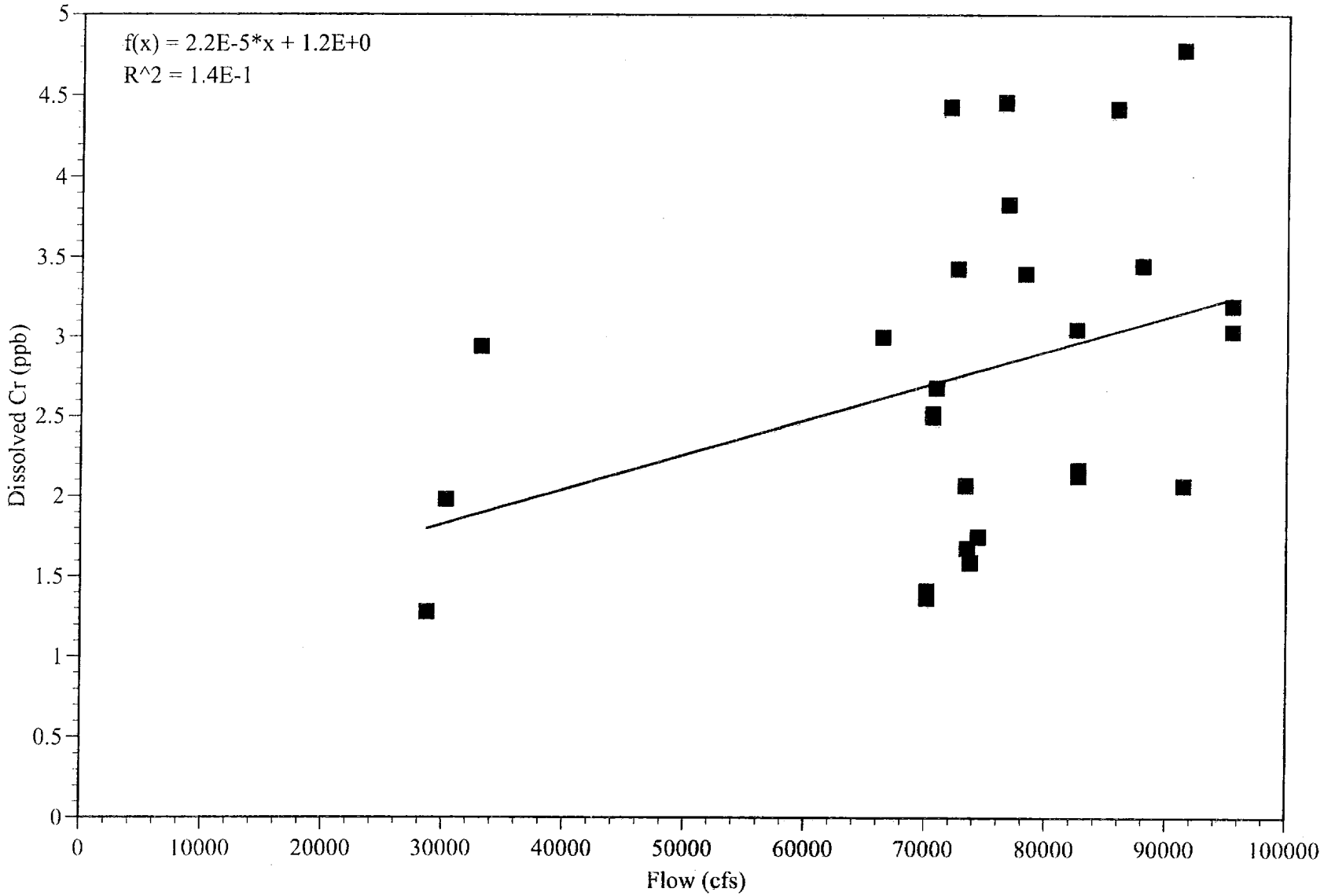

Figure 26. Regression of flow versus dissolved (0.45 µm) chromium concentration in water samples collected from the Sacramento River at Greene's Landing during Water Year 1995.

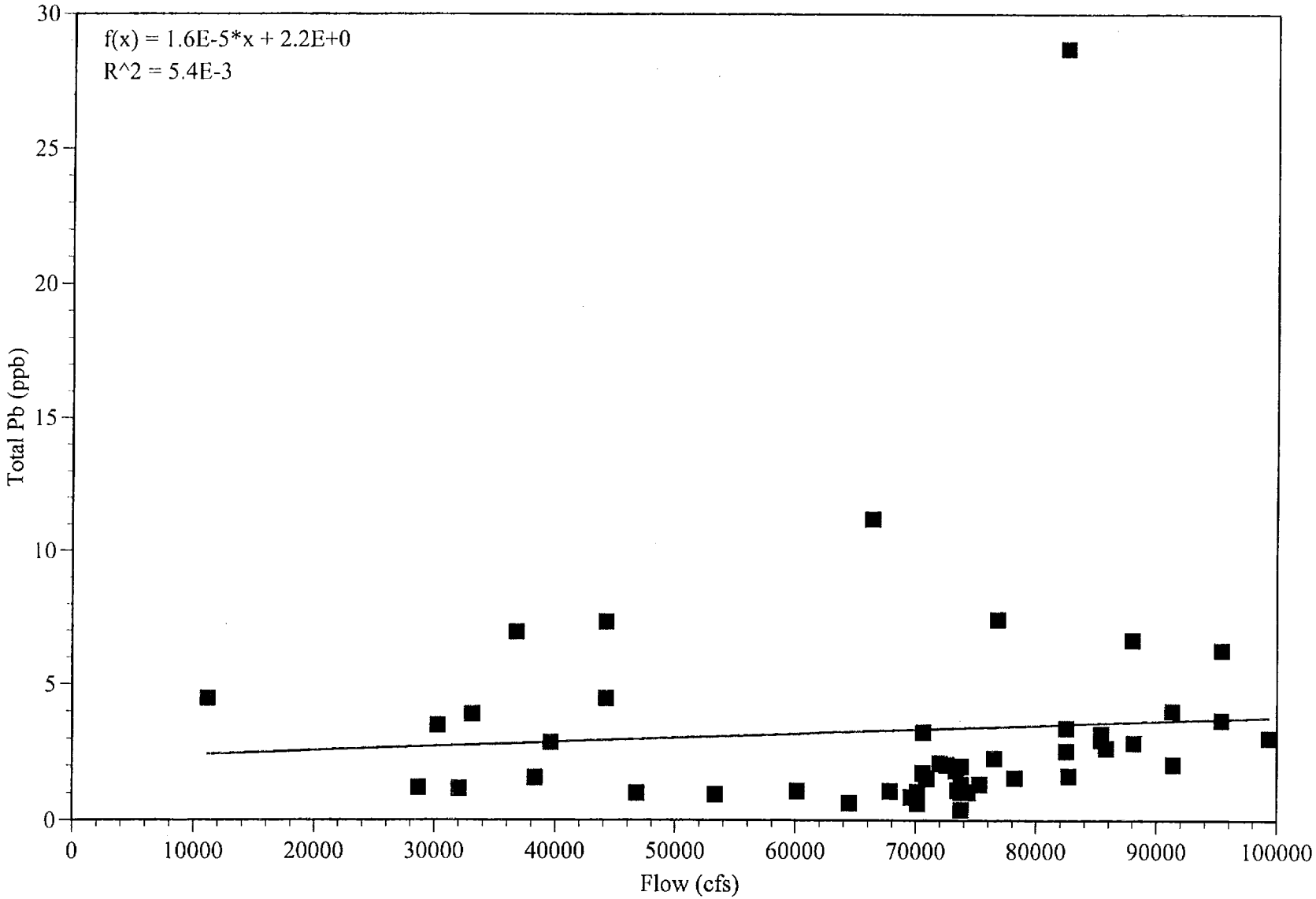

Figure 27. Regression of flow versus total recoverable lead concentration in water samples collected from the Sacramento River at Greene's Landing during Water Year 1995.

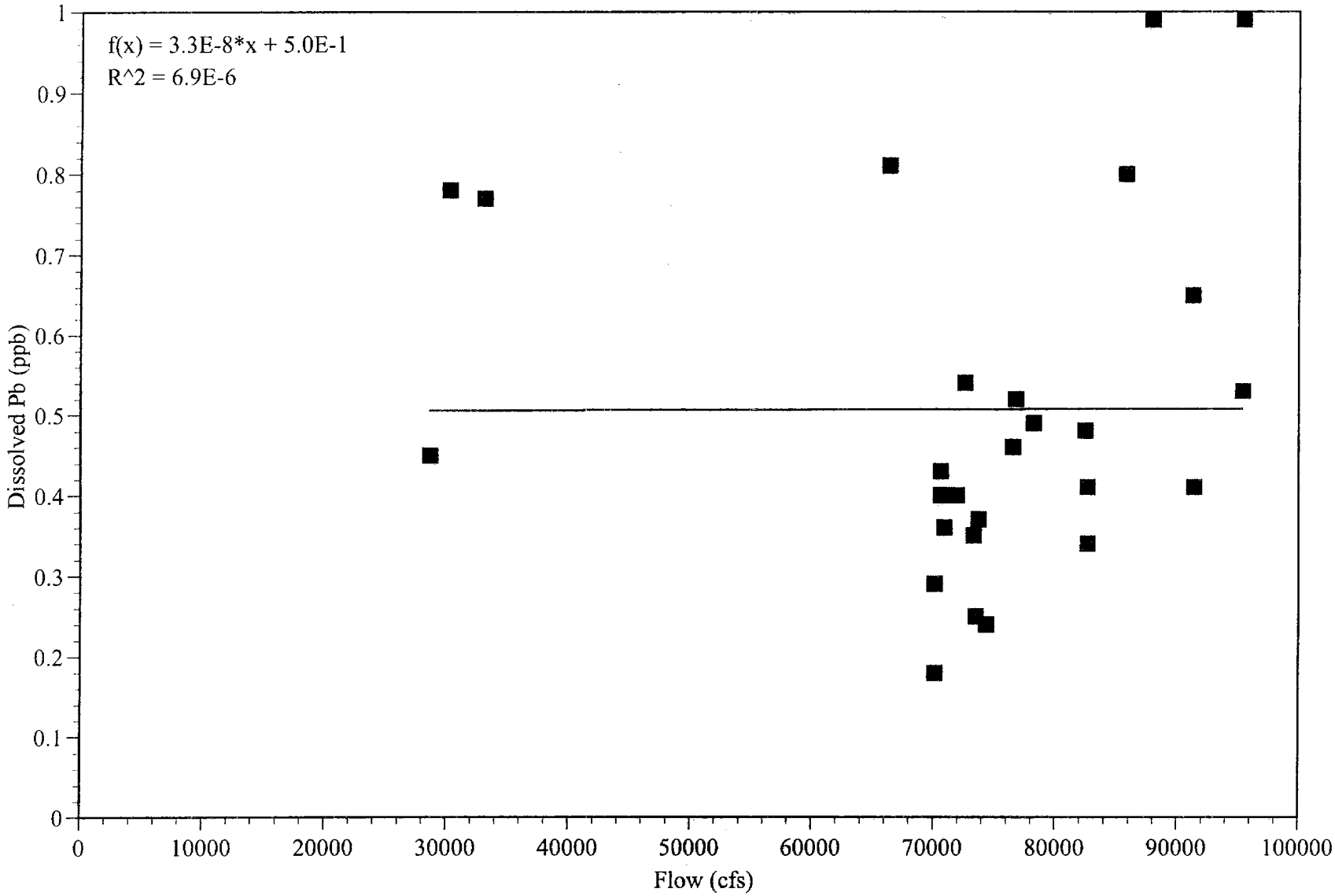

Figure 28. Regression of flow versus dissolved (0.45 µm) lead concentration in water samples collected from the Sacramento River at Greene's Landing during Water Year 1995.

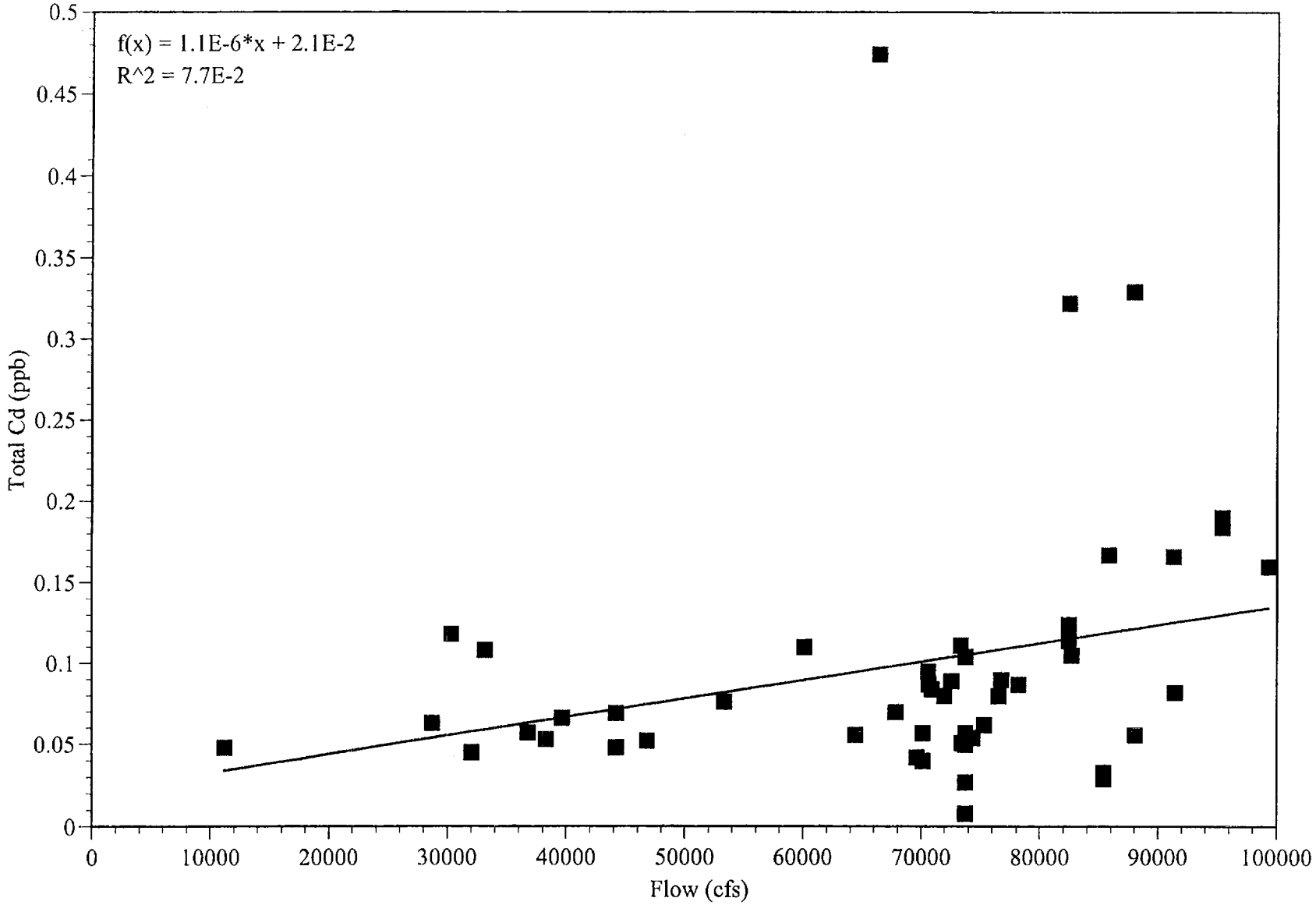

Figure 29. Regression of flow versus total recoverable cadmium concentration in water samples collected from the Sacramento River at Greene's Landing during Water Year 1995.

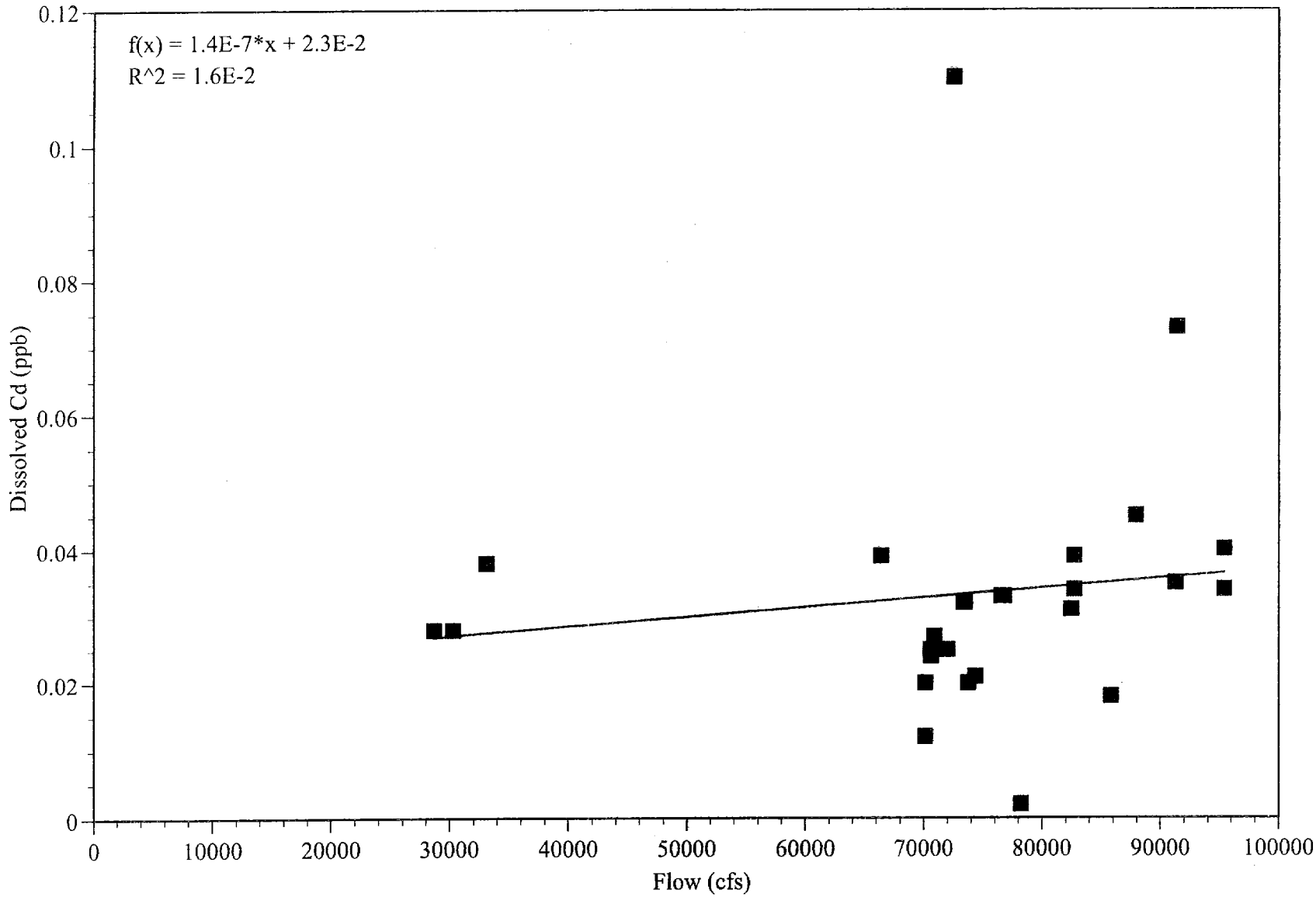

Figure 30. Regression of flow versus dissolved (0.45 µm) cadmium concentration in water samples collected from the Sacramento River at Greene's Landing during Water Year 1995.

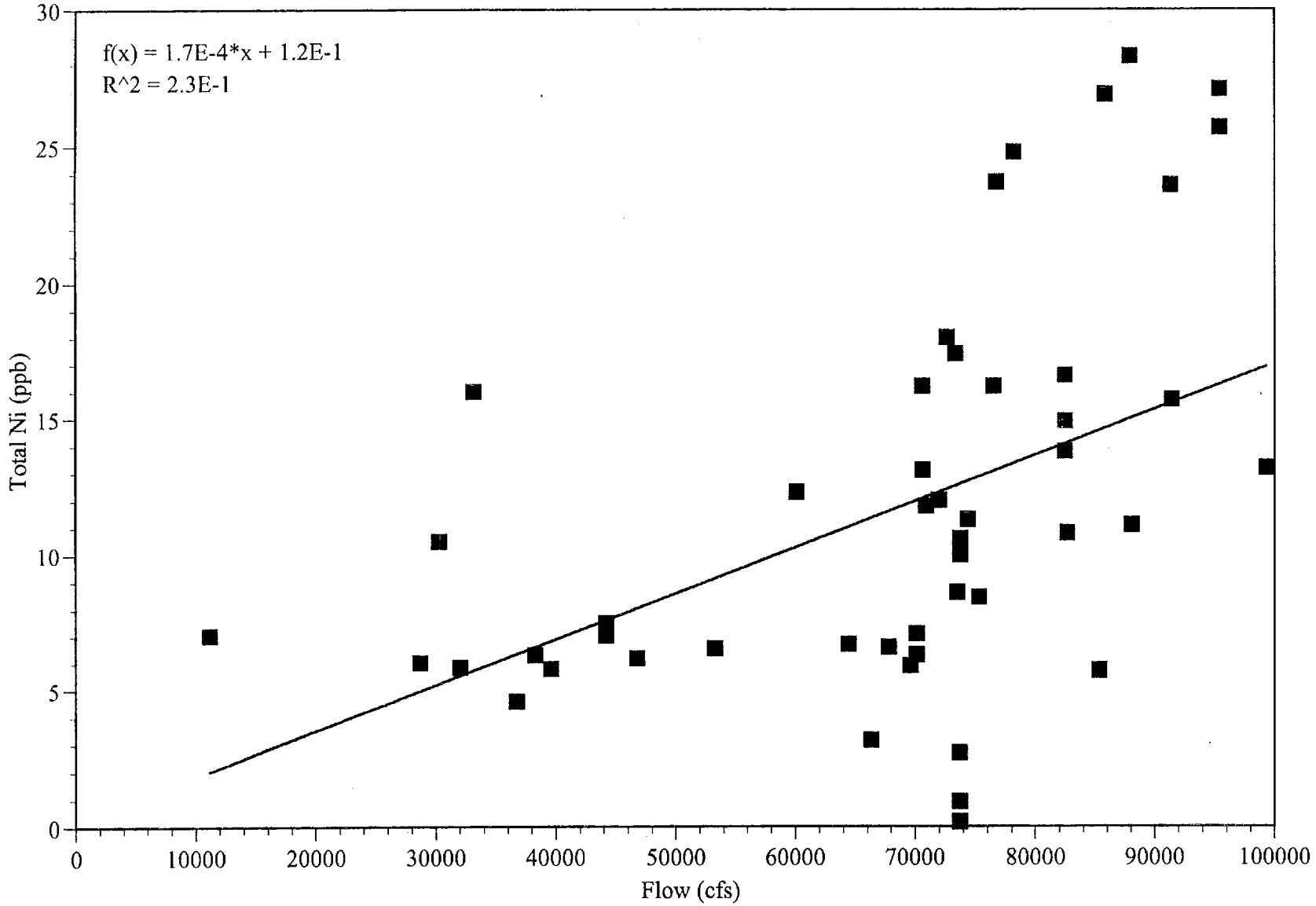

Figure 31. Regression of flow versus total recoverable nickel concentration in water samples collected from the Sacramento River at Greene's Landing during Water Year 1995.

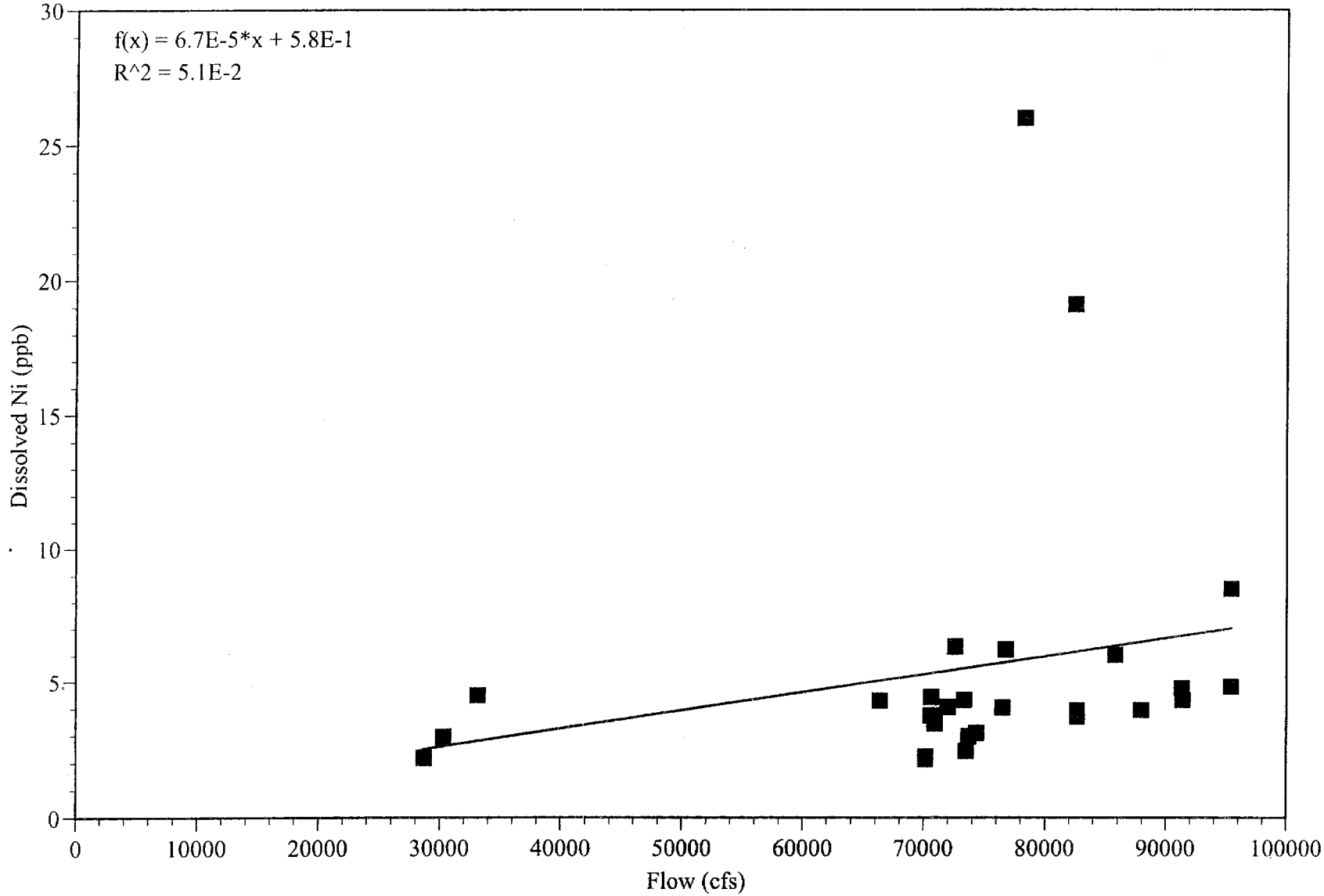

Figure 32. Regression of flow versus dissolved (0.45 µm) nickel concentration in water samples collected from the Sacramento River at Greene's Landing during Water Year 1995.

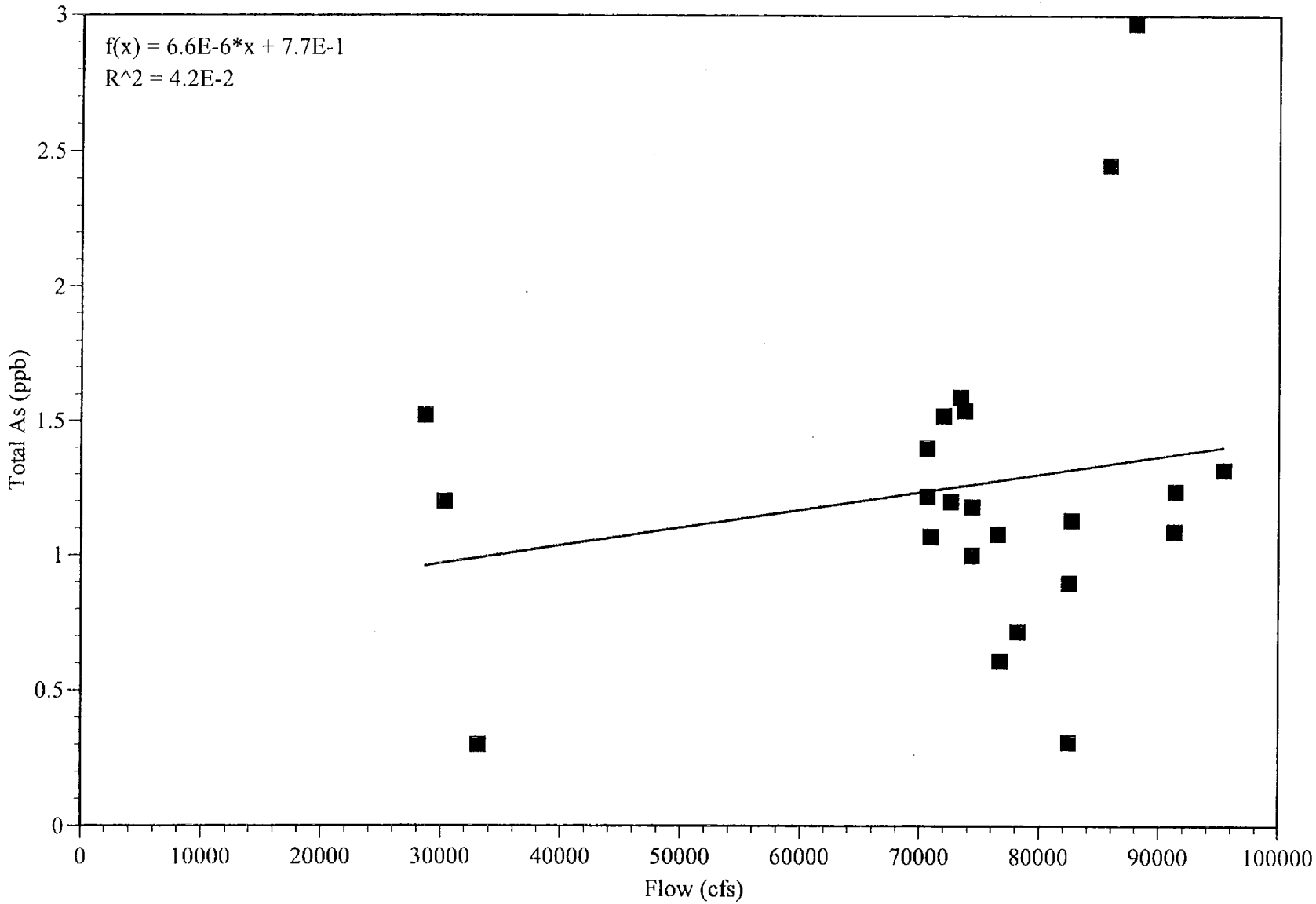

Figure 33. Regression of flow versus total recoverable arsenic concentration in water samples collected from the Sacramento River at Greene's Landing during Water Year 1995.

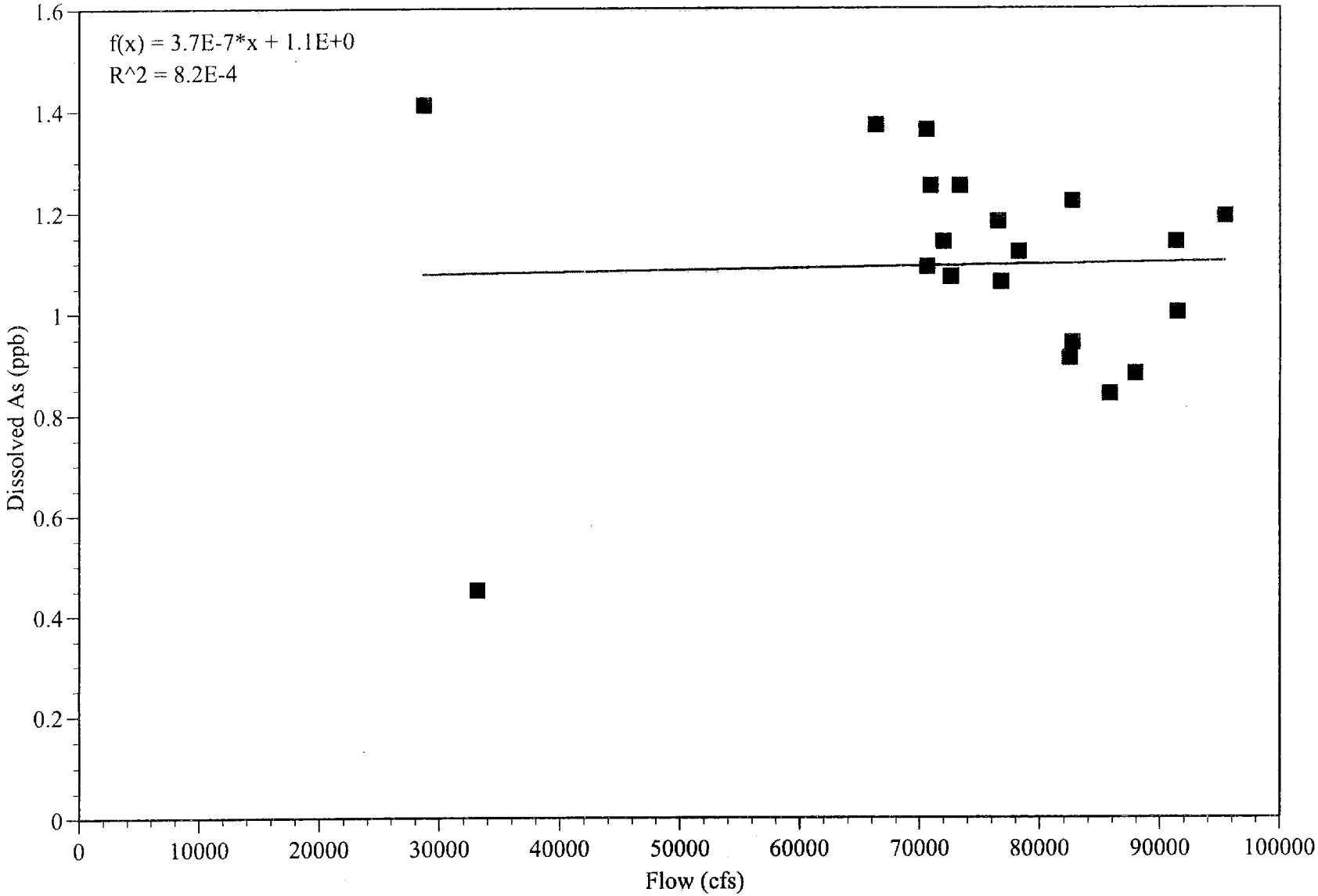

Figure 34. Regression of flow versus dissolved (0.45 µm) arsenic concentration in water samples collected from the Sacramento River at Greene's Landing during Water Year 1995.

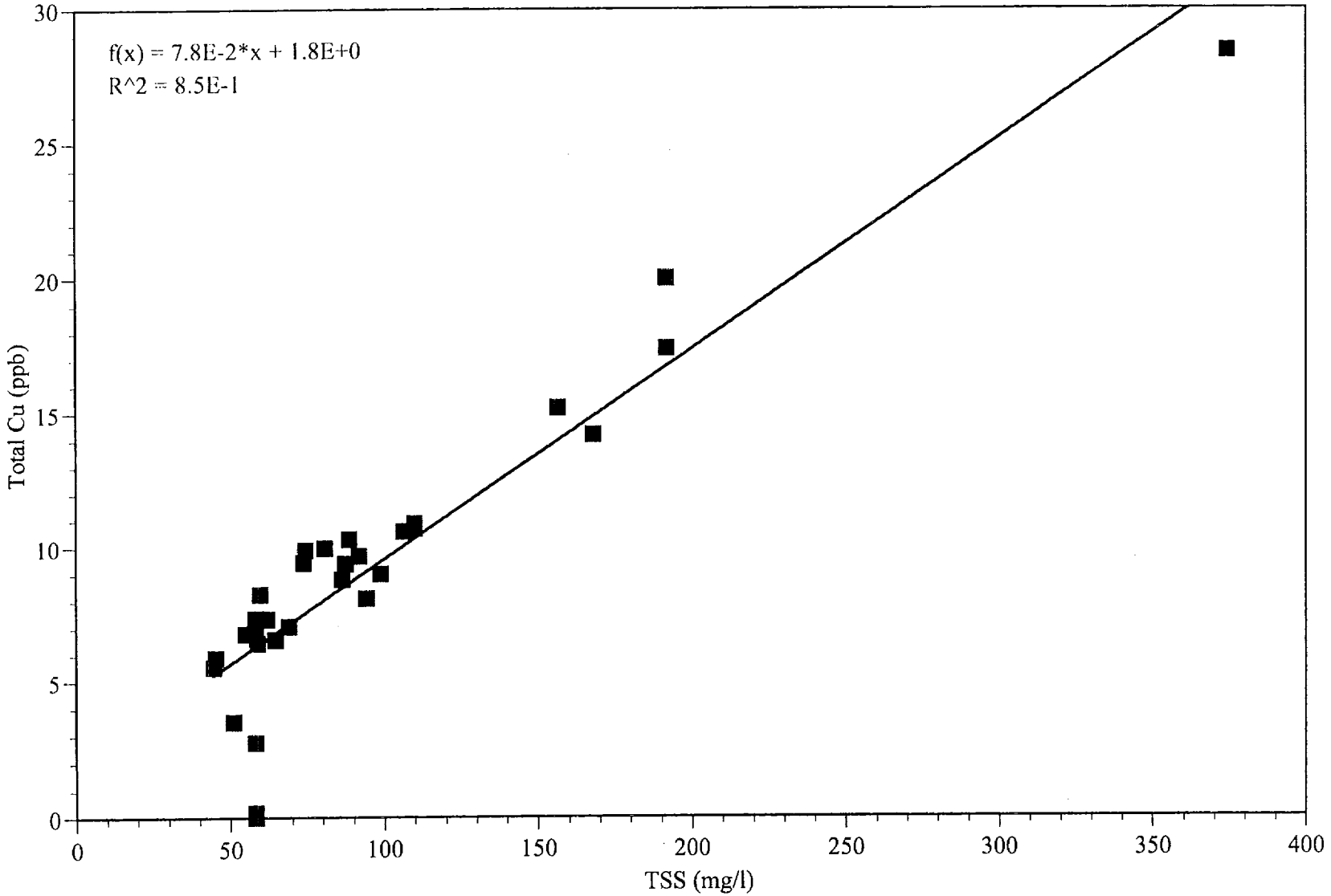

Figure 35. Regression of TSS versus total recoverable copper concentration in water samples collected from the Sacramento River at Greene's Landing during Water Year 1995.

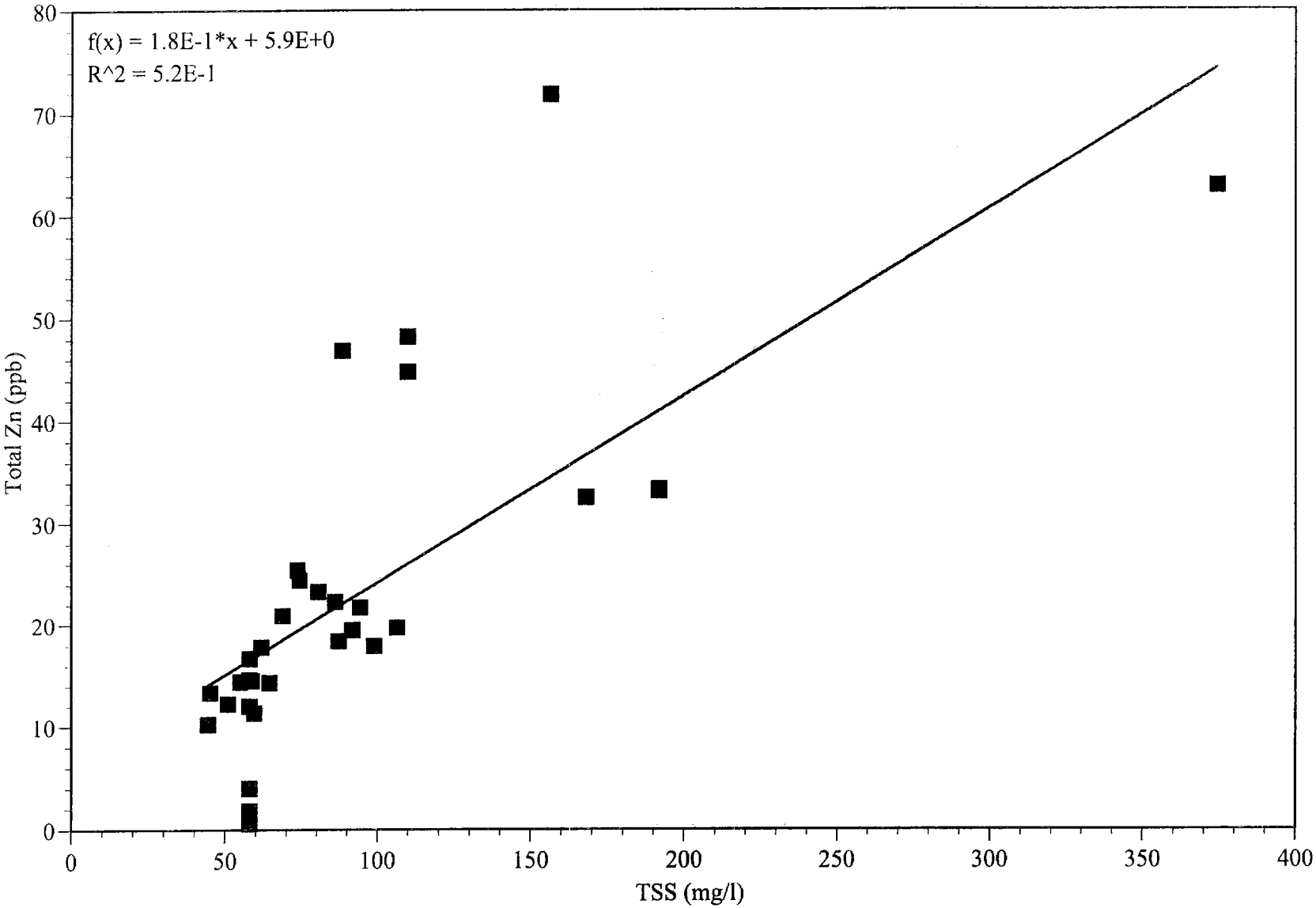

Figure 36. Regression of TSS versus total recoverable zinc concentration in water samples collected from the Sacramento River at Greene's Landing during Water Year 1995.

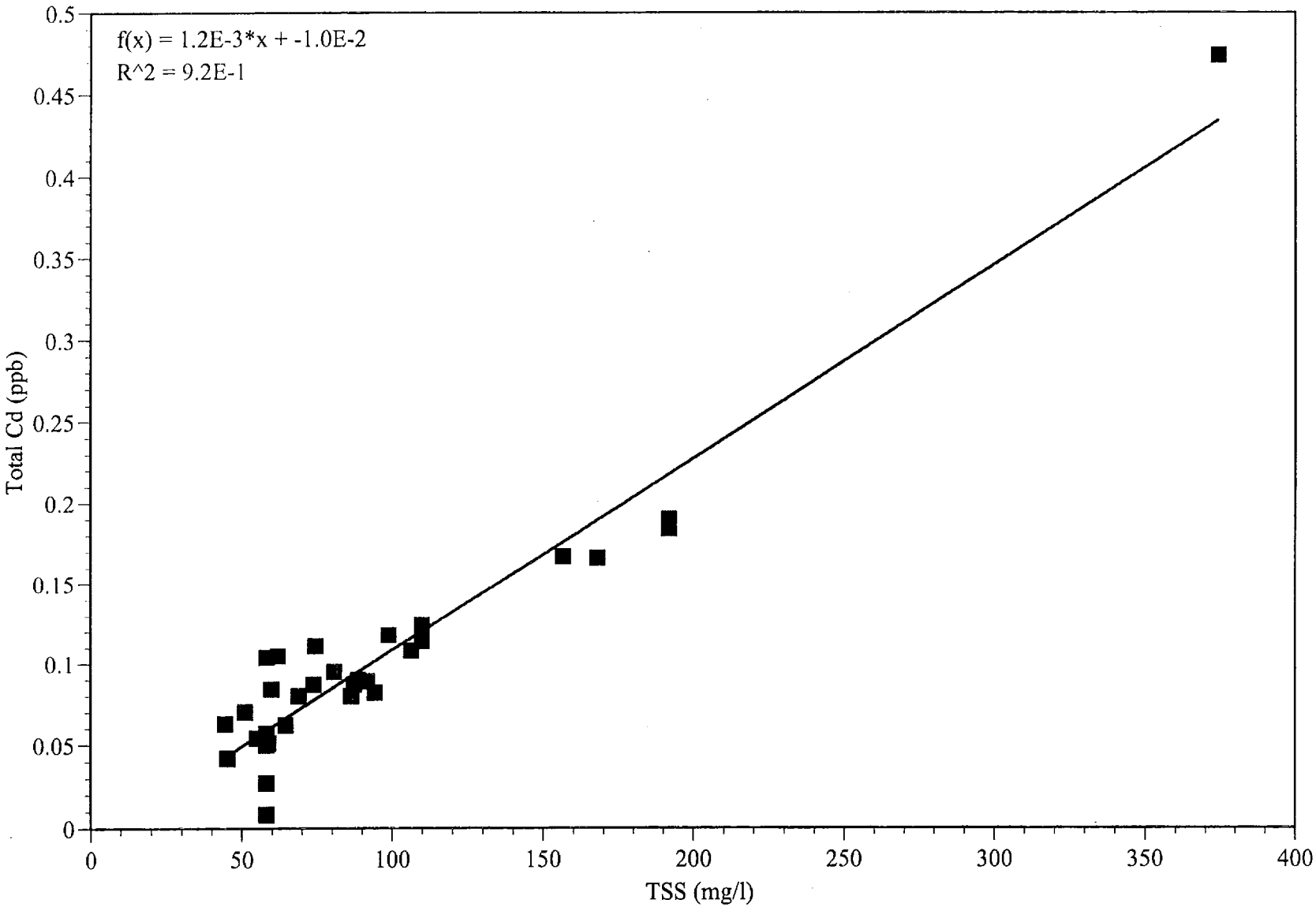

Figure 37. Regression of TSS versus total recoverable cadmium concentration in water samples collected from the Sacramento River at Greene's Landing during Water Year 1995.

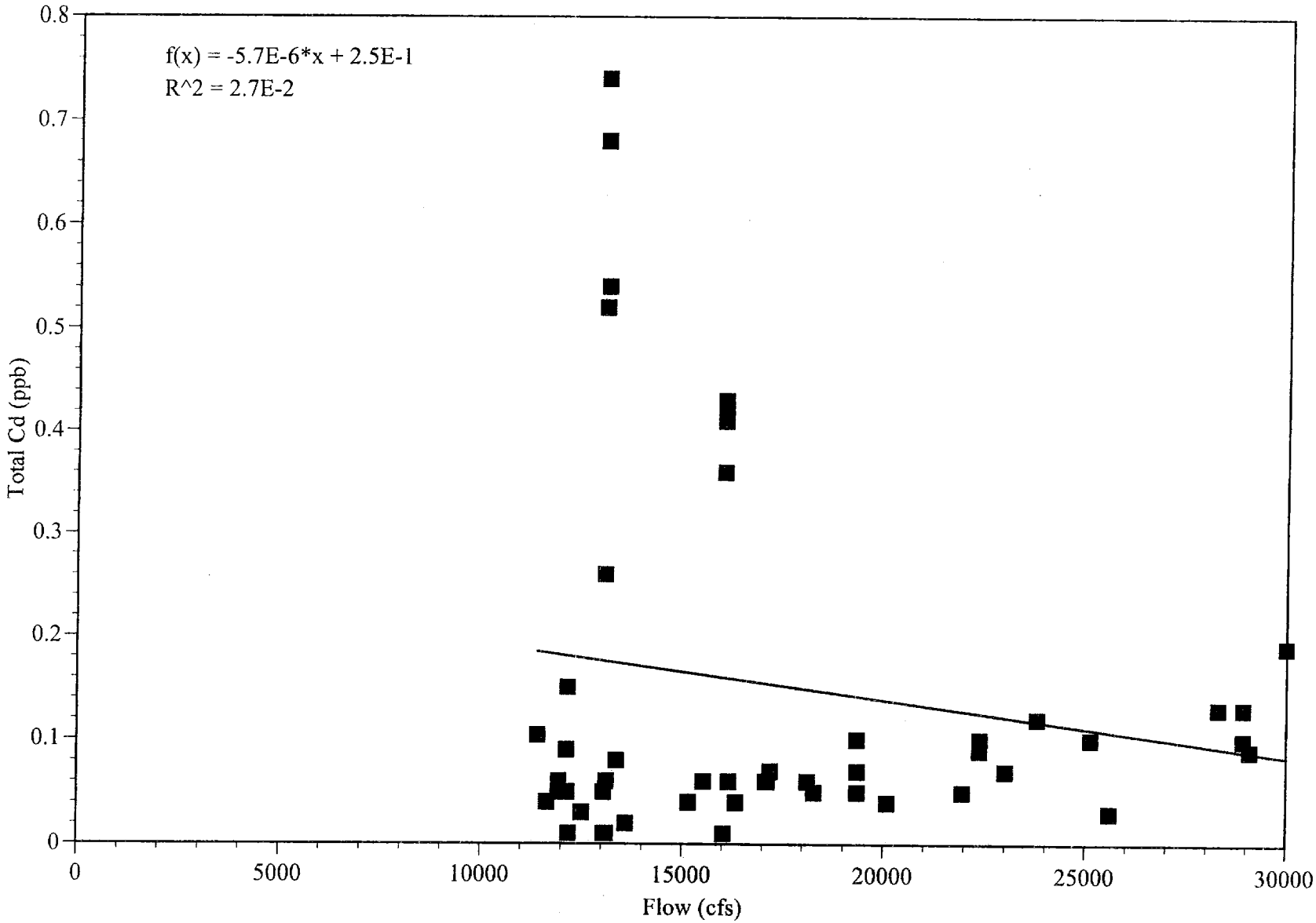

Figure 38. Regression of flow versus total recoverable cadmium concentration in water samples collected from the Sacramento River at Greene's Landing during Water Year 1994.

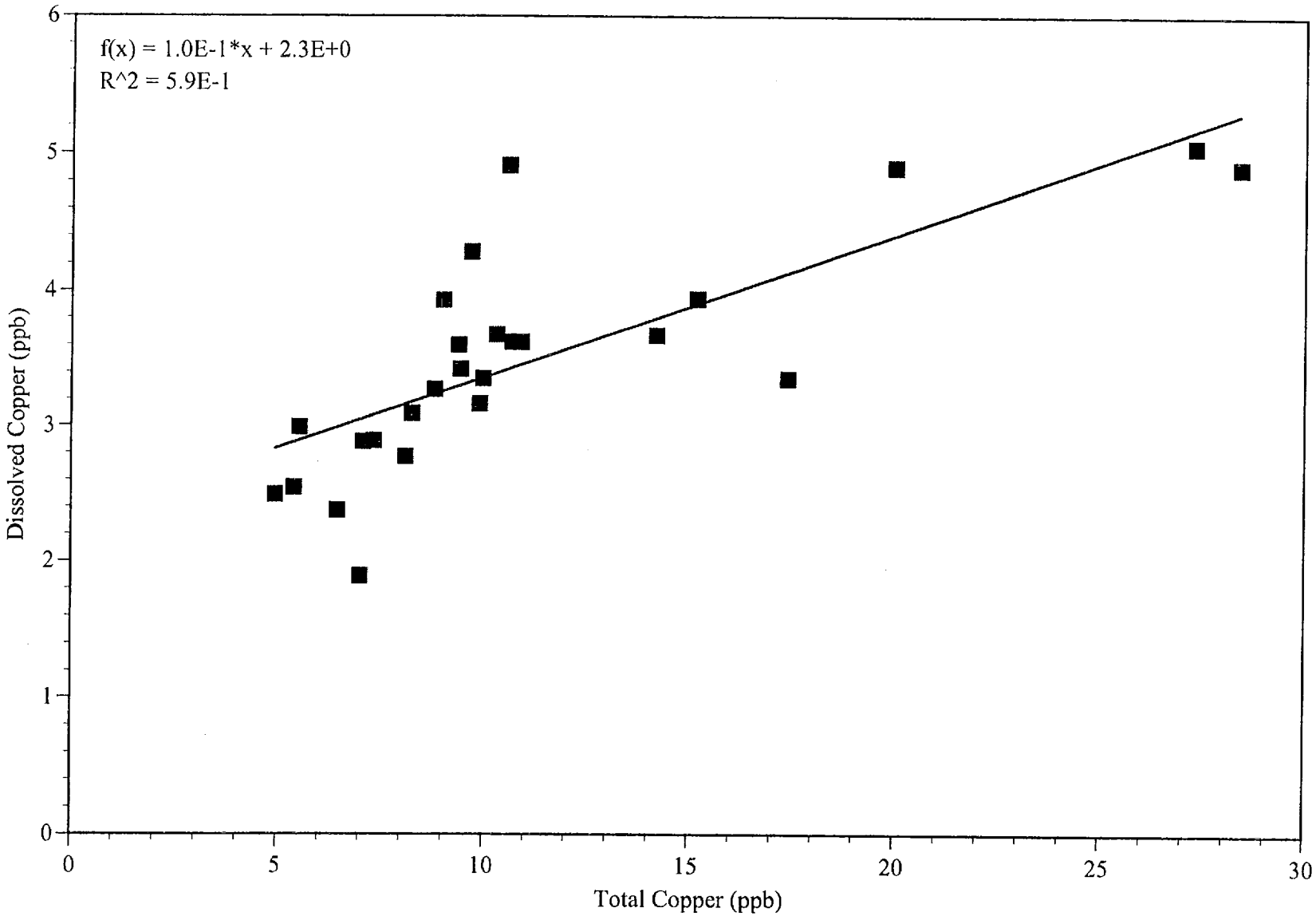

Figure 39. Regression of total recoverable copper versus dissolved (0.45 µm) copper concentration in water samples collected from the Sacramento River at Greene's Landing during Water Year 1995.

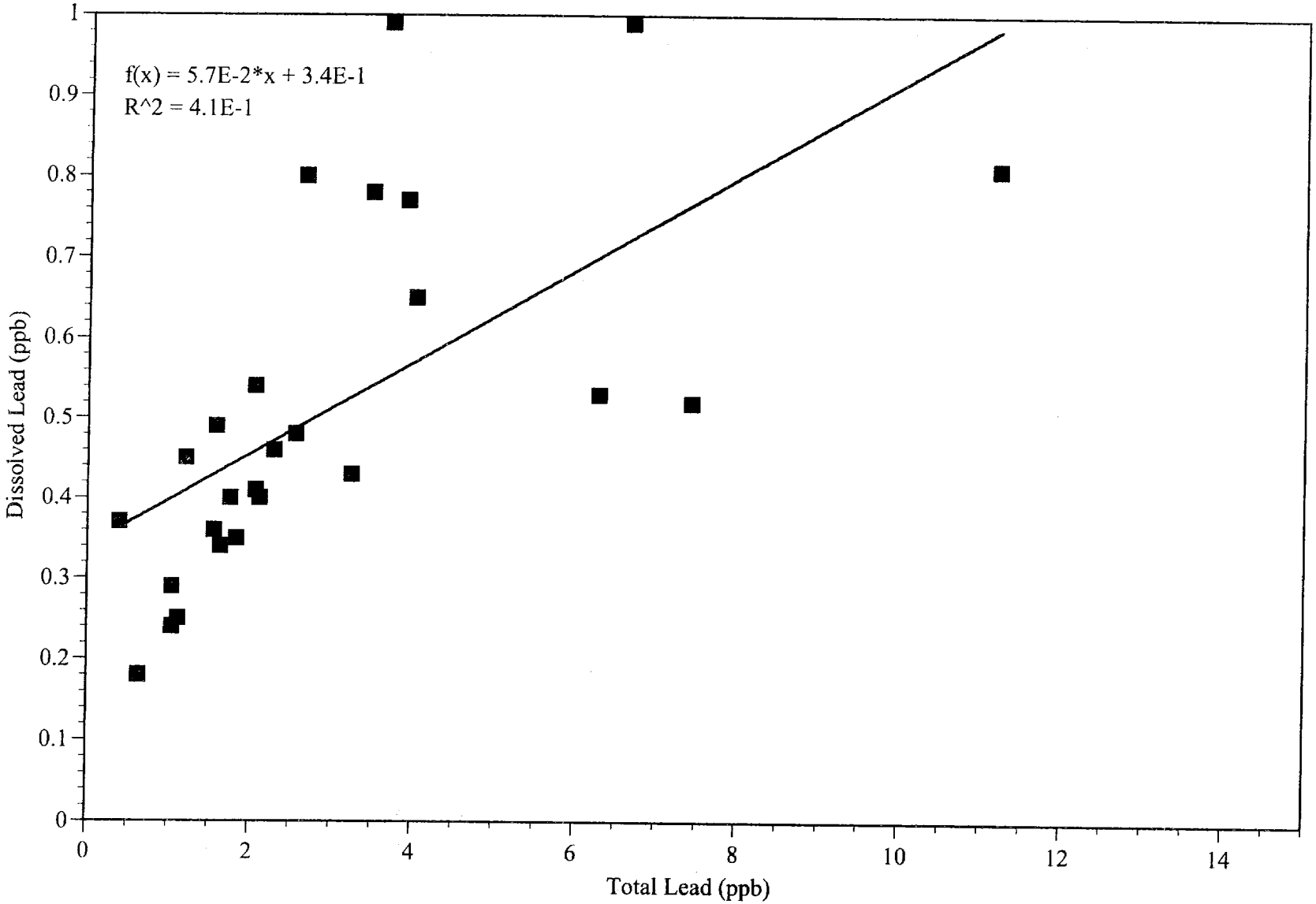

Figure 40. Regression of total recoverable lead versus dissolved (0.45 µm) lead concentration in water samples collected from the Sacramento River at Greene's Landing during Water Year 1995.

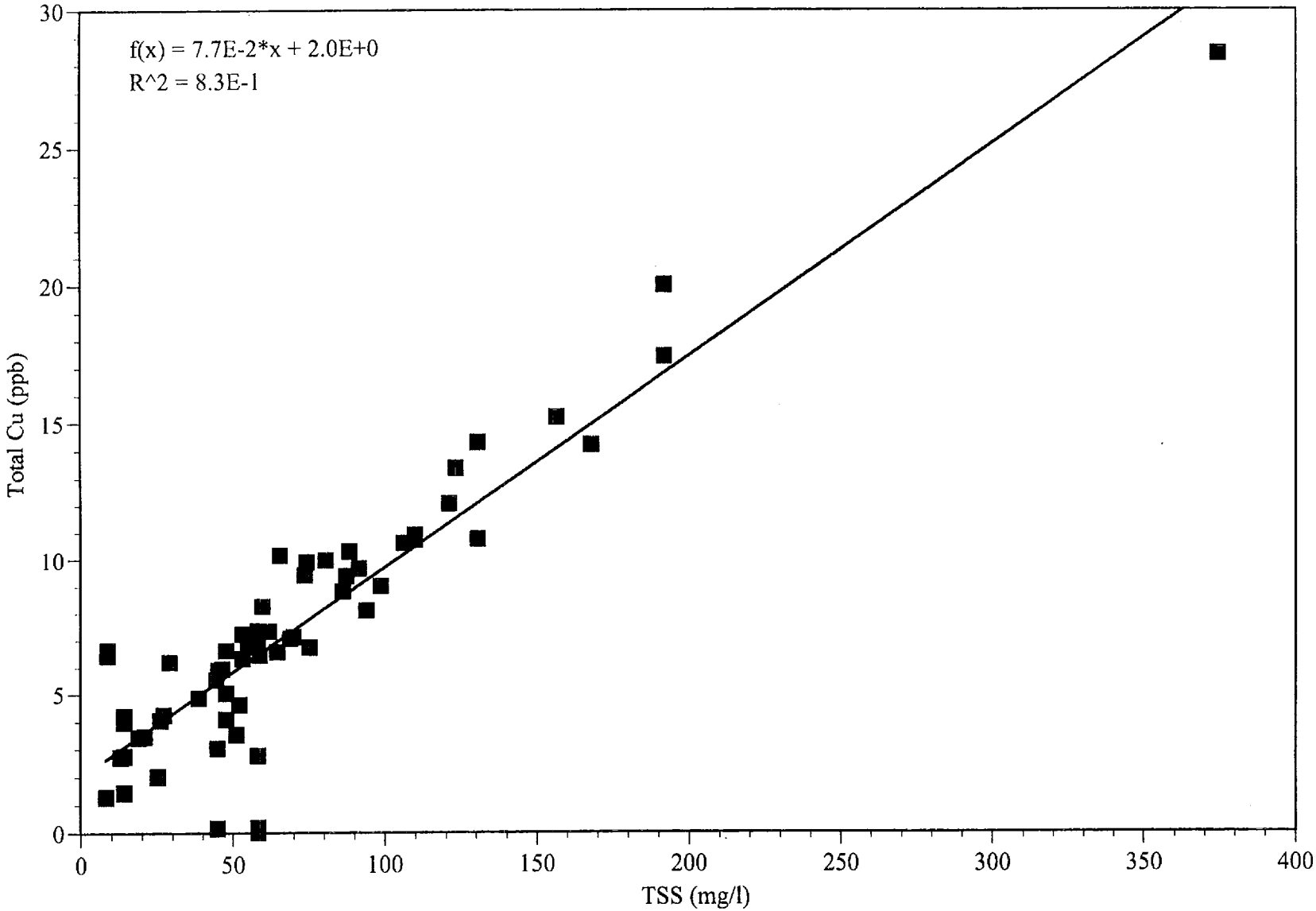

Figure 41. Regression of TSS versus total recoverable copper concentration in water samples collected from the Sacramento River at Greene's Landing during Water Years 1994 and 1995.

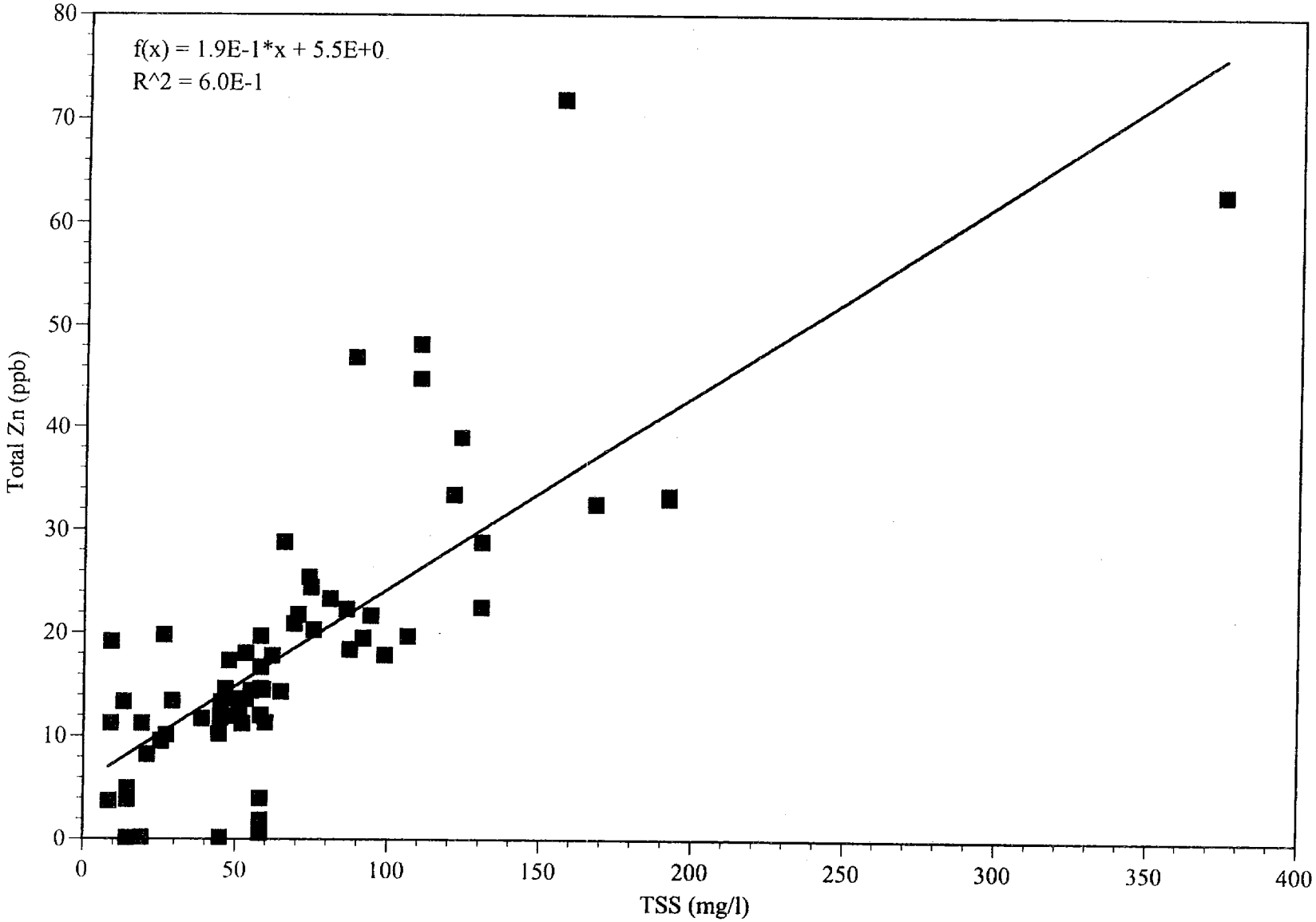

Figure 42. Regression of TSS versus total recoverable zinc concentration in water samples collected from the Sacramento River at Greene's Landing during Water Years 1994 and 1995.

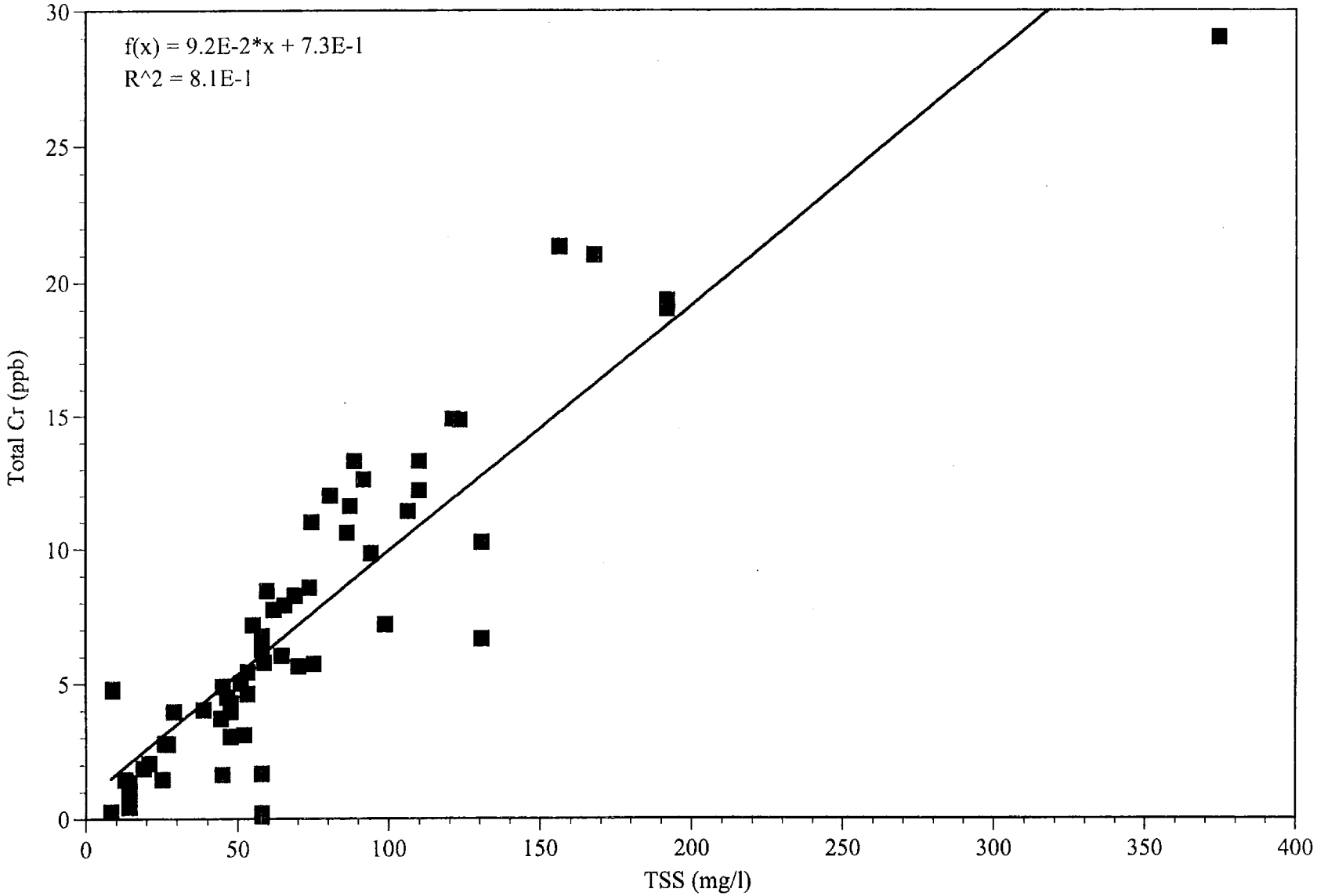

Figure 43. Regression of TSS versus total recoverable chromium concentration in water samples collected from the Sacramento River at Greene's Landing during Water Years 1994 and 1995.

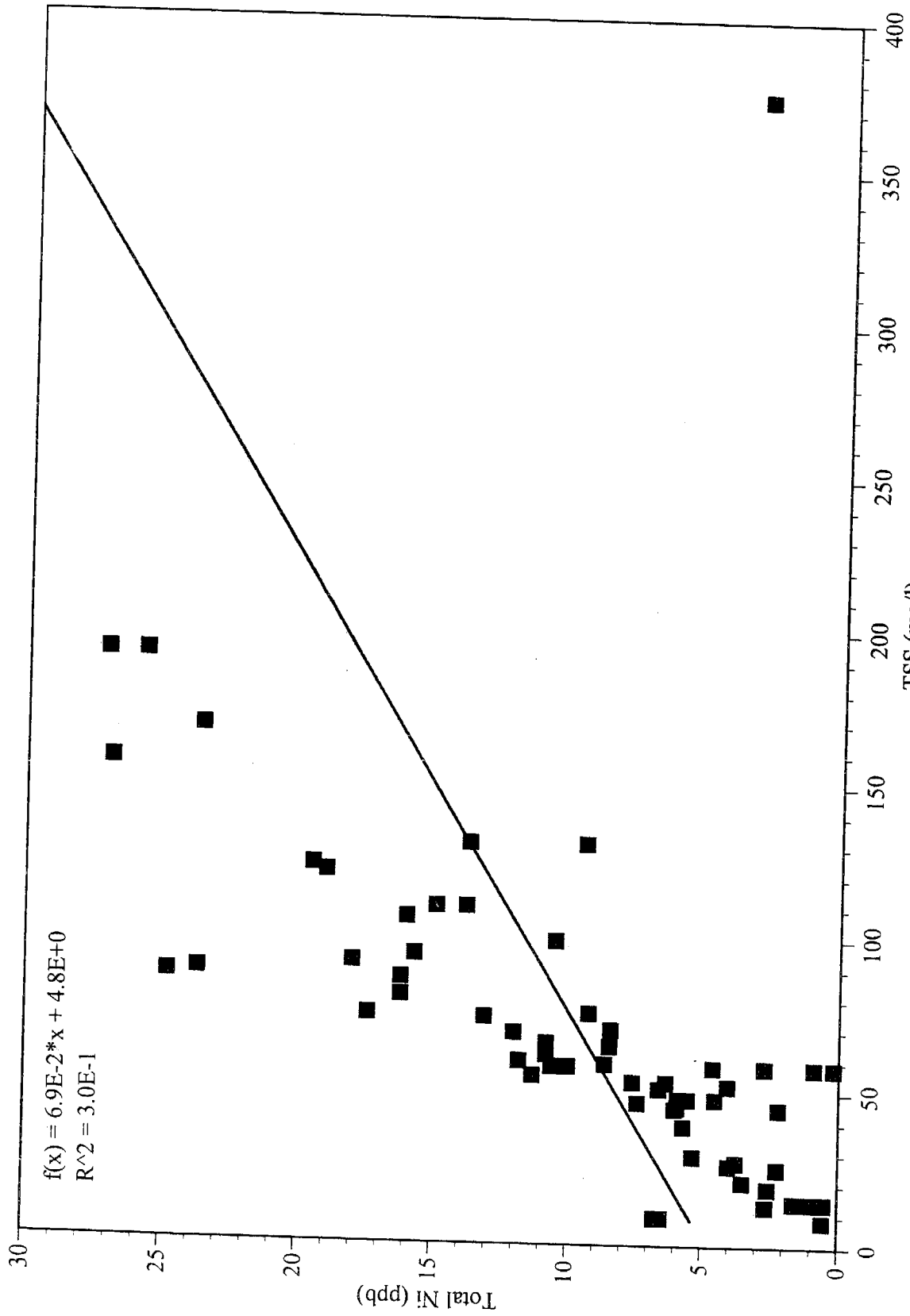

Figure 44. Regression of TSS versus total recoverable nickel concentration in water samples collected from the Sacramento River at Greene's Landing during Water Years 1994 and 1995.

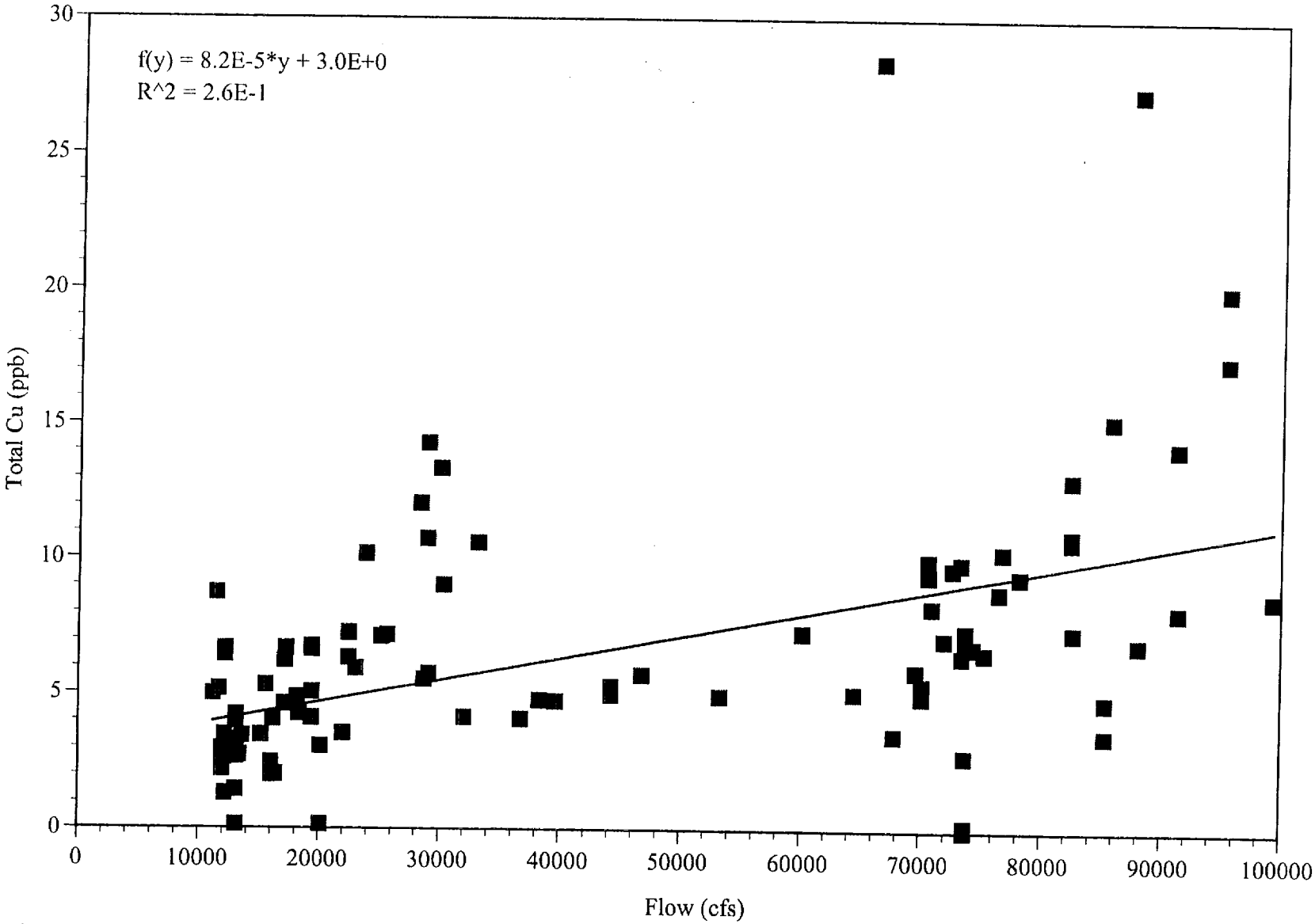

Figure 45. Regression of flow versus total recoverable copper concentration in water samples collected from the Sacramento River at Greene's Landing during Water Years 1994 and 1995.

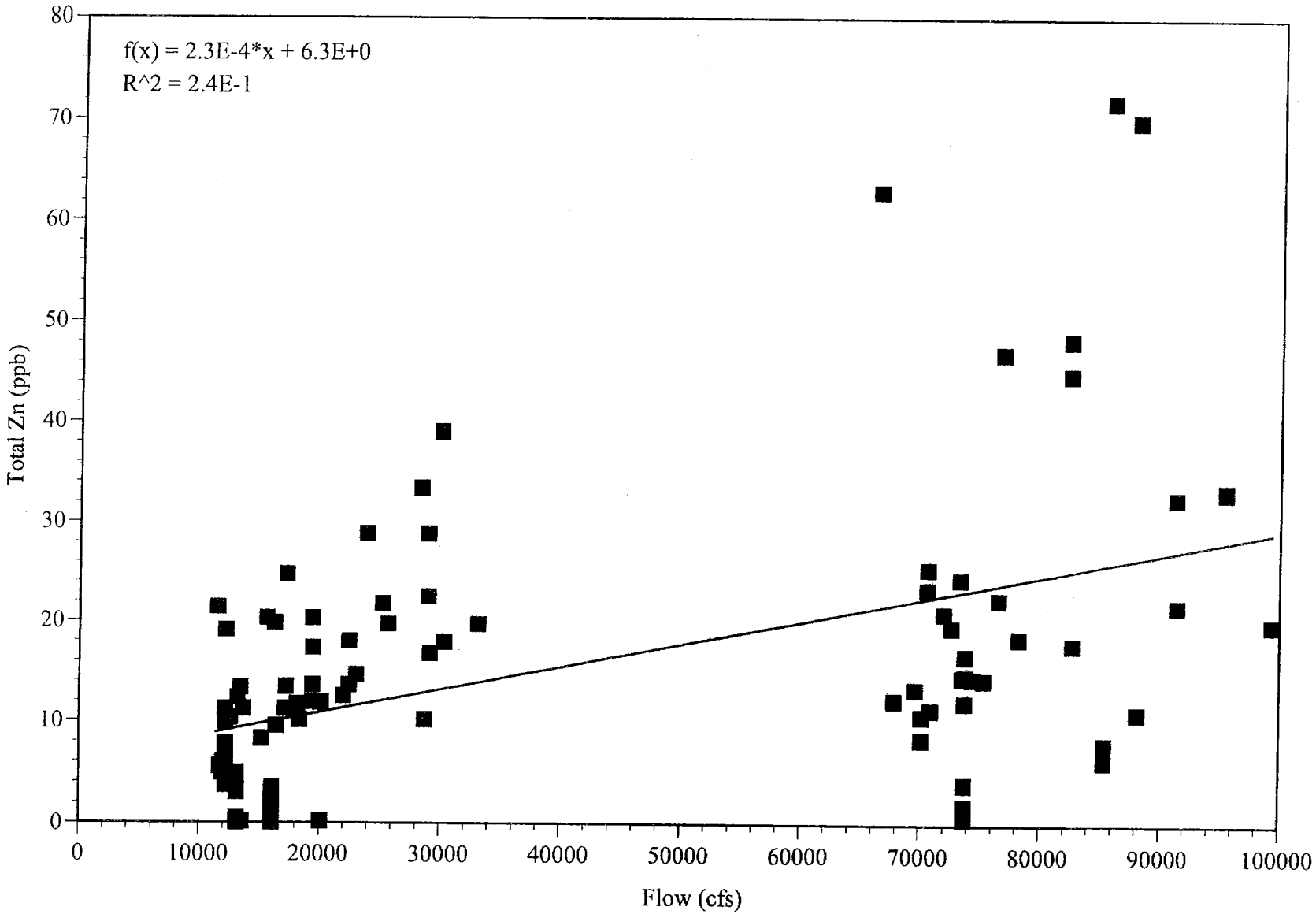

Figure 46. Regression of flow versus total recoverable zinc concentration in water samples collected from the Sacramento River at Greene's Landing during Water Years 1994 and 1995.

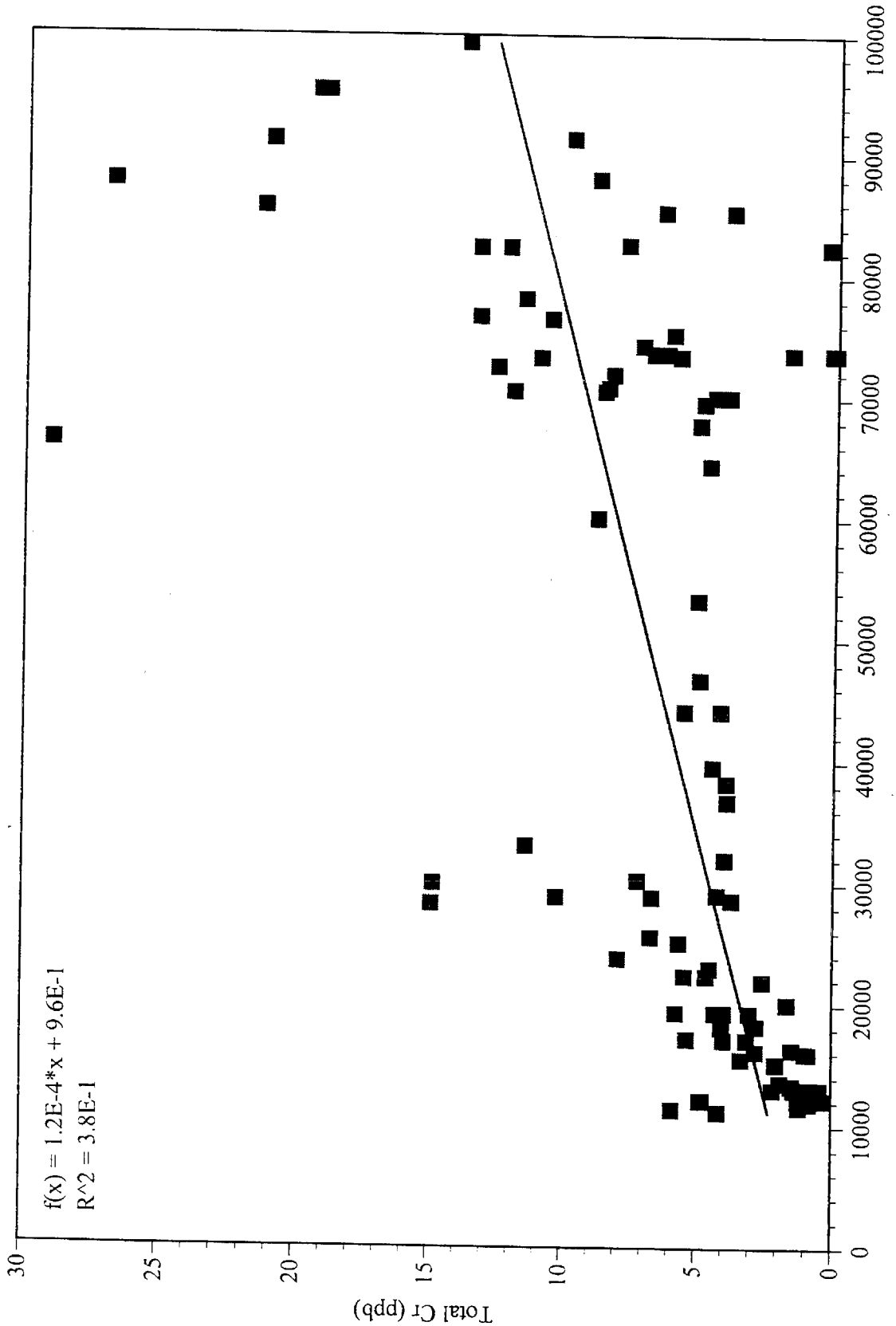

Figure 47. Regression of flow versus total recoverable chromium concentration in water samples collected from the Sacramento River at Greene's Landing during Water Years 1994 and 1995.

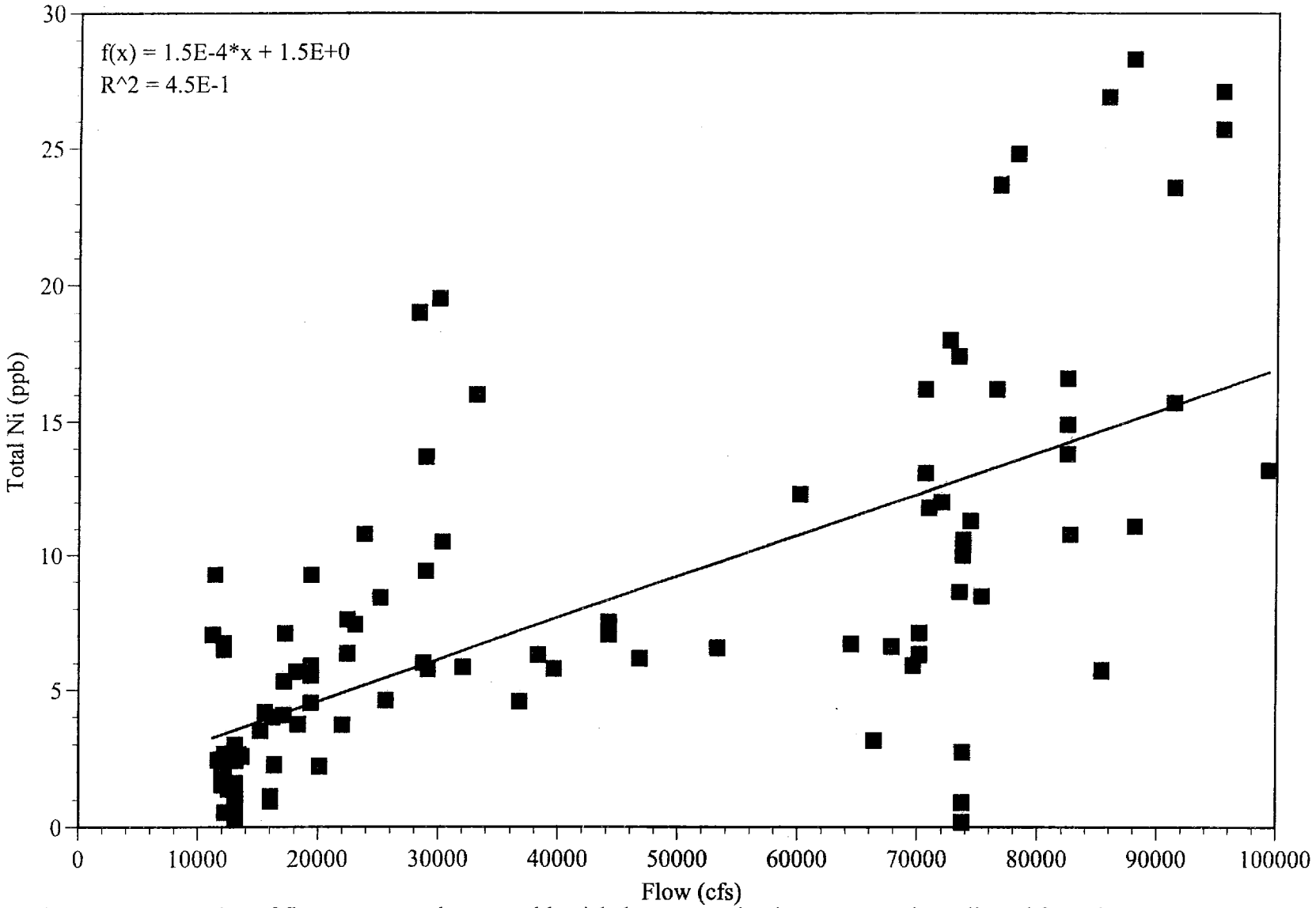

Figure 48. Regression of flow versus total recoverable nickel concentration in water samples collected from the Sacramento River at Greene's Landing during Water Years 1994 and 1995.

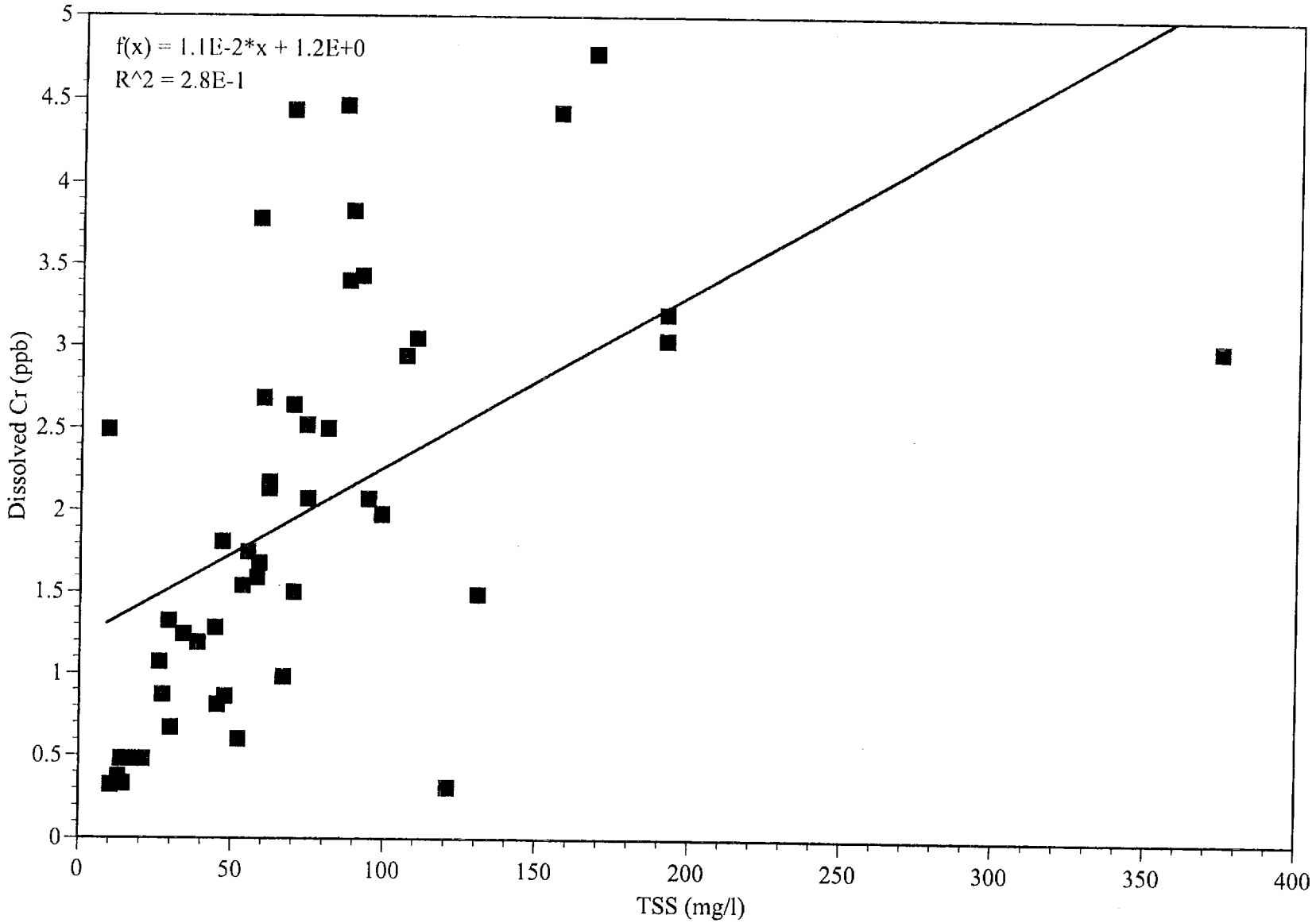

Figure 49. Regression of TSS versus dissolved (0.45 µm) chromium concentration in water samples collected from the Sacramento River at Greene's Landing during Water Years 1994 and 1995.

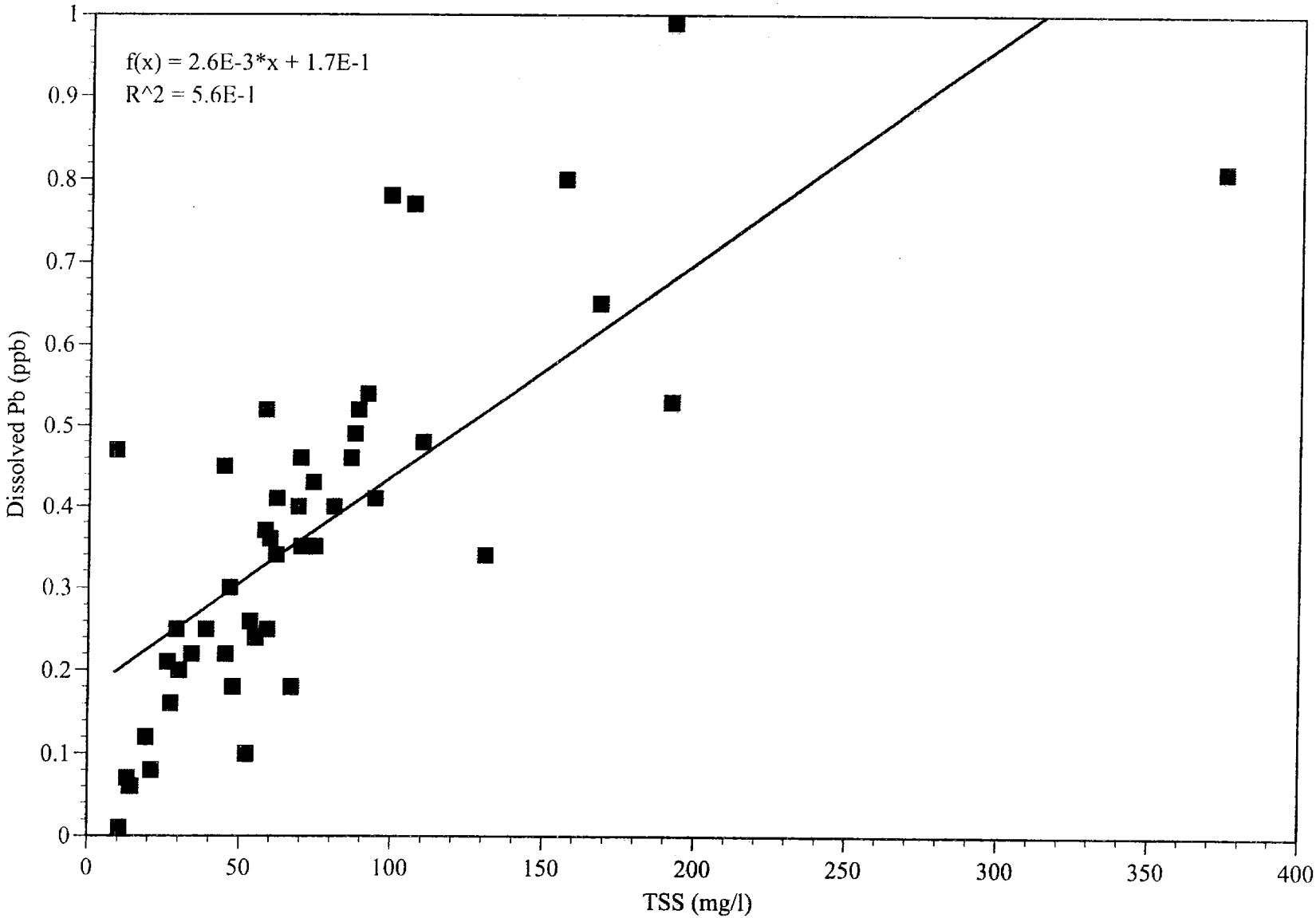

Figure 50. Regression of TSS versus dissolved (0.45 µm) lead concentration in water samples collected from the Sacramento River at Greene's Landing during Water Years 1994 and 1995.

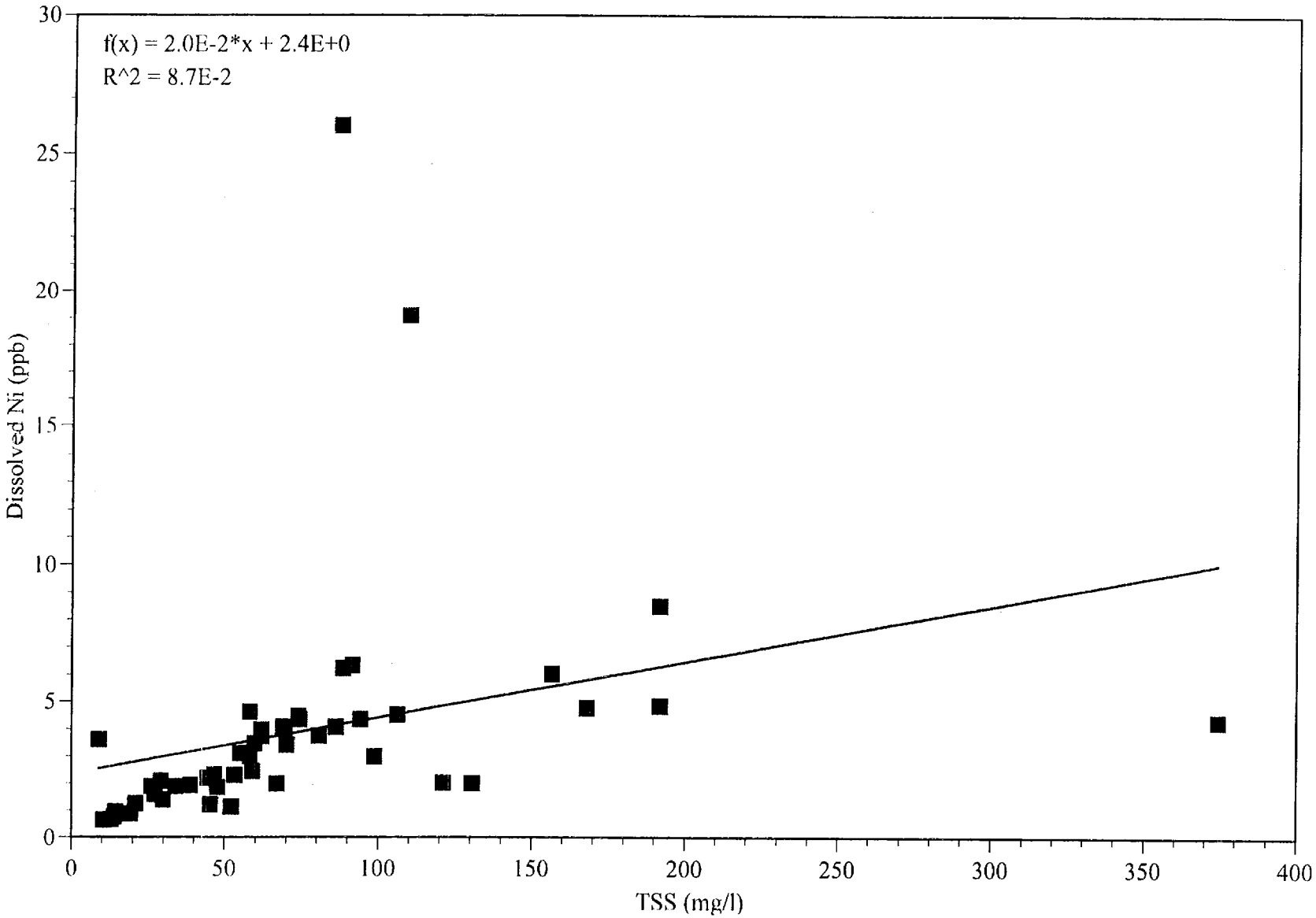

Figure 51. Regression of TSS versus dissolved (0.45 µm) nickel concentration in water samples collected from the Sacramento River at Greene's Landing during Water Years 1994 and 1995.

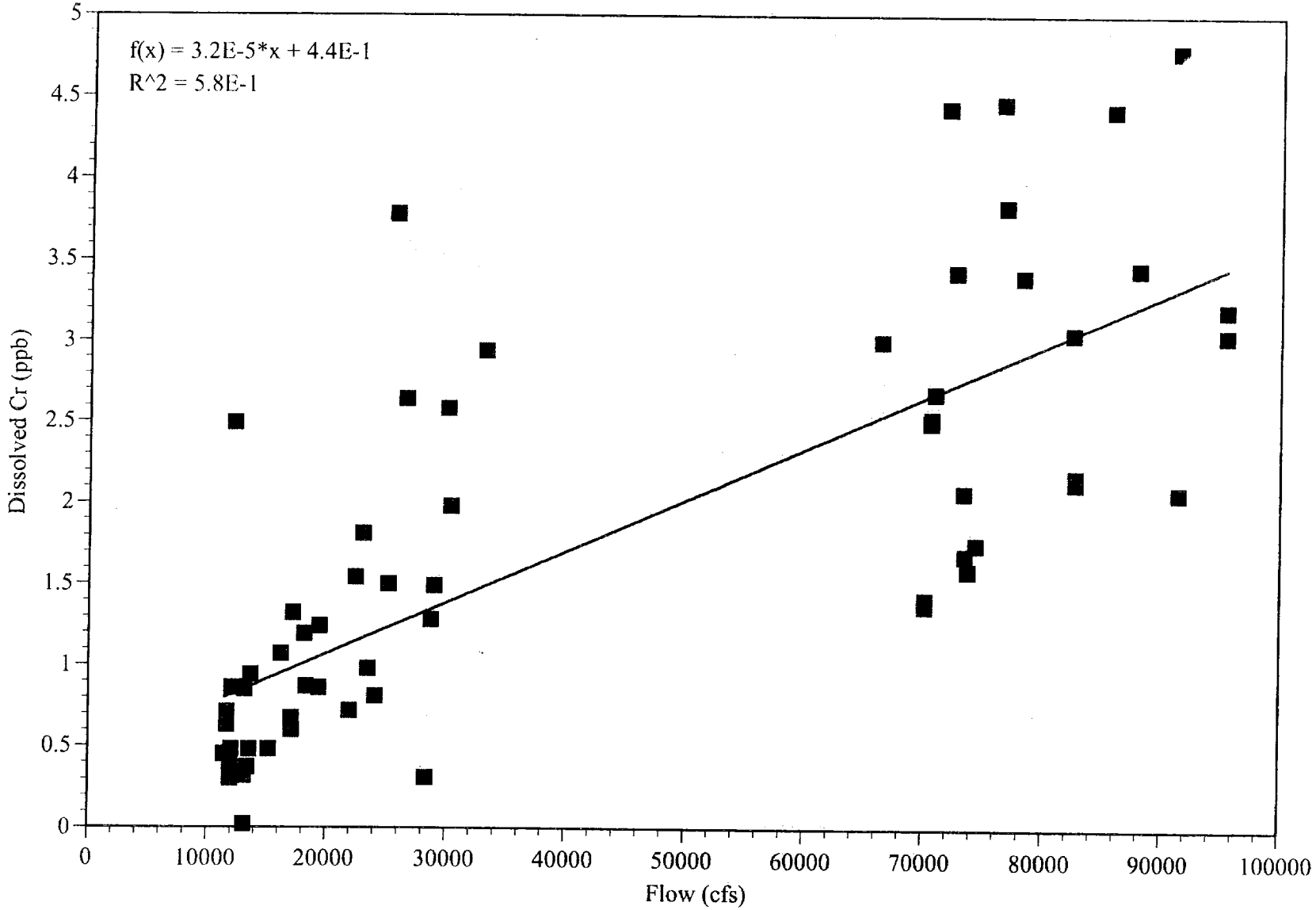

Figure 52. Regression of flow versus dissolved (0.45 µm) chromium concentration in water samples collected from the Sacramento River at Greene's Landing during Water Years 1994 and 1995.

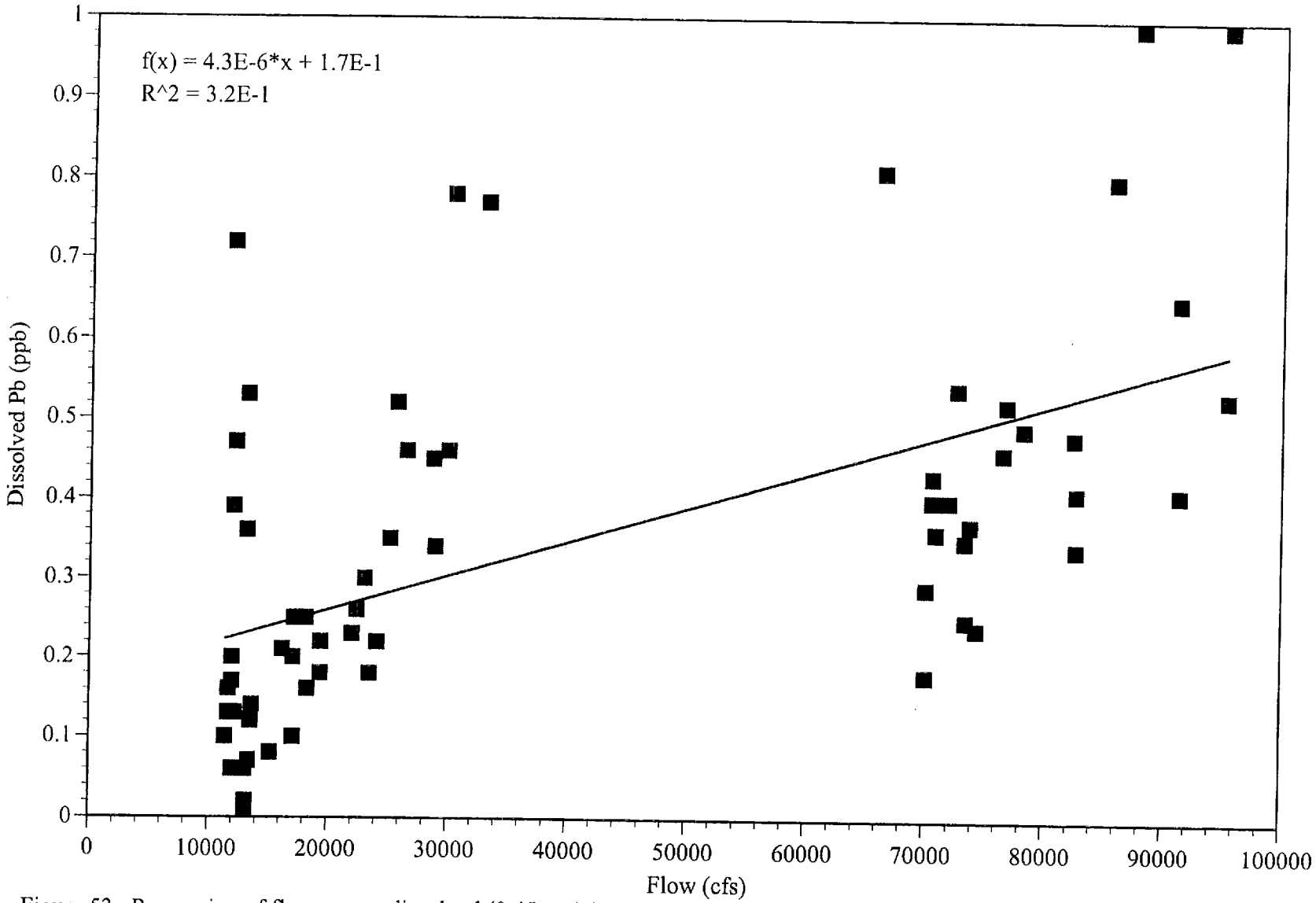

Figure 53. Regression of flow versus dissolved (0.45 µm) lead concentration in water samples collected from the Sacramento River at Greene's Landing during Water Years 1994 and 1995.

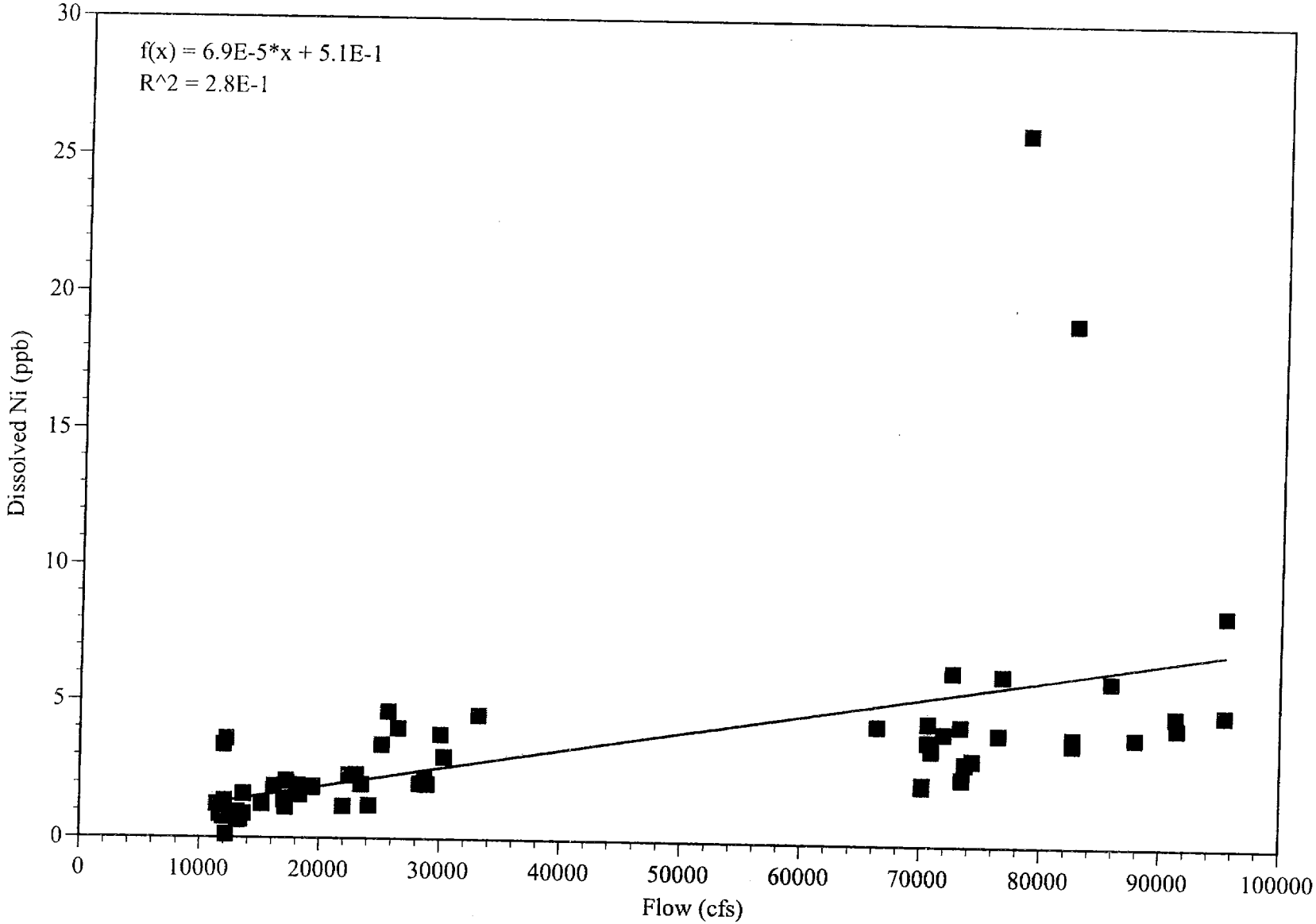

Figure 54. Regression of flow versus dissolved (0.45 µm) nickel concentration in water samples collected from the Sacramento River at Greene's Landing during Water Years 1994 and 1995.

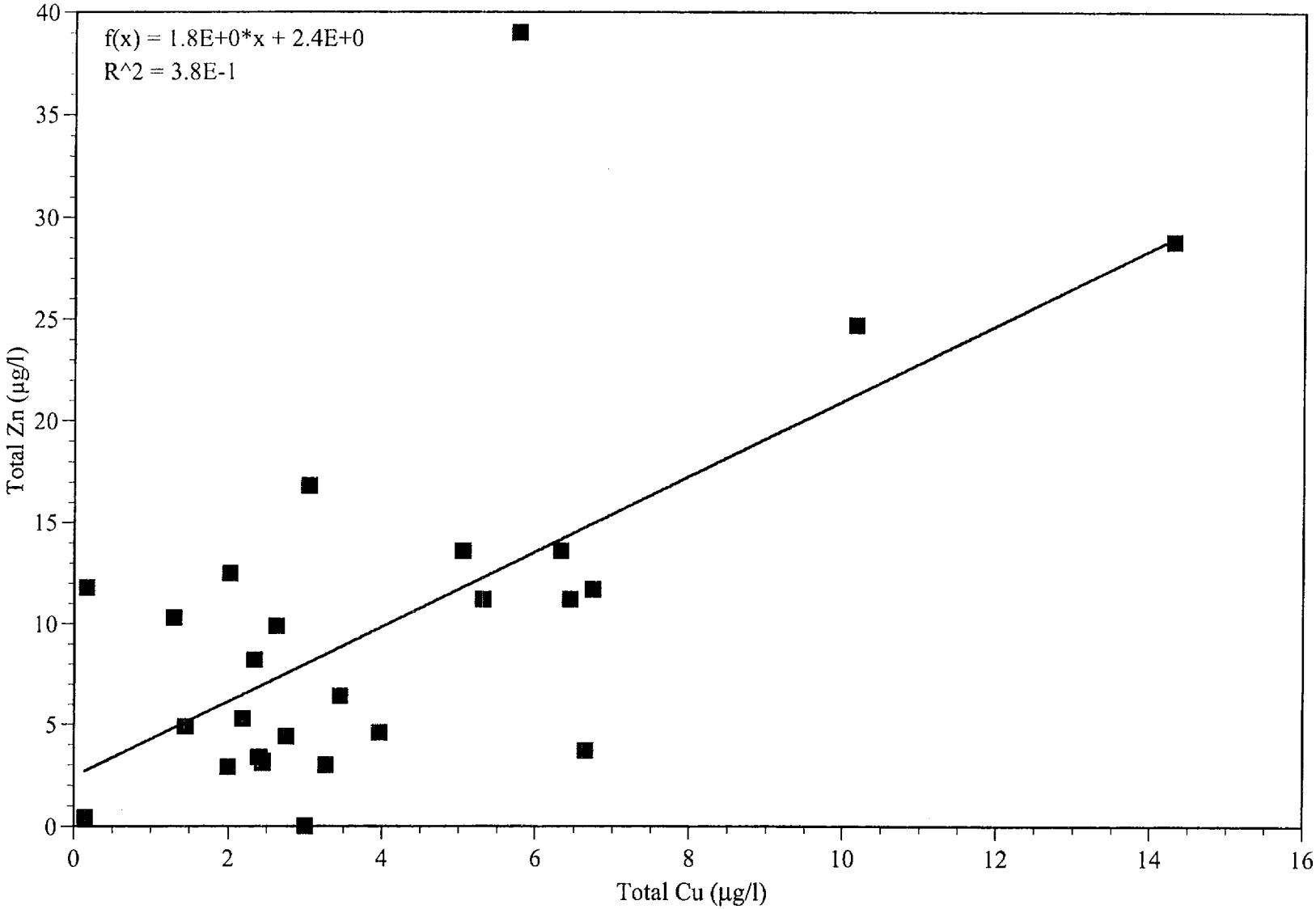

Figure 55. Regression of total recoverable copper and total recoverable zinc concentrations in water samples collected from the Sacramento River at Greene's Landing during Water Year 1994.

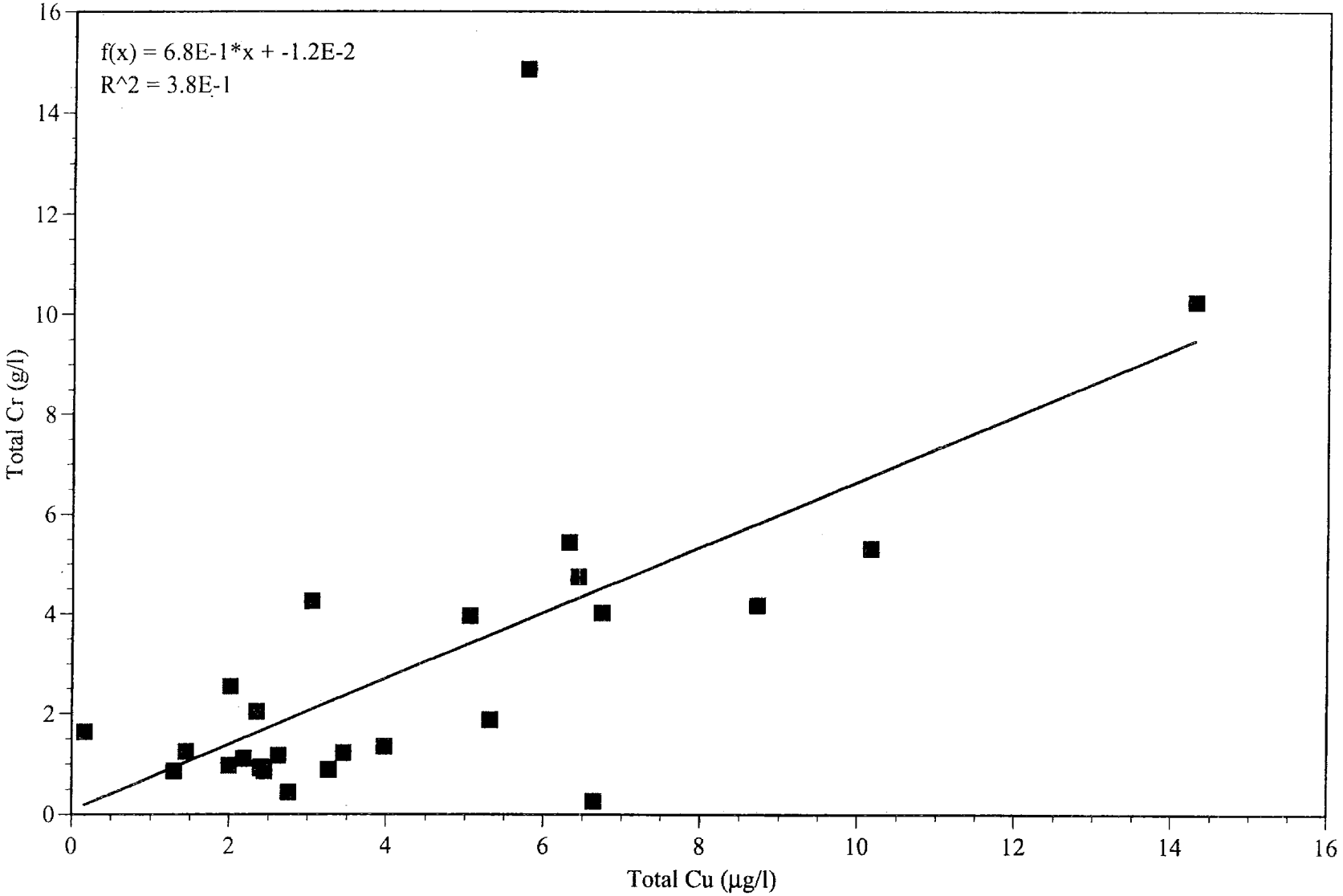

Figure 56. Regression of total recoverable copper and total recoverable chromium concentrations in water samples collected from the Sacramento River at Greene's Landing during Water Year 1994.

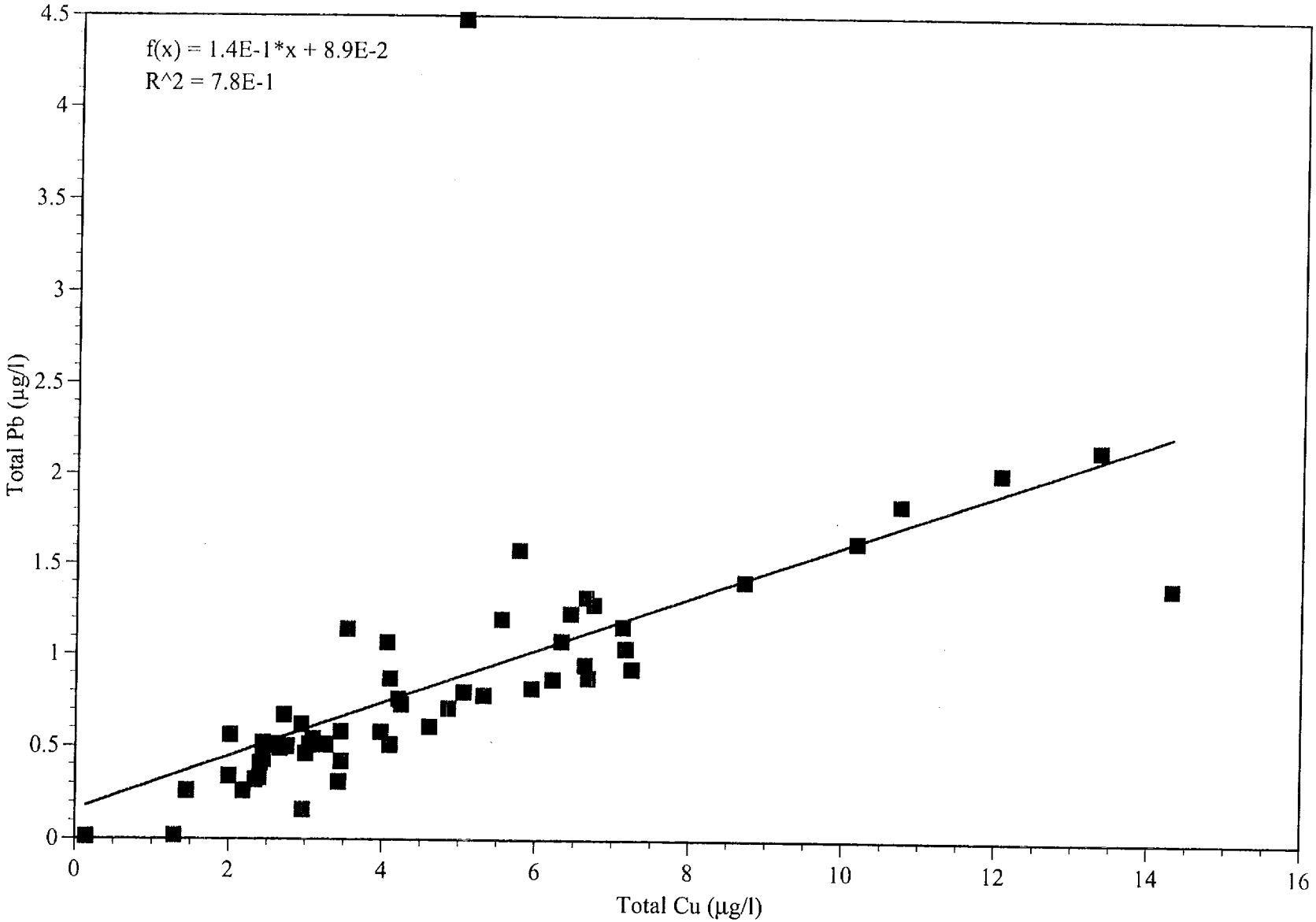

Figure 57. Regression of total recoverable copper and total recoverable lead concentrations in water samples collected from the Sacramento River at Greene's Landing during Water Year 1994.

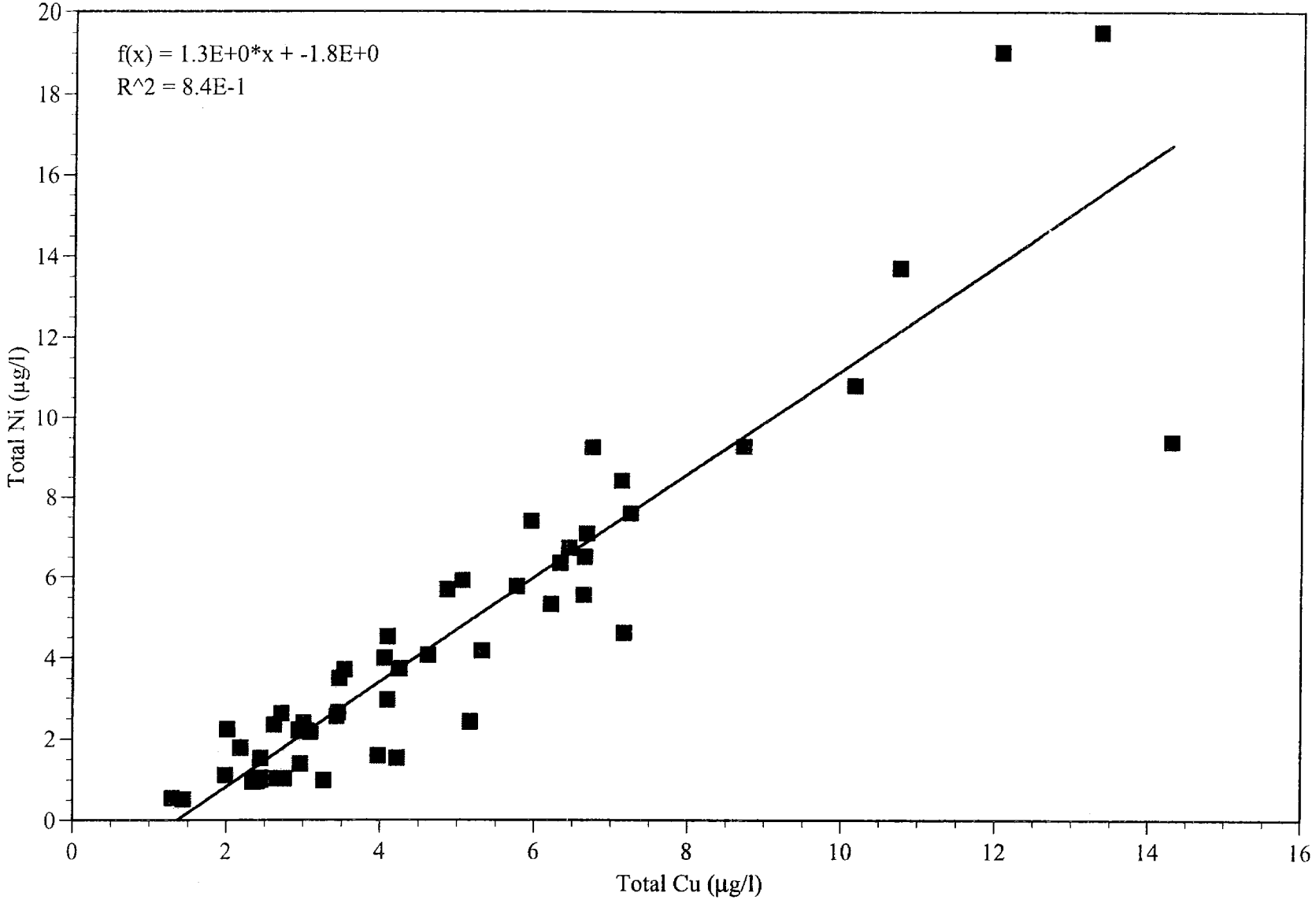

Figure 58. Regression of total recoverable copper and total recoverable nickel concentrations in water samples collected from the Sacramento River at Greene's Landing during Water Year 1994.

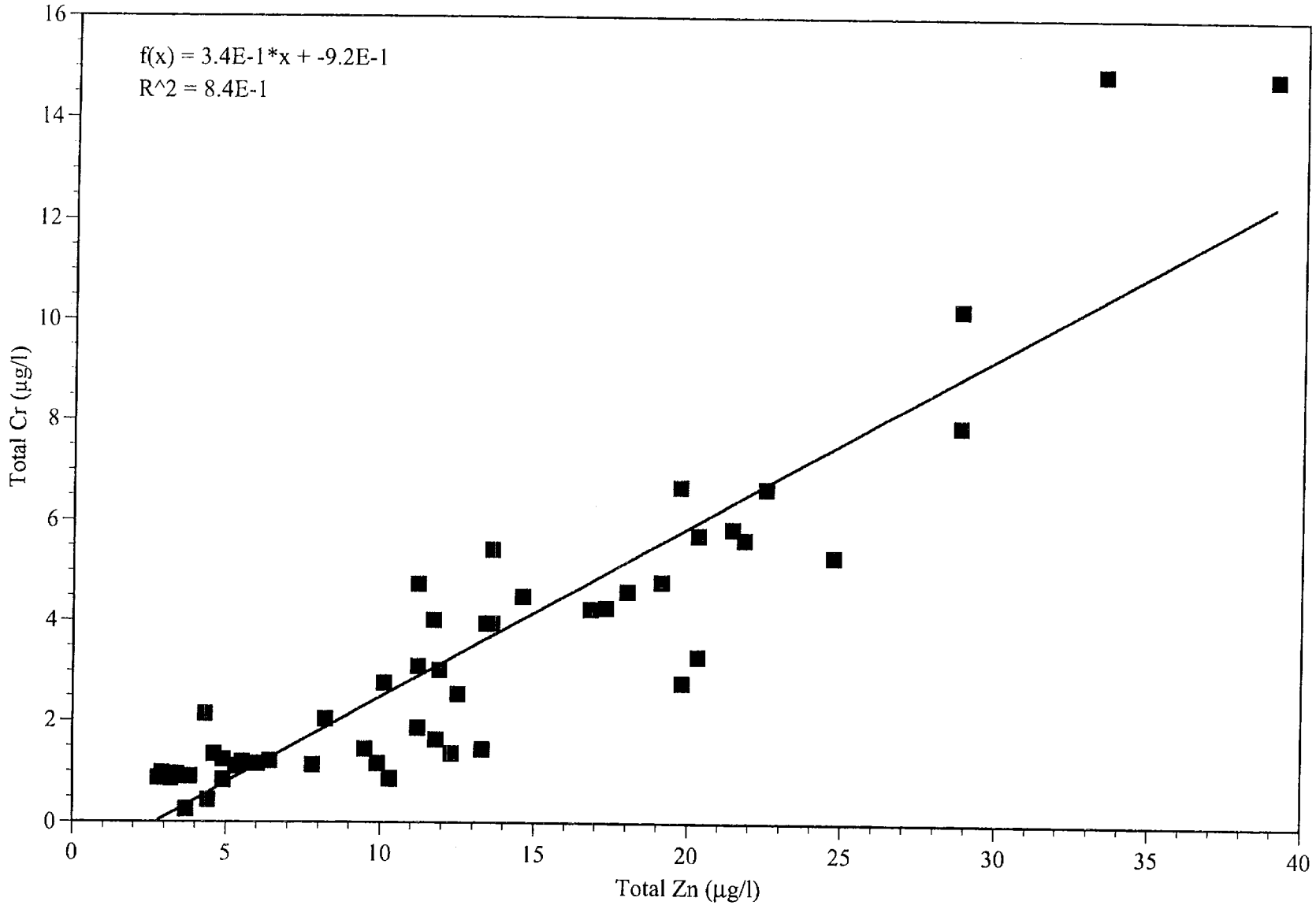

Figure 59. Regression of total recoverable zinc and total recoverable chromium concentrations in water samples collected from the Sacramento River at Greene's Landing during Water Year 1994.

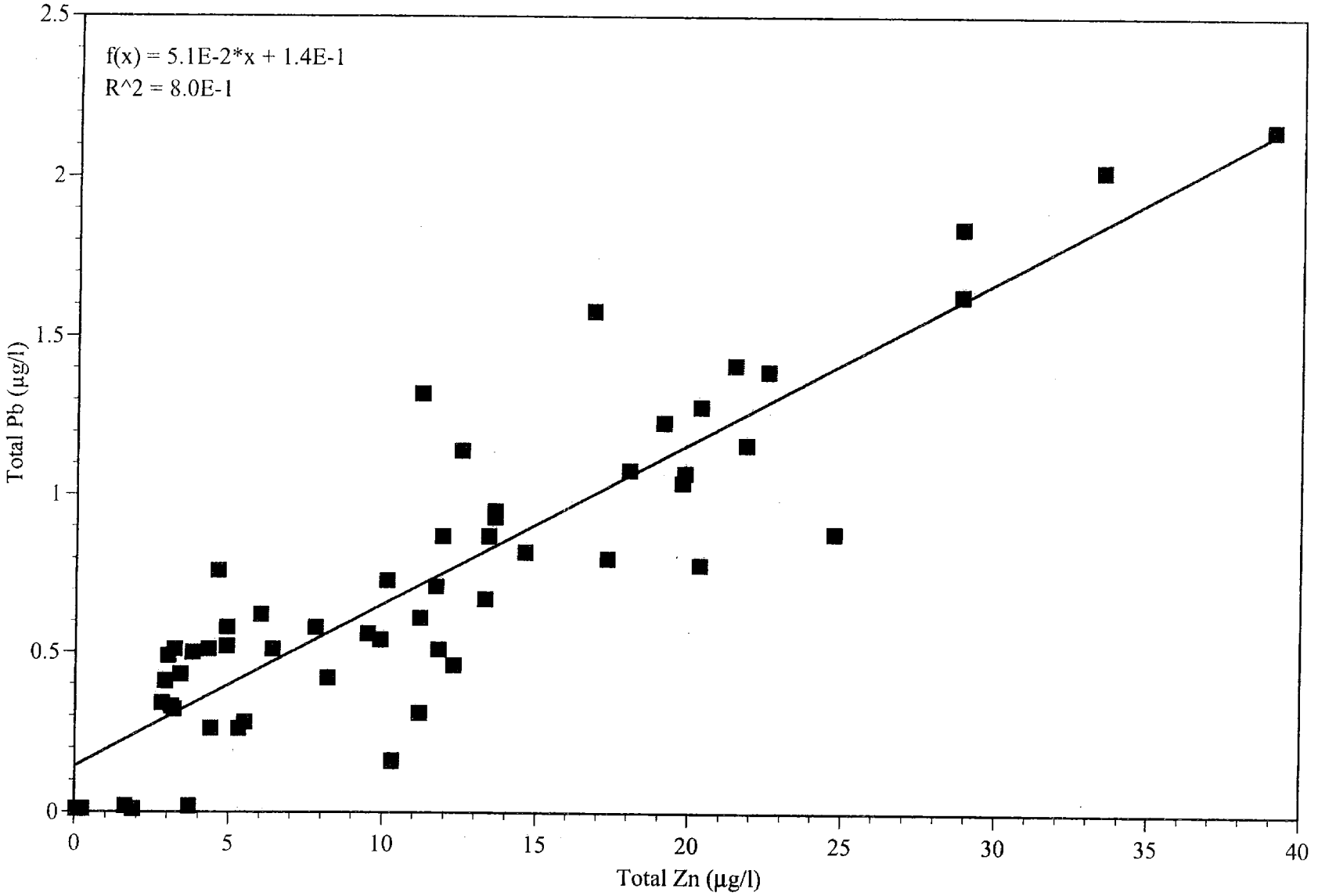

Figure 60. Regression of total recoverable zinc and total recoverable lead concentrations in water samples collected from the Sacramento River at Greene's Landing during Water Year 1994.

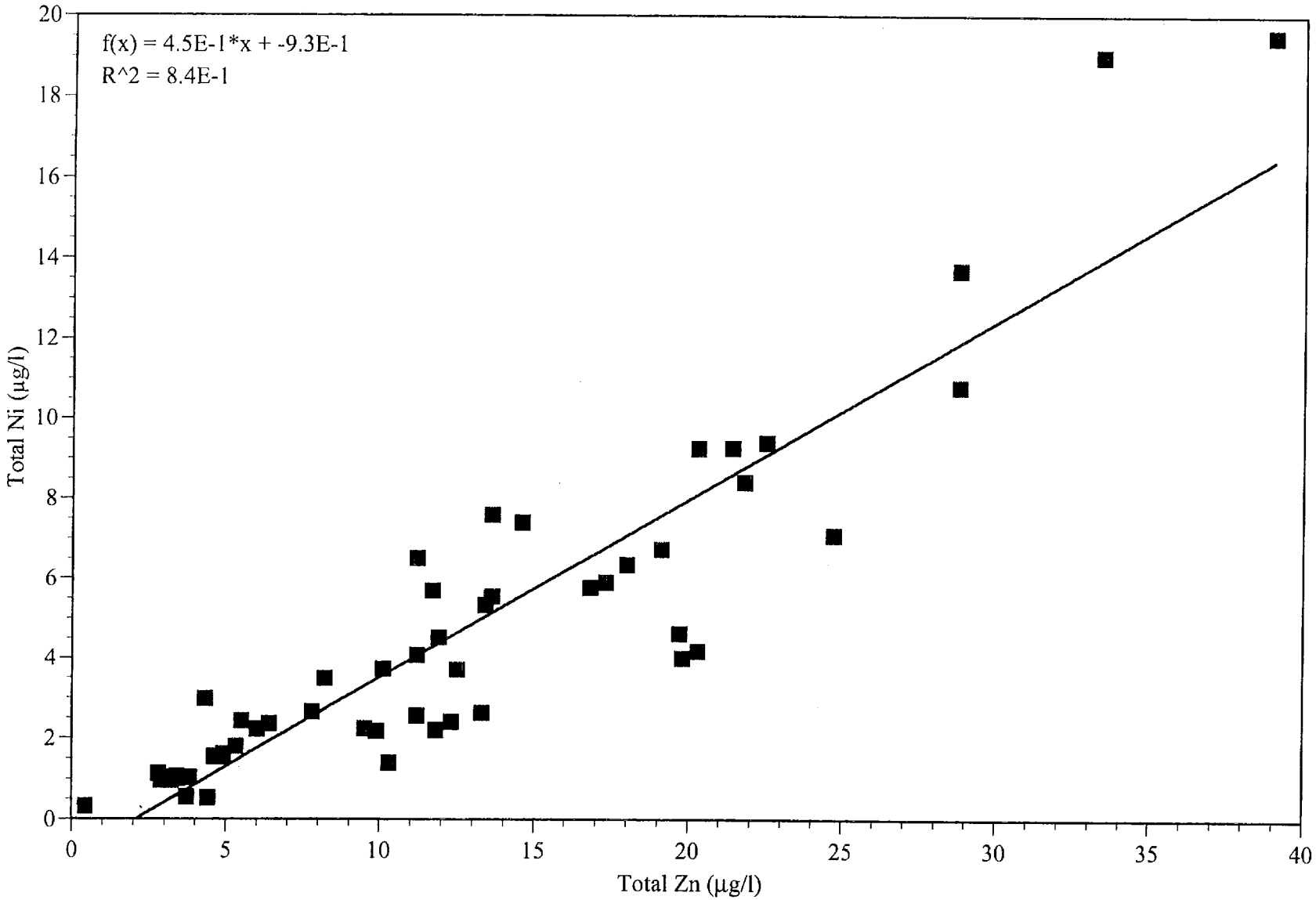

Figure 61. Regression of total recoverable zinc and total recoverable nickel concentrations in water samples collected from the Sacramento River at Greene's Landing during Water Year 1994.

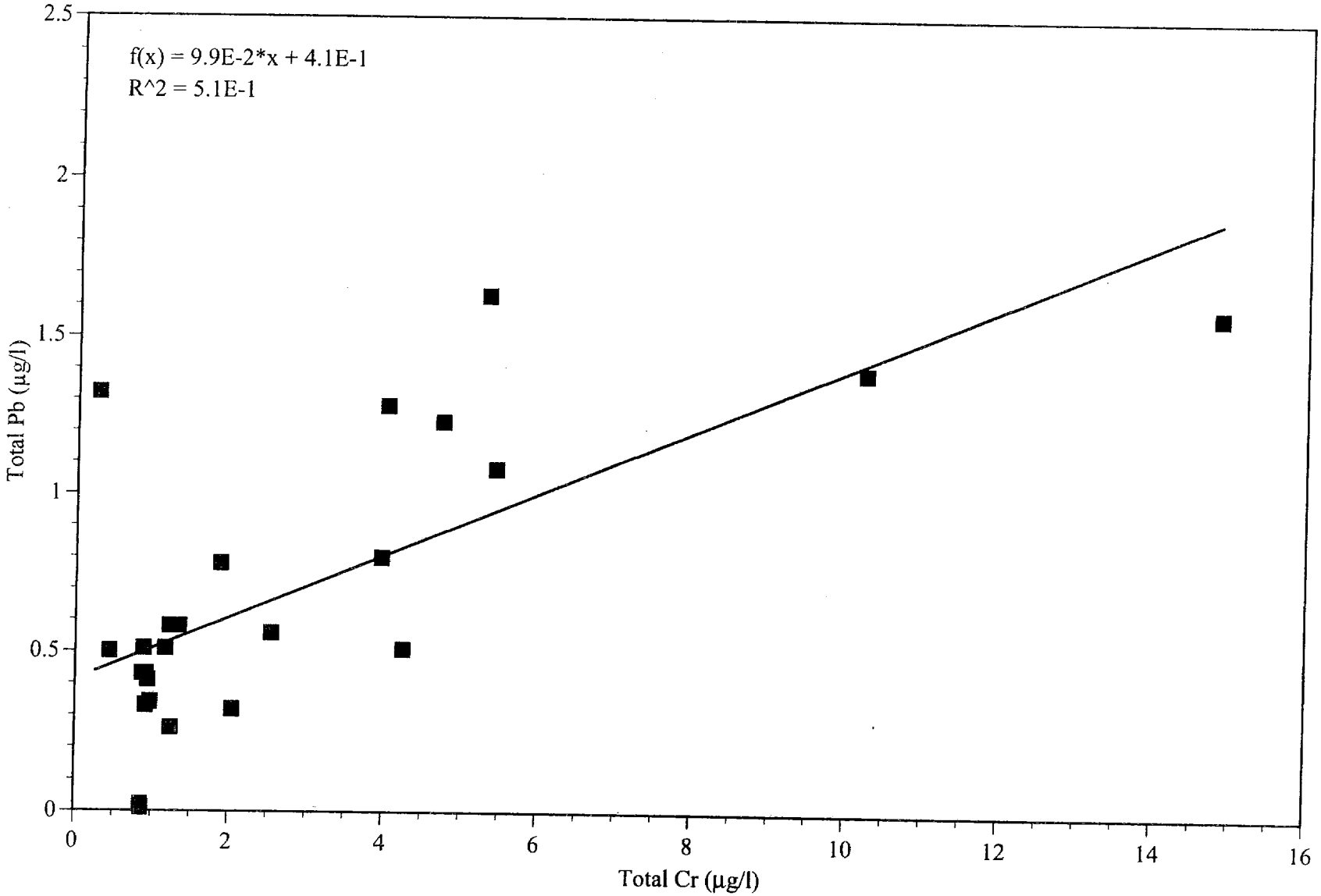

Figure 62. Regression of total recoverable chromium and total recoverable lead concentrations in water samples collected from the Sacramento River at Greene's Landing during Water Year 1994.

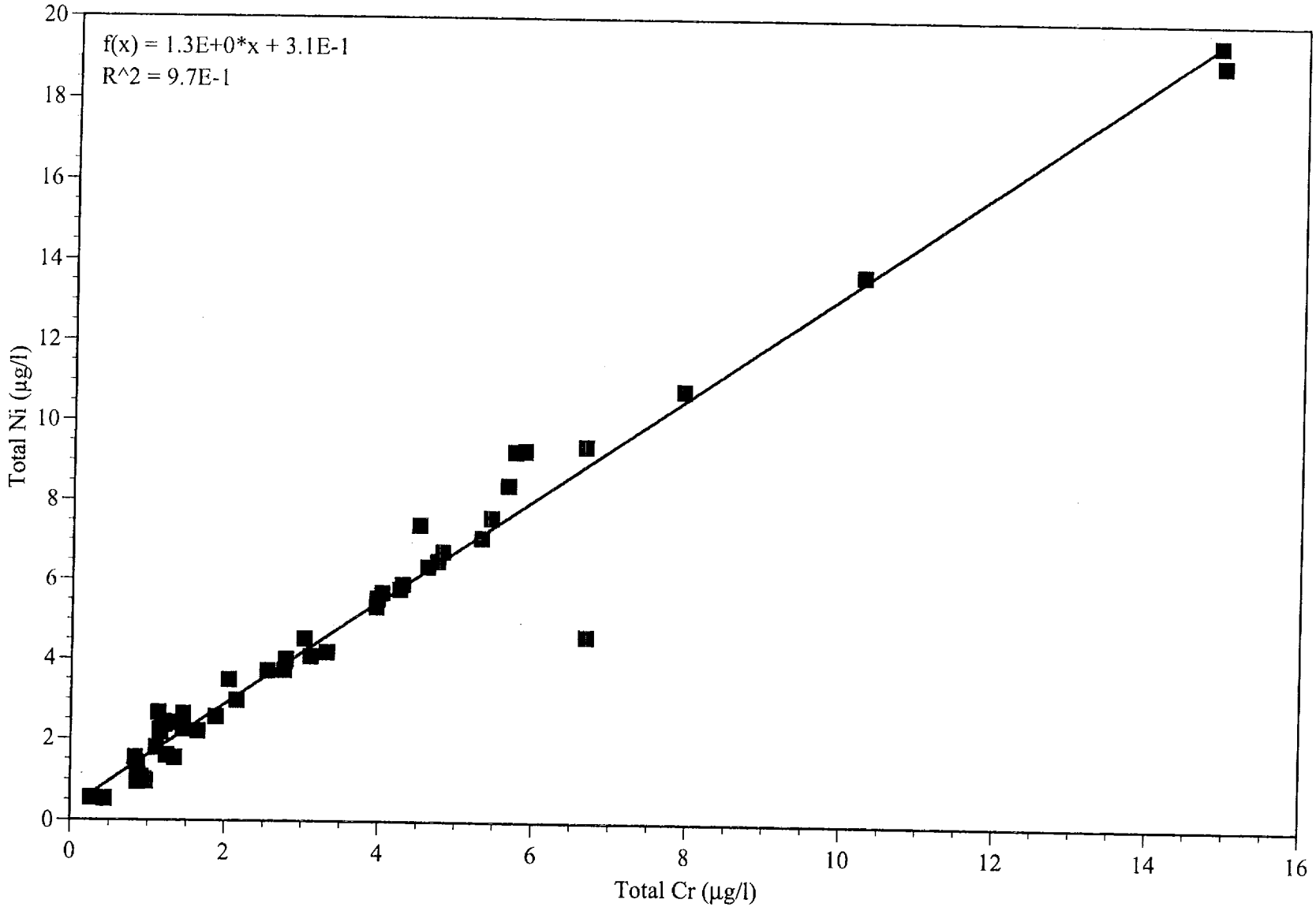

Figure 63. Regression of total recoverable chromium and total recoverable nickel concentrations in water samples collected from the Sacramento River at Greene's Landing during Water Year 1994.

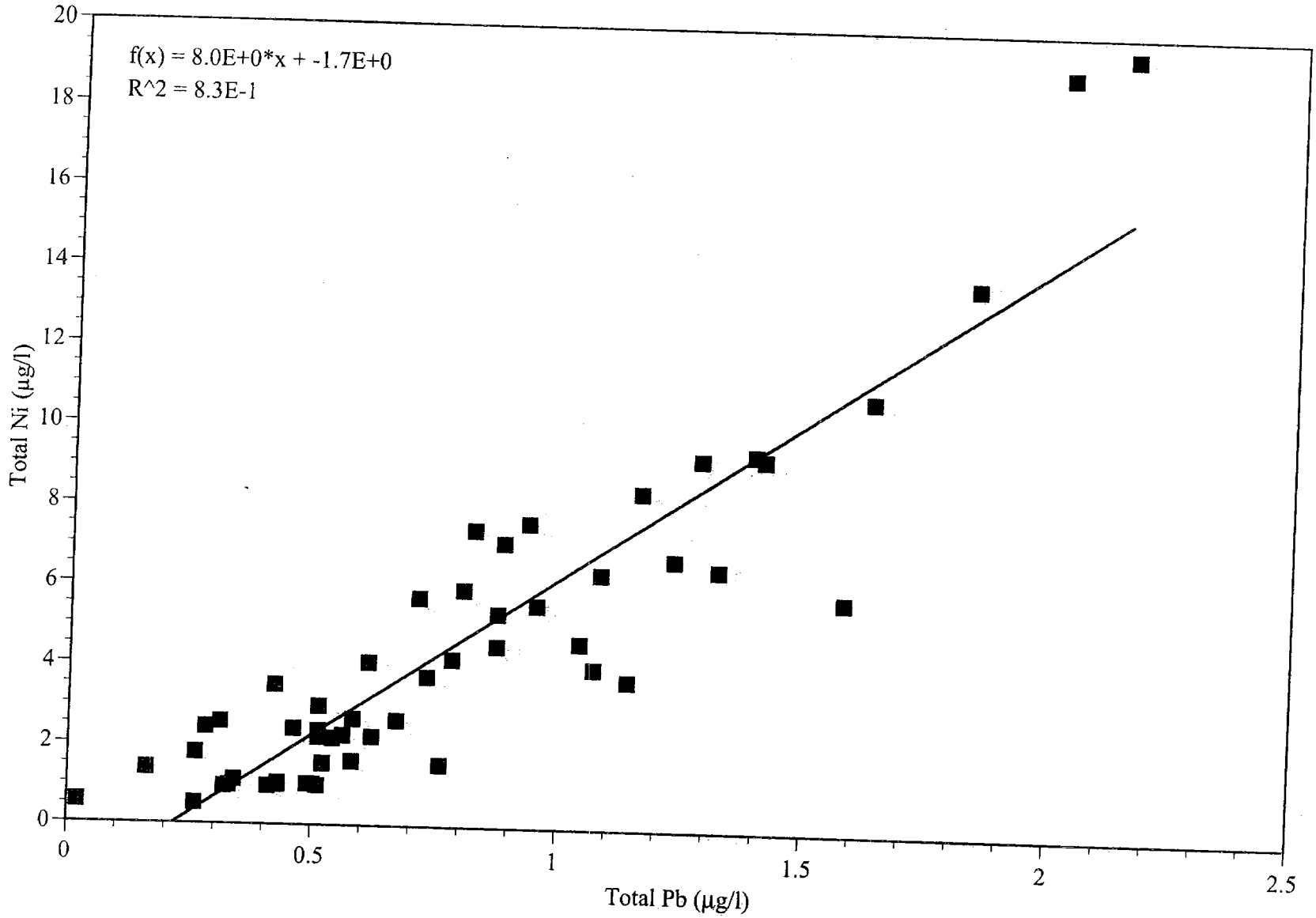

Figure 64. Regression of total recoverable lead and total recoverable nickel concentrations in water samples collected from the Sacramento River at Greene's Landing during Water Year 1994.

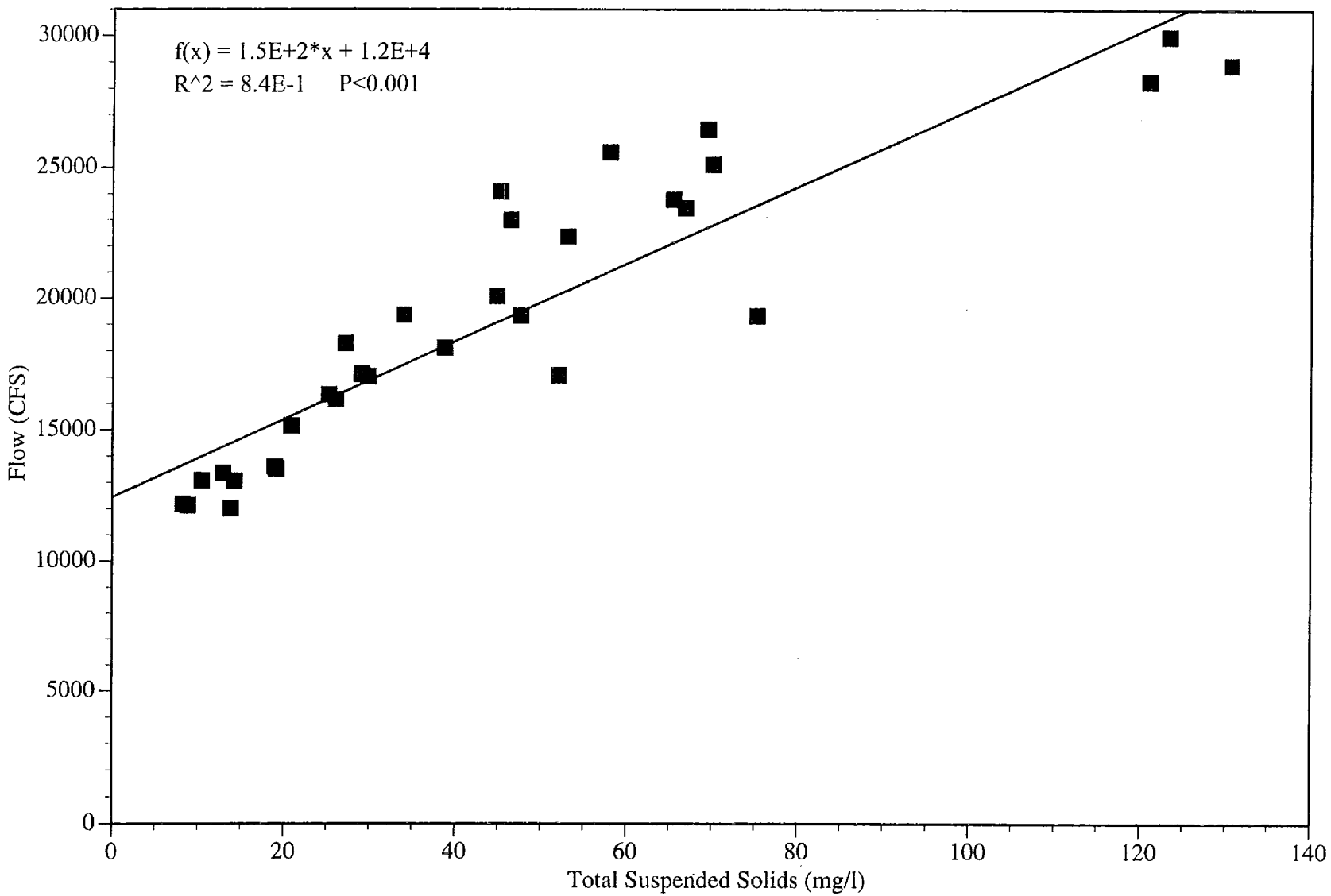

Figure 65. Regression of flow versus total suspended solids in water samples collected from the Sacramento River at Greene's Landing during Water Year 1994.

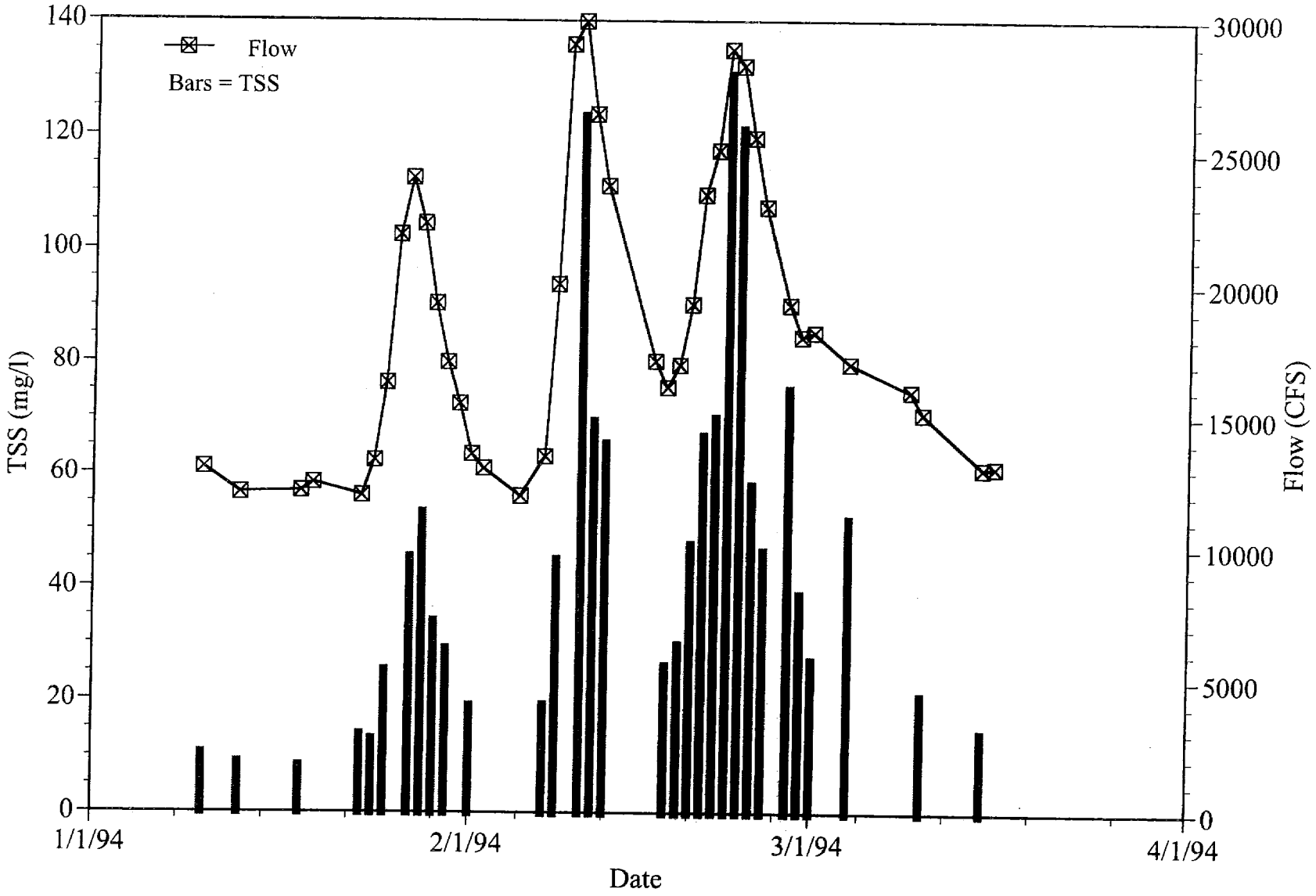

Figure 66. Flow and total suspended solids (TSS) pattern in the Sacramento River at Greene's Landing during low flow conditions from January through March of 1994.

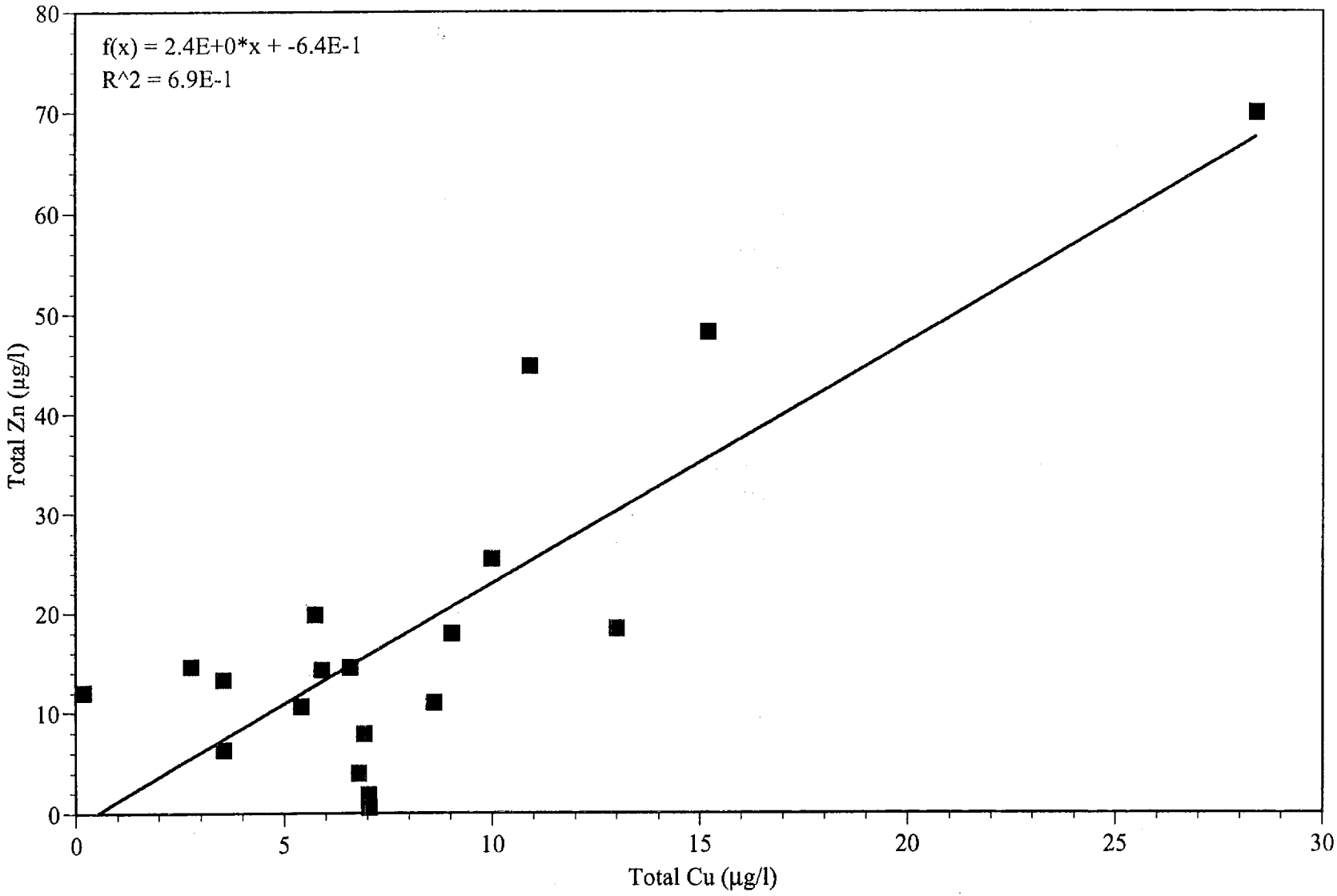

Figure 67. Regression of total recoverable copper and total recoverable zinc concentrations in water samples collected from the Sacramento River at Greene's Landing during Water Year 1995.

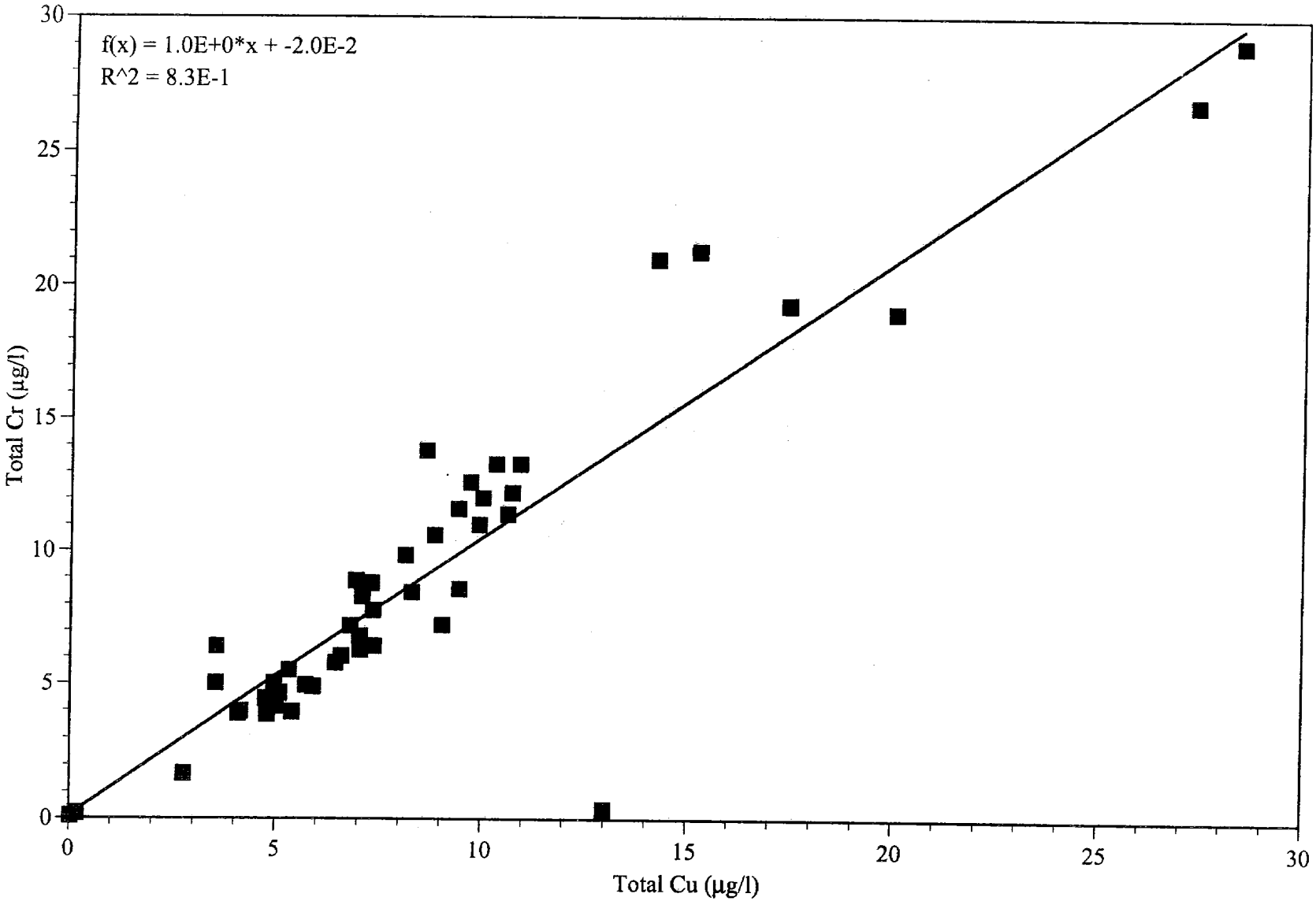

Figure 68. Regression of total recoverable copper and total recoverable chromium concentrations in water samples collected from the Sacramento River at Greene's Landing during Water Year 1995.

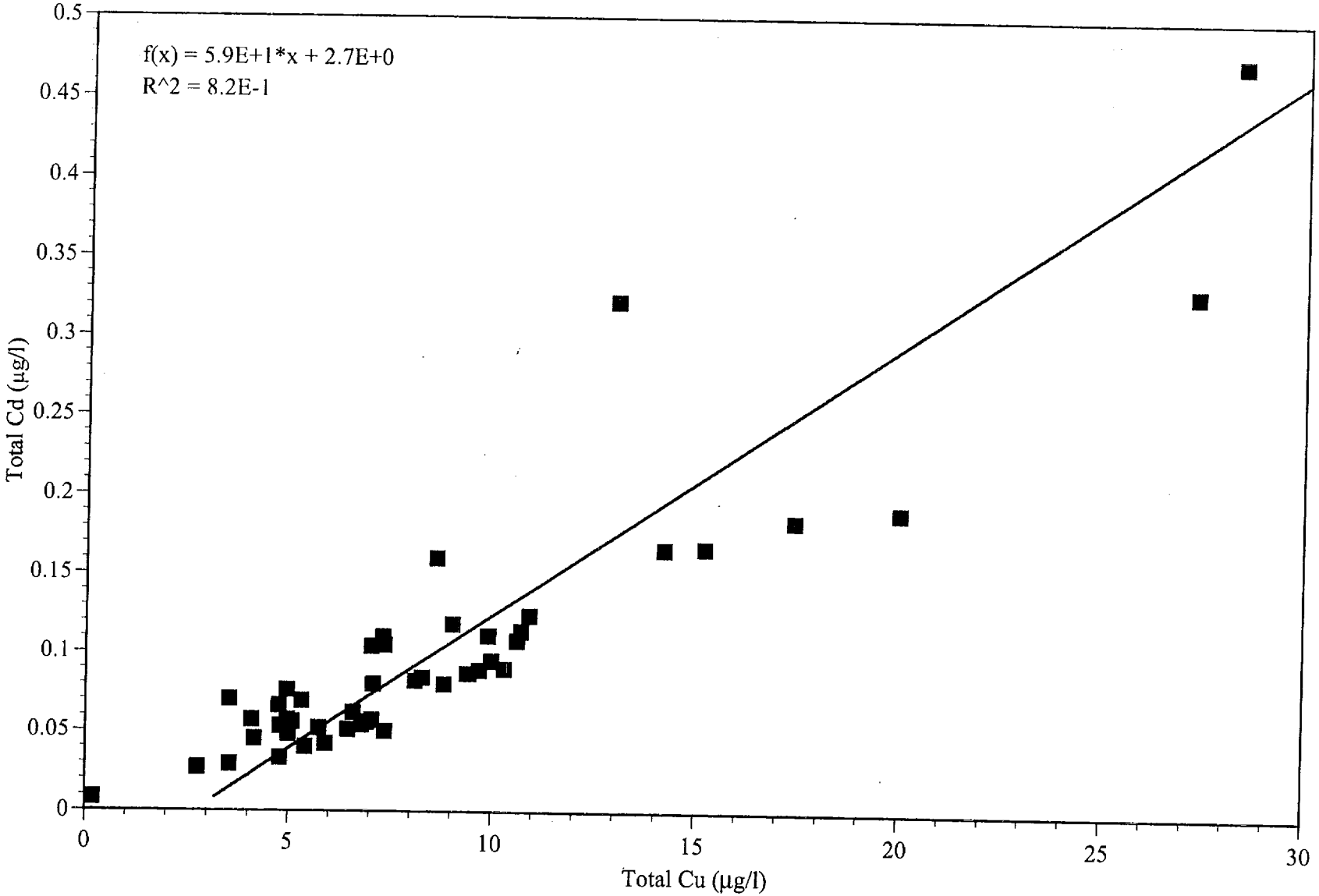

Figure 69. Regression of total recoverable copper and total recoverable cadmium concentrations in water samples collected from the Sacramento River at Greene's Landing during Water Year 1995.

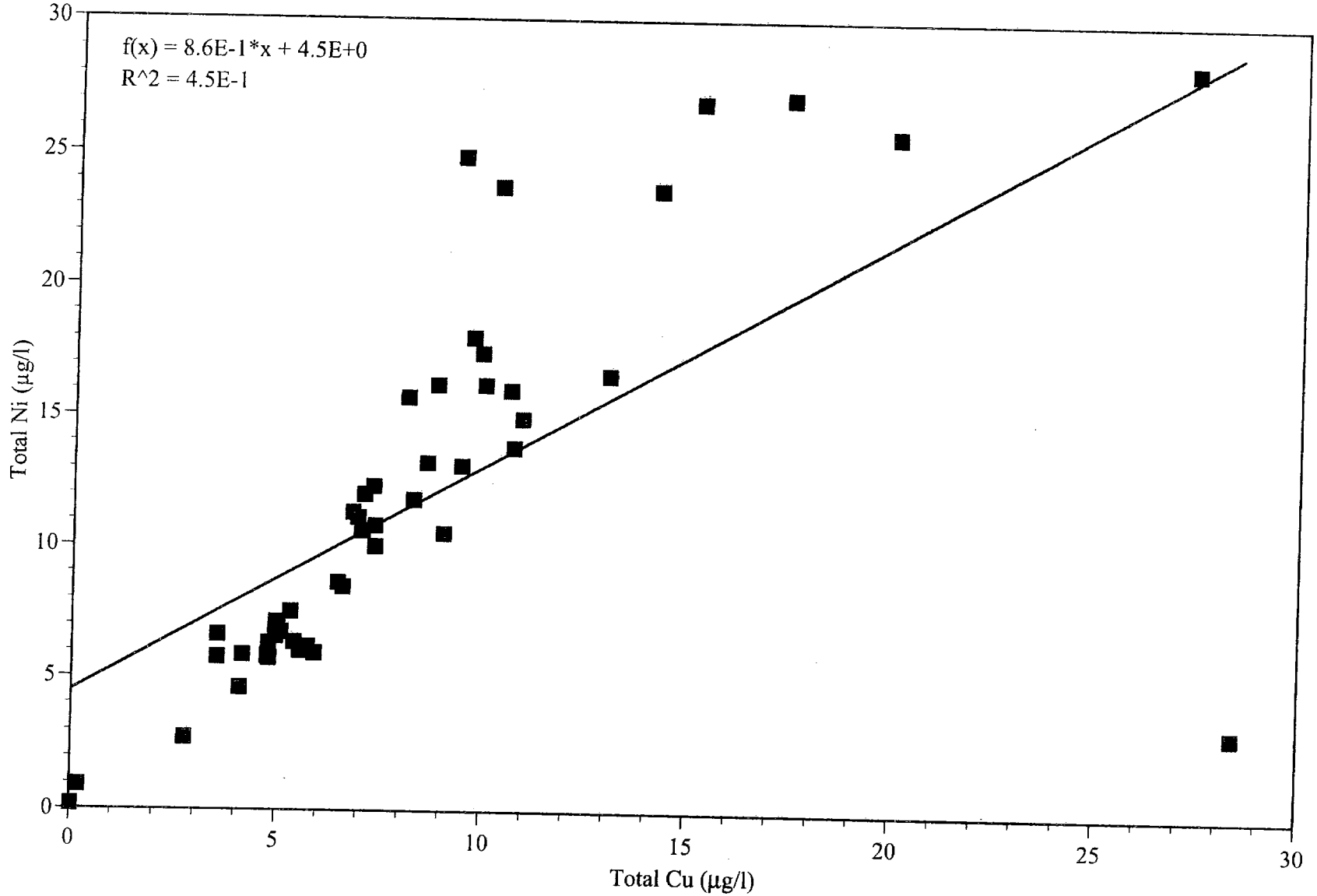

Figure 70. Regression of total recoverable copper and total recoverable nickel concentrations in water samples collected from the Sacramento River at Greene's Landing during Water Year 1995.

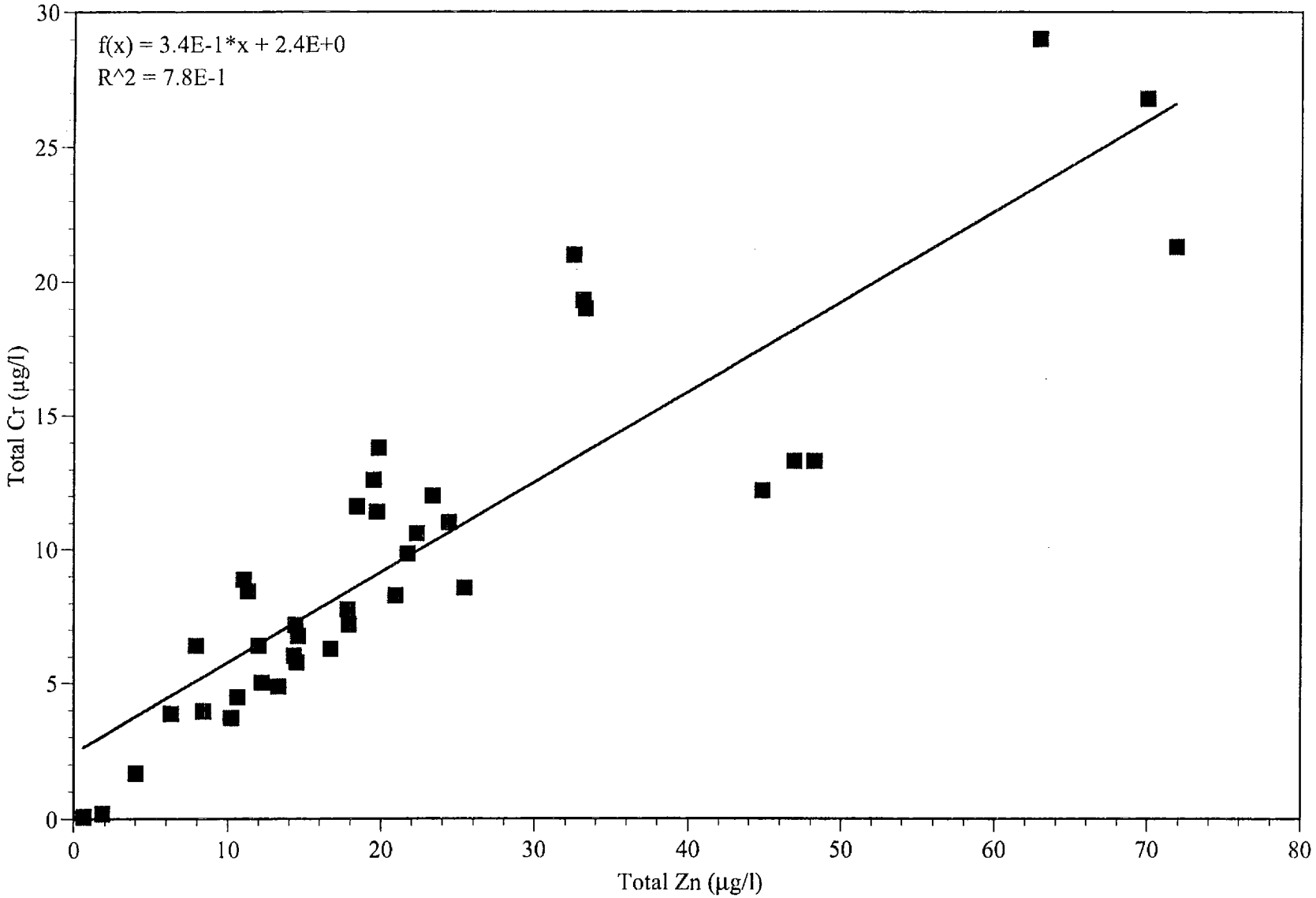

Figure 71. Regression of total recoverable zinc and total recoverable chromium concentrations in water samples collected from the Sacramento River at Greene's Landing during Water Year 1995.

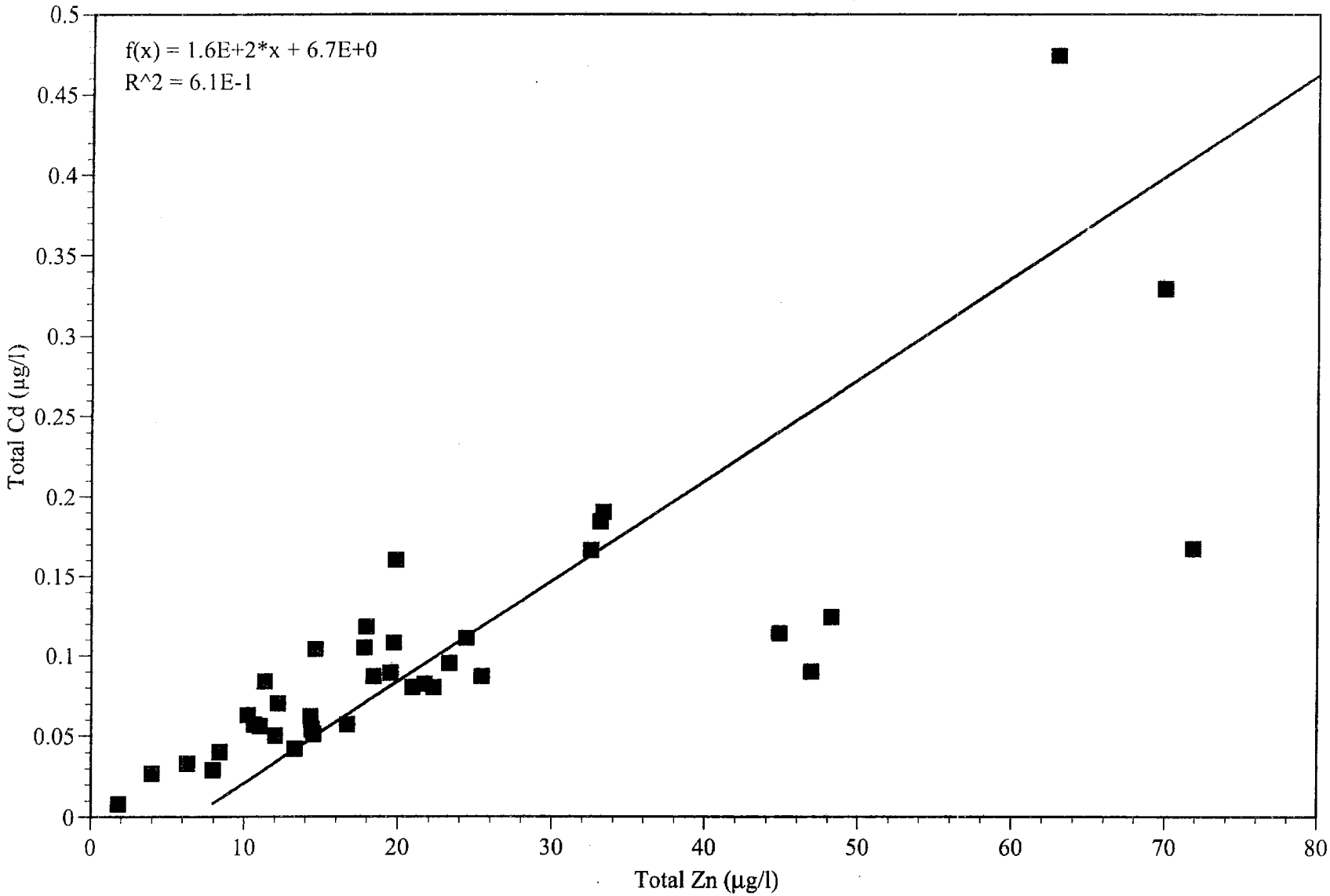

Figure 72. Regression of total recoverable zinc and total recoverable cadmium concentrations in water samples collected from the Sacramento River at Greene's Landing during Water Year 1995.

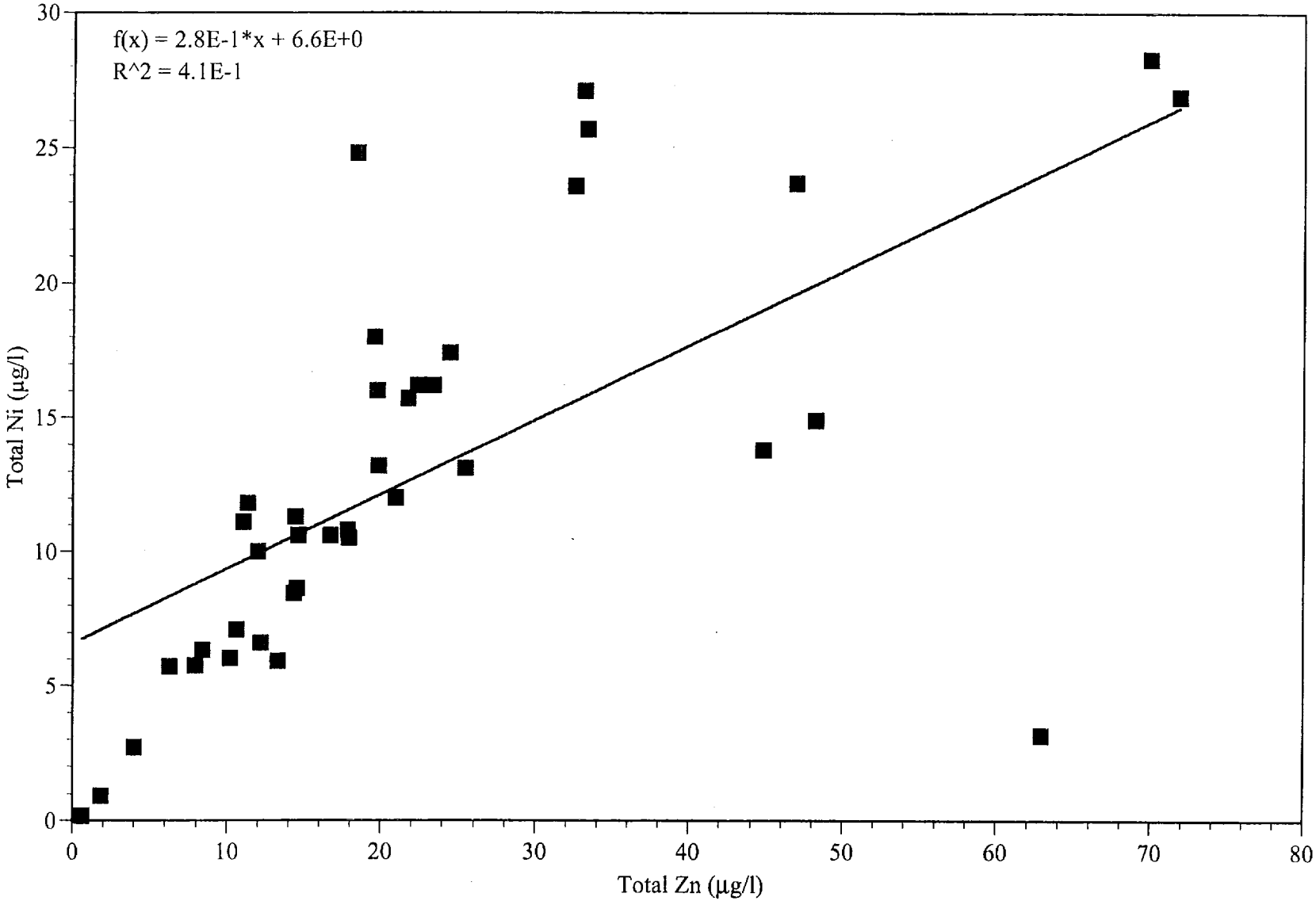

Figure 73. Regression of total recoverable zinc and total recoverable nickel concentrations in water samples collected from the Sacramento River at Greene's Landing during Water Year 1995.

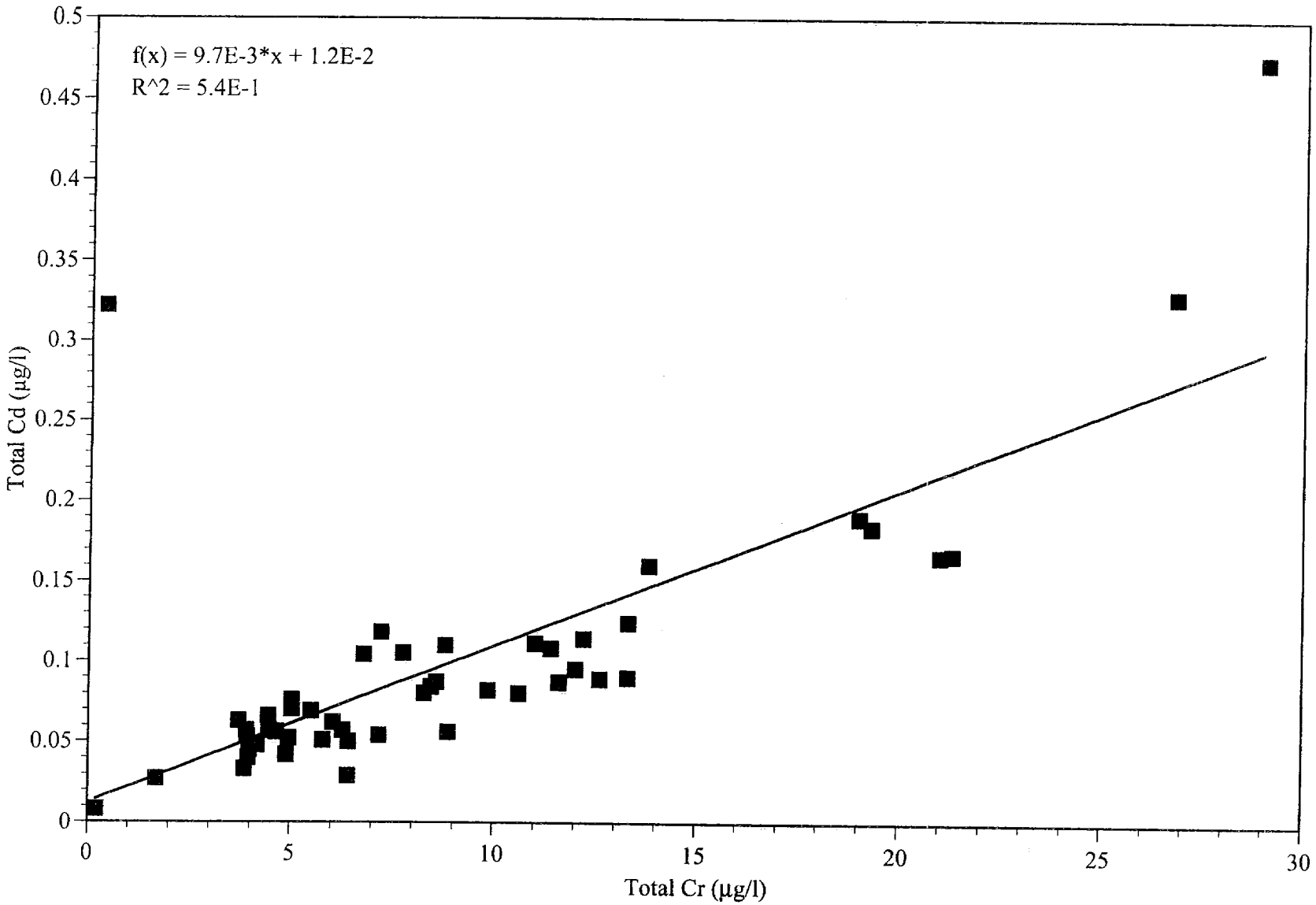

Figure 74. Regression of total recoverable chromium and total recoverable cadmium concentrations in water samples collected from the Sacramento River at Greene's Landing during Water Year 1995.

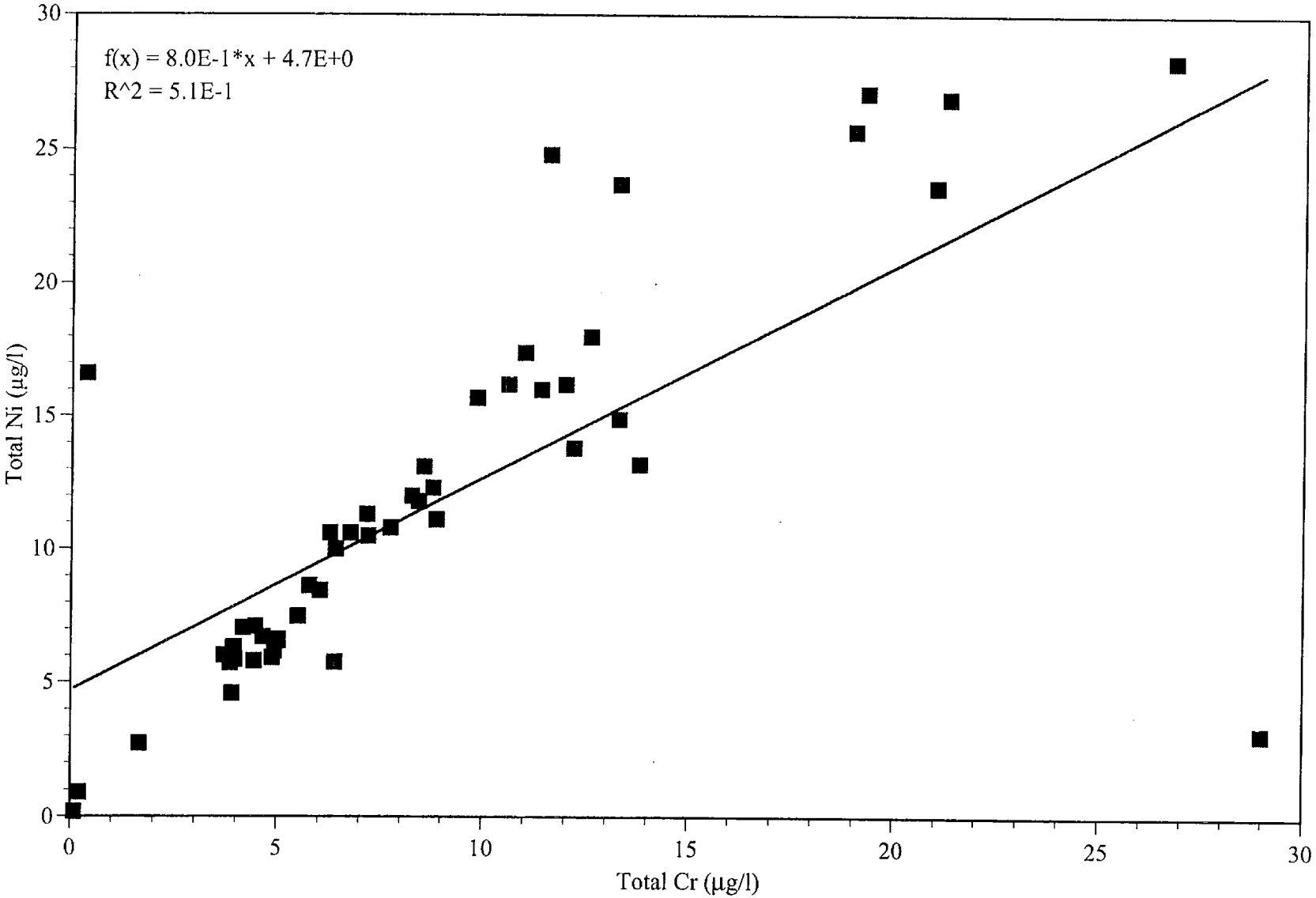

Figure 75. Regression of total recoverable chromium and total recoverable nickel concentrations in water samples collected from the Sacramento River at Greene's Landing during Water Year 1995.

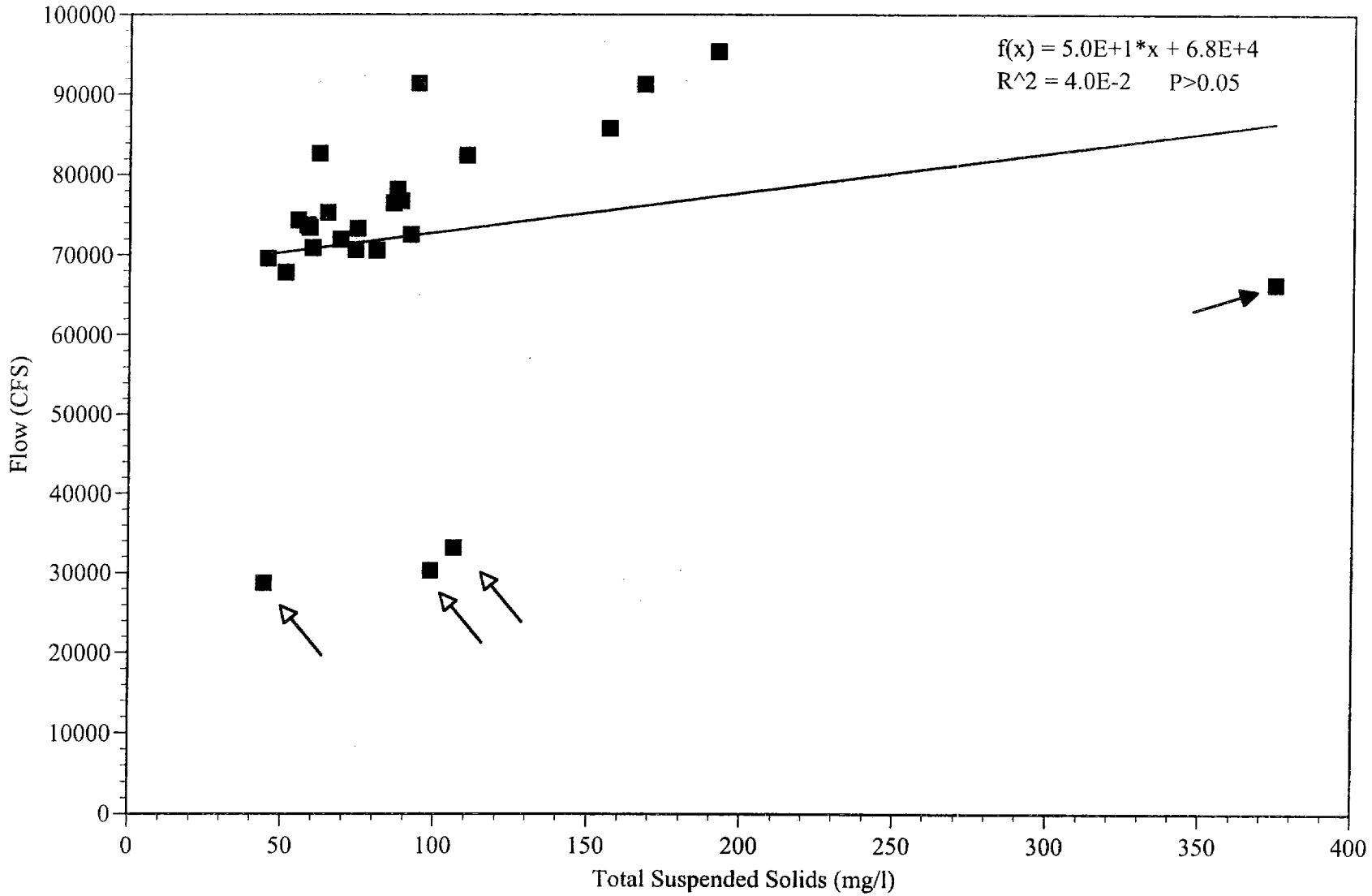

Figure 76. Regression of flow versus total suspended solids in water samples collected from the Sacramento River at Greene's Landing during Water Year 1995. Solid arrow represents a first flush event with very high suspended solids which was preceeded by a low flow period (open arrows).

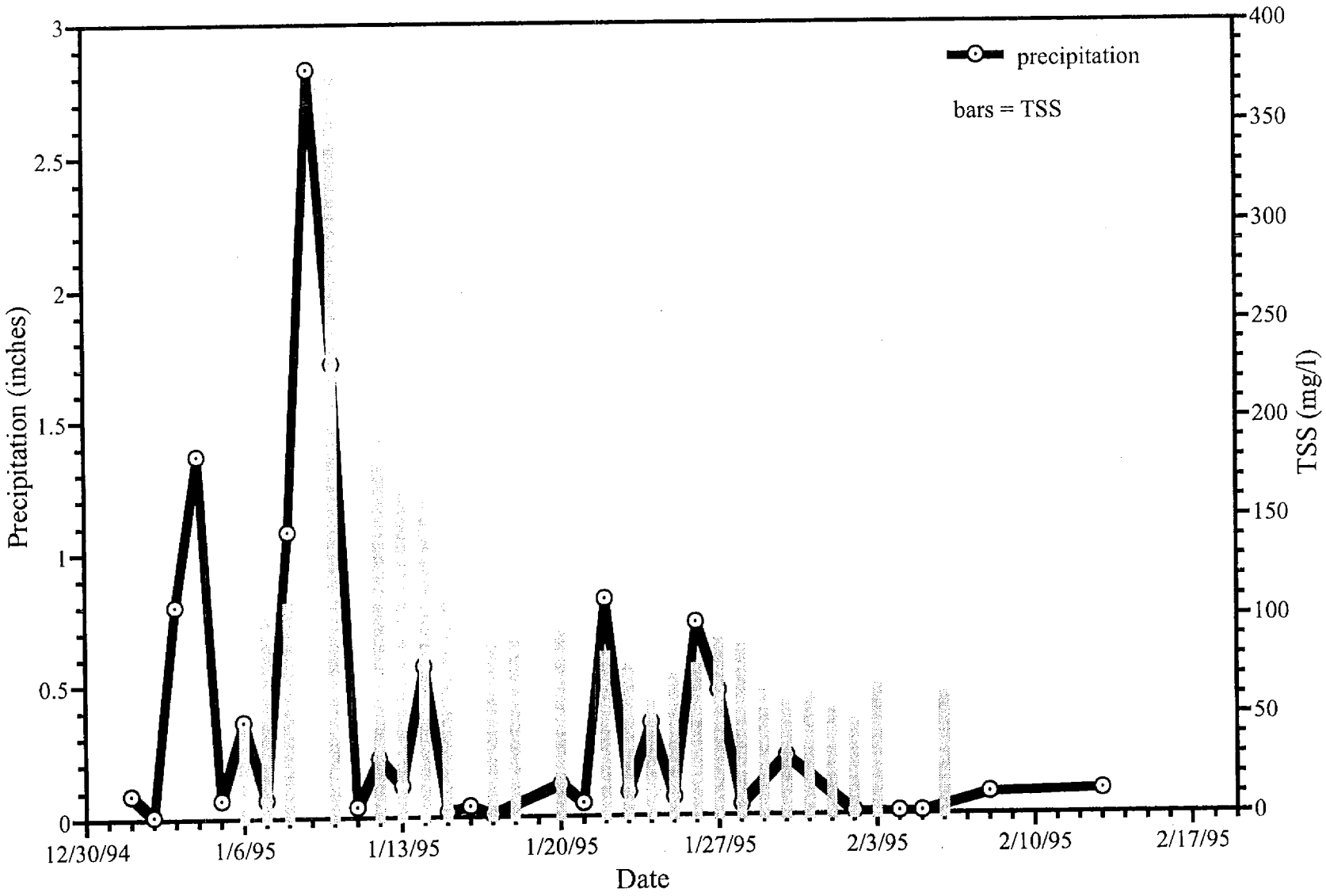

Figure 77. Precipitation and total suspended solids (TSS) measured at Greene's Landing from January through mid-February, 1995.

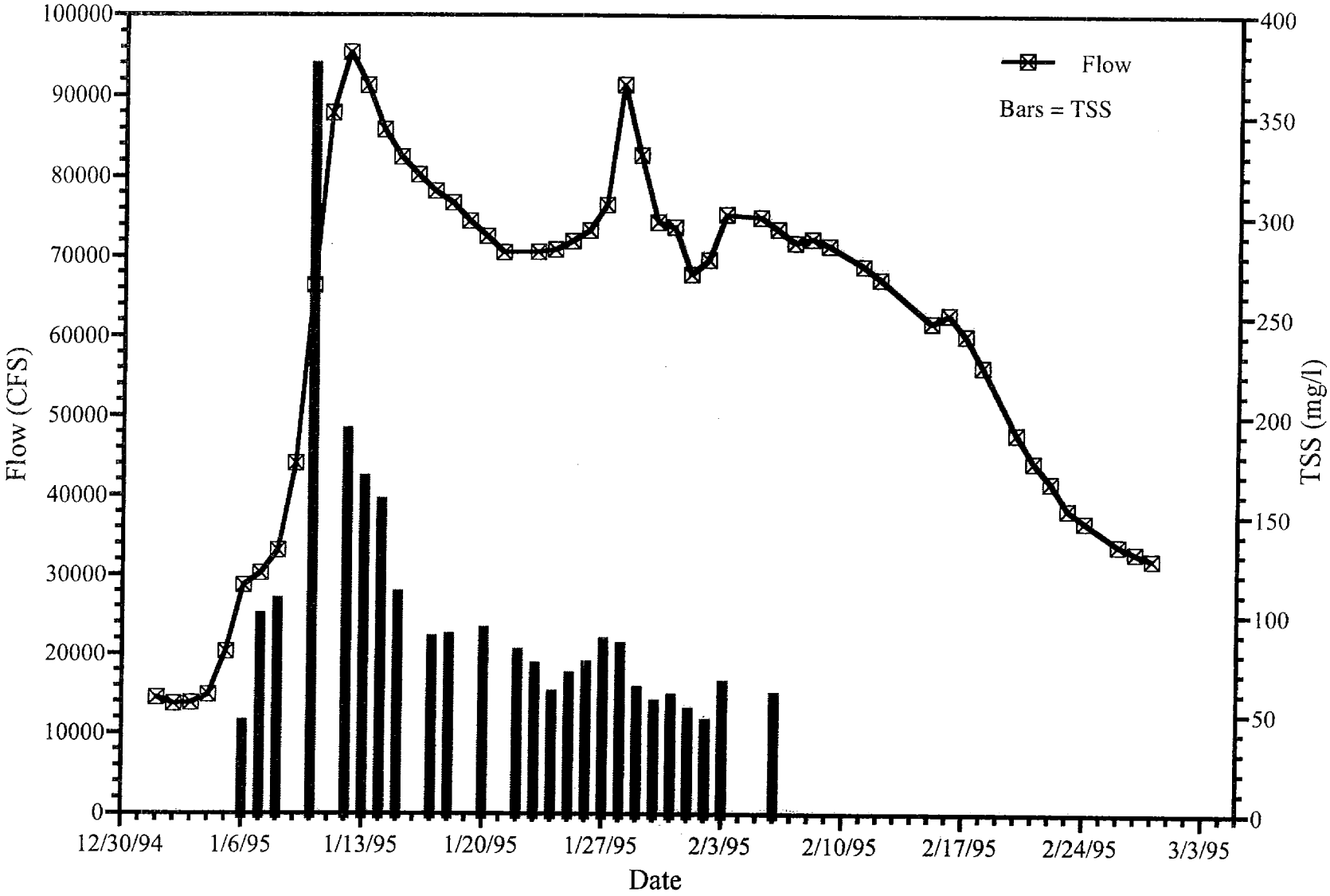

Figure 78. Flow and total suspended solids (TSS) pattern in the Sacramento River at Greene's Landing during high flow conditions from January through March of 1995.

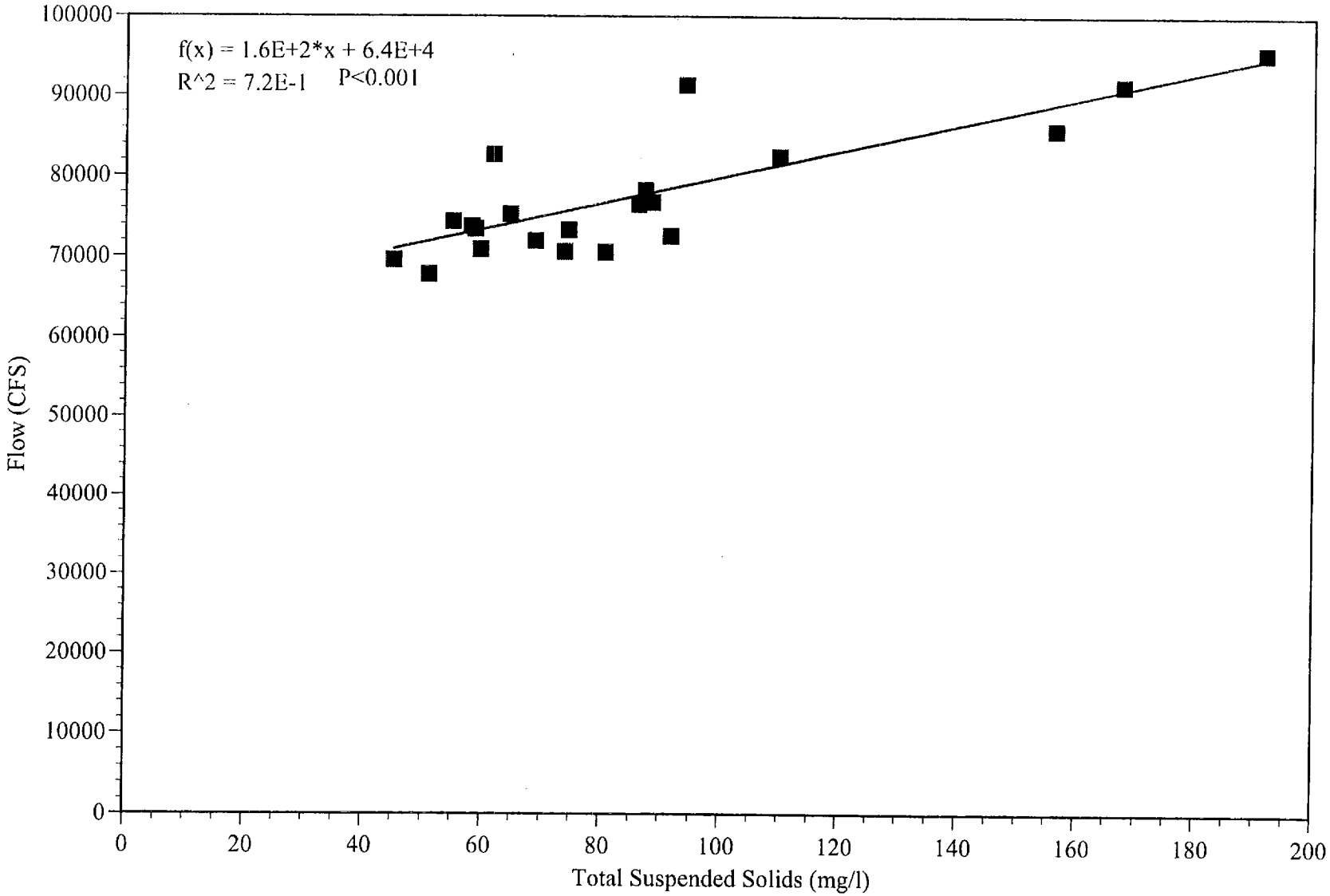

Figure 79. Regression of flow versus total suspended solids in water samples collected from the Sacramento River at Greene's Landing during Water Year 1995 without first flush and pre-first flush values.

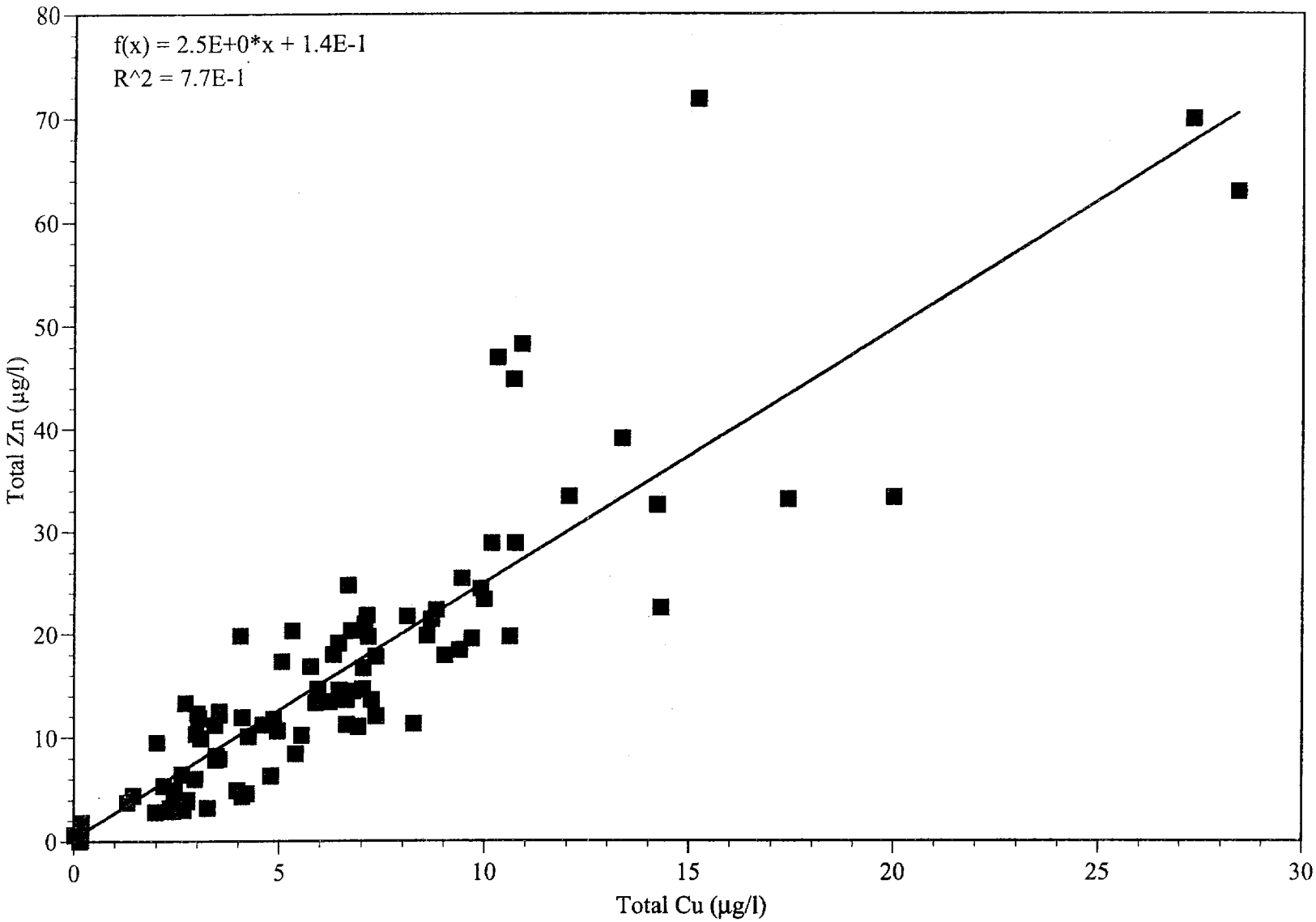

Figure 80. Regression of total recoverable copper and total recoverable zinc concentrations in water samples collected from the Sacramento River at Greene's Landing during Water Years 1994 and 1995.

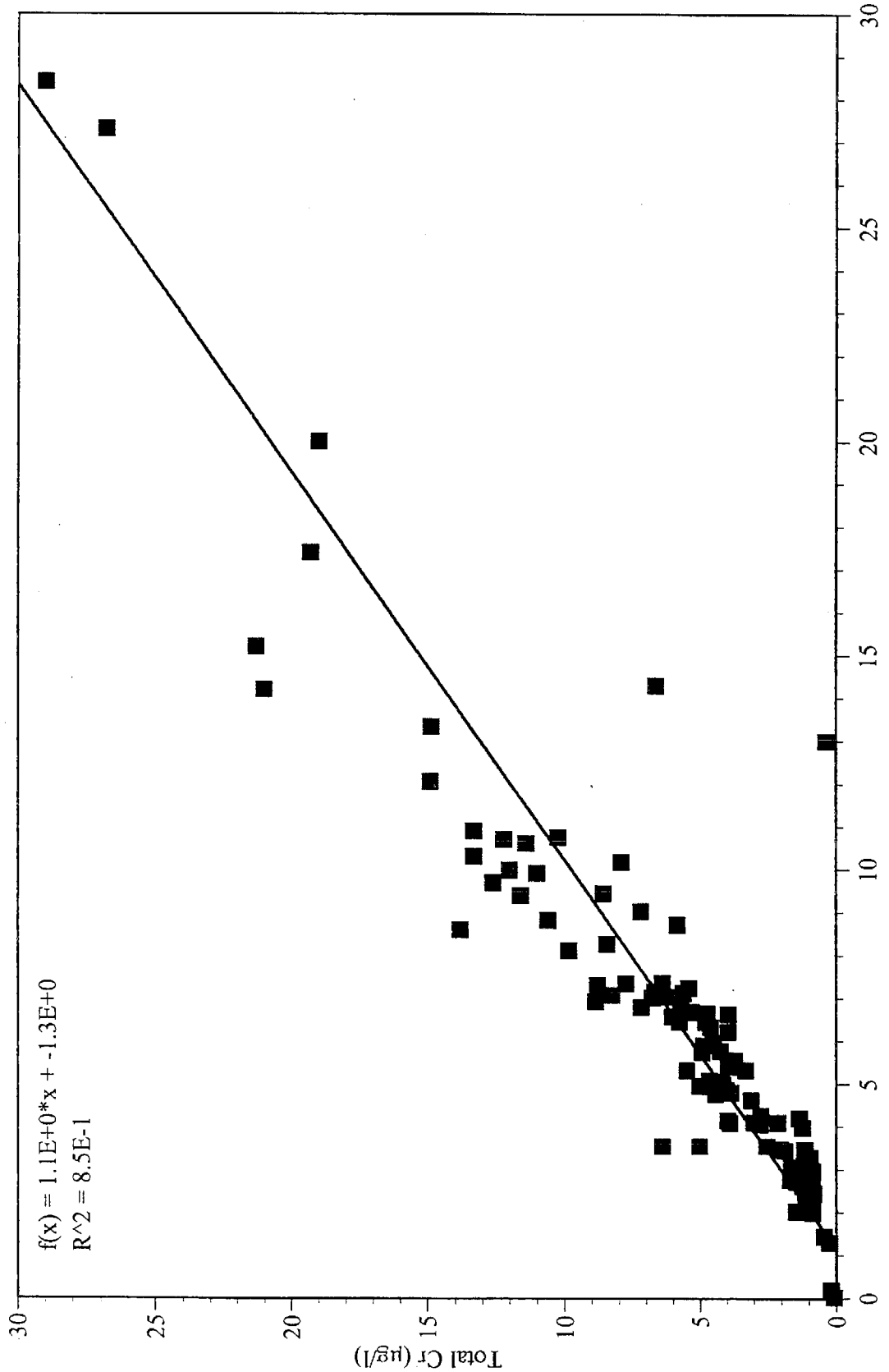

Figure 81. Regression of total recoverable copper and total recoverable chromium concentrations in water samples collected from the Sacramento River at Greene's Landing during Water Years 1994 and 1995.

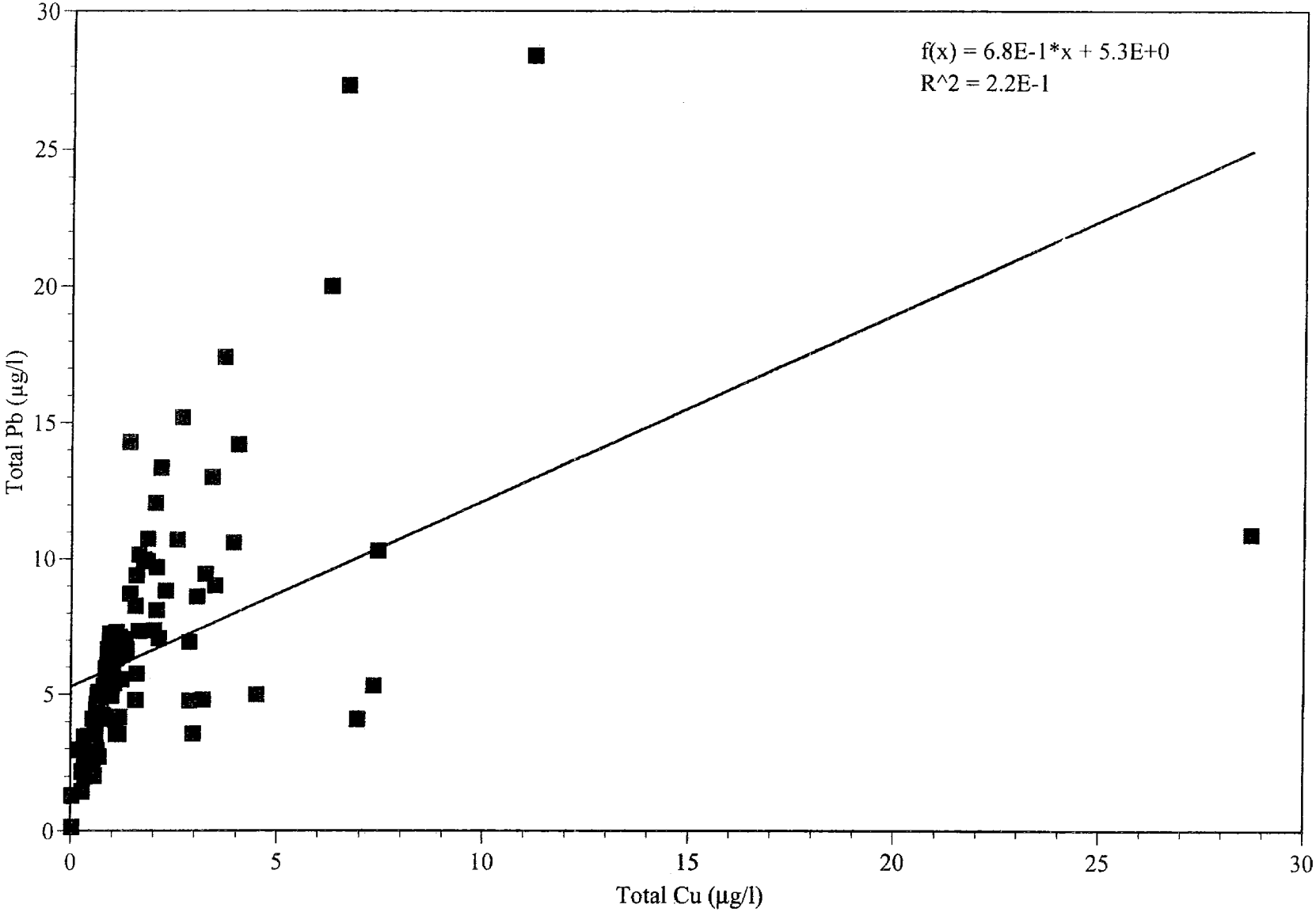

Figure 82. Regression of total recoverable copper and total recoverable lead concentrations in water samples collected from the Sacramento River at Greene's Landing during Water Years 1994 and 1995.

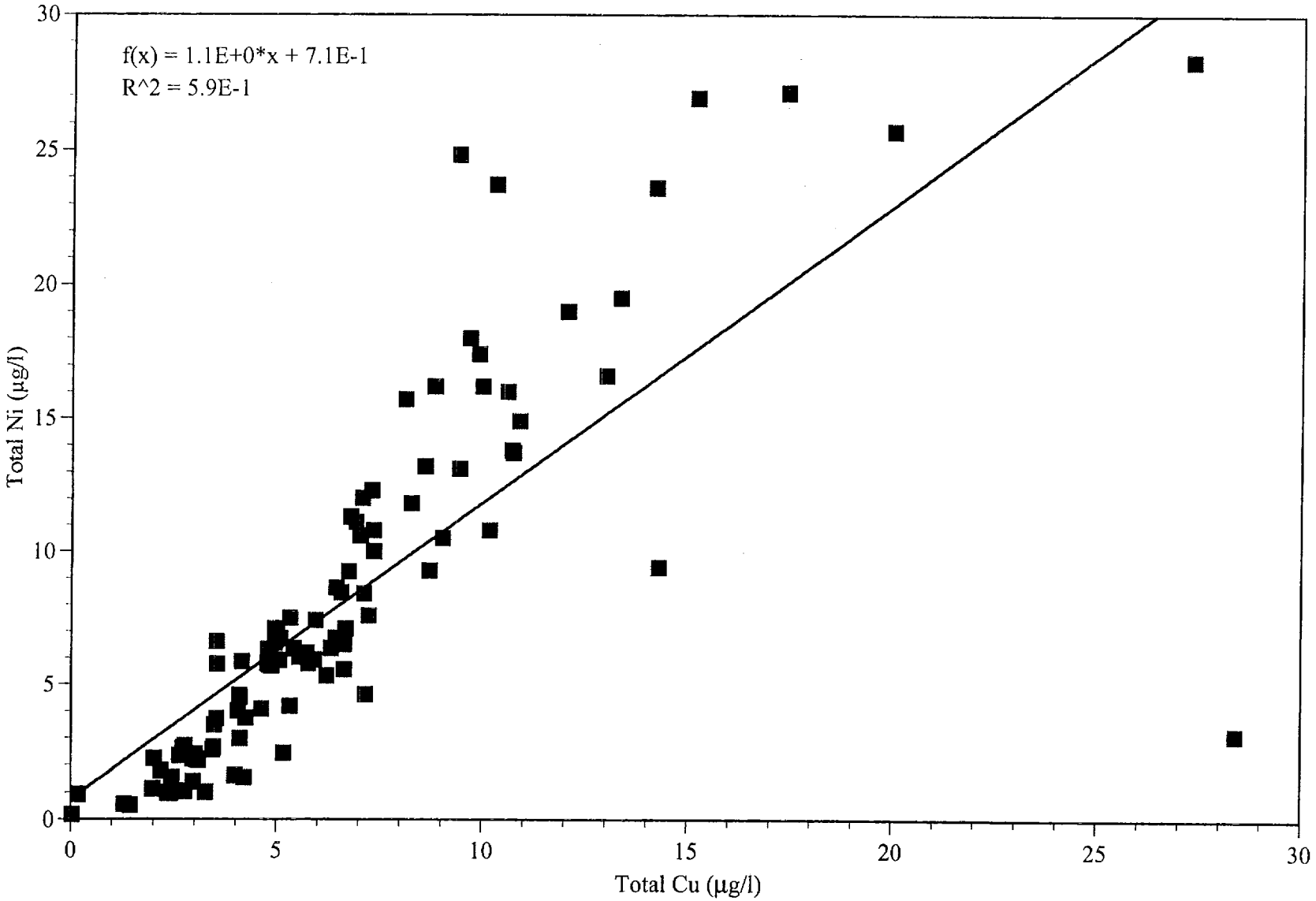

Figure 83. Regression of total recoverable copper and total recoverable nickel concentrations in water samples collected from the Sacramento River at Greene's Landing during Water Years 1994 and 1995.

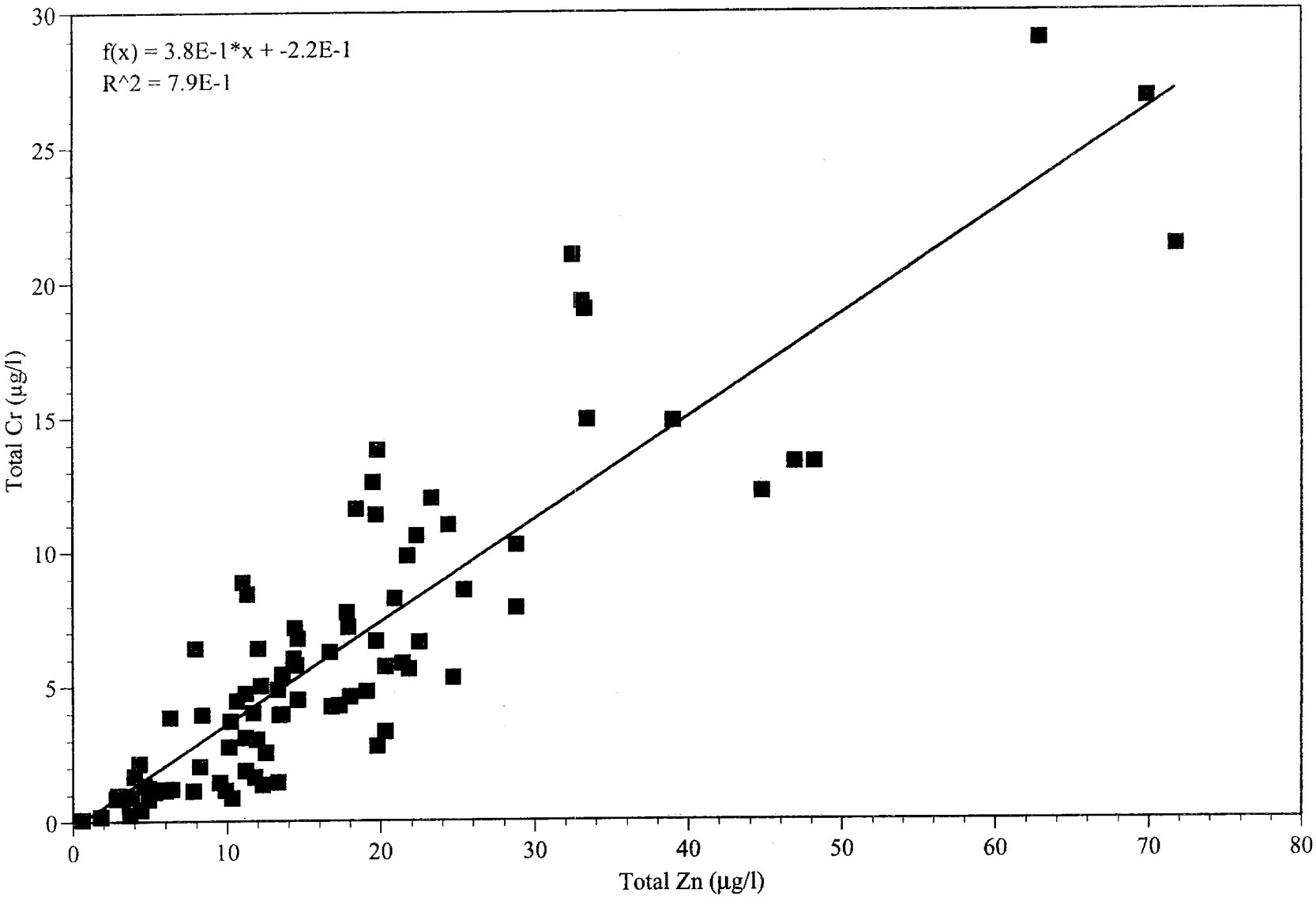

Figure 84. Regression of total recoverable zinc and total recoverable chromium concentrations in water samples collected from the Sacramento River at Greene's Landing during Water Years 1994 and 1995.

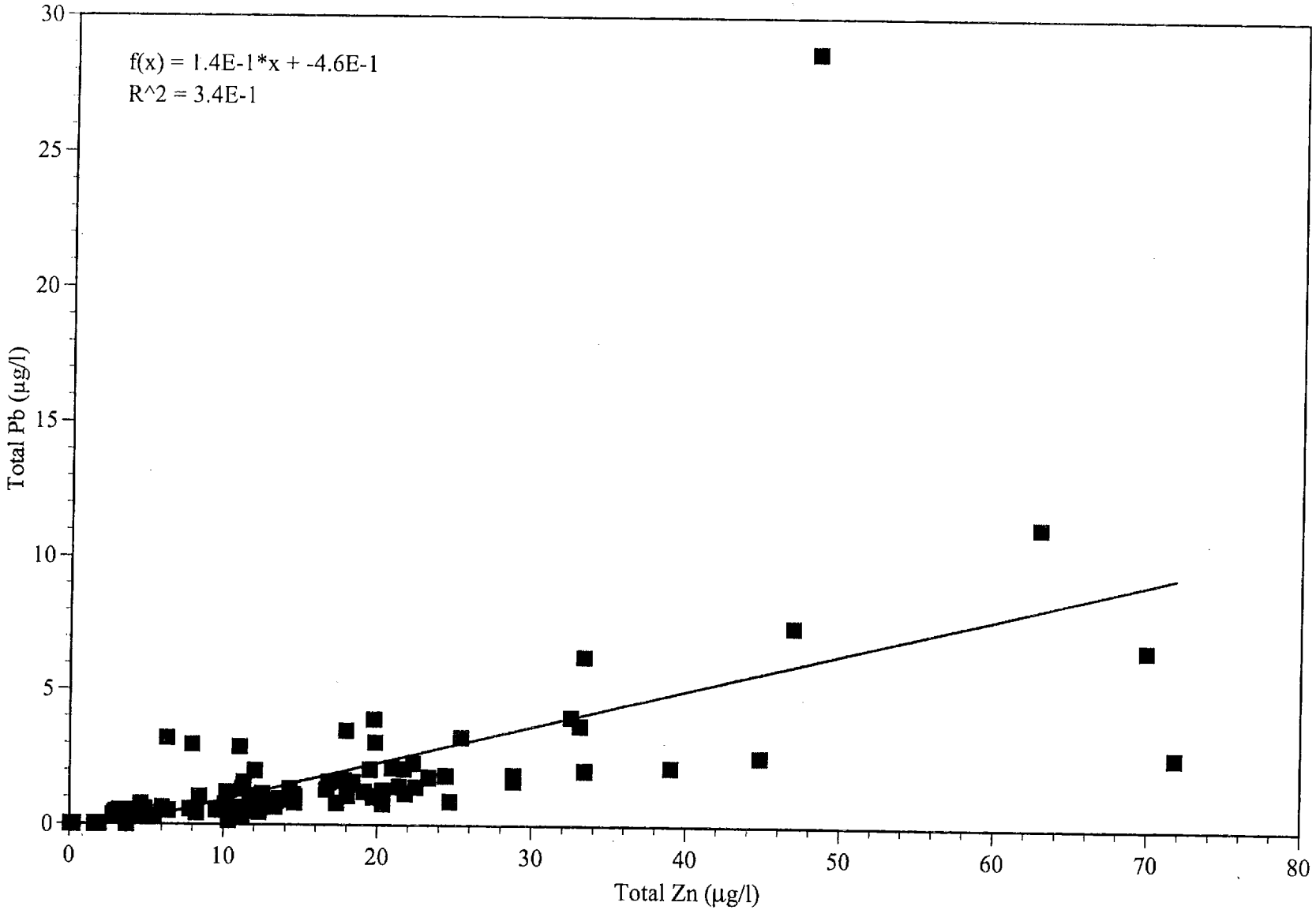

Figure 85. Regression of total recoverable zinc and total recoverable lead concentrations in water samples collected from the Sacramento River at Greene's Landing during Water Years 1994 and 1995.

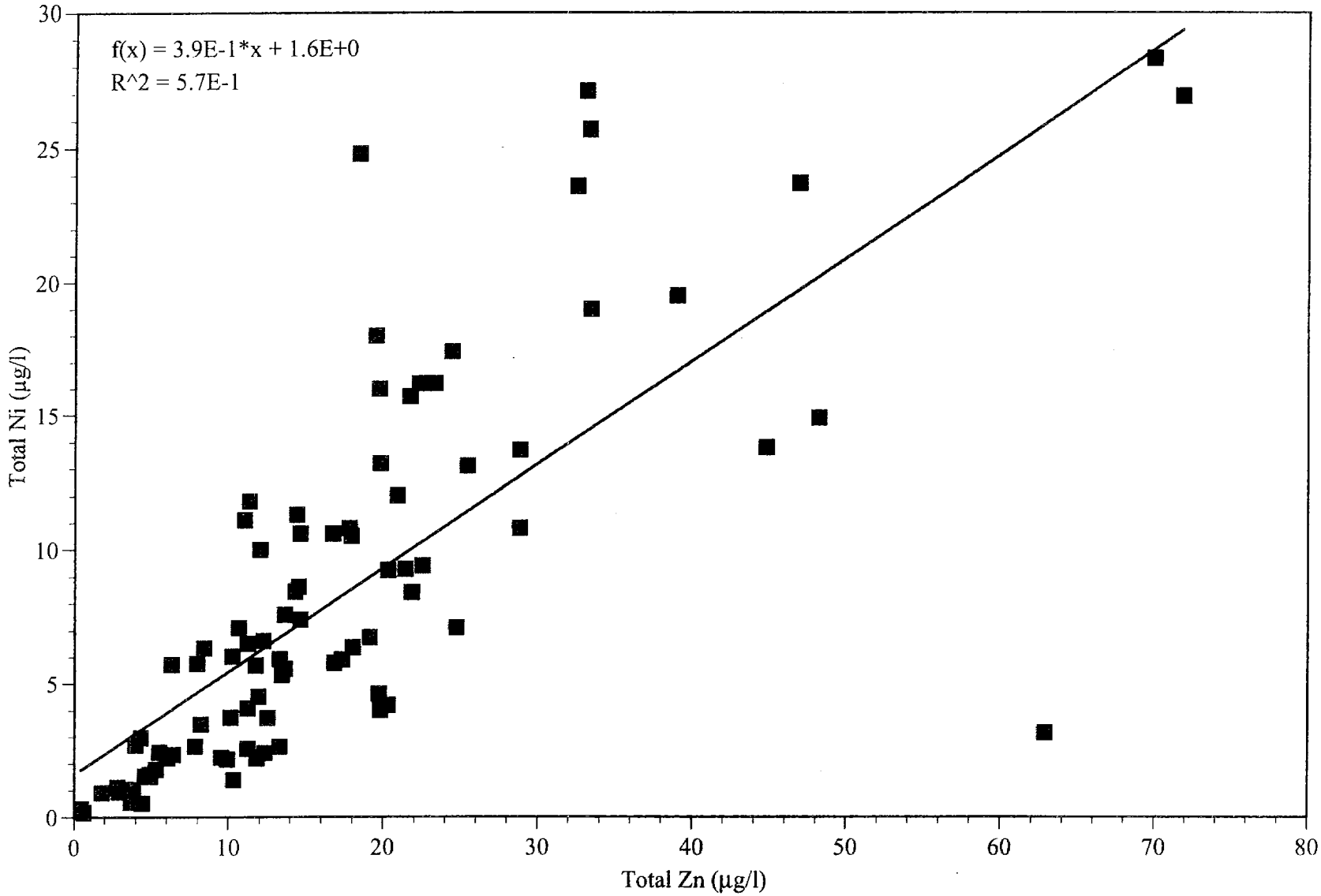

Figure 86. Regression of total recoverable zinc and total recoverable nickel concentrations in water samples collected from the Sacramento River at Greene's Landing during Water Years 1994 and 1995.

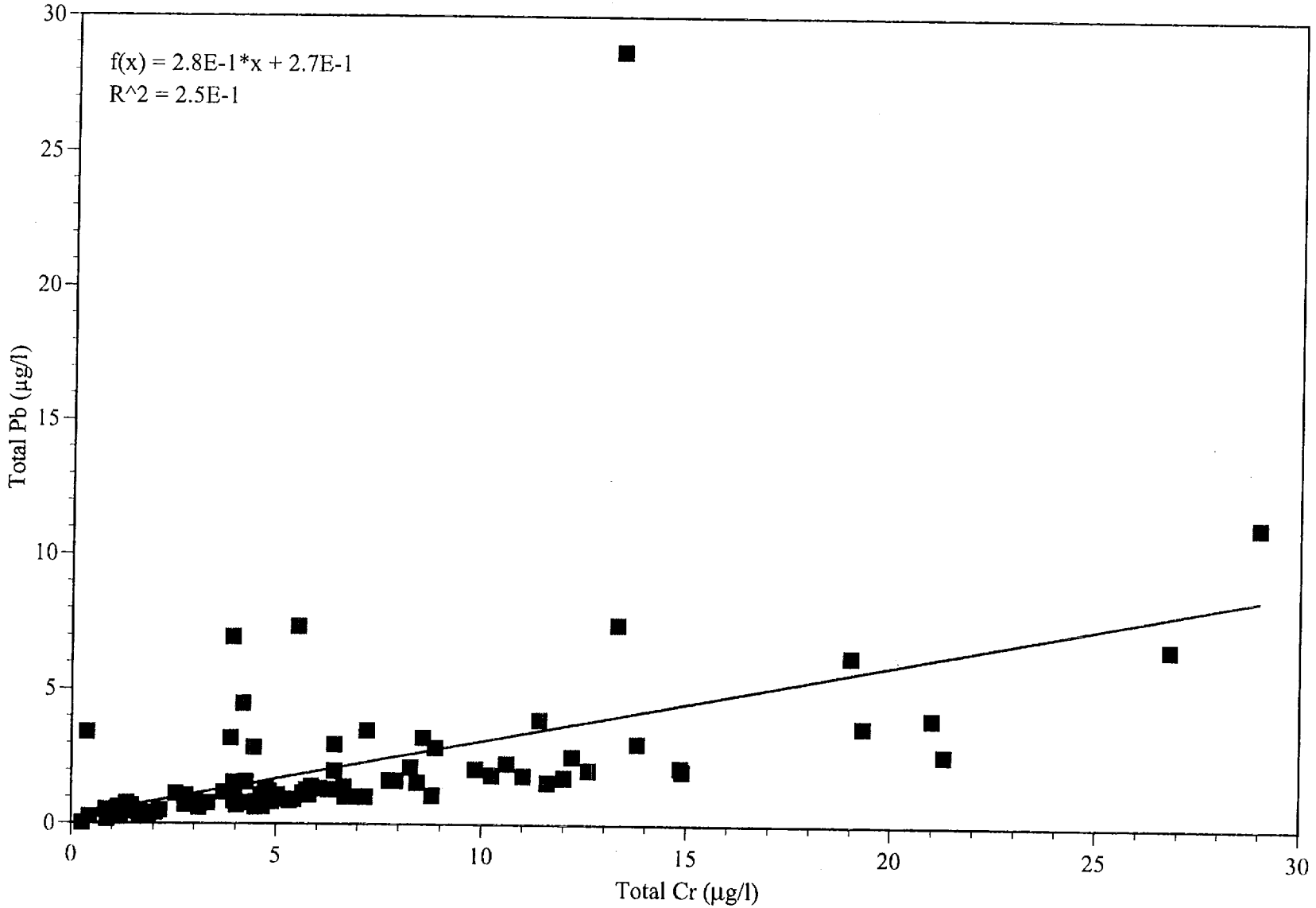

Figure 87. Regression of total recoverable chromium and total recoverable lead concentrations in water samples collected from the Sacramento River at Greene's Landing during Water Years 1994 and 1995.

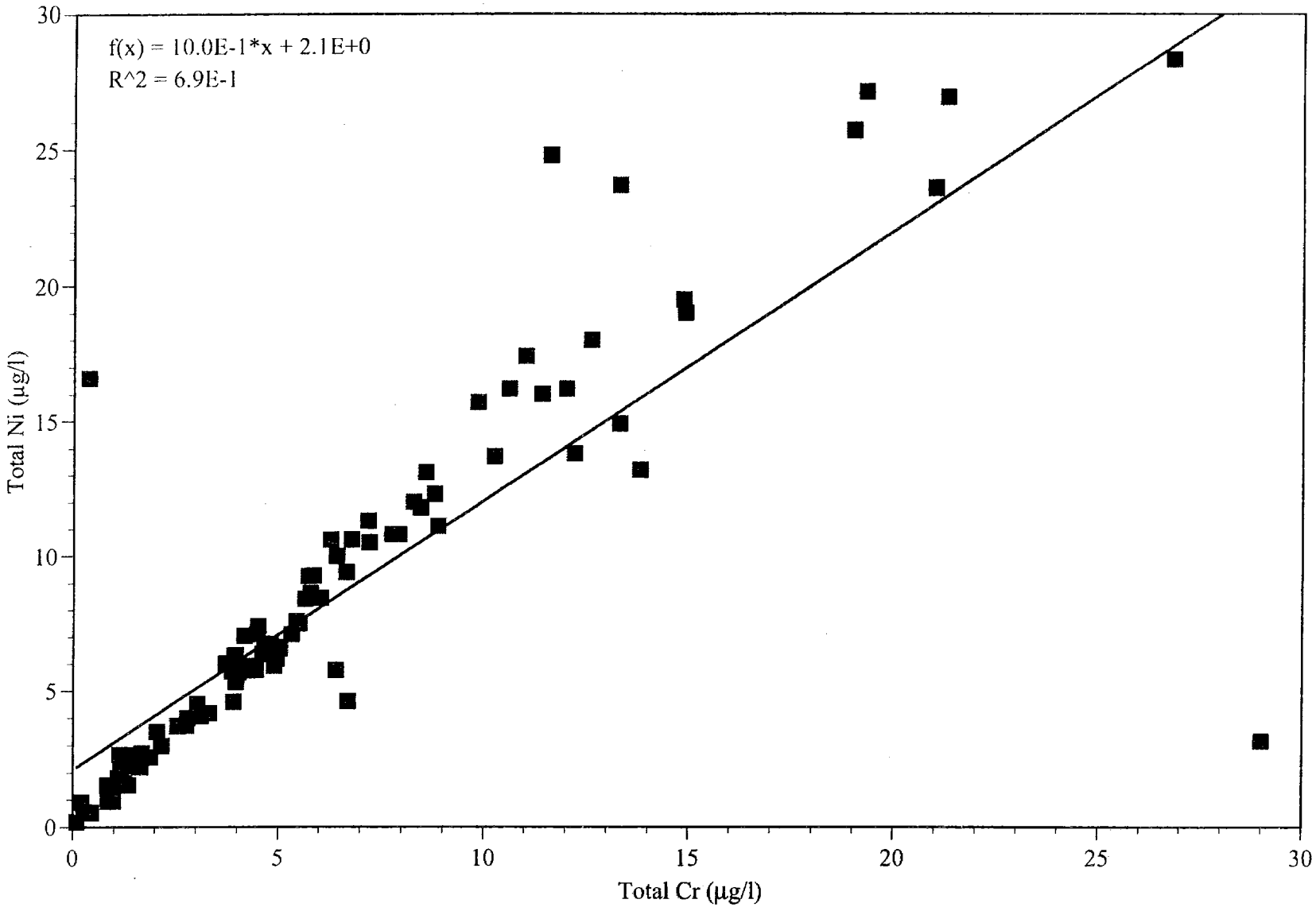

Figure 88. Regression of total recoverable chromium and total recoverable nickel concentrations in water samples collected from the Sacramento River at Greene's Landing during Water Years 1994 and 1995.

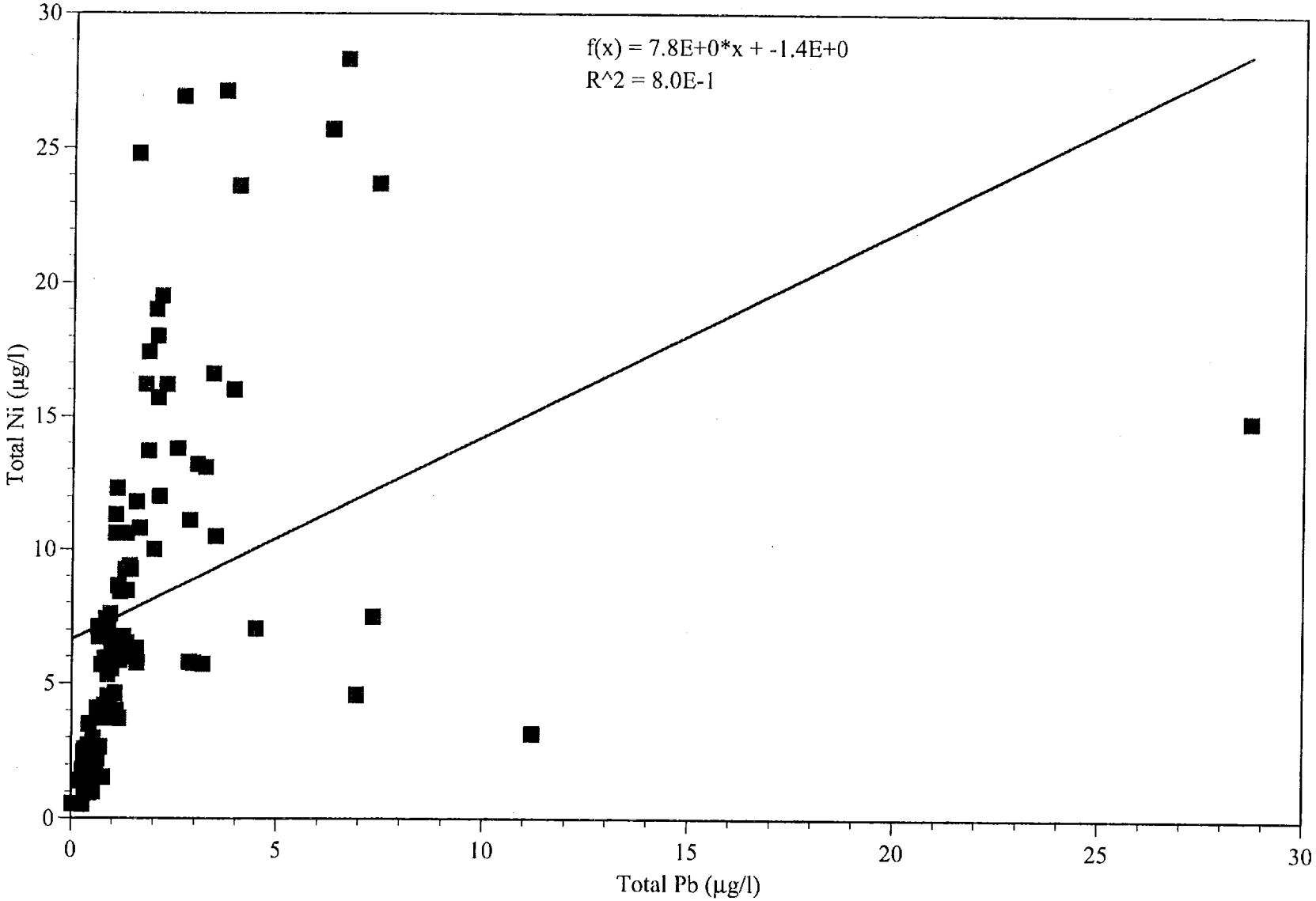

Figure 89. Regression of total recoverable lead and total recoverable nickel concentrations in water samples collected from the Sacramento River at Greene's Landing during Water Years 1994 and 1995.

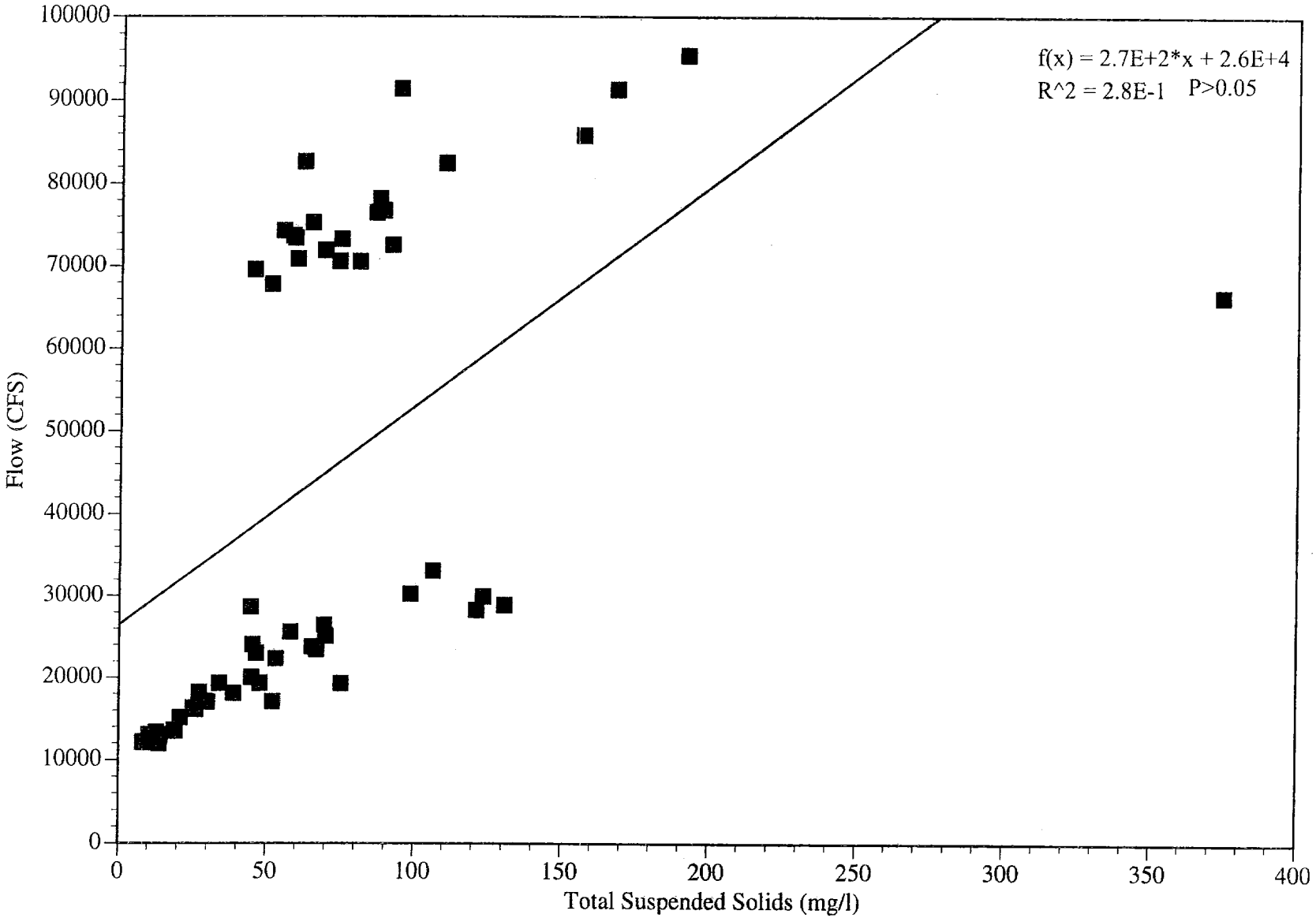

Figure 90. Regression of flow versus total suspended solids in water samples collected from the Sacramento River at Greene's Landing during Water Years 1994 and 1995.

APPENDIX A:

List of Site Locations

Site numbers correspond to numbers in Figure 1.

Sacramento River @ Greene's Landing (site 1): Sacramento River sampled from end of the U.S. Bureau of Reclamation water quality pier off Randall Island Road. Site is about three miles downstream of Hood. Samples collected at outgoing tide.

Sacramento River @ Hood (site 2): Sacramento River samples collected by boat from mid channel off steps on east bank of River upstream of Hood. Samples collected at outgoing tide.

Mokelumne River (site 3): Samples collected from shore approximately one mile downstream of confluence of Cosumnes River off New Hope Road. Samples collected at outgoing tide.

Ulatis Creek (site 4): Samples collected from mid channel under bridge at Brown Road. Ulatis Creek discharges into Cache Slough.

Skag Slough (site 5): Sampled from middle of Liberty Island Road bridge. Skag Slough is the secondary channel draining the Yolo Bypass. Samples collected at outgoing tide.

Prospect Slough (site 6): Sampled by boat at junction of Prospect Slough and Toe drain. Prospect Slough is the main channel draining the Yolo Bypass. Samples collected at outgoing tide.

Duck Slough (site 7): Samples collected from middle of drain off discharge pump platform. Drain discharges into Miners Slough at Five Points Marina.

Sacramento River @ Rio Vista (site 8): Sacramento River samples collected at low tide in mid channel by boat about one mile downstream of HWY 12 bridge.

San Joaquin River @ Vernalis (site 9): San Joaquin River samples collected off middle of Airport Way Bridge (County Road J3).

Paradise Cut (site 10): Samples collected from middle of south channel off Paradise Road bridge.

Old River @ Tracy Blvd (site 11): Samples collected in mid channel off Tracy Blvd. bridge.

French Camp Slough (site 12): Samples collected from mid channel off Manthey Road bridge. Slough is discharged into the San Joaquin River about one mile upstream of Highway 4 Bridge.

San Joaquin River @ City of Stockton (site 13): San Joaquin River samples collected by boat off entrance to McLeod Lake.

Middle River @ Bullfrog (site 14): Middle River samples collected on an incoming tide at mid channel off Bacon Island Road Bridge.

San Joaquin River @ Point Antioch (site 15): San Joaquin River samples collected from boat in mid channel at low tide off Point Beenar. Site is about five miles upstream of confluence of Sacramento River.

Chipps Island: Sacramento River samples collected from boat in mid channel off Chipps Island at lower low tide.

Grizzly Bay: Sample collected by boat at lower low tide in mid Bay off pilings.

Martinez: Samples collected by boat at lower low tide in mid channel about two miles downstream of HWY 680 bridge.

APPENDIX B:

Raw Metal Analysis Data

Date	Hour	Station #	Station Name	Total Cu	Dis Cu	Total Zn	Dis Zn	Total Cr	Dis Cr	Total Pb
1/11/93		GL 22	Greene's Landing	4.21		6.1		2.16		0.37
1/13/93		GL 23	Greene's Landing		2.91		2.1		0.29	
1/14/93		GL 24	Greene's Landing	3.63		6.3		0.92		0.2
3/23/93	1030	3	Sac R.- depth 1	9.92		26.8		11.1		1.53
3/23/93	1030	1	Sac R.- surface 1	8.5		24.3		7.28		1.3
3/23/93	1030	2	Sac R.- surface 2		2.34		2.63		1.01	
3/23/93	1030	4	Sac. R.- depth 2		2.87		3.63		1.42	
4/13/93	1700	36	Sac. River @ Delta		0.32		1.34		1.13	
7/7/93	1510	135	Middle R. @ Bullfrog Ldg.	2.54		6.77		0.007		0.46
7/7/93	1510	136	Middle R. @ Bullfrog Ldg.		1.67		1.15		0.45	
7/7/93	1750	149	S.J. River @ Vernalis	6.38		16.1		8.38		1.43
7/7/93	1750	150	S.J. River @ Vernalis		1.63		1.52		0.63	
7/19/93	1038	151	S.J. River @ Antioch	4.65		9.98		4.09		0.85
7/19/93	1038	152	S.J. River @ Antioch		2.22		2.06		0.78	
7/19/93	1300	153	Sac. River @ Hood	3.6		6.46		2.85		2.85
7/19/93	1300	154	Sac. River @ Hood		1.42		1.12		0.32	
7/20/93		F1	Sac R. @ Rio Vista	3.51		6.96		2.63		0.62
7/20/93		F2	Sac R. @ Rio Vista		1.56		1.31		0.41	
7/20/93		F3	Sac R. @ Rio Vista		1.45		0.7		0.5	
8/3/93	1311	193	Mokelumne River	1.98		6.15		0.66		0.3
8/3/93	1311	194	Mokelumne River		1.62		2.49		0.09	
8/3/93		F-11	Sac R. @ Rio Vista		2.4		2.64		1.14	
8/3/93		F-12	Sac R. @ Rio Vista	3.17		4.55		2.06		0.32
8/3/93		F-10/QC	Sac. River @ Hood	3.77		5.91		3.25		0.61
8/3/93		F-8	Sac. River @ Hood		1.61		1.47		0.36	
8/3/93		F-9	Sac. River @ Hood	4.18		7.41		3.27		0.53
8/17/93	1200	207	Middle R. @ Bullfrog Ldg.	28.3		6.66		26.8		39.4
8/17/93	1200	208	Middle R. @ Bullfrog Ldg.		1.73		1.31		0.58	
8/17/93	1450	221	S.J. River @ Vernalis	4.49		11.1		5.7		1.13
8/17/93	1450	222	S.J. River @ Vernalis		1.5		0.96		0.64	
9/14/93	1200	246	Mokelumne River	3.19		4.84		1.08		0.45
9/14/93	1200	247	Mokelumne River	2.8		4.12		1.51		0.5
9/14/93	1200	248	Mokelumne River		1.6		3.16		0.09	
9/14/93		13 CF	Sac R. @ Rio Vista	2.98		6.08		2.11		0.21
9/14/93		14 CF	Sac R. @ Rio Vista		1.97		1.4		0.56	
9/14/93		15 CF	Sac R. @ Rio Vista		1.86		0.88		0.59	
9/14/93		16 CF	Sac. River @ Hood	3.76		16		2.52		0.3
9/14/93		17 CF	Sac. River @ Hood		2		5.02		0.36	
10/4/93	2030	269	Sac. River @ Freeport		2.26		3.84		0.99	
10/4/93	2030	270	Sac. River @ Freeport	1.69		1.26		1.08		0.45
10/4/93	1100	272	Sac. River @ Freeport	2.34		4.67		1.04		0.18
10/4/93		271		2.24		3.25		1.14		0.18
10/4/93		273		2.7		2.99		1.14		0.22
10/14/93	1251	298	Mokelumne River	1.77		3.37		0.54		0.26
10/14/93	1251	299	Mokelumne River		1.37		1.24		0.11	
10/14/93		18 CF	Sac R. @ Rio Vista	3.48		12.5		2.36		0.27
10/14/93		19 CF	Sac R. @ Rio Vista		1.91		2.64		0.3	
10/14/93		20 CF	Sac. River @ Hood	2.71		8.55		1.57		0.31
10/14/93		21 CF	Sac. River @ Hood		1.38		1.29		0.22	
10/14/93		22 CF	Sac. River @ Hood		1.39		0.95		0.34	
10/29/93	1030	312	Middle R. @ Bullfrog Ldg.	1.59		1.34		0.41		0.13
10/29/93	1030	313	Middle R. @ Bullfrog Ldg.		1.47		0.62		0.24	
10/29/93		23 CF	S.J. River @ Antioch	2.72		4.99		1.34		0.03
10/29/93		24 CF/QC	S.J. River @ Antioch	1.72		1.68		0.19		
10/29/93		25 CF/QC	S.J. River @ Antioch		2.73		3.18		2.62	

Date	Hour	Station #	Station Name	Total Cu	Dis Cu	Total Zn	Dis Zn	Total Cr	Dis Cr	Total Pb
10/29/93		26 CF	S.J. River @ Stockton	2.85		5.55		0.83		1.18
10/29/93		27 CF	S.J. River @ Stockton	2.66		4.96		1.16		1.36
10/29/93		28 CF	S.J. River @ Stockton		1.98		4.5		0.15	
10/29/93		323	S.J. River @ Vernalis	2.83		9.48		2.62		0.14
10/29/93		324	S.J. River @ Vernalis		1.09		0.47		0.2	
11/10/93		29 CF	Greene's Landing	5.16		5.5		1.19		0.28
11/10/93		30 CF A	Greene's Landing		1.62		1.6		0.63	
11/10/93		30 CF B	Greene's Landing		1.81		1.4		0.71	
11/11/93		31 CF	Greene's Landing	2.18		5.3		1.1		0.26
11/11/93		32 CF	Greene's Landing		1.43		1.4		0.3	
11/11/93		33 CF	Greene's Landing	2.44		4.9		0.83		0.52
11/11/93		34 CF	Greene's Landing		2.04		6		0.38	
11/11/93		35 CF	Greene's Landing	2.94		6		1.15		0.62
11/11/93		36CF	Greene's Landing		1.77		4.4		0.33	
11/12/93		37 CF A	Greene's Landing	3.45		7.8		1.13		0.58
11/12/93		37 CF B	Greene's Landing	2.62		6.4		1.21		0.51
11/12/93		38 CF	Greene's Landing	3.09		9.9		1.16		0.54
11/12/93		39 CF	Greene's Landing		1.72		2.1		0.32	
11/29/93		40 CF	S.J. River @ Antioch	2.69		2.3		1.86		0.07
11/29/93		41 CF	S.J. River @ Stockton	2.66		8.2		0.98		0.95
12/13/93		42 CF	Sac R. @ Rio Vista	2.97		4.6		1.56		0.36
12/13/93		43 CF	Sac R. @ Rio Vista		1.58		0.71		0.72	
12/13/93		44 CF	Sac. River @ Hood	4.38		7.5		3.99		0.64
12/13/93		44 CF	Sac. River @ Hood	4.35		7.6		3.4		0.63
12/13/93		45 CF	Sac. River @ Hood		2.16		0.38		0.19	
1/10/94		GL 21	Greene's Landing		1.46		4.3		0.32	
1/10/94		46 CF	S.J. River @ Antioch	3.68		10.5		3.35		0.41
1/10/94		47 CF	S.J. River @ Antioch		3.82		2		0.12	
1/10/94		48 CF	S.J. River @ Stockton	2.96		10.3		0.38		0.1
1/10/94		48 CF	S.J. River @ Stockton	2.76		10.8		0.54		0.74
1/10/94		49 CF	S.J. River @ Stockton		2.67		10		0.08	
1/11/94	914	410	Middle R. @ Bullfrog Ldg.	2.06		2.2		0.56		0.11
1/11/94	914	411	Middle R. @ Bullfrog Ldg.	0.75		1.7		0.24		0.03
1/11/94	914	412	Middle R. @ Bullfrog Ldg.		2.01		1.2		0.39	
1/11/94	914	425	S.J. River @ Vernalis		2.47		0.39		0.17	
1/11/94	914	426	S.J. River @ Vernalis		1.93		0.3		0.74	
1/11/94	914	427	S.J. River @ Vernalis	1.51		3.5		1.19		0.06
1/13/94		66	Greene's Landing		4.01		8.2		2.49	
1/13/94		65 A	Greene's Landing	6.44		19.1		4.8		1.23
1/13/94		65 B	Greene's Landing	6.64		11.2		4.74		1.32
1/18/94		25	Greene's Landing	1.29		3.7		0.26		0.02
1/19/94		24	Greene's Landing	2.96		10.3		0.86		0.16
1/23/94		27	Greene's Landing		1.32		1.8		0.48	
1/24/94		26	Greene's Landing	2.71		13.3		1.45		0.67
1/24/94		29	Greene's Landing		1.33		1.4		0.37	
1/25/94		28	Greene's Landing	2.01		9.5		1.45		0.56
1/26/94		30	Greene's Landing	3.53		12.5		2.54		1.14
1/26/94		31	Greene's Landing		1.79		8.5		0.72	
1/27/94		33	Greene's Landing		2.11		3.9		0.81	
1/28/94		32	Greene's Landing	6.32		18		4.61		1.08
1/28/94		35	Greene's Landing	7.24		13.6		5.43		0.93
1/28/94		36	Greene's Landing		3.6		4.8		1.54	
1/29/94	900	40	Greene's Landing		3.18		2.6		1.24	
1/30/94		38	Greene's Landing	6.21		13.4		3.95		0.87
1/30/94	1000	42	Greene's Landing		3.27		4.2		1.32	

Date	Hour	Station #	Station Name	Total Cu	Dis Cu	Total Zn	Dis Zn	Total Cr	Dis Cr	Total Pb
1/31/94		41	Greene's Landing	5.31		20.3		3.31		0.78
2/1/94		44	Greene's Landing	3.43		11.2		1.87		0.31
2/1/94		48	Greene's Landing		4.94		3		0.94	
2/2/94		43	Greene's Landing	4.09		4.3		2.14		0.51
2/5/94	1700	55	Greene's Landing		1.92		5.6		0.86	
2/7/94		50	Greene's Landing	nd		0.14		nd		nd
2/7/94		53	Greene's Landing		1.84		2.5		0.48	
2/8/94		51	Greene's Landing	0.16		0.16		nd		nd
2/8/94		52	Greene's Landing	3.04		11.8		1.64		0.51
2/9/94		54	Greene's Landing	5.76		16.8		4.25		1.58
2/10/94		56	Greene's Landing	13.34		39		14.85		2.15
2/10/94	930	58	Greene's Landing		5.33		7.3		2.58	
2/11/94	1000	61	Greene's Landing		6.12		18.5		2.64	
2/11/94	1600	62	Greene's Landing	nd		nd		nd		nd
2/12/94		60	Greene's Landing	10.16		28.8		7.91		1.63
2/16/94	700	63	Greene's Landing	6.67		24.7		5.31		0.88
2/16/94	700	64	Greene's Landing							
2/17/94		67	Greene's Landing	4.05		19.8		2.78		1.07
2/17/94		68	Greene's Landing		2.23		4.6		1.07	
2/18/94	1200	70	Greene's Landing		1.94		3.2		0.67	
2/19/94		69	Greene's Landing	4.09		11.9		3.02		0.87
2/19/94	1400	72	Greene's Landing		2.26		2.9		0.86	
2/19/94	1400	71 A	Greene's Landing	5.05		17.3		4.28		0.8
2/19/94	1400	71 B	Greene's Landing	6.63		13.6		3.96		0.95
2/20/94	1550	74	Greene's Landing		2.11		3		0.98	
2/21/94		73	Greene's Landing	7.12		21.8		5.64		1.16
2/21/94	1600	76	Greene's Landing		3.05		6.4		1.5	
2/22/94		75	Greene's Landing	14.29		22.5		6.65		1.39
2/22/94		77	Greene's Landing	10.74		28.8		10.24		1.84
2/22/94	1600	79	Greene's Landing		3.14		4.5		1.49	
2/23/94		81	Greene's Landing	12.05		33.4		14.9		2.02
2/23/94	1700	82	Greene's Landing		3.01		3.7		0.31	
2/24/94		83	Greene's Landing	7.16		19.7		6.68		1.04
2/24/94	1700	84	Greene's Landing		9.48		8.4		3.78	
2/25/94		85	Greene's Landing	5.94		14.6		4.5		0.82
2/25/94	1800	86	Greene's Landing		2.56		3.8		1.81	
2/27/94		87	Greene's Landing	6.74		20.3		5.73		1.28
2/28/94		89	Greene's Landing	4.86		11.7		4.02		0.71
2/28/94	1200	90	Greene's Landing		2.29		3.8		1.19	
3/1/94		91	Greene's Landing	4.24		10.1		2.76		0.73
3/1/94		93	Greene's Landing		3.03		3.4		0.87	
3/4/94		95	Greene's Landing	4.61		11.2		3.1		0.61
3/4/94	1200	96	Greene's Landing		2.32		2.3		0.6	
3/9/94	1130	100	Greene's Landing			0.23				0.01
3/9/94	1130	101	Greene's Landing			0.02				
3/9/94	1130	102	Greene's Landing			1.62				0.02
3/9/94	1130	103	Greene's Landing			1.88				0.01
3/9/94	1130	104	Greene's Landing	1.99		2.8		0.87		0.34
3/9/94	1130	107	Greene's Landing	2.4		2.9		0.97		0.41
3/9/94	1130	105a	Greene's Landing	2.44		3.4		0.94		0.43
3/9/94	1130	105b	Greene's Landing	2.39		3.1		0.91		0.33
3/9/94	1130	106a	Greene's Landing	2.44		3.4		0.91		0.43
3/9/94	1130	106b	Greene's Landing	2.34		3.2		0.86		0.32
3/10/94		108	Greene's Landing	3.46		8.2		2.04		0.42
3/10/94	1800	109	Greene's Landing		1.79		2		0.48	

Date	Hour	Station #	Station Name	Total Cu	Dis Cu	Total Zn	Dis Zn	Total Cr	Dis Cr	Total Pb
3/15/94		110	Greene's Landing			0.11				
3/15/94		111	Greene's Landing	2.75		3.8		0.9		0.5
3/15/94		112	Greene's Landing	1.44		4.4		0.44		0.26
3/15/94		113	Greene's Landing	3.97		4.9		1.24		0.58
3/15/94		113	Greene's Landing	4.2		4.6		1.34		0.76
3/15/94	1800	115	Greene's Landing		1.5		1.7		0.33	
3/16/94		114	Greene's Landing	3		12.3		1.36		0.46
3/16/94	1100	116	Greene's Landing	0.14		0.03				0.01
3/16/94		117	Greene's Landing			0.43				
3/16/94		118	Greene's Landing		0.26		0.58		0.02	
3/16/94		119	Greene's Landing	3.26		3.2		0.95		0.51
3/16/94		120	Greene's Landing	2.66		3		0.88		0.49
3/16/94		121	Greene's Landing		2.4		2.9		0.86	
3/16/94		122	Greene's Landing		2.59		2.8		0.85	
3/23/94		aa33	French Camp Slough	2.72		9.24		4		2.26
3/23/94		aa34	French Camp Slough		2.83		3.59		0.81	
3/23/94		aa31	Ulatis Creek	4.23		9.56		3.87		0.46
3/23/94		aa32	Ulatis Creek		2.98		5.55		1.71	
4/12/94	1400	474	Mokelumne River	2.21		4.2		1.49		0.34
4/12/94	1400	475	Mokelumne River		1.29		0.75		0.2	
4/12/94	1200	104CF	Sac R. @ Rio Vista	2.98		4.02		1.77		0.26
4/12/94	1200	105CF	Sac R. @ Rio Vista		1.88		1.06		0.37	
4/12/94	900	100CF	Sac. River @ Hood	2.89		4.62		1.34		0.24
4/12/94	900	101CF	Sac. River @ Hood	2.94		3.81		1.03		0.24
4/12/94	900	102CF	Sac. River @ Hood		2.12		2.36		0.4	
4/12/94	900	103CF	Sac. River @ Hood		2.17		1.72		0.34	
4/27/94	1300	497	Middle R. @ Bullfrog Ldg.	2.38		1.97		0.68		0.16
4/27/94	1300	498	Middle R. @ Bullfrog Ldg.		2.07		0.16		0.28	
4/27/94	900	106CF	S.J. River @ Antioch	4.72		7.06		3.27		0.66
4/27/94	900	107CF	S.J. River @ Antioch	4.85		6.48		2.82		0.93
4/27/94	900	108CF	S.J. River @ Antioch		2.71		1.46		0.81	
4/27/94	900	109 cf	S.J. River @ Antioch		2.75		1.23		0.63	
4/27/94	900	110CF	S.J. River @ Stockton	4.25		13		0.6		0.83
4/27/94	900	111CF	S.J. River @ Stockton		2.99		6.65		0.2	
4/27/94	930	480	S.J. River @ Vernalis			0.08				
4/27/94	930	481	S.J. River @ Vernalis			0.24				
4/27/94	930	482	S.J. River @ Vernalis	3.58		9.24		4.4		0.79
4/27/94	930	483	S.J. River @ Vernalis		1.17		0.48		0.4	
4/27/94	930	484	S.J. River @ Vernalis		0.68		0.54		0.34	
4/30/94		aa1	Paradise Cut		1.19		0.83		0.21	
5/10/94		aa6	Duck Slough	12		26		18.7		3.3
5/10/94		aa7	Duck Slough		4.9		7.76		5.39	
5/10/94	930	GL 201	Greene's Landing		1.95		2.39		0.45	
5/10/94		gl200	Greene's Landing	8.71		21.4		5.85		1.41
5/10/94		gl201	Greene's Landing		1.95		2.39		0.45	
5/10/94	1200	541	Mokelumne River	2.42		4.51		0.94		0.32
5/10/94	1200	541/QA	Mokelumne River	2.05		2.91		1.06		0.38
5/10/94		aa3	Paradise Cut	3.42		4.86		2.13		0.33
5/10/94		aa4	Paradise Cut		2.19		nd		0.06	
5/10/94		114cf	Sac R. @ Rio Vista	2.97		5.07		2.05		0.29
5/10/94		115cf	Sac R. @ Rio Vista		1.9		1.75		0.52	
5/10/94		112cf	Sac. River @ Hood	2.63		5.14		1.52		0.29
5/10/94		112cf/QA	Sac. River @ Hood	2.94		3.8		1.36		0.34
5/10/94		113cf	Sac. River @ Hood		1.84		1.33		0.55	
5/25/94		aa10	Old River @ Tracy Blvd.		1.44		1.99		0.37	

Date	Hour	Station #	Station Name	Total Cu	Dis Cu	Total Zn	Dis Zn	Total Cr	Dis Cr	Total Pb
5/25/94		aa9	Old River @ Tracy Blvd.	2.43		7.18		2.33		3.06
5/25/94		aa35	Paradise Cut		1.01		2.07		0.25	
5/25/94		aa8	Paradise Cut		1.81		1.43		0.08	
6/3/94		aa11	Old River @ Tracy Blvd.	3.84		9.26		3.2		1.92
6/3/94		aa12	Old River @ Tracy Blvd.		1.74		1.99		0.25	
6/3/94		aa14	Paradise Cut	4.3		7.3		nd		0.64
6/3/94		aa15	Paradise Cut		2.41		2.54		0.08	
7/12/94		aa21	Duck Slough	12.6		32.3		19.6		4.28
7/12/94		aa22	Duck Slough		4.41		7.17		4.78	
7/12/94		aa19	Paradise Cut	4.88		8.95		4.72		0.6
7/12/94		aa20	Paradise Cut		0.2		3.55		0.2	
7/12/94		aa23	Prospect Slough	8.29		16.6		10.8		1.24
7/12/94		aa24	Prospect Slough		3.52		6.83		3.06	
7/21/94		aa25a	Mokelumne River		1.25		5.65		0.16	
7/21/94		aa25b/QA	Mokelumne River		1.14		5.57		0.11	
7/21/94		aa26a	Mokelumne River	2.01		5.32		0.72		0.3
7/21/94		aa26b/QA	Mokelumne River	1.88		6.34		0.57		0.25
8/9/94		bp 27	Duck Slough	12.5		27.5		22.4		8.98
8/9/94		bp 28	Duck Slough		4.52		6.75		5	
8/9/94		bp 29	Prospect Slough	7.7		12.1		11		1.24
8/9/94		bp 30	Prospect Slough		4.1		4.03		3.83	
9/2/94		bp1	Duck Slough	13.5		29.6		23.1		8.56
9/2/94		bp1/QA	Duck Slough	14.9		30.7		21.9		7.39
9/2/94		bp2	Duck Slough		3.58		4.56		4.08	
9/2/94		bp5	French Camp Slough	6.17		13.3		3.64		1.58
9/2/94		bp6	French Camp Slough		2.94		2.27		0.99	
9/2/94		bp3	Prospect Slough	8.16		13.3		9.58		2.24
9/2/94		bp3/QA	Prospect Slough	8.49		12.2		9.84		2.06
9/2/94		bp4	Prospect Slough		4.22		3.97		3.52	
10/5/94		bp36	5 mile		5.12		70.2		1.01	
10/5/94		bp96	Greene's Landing	4.99				4.16		4.48
10/19/94		aa36	Mokelumne River	2.15		7.29		0.73		0.28
11/4/94		aa27	S.J. River @ Antioch	3.69		7.23		2.31		0.36
11/4/94		aa28	S.J. River @ Antioch		2.19		2.97		0.71	
12/13/94	1245	400	Mokelumne River	3.97		52.8		3.54		0.67
12/13/94	1245	401	Mokelumne River		1.84		4.1		0.72	
12/13/94	1245	402	Mokelumne River		1.89		2		0.77	
12/13/94		aa29	Ulatis Creek	21.1		57.3		13.1		5.18
12/13/94		aa30	Ulatis Creek		3.89		18.5		0.65	
1/6/95	1500	bp44	Greene's Landing	5.54		10.2		3.71		1.2
1/6/95	1500	bp45	Greene's Landing		2.99		3.2		1.28	
1/7/95		bp46	Greene's Landing	9.02		17.9		7.2		3.48
1/7/95		bp47	Greene's Landing		3.93		3.75		1.98	
1/8/95	1330	bp48	Greene's Landing	10.6		19.7		11.4		3.91
1/8/95	1330	bp49	Greene's Landing		4.91		5.59		2.94	
1/9/95		bp53	Duck Slough		3.39		2.75		2.41	
1/10/95		bp52	Greene's Landing	28.4		62.9		29		11.2
1/10/95		bp53	Greene's Landing		4.9		5.99		3	
1/10/95		bp54	Prospect Slough	124		270		242		28.4
1/10/95		bp54/QA	Prospect Slough	162		328		271		41.2
1/11/95	1430	bp55	Greene's Landing	27.3		69.9		26.8		6.65
1/11/95	1430	bp56	Greene's Landing		5.05		5.92		3.45	
1/11/95	1630	bp59	Prospect Slough	86.9		172		168		16
1/12/95	1400	bp61	Greene's Landing	17.4		33.1		19.3		3.69
1/12/95	1400	bp62/QA	Greene's Landing	20		33.3		19		6.28

Date	Hour	Station #	Station Name	Total Cu	Dis Cu	Total Zn	Dis Zn	Total Cr	Dis Cr	Total Pb
1/12/95	1400	bp63	Greene's Landing		3.35		2.86		3.2	
1/12/95	1400	bp64/QA	Greene's Landing		4.9		4.11		3.04	
1/12/95	1030	bp60	Prospect Slough	34.4		66.3		57.6		7.81
1/13/95	1500	bp65	Greene's Landing	14.2		32.5		21		4.02
1/13/95	1500	bp66	Greene's Landing		3.67		6.32		4.78	
1/13/95	1000	bp67	Prospect Slough	17.9		42.4		32.7		3.65
1/14/95	1300	bp69	Greene's Landing	15.2		71.8		21.3		2.66
1/14/95	1300	bp70	Greene's Landing		3.94		11.2		4.42	
1/14/95	1000	bp68	Prospect Slough	40.3		84		58		13.5
1/15/95	1400	bp71	Greene's Landing	10.7		44.8		12.2		2.55
1/15/95	1400	bp72	Greene's Landing	10.9		48.2		13.3		28.7
1/15/95	1400	bp77	Greene's Landing		3.62		7.93		3.05	
1/15/95	1000	bp74	Prospect Slough	29.8		128		42.3		6.54
1/15/95	1000	bp75	Prospect Slough	28.9		128		42.5		6.15
1/17/95	1400	bp78	Greene's Landing	9.39		18.4		11.6		1.57
1/17/95	1400	bp79	Greene's Landing		3.6		9.4		3.4	
1/17/95	1000	bp80	Prospect Slough	19		78.9		27.1		2.95
1/18/95	1400	bp82	Greene's Landing	10.3		46.9		13.3		7.42
1/18/95	1400	bp83	Greene's Landing		3.68		4.68		3.83	
1/18/95	1100	bp81	Prospect Slough	24.3		103		32.9		4.82
1/20/95	1600	bp86	Greene's Landing	9.68		19.5		12.6		2.05
1/20/95	1600	bp87	Greene's Landing		4.28		4.84		3.43	
1/22/95	1430	bp90	Greene's Landing	9.98		23.3		12		1.75
1/22/95	1430	bp91	Greene's Landing		3.35		4.25		2.5	
1/22/95	1200	bp89	Prospect Slough	13.3		26.3		18.7		2.49
1/22/95	1100	bp88	Skag Slough	11.9		26.3		22.7		2.52
1/23/95	1500	cf500	Greene's Landing	9.43		25.4		8.57		3.24
1/23/95	1500	cf501	Greene's Landing		3.42		4.41		2.52	
1/23/95	1200	cf502	Prospect Slough	14.9		39.3		17.4		3
1/23/95	1000	cf503	Skag Slough	14.6		45.6		24.3		3.9
1/24/95	1600	cf504	Greene's Landing	8.27		11.3		8.44		1.55
1/24/95	1600	cf505	Greene's Landing		3.09		22.4		2.68	
1/25/95	1500	cf506	Greene's Landing	7.07		20.9		8.27		2.11
1/25/95	1500	cf507	Greene's Landing		2.88		5.06		4.43	
1/25/95	1000	cf508	Prospect Slough	9.06		28.3		9.56		1.26
1/25/95	1000	cf509	Prospect Slough		3.48		5.69		2.51	
1/26/95	1400	cf512	Greene's Landing	9.9		24.4		11		1.83
1/26/95	1500	cf513	Greene's Landing		3.16		4.86		2.07	
1/26/95	1600	cf510	Prospect Slough	15		36.3		21.6		2.53
1/26/95	1600	cf511	Prospect Slough		4.78		8.17		4.08	
1/27/95	1000	cf514	Greene's Landing	8.82		22.3		10.6		2.28
1/27/95	1000	cf515	Greene's Landing		3.27		6.06		4.46	
1/27/95	1530	cf516	Prospect Slough	12.3		31.9		19.2		2.07
1/28/95	1500	cf517	Greene's Landing	8.11		21.7		9.84		2.06
1/28/95	1500	cf518	Greene's Landing		2.77		5.9		2.07	
1/28/95	1200	cf519	Prospect Slough	12.5		32.8		17.6		2.11
1/28/95	1200	cf520	Prospect Slough		4.51		7.87		3.69	
1/28/95	1000	cf521	Skag Slough	13		30.3		20.1		2.19
1/29/95	1100	bp92	Greene's Landing	7.34		17.8		7.75		1.63
1/29/95	1100	bp93	Greene's Landing		2.89		4.34		2.13	
1/29/95		bp94	Greene's Landing		3		4.58		2.17	
1/30/95	1700	cf600	Greene's Landing	6.79		14.4		7.17		1.04
1/30/95	1700	cf601	Greene's Landing		2.87		2.47		1.75	
1/31/95	1600	cf602	Greene's Landing	7.02		14.6		6.77		1.04
1/31/95	1600	cf603	Greene's Landing	0.02		0.599		0.09		nd

Date	Hour	Station #	Station Name	Total Cu	Dis Cu	Total Zn	Dis Zn	Total Cr	Dis Cr	Total Pb
1/31/95	1600	cf604	Greene's Landing	7.04		16.7		6.27		1.31
1/31/95	1600	cf605/QA	Greene's Landing	7.36		12		6.41		1.99
1/31/95	1600	cf607	Greene's Landing	0.18		1.81		0.2		nd
1/31/95	1600	cf610	Greene's Landing		1.89		3.98		1.59	
1/31/95	1600	cf611	Greene's Landing	2.76		3.98		1.67		0.39
1/31/95	1200	cf606	Prospect Slough	9.73		23.3		11.5		1.45
2/1/95	1300	cf608	Greene's Landing	3.53		12.2		5.02		1.08
2/1/95	1600	cf609	Greene's Landing							
2/2/95	1600	cf612	Greene's Landing	5.9		13.3		4.88		0.86
2/3/95	1400	cf613	Greene's Landing	6.57		14.3		6.03		1.33
2/3/95	1000	cf614	Prospect Slough	8.69		19.9		10		1.12
2/5/95	1500	cf615	Chipps Island	7.96		16.2		7		1.18
2/5/95	1500	cf625	Chipps Island		3.13		4.37		1.7	
2/5/95	1300	cf616	Grizzly Bay	6.58		13.4		5.94		0.95
2/5/95	1300	cf623	Grizzly Bay		3.29		4.84		2.26	
2/5/95	1600	cf617	Martinez	7.15		17.9		6.69		1.01
2/5/95	1000	cf624a	Martinez	3.09		4.21		1.86		0.36
2/5/95	1000	cf624b/QA	Martinez	3.77		3.2		2.05		0.64
2/6/95	1600	cf619	Greene's Landing	6.45		14.5		5.78		1.11
2/6/95	1600	cf622	Greene's Landing		2.37		3.6		1.68	
2/6/95	1400	cf618	Prospect Slough	14.7		29.2		14.3		1.95
2/10/95	1600	cf701a	Greene's Landing	4.95		10.6		4.47		0.63
2/10/95	1600	cf701b/QA	Greene's Landing	5.4		8.38		3.95		1.04
2/10/95	1600	cf702a	Greene's Landing		2.49		2.41		1.41	
2/10/95	1300	cf702b/QA	Greene's Landing		2.54		1.98		1.37	
2/10/95	1400	cf700	Prospect Slough	7.34				7.65		0.76
2/14/95	1600	cf703	Greene's Landing	5.07				4.65		0.65
2/14/95	1300	cf704	Prospect Slough	8.22				10.5		4.2
2/14/95	1000	cf705	Skag Slough	3.89				5.74		0.5
2/17/95	1350	cf706	Greene's Landing	7.3				8.79		1.08
2/17/95	1100	cf707	Prospect Slough	5.72				8.08		0.75
2/21/95	1400	bp96	Greene's Landing	4.99				4.16		4.48
2/21/95	930	cf708	Greene's Landing	5.31				5.5		7.33
2/23/95	1600	bp97	Greene's Landing	4.78				3.93		1.56
2/24/95	900	cf711	Greene's Landing	4.08				3.9		6.94
2/28/95	2030	cf712	Greene's Landing	4.14				3.97		1.16
2/28/95	800	cf713	Prospect Slough	8.59				14.5		1.93
3/3/95	1530	cf714	Greene's Landing	4.75				4.44		2.86
3/5/95	1600	cf715	Greene's Landing	4.94				5.02		0.96
3/7/95		cf716	Greene's Landing	5.73				4.94		1
3/10/95	1330	bp102	Cottonwood Creek	89.8		189		170		20.9
3/10/95	1330	bp102	Cottonwood Creek	95		151		130		18.9
3/10/95		bp114	East Yolo Bypass	121		333		303		33.3
3/10/95	1115	bp106	Little Cow Cr. @ Dersch Br.	11.6		36.7		8.47		6.65
3/10/95	1115	bp106	Little Cow Cr. @ Dersch Br.	13.2		29.3		6.3		7.14
3/10/95	1240	bp108	Putah Creek @ Mace Blvd.	76.9		253		98.4		28
3/10/95	1430	bp105	Sac R. @ Bend Bdg	28.8		68.8		39.6		7.68
3/10/95	2000	bp100	Sac R. @ Colusa Bdg	58.1		129		94.8		12.1
3/10/95	1000	bp97	Sac R. @ Cypress Bdg	8.23		18.7		2.03		0.83
3/10/95	1830	bp98	Sac R. @ Old Ferry	46.8		97.2		75.7		10.2
3/10/95	1550	bp99	Sac R. @ Road a-8	70.4		157		150		15.7
3/10/95	1700	bp107	Sac R. @ Road a-9	56.6		134		99.6		12.9
3/10/95	800	bp103	Sac R. @ Shasta Dam	1.23		4.6		1.44		2.68
3/10/95	1230	bp104	Sac R. @ Balls Ferry Bdg	10.7		29.6		6.5		4.32
3/10/95	2230	bp101	Sacramento Slough	73.2		173		122		17.5

Date	Hour	Station #	Station Name	Total Cu	Dis Cu	Total Zn	Dis Zn	Total Cr	Dis Cr	Total Pb
3/10/95		bp112	Skag Slough	5.22		15.3		4.82		4.66
3/10/95		bp113	West Yolo bypass	43		144		90		15.6
3/11/95	1530	bp110	American River @ Sac State	1.15		3.87		1.28		0.44
3/11/95	1200	bp109	Cache Creek 102	130		311		312		30
3/11/95	1200	bp109	Cache Creek 102	151		266		270		31.2
3/11/95	1630	bp111	Feather River @ Hwy 99	4.54		6.29		3.14		0.72
3/11/95	1300	CF 800	Greene's Landing	8.6		19.8		13.8		3.04
3/11/95	1500	CF 801	Mokelumne River	4.31		16.1		2.41		4.66
3/11/95	1500	CF 801	Mokelumne River	4.79		6.27		3.86		3.19
3/11/95	1600	CF 802	S.J. River @ Vernalis	34.1		107		69.1		17.6
3/13/95	1100	CF 803	Sutter Bypass	12		24.8		17.6		4.88
3/13/95		bp117	Sycamore		5.4		18.4		0.39	
3/14/95		bp115	Greene's Landing	6.92		11		8.87		2.86
3/21/95	1800	CF 807	Prospect Slough	10		20.5		13.3		3.45
3/22/95	1700	CF 808	Greene's Landing	3.54		7.92		6.4		2.96
3/22/95	1700	CF 811	Greene's Landing	4.79		6.27		3.86		3.19
3/22/95	1000	CF 809	Mokelumne River	4.26		18.2		2.1		0.89
3/22/95	1000	CF 809	Mokelumne River	4.72		13.3		1.93		1.3
3/22/95	1400	CF 810	S.J. River @ Vernalis	2.89		5.87		2.11		5.43

Date	Hour	Station #	Station Name	Dis Pb	Total Cd	Dis Cd	Total Ni	Dis Ni	Total As	Dis As
1/11/93		GL 22	Greene's Landing		0.04		2.1			
1/13/93		GL 23	Greene's Landing	0.08		0.03		0.75		
1/14/93		GL 24	Greene's Landing		0.05		1.59			
3/23/93	1030	3	Sac R.- depth 1		0.12		17.2			
3/23/93	1030	1	Sac R.- surface 1		0.099		11.6			
3/23/93	1030	2	Sac R.- surface 2	0.21		0.009		1.65		
3/23/93	1030	4	Sac. R.- depth 2	0.26		0.02		2.15		
4/13/93	1700	36	Sac. River @ Delta			0.02		4.15		
7/7/93	1510	135	Middle R. @ Bullfrog Ldg.		0.007		2.62			
7/7/93	1510	136	Middle R. @ Bullfrog Ldg.	0.1				1.04		
7/7/93	1750	149	S.J. River @ Vernalis		0.015		11.2			
7/7/93	1750	150	S.J. River @ Vernalis					2.23		
7/19/93	1038	151	S.J. River @ Antioch		0.03		5.91			
7/19/93	1038	152	S.J. River @ Antioch	0.08		0.013		1.47		
7/19/93	1300	153	Sac. River @ Hood		0.041		4.19			
7/19/93	1300	154	Sac. River @ Hood	0.06		nd		0.7		
7/20/93		F1	Sac R. @ Rio Vista		0.04		4.97			
7/20/93		F2	Sac R. @ Rio Vista	0.1		0.01		1.35		
7/20/93		F3	Sac R. @ Rio Vista	0.08		0.015		1.02		
8/3/93	1311	193	Mokelumne River		0.022		0.75			
8/3/93	1311	194	Mokelumne River	0.08		0.013		0.31		
8/3/93		F-11	Sac R. @ Rio Vista	0.18		0.024		1.71		
8/3/93		F-12	Sac R. @ Rio Vista		0.031		2.89			
8/3/93		F-10/QC	Sac. River @ Hood		0.039		4.3			
8/3/93		F-8	Sac. River @ Hood	0.05		0.015		0.84		
8/3/93		F-9	Sac. River @ Hood		0.037		4.81			
8/17/93	1200	207	Middle R. @ Bullfrog Ldg.		0.456		38.8			
8/17/93	1200	208	Middle R. @ Bullfrog Ldg.	0.22				1.22		
8/17/93	1450	221	S.J. River @ Vernalis		0.011		8.9			
8/17/93	1450	222	S.J. River @ Vernalis					1.7		
9/14/93	1200	246	Mokelumne River		0.031		1.23			
9/14/93	1200	247	Mokelumne River		0.026		1.11			
9/14/93	1200	248	Mokelumne River	0.1		0.011		0.39		
9/14/93		13 CF	Sac R. @ Rio Vista		0.035		3.24			
9/14/93		14 CF	Sac R. @ Rio Vista	0.03		0.017		1.22		
9/14/93		15 CF	Sac R. @ Rio Vista	0.09		0.014		1.1		
9/14/93		16 CF	Sac. River @ Hood		0.038		3.76			
9/14/93		17 CF	Sac. River @ Hood	0.03		0.026		0.96		
10/4/93	2030	269	Sac. River @ Freeport	0.13		0.029		1.62		
10/4/93	2030	270	Sac. River @ Freeport		0.015		0.54			
10/4/93	1100	272	Sac. River @ Freeport		0.044		1.71			
10/4/93		271			0.022		1.51			
10/4/93		273			0.036		1.8			
10/14/93	1251	298	Mokelumne River		0.017		0.92			
10/14/93	1251	299	Mokelumne River	0.07		0.01		0.31		
10/14/93		18 CF	Sac R. @ Rio Vista		0.035		3.62			
10/14/93		19 CF	Sac R. @ Rio Vista	0.04		0.025		0.85		
10/14/93		20 CF	Sac. River @ Hood		0.036		2.3			
10/14/93		21 CF	Sac. River @ Hood	nd		0.012		0.63		
10/14/93		22 CF	Sac. River @ Hood	0.06		0.014		0.67		
10/29/93	1030	312	Middle R. @ Bullfrog Ldg.		0.01		1.07			
10/29/93	1030	313	Middle R. @ Bullfrog Ldg.			0.005		0.71		
10/29/93		23 CF	S.J. River @ Antioch		0.014		3.21			
10/29/93		24 CF/QC	S.J. River @ Antioch		0.017		1.61			
10/29/93		25 CF/QC	S.J. River @ Antioch	0.25		0.018		2.73		

Date	Hour	Station #	Station Name	Dis Pb	Total Cd	Dis Cd	Total Ni	Dis Ni	Total As	Dis As
10/29/93		26 CF	S.J. River @ Stockton		0.009		1.66			
10/29/93		27 CF	S.J. River @ Stockton		0.014		1.71			
10/29/93		28 CF	S.J. River @ Stockton	0.23		0.006		1.29		
10/29/93		323	S.J. River @ Vernalis		0.02		4.03			
10/29/93		324	S.J. River @ Vernalis	0.04		0.008		1.13		
11/10/93		29 CF	Greene's Landing		0.04		2.43			
11/10/93		30 CF A	Greene's Landing	0.13		0.15		0.87		
11/10/93		30 CF B	Greene's Landing	0.16		0.14		0.86		
11/11/93		31 CF	Greene's Landing		0.05		1.79			
11/11/93		32 CF	Greene's Landing	0.17		0.1		0.76		
11/11/93		33 CF	Greene's Landing		0.06		1.54			
11/11/93		34 CF	Greene's Landing	0.72		0.35		3.36		
11/11/93		35 CF	Greene's Landing		0.05		2.22			
11/11/93		36CF	Greene's Landing	0.2		0.04		0.9		
11/12/93		37 CF A	Greene's Landing		0.05		2.65			
11/12/93		37 CF B	Greene's Landing		0.05		2.35			
11/12/93		38 CF	Greene's Landing		0.15		2.17			
11/12/93		39 CF	Greene's Landing	0.13		0.04		0.13		
11/29/93		40 CF	S.J. River @ Antioch		0.02		2.97			
11/29/93		41 CF	S.J. River @ Stockton		0.03		1.94			
12/13/93		42 CF	Sac R. @ Rio Vista		0.03		2.88			
12/13/93		43 CF	Sac R. @ Rio Vista	0.04		0.01		0.87		
12/13/93		44 CF	Sac. River @ Hood		0.08		4.52			
12/13/93		44 CF	Sac. River @ Hood		0.07		4.81			
12/13/93		45 CF	Sac. River @ Hood	0.04		0.01		0.87		
1/10/94		GL 21	Greene's Landing	0.01		nd		0.64		
1/10/94		46 CF	S.J. River @ Antioch		0.02		3.42			
1/10/94		47 CF	S.J. River @ Antioch	0.04		0.04		0.98		
1/10/94		48 CF	S.J. River @ Stockton		0.02		2.52			
1/10/94		48 CF	S.J. River @ Stockton		0.02		2.3			
1/10/94		49 CF	S.J. River @ Stockton					2.07		
1/11/94	914	410	Middle R. @ Bullfrog Ldg.		0.02		2.16			
1/11/94	914	411	Middle R. @ Bullfrog Ldg.		0.01		0.84			
1/11/94	914	412	Middle R. @ Bullfrog Ldg.	0.06		0.02		1.52		
1/11/94	914	425	S.J. River @ Vernalis					0.95		
1/11/94	914	426	S.J. River @ Vernalis	0.15		0.001		1.93		
1/11/94	914	427	S.J. River @ Vernalis		0.01		2			
1/13/94		66	Greene's Landing	0.47		0.03		3.6		
1/13/94		65 A	Greene's Landing		0.09		6.73			
1/13/94		65 B	Greene's Landing		0.09		6.5			
1/18/94		25	Greene's Landing		0.01		0.55			
1/19/94		24	Greene's Landing		0.03		1.39			
1/23/94		27	Greene's Landing	0.06		0.02		0.76		
1/24/94		26	Greene's Landing		0.08		2.63			
1/24/94		29	Greene's Landing	0.07		nd		0.67		
1/25/94		28	Greene's Landing		0.04		2.24			
1/26/94		30	Greene's Landing		0.05		3.71			
1/26/94		31	Greene's Landing	0.23		0.01		1.17		
1/27/94		33	Greene's Landing	0.22		0.01		1.21		
1/28/94		32	Greene's Landing		0.09		6.35			
1/28/94		35	Greene's Landing		0.1		7.59			
1/28/94		36	Greene's Landing	0.26		0.02		2.3		
1/29/94	900	40	Greene's Landing	0.22		0.01		1.89		
1/30/94		38	Greene's Landing		0.06		5.33			
1/30/94	1000	42	Greene's Landing	0.25		0.01		2.09		

Date	Hour	Station #	Station Name	Dis Pb	Total Cd	Dis Cd	Total Ni	Dis Ni	Total As	Dis As
1/31/94		41	Greene's Landing		0.06		4.18			
2/1/94		44	Greene's Landing		0.02		2.56			
2/1/94		48	Greene's Landing	0.14		0.01		1.61		
2/2/94		43	Greene's Landing		0.05		2.97			
2/5/94	1700	55	Greene's Landing	0.39		0.01		1.36		
2/7/94		50	Greene's Landing		nd		nd			
2/7/94		53	Greene's Landing	0.12		nd		0.87		
2/8/94		51	Greene's Landing		nd		nd			
2/8/94		52	Greene's Landing		0.04		2.2			
2/9/94		54	Greene's Landing		0.09		5.77			
2/10/94		56	Greene's Landing		0.19		19.5			
2/10/94	930	58	Greene's Landing	0.46		0.04		3.79		
2/11/94	1000	61	Greene's Landing	0.46		0.03		4.01		
2/11/94	1600	62	Greene's Landing		nd		nd			
2/12/94		60	Greene's Landing		0.12		10.8			
2/16/94	700	63	Greene's Landing		0.07		7.09			
2/16/94	700	64	Greene's Landing							
2/17/94		67	Greene's Landing		0.06		4			
2/17/94		68	Greene's Landing	0.21		0.02		1.89		
2/18/94	1200	70	Greene's Landing	0.2		0.02		1.39		
2/19/94		69	Greene's Landing		0.05		4.52			
2/19/94	1400	72	Greene's Landing	0.18		0.02		1.85		
2/19/94	1400	71 A	Greene's Landing		0.07		5.91			
2/19/94	1400	71 B	Greene's Landing		0.07		5.55			
2/20/94	1550	74	Greene's Landing	0.18		0.03		1.98		
2/21/94		73	Greene's Landing		0.1		8.41			
2/21/94	1600	76	Greene's Landing	0.35		0.02		3.4		
2/22/94		75	Greene's Landing		0.1		9.4			
2/22/94		77	Greene's Landing		0.13		13.7			
2/22/94	1600	79	Greene's Landing	0.34		0.01		2		
2/23/94		81	Greene's Landing		0.13		19			
2/23/94	1700	82	Greene's Landing			0.03		2.02		
2/24/94		83	Greene's Landing		0.03		4.62			
2/24/94	1700	84	Greene's Landing	0.52		0.03		4.62		
2/25/94		85	Greene's Landing		0.07		7.4			
2/25/94	1800	86	Greene's Landing	0.3		0.02		2.31		
2/27/94		87	Greene's Landing		0.1		9.25			
2/28/94		89	Greene's Landing		0.06		5.69			
2/28/94	1200	90	Greene's Landing	0.25		0.03		1.92		
3/1/94		91	Greene's Landing		0.05		3.73			
3/1/94		93	Greene's Landing	0.16		0.02		1.59		
3/4/94		95	Greene's Landing		0.06		4.07			
3/4/94	1200	96	Greene's Landing	0.1		0.03		1.13		
3/9/94	1130	100	Greene's Landing							
3/9/94	1130	101	Greene's Landing							
3/9/94	1130	102	Greene's Landing		0.01					
3/9/94	1130	103	Greene's Landing							
3/9/94	1130	104	Greene's Landing		0.36		1.12			
3/9/94	1130	107	Greene's Landing		0.41		0.96			
3/9/94	1130	105a	Greene's Landing		0.42		1			
3/9/94	1130	105b	Greene's Landing		0.43		0.98			
3/9/94	1130	106a	Greene's Landing		0.42		1.05			
3/9/94	1130	106b	Greene's Landing		0.42		0.95			
3/10/94		108	Greene's Landing		0.04		3.49			
3/10/94	1800	109	Greene's Landing	0.08		0.01		1.25		

Date	Hour	Station #	Station Name	Dis Pb	Total Cd	Dis Cd	Total Ni	Dis Ni	Total As	Dis As
3/15/94		110	Greene's Landing		0.01					
3/15/94		111	Greene's Landing		0.52		1.03			
3/15/94		112	Greene's Landing		0.26		0.52			
3/15/94		113	Greene's Landing		0.68		1.6			
3/15/94		113	Greene's Landing		0.74		1.54			
3/15/94	1800	115	Greene's Landing	0.06		0.02		0.94		
3/16/94		114	Greene's Landing		0.06		2.4			
3/16/94	1100	116	Greene's Landing							
3/16/94		117	Greene's Landing		0.01		0.32			
3/16/94		118	Greene's Landing	0.02		0.01				
3/16/94		119	Greene's Landing		0.54		0.99			
3/16/94		120	Greene's Landing		0.54		1.03			
3/16/94		121	Greene's Landing	0.53		0.55		0.92		
3/16/94		122	Greene's Landing	0.36		0.41		0.84		
3/23/94		aa33	French Camp Slough		0.044		3.33		1.49	
3/23/94		aa34	French Camp Slough	0.41		0.011		1.29		1.33
3/23/94		aa31	Ulatis Creek		0.027		5.69		1.78	
3/23/94		aa32	Ulatis Creek	0.07		0.018		3.65		1.62
4/12/94	1400	474	Mokelumne River		0.013		1.73			
4/12/94	1400	475	Mokelumne River	0.1		0.005		0.55		
4/12/94	1200	104CF	Sac R. @ Rio Vista		0.024		2.99			
4/12/94	1200	105CF	Sac R. @ Rio Vista	0.08		0.019		1.21		
4/12/94	900	100CF	Sac. River @ Hood		0.027		2.02			
4/12/94	900	101CF	Sac. River @ Hood		0.033		1.64			
4/12/94	900	102CF	Sac. River @ Hood	0.07		0.015		0.92		
4/12/94	900	103CF	Sac. River @ Hood	0.075		0.015		0.75		
4/27/94	1300	497	Middle R. @ Bullfrog Ldg.		0.01		1.98			
4/27/94	1300	498	Middle R. @ Bullfrog Ldg.	0.06		0.007		1.41		
4/27/94	900	106CF	S.J. River @ Antioch		0.031		5.15			
4/27/94	900	107CF	S.J. River @ Antioch		0.029		4.15			
4/27/94	900	108CF	S.J. River @ Antioch	0.12		0.013		1.98		
4/27/94	900	109 cf	S.J. River @ Antioch	0.13		0.016		1.43		
4/27/94	900	110CF	S.J. River @ Stockton		0.021		2.17			
4/27/94	900	111CF	S.J. River @ Stockton	0.16		0.01		1.84		
4/27/94	930	480	S.J. River @ Vernalis							
4/27/94	930	481	S.J. River @ Vernalis							
4/27/94	930	482	S.J. River @ Vernalis		0.014		5.53			
4/27/94	930	483	S.J. River @ Vernalis	0.07				0.97		
4/27/94	930	484	S.J. River @ Vernalis	0.09		0.002		0.88		
4/30/94		aa1	Paradise Cut	nd		0.008		2.07		1.24
5/10/94		aa6	Duck Slough		0.069		24.1		2.06	
5/10/94		aa7	Duck Slough	1.05		0.012		8.52		1.09
5/10/94	930	GL 201	Greene's Landing	0.1		0.032		1.23		0.71
5/10/94		gl200	Greene's Landing		0.104		9.27		0.83	
5/10/94		gl201	Greene's Landing	0.1		0.032		1.23		0.71
5/10/94	1200	541	Mokelumne River		0.012		1.48		1.27	
5/10/94	1200	541/QA	Mokelumne River		0.006		1.19		1.22	
5/10/94		aa3	Paradise Cut		0.018		3.79		0.11	
5/10/94		aa4	Paradise Cut	nd		0.008		1.83		0.24
5/10/94		114cf	Sac R. @ Rio Vista		0.028		3.45		2.2	
5/10/94		115cf	Sac R. @ Rio Vista	0.09		0.015		1.43		1.9
5/10/94		112cf	Sac. River @ Hood		0.036		2.34		1.72	
5/10/94		112cf/QA	Sac. River @ Hood		0.026		1.83		1.61	
5/10/94		113cf	Sac. River @ Hood	0.09		0.016		1		1.84
5/25/94		aa10	Old River @ Tracy Blvd.	0.12		0.014		3.01		1

Date	Hour	Station #	Station Name	Dis Pb	Total Cd	Dis Cd	Total Ni	Dis Ni	Total As	Dis As
5/25/94		aa9	Old River @ Tracy Blvd.		0.02		2.82		0.98	
5/25/94		aa35	Paradise Cut	0.04		0.009		2.12		1.4
5/25/94		aa8	Paradise Cut	nd		nd		2.29		1.34
6/3/94		aa11	Old River @ Tracy Blvd.		0.023		3.28		0.81	
6/3/94		aa12	Old River @ Tracy Blvd.	0.05		0.008		1		1.58
6/3/94		aa14	Paradise Cut		0.019		4.75		1.74	
6/3/94		aa15	Paradise Cut	0.07		0.008		2.38		1
7/12/94		aa21	Duck Slough		0.081		28.8		1.58	
7/12/94		aa22	Duck Slough	0.88		0.035		6.85		1.32
7/12/94		aa19	Paradise Cut		0.025		8.59		3.15	
7/12/94		aa20	Paradise Cut	0.05		0.007		2.16		2.27
7/12/94		aa23	Prospect Slough		0.035		15.3		1.06	
7/12/94		aa24	Prospect Slough	0.4		0.017		5.36		1
7/21/94		aa25a	Mokelumne River	0.08		0.017		0.44		0.6
7/21/94		aa25b/QA	Mokelumne River	0.1		0.008		0.47		0.45
7/21/94		aa26a	Mokelumne River		0.024		0.68		0.5	
7/21/94		aa26b/QA	Mokelumne River		0.022		0.63		0.63	
8/9/94		bp 27	Duck Slough		0.066		31.4		2.4	
8/9/94		bp 28	Duck Slough	1.38		0.011		8		2.05
8/9/94		bp 29	Prospect Slough		0.03		15.7		1.67	
8/9/94		bp 30	Prospect Slough	0.41		0.023		7.04		1.93
9/2/94		bp1	Duck Slough		0.071		35.8		2.21	
9/2/94		bp1/QA	Duck Slough		0.064		34.3		3.98	
9/2/94		bp2	Duck Slough	1.08		0.021		5.16		2.17
9/2/94		bp5	French Camp Slough		0.038		2.15		2.71	
9/2/94		bp6	French Camp Slough	0.37		0.014		0.99		2.4
9/2/94		bp3	Prospect Slough		0.036		18.3		2.1	
9/2/94		bp3/QA	Prospect Slough		0.031		18.5		3.24	
9/2/94		bp4	Prospect Slough	0.73		0.021		6.12		2.04
10/5/94		bp36	5 mile	3.87		0.081		5.29		3.03
10/5/94		bp96	Greene's Landing		0.048		7.04			
10/19/94		aa36	Mokelumne River		0.019		0.83			
11/4/94		aa27	S.J. River @ Antioch		0.012		4.2		0.41	
11/4/94		aa28	S.J. River @ Antioch	0.09		0.014		2.12		0.13
12/13/94	1245	400	Mokelumne River		0.02		3.34			
12/13/94	1245	401	Mokelumne River	0.18		0.01		1.34		
12/13/94	1245	402	Mokelumne River	0.18		0.01		1.33		
12/13/94		aa29	Ulatis Creek		0.126		16.2		1.22	
12/13/94		aa30	Ulatis Creek	0.2		0.043		3.45		1.39
1/6/95	1500	bp44	Greene's Landing		0.063		6.02		1.52	
1/6/95	1500	bp45	Greene's Landing	0.45		0.028		2.19		1.41
1/7/95		bp46	Greene's Landing		0.118		10.5		1.2	
1/7/95		bp47	Greene's Landing	0.78		0.028		2.97		
1/8/95	1330	bp48	Greene's Landing		0.108		16		0.3	
1/8/95	1330	bp49	Greene's Landing	0.77		0.038		4.51		0.45
1/9/95		bp53	Duck Slough	0.37		0.021		6.35		
1/10/95		bp52	Greene's Landing		0.474		3.16			
1/10/95		bp53	Greene's Landing	0.81		0.039		4.31		1.37
1/10/95		bp54	Prospect Slough		0.568		601		0.6	
1/10/95		bp54/QA	Prospect Slough		0.52		587			
1/11/95	1430	bp55	Greene's Landing		0.329		28.3		2.97	
1/11/95	1430	bp56	Greene's Landing	0.99		0.045		3.97		0.88
1/11/95	1630	bp59	Prospect Slough		0.229		417		1.46	
1/12/95	1400	bp61	Greene's Landing		0.184		27.1		1.32	
1/12/95	1400	bp62/QA	Greene's Landing		0.19		25.7			

Date	Hour	Station #	Station Name	Dis Pb	Total Cd	Dis Cd	Total Ni	Dis Ni	Total As	Dis As
1/12/95	1400	bp63	Greene's Landing	0.53		0.034		8.5		1.19
1/12/95	1400	bp64/QA	Greene's Landing	0.99		0.04		4.85		
1/12/95	1030	bp60	Prospect Slough		0.181		103		1.5	
1/13/95	1500	bp65	Greene's Landing		0.166		23.6		1.09	
1/13/95	1500	bp66	Greene's Landing	0.65		0.035		4.78		1.14
1/13/95	1000	bp67	Prospect Slough		0.163		38		1.63	
1/14/95	1300	bp69	Greene's Landing		0.167		26.9		2.45	
1/14/95	1300	bp70	Greene's Landing	0.8		0.018		6.02		0.84
1/14/95	1000	bp68	Prospect Slough		0.224		79.2		1.2	
1/15/95	1400	bp71	Greene's Landing		0.114		13.8		0.9	
1/15/95	1400	bp72	Greene's Landing		0.124		14.9		0.31	
1/15/95	1400	bp77	Greene's Landing	0.48		0.031		19.1		0.91
1/15/95	1000	bp74	Prospect Slough		0.203		53.7		2.48	
1/15/95	1000	bp75	Prospect Slough		0.197		62.8		2.27	
1/17/95	1400	bp78	Greene's Landing		0.087		24.8		0.72	
1/17/95	1400	bp79	Greene's Landing	0.49		0.002		26		1.12
1/17/95	1000	bp80	Prospect Slough		0.087		36.6		3.32	
1/18/95	1400	bp82	Greene's Landing		0.09		23.7		0.61	
1/18/95	1400	bp83	Greene's Landing	0.52		0.033		6.21		1.06
1/18/95	1100	bp81	Prospect Slough		0.17		45.1		4.41	
1/20/95	1600	bp86	Greene's Landing		0.089		18		1.2	
1/20/95	1600	bp87	Greene's Landing	0.54		0.11		6.33		1.07
1/22/95	1430	bp90	Greene's Landing		0.095		16.2		1.4	
1/22/95	1430	bp91	Greene's Landing	0.4		0.025		3.75		1.36
1/22/95	1200	bp89	Prospect Slough		0.092		27.3		1.07	
1/22/95	1100	bp88	Skag Slough		0.068		33.9		2.54	
1/23/95	1500	cf500	Greene's Landing		0.087		13.1		1.22	
1/23/95	1500	cf501	Greene's Landing	0.43		0.024		4.45		1.09
1/23/95	1200	cf502	Prospect Slough		0.104		28.8		1.18	
1/23/95	1000	cf503	Skag Slough		0.068		41.9		3.08	
1/24/95	1600	cf504	Greene's Landing		0.084		11.8		1.07	
1/24/95	1600	cf505	Greene's Landing	0.36		0.027		3.46		1.25
1/25/95	1500	cf506	Greene's Landing		0.08		12		1.52	
1/25/95	1500	cf507	Greene's Landing	0.4		0.025		4.07		1.14
1/25/95	1000	cf508	Prospect Slough		0.075		16.7		1.81	
1/25/95	1000	cf509	Prospect Slough	0.38		0.023		4.39		1.43
1/26/95	1400	cf512	Greene's Landing		0.111		17.4		1.59	
1/26/95	1500	cf513	Greene's Landing	0.35		0.032		4.34		1.25
1/26/95	1600	cf510	Prospect Slough		0.107		36.6		nd	
1/26/95	1600	cf511	Prospect Slough	0.57		0.064		7.28		1.51
1/27/95	1000	cf514	Greene's Landing		0.08		16.2		1.08	
1/27/95	1000	cf515	Greene's Landing	0.46		0.033		4.06		1.18
1/27/95	1530	cf516	Prospect Slough		0.096		28.3		1.48	
1/28/95	1500	cf517	Greene's Landing		0.082		15.7		1.24	
1/28/95	1500	cf518	Greene's Landing	0.41		0.073		4.34		1
1/28/95	1200	cf519	Prospect Slough		0.111		29.3		0.99	
1/28/95	1200	cf520	Prospect Slough	0.57		0.064		6.75		1.45
1/28/95	1000	cf521	Skag Slough		0.12		37.2		1.48	
1/29/95	1100	bp92	Greene's Landing		0.105		10.8		1.13	
1/29/95	1100	bp93	Greene's Landing	0.34		0.034		3.95		1.22
1/29/95		bp94	Greene's Landing	0.41		0.039		3.72		0.94
1/30/95	1700	cf600	Greene's Landing		0.054		11.3		1.18	
1/30/95	1700	cf601	Greene's Landing	0.24		0.021		3.11	1	
1/31/95	1600	cf602	Greene's Landing		0.104		10.6		1.54	
1/31/95	1600	cf603	Greene's Landing		nd		0.18		nd	

Date	Hour	Station #	Station Name	Dis Pb	Total Cd	Dis Cd	Total Ni	Dis Ni	Total As	Dis As
1/31/95	1600	cf604	Greene's Landing		0.057		10.6		1.54	
1/31/95	1600	cf605/QA	Greene's Landing		0.05		10			
1/31/95	1600	cf607	Greene's Landing		0.008		0.91			
1/31/95	1600	cf610	Greene's Landing	0.37		0.02		2.99		
1/31/95	1600	cf611	Greene's Landing		0.027		2.71			
1/31/95	1200	cf606	Prospect Slough		0.065		14.8			
2/1/95	1300	cf608	Greene's Landing		0.07		6.61			
2/1/95	1600	cf609	Greene's Landing							
2/2/95	1600	cf612	Greene's Landing		0.042		5.92			
2/3/95	1400	cf613	Greene's Landing		0.062		8.45			
2/3/95	1000	cf614	Prospect Slough		0.07		13.5			
2/5/95	1500	cf615	Chipps Island		0.065		11.5			
2/5/95	1500	cf625	Chipps Island	0.43		0.039		2.67		
2/5/95	1300	cf616	Grizzly Bay		0.045		9.64			
2/5/95	1300	cf623	Grizzly Bay	0.31		0.024		3.27		
2/5/95	1600	cf617	Martinez		0.056		10.9			
2/5/95	1000	cf624a	Martinez		0.035		3.12			
2/5/95	1000	cf624b/QA	Martinez		0.03		3.88			
2/6/95	1600	cf619	Greene's Landing		0.051		8.63			
2/6/95	1600	cf622	Greene's Landing	0.25		0.032		2.44		
2/6/95	1400	cf618	Prospect Slough		0.082		21.3			
2/10/95	1600	cf701a	Greene's Landing		0.057		7.1			
2/10/95	1600	cf701b/QA	Greene's Landing		0.04		6.33			
2/10/95	1600	cf702a	Greene's Landing	0.18		0.012		2.23		
2/10/95	1300	cf702b/QA	Greene's Landing	0.29		0.02		2.15		
2/10/95	1400	cf700	Prospect Slough		0.068		11.4			
2/14/95	1600	cf703	Greene's Landing		0.056		6.71			
2/14/95	1300	cf704	Prospect Slough		0.084		15.8			
2/14/95	1000	cf705	Skag Slough		0.026		11.1			
2/17/95	1350	cf706	Greene's Landing		0.11		12.3			
2/17/95	1100	cf707	Prospect Slough		0.036		13.8			
2/21/95	1400	bp96	Greene's Landing		0.048		7.04			
2/21/95	930	cf708	Greene's Landing		0.069		7.49			
2/23/95	1600	bp97	Greene's Landing		0.053		6.31			
2/24/95	900	cf711	Greene's Landing		0.057		4.59			
2/28/95	2030	cf712	Greene's Landing		0.045		5.85			
2/28/95	800	cf713	Prospect Slough		0.065		28.3			
3/3/95	1530	cf714	Greene's Landing		0.066		5.79			
3/5/95	1600	cf715	Greene's Landing		0.076		6.56			
3/7/95		cf716	Greene's Landing		0.052		6.18			
3/10/95	1330	bp102	Cottonwood Creek		0.416		233			
3/10/95	1330	bp102	Cottonwood Creek		0.29		189			
3/10/95		bp114	East Yolo Bypass		0.438		600			
3/10/95	1115	bp106	Little Cow Cr. @ Dersch Br.		0.123		7.98			
3/10/95	1115	bp106	Little Cow Cr. @ Dersch Br.		0.105		6.2			
3/10/95	1240	bp108	Putah Creek @ Mace Blvd.		0.47		88.1			
3/10/95	1430	bp105	Sac R. @ Bend Bdg		0.2		52			
3/10/95	2000	bp100	Sac R. @ Colusa Bdg		0.409		266			
3/10/95	1000	bp97	Sac R. @ Cypress Bdg		0.11		2.3			
3/10/95	1830	bp98	Sac R. @ Old Ferry		0.296		251			
3/10/95	1550	bp99	Sac R. @ Road a-8		0.371		492			
3/10/95	1700	bp107	Sac R. @ Road a-9		0.377		112			
3/10/95	800	bp103	Sac R. @ Shasta Dam		0.026		2.36			
3/10/95	1230	bp104	Sac R. @ Balls Ferry Bdg		0.154		7.41			
3/10/95	2230	bp101	Sacramento Slough		0.433		120			

Date	Hour	Station #	Station Name	Dis Pb	Total Cd	Dis Cd	Total Ni	Dis Ni	Total As	Dis As
3/10/95		bp112	Skag Slough		0.057		14.1			
3/10/95		bp113	West Yolo bypass		0.311		165			
3/11/95	1530	bp110	American River @ Sac State		0.017		2.17			
3/11/95	1200	bp109	Cache Creek 102		0.495		651			
3/11/95	1200	bp109	Cache Creek 102		0.311		653			
3/11/95	1630	bp111	Feather River @ Hwy 99		0.026		4.06			
3/11/95	1300	CF 800	Greene's Landing		0.16		13.2			
3/11/95	1500	CF 801	Mokelumne River		0.066		2.61			
3/11/95	1500	CF 801	Mokelumne River		0.033		5.72			
3/11/95	1600	CF 802	S.J. River @ Vernalis		0.169		128			
3/13/95	1100	CF 803	Sutter Bypass		0.068		20.4			
3/13/95		bp117	Sycamore					2.86		
3/14/95		bp115	Greene's Landing		0.056		11.1			
3/21/95	1800	CF 807	Prospect Slough		0.072		19.3			
3/22/95	1700	CF 808	Greene's Landing		0.029		5.76			
3/22/95	1700	CF 811	Greene's Landing		0.033		5.72			
3/22/95	1000	CF 809	Mokelumne River		0.095		2.47			
3/22/95	1000	CF 809	Mokelumne River		0.084		1.72			
3/22/95	1400	CF 810	S.J. River @ Vernalis		0.024		3.97			

Date	Hour	Station #	Station Name	Total Ag	Dis Ag	Total Fe	Dis Fe	Hardness
1/11/93		GL 22	Greene's Landing		0.013			
1/13/93		GL 23	Greene's Landing		0.008			
1/14/93		GL 24	Greene's Landing	0.014				
3/23/93	1030	3	Sac R.- depth 1			4600		
3/23/93	1030	1	Sac R.- surface 1			3600		
3/23/93	1030	2	Sac R.- surface 2				410	
3/23/93	1030	4	Sac. R.- depth 2				600	
4/13/93	1700	36	Sac. River @ Delta					
7/7/93	1510	135	Middle R. @ Bullfrog Ldg.	0.013				74
7/7/93	1510	136	Middle R. @ Bullfrog Ldg.		0.005			74
7/7/93	1750	149	S.J. River @ Vernalis	0.015				146
7/7/93	1750	150	S.J. River @ Vernalis					146
7/19/93	1038	151	S.J. River @ Antioch	0.01				78
7/19/93	1038	152	S.J. River @ Antioch					78
7/19/93	1300	153	Sac. River @ Hood	0.009				48
7/19/93	1300	154	Sac. River @ Hood		0.003			48
7/20/93		F1	Sac R. @ Rio Vista	0.009				44
7/20/93		F2	Sac R. @ Rio Vista		nd			44
7/20/93		F3	Sac R. @ Rio Vista		<0.002			44
8/3/93	1311	193	Mokelumne River	0.003				36
8/3/93	1311	194	Mokelumne River		nd			36
8/3/93		F-11	Sac R. @ Rio Vista		0.006			64
8/3/93		F-12	Sac R. @ Rio Vista	0.007				64
8/3/93		F-10/QC	Sac. River @ Hood					66
8/3/93		F-8	Sac. River @ Hood		0.004			66
8/3/93		F-9	Sac. River @ Hood	0.011				66
8/17/93	1200	207	Middle R. @ Bullfrog Ldg.					48
8/17/93	1200	208	Middle R. @ Bullfrog Ldg.					48
8/17/93	1450	221	S.J. River @ Vernalis					136
8/17/93	1450	222	S.J. River @ Vernalis					136
9/14/93	1200	246	Mokelumne River					32
9/14/93	1200	247	Mokelumne River					32
9/14/93	1200	248	Mokelumne River					32
9/14/93		13 CF	Sac R. @ Rio Vista	0.006				64
9/14/93		14 CF	Sac R. @ Rio Vista	nd				64
9/14/93		15 CF	Sac R. @ Rio Vista		<0.002			64
9/14/93		16 CF	Sac. River @ Hood					64
9/14/93		17 CF	Sac. River @ Hood					64
10/4/93	2030	269	Sac. River @ Freeport					80
10/4/93	2030	270	Sac. River @ Freeport					80
10/4/93	1100	272	Sac. River @ Freeport					68
10/4/93		271						
10/4/93		273						
10/14/93	1251	298	Mokelumne River					24
10/14/93	1251	299	Mokelumne River					24
10/14/93		18 CF	Sac R. @ Rio Vista	0.008				56
10/14/93		19 CF	Sac R. @ Rio Vista		nd			56
10/14/93		20 CF	Sac. River @ Hood					48
10/14/93		21 CF	Sac. River @ Hood					48
10/14/93		22 CF	Sac. River @ Hood					48
10/29/93	1030	312	Middle R. @ Bullfrog Ldg.					62
10/29/93	1030	313	Middle R. @ Bullfrog Ldg.					62
10/29/93		23 CF	S.J. River @ Antioch			760		626
10/29/93		24 CF/QC	S.J. River @ Antioch			75		626
10/29/93		25 CF/QC	S.J. River @ Antioch				810	626

Date	Hour	Station #	Station Name	Total Ag	Dis Ag	Total Fe	Dis Fe	Hardness
10/29/93		26 CF	S.J. River @ Stockton					74
10/29/93		27 CF	S.J. River @ Stockton					74
10/29/93		28 CF	S.J. River @ Stockton					74
10/29/93		323	S.J. River @ Vernalis					128
10/29/93		324	S.J. River @ Vernalis					128
11/10/93		29 CF	Greene's Landing					60
11/10/93		30 CF A	Greene's Landing					60
11/10/93		30 CF B	Greene's Landing					60
11/11/93		31 CF	Greene's Landing					60
11/11/93		32 CF	Greene's Landing					60
11/11/93		33 CF	Greene's Landing					60
11/11/93		34 CF	Greene's Landing					60
11/11/93		35 CF	Greene's Landing					60
11/11/93		36CF	Greene's Landing					60
11/12/93		37 CF A	Greene's Landing					60
11/12/93		37 CF B	Greene's Landing					60
11/12/93		38 CF	Greene's Landing					60
11/12/93		39 CF	Greene's Landing					60
11/29/93		40 CF	S.J. River @ Antioch	0.014				616
11/29/93		41 CF	S.J. River @ Stockton	0.012				188
12/13/93		42 CF	Sac R. @ Rio Vista	0.01				76
12/13/93		43 CF	Sac R. @ Rio Vista		0.002			76
12/13/93		44 CF	Sac. River @ Hood	0.012				54
12/13/93		44 CF	Sac. River @ Hood					54
12/13/93		45 CF	Sac. River @ Hood		0.002			54
1/10/94		GL 21	Greene's Landing	0.002				64
1/10/94		46 CF	S.J. River @ Antioch	0.004				262
1/10/94		47 CF	S.J. River @ Antioch					262
1/10/94		48 CF	S.J. River @ Stockton					204
1/10/94		48 CF	S.J. River @ Stockton					204
1/10/94		49 CF	S.J. River @ Stockton					204
1/11/94	914	410	Middle R. @ Bullfrog Ldg.					88
1/11/94	914	411	Middle R. @ Bullfrog Ldg.					88
1/11/94	914	412	Middle R. @ Bullfrog Ldg.					88
1/11/94	914	425	S.J. River @ Vernalis					156
1/11/94	914	426	S.J. River @ Vernalis					156
1/11/94	914	427	S.J. River @ Vernalis					156
1/13/94		66	Greene's Landing					66
1/13/94		65 A	Greene's Landing					66
1/13/94		65 B	Greene's Landing					66
1/18/94		25	Greene's Landing					60
1/19/94		24	Greene's Landing					60
1/23/94		27	Greene's Landing					80
1/24/94		26	Greene's Landing					88
1/24/94		29	Greene's Landing					88
1/25/94		28	Greene's Landing					76
1/26/94		30	Greene's Landing					88
1/26/94		31	Greene's Landing					88
1/27/94		33	Greene's Landing					88
1/28/94		32	Greene's Landing					64
1/28/94		35	Greene's Landing					64
1/28/94		36	Greene's Landing					64
1/29/94	900	40	Greene's Landing					66
1/30/94		38	Greene's Landing					66
1/30/94	1000	42	Greene's Landing					66

Date	Hour	Station #	Station Name	Total Ag	Dis Ag	Total Fe	Dis Fe	Hardness
1/31/94		41	Greene's Landing					66
2/1/94		44	Greene's Landing					72
2/1/94		48	Greene's Landing					72
2/2/94		43	Greene's Landing					72
2/5/94	1700	55	Greene's Landing					60
2/7/94		50	Greene's Landing					68
2/7/94		53	Greene's Landing					68
2/8/94		51	Greene's Landing					72
2/8/94		52	Greene's Landing					72
2/9/94		54	Greene's Landing					80
2/10/94		56	Greene's Landing					54
2/10/94	930	58	Greene's Landing					54
2/11/94	1000	61	Greene's Landing					60
2/11/94	1600	62	Greene's Landing					60
2/12/94		60	Greene's Landing					64
2/16/94	700	63	Greene's Landing					
2/16/94	700	64	Greene's Landing					
2/17/94		67	Greene's Landing					80
2/17/94		68	Greene's Landing					80
2/18/94	1200	70	Greene's Landing					80
2/19/94		69	Greene's Landing					86
2/19/94	1400	72	Greene's Landing					86
2/19/94	1400	71 A	Greene's Landing					86
2/19/94	1400	71 B	Greene's Landing					86
2/20/94	1550	74	Greene's Landing					72
2/21/94		73	Greene's Landing					66
2/21/94	1600	76	Greene's Landing					66
2/22/94		75	Greene's Landing					56
2/22/94		77	Greene's Landing					56
2/22/94	1600	79	Greene's Landing					56
2/23/94		81	Greene's Landing					58
2/23/94	1700	82	Greene's Landing					58
2/24/94		83	Greene's Landing					62
2/24/94	1700	84	Greene's Landing					62
2/25/94		85	Greene's Landing					66
2/25/94	1800	86	Greene's Landing					66
2/27/94		87	Greene's Landing					80
2/28/94		89	Greene's Landing					82
2/28/94	1200	90	Greene's Landing					82
3/1/94		91	Greene's Landing					84
3/1/94		93	Greene's Landing					84
3/4/94		95	Greene's Landing					88
3/4/94	1200	96	Greene's Landing					88
3/9/94	1130	100	Greene's Landing					
3/9/94	1130	101	Greene's Landing					
3/9/94	1130	102	Greene's Landing					
3/9/94	1130	103	Greene's Landing					
3/9/94	1130	104	Greene's Landing					
3/9/94	1130	107	Greene's Landing					
3/9/94	1130	105a	Greene's Landing					
3/9/94	1130	105b	Greene's Landing					
3/9/94	1130	106a	Greene's Landing					
3/9/94	1130	106b	Greene's Landing					
3/10/94		108	Greene's Landing					76
3/10/94	1800	109	Greene's Landing					76

Date	Hour	Station #	Station Name	Total Ag	Dis Ag	Total Fe	Dis Fe	Hardness
3/15/94		110	Greene's Landing					72
3/15/94		111	Greene's Landing					72
3/15/94		112	Greene's Landing					72
3/15/94		113	Greene's Landing					72
3/15/94		113	Greene's Landing					72
3/15/94	1800	115	Greene's Landing					72
3/16/94		114	Greene's Landing					72
3/16/94	1100	116	Greene's Landing					72
3/16/94		117	Greene's Landing					72
3/16/94		118	Greene's Landing					72
3/16/94		119	Greene's Landing					72
3/16/94		120	Greene's Landing					72
3/16/94		121	Greene's Landing					72
3/16/94		122	Greene's Landing					72
3/23/94		aa33	French Camp Slough					44
3/23/94		aa34	French Camp Slough					44
3/23/94		aa31	Ulatis Creek					304
3/23/94		aa32	Ulatis Creek					304
4/12/94	1400	474	Mokelumne River					32
4/12/94	1400	475	Mokelumne River					32
4/12/94	1200	104CF	Sac R. @ Rio Vista					76
4/12/94	1200	105CF	Sac R. @ Rio Vista					76
4/12/94	900	100CF	Sac. River @ Hood					70
4/12/94	900	101CF	Sac. River @ Hood					70
4/12/94	900	102CF	Sac. River @ Hood					70
4/12/94	900	103CF	Sac. River @ Hood					70
4/27/94	1300	497	Middle R. @ Bullfrog Ldg.					124
4/27/94	1300	498	Middle R. @ Bullfrog Ldg.					124
4/27/94	900	106CF	S.J. River @ Antioch					154
4/27/94	900	107CF	S.J. River @ Antioch					154
4/27/94	900	108CF	S.J. River @ Antioch					154
4/27/94	900	109 cf	S.J. River @ Antioch					154
4/27/94	900	110CF	S.J. River @ Stockton					172
4/27/94	900	111CF	S.J. River @ Stockton					172
4/27/94	930	480	S.J. River @ Vernalis					84
4/27/94	930	481	S.J. River @ Vernalis					84
4/27/94	930	482	S.J. River @ Vernalis					84
4/27/94	930	483	S.J. River @ Vernalis					84
4/27/94	930	484	S.J. River @ Vernalis					84
4/30/94		aa1	Paradise Cut					432
5/10/94		aa6	Duck Slough					98
5/10/94		aa7	Duck Slough					98
5/10/94	930	GL 201	Greene's Landing					66
5/10/94		gl200	Greene's Landing					66
5/10/94		gl201	Greene's Landing					66
5/10/94	1200	541	Mokelumne River					30
5/10/94	1200	541/QA	Mokelumne River					30
5/10/94		aa3	Paradise Cut					396
5/10/94		aa4	Paradise Cut					396
5/10/94		114cf	Sac R. @ Rio Vista					62
5/10/94		115cf	Sac R. @ Rio Vista					62
5/10/94		112cf	Sac. River @ Hood					54
5/10/94		112cf/QA	Sac. River @ Hood					54
5/10/94		113cf	Sac. River @ Hood					54
5/25/94		aa10	Old River @ Tracy Blvd.					152

Date	Hour	Station #	Station Name	Total Ag	Dis Ag	Total Fe	Dis Fe	Hardness
5/25/94		aa9	Old River @ Tracy Blvd.					152
5/25/94		aa35	Paradise Cut					398
5/25/94		aa8	Paradise Cut					398
6/3/94		aa11	Old River @ Tracy Blvd.					238
6/3/94		aa12	Old River @ Tracy Blvd.					238
6/3/94		aa14	Paradise Cut					384
6/3/94		aa15	Paradise Cut					384
7/12/94		aa21	Duck Slough					72
7/12/94		aa22	Duck Slough					72
7/12/94		aa19	Paradise Cut					400
7/12/94		aa20	Paradise Cut					400
7/12/94		aa23	Prospect Slough					84.3
7/12/94		aa24	Prospect Slough					84.3
7/21/94		aa25a	Mokelumne River		0.008			
7/21/94		aa25b/QA	Mokelumne River					
7/21/94		aa26a	Mokelumne River	0.008				
7/21/94		aa26b/QA	Mokelumne River					
8/9/94		bp 27	Duck Slough					68
8/9/94		bp 28	Duck Slough					68
8/9/94		bp 29	Prospect Slough					72
8/9/94		bp 30	Prospect Slough					72
9/2/94		bp1	Duck Slough					70
9/2/94		bp1/QA	Duck Slough					70
9/2/94		bp2	Duck Slough					70
9/2/94		bp5	French Camp Slough					82
9/2/94		bp6	French Camp Slough					82
9/2/94		bp3	Prospect Slough					86
9/2/94		bp3/QA	Prospect Slough					86
9/2/94		bp4	Prospect Slough					86
10/5/94		bp36	5 mile					80
10/5/94		bp96	Greene's Landing					56
10/19/94		aa36	Mokelumne River					
11/4/94		aa27	S.J. River @ Antioch	0.012				
11/4/94		aa28	S.J. River @ Antioch		0.004			
12/13/94	1245	400	Mokelumne River					
12/13/94	1245	401	Mokelumne River					
12/13/94	1245	402	Mokelumne River					
12/13/94		aa29	Ulatis Creek					
12/13/94		aa30	Ulatis Creek					
1/6/95	1500	bp44	Greene's Landing					92
1/6/95	1500	bp45	Greene's Landing					92
1/7/95		bp46	Greene's Landing					66
1/7/95		bp47	Greene's Landing					66
1/8/95	1330	bp48	Greene's Landing					60
1/8/95	1330	bp49	Greene's Landing					60
1/9/95		bp53	Duck Slough					234
1/10/95		bp52	Greene's Landing					52
1/10/95		bp53	Greene's Landing					52
1/10/95		bp54	Prospect Slough					82
1/10/95		bp54/QA	Prospect Slough					82
1/11/95	1430	bp55	Greene's Landing					44
1/11/95	1430	bp56	Greene's Landing					44
1/11/95	1630	bp59	Prospect Slough					88
1/12/95	1400	bp61	Greene's Landing					42
1/12/95	1400	bp62/QA	Greene's Landing					42

Date	Hour	Station #	Station Name	Total Ag	Dis Ag	Total Fe	Dis Fe	Hardness
1/12/95	1400	bp63	Greene's Landing					42
1/12/95	1400	bp64/QA	Greene's Landing					42
1/12/95	1030	bp60	Prospect Slough					62
1/13/95	1500	bp65	Greene's Landing					58
1/13/95	1500	bp66	Greene's Landing					58
1/13/95	1000	bp67	Prospect Slough					58
1/14/95	1300	bp69	Greene's Landing					40
1/14/95	1300	bp70	Greene's Landing					40
1/14/95	1000	bp68	Prospect Slough					82
1/15/95	1400	bp71	Greene's Landing					44
1/15/95	1400	bp72	Greene's Landing					44
1/15/95	1400	bp77	Greene's Landing					44
1/15/95	1000	bp74	Prospect Slough					60
1/15/95	1000	bp75	Prospect Slough					60
1/17/95	1400	bp78	Greene's Landing					44
1/17/95	1400	bp79	Greene's Landing					44
1/17/95	1000	bp80	Prospect Slough					48
1/18/95	1400	bp82	Greene's Landing					44
1/18/95	1400	bp83	Greene's Landing					44
1/18/95	1100	bp81	Prospect Slough					
1/20/95	1600	bp86	Greene's Landing					48
1/20/95	1600	bp87	Greene's Landing					48
1/22/95	1430	bp90	Greene's Landing					54
1/22/95	1430	bp91	Greene's Landing					54
1/22/95	1200	bp89	Prospect Slough					64
1/22/95	1100	bp88	Skag Slough					116
1/23/95	1500	cf500	Greene's Landing					50
1/23/95	1500	cf501	Greene's Landing					50
1/23/95	1200	cf502	Prospect Slough					60
1/23/95	1000	cf503	Skag Slough					124
1/24/95	1600	cf504	Greene's Landing					56
1/24/95	1600	cf505	Greene's Landing					56
1/25/95	1500	cf506	Greene's Landing					54
1/25/95	1500	cf507	Greene's Landing					54
1/25/95	1000	cf508	Prospect Slough					64
1/25/95	1000	cf509	Prospect Slough					64
1/26/95	1400	cf512	Greene's Landing					50
1/26/95	1500	cf513	Greene's Landing					50
1/26/95	1600	cf510	Prospect Slough					56
1/26/95	1600	cf511	Prospect Slough					56
1/27/95	1000	cf514	Greene's Landing					48
1/27/95	1000	cf515	Greene's Landing					48
1/27/95	1530	cf516	Prospect Slough					60
1/28/95	1500	cf517	Greene's Landing					48
1/28/95	1500	cf518	Greene's Landing					48
1/28/95	1200	cf519	Prospect Slough					60
1/28/95	1200	cf520	Prospect Slough					60
1/28/95	1000	cf521	Skag Slough					104
1/29/95	1100	bp92	Greene's Landing					44
1/29/95	1100	bp93	Greene's Landing					44
1/29/95		bp94	Greene's Landing					44
1/30/95	1700	cf600	Greene's Landing					48
1/30/95	1700	cf601	Greene's Landing					48
1/31/95	1600	cf602	Greene's Landing					48
1/31/95	1600	cf603	Greene's Landing					48

Date	Hour	Station #	Station Name	Total Ag	Dis Ag	Total Fe	Dis Fe	Hardness
1/31/95	1600	cf604	Greene's Landing					48
1/31/95	1600	cf605/QA	Greene's Landing					48
1/31/95	1600	cf607	Greene's Landing					48
1/31/95	1600	cf610	Greene's Landing					48
1/31/95	1600	cf611	Greene's Landing					48
1/31/95	1200	cf606	Prospect Slough					68
2/1/95	1300	cf608	Greene's Landing					50
2/1/95	1600	cf609	Greene's Landing					50
2/2/95	1600	cf612	Greene's Landing					50
2/3/95	1400	cf613	Greene's Landing					48
2/3/95	1000	cf614	Prospect Slough					68
2/5/95	1500	cf615	Chipps Island					62
2/5/95	1500	cf625	Chipps Island					62
2/5/95	1300	cf616	Grizzly Bay					66
2/5/95	1300	cf623	Grizzly Bay					66
2/5/95	1600	cf617	Martinez					72
2/5/95	1000	cf624a	Martinez					72
2/5/95	1000	cf624b/QA	Martinez					72
2/6/95	1600	cf619	Greene's Landing					46
2/6/95	1600	cf622	Greene's Landing					46
2/6/95	1400	cf618	Prospect Slough					46
2/10/95	1600	cf701a	Greene's Landing					52
2/10/95	1600	cf701b/QA	Greene's Landing					52
2/10/95	1600	cf702a	Greene's Landing					52
2/10/95	1300	cf702b/QA	Greene's Landing					52
2/10/95	1400	cf700	Prospect Slough					66
2/14/95	1600	cf703	Greene's Landing					62
2/14/95	1300	cf704	Prospect Slough					80
2/14/95	1000	cf705	Skag Slough					192
2/17/95	1350	cf706	Greene's Landing					56
2/17/95	1100	cf707	Prospect Slough					148
2/21/95	1400	bp96	Greene's Landing					56
2/21/95	930	cf708	Greene's Landing					56
2/23/95	1600	bp97	Greene's Landing					64
2/24/95	900	cf711	Greene's Landing					64
2/28/95	2030	cf712	Greene's Landing					64
2/28/95	800	cf713	Prospect Slough					244
3/3/95	1530	cf714	Greene's Landing					58
3/5/95	1600	cf715	Greene's Landing					50
3/7/95		cf716	Greene's Landing					46
3/10/95	1330	bp102	Cottonwood Creek					60
3/10/95	1330	bp102	Cottonwood Creek					60
3/10/95		bp114	East Yolo Bypass					148
3/10/95	1115	bp106	Little Cow Cr. @ Dersch Br.					36
3/10/95	1115	bp106	Little Cow Cr. @ Dersch Br.					36
3/10/95	1240	bp108	Putah Creek @ Mace Blvd.					112
3/10/95	1430	bp105	Sac R. @ Bend Bdg					36
3/10/95	2000	bp100	Sac R. @ Colusa Bdg					48
3/10/95	1000	bp97	Sac R. @ Cypress Bdg					40
3/10/95	1830	bp98	Sac R. @ Old Ferry					48
3/10/95	1550	bp99	Sac R. @ Road a-8					54
3/10/95	1700	bp107	Sac R. @ Road a-9					136
3/10/95	800	bp103	Sac R. @ Shasta Dam					46
3/10/95	1230	bp104	Sac R. @ Balls Ferry Bdg					38
3/10/95	2230	bp101	Sacramento Slough					108

Date	Hour	Station #	Station Name	Total Ag	Dis Ag	Total Fe	Dis Fe	Hardness
3/10/95		bp112	Skag Slough					220
3/10/95		bp113	West Yolo bypass					62
3/11/95	1530	bp110	American River @ Sac State					28
3/11/95	1200	bp109	Cache Creek 102					128
3/11/95	1200	bp109	Cache Creek 102					128
3/11/95	1630	bp111	Feather River @ Hwy 99					28
3/11/95	1300	CF 800	Greene's Landing					30
3/11/95	1500	CF 801	Mokelumne River					22
3/11/95	1500	CF 801	Mokelumne River					22
3/11/95	1600	CF 802	S.J. River @ Vernalis					114
3/13/95	1100	CF 803	Sutter Bypass					46
3/13/95		bp117	Sycamore					128
3/14/95		bp115	Greene's Landing					30
3/21/95	1800	CF 807	Prospect Slough					56
3/22/95	1700	CF 808	Greene's Landing					56
3/22/95	1700	CF 811	Greene's Landing					56
3/22/95	1000	CF 809	Mokelumne River					36
3/22/95	1000	CF 809	Mokelumne River					36
3/22/95	1400	CF 810	S.J. River @ Vernalis					84

APPENDIX C:

Quality Assurance/Quality Control Methods and Results

METHODS

METAL ANALYSES

Field The field portion of the QA program consisted of collecting blanks and field duplicates. Field blanks were collected to insure that samples were not contaminated by any aspect of the collecting procedure. A five gallon carboy of ultra pure water was brought to a field site. Water was pumped from the carboy following the same procedures which were used when a routine field sample was collected.

On 64 occasions duplicate water samples were collected from randomly selected sites to characterize field variability and the reproducibility of the measurements performed by the Trace Metal Laboratory and the Mussel Watch Laboratory. Field duplicates consisted of collecting two samples with a ten minute lapse between samples. This field duplicate collection method does not allow precision to be evaluated rigorously, for any observed variability could be a combination of inter-laboratory variability and real changes in the system during the ten minute lag in sample collection. Therefore, the measured variability could be considered a maximum with the true inter-laboratory precision being lower.

Laboratory The laboratory component of the QA program was focused toward characterizing contamination of sampling equipment and assessing measures of precision and accuracy. Laboratory blanks were collected to insure that the sampling equipment was not contaminated. This procedure consisted of pumping ultra pure water (18 megaohm deionized) water through the peristaltic tubing and filter apparatus into an analysis bottle. Precision is a measure of the reproducibility of a test method when it is repeated under controlled conditions. As described in the QA/QC documents (Goetzl *et al.*, 1994; 1995), precision was evaluated by two methods: (1) inter-laboratory analyses of field duplicates (see sample collection description above) between the Trace Metal Laboratory and Mussel Watch Laboratory, and 2) an intra-laboratory repeated analysis of the standard reference materials (SRMs) by the Mussel Watch Laboratory. The agreement between the amount of a component measured by the test method and the amount actually present is a measure of accuracy of the test method. To measure accuracy, one SRM was run for approximately every 25 samples analyzed. The standard reference materials used were Riverine Water SLRS-2 and SLRS-3 (for 1993-94 samples and 1994-95 samples, respectively) from the National Research Council of Canada. Certified values for the SRMs used in this study can be found in the QA/QC reports (Goetzl *et al.*, 1994, 1995).

TOXICITY ASSESSMENT

Standard procedures were followed in all aspects of the toxicity assessment. Monthly reference toxicant tests, consisting of five to six known concentrations of NaCl in laboratory control water, were conducted for each species. Chronic LC_{50} and EC_{50} concentrations were calculated to ascertain changes in animal sensitivity throughout the time period of the study. A complete description of quality assurance measures can be found in the Delta Monitoring Quality Assurance Project Plans (Connor *et al.*, 1995; Nielsen *et al.*, 1995).

RESULTS

METAL ANALYSES

Field On nine occasions field blanks were collected; twice for dissolved metals and seven times for total recoverable metals (Table C-1). Contamination was negligible with no metals detected above 1 µg/l. This finding is consistent with the minimal contamination reported when the technique was applied to quantify metal concentrations in Central Valley reservoir releases (Goetzl and Stephenson, 1993). Field duplicates were collected on 64 occasions with a resulting average difference between the two laboratories of 16% (Table C-2; Goetzl *et al.*, 1995). Differences between the two laboratories were found to be random, with neither laboratory consistently higher or lower than the other. This value incorporates both a measure of the ten minute lag in sample collection of the duplicates and inter-laboratory variability. Values not detected by either laboratory or very close to the detection limit (e.g., cutoff point at 5x the detection limit) were not included.

Laboratory Laboratory blanks were collected on 11 occasions with 65% of the individual metals data quantified as below the detection limits from the method (Table C-3). Contamination was negligible with only one metal detected above 1 µg/l on one occasion when metals were detected in the laboratory blanks. These findings were consistent with those in Goetzl and Stephenson (1993), indicating the sampling gear was relatively free of metal contamination. Laboratory blanks were also collected to determine if filtration of samples prior to conducting toxicity tests resulted in contamination (Table C-4). Of three laboratory blanks tested for filtration effects, there was no consistent pattern of removal or contamination for the seven metals. Although 0.45 µm filtration of laboratory waters did not consistently increase or decrease metal concentrations, filtration of field samples may have removed colloids and possibly resulted in sorption of metals on the membrane. Since filtration effects were not assessed for field samples, the concentrations reported for metals in this study are conservative estimates and may somewhat underestimate the actual values.

Intra-laboratory precision was assessed between five and 11 times depending on the metal. The average difference between the certified and mean detected values ranged from 2 to 20% (Goetzl *et al.*, 1994; 1995). All values were between the 99% confidence limits for the SRMs (Goetzl *et al.*, 1994; 1995). Inter-laboratory precision, which incorporated a measure of inter-laboratory and field variability, was shown to be within an average of 14% and 18% of each other for the 1993-94 and 1994-95 samples, respectively (Table C-2; Goetzl *et al.,* 1995). Values that were not detected by either lab or values that were very close to the detection limit (i.e., cutoff point at 5x the detection limit) were not included in the precision calculation. In addition, the calculation did not include values that differed between labs by a large amount (e.g., outliers). Those values were highlighted in the reports (Goetzl and Stephenson, 1993; Goetzl *et al.*, 1995). Single-laboratory precision was analyzed using the SRM SLRS-2 and SRM SLRS-3 for the 1993-94 and 1994-95 samples, respectively. All of the values for the elements were within the 99% confidence limits of the SRMs.

Approximately one standard reference material (SRMs) was analyzed for every 25 samples to address the accuracy of the evapoconcentration method. The SRM metal values were all greater than ten times the detectable limits with the exception of silver (1993-94 and 1994-95 samples) and lead (1994-95 samples) (Goetzl *et al.*, 1994; 1995). All of the 1993-94 SRMs were within the warning limits, which are ± 15% greater than the 95% SRM confidence limits. All of the 1994-95 SRMs were within the warning limits, with the exception of lead. The SRM for lead used with the 1994-95 samples was considerably lower than the lead SRM used with the 1993-94 samples. The 1994-1995 value was very close to the detection limit, making it difficult to analyze. All values (in both years) were within the warning and control limits (± 20% greater than the 95% SRM confidence limits) with the exception of lead. All but one lead SRM value in the 1994-95 document was between the warning and control limits. These results indicate, with few exceptions, a high level of accuracy and precision were associated with the evapo-concentration method utilized in this program. Analysis of SRMs can be used to describe the expected accuracy of field samples if the certified SRM values are similar to mean ambient metal concentrations. The certified SRM values in this study ranged from 31% to 99% lower than the mean metal concentrations measured in field samples collected from 1993 to 1995. Obtaining similar certified SRM values and mean field concentrations was inhibited by the nature of sampling which occurred over a wide spatial and temporal scale. This resulted in considerable spatial and temporal differences in metal concentrations over the course of the study.

TOXICITY ASSESSMENT

Between test variability was assessed for this study with reference toxicant tests. USEPA (1994) recommends reference toxicant testing to ascertain whether changes in animal sensitivity occurred. Of particular interest are the detection of outlier values exceeding the upper or lower 95 percent confidence limits of the long term mean or of general trends in changing animal sensitivity. During the 1993-1994 phase of testing, neither were noted in the control charts of any of the test species (Deanovic *et al.*, 1996). One outlier occurred in the LC_{50} chart for *Pimephales* mortality. In this particular case, the fathead minnow was less sensitive to NaCl. All quality control measurements showed acceptable characteristics suggesting toxicity test data were reliable. One outlying value each occurred in the *Ceriodaphnia* reproduction and survival test, the *Selenastrum* and *Pimephales* growth assays, and the fish mortality data during the 1994-1995 phase of testing (Deanovic *et al.*, 1998). The USEPA (1994) suggests one outlying value may be expected to occur by chance when 20 or more events are compared. Twenty-one to twenty-four data points were presented in the control charts, therefore, quality control measurements were acceptable and indicated the bioassay data were reliable. A more complete description of the Quality Assurance information for the toxicity studies can be found in the toxicity reports (Deanovic *et al.*, 1996; 1998).

Table C-1. Summary of field blanks (18 megaohm deionized water) run through field sampling equipment at various sampling sites. Values are expressed as µg/l. Sample sites are in parentheses.

Sample ID	Cu	Zn	Cr	Pb	Cd	Ni	As
dissolved (cf630)	<.04	0.04	<.05	<.01	0.011	0.25	
total recoverable (cf805)	<.04	<.01	<.05	<.01	<.002	<.02	
total recoverable (cf603)	0.02	0.599	0.09	<.01	<.002	0.18	<.1
total recoverable (cf804)	<.04	0.01	<.05	<.02	<.002	<.02	
total recoverable (51)	0.16	0.16	<.05	<.01	<.002	<.02	
total recoverable (110)	<.04	0.11	<.05	<.01	0.01	<.02	
total recoverable (117)	<.04	0.43	<.05	<.01	0.01	0.32	
total recoverable (481)	<.04	0.24	<.05	<.01	<.002	<.02	
dissolved (cf105)	0.07	0.09	0.08	<.01	0.003	0.1	

Table C-2. Percent Difference Between Duplicate Analyses for Total Recoverable and Dissolved Concentrations of Seven Metals in Field Samples Collected from the Sacramento/San Joaquin Delta Estuary. (D) = dissolved; (TR) = total recoverable.

Station Code	Metal Species						
	Cu	Zn	Cr	Pb	Cd	Ni	As
1994							
F9/F10 (TR)	10	2	1	13	5	11	
F2/F3 (D)	7	47	18	20	33	24	
246/247 (TR)	12	15	29	10	16	10	
270/271 (TR)	25				32		
272/273 (TR)	13	36	9	18	18	5	
14CF/15CF (D)	6	37	5	67	17	10	
21CF/22CF (D)	1	26	35	13	14	6	
26CF/27CF (TR)	7	11	28	13	36	3	
44CFA/44CFB (TR)	1	1	15	2	13	6	
48CFA/48CFB (TR)	7	5	30		0	9	
401/402 (D)	3		6	0	0	1	
410/411 (TR)		23	57	73	50		
425/426 (D)	30	23					
30CFA/30CFB (D)	11	13	11	19	7	1	
37CFA/37CFB (TR)	24	18	7	12	0	11	
25/25B (D)	1		28	67	0	29	
30/30B (TR)	2	30	12	1	0	8	
33/34 (D)	1		19	15	50	12	
38/39 (TR)	14		2	7	14	11	
44/45 (TR)	8		4	24	33	2	
46A/46B (TR)	14	20	10	0	5	7	
47A/47B (TR)	9	33	11	9	1	13	

Table C-2 (cont.). Percent Difference Between Duplicate Analyses for Total Recoverable and Dissolved Concentrations of Seven Metals in Field Samples Collected from the Sacramento/San Joaquin Delta Estuary. (D) = dissolved; (TR) = total recoverable.

Station Code	Metal Species						
	Cu	Zn	Cr	Pb	Cd	Ni	As
48/49 (D)	6	27	0	36	50	12	
56/57 (TR)	9	27	5	41	10	1	
58/59 (D)	3	4	10	28	20	1	
65A/65B (TR)	3	41	1	7	0	3	
71A/71B (TR)	24	21	8	16	0	6	
77/78 (TR)	4	15	6	15	13	2	
79/80 (D)	2	22	3	6	50	5	
91/92 (TR)	6	34	8	18	0	1	
93/94 (D)	29	18	7	20	0	13	
105A/105B (TR)	2	9	3	23	23	2	
106A/106B (TR)	4	6	6	26	0	10	
111A/111B (TR)	4	24	7	20	12	5	
113/113QC (TR)	6	6	8	24	8	4	
121/121QC (D)	7	4	1	5	26	9	
GL131/GL132 (D)	8	28	3	0	16	13	
483/484 (D)	42	11	15	22		9	
100CF/101CF (TR)	2	18	23	0	18	19	
102CF/103CF (D)	2	27	15	7	0	19	
CF106/CF107 (TR)	3	8	14	29	6	19	
CF108/CF109 (D)	2	16	22	8	19	28	
bp1 (TR)	9	4	5	14	10	4	45
bp3/bp32 (TR)	5	8	3	8	14	1	35

Table C-2 (cont.). Percent Difference Between Duplicate Analyses for Total Recoverable and Dissolved Concentrations of Seven Metals in Field Samples Collected from the Sacramento/San Joaquin Delta Estuary. (D) = dissolved; (TR) = total recoverable.

	Metal Species						
Station Code	**Cu**	**Zn**	**Cr**	**Pb**	**Cd**	**Ni**	**As**
bp10/bp11 (TR)	11	14	12	13	18	21	20
bp15/bp16 (TR)	15	20	14	21	9	13	15
112cf (TR)	11	26	11	15	28	22	6
541 (TR)	15	36	11	16	50	20	14
380/381 (TR)	1	27	1	4	23	18	20
aa25a/aa25b (D)	9	2	31	0	53	6	25
aa26a/aa26b (TR)	7	16	21	17	8	7	21
bp51 (TR)	20	0	1	22	8	18	
bp54 (TR)	24	18	11	31	9	2	
bp61/bp62 (TR)	13	1	2	41	3	5	
bp63/bp64 (D)	32	31	5	47	15	43	
cf604/cf605 (TR)	4	28	2	34	12	6	
cf624a/cf624b (D)	18	24	9	44	14	20	
cf701A/cf701B (TR)	18	21	12	40	30	12	
cf702A/cf702B (D)	2	12	3	38	40	4	
bp102 (TR)	5	20	24	10	30	19	
bp106 (TR)	12	20	26	7	15	22	
bp109 (TR)	14	15	14	4	37	0	
cf801 (TR)	10	61	38	32	50	54	
cf809 (TR)	10	27	7	32	12	30	
Mean % Difference	10	19	13	20	17	11	31
SD	9	13	12	17	16	11	11

Mean % Difference WY94 = 14%; Mean % Difference WY95 = 18%; Overall Mean% Difference WY94 & WY95 = 16%

Table C-3. Summary of laboratory blanks (18 megaohm deionized water) run through field sampling equipment. Values are expressed as µg/l. Sample numbers are in parentheses.

Sample ID	Cu	Zn	Cr	Pb	Cd	Ni	As
total recoverable (bp7)	<.04	0.05	<.05	<.01	<.002	0.02	<.03
total recoverable (bp32)	0.13	0.22	<.05	0.03	0.002	0.04	<.03
total recoverable (bp26)	<.04	0.04	<.05	<.01	<.002	<.02	0.12
dissolved (cf628)	<.04	0.39	<.05	<.01	0.009	0.24	
total recoverable (50)	<.04	0.14	<.05	<.01	<.002	<.02	
total recoverable (cf607)	0.18	1.81	0.2	<.01	0.008	0.91	
total recoverable (62)	<.04	<.01	<.05	<.01	<.002	<.02	
total recoverable (cf804)	<.04	<.01	<.05	<.01	<.002	<.02	
total recoverable (116)	0.14	0.03	<.05	0.01	<.002	<.02	
total recoverable (480)	<.04	0.08	<.05	<.01	<.002	<.02	
dissolved (cf104)	<.04	<.01	0.08	<.01	0.005	<.02	

Table C-4. Summary of toxicity study blanks (deionized water) analyzed to assess potential addition of metals via filtration. Filtered treatments were passed through a through 0.45 µm filter. Values are expressed as µg/l. nd = non-detect

#	Cu	Zn	Cr	Pb	Cd	Ni	As
1 Unfiltered	0.09	0.2	nd	nd	nd	nd	0.18
1 Filtered	0.06	0.36	nd	nd	nd	nd	0.18
2 Unfiltered	nd	0.08	nd	nd	0.01	0.11	0.14
2 Filtered	0.02	0.28	nd	0.06	nd	nd	nd
3 Unfiltered	nd	0.84	nd	nd	0.009	nd	
3 Filtered	nd	0.26	nd	nd	nd	nd	

APPENDIX D

Metals Source Pilot Study

INTRODUCTION

Water samples were collected for a one-time pilot study during a major storm event in March 1995 to assess the relative metal load contribution from sources upstream of the Delta, primarily in the Sacramento River Watershed. The study was designed to assess metal loads, therefore only total recoverable concentrations were quantified. No toxicity samples were collected and the lack of dissolved metals analyses prohibited an assessment of water quality objective exceedances. Although the objective of the pilot study was to track sources of metals during a high flow event, the data could not be used to quantify the load contribution from mines in the area of Lake Shasta and Keswick Reservoir because discharges from the reservoirs were maintained at low levels to minimize downstream flooding. This resulted in samples downstream of the reservoirs which were negligibly affected by runoff from this mining region.

MATERIALS AND METHODS

Sample collection and metal analyses followed the ultra-clean methods described in the main body of this report. Load calculations were point estimates because samples were only collected once. Loads were calculated by simply multiplying the total recoverable metal concentrations by flow measurements.

Sample Locations

A special study was undertaken from 10 March to 13 March 1995 to track sources of metals into the Delta. Samples were collected from 22 stations including nine Sacramento River stations downstream of Shasta Dam, four western valley drainages (i.e., Cottonwood Creek, Putah Creek, Cache Creek, and Skag Slough), four major river inputs (i.e., Feather, American, Mokelumne, and San Joaquin), and the Yolo and Sutter Bypass (Fig. D-1; Table D-1).

RESULTS

HYDROLOGICAL CONDITIONS

The samples were collected during the largest storm of the year when combined outflows from the basin peaked on 13 March at 297,000 CFS (Fig. D-2). Discharges from Shasta Dam were maintained at low levels during this special study (e.g., 2,300 CFS on 10 March), to minimize downstream flooding. Peak releases of approximately 68,000 CFS from Shasta Dam did not occur until 17 March (Markham *et al.*, 1996). This was also true for Keswick Reservoir which had a mean daily release of 16,100 CFS on 10 March and did not reach the peak release for WY95 of 74,800 until 17 March (Markham *et al.*, 1996). Therefore, potentially substantial metal loading, especially of cadmium, copper, and zinc, from historic mines above Shasta Dam and from the historic mines which drain into Keswick Reservoir would not have been represented in the Sacramento River for this study.

Results from this study characterize a temporal period when the basin is rapidly filling with water (Table D-2). Flows were low on the Sacramento River from Shasta Dam and Keswick Dam but increased downstream and peaked at 129,000 CFS at the Ord Ferry Bridge. The majority of river volume originated between Bend Bridge (Site 6) and Woodsen Bridge (Site 8). Sources of water in this region include several undammed creeks such as Spring (near the town of Bend), Willow, Reeds, Red Bank, Elder, Paynes, Antelope, and Mill (Table D-2). Over approximately the next 80 river miles flows decreased reaching 42,000 CFS at the City of Colusa where a weir diverts water into the Sutter Bypass. The decrease in volume from Ord Ferry to Colusa is primarily accounted for by the timing of sample collection; the pulse of water at Ord Ferry had not yet reached the Colusa site.

METAL CONCENTRATIONS

Both metal concentrations and flow estimates are need to calculate loads. A description of metal concentrations is provided below to provide a picture, independent of flow, of the total concentration of each metal from each sampling location. The following section then combines the concentration data with flow measurements to provide an estimate of loads.

The highest total recoverable metal concentrations in the upper Sacramento River Watershed were seen in Cottonwood Creek approximately four miles upstream of the confluence with the Sacramento River. (Table D-2; Figs. D-3 to D-8). Montoya and Pan (1992) was the only reference found which indicates historic mineral activity in this watershed. Chromium was extracted from the Round Bottom mine while gold was mined from the Midas mine site. Trace metal analyses were performed on one sample collected downstream from each mine in July 1989 when flows ranged from a slow seep to less than two liters per minute (Montoya and Pan, 1992). Total concentrations of cadmium, chromium, and nickel in the Round Bottom sample were 1.2, 16, and 54 µg/l, respectively (Montoya and Pan, 1992). Only trace concentrations of arsenic were detected at the Midas Mine (Montoya and Pan, 1992). By comparison, total recoverable cadmium, chromium, and nickel concentrations measured near the confluence of Cottonwood Creek and the Sacramento River in this study were 0.35, 150, 211 µg/l. However there is not enough information in the literature to definitively identify the mines as the source of the high metal concentrations. Increased drainage from the mine(s) and erosion of metal rich geological deposits are other potential sources of metal enrichment measured during this storm event.

Concentrations decreased from the confluence of Cottonwood Creek and the Sacramento River to the Bend Bridge station, with an associated increased river volume (Figs. D-3 to D-8). However, concentrations increased again at Road a-8 which is near the input of many of the undammed creeks mentioned above. These data indicate the undammed creeks may be an important source of metal enrichment in the river during high flows. Concentrations of all metals measured except nickel decreased downstream from Road a-8 then increased again at the Colusa Bridge station where values were close to the those at Road a-8. This again points to undammed creeks, such as Deer and Big Chico, as potential sources for metal enrichment.

Other studies reported unknown sources of metals upstream of Sacramento were responsible for increased metal concentrations in the lower Sacramento River (Larry Walker & Associates, 1997; Alpers, written comm.; Foe and Croyle, 1998). Larry Walker & Associates (1997) reported the largest loads of mercury in the Sacramento River occurred during storm events and originated from above the Feather River. Alpers (written comm.) conducted a metals transport study during both wet and dry weather and consistently noted an increase in mercury load in the Sacramento River between Redding and Colusa. Increased loads of other metals, such as lead and copper, were noted for the Sacramento River between Keswick Dam and Bend Bridge (Charlie Alpers, written comm.). However, neither study identified the source(s). In addition, it is not clear from these studies if other metals are enriched along this stretch of river. To address this question, one must compare the results of this study with those of Foe and Croyle (1998). Samples for both studies were collected at the same time for the metals source components. Mercury followed the same pattern in upper Sacramento River, with enrichment between Bend Bridge and Ord Ferry (Foe and Croyle, 1998). Detailed follow-up studies are needed to identify the major source(s) of these metals along this stretch of river.

During high flow conditions, a weir is opened on the Sacramento River near the Colusa station. River water enters the Sutter Bypass which eventually drains into the Yolo Bypass. Samples collected from the Sutter Bypass downstream of the Colusa station had greatly reduced metal concentrations, suggesting a dilution effect or settling (Table D-2; Figs. D-9 to D-14). However, Sacramento Slough which runs parallel to the Bypass had concentrations as high as those measured in Cottonwood Creek. Both the Sutter Bypass and Sacramento Slough are not well mixed at the sample stations during high flow events and can contain water from the Sacramento River, the Colusa Basin Drain, and several small creeks and sloughs. The complex hydrology in the Sutter Bypass and Sacramento Slough during high flows makes interpretation of metal concentrations at these stations difficult.

Several stations which discharge into the Yolo Bypass, and eventually the north Delta, were monitored for total recoverable metals. Cache Creek was sampled a short distance upstream of where it discharges into the Bypass. Concentrations of all metals were 150% to approximately 300% higher than at Cottonwood Creek (Table D-2; Figs. D-9 to D-14). Concentrations in Putah Creek prior to discharging into the Bypass were much higher than most main river stations. The west and east side of the Yolo Bypass was monitored near Interstate 80 in the region receiving water from Cache Creek, Putah Creek, Colusa Basin Drain, the Sacramento River, and the Sutter Bypass. Concentrations on the east side were consistently higher than those on the west side, indicating the Bypass is not well mixed during such high flow events. Concentrations on the east side were by far the highest concentrations measured during this survey.

One station was selected to quantify metal concentrations entering the Delta from the San Joaquin River. Metal concentrations in the San Joaquin River at Vernalis were moderately high when compared to those in the upper Sacramento River and Yolo Bypass (Table D-2; Figs. D-9 to D-14).

The pattern of total recoverable metal concentrations was quite different in the lower Sacramento River. The Feather and American Rivers are the primary tributaries which enter the Sacramento River in the lower watershed. Metal concentrations in the Feather and American Rivers were much lower than the upper Sacramento River (Table D-2; Figs. D-9 to D-14). Water from the Sacramento River above the Feather and American Rivers begins to enter the Yolo Bypass when flows exceed 60,000 CFS. All additional water in the river is diverted into the Bypass when flows reach 100,000 CFS. The combined discharges of the Feather and American River was approximately 112,000 CFS on 11 March. Therefore, most of the water reaching Greene's Landing during this study is expected to have come from these two watersheds while most water in the upper Sacramento River would flow into the Bypass. For reasons which are unclear, metal concentrations at Greene's Landing were greater than those in the Feather and American Rivers. Possible explanations include, but are not limited to, a sediment bedload source during high flows, urban runoff from storm drains in Sacramento and West Sacramento, and/or municipal sewage treatment plants along the Sacramento River, although municipal sources were unlikely to be of sufficient magnitude.

METAL LOADS

Load calculations were point estimates for the load tracking study because a one time analysis of metals was performed at each station.

Overall conclusions for load estimates in this study may be limited or incomplete due to the lack of measured flows at several stations. In addition, flows out of Shasta Dam and Keswick Reservoir were maintained at low levels during the storm event which resulted in an incomplete description of metal loading from mines which drain into these two water bodies. However, similar patterns determined for the metal analysis component of the source study emerged when metal loads were assessed. A significant sources of metal load to the upper Sacramento River during the storm was Cottonwood Creek (Table D-2; Figs. D-3 to D-8). Additional significant sources of metal loads entered the river between Bend Bridge and the Ord Ferry Road Bridge, again pointing toward undammed creeks as sources along this stretch of river. Cache Creek contributed significant loads to the lower stretches of the watershed (Table D-2; Figs. D-9 to D-14). In fact, Cache Creek loads exceeded those of Cottonwood Creek. These results confirm that Cache Creek is a major source of metals during high flow years. Although metal concentrations in Putah Creek were among the highest measured in the study, loads were relatively low due to low flows when compared to other stations. Many of the load estimates measured during the short sampling period for the metal source study exceeded the average daily loads entering the Delta during WY95 (Table 57 & 59). Data obtained from this study indicate major storm events can contribute significant metal loads to the river. However, stations monitored for the metals source study did not provide an assessment of metal loads in the entire Sacramento River Watershed because samples were not collected from sites where metal loads are most heavily influenced by upstream sources of metals such as historic base-metal mining. Additional studies should be performed to identify sources of loads between Bend Bridge and the Ord Ferry Road Bridge. In addition, this study should be repeated over a wider temporal period, should include flow

measurements at all stations to better characterize loads into the system, and incorporate stations which would permit a characterization of metal loading from mining activities.

SUMMARY OF RECOMMENDATIONS

1. Repeat the metals source study on the Sacramento River from Shasta Dam to Greene's Landing and the Yolo Bypass during major rain events to better characterize metal and sediment loads in the system. Incorporate flow measurements at all stations where such studies are performed to permit calculations of loads. In addition, apply more rigorous load calculation methods such as those in Cohn *et al.*, (1989). Measurements of dissolved metals should be incorporated into future studies in this region to permit an assessment of compliance with water quality objectives. Furthermore, a toxicity assessment should be incorporated into the overall study design.

2. Conduct a special study on the Sacramento River downstream from the Bend River Bridge to the Ord Ferry Bridge during major storm events to characterize the sources of increased flows, metal concentrations, and loads. Monitoring should include stations in undammed creeks including Spring (near the town of Bend), Reeds, Red Bank, Elder, Paynes, Antelope, and Mill. Dissolved metal concentrations should be measured as well to permit an assessment of water quality objective exceedances. Load calculations should follow current methods which are more rigorous than those applied in this report.

3. Conduct a special study on the Sacramento River downstream from County Road A-8 to Colusa during major storm events to characterize sources of enriched metal concentrations along this stretch of the Sacramento River. Samples should be collected from Big Chico and Mill Creeks which are sources of water to the river in this area. Dissolved metal concentrations should be measured as well to permit an assessment of water quality objective exceedances.

4. Additional studies should be performed during high flow years when the Yolo Bypass is operational to better characterize the source(s) of elevated metal concentrations at Greene's Landing reported in this study when compared to concentrations in the American and Feather River.

DESCRIPTION OF SAMPLING LOCATIONS

Sacramento River @ Shasta Dam (site 1): Sample collected from east bank below Shasta Dam at Powerhouse.

Sacramento River @ Cypress Bridge (site 2): Sample collected in mid channel from Cypress Avenue bridge.

Little Cow Creek (site 3): Sample collected from mid channel off the Dersch Road Bridge outside of Anderson.

Sacramento River @ Balls Ferry (site 4): Sample collected in mid channel from Balls Ferry Road bridge.

Cottonwood Creek (site 5): Sample collected in mid channel off HWY 5 frontage road bridge about one mile south of the town of Cottonwood.

Sacramento River @ Bend (site 6): Sample collected in mid channel from Bend bridge Park.

Sacramento River @ Road a-8 (site 7): Sample collected in mid channel off County Road A8 bridge near Tehema and the Mills Creek Recreation Area.

Sacramento River @ Road a-9 (site 8): Sample collected in mid channel from South Avenue bridge at Woodson State Recreation Area.

Sacramento River @ Ord Ferry (site 9): Sample collected in mid channel from Ord Ferry Road bridge.

Sacramento River @ Colusa (site 10): Sample collected on west side of channel off River Road bridge.

Sutter Bypass (site 11): Sample collected about one third of way across Bypass on north side of channel off HWY 113 bridge.

Sacramento Slough (site 12): Sampled from the Reclamation District pumphouse at Karnack.

Feather River (site 13): Sample collected by wading off intersection of Garden Highway and Lee Road.

American River (site 14): American River sample collected in mid channel off bridge at Sacramento State University in the City of Sacramento.

Table D-1. Sites and Dates of Sampling for the Metals Source Study

Site Name	Date Sampled
American R. Sac State	3/11/95
Cache Creek @ Road 102	3/11/95
Cache Creek @ Road 102	3/11/95
Cottonwood Creek	3/10/95
Cottonwood Creek	3/10/95
East Yolo bypass	3/10/95
Feather R. @ Highway 99	3/11/95
Little Cow Cr. Dersch Br.	3/10/95
Little Cow Cr. Dersch Br.	3/10/95
Mokelumne River	3/11/95
Mokelumne River	3/11/95
Putah Creek @ Mace Blvd.	3/10/95
Sac R. @ Shasta Dam	3/10/95
Sac R. @ Balls Ferry Br.	3/10/95
Sac R. @ Bend Bridge	3/10/95
Sac R. @ Colusa Bridge	3/10/95
Sac R. @ Cypress Bridge	3/10/95
Sac R. @ Ord Ferry	3/10/95
Sac R. @ Road a-8	3/10/95
Sac R. @ Road a-9	3/10/95
Sacramento Slough	3/10/95
Skag Slough	3/10/95
Sutter Bypass	3/13/95
S.J. River @ Vernalis	3/11/95
West Yolo Bypass	3/10/95

Table D-2. Total recoverable metal concentrations, metal loads, and flows in the Sacramento River Watershed during the largest storm event of the year in March 1995.

Date	Hour	Station #	Station Name	Flow (cfs)	Total Cu (µg/l)	Cu Load (kg)	Total Zn (µg/l)	Zn Load (kg)	Total Cr (µg/l)	Cr Load (kg)
3/10/95	800	bp103	Sac. River @ Shasta Dam	2300	1.23	6.92	4.6	25.87	1.44	8.10
3/10/95	1000	bp97	Sac. River @ Cypress Br.	18000	8.23	362.20	18.7	822.99	2.03	89.34
3/10/95	1115	bp106	Little Cow Creek @ Dersch Br.	10000	12.4	303.18	33	806.85	7.39	180.56
3/10/95	1230	bp104	Sac. River @ Balls Ferry Br.		10.7		29.6		6.5	
3/10/95	1330	bp102	Cottonwood Creek	21000	92.4	4744.28	170	8728.65	150	7701.75
3/10/95	1430	bp105	Sac. River @ Bend Br.	67000	28.8	4717.87	68.8	11270.47	39.6	6487.07
3/10/95	1550	bp99	Sac. River @ Road a-8		70.4		157		150	
3/10/95	1700	bp107	Sac. River @ Road a-9	102000	56.6	14115.47	134	33418.26	99.6	24839.24
3/10/95	1830	bp98	Sac. River @ Ord Ferry	129000	46.8	14760.95	97.2	30657.37	75.7	23876.16
3/10/95	2000	bp100	Sac. River @ Colusa Br.	42000	58.1	5966.29	129	13247.01	94.8	9735.01
3/11/95	1630	bp111	Feather R. Highway 99	34500	4.54	382.96	6.29	530.58	3.14	264.87
3/11/95	1530	bp110	American R. @ Sac. State	77800	1.15	218.75	3.87	736.16	1.28	243.48
3/11/95	1300	CF 800	Sac. River @ Greene's Landing	99000	8.6	2081.67	19.8	4792.69	13.8	3340.36
3/11/95	1500	CF 801	Mokelumne River		4.55		11.19		3.14	
3/13/95	1100	CF 803	Sutter Bypass		12		24.8		17.6	
3/10/95	2230	bp101	Sacramento Slough		73.2		173		122	
3/11/95	1200	bp109	Cache Creek @ Road 102	17500	140.5	6011.64	288.5	12344.19	291	12451.16
3/10/95	1240	bp108	Putah Creek @ Mace Blvd.	682	76.9	128.23	253	421.87	98.4	164.08
3/10/95		bp114	East Yolo Bypass		121		333		303	
3/10/95		bp113	West Yolo Bypass		43		144		90	
3/10/95		bp112	Skag Slough		5.22		15.3		4.82	
3/11/95	1600	CF 802	Vernalis	7830	34.1	652.82	107	2048.45	69.1	1322.87

Table D-2 (cont). Total recoverable metal concentrations, metal loads, and flows in the Sacramento River Watershed during the largest storm event of the year in March 1995.

Date	Hour	Station #	Station Name	Flow (cfs)	Total Pb (µg/l)	Pb Load (kg)	Total Cd (µg/l)	Cd Load (kg)	Total Ni (µg/l)	Ni Load (kg)
3/10/95	800	bp103	Sac. River @ Shasta Dam	2300	2.68	15.07	0.026	0.15	2.36	13.27
3/10/95	1000	bp97	Sac. River @ Cypress Br.	18000	0.83	36.53	0.11	4.84	2.3	101.22
3/10/95	1115	bp106	Little Cow Creek @ Dersch Br.	10000	6.9	168.71	0.114	2.79	7.09	173.35
3/10/95	1230	bp104	Sac. River @ Balls Ferry Br.		4.32		0.154		7.41	
3/10/95	1330	bp102	Cottonwood Creek	21000	19.9	1021.77	0.353	18.12	211	10833.80
3/10/95	1430	bp105	Sac. River @ Bend Br.	67000	7.68	1258.10	0.2	32.76	52	8518.38
3/10/95	1550	bp99	Sac. River @ Road a-8		15.7		0.371		492	
3/10/95	1700	bp107	Sac. River @ Road a-9	102000	12.9	3217.13	0.377	94.02	112	27931.68
3/10/95	1830	bp98	Sac. River @ Ord Ferry	129000	10.2	3217.13	0.296	93.36	251	79166.66
3/10/95	2000	bp100	Sac. River @ Colusa Br.	42000	12.1	1242.55	0.409	42.00	266	27315.54
3/11/95	1630	bp111	Feather R. Highway 99	34500	0.72	60.73	0.026	2.19	4.06	342.47
3/11/95	1530	bp110	American R. @ Sac. State	77800	0.44	83.70	0.017	3.23	2.17	412.78
3/11/95	1300	CF 800	Sac. River @ Greene's Landing	99000	3.04	735.85	0.16	38.73	13.2	3195.13
3/11/95	1500	CF 801	Mokelumne River		3.93		0.05		4.17	
3/13/95	1100	CF 803	Sutter Bypass		4.88		0.068		20.4	
3/10/95	2230	bp101	Sacramento Slough		17.5		0.433		120	
3/11/95	1200	bp109	Cache Creek @ Road 102	17500	30.6	1309.30	0.403	17.24	652	27897.45
3/10/95	1240	bp108	Putah Creek @ Mace Blvd.	682	28	46.69	0.47	0.78	88.1	146.91
3/10/95		bp114	East Yolo Bypass		33.3		0.438		600	
3/10/95		bp113	West Yolo Bypass		15.6		0.311		165	
3/10/95		bp112	Skag Slough		4.66		0.057		14.1	
3/11/95	1600	CF 802	Vernalis	7830	17.6	336.94	0.169	3.24	128	2450.48

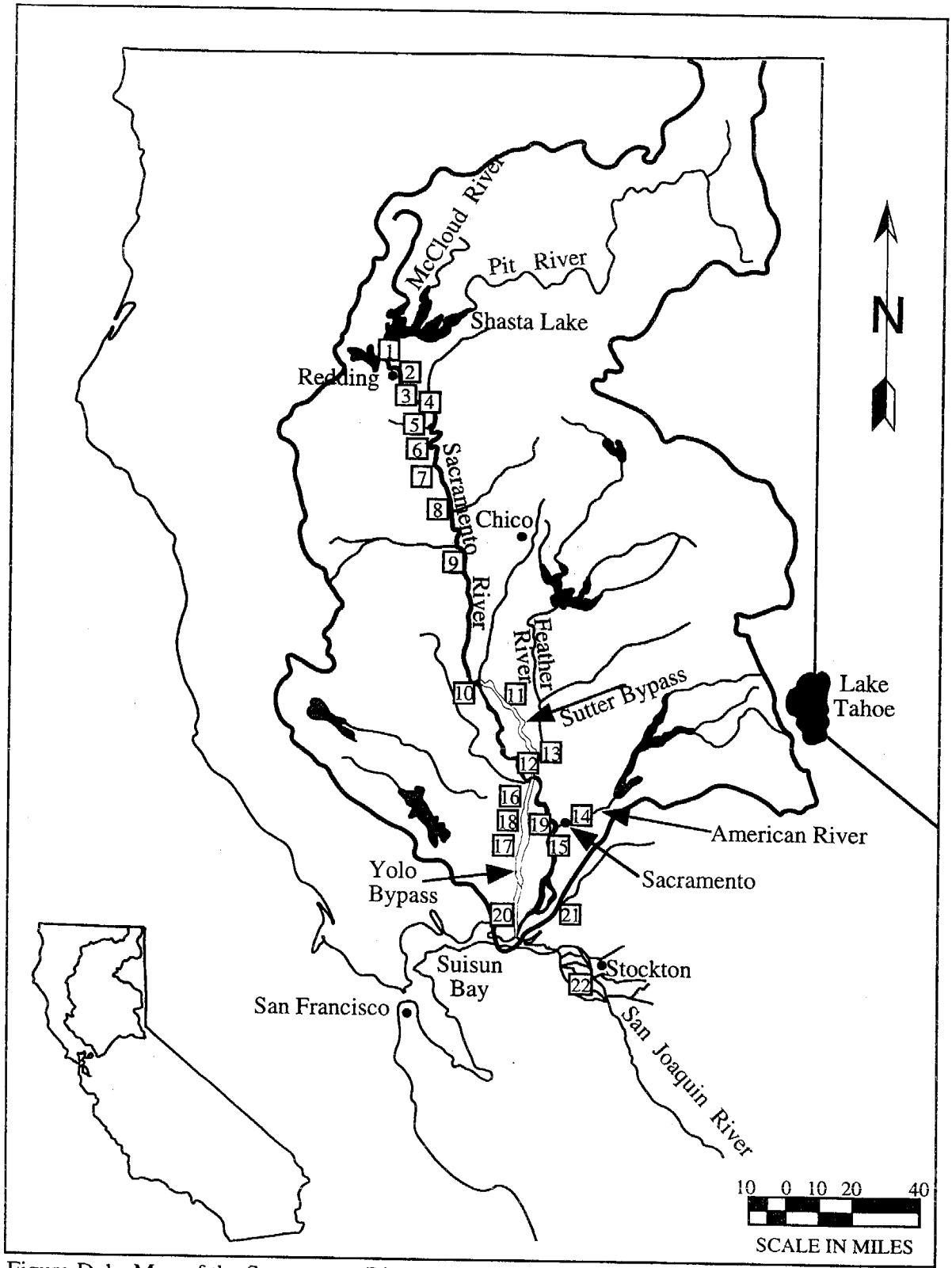

Figure D-1. Map of the Sacramento River Watershed and its major tributaries. Numbers refer tc sample stations described in Appendix A.

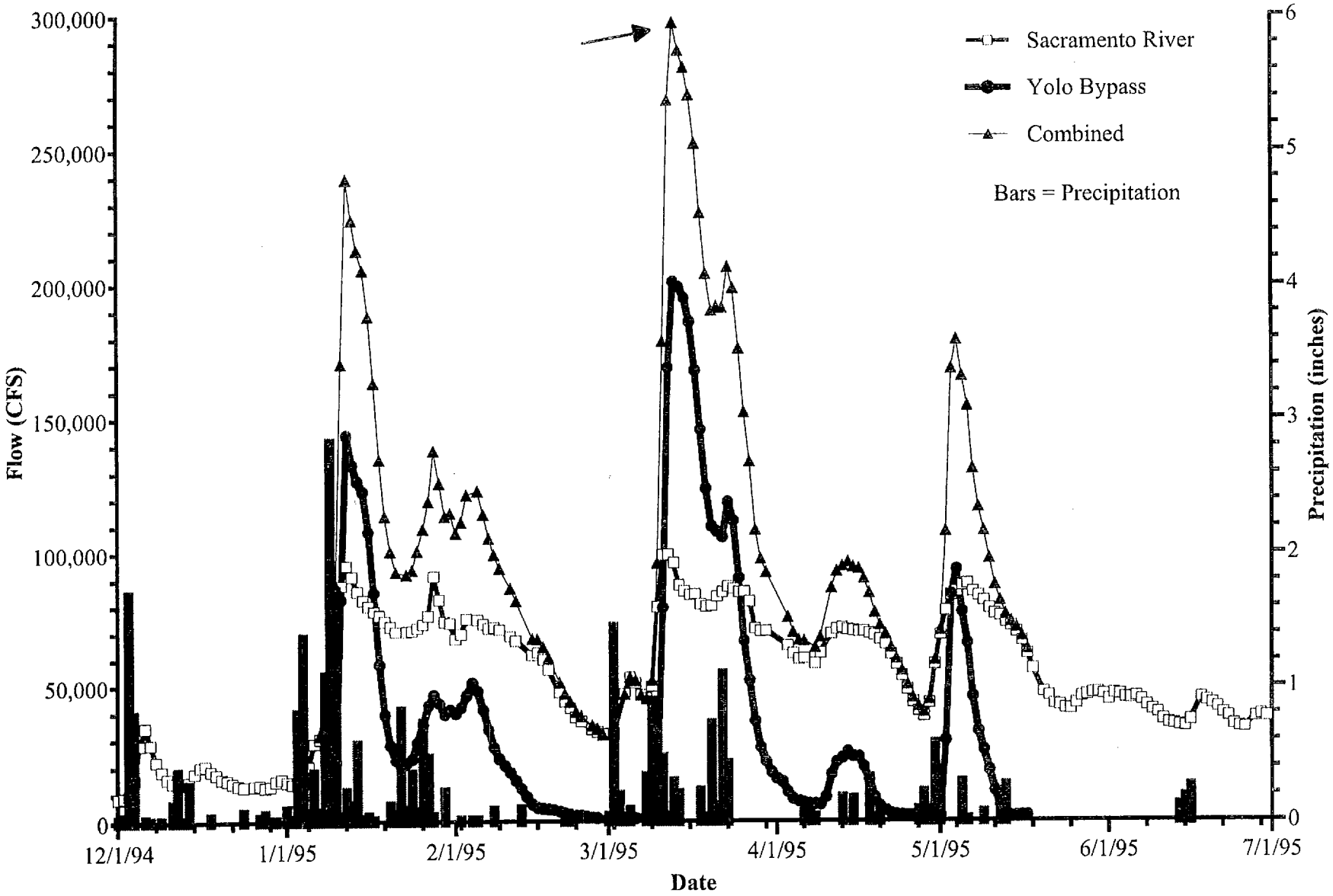

Figure D-2. Precipitation and flow pattern in the Sacramento Basin during the winter and spring of 1995. Arrow indicates sampling for the metals source study.

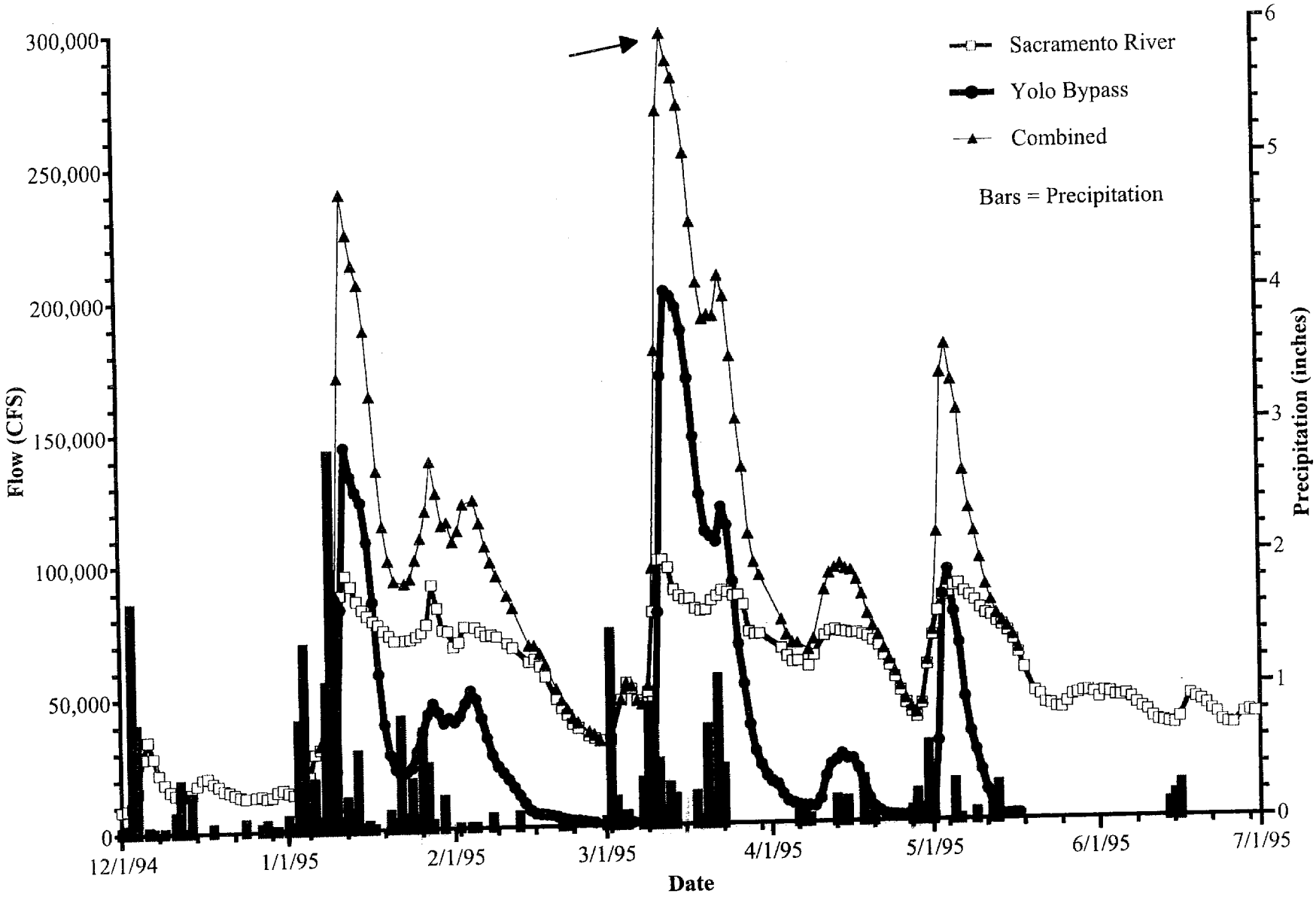

Figure D-2. Precipitation and flow pattern in the Sacramento Basin during the winter and spring of 1995. Arrow indicates sampling for the metals source study.

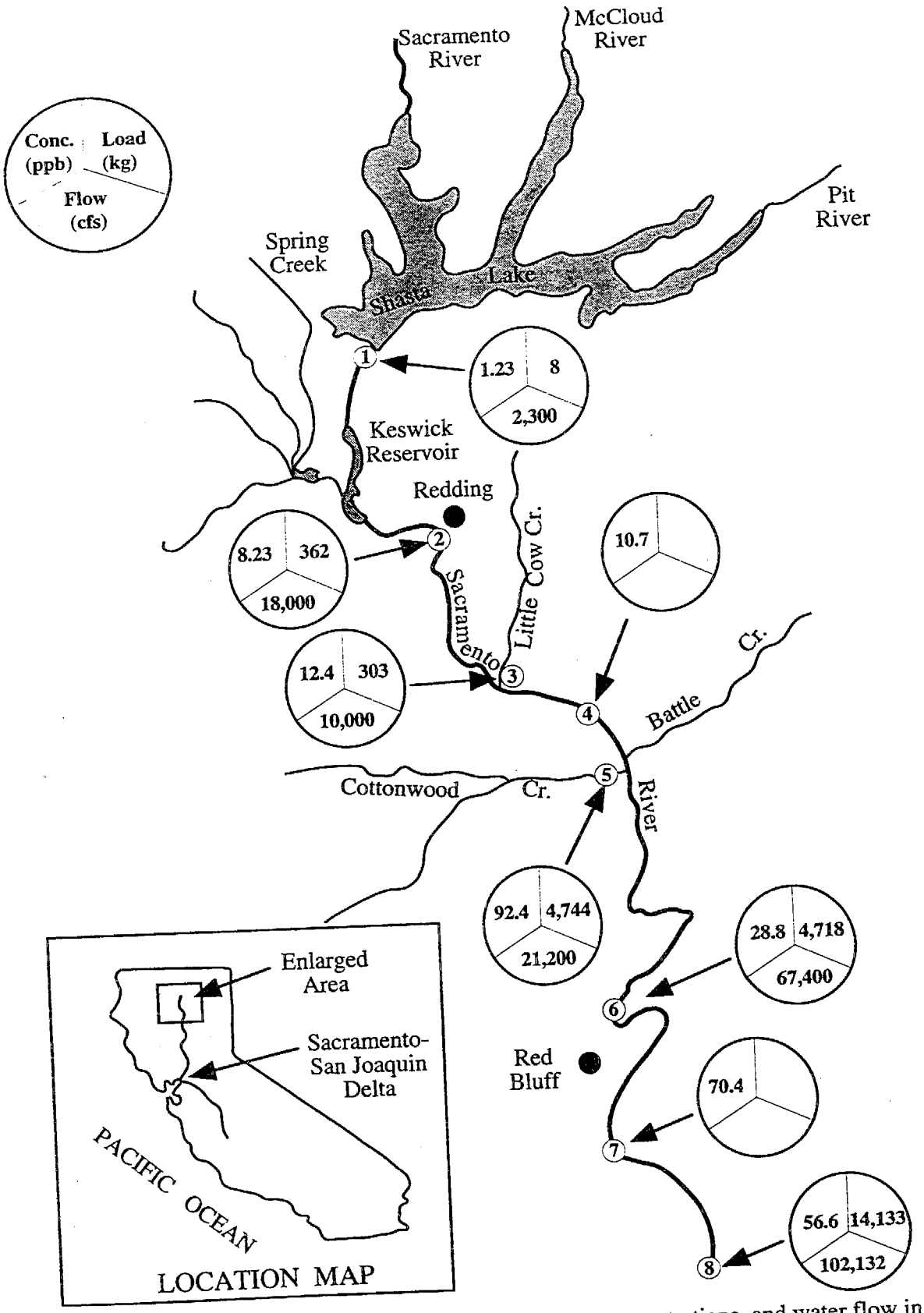

Figure D-3. Schematic of copper loads, total recoverable concentrations, and water flow in the upper Sacramento River during the largest storm event of the year in March 1995. Small circles with numbers represent stations described in Appendix A. Results suggest an unknown riverine cadmium source between Bend (site 6) and Woodson Bridge (site 8).

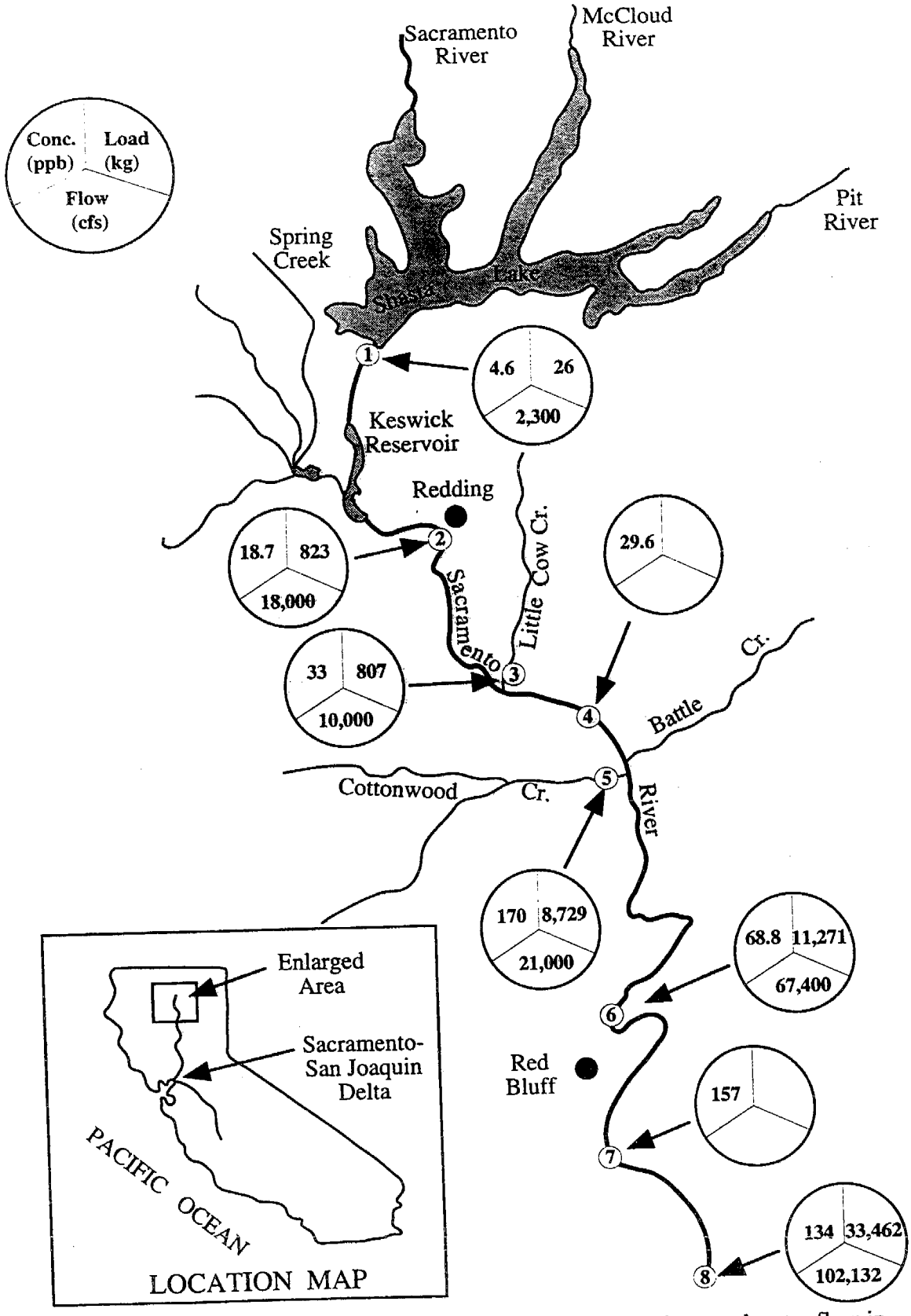

Figure D-4. Schematic of zinc loads, total recoverable concentrations, and water flow in the upper Sacramento River during the largest storm event of the year in March 1995. Small circles with numbers represent stations described in Appendix A. Results suggest an unknown riverine cadmium source between Bend (site 6) and Woodson Bridge (site 8).

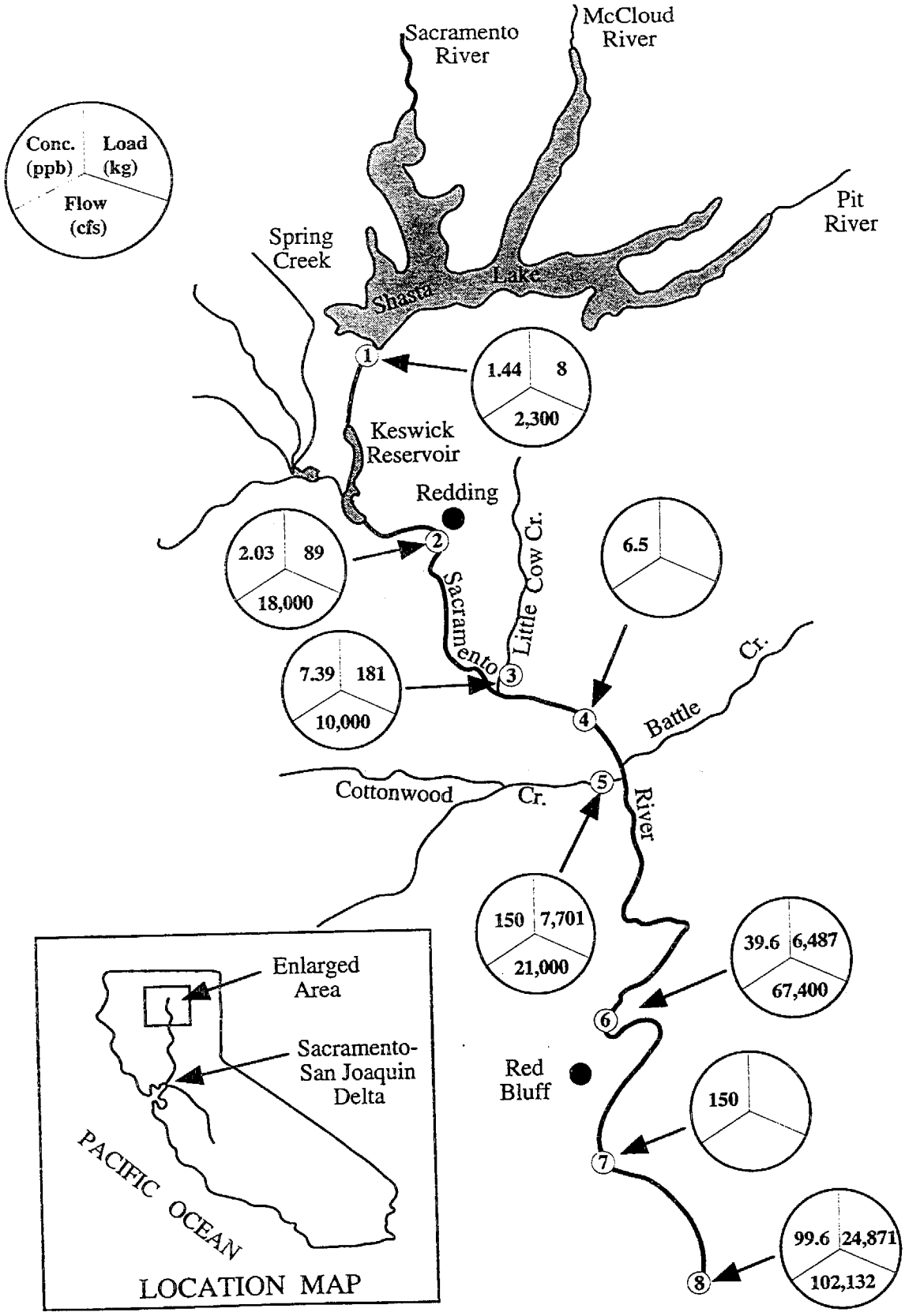

Figure D-5. Schematic of chromium loads, total recoverable concentrations, and water flow in the upper Sacramento River during the largest storm event of the year in March 1995. Small circles with numbers represent stations described in Appendix A. Results suggest an unknown riverine cadmium source between Bend (site 6) and Woodson Bridge (site 8).

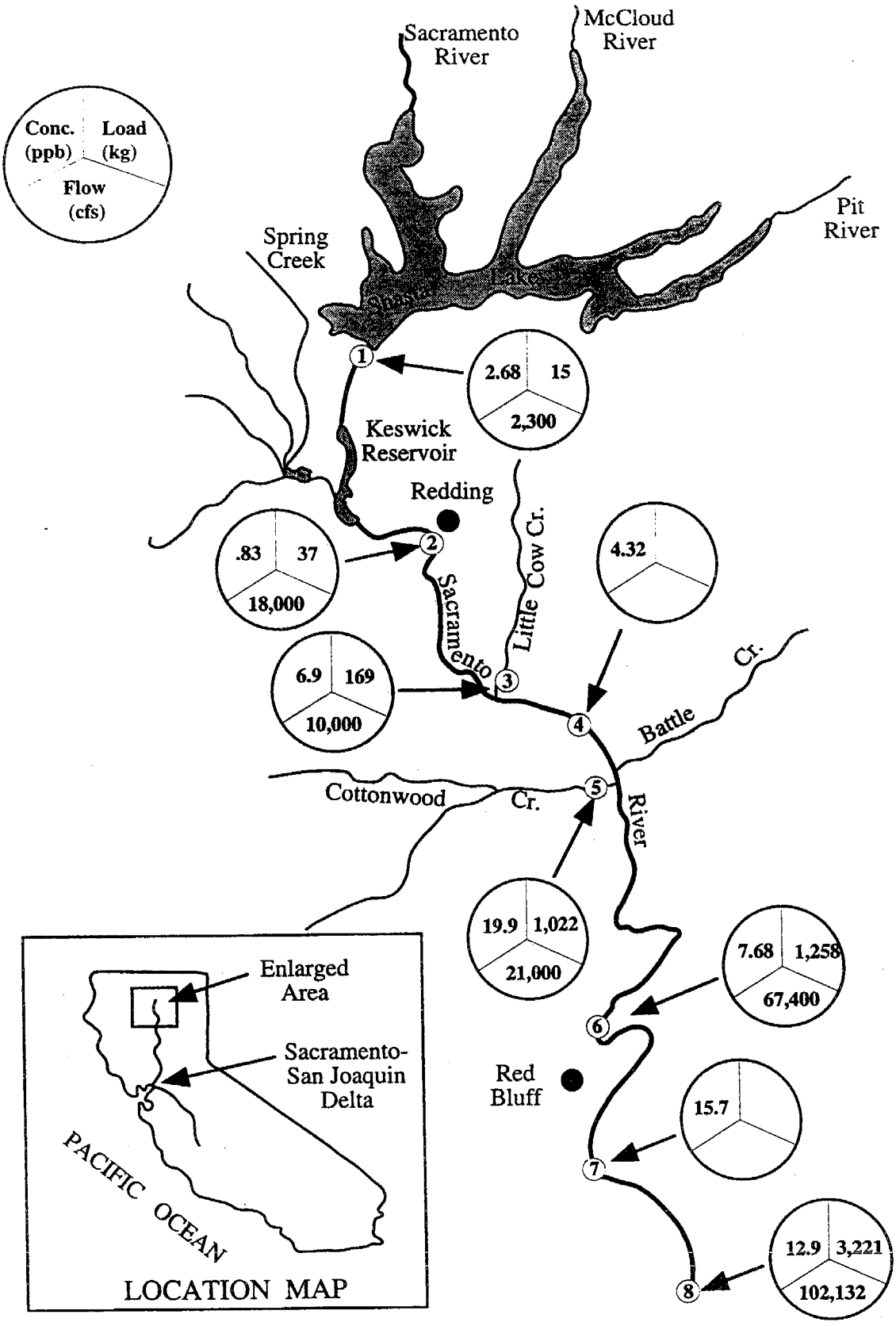

Figure D-6. Schematic of lead loads, total recoverable concentrations, and water flow in the upper Sacramento River during the largest storm event of the year in March 1995. Small circles with numbers represent stations described in Appendix A. Results suggest an unknown riverine cadmium source between Bend (site 6) and Woodson Bridge (site 8).

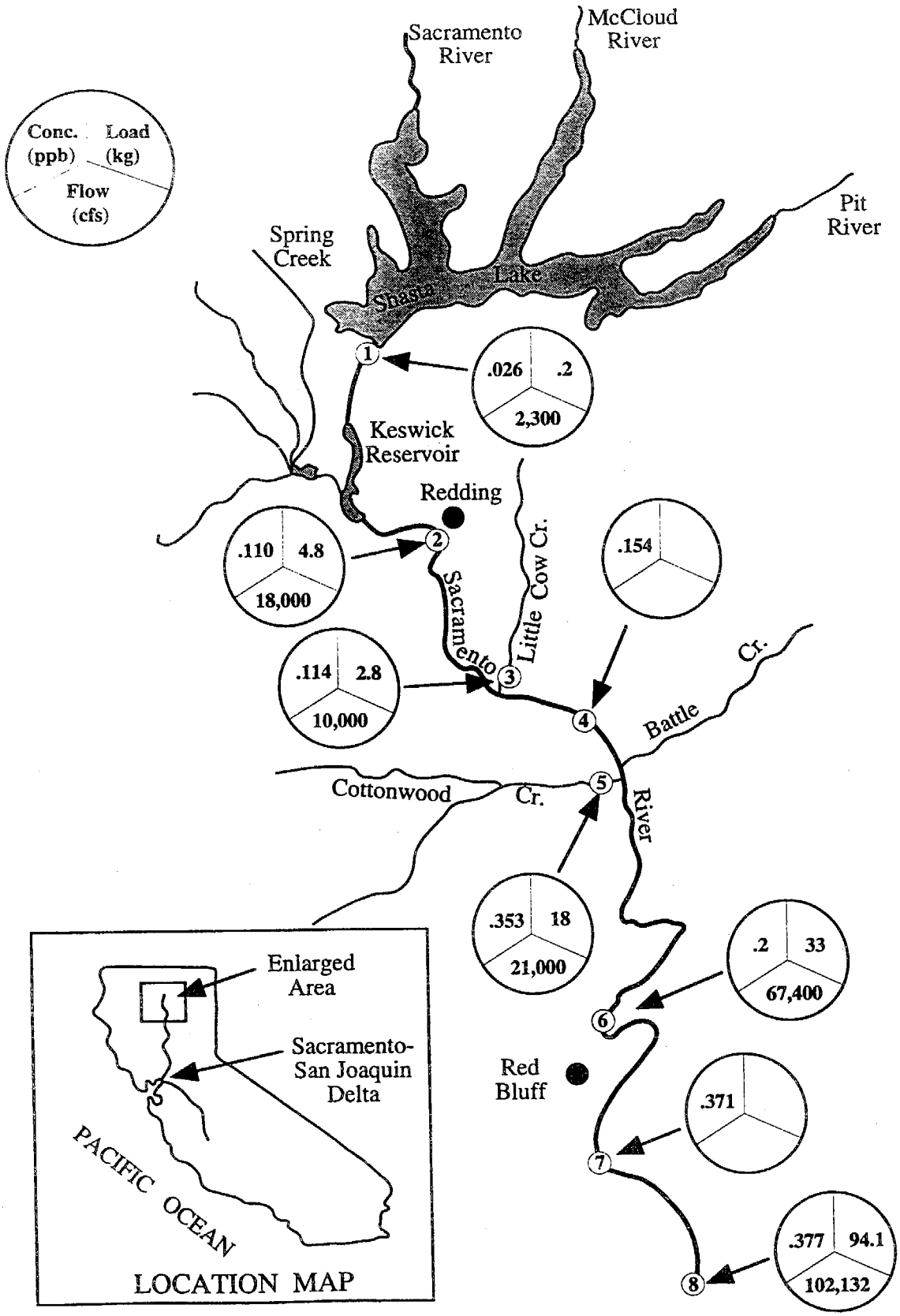

Figure D-7. Schematic of cadmium loads, total recoverable concentrations, and water flow in the upper Sacramento River during the largest storm event of the year in March 1995. Small circles with numbers represent stations described in Appendix A. Results suggest an unknown riverine cadmium source between Bend (site 6) and Woodson Bridge (site 8).

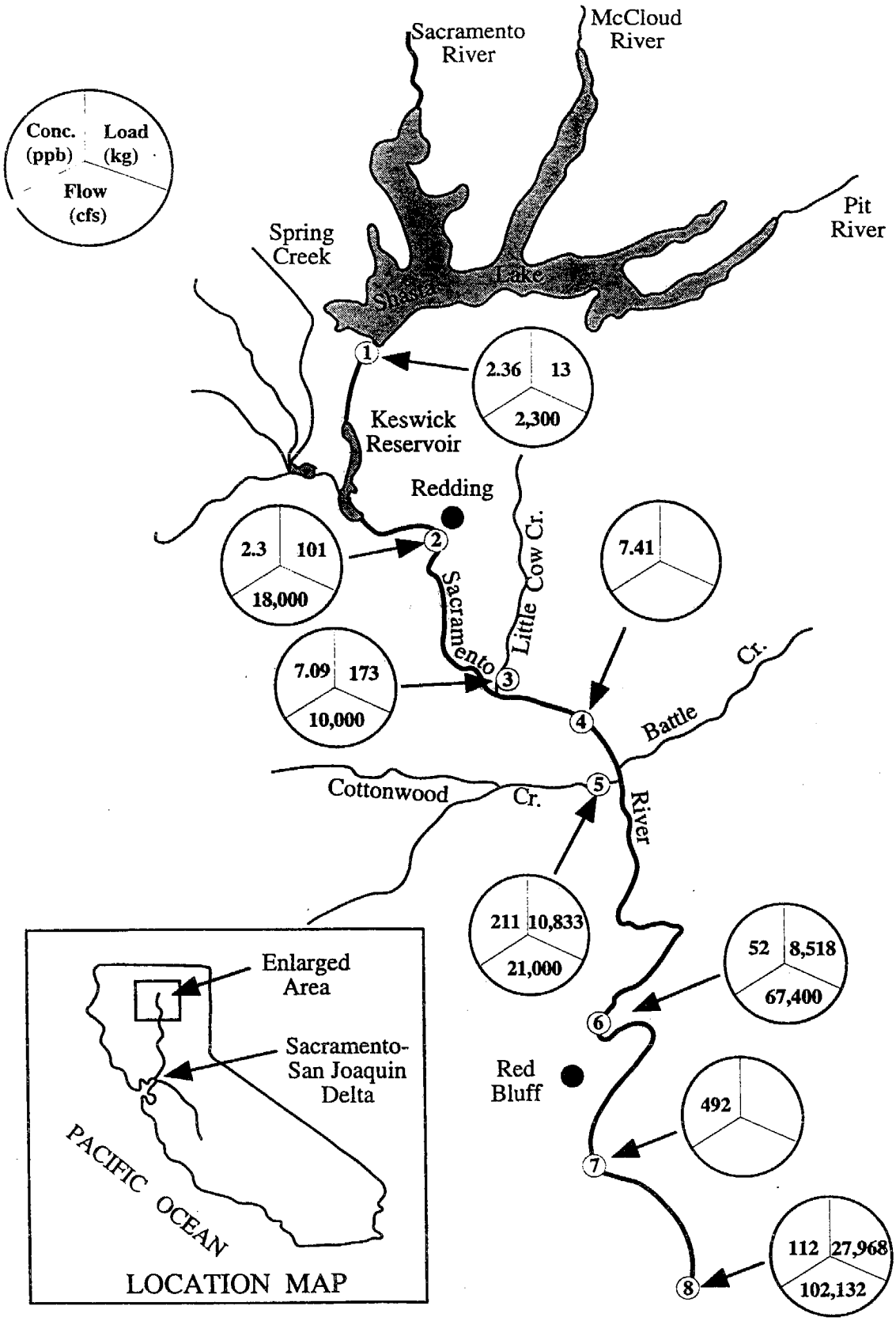

Figure D-8. Schematic of nickel loads, total recoverable concentrations, and water flow in the upper Sacramento River during the largest storm event of the year in March 1995. Small circles with numbers represent stations described in Appendix A. Results suggest an unknown riverine cadmium source between Bend (site 6) and Woodson Bridge (site 8).

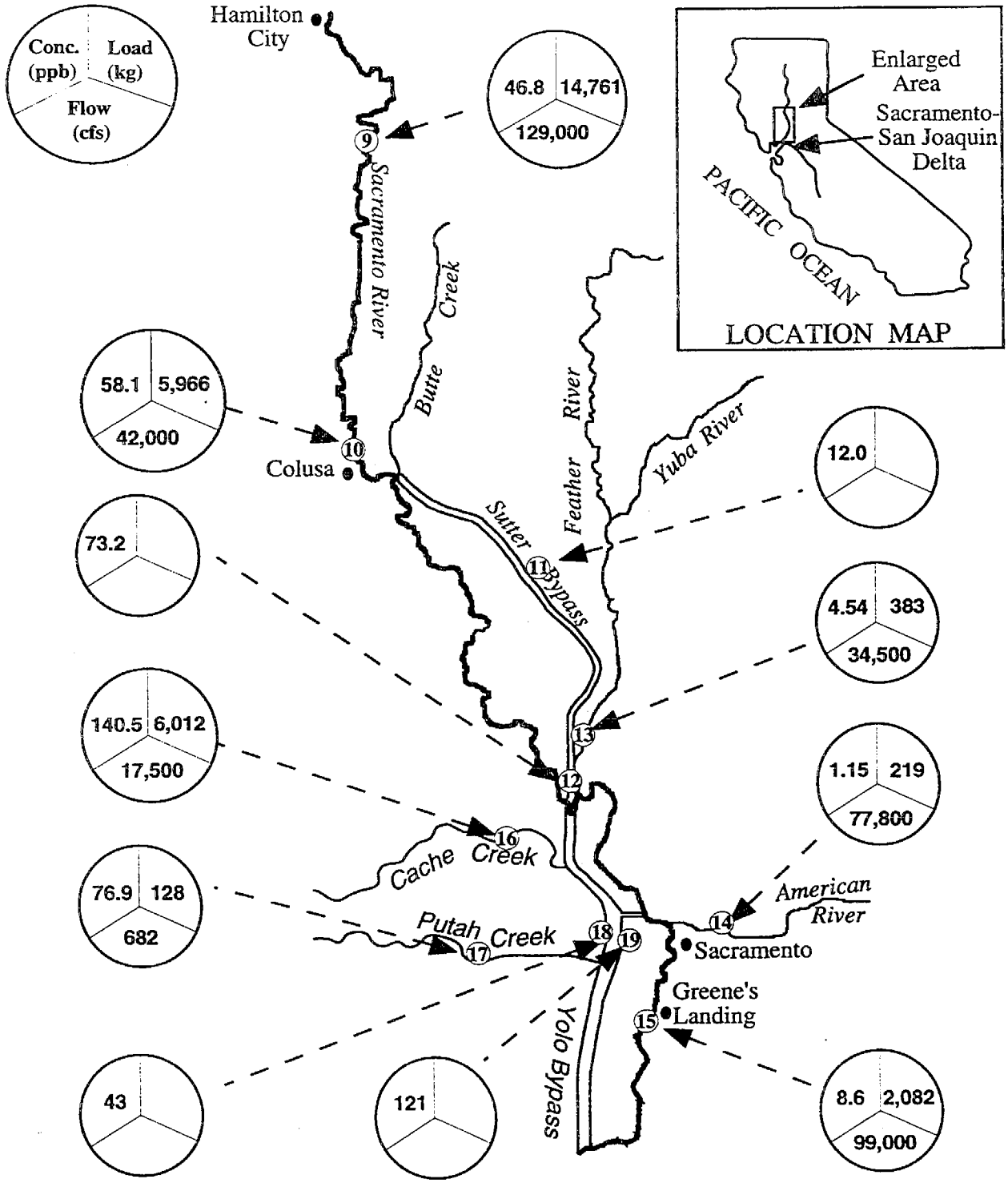

Figure D-9. Schematic of copper loads, total recoverable concentrations, and water flow in the lower Sacramento River during the largest storm event of the year in March 1995. Small circles with numbers represent stations described in Appendix A. Results suggest enrichment of cadmium at Cache Creek (site 16), Putah Creek (site 17), and the Sacramento River at Greene's Landing (site 15).

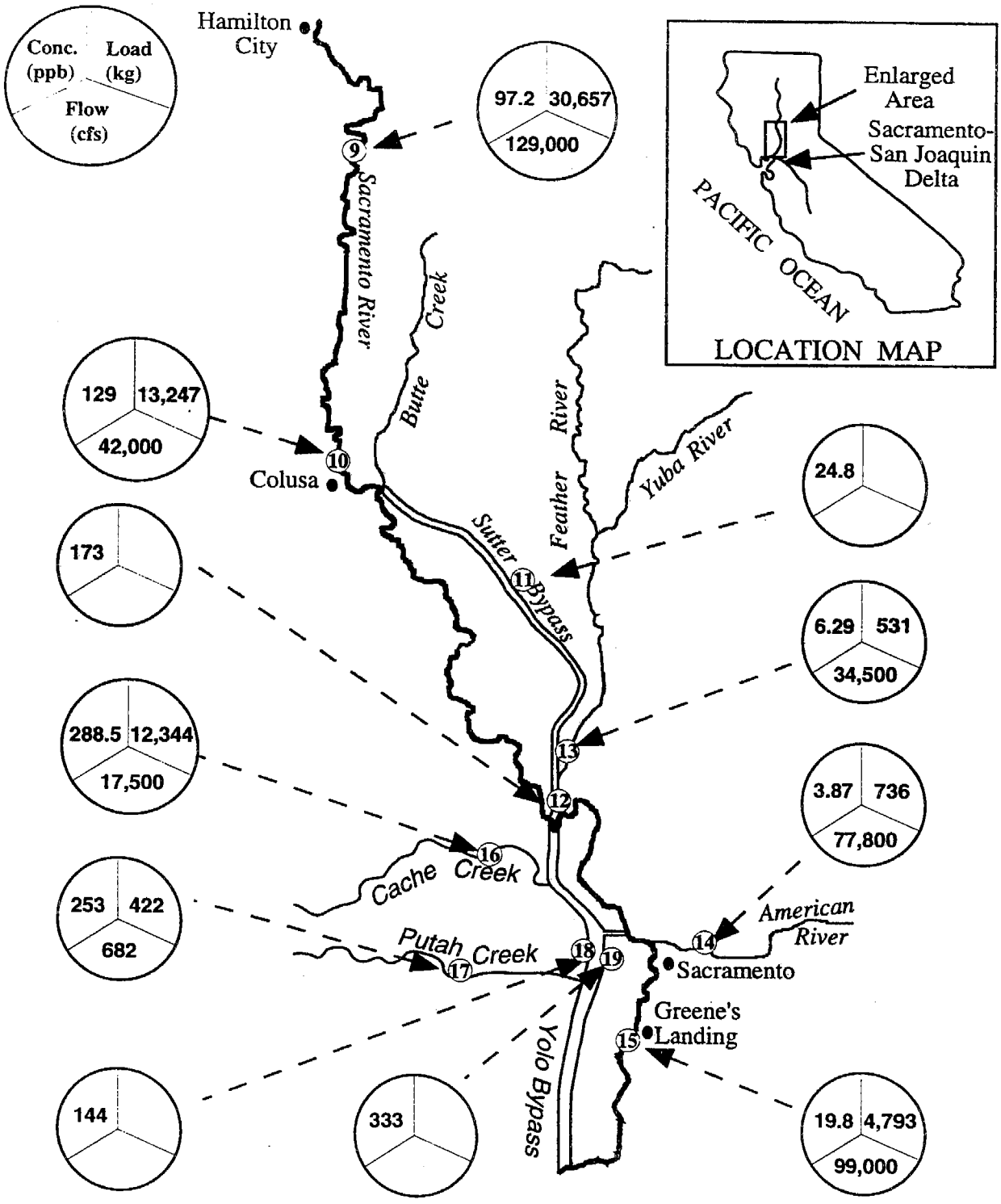

Figure D-10. Schematic of zinc loads, total recoverable concentrations, and water flow in the lower Sacramento River during the largest storm event of the year in March 1995. Small circles with numbers represent stations described in Appendix A. Results suggest enrichment of cadmium at Cache Creek (site 16), Putah Creek (site 17), and the Sacramento River at Greene's Landing (site 15).

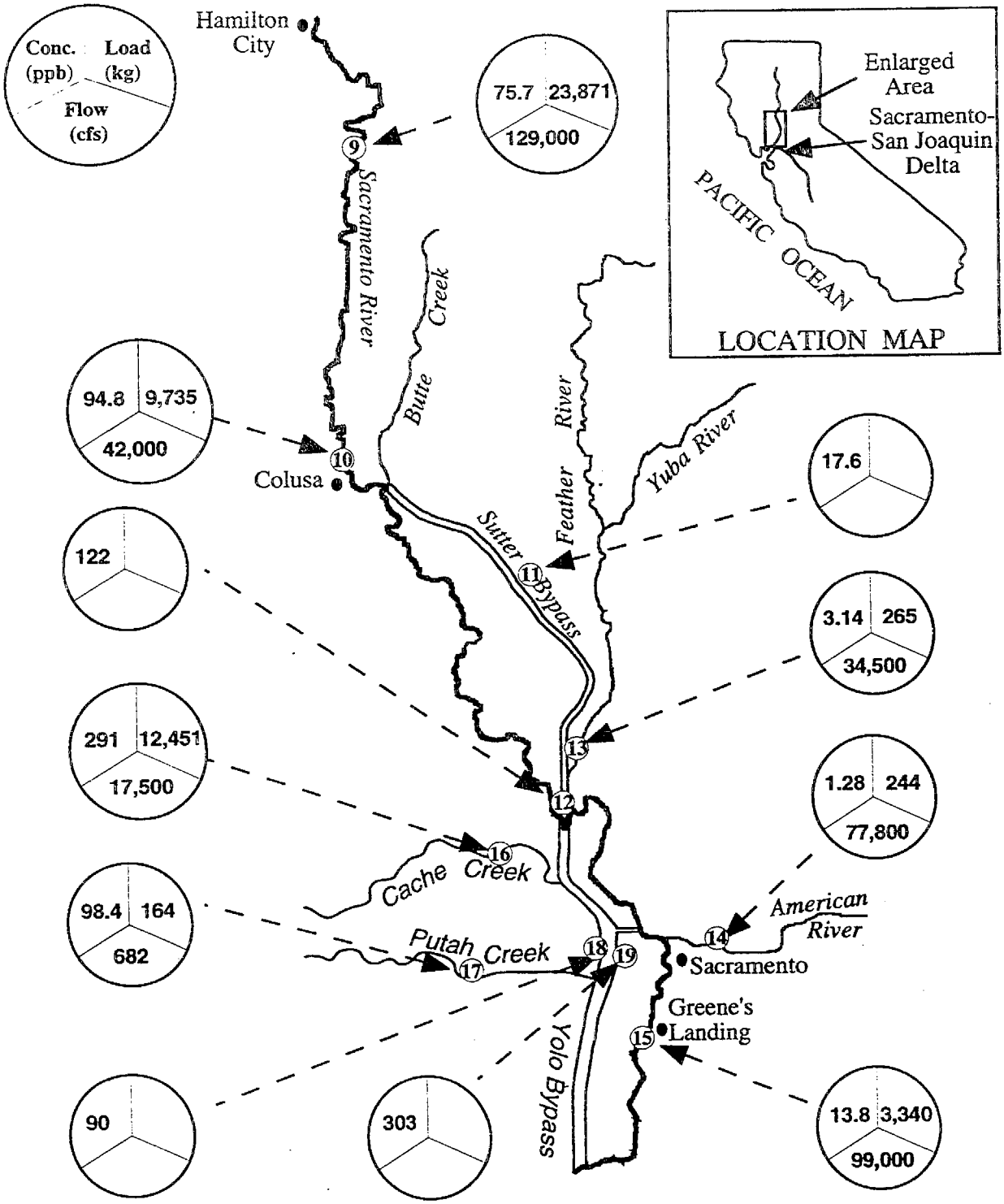

Figure D-11. Schematic of chromium loads, total recoverable concentrations, and water flow in the lower Sacramento River during the largest storm event of the year in March 1995. Small circles with numbers represent stations described in Appendix A. Results suggest enrichment of cadmium at Cache Creek (site 16), Putah Creek (site 17), and the Sacramento River at Greene's Landing (site 15).

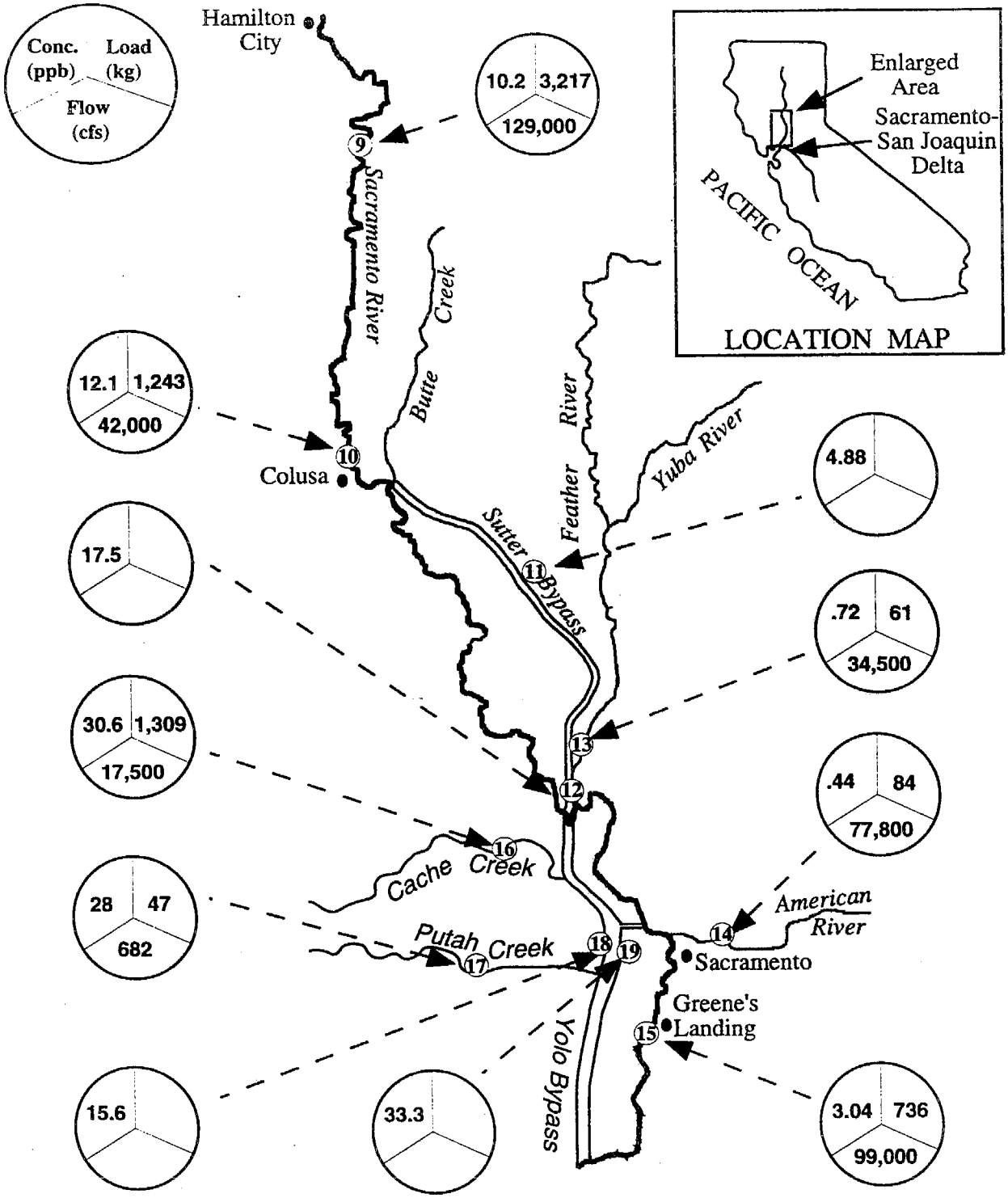

Figure D-12. Schematic of lead loads, total recoverable concentrations, and water flow in the lower Sacramento River during the largest storm event of the year in March 1995. Small circles with numbers represent stations described in Appendix A. Results suggest enrichment of cadmium at Cache Creek (site 16), Putah Creek (site 17), and the Sacramento River at Greene's Landing (site 15).

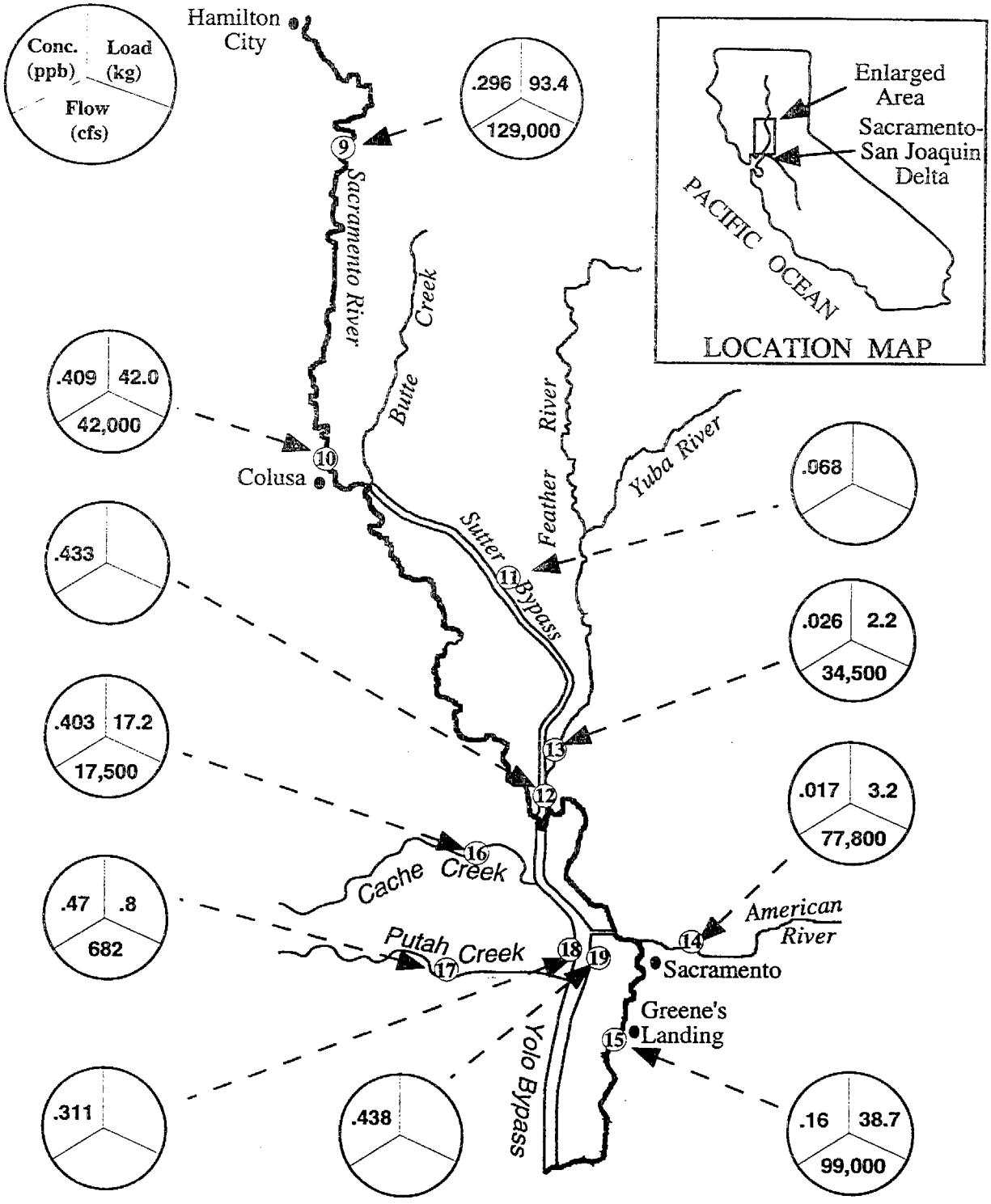

Figure D-13. Schematic of cadmium loads, total recoverable concentrations, and water flow in the lower Sacramento River during the largest storm event of the year in March 1995. Small circles with numbers represent stations described in Appendix A. Results suggest enrichment of cadmium at Cache Creek (site 16), Putah Creek (site 17), and the Sacramento River at Greene's Landing (site 15).

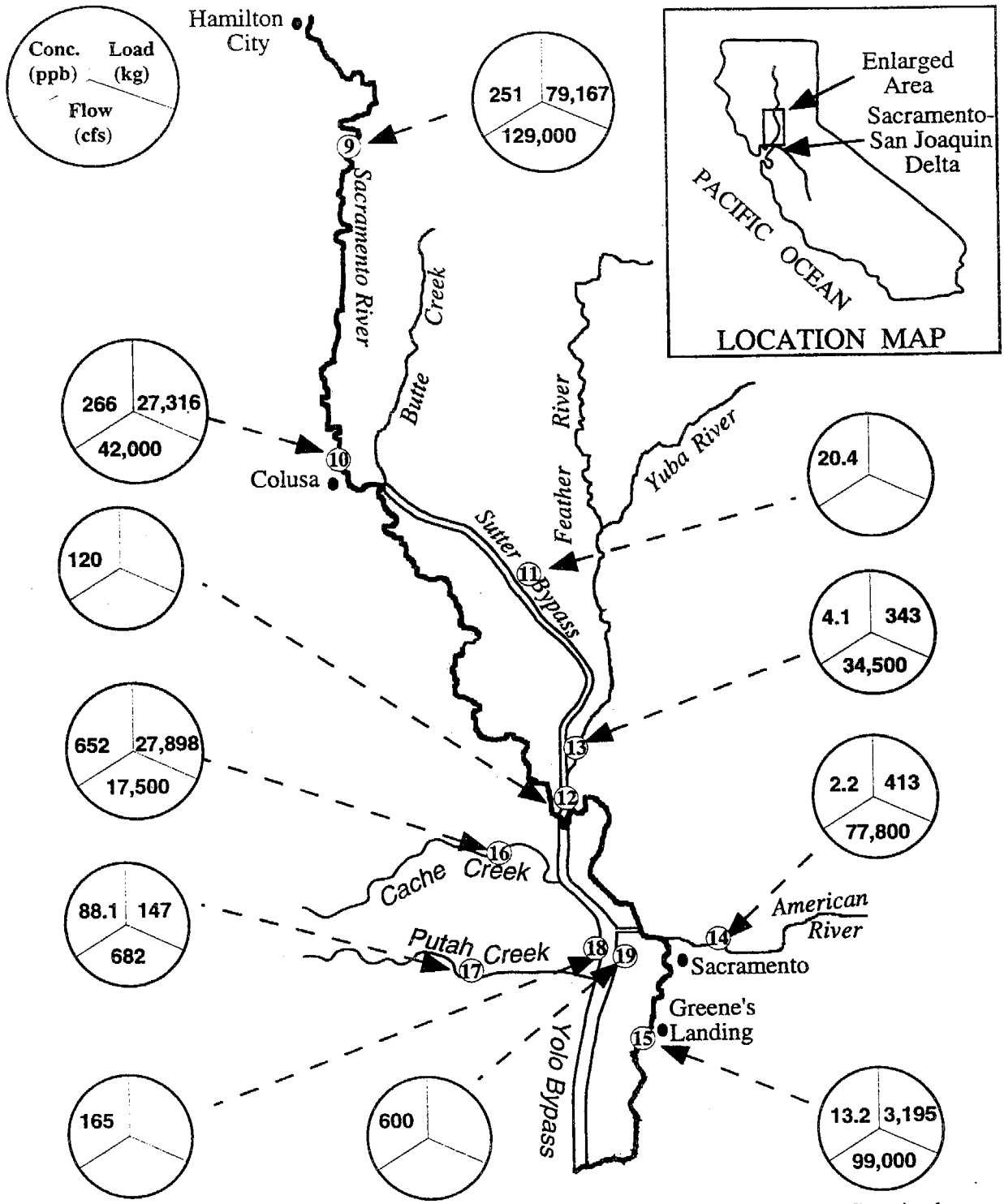

Figure D-14. Schematic of nickel loads, total recoverable concentrations, and water flow in the lower Sacramento River during the largest storm event of the year in March 1995. Small circles with numbers represent stations described in Appendix A. Results suggest enrichment of cadmium at Cache Creek (site 16), Putah Creek (site 17), and the Sacramento River at Greene's Landing (site 15).