APPENDIX D

Downstream Released Sediment Fate and Transport Supplemental Tables and Figures

Table D-1 Water Quality Data Sources

Source	Stations	Date
MDEQ_CDMH	Missoula	1988
EPA_CH2M	Missoula	2002
MDEQ_MDEQGLI	Missoula	1984-93
MDEQ_USGS	Missoula	1969-1971
MPC	Missoula	1986-89
MSLACOUNTY	Missoula	1996
USGS - JHL	Missoula	1985-1997

Table D-2 Dissolved Metals-TSS Correlations at the Clark Fork above Missoula Station

Dissolved Metal	Suspended Sediment
Arsenic	0.319
Cadmium	ns
Copper	0.212
Iron	0.793
Lead	-0.183
Manganese	0.489
Zinc	ns

Table D-3 Regression Coefficients for Dissolved Metals versus TSS Concentration

Dissolved Metal	Regression Coefficients	
	Intercept	Slope
As	3.181	0.007277
Cu	4.603	0.008105
Fe	10.693	0.187828
Mn	5.507	0.093868

Table D-4: Water Rights on Clark Fork River: from the Milltown Dam to the Bitterroot River

Div. ID	Water Right #	Owner	Address: Street/PO	City	State	Zip Code	Telephone (if known)	Diversion Type	Purpose/ Use✦	TR	Sec	QS	Max Flow Rate	Units	Period of Use (based on climatic area)
1	76M 149703 00 b	Wood, Clyde, et al.	c/o First National Bank 201 N Higgins	Missoula	MT	59802	829-2666	pump/headgate w/ditch or pipeline	IR	13N18W	20	SWSENE			Apr 15 to Oct 19
2	76M 43215 00	Russell David M, Susan M	11300 Chumrau Loop	Missoula	MT	59802	(406)258-6390	pump	IR	1318W	20	NWNENW			Apr 15 to Oct 19
3	76M 100546 00	GREIL ENTERPRISES	6207 Pine Grove Ln	Missoula	MT	59802	(406)258-6213	pump	IR	13N18W	17	SWSWSW	100	GPM	Apr 15 to Oct 19
4	76M 149703 00 a	WOOD CLYDE A	c/o First National Bank 201 N Higgins	Missoula	MT	59802	829-2666	pump/headgate w/ditch or pipeline	IR	13N18W	17	SWSWSW	12.5	CFS	Apr 15 to Oct 19
5	76M 150016 00	HEYER ROBERT E, Phyllis J	6395 Pine Grove Ln	Missoula	MT	59802	(406)258-6288	pump	IR	13N18W	17	SWSWSW	34	GPM	Apr 15 to Oct 19
6	76M 100544 00	GREIL ELVA M	6205 Pine Grove Ln	Missoula	MT	59802	(406)258-6213	pump	IR	13N18W	17	NWSWSW	85	GPM	Apr 15 to Oct 19
7	76M 100545 00	GREIL ENTERPRISES	6206 Pine Grove Ln	Missoula	MT	59802	(406)258-6213	pump	IR	13N18W	17	NWSWSW	51	GPM	Apr 15 to Oct 19
8	76M 149703 00 c	Wood, Clyde, et al.	c/o First National Bank 201 N Higgins	Missoula	MT	59802	829-2666	pump/headgate w/ditch or pipeline	IR	13N18W	18	SENESE			Apr 15 to Oct 19
9	76M 149703 00 d	Wood, Clyde, et al.	c/o First National Bank 201 N Higgins	Missoula	MT	59802	829-2666	pump/headgate w/ditch or pipeline	IR	13N18W	18	NENWSE			Apr 15 to Oct 19
10	76M 149703 00 e	Wood, Clyde, et al.	c/o First National Bank 201 N Higgins	Missoula	MT	59802	829-2666	pump/headgate w/ditch or pipeline	IR	13N18W	18	NENWSW			Apr 15 to Oct 19
11	76M 151815 00	NELSON LINDA M, Michael B	PO Box 4	Milltown	MT	59851	not found	pump	IR	13N18W	18	NWNWSW	85	GPM	Apr 15 to Oct 19
12	76M 149703 00 f	Wood, Clyde, et al.	c/o First National Bank 201 N Higgins	Missoula	MT	59802	829-2666	pump/headgate w/ditch or pipeline	IR	13N18W	18	SWNWSW			Apr 15 to Oct 19
13	76M 149093 00	JACOBS RANDOLPH	4850 Deer Creek Rd	Missoula	MT	59801	(406)258-6914	pump	IR	13N18W	18	NWSWSW	60	GPM	Apr 15 to Oct 19
14	76M 4490 00	DOMITROVICH AILI, Michael	4855 Deer Creek Rd	Missoula	MT	59801	(406)258-6959	pump	IR	13N18W	18	W2SWSW	46.75	GPM	Apr 15 to Oct 19
15	76M 99386 00	SHAW E EUGENE, Maile L	885 Speedway	Missoula	MT	59802	not found	pump	IR	13N18W	19	NWNWNW	120	GPM	Apr 15 to Oct 19
16	76M 35376 00	HUTCHESON ALRED M, Ellen M	460 Montana Ave	Missoula	MT	59801	(406)728-0730 ?	pump	IR	13N19W	24	NENESE	30	GPM	Apr 15 to Oct 19
17	76M 75184 00	MISSOULA ATHLETIC CLUB	1311 E Broadway	Missoula	MT	59802	728-0714	pump	IR	13N19W	26	NWNWNW	29	GPM	Apr 15 to Oct 19
18	76M 151824 00	MONTANA, STATE OF UNIVERSITY SYST	Legal Counsel	Missoula	MT	59812	243-0211 (info)	pump	IR	13N19W	27	NENENE	85.3	GPM	Apr 15 to Oct 19
19	76M 99202 00	JENNINGS MARJORIE I, Mark	2537 Olofson Dr	Missoula	MT	59801	not found	headgate	IR	13N19W	22	NESWSE	0.04	CFS	Apr 15 to Oct 19
20	76M 99407 00	WALKER DOUG J, Elaine M	1819 Clements Rd	Missoula	MT	59801	not found	headgate	IR	13N19W	22	NESWSE	0.04	CFS	Apr 15 to Oct 19
21	76M 99409 00	WALKER DOUG J, Elaine M	1821 Clements Rd	Missoula	MT	59801	not found	ditch	ST	14N21W	15	NENWSE			year round
22	76M 99410 00	WALKER DOUG J	1822 Clements Rd	Missoula	MT	59801	not found	ditch	ST	14N21W	10	NENENE			year round
23	76M 103809 00	BOYCE BOB, Marcheta	1025 Longstaff	Missoula	MT	59801	not found	headgate	IR	13N19W	22	NESWSE	0.13	CFS	Apr 15 to Oct 19
24	76M 181770 00	MISSOULA IRRIGATION DISTRICT	PO Box 3778	Missoula	MT	59806	549-5186 Ray Tipp	headgate	IR	13N19W	22	NESWSE	**88.27**	**CFS******	Apr 15 to Oct 19
25	76M 26947 00	ROGERS GUY C, Marie C	2828 Spurgin Rd	Missoula	MT	59801	not found	headgate	IR	13N19W	22	NESWSE	0.1	CFS	Apr 15 to Oct 19
26	76M 118524 00	ROMAN CATHOLIC BISHOP OF HELENA	PO Box 1729	Helena	MT	59624	not found	headgate	IR	13N19W	22	NWSWSE	0.13	CFS	Apr 15 to Oct 19
27	76M 99601 00	WOOD JOHN T	2805 Queen St	Missoula	MT	59801	not found	pump	CM	13N19W	22	NWSE	500	GPM	year round
28	76M 105253 00	ORCHARD HOMES DITCH CO	PO Box 7347	Missoula	MT	59807	549-0941 Marvin Ross	headgate	IR	13N19W	21	NESE	**19.8**	**CFS*******	Apr 15 to Oct 19
29	76M 147286 00	MISSOULA, CITY OF	435 Ryman	Missoula	MT	59802	(406) 523-4935	headgate	RC	13N19W	21	SWNESE			recreation?
30	76M 118513 00	HELLGATE VALLEY IRRIGATION CO	5905 Mullan Rd	Missoula	MT	59802	549-7389 Harvey Clouse	headgate	IR	13N19W	21	SWNWNE	**62.5**	**CFS *****	Apr 15 to Oct 19
31	76M 7415 00	POLSON READY MIX CONCRETE INC	57093 Hwy 93	Polson	MT	59860	(406) 883-7800	pump	IN	13N19W	17	SESWSE	1000	GPM	year round
32	76M 116617 00	CRAM ARCHIE G	6705 Juniper Dr	Missoula	MT	59802	(406)258-6126	pump	IR	13N19W	20	NENENW	17	GPM	Apr 15 to Oct 19
33	76M 149162 00	EMMA COURT DEVELOPMENT INC	2634 S 3rd W	Missoula	MT	59804	not found	pump	IR	13N19W	19	SWNENE	12	GPM	Apr 15 to Oct 19
34	76M 116796 00	KOLENDICH, EVELYN M TRUST	311 N Grove	Missoula	MT	59804	not found	pump	IR	13N19W	19	NESWNE	136	GPM	Apr 15 to Oct 19
35	76M 149085 00	HINTON DONALD E, Virginia M	3220 S 3rd St	Missoula	MT	59801	(406)549-1470	pump	IR	13N19W	19	SWNWSW	34	GPM	Apr 15 to Oct 19
36	76M 99129 00	BISHOP CHARLOTTE, Frank J	3422 S 3rd St W	Missoula	MT	59801	(406)721-4184	pump	IR	13N20W	24	SWNESE	50	GPM	Apr 15 to Oct 19
37	76M 149683 00 b	EVANS CATHRYN J, Clifford Jr.	4895 Mullan Rd	Missoula	MT	59802	721-8733	pump/headgate w/ditch or pipeline/flood and dike	IR	13N20W	24	SWNWNE			Apr 15 to Oct 19
38	76M 149683 00 a	EVANS CATHRYN J, Clifford Jr.	4895 Mullan Rd	Missoula	MT	59802	721-8733	pump/headgate w/ditch or pipeline/flood and dike	IR	13N20W	24	SWNENW	152.6	GPM	Apr 15 to Oct 19
39	76M 131069 00	RUSH FRED G, Linda K	3618 S 3rd St W	Missoula	MT	59801	(406)822-3729	pump	IR	13N20W	24	SWNWSE	68	GPM	Apr 15 to Oct 19
40	76M 15393 00	BLACKLER, DOROTHY S TRUST	3726 S 3rd St W	Missoula	MT	59801	(406)543-6068	pump	IR	13N20W	24	SWNESW	80	GPM	Apr 15 to Oct 19
41	76M 149627 00	CHRISTOFFERSON LEROY L	3820 S 3rd St W	Missoula	MT	59801	(406)543-6121	pump	IR	13N20W	24	SWNESW	25	GPM	Apr 15 to Oct 19
42	76M 44681 00	WOLFF ERNEST H, Lena C	4028 S 3rd W	Missoula	MT	59801	(406)721-2315	pump	IR/ST	13N20W	24	SWNWSW	45	GPM	year round
43	76M 110493 00	GRASS VALLEY FRENCH DITCH CO	c/o Lavern Mastel	Missoula	MT	59802	728-1526 Tim Fister	headgate	IR	13N20W	22	NENESE	**105.75**	**CFS ****	Apr 15 to Oct 19

Notes:

✦Purpose/Use: Water rights to water stock directly from the Clark Fork may not be represented on this table. Historic instream stock watering rights are exempt from Montana Water Court filing requirements.

** According to the 1960 Water Resources Survey for Missoula County (pub. State Engineer's Office, Helena, MT), the Grass Valley French Ditch Company has an initial carrying capacity of about 100 second-feet.

***According to the 1960 Water Resources Survey for Missoula County (pub. State Engineer's Office, Helena, MT), the Hellgate Valley Irrigation Company (Flynn-Lowney Ditch) has an initial carrying capacity in excess of 50 cfs.

**** According to the 1960 Water Resources Survey for Missoula County (pub. State Engineer's Office, Helena, MT), the Missoula Irrigation District has an estimated initial carrying capacity of about 100 second-feet.

*****According to the 1960 Water Resources Survey for Missoula County (pub. State Engineer's Office, Helena, MT), the Orchard Homes Ditch Company has an initial capacity of approximately 33 cfs.

Those water rights having multiple points of diversion appear more than once in the table:
these are labeled 'a', 'b', etc.

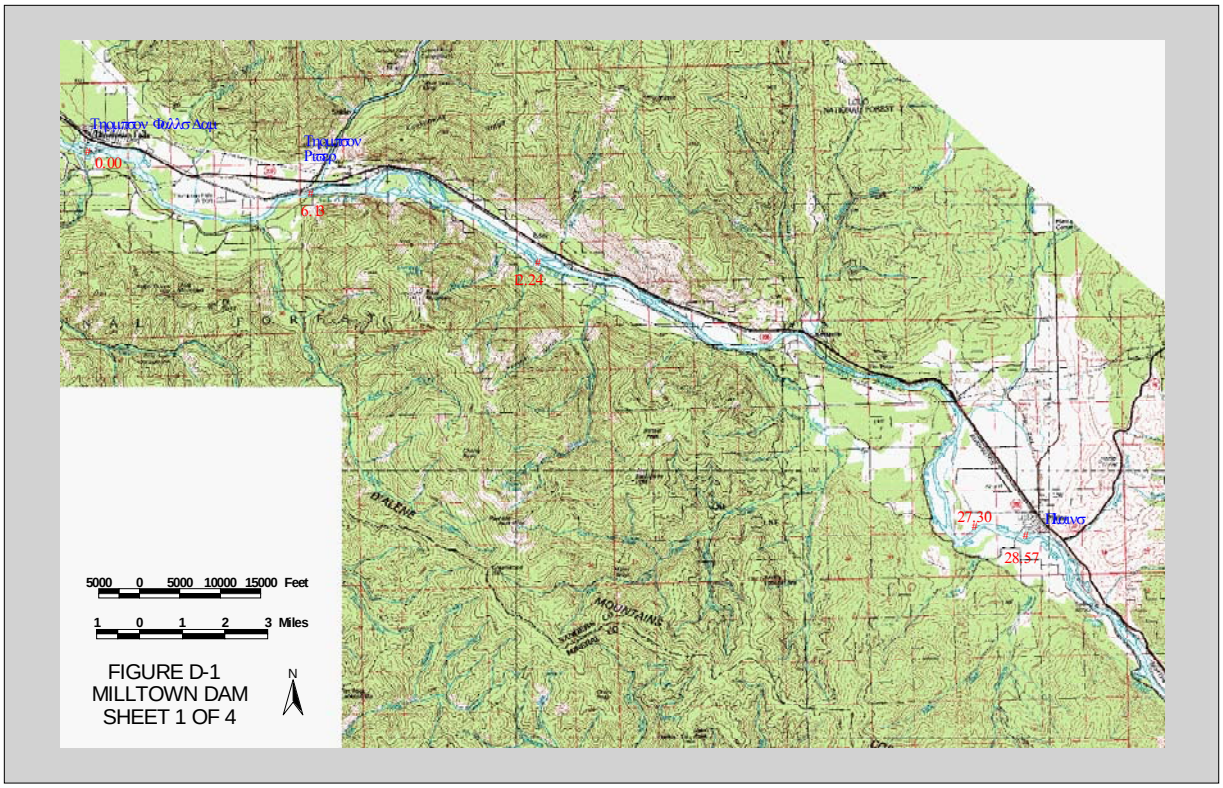


FIGURE D-1
MILLTOWN DAM
SHEET 1 OF 4

5000 0 5000 10000 15000 Feet

1 0 1 2 3 Miles

FIGURE D-2
MILLTOWN DAM
SHEET 2 OF 4

N

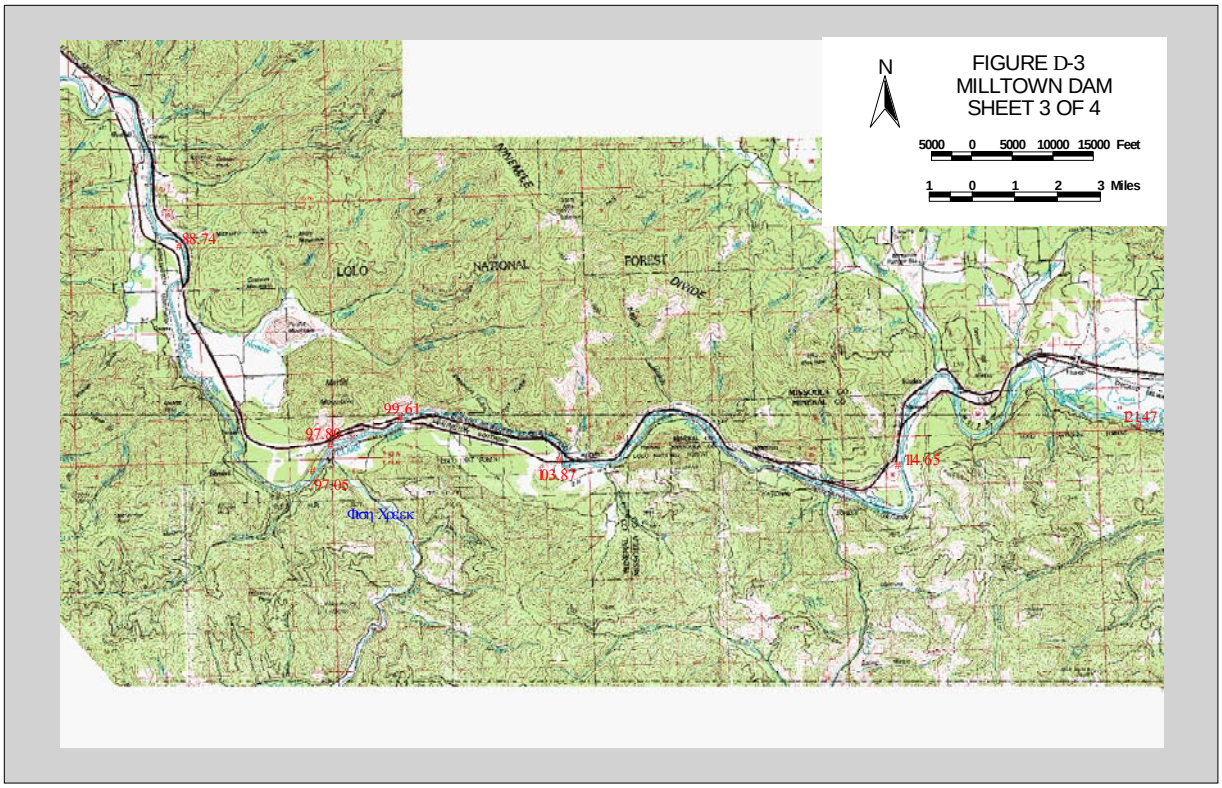


FIGURE D-3
MILLTOWN DAM
SHEET 3 OF 4
N
5000 0 5000 10000 15000 Feet
1 0 1 2 3 Miles
LOLO
NATIONAL
FOREST
DIVIDE
88.74
99.61
97.80
97.05
103.87
114.65
121.47
Φιση Χρέεκ

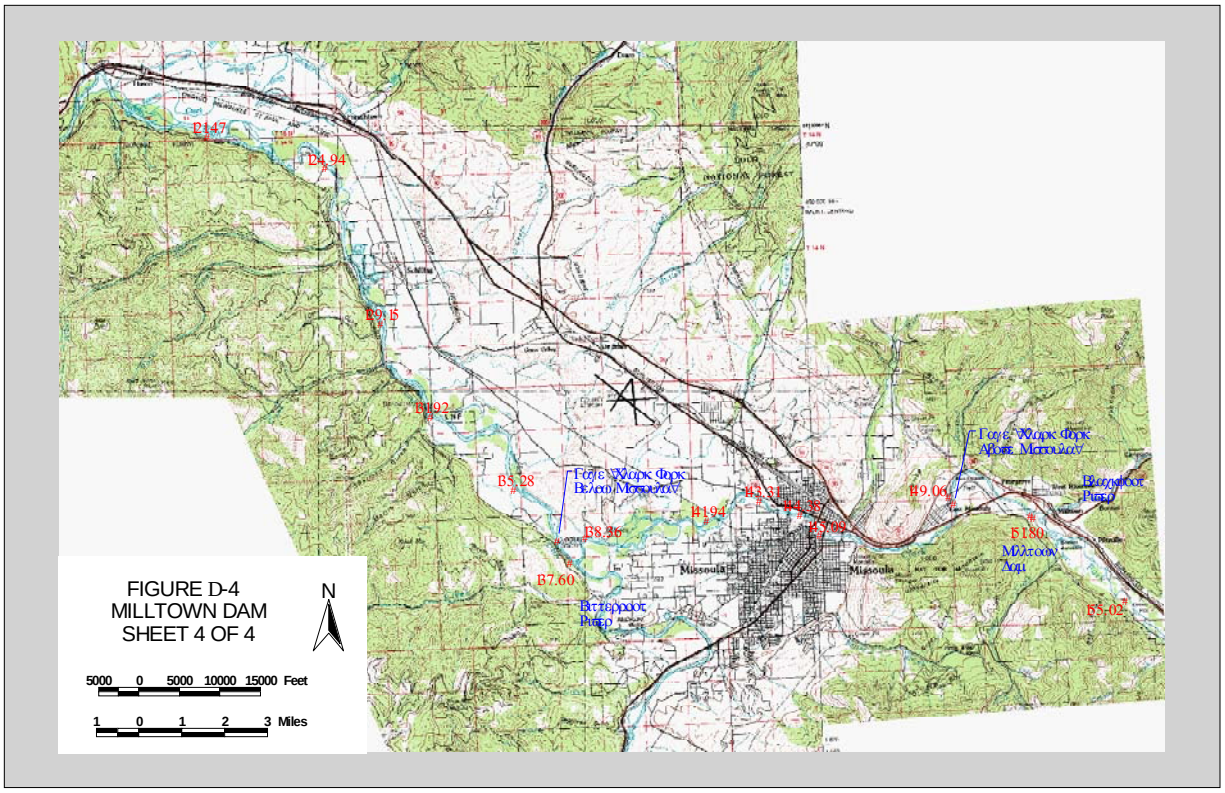
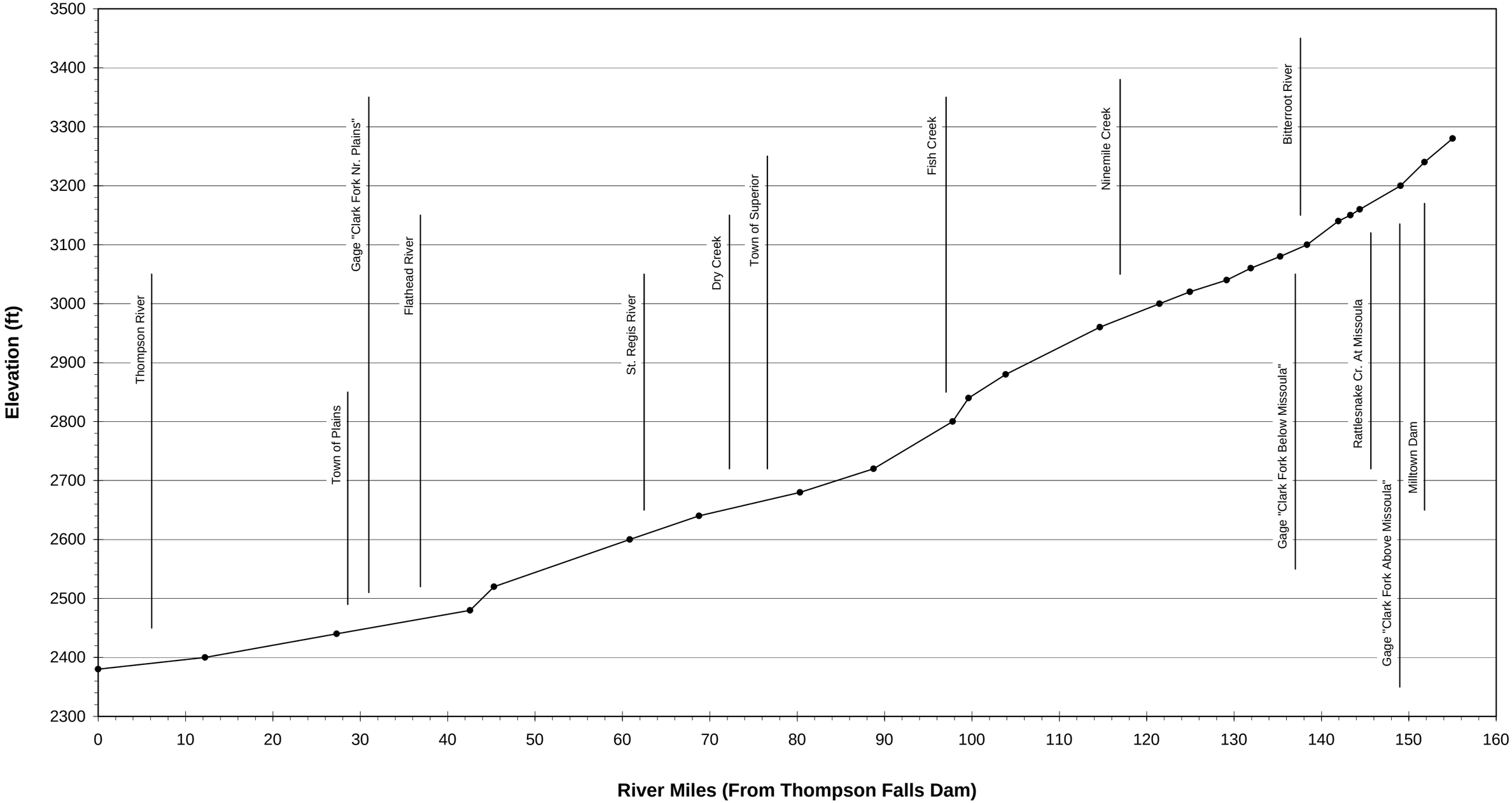


FIGURE D-4
MILLTOWN DAM
SHEET 4 OF 4
N
5000 0 5000 10000 15000 Feet
1 0 1 2 3 Miles
Missoula
Missoula

Figure D-5
Longitudinal Profile - Clark Fork
Thompson Falls Dam to Milltown Dam



H:\Projects\Milltown RD-RA\Scour Evaluation\May 17, 2004 Submittal\Appendices\App D\D-5-11 WEST Figure D-5

Figure D-6
Suspended Sediment Load for Clark Fork at St. Regis Gage # 12354500

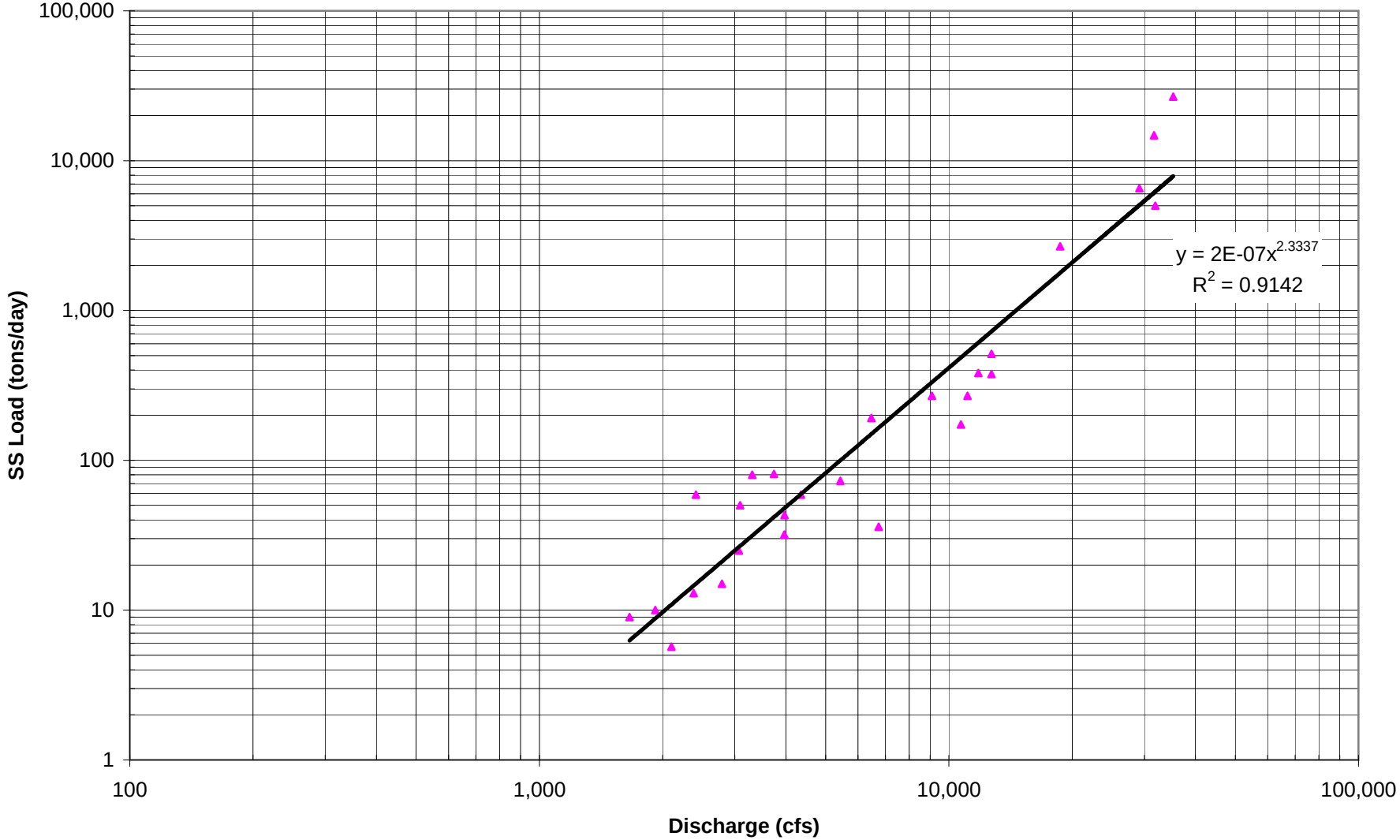


Figure D-7
Suspended Sediment Load for Clark Fork bl. Missoula Gage # 12353000

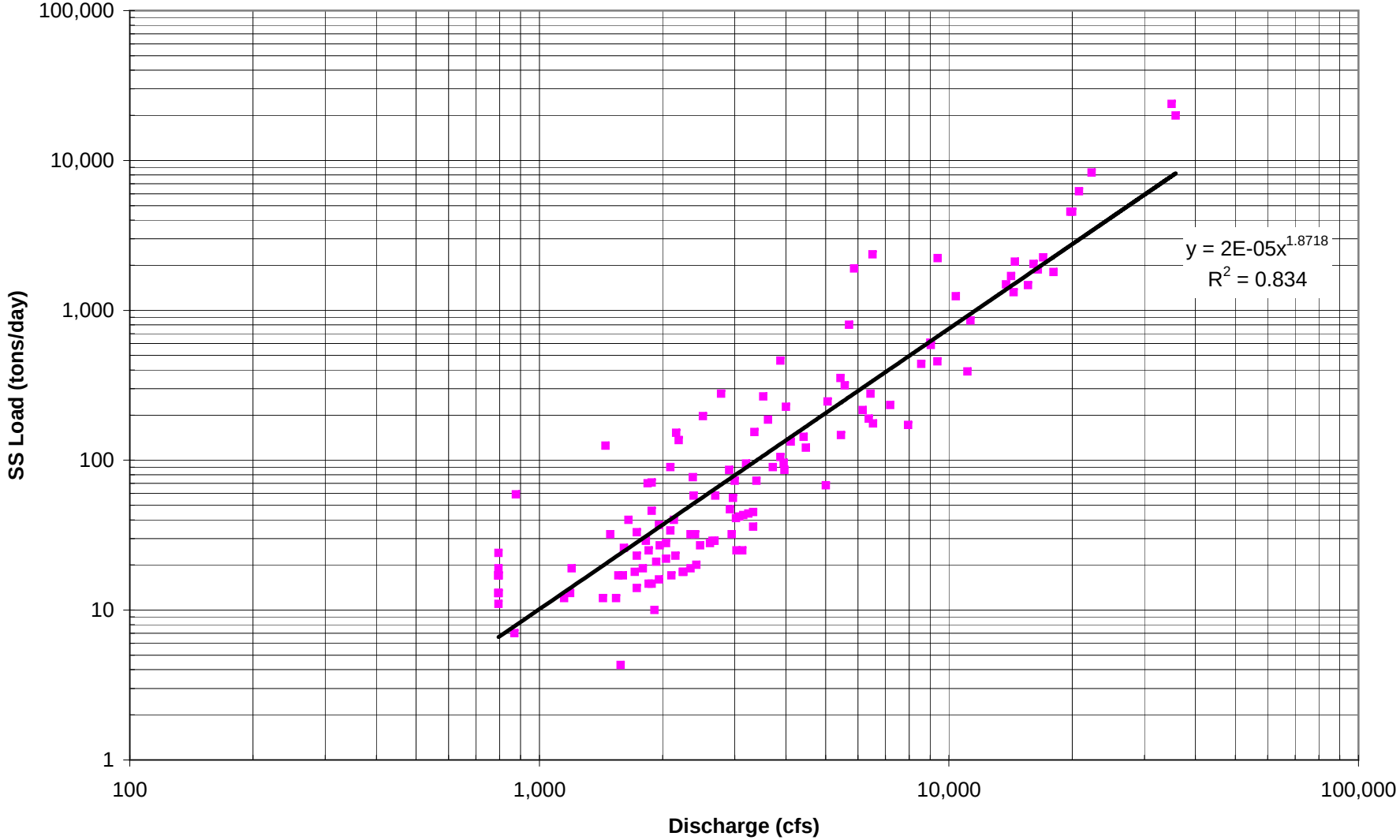


Figure D-8
Suspended Sediment Load for Clark Fork ab. Missoula Gage # 12340500

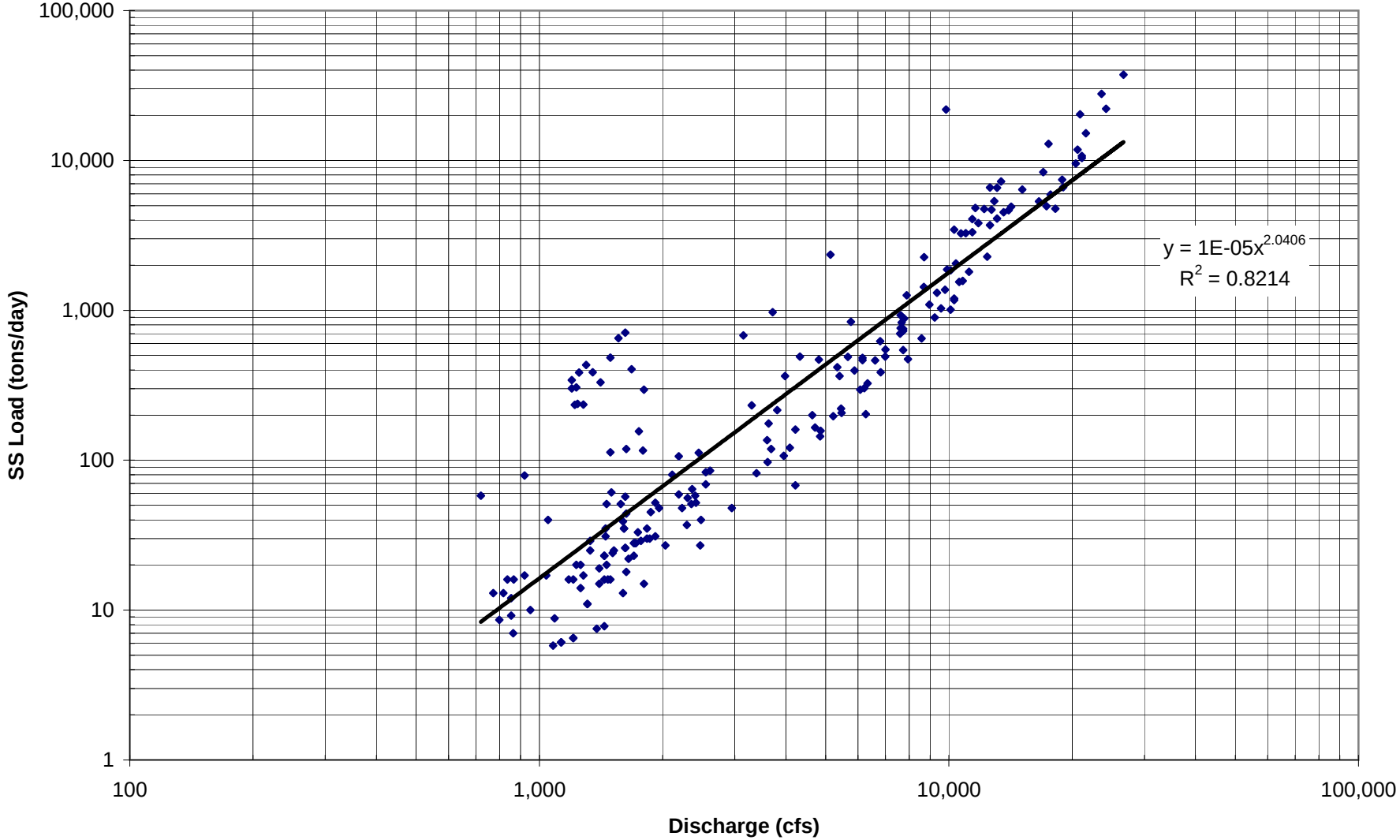


Figure D-9
Suspended Sediment Load for Bitterroot River Gage # 12352500

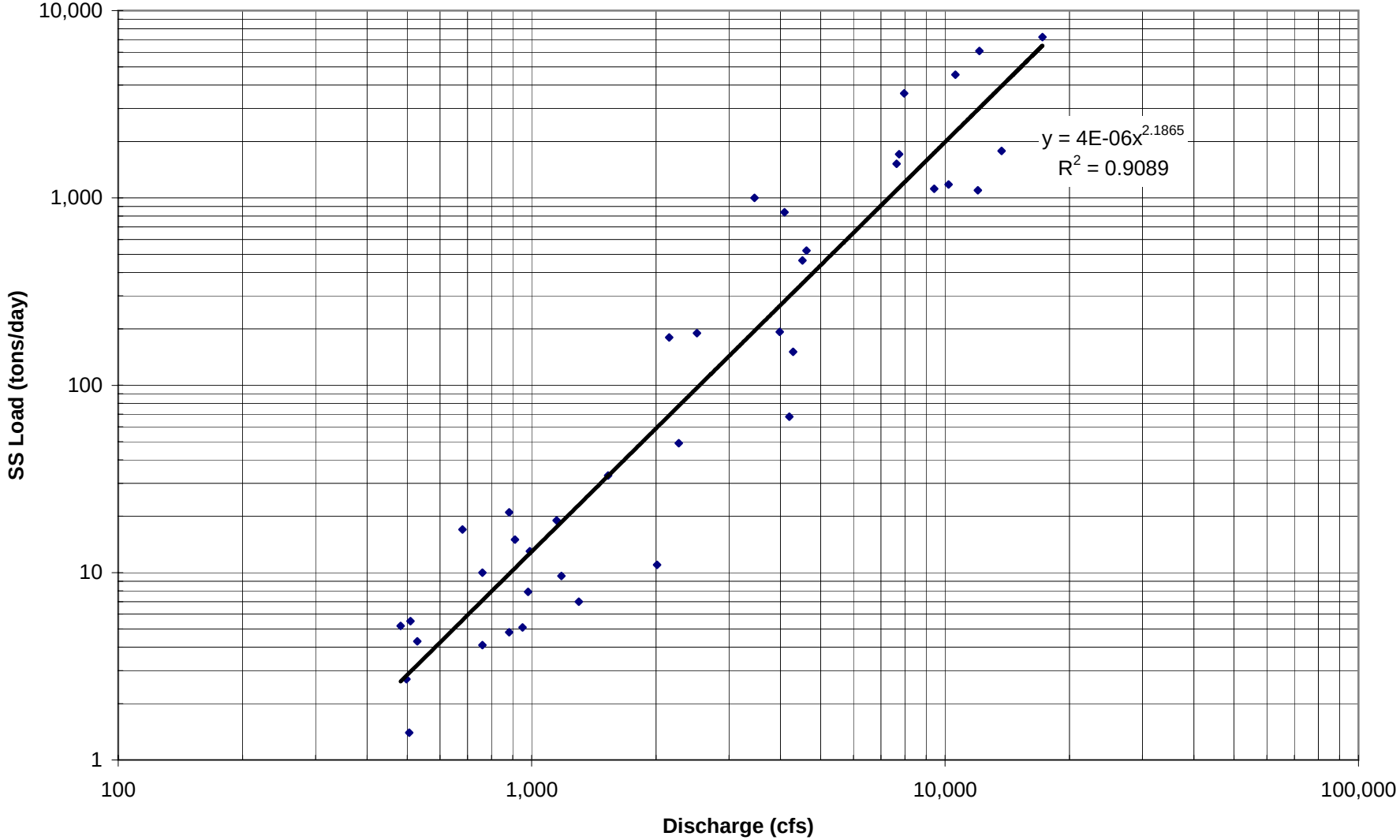


Figure D-10
Suspended Sediment Load for Flathead River Gage # 12388700

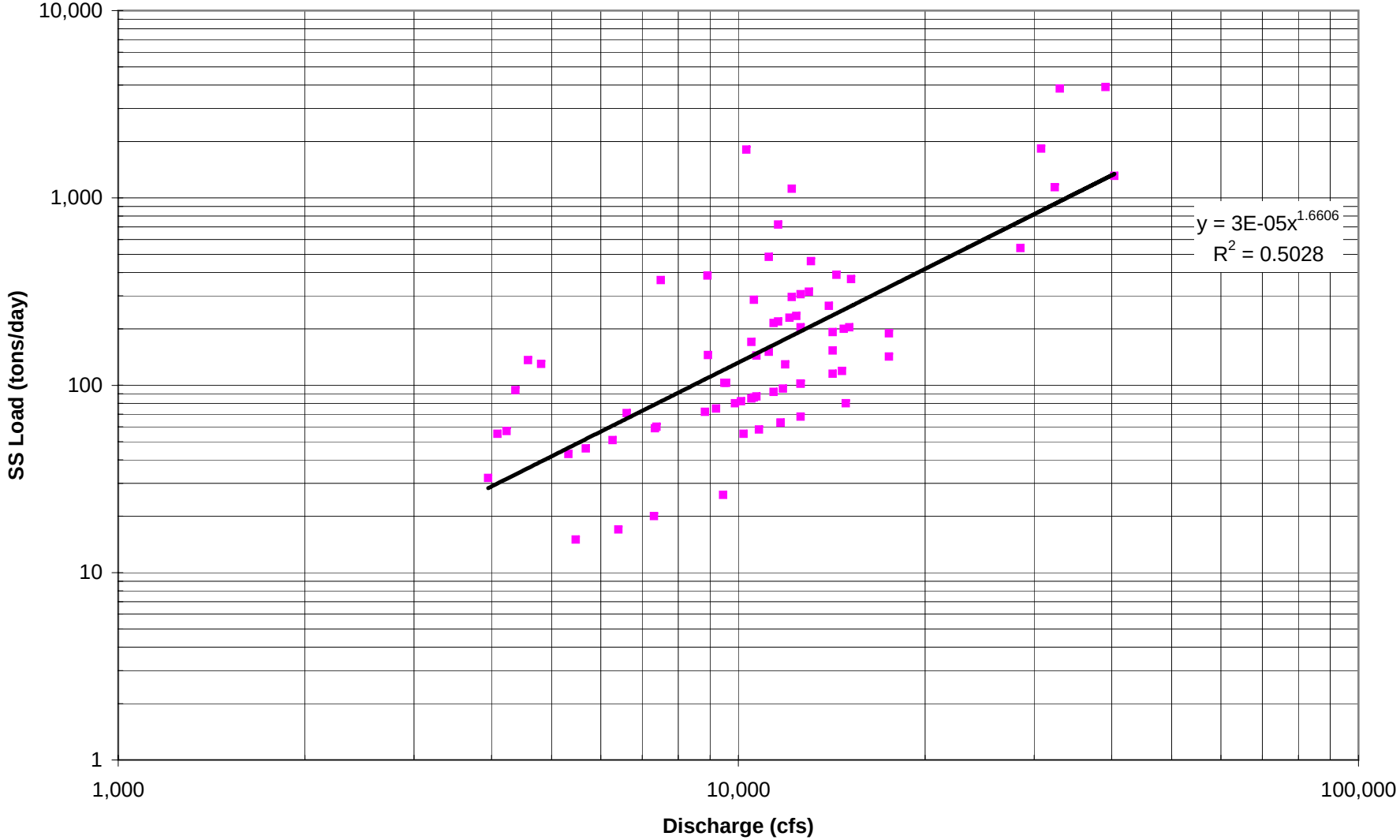


Figure D-11
Representative Hydrograph for Water Year 1999

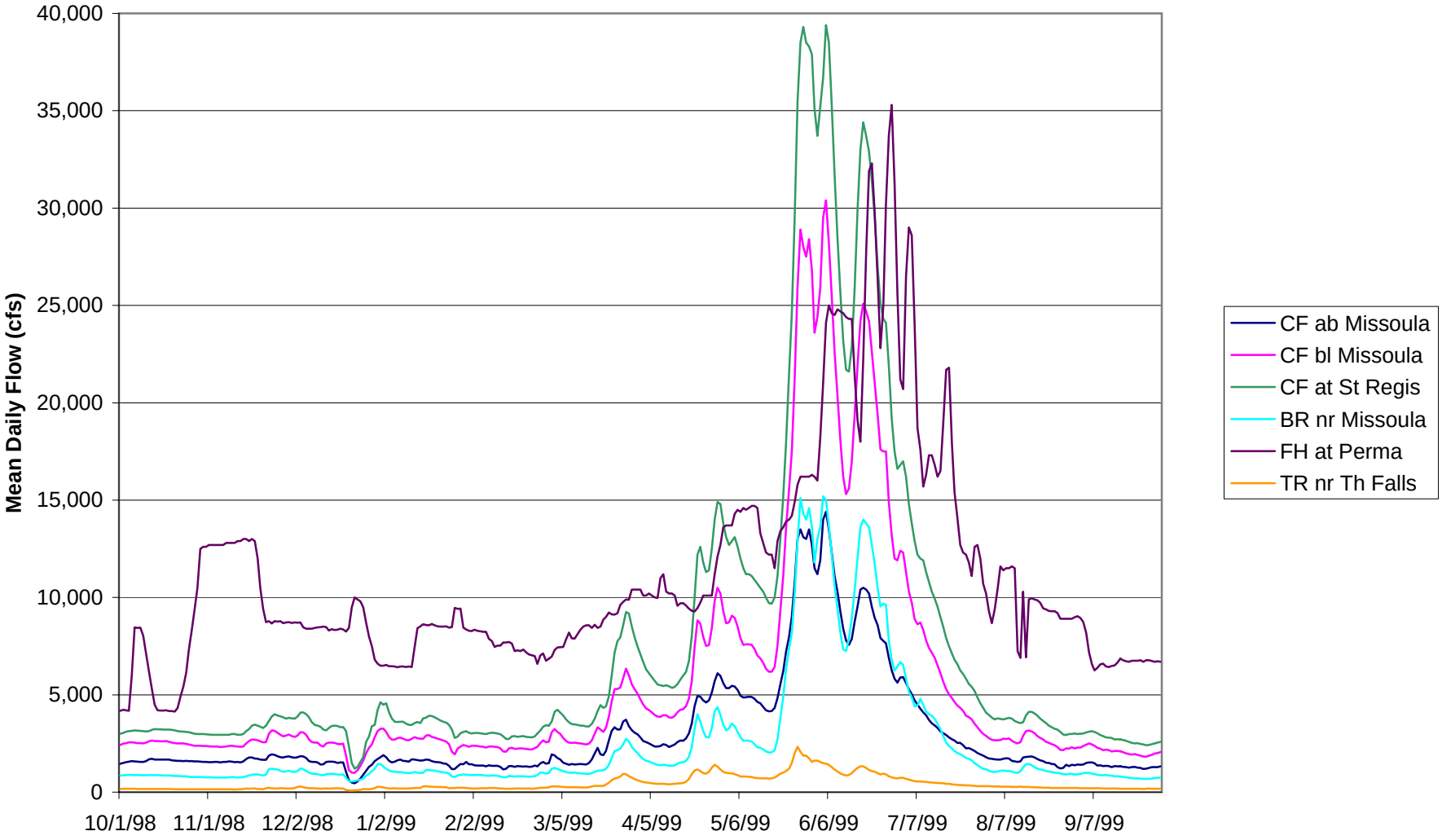
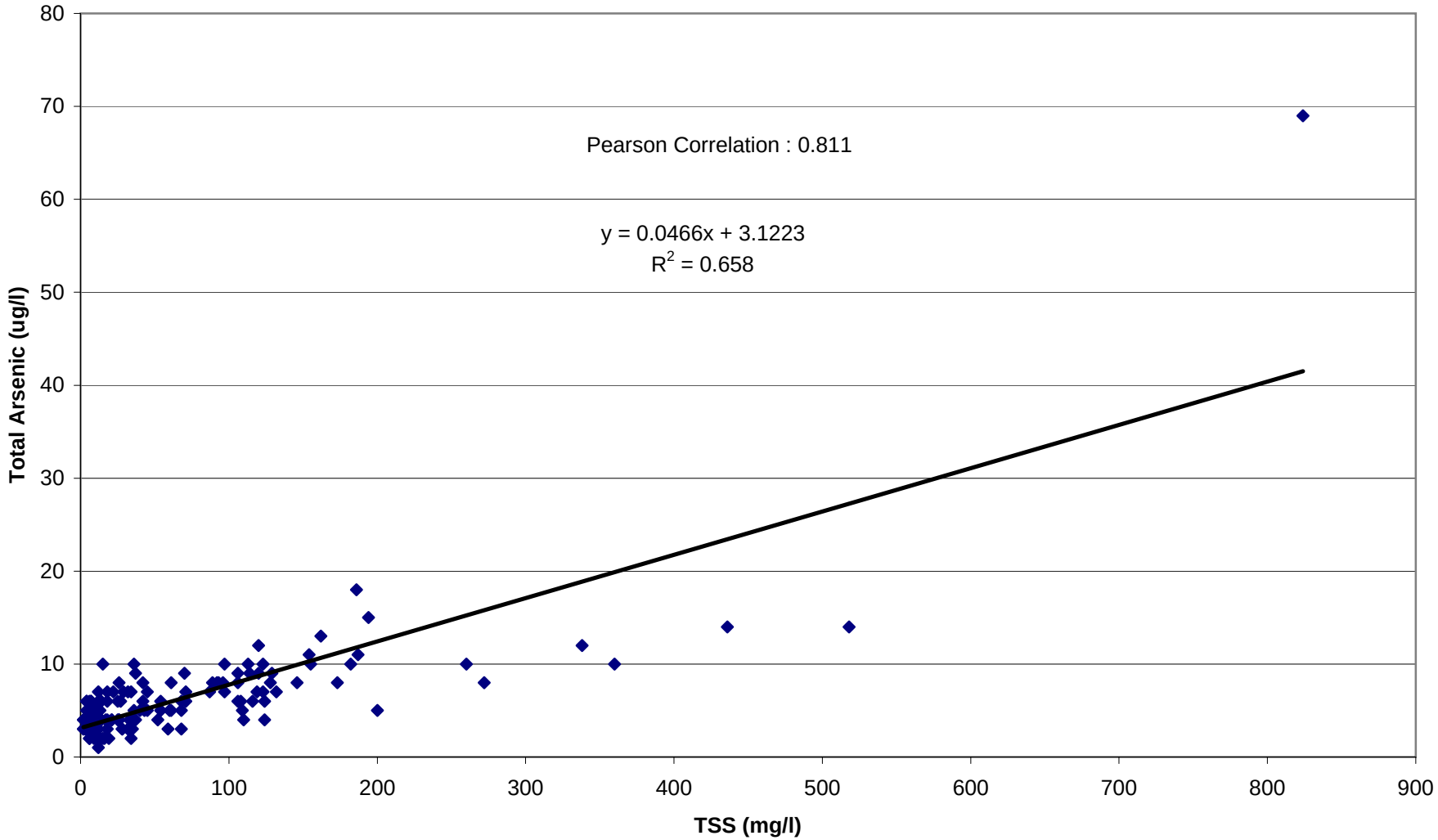
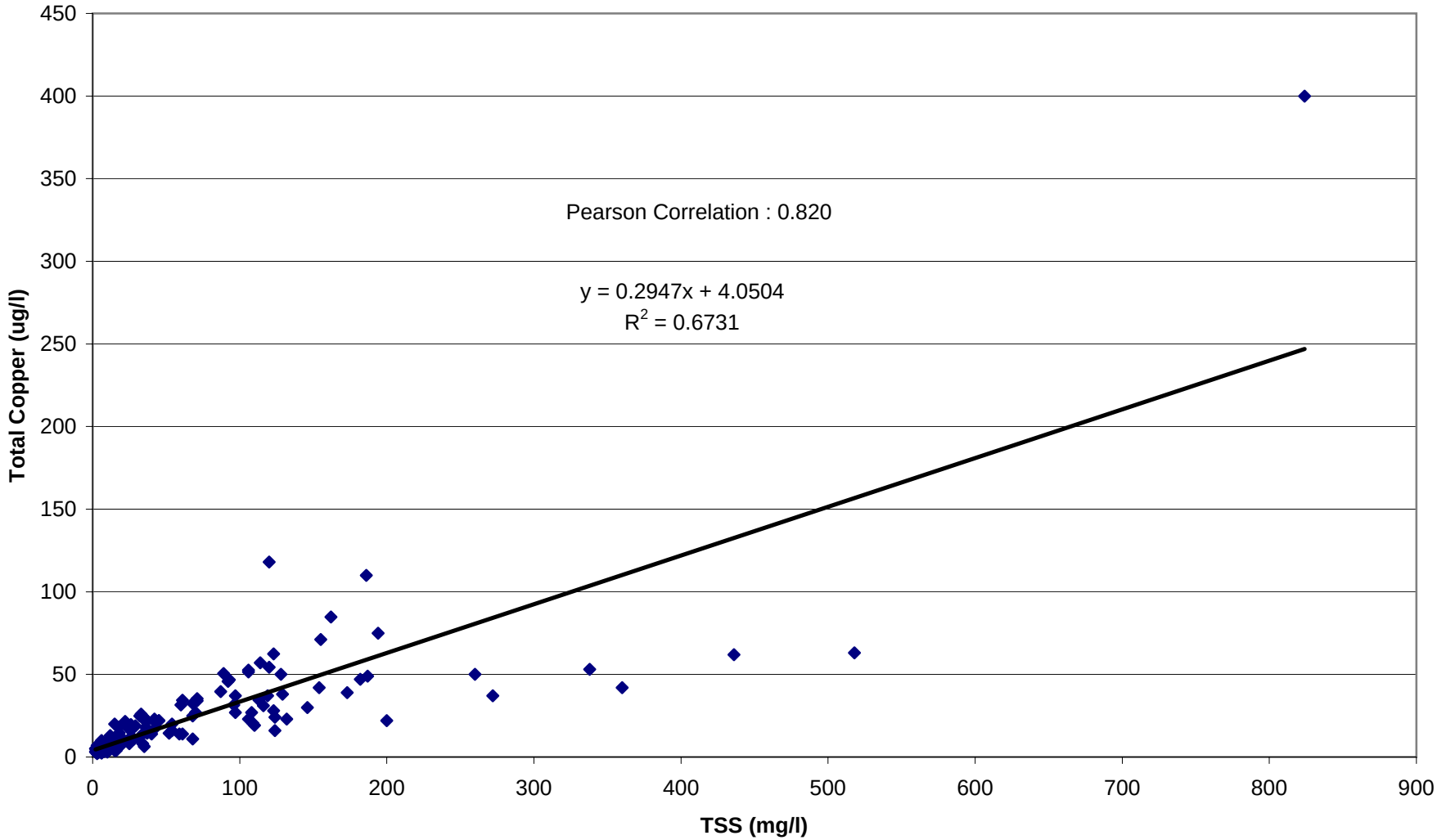


Figure D-12
Total Arsenic vs TSS Concentrations at CFR above Missoula Station (USGS data)



Data Source: USGS website station 12340500 from 12/28/89 to 8/31/02
H:\Projects\Milltown RD-RA\Scour Evaluation\May 17, 2004 Submittal\Appendices\App D\D-12,13,18,19 USGS data set regressions Fig D-12 Tot As vs TSS

Figure D-13
Total Copper vs TSS Concentrations at CFR above Missoula Station (USGS data)



Data Source: USGS website station 12340500 from 12/28/89 to 12/31/02
H:\Projects\Milltown RD-RA\Scour Evaluation\May 17, 2004 Submittal\Appendices\App D\D-12,13,18,19 USGS data set regressions Fig D-13 Tot Cu vs TSS

Figure D-14 Dissolved Arsenic Concentrations Below Milltown Dam
Combined Data Sources

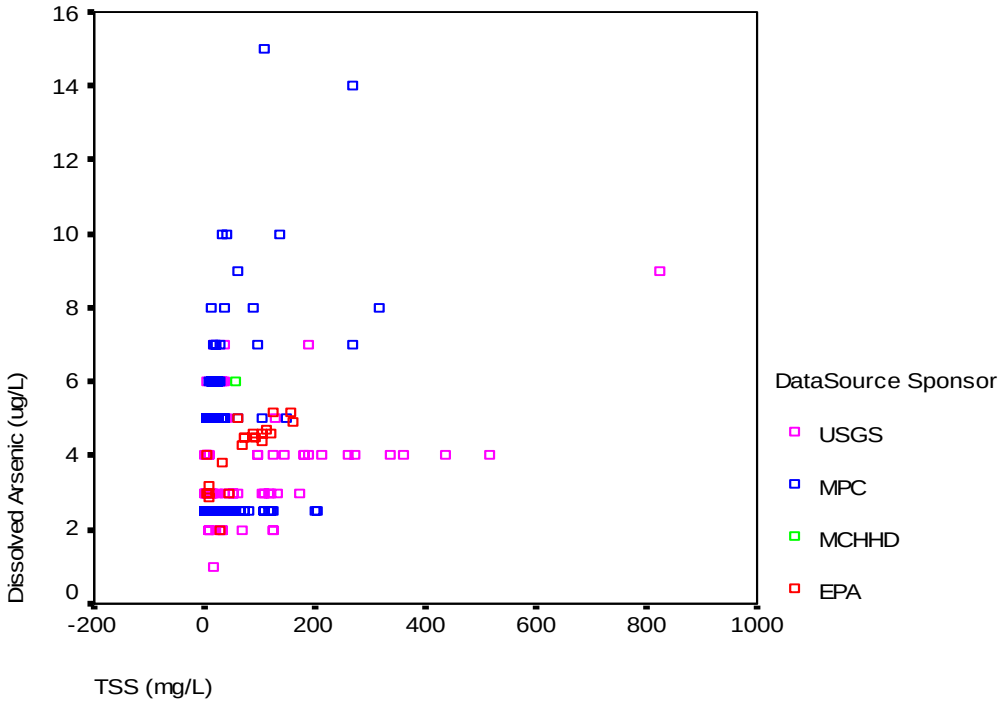


Figure D-15 Dissolved Copper Concentrations Below Milltown Dam
Combined Data Sources

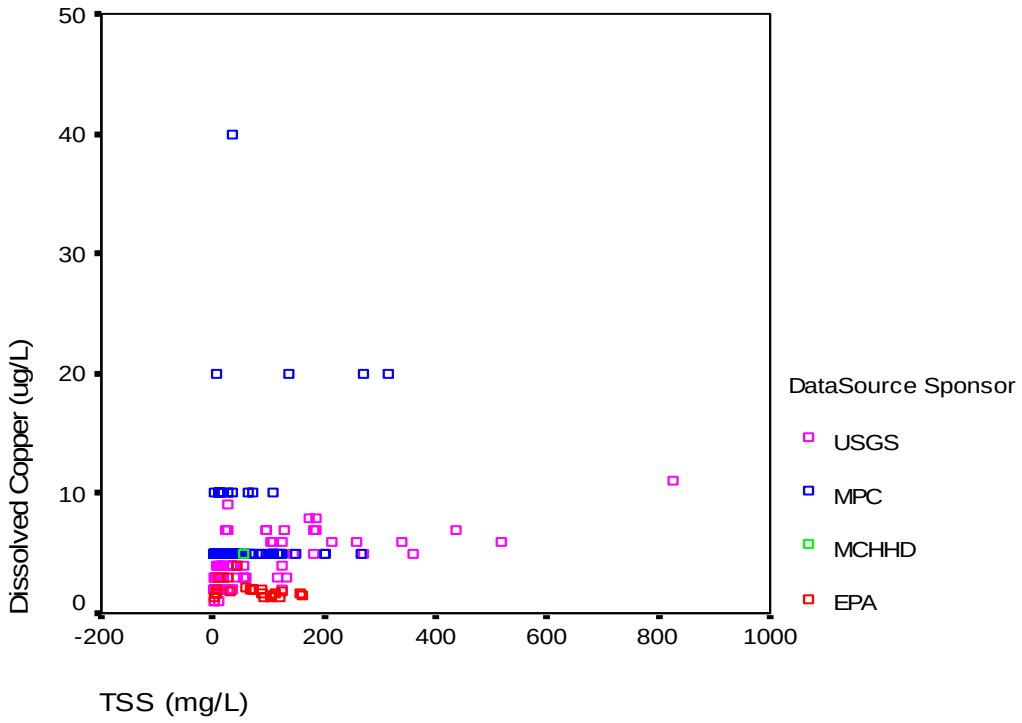


Figure D-16 Predicted Dissolved Arsenic Concentrations (*u*g/l) as a Function of TSS (mg/l) Combined Data Sources - 95% Individual & Mean Confidence Intervals Shown

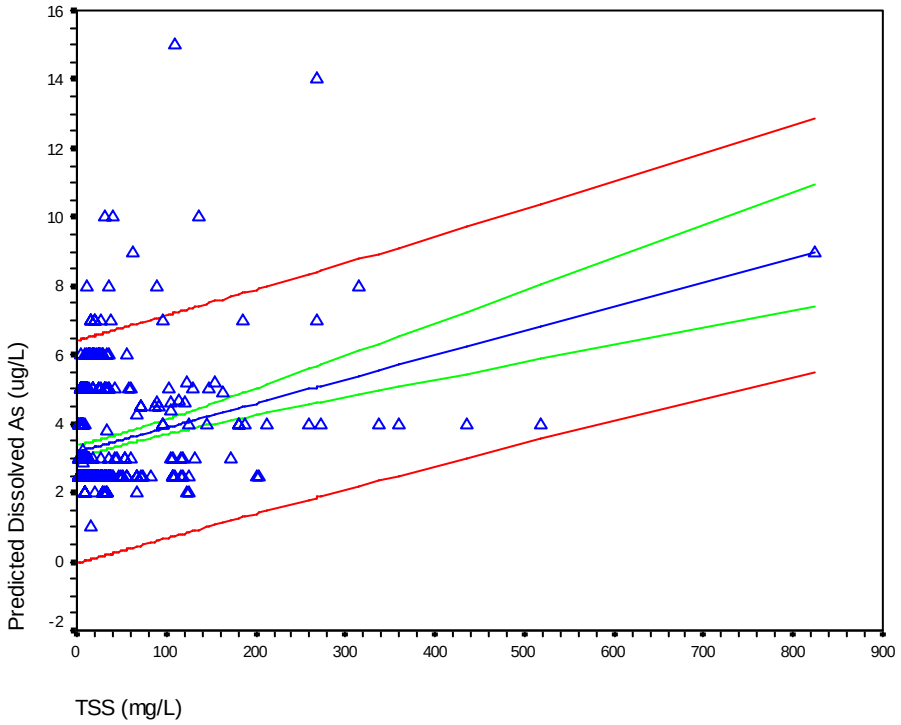


Figure D-17 Predicted Dissolved Copper Concentrations (*u*g/l) as a Function of TSS (mg/l) Combined Data Sources - 95% Individual & Mean Confidence Intervals Shown

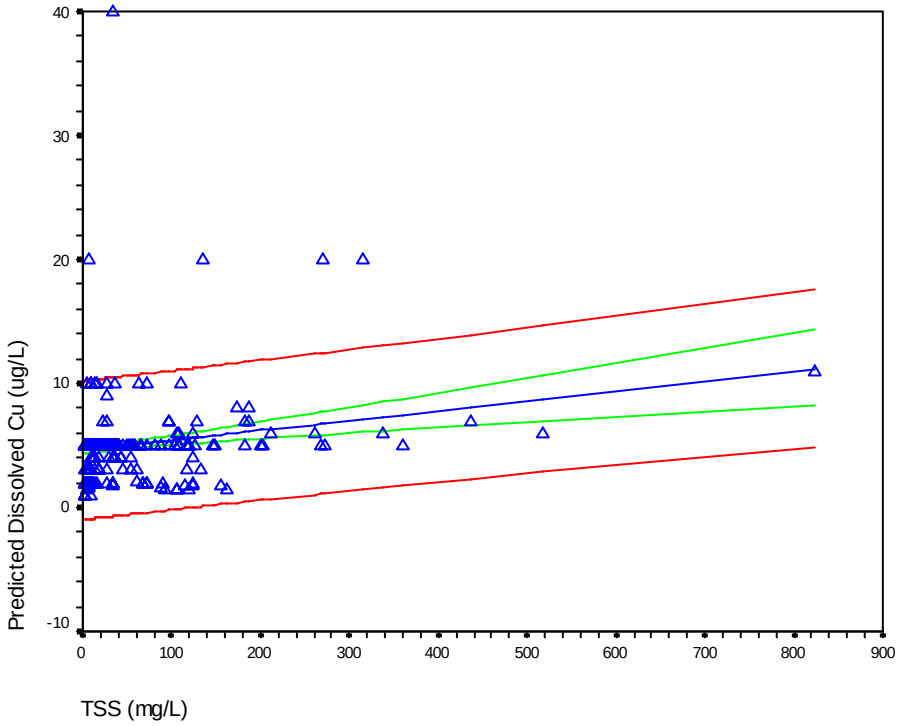
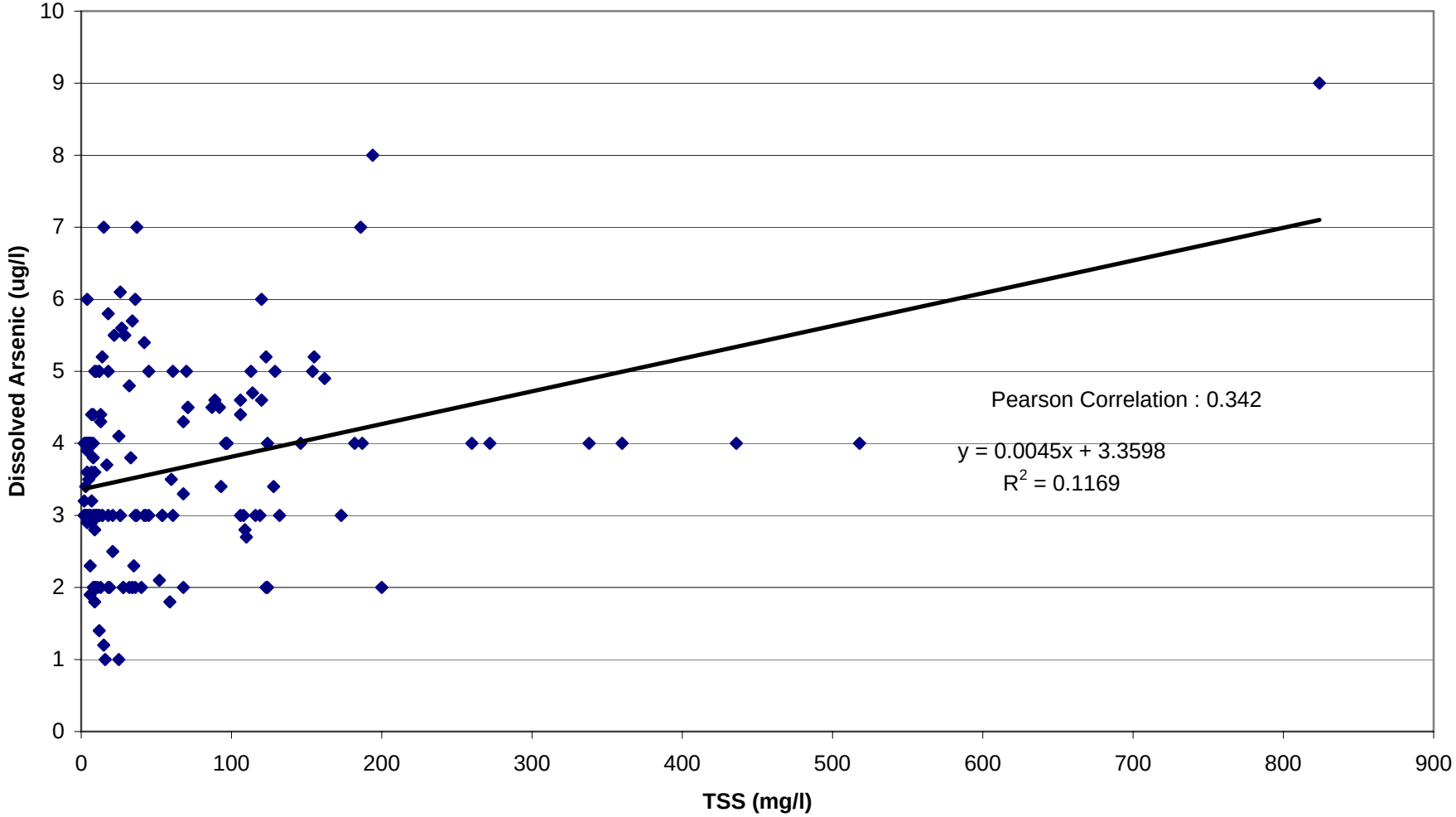
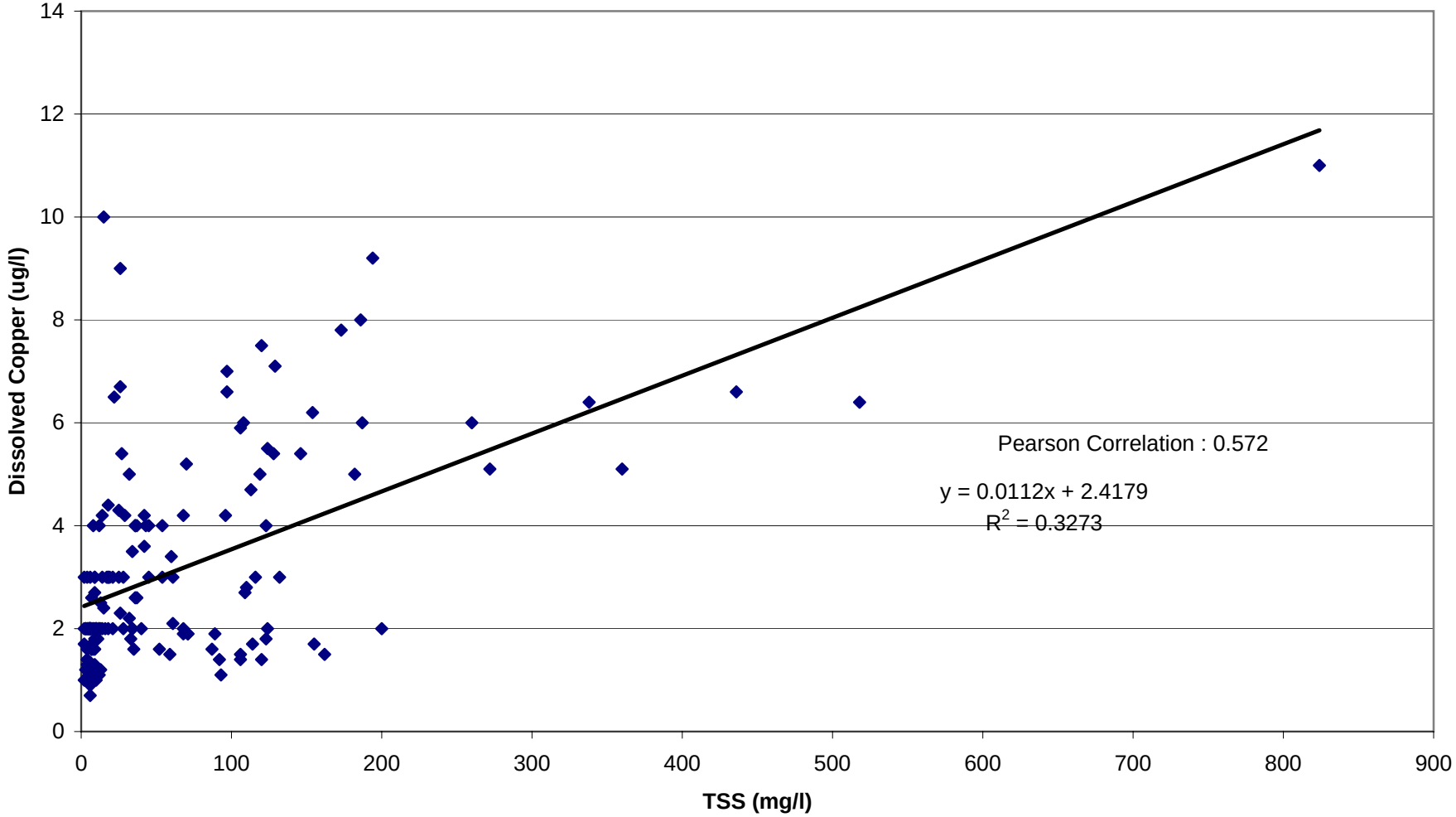


Figure D-18
Linear Regression of Dissolved Arsenic to TSS Concentrations at CFR above Missoula Station (USGS data)



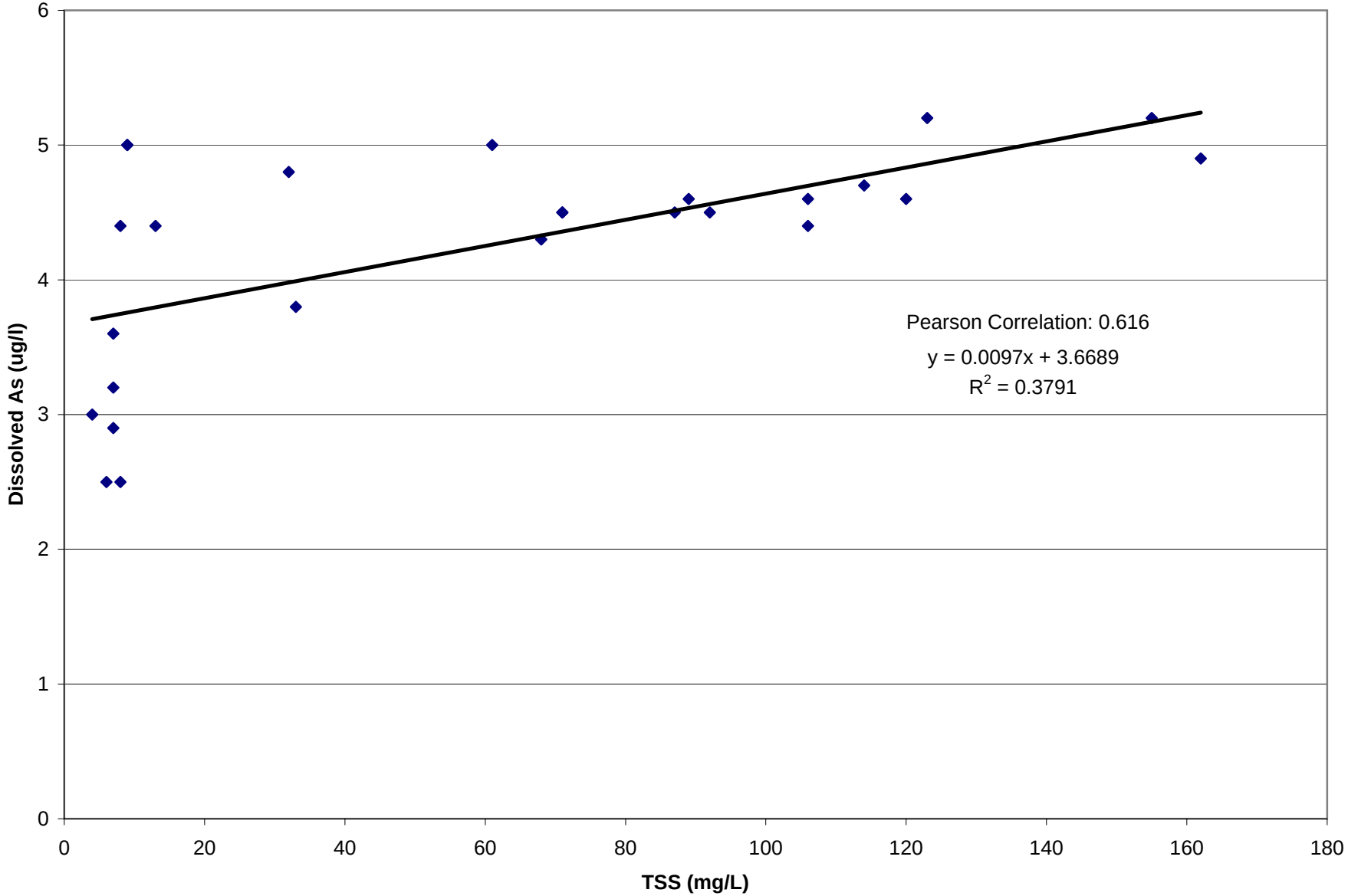
Data Source: USGS website station 12340500 from 12/28/89 to 8/31/02
H:\Projects\Milltown RD-RA\Scour Evaluation\May 17, 2004 Submittal\Appendices\App D\D-12,13,18,19 USGS data set regressions Fig D-18 Diss As vs TSS

Figure D-19
Linear Regression of Dissolved Copper to TSS Concentrations at CFR above Missoula Station
(USGS data)



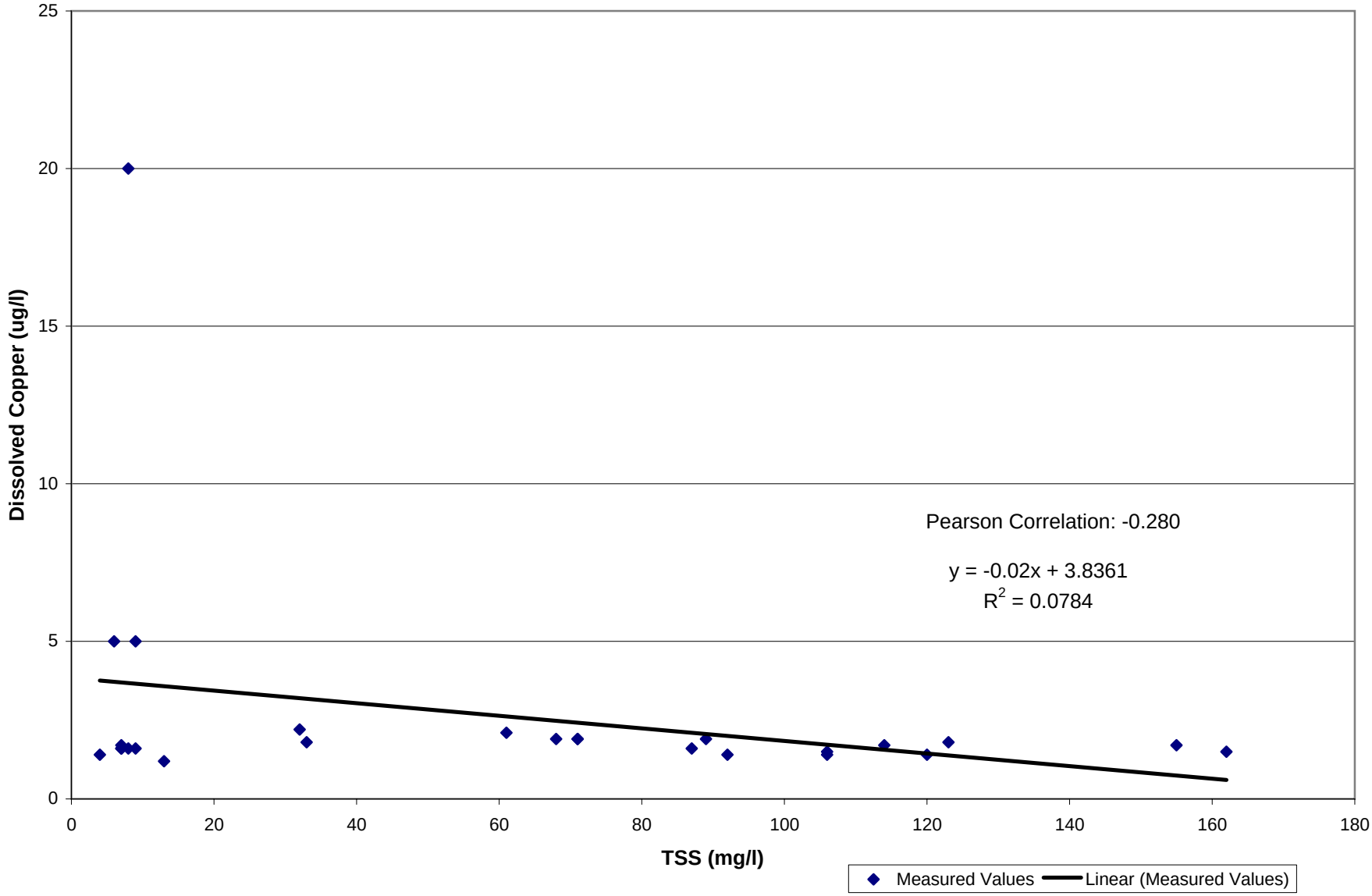
Data Source: USGS website station 12340500 from 12/28/89 to 8/31/02
H:\Projects\Milltown RD-RA\Scour Evaluation\May 17, 2004 Submittal\Appendices\App D\D-12,13,18,19 USGS data set regressions Fig D-19 Diss Cu vs TSS

Figure D-20
Linear Regression of Dissolved Arsenic to TSS Concentrations at above Missoula Station
During Reservoir Drawdowns



Data Source: Drawdown Data Only - USGS website station 12340500 from 8/19/99 to 8/31/02, MPC data of Land and Water 1999 report from 7/15/86 to 7/29/86
H:\Projects\Milltown RD-RA\Scour Evaluation\May 17, 2004 Submittal\Appendices\App D\D20-21 TSS vs Metal

Figure D-21
Linear Regression of Dissolved Copper to TSS Concentrations at above Missoula Station
During Reservoir Drawdowns



Data Source: Drawdown Data Only - USGS website station 12340500 from 8/19/99 to 8/31/02, MPC data of Land and Water 1999 report from 7/15/86 to 7/29/86
H:\Projects\Milltown RD-RA\Scour Evaluation\May 17, 2004 Submittal\Appendices\App D\D20-21 TSS vs Metal