

APPENDIX 22

DISCHARGE RELATIONSHIPS BETWEEN SAMPLE STATIONS
AND
CONTINUOUS RECORDING FLOW MEASUREMENT STATION

SLIPPERY ROCK CREEK

PA STATE GAME LANDS #95

PROJECT SL-110-7-101.5

SAMPLE ONE

TRESTLE STATION DISCHARGE VS. SAMPLE

COEFFICIENT MATRIX AND AUGMENTED MATRIX

2

29

524.1182

29

527

9705.2773

REGRESSION COEFFICIENTS OF NORMAL EQUATION

2.397018432617

1.974182128906

ORIGINAL X - Y PAIRS	PREDICTED VALUES	DEVIATION
8.7600 14.6900	14.8968	0.2068
6.9800 10.2900	11.3828	1.0928
5.7200 8.3600	8.8953	0.5353
8.3300 13.8400	14.0479	0.2079
15.7900 28.7100	28.7753	0.0653
15.7900 28.2000	28.7753	0.5753
17.5400 29.9500	32.2301	2.2801
23.2600 49.9400	43.5224	6.4176
17.5400 31.0000	32.2301	1.2301
9.6500 15.9900	16.6538	0.6638
33.6100 63.6000	63.9552	0.3552
12.5400 21.5800	22.3592	0.7792
11.8000 19.9200	20.8983	0.9783
26.2200 48.8100	49.3660	0.5560
11.8000 18.5600	20.8983	2.3383
12.8800 22.3600	23.0304	0.6704
6.6400 10.6400	10.7116	0.0716
5.7200 8.3600	8.8953	0.5353
5.3300 7.9700	8.1254	0.1554
27.1800 51.8600	51.2612	0.5988
3.8200 6.1700	5.1444	1.0256
3.4700 5.5300	4.4534	1.0766
2.1900 3.2300	1.9264	1.3036
1.9000 2.7300	1.3539	1.3761
1.3800 1.8300	0.3274	1.5026

STATISTICAL ANALYSIS WITH ORDER OF EQUATION= 1

NUMBER OF X - Y PAIRS= 25

TOTAL SUMS OF SQUARE= 6982.621

SUMS OF SQUARES DUE TO REGRESSION= 6915.898

SUMS OF SQUARES DUE TO DEVIATION= 66.72265

GOODNESS OF FIT= .990444

MULTIPLE CORRELATION COEFFICIENT 0.99521

STANDARD DEVIATION 1.667364

SOURCE OF VARIATION	ANALYSIS OF VARIANCE		MEAN SQUARE
	SUM OF SQUARES	DEGREES OF FREEDOM	
LIN. REGRESSION	6915.90	1	6915.90
DEVIATION	66.72	23	2.90
TOTAL VARIATION	6982.62	24	

F-TEST FOR EQUALITY OF SAMPLE/REGRESSION VARIANCE

F TEST - SIGNIFICANCE OF REGRESSION = 2383.99

LEVEL .05% - CRITICAL VALUE = 4.28

SAMPLE NO

TRESTLE STATION DISCHARGE VS. SAMPLE

COEFFICIENT MATRIX AND AUGMENTED MATRIX

	2	29	527	1
	29	527	11814	30
	527	11814	301886	335
	11814	301886	8355167	24329

REGRESSION COEFFICIENTS OF NORMAL EQUATION

- 0.072393063227
 0.352905755331
 0.032586526454
 0.000500654152

ORIGINAL X - Y PAIRS	PREDICTED VALUES	DEVIATION
8.7600 5.7200	5.1831	0.5369
3.9800 3.1300	3.8083	0.6783
5.7200 2.4800	2.9187	0.4387
8.3300 5.3300	4.8391	0.4909
15.7900 12.8500	11.6536	0.9964
15.7900 12.1400	11.6536	0.4864
17.5400 12.1400	13.4412	1.3012
23.2300 19.3300	19.4660	0.1360
17.5400 13.1900	13.4412	0.2512
8.8500 8.1300	5.9178	0.2122
33.6100 29.4600	29.5913	0.1313
12.5400 8.7700	8.4991	0.2799
11.8000 7.8500	7.8067	0.0433
26.2200 22.2800	22.5539	0.2789
11.8000 6.5500	7.8067	1.2567
12.8800 9.2400	8.3072	0.4308
6.3400 3.8200	3.5711	0.2589
3.7200 2.4800	2.9187	0.4387
5.3300 2.4800	2.6585	0.1785
17.1200 24.2500	23.5402	0.7098
2.3200 2.1900	1.7233	0.4667
2.4700 1.9000	1.5236	0.3764
2.1900 0.8300	0.8515	0.0265
1.9800 0.6700	0.7123	0.0423
1.3800 0.2900	0.4754	0.1854

STATISTICAL ANALYSIS WITH ORDER OF EQUATION= 3

NUMBER OF X - Y PAIRS= 25

TOTAL SUMS OF SQUARE= 1517.808

SUMS OF SQUARES DUE TO REGRESSION= 1510.445346

SUMS OF SQUARES DUE TO DEVIATION= 7.362654

GOODNESS OF FIT= .995149

MULTIPLE CORRELATION COEFFICIENT

0.99757

STANDARD DEVIATION .553875

ANALYSIS OF VARIANCE

SOURCE OF VARIATION	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE
LAST REGRESSION	1507.49	1	1507.49
CUR. REGRESSION	1510.45	3	503.48
CUR. ADDITION	2.95	1	2.95
CUR. DEVIATION	7.36	22	0.33
TOTAL VARIATION	1517.81	24	

F-TEST FOR EQUALITY OF SAMPLE REGRESSION VARIANCE

F TEST - SIGNIFICANCE OF REGRESSION = 1504.43

LEVEL .05% - CRITICAL VALUE = 3.05

F TEST - IMPROVEMENT OF ADDED TERM =

8.83

LEVEL .05% - CRITICAL VALUE = 4.30

SAMPLE.FIVE

TRESTLE STATION DISCHARGE VS. SAMPLE

COEFFICIENT MATRIX AND AUGMENTED MATRIX

2 29
29 527
527 11814

527
11814
301885

5.9300
88.4508
1854.5144

REGRESSION COEFFICIENTS OF NORMAL EQUATION

0.145412623882
0.004412479699
0.000187528916

ORIGINAL X - Y PAIRS	PREDICTED VALUES	DEVIATION
8.7600	0.2100	0.1985
6.9800	0.1800	0.1853
5.7200	0.1600	0.1768
8.3300	0.1800	0.1952
15.7900	0.2700	0.2618
15.7900	0.2700	0.2618
17.5400	0.2700	0.2805
23.2600	0.3500	0.3495
17.5400	0.2700	0.2805
9.6500	0.2100	0.2055
33.6100	0.5300	0.5056
12.5400	0.2700	0.2302
11.8000	0.2700	0.2236
26.2200	0.3100	0.3900
11.8000	0.2100	0.2236
12.8800	0.2400	0.2334
6.6400	0.1800	0.1830
5.7200	0.1600	0.1768
5.3300	0.1600	0.1743
27.1800	0.4300	0.4039
3.8200	0.1600	0.1650
3.4700	0.1600	0.1630
2.1900	0.1600	0.1560
1.9000	0.1600	0.1545
1.3800	0.1600	0.1519

STATISTICAL ANALYSIS WITH ORDER OF EQUATION= 2
 NUMBER OF X - Y PAIRS= 25
 TOTAL SUMS OF SQUARE= .207107
 SUMS OF SQUARES DUE TO REGRESSION= .193784
 SUMS OF SQUARES DUE TO DEVIATION= .013323
 GOODNESS OF FIT= .935672
 MULTIPLE CORRELATION COEFFICIENT 0.96730
 STANDARD DEVIATION .023561

SOURCE OF VARIATION	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE
LAST REGRESSION	.19	1	.19
CUR. REGRESSION	.19	2	.10
CUR. ADDITION	.01	1	.01
CUR. DEVIATION	.01	22	0.00
TOTAL VARIATION	.21	24	

F-TEST FOR EQUALITY OF SAMPLE/REGRESSION VARIANCE
 F TEST - SIGNIFICANCE OF REGRESSION = 160.00
 LEVEL .05% - CRITICAL VALUE = 3.44
 F TEST - IMPROVEMENT OF ADDED TERM = 9.08
 LEVEL .05% - CRITICAL VALUE = 4.30

SAMPLE.SIX

TRESTLE STATION DISCHARGE VS. SAMPLE

COEFFICIENT MATRIX AND AUGMENTED MATRIX

2
29

29
527

56.7899
1088.3328

REGRESSION COEFFICIENTS OF NORMAL EQUATION

0.504687309265
0.234610378742

ORIGINAL X - Y PAIRS		PREDICTED VALUES	DEVIATION
8.7600	1.6200	1.5505	0.0695
6.9800	1.3600	1.1329	0.2271
5.7200	1.1100	0.8373	0.2727
8.3300	1.6200	1.4496	0.1704
15.7900	3.1300	3.1998	0.0698
15.7900	3.1300	3.1998	0.0698
17.5400	3.7400	3.6104	0.1296
23.2600	4.9300	4.9523	0.0223
17.5400	3.7400	3.6104	0.1296
9.6500	1.9000	1.7593	0.1407
33.6100	4.9800	7.3806	0.4006
12.5400	2.4800	2.4373	0.0427
11.8000	2.4800	2.2637	0.2163
26.2200	5.7200	5.6468	0.0732
11.8000	2.1900	2.2637	0.0737
12.8800	2.7300	2.5171	0.2129
6.6400	0.4800	1.0531	0.5731
5.7200	0.4800	0.8373	0.3573
5.3300	0.3000	0.7458	0.4458
27.1800	6.1300	5.8720	0.2580
3.8200	0.1800	0.3915	0.2115
3.4700	0.1800	0.3094	0.1294
2.1900	0.0800	0.0091	0.0709
1.9000	0.0800	0.0589	0.1389
1.3800	0.0200	0.1809	0.2009

STATISTICAL ANALYSIS WITH ORDER OF EQUATION= 1
NUMBER OF X - Y PAIRS= 25
TOTAL SUMS OF SQUARE= 99.00514
SUMS OF SQUARES DUE TO REGRESSION= 97.6714
SUMS OF SQUARES DUE TO DEVIATION= 1.33374
GOODNESS OF FIT= .984529
MULTIPLE CORRELATION COEFFICIENT 0.99324
STANDARD DEVIATION .235738

ANALYSIS OF VARIANCE			
SOURCE OF VARIATION	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE
LIN. REGRESSION	97.67	1	97.67
DEVIATION	1.33	23	.06
TOTAL VARIATION	99.01	24	

F-TEST FOR EQUALITY OF SAMPLE/REGRESSION VARIANCE
F TEST - SIGNIFICANCE OF REGRESSION = 1684.32
LEVEL .05% - CRITICAL VALUE = 4.28

SAMPLE SEVEN

TRESTLE STATION DISCHARGE VS. SAMPLE

COEFFICIENT MATRIX AND AUGMENTED MATRIX

2
29

29
527

236.8698
4163.0938

REGRESSION COEFFICIENTS OF NORMAL EQUATION

0.404668807983
0.766473829746

ORIGINAL X - Y PAIRS	PREDICTED VALUES	DEVIATION	
8.7600	7.4100	7.1190	0.2910
6.9800	5.3300	5.7547	0.4247
5.7200	4.5600	4.7889	0.2289
8.3300	6.5500	6.7894	0.2394
15.7900	12.6500	12.5073	0.1427
15.7900	12.6500	12.5073	0.1427
17.5400	13.7300	13.8486	0.1186
23.2600	18.2800	18.2328	0.0472
17.5400	13.7300	13.8486	0.1186
9.6500	7.8500	7.8011	0.0489
33.6100	26.3400	26.1658	0.1741
12.5400	9.7000	10.0162	0.3162
11.8000	9.2400	9.4491	0.2091
26.2200	20.4700	20.5016	0.0316
11.8000	9.7000	9.4491	0.2509
12.8800	10.1800	10.2769	0.0969
6.6400	6.1300	5.4941	0.6359
5.7200	4.9300	4.7889	0.1411
5.3300	4.9300	4.4900	0.4400
27.1800	21.0300	21.2374	0.2074
3.8200	3.4700	3.3326	0.1374
3.4700	3.1300	3.0643	0.0657
2.1900	1.9000	2.0832	0.1832
1.9000	1.6200	1.8610	0.2410
1.3800	1.3600	1.4624	0.1024

1 STATISTICAL ANALYSIS WITH ORDER OF EQUATION= 1

NUMBER OF X - Y PAIRS= 25

TOTAL SUMS OF SQUARE= 1043.947

1 SUMS OF SQUARES DUE TO REGRESSION= 1042.472

SUMS OF SQUARES DUE TO DEVIATION= 1.47583

GOODNESS OF FIT= .998586

1 MULTIPLE CORRELATION COEFFICIENT 0.99929

STANDARD DEVIATION .247978

ANALYSIS OF VARIANCE			
SOURCE OF VARIATION	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE
LIN. REGRESSION	1042.47	1	1042.47
DEVIATION	1.48	23	.06
TOTAL VARIATION	1043.95	24	

1 F-TEST FOR EQUALITY OF SAMPLE/REGRESSION VARIANCE

F TEST - SIGNIFICANCE OF REGRESSION = 16246.44

1 LEVEL .05% - CRITICAL VALUE = 4.28

SAMPLE.EIGHT

TRESTLE STATION DISCHARGE VS. SAMPLE

COEFFICIENT MATRIX AND AUGMENTED MATRIX

2
29

29
527

0.6800
10.7191

REGRESSION COEFFICIENTS OF NORMAL EQUATION

0.009378943592
0.001505967928

ORIGINAL X - Y PAIRS		PREDICTED VALUES	DEVIATION
8.7600	0.0200	0.0226	0.0026
4.9800	0.0200	0.0199	0.0001
5.7200	0.0100	0.0180	0.0080
8.3300	0.0200	0.0219	0.0019
15.7900	0.0300	0.0332	0.0032
15.7900	0.0300	0.0332	0.0032
17.5400	0.0300	0.0358	0.0058
23.2600	0.0400	0.0444	0.0044
17.5400	0.0400	0.0358	0.0042
9.6500	0.0300	0.0239	0.0061
33.6100	0.0700	0.0600	0.0100
12.5400	0.0300	0.0283	0.0017
11.8000	0.0300	0.0271	0.0029
26.2200	0.0400	0.0489	0.0089
11.8000	0.0300	0.0271	0.0029
12.8800	0.0300	0.0288	0.0012
6.6400	0.0200	0.0194	0.0006
5.7200	0.0200	0.0180	0.0020
5.3300	0.0200	0.0174	0.0026
27.1800	0.0500	0.0503	0.0003
3.8200	0.0200	0.0151	0.0049
3.4700	0.0200	0.0146	0.0054
2.1900	0.0100	0.0127	0.0027
1.9000	0.0100	0.0122	0.0022
1.3800	0.0100	0.0115	0.0015

STATISTICAL ANALYSIS WITH ORDER OF EQUATION= 1

NUMBER OF X - Y PAIRS= 25

TOTAL SUMS OF SQUARE= 4.50404E-3

SUMS OF SQUARES DUE TO REGRESSION= 4.02446E-3

SUMS OF SQUARES DUE TO DEVIATION= 4.79579E-4

GOODNESS OF FIT= .893522

MULTIPLE CORRELATION COEFFICIENT 0.94526

STANDARD DEVIATION 4.476173E-3

ANALYSIS OF VARIANCE			
SOURCE OF VARIATION	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE
LIN. REGRESSION	.00	1	.00
DEVIATION	.00	23	.00
TOTAL VARIATION	.00	24	

F-TEST FOR EQUALITY OF SAMPLE/REGRESSION VARIANCE

F TEST - SIGNIFICANCE OF REGRESSION = 193.01

LEVEL .05% - CRITICAL VALUE = 4.28