9		.0					72					914		7.9			198	242	.0							
2-07 14:25	9		.0					66					815		7.9			186	227	.0							
3-15 10:35	9		4.0					87					939		8.1			185	226	.0							
4-05 13:30	9		10.5					71					859		8.0			170	207	.0							
5-03 16:05	9		17.0					57					1070		7.9			176	214	.0							
6-01 16:15	9		13.5					1340					282		7.8			81	99	.0							
7-07 14:45	9		20.5					195					709		8.3			140	171	.0							
8-22 11:15	9		21.0					49					1640		8.0			210	256	.0							
9-07 13:15	9		19.5					37					1210		8.0			190	232	.0							
0-12 16:00	9		11.5					128					1000		8.0		3.4	176	214	.0			.32				
1-10 11:30	9		4.0					81					1200		8.0		3.8	195	238	.0			.50				
2-13 14:25	9		.0					79					902		7.8		6.1	198	241	.0			.61				
1-08 14:50	9		.0					53					983		7.8		6.6	215	262	.0			.59				
2-06 13:00	9		.0					81					853		8.0		3.7	190	232	.0			.38				

Sample Datetime	Sample Medium Code	Agency Collecting Sample, Code	Temperature, water, deg C (00010)	Temperature, air, deg C (00020)	Barometric pressure, mm Hg (00025)	Agency analyzing sample, code (00028)	Project number (00029)	Streamflow (ft^3/s) (00060)	Instantaneous discharge, cfs (00061)	Turbidity, JTU (00070)	Turbidity, NTU (00076)	Color, water, fltrd, Pt-Co units (00080)	Specif. conductance, wat unf uS/cm 25 degC (00095)	Dissolved oxygen, mg/L (00300)	pH, water, unfltrd field, std units (00400)	pH, water, unfltrd lab, std units (00403)	Carbon dioxide water, unfltrd mg/L (00405)	ANC, wat unf fixed end pt, field, mg/L as CaCO3 (00410)	Bicarbonate, wat unf fixed end pt, field, mg/L (00440)	Carbonate, wat unf fixed end pt, field, mg/L (00445)	Carbonate, wat flt incrm. titr., field, mg/L (00452)	Bicarbonate, wat flt incrm. titr., field, mg/L (00453)	Nitrate water, fltrd, mg/L as N (00618)	Nitrite + nitrate water fltrd, mg/L as N (00631)	Phosphorus, water, unfltrd mg/L (00665)	Phosphorus, water, fltrd, mg/L (00666)
3-05 13:45	9		.5					93					989		8.0		3.7	190	232	.0			.59			
4-02 12:40	9		8.0					72					942		8.2		2.2	182	222	.0			.34			
5-01 10:25	9		6.0					41					1200		8.2		2.5	200	244	.0			.18			
6-04 12:45	9		11.0					522					412		7.9		2.3	93	113	.0			.14			
6-14 13:30	9		16.0					1900					338		7.9		1.9	76	93	.0			.11			
6-26 12:15	9		20.0					498					424		8.1		1.4	92	112	.0			.11			
8-02 10:15	9		21.0					34					1500		8.2		2.3	190	231	.0			.05			
9-04 10:25	9		14.0					75					1420		8.3		2.1	212	259	.0			.54			
0-01 10:00	9		11.0						71				1300		8.1		2.9	190	232	.0			.29			
0-09 17:30	9		2.5						71	4			1400	11.2	8.1		2.9	190	232	.0			.43			
0-30 07:30	9		3.0						97	7			1050	11.5	8.3		1.9	190	232	.0			.32		< .010	
1-29 07:00	9		.0						83	6			988	11.7	8.2		2.4	195	238	.0			.50		.010	
1-15 09:00	9		.0						76	8			817	11.3	8.0		3.6	185	226	.0			.43		< .010	
2-19 13:40	9		.0						72	25			962	11.2	8.1		3.1	199	242	.0			.47		.010	
3-19 16:45	9		2.5						72	10			969	11.7	8.2		2.3	190	232	.0			.36		< .010	
4-22 18:15	9		15.0						31	40			1360	9.8	8.1		3.1	197	240	.0			.18		< .010	
5-20 13:45	9		10.0						157	170			813	8.8	8.0		2.9	150	183	.0			.27		.010	
6-18 13:00	9		15.5						1560	85			252	9.7	8.0		1.4	72	88	.0			.29		.010	
7-25 09:00	9		19.0						107	30			900	8.4	8.1		2.8	180	220	.0			.18		< .010	
8-19 12:00	9		17.5						28	2			1730	10.0	8.0		4.1	210	256	.0			.52		< .010	
9-19 11:30	9		13.0						51	2			1490	10.4	8.0		4.3	221	270	.0			.43		< .010	
0-18 10:30	9		10.0						55	1				10.4				213	260	.0			.45		< .010	
1-19 11:00	9		3.5						88	1				11.8				197	240	.0			.56		.010	
2-10 11:00	9		.0						82	1				12.8				213	260	.0			.47		< .010	
1-06 13:00	9		.0						77	2				12.9				205	250	.0			.54		.020	
2-04 12:00	9		.0						66	1				11.6				205	250	.0			2.90		.010	
3-04 17:00	9		.0						120	30				11.8				164	200	.0			1.80		.110	
4-16 11:00	9		7.5						75	200				10.4				156	190	.0			.56		.060	
5-05 11:00	9		10.0						75	40				10.2				189	230	.0			.16		.010	
6-02 11:00	9		12.5	19.0					192	30				9.8				139	170	.0			.09		.030	
6-30 12:20	9		12.0	31.0					2170	200				9.9				76	93	.0			.09		.030	
8-04 11:00	9		20.0						78	5				10.3				199	230	6			.07		.040	
9-07 10:00	9		15.0						44	3				8.9				213	260	.0			.23		.030	
0-05 10:00	9		12.0						43	2				9.8				221	270	.0			.27		.010	
1-09 11:00	9		3.0						111	2				12.2				189	230	.0			.36		.010	
2-07 10:30	9		1.5						119	5				11.2				197	240	.0			.54		.030	
1-11 11:00	9		.0						110	2				11.8				206	251	.0			.47		.020	
2-08 10:30	9		.0						85	10				9.6				230	280	.0			.61		.040	
3-09 10:30	9		.5						E 100	210				10.7				180	220	.0			.56		.270	
4-11 10:30	9		9.0						72	7				12.4				189	230	.0			.25		.040	
5-08 14:00	9		17.0						25	10				10.4				189	230	.0			.05		.010	
6-13 15:00	9		12.0						631	25				8.7				98	120	.0			.18		.050	
7-11 15:15	9		25.0						130	2				9.5				156	190	.0			.07		.030	
8-07 15:00	9		23.0						91	7				9.2				197	240	.0			.63		.060	
9-04 15:10	9		21.0						43	3				9.3				226	270	3			.00		.010	
0-02 15:30	9		15.5						77	3				10.4				197	240	.0			.47		.010	
1-08 12:30	9		7.0						103	1				10.3				197	240	.0			.41		.010	
2-12 11:00	9		.5						95	2				10.6				205	250	.0			.81		.020	
1-12 09:00	9		.0						105	3				10.6				205	250	.0			.56		.020	
2-08 09:30	9		.0						110	7				10.0				205	250	.0			.52		< .010	

Sample Datetime	Sample Medium Code	Agency Collecting Sample, Code	Temperature, water, deg C (00010)	Temperature, air, deg C (00020)	Barometric pressure, mm Hg (00025)	Agency analyzing sample, code (00028)	Project number (00029)	Streamflow (ft^3/s) (00060)	Instantaneous discharge, cfs (00061)	Turbidity, JTU (00070)	Turbidity, NTU (00076)	Color, water, fltrd, Pt-Co units (00080)	Specif. conductance, wat unf uS/cm 25 degC (00095)	Dissolved oxygen, mg/L (00300)	pH, water, unfltrd field, std units (00400)	pH, water, unfltrd lab, std units (00403)	Carbon dioxide water, unfltrd mg/L (00405)	ANC, wat unf fixed end pt, field, mg/L as CaCO3 (00410)	Bicarbonate, wat unf fixed end pt, field, mg/L (00440)	Carbonate, wat unf fixed end pt, field, mg/L (00445)	Carbonate, wat flt incrm. titr., field, mg/L (00452)	Bicarbonate, wat flt incrm. titr., field, mg/L (00453)	Nitrate water, fltrd, mg/L as N (00618)	Nitrite + nitrate water fltrd, mg/L as N (00631)	Phosphorus, water, unfltrd mg/L (00665)	Phosphorus, water, fltrd, mg/L (00666)
3-08 08:30	9		2.0						78	600				10.3				172	210	.0			.90		.550	
4-04 10:15	9		4.5						75	120				12.2				189	230	.0			.68		.120	
5-02 09:30	9		10.0						395	140				9.8				98	120	.0			.54		.160	
5-28 16:30	9		16.0						248	25				9.9				107	130	.0			.11		.090	
7-11 10:00	9		18.0						60	15				9.2				213	260	.0			.18		.050	
8-06 08:30	9		16.0						45	25				8.8				240	280	6			.00		.070	
9-02 13:40	9		17.5						57	15				10.2				221	270	.0			.18		.020	
0-02 16:15	9		13.0						53	8				10.8				180	220	.0			.36		.070	
1-12 16:30	9		5.0						76	4				9.3				250	300	.0			.72		< .010	
2-11 15:00	9		.5						105	5				9.5				210	260	.0			1.10		.010	
1-04 08:30	9		.0						E 100	1				11.7				220	270	.0			.88		< .010	
2-04 15:00	9		.0						E 100	1				9.8				200	250	.0			.47		.010	
3-05 14:30	9		.0						E 80	15				11.8				200	240	.0			.56		.230	
4-01 15:15	9		13.0						118	500				9.3				190	230	.0			.72		.260	
5-13 16:00	9		15.0						97	25				9.8				160	200	.0			.16		.120	
6-10 16:00	9		10.0						2350	500			275	9.2	8.2		.6	51	62	.0			.52		.930	
7-22 15:40	9		18.0						186	20			750	10.0	8.6		.6	130	160	.0			.36		.060	
8-19 15:30	9		19.0						121	7			1000	10.2	8.2		2.1	170	210	.0			.29		.050	
9-17 09:10	9		12.0						115	30			1000	10.8	8.1		2.9	190	230	.0			.56		.100	
0-15 09:15	9		5.0						115	6			890	10.8	8.1		2.8	180	220	.0			.25		.050	
1-12 09:00	9		.0						95				950		8.3		2.0	200	250	.0			.59		.020	
2-10 09:00	9		.0						100				950		7.9		5.0	200	250	.0			.66		.010	
1-10 08:15	9		.0						80				840		7.6		9.6	200	240	.0			.75		.020	
2-04 17:15	9		.0						50				830		7.6		9.6	200	240	.0			.50		.060	
3-18 09:50	9		2.0						252				1300		7.9		3.2	130	160	.0			2.70		2.20	
4-18 08:30	9		11.0						95				1010		8.2		2.2	180	210	3			.09		.070	
6-12 16:45	9		16.5			80020			850				340		7.8		2.4	77	94	.0			.11		.120	
7-21 17:00	9		28.0			80020			36				1580		8.2		2.6	210	260	.0			.20		.020	
8-23 10:40	9		17.0			80020			109				1380		8.1		3.3	210	260	.0			.52		.180	
9-17 10:00	9		13.0			80020			44				1800		8.0		3.4	170	210	.0			.11		.020	
0-04 13:00	9		11.0			80020			71				1500		8.2		2.4	200	240	.0				.400	.020	
0-24 13:00	9		10.0						67				1450		8.4		1.6	200	250	.0				.500	.010	
2-03 09:00	9		.0						50				1100		7.9		5.4	220	270	.0				.600	.000	
1-02 08:55	9		.0						E 35				900		8.2		2.5	200	250	.0				.670	.020	
2-20 13:00	9		.0						40									170	210	.0				.830	.020	
3-31 09:25	9		4.0						56				1150		7.9		4.4	180	220	.0				.510	.010	
5-06 12:20	9		19.0			80020			22				1550		8.5		1.3	210	260	.0				.050	.020	
6-05 14:15	9		15.0			80020			640				390		7.9		2.0	82	100	.0				.460	.380	
7-01 12:10	9		20.0			80020			85				1200		7.2		19	160	190	.0				.050	.020	
8-05 11:00	9		13.0			80020			37				2080		8.2		2.6	210	260	.0				.090	.020	
9-04 09:20	9		13.0			85641			15				1700		7.9		5.2	210	260	.0				.440	.010	
0-10 11:00	9		8.0	12.0		85641			48				1320		7.5	7.9	12		240	.0				.270	.010	
1-12 09:15	9		4.5	4.0		85641			61				1140		7.1	8.1	31		240	.0				.450	.050	
2-04 12:00	9		.5			85641			54				1250		7.9	8.0	4.8		240	.0				.660	.080	
2-30 14:15	9		3.0	12.0		85641			35				1260		8.0	7.9	3.5		220	.0				.510	.010	
2-26 09:30	9		2.5			85641			38				1100		8.2	7.9	2.4		240	.0				.480	.020	
3-24 14:20	9		12.0	15.5		85641			28				1650		8.2	8.0	2.5		250	.0				.380	.020	
4-20 09:00	9		9.0			85641			15							8.2			300	.0				.050	.070	
5-28 10:50	9		9.0			85641			1600							8.0			110	.0				.470	.140	
6-23 08:15	9		18.0	18.0		80020			240							7.9			140	.0				.160	.020	

Sample Datetime	Sample Medium Code	Agency Collecting Sample, Code	Temperature, water, deg C (00010)	Temperature, air, deg C (00020)	Barometric pressure, mm Hg (00025)	Agency analyzing sample, code (00028)	Project number (00029)	Streamflow (ft^3/s) (00060)	Instantaneous discharge, cfs (00061)	Turbidity, JTU (00070)	Turbidity, NTU (00076)	Color, water, fltrd, Pt-Co units (00080)	Specif. conductance, wat unf uS/cm 25 degC (00095)	Dissolved oxygen, mg/L (00300)	pH, water, unfltrd field, std units (00400)	pH, water, unfltrd lab, std units (00403)	Carbon dioxide water, unfltrd mg/L (00405)	ANC, wat unf fixed end pt, field, mg/L as CaCO3 (00410)	Bicarbonate, wat unf fixed end pt, field, mg/L (00440)	Carbonate, wat unf fixed end pt, field, mg/L (00445)	Carbonate, wat flt incrm. titr., field, mg/L (00452)	Bicarbonate, wat flt incrm. titr., field, mg/L (00453)	Nitrate water, fltrd, mg/L as N (00618)	Nitrite + nitrate water fltrd, mg/L as N (00631)	Phosphorus, water, unfltrd mg/L (00665)	Phosphorus, water, fltrd, mg/L (00666)
8-03 12:00	9		20.0	27.0		80020			40							8.2			270	.0				.030	.060	
9-15 08:55	9		15.0	17.5		80020			34							8.2			300	.0				.290	.080	
0-14 10:15	9	WY-DA	7.0	9.5		85641			99							8.2			250	.0				.610	.140	
2-08 09:45	9	WY-DA	.0	-10.0		85641			25							7.9								.500	.010	
4-13 09:00	9	USGS-WRD	9.5			1028			67							8.1								.400	.090	
7-08 14:10	9	USGS-WRD	17.0	24.5		1028			280							7.6								.500	.080	
0-07 08:50	9	USGS-WRD	7.0	12.0		1028			152							8.1								.200	.080	
1-07 09:00	9	USGS-WRD	.0	5.0		1028			26							8.1								.600	.010	
3-22 14:30	9	USGSNWQL	5.0	10.0		85641			77							8.1								.300	.040	
6-14 12:30	9	USGSNWQL	10.0	20.0		85641			855							8.0								.200	.140	
0-03 17:20	9	USGSNWQL	13.0	14.0		85641			112							8.3								.400	.060	
1-10 15:00	9	USGSNWQL	.0	3.5		85641			62							8.0								.600	.000	
4-04 11:00	9	USGSNWQL	5.0	10.5		85641			77							8.2								.300	.020	
6-25 17:40	9	USGSNWQL	10.5	34.0		85641			827							7.7								.200	.010	
0-12 15:50	9	USGSNWQL	12.0	18.0		85641			82							8.1								.400	.070	
1-07 16:00	9	USGSNWQL	.0	-5.0		85641			66							8.2								.600	.000	
5-16 07:30	9	USGSNWQL	13.0	10.0		85641			101							8.0								.100	.110	
8-19 11:20	9	USGSNWQL	18.0	24.0		85641			56							8.2								.000	.050	
0-10 14:40	9	USGSNWQL	5.0	15.0		80020			104							8.1								.500	.100	
1-07 14:00	9	USGS-WRD	.0	13.0		1028			57							8.0								.600	.020	
4-03 08:30	9	USGS-WRD	4.5	4.5		1028			65							8.2								.200	.040	
6-23 08:10	9	USGS-WRD	14.0	22.5		85641			268							8.7								.200	.110	
7-18 14:30	9	USGS-WRD	24.5	29.0	667	1028	14620		27		18		1540	8.1	8.4						6	253				

Water Quality Remark Code	Description
<	Actual value is known to be less than the value shown.
E	Estimated value

Hard-ness, water, mg/L as CaCO3 -900	Noncarb hard-ness, wat unf field, mg/L as CaCO3 -902	Calcium water, fltrd, mg/L -915	Magnes-ium, water, fltrd, mg/L -925	Sodium, water, fltrd, mg/L -930	Sodium adsorp-tion ratio -931	Sodium frac-tion of cations percent -932	Potas-sium, water, fltrd, mg/L -935	Chlor-ide, water, fltrd, mg/L -940	Sulfate water, fltrd, mg/L -945	Fluor-ide, water, fltrd, mg/L -950	Silica, water, fltrd, mg/L -955	Boron, water, fltrd, ug/L -1020	Iron, water, unfltrd recover-able, ug/L (01045)	Iron, water, fltrd, ug/L (01046)	Mangan-ese, water, unfltrd recover-able, ug/L (01055)	Fecal coli-form, M-FC 0.45uMF col/ 100 mL (31616)	Fecal coli-form, M-FC 0.7u MF col/ 100 mL (31625)	E coli, m-TEC MF, water, col/ 100 mL (31633)	Phen-olic com-pounds, water, unfltrd ug/L (32730)	2,4-Di-methyl-phenol, bed sedimnt ug/kg (34609)	Alka-linity, wat flt inc tit field, mg/L as CaCO3 (39086)	2,4-D, water, unfltrd ug/L (39730)	2,4-D, bed sedimnt ug/kg (39731)	2,4,5-T water, unfltrd ug/L (39740)	2,4,5-T bed sedimnt ug/kg (39741)	Silvex, water, unfltrd ug/L (39760)
400	210	101	36.0					3.5	333	.40	11.0	200	40							8000							
420	230	117	30.0					5.5	388	.20	10.0	150	80							7500							
410	230	102	37.0					4.5	373	.30	14.0	350	80							1000							
390	220	93.0	38.0					4.0	350	.20	8.30	100	60							7800							
170	39	56.0	8.10					.6	64.0	.10	8.40	50	20							7600							
160	57	46.0	11.0					1.1	93.0	.40	7.50	60	40							4000							
280	150	74.0	24.0					2.3	250	.20	11.0	130	40							2000							
620	420	163	51.0					8.2	678	.40	11.0	330	20							2000							
610	430	158	54.0					7.8	695	.40	12.0	300	20							7800							
380	200	133	11.0	70.0	2		2.50	1.4	346	.50	10.0	210								8000							
530	350	107	64.0	80.0	2		4.20	2.5	525	.70	10.0	220								7500							
400	230	102	34.0	74.0	2		1.90	2.8	360	.20	8.90	140								1000							
410	230	100	39.0	62.0	1	25	3.20	3.5	360	.50	8.60	160								7800							
400	210	89.0	42.0	70.0	2	28	3.00	6.0	333	.50	9.00	130								7600							
390	190	98.0	36.0	54.0	1	23	1.40	1.6	280	.20	10.0	140			120					4000							
390	180	98.0	36.0	53.0	1	23	1.50	2.4	276	.30	11.0	110								2000							
410	200	103	37.0	60.0	1	24	1.50	2.0	304	.30	12.0	150								2000							
400	210	102	36.0	81.0	2	30	2.20	2.7	374	.30	14.0	150								7800							
490	340	112	52.0	109	2	32	2.50	7.1	559	.70	8.30	150								8300							
340	180	77.0	37.0	55.0	1	25	6.00	5.7	274	.30	10.0	50								7900							
240	130	66.0	19.0	37.0	1	25	1.60	5.3	197	.30	7.80	70								8000							
800	590	206	70.0	200	3	35	4.50	7.1	1000	.90	8.40	300								7800							
970	760	251	85.0	227	3	33	5.10	5.6	1220	.60	10.0	430								7900							
910	680	246	72.0	230	3	35	4.60	5.0	1080	.50	11.0	440								7800							
690	490	190	53.0	146	2	31	3.00	3.5	760	.40	9.90	360	10														
820	580	217	68.0	179	3	32	3.30	3.7	926	.40	9.90	370															
520	300	134	44.0	97.0	2	29	1.60	3.0	469	.40	10.0	140															
450	250	144	21.0	63.0	1	23	1.50	2.3	360	.20	10.0	140															
460	250	124	37.0	84.0	2	28	1.70	2.6	405	.20	10.0	170															
460	270	127	36.0	103	2	32	3.30	4.8	457	.30	10.0	160															
430	240	133	25.0	86.0	2	30	2.00	1.8	394	.10	8.00	170															
380	200	109	27.0	66.0	2	27	4.00	2.2	325	.20	6.70	130															
180	64	54.0	10.0	19.0	.6	19	1.70	1.0	102	.50	7.20	50															
340	180	92.0	27.0	47.0	1	23	2.20	2.0	286	.40	9.00	110															
580	450	147	52.0	105	2	28	4.00	3.3	645	.70	15.0	220															
610	400	174	42.0	133	2	32	3.90	2.7	631	.30	10.0	310															
460	290	132	32.0	83.0	2	28	2.00	2.5	428	.40	9.10	160	50														
400	220	113	30.0	63.0	1	25	1.50	1.9	334	.20	9.60	130	20														
370	180	96.0	31.0	47.0	1	22	1.50	2.0	269	.30	9.70	110	50														
370	180	97.0	32.0	49.0	1	22	1.10	2.7	276	.30	10.0	100	30														
420	230	109	37.0	97.0	2	33	2.20	3.8	404	.60	9.70	150		240													
380	190	103	29.0	58.0	1	25	1.50	4.7	291	.20	8.60	100	.0														
440	250	120	35.0	90.0	2	31	1.80	2.9	425	.30	6.80	170	10														
170	52	46.0	14.0	16.0	.5	17	1.70	2.5	84.0	.40	7.40	70	130														
250	110	71.0	18.0	32.0	.9	22	1.90	1.7	184	.20	9.50	90	110														
390	220	103	33.0	62.0	1	25	2.10	1.9	349	.30	11.0	140	260														

Hard-ness, water, mg/L as CaCO3 (00900)	Noncarb hard-ness, wat unf field, mg/L as CaCO3 (00902)	Calcium water, fltrd, mg/L (00915)	Magnes-ium, water, fltrd, mg/L (00925)	Sodium, water, fltrd, mg/L (00930)	Sodium adsorp-tion ratio (00931)	Sodium frac-tion of cations percent (00932)	Potas-sium, water, fltrd, mg/L (00935)	Chlor-ide, water, fltrd, mg/L (00940)	Sulfate water, fltrd, mg/L (00945)	Fluor-ide, water, fltrd, mg/L (00950)	Silica, water, fltrd, mg/L (00955)	Boron, water, fltrd, ug/L (01020)	Iron, water, unfltrd recover-able, ug/L (01045)	Iron, water, fltrd, ug/L (01046)	Mangan-ese, water, unfltrd recover-able, ug/L (01055)	Fecal coli-form, M-FC 0.45uMF col/ 100 mL (31616)	Fecal coli-form, M-FC 0.7u MF col/ 100 mL (31625)	E coli, m-TEC MF, water, col/ 100 mL (31633)	Phen-olic com-pounds, water, unfltrd ug/L (32730)	2,4-Di-methyl-phenol, bed sedimnt ug/kg (34609)	Alka-linity, wat flt inc tit field, mg/L as CaCO3 (39086)	2,4-D, water, unfltrd ug/L (39730)	2,4-D, bed sedimnt ug/kg (39731)	2,4,5-T water, unfltrd ug/L (39740)	2,4,5-T bed sedimnt ug/kg (39741)	Silvex, water, unfltrd ug/L (39760)
300	160	64.0	35.0	46.0	1	25	1.40	1.8	244	.40	12.0	120	20														
370	200	113	21.0	67.0	2	28	1.90	2.4	316	.30	8.20	170	50														
360	190	99.0	27.0	52.0	1	24	1.90	2.4	288	.50	8.70	130	70														
350	170	90.0	30.0	45.0	1	22	1.40	1.9	252	.30	9.20	80	30														
350	160	94.0	28.0	42.0	1	21	2.60	3.0	246	.20	8.50	70	80														
410	240	103	37.0	92.0	2	33	2.10	3.7	408	.90	9.20	150	280														
290	120	74.0	25.0	37.0	.9	22	1.00	1.8	197	.20	8.00	110	40	40													
140	48	42.0	9.00	15.0	.5	19	1.10	.8	76.0	.20	5.80	30	100														
280	140	73.0	23.0	40.0	1	24	1.80	1.5	217	.20	9.20	100	20														
470	280	117	43.0	84.0	2	28	1.90	2.7	430	.20	9.90	180	60														
680	470	178	57.0	140	2	31	4.00	3.7	750	.40	11.0	410	40														
630	420	162	55.0	138	2	32	2.90	3.7	670	.40	18.0	290	70														
480	280	134	35.0	79.0	2	26	2.00	3.0	422	.30	9.50	170	70														
450	250	118	38.0	64.0	1	23	2.10	2.5	354	.30	10.0	160	90														
390	200	100	34.0	51.0	1	22	2.30	2.4	297	.90	9.50	130	.0														
400	210	101	36.0	62.0	1	25	1.70	2.6	330	1.10	9.30	100	60														
470	270	125	38.0	70.0	1	24	2.20	3.1	400	1.10	8.90	130	110														
420	250	105	39.0	98.0	2	33	2.20	4.9	434	1.20	7.30	210	130														
120	42	34.0	9.20	13.0	.5	19	1.40	3.7	63.0	.30	7.20	40	170														
390	220	102	34.0	65.0	1	26	2.40	2.0	359	.40	9.30	220	50														
640	470	167	55.0	128	2	30	3.80	2.8	700	.50	11.0	320	30														
610	390	161	51.0	111	2	28	3.40	4.0	604	.40	10.0	190	50														
560	360	140	48.0	100	2	28	2.30	2.9	570	.40	12.0	250	80														
440	240	120	36.0	75.0	2	27	2.00	3.2	400	.60	11.0	10	50														
420	220	110	34.0	70.0	2	27	1.80	3.2	380	.40	10.0	180															
420	220	110	37.0	48.0	1	20	1.10	3.2	290	.50	11.0	90	10														
400	200	69.0	55.0	50.0	1	21	1.80	3.2	310	.40	13.0	100	40														
370	200	90.0	34.0	52.0	1	24	2.20	4.9	300	.50	7.60	110	90														
360	220	88.0	34.0	62.0	1	27	2.20	4.4	330	.40	6.30	140	170														
140	42	41.0	8.80	13.0	.5	17	1.30	1.1	65.0	.20	5.30	30	440														
510	320	130	41.0	98.0	2	30	3.30	4.1	530	.60	9.50	170	10														
560	370	150	46.0	130	2	33	3.10	3.3	610	.60	11.0	220	30														
660	470	170	58.0	120	2	28	3.30	3.8	700	.60	9.40	210	220														
450	290	130	33.0	110	2	34	4.40	7.3	500	.50	13.0	150		80													
420	230	110	36.0	64.0	1	25	2.00	3.8	370	.40	8.40	130		.0													
400	220	100	35.0	56.0	1	24	1.30	4.2	330	.40	7.80	80		110													
400	200	100	36.0	50.0	1	21	1.30	2.1	300	.40	9.70	140		50													
370	180	95.0	32.0	44.0	1	21	1.10	2.7	260	.40	12.0	110		10													
410	220	100	38.0	63.0	1	25	1.60	5.0	340	.40	8.60	110		20													
370	200	93.0	33.0	52.0	1	23	1.40	3.6	290	.30	7.80	90		200													
460	280	100	48.0	76.0	2	27	2.30	3.8	420	.60	6.90	190		120													
120	39	34.0	8.40	12.0	.5	18	1.20	2.7	63.0	.10	7.90	30		60													
290	150	77.0	24.0	40.0	1	23	1.60	2.0	230	.40	8.50	110		.0													
690	480	180	61.0	140	2	30	4.00	5.0	750	.70	10.0	230		100													
500	310	130	46.0	82.0	2	26	3.30	4.0	460	.50	8.70	220		260													
430	250	120	34.0	61.0	1	23	2.10	2.0	370	.40	10.0	140		100													
500	310	130	43.0	85.0	2	27	1.90	4.3	480	.50	11.0	190		190													
400	200	110	34.0	52.0	1	21	2.10	2.7	300	.40	10.0	120		130													
450	240	120	39.0	59.0	1	22	1.90	3.7	350	.40	11.0	120		140													
380	190	99.0	31.0	47.0	1	21	1.60	2.7	280	.40	9.60	100		50													

Hard-ness, water, mg/L as CaCO3 (00900)	Noncarb hard-ness, wat unf field, mg/L as CaCO3 (00902)	Calcium water, fltrd, mg/L (00915)	Magnes-ium, water, fltrd, mg/L (00925)	Sodium, water, fltrd, mg/L (00930)	Sodium adsorp-tion ratio (00931)	Sodium frac-tion of cations percent (00932)	Potas-sium, water, fltrd, mg/L (00935)	Chlor-ide, water, fltrd, mg/L (00940)	Sulfate water, fltrd, mg/L (00945)	Fluor-ide, water, fltrd, mg/L (00950)	Silica, water, fltrd, mg/L (00955)	Boron, water, fltrd, ug/L (01020)	Iron, water, unfltrd recover-able, ug/L (01045)	Iron, water, fltrd, ug/L (01046)	Mangan-ese, water, unfltrd recover-able, ug/L (01055)	Fecal coli-form, M-FC 0.45uMF col/ 100 mL (31616)	Fecal coli-form, M-FC 0.7u MF col/ 100 mL (31625)	E coli, m-TEC MF, water, col/ 100 mL (31633)	Phen-olic com-pounds, water, unfltrd ug/L (32730)	2,4-Di-methyl-phenol, bed sedimnt ug/kg (34609)	Alka-linity, wat flt inc tit field, mg/L as CaCO3 (39086)	2,4-D, water, unfltrd ug/L (39730)	2,4-D, bed sedimnt ug/kg (39731)	2,4,5-T water, unfltrd ug/L (39740)	2,4,5-T bed sedimnt ug/kg (39741)	Silvex, water, unfltrd ug/L (39760)
400	210	100	35.0	70.0	2	28	1.90	4.0	330	.40	9.70	110		160													
400	220	100	36.0	64.0	1	26	1.60	5.3	330	.40	8.60	120		160													
490	290	120	46.0	89.0	2	28	2.10	6.3	470	.50	7.70	160		120													
170	77	46.0	12.0	20.0	.7	21	1.20	1.8	120	.20	5.80	60		130													
140	64	38.0	10.0	13.0	.5	17	1.20	3.9	82.0	.20	6.10	60		170													
180	88	50.0	12.0	18.0	.6	18	1.20	2.5	120	.30	8.20	70		160													
630	440	170	51.0	110	2	27	3.50	4.2	670	.60	10.0	250		100													
580	370	150	48.0	110	2	29	3.50	3.5	610	.60	12.0	200		100													
530	340	140	42.0	110	2	31	2.30	4.6	550	.50	8.90	190		100													
630	440	140	66.0	96.0	2	25	2.60	3.1	620	.50	6.90	< 20		< 10													
440	250	120	37.0	64.0	1	23	2.10	3.4	360	.40	11.0					72											
430	240	110	37.0	60.0	1	23	1.60	3.1	330	.40	9.90					120											
360	180	92.0	31.0	42.0	1	20	1.40	3.4	260	.30	10.0					90											
400	200	100	36.0	65.0	1	26	1.60	2.7	340	.40	11.0					94											
390	200	120	25.0	65.0	1	26	1.60	5.7	330	.80	8.60					E 19											
580	380	139	55.0	109	2	29	2.60	5.7	590	.50	8.00					68											
330	180	88.0	27.0	48.0	1	24	2.10	1.8	280	.30	8.60					1600											
100	28	32.0	5.50	9.10	.4	16	1.20	< .1	48.0	.20	5.00					1600											
400	220	109	32.0	52.0	1	22	2.30	1.8	320	.40	9.30					220											
730	520	190	61.0	150	2	31	3.70	1.8	830	.70	8.40					76											
690	470	170	66.0	110	2	25	3.00	1.8	690	.60	10.0					E 8											
630	420	160	54.0	92.0	2	24	2.30	7.3	560	.70	7.50					40											
480	280	120	43.0	68.0	1	24	1.90	9.1	410	.30	9.80					E 13											
500	290	120	46.0	58.0	1	20	2.30	7.3	400	.40	9.60					28											
440	240	110	38.0	50.0	1	20	1.60	5.4	320	.40	8.90					38											
440	240	110	40.0	47.0	1	19	1.60	7.1	310	.30	9.80					61											
410	250	100	37.0	110	2	37	5.10	7.1	450	.50	9.10					160											
420	260	110	34.0	95.0	2	33	2.10	3.6	430	.50	9.60					640											
380	190	99.0	33.0	59.0	1	25	1.60	1.8	330	.40	7.60					110											
230	91	59.0	20.0	34.0	1	24	1.90	1.8	150	.30	7.30					750											
120	44	35.0	7.10	9.60	.4	15	1.40	1.8	55.0	.10	5.70					1800											
450	250	120	36.0	72.0	2	26	3.00	1.8	420	.40	8.50					380											
600	390	160	51.0	99.0	2	26	2.80	4.3	600	.50	9.20					120											
700	480	190	55.0	140	2	30	3.70	5.4	780	.70	10.0					E 500											
450	260	120	36.0	59.0	1	22	1.60	2.1	360	.50	9.00					E 8											
420	220	110	36.0	66.0	1	25	1.90	5.3	350	.50	10.0					38											
390	180	100	33.0	53.0	1	23	2.30	1.7	310	.40	10.0					34											
440	210	110	39.0	53.0	1	21	2.30	2.8	330	.50	11.0					28											
360	180	94.0	30.0	78.0	2	32	3.50	4.2	330	.50	9.50					48											
380	190	94.0	34.0	59.0	1	25	1.90	4.3	300	.40	7.50					54											
450	260	110	41.0	100	2	33	3.00	4.7	460	.60	4.00					E 18											
180	82	49.0	14.0	22.0	.7	21	1.40	1.9	110	.30	7.00					120											
350	190	94.0	29.0	50.0	1	23	1.40	3.7	280	.50	9.10					92											
470	270	130	37.0	75.0	2	25	2.80	3.7	420	.60	11.0					110											
630	400	170	51.0	130	2	31	4.40	6.6	690	.80	9.30					110											
520	320	130	44.0	97.0	2	29	2.80	4.7	510	.60	9.30						76										
420	220	110	37.0	64.0	1	24	2.30	2.5	350	.50	8.30						E 8										
420	220	110	37.0	60.0	1	23	2.30	2.8	330	.50	9.40						72										
380	180	100	33.0	50.0	1	22	1.90	6.8	250	.40	11.0						48										
370	170	96.0	32.0	52.0	1	23	1.40	3.0	250	.40	10.0																

Hard-ness, water, mg/L as CaCO3 (00900)	Noncarb hard-ness, wat unf field, mg/L as CaCO3 (00902)	Calcium water, fltrd, mg/L (00915)	Magnes-ium, water, fltrd, mg/L (00925)	Sodium, water, fltrd, mg/L (00930)	Sodium adsorp-tion ratio (00931)	Sodium frac-tion of cations percent (00932)	Potas-sium, water, fltrd, mg/L (00935)	Chlor-ide, water, fltrd, mg/L (00940)	Sulfate water, fltrd, mg/L (00945)	Fluor-ide, water, fltrd, mg/L (00950)	Silica, water, fltrd, mg/L (00955)	Boron, water, fltrd, ug/L (01020)	Iron, water, unfltrd recover-able, ug/L (01045)	Iron, water, fltrd, ug/L (01046)	Mangan-ese, water, unfltrd recover-able, ug/L (01055)	Fecal coli-form, M-FC 0.45uMF col/ 100 mL (31616)	Fecal coli-form, M-FC 0.7u MF col/ 100 mL (31625)	E coli, m-TEC MF, water, col/ 100 mL (31633)	Phen-olic com-pounds, water, unfltrd ug/L (32730)	2,4-Di-methyl-phenol, bed sedimnt ug/kg (34609)	Alka-linity, wat flt inc tit field, mg/L as CaCO3 (39086)	2,4-D, water, unfltrd ug/L (39730)	2,4-D, bed sedimnt ug/kg (39731)	2,4,5-T water, unfltrd ug/L (39740)	2,4,5-T bed sedimnt ug/kg (39741)	Silvex, water, unfltrd ug/L (39760)
360	190	93.0	30.0	94.0	2	36	2.60	.4	380	.60	9.60						E 480										
340	150	84.0	32.0	81.0	2	34	2.10	< .1	320	.40	7.80						230										
160	62	43.0	12.0	17.0	.6	19	1.40	2.6	79.0	.20	6.30						420										
200	93	54.0	16.0	32.0	1	26	1.40	2.4	160	.30	5.40						200										
540	330	140	46.0	110	2	31	4.10	16.0	500	.60	8.80						110										
650	410	170	58.0	140	2	31	4.10	5.1	720	.80	15.0						E 410										
520	300	130	46.0	140	3	37	4.50	22.0	560	.90	9.40						370										
650	470	160	59.0	130	2	30	4.00	6.4	710	.60	11.0						88										
470	220	120	40.0	95.0	2	31	2.10	4.6	420	.50	9.90						E 48										
490	280	180	8.50	74.0	2	25	2.10	3.2	410	.40	14.0						E 30										
430	210	110	36.0	67.0	1	26	2.00	6.3	340	.50	12.0						27										
420	220	110	35.0	60.0	1	24	1.10	13.0	310	.30	9.40						E 85										
390	190	100	33.0	58.0	1	25	1.80	4.7	290	.40	10.0						31										
410	220	100	37.0	120	3	39	2.20	5.3	450	.50	9.40						E 590										
290	130	73.0	27.0	52.0	1	28	1.50	3.0	230	.40	12.0						E 130										
110	59	30.0	7.50	14.0	.6	22	1.70	3.8	76.0	.20	< .100						E 960										
290	160	80.0	22.0	48.0	1	26	.30	3.7	260	.40	7.00						250										
430	260	120	31.0	80.0	2	29	2.80	3.3	420	.50	7.30						170										
430	240	120	32.0	74.0	2	27	2.30	3.7	380	.40	8.50						150										
400	220	98.0	37.0	88.0	2	32	1.90	2.9	370	.50	6.30						E 40										
470	270	130	36.0	74.0	2	25	1.80	1.8	420	.50	3.60																
390	190	110	31.0	63.0	1	25	1.50	1.8	300	.40	9.30																
360	160	96.0	30.0	46.0	1	22	1.40	.7	260	.40	10.0																
350	150	97.0	27.0	48.0	1	23	1.10	14.0	220	.50	8.90																
360	230	100	27.0	150	3	47	4.30	7.7	550	.70	5.50																
360	180	93.0	32.0	74.0	2	30	4.30	4.9	350	.50	1.70																
120	43	33.0	9.30	18.0	.7	24	.80	< .1	85.0	.20	4.40												.00	.0	.00	.0	.00
620	410	170	47.0	140	2	33	3.90	4.3	700	.70	7.70												.16	.0	.00	.0	.00
560	350	160	39.0	110	2	30	3.80	3.4	550	.60	10.0												.00		.00		.00
570	400	150	46.0	140	3	35	3.80	4.3	680	.60	3.60												.00	.0	.00	.0	.00
630	430	180	43.0	74.0	1	20	2.80	5.2	560	.50	10.0										.0		.00	.0	.00	.0	.00
570	370	150	47.0	110	2	30	3.00	4.3	580	.50	9.10																
440	220	120	36.0	68.0	1	25	2.80	5.2	330	.50	10.0																
410	210	120	29.0	49.0	1	20	1.80	2.8	290	.40	9.80																
350	180	93.0	28.0	42.0	1	21	2.00	3.1	250	.40	9.60																
420	240	120	32.0	67.0	1	25	1.90	2.8	360	.50	8.20																
510	300	120	48.0	160	3	41	2.90	7.0	630	.60	8.10										.0		.00	.0	.01	.0	.00
160	78	48.0	10.0	22.0	.8	23	1.00	.7	110	.40	6.80										.0			.0	.00	.0	.00
440	280	120	35.0	71.0	2	26	2.10	2.7	400	.60	10.0										.0		.37	.0	.00	.0	.00
680	470	190	51.0	140	2	31	4.00	3.1	710	.70	8.20										.0		.00	.0	.00	.0	.00
630	420	160	54.0	110	2	28	3.60	3.2	660	.60	10.0										.0		.04	.0	.00	.0	.00
530	330	140	42.0	83.0	2	26	2.20	3.6	480	.50	6.20																
450	250	120	35.0	76.0	2	27	1.20	.5	380	.30	2.20																
400	200	100	34.0	65.0	1	27	2.00	1.8	340	.60	5.10																
390	210	99.0	36.0	66.0	1	27	1.70	2.4	340	.50	14.0																
440	240	110	37.0	63.0	1	24	1.60	3.6	350	.60	8.40																
590	390	150	53.0	150	3	35	2.80	7.3	650	.60	7.50																
800	550	200	74.0	280	4	43	4.60	14.0	1100	.90	5.80																
130	40	35.0	11.0	18.0	.7	23	1.50	.7	83.0	.30	57.0																
210	95	58.0	15.0	30.0	.9	24	1.80	13.0	140	.30	5.60										.0		.00	.0	.00	.0	.00

Hard-ness, water, mg/L as CaCO3 (00900)	Noncarb hard-ness, wat unf field, mg/L as CaCO3 (00902)	Calcium water, fltrd, mg/L (00915)	Magnes-ium, water, fltrd, mg/L (00925)	Sodium, water, fltrd, mg/L (00930)	Sodium adsorp-tion ratio (00931)	Sodium frac-tion of cations percent (00932)	Potas-sium, water, fltrd, mg/L (00935)	Chlor-ide, water, fltrd, mg/L (00940)	Sulfate water, fltrd, mg/L (00945)	Fluor-ide, water, fltrd, mg/L (00950)	Silica, water, fltrd, mg/L (00955)	Boron, water, fltrd, ug/L (01020)	Iron, water, unfltrd recover-able, ug/L (01045)	Iron, water, fltrd, ug/L (01046)	Mangan-ese, water, unfltrd recover-able, ug/L (01055)	Fecal coli-form, M-FC 0.45uMF col/ 100 mL (31616)	Fecal coli-form, M-FC 0.7u MF col/ 100 mL (31625)	E coli, m-TEC MF, water, col/ 100 mL (31633)	Phen-olic com-pounds, water, unfltrd ug/L (32730)	2,4-Di-methyl-phenol, bed sedimnt ug/kg (34609)	Alka-linity, wat flt inc tit field, mg/L as CaCO3 (39086)	2,4-D, water, unfltrd ug/L (39730)	2,4-D, bed sedimnt ug/kg (39731)	2,4,5-T water, unfltrd ug/L (39740)	2,4,5-T bed sedimnt ug/kg (39741)	Silvex, water, unfltrd ug/L (39760)
640	420	170	54.0	130	2	30	3.70	4.3	690	.90	13.0												.02	.0	.00	.0	.00
760	510	200	61.0	160	2	32	3.00	5.3	850	1.10	11.0												.04	.0	.00	.0	.00
510	310	140	38.0	84.0	2	26	1.60	2.8	470	.60	11.0																
390		99.0	35.0	52.0	1	22	1.60	1.9	270	.30	11.0																
390		100	32.0	64.0	1	27	1.70	3.1	300	.40	7.60																
220		63.0	16.0	29.0	.8	22	2.90	1.4	150	.50	8.30																
370		100	28.0	62.0	1	27	1.50	2.0	310	.60	10.0																
350		91.0	30.0	48.0	1	23	1.30	2.4	260	1.20	10.0																
		96.0	35.0	66.0			2.00	2.8	280	.10	9.00																
		44.0	13.0	24.0			1.10	2.0	100	.80	7.20																
		140	45.0	100			2.90	4.2	520	.50	9.90																
		110	33.0	60.0			1.70	3.2	310	.20	11.0																
		100	37.0	65.0			1.60	3.4	340	.10	7.90																
		38.0	10.0	14.0			.00	.8	67.0	.00	5.60																
		110	35.0	63.0			1.10	2.8	380	.30	7.20																
		110	33.0	47.0			1.80	2.5	260	.00	8.50																
		88.0	29.0	67.0			2.50	3.1	290	.10	7.90																
		180	52.0	120			3.50	4.3	680	.70	7.90																
		110	37.0	66.0			1.80	2.9	370	.20	8.50																
		98.0	35.0	47.0			1.70	3.3	270	.30	8.90																
		95.0	36.0	68.0			1.80	3.5	310	.20	6.80																
		61.0	17.0	29.0			1.00	1.8	150	.30	7.30																
																	E 630	600				217					

Silvex, bed sedimnt ug/kg (39761)	Purpose site visit, code (50280)	Residue on evap. at 180degC wat flt mg/L (70300)	Residue water, fltrd, sum of consti-tuents mg/L (70301)	Residue water, dis-solved, tons/d (70302)	Residue water, fltrd, tons/ acre-ft (70303)	Ammonia water, fltrd, mg/L (71846)	Nitrate water, fltrd, mg/L (71851)	Nitrite water, fltrd, mg/L (71856)	Bromide water, fltrd, mg/L (71870)	Iron, water, unfltrd ug/L (71885)	Sample purpose code (71999)	Sus-pended sedi-ment concen-tration mg/L (80154)	Sus-pended sedi-ment dis-charge, tons/d (80155)	Di-chlor-prop, water, unfltrd ug/L (82183)	Sam-pling method, code (82398)	Sampler type, code (84164)	Specif. conduc-tance, wat unf lab, uS/cm 25 degC (90095)	ANC, wat unf fixed end pt, lab, mg/L as CaCO3 (90410)	Type of sample related QA data, code (99111)
		696			.95		3.30												
		792			1.08		3.20												
		778			1.06		4.00												
		714			.97		1.30												
		252			.34		3.10												
		246			.33		1.50												
		510			.69		2.10												
		1260	1170		1.71		4.20												
		1250	1180		1.70		2.10												
												1220	1980						
		650		202	.88		.600		.3	180									
		900		182	1.22		.000		.2	60									
		706		278	.96	1.60	1.30	9.00	.3	50									
		730		237	.99		2.50			20									
		714		181	.97		2.80			.00									
		646		160	.88		1.50			50									
		656		101	.89		2.10			20									
		698		94.1	.95		2.00			40									
		768		137	1.04		2.80			70									
												467	83						
		950		105	1.29		2.00			.00									
		598		152	.81		1.90			70									
		412		289	.56		1.20			80									
		1630		114	2.22		2.50			220									
		1940		62.8	2.64		1.40			130									
		1780		91.2	2.42		.200			170									
		1290		178	1.75		1.50												
		1560		198	2.12		3.10			340									
		900		156	1.22		2.90			50									
												48	8.3						
		734		153	1.00		2.20			30									
		818		166	1.11		3.10			70									
		920		184	1.25		3.90			60									
		770		141	1.05		1.00			10									
		676		120	.92		.100			20									
		280		968	.38		.100			100									
												3080	10700						
		580		243	.79		.100			110									
		1050		136	1.43		.200			30									
		1120		142	1.52		.400												
		840	796	243	1.14		1.20												
		698	666	207	.95		2.00												
		600	572	81.0	.82		2.70												
		616	585	150	.84		2.10												
		810	780	219	1.10		2.10												
		616	609	116	.84		1.30												
		836	796	181	1.14		.400												
		258	245	906	.35		.200												
		406	404	241	.55		.000												
		670	669	130	.91		.200												

Silvex, bed sedimnt ug/kg (39761)	Purpose site visit, code (50280)	Residue on evap. at 180degC wat flt mg/L (70300)	Residue water, fltrd, sum of consti-tuents mg/L (70301)	Residue water, dis-solved, tons/d (70302)	Residue water, fltrd, tons/ acre-ft (70303)	Ammonia water, fltrd, mg/L (71846)	Nitrate water, fltrd, mg/L (71851)	Nitrite water, fltrd, mg/L (71856)	Bromide water, fltrd, mg/L (71870)	Iron, water, unfltrd ug/L (71885)	Sample purpose code (71999)	Sus-pended sedi-ment concen-tration mg/L (80154)	Sus-pended sedi-ment dis-charge, tons/d (80155)	Di-chlor-prop, water, unfltrd ug/L (82183)	Sam-pling method, code (82398)	Sampler type, code (84164)	Specif. conduc-tance, wat unf lab, uS/cm 25 degC (90095)	ANC, wat unf fixed end pt, lab, mg/L as CaCO3 (90410)	Type of sample related QA data, code (99111)
		502	493	225	.68		.100												
		630	632	214	.86		.500												
		614	584	211	.84		1.70												
		528	538	85.5	.72		2.10												
		572	540	105	.78		2.60												
		756	764	216	1.03		4.20												
		444	443	144	.60		.100												
		214	206	435	.29		.200												
		452	446	300	.61		.200												
		852	801	186	1.16		.000												
		1310	1270	141	1.78		.200												
		1210	1180	297	1.65		1.70												
		856	805	243	1.16		2.00												
		742	714	292	1.01		2.40												
		642	615	109	.87		2.00												
		682	662	140	.93		1.10												
		800	768	140	1.09		2.00												
		844	796	146	1.15		.600												
		200	182	478	.27		.500												
		732	679	166	1.00		.400												
		1240	1170	90.4	1.69		.200												
		1170	1080	338	1.59		2.20												
		1020	1000	242	1.39		1.70												
		800	771	225	1.09		2.20												
		760	735	187	1.03		2.90												
		622	618	119	.85		3.00												
		626	625	112	.85		2.70												
		588	588	117	.80		.900												
		602	614	185	.82		.400												
		198	195	545	.27		.100												
		948	929	113	1.29		.100												
		1070	1070	127	1.46		.100												
		1200	1180	162	1.63		.600												
		910	903	393	1.24		8.30												
		722	707	205	.98		1.80												
		644	644	139	.88		1.70												
		642	624	125	.87		2.40												
		566	565	101	.77		2.20												
		674	673	158	.92		1.70												
		590	583	113	.80		1.00												
		774	762	119	1.05		1.50												
		190	179	687	.26		1.00												
		484	470	255	.66		.900												
		1300	1280	172	1.77		4.20												
		858	842	85.7	1.17		.800												
		726	705	251	.99		1.40												
		884	879	193	1.20		2.20												
		624	632	133	.85		2.70												
		718	713	103	.98		2.60												
		588	587	129	.80		1.70												

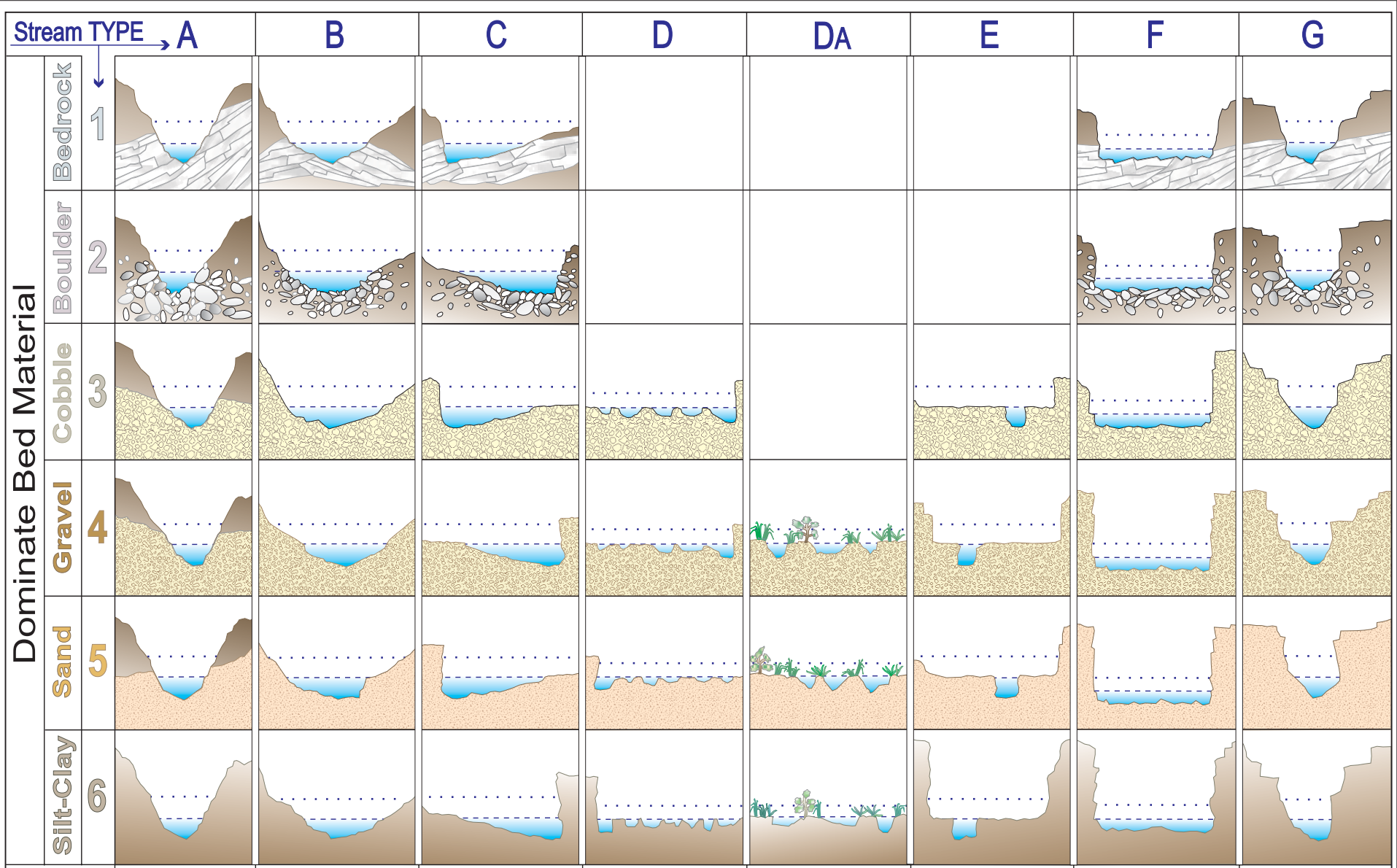
Silvex, bed sedimnt ug/kg (39761)	Purpose site visit, code (50280)	Residue on evap. at 180degC wat flt mg/L (70300)	Residue water, fltrd, sum of consti-tuents mg/L (70301)	Residue water, dis-solved, tons/d (70302)	Residue water, fltrd, tons/ acre-ft (70303)	Ammonia water, fltrd, mg/L (71846)	Nitrate water, fltrd, mg/L (71851)	Nitrite water, fltrd, mg/L (71856)	Bromide water, fltrd, mg/L (71870)	Iron, water, unfltrd ug/L (71885)	Sample purpose code (71999)	Sus-pended sedi-ment concen-tration mg/L (80154)	Sus-pended sedi-ment dis-charge, tons/d (80155)	Di-chlor-prop, water, unfltrd ug/L (82183)	Sam-pling method, code (82398)	Sampler type, code (84164)	Specif. conduc-tance, wat unf lab, uS/cm 25 degC (90095)	ANC, wat unf fixed end pt, lab, mg/L as CaCO3 (90410)	Type of sample related QA data, code (99111)
		702	667	176	.95		2.60												
		678	658	132	.92		1.50												
		876	859	97.0	1.19		.800												
		264	258	372	.36		.600												
		200	201	1030	.27		.500												
		274	265	368	.37		.500												
		1180	1140	108	1.61		.200												
		1090	1070	221	1.48		2.40												
		974	977	187	1.32		1.30												
		1070	1050	205	1.46		1.90												
			713	187	.97		1.40												
			668	150	.91		2.20												
			550	113	.75		1.90												
			676	131	.92		2.10												
			663	129	.90		1.60												
			1030	85.9	1.40		.800												
			547	232	.74		1.20												
			145	611	.20		1.30												
			636	184	.86		.800												
			1370	104	1.86		2.30												
			1180	163	1.61		1.90												
			1020	152	1.39		2.00												
			782	186	1.06		2.50												
			773	171	1.05		2.10												
			665	138	.90		2.40												
			664	118	.90		13.0												
			833	270	1.13		8.00												
			783	159	1.06		2.50												
			642	130	.87		.700												
			361	187	.49		.400												
			162	949	.22		.400												
			781	164	1.06		.300												
			1060	126	1.44		1.00												
			1320	153	1.80		1.20												
			701	210	.95		1.60												
			703	226	.96		2.40												
			631	188	.86		2.10												
			685	157	.93		2.70												
			661	178	.90		2.50												
			613	119	.83		1.10												
			845	57.0	1.15		.200												
			268	457	.36		.800												
			566	199	.77		.300												
			795	195	1.08		2.80												
			1200	139	1.63		.000												
			927	193	1.26		2.10												
			690	192	.94		1.80												
			681	175	.93		3.60												
			579	164	.79		2.50												
			570	169	.78		2.30												

Silvex, bed sedimnt ug/kg (39761)	Purpose site visit, code (50280)	Residue on evap. at 180degC wat flt mg/L (70300)	Residue water, fltrd, sum of consti-tuents mg/L (70301)	Residue water, dis-solved, tons/d (70302)	Residue water, fltrd, tons/ acre-ft (70303)	Ammonia water, fltrd, mg/L (71846)	Nitrate water, fltrd, mg/L (71851)	Nitrite water, fltrd, mg/L (71856)	Bromide water, fltrd, mg/L (71870)	Iron, water, unfltrd ug/L (71885)	Sample purpose code (71999)	Sus-pended sedi-ment concen-tration mg/L (80154)	Sus-pended sedi-ment dis-charge, tons/d (80155)	Di-chlor-prop, water, unfltrd ug/L (82183)	Sam-pling method, code (82398)	Sampler type, code (84164)	Specif. conduc-tance, wat unf lab, uS/cm 25 degC (90095)	ANC, wat unf fixed end pt, lab, mg/L as CaCO3 (90410)	Type of sample related QA data, code (99111)
			718	151	.98		4.00												
			639	129	.87		3.00												
			225	240	.31		2.40												
			332	222	.45		.500												
			955	155	1.30		.800												
			1250	152	1.70		.000												
			1050	162	1.43		.800												
			1190	170	1.62		1.60												
			844	173	1.15		3.20												
			819	232	1.11		4.70												
			717	194	.98		3.90												
			660		.90		2.10												
			623		.85		2.50												
			847	270	1.15		3.20												
			480	126	.65		.700												
			200	1270	.27		2.30												
			501	252	.68		1.60												
			766	250	1.04		1.30												
			737	229	1.00		2.50												
			716	222	.97		1.10												
			790	203	1.07		2.60												
			640	173	.87		2.90												
			568	123	.77		3.30												
			539	72.8	.73		2.20												
			938	638	1.28		12.0												
			664	170	.90		.400												
.0			197	452	.27		.500												
.0			1200	117	1.63		.900												
			1010	297	1.37		2.30												
.0			1140	135	1.55		.500												
.0			996	191	1.35										.00				
			1020	185	1.39														
			703	94.9	.96														
			623	58.9	.85														
			535	57.8	.73														
			703	106	.96														
.0			1110	65.9	1.51										.32				
.0			250	432	.34										.00				
.0			740	170	1.01										.00				
.0			1200	121	1.63										.00				
.0			1130	45.8	1.54										.00				
			880	114	1.20													1190	200	
			740	122	1.01													1000	200	
			669	97.5	.91													1020	200	
			670	63.3	.91													966	180	
			695	71.3	.95													997	200	
			1100	83.2	1.50													1540	200	
			1810	73.3	2.46													2370	250	
			261	1130	.35													362	90	
.0			330	214	.45										.00			502	120	

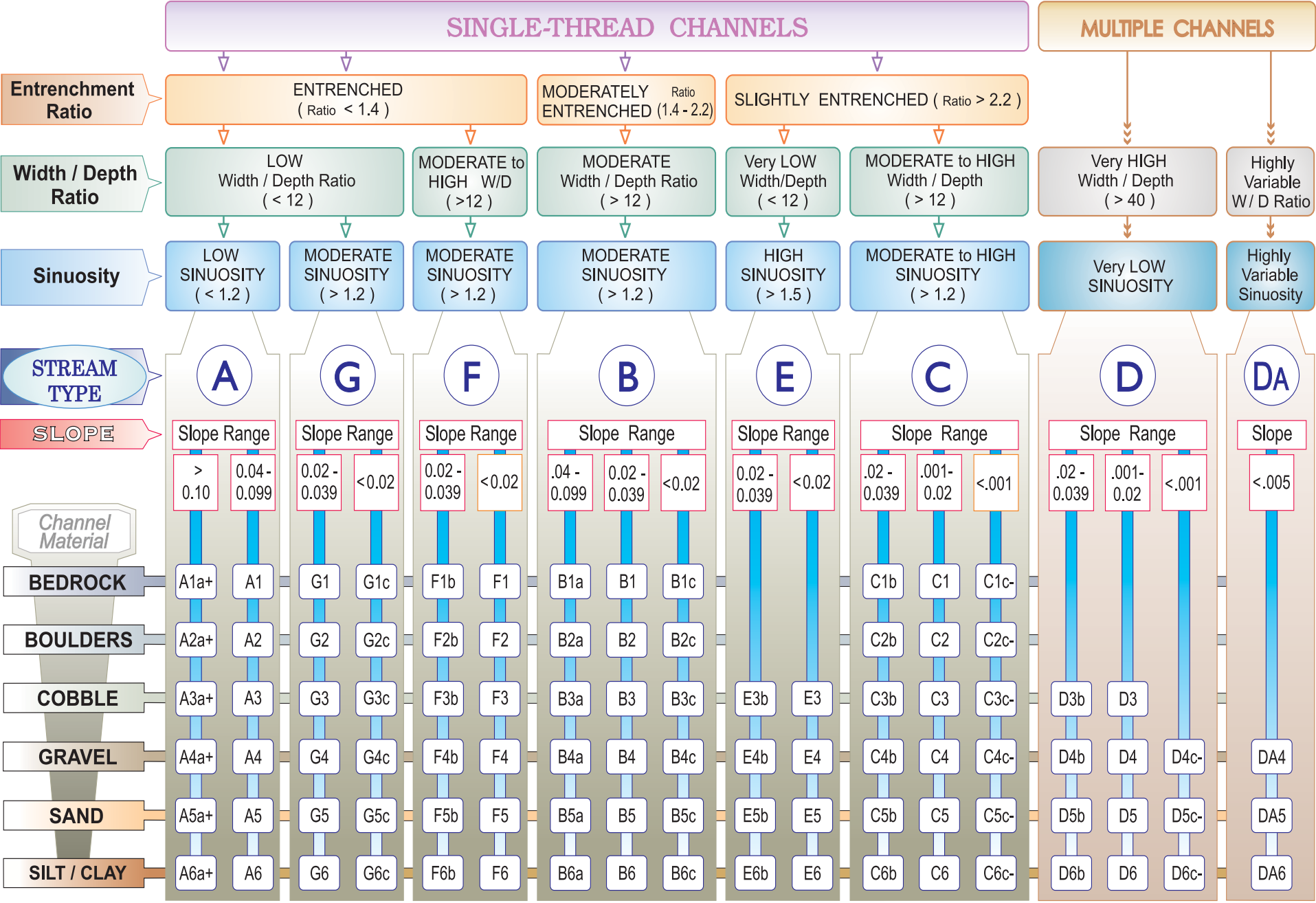
Silvex, bed sedimnt ug/kg (39761)	Purpose site visit, code (50280)	Residue on evap. at 180degC wat flt mg/L (70300)	Residue water, fltrd, sum of consti-tuents mg/L (70301)	Residue water, dis-solved, tons/d (70302)	Residue water, fltrd, tons/ acre-ft (70303)	Ammonia water, fltrd, mg/L (71846)	Nitrate water, fltrd, mg/L (71851)	Nitrite water, fltrd, mg/L (71856)	Bromide water, fltrd, mg/L (71870)	Iron, water, unfltrd ug/L (71885)	Sample purpose code (71999)	Sus-pended sedi-ment concen-tration mg/L (80154)	Sus-pended sedi-ment dis-charge, tons/d (80155)	Di-chlor-prop, water, unfltrd ug/L (82183)	Sam-pling method, code (82398)	Sampler type, code (84164)	Specif. conduc-tance, wat unf lab, uS/cm 25 degC (90095)	ANC, wat unf fixed end pt, lab, mg/L as CaCO3 (90410)	Type of sample related QA data, code (99111)
.0			1200	130	1.63									.00			1570	220	
.0			1400	129	1.90									.00			1820	250	
			870	233	1.18												1210	200	
			600	40.5	.82												880	220	
			630	114	.86												750	200	
			350	265	.48												553	130	
			620	254	.84												881	190	
			560	39.3	.76												849	200	
																	887	230	
																	433	110	
																	1270	200	
															10		942	220	
																	977	200	
															10		320	92	
															10		980	170	
															20		878	210	
															10		885	170	
																	1530	220	
															10		1030	190	
															10		887	210	
															10		960	190	
															10		524	130	
	1006										15.00	80			10	3044			1

APPENDIX H

- Stream Channel Geomorphology Forms
- Geomorphology Field Surveys by Reach ID
  - SC-5
  - SC-100
  - SC-USGS
  - SC-101
  - BC-5 / RG-1
  - BC-2
  - BC-1
  - GC-1
  - HC-1
  - RCC-1
  - BC-5
  - SCG-1
  - SHG-1
  - TC-1
  - WC-1
  - WHC-1



Stream TYPE	A	B	C	D	DA	E	F	G
Entrchmnt.	< 1.4	1.4 - 2.2	> 2.2	n/a	> 4.0	> 2.2	< 1.4	< 1.4
W/D Ratio	< 12	> 12	> 12	> 40	< 40	< 12	> 12	< 12
Sinuosity	1 - 1.2	> 1.2	> 1.2	n/a	variable	> 1.5	> 1.2	> 1.2
H_2O Slope	.04-.099	.02-.039	< .02	< .04	<.005	< .02	< .02	.02-.039



KEY to the *ROSGEN* CLASSIFICATION of NATURAL RIVERS. As a function of the "*continuum of physical variables*" within stream reaches, values of ***Entrenchment*** and ***Sinuosity*** ratios can vary by +/- 0.2 units; while values for ***Width / Depth*** ratios can vary by +/- 2.0 units.

Geomorphic Field Survey

Reach ID SC-5 Date 7/26/06

Stream Name Shell Creek Wx

Location (TR,S,1/4 or lat,long) Personnel

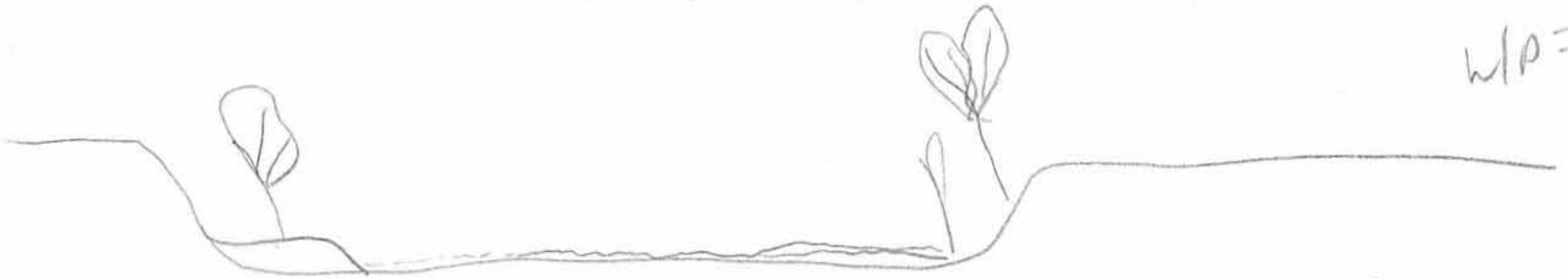
Channel Type

Surveyed Length [m] Sinuosity

Survey Direction (circle one) upstrm dnstrm

Distance [m]	Unit Type	Gradient [%]	Substrate (D/S)	Bankfull Width [ft]	Avg. Bankfull Depth [cm]	Max. Bankfull Depth [cm]	Floodprone Width [ft] LB	Floodprone Width [ft] RB	Visual Est. of Confinement	Residual Pool Depth [cm]	Photo#	Entrenchment	Sinuosity	Rosgen class	Note#
		0.5	cobble/gravel	61	1.6	1.6	68					1.1	1.3	F3	5.3 5.4 Slope = 1.32'/184' = 0.007 = 0.7%

Notes: Stable, grassy banks; mature trees; pool present w/ riprap; spacing (w/ shadow)



W/P = 61/1.6 = 38

Very low water; stream bed takes up most of channel; wetted width ~ Wbf.

Geomorphic Field Survey

Reach ID SC-100 Date 7/26/06

Stream Name Shell Creek Wx

Location (TR,S,¼ or lat,long) Personnel GWJ

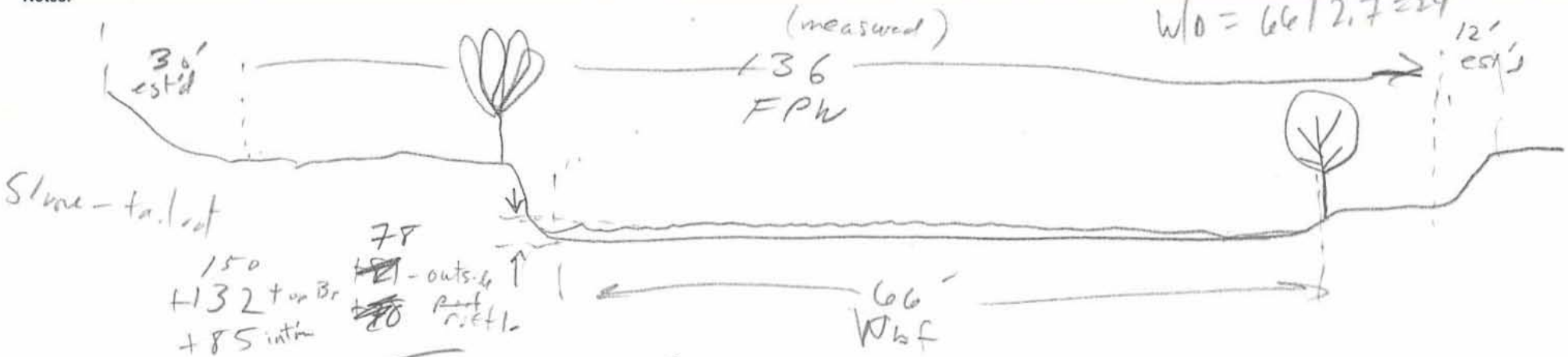
Channel Type

Surveyed Length [m] 150 m Sinuosity <1.5

Survey Direction (circle one) upstrm dnstrm

Distance [m]	Unit Type	Gradient [%]	Substrate (D/S)	Bankfull Width [m]	Avg. Bankfull Depth [cm]	Max. Bankfull Depth [cm]	Floodprone Width [m] feet LB	Floodprone Width [m] feet RB	Visual Est. of Confinement	Residual Pool Depth [cm]	Photo#	Entrenchment	Sinuosity	Rosgen class	Note#
ft 200		2. clino reading	cobble/gravel	40	1.1	3	60'								estimated – u/s of Br outcrop
150		2.	Bedrock	55	0.3	0.8	70'								
		1.0		66	2.7		17-8'					2.7	1.7	E3	measured

Notes:



total = 445'

Geomorphic Field Survey

Reach ID SC-USGS Date 7/28/06

Stream Name Shell Ck - at Hedesh Ranch (USGS gage site) Wx

Location (TR,S,1/4 or lat,long) Personnel GWJ

Channel Type

Surveyed Length [m] Sinuosity

Survey Direction (circle one) upstrm dnstrm

Distance [m]	Unit Type	Gradient [%]	Substrate (D/S) ft	Bankfull Width [m]	Avg. Bankfull Depth [cm]	Max. Bankfull Depth [cm]	Floodprone Width [m] feet LB	Floodprone Width [m] feet RB	Visual Est. of Confinement	Residual Pool Depth [cm]	Photo#	Entrenchment	Sinuosity	Rosgen class	Note#
		1.5	Cobble/gravel	30	—	4.5	200		—	—	See log	6.7	1.1	B3c	All riffle; partly confined

Notes:

Geomorphic Field Survey

Reach ID SC-101 Date 7/27/06

Stream Name Shell Creek Wx

Location (TR,S,1/4 or lat,long) Personnel GWJ

Channel Type

Surveyed Length [m] ~ 300' Sinuosity

Survey Direction (circle one) upstrm dnstrm

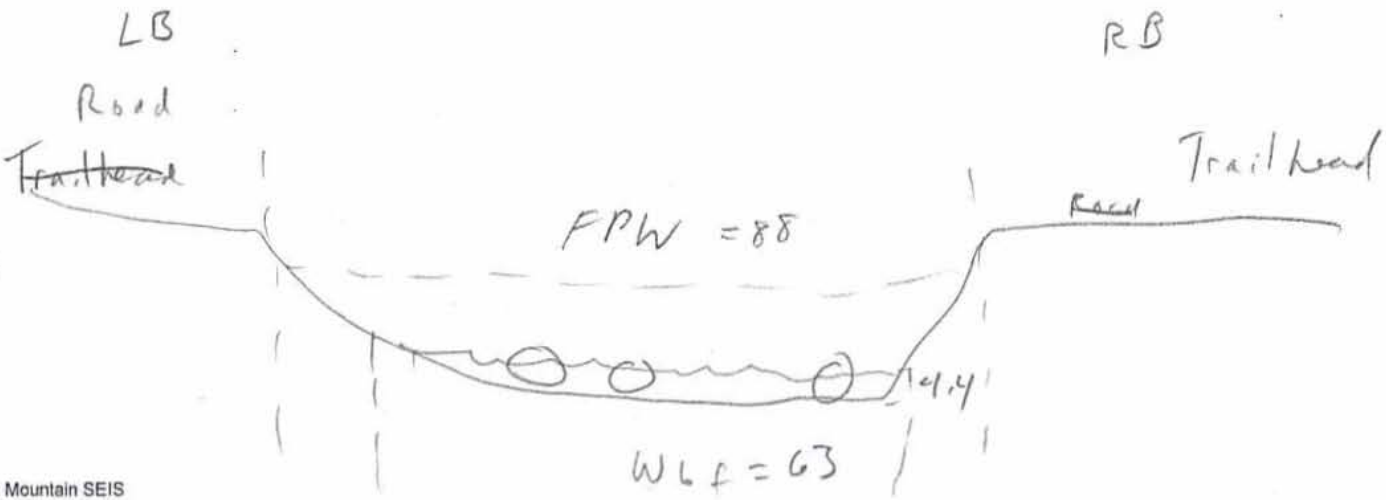
Distance [m]	Unit Type	Gradient [%]	Substrate (D/S)	Bankfull Width [m]	Avg. Bankfull Depth [cm]	Max. Bankfull Depth [cm]	Floodprone Width [m] feet LB	Floodprone Width [m] feet RB	Visual Est. of Confinement	Residual Pool Depth [cm]	Photo#	Entrenchment	Sinuosity	Rosgen class	Note#
		1.4	Boulder/cobble	~~ft~~	4.4		88			2.5	See log	~~ft~~ 1.4	1.1	B2c	
				63	4.4										

Notes:

Slope

X	Y
54	4.95
53.5	5.12
	6.50
107.5	7.55

= 1.4%



Geomorphic Field Survey

Reach ID BC-5 / RG-1 Date 7/24/06

Stream Name Beaver Creek / Red Gulch Wx

Location (TR,S,1/4 or lat,long) Personnel GWJ

Channel Type

Surveyed Length [m] ~100' Sinuosity

Survey Direction (circle one) upstrm dnstrm

1.85 - 0.15

Distance [m]	Unit Type	Gradient [%]	Substrate (D/S)	Bankfull Width [m]	Avg. Bankfull Depth [cm]	Max. Bankfull Depth [cm]	Floodprone Width [m] LB	Floodprone Width [m] RB	Visual Est. of Confinement	Residual Pool Depth [cm]	Photo#	Entrenchment	Sinuosity	Rosgen class	Note#
BC-5			BC-5 / Beaver Ch												Slope = 0.29 / 61' = 0.005
100	-	0.5	gravel/sand	12.4	-	20	17		-	1.70'	See log	1.37	1.7	E4	or G4c
			Red Gulch												
RG-1 100		1.5	silt/clay	13	-	2.8	22					1.7	1.2	G6c	* Rosgen class doesn't describe well; took liberty of choosing best-fit category according to description

Notes:

$D_{bf} = 2.82$

Slope = 41'

W/D = 6.2

Red Gulch W/D = 13/2.8 = 4.6

Geomorphic Field Survey

Reach ID BC-2 Date 7/26/04

Stream Name Beaver Creek Wx

Location (TR,S,1/4 or lat,long) Personnel GWJ

Channel Type

Surveyed Length [m] Sinuosity

Survey Direction (circle one) upstrm dnstrm

Distance [m]	Unit Type	Gradient [%]	Substrate (D/S) ~~feet~~	Bankfull Width [m]	Avg. Bankfull Depth [cm]	Max. Bankfull Depth [cm]	Floodprone Width [m] ~~feet~~ LB	Floodprone Width [m] ~~feet~~ RB	Visual Est. of Confinement	Residual Pool Depth [cm]	Photo#	Entrenchment	Sinuosity	Rosgen class	Note#
		1.7	cobble/gravel	30	1.9	4.9	34.7		—	—	—	1.1	1.4	F3	*scarlet log

Notes:

Just D/s from 8' elliptical culvert

W/D = 15.8

Geomorphic Field Survey

Reach ID BC-1 Date 7/25/04

Stream Name Beaver Ck Wx

Location (TR,S,1/4 or lat,long) Personnel GWS

Channel Type

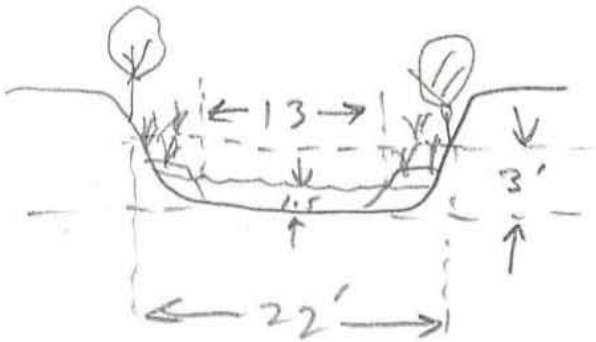
Surveyed Length [m] 200' Sinuosity

Survey Direction (circle one) upstrm dnstrm

Distance [m] ~~ft~~	Unit Type	Gradient [%]	Substrate (D/S) ~~ft~~	Bankfull Width [m]	Avg. Bankfull Depth [cm]	Max. Bankfull Depth [cm]	Floodprone Width [m] LB	Floodprone Width [m] RB	Visual Est. of Confinement	Residual Pool Depth [cm] FT	Photo#	Entrenchment	Sinuosity	Rosgen class	Note# W/D=8.7
100		1.3	Gravel/cobble	13	1.5		22	22		0.8	5clog	1.7	1.5	~~B~~C	Moderately entrenched cobble stream

Notes:

6.52
4.94
8
1.5



Geomorphic Field Survey

Reach ID GC-1 Date 7/27/06

Stream Name Granite Creek Wx

Location (TR,S,1/4 or lat,long) Personnel GWJ

Channel Type

Surveyed Length [m] 250' Sinuosity

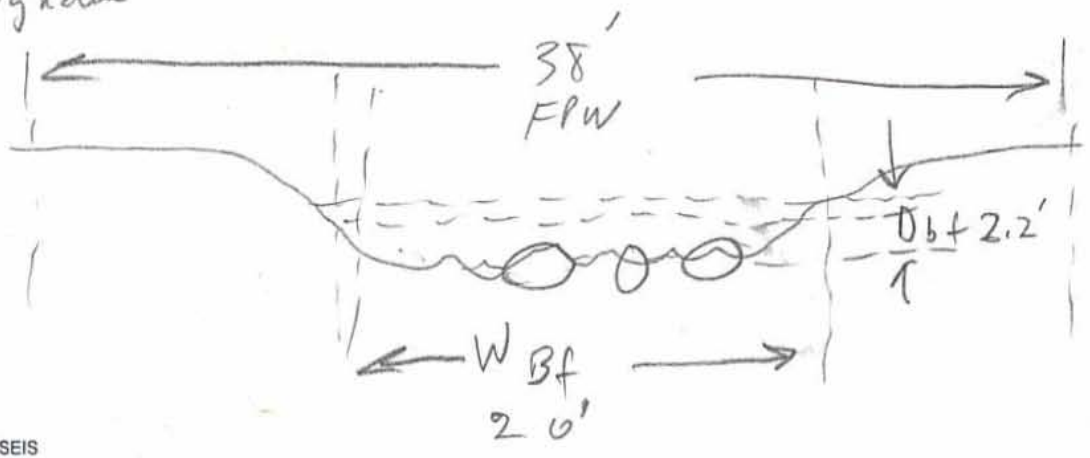
Survey Direction (circle one) upstrm (dnstrm)

Distance [m] ft	Unit Type	Gradient [%]	Substrate (D/S)	Bankfull Width [m]	Avg. Bankfull Depth [cm]	Max. Bankfull Depth [cm]	Floodprone Width [m] LB	Floodprone Width [m] RB	Visual Est. of Confinement	Residual Pool Depth [cm]	Photo#	Entrenchment	Sinuosity	Rosgen class	Note#
250		20.	Boulder/cobble	20.	2.0	2.2	38'					1.9	<1.2	A2a*	Surveyed. Boulder-step stream
		6.5												A2	

Notes:

* Preliminary designation

slope: 4/61'



Geomorphic Field Survey

Reach ID HC-1 Date 7/26/06

Stream Name Horse Creek Wx

Location (TR,S,1/4 or lat,long) Personnel

Channel Type G(3)

Surveyed Length [m] Sinuosity

Survey Direction (circle one) upstrm dnstrm from Lane 31

Distance [m]	Unit Type	Gradient [%]	Substrate (D/S) ~~ft~~	Bankfull Width [m]	Avg. Bankfull Depth [cm]	Max. Bankfull Depth [cm]	Floodprone Width [m] LB	Floodprone Width [m] RB	Visual Est. of Confinement	Residual Pool Depth [cm]	Photo#	Entrenchment	Sinuosity	Rosgen class	Note#
		1.6	gravel/cobble	7.0	—	2.5	24		—	—		3.4	2.7	E4	Highly entrenched, disturbed

Slope = 13.7 - 6.9 = 6.8/428 = 1.6

Notes:

W/D = 7.0/2.5 = 2.8

LB RB 2.47 5.0

For Sinuosity

Used Trimble GPS

Prelim. length between elevation spots = 130.4m = 427.7'

Straight line = 156

Sinuosity = 427.7/156

Geomorphic Field Survey

Reach ID RCC-1 Date 7/25/06

Stream Name Red Canyon Creek Wx

Location (TR,S,1/4 or lat,long) Personnel GWJ

Channel Type

Surveyed Length [m] 10 Sinuosity

Survey Direction (circle one) upstrm dnstrm

Distance [m]	Unit Type	Gradient [%]	Substrate (D/S) ft	Bankfull Width [m]	Avg. Bankfull Depth [cm]	Max. Bankfull Depth [cm]	Floodprone Width [m] feet LB	Floodprone Width [m] feet RB	Visual Est. of Confinement	Residual Pool Depth [cm]	Photo#	Entrenchment	Sinuosity	Rosgen class	Note#
		0.8	silt/clay	3	2.1		33					11	1.2	E4*	closest Rosgen class A

Notes:

W/D = 3 / 2.1 = 1.4

*

Geomorphic Field Survey

Reach ID BC-5 / RG-1 Date 7/24/06

Stream Name Beaver Creek / Red Gulch Wx

Location (TR,S,1/4 or lat,long) Personnel GWJ

Channel Type

Surveyed Length [~~ft~~] ~100' Sinuosity

Survey Direction (circle one) upstrm dnstrm

1.85 - 0.15

Distance [~~ft~~]	Unit Type	Gradient [%]	Substrate (D/S)	Bankfull Width [m]	Avg. Bankfull Depth [cm]	Max. Bankfull Depth [cm]	Floodprone Width [~~ft~~] LB	Floodprone Width [~~ft~~] RB	Visual Est. of Confinement	Residual Pool Depth [~~ft~~]	Photo#	Entrenchment	Sinuosity	Rosgen class	Note#
BC-5			Beaver Ck												
100	—	0.5	gravel/sand	12.4	—	20	17		—	1.70'	see log	1.37	1.7	E4	Gr 64 c
			Red Gulch												
RG-1 100'		1.5	silt/clay	13	—	2.8	22					1.7	41.2	G6c	* Rosgen class doesn't describe well; took liberty of choosing best fit category according to description

Notes:

Slope = 0.29 / 161'
= 0.005

$D_{bf} = 2.82$

Slope = 41'

W/D = 6.2

Red Gulch W/D = 13/2.8 = 4.6

Geomorphic Field Survey

Reach ID SCG-1 Date 7/25/06

Stream Name Scharen Gulch Wx

Location (TR,S,1/4 or lat,long) Personnel Sally, Brendon, Garrett

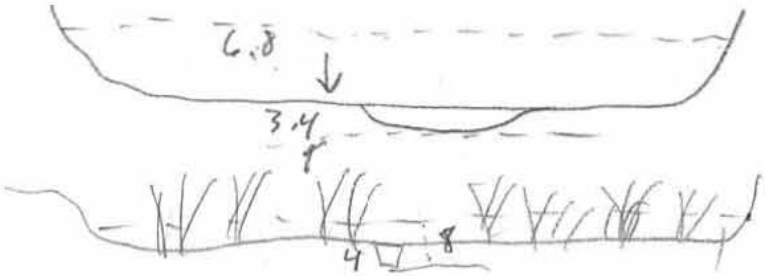
Channel Type

Surveyed Length [m] Sinuosity

Survey Direction (circle one) upstrm dnstrm

Distance [m]	Unit Type	Gradient [%]	Substrate (D/S)	Bankfull Width [m]	Avg. Bankfull Depth [cm]	Max. Bankfull Depth [cm]	Floodprone Width [m] yards LB	Floodprone Width [m] yards RB	Visual Est. of Confinement	Residual Pool Depth [cm]	Photo#	Entrenchment	Sinuosity	Rosgen class	Note#
		0.3*	clay/silt	42.9	2	3.4	113	+40				10.6	1.2	C6	113 yds + 40 = 153 x 3 = 459'

Notes:



* measured in Global Mapper from USGS topo 1:24,000

W/D = 42.9/2 = 21.5

Geomorphic Field Survey

Reach ID SHG-1 Date 7/25/02

Stream Name Sheldon Gulch Wx

Location (TR,S,1/4 or lat,long) Personnel Braden, Garrett, Sally

Channel Type

Surveyed Length [m] Sinuosity

Survey Direction (circle one) upstrm dnstrm

Distance [m]	Unit Type	Gradient [%]	Substrate (D/S)	Bankfull Width [m]	Avg. Bankfull Depth [cm]	Max. Bankfull Depth [cm]	Floodprone Width [m] LB	Floodprone Width [m] RB	Visual Est. of Confinement	Residual Pool Depth [cm]	Photo#	Entrenchment	Sinuosity	Rosgen class	Note#
		0.5*	Organic/Silt	22.0	2.0	2.8	61					8.3	>1.2	C6	Couldn't go u/s - priv. Land

Notes:

* estimated

12.1
14.93
2.03 x4
2.8

W/D = 11

Geomorphic Field Survey

Reach ID TC-1 Date 7/26/06

Stream Name Trapper Creek Wx

Location (TR,S,1/4 or lat,long) Personnel

Channel Type

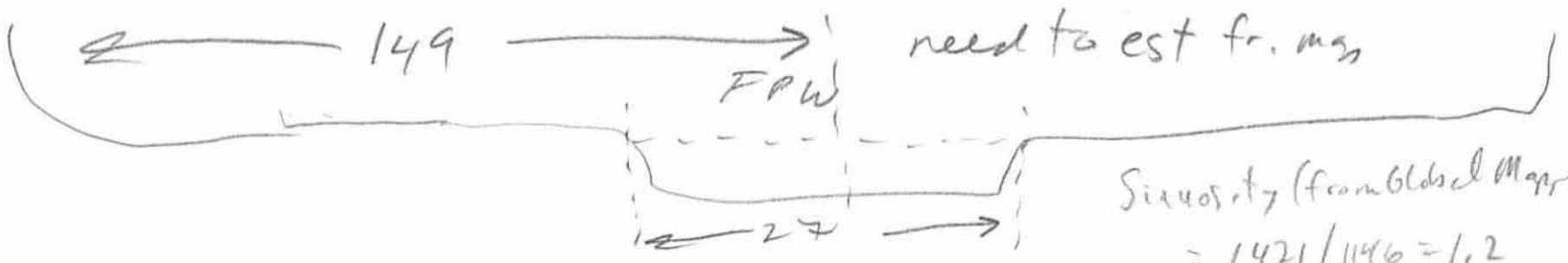
Surveyed Length [m] 250' Sinuosity <1.5

Survey Direction (circle one) upstrm dnstrm

Distance [m]	Unit Type	Gradient [%]	Substrate (D/S) ft	Bankfull Width [m]	Avg. Bankfull Depth [cm]	Max. Bankfull Depth [cm]	Floodprone Width [m] LB	Floodprone Width [m] RB	Visual Est. of Confinement	Residual Pool Depth [cm]	Photo#	Entrenchment	Sinuosity	Rosgen class	Note#
		1.4	cobble/gravel	27	—	2.3	149' +	(m)				5.5	1.2	C3	

Notes:

w/d = 27 / 2.3 = 11.7



Geomorphic Field Survey

Reach ID WC-1 Date 7/27/06

Stream Name Willett Creek Wx

Location (TR,S,1/4 or lat,long) Personnel GWS

Channel Type

Surveyed Length [m] 206' Sinuosity 1.1

Survey Direction (circle one) upstrm dnstrm

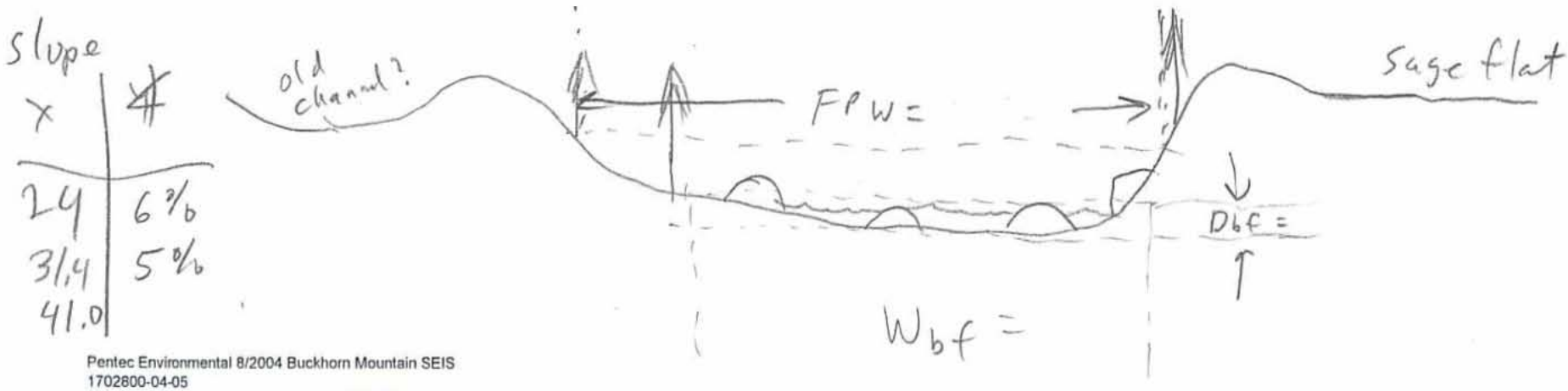
bottom 6.4

top bank 3.5

2.9

Distance [m]	Unit Type	Gradient [%]	Substrate (D/S) ~~ft~~	Bankfull Width [m]	Avg. Bankfull Depth [cm]	Max. Bankfull Depth [cm]	Floodprone Width [m] ~~feet~~ LB	Floodprone Width [m] ~~feet~~ RB	Visual Est. of Confinement	Residual Pool Depth [cm]	Photo#	Entrenchment	Sinuosity	Rosgen class	Note#
		5.0	Boulder/cobble	36	-	2.9	50			2.5		1.4	<1.1	A2	Very bouldery

Notes:



Geomorphic Field Survey

Reach ID WHC-1 Date 7/26/06

Stream Name White Creek Wx

Location (TR,S,1/4 or lat,long) Personnel

Channel Type

Surveyed Length [m] Sinuosity

Survey Direction (circle one) upstrm dnstrm

Distance [m]	Unit Type	Gradient [%]	Substrate (D/S) ~~ft~~	Bankfull Width [m]	Avg. Bankfull Depth [cm]	Max. Bankfull Depth [cm]	Floodprone Width [m] ~~LB~~ feet	~~RB~~	Visual Est. of Confinement	Residual Pool Depth [cm]	Photo#	Entrenchment	Sinuosity	Rosgen class	Note#
		3.0	Cobble/gravel	11.3	—	1.6	18.4					1.6	4.2	B3	

Notes:

Channel is dry 9.2 slope

X	Y
45	8.5
49+38	10.62
	12.66
132	4.16

3%

APPENDIX I

Photographs of Stream Monitoring Sites

- SC-2
- SC-8
- SC-5
- SC-100
- SC-101
- SC-USCG-6278500
- BC-1
- BC-3
- BC-4
- BC-2
- BC-5
- HC-1
- RCC-1
- GC-1
- RG-1
- SCG-1
- SHG-1
- TC-1
- WC-1
- WHC-1

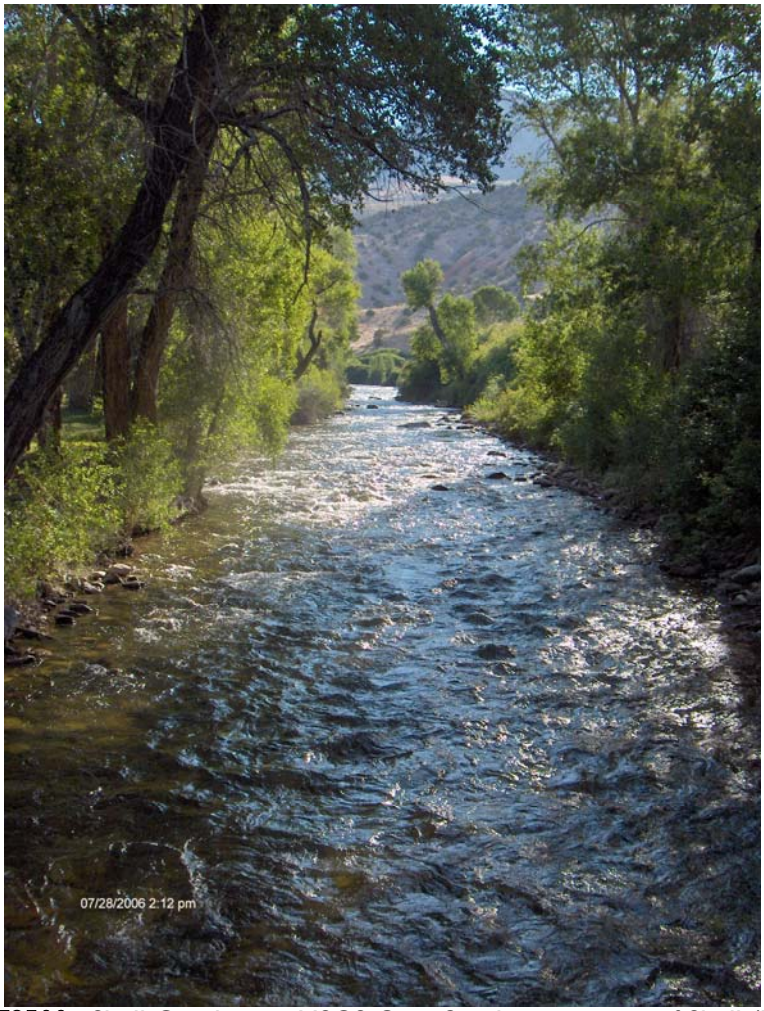
SC-2: Shell Creek at bridge near town of Greybull (July 25, 2006)

SC-8: Shell Creek at bridge along Porter Gulch Road (July 10, 2007)

SC-5: Shell Creek at bridge along Beaver Creek Road (July 10, 2007)

SC-100: Shell Creek at bridge near town of Shell (July 10, 2007)

SC-101: Shell Creek at bridge near USFS Campground (June 22, 2006)



SC-USGS-6278500: Shell Creek near USGS Gage 3 miles upstream of Shell (July 28, 2006)

BC-1: Beaver Creek at culvert near Leavitt Reservoir (July 10, 2007)

BC-3: Beaver Creek at culvert upstream of confluence with Red Canyon Creek (July 10, 2007)

BC-4: Beaver Creek at culvert 3.5 miles upstream of Shell Creek (July 10, 2007)

BC-2: Beaver Creek 1.5 miles upstream of Shell Creek (July 25, 2006)

BC-5: Beaver Creek at culvert 0.5 mile upstream of Shell Creek (July 10, 2007)

HC-1: Horse Creek at culvert along County Rd 31 (July 10, 2007)

RCC-1: Red Canyon Creek at culvert 0.2 mile upstream of Beaver Creek (July 10, 2007)

GC-1: Granite Creek at Hwy 14 crossing, 0.25 mile upstream of Shell Creek (July 10, 2007)

RG-1: Red Gulch south of Hwy 14, looking downstream (July 26, 2006)

SCG-1: Scharen Gulch south of Hwy 14, looking upstream (July 10, 2007)

SHG-1: Sheldon Gulch at Hwy 14 crossing (July 10, 2007)

TC-1: Trapper Creek at bridge (July 10, 2007)

WC-1: Willett Creek at trail bridge (6-22-06)

WHC-1: White Creek looking downstream (July 26, 2006)

APPENDIX J

Reservoir Location Photos

- Bratsky Draw (Photos 1-9)
- Collingwood Draw (Photos 10-14)
- Collingwood Draw Middle (Photos 15-16)
- Coyote Basin (Photos 17-23)
- High Line Reservoir (Photos 24-27)
- Leavitt Reservoir (Photos 28-31)
- Red Canyon (Photos 32-37)
- Trapper Creek (Photo 38)

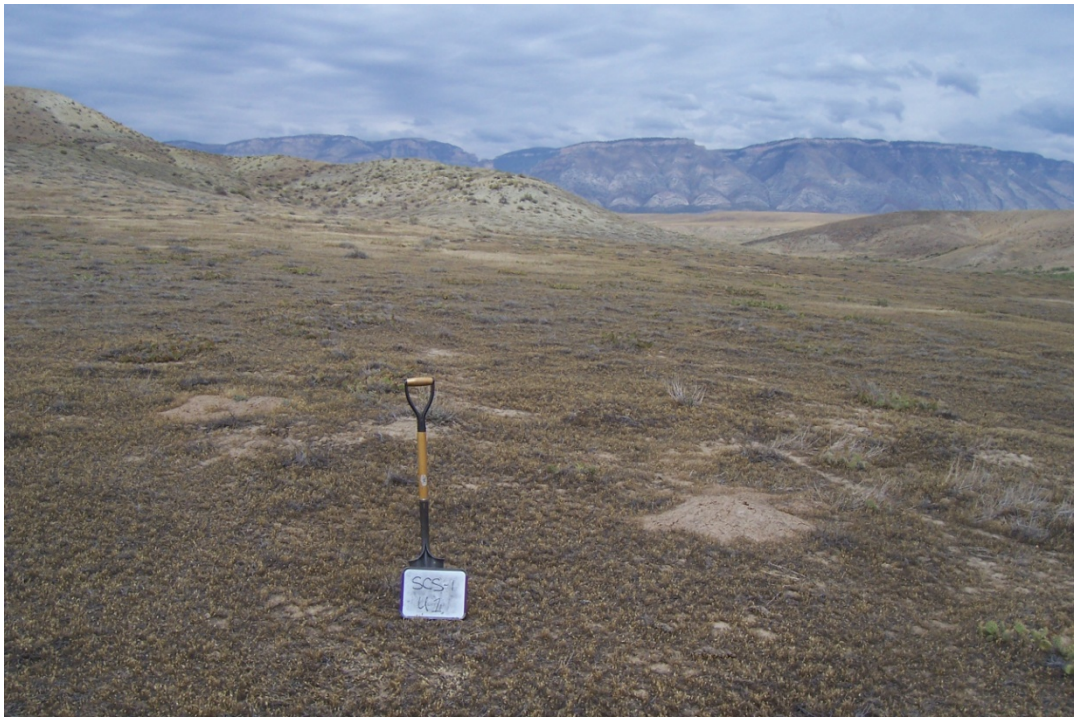


Photo 1: Bratsky Draw Upland Plot 1

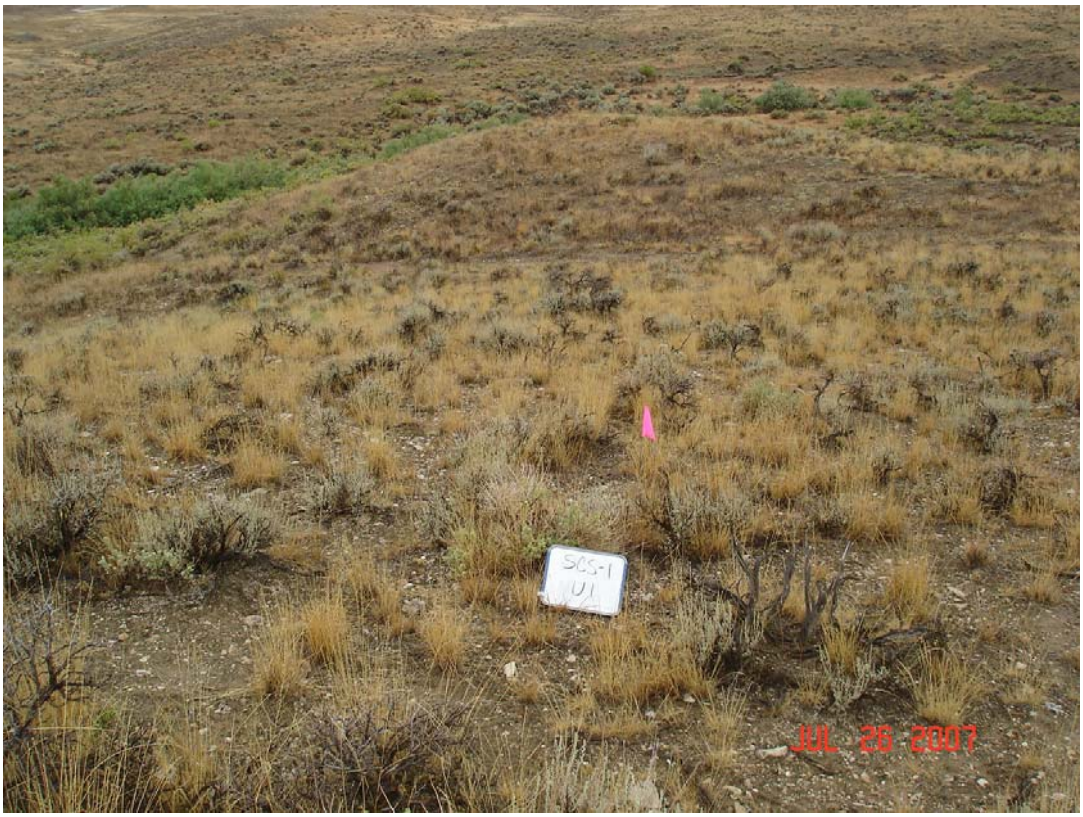


Photo 2: Bratsky Draw Upland Plot 1a

Photo 3: Bratsky Draw Upland Plot 2

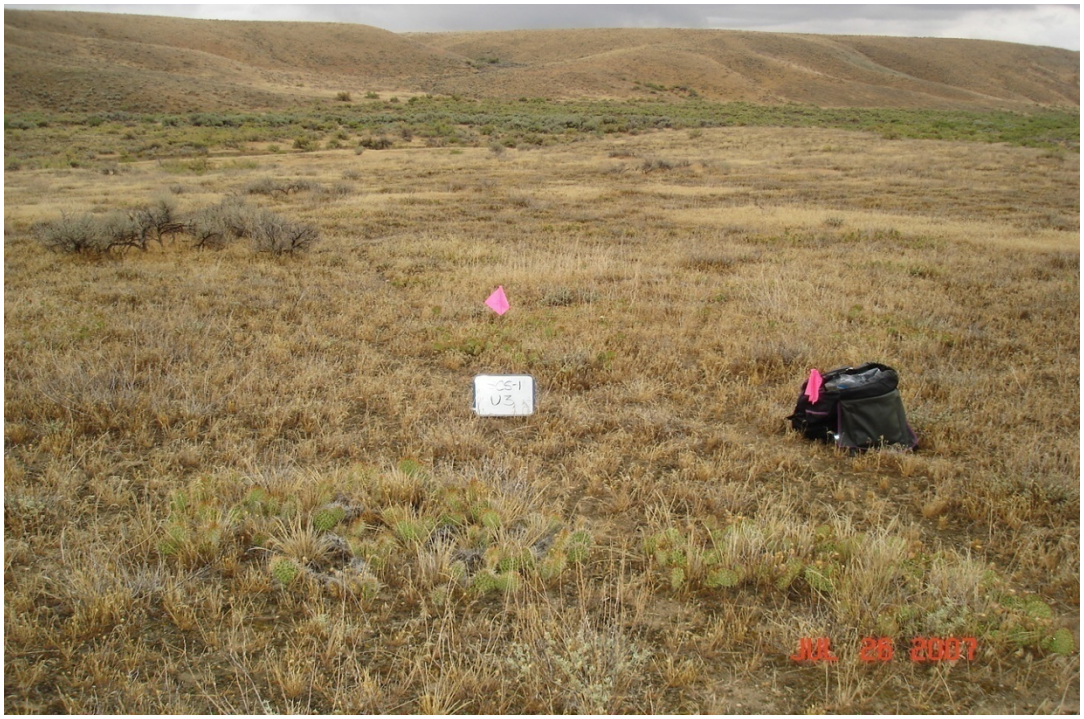


Photo 4: Bratsky Draw Upland Plot 3

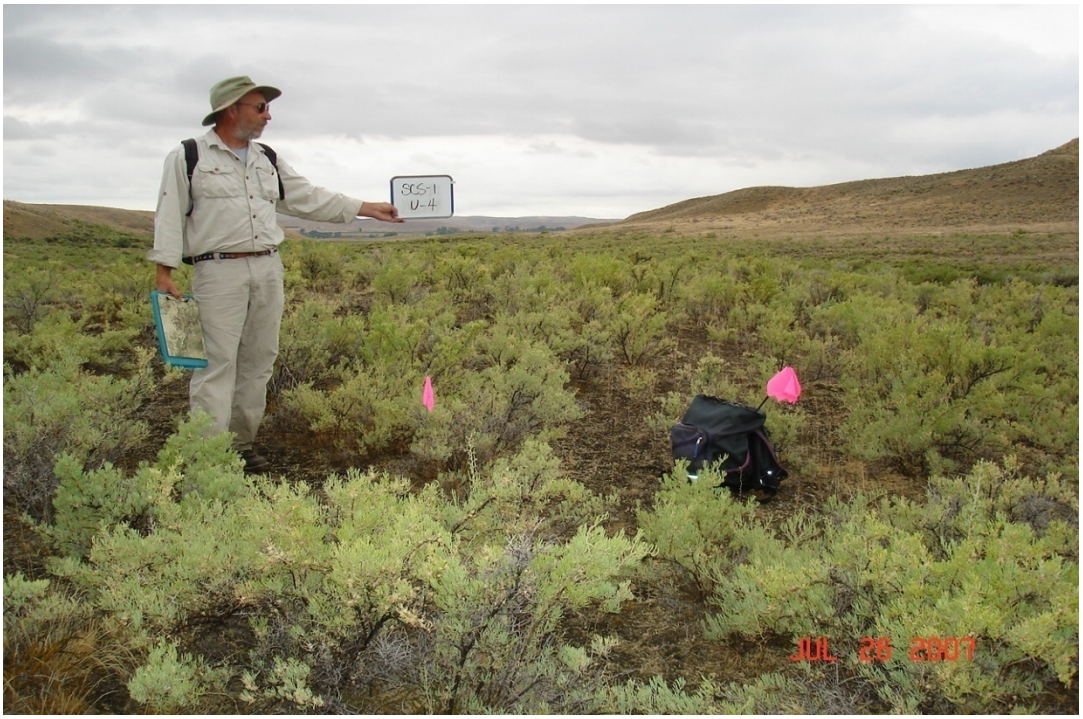


Photo 5: Bratsky Draw Upland Plot 4

Photo 6: Bratsky Draw Wetland Plot 1

Photo 7: Bratsky Draw Wetland Plot 2

Photo 8: Bratsky Draw West Abutment

Photo 9: Bratsky Draw East Abutment

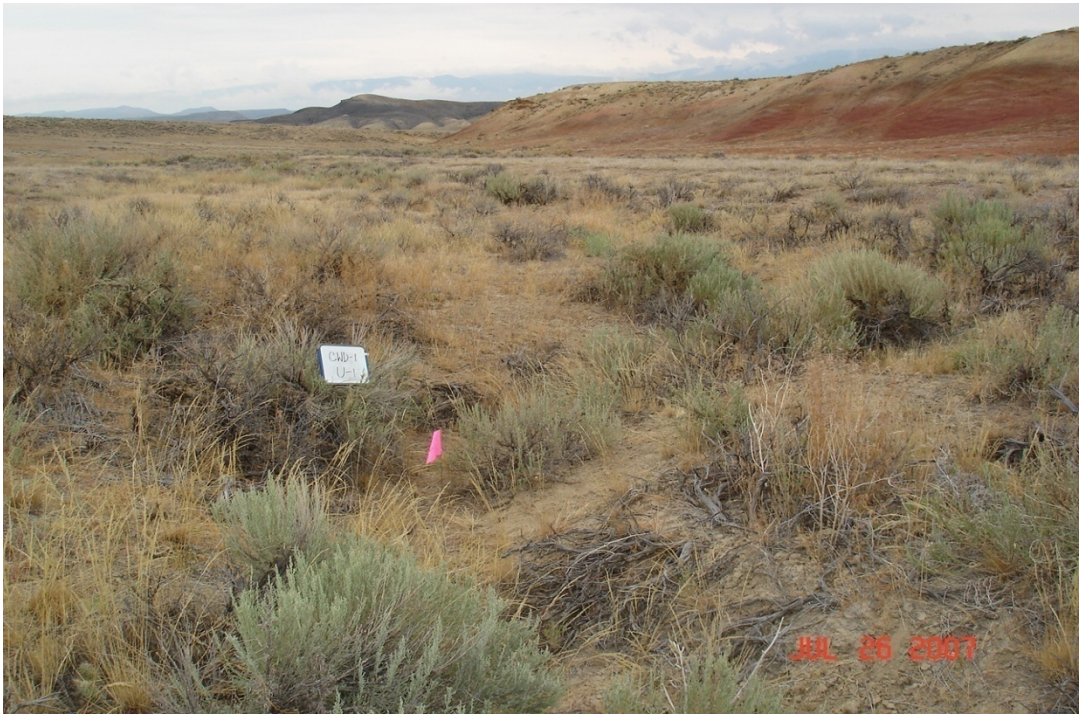


Photo 10: Collingwood Draw Upper - Upland Plot 1

Photo 11: Collingwood Draw Upper - Upland Plot 2

Photo 12: Collingwood Draw Upper - Upland Plot 3

Collingwood Draw – Upper: Upland Plots 4 and 5 – Photos unavailable

Photo 13: Collingwood Draw Upper - East Abutment

Photo 14: Collingwood Draw Upper - West Abutment

Photo 15: Collingwood Draw Middle - Old Dam

Photo 16: Collingwood Draw Middle - Break in Dam

Photo 17: Coyote Basin - Upland Plot 1

Photo 18: Coyote Basin - Upland Plot 2

Photo 19: Coyote Basin - Upland Plot 3

Photo 20: Coyote Basin - Upland Plot 10 (Note, numbering between crews resulted in plots numbered 1, 2, 3 & 10).

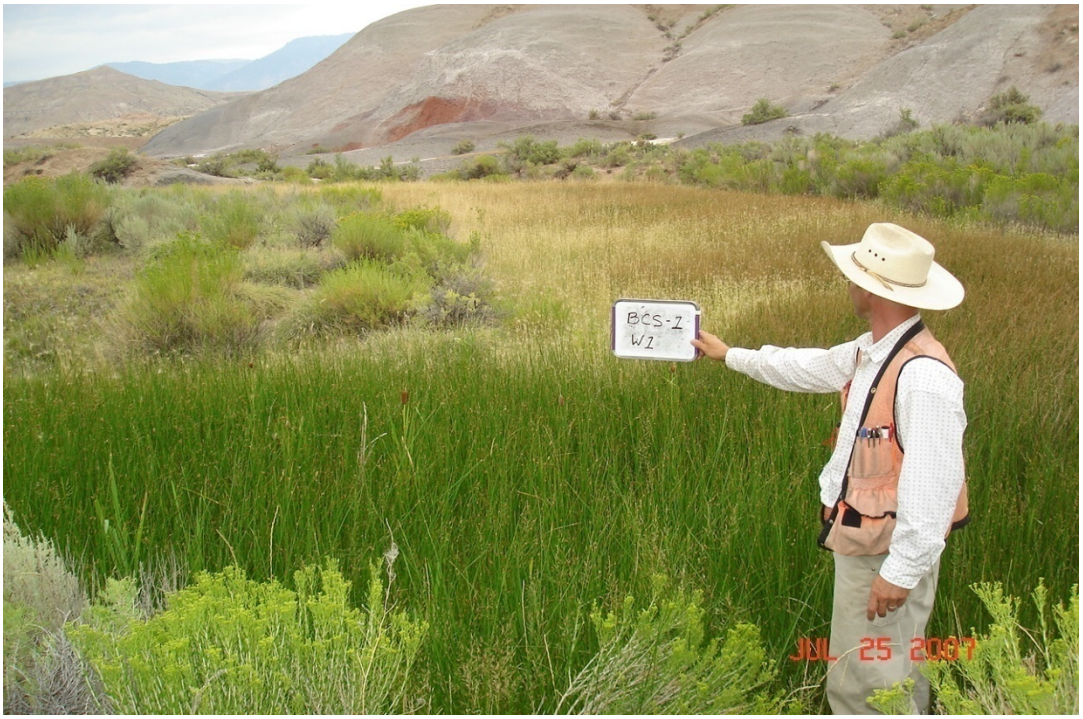


Photo 21: Coyote Basin - Wetland Plot 1

Photo 22: Coyote Basin - Wetland Plot 2

Photo 23: Coyote Basin - General wetland site photo, upper west drainage within site.

Photo 24: High Line Reservoir Expansion - Upland Plot 1

Photo 25: High Line Reservoir Expansion - Wetland Plot 1

Photo 26: High Line Reservoir Expansion - East Abutment

Photo 27: High Line Reservoir Expansion - West Abutment

Photo 28: Leavitt Reservoir Expansion - Upland Plot 1

Photo 29: Leavitt Reservoir Expansion - Upland Plot 2

Photo 30: Leavitt Reservoir Expansion - Wetland Plot 1

Photo 31: Leavitt Reservoir Expansion - Dam Abutments (general photo)

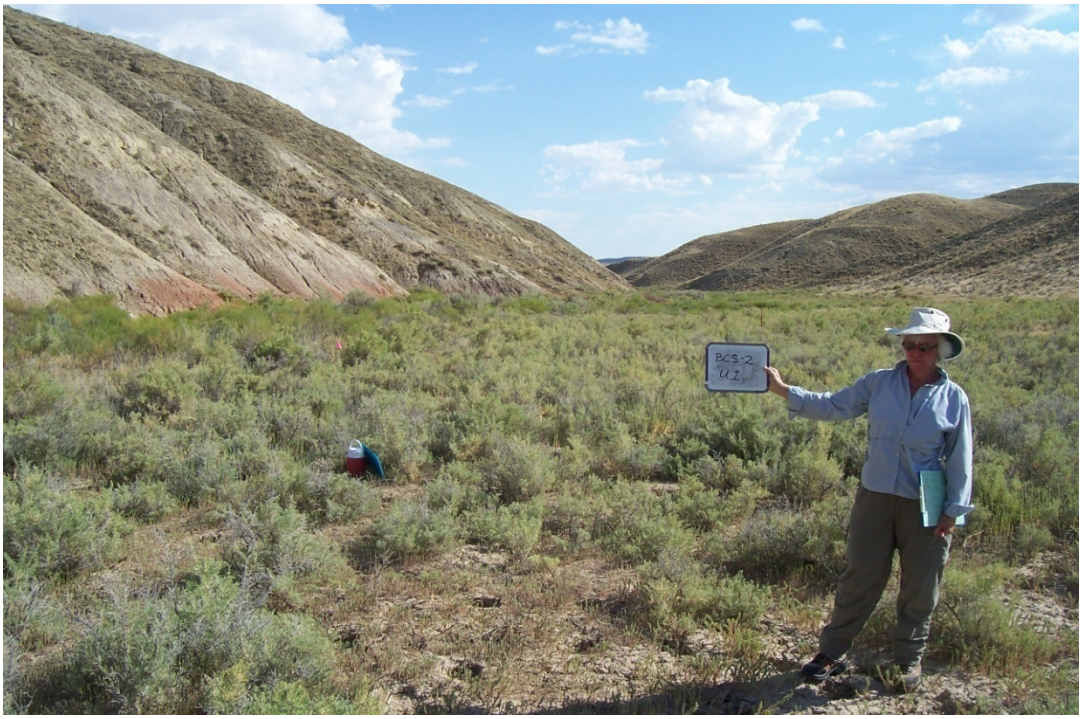


Photo 32: Red Canyon - Upland Plot 1

Photo 33: Red Canyon - Upland Plot 2

Photo 34: Red Canyon - Upland Plot 3

Photo 35: Red Canyon - Wetland Plot 1

Photo 36: Red Canyon - East Abutment

Photo 37: Red Canyon - West Abutment

Photo 38: Trapper Creek - General site photo. Other site and plot photos unavailable.

APPENDIX K

- Structure Data Sheets & Irrigation Inventory Maps
  - (See DVD for Complete Set)

STRUCTURE DATA SHEET

Project Name: WWDC Level I Study; SVWID **Date: 8-23-06**

Task No. 6 **Structure Name: Pump**

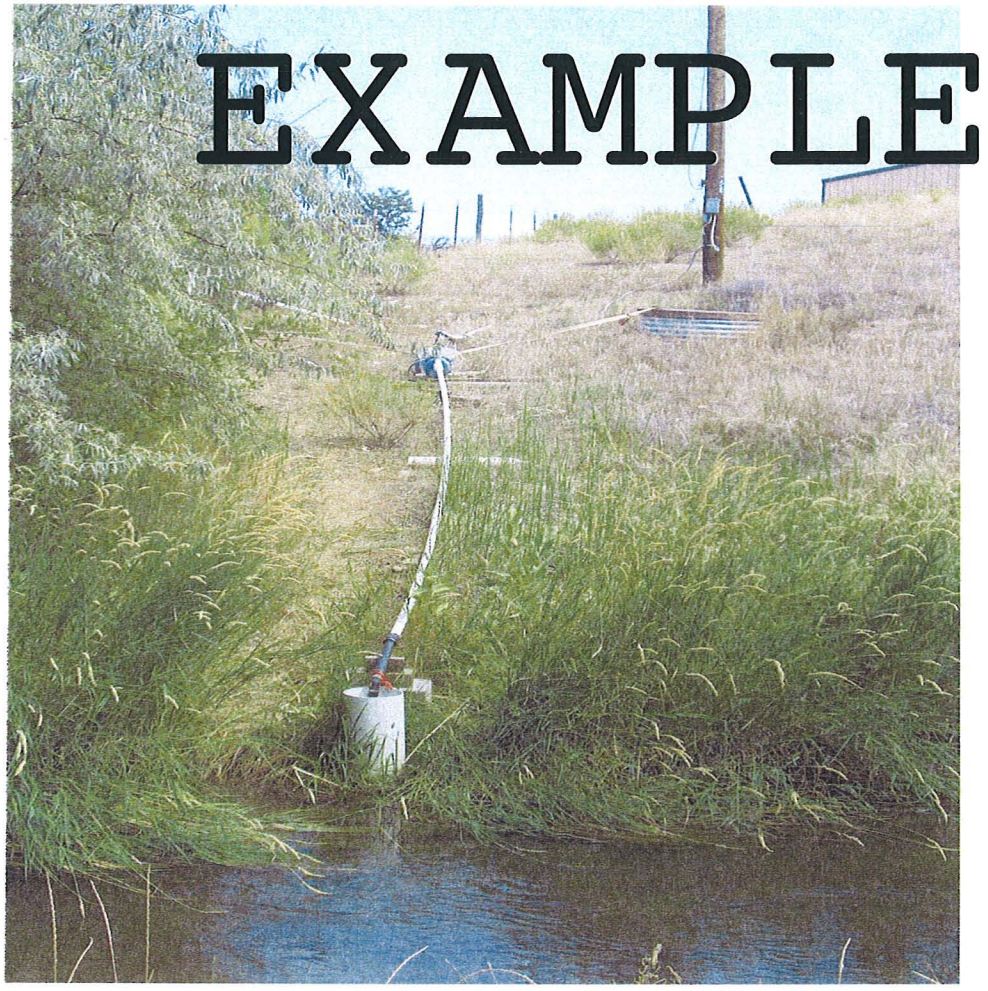
Point No. 212 **Descriptor: MCDLD-D-P**

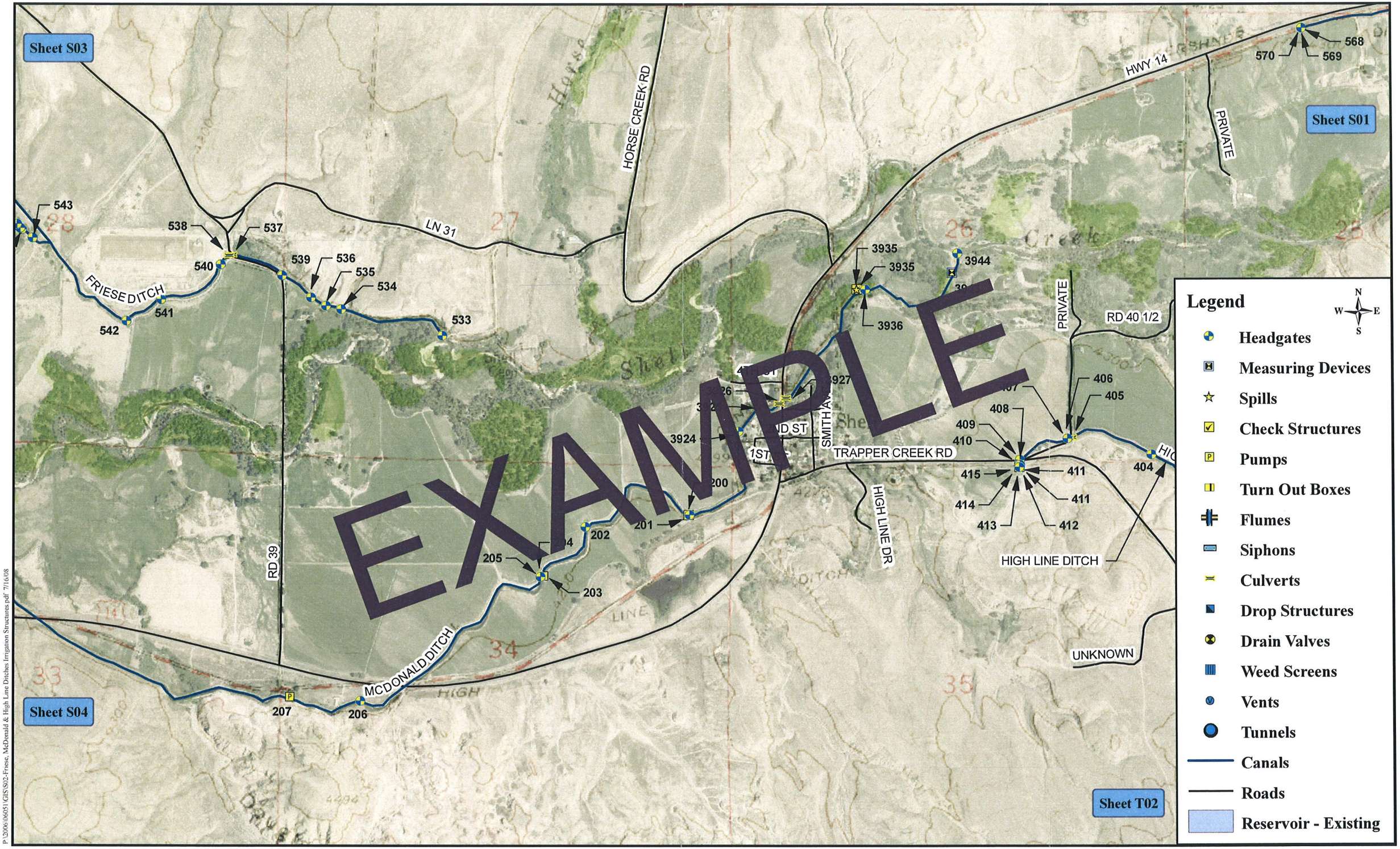
Structure Description and Function:
Mc Donald Ditch Pump

Structure Condition: Poor ☐ Fair ☐ Good ☐ Excellent ☐

Pump condition unknown.

Structure Rating:
Note: 1 through 10 – Suggested repair in 1 year to 10 years





P:\2006\06051\GIS\S02-Friese, McDonald & High Line Ditches Irrigation Structures.pdf 7/16/08

ENGINEERING ASSOCIATES
CONSULTING ENGINEERS & SURVEYORS
CODY, WYOMING

0 500 1,000 2,000 Feet

Shell Valley Watershed - Level I

Shell Valley Watershed Improvement District
Friese, McDonald & High Line Ditches
Sheet S02

APPENDIX L

- Flow Data

APPENDIX L
FLOW DATA - August 9, 2007
Shell Valley Watershed Improvement District
Job No. 06051

Location	Method	Distance (feet)	Bottom Depth (feet)	Velocity 20% (feet/second)	Velocity 60% (feet/second)	Velocity 80 % (feet/second)	Velocity Average (feet/second)	Flow (q) (cfs)
Location 1	Six Tenths	3	1		4.5			13.5
		6	1.2		5.28			19.008
100' downstream of Measuring Flume		9	1.5		4.11			18.495
Head end of McDonald Ditch/Shell Canal		12	1.2		4.16			14.976
		15	1		4.59			13.77
		18	1		4			12
		21						
							Total	91.749
Location 2	2 point	3	3	1.851		1.932	1.8915	17.0235
		6	3.5	1.789		1.21	1.4995	15.74475
50' upstream of HWY box culvert		9	3.5	2.32		1.231	1.7755	18.64275
Box culvert located southwest of Shell		12	3.4	1.717		1.488	1.6025	16.3455
		15						
							Total	67.7565

Note: Many headgates were open from Location 1 to Location 2

APPENDIX L
FLOW DATA - August 9, 2007
Shell Valley Watershed Improvement District
Job No. 06051

Location	Method	Distance (feet)	Bottom Depth (feet)	Velocity 20% (feet/second)	Velocity 60% (feet/second)	Velocity 80 % (feet/second)	Velocity Average (feet/second)	Flow (q) (cfs)
Location 3	2 point	3.5	2.5	1.053		0.704	0.8785	6.58875
		6.5	4	1.49		1.279	1.3845	16.614
50' downstream of Third highway crossing		9.5	4.2	1.65		1.347	1.4985	18.8811
Existing Bentonite liner.		12.5	4	1.329		0.842	1.0855	13.026
Approximately 1.4 miles south of Shell		15.5	3	0.421		0.675	0.548	4.932
		18.5						
							Total	60.04185
Location 4	2 point	1	4	0.921		1.448	1.1845	14.214
		4	3.5	1.987		1.759	1.873	19.6665
0.1 miles downstream of Location 3		7	3.5	1.611		1.728	1.6695	17.52975
end of Bentonite lined section, Head Gates are closed		10	3.5	1.127		1.131	1.129	11.8545
Cross Section is on a left hand turn		13						
							Total	63.26475

Note: Headgates are closed between Location 3 and Location4

APPENDIX L
FLOW DATA - August 9, 2007
Shell Valley Watershed Improvement District
Job No. 06051

Location	Method	Distance (feet)	Bottom Depth (feet)	Velocity 20% (feet/second)	Velocity 60% (feet/second)	Velocity 80 % (feet/second)	Velocity Average (feet/second)	Flow (q) (cfs)
Location 5	2 point	5	3.4	1.7		1.325	1.5125	15.4275
		8	3.9	1.805		1.424	1.6145	18.88965
Helen Sabins 100' downstream of Highway Crossing		11	3.9	1.854		1.649	1.7515	20.49255
		14	3.5	1.614		1.097	1.3555	14.23275
		17						
							Total	69.04245
Location 6	2 point	4	4	1.142		1.302	1.222	14.664
		7	4.6	1.755		1.708	1.7315	23.8947
Helen Sabins near fence line of Alfalfa field		10	4.5	1.296		1.759	1.5275	20.62125
Some seepage areas on lower end of alfalfa field		13						
Ditch is mossy.								
							Total	59.17995

APPENDIX L
FLOW DATA - August 9, 2007
Shell Valley Watershed Improvement District
Job No. 06051

Location	Method	Distance (feet)	Bottom Depth (feet)	Velocity 20% (feet/second)	Velocity 60% (feet/second)	Velocity 80 % (feet/second)	Velocity Average (feet/second)	Flow (q) (cfs)
Location 7								
100' downstream of Headgate McDonald Ditch siphon cut across	2 point	3	3	1.38		0.863	1.1215	10.0935
Crosses seepage area		6	4.5	2.09		1.373	1.7315	23.37525
		9	4	2.104		2.16	2.132	17.056
		11	3	0.96		0.581	0.7705	6.9345
		14						
							Total	57.45925
Location 8	2 point	3	3	1.734		0.585	1.1595	10.4355
		6	3.5	1.675		0.171	0.923	9.6915
At location of old Head gate that was replaced by		9	4	1.497		0.637	1.067	12.804
siphon cut-across		12						
							Total	32.931

APPENDIX L
FLOW DATA - August 9, 2007
Shell Valley Watershed Improvement District
Job No. 06051

Location	Method	Distance (feet)	Bottom Depth (feet)	Velocity 20% (feet/second)	Velocity 60% (feet/second)	Velocity 80 % (feet/second)	Velocity Average (feet/second)	Flow (q) (cfs)
Location 9	Six Tenths	4	2		2.596			10.384
		6	2		3.49			20.94
40' upstream of siphon inlet		9						
before Shell Canal Tunnel								
							Total	31.324
Location 10	2 point	3	2.5	1.768		1.244	1.506	11.295
		6	2.5	2.176		1.267	1.7215	12.91125
150' downstream of siphon outlet		9	2.5	1.568		1.36	1.464	10.98
		12						
							Total	35.18625

APPENDIX M

- Water Rights by Ditch Summary
- Irrigation Easement and Water Rights Research Maps

Appendix M - Table 1 Water Right Summary by Ditch*					
Permit Number	**Source**	**Facility Name (Ditch GIS ID)** Facility Name on SEO Permit	**Priority Date**	**Adjudicated Flow**	**Adjudicated Acreage**
Arthur Mason Ditch (AMD)					
6217	Beaver Creek	Arthur Mason Ditch	7/28/1904	0.53 cfs	37.00
Anderson Ditch (AND)					
853	Beaver Creek	Anderson Ditch	11/20/1894	1.33 cfs	93.00
3559 Enl	Beaver Creek	Anderson Ditch	11/12/1915	0.3 cfs	21.00
Bench Ditch (BED)					
3648	Horse Creek	Bench Ditch	1/9/1902	0.19 cfs	13.00
4715Enl.	Horse Creek	Enl.Bench Ditch	3/5/1931	0.36 cfs	25.00
Bernie Ditch (BER)					Note 1
Beaver Ditch (BVD)					
3971	Shell Creek	Beaver Ditch	Spring 1887	0.71 cfs	50.00
270	Beaver Creek	Beaver Ditch	5/5/1892	1.96 cfs	137.00
1601 Enl	Beaver Creek	Beaver Ditch	8/6/1906	0.27 cfs	19.00
1808 Enl	Beaver Creek	Beaver Ditch	9/16/1907	1.1 cfs	77.00
3192 Enl	Beaver Creek	Beaver Ditch	6/20/1913	0.63 cfs	44.40
Calvin Ditch (CALD)					
1438 Enl.	Beaver Creek	Enl. Calvin Ditch	5/22/1905	0.54 cfs	38.00
Casey Pipeline (CASPL)					
24240	Trapper Creek	*Casey Pipeline*	10/15/1973	0.06 cfs	4.50
Crain Jenks Ditch (CJD)					
7438	Trapper Creek	Crain-Jenks Ditch	8/11/1906	0.60 cfs	42.00
Crandall Ditch (CRD)					
691	Beaver Creek	Crandall Ditch	9/04/1894	1.07 cfs	75.00
Cull Ditch (CULD)					
3720	Trapper Creek	Cull No.1 Ditch	2/13/1902	0.7 cfs	49.00
Cottonwood Ditch (CWD) Supplemental Supply					Note 1
17878	Cottonwood Creek	Cottonwood Ditch	1/12/1931	None	513.00
Davis Ditch (DAVD)					
2967	South Fork Beaver Creek	Davis Ditch	12/22/1900	1.63 cfs	114.00
2747Enl.	South Fork Beaver Creek	Enl. Davis Ditch	7/27/1912	1.73 cfs	121.00
Denny Ditch (DED)					
3976	Shell Creek	Denny Ditch	5/8/1888	3.29 cfs	230.00
1274Enl.	Shell Creek	Enl. Denny Ditch	4/18/1904	0.36 cfs	25.00
Dunshee Ditch (DNSD)					
3974	Shell Creek	Dunshee Ditch	4/15/1888	1.79 cfs	125.00
3975	Shell Creek	Dunshee Ditch	4/15/1888	6.74 cfs	472.00
1275 Enl	Shell Creek	Dunshee Ditch	4/18/1904	0.36 cfs	25.00
3786 Enl	Shell Creek	Dunshee Ditch	4/2/1917	0.31 cfs	21.70
5859Enl.	Shell Creek	Enl. Dunshee Ditch	6/19/1956	0.67 cfs	47.11
Emerick Ditch (EMD)					
14358	Horse Creek	Emerick Ditch	6/3/1916	0.14 cfs	10.00
Ewen Ditch (EWD)					
13194	Beaver Creek	Ewen No. 1 Ditch	6/6/1913	0.31 cfs	21.80
13195	Beaver Creek	Ewen Ditch No. 2	6/6/1913	0.22 cfs	15.60
21842	Beaver Creek	Ewen No. 3 Ditch	6/24/1957	0.19 cfs	13.20
Fender Ditch (FEND)					
3246	Shell Creek	Fender Ditch	6/10/1901	1.07 cfs	75.00
Frank Gould Ditch (FGD)					
17817	Horse Creek	Frank Gould No.2 Ditch	12/12/1930	0.43 cfs	30.00
Flitner Ditch (FLTD)					
19680	Shell Creek	Flitner Ditch	6/3/1941	0.53 cfs	37.00

Appendix M - Table 1 Water Right Summary by Ditch					
Permit Number	**Source**	**Facility Name (Ditch GIS ID)** Facility Name on SEO Permit	**Priority Date**	**Adjudicated Flow**	**Adjudicated Acreage**
Friese Ditch (FRD)					
605 Enl	Shell Creek	Frieze Ditch, Beaver Enl	12/17/1900	8.6 cfs	602.30
1348 Enl	Shell Creek	Freese Ditch	3/11/1905	0.77 cfs	54.00
1964 Enl	Shell Creek	Freise Ditch	10/12/1908	0.26 cfs	18.00
Hatten Ditch (HATD)					
1075	Trapper Creek	Hatten Ditch	11/13/1895	0.86 cfs	60.00
1262 Enl	Trapper Creek	Hatten Ditch	8/8/1904	0.5 cfs	35.00
High Line Ditch (HLD)					
1716	Trapper Creek	Highline Ditch	1/12/1898	3.01 cfs	211.00
1522Enl.	Trapper Creek	Enl. Highline Ditch	4/7/1906	0.93 cfs	65.00
1962Enl.	Trapper Creek	Enl. Highline Ditch	10/9/1908	0.79 cfs	55.00
2469Enl.	Trapper Creek	Enl. Highline Ditch	5/5/1911	0.11 cfs	7.50
Hunt Ditch (HNTD)					
5363	Hudson Falls	Hunt Ditch	3/17/1903	1.97 cfs	138.17
Howe Ditch (HOWD)					
12217	Cedar Creek	Howe Ditch	12/18/1912	0.38 cfs	26.70
Jenks Ditch (JKD)					
2563	Trapper Creek	Jenks Ditch	4/20/1900	0.8 cfs	56.00
Kenyon Ditch (KEND)					
682	Beaver Creek	Kenyon Ditch	4/03/1894	0.21 cfs	15.00
232 Enl	Beaver Creek	Kenyon Ditch	1/7/1897	0.51 cfs	36.00
Kerchner-Lampman Ditch (KLD)					
510	Horse Creek	Kershner-Lampman Ditch	6/01/1893	0.69 cfs	48.00
Kimbro Ditch (KMBD)					
11335	South Fork Beaver Creek	Kimbrow No.1 Ditch	6/21/1912	0.17 cfs	12.00
Kerschner Ditch (KRSD)					
508	Shell Creek	Kershner Ditch	6/01/1893	1.23 cfs	86.00
Lampman Ditch (LAMD)					
1573	Horse Creek	Lampman No. 2 Ditch	9/13/1897	1.14 cfs	80.00
Unnamed Lateral 1 (Not known to SEO Superintendent) (LAT1)					Note 3
Unnamed Lateral 2 (Not known to SEO Superintendent) (LAT2)					Note 3
Unnamed Lateral 3 (Not known to SEO Superintendent) (LAT3)					Note 3
Unnamed Lateral 4 (Not known to SEO Superintendent) (LAT4)					Note 3
Unnamed Lateral 5 (Not known to SEO Superintendent) (LAT5)					Note 3
London Ditch (LOND)					
686	South Fork Beaver Creek	London Ditch	4/07/1894	3.86 cfs	270.00
Lynn Ditch (LYND)					
3721	Shell Creek	Lynn Ditch	2/13/1902	6.1 cfs	427.00
2446 Enl	Shell Creek	Lynn Ditch	4/6/1911	3.93 cfs	275.00
3777 Enl	Shell Creek	Lynn Ditch	2/14/1917	0.43 cfs	30.00

Appendix M - Table 1 Water Right Summary by Ditch					
Permit Number	**Source**	**Facility Name (Ditch GIS ID)** Facility Name on SEO Permit	**Priority Date**	**Adjudicated Flow**	**Adjudicated Acreage**
McDonald Ditch (MCDLD)					Note 2
3965	Shell Creek	McDonald(Shell Canal)	Spring 1886	2 cfs	140.00
3966	Shell Creek	McDonald(Shell Canal)	Spring 1886	1.5 cfs	105.00
430	Shell Creek	McDonald(Shell Canal)	3/7/1893	3.14 cfs	220.00
271Enl.	Shell Creek	Enl. McDonald (Shell Canal)	9/18/1897	7.67 cfs	537.00
1439Enl.	Shell Creek	Enl. McDonald (Shell Canal)	5/22/1905	2.71 cfs	190.00
1330Enl.	Shell Creek	McDonald(Shell Canal)	1/6/1905	2.71 cfs	190.00
1938 Enl	Shell Creek	McDonald(Shell Canal)	4/10/1907	0.29 cfs	20.00
5312 Enl	Shell Creek	McDonald(Shell Canal)	5/24/1941	2 cfs	140.00
5986 Enl	Shell Creek	McDonald(Shell Canal)	6/23/1959	0.6 cfs	42.00
Jackson Ditch (MEJDME)					
3722	Red Gulch	M.E. Jackson Ditch	2/13/1902	0.43 cfs	30.00
Mathews Ditch (MTHWD)					
1341	Beaver Creek	*Mathews Ditch*	10/15/1896	1.31 cfs	92.00
Odessa Ditch (OD)					
3967	Shell Creek	Odessa Ditch	1/10/1887	1.93 cfs	135.00
3968	Shell Creek	Odessa Ditch	1/10/1887	1.36 cfs	95.00
3969	Shell Creek	Odessa Ditch	1/10/1887	0.91 cfs	64.00
3970	Shell Creek	Odessa Ditch	1/10/1887	0.93 cfs	65.00
2031Enl.	Shell Creek	Enl. Odessa Ditch	3/23/1909	0.63 cfs	44.00
Porter Canal (PC)					
365	Shell Creek	Porter Ditch	11/18/1892	16 cfs	1120.00
322 Enl	Shell Creek	Porter Canal	1/21/1898	2.09 cfs	146.00
1464 Enl	Shell Creek	Porter Canal	11/13/1905	0.77 cfs	54.00
1726 Enl.	Shell Creek	Enl. Porter Ditch	4/22/1907	0.61 cfs	43.00
Pense Ditch (PEND)					
4001	Beaver Creek	Pense Ditch	Spring 1888	0.29 cfs	20.00
1807	Beaver Creek	Pense Ditch	3/28/1898	0.79 cfs	55.00
1850	Beaver Creek	Pense Ditch	3/19/1908	0.2 cfs	14.00
Rath Early Ditch (RED)					
1010	Shell Creek	Rath Ditch	7/5/1895	1.17 cfs	82.00
8538	Rath Springs	Rath-Early Ditch	7/13/1908	0.46 cfs	32.00
Sabin Brown Ditch (SBD)					
3132	Trapper Creek	Sabin-Brown Ditch	4/22/1901	0.81 cfs	57.00
1244Enl.	Trapper Creek	Enl. Sabin-Brown Ditch	5/19/1904	0.13 cfs	9.00
Shell Canal (SC)					
8290	Shell Creek	Shell Canal	4/22/1907	12.51 cfs	876.00
6091 Enl	Shell Creek	Shell Canal	1/18/1963	0.29 cfs	20.29
2084Enl.	Shell Creek	Enl.Shell Canal	6/1/1909	34.35 cfs	2404.55
Shell Canal North Branch (SCN)					Note 2
Sharen Ditch (Permitted as Scharen) (SHRD)					
5274	Shell Creek	*Scharen Ditch*	1/12/1903	0.79 cfs	55.00
Saint Jermain Ditch (SJD)					
1415	Beaver Creek	St. Jermain Ditch	1/15/1897	1.69 cfs	118.00
Spring Creek Ditch (SPCRD)					Note 1
Thompson Lateral (TL)					Note 1

Appendix M - Table 1 Water Right Summary by Ditch					
Permit Number	**Source**	**Facility Name (Ditch GIS ID)** Facility Name on SEO Permit	**Priority Date**	**Adjudicated Flow**	**Adjudicated Acreage**
Trout Ditch (TRD)					
386	Beaver Creek	Trout Ditch	1/3/1893	0.84 cfs	59.00
Whaley Ditch (WHD)					
3977	Shell Creek	Whaley Ditch	Spring 1889	2.03 cfs	142.00
1730	Shell Creek	Whaley Ditch	12/18/1906	2.14 cfs	150.00
5472 Enl	Shell Creek	Whaley Ditch	7/26/1948	0.22 cfs	15.24
42Enl.	Shell Creek	Enl. Whaley Ditch	6/17/1893	9.89 cfs	692.00
462Enl.	Shell Creek	Enl. Whaley Ditch	9/18/1899	6.2 cfs	434.00
650Enl.	Shell Creek	Enl. Whaley Ditch	4/22/1901	3.84 cfs	269.00
5420Enl.	Shell Creek	Enl. Whaley Ditch	4/19/1945	0.57 cfs	40.00
Willard Dtich (WILD)					
1039	Trapper Creek	Willard Ditch	8/16/1895	0.57 cfs	40.00
		Total Table 2			**14,285.06**

* All Water Rights are Original Supply unless noted otherwise.

Note 1: Water Rights may be permitted under a different facility name.

Note 2: Water Rights may be permitted within the total for Shell Canal.

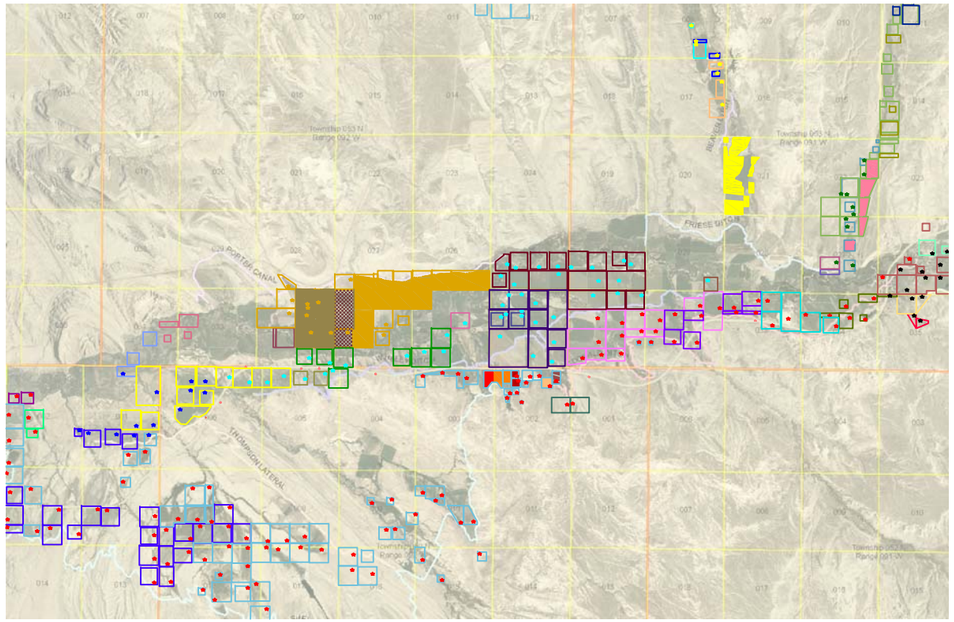
Note 3: Water Rights may be permitted under an unidentified facility name.

* Water Right Permits located within the Shell Watershed, but outside of the boundary of the Shell Valley Improvement District were not calculated. All water rights are permitted for 1 cfs/acre. Water rights before March 1, 1945 are entitled to an additional 1 cfs/70 acres when water is available. Water rights within the entire Shell Watershed were calculated in the 1985 Level I Study performed by HKM for WWDC.

Appendix M - Table 2 Water Rights for Ditches that were Not Surveyed					
Permit Number	**Source**	**Ditches Not Surveyed** Facility Name on SEO Permit	**Priority Date**	**Adjudicated Flow**	**Adjudicated Acreage**
Allen & Hough Ditch					
3972	Shell Creek	Allen & Hough Ditch	Spring 1887	1.57 cfs	110.00
3973	Shell Creek	Allen & Hough Ditch	Spring 1887	1.79 cfs	125.00
Austin Ditch					
4016	Horse Creek	Austin Ditch	4/26/1887	0.5 cfs	35.00
Bond Ditch					
13196	Beaver Creek	Bond Ditch	6/20/1913	0.25 cfs	17.30
Boylan Ditch					
6799	White Creek	Boylan Ditch	7/10/1905	3.03 cfs	212.00
Cropsey Ditch					
20877	Frenchy Draw	Cropsey Ditch	11/29/1951	0.13 cfs	9.00
Leavitt Ditch					
13197	Red Canyon Creek	Leavitt Ditch	12/8/1913	0.47 cfs	32.70
Fletcher Ditch					
8627	Shell Creek	Fletcher Ditch	9/4/1908	0.88 cfs	61.75
Loveland					
3999	Beaver Creek	Loveland Ditch	6/15/1888	0.21 cfs	15.00
Red Bluff Ditch					
16412	Shell Creek	Red Bluff Ditch	8/3/1922	1.07 cfs	75.00
Spring Creek Ditch - Supplimentary Supply					
17571	Spring Creek	Spring Creek Ditch	8/2/1922	None	115.00
Trone & Hurt Ditch					
3558 Enl	Beaver Creek	Trone & Hurt Ditch	11/15/1915	None	67.00
		Total Table 2			**874.75**

Total Table 1 and 2 15,159.81

* Water Right Permits located within the Shell Watershed, but outside of the boudary of the Shell Valley Improvement District were not calculated. All water rights are permitted for 1 cfs/acre. Water rights before March 1, 1945 are entitieled to an additional 1 cfs/70 acres when water is available. Water rights within the entire Shell Watershed were calculated in the 1985 Level I Study performed by HKM for WWDC.



SHELL VALLEY WATERSHED IMPROVEMENT DISTRICT

DRAWINGS OF

IRRIGATION EASEMENT RESEARCH

PREPARED BY

ENGINEERING ASSOCIATES
CONSULTING ENGINEERS & SURVEYORS
P.O. BOX 1900
CODY, WYOMING 82414

ACEC
AMERICAN COUNCIL OF ENGINEERING COMPANIES
The Voice of America's Engineering Industry

LEGEND

DITCH NAME

- BEAVER DITCH
- BENCH DITCH
- COTTONWOOD DITCH
- HIGHLAND DITCH
- HATTEN DITCH
- PORTER CANAL
- THOMPSON LATERAL
- SHELL CANAL
- WHALEY DITCH

LANDOWNER NAME

- BARNETT RANCH
- BULLINGER, LARRY & JESSE
- CHEATHAM, CLAIR & VIDA
- CUMMINGS, DIXIE & TIMOTHY
- DRWENSKI LLC
- GOOD, GARY G. TRUST
- HANKINS, MARVIN & BEVERLEY
- MICHELENA, MARTIN
- MORGAN DEAN PROPERTIES, LLC
- NELSON, JACKIE
- REICHMUTH, DONALD
- SMITH, CHARLES

- BEAVER DITCH
- FRIESE DITCH
- HIGHLINE DITCH
- KERSHNER DITCH
- MCDONALD DITCH
- PORTER CANAL
- SABIN BROWN DITCH
- SHELL CANAL
- THOMPSON LATERAL
- WHALEY DITCH

NOTES:

- ★ WATER FACILITY ASSOCIATED WITH ACREAGE.
- WATER RIGHTS THAT WERE RESEARCHED FOR IRRIGATION EASEMENTS.
- □ PERMIT NUMBER FOR EACH WATER RIGHT FOUND.

DATE	DRAWING LOG	BY	CHECKED	APPROVED
12/04/07	ORIGINAL DRAWING	TSW	LCS	

DRAWN BY: TSW
JOB NO. 06051.00
FIELD BOOK NO. 440
DRAWING NO. lynn water rights

ENGINEERING ASSOCIATES – CODY, WYOMING
CONSULTING ENGINEERS & SURVEYORS

OWNER: SHELL VALLEY WATERSHED IMPROVEMENT DISTRICT

PROJECT: SHELL VALLEY WATERSHED IMPROVEMENT DISTRICT

TITLE: IRRIGATION EASEMENT RESEARCH – TITLE SHEET

SHEET T1 OF T2

U:\2006\06051\acad\lynn water rights BASE+Title 05/22/08

LEGEND

DITCH NAME

- BEAVER DITCH
- BENCH DITCH
- COTTONWOOD DITCH
- HIGHLAND DITCH
- HATTEN DITCH
- PORTER CANAL
- THOMPSON LATERAL
- SHELL CANAL
- WHALEY DITCH

- BEAVER DITCH
- FRIESE DITCH
- HIGHLINE DITCH
- KERSHNER DITCH
- MCDONALD DITCH
- PORTER CANAL
- SABIN BROWN DITCH
- SHELL CANAL
- THOMPSON LATERAL
- WHALEY DITCH

HEADGATE

PERMIT NUMBERS

- 270–BEAVER DITCH
- 3648–BENCH DITCH
- 4715ENL.–ENL BENCH DITCH
- 1438ENL.–ENL. CALVIN DITCH
- 24240–CASEY PIPELINE
- 17878–COTTONWOOD DITCH
- 691–CRANDALL DITCH
- 3720–CULL NO. 1 DITCH
- 2967–DAVIS DITCH
- 1274ENL.–DENNY DITCH
- 5859ENL.–ENL. DUNSHEE DITCH
- 14358–EMERICK DITCH
- 13194–EWEN NO. 1 DITCH
- 21842–EWEN NO. 3 DITCH
- 3246–FENDER DITCH
- 19860–FLITNER DITCH
- 17817–FRANK GOULD NO. 2 DITCH
- 1075–HATTEN DITCH
- 1716–HIGHLINE DITCH
- 1962ENL.–ENL HIGHLINE DITCH
- 2469ENL.–ENL. HIGHLINE DITCH
- 1522ENL.–ENL. HIGHLINE DITCH
- 12217–HOWE DITCH
- 5363–HUNT DITCH
- 2563–JENKS DITCH
- 682–KENYON DITCH
- 508–KERSHNER DITCH
- 510–KERSHNER–LAMPMAN DITCH
- 11335–KIMBROW NO. 1 DITCH
- 1573–LAMPMAN NO. 2 DITCH
- 686–LONDON DITCH
- 3721–LYNN DITCH
- 3722–M.E. JACKSON DITCH
- 1341–MATHEWS DITCH
- 2747ENL.–MCDONALD DITCH
- 430–MCDONALD DITCH
- 1439ENL.–MCDONALD DITCH
- 1330ENL.–MCDONALD DITCH
- 271ENL.–ENL. MCDONALD DITCH
- 2031ENL.–ENL ODESSA DITCH
- 1807F–PENSE DITCH
- 365–PORTER DITCH
- 1726ENL.–ENL. POERTER DITCH
- 8538–RATH–EARLY DITCH
- 3132–SABIN–BROWN DITCH
- 1244ENL.–ENL SABIN–BROWN
- 5274–SCHAREN DITCH
- 8290–SHELL CANAL
- 2084ENL.–ENL SHELL CANAL
- 17571–SPRING CREEK DITCH
- 1415–ST. JERMAIN DITCH
- 386–TROUT DITCH
- 1039–WILLARD DITCH
- 650ENL.–ENL WHALEY DITCH
- 5420ENL.–ENL. WALEY DITCH
- 462ENL.–ENL WHALEY DITCH
- 42ENL.–ENL WHALEY DITCH

ACEC
AMERICAN COUNCIL OF ENGINEERING COMPANIES
The Voice of America's Engineering Industry

U:\2006\06051\acad\lynn water rights BASE+Title (2) 05/21/08

DATE	DRAWING LOG	BY	CHECKED	APPROVED
12/04/07	ORIGINAL DRAWING	TSW	LCS	

DRAWN BY: TSW
JOB NO. 06051.00
FIELD BOOK NO. 440
DRAWING NO. lynn water rights

ENGINEERING ASSOCIATES – CODY, WYOMING
CONSULTING ENGINEERS & SURVEYORS

OWNER: SHELL VALLEY WATERSHED IMPROVEMENT DISTRICT

PROJECT: SHELL VALLEY WATERSHED IMPROVEMENT DISTRICT

TITLE: IRRIGTION EASEMENT RESEARCH – TITLE SHEET

SHEET T2 OF T2

LEGEND

- 3721—LYNN DITCH
- 2084ENL.—ENL SHELL CANAL
- 8290—SHELL CANAL
- 5274—SCHAREN DITCH
- 5274—SCHAREN DITCH
- 462ENL.—ENL WHALEY DITCH
- 1274ENL.—DENNY DITCH
- THOMPSON LATERAL
- SHELL CANAL
- SHELL CANAL NORTH
- SHELL CANAL
- GOOD, GARY G. TRUST

034 035 036
033
005 004 003 002 001
SHELL CANAL NORTH
007 008 010 011 012
Township 052 N
Range 093 W
018 017 016 015 014 013

0 1000 2000 4000
SCALE (FT)

DATE	DRAWING LOG	BY	CHECKED	APPROVED
12/04/07	ORIGINAL DRAWING	TSW	LCS	

DRAWN BY: TSW
JOB NO. 06051.00
FIELD BOOK NO. 440
DRAWING NO. lynn water rights

ENGINEERING ASSOCIATES — CODY, WYOMING
CONSULTING ENGINEERS & SURVEYORS

OWNER: SHELL VALLEY WATERSHED IMPROVEMENT DISTRICT

PROJECT: SHELL VALLEY WATERSHED IMPROVEMENT DISTRICT

TITLE: WATER RIGHTS MAP

SHEET M1 OF M3

U:\2006\06051\acad\lynn water rights BASE+Permits 05/23/08

PORTER CANAL

028 027 026 025 030 029

034 035 036 031 032

W HALEY DITCH

MCDONALD DITCH

1250 SQ. FT.
DRAINAGE EASEMENT
BK 65 PAGE 477

.11 ACRE
DRAINAGE EASEMENT
BK 65 PAGE 479
BK 65 PAGE 483
BK 65 PAGE 484

005 004 003 002

THOMPSON LATERAL

008 009 010

0 1000 2000 4000
SCALE (FT)

LEGEND

- SHELL CANAL
- WHALEY DITCH
- CHEATHAM, CLAIR & VIDA
- SMITH, CHARLES
- BULLINGER, LARRY & JESSE
- HANKINS, MARVIN & BEVERLEY
- BARNETT RANCH
- REICHMUTH, DONALD
- MORGAN DEAN PROPERTIES, LLC
- NELSON, JACKIE

- 650ENL.–ENL WHALEY DITCH
- 3722–M.E. JACKSON DITCH
- 271ENL.–ENL. MCDONALD DITCH
- 17571–SPRING CREEK DITCH
- 42ENL.–ENL WHALEY DITCH
- 1075–HATTEN DITCH
- 1330ENL.–MCDONALD DITCH
- 365–PORTER DITCH
- 1726ENL.–ENL. POERTER DITCH
- 2084ENL.–ENL SHELL CANAL
- SHELL CANAL NORTH
- MCDONALD DITCH
- FRIESE DITCH
- THOMPSON LATERAL
- PORTER CANAL
- WHALEY DITCH

DATE	DRAWING LOG	BY	CHECKED	APPROVED
12/04/07	ORIGINAL DRAWING	TSW	LCS	

DRAWN BY: TSW
JOB NO. 06051.00
FIELD BOOK NO. 440
DRAWING NO. lynn water rights

ENGINEERING ASSOCIATES – CODY, WYOMING
CONSULTING ENGINEERS & SURVEYORS

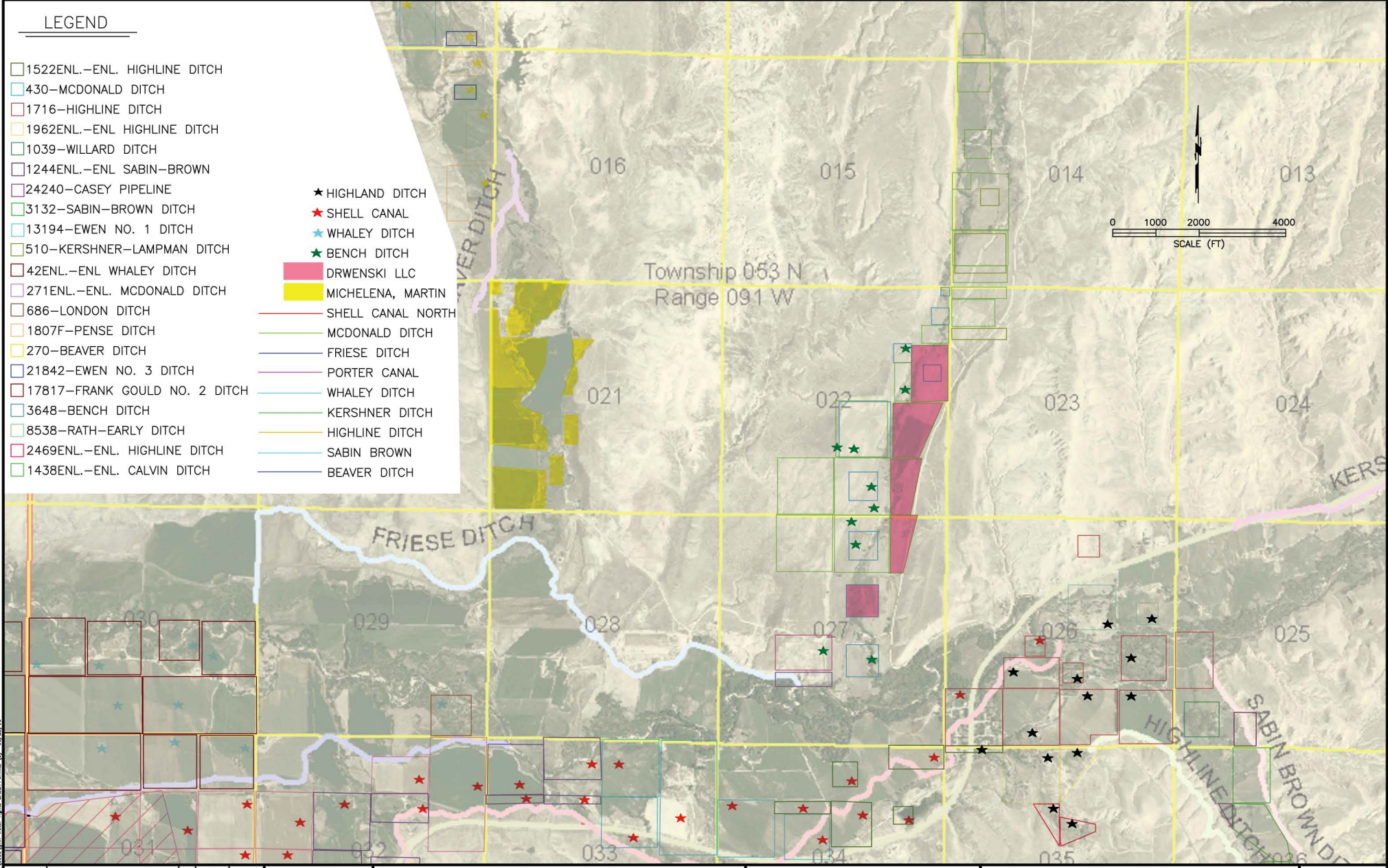
OWNER: SHELL VALLEY WATERSHED IMPROVEMENT DISTRICT

PROJECT: SHELL VALLEY WATERSHED IMPROVEMENT DISTRICT

TITLE: WATER RIGHTS MAP

SHEET M2 OF M3

J:\2006\06051\acad\lynn water rights BASE+Permits (2) 12/04/07



DATE	DRAWING LOG	BY	CHECKED	APPROVED
12/04/07	ORIGINAL DRAWING	TSW	LCS	

DRAWN BY: TSW
JOB NO. 06051.00
FIELD BOOK NO. 440
DRAWING NO. lynn water rights

ENGINEERING ASSOCIATES – CODY, WYOMING
CONSULTING ENGINEERS & SURVEYORS

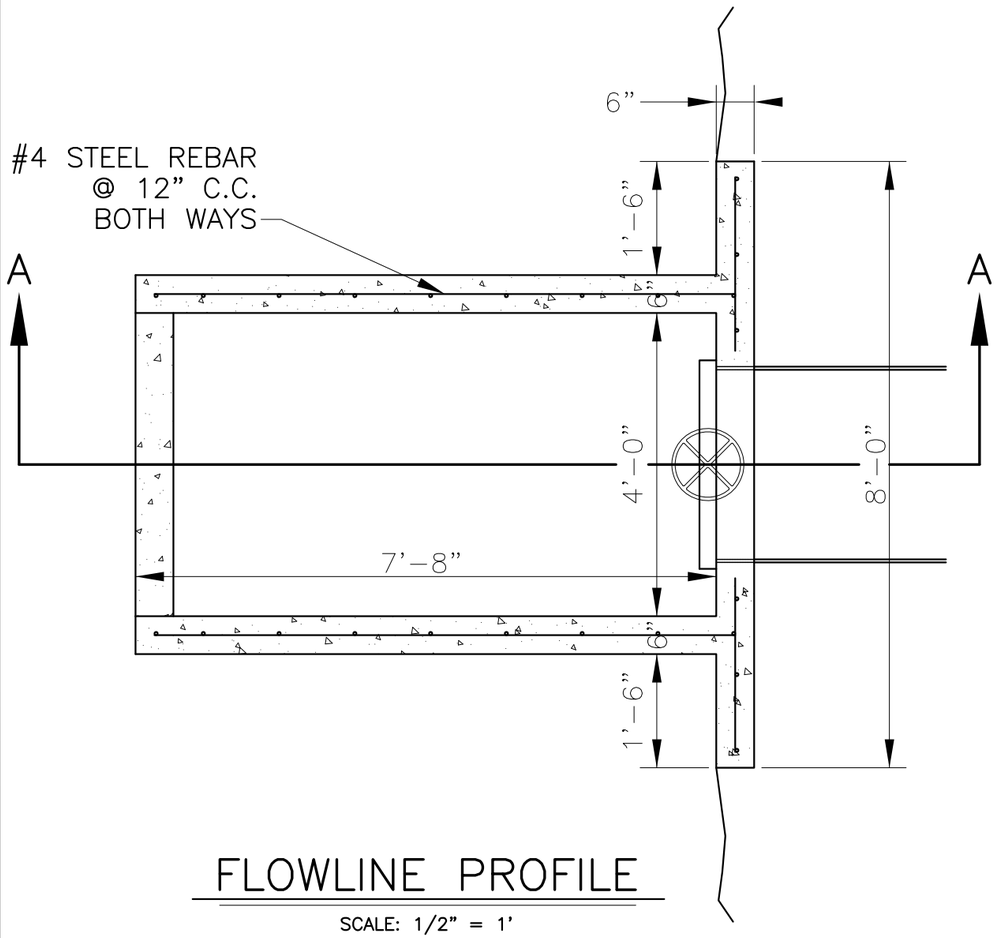
OWNER: SHELL VALLEY WATERSHED IMPROVEMENT DISTRICT

PROJECT: SHELL VALLEY WATERSHED IMPROVEMENT DISTRICT

TITLE: WATER RIGHTS MAP

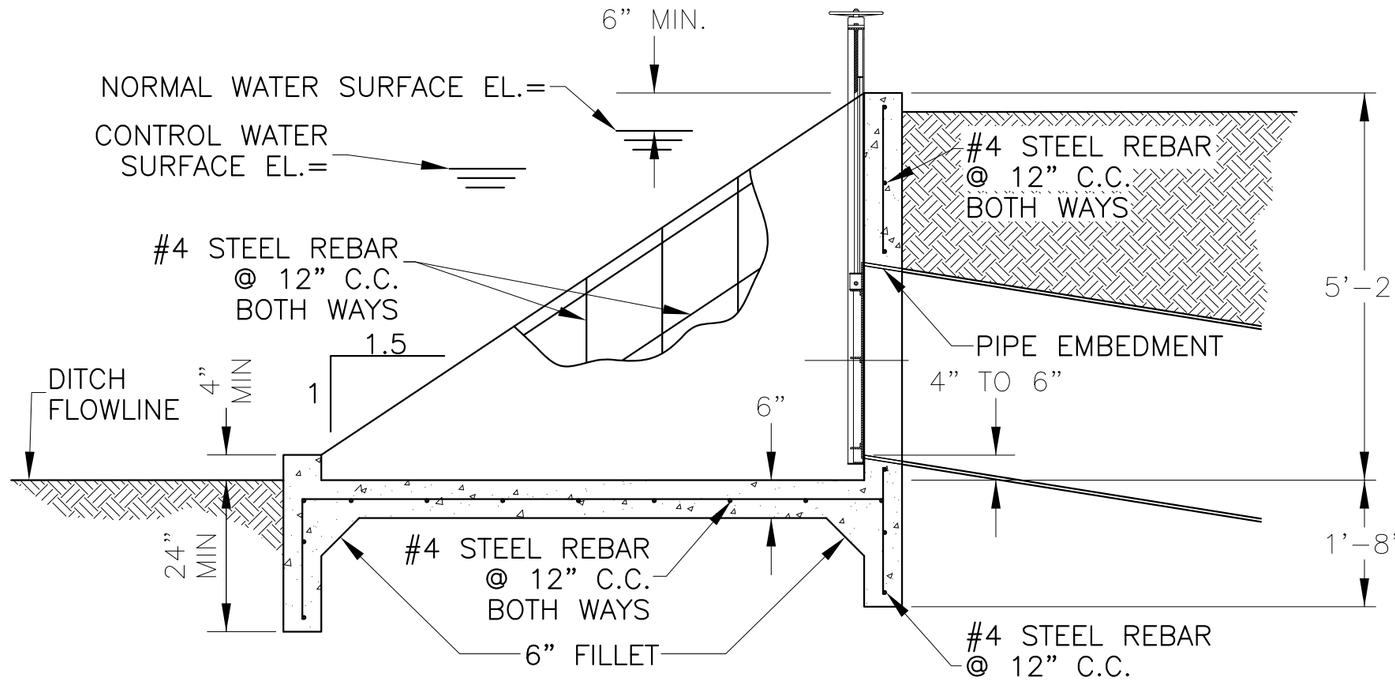
SHEET M3 OF M3

Construction Details



FLOWLINE PROFILE

SCALE: 1/2" = 1'



HEAD GATE
SECTION A-A

NOTE: 1. STRUCTURE DESIGNED FOR PIPE SIZES OF 15" TO 30" WITH FLOWS OF 3 CFS TO 30 CFS

2. STRUCTURE, HEAD GATE, AND PIPE DIAMETER FLOWS LESS THAN OR GREATER THAN THE SPECIFIED RANGE WILL NEED TO BE DESIGNED.

PRELIMINARY

DATE	DRAWING LOG	BY	CHECKED	APPROVED
09/21/07	ORIGINAL DRAWING	IKSM	LCS	

DRAWN BY: IKSM
DATE: 09/21/07
JOB NO. 06051.00
FIELD BOOK NO. NA
DRAWING NO. DETAIL

ENGINEERING ASSOCIATES – CODY, WYOMING
CONSULTING ENGINEERS & SURVEYORS

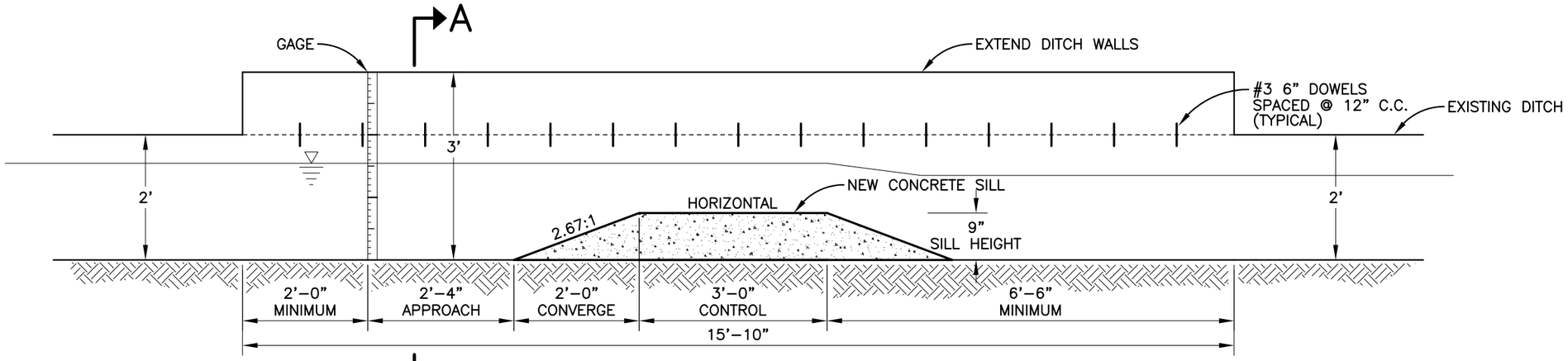
OWNER: WYOMING WATER DEVELOPMENT COMMISSION

PROJECT: SHELL VALLEY LEVEL I STUDY

TITLE: STANDARD HEADGATE

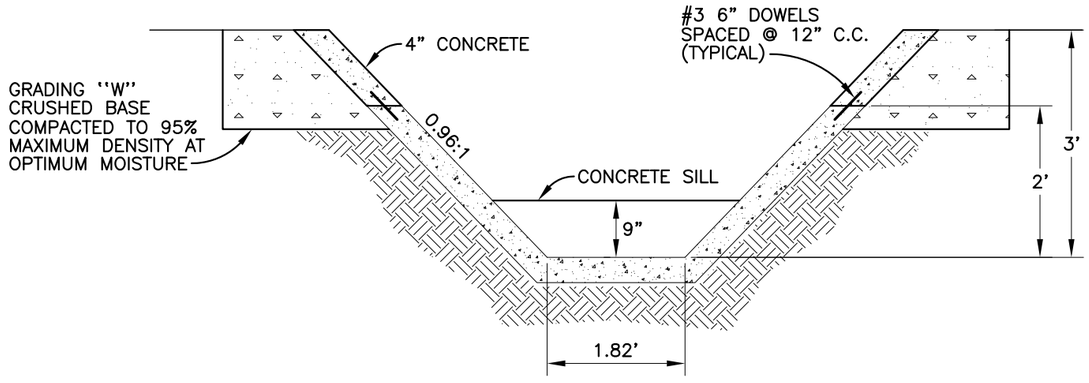
SHEET HG1

U:\2006\06051_Shell Valley\acad\DETAILS+HEAD GATE 09/21/07



FLOWLINE PROFILE

SCALE: 1/2" = 1'



DITCH SECTION A–A

SCALE: 1/2" = 1'

NOTE: 1. CONCRETE SHALL BE 3000 psi 28–DAY STRENGTH, 5% TO 7% ENTRAINED AIR, AND 1"–2" SLUMP

2. FOR DITCH SECTIONS LARGER OR SMALLER THAN SHOWN, WIN FLUME SOFTWARE SHOULD BE USED. WIN FLUME SOFTWARE CAN BE DOWNLOADED FROM THE BUREAU OF RECLAMATION WEB SITE.

PRELIMINARY

DATE	DRAWING LOG	BY	CHECKED	APPROVED
09/21/07	ORIGINAL DRAWING	IKSM	LCS	

DRAWN BY: IKSM
DATE: 09/21/07
JOB NO. 06051.00
FIELD BOOK NO. NA
DRAWING NO. DETAIL

ENGINEERING ASSOCIATES – CODY, WYOMING
CONSULTING ENGINEERS & SURVEYORS

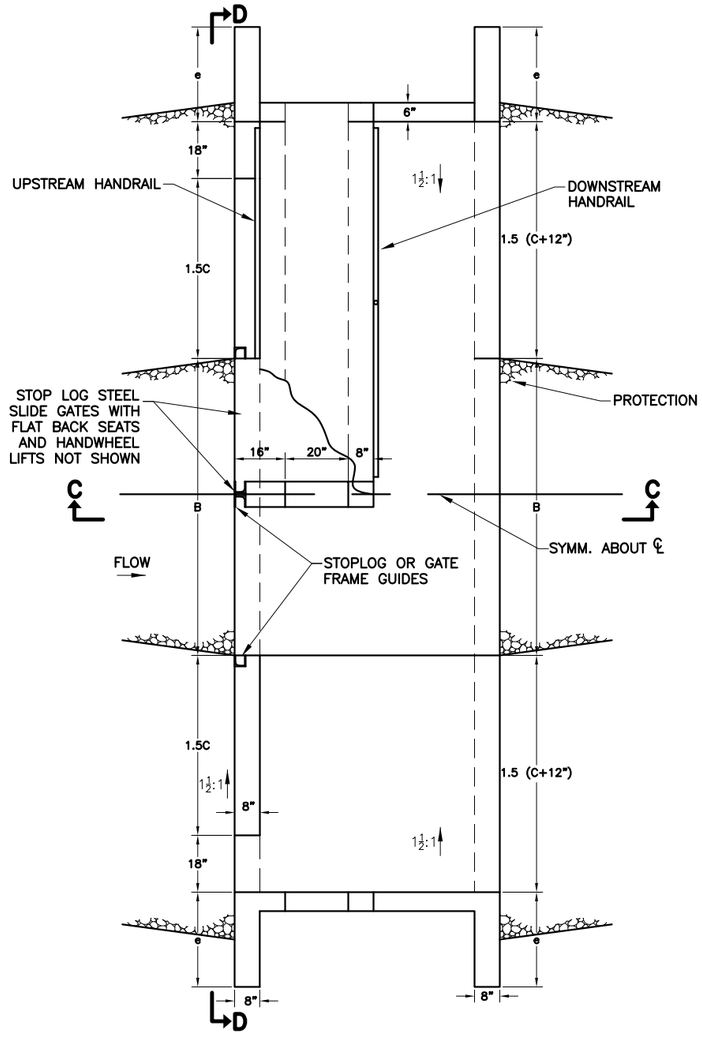
OWNER: WYOMING WATER DEVELOPMENT COMMISSION

PROJECT: SHELL VALLEY LEVEL I STUDY

TITLE: STANDARD RAMP FLUME DETAIL

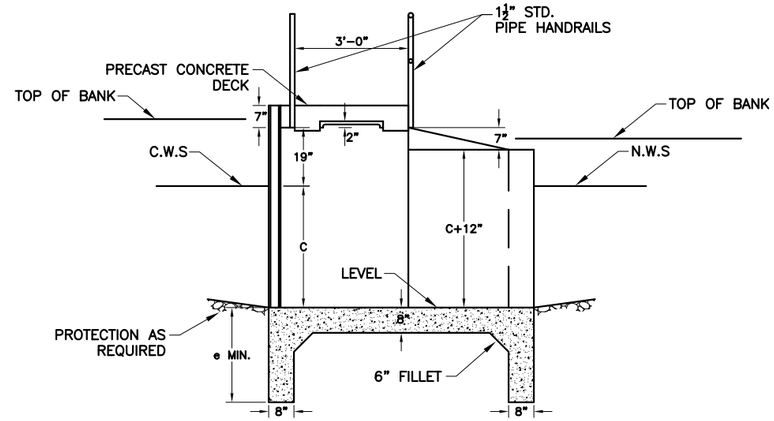
SHEET RF1

U:\2006\06051_Shell Valley\acad\DETAILS+RAMP FLUME 09/21/07

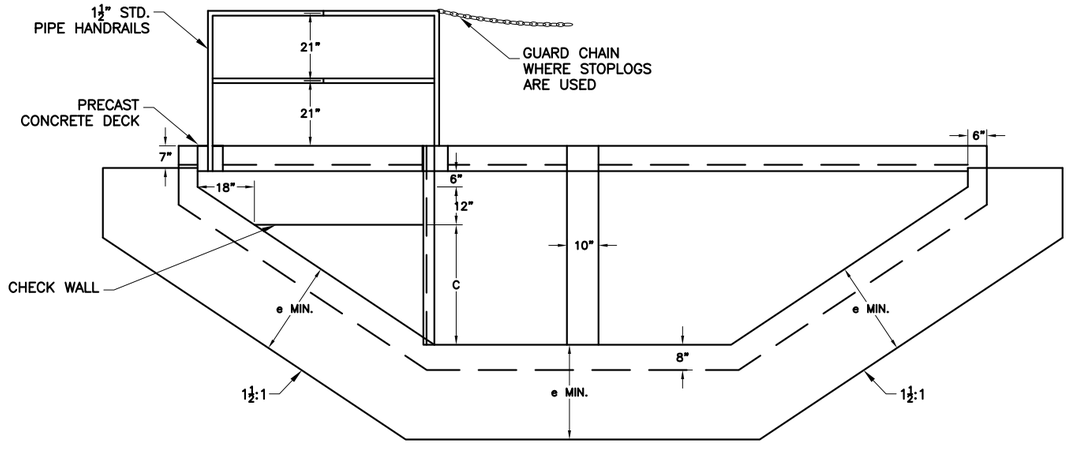


CHECK STRUCTURE

SCALE: 1/4" = 1'



SECTION C–C



SECTION D–D

STR. NO.	MAX Q (CFS)	**SLIDE GATES *WIDTH x HEIGHT	FRM. HT.	STANDARD DIMENSIONS B	C	L	e	S	X	ESTIMATED QUANTITIES CON. (CU. YDS.)	REINF. STEEL (LBS)	MISC. METAL (LBS)
1	74	42"x36"	7'-0"	7'-10"	3'-2"	7'-0"	2'-6"	21'-4"	9'-2"	8.9	910	620
2	86	42"x42"	7'-6"	7'-10"	3'-8"	7'-6"	2'-6"	22'-10"	10'-0"	10.0	1000	660
3	98	42"x48"	8'-0"	7'-10"	4'-3"	8'-0"	2'-6"	24'-7"	10'-0"	11.3	1100	710
4	84	48"x36"	7'-0"	8'-10"	3'-3"	7'-0"	2'-6"	22'-7"	9'-10"	9.4	960	630
5	98	48"x42"	7'-6"	8'-10"	3'-9"	7'-6"	2'-6"	24'-1"	10'-8"	10.5	1050	680
6	105	60"x36"	7'-0"	10'-10"	3'-3"	7'-6"	2'-6"	24'-7"	10'-10":	10.4	1050	640

* When a gate of specific height is not available, a gate with next greater available height shal be used with appropriate frame height.

** Two gates required for each check.

PRELIMINARY

DATE	DRAWING LOG	BY	CHECKED	APPROVED
09/27/07	ORIGINAL DRAWING	TSW	LCS	

DRAWN BY: IKSM
DATE: 09/21/07
JOB NO. 06051.00
FIELD BOOK NO. NA
DRAWING NO. DETAIL

ENGINEERING ASSOCIATES – CODY, WYOMING
CONSULTING ENGINEERS & SURVEYORS

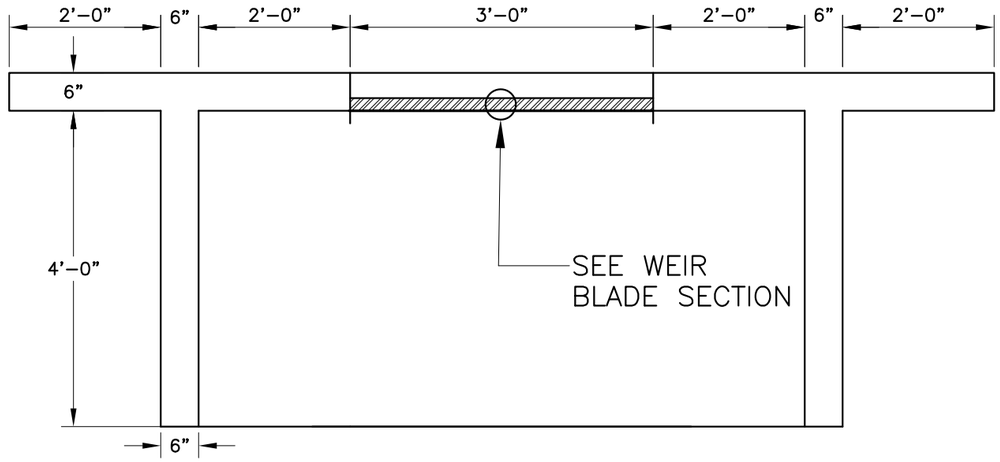
OWNER: WYOMING WATER DEVELOPMENT COMMISSION

PROJECT: SHELL VALLEY LEVEL I STUDY

TITLE: CHECK STRUCTURE

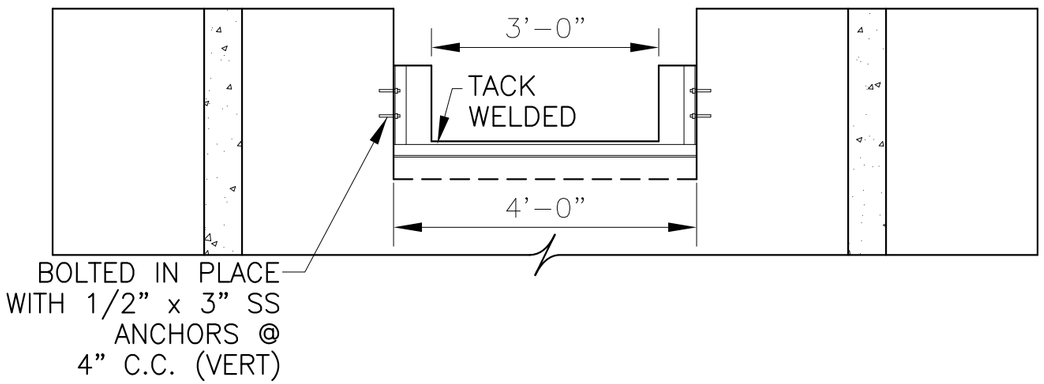
SHEET CS1

U:\2006\06051_Shell Valley\acad\DETAILS+CHECK STRUCTURE 09/21/07

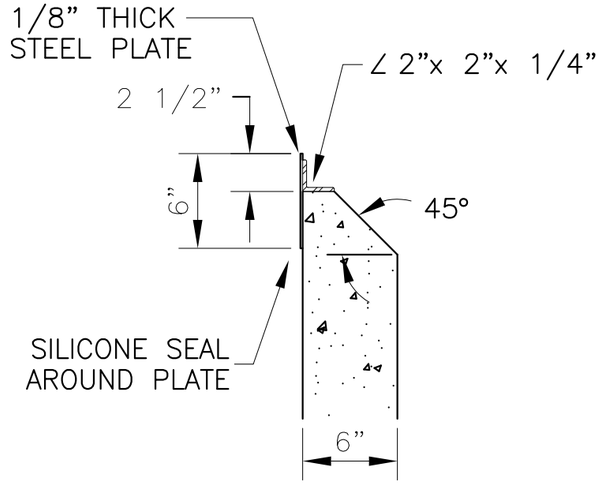


PLAN

SCALE: 1/2" = 1'



WEIR BLADE (FRONT)



WEIR BLADE (SECTION)

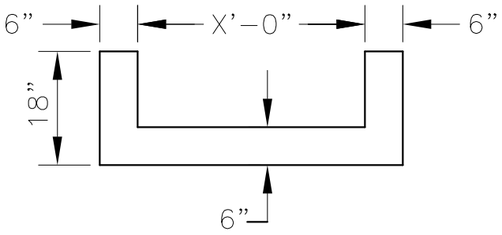


PLATE FABRICATION

NOTE: FOR FLOWS FROM 1 CFS TO 9 CFS A 3' WEIR BLADE IS APPROPRIATE,
FOR FLOW GREATER THAN 9 CFS, WEIR BLADE WIDTH NEEDS TO BE DESIGNED.

PRELIMINARY

DATE	DRAWING LOG	BY	CHECKED	APPROVED
09/21/07	ORIGINAL DRAWING	IKSM	LCS	

DRAWN BY: IKSM
DATE: 09/21/07
JOB NO. 06051.00
FIELD BOOK NO. NA
DRAWING NO. DETAIL

ENGINEERING ASSOCIATES – CODY, WYOMING
CONSULTING ENGINEERS & SURVEYORS

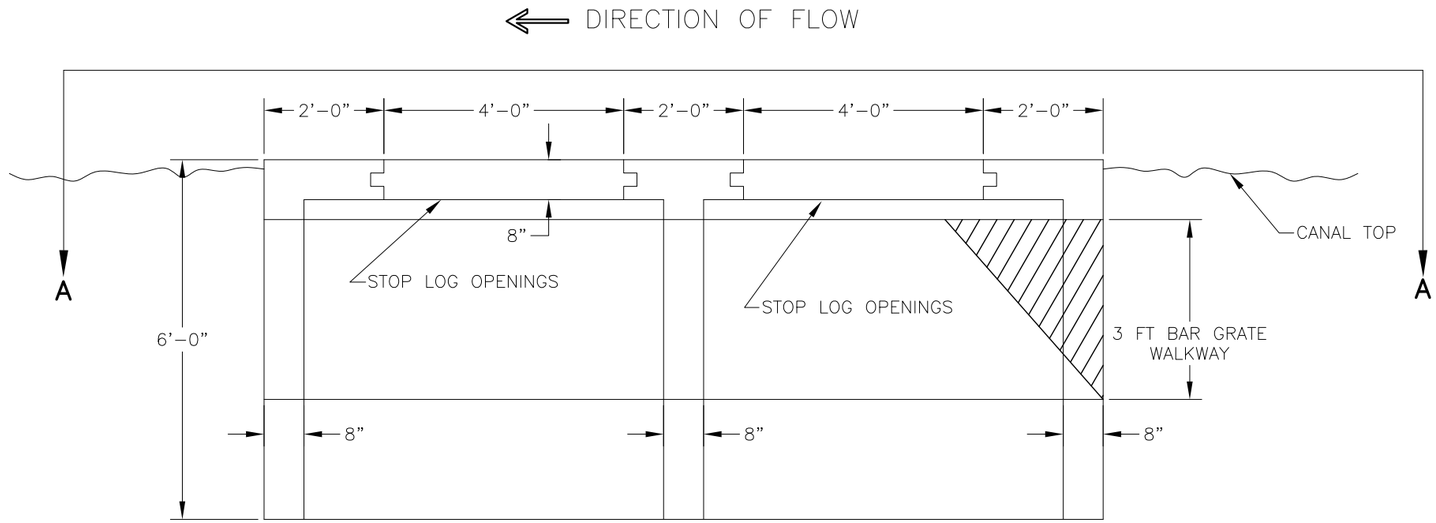
OWNER: WYOMING WATER DEVELOPMENT COMMISSION

PROJECT: SHELL VALLEY LEVEL I STUDY

TITLE: RECTANGULAR WEIR DETAIL

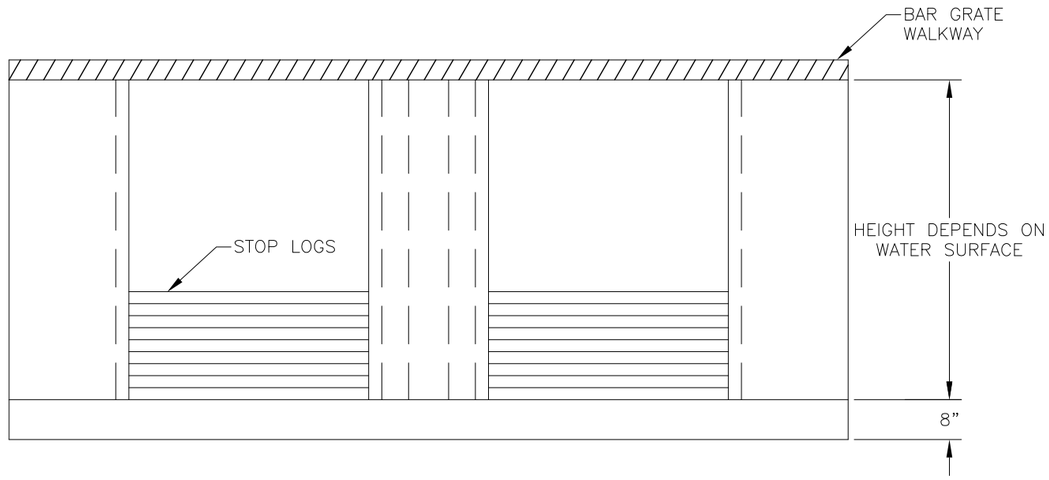
SHEET W1

U:\2006\06051_Shell Valley\acad\DETAILS+WEIR DETAIL 09/21/07



SPILL STRUCTURE

NOT TO SCALE



NOTE: #5 REBAR SPACED @ 12" C.C. EACH WAY

SECTION A–A

NOT TO SCALE

PRELIMINARY

DATE	DRAWING LOG	BY	CHECKED	APPROVED
09/21/07	ORIGINAL DRAWING	TSW	JLM	

DRAWN BY: TSW
DATE: 09/21/07
JOB NO. 06051.00
FIELD BOOK NO. NA
DRAWING NO. DETAIL

ENGINEERING ASSOCIATES – CODY, WYOMING
CONSULTING ENGINEERS & SURVEYORS

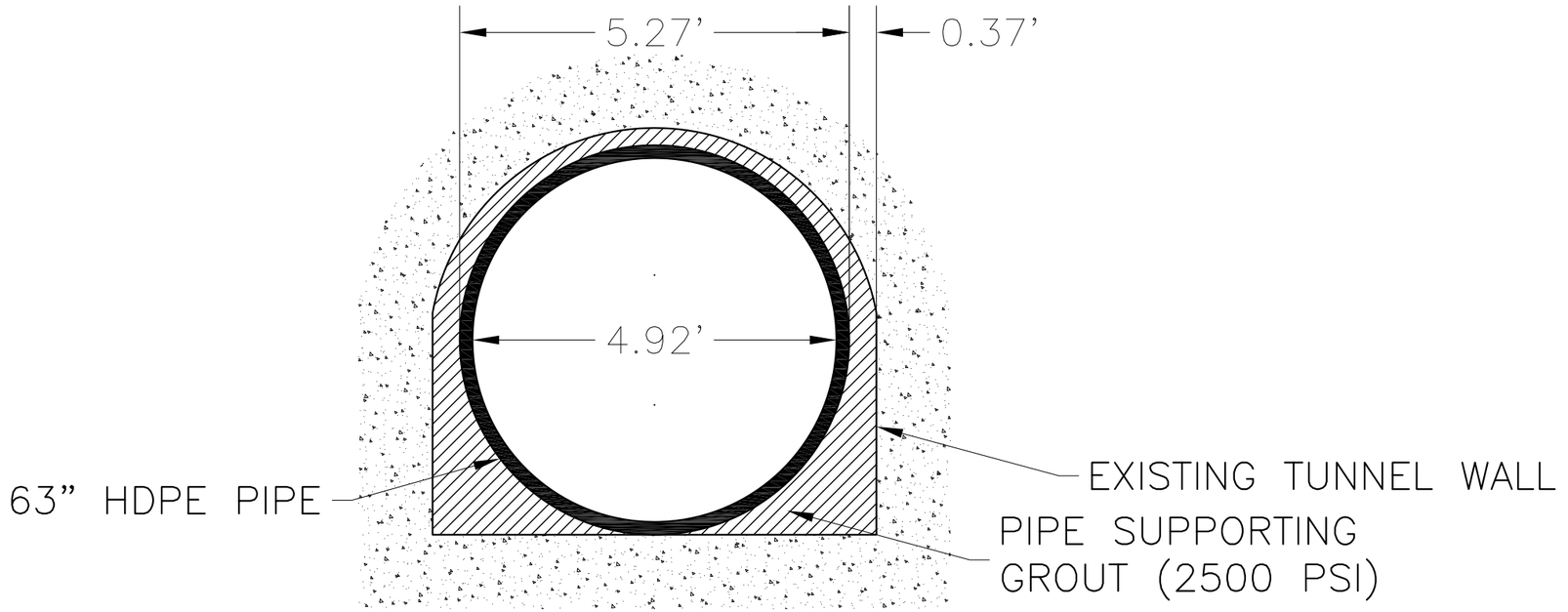
OWNER: WYOMING WATER DEVELOPMENT COMMISSION

PROJECT: SHELL VALLEY LEVEL I STUDY

TITLE: STANDARD RAMP FLUME DETAIL

SHEET SP1

U:\2006\06051_Shell Valley\acad\DETAILS+RAMP FLUME 09/21/07



DATE	DRAWING LOG	BY	CHECKED	APPROVED
09/21/07	ORIGANAL DWG	IKSM	LCS	

DRAWN BY: IKSM
DATE: 06/20/07
JOB NO. 06051.00
FIELD BOOK NO. 441
DRAWING NO. DETAIL

ENGINEERING ASSOCIATES – CODY, WYOMING
CONSULTING ENGINEERS & SURVEYORS

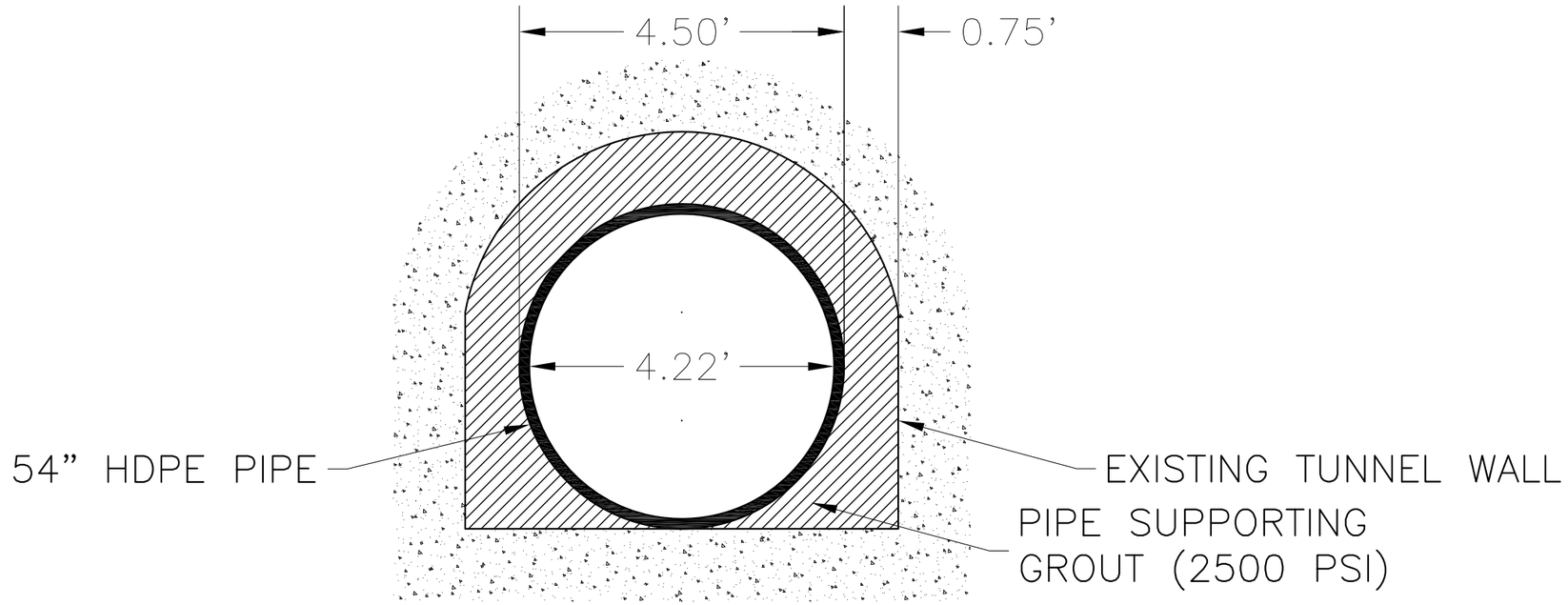
OWNER: WYOMING WATER DEVELOPMENT COMMISSION

PROJECT: SHELL VALLEY WATERSHED IMPROVEMENT DISTRICT LEVEL I STUDY

TITLE: SHELL TUNNEL 63” HDPE

SHEET D1

U:\2006\06051_Shell Valley\acad\tunnel+63 in HDPE 09/21/07



DATE	DRAWING LOG	BY	CHECKED	APPROVED
09/21/07	ORIGANAL DWG	IKSM	LCS	

DRAWN BY: IKSM
DATE: 06/20/07
JOB NO. 06051.00
FIELD BOOK NO. 441
DRAWING NO. DETAIL

ENGINEERING ASSOCIATES – CODY, WYOMING
CONSULTING ENGINEERS & SURVEYORS

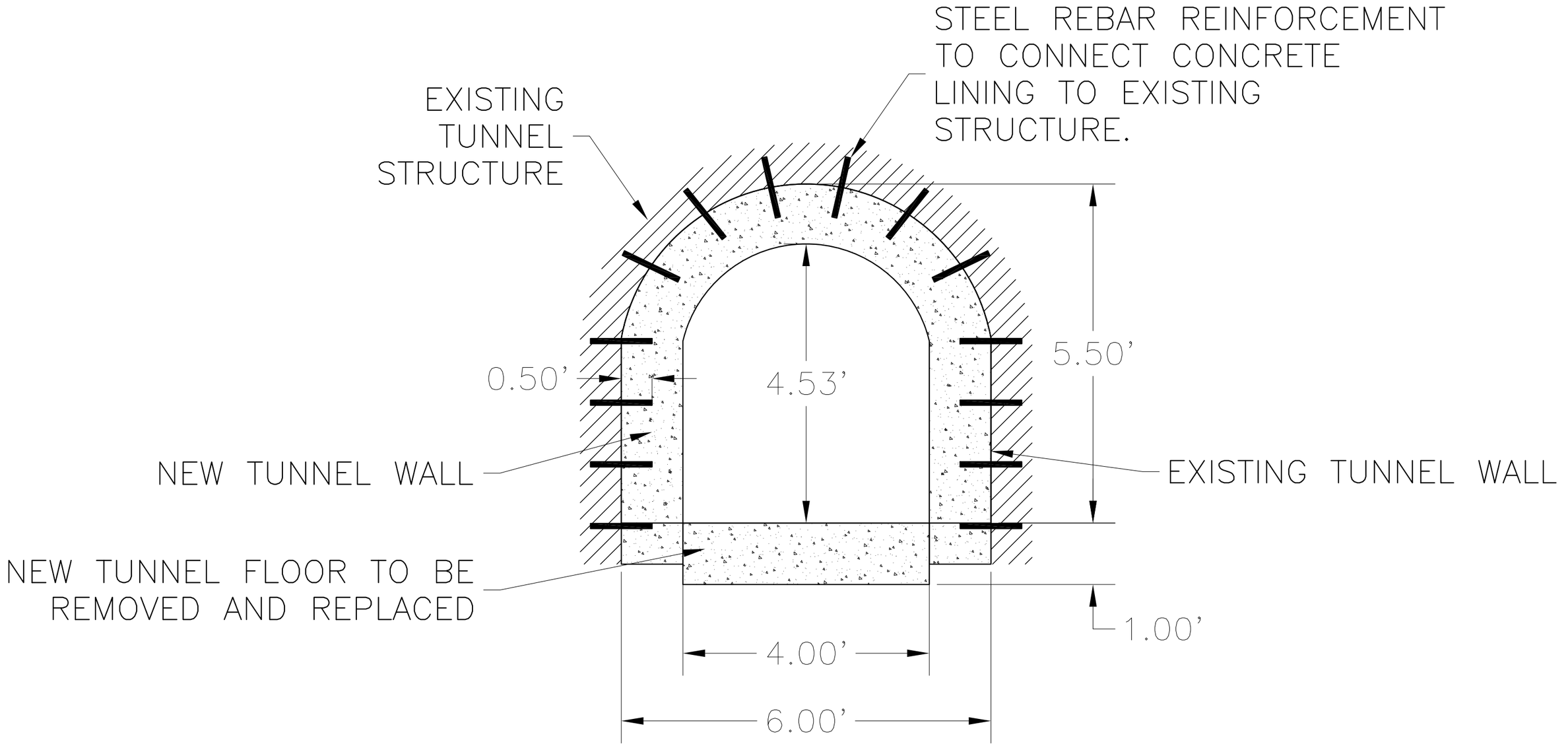
OWNER: WYOMING WATER DEVELOPMENT COMMISSION

PROJECT: SHELL VALLEY WATERSHED IMPROVEMENT DISTRICT LEVEL I STUDY

TITLE: SHELL TUNNEL 54” HDPE

SHEET D2

U:\2006\06051_Shell Valley\acad\tunnel+54 in HDPE 09/21/07



DATE	DRAWING LOG	BY	CHECKED	APPROVED
09/21/07	ORIGANAL DWG	IKSM	LCS	

DRAWN BY: IKSM
DATE: 06/20/07
JOB NO. 06051.00
FIELD BOOK NO. 441
DRAWING NO. DETAIL

ENGINEERING ASSOCIATES – CODY, WYOMING
CONSULTING ENGINEERS & SURVEYORS

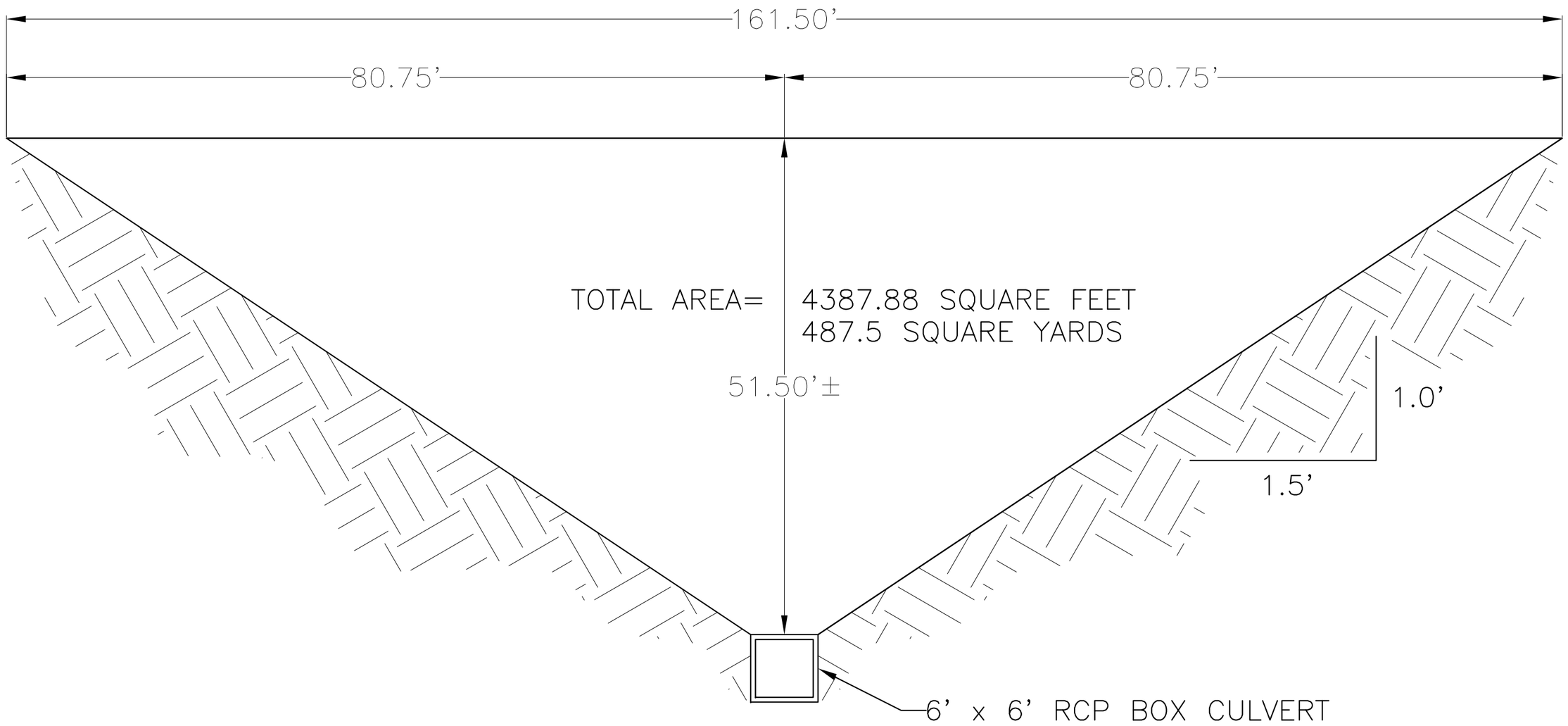
OWNER: WYOMING WATER DEVELOPMENT COMMISSION

PROJECT: SHELL VALLEY WATERSHED IMPROVEMENT DISTRICT LEVEL I STUDY

TITLE: SHELL TUNNEL CONCRETE LINING

SHEET D3

U:\2006\06051_Shell Valley\acad\tunnel+CONC LINING 09/21/07



DATE	DRAWING LOG	BY	CHECKED	APPROVED
09/21/07	ORIGANAL DWG	IKSM	LCS	

DRAWN BY: IKSM
DATE: 06/20/07
JOB NO. 06051.00
FIELD BOOK NO. 441
DRAWING NO. DETAIL

ENGINEERING ASSOCIATES – CODY, WYOMING
CONSULTING ENGINEERS & SURVEYORS

OWNER:
WYOMING WATER
DEVELOPMENT COMMISSION

PROJECT: SHELL VALLEY WATERSHED IMPROVEMENT DISTRICT
LEVEL I STUDY

TITLE: 6’ X 6’ BOX CULVERT; OPEN TRENCH CUT

SHEET
D4

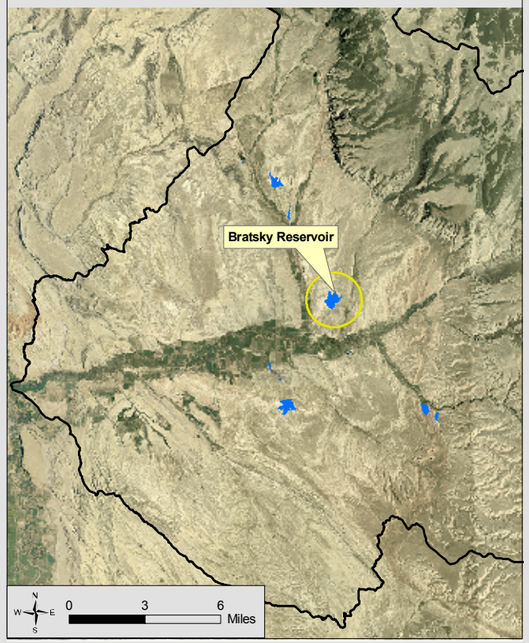
U:\2006\06051_Shell Valley\acad\tunnel+OPEN CUT BOX CULVERT 09/21/07

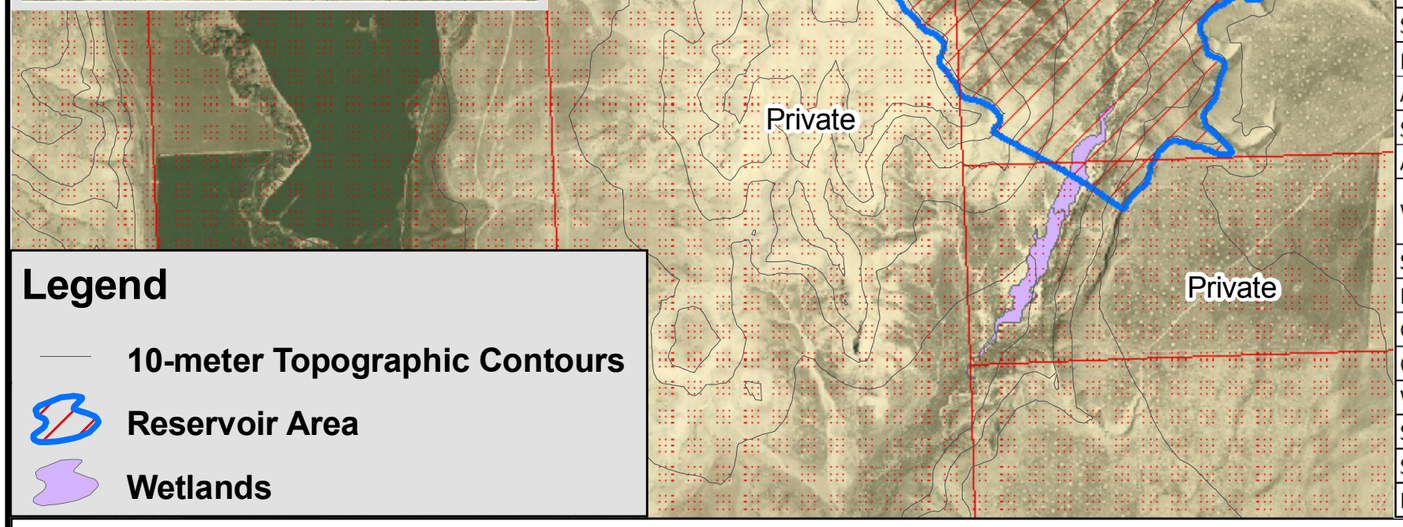
APPENDIX O

Water Storage Site Maps

- Bratsky Draw
- Collingwood Middle and Lower Reservoir Sites
- Collingwood Upper Reservoir Site
- Coyote Basin Reservoir Site
- High Line Expansion Reservoir Site
- Leavitt Expansion Reservoir Site
- Red Canyon Creek Reservoir Site
- Trapper Creek Reservoir Sites

Shell Valley Overview





Characteristics	Bratsky Draw
Maximum Water Depth (ft)	98
Average Water Depth (ft)	36
Storage Capacity (ac-ft)	5839
Surface Area (ac)	160
Immediate Direct Drainage Area (mi^2)	3.1
Assumed Mean Annual Flow Volume (af/yr)	1,900
Supplemental Drainage Area (mi^2)	285.6
Assumed Mean Annual Flow Volume (af/yr)	174,710
Water Source	Seasonal run-off, possibly diverter from Horse Creek, Red Canyon Creek, Beaver Creek and/or Shell Creek
Service Area (ac)	8,807
Primary Conveyance	Horse Creek
Geotechnical Constraints	Potential soil constraints and landslide hazarads
On Perennial Stream	No
Wetlands Potentially Filled (ac)	0.96
Significant Cultural Resources	None recorded
Special-Status Species	None recorded
Land Ownership	Private/Public

Legend

- 10-meter Topographic Contours
- Reservoir Area
- Wetlands

Bratsky Reservoir Site

Geomatrix

Westech Environmental Services, Inc.

ENGINEERING ASSOCIATES
CONSULTING ENGINEERS & SURVEYORS
CODY, WYOMING

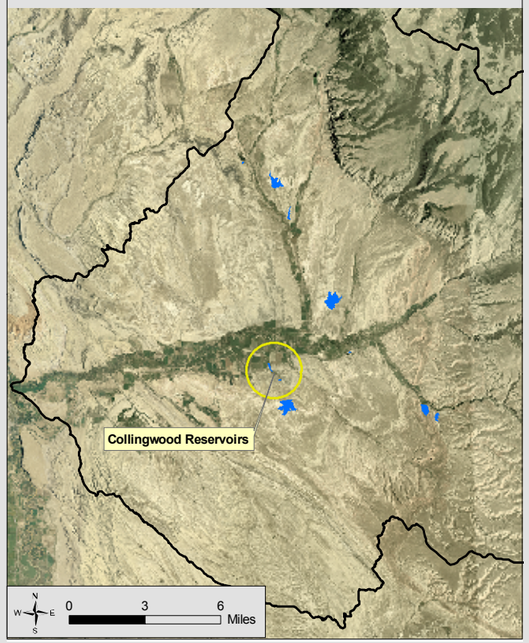
Aerial Photo: 2006 NAIP Imagery
Wetlands: GPS Located - July 2007

N
W
E
S

0 1,500 3,000 Feet

P:\2006\06051\GIS\Bratsky_Draw.pdf 6/26/08

Shell Valley Overview



Characteristics	Collingwood Lower
Maximum Water Depth (ft)	16
Average Water Depth (ft)	6
Storage Capacity (ac-ft)	71
Surface Area (ac)	13
Immediate Direct Drainage Area (mi^2)	2.8
Assumed Mean Annual Flow Volume (af/yr)	1,800
Supplemental Drainage Area (mi^2)	257.2
Assumed Mean Annual Flow Volume (af/yr)	162,200
Water Source	Seasonal runoff
Service Area (ac)	6,499
Primary Conveyance	Whaley Ditch
Geotechnical Constraints	Potential soil constraints
On Perennial Stream	No
Wetlands Potentially Filled (ac)	7.8
Significant Cultural Resources	None recorded
Special-Status Species	None recorded
Land Ownership	Public/Private

Characteristics	Collingwood Middle
Maximum Water Depth (ft)	16
Average Water Depth (ft)	3
Storage Capacity (ac-ft)	11
Surface Area (ac)	4
Immediate Direct Drainage Area (mi^2)	2.8
Assumed Mean Annual Flow Volume (af/yr)	1,800
Supplemental Drainage Area (mi^2)	None
Assumed Mean Annual Flow Volume (af/yr)	None
Water Source	Seasonal runoff
Service Area (ac)	4,719
Primary Conveyance	Shell Canal
Geotechnical Constraints	Potential soil constraints
On Perennial Stream	No
Wetlands Potentially Filled (ac)	0
Significant Cultural Resources	None recorded
Special-Status Species	None recorded
Land Ownership	Public

Legend

- 10-meter Topographic Contours
- Reservoir Area
- Wetlands

Collingwood Middle & Lower Reservoir Sites

Geomatrix

Westech Environmental Services, Inc.

ENGINEERING ASSOCIATES
CONSULTING ENGINEERS & SURVEYORS
CODY, WYOMING

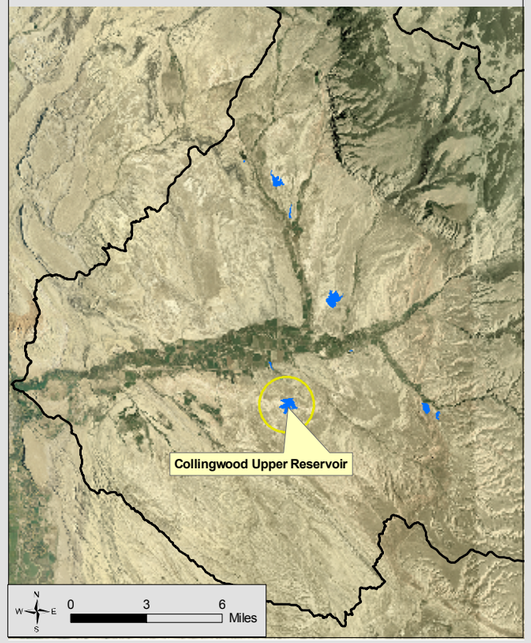
Aerial Photo: 2006 NAIP Imagery
Wetlands: GPS Located - July 2007

N
W E
S

0 1,500 3,000 Feet

P:\2006\06051\GIS\Collingwood_Middle_Lower-EA.pdf 6/30/08

Shell Valley Overview



BLM

BLM

BLM

BLM

Characteristics	Collingwood Upper
Maximum Water Depth (ft)	65
Average Water Depth (ft)	17
Storage Capacity (ac-ft)	2692
Surface Area (ac)	157
Immediate Direct Drainage Area (mi^2)	2.8
Assumed Mean Annual Flow Volume (af/yr)	1,800
Supplemental Drainage Area (mi^2)	None
Assumed Mean Annual Flow Volume (af/yr)	None
Water Source	Seasonal runoff
Service Area (ac)	4,719
Primary Conveyance	Shell Canal
Geotechnical Constraints	Potential soil constraints
On Perennial Stream	No
Wetlands Potentially Filled (ac)	0
Significant Cultural Resources	None recorded
Special-Status Species	None recorded
Land Ownership	Public

Legend

- 10-meter Topographic Contours
- Reservoir Area
- Wetlands

Collingwood Upper Reservoir Site

Geomatrix

Westech Environmental Services, Inc.

ENGINEERING ASSOCIATES
CONSULTING ENGINEERS & SURVEYORS
CODY, WYOMING

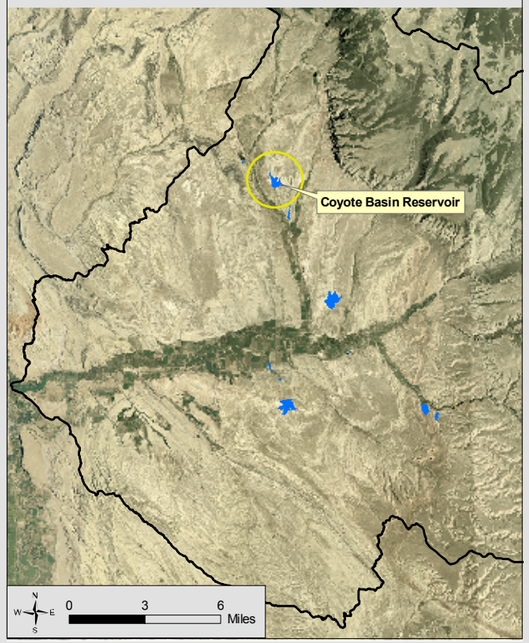
Aerial Photo: 2006 NAIP Imagery
Wetlands: GPS Located - July 2007

N
W
E
S

0 1,500 3,000 Feet

P:\2006\06051\GIS\Collingwood_Upper-EA.pdf 6/30/08

Shell Valley Overview



Characteristics	Coyote Basin
Maximum Water Depth (ft)	98
Average Water Depth (ft)	36
Storage Capacity (ac-ft)	3112
Surface Area (ac)	86
Immediate Direct Drainage Area (mi^2)	1.1
Assumed Mean Annual Flow Volume (af/yr)	620
Supplemental Drainage Area (mi^2)	64.9
Assumed Mean Annual Flow Volume (af/yr)	36,500
Water Source	Seasonal run-off, possibly water from Beaver Creek
Service Area (ac)	9,840
Primary Conveyance	Beaver Creek
Geotechnical Constraints	Potential soil constraints
On Perennial Stream	No
Wetlands Potentially Filled (ac)	1.71
Significant Cultural Resources	None recorded
Special-Status Species	None recorded
Land Ownership	Private/Public

Legend

- 10-meter Topographic Contours
- Reservoir Area
- Wetlands

Coyote Basin Reservoir Site

Geomatrix

Westech Environmental Services, Inc.

ENGINEERING ASSOCIATES
CONSULTING ENGINEERS & SURVEYORS
CODY, WYOMING

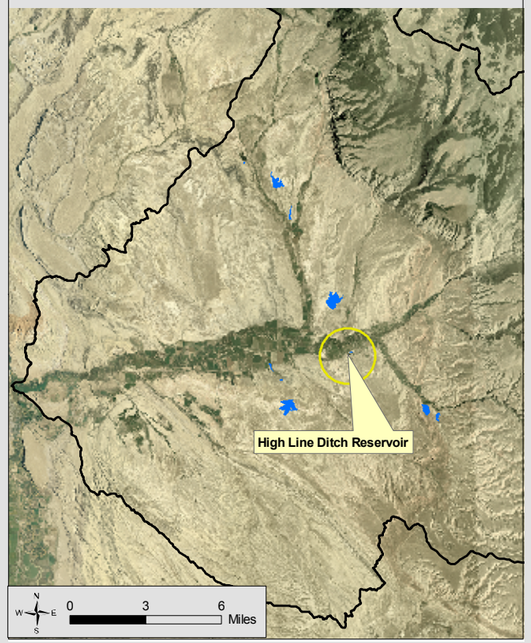
Aerial Photo: 2006 NAIP Imagery
Wetlands: GPS Located - July 2007

N
W
E
S

0 1,500 3,000 Feet

P:\2006\06051\GIS\Coyote_Basin-EA.pdf 6/30/08

Shell Valley Overview



Characteristics	High Line Expansion
Maximum Water Depth (ft)	16
Average Water Depth (ft)	5
Storage Capacity (ac-ft)	20
Surface Area (ac)	4
Immediate Direct Drainage Area (mi^2)	61.0
Assumed Mean Annual Flow Volume (af/yr)	35,300
Supplemental Drainage Area (mi^2)	61.0
Assumed Mean Annual Flow Volume (af/yr)	35,336
Water Source	Water provided via siphon from High Line Ditch
Service Area (ac)	5,326
Primary Conveyance	Shell Canal
Geotechnical Constraints	None
On Perennial Stream	No
Wetlands Potentially Filled (ac)	4
Significant Cultural Resources	None recorded
Special-Status Species	None recorded
Land Ownership	Private

Legend

- 10-meter Topographic Contours
- Reservoir Area
- Wetlands

High Line Expansion Reservoir Site

Geomatrix

Westech Environmental Services, Inc.

ENGINEERING ASSOCIATES
CONSULTING ENGINEERS & SURVEYORS
CODY, WYOMING

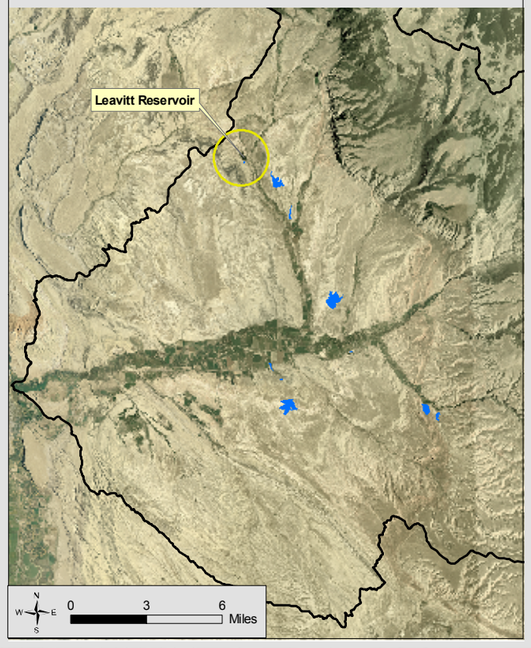
Aerial Photo: 2006 NAIP Imagery
Wetlands: GPS Located - July 2007

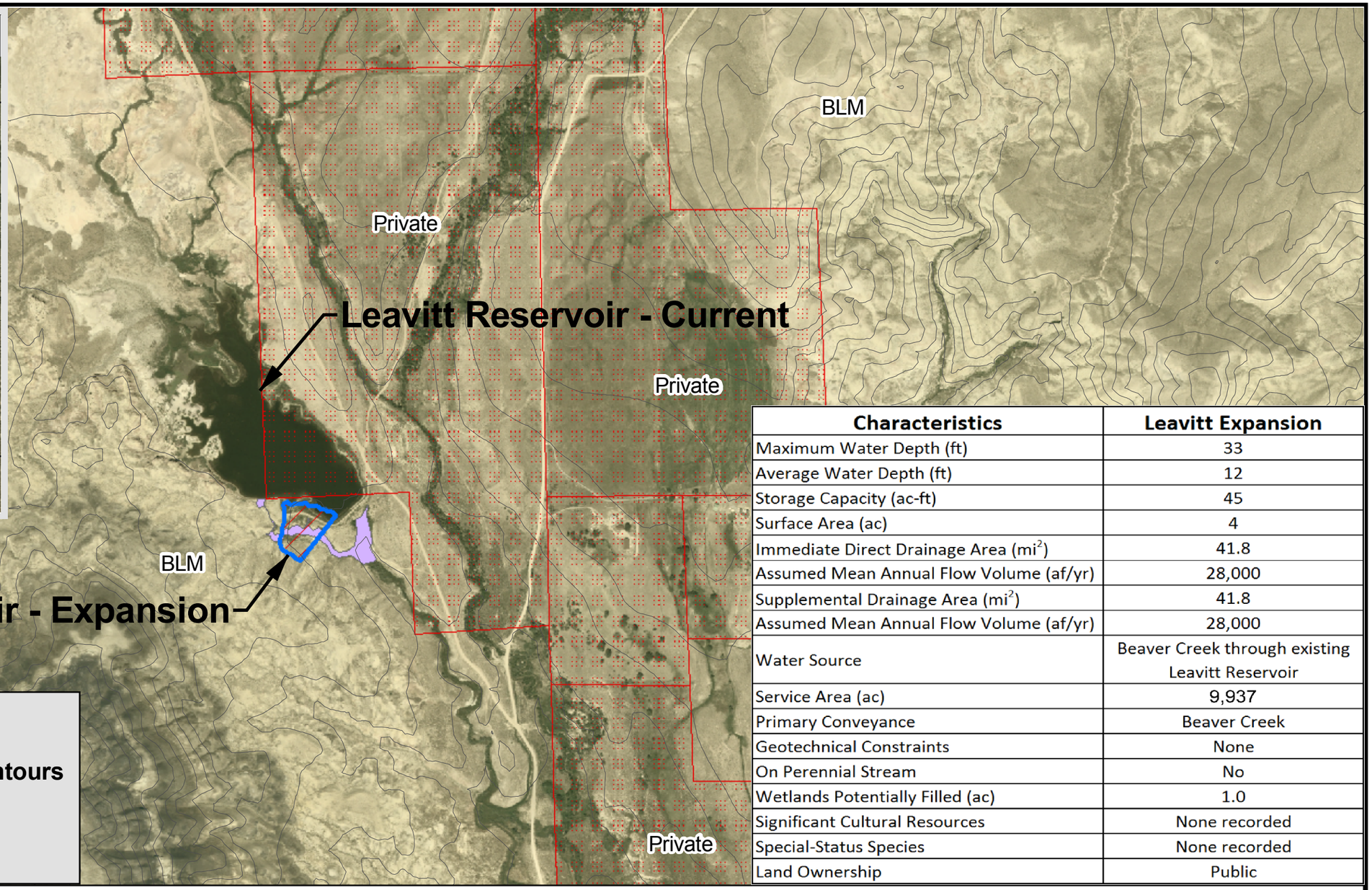
N
W
E
S

0 1,500 3,000 Feet

P:\2006\06051\GIS\High_Line-EA.pdf 6/30/08

Shell Valley Overview





Characteristics	Leavitt Expansion
Maximum Water Depth (ft)	33
Average Water Depth (ft)	12
Storage Capacity (ac-ft)	45
Surface Area (ac)	4
Immediate Direct Drainage Area (mi^2)	41.8
Assumed Mean Annual Flow Volume (af/yr)	28,000
Supplemental Drainage Area (mi^2)	41.8
Assumed Mean Annual Flow Volume (af/yr)	28,000
Water Source	Beaver Creek through existing Leavitt Reservoir
Service Area (ac)	9,937
Primary Conveyance	Beaver Creek
Geotechnical Constraints	None
On Perennial Stream	No
Wetlands Potentially Filled (ac)	1.0
Significant Cultural Resources	None recorded
Special-Status Species	None recorded
Land Ownership	Public

Legend

- 10-meter Topographic Contours
- Reservoir Area
- Wetlands

Leavitt Reservoir Site

Geomatrix

Westech Environmental Services, Inc.

ENGINEERING ASSOCIATES
CONSULTING ENGINEERS & SURVEYORS
CODY, WYOMING

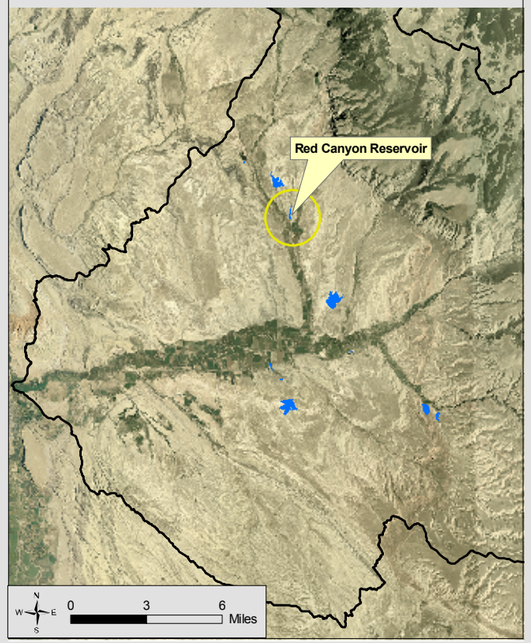
Aerial Photo: 2006 NAIP Imagery
Wetlands: GPS Located - July 2007

N
W E
S

0 1,500 3,000 Feet

P:\2006\06051\GIS\Leavitt-EA.pdf 6/30/08

Shell Valley Overview



Characteristics	Red Canyon Creek
Maximum Water Depth (ft)	65
Average Water Depth (ft)	27
Storage Capacity (ac-ft)	546
Surface Area (ac)	20
Immediate Direct Drainage Area (mi^2)	3.0
Assumed Mean Annual Flow Volume (af/yr)	1,600
Supplemental Drainage Area (mi^2)	67.8
Assumed Mean Annual Flow Volume (af/yr)	36,500
Water Source	Seasonal run-off, possibly diverted from Red Canyon Creek
Service Area (ac)	9,765
Primary Conveyance	Beaver Creek
Geotechnical Constraints	Potential soil constraints
On Perennial Stream	No
Wetlands Potentially Filled (ac)	<0.01
Significant Cultural Resources	None recorded
Special-Status Species	None recorded
Land Ownership	Private/Public

Legend

- 10-meter Topographic Contours
- Reservoir Area
- Wetlands

Red Canyon Reservoir Site

Geomatrix

Westech Environmental Services, Inc.

ENGINEERING ASSOCIATES
CONSULTING ENGINEERS & SURVEYORS
CODY, WYOMING

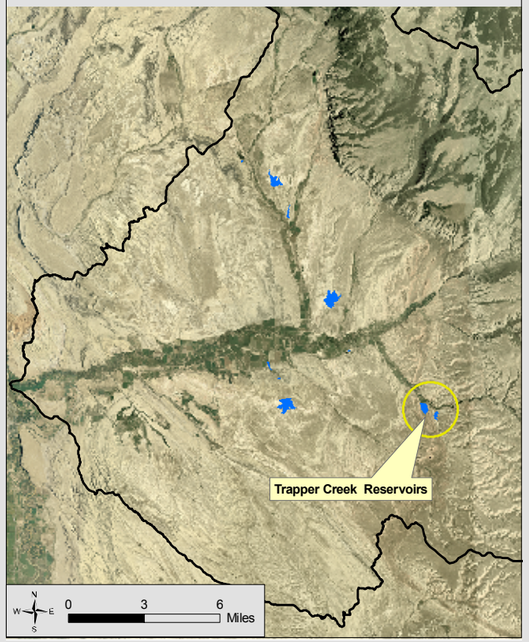
Aerial Photo: 2006 NAIP Imagery
Wetlands: GPS Located - July 2007

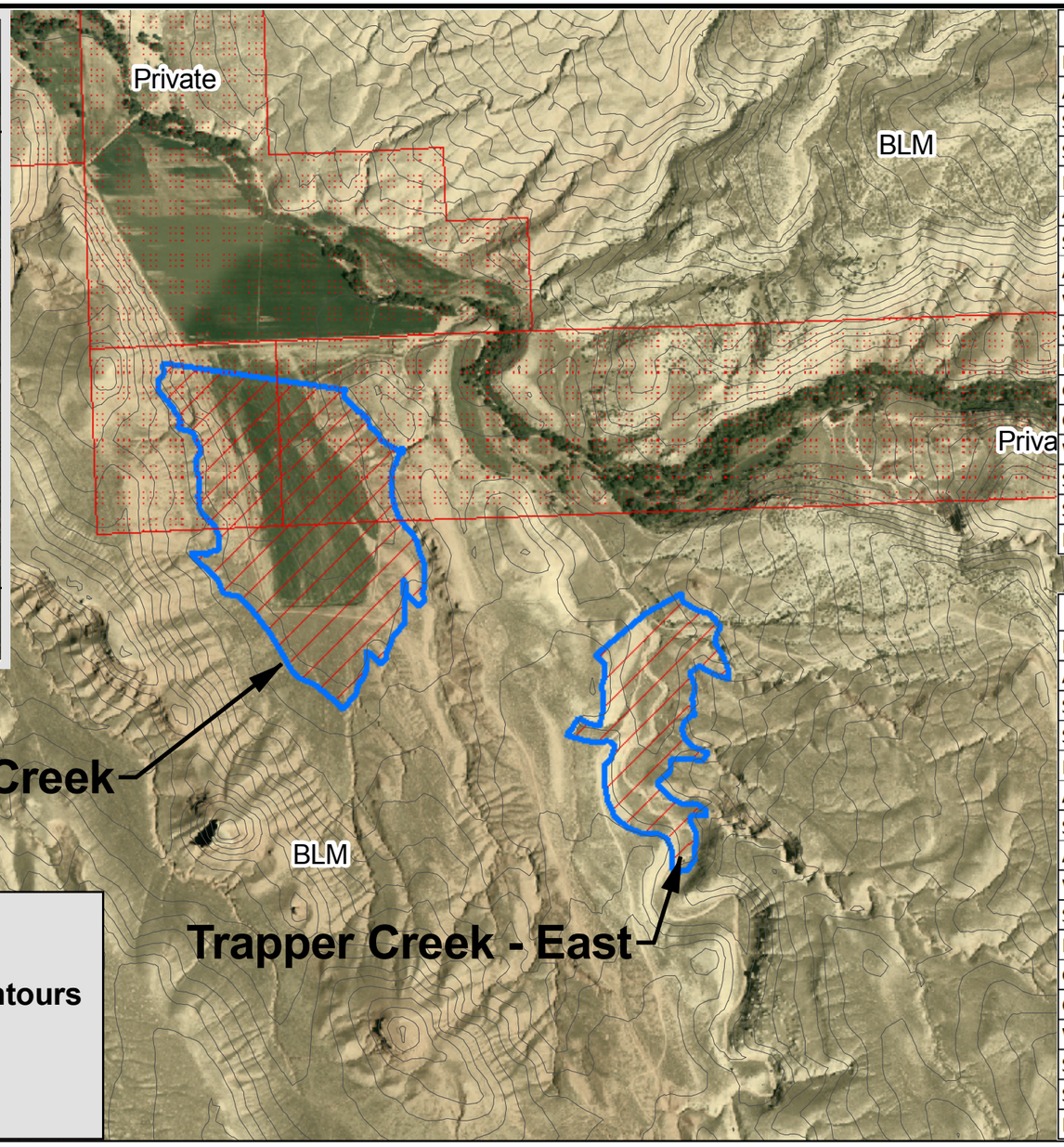
N
W E
S

0 1,500 3,000 Feet

P:\2006\06051\GIS\Red_Canyon-EA.pdf 6/30/08

Shell Valley Overview





Characteristics	Trapper Creek
Maximum Water Depth (ft)	98
Average Water Depth (ft)	40
Storage Capacity (ac-ft)	2,507
Surface Area (ac)	62
Immediate Direct Drainage Area (mi^2)	60.2
Assumed Mean Annual Flow Volume (af/yr)	35,300
Supplemental Drainage Area (mi^2)	60.2
Assumed Mean Annual Flow Volume (af/yr)	35,300
Water Source	Trapper Creek
Service Area (ac)	14,962
Primary Conveyance	High Line Ditch/Shell Canal
Geotechnical Constraints	Potential soil constraints
On Perennial Stream	No
Wetlands Potentially Filled (ac)	None
Significant Cultural Resources	None recorded
Special-Status Species	None recorded
Land Ownership	Private/Public

Characteristics	Trapper Creek East
Maximum Water Depth (ft)	65
Average Water Depth (ft)	31
Storage Capacity (ac-ft)	734
Surface Area (ac)	24
Immediate Direct Drainage Area (mi^2)	No Data
Assumed Mean Annual Flow Volume (af/yr)	No Data
Supplemental Drainage Area (mi^2)	60.2
Assumed Mean Annual Flow Volume (af/yr)	35,300
Water Source	Bush Creek seasonal flows
Service Area (ac)	14,962
Primary Conveyance	High Line Ditch/Shell Canal
Geotechnical Constraints	Potential soil constraints
On Perennial Stream	No
Wetlands Potentially Filled (ac)	Probably none
Significant Cultural Resources	None recorded
Special-Status Species	None recorded
Land Ownership	Private/Public

Legend

- 10-meter Topographic Contours
- Reservoir Area
- Wetlands

Trapper Creek Reservoir Sites

Geomatrix

Westech Environmental Services, Inc.

ENGINEERING ASSOCIATES
CONSULTING ENGINEERS & SURVEYORS
CODY, WYOMING

Aerial Photo: 2006 NAIP Imagery
Wetlands: GPS Located - July 2007

N
W E
S

0 1,500 3,000 Feet

P:\2006\06051\GIS\Trapper_Creek_Complex-EA.pdf 6/30/08

APPENDIX P

Project Overview Maps

- Irrigated Overview
- Overview
- Water Rights Permit Overview


Leavitt Reservoir
Leavitt - Expansion
Coyote Basin
Red Canyon Creek
Ewen Pence Gulch Reservoir
Bratsky Draw
BEAVER DITCH
BEAVER DITCH
FRIESE DITCH
KERSHNER DITCH
PORTER CANAL
WHALEY DITCH
MCDONALD DITCH
High Line Reservoir - Expansion
HIGH LINE DITCH
SABIN BROWN DITCH
HATTEN DITCH
CRAIN JENKS DITCH
Trapper Creek
Trapper Creek - East
Collingwood Draw - lower
Collingwood Draw - middle
Collingwood Draw - upper
SHELL CANAL NORTH
THOMPSON LATERAL
SHELL CANAL
Shell
Greybull
Cedar Creek
Legend
Canals Mapped
Big Horn County Roads
Reservoirs - Study
Reservoirs - Existing
Shell Valley Watershed Improvement District Boundary
Bureau of Land Management
Forest Service
Private
State
Water
Shell Watershed Boundary
Aerial Orthophoto 2006
0
3,000
6,000
12,000
Feet
N
W
E
S
P:\2006\06051\GIS\Overview Irrigated Report.mxd 11/21/2007
ENGINEERING ASSOCIATES
CONSULTING ENGINEERS & SURVEYORS
CODY, WYOMING
Shell Valley Watershed Improvement District
Shell Creek Watershed - Irrigated Overview
Funded by Wyoming Water Development Commission


Shell
Greybull
Basin
Leavitt Reservoir
Leavitt - Expansion
Coyote Basin
Red Canyon Creek
Ewen Pence Gulch Reservoir
BEAVER DITCH
Beatsky Draw
KERSHNER DITCH
FRIESE DITCH
PORTER CANAL
MCDONALD DITCH
WHALEY DITCH
SABIN BROWN DITCH
SHELL CANAL NORTH
High Line Reservoir - Expansion
HIGH LINE DITCH
HATTEN DITCH
CRAIN JENKS DITCH
THOMPSON LATERAL
Collingwood Draw - lower
Collingwood Draw - middle
Collingwood Draw - upper
Trapper Creek
Trapper Creek - East
SHELL CANAL
Shell Creek Reservoir
Adelaide Reservoir
Shell Lake
Emerald Lake
Legend
Canals Mapped
Big Horn County Roads
Reservoirs - Study
Reservoirs - Existing
Shell Valley Watershed Improvement District Boundary
Bureau of Land Management
Forest Service
Private
State
Water
Shell Watershed Boundary
Aerial Orthophoto 2006
0 5,000 10,000 20,000
Feet
N
W E
S
P:\2006\06051\GIS\Overview Report.mxd 11/21/2007
ENGINEERING ASSOCIATES
CONSULTING ENGINEERS & SURVEYORS
CODY, WYOMING
Shell Valley Watershed Improvement District
Shell Creek Watershed - Overview
Funded by Wyoming Water Development Commission

Water Right Permit Number Legend
1039
1075
11335
12217
1244 Enl.
1274 Enl.
13194
1330 Enl.
1341
1415
14358
1438 Enl.
1439 Enl.
1522 Enl.
1573
1716
1726 Enl.
17571
17817
17878
1807
1962 Enl.
19860
2031 Enl.
2084 Enl.
21842
24240
2469 Enl.
2563
270
271 Enl.
2747 Enl.
2967
3132
3246
3648
365
3720
3721
3722
386
42 Enl.
430
462 Enl.
4715 Enl.
508
510
5274
5363
5420 Enl.
5859 Enl.
650 Enl.
682
686
691
8290
8538
Terr.
none
Leavitt Reservoir
Leavitt - Expansion
Coyote Basin
Red Canyon Creek
Ewen Pence Gulch Reservoir
Bratsky Draw
BEAVER DITCH
FRIESE DITCH
KERSHNER DITCH
Shell
PORTER CANAL
WHALEY DITCH
MCDONALD DITCH
SABIN BROWN DITCH
High Line Reservoir - Expansion
HIGH LINE DITCH
Collingwood Draw - lower
Collingwood Draw - middle
Collingwood Draw - upper
HATTEN DITCH
CRAIN JENKS DITCH
Trapper Creek
Trapper Creek - East
SHELL CANAL NORTH
THOMPSON LATERAL
SHELL CANAL
Greybull
Legend
Canals Mapped
Big Horn County Roads
Reservoirs - Study
Reservoirs - Existing
Shell Valley Watershed Improvement District Boundary
Shell Watershed Boundary
Aerial Orthophoto 2006
0 3,000 6,000 12,000
Feet
ENGINEERING ASSOCIATES
CONSULTING ENGINEERS & SURVEYORS
CODY, WYOMING
Shell Valley Watershed Improvement District
Shell Creek Watershed - Water Right Permit Overview
Funded by Wyoming Water Development Commission