

GIANT
Yellowknife Mines Limited

DATE: November 15, 1988
TO: Doug Bartlett
FROM: Jim Shepherd
CC: Sadek El-Alfy, Gerry Wolfe
RE: TRP Multivariate Analysis

CONCLUSIONS

1. Gold extraction is not significantly related to any plant operating variables for which data is available.
2. Tailings grade provides a better basis for comparison of operating variables than gold extraction.
3. The only significant prediction of tailings grade appears to be based on head grade, eg: plant feed characteristics, not plant operating characteristics.

FIGURE 1:

Variability in gold extraction is not explained by a combination of density, pH, flow rate, tonnage, and head grade.

Since gold extraction is a mathematical value calculated as a function of head grade and tailings grade, the variability of gold extraction is effectively doubled in comparison with head grade and tails grade which are directly measured. Therefore, gold extraction provides a relatively meaningless basis for comparison of operating variables.

FIGURE 2:

Variability in tails grade is approximately 67% accounted for by a combination of density, pH, flow rate, tonnage, and head grade.

Expressing tailings grade instead of gold extraction as a function of the same independent variables as Figure 1 produces a relatively strong correlation.

FIGURE 3:

Variability in tails grade is approximately 64% accounted for by variation in head grade.

Head grade essentially provides the correlation in Figure 2.

Memo to D. Bartlett
November 15, 1988
Page Two


FIGURE 4:

Variability in tails grade is not explained by variation in density, pH, flow, and tonnage.

Tested individually against tails grade to account for approximate variability: tonnage 0.8%, density 3.5%, flow rate 0.1%, pH 14% (head grade 64%).

FIGURE 5:

Variation in tails grade is not explained by variation in pH.


Jim Shepherd
Planning Engineer

/lh

1988 TRP MULTIVARIATE ANALYSIS

EXT. VS DENSITY, pH, FLOW, TONS, HEADS

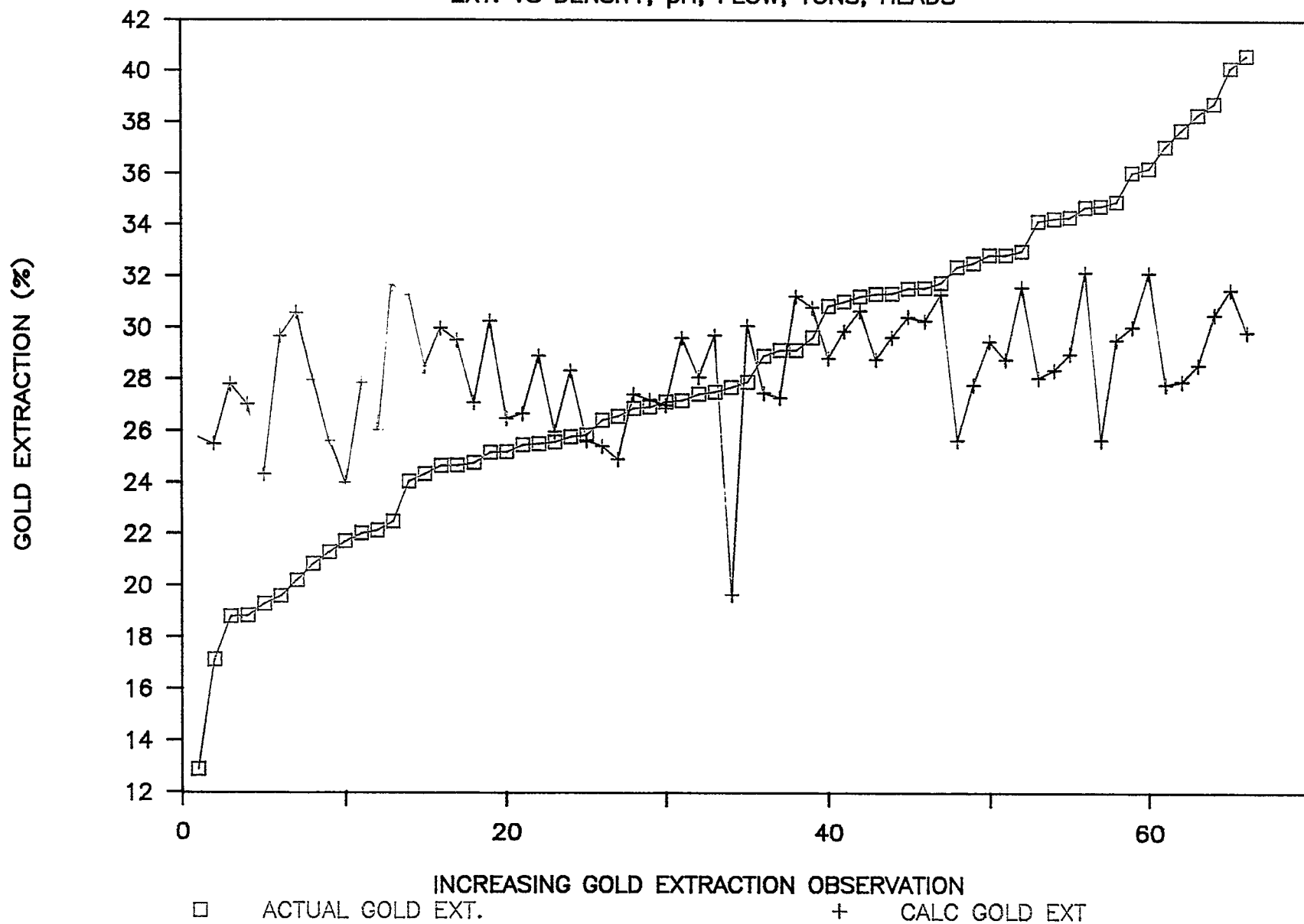


FIG. 1

1988 TRP OPERATING DATA
AUG 15 - OCT 15
JUL 25, AUG 4 DELETED

INDEP VAR (X): DENSITY, pH, FLOW, TONNAGE, HEAD GRADE
DEP VAR (Y): GOLD EXTRACTION

STD CONCLUSION: VARIABILITY IN GOLD EXTRACTION IS NOT
EXPLAINED BY COMBINATION OF DENSITY, pH,
FLOW, TONNAGE, AND HEAD GRADE.

Regression Output:

Constant -0.00708
Std Err of Y Est 5.806707
R Squared 0.146258
No. of Observations 66
Degrees of Freedom 60

X Coefficient(s) 0.000251 -0.30316 226.4954 -0.00266 2.720645
Std Err of Coef. 0.000801 0.361023 86.01191 0.003093 1.691115

Date	Gold Ext	Feed Tons	Feed %Sol	Head Oz	USGPM	pH	Tails Oz	Est Rec	Observation
25-Sep	12.90	6951.0	38.77	0.055	2492	11.03	0.048	25.82	1
19-Aug	17.12	5528.8	34.44	0.069	2609	9.53	0.057	25.56	2
09-Oct	18.80	10493.0	39.44	0.070	3339	11.10	0.057	27.85	3
04-Oct	18.83	8871.4	39.59	0.063	2869	11.10	0.051	27.06	4
15-Oct	19.28	8304.4	38.66	0.048	2772	11.21	0.039	24.36	5
15-Sep	19.59	5816.7	37.05	0.067	2062	10.94	0.054	29.68	6
12-Sep	20.20	6393.2	36.76	0.082	2804	10.67	0.065	30.60	7
17-Sep	20.85	5414.6	33.83	0.061	2487	10.91	0.048	27.98	8
21-Aug	21.30	9642.1	40.22	0.070	3120	10.24	0.055	25.64	9
12-Oct	21.72	8577.9	39.48	0.056	2881	10.59	0.044	24.01	10
08-Oct	22.02	8439.0	40.24	0.073	3284	11.09	0.057	27.88	11
11-Oct	22.14	10040.7	40.95	0.061	3038	11.11	0.047	26.06	12
13-Sep	22.50	7524.7	34.17	0.083	2887	10.67	0.064	31.67	13
08-Sep	24.06	6941.0	38.63	0.083	2270	10.47	0.063	31.27	14
28-Aug	24.35	4303.9	36.36	0.064	1524	10.30	0.048	28.51	15
27-Aug	24.68	4302.3	37.18	0.071	1480	10.31	0.053	30.00	16
24-Sep	24.69	6027.3	35.61	0.066	2268	10.99	0.050	29.53	17
23-Aug	24.80	8383.0	38.62	0.074	2743	10.02	0.056	27.12	18
02-Sep	25.20	7678.0	40.36	0.077	2473	10.93	0.058	30.29	19
19-Sep	25.22	5122.0	28.68	0.050	2919	11.16	0.037	26.51	20
05-Oct	25.48	7980.0	44.66	0.062	2449	11.29	0.046	26.70	21
18-Aug	25.54	7571.0	37.11	0.080	2847	10.20	0.059	28.94	22
20-Aug	25.60	9285.3	39.80	0.070	3047	10.29	0.052	26.01	23
18-Oct	25.81	6634.1	34.97	0.062	2471	10.97	0.046	28.37	24
19-Oct	25.87	1056.4	34.59	0.061	2181	10.25	0.046	25.67	25
17-Oct	26.45	8314.4	39.16	0.063	2671	10.32	0.046	25.45	26
14-Oct	26.59	8763.5	38.79	0.054	3039	11.16	0.040	24.94	27
24-Aug	26.90	8250.0	40.66	0.079	2585	9.81	0.058	27.45	28
02-Oct	26.95	4124.5	35.62	0.059	2517	11.15	0.043	27.23	29
18-Sep	27.16	6691.0	31.41	0.057	2966	10.97	0.041	27.02	30
16-Sep	27.21	5515.0	35.40	0.079	2332	10.03	0.058	29.62	31

07-Sep	27.46	6205.0	36.83	0.065	2161	10.57	0.048	28.12	32
01-Oct	27.54	4730.1	39.48	0.063	1831	11.44	0.046	29.74	33
13-Oct	27.73	10192.2	42.81	0.052	3014	9.68	0.038	19.67	34
14-Sep	27.93	7384.5	37.48	0.076	2514	10.70	0.055	30.12	35
06-Sep	28.93	6536.9	39.88	0.063	2049	10.71	0.045	27.50	36
31-Aug	29.16	8030.0	41.09	0.069	2418	10.50	0.049	27.32	37
29-Sep	29.16	5482.5	33.10	0.068	2358	11.32	0.048	31.26	38
10-Oct	29.65	6191.0	38.33	0.076	2274	10.93	0.054	30.83	39
25-Aug	30.87	3930.7	39.66	0.078	2241	10.36	0.054	28.85	40
05-Sep	31.04	5865.2	36.92	0.067	2327	11.26	0.047	29.89	41
21-Sep	31.24	3826.2	36.44	0.061	1622	11.50	0.042	30.69	42
26-Sep	31.34	6248.0	37.72	0.067	2557	11.14	0.046	28.81	43
26-Aug	31.37	3215.4	39.03	0.079	2042	10.38	0.054	29.67	44
27-Sep	31.57	6183.0	38.04	0.074	2392	11.04	0.051	30.45	45
30-Sep	31.58	7302.1	41.39	0.075	2430	11.21	0.052	30.30	46
04-Sep	31.78	7854.9	37.83	0.080	2663	10.95	0.054	31.33	47
06-Oct	32.41	10386.6	42.83	0.060	2956	11.15	0.040	25.68	48
09-Sep	32.57	8035.0	37.62	0.069	2722	10.60	0.047	27.83	49
29-Aug	32.88	5005.0	38.67	0.072	1635	10.30	0.048	29.51	50
10-Sep	32.89	7079.1	35.63	0.071	2733	10.67	0.048	28.81	51
30-Aug	33.04	7883.8	39.39	0.090	2513	10.25	0.060	31.62	52
22-Aug	34.19	8090.0	38.02	0.075	2703	10.22	0.050	28.10	53
17-Aug	34.30	8636.1	37.49	0.072	2939	10.70	0.047	28.40	54
11-Sep	34.35	6035.2	33.93	0.072	2749	10.59	0.047	29.03	55
28-Sep	34.74	5519.0	34.68	0.076	2433	11.24	0.050	32.19	56
16-Oct	34.78	9456.8	41.79	0.068	2783	10.29	0.045	25.69	57
22-Sep	34.95	5495.7	35.90	0.062	2013	11.17	0.040	29.57	58
07-Oct	36.09	8854.5	41.36	0.077	2643	11.02	0.049	30.07	59
03-Sep	36.26	6376.0	38.00	0.084	2596	11.02	0.053	32.18	60
15-Aug	37.10	6312.3	35.77	0.068	2480	10.40	0.043	27.83	61
16-Aug	37.74	9159.0	38.27	0.068	3033	11.00	0.042	27.95	62
01-Sep	38.32	7080.0	39.24	0.073	2418	10.52	0.045	28.60	63
23-Sep	38.76	4809.1	32.35	0.064	2054	11.07	0.039	30.54	64
03-Oct	40.15	6230.3	34.48	0.077	2638	11.02	0.046	31.51	65
20-Sep	40.63	3246.7	30.54	0.062	2513	11.38	0.037	29.87	66

1988 TRP MULTIVARIATE ANALYSIS

TAILS VS DENSITY, pH, FLOW, TONS, HEADS

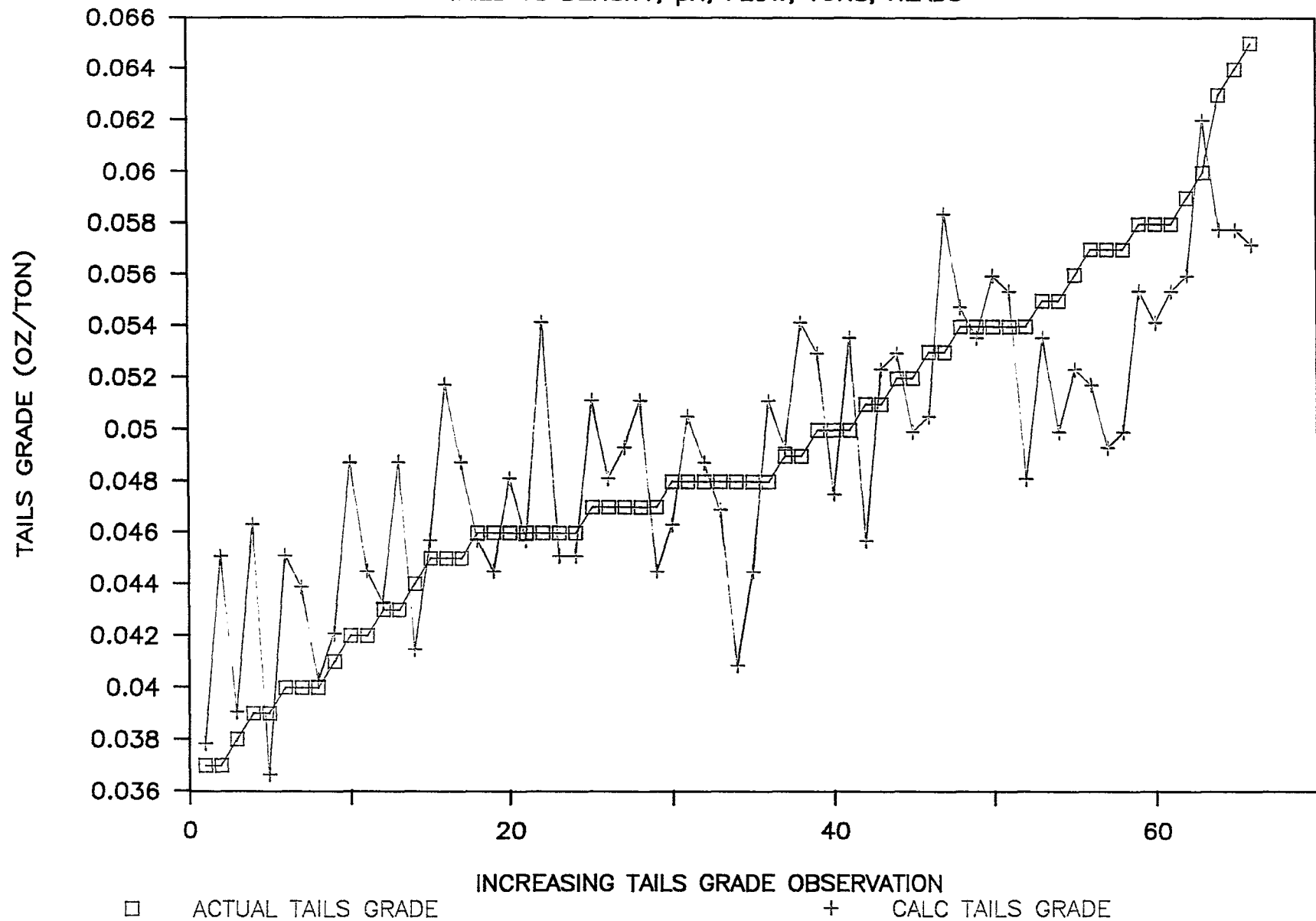


FIG. 2

1988 TRP OPERATING DATA

AUG 15 - OCT 15

JUL 25, AUG 4 DELETED

INDEP VAR (X): DENSITY, pH, FLOW, TONNAGE, HEAD GRADE
 DEP VAR (Y): TAILS GRADE

STD CONCLUSION: VARIABILITY IN TAILS GRADE IS APPROX 67%
 ACCOUNTED FOR BY COMBINATION OF DENSITY, pH,
 FLOW, TONNAGE, AND HEAD GRADE.

Regression Output:

Constant 0.020550
 Std Err of Y Est 0.003975
 R Squared 0.671500
 No. of Observations 66
 Degrees of Freedom 60

X Coefficient(s) -0.00000 0.000214 0.569127 0.000001 -0.00202
 Std Err of Coef. 0.000000 0.000247 0.058892 0.000002 0.001157

Date	Gold Ext	Feed Tons	Feed %Sol	Head Oz	USGPM	pH	Tails Oz	Est Rec	Observation
19-Sep	25.22	5122.0	28.68	0.050	2919	11.16	0.037	0.037	1
20-Sep	40.63	3246.7	30.54	0.062	2513	11.38	0.037	0.043	2
13-Oct	27.73	10192.2	42.81	0.052	3014	9.68	0.038	0.043	3
23-Sep	38.76	4809.1	32.35	0.064	2054	11.07	0.039	0.044	4
15-Oct	19.28	8304.4	38.66	0.048	2772	11.21	0.039	0.037	5
22-Sep	34.95	5495.7	35.90	0.062	2013	11.17	0.040	0.043	6
06-Oct	32.41	10386.6	42.83	0.060	2956	11.15	0.040	0.044	7
14-Oct	26.59	8763.5	38.79	0.054	3039	11.16	0.040	0.041	8
18-Sep	27.16	6691.0	31.41	0.057	2966	10.97	0.041	0.041	9
16-Aug	37.74	9159.0	38.27	0.068	3033	11.00	0.042	0.049	10
21-Sep	31.24	3826.2	36.44	0.061	1622	11.50	0.042	0.042	11
02-Oct	26.95	4124.5	35.62	0.059	2517	11.15	0.043	0.043	12
15-Aug	37.10	6312.3	35.77	0.068	2480	10.40	0.043	0.049	13
12-Oct	21.72	8577.9	39.48	0.056	2881	10.59	0.044	0.043	14
06-Sep	28.93	6536.9	39.88	0.063	2049	10.71	0.045	0.046	15
01-Sep	38.32	7080.0	39.24	0.073	2418	10.52	0.045	0.052	16
16-Oct	34.78	9456.8	41.79	0.068	2783	10.29	0.045	0.050	17
01-Oct	27.54	4730.1	39.48	0.063	1831	11.44	0.046	0.044	18
19-Oct	25.87	1056.4	34.59	0.061	2181	10.25	0.046	0.046	19
26-Sep	31.34	6248.0	37.72	0.067	2557	11.14	0.046	0.048	20
17-Oct	26.45	8314.4	39.16	0.063	2671	10.32	0.046	0.047	21
03-Oct	40.15	6230.3	34.48	0.077	2638	11.02	0.046	0.053	22
05-Oct	25.48	7980.0	44.66	0.062	2449	11.29	0.046	0.045	23
18-Oct	25.81	6634.1	34.97	0.062	2471	10.97	0.046	0.044	24
11-Sep	34.35	6035.2	33.93	0.072	2749	10.59	0.047	0.051	25
05-Sep	31.04	5865.2	36.92	0.067	2327	11.26	0.047	0.047	26
09-Sep	32.57	8035.0	37.62	0.069	2722	10.60	0.047	0.050	27
17-Aug	34.30	8636.1	37.49	0.072	2939	10.70	0.047	0.051	28
11-Oct	22.14	10040.7	40.95	0.061	3038	11.11	0.047	0.045	29
28-Aug	24.35	4303.9	36.36	0.064	1524	10.30	0.048	0.046	30
10-Sep	32.89	7079.1	35.63	0.071	2733	10.67	0.048	0.050	31

29-Sep	29.16	5482.5	33.10	0.068	2358	11.32	0.048	0.047	32
07-Sep	27.46	6205.0	36.83	0.065	2161	10.57	0.048	0.047	33
25-Sep	12.90	6951.0	38.77	0.055	2492	11.03	0.048	0.041	34
17-Sep	20.85	5414.6	33.83	0.061	2487	10.91	0.048	0.044	35
29-Aug	32.88	5005.0	38.67	0.072	1635	10.30	0.048	0.051	36
31-Aug	29.16	8030.0	41.09	0.069	2418	10.50	0.049	0.050	37
07-Oct	36.09	8854.5	41.36	0.077	2643	11.02	0.049	0.054	38
22-Aug	34.19	8090.0	38.02	0.075	2703	10.22	0.050	0.054	39
24-Sep	24.69	6027.3	35.61	0.066	2268	10.99	0.050	0.046	40
28-Sep	34.74	5519.0	34.68	0.076	2433	11.24	0.050	0.052	41
04-Oct	18.83	8871.4	39.59	0.063	2869	11.10	0.051	0.046	42
27-Sep	31.57	6183.0	38.04	0.074	2392	11.04	0.051	0.052	43
30-Sep	31.58	7302.1	41.39	0.075	2430	11.21	0.052	0.052	44
20-Aug	25.60	9285.3	39.80	0.070	3047	10.29	0.052	0.052	45
27-Aug	24.68	4302.3	37.18	0.071	1480	10.31	0.053	0.050	46
03-Sep	36.26	6376.0	38.00	0.084	2596	11.02	0.053	0.058	47
25-Aug	30.87	3930.7	39.66	0.078	2241	10.36	0.054	0.056	48
10-Oct	29.65	6191.0	38.33	0.076	2274	10.93	0.054	0.053	49
04-Sep	31.78	7854.9	37.83	0.080	2663	10.95	0.054	0.055	50
26-Aug	31.37	3215.4	39.03	0.079	2042	10.38	0.054	0.056	51
15-Sep	19.59	5816.7	37.05	0.067	2062	10.94	0.054	0.047	52
14-Sep	27.93	7384.5	37.48	0.076	2514	10.70	0.055	0.053	53
21-Aug	21.30	9642.1	40.22	0.070	3120	10.24	0.055	0.052	54
23-Aug	24.80	8383.0	38.62	0.074	2743	10.02	0.056	0.054	55
08-Oct	22.02	8439.0	40.24	0.073	3284	11.09	0.057	0.052	56
19-Aug	17.12	5528.8	34.44	0.069	2609	9.53	0.057	0.051	57
09-Oct	18.80	10493.0	39.44	0.070	3339	11.10	0.057	0.050	58
16-Sep	27.21	5515.0	35.40	0.079	2332	10.03	0.058	0.056	59
02-Sep	25.20	7678.0	40.36	0.077	2473	10.93	0.058	0.054	60
24-Aug	26.90	8250.0	40.66	0.079	2585	9.81	0.058	0.057	61
18-Aug	25.54	7571.0	37.11	0.080	2847	10.20	0.059	0.057	62
30-Aug	33.04	7883.8	39.39	0.090	2513	10.25	0.060	0.062	63
08-Sep	24.06	6941.0	38.63	0.083	2270	10.47	0.063	0.058	64
13-Sep	22.50	7524.7	34.17	0.083	2887	10.67	0.064	0.057	65
12-Sep	20.20	6393.2	36.76	0.082	2804	10.67	0.065	0.057	66

1988 TRP MULTIVARIATE ANALYSIS

TAILS GRADE VS HEAD GRADE

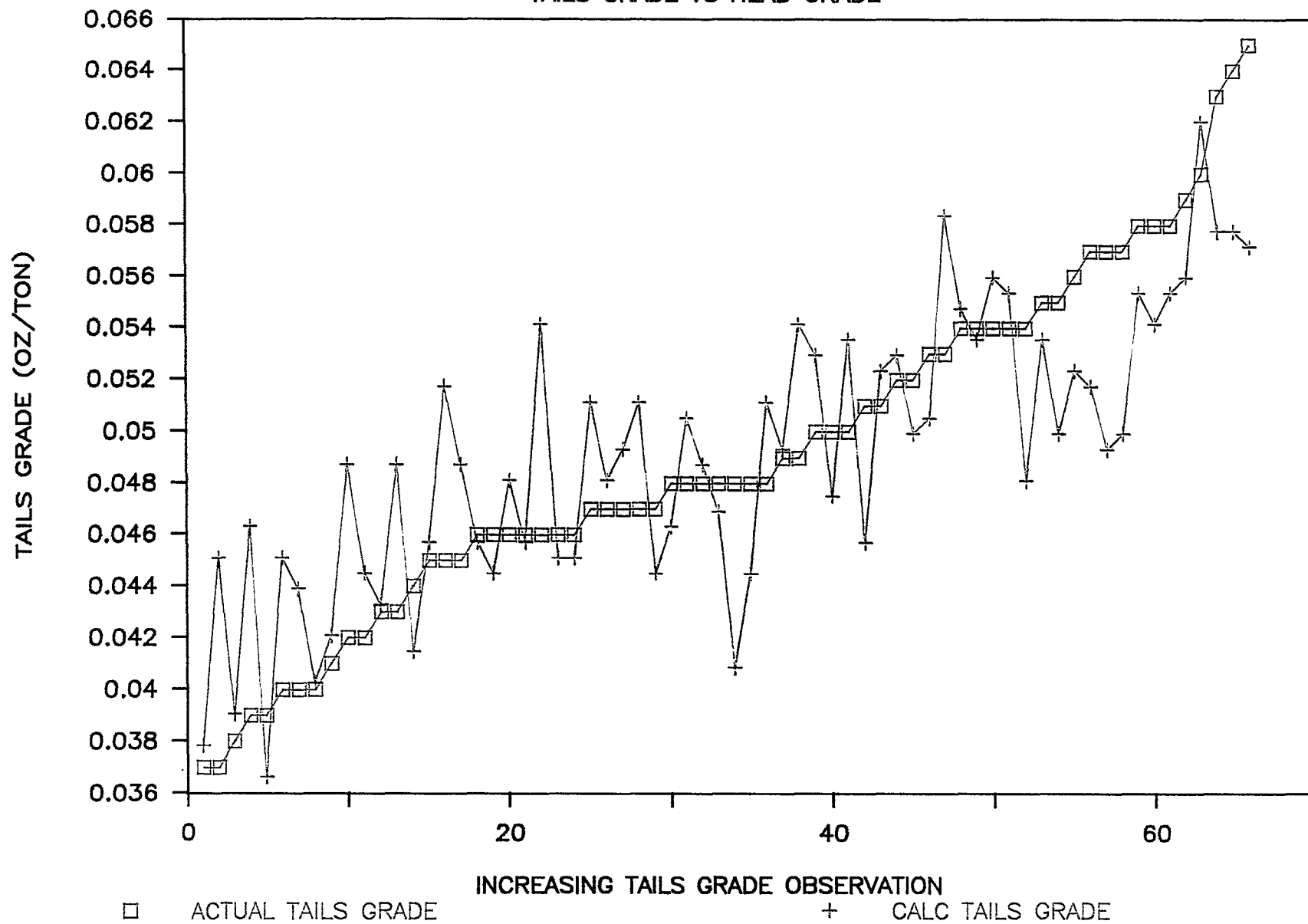


FIG. 3

1988 TRP OPERATING DATA
AUG 15 - OCT 15
JUL 25, AUG 4 DELETED

INDEP VAR (X): HEAD GRADE
DEP VAR (Y): TAILS GRADE

STD CONCLUSION: VARIABILITY IN TAILS GRADE IS APPROX 64%
ACCOUNTED FOR BY VARIATION IN HEAD GRADE

Regression Output:

Constant 0.007605
Std Err of Y Est 0.004025
R Squared 0.640705
No. of Observations 66
Degrees of Freedom 64

X Coefficient(s) 0.603925
Std Err of Coef. 0.056531

Date	Gold Ext	Feed Tons	Feed %Sol	Head Oz	USGPM	pH	Tails Oz	Est Tails	Observation
19-Sep	25.22	5122.0	28.68	0.050	2919	11.16	0.037	0.038	1
20-Sep	40.63	3246.7	30.54	0.062	2513	11.38	0.037	0.045	2
13-Oct	27.73	10192.2	42.81	0.052	3014	9.68	0.038	0.039	3
23-Sep	38.76	4809.1	32.35	0.064	2054	11.07	0.039	0.046	4
15-Oct	19.28	8304.4	38.66	0.048	2772	11.21	0.039	0.037	5
22-Sep	34.95	5495.7	35.90	0.062	2013	11.17	0.040	0.045	6
06-Oct	32.41	10386.6	42.83	0.060	2956	11.15	0.040	0.044	7
14-Oct	26.59	8763.5	38.79	0.054	3039	11.16	0.040	0.040	8
18-Sep	27.16	6691.0	31.41	0.057	2966	10.97	0.041	0.042	9
16-Aug	37.74	9159.0	38.27	0.068	3033	11.00	0.042	0.049	10
21-Sep	31.24	3826.2	36.44	0.061	1622	11.50	0.042	0.044	11
02-Oct	26.95	4124.5	35.62	0.059	2517	11.15	0.043	0.043	12
15-Aug	37.10	6312.3	35.77	0.068	2480	10.40	0.043	0.049	13
12-Oct	21.72	8577.9	39.48	0.056	2881	10.59	0.044	0.041	14
06-Sep	28.93	6536.9	39.88	0.063	2049	10.71	0.045	0.046	15
01-Sep	38.32	7080.0	39.24	0.073	2418	10.52	0.045	0.052	16
16-Oct	34.78	9456.8	41.79	0.068	2783	10.29	0.045	0.049	17
01-Oct	27.54	4730.1	39.48	0.063	1831	11.44	0.046	0.046	18
19-Oct	25.87	1056.4	34.59	0.061	2181	10.25	0.046	0.044	19
26-Sep	31.34	6248.0	37.72	0.067	2557	11.14	0.046	0.048	20
17-Oct	26.45	8314.4	39.16	0.063	2671	10.32	0.046	0.046	21
03-Oct	40.15	6230.3	34.48	0.077	2638	11.02	0.046	0.054	22
05-Oct	25.48	7980.0	44.66	0.062	2449	11.29	0.046	0.045	23
18-Oct	25.81	6634.1	34.97	0.062	2471	10.97	0.046	0.045	24
11-Sep	34.35	6035.2	33.93	0.072	2749	10.59	0.047	0.051	25
05-Sep	31.04	5865.2	36.92	0.067	2327	11.26	0.047	0.048	26
09-Sep	32.57	8035.0	37.62	0.069	2722	10.60	0.047	0.049	27
17-Aug	34.30	8636.1	37.49	0.072	2939	10.70	0.047	0.051	28
11-Oct	22.14	10040.7	40.95	0.061	3038	11.11	0.047	0.044	29
28-Aug	24.35	4303.9	36.36	0.064	1524	10.30	0.048	0.046	30
10-Sep	32.89	7079.1	35.63	0.071	2733	10.67	0.048	0.050	31
29-Sep	29.16	5482.5	33.10	0.068	2358	11.32	0.048	0.049	32

07-Sep	27.46	6205.0	36.83	0.065	2161	10.57	0.048	0.047	33
25-Sep	12.90	6951.0	38.77	0.055	2492	11.03	0.048	0.041	34
17-Sep	20.85	5414.6	33.83	0.061	2487	10.91	0.048	0.044	35
29-Aug	32.88	5005.0	38.67	0.072	1635	10.30	0.048	0.051	36
31-Aug	29.16	8030.0	41.09	0.069	2418	10.50	0.049	0.049	37
07-Oct	36.09	8854.5	41.36	0.077	2643	11.02	0.049	0.054	38
22-Aug	34.19	8090.0	38.02	0.075	2703	10.22	0.050	0.053	39
24-Sep	24.69	6027.3	35.61	0.066	2268	10.99	0.050	0.047	40
28-Sep	34.74	5519.0	34.68	0.076	2433	11.24	0.050	0.054	41
04-Oct	18.83	8871.4	39.59	0.063	2869	11.10	0.051	0.046	42
27-Sep	31.57	6183.0	38.04	0.074	2392	11.04	0.051	0.052	43
30-Sep	31.58	7302.1	41.39	0.075	2430	11.21	0.052	0.053	44
20-Aug	25.60	9285.3	39.80	0.070	3047	10.29	0.052	0.050	45
27-Aug	24.68	4302.3	37.18	0.071	1480	10.31	0.053	0.050	46
03-Sep	36.26	6376.0	38.00	0.084	2596	11.02	0.053	0.058	47
25-Aug	30.87	3930.7	39.66	0.078	2241	10.36	0.054	0.055	48
10-Oct	29.65	6191.0	38.33	0.076	2274	10.93	0.054	0.054	49
04-Sep	31.78	7854.9	37.83	0.080	2663	10.95	0.054	0.056	50
26-Aug	31.37	3215.4	39.03	0.079	2042	10.38	0.054	0.055	51
15-Sep	19.59	5816.7	37.05	0.067	2062	10.94	0.054	0.048	52
14-Sep	27.93	7384.5	37.48	0.076	2514	10.70	0.055	0.054	53
21-Aug	21.30	9642.1	40.22	0.070	3120	10.24	0.055	0.050	54
23-Aug	24.80	8383.0	38.62	0.074	2743	10.02	0.056	0.052	55
08-Oct	22.02	8439.0	40.24	0.073	3284	11.09	0.057	0.052	56
19-Aug	17.12	5528.8	34.44	0.069	2609	9.53	0.057	0.049	57
09-Oct	18.80	10493.0	39.44	0.070	3339	11.10	0.057	0.050	58
16-Sep	27.21	5515.0	35.40	0.079	2332	10.03	0.058	0.055	59
02-Sep	25.20	7678.0	40.36	0.077	2473	10.93	0.058	0.054	60
24-Aug	26.90	8250.0	40.66	0.079	2585	9.81	0.058	0.055	61
18-Aug	25.54	7571.0	37.11	0.080	2847	10.20	0.059	0.056	62
30-Aug	33.04	7883.8	39.39	0.090	2513	10.25	0.060	0.062	63
08-Sep	24.06	6941.0	38.63	0.083	2270	10.47	0.063	0.058	64
13-Sep	22.50	7524.7	34.17	0.083	2887	10.67	0.064	0.058	65
12-Sep	20.20	6393.2	36.76	0.082	2804	10.67	0.065	0.057	66

1988 TRP MULTIVARIATE ANALYSIS

TAILS GRADE VS DENSITY, pH, FLOW, TONS

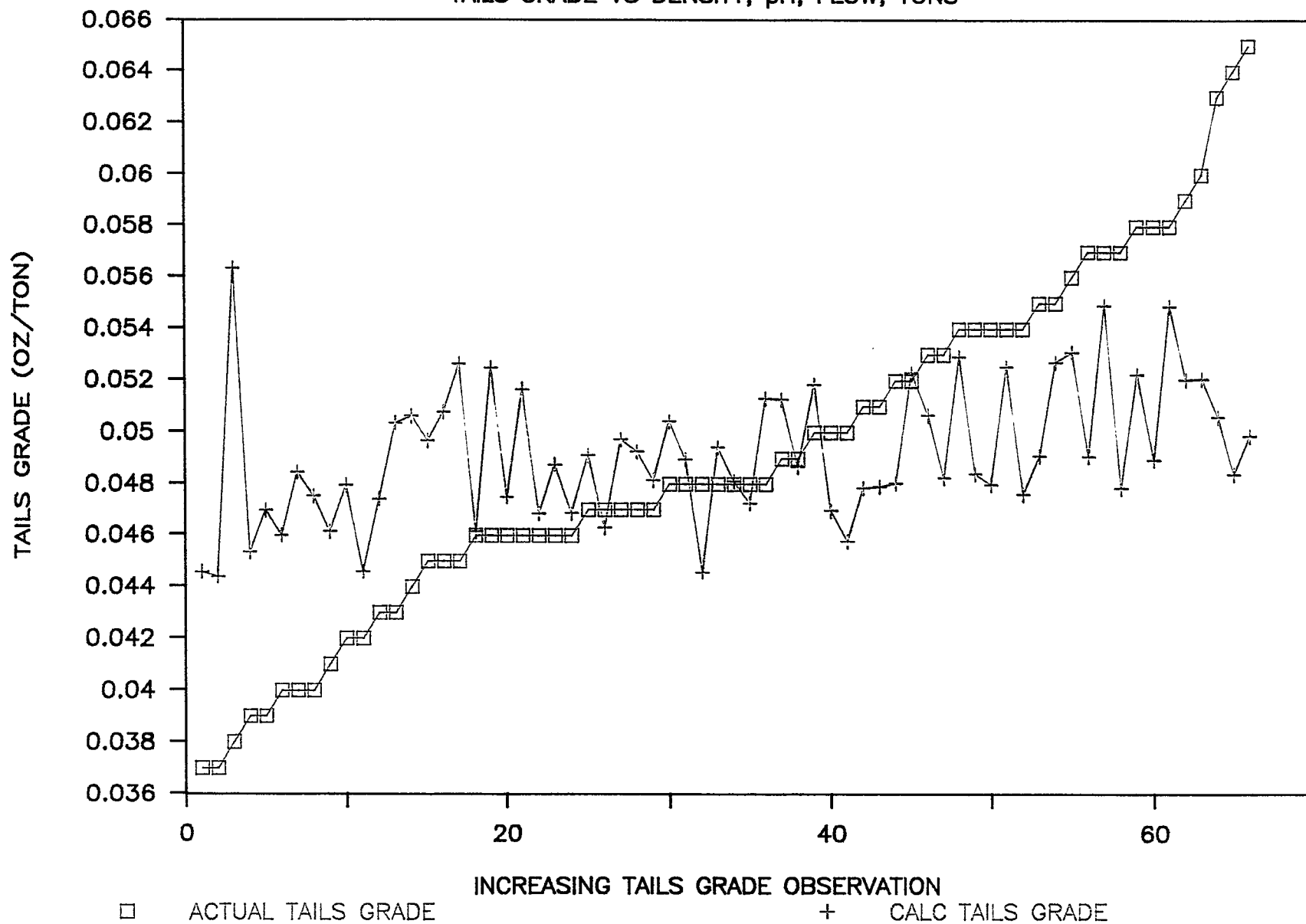


FIG. 4

1988 TRP OPERATING DATA
AUG 15 - OCT 15
JUL 25, AUG 4 DELETED

INDEP VAR (X): DENSITY, pH, FLOW, TONNAGE
DEP VAR (Y): TAILS GRADE

STD CONCLUSION: VARIABILITY IN TAILS GRADE IS NOT
EXPLAINED BY VARIATION IN
DENSITY, pH, FLOW, AND TONNAGE.

Regression Output:

Constant 0.087850
Std Err of Y Est 0.006304
R Squared 0.160183
No. of Observations 66
Degrees of Freedom 61

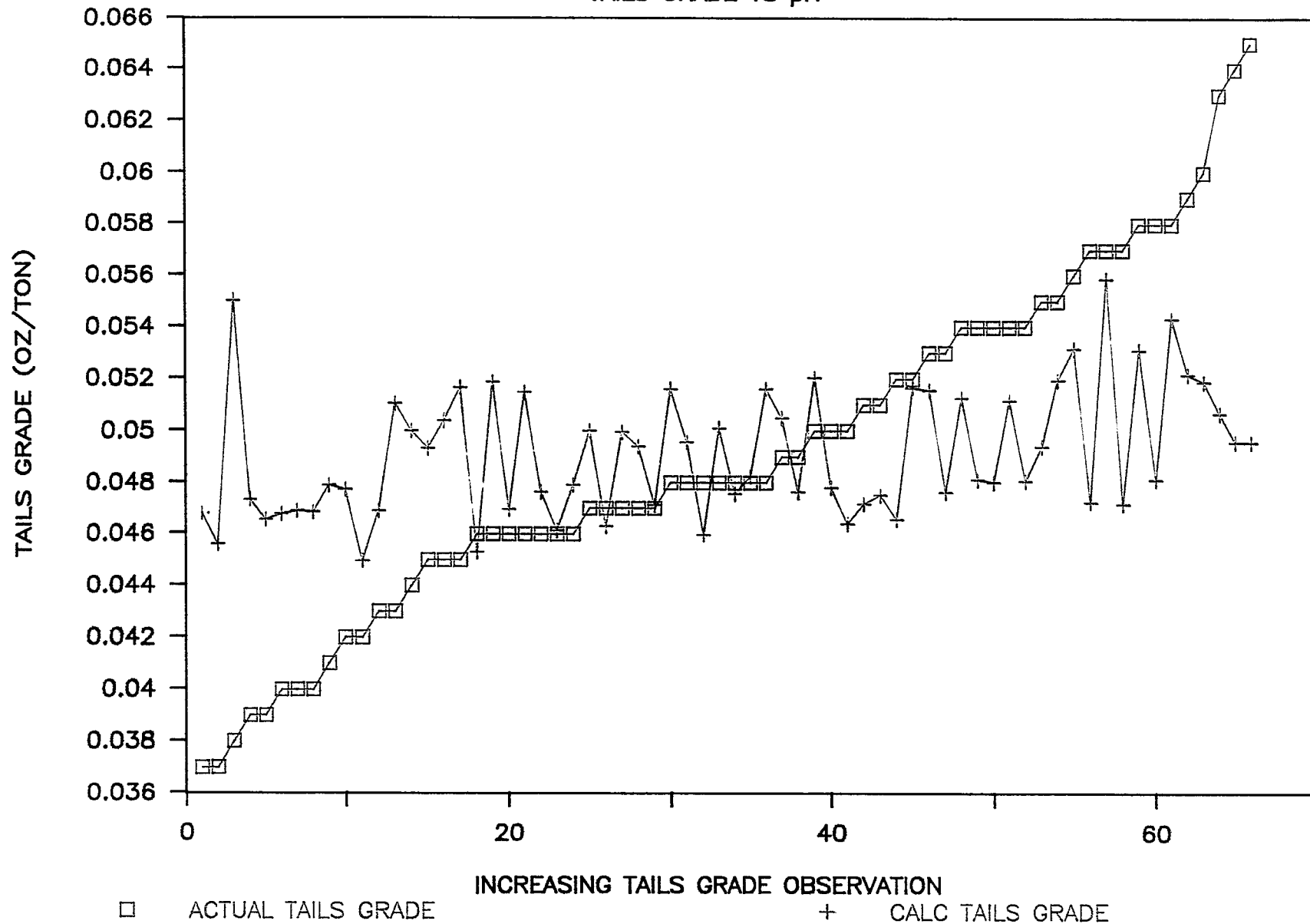
X Coefficient(s) -0.00000 0.000433 0.000001 -0.00522 2.720645
Std Err of Coef. 0.000000 0.000390 0.000003 0.001759 1.691115

Date	Gold Ext	Head Oz	Feed Tons	Feed %Sol	USGPM	pH	Tails Oz	Est Rec	Observation
19-Sep	25.22	0.050	5122.0	28.68	2919	11.16	0.037	0.04	1
20-Sep	40.63	0.062	3246.7	30.54	2513	11.38	0.037	0.04	2
13-Oct	27.73	0.052	10192.2	42.81	3014	9.68	0.038	0.06	3
23-Sep	38.76	0.064	4809.1	32.35	2054	11.07	0.039	0.05	4
15-Oct	19.28	0.048	8304.4	38.66	2772	11.21	0.039	0.05	5
22-Sep	34.95	0.062	5495.7	35.90	2013	11.17	0.040	0.05	6
06-Oct	32.41	0.060	10386.6	42.83	2956	11.15	0.040	0.05	7
14-Oct	26.59	0.054	8763.5	38.79	3039	11.16	0.040	0.05	8
18-Sep	27.16	0.057	6691.0	31.41	2966	10.97	0.041	0.05	9
16-Aug	37.74	0.068	9159.0	38.27	3033	11.00	0.042	0.05	10
21-Sep	31.24	0.061	3826.2	36.44	1622	11.50	0.042	0.04	11
02-Oct	26.95	0.059	4124.5	35.62	2517	11.15	0.043	0.05	12
15-Aug	37.10	0.068	6312.3	35.77	2480	10.40	0.043	0.05	13
12-Oct	21.72	0.056	8577.9	39.48	2881	10.59	0.044	0.05	14
06-Sep	28.93	0.063	6536.9	39.88	2049	10.71	0.045	0.05	15
01-Sep	38.32	0.073	7080.0	39.24	2418	10.52	0.045	0.05	16
16-Oct	34.78	0.068	9456.8	41.79	2783	10.29	0.045	0.05	17
01-Oct	27.54	0.063	4730.1	39.48	1831	11.44	0.046	0.05	18
19-Oct	25.87	0.061	1056.4	34.59	2181	10.25	0.046	0.05	19
26-Sep	31.34	0.067	6248.0	37.72	2557	11.14	0.046	0.05	20
17-Oct	26.45	0.063	8314.4	39.16	2671	10.32	0.046	0.05	21
03-Oct	40.15	0.077	6230.3	34.48	2638	11.02	0.046	0.05	22
05-Oct	25.48	0.062	7980.0	44.66	2449	11.29	0.046	0.05	23
18-Oct	25.81	0.062	6634.1	34.97	2471	10.97	0.046	0.05	24
11-Sep	34.35	0.072	6035.2	33.93	2749	10.59	0.047	0.05	25
05-Sep	31.04	0.067	5865.2	36.92	2327	11.26	0.047	0.05	26
09-Sep	32.57	0.069	8035.0	37.62	2722	10.60	0.047	0.05	27
17-Aug	34.30	0.072	8636.1	37.49	2939	10.70	0.047	0.05	28
11-Oct	22.14	0.061	10040.7	40.95	3038	11.11	0.047	0.05	29
28-Aug	24.35	0.064	4303.9	36.36	1524	10.30	0.048	0.05	30

10-Sep	32.89	0.071	7079.1	35.63	2733	10.67	0.048	0.05	31
29-Sep	29.16	0.068	5482.5	33.10	2358	11.32	0.048	0.04	32
07-Sep	27.46	0.065	6205.0	36.83	2161	10.57	0.048	0.05	33
25-Sep	12.90	0.055	6951.0	38.77	2492	11.03	0.048	0.05	34
17-Sep	20.85	0.061	5414.6	33.83	2487	10.91	0.048	0.05	35
29-Aug	32.88	0.072	5005.0	38.67	1635	10.30	0.048	0.05	36
31-Aug	29.16	0.069	8030.0	41.09	2418	10.50	0.049	0.05	37
07-Oct	36.09	0.077	8854.5	41.36	2643	11.02	0.049	0.05	38
22-Aug	34.19	0.075	8090.0	38.02	2703	10.22	0.050	0.05	39
24-Sep	24.69	0.066	6027.3	35.61	2268	10.99	0.050	0.05	40
28-Sep	34.74	0.076	5519.0	34.68	2433	11.24	0.050	0.05	41
04-Oct	18.83	0.063	8871.4	39.59	2869	11.10	0.051	0.05	42
27-Sep	31.57	0.074	6183.0	38.04	2392	11.04	0.051	0.05	43
30-Sep	31.58	0.075	7302.1	41.39	2430	11.21	0.052	0.05	44
20-Aug	25.60	0.070	9285.3	39.80	3047	10.29	0.052	0.05	45
27-Aug	24.68	0.071	4302.3	37.18	1480	10.31	0.053	0.05	46
03-Sep	36.26	0.084	6376.0	38.00	2596	11.02	0.053	0.05	47
25-Aug	30.87	0.078	3930.7	39.66	2241	10.36	0.054	0.05	48
10-Oct	29.65	0.076	6191.0	38.33	2274	10.93	0.054	0.05	49
04-Sep	31.78	0.080	7854.9	37.83	2663	10.95	0.054	0.05	50
26-Aug	31.37	0.079	3215.4	39.03	2042	10.38	0.054	0.05	51
15-Sep	19.59	0.067	5816.7	37.05	2062	10.94	0.054	0.05	52
14-Sep	27.93	0.076	7384.5	37.48	2514	10.70	0.055	0.05	53
21-Aug	21.30	0.070	9642.1	40.22	3120	10.24	0.055	0.05	54
23-Aug	24.80	0.074	8383.0	38.62	2743	10.02	0.056	0.05	55
08-Oct	22.02	0.073	8439.0	40.24	3284	11.09	0.057	0.05	56
19-Aug	17.12	0.069	5528.8	34.44	2609	9.53	0.057	0.05	57
09-Oct	18.80	0.070	10493.0	39.44	3339	11.10	0.057	0.05	58
16-Sep	27.21	0.079	5515.0	35.40	2332	10.03	0.058	0.05	59
02-Sep	25.20	0.077	7678.0	40.36	2473	10.93	0.058	0.05	60
24-Aug	26.90	0.079	8250.0	40.66	2585	9.81	0.058	0.05	61
18-Aug	25.54	0.080	7571.0	37.11	2847	10.20	0.059	0.05	62
30-Aug	33.04	0.090	7883.8	39.39	2513	10.25	0.060	0.05	63
08-Sep	24.06	0.083	6941.0	38.63	2270	10.47	0.063	0.05	64
13-Sep	22.50	0.083	7524.7	34.17	2887	10.67	0.064	0.05	65
12-Sep	20.20	0.082	6393.2	36.76	2804	10.67	0.065	0.05	66

1988 TRP MULTIVARIATE ANALYSIS

TAILS GRADE VS pH



1988 TRP OPERATING DATA
AUG 15 - OCT 15
JUL 25, AUG 4 DELETED

INDEP VAR (X): pH
DEP VAR (Y): TAILS GRADE

STD CONCLUSION: VARIABILITY IN TAILS GRADE IS NOT
EXPLAINED BY VARIATION IN pH.

Regression Output:
Constant 0.108590
Std Err of Y Est 0.006230
R Squared 0.139547
No. of Observations 66
Degrees of Freedom 64

X Coefficient(s) -0.00553
Std Err of Coef. 0.001716

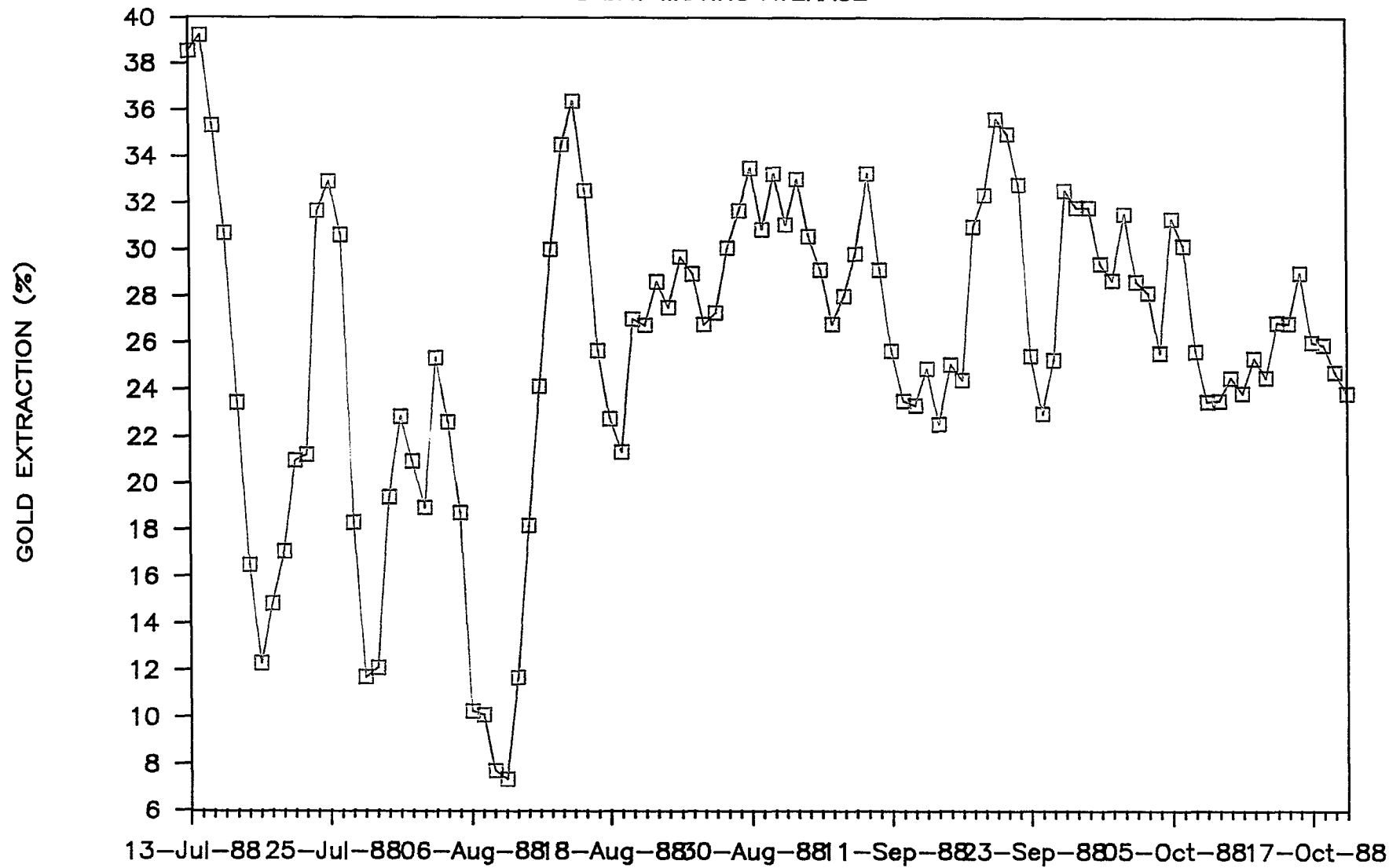
Date	Gold Ext	Head Oz	Feed Tons	Feed %Sol	USGPM	pH	Tails Oz	Est Tails	Observation
19-Sep	25.22	0.050	5122.0	28.68	2919	11.16	0.037	0.05	1
20-Sep	40.63	0.062	3246.7	30.54	2513	11.38	0.037	0.05	2
13-Oct	27.73	0.052	10192.2	42.81	3014	9.68	0.038	0.06	3
23-Sep	38.76	0.064	4809.1	32.35	2054	11.07	0.039	0.05	4
15-Oct	19.28	0.048	8304.4	38.66	2772	11.21	0.039	0.05	5
22-Sep	34.95	0.062	5495.7	35.90	2013	11.17	0.040	0.05	6
06-Oct	32.41	0.060	10386.6	42.83	2956	11.15	0.040	0.05	7
14-Oct	26.59	0.054	8763.5	38.79	3039	11.16	0.040	0.05	8
18-Sep	27.16	0.057	6691.0	31.41	2966	10.97	0.041	0.05	9
16-Aug	37.74	0.068	9159.0	38.27	3033	11.00	0.042	0.05	10
21-Sep	31.24	0.061	3826.2	36.44	1622	11.50	0.042	0.04	11
02-Oct	26.95	0.059	4124.5	35.62	2517	11.15	0.043	0.05	12
15-Aug	37.10	0.068	6312.3	35.77	2480	10.40	0.043	0.05	13
12-Oct	21.72	0.056	8577.9	39.48	2881	10.59	0.044	0.05	14
06-Sep	28.93	0.063	6536.9	39.88	2049	10.71	0.045	0.05	15
01-Sep	38.32	0.073	7080.0	39.24	2418	10.52	0.045	0.05	16
16-Oct	34.78	0.068	9456.8	41.79	2783	10.29	0.045	0.05	17
01-Oct	27.54	0.063	4730.1	39.48	1831	11.44	0.046	0.05	18
19-Oct	25.87	0.061	1056.4	34.59	2181	10.25	0.046	0.05	19
26-Sep	31.34	0.067	6248.0	37.72	2557	11.14	0.046	0.05	20
17-Oct	26.45	0.063	8314.4	39.16	2671	10.32	0.046	0.05	21
03-Oct	40.15	0.077	6230.3	34.48	2638	11.02	0.046	0.05	22
05-Oct	25.48	0.062	7980.0	44.66	2449	11.29	0.046	0.05	23
18-Oct	25.81	0.062	6634.1	34.97	2471	10.97	0.046	0.05	24
11-Sep	34.35	0.072	6035.2	33.93	2749	10.59	0.047	0.05	25
05-Sep	31.04	0.067	5865.2	36.92	2327	11.26	0.047	0.05	26
09-Sep	32.57	0.069	8035.0	37.62	2722	10.60	0.047	0.05	27
17-Aug	34.30	0.072	8636.1	37.49	2939	10.70	0.047	0.05	28
11-Oct	22.14	0.061	10040.7	40.95	3038	11.11	0.047	0.05	29
28-Aug	24.35	0.064	4303.9	36.36	1524	10.30	0.048	0.05	30
10-Sep	32.89	0.071	7079.1	35.63	2733	10.67	0.048	0.05	31

29-Sep	29.16	0.068	5482.5	33.10	2358	11.32	0.048	0.05	32
07-Sep	27.46	0.065	6205.0	36.83	2161	10.57	0.048	0.05	33
25-Sep	12.90	0.055	6951.0	38.77	2492	11.03	0.048	0.05	34
17-Sep	20.85	0.061	5414.6	33.83	2487	10.91	0.048	0.05	35
29-Aug	32.88	0.072	5005.0	38.67	1635	10.30	0.048	0.05	36
31-Aug	29.16	0.069	8030.0	41.09	2418	10.50	0.049	0.05	37
07-Oct	36.09	0.077	8854.5	41.36	2643	11.02	0.049	0.05	38
22-Aug	34.19	0.075	8090.0	38.02	2703	10.22	0.050	0.05	39
24-Sep	24.69	0.066	6027.3	35.61	2268	10.99	0.050	0.05	40
28-Sep	34.74	0.076	5519.0	34.68	2433	11.24	0.050	0.05	41
04-Oct	18.83	0.063	8871.4	39.59	2869	11.10	0.051	0.05	42
27-Sep	31.57	0.074	6183.0	38.04	2392	11.04	0.051	0.05	43
30-Sep	31.58	0.075	7302.1	41.39	2430	11.21	0.052	0.05	44
20-Aug	25.60	0.070	9285.3	39.80	3047	10.29	0.052	0.05	45
27-Aug	24.68	0.071	4302.3	37.18	1480	10.31	0.053	0.05	46
03-Sep	36.26	0.084	6376.0	38.00	2596	11.02	0.053	0.05	47
25-Aug	30.87	0.078	3930.7	39.66	2241	10.36	0.054	0.05	48
10-Oct	29.65	0.076	6191.0	38.33	2274	10.93	0.054	0.05	49
04-Sep	31.78	0.080	7854.9	37.83	2663	10.95	0.054	0.05	50
26-Aug	31.37	0.079	3215.4	39.03	2042	10.38	0.054	0.05	51
15-Sep	19.59	0.067	5816.7	37.05	2062	10.94	0.054	0.05	52
14-Sep	27.93	0.076	7384.5	37.48	2514	10.70	0.055	0.05	53
21-Aug	21.30	0.070	9642.1	40.22	3120	10.24	0.055	0.05	54
23-Aug	24.80	0.074	8383.0	38.62	2743	10.02	0.056	0.05	55
08-Oct	22.02	0.073	8439.0	40.24	3284	11.09	0.057	0.05	56
19-Aug	17.12	0.069	5528.8	34.44	2609	9.53	0.057	0.06	57
09-Oct	18.80	0.070	10493.0	39.44	3339	11.10	0.057	0.05	58
16-Sep	27.21	0.079	5515.0	35.40	2332	10.03	0.058	0.05	59
02-Sep	25.20	0.077	7678.0	40.36	2473	10.93	0.058	0.05	60
24-Aug	26.90	0.079	8250.0	40.66	2585	9.81	0.058	0.05	61
18-Aug	25.54	0.080	7571.0	37.11	2847	10.20	0.059	0.05	62
30-Aug	33.04	0.090	7883.8	39.39	2513	10.25	0.060	0.05	63
08-Sep	24.06	0.083	6941.0	38.63	2270	10.47	0.063	0.05	64
13-Sep	22.50	0.083	7524.7	34.17	2887	10.67	0.064	0.05	65
12-Sep	20.20	0.082	6393.2	36.76	2804	10.67	0.065	0.05	66

END
Jim's Memo

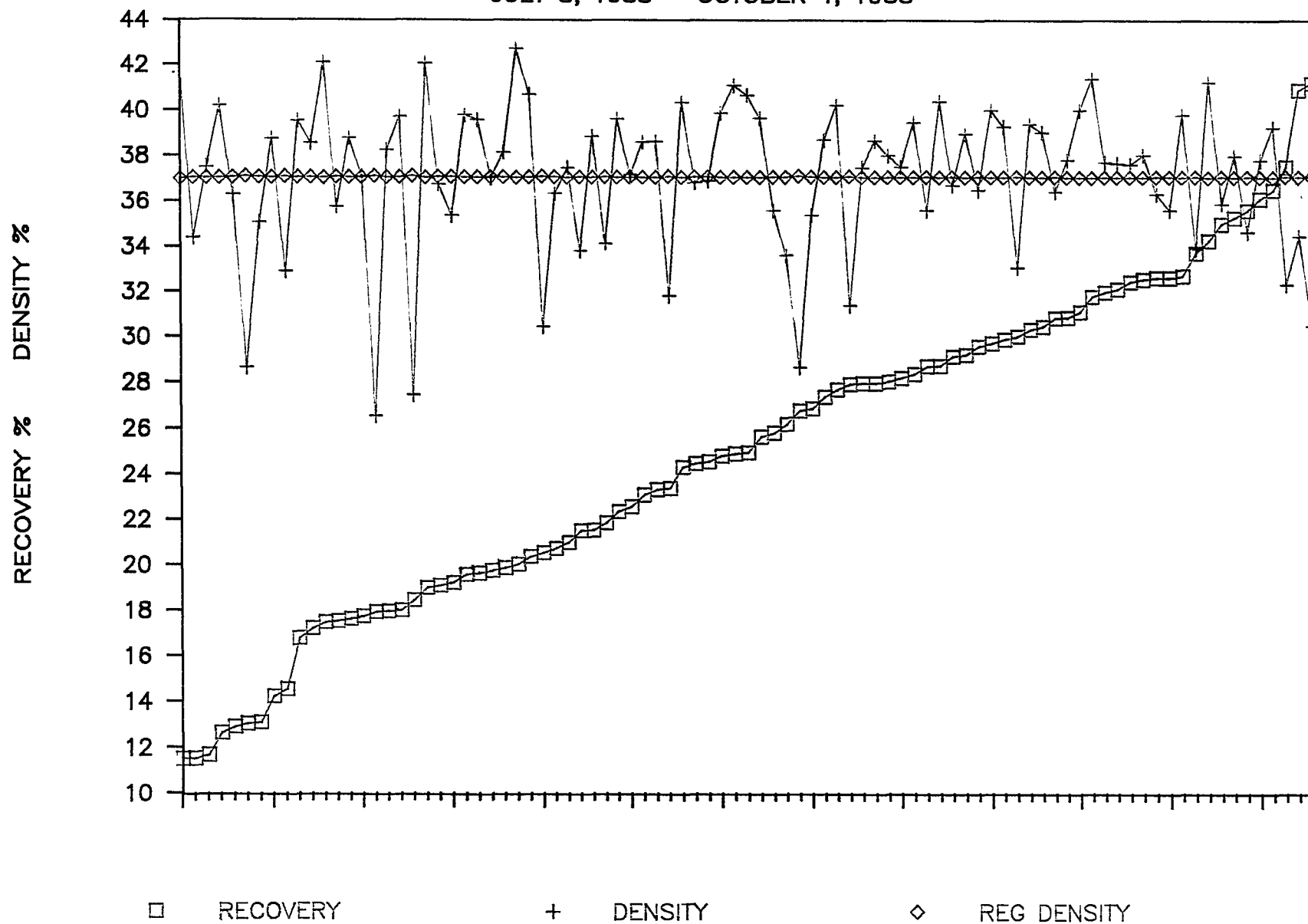
TRP GOLD EXTRACTION

3 DAY MOVING AVERAGE



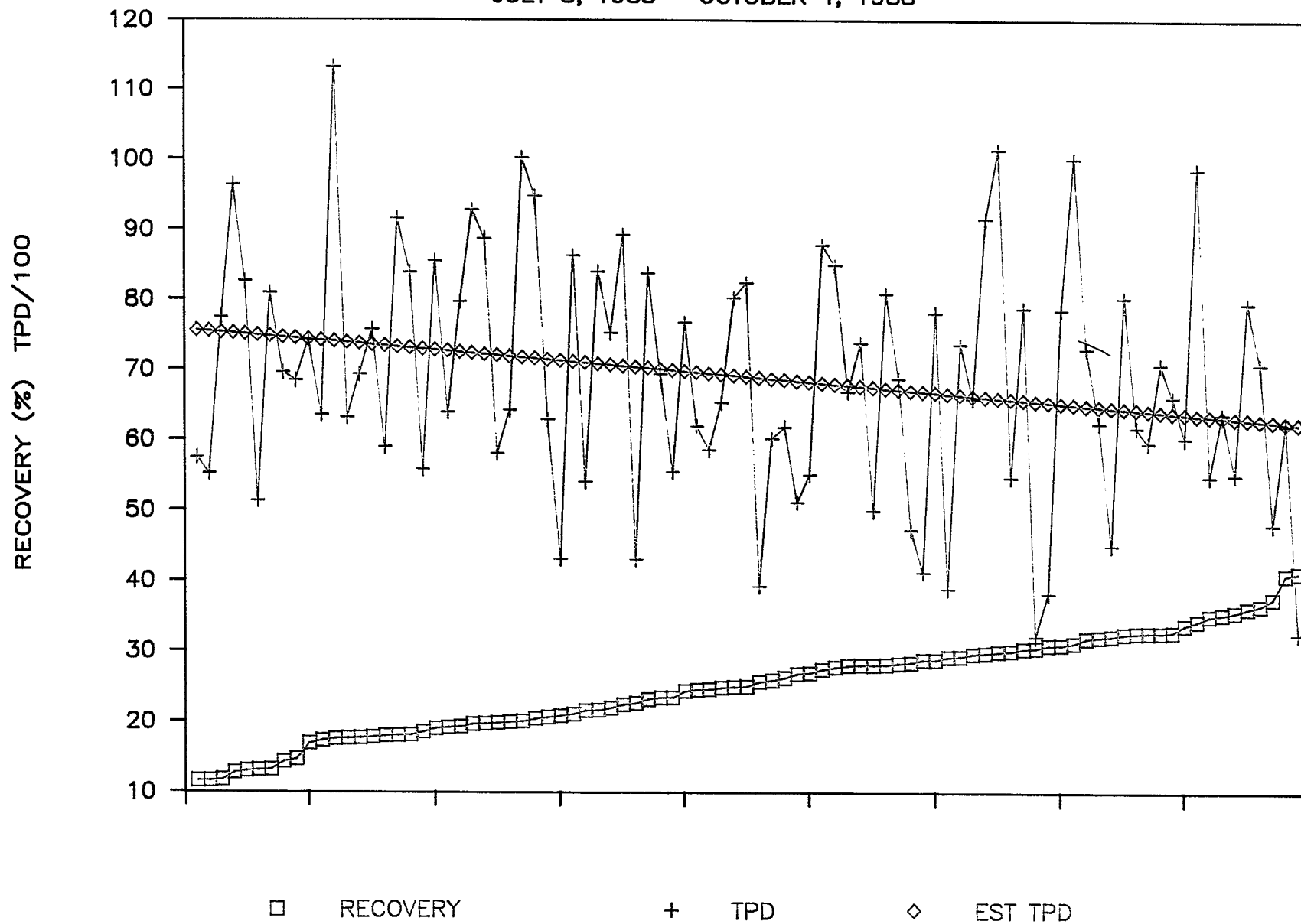
TRP DENSITY/RECOVERY REGRESSION

JULY 8, 1988 - OCTOBER 4, 1988



TRP TONNAGE/RECOVERY REGRESSION

JULY 8, 1988 - OCTOBER 4, 1988



TRP TONNAGE/RECOVERY REGRESSION

CONCLUSION: RECOVERY INCREASES WITH DECREASED TONNAGE

DATE	HEADS	TAILS	RECOVERY	TONS/DAY	DENSITY	ORDER	REG TONS	TPD/100	REG/100
July 28	0.058	0.051	11.52	5760.9	41.70	1	7558.87	57.6	75.6
AUG 19	0.072	0.064	11.52	5528.8	34.44	2	7543.81	55.3	75.4
Aug 9	0.065	0.057	11.68	7743.1	37.53	3	7528.75	77.4	75.3
Aug 21	0.072	0.063	12.64	9642.1	40.22	4	7513.69	96.4	75.1
AUG 12	0.063	0.055	12.90	8261.5	36.33	5	7498.63	82.6	75.0
Aug 6	0.091	0.079	13.03	5132.2	28.68	6	7483.57	51.3	74.8
Aug 11	0.069	0.060	13.10	8087.1	35.10	7	7468.51	80.9	74.7
Sept 25	0.057	0.049	14.22	6951.0	38.77	8	7453.45	69.5	74.5
Aug 10	0.066	0.056	14.55	6842.0	32.93	9	7438.39	68.4	74.4
July 10	0.075	0.062	16.78	7412.7	39.54	10	7423.33	74.1	74.2
JUL 29	0.054	0.045	17.21	6353.7	38.56	11	7408.27	63.5	74.1
July 18	0.066	0.054	17.47	11313.8	42.10	12	7393.21	113.1	73.9
Aug 15	0.071	0.058	17.53	6312.3	35.77	13	7378.15	63.1	73.8
JUL 22	0.059	0.049	17.63	6925.1	38.78	14	7363.09	69.3	73.6
Aug 18	0.082	0.068	17.74	7571.0	37.11	15	7348.03	75.7	73.5
Aug 8	0.080	0.066	17.93	5901.0	26.57	16	7332.97	59.0	73.3
Aug 16	0.070	0.058	17.96	9159.0	38.27	17	7317.91	91.6	73.2
July 12	0.059	0.049	18.01	8393.1	39.72	18	7302.85	83.9	73.0
Aug 7	0.095	0.078	18.45	5587.1	27.47	19	7287.79	55.9	72.9
July 21	0.066	0.053	18.99	8558.9	42.07	20	7272.73	85.6	72.7
Sept 12	0.084	0.068	19.09	6393.2	36.76	21	7257.67	63.9	72.6
Aug 13	0.064	0.052	19.22	7971.2	35.38	22	7242.61	79.7	72.4
Aug 20	0.072	0.058	19.59	9285.3	39.80	23	7227.55	92.9	72.3
Oct 4	0.066	0.053	19.64	8871.4	39.59	24	7212.49	88.7	72.1
Sept 15	0.070	0.056	19.77	5816.7	37.05	25	7197.43	58.2	72.0
July 11	0.077	0.061	19.88	6427.5	38.15	26	7182.37	64.3	71.8
July 19	0.060	0.048	20.03	10025.8	42.72	27	7167.31	100.3	71.7
JUL 8	0.075	0.060	20.38	9482.0	40.69	28	7152.25	94.8	71.5
AUG 5	0.103	0.082	20.54	6288.9	30.47	29	7137.20	62.9	71.4
Aug 28	0.067	0.053	20.74	4303.9	36.36	30	7122.14	43.0	71.2
Aug 17	0.074	0.058	21.01	8636.1	37.49	31	7107.08	86.4	71.1
Sept 17	0.064	0.050	21.52	5414.6	33.83	32	7092.02	54.1	70.9
Aug 2	0.066	0.052	21.53	8407.5	38.87	33	7076.96	84.1	70.8
Sept 13	0.086	0.067	21.86	7524.7	34.17	34	7061.90	75.2	70.6
Aug 1	0.061	0.047	22.36	8929.0	39.63	35	7046.84	89.3	70.5
Aug 27	0.074	0.057	22.56	4302.3	37.18	36	7031.78	43.0	70.3
Aug 23	0.077	0.059	23.09	8383.0	38.62	37	7016.72	83.8	70.2
Sept 8	0.086	0.066	23.32	6941.0	38.63	38	7001.66	69.4	70.0
Aug 4	0.091	0.070	23.37	5555.9	31.83	39	6986.60	55.6	69.9
SEP 2	0.080	0.061	24.30	7678.0	40.36	40	6971.54	76.8	69.7
Sept 7	0.069	0.052	24.47	6205.0	36.83	41	6956.48	62.1	69.6
Sept 5	0.070	0.053	24.55	5865.2	36.92	42	6941.42	58.7	69.4
Sept 6	0.065	0.049	24.80	6536.9	39.88	43	6926.36	65.4	69.3
Aug 31	0.071	0.054	24.89	8030.0	41.09	44	6911.30	80.3	69.1
Aug 24	0.082	0.061	24.96	8250.0	40.66	45	6896.24	82.5	69.0
Aug 25	0.080	0.060	25.64	3930.7	39.66	46	6881.18	39.3	68.8
Sept 24	0.069	0.051	25.82	6027.3	35.61	47	6866.12	60.3	68.7
Aug 3	0.065	0.048	26.20	6190.2	33.65	48	6851.06	61.9	68.5
Sept 19	0.053	0.039	26.77	5122.0	28.68	49	6836.00	51.2	68.4

Sept 25	0.057	0.049	14.22	6951.0	38.77	55	0.071	0.049
Sept 26	0.070	0.047	31.98	6248.0	37.72	56	0.071	0.049
Sept 27	0.077	0.052	32.55	6183.0	38.04	57	0.071	0.049
Sept 28	0.079	0.051	35.59	5519.0	34.68	58	0.071	0.049
Sept 29	0.071	0.050	30.03	5482.5	33.10	59	0.070	0.048
Sept 30	0.078	0.053	31.79	7302.1	41.39	60	0.070	0.048
Oct 1	0.066	0.047	28.38	4730.1	39.48	61	0.070	0.048
Oct 2	0.061	0.044	28.72	4124.5	35.62	62	0.070	0.048
Oct 3	0.080	0.047	40.88	6230.3	34.48	63	0.070	0.047
Oct 4	0.066	0.053	19.64	8871.4	39.59	64	0.070	0.047

HEAD GRADE REGRESSION

Regression Output:

Constant	0.077351
Std Err of Y Est	0.009352
R Squared	0.051890
No. of Observations	64
Degrees of Freedom	62

X Coefficient(s)	-0.00011
Std Err of Coef.	0.000063

TAILS GRADE REGRESSION

Regression Output:

Constant	0.063647
Std Err of Y Est	0.007444
R Squared	0.300254
No. of Observations	64
Degrees of Freedom	62

X Coefficient(s)	-0.00025
Std Err of Coef.	0.000050

DATE	HEADS	TAILS	REC	TONS	DENS		REG HEAD	REG TAIL
Aug 1	0.061	0.047	22.36	8929.0	39.63	1	0.077	0.063
Aug 2	0.066	0.052	21.53	8407.5	38.87	2	0.077	0.063
Aug 3	0.065	0.048	26.20	6190.2	33.65	3	0.077	0.063
Aug 5	0.103	0.082	20.54	6288.9	30.47	4	0.077	0.063
Aug 6	0.091	0.079	13.03	5132.2	28.68	5	0.077	0.062
Aug 7	0.095	0.078	18.45	5587.1	27.47	6	0.077	0.062
Aug 8	0.080	0.066	17.93	5901.0	26.57	7	0.077	0.062
Aug 9	0.065	0.057	11.68	7743.1	37.53	8	0.076	0.062
Aug 10	0.066	0.056	14.55	6842.0	32.93	9	0.076	0.061
Aug 11	0.069	0.060	13.10	8087.1	35.10	10	0.076	0.061
Aug 12	0.063	0.055	12.90	8261.5	36.33	11	0.076	0.061
Aug 13	0.064	0.052	19.22	7971.2	35.38	12	0.076	0.061
Aug 14	0.082	0.058	29.59	6599.6	36.51	13	0.076	0.060
Aug 15	0.071	0.058	17.53	6312.3	35.77	14	0.076	0.060
Aug 16	0.070	0.058	17.96	9159.0	38.27	15	0.076	0.060
Aug 17	0.074	0.058	21.01	8636.1	37.49	16	0.075	0.059
Aug 18	0.082	0.068	17.74	7571.0	37.11	17	0.075	0.059
Aug 19	0.072	0.064	11.52	5528.8	34.44	18	0.075	0.059
Aug 20	0.072	0.058	19.59	9285.3	39.80	19	0.075	0.059
Aug 21	0.072	0.063	12.64	9642.1	40.22	20	0.075	0.058
Aug 22	0.078	0.056	28.05	8090.0	38.02	21	0.075	0.058
Aug 23	0.077	0.059	23.09	8383.0	38.62	22	0.075	0.058
Aug 24	0.082	0.061	24.96	8250.0	40.66	23	0.075	0.058
Aug 25	0.080	0.060	25.64	3930.7	39.66	24	0.075	0.057
Aug 26	0.081	0.057	30.48	3215.4	39.03	25	0.074	0.057
Aug 27	0.074	0.057	22.56	4302.3	37.18	26	0.074	0.057
Aug 28	0.067	0.053	20.74	4303.9	36.36	27	0.074	0.057
Aug 29	0.074	0.054	27.98	5005.0	38.67	28	0.074	0.056
Aug 30	0.092	0.064	30.35	7883.8	39.39	29	0.074	0.056
Aug 31	0.071	0.054	24.89	8030.0	41.09	30	0.074	0.056
Sept 1	0.076	0.048	36.50	7080.0	39.24	31	0.074	0.056
Sept 2	0.080	0.061	24.30	7678.0	40.36	32	0.074	0.055
Sept 3	0.087	0.056	35.27	6376.0	38.00	33	0.074	0.055
Sept 4	0.083	0.057	30.88	7854.9	37.83	34	0.073	0.055
Sept 5	0.070	0.053	24.55	5865.2	36.92	35	0.073	0.055
Sept 6	0.065	0.049	24.80	6536.9	39.88	36	0.073	0.054
Sept 7	0.069	0.052	24.47	6205.0	36.83	37	0.073	0.054
Sept 8	0.086	0.066	23.32	6941.0	38.63	38	0.073	0.054
Sept 9	0.072	0.048	32.44	8035.0	37.62	39	0.073	0.054
Sept 10	0.074	0.050	32.64	7079.1	35.63	40	0.073	0.053
Sept 11	0.075	0.050	33.73	6035.2	33.93	41	0.073	0.053
Sept 12	0.084	0.068	19.09	6393.2	36.76	42	0.072	0.053
Sept 13	0.086	0.067	21.86	7524.7	34.17	43	0.072	0.052
Sept 14	0.079	0.057	27.97	7384.5	37.48	44	0.072	0.052
Sept 15	0.070	0.056	19.77	5816.7	37.05	45	0.072	0.052
Sept 16	0.082	0.060	26.87	5515.0	35.40	46	0.072	0.052
Sept 17	0.064	0.050	21.52	5414.6	33.83	47	0.072	0.051
Sept 18	0.060	0.043	27.94	6691.0	31.41	48	0.072	0.051
Sept 19	0.053	0.039	26.77	5122.0	28.68	49	0.072	0.051
Sept 20	0.066	0.039	41.19	3246.7	30.54	50	0.072	0.051
Sept 21	0.063	0.044	30.85	3826.2	36.44	51	0.071	0.050
Sept 22	0.065	0.042	35.00	5495.7	35.90	52	0.071	0.050
Sept 23	0.066	0.042	37.50	4809.1	32.35	53	0.071	0.050
Sept 24	0.069	0.051	25.82	6027.3	35.61	54	0.071	0.050

TRP TONNAGE/RECOVERY REGRESSION
REGRESSION ANALYSIS TO DETERMINE TONNAGE
BASED ON RECOVERY

CONCLUSION: DENSITY DOES NOT AFFECT RECOVERY

DATE	HEADS	TAILS	RECOVERY	TONS	DENSITY	DENSITY	REG	DENSI
July 28	0.058	0.051	11.52	5760.9	41.70	41.7	37.2	
Aug 19	0.072	0.064	11.52	5528.8	34.44	34.4	37.2	
Aug 9	0.065	0.057	11.68	7743.1	37.53	37.5	37.2	
Aug 21	0.072	0.063	12.64	9642.1	40.22	40.2	37.2	
Aug 12	0.063	0.055	12.90	8261.5	36.33	36.3	37.2	
Aug 6	0.091	0.079	13.03	5132.2	28.68	28.7	37.2	
Aug 11	0.069	0.060	13.10	8087.1	35.10	35.1	37.2	
Sept 25	0.057	0.049	14.22	6951.0	38.77	38.8	37.2	
Aug 10	0.066	0.056	14.55	6842.0	32.93	32.9	37.2	
July 10	0.075	0.062	16.78	7412.7	39.54	39.5	37.2	
July 29	0.054	0.045	17.21	6353.7	38.56	38.6	37.2	
July 18	0.066	0.054	17.47	11313.8	42.10	42.1	37.2	
Aug 15	0.071	0.058	17.53	6312.3	35.77	35.8	37.2	
July 22	0.059	0.049	17.63	6925.1	38.78	38.8	37.2	
Aug 18	0.082	0.068	17.74	7571.0	37.11	37.1	37.2	
Aug 8	0.080	0.066	17.93	5901.0	26.57	26.6	37.2	
Aug 16	0.070	0.058	17.96	9159.0	38.27	38.3	37.2	
July 12	0.059	0.049	18.01	8393.1	39.72	39.7	37.2	
Aug 7	0.095	0.078	18.45	5587.1	27.47	27.5	37.2	
July 21	0.066	0.053	18.99	8558.9	42.07	42.1	37.2	
Sept 12	0.084	0.068	19.09	6393.2	36.76	36.8	37.2	
Aug 13	0.064	0.052	19.22	7971.2	35.38	35.4	37.2	
Aug 20	0.072	0.058	19.59	9285.3	39.80	39.8	37.2	
Oct 4	0.066	0.053	19.64	8871.4	39.59	39.6	37.2	
Sept 15	0.070	0.056	19.77	5816.7	37.05	37.1	37.2	
July 11	0.077	0.061	19.88	6427.5	38.15	38.2	37.2	
July 19	0.060	0.048	20.03	10025.8	42.72	42.7	37.2	
July 8	0.075	0.060	20.38	9482.0	40.69	40.7	37.2	
Aug 5	0.103	0.082	20.54	6288.9	30.47	30.5	37.2	
Aug 28	0.067	0.053	20.74	4303.9	36.36	36.4	37.2	
Aug 17	0.074	0.058	21.01	8636.1	37.49	37.5	37.2	
Sept 17	0.064	0.050	21.52	5414.6	33.83	33.8	37.1	
Aug 2	0.066	0.052	21.53	8407.5	38.87	38.9	37.1	
Sept 13	0.086	0.067	21.86	7524.7	34.17	34.2	37.1	
Aug 1	0.061	0.047	22.36	8929.0	39.63	39.6	37.1	
Aug 27	0.074	0.057	22.56	4302.3	37.18	37.2	37.1	
Aug 23	0.077	0.059	23.09	8383.0	38.62	38.6	37.1	
Sept 8	0.086	0.066	23.32	6941.0	38.63	38.6	37.1	
Aug 4	0.091	0.070	23.37	5555.9	31.83	31.8	37.1	
Sept 2	0.080	0.061	24.30	7678.0	40.36	40.4	37.1	
Sept 7	0.069	0.052	24.47	6205.0	36.83	36.8	37.1	
Sept 5	0.070	0.053	24.55	5865.2	36.92	36.9	37.1	
Sept 6	0.065	0.049	24.80	6536.9	39.88	39.9	37.1	
Aug 31	0.071	0.054	24.89	8030.0	41.09	41.1	37.1	
Aug 24	0.082	0.061	24.96	8250.0	40.66	40.7	37.1	
Aug 25	0.080	0.060	25.64	3930.7	39.66	39.7	37.1	
Sept 24	0.069	0.051	25.82	6027.3	35.61	35.6	37.1	
Aug 3	0.065	0.048	26.20	6190.2	33.65	33.7	37.1	

Sept 19	0.053	0.039	26.77	5122.0	28.68	28.7	37.1
Sept 16	0.082	0.060	26.87	5515.0	35.40	35.4	37.1
July 30	0.058	0.042	27.39	8794.8	38.71	38.7	37.1
July 17	0.070	0.051	27.70	8500.6	40.21	40.2	37.1
Sept 18	0.060	0.043	27.94	6691.0	31.41	31.4	37.1
Sept 14	0.079	0.057	27.97	7384.5	37.48	37.5	37.1
Aug 29	0.074	0.054	27.98	5005.0	38.67	38.7	37.1
Aug 22	0.078	0.056	28.05	8090.0	38.02	38.0	37.1
July 26	0.071	0.051	28.21	6876.7	37.51	37.5	37.1
Oct 1	0.066	0.047	28.38	4730.1	39.48	39.5	37.1
Oct 2	0.061	0.044	28.72	4124.5	35.62	35.6	37.1
July 20	0.062	0.044	28.73	7815.5	40.39	40.4	37.1
July 27	0.048	0.034	29.16	3894.5	36.73	36.7	37.1
July 9	0.080	0.057	29.24	7365.1	38.98	39.0	37.1
Aug 14	0.082	0.058	29.59	6599.6	36.51	36.5	37.1
July 24	0.141	0.099	29.74	9165.2	40.00	40.0	37.1
July 25	0.083	0.059	29.90	10148.1	39.28	39.3	37.1
Sept 29	0.071	0.050	30.03	5482.5	33.10	33.1	37.1
Aug 30	0.092	0.064	30.35	7883.8	39.39	39.4	37.1
Aug 26	0.081	0.057	30.48	3215.4	39.03	39.0	37.1
Sept 21	0.063	0.044	30.85	3826.2	36.44	36.4	37.1
Sept 4	0.083	0.057	30.88	7854.9	37.83	37.8	37.1
July 23	0.072	0.049	31.12	10014.8	40.01	40.0	37.1
Sept 30	0.078	0.053	31.79	7302.1	41.39	41.4	37.1
Sept 26	0.070	0.047	31.98	6248.0	37.72	37.7	37.1
July 15	0.067	0.046	32.12	4508.5	37.67	37.7	37.1
Sept 9	0.072	0.048	32.44	8035.0	37.62	37.6	37.1
Sept 27	0.077	0.052	32.55	6183.0	38.04	38.0	37.1
July 14	0.069	0.046	32.63	5971.6	36.34	36.3	37.1
Sept 10	0.074	0.050	32.64	7079.1	35.63	35.6	37.1
July 16	0.068	0.046	32.72	6611.3	39.80	39.8	37.1
Sept 11	0.075	0.050	33.73	6035.2	33.93	33.9	37.1
July 13	0.071	0.047	34.27	9870.9	41.23	41.2	37.1
Sept 22	0.065	0.042	35.00	5495.7	35.90	35.9	37.1
Sept 3	0.087	0.056	35.27	6376.0	38.00	38.0	37.1
Sept 28	0.079	0.051	35.59	5519.0	34.68	34.7	37.1
July 31	0.064	0.041	36.11	7954.3	37.81	37.8	37.1
Sept 1	0.076	0.048	36.50	7080.0	39.24	39.2	37.1
Sept 23	0.066	0.042	37.50	4809.1	32.35	32.4	37.1
Oct 3	0.080	0.047	40.88	6230.3	34.48	34.5	37.1
Sept 20	0.066	0.039	41.19	3246.7	30.54	30.5	37.1

Regression Output:

Constant	37.25
Std Err of Y Est	3.35
R Squared	0.00
No. of Observations	89.00
Degrees of Freedom	87.00

X Coefficient(s)	-0.00469
Std Err of Coef.	0.049990

Aug 28	0.067	0.053	20.74	4303.9	36.36	52	0.073
Aug 29	0.074	0.054	27.98	5005.0	38.67	53	0.073
Aug 30	0.092	0.064	30.35	7883.8	39.39	54	0.073
Aug 31	0.071	0.054	24.89	8030.0	41.09	55	0.073
Sept 1	0.076	0.048	36.50	7080.0	39.24	56	0.073
Sept 2	0.080	0.061	24.30	7678.0	40.36	57	0.073
Sept 3	0.087	0.056	35.27	6376.0	38.00	58	0.073
Sept 4	0.083	0.057	30.88	7854.9	37.83	59	0.073
Sept 5	0.070	0.053	24.55	5865.2	36.92	60	0.073
Sept 6	0.065	0.049	24.80	6536.9	39.88	61	0.073
Sept 7	0.069	0.052	24.47	6205.0	36.83	62	0.073
Sept 8	0.086	0.066	23.32	6941.0	38.63	63	0.073
Sept 9	0.072	0.048	32.44	8035.0	37.62	64	0.073
Sept 10	0.074	0.050	32.64	7079.1	35.63	65	0.073
Sept 11	0.075	0.050	33.73	6035.2	33.93	66	0.073
Sept 12	0.084	0.068	19.09	6393.2	36.76	67	0.073
Sept 13	0.086	0.067	21.86	7524.7	34.17	68	0.073
Sept 14	0.079	0.057	27.97	7384.5	37.48	69	0.073
Sept 15	0.070	0.056	19.77	5816.7	37.05	70	0.073
Sept 16	0.082	0.060	26.87	5515.0	35.40	71	0.073
Sept 17	0.064	0.050	21.52	5414.6	33.83	72	0.073
Sept 18	0.060	0.043	27.94	6691.0	31.41	73	0.073
Sept 19	0.053	0.039	26.77	5122.0	28.68	74	0.073
Sept 20	0.066	0.039	41.19	3246.7	30.54	75	0.073
Sept 21	0.063	0.044	30.85	3826.2	36.44	76	0.073
Sept 22	0.065	0.042	35.00	5495.7	35.90	77	0.073
Sept 23	0.066	0.042	37.50	4809.1	32.35	78	0.073
Sept 24	0.069	0.051	25.82	6027.3	35.61	79	0.073
Sept 25	0.057	0.049	14.22	6951.0	38.77	80	0.073
Sept 26	0.070	0.047	31.98	6248.0	37.72	81	0.073
Sept 27	0.077	0.052	32.55	6183.0	38.04	82	0.073
Sept 28	0.079	0.051	35.59	5519.0	34.68	83	0.073
Sept 29	0.071	0.050	30.03	5482.5	33.10	84	0.073
Sept 30	0.078	0.053	31.79	7302.1	41.39	85	0.073
Oct 1	0.066	0.047	28.38	4730.1	39.48	86	0.073
Oct 2	0.061	0.044	28.72	4124.5	35.62	87	0.073
Oct 3	0.080	0.047	40.88	6230.3	34.48	88	0.073
Oct 4	0.066	0.053	19.64	8871.4	39.59	89	0.073

Regression Output:

Constant	0.072880
Std Err of Y Est	0.012338
R Squared	0.000057
No. of Observations	89
Degrees of Freedom	87

X Coefficient(s)	-0.00000
Std Err of Coef.	0.000050

TRP HEAD GRADE/TIME REGRESSION ANALYSIS

DATE	HEADS	TAILS	RECOVERY	TONS/DAY	DENSITY	ORDER	REG HEADS
July 8	0.075	0.060	20.38	9482.0	40.69	1	0.073
July 9	0.080	0.057	29.24	7365.1	38.98	2	0.073
July 10	0.075	0.062	16.78	7412.7	39.54	3	0.073
July 11	0.077	0.061	19.88	6427.5	38.15	4	0.073
July 12	0.059	0.049	18.01	8393.1	39.72	5	0.073
July 13	0.071	0.047	34.27	9870.9	41.23	6	0.073
July 14	0.069	0.046	32.63	5971.6	36.34	7	0.073
July 15	0.067	0.046	32.12	4508.5	37.67	8	0.073
July 16	0.068	0.046	32.72	6611.3	39.80	9	0.073
July 17	0.070	0.051	27.70	8500.6	40.21	10	0.073
July 18	0.066	0.054	17.47	11313.8	42.10	11	0.073
July 19	0.060	0.048	20.03	10025.8	42.72	12	0.073
July 20	0.062	0.044	28.73	7815.5	40.39	13	0.073
July 21	0.066	0.053	18.99	8558.9	42.07	14	0.073
July 22	0.059	0.049	17.63	6925.1	38.78	15	0.073
July 23	0.072	0.049	31.12	10014.8	40.01	16	0.073
July 24	0.141	0.099	29.74	9165.2	40.00	17	0.073
July 25	0.083	0.116	-39.32	10148.1	39.28	18	0.073
July 26	0.071	0.051	28.21	6876.7	37.51	19	0.073
July 27	0.048	0.034	29.16	3894.5	36.73	20	0.073
July 28	0.058	0.051	11.52	5760.9	41.70	21	0.073
July 29	0.054	0.045	17.21	6353.7	38.56	22	0.073
July 30	0.058	0.042	27.39	8794.8	38.71	23	0.073
July 31	0.064	0.041	36.11	7954.3	37.81	24	0.073
Aug 1	0.061	0.047	22.36	8929.0	39.63	25	0.073
Aug 2	0.066	0.052	21.53	8407.5	38.87	26	0.073
Aug 3	0.065	0.048	26.20	6190.2	33.65	27	0.073
Aug 4	0.091	0.111	-22.25	5555.9	31.83	28	0.073
Aug 5	0.103	0.082	20.54	6288.9	30.47	29	0.073
Aug 6	0.091	0.079	13.03	5132.2	28.68	30	0.073
Aug 7	0.095	0.078	18.45	5587.1	27.47	31	0.073
Aug 8	0.080	0.066	17.93	5901.0	26.57	32	0.073
Aug 9	0.065	0.057	11.68	7743.1	37.53	33	0.073
Aug 10	0.066	0.056	14.55	6842.0	32.93	34	0.073
Aug 11	0.069	0.060	13.10	8087.1	35.10	35	0.073
Aug 12	0.063	0.055	12.90	8261.5	36.33	36	0.073
Aug 13	0.064	0.052	19.22	7971.2	35.38	37	0.073
Aug 14	0.082	0.058	29.59	6599.6	36.51	38	0.073
Aug 15	0.071	0.058	17.53	6312.3	35.77	39	0.073
Aug 16	0.070	0.058	17.96	9159.0	38.27	40	0.073
Aug 17	0.074	0.058	21.01	8636.1	37.49	41	0.073
Aug 18	0.082	0.068	17.74	7571.0	37.11	42	0.073
Aug 19	0.072	0.064	11.52	5528.8	34.44	43	0.073
Aug 20	0.072	0.058	19.59	9285.3	39.80	44	0.073
Aug 21	0.072	0.063	12.64	9642.1	40.22	45	0.073
Aug 22	0.078	0.056	28.05	8090.0	38.02	46	0.073
Aug 23	0.077	0.059	23.09	8383.0	38.62	47	0.073
Aug 24	0.082	0.061	24.96	8250.0	40.66	48	0.073
Aug 25	0.080	0.060	25.64	3930.7	39.66	49	0.073
Aug 26	0.081	0.057	30.48	3215.4	39.03	50	0.073
Aug 27	0.074	0.057	22.56	4302.3	37.18	51	0.073

SEP 16	0.082	0.060	26.87	5515.0	35.40	50	6820.94	55.2	68.2
July 30	0.058	0.042	27.39	8794.8	38.71	51	6805.88	87.9	68.1
July 17	0.070	0.051	27.70	8500.6	40.21	52	6790.82	85.0	67.9
Sept 18	0.060	0.043	27.94	6691.0	31.41	53	6775.76	66.9	67.8
Sept 14	0.079	0.057	27.97	7384.5	37.48	54	6760.70	73.8	67.6
Aug 29	0.074	0.054	27.98	5005.0	38.67	55	6745.64	50.1	67.5
Aug 22	0.078	0.056	28.05	8090.0	38.02	56	6730.58	80.9	67.3
July 26	0.071	0.051	28.21	6876.7	37.51	57	6715.52	68.8	67.2
Oct 1	0.066	0.047	28.38	4730.1	39.48	58	6700.46	47.3	67.0
Oct 2	0.061	0.044	28.72	4124.5	35.62	59	6685.40	41.2	66.9
July 20	0.062	0.044	28.73	7815.5	40.39	60	6670.34	78.2	66.7
July 27	0.048	0.034	29.16	3894.5	36.73	61	6655.28	38.9	66.6
July 9	0.080	0.057	29.24	7365.1	38.98	62	6640.22	73.7	66.4
Aug 14	0.082	0.058	29.59	6599.6	36.51	63	6625.16	66.0	66.3
July 24	0.141	0.099	29.74	9165.2	40.00	64	6610.10	91.7	66.1
July 25	0.083	0.059	29.90	10148.1	39.28	65	6595.04	101.5	66.0
Sept 29	0.071	0.050	30.03	5482.5	33.10	66	6579.98	54.8	65.8
Aug 30	0.092	0.064	30.35	7883.8	39.39	67	6564.92	78.8	65.6
AUG 26	0.081	0.057	30.48	3215.4	39.03	68	6549.87	32.2	65.5
Sept 21	0.063	0.044	30.85	3826.2	36.44	69	6534.81	38.3	65.3
Sept 4	0.083	0.057	30.88	7854.9	37.83	70	6519.75	78.5	65.2
July 23	0.072	0.049	31.12	10014.8	40.01	71	6504.69	100.1	65.0
SEP 30	0.078	0.053	31.79	7302.1	41.39	72	6489.63	73.0	64.9
Sept 26	0.070	0.047	31.98	6248.0	37.72	73	6474.57	62.5	64.7
JUL 15	0.067	0.046	32.12	4508.5	37.67	74	6459.51	45.1	64.6
SEP 9	0.072	0.048	32.44	8035.0	37.62	75	6444.45	80.4	64.4
Sept 27	0.077	0.052	32.55	6183.0	38.04	76	6429.39	61.8	64.3
July 14	0.069	0.046	32.63	5971.6	36.34	77	6414.33	59.7	64.1
Sept 10	0.074	0.050	32.64	7079.1	35.63	78	6399.27	70.8	64.0
July 16	0.068	0.046	32.72	6611.3	39.80	79	6384.21	66.1	63.8
Sept 11	0.075	0.050	33.73	6035.2	33.93	80	6369.15	60.4	63.7
July 13	0.071	0.047	34.27	9870.9	41.23	81	6354.09	98.7	63.5
Sept 22	0.065	0.042	35.00	5495.7	35.90	82	6339.03	55.0	63.4
Sept 3	0.087	0.056	35.27	6376.0	38.00	83	6323.97	63.8	63.2
Sept 28	0.079	0.051	35.59	5519.0	34.68	84	6308.91	55.2	63.1
July 31	0.064	0.041	36.11	7954.3	37.81	85	6293.85	79.5	62.9
Sept 1	0.076	0.048	36.50	7080.0	39.24	86	6278.79	70.8	62.8
SEP 23	0.066	0.042	37.50	4809.1	32.35	87	6263.73	48.1	62.6
Oct 3	0.080	0.047	40.88	6230.3	34.48	88	6248.67	62.3	62.5
Sept 20	0.066	0.039	41.19	3246.7	30.54	89	6233.61	32.5	62.3

Regression Output:

Constant	7573.927
Std Err of Y Est	1680.887
R Squared	0.051410
No. of Observations	89
Degrees of Freedom	87

X Coefficient(s)	-15.0597
Std Err of Coef.	6.935403

TRP Operating DATA

1. Gold Extraction to Solution , %
2. Gold Adsorption to Carbon , %.
3. Total Gold Recovery , %
4. Total Tail Assay , g / ton
5. Feed Tons
6. Feed % Solids
7. ~~Feed Grade~~ HEAD GRADE g / ton Au
8. Reclaim Solution Assay g / ton Au
9. Tails Solids Assay g / ton Au
10. Tails Solution Assay g / ton Au
11. % Availability
12. Average Feed Flowrate us gpm.
To be calculated.

	Gold Ext'n to Sol'n	Gold Adsorp to Carbon	Gold Recovery	Total Tails Assay	Plant Availability	Day Feed Tons per Day	Feed % Solids	Head Grade	Reclaim Solution	Tails Solids Assay	Tails Solution Assay	Average Feed Spent.	Feed Tonnage Rate	Residual Time
Date	1 Gold Ext %	2 Gold Ads %	3 Gold Rec %	4 Tail Oz oz/ton	5 Avail %	6 Feed Tons 24 hrs	7 Feed %Sol	8 Head Oz oz/ton	9 Rec Soln oz/ton	10 Tails Oz	11 Tail Soln	12 Flowrate US GPM.	13 Tons/24hr	14 hrs.
13-Jul-88	30.47	85.59	34.27	0.047	96.2	9870.9	41.23	0.061	0.0058	0.042	0.0029			
14-Jul-88	28.6	78.1	32.63	0.046	73	5971.6	36.34	0.056	0.0072	0.04	0.0036			
15-Jul-88	27.53	78.98	32.2	0.046	60.83	4508.5	37.67	0.0551	0.0074	0.04	0.0035			
16-Jul-88	24.67	79.5	32.72	0.046	84.6	6611.3	39.8	0.0531	0.0098	0.04	0.0038			
17-Jul-88	18.18	76.64	27.7	0.051	76.3	8500.6	40.21	0.055	0.0104	0.045	0.004			
18-Jul-88	6.64	65.16	17.47	0.054	100	11313.8	42.1	0.0514	0.0103	0.048	0.0045			
19-Jul-88	12.03	69.09	20.03	0.048	100	10025.8	42.72	0.0487	0.0087	0.043	0.004			
20-Jul-88	25.88	75.01	28.73	0.044	98.3	7815.5	40.39	0.0512	0.007	0.038	0.004			
21-Jul-88	13.31	79.59	18.99	0.053	100	8558.9	42.07	0.0576	0.0058	0.05	0.0023			
22-Jul-88	23.73	60.06	17.63	0.049	90.8	6925.1	38.78	0.055	0.0028	0.042	0.0044			
23-Jul-88	26.61	79.26	31.12	0.049	99.2	10014.8	40.01	0.059	0.0083	0.044	0.0039			
24-Jul-88	44.69	53.33	29.74	0.099	100	9165.2	40	0.112	0.0188	0.062	0.0244			
25-Jul-88	-0.36	198.14	39.32	0.116	100	10148.1	39.28	0.067	0.0109	0.067	0.0319			
26-Jul-88	27.5	70.36	28.21	0.051	100	6876.7	37.51	0.059	0.0074	0.042	0.0051			
27-Jul-88	19.73	70.68	29.16	0.034	100	3894.5	36.73	0.035	0.0074	0.028	0.0033			
28-Jul-88	7.65	40.26	11.52	0.051	79.2	5760.9	41.7	0.045	0.0094	0.041	0.0071			
29-Jul-88	7.69	50.79	17.21	0.045	89.9	6353.7	38.56	0.039	0.0097	0.036	0.0057			
30-Jul-88	20.96	68.98	27.39	0.042	100	8794.8	38.71	0.044	0.0087	0.035	0.0045			
31-Jul-88	29.5	82.47	36.11	0.041	100	7954.3	37.81	0.051	0.0079	0.036	0.003			
01-Aug-88	18.11	75.4	22.36	0.047	100	8929	39.63	0.052	0.0056	0.043	0.0029			
02-Aug-88	15.21	76.77	21.53	0.052	100	8407.5	38.87	0.056	0.0064	0.048	0.0027			
03-Aug-88	23.53	66.12	28.2	0.048	96.3	6190.2	33.65	0.051	0.0069	0.039	0.0044			
04-Aug-88	-7.5	143.21	-22.25	0.111	84.2	5555.9	31.83	0.071	0.0091	0.077	0.016			
05-Aug-88	17.57	59.4	20.54	0.082	94.6	6288.9	30.47	0.082	0.0093	0.067	0.0063			
06-Aug-88	6.91	54.97	23.03	0.079	100	5132.2	28.68	0.074	0.0067	0.069	0.004			
07-Aug-88	11.93	60.06	18.45	0.078	88.8	5587.1	27.47	0.075	0.0077	0.066	0.0044			
08-Aug-88	11.89	58.9	17.93	0.066	98.3	5901	26.57	0.063	0.0061	0.056	0.0036			
09-Aug-88	6.42	53.27	11.68	0.057	97.5	7743.1	37.53	0.054	0.0064	0.05	0.004			
10-Aug-88	4.77	57.71	14.55	0.056	100	6842	32.93	0.052	0.0069	0.049	0.0034			
11-Aug-88	10.8	49.67	13.1	0.06	100	8087.1	35.1	0.057	0.0065	0.051	0.0049			
12-Aug-88	19.43	34.57	12.9	0.055	97.1	8261.5	36.33	0.049	0.008	0.04	0.0088			
13-Aug-88	24.28	50.78	19.22	0.052	100	7971.2	35.38	0.053	0.0061	0.04	0.0067			
14-Aug-88	28.65	60.02	29.59	0.058	99.2	6599.6	36.51	0.058	0.0097	0.042	0.0093			
15-Aug-88	37.1	44.38	17.53	0.058	92.1	6312.3	35.77	0.068	0.0015	0.043	0.0087			
16-Aug-88	37.74	45.51	17.96	0.058	100	9159	38.27	0.068	0.0012	0.042	0.0094			
17-Aug-88	34.3	58.23	21.01	0.058	100	8636.1	37.49	0.072	0.0012	0.047	0.0066			
18-Aug-88	25.54	64.06	17.74	0.068	91.7	7571	37.11	0.08	0.0014	0.059	0.0048			
19-Aug-88	17.12	57.04	11.52	0.064	80.5	5528.8	34.44	0.069	0.0014	0.057	0.0033			
20-Aug-88	25.6	70.52	19.59	0.058	95.8	9285.3	39.8	0.07	0.0014	0.052	0.0039			
21-Aug-88	21.3	53.62	12.64	0.063	95.8	9642.1	40.22	0.07	0.0014	0.055	0.0053			
22-Aug-88	34.19	77.64	28.05	0.056	100	8090	38.02	0.075	0.0014	0.05	0.0039			
23-Aug-88	24.8	86.07	23.09	0.059	100	8383	38.62	0.074	0.0013	0.056	0.0018			
24-Aug-88	26.9	86.46	24.96	0.061	97.5	8250	40.66	0.079	0.0015	0.058	0.0022			
25-Aug-88	30.87	77.18	25.64	0.06	55.4	3930.7	39.66	0.078	0.0018	0.054	0.004			
26-Aug-88	31.37	90.34	30.48	0.057	50.8	3215.4	39.03	0.079	0.0018	0.054	0.0017			
27-Aug-88	24.68	81.21	22.56	0.057	100	4302.3	37.18	0.071	0.0018	0.053	0.0023			
28-Aug-88	24.35	74.34	20.74	0.053	100	4303.9	36.36	0.064	0.0018	0.048	0.0028			
29-Aug-88	32.88	78.9	27.98	0.054	100	5005	38.67	0.072	0.0018	0.048	0.0035			
30-Aug-88	33.04	86.61	30.35	0.064	100	7883.8	39.39	0.09	0.0018	0.06	0.0028			
31-Aug-88	29.16	78.1	24.89	0.054	100	8030	41.09	0.069	0.0019	0.049	0.0035			
01-Sep-88	38.32	89.66	36.5	0.048	93.8	7080	39.24	0.073	0.0019	0.045	0.0021			
02-Sep-88	25.2	87.31	24.3	0.061	95.8	7678	40.36	0.077	0.0019	0.058	0.0019			
03-Sep-88	36.26	91.52	35.27	0.056	82.1	6376	38	0.084	0.0019	0.053	0.0017			
04-Sep-88	31.78	89.9	30.88	0.057	99.2	7854.9	37.83	0.08	0.0019	0.054	0.0018			

05-Sep-88	31.04	72.79	24.55	0.053	87.5	5865.2	36.92	0.067	0.0016	0.047	0.0038
06-Sep-88	28.93	79.83	24.8	0.049	100	6536.9	39.88	0.063	0.0013	0.045	0.0027
07-Sep-88	27.46	79.65	24.47	0.052	100	6205	36.83	0.065	0.0018	0.048	0.0025
08-Sep-88	24.06	88.61	23.32	0.066	100	6941	38.63	0.083	0.0016	0.063	0.0016
09-Sep-88	32.57	92.11	32.44	0.048	100	8035	37.62	0.069	0.0017	0.047	0.0012
10-Sep-88	32.89	91.49	32.64	0.05	94.2	7079.1	35.63	0.071	0.0017	0.048	0.0012
11-Sep-88	34.35	91.01	33.73	0.05	85	6035.2	33.93	0.072	0.0016	0.047	0.0013
12-Sep-88	20.2	83.72	19.09	0.068	79.6	6393.2	36.76	0.082	0.0016	0.065	0.0018
13-Sep-88	22.5	85.92	21.86	0.067	100	7524.7	34.17	0.083	0.0017	0.064	0.0016
14-Sep-88	27.93	91.19	27.97	0.057	100	7384.5	37.48	0.076	0.0018	0.055	0.0013
15-Sep-88	19.59	88.49	19.77	0.056	97.5	5816.7	37.05	0.067	0.0014	0.054	0.0011
16-Sep-88	27.21	91.15	26.87	0.06	86.7	5515	35.4	0.079	0.0014	0.058	0.0012
17-Sep-88	20.85	86.98	21.52	0.05	84.6	5414.6	33.83	0.061	0.0016	0.048	0.0011
18-Sep-88	27.16	89.03	27.94	0.043	96.3	6691	31.41	0.057	0.0016	0.041	0.001
19-Sep-88	25.22	87.95	26.77	0.039	83.8	5122	28.68	0.05	0.0015	0.037	0.0008
20-Sep-88	40.63	94.21	41.19	0.039	57.1	3246.7	30.54	0.062	0.0015	0.037	0.0007
21-Sep-88	31.24	91.55	30.85	0.044	83.3	3826.2	36.44	0.061	0.0013	0.042	0.001
22-Sep-88	34.95	92.12	35	0.042	98.3	5495.7	35.9	0.062	0.0017	0.04	0.0011
23-Sep-88	38.76	90.47	37.5	0.042	96.3	4809.1	32.35	0.064	0.0014	0.039	0.0013
24-Sep-88	24.69	93.41	25.82	0.051	96.7	6027.3	35.61	0.066	0.0015	0.05	0.0007
25-Sep-88	12.9	83.79	14.22	0.049	90.8	6951	38.77	0.055	0.0017	0.048	0.001
26-Sep-88	31.34	93.75	31.98	0.047	82.5	6248	37.72	0.067	0.0017	0.046	0.0009
27-Sep-88	31.57	95.63	32.55	0.052	86.3	6183	38.04	0.074	0.0017	0.051	0.0007
28-Sep-88	34.74	95.61	35.59	0.051	85.4	5519	34.68	0.076	0.0016	0.05	0.0007
29-Sep-88	29.16	92.74	30.03	0.05	92.9	5482.5	33.1	0.068	0.0016	0.048	0.0008
30-Sep-88	31.58	94.66	31.79	0.053	89.6	7302.1	41.39	0.075	0.0016	0.052	0.001
01-Oct-88	27.54	93.85	28.38	0.047	82.1	4730.1	39.48	0.063	0.0016	0.046	0.0008
02-Oct-88	26.95	94.49	28.72	0.044	59.6	4124.5	35.62	0.059	0.0016	0.043	0.0006
03-Oct-88	40.15	96.37	40.88	0.047	89.6	6230.3	34.48	0.077	0.0016	0.046	0.0007
04-Oct-88	18.83	89.87	19.64	0.053	97.9	8871.4	39.59	0.063	0.0016	0.051	0.001
05-Oct-88	25.48	93.67	25.9	0.047	87.5	7980	44.66	0.062	0.0015	0.046	0.0009
06-Oct-88	32.41	93.68	32.68	0.042	100	10386.6	42.83	0.06	0.0017	0.04	0.001
07-Oct-88	36.09	95.47	36.09	0.051	100	8854.5	41.36	0.077	0.0015	0.049	0.001
08-Oct-88	22.02	91.66	22.3	0.059	79.6	8439	40.24	0.073	0.0015	0.057	0.001
09-Oct-88	18.8	84.84	18.15	0.059	100	10493	39.44	0.07	0.0015	0.057	0.0015
10-Oct-88	29.65	94.18	29.82	0.055	90	6191	38.33	0.076	0.0014	0.054	0.0009
11-Oct-88	22.14	87.39	21.54	0.049	100	10040.7	40.95	0.061	0.0014	0.047	0.0014
12-Oct-88	21.72	86.7	21.32	0.046	94.6	8577.9	39.48	0.056	0.0014	0.044	0.0012
13-Oct-88	27.73	91	27.51	0.039	96.3	10192.2	42.81	0.052	0.0014	0.038	0.0011
14-Oct-88	26.59	88.54	26.1	0.041	93.8	8763.5	38.79	0.054	0.0014	0.04	0.0012
15-Oct-88	19.28	75.88	17.35	0.041	97.9	8304.4	38.66	0.048	0.0014	0.039	0.0017
16-Oct-88	34.78	93.51	34.22	0.046	100	9456.8	41.79	0.068	0.0014	0.045	0.0012
17-Oct-88	26.45	84.6	24.45	0.049	100	8314.4	39.16	0.063	0.0014	0.046	0.0019
18-Oct-88	25.81	88.7	25.56	0.048	100	6634.1	34.97	0.062	0.0014	0.046	0.0011
19-Oct-88	25.87	88.37	25.56	0.048	18.3	1056.4	34.59	0.061	0.0014	0.046	0.0011
20-Oct-88	26.06	83.58	26.74	0.045	56.3	1862	22.2	0.056	0.0014	0.042	0.0009
21-Oct-88	22.33	88.86	24.06	0.039	100	4545.8	30.37	0.048	0.0014	0.038	0.0007
22-Oct-88	23.19	85.39	24.49	0.041	64.6	1995.2	26.51	0.05	0.0014	0.039	0.0008

	[CN ⁻]	pH
Sept. 5	-	11.26
4	0.3	10.95
3	0.5	11.02
2	0.5	10.93
1	-	10.52
Aug 31	-	10.50
30	0.2	10.25
29	-	10.30
28	-	10.30
27	0.2 0.2	10.31
26	-	10.38
25	-	10.36
24	-	9.81
23	-	10.02
22	-	10.22
21	-	10.24
20	-	10.29
19	-	9.53
18	-	10.2
17	-	10.7
16	-	11.0
15	-	10.4
14	-	10.9
13	-	11.0
12	-	10.99
11	-	10.50
10	-	10.90
9	-	10.70
8	-	10.61
7	-	10.60
6	-	10.50
5	-	10.6
4	-	10.6
3	-	10.5
2	-	10.6
1	-	10.7
July 31	-	10.64
30	-	10.43
29		
28		
27		
26		
25		
24		
23		
22		

	CN ⁻	pH
Oct. 22	.13 10.2 16/tn	Frozen Manual add'n
21	.228	"
20	.24	"
19	-	10.25
18	.29	10.97
17	.29	10.32
16	.32	10.29
15	-	11.21
14	.365	11.16
13	.278	9.68
12	.23	10.59
11	.375	11.11
10	.40	10.93
9	-	11.10
8	-	11.09
7	0.50	11.02
6	0.30	11.15
5	0.70	11.29
4	0.60	11.10
3	0.28	11.02
2	0.45	11.15
1	1.00	11.44
Sept 30	-	11.21
29	-	11.32
28	-	11.24
27	0.26	11.04
26	1.06	11.14
25	2.93	11.03
24	2.48	10.99
23	-	11.07
22	1.53	11.17
21	-	11.50
20	-	11.38
19	-	11.16
18	11.6 .225	10.97
17	0.40	10.91
16	-	10.03
15	0.3	10.94
14	-	10.70
13	0.3	10.67
12	-	10.67
11	0.3	10.59
10	0.11 0.2	10.67
9	0.06	10.60
8	.245	10.47
7	.3	10.57
6	.3	10.71

lowest degree model that adequately describes the data. The lack of a theory may be useful in this respect. However, it is always possible to fit a polynomial of degree $n - 1$ to n data points, and the experimenter should consider using a model that is "saturated," that is, that has very few independent variables as observations on y .

12-5.3 The Coefficient of Determination

The quantity

$$R^2 = \frac{SS_R}{S_{yy}} = 1 - \frac{SS_E}{S_{yy}}$$

is called the coefficient of determination, and it is often used to judge the adequacy of a regression model. (We will see subsequently that in the case where x and y are jointly distributed random variables R^2 is the square of the correlation coefficient between x and y .) Clearly $0 \leq R^2 \leq 1$. We often refer loosely to R^2 as the amount of variability in the data explained or accounted for by the regression model. For the data in Example 12-1, we have $R^2 = SS_R/S_{yy} = 1924.87/1932.10 = .9963$; that is, 99.63 percent of the variability in the data is accounted for by the model.

The statistic R^2 should be used with caution, since it is always possible to make R^2 unity by simply adding enough terms to the model. For example, we can obtain a "perfect" fit to n data points with a polynomial of degree $n - 1$. Also, R^2 will always increase if we add a variable to the model, but this does not necessarily mean the new model is superior to the old one. Unless the error sum of squares in the new model is reduced by an amount equal to the original error mean square, the new model will have a larger error mean square than the old one, because of the loss of one degree of freedom. Thus the new model will actually be worse than the old one.

There are several important misconceptions about R^2 . In general, R^2 does not measure the magnitude of the slope of the regression line. A large value of R^2 does not imply a steep slope. Furthermore, R^2 does not measure the appropriateness of the model, since it can be artificially inflated by adding higher-order polynomial terms. Even if y and x are related in a nonlinear fashion, R^2 will often be large. For example, R^2 for the regression equation in Fig. 12-3b will be relatively large, even though the linear approximation is poor. Finally, even though R^2 is large, this does not necessarily imply that the regression model will provide accurate predictions of future observations.

12-6 Transformations to a Straight Line

We occasionally find that the straight-line regression model $y = \beta_0 + \beta_1 x + \epsilon$ is inappropriate because the true regression function is nonlinear. Sometimes this is visually determined from the scatter diagram, and sometimes we know

that the model is nonlinear by theory. In some situations a straight line can be obtained by using a suitable transformation. An example of a nonlinear model is an exponential function

$$y = e^{\beta_0 + \beta_1 x}$$

which is intrinsically linear, since a logarithmic transformation

$$\ln y = \ln e^{\beta_0 + \beta_1 x}$$

transformation requires that the variables be jointly and independently distributed. Another example of an intrinsically linear function is

$$y = \beta_0 + \beta_1 e^x$$

which can be linearized by using the reciprocal transformation

$$y = 1/(e^{\beta_0 + \beta_1 x})$$

Sometimes the logarithmic and reciprocal transformations are used jointly to linearize a function. For example,

$$y = \frac{e^{\beta_0 + \beta_1 x}}{e^{\beta_2 + \beta_3 x}}$$

Letting $y^* = 1/y$, we have the linear function

$$\ln y^* = \beta_2 + \beta_3 x - \beta_0 - \beta_1 x$$

Several other examples of nonlinear functions are given by Daniel and Wood (1971).

12-7 Correlation

Our development of regression theory has been based on the assumption that the mathematical variable, measured variable, and the independent variable, both x and y are random variables. Many applications of regression analysis require that the observations (y_i, x_i) , $i = 1, \dots, n$, be independent variables obtained from the distribution. We wish to develop a regression model for the weld diameter. In this example we would randomly select n spot welds

Therefore, we have

$$\begin{aligned} SS_R(\beta_2|\beta_1, \beta_0) &= 5990.7712 - 5885.8521 \\ &= 104.9191 \quad (1 \text{ degree of freedom}) \end{aligned}$$

This is the increase in the regression sum of squares by adding x_2 to already containing x_1 . To test $H_0: \beta_2 = 0$, form the test statistic

$$F_0 = \frac{SS_R(\beta_2|\beta_1, \beta_0)/1}{MS_E} = \frac{104.9191/1}{5.2352} = 20.04$$

Note that the MS_E from the *full* model, using both x_1 and x_2 , is used as the denominator of the test statistic. Since $F_{0.05, 1, 22} = 4.30$, we reject $H_0: \beta_2 = 0$ and conclude that distance (x_2) contributes significantly to the model.

Since this partial F -test involves a single variable, it is equivalent to a t -test. To see this, recall that the t -test on $H_0: \beta_2 = 0$ resulted in the test statistic $t_0 = 4.4767$. Furthermore, the square of a t random variable with ν degrees of freedom is an F random variable with one and ν degrees of freedom, and we note that $t_0^2 = (4.4767)^2 = 20.04 = F_0$.

13-6 Measures of Model Adequacy

A number of techniques can be used to measure the adequacy of a multiple regression model. This section will present several of these techniques. Model validation is an important part of the multiple regression model building process. A good paper on this subject is Snee (1977).

13-6.1 The Coefficient of Multiple Determination

The coefficient of multiple determination R^2 is defined as

$$R^2 = \frac{SS_R}{S_{yy}} = 1 - \frac{SS_E}{S_{yy}} \quad (13-39)$$

R^2 is a measure of the amount of reduction in the variability of y obtained by using the regressor variables x_1, x_2, \dots, x_k . As in the simple linear regression case, we must have $0 \leq R^2 \leq 1$. However, a large value of R^2 does not necessarily imply that the regression model is a good one. Adding a variable to the model will always increase R^2 , regardless of whether the additional variable is statistically significant or not. Thus it is possible for models that have large values of R^2 to yield poor predictions of new observations or estimates of the mean response.

The positive square root of R^2 is the multiple correlation coefficient between y and the set of regressor variables x_1, x_2, \dots, x_k . That is, R is a measure of the linear association between y and x_1, x_2, \dots, x_k . When $k = 1$, this becomes the simple correlation between y and x .

13-8. The coefficient of multiple determination estimated in Example 13-1

$$R^2 = \frac{SS_R}{S_{yy}} =$$

about 98.11 percent of the variability in y is explained when the two independent variables (x_1 and x_2) are used. In Example 13-8, the value of R^2 for the full model (including variable x_2 to the model) has

13-6.2 Residual Analysis

The residuals from the estimated regression model, $y_i - \hat{y}_i$, play an important role in the analysis of a simple linear regression. As in the case of simple linear regression, residual plots that are often used to check the adequacy of the model. It is also helpful to plot the residuals against the independent variables. These plots are possible candidates for identifying which of the variables in Fig. 12-5, indicate the best candidate variable.

Example 13-9. The residuals from the regression model are shown in Table 13-3. These residuals are plotted in Fig. 13-2. No severe deviations are apparent, although the two largest residuals are extremely close to a straight line. However, the standardized residuals for the two largest residuals, 1.89, do not seem excessively large. The error in collecting observations may modify these two points.

The residuals are plotted against x_1 in Fig. 13-4 and 13-5, respectively. The residuals in Fig. 13-4 there is some indication of a non-linear relationship with small delivery volumes (cases), and over predicts the time for delivery ($7 \leq x_1 \leq 14$ cases). The same is true for the relationship between time and delivery volume involving x_2 , say, be added to the model. The present model affects the relationship between the regressor variable is required

- **Example 13-8.** The coefficient of multiple determination for the regression model estimated in Example 13-1 is

$$R^2 = \frac{SS_R}{S_{yy}} = \frac{5990.7712}{6105.9447} = .981137$$

That is, about 98.11 percent of the variability in delivery time y has been explained when the two independent variables delivery volume (x_1) and distance (x_2) are used. In Example 12-7, a model relating y to x_1 only was developed. The value of R^2 for this model is $R^2 = .963954$. Therefore, adding the variable x_2 to the model has increased R^2 from .963954 to .981137.

13-6.2 Residual Analysis

The residuals from the estimated multiple regression model, defined by $e_i = y_i - \hat{y}_i$, play an important role in judging model adequacy just as they do in simple linear regression. As noted in Section 12-5.1, there are several residual plots that are often useful. These are illustrated in Example 13-9. It is so helpful to plot the residuals against variables not presently in the model that are possible candidates for inclusion. Patterns in these plots, similar to those in Fig. 12-5, indicate that the model may be improved by adding the candidate variable.

● **Example 13-9.** The residuals for the model estimated in Example 13-1 are shown in Table 13-3. These residuals are plotted on normal probability paper in Fig. 13-2. No severe deviations from normality are obviously apparent, although the two largest residuals ($e_{15} = 5.88$ and $e_{17} = 4.33$) do not fall very close to a straight line drawn through the remaining residuals. However, the standardized residuals, $5.88/\sqrt{5.2352} = 2.57$ and $4.33/\sqrt{5.2352} = 1.91$, do not seem excessively large. Inspection of the data does not reveal any unusual observations in collecting observations 15 and 17, or any other reason to discard or question these two points.

The residuals are plotted against \hat{y} in Fig. 13-3, and against x_1 and x_2 in Fig. 13-5, respectively. The two largest residuals e_{15} and e_{17} are apparent. In Fig. 13-5, there is some indication that the model underpredicts the time at outlets with small delivery volumes ($x_1 \leq 6$ cases) and large delivery volumes ($x_1 \geq 15$ cases). The same impression is obtained from Fig. 13-3. Possibly the relationship between time and delivery volume is not linear (requiring that a term such as x_1^2 be added to the model), or other regressor variables not included in the model affect the response. We will see subsequently that a third variable is required to adequately model this data.

5.8521

degree of freedom)

squares by adding x_2 to a model
in the test statistic

$$\frac{04.9191/1}{5.2352} = 20.04$$

ing both x_1 and x_2 , is used in the
test statistic $F = 4.30$, we reject $H_0: \beta_2 = 0$ and
conclude that x_2 is significantly
important to the model.

variable, it is equivalent to the
test of $H_0: \beta_2 = 0$ resulted in the test
statistic of a t random variable with
degrees of freedom one and ν degrees of
freedom $F_{0.05}$.

by

measure the adequacy of a multiple
regression model. Several of these techniques. Most
of these techniques. Multiple regression model built
using the technique of (1977).

Definition

is defined as

$$\frac{SS_E}{S_{yy}} \quad (13-1)$$

the variability of y obtained
from the simple linear regression
model. A large value of R^2 indicates
that the model is a good one. Adding a
new variable to the model, regardless of whether the
variable is significant, tells us it is possible for model
adequacy to be improved by adding new observations.

multiple correlation coefficient
between y and x_1, x_2, \dots, x_k . That is,
the multiple correlation coefficient between y and x_1, x_2, \dots, x_k is
the square root of the coefficient of multiple determination R^2 .

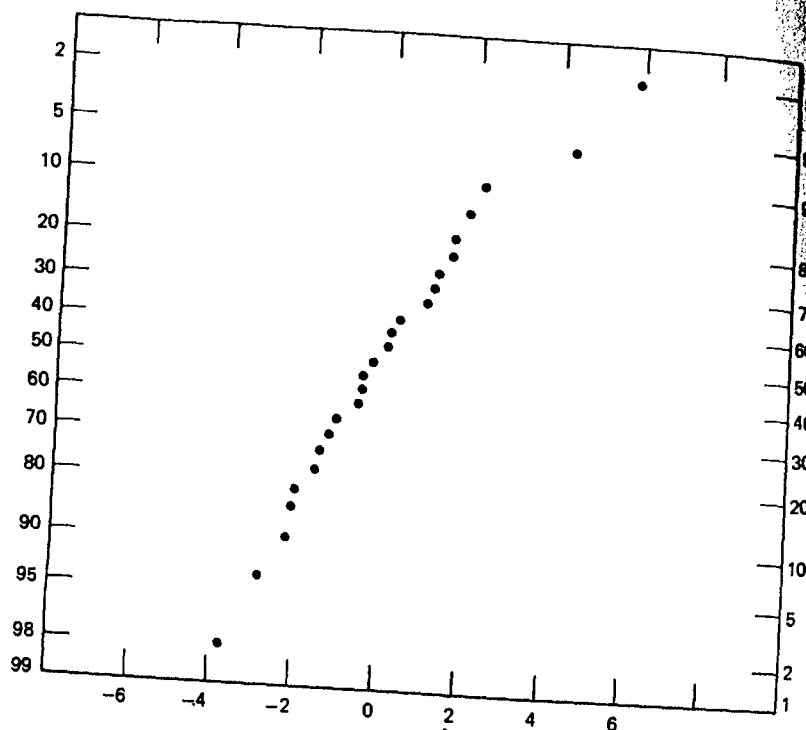


Fig. 13-2. Normal probability plot of residuals.

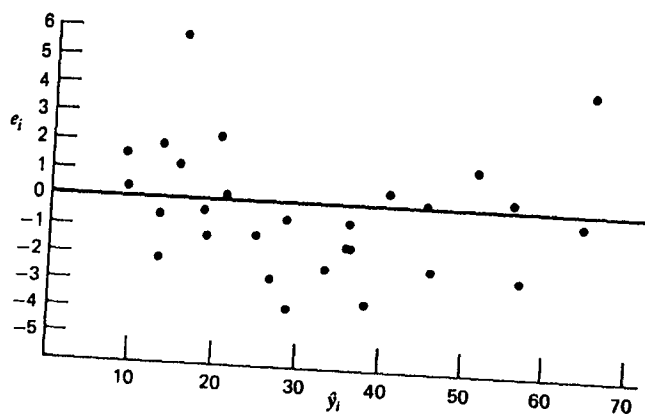


Fig. 13-3. Plot of residuals against \hat{y} .

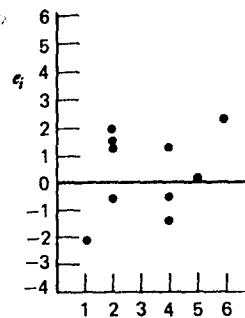


Fig. 13-4. Plot of residuals against \hat{y} .

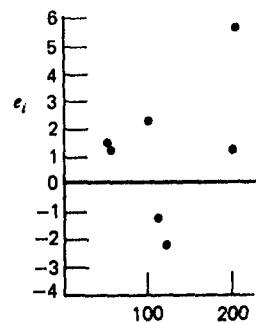


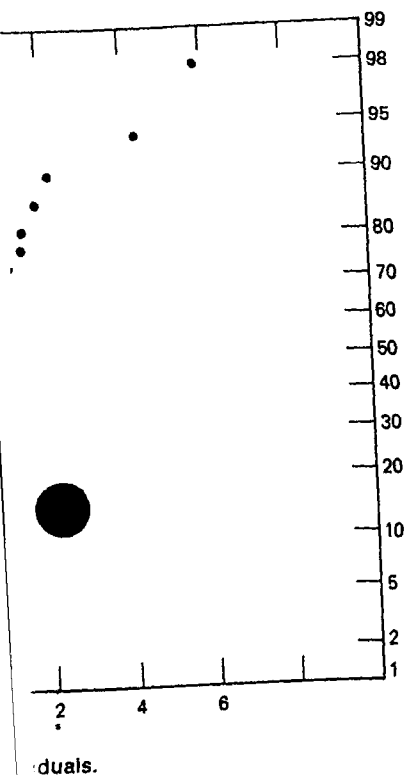
Fig. 13-5. Plot of residuals against \hat{y} .

13-6.3 Estimation of Pure Error

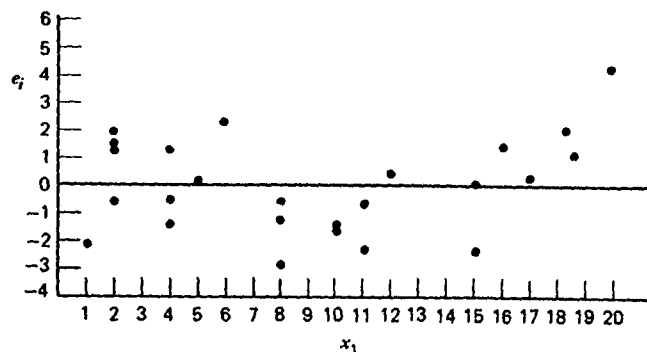
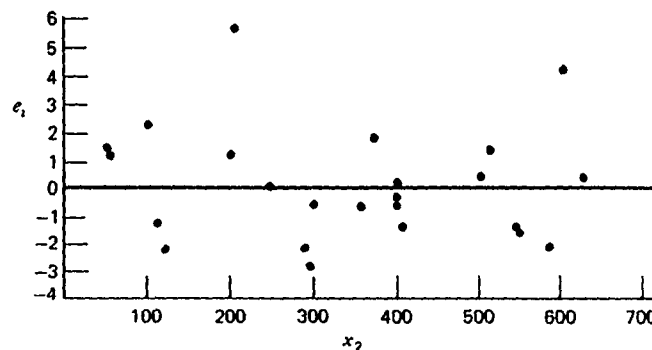
In Section 12-5.2 we described the procedure involved in estimating the pure error component due to pure error.

The pure error sum of squares is calculated by repeated observations at each level of the regressor.

This general procedure can be applied to any set of levels on the regressor. The calculation of SS_{PE} requires that the X matrix must be of full rank.



duals.

Fig. 13-4. Plot of residuals against x_1 .Fig. 13-5. Plot of residuals against x_2 .

12.5.3 Estimation of Pure Error from Near Neighbors

In Section 12-5.2 we described a test for lack of fit in simple linear regression. This procedure involved partitioning the error or residual sum of squares into a component due to pure error and a component due to lack of fit, say

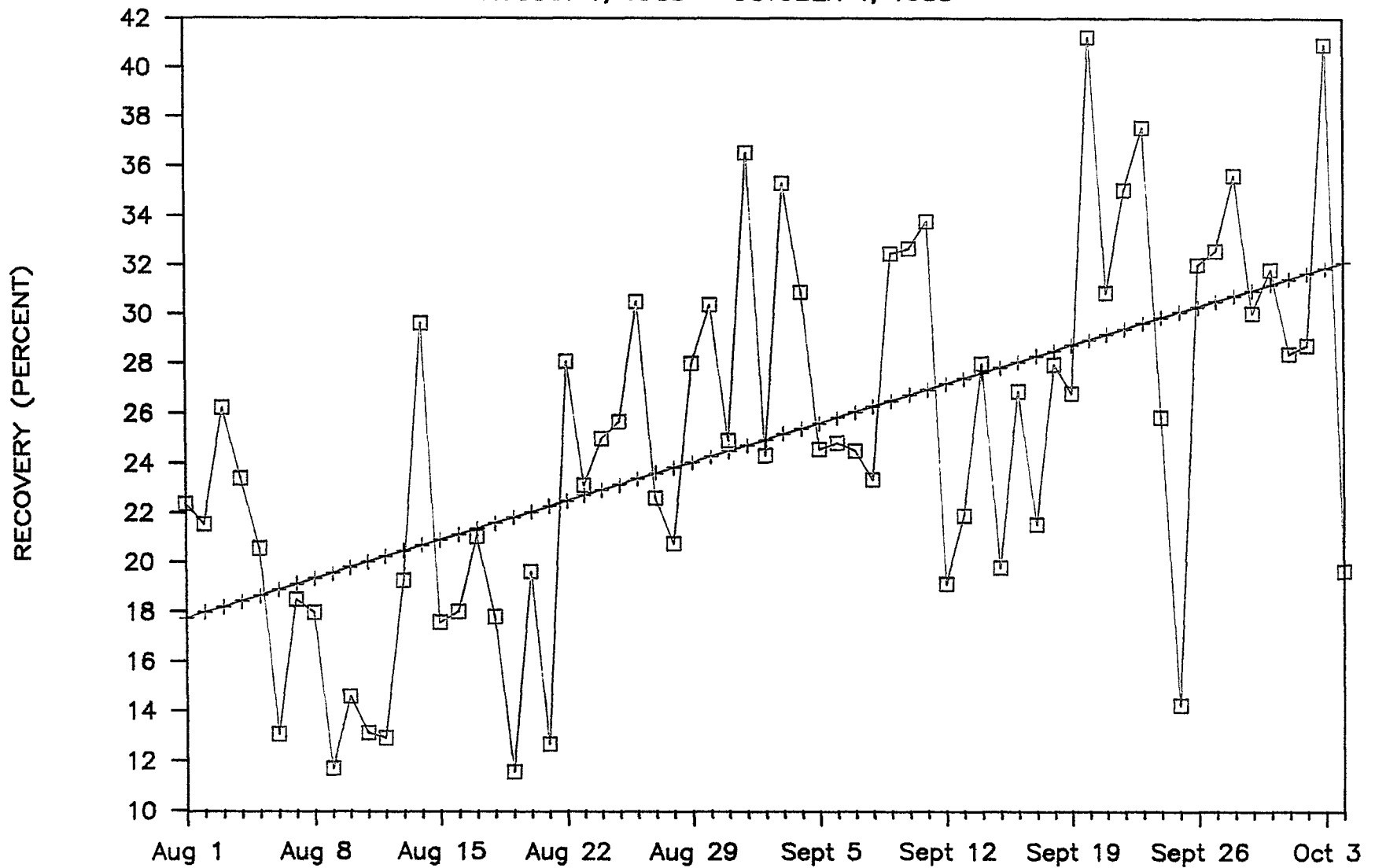
$$SS_E = SS_{PE} + SS_{LOF}$$

The pure error sum of squares SS_{PE} is computed from the responses obtained from repeated observations at the same level of x .

The general procedure can, in principle, be extended to multiple regression. The calculation of SS_{PE} requires repeated observations on y at the same levels on the regressor variables x_1, x_2, \dots, x_k . That is, some of the rows of the X matrix must be the same. However, the occurrence of repeated

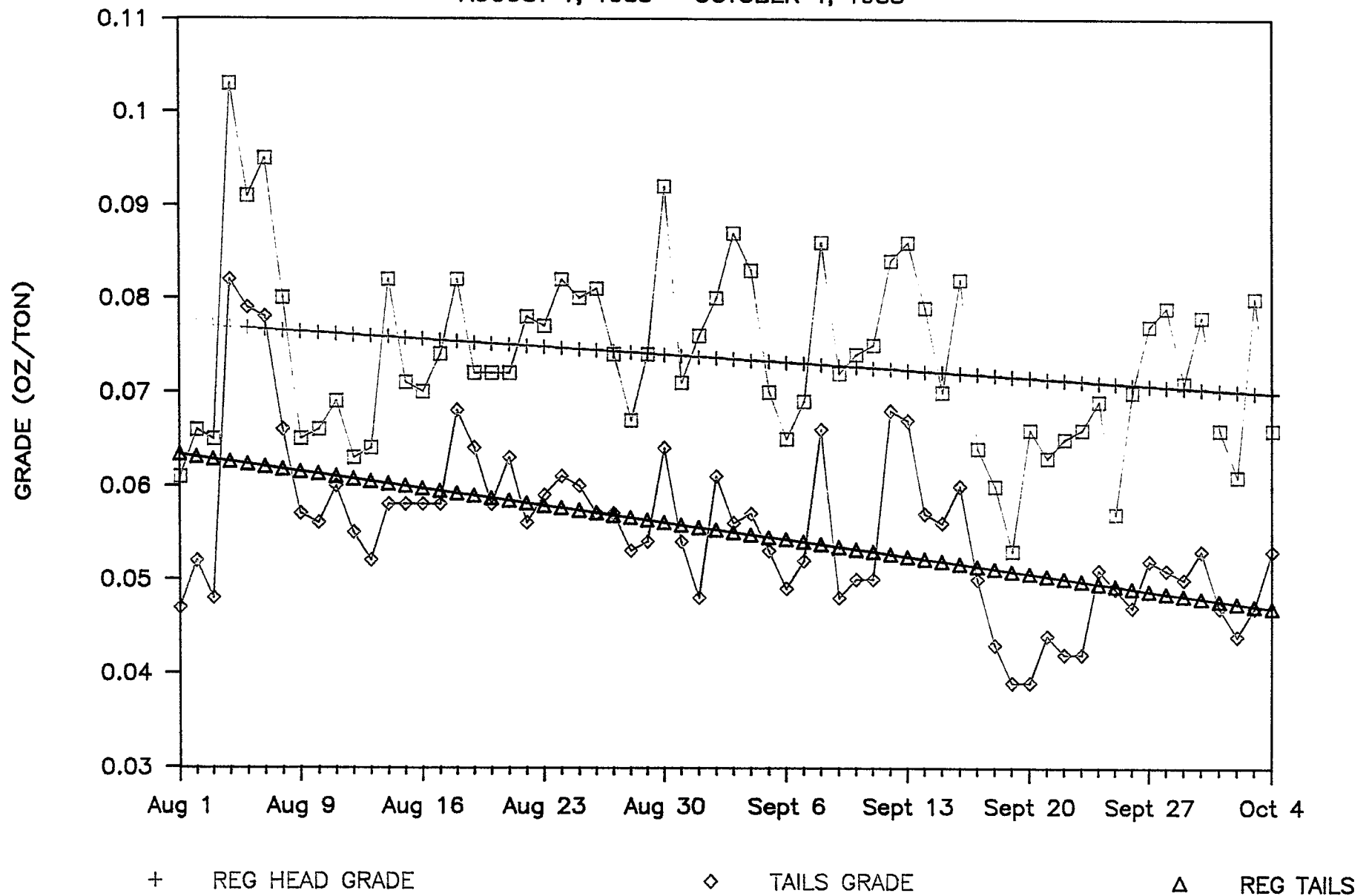
TRP RECOVERY/TIME REGRESSION ANALYSIS

AUGUST 1, 1988 - OCTOBER 4, 1988



TRP HEAD/TAILS GRADE REGRESSION

AUGUST 1, 1988 - OCTOBER 4, 1988



1988 TRP GOLD EXTRACTION VS HEAD GRADE

JUL 13 - OCT 22

