TECHNICAL MEMORANDUM

CH2M HILL
SEP 15 1995
Department of Environmental Protection
SOUTHWEST DISTRICT
BY

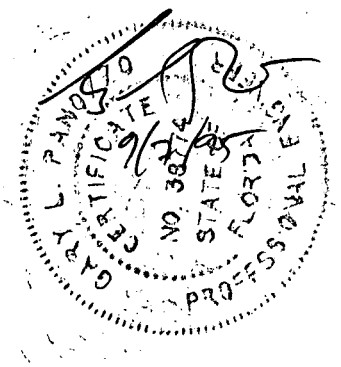
TO: Susan J. Metcalfe, P.G. - Citrus County

FROM: Gary L. Panozzo, P.E. - CH2M HILL/TPA

DATE: September 6, 1995

SUBJECT: North Face Slope Stability Analysis
Citrus County Central Landfill

PROJECT: 130778.29.ZZ



Introduction

The purpose of this technical memorandum is to evaluate the stability of the north slope of the Citrus County Central Landfill along potential failure surfaces which extend along the landfill lining into the solid waste zone of the landfill. A site plan of the landfill is shown on Figure 1. Figure 1 also identifies a baseline north of the isolation berm at the toe of the northern slope. The northern slope is characterized by a steeped section. A summary of the angle and lengths of the steeped northern slope is provided in Table 1. Landfill filling along the northern slope has occurred at flatter slopes (less than 4 horizontal to 1 vertical) above this steeped section. Filling will be continued to elevation 120 feet NGVD.

Analysis

The slope stability of the north slope of the Citrus County Central Landfill was analyzed by evaluating potential failure surfaces which extend along the landfill lining into the solid waste zone of the landfill at Stations 15+00 and 16+00. As indicated in Table 1, these locations are consistent with the steepest portions of the northern slope. The potential failure surfaces were

Table 1
Summary of Steeped Northern Slope

Station along Baseline	Slope (horizontal:vertical)	Vertical Slope Length (feet)
13+00	1.9:1.0	31
14+00	1.7:1.0	30
15+00	1.5:1.0	27
16+00	1.4:1.0	21
17+00	1.6:1.0	19

ATTACHMENT D

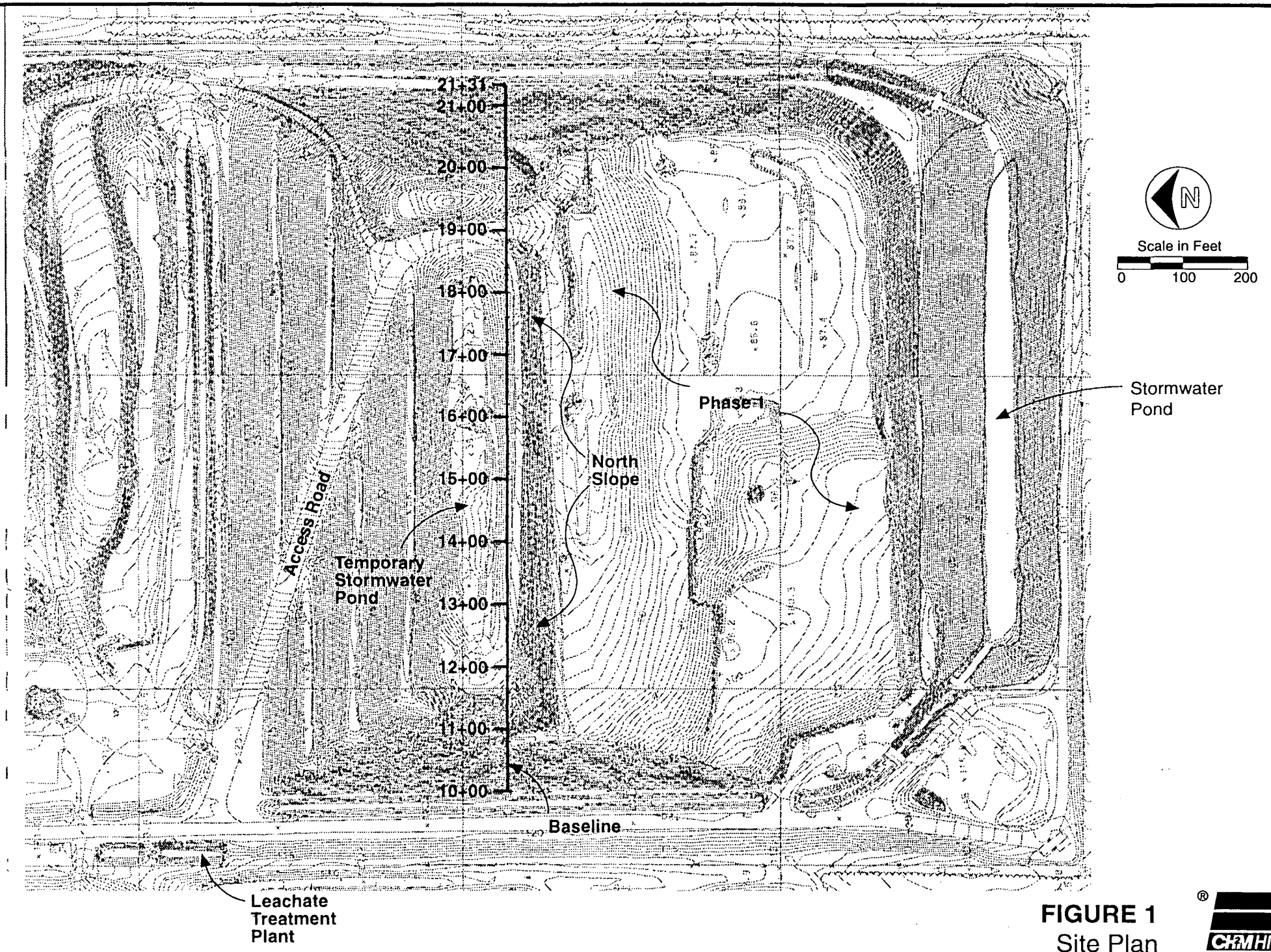


FIGURE 1
Site Plan

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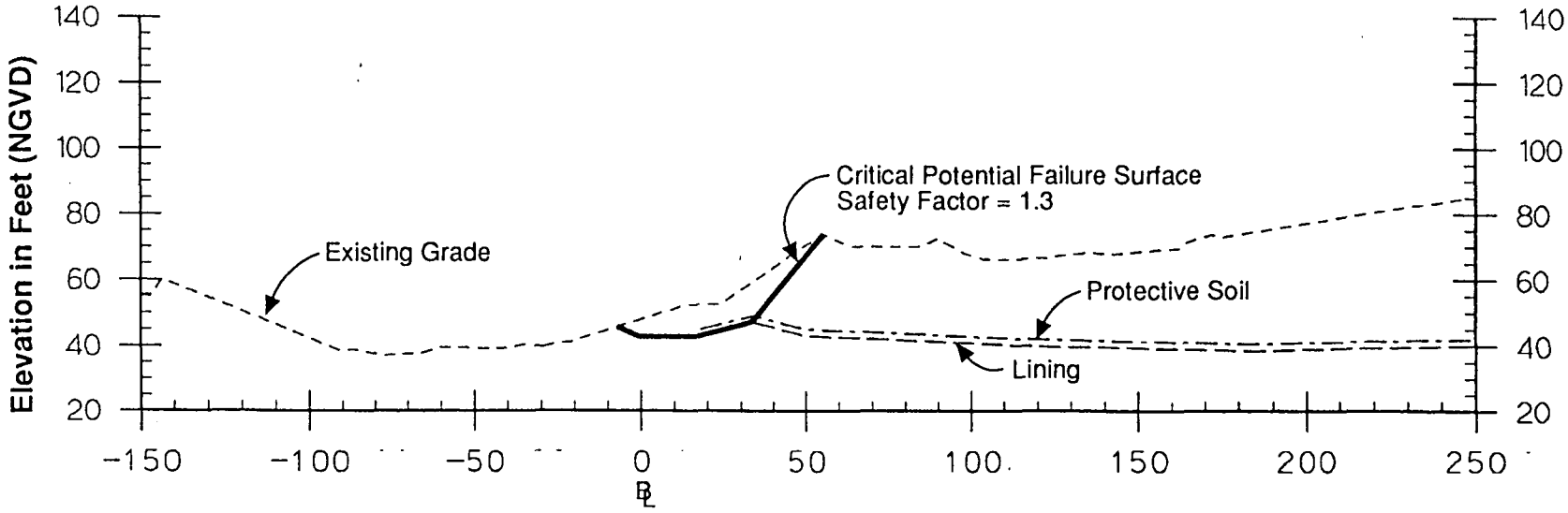
evaluated with limit equilibrium methodology which includes a calculation of the shear resistance along the potential failure surfaces necessary for equilibrium, and a calculation of available shear strength using the Janbu theory of inter-slice forces. These two calculations are compared by a ratio in the methodology to give an indication of the factor of safety along the potential failure surface. If the safety factor is less than 1, the methodology indicates that there may not be enough available shear strength along the failure surface for equilibrium. If the safety factor is greater than 1, the methodology predicts that the available shear strength will provide for equilibrium.

The computer program PCSTABL6 was used to perform the limit equilibrium analyses for the slope stability analysis (Humphrey and Holtz, 1986). Copies of the computer input and output files are provided in the calculations within Attachment A. The material properties and problem geometries used in the analyses were based on the project geotechnical investigation, as-built drawings of the facility, and published literature. Where ranges of parameters were available, parameters were selected to yield conservative results; and therefore, the estimated safety factors represent a lower limit. A summary of the material properties used with the source of the information and related comments is provided in Table 2.

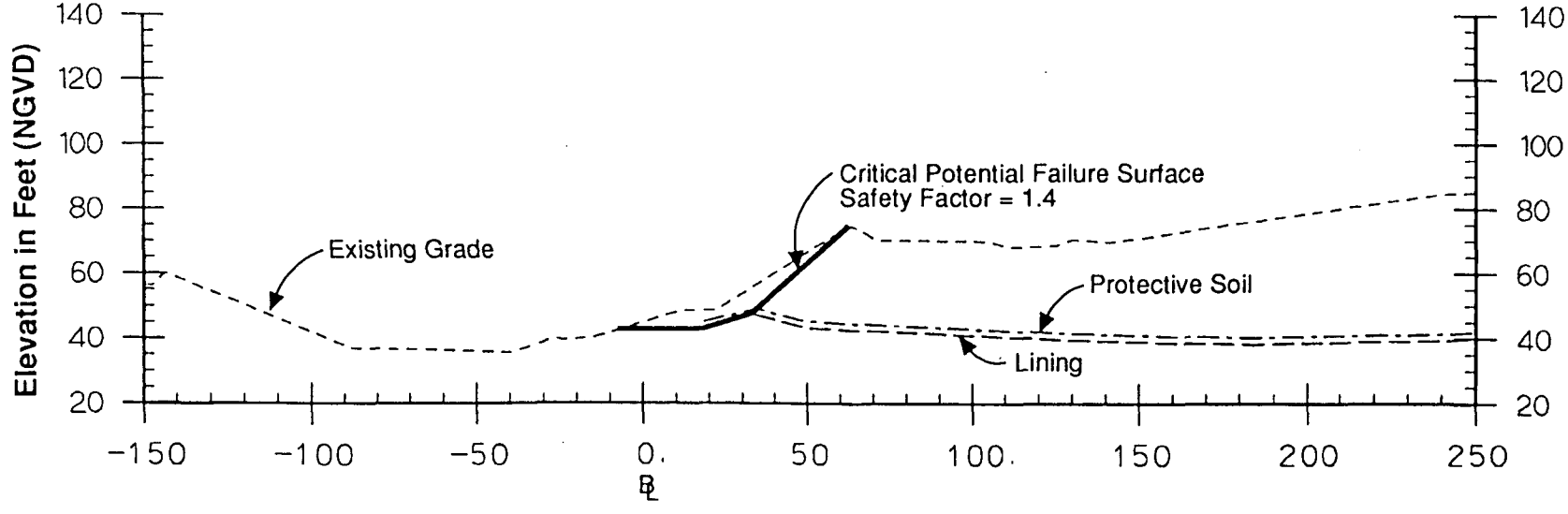
Table 2
Summary of Input Material Properties for the Limit Equilibrium Analysis

Material	Unit Weight (pcf)	Friction Angle (degree)	Comments
Clean fill and natural in place soils	118	26	Unit weight and friction angle based on local experience and published literature
HDPE Geomembrane Lining	55	15	Friction angle based on published literature for HDPE/soil interfaces
Landfill Contents (municipal solid waste and soil cover)	80	25	Unit weight and friction angle based on published literature

The computer program PCSTABL6 was used to evaluate safety factors of potential failure surfaces generated within the bounds of a block search routine. For existing conditions of the north slope, a block-search routine was performed along the interfaces of the HDPE geomembrane lining below the landfill and into the solid waste south of the isolation berm at the toe of the northern slope. The potential failure surfaces with the lowest safety factors at Stations 15+00 and 16+00, or critical potential failure surfaces, are shown in Figure 2. Safety factors along these critical surfaces are 1.3 and 1.4. For final conditions, a block-search routine was performed along the interfaces of the HDPE geomembrane lining below the landfill and into the solid waste below the future areas to be filled. The critical potential failure surfaces at Stations



Station 16 + 00



Station 15 + 00

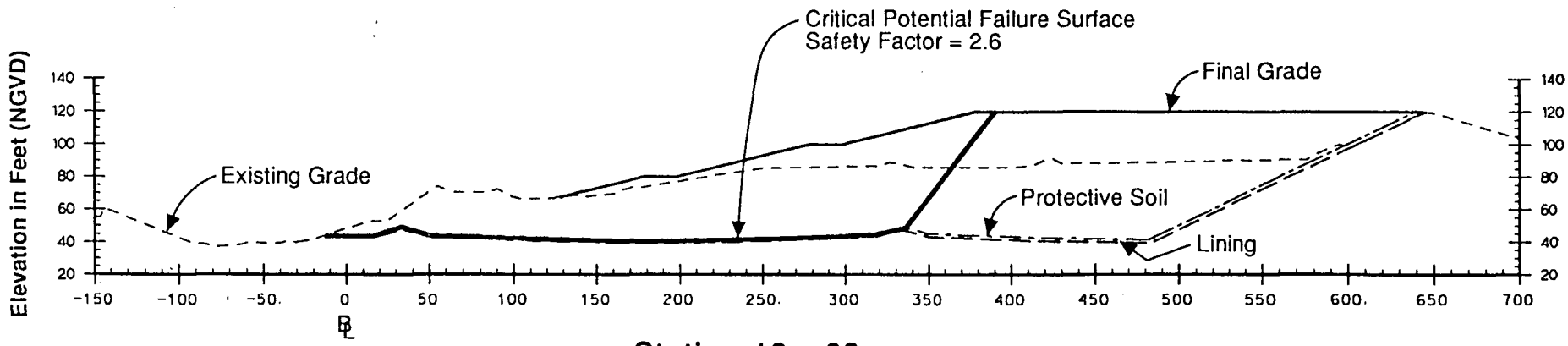
FIGURE 2
Slope Stability Analysis of Existing Slope Conditions

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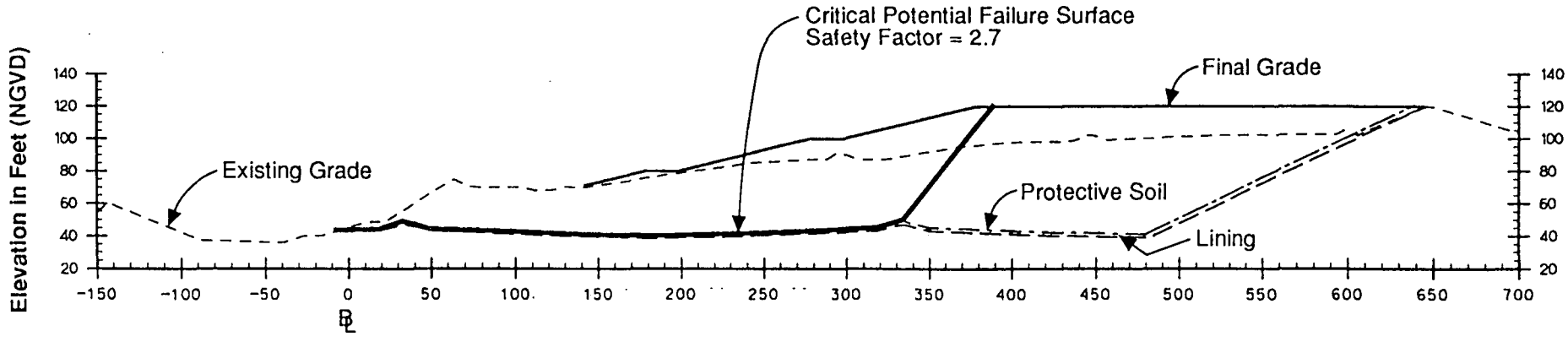
15+00 and 16+00 for these final conditions after the landfill is filled to elevation 120 feet NGVD are shown in Figure 3. Safety factors along these critical surfaces are 2.6 and 2.7.

Conclusions

Based on the results of a limit equilibrium analysis, the stability of the north slope along potential failure surfaces along the landfill lining into the solid waste zone of the landfill is adequate under both existing and final conditions.



Station 16 + 00



Station 15 + 00

FIGURE 3
Slope Stability Analysis of Final Slope Conditions

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Appendix A

Calculations

--Slope Stability Analysis--
Simplified Janbu, Simplified Bishop
or Spencer's Method of Slices

STATION 15+00
EXISTING
CONDITIONS

Run Date: 09-05-95
Time of Run: 3:01pm
Run By: tho
Input Data Filename: F:CITII_2.IN
Output Filename: F:CITII_2.OUT
Plotted Output Filename: F:CITII_2.PLT

PROBLEM DESCRIPTION Citrus County Landfill S
liding Block - LinerFailure

BOUNDARY COORDINATES

33 Top Boundaries
54 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	100.00	172.00	147.00	157.00	1
2	147.00	157.00	153.00	156.00	1
3	153.00	156.00	156.00	160.00	1
4	156.00	160.00	213.00	137.00	1
5	213.00	137.00	260.00	135.00	1
6	260.00	135.00	275.00	140.00	1
7	275.00	140.00	285.00	140.00	1
8	285.00	140.00	292.00	142.50	1
9	292.00	142.50	292.43	142.75	2
10	292.43	142.75	311.00	158.25	1
11	311.00	158.25	322.00	159.00	1
12	322.00	159.00	363.00	175.00	1
13	363.00	175.00	370.00	170.00	3
14	370.00	170.00	405.00	169.50	3

15	405.00	169.50	411.00	168.00	3
16	411.00	168.00	425.00	168.50	3
17	425.00	168.50	430.00	170.50	3
18	430.00	170.50	440.00	169.00	3
19	440.00	169.00	540.00	185.00	3
20	540.00	185.00	590.00	187.00	3
21	590.00	187.00	595.00	191.00	3
22	595.00	191.00	607.00	187.00	3
23	607.00	187.00	624.00	187.00	3
24	624.00	187.00	680.00	195.00	3
25	680.00	195.00	700.00	198.00	3
26	700.00	198.00	735.00	198.50	3
27	735.00	198.50	743.00	202.00	3
28	743.00	202.00	750.00	202.50	3
29	750.00	202.50	757.00	199.00	3
30	757.00	199.00	800.00	201.00	3
31	800.00	201.00	895.00	203.00	3
32	895.00	203.00	897.00	205.00	3
33	897.00	205.00	944.75	220.00	3
34	292.43	142.75	318.00	143.25	2
35	318.00	143.25	334.00	147.25	2
36	334.00	147.25	363.00	175.00	3
37	334.00	147.25	350.00	143.25	2
38	350.00	143.25	428.00	139.75	2
39	428.00	139.75	485.00	138.25	2
40	485.00	138.25	619.00	143.25	2
41	619.00	143.25	634.00	147.25	2
42	634.00	147.25	650.00	143.25	2
43	650.00	143.25	732.00	138.75	2
44	732.00	138.75	944.75	220.00	2
45	292.00	142.50	318.00	143.00	1
46	318.00	143.00	334.00	147.00	1
47	334.00	147.00	350.00	143.00	1
48	350.00	143.00	428.00	139.50	1
49	428.00	139.50	485.00	138.00	1
50	485.00	138.00	619.00	143.00	1
51	619.00	143.00	634.00	147.00	1
52	634.00	147.00	650.00	143.00	1
53	650.00	143.00	732.00	138.50	1
54	732.00	138.50	945.00	220.00	1

ISOTROPIC SOIL PARAMETERS

3 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	90.0	118.0	0.0	26.0	0.00	0.0	1
2	55.0	55.0	0.0	15.0	0.00	0.0	1
3	80.0	80.0	0.0	25.0	0.00	0.0	1

A Critical Failure Surface Searching Method, Using A Random Technique For Generating Sliding Block Surfaces, Has Been Specified.

40 Trial Surfaces Have Been Generated.

3 Boxes Specified For Generation Of Central Block Base

Length Of Line Segments For Active And Passive Portions Of Sliding Block Is 5.0

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height
1	292.50	142.63	318.00	143.13	0.25
2	318.10	143.13	334.00	147.13	0.25
3	334.10	147.13	350.00	143.13	0.25

Following Are Displayed The Ten Most Critical Of The Trial Failure Surfaces Examined. They Are Ordered - Most Critical First.

* * Safety Factors Are Calculated By The Modified Janbu Method * *

Failure Surface Specified By 13 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	296.40	146.06
2	296.87	145.90
3	300.70	142.69
4	323.18	144.37
5	336.09	146.50
6	339.39	150.26
7	342.90	153.82
8	346.42	157.38
9	349.82	161.04
10	352.38	165.33
11	355.89	168.90
12	359.14	172.70
13	359.90	173.79

*** 1.419 ***

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	292.55	142.85
2	292.95	142.66
3	329.00	145.87
4	335.42	146.74
5	338.95	150.28

6	340.93	154.88
7	343.36	159.25
8	346.87	162.81
9	349.46	167.08
10	351.28	170.43

*** 1.469 ***

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	295.31	145.16
2	299.06	142.81
3	330.85	146.35
4	334.57	146.94
5	337.82	150.73
6	339.96	155.25
7	343.08	159.17
8	345.84	163.33
9	348.20	167.74
10	348.43	169.31

*** 1.472 ***

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	294.09	144.14
2	298.88	142.77
3	323.50	144.48
4	334.65	147.02
5	338.17	150.57
6	339.15	155.47
7	340.88	160.16
8	344.32	163.79
9	347.76	167.42
10	349.25	169.64

*** 1.509 ***

Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	293.08	143.29
2	297.11	142.77
3	325.00	144.98
4	339.75	145.66
5	343.05	149.42
6	344.27	154.27
7	347.59	158.01
8	350.14	162.31
9	353.31	166.17
10	356.50	170.03
11	359.40	173.60

*** 1.577 ***

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	293.91	143.98
2	295.24	142.70
3	326.04	145.15
4	337.78	146.30
5	340.65	150.40
6	341.80	155.26
7	345.33	158.80
8	347.50	163.30
9	351.04	166.84
10	352.92	171.07

*** 1.584 ***

Failure Surface Specified By 13 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	295.06	144.95
2	295.47	144.55
3	300.19	142.90
4	324.62	144.84
5	344.53	144.55
6	347.97	148.18
7	351.46	151.76
8	354.93	155.36
9	357.45	159.68
10	359.73	164.13
11	363.26	167.67
12	366.46	171.51
13	366.61	172.42

*** 1.624 ***

Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	294.77	144.71
2	297.09	142.69
3	333.31	146.89
4	347.44	143.85
5	350.83	147.52
6	353.46	151.78
7	356.68	155.60
8	359.26	159.88
9	361.18	164.50
10	364.71	168.04
11	366.54	172.47

*** 1.669 ***

Failure Surface Specified By 12 Coordinate Points

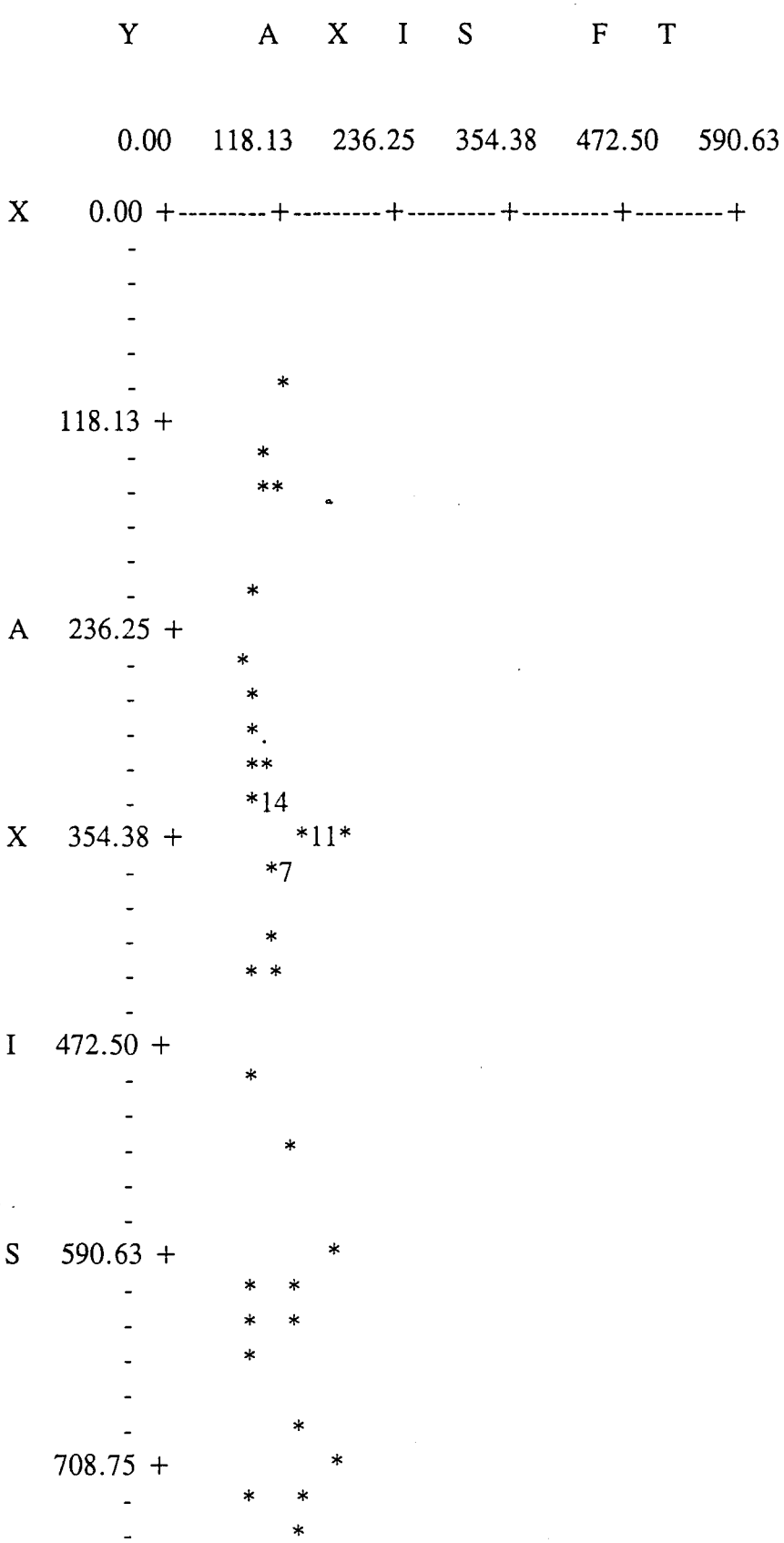
Point No.	X-Surf (ft)	Y-Surf (ft)
1	292.79	143.05
2	293.21	142.67
3	327.32	145.53
4	344.09	144.59
5	346.94	148.70
6	350.14	152.54
7	353.66	156.09
8	356.62	160.12
9	357.23	165.08
10	357.92	170.03
11	360.84	174.09
12	360.86	174.16

*** 1.727 ***

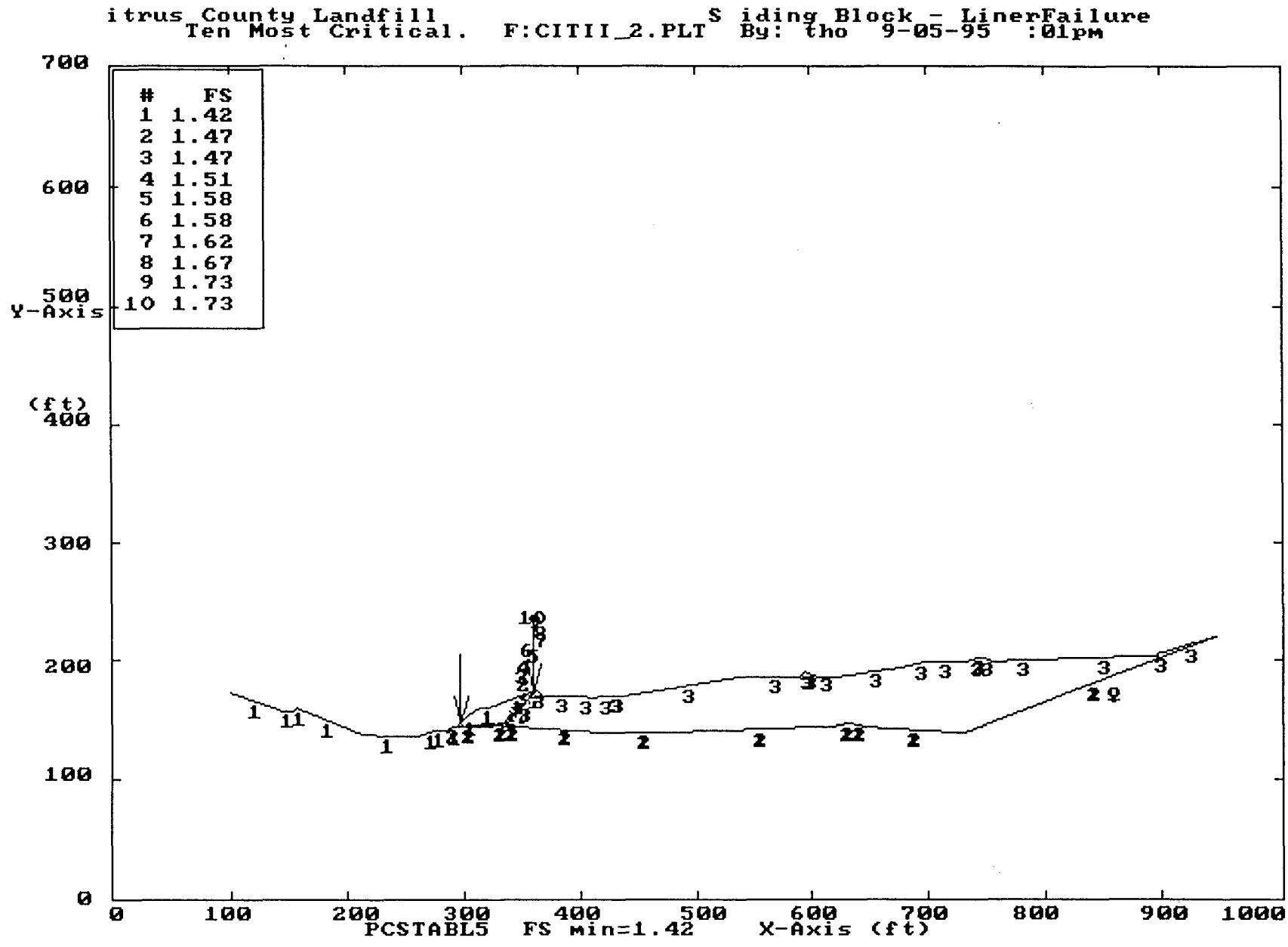
Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	294.03	144.08
2	296.03	142.80
3	328.61	145.73
4	340.20	145.64
5	341.21	150.54
6	344.74	154.08
7	347.69	158.12
8	349.73	162.68
9	351.28	167.43
10	351.81	170.63

*** 1.732 ***


Y A X I S F T
0.00 118.13 236.25 354.38 472.50 590.63
X 0.00
118.13
A 236.25
X 354.38
I 472.50
S 590.63
708.75

```
          -
          -
          -          *
F  826.88 +
          -
          -
          -          *
          -          *
          -
T  945.00 +                    *
```


itrus County Landfill
Ten Most Critical.
F:CITII_2.PLT
S iding Block - LinerFailure
By: tho 9-05-95 :01pm
FS
1 1.42
2 1.47
3 1.47
4 1.51
5 1.58
6 1.58
7 1.62
8 1.67
9 1.73
10 1.73
Y-Axis (ft)
700
600
500
400
300
200
100
0
0 100 200 300 400 500 600 700 800 900 1000
PCSTABL5 FS Min=1.42 X-Axis (ft)

--Slope Stability Analysis--
Simplified Janbu, Simplified Bishop
or Spencer's Method of Slices

STATION 16+00
EXISTING
CONDITIONS

Run Date: 09-05-95
Time of Run: 4:46pm
Run By: tho
Input Data Filename: F:CITII_5.IN
Output Filename: F:CITII_5.OUT
Plotted Output Filename: F:CITII_5.PLT

PROBLEM DESCRIPTION Citrus County Landfill S
liding Block - LinerFailure

BOUNDARY COORDINATES

31 Top Boundaries
50 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	100.00	172.00	145.00	176.00	1
2	145.00	176.00	154.00	175.50	1
3	154.00	175.50	156.00	160.00	1
4	156.00	160.00	215.00	139.00	1
5	215.00	139.00	225.00	137.00	1
6	225.00	137.00	235.00	138.00	1
7	235.00	138.00	241.00	140.00	1
8	241.00	140.00	272.00	140.00	1
9	272.00	140.00	312.00	152.00	1
10	312.00	152.00	325.00	153.00	1
11	325.00	153.00	360.00	174.00	1
12	360.00	174.00	362.00	172.00	1
13	362.00	172.00	364.00	170.00	3
14	364.00	170.00	385.00	170.00	3

15	385.00	170.00	390.00	173.00	3
16	390.00	173.00	405.00	166.00	3
17	405.00	166.00	435.00	168.00	3
18	435.00	168.00	442.00	167.50	3
19	442.00	167.50	463.00	169.00	3
20	463.00	169.00	473.00	173.00	3
21	473.00	173.00	500.00	185.50	3
22	500.00	185.50	620.00	186.50	3
23	620.00	186.50	626.00	189.00	3
24	626.00	189.00	640.00	186.00	3
25	640.00	186.00	712.00	187.00	3
26	712.00	187.00	724.00	191.50	3
27	724.00	191.50	730.00	188.00	3
28	730.00	188.00	875.00	190.50	3
29	875.00	190.50	895.00	200.00	3
30	895.00	200.00	904.75	200.00	3
31	904.75	200.00	905.00	200.00	2
32	300.00	143.25	318.00	143.25	2
33	318.00	143.25	334.00	147.25	2
34	334.00	147.25	362.00	172.00	3
35	334.00	147.25	350.00	143.25	2
36	350.00	143.25	483.00	139.25	2
37	483.00	139.25	618.00	143.25	2
38	618.00	143.25	635.00	147.25	2
39	635.00	147.25	650.00	143.25	2
40	650.00	143.25	783.00	139.25	2
41	783.00	139.25	904.75	200.00	2
42	300.00	143.00	318.00	143.00	1
43	318.00	143.00	334.00	147.00	1
44	334.00	147.00	350.00	143.00	1
45	350.00	143.00	483.00	139.00	1
46	483.00	139.00	618.00	143.00	1
47	618.00	143.00	635.00	147.00	1
48	635.00	147.00	650.00	143.00	1
49	650.00	143.00	783.00	139.00	1
50	783.00	139.00	905.00	200.00	1

ISOTROPIC SOIL PARAMETERS

3 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	90.0	118.0	0.0	26.0	0.00	0.0	1
2	55.0	55.0	0.0	15.0	0.00	0.0	1
3	80.0	80.0	0.0	25.0	0.00	0.0	1

A Critical Failure Surface Searching Method, Using A Random Technique For Generating Sliding Block Surfaces, Has Been Specified.

100 Trial Surfaces Have Been Generated.

3 Boxes Specified For Generation Of Central Block Base

Length Of Line Segments For Active And Passive Portions Of Sliding Block Is 5.0

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height
1	300.00	143.13	318.00	143.13	0.25
2	318.10	143.13	334.00	147.13	0.25
3	334.10	147.13	350.00	143.13	0.25

Following Are Displayed The Ten Most Critical Of The Trial Failure Surfaces Examined. They Are Ordered - Most Critical First.

* * Safety Factors Are Calculated By The Modified Janbu Method * *

Failure Surface Specified By 12 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	294.50	146.75
2	296.83	144.71
3	301.56	143.08
4	323.69	144.44
5	334.16	147.07
6	337.67	150.63
7	341.19	154.19
8	344.59	157.85
9	347.15	162.14
10	350.66	165.71
11	353.90	169.51
12	354.91	170.95

*** 1.294 ***

Failure Surface Specified By 13 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	293.84	146.55
2	297.34	146.23
3	302.02	144.47
4	306.83	143.11
5	325.96	145.22
6	343.72	144.67

7	347.19	148.27
8	349.59	152.65
9	352.86	156.43
10	356.35	160.02
11	358.54	164.51
12	360.82	168.96
13	362.64	171.36

*** 1.417 ***

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	300.03	148.41
2	300.84	148.40
3	305.07	145.72
4	309.72	143.89
5	314.65	143.06
6	333.98	147.24
7	341.93	145.17
8	344.67	149.35
9	347.26	153.63
10	349.32	158.18
11	352.44	162.09
12	354.76	166.52
13	358.20	170.14
14	359.88	173.93

*** 1.422 ***

Failure Surface Specified By 13 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	289.12	145.13
2	293.00	144.55
3	297.91	143.65
4	302.89	143.13
5	324.55	144.74
6	342.16	145.19
7	345.40	149.01
8	348.51	152.92
9	349.92	157.71
10	353.43	161.27
11	355.66	165.75
12	358.44	169.91
13	358.68	173.21

*** 1.434 ***

Failure Surface Specified By 12 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	296.53	147.36
2	299.43	145.79
3	303.66	143.13
4	326.64	145.38
5	343.90	144.75
6	347.39	148.34
7	350.88	151.92
8	354.42	155.45
9	357.92	159.02
10	360.63	163.23
11	364.15	166.77
12	365.36	170.00

*** 1.439 ***

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	298.47	147.94
2	302.10	145.12
3	306.74	143.24
4	319.79	143.50
5	334.45	147.13
6	337.13	151.35
7	340.19	155.31
8	342.76	159.59
9	346.28	163.14
10	348.13	166.88

*** 1.440 ***

Failure Surface Specified By 13 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	304.78	149.83
2	308.32	147.69
3	312.31	144.68
4	317.05	143.09
5	321.01	143.82
6	342.19	145.06
7	345.62	148.70
8	349.03	152.36
9	352.49	155.97
10	353.67	160.83
11	356.25	165.11
12	359.59	168.83
13	362.13	171.87

*** 1.445 ***

Failure Surface Specified By 13 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	297.17	147.55
2	299.62	145.72
3	304.30	143.95
4	309.24	143.20
5	318.68	143.20
6	346.16	144.11
7	349.40	147.91
8	352.93	151.46
9	355.13	155.95
10	358.47	159.67
11	359.76	164.50
12	363.09	168.23
13	363.94	170.06

*** 1.446 ***

Failure Surface Specified By 12 Coordinate Points

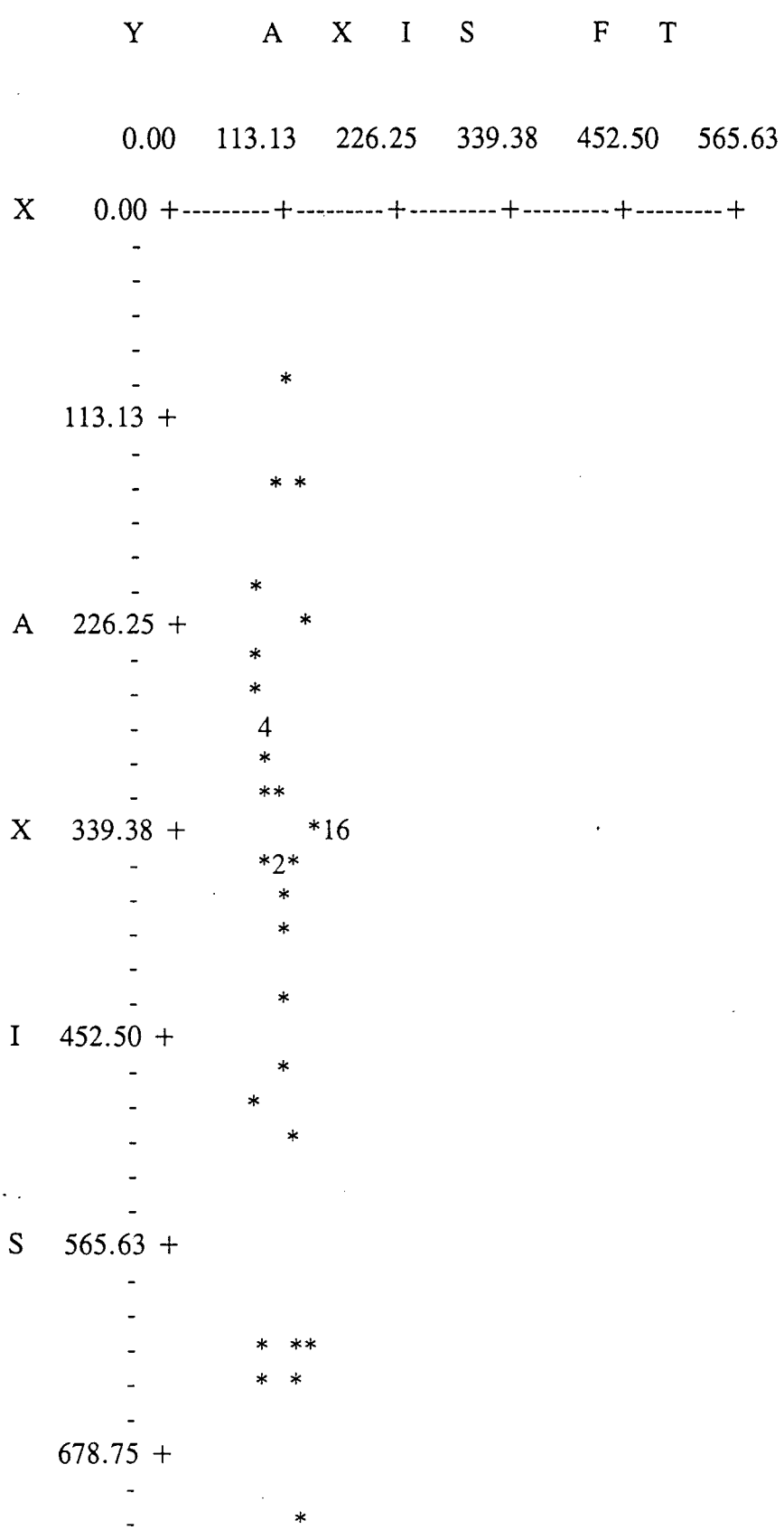
Point No.	X-Surf (ft)	Y-Surf (ft)
1	297.80	147.74
2	300.70	144.90
3	305.43	143.25
4	324.62	144.84
5	344.53	144.55
6	347.97	148.18
7	351.46	151.76
8	354.93	155.36
9	357.45	159.68
10	359.73	164.13
11	363.26	167.67
12	365.20	170.00

*** 1.451 ***

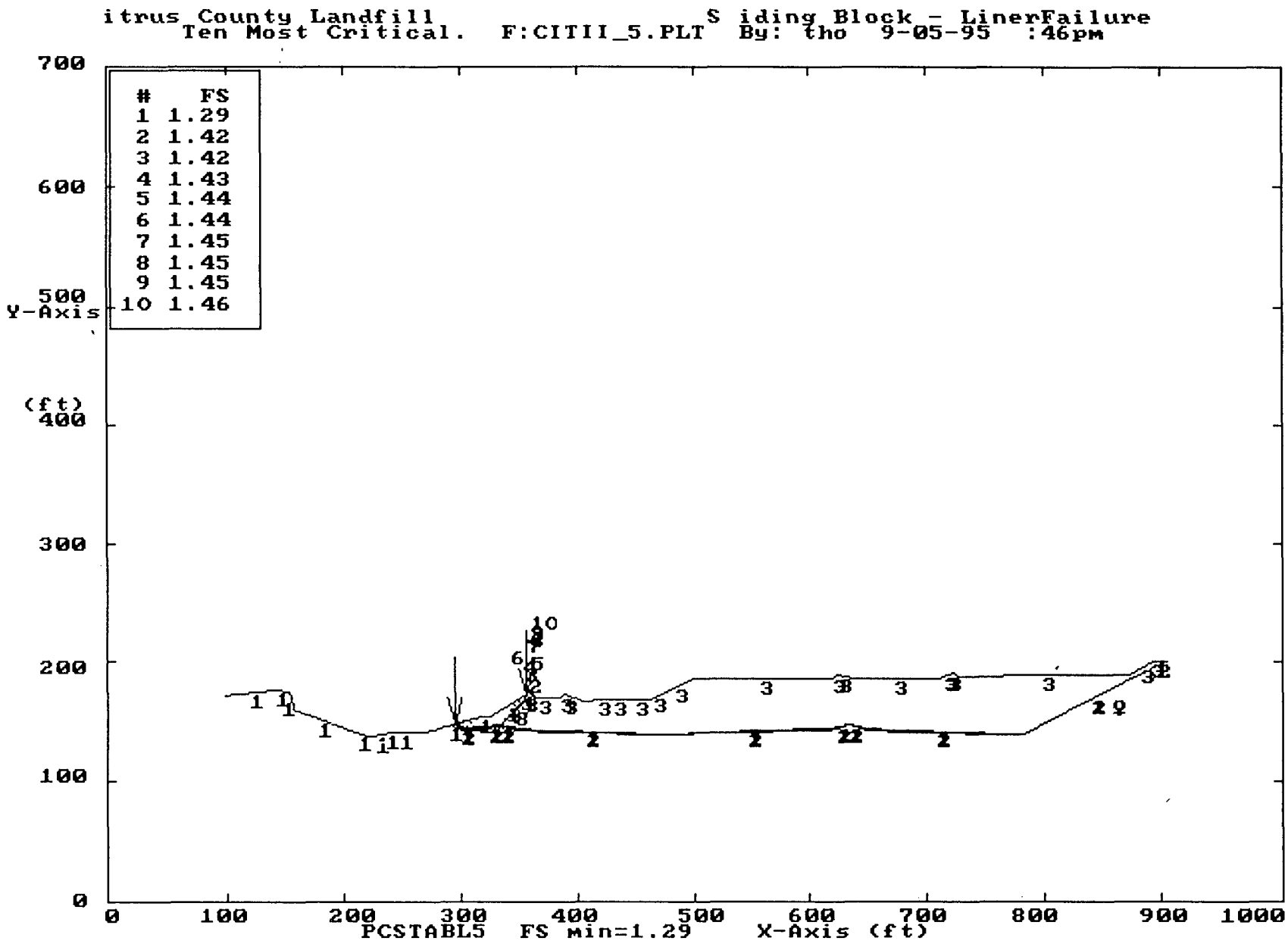
Failure Surface Specified By 13 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	292.79	146.24
2	293.13	145.97
3	298.13	145.84
4	302.26	143.02
5	325.31	144.99
6	344.72	144.39
7	348.23	147.95
8	350.76	152.26
9	353.87	156.17
10	357.41	159.71
11	360.34	163.76
12	363.28	167.80
13	364.39	170.00

*** 1.460 ***


Y A X I S F T
0.00 113.13 226.25 339.38 452.50 565.63
X 0.00
113.13
A 226.25
X 339.38
I 452.50
S 565.63
678.75

```
          -          *
          -
          -
F  791.88 +          *
          -
          -
          -
          -          *
          -          *
T  905.00 +                *
```


itrus County Landfill S iding Block - LinerFailure
Ten Most Critical. F:CITII_5.PLT By: tho 9-05-95 :46pm
FS
1 1.29
2 1.42
3 1.42
4 1.43
5 1.44
6 1.44
7 1.45
8 1.45
9 1.45
10 1.46
Y-Axis
(ft)
700
600
500
400
300
200
100
0
0
100
200
300
400
500
600
700
800
900
1000
PCSTABL5 FS min=1.29 X-Axis (ft)

--Slope Stability Analysis--
Simplified Janbu, Simplified Bishop
or Spencer's Method of Slices

Station 15+90
FINAL
CONDITIONS

Run Date: 09-05-95
Time of Run: 3:45pm
Run By: tho
Input Data Filename: F:CITII_3.IN
Output Filename: F:CITII_3.OUT
Plotted Output Filename: F:CITII_3.PLT

PROBLEM DESCRIPTION Citrus County Landfill S
liding Block - LinerFailure

BOUNDARY COORDINATES

25 Top Boundaries
46 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	100.00	172.00	147.00	157.00	1
2	147.00	157.00	153.00	156.00	1
3	153.00	156.00	156.00	160.00	1
4	156.00	160.00	213.00	137.00	1
5	213.00	137.00	260.00	135.00	1
6	260.00	135.00	275.00	140.00	1
7	275.00	140.00	285.00	140.00	1
8	285.00	140.00	292.00	142.50	1
9	292.00	142.50	292.43	142.75	2
10	292.43	142.75	311.00	158.25	1
11	311.00	158.25	322.00	159.00	1
12	322.00	159.00	363.00	175.00	1
13	363.00	175.00	370.00	170.00	3
14	370.00	170.00	405.00	169.50	3

15	405.00	169.50	411.00	168.00	3
16	411.00	168.00	425.00	168.50	3
17	425.00	168.50	430.00	170.50	3
18	430.00	170.50	438.00	170.00	3
19	438.00	170.00	476.00	180.00	3
20	476.00	180.00	500.00	180.00	3
21	500.00	180.00	576.00	200.00	3
22	576.00	200.00	600.00	200.00	3
23	600.00	200.00	676.00	220.00	3
24	676.00	220.00	944.75	220.00	3
25	944.75	220.00	945.00	220.00	2
26	292.43	142.75	318.00	143.25	2
27	318.00	143.25	334.00	147.25	2
28	334.00	147.25	363.00	175.00	3
29	334.00	147.25	350.00	143.25	2
30	350.00	143.25	428.00	139.75	2
31	428.00	139.75	485.00	138.25	2
32	485.00	138.25	619.00	143.25	2
33	619.00	143.25	634.00	147.25	2
34	634.00	147.25	650.00	143.25	2
35	650.00	143.25	732.00	138.75	2
36	732.00	138.75	944.75	220.00	2
37	292.00	142.50	318.00	143.00	1
38	318.00	143.00	334.00	147.00	1
39	334.00	147.00	350.00	143.00	1
40	350.00	143.00	428.00	139.50	1
41	428.00	139.50	485.00	138.00	1
42	485.00	138.00	619.00	143.00	1
43	619.00	143.00	634.00	147.00	1
44	634.00	147.00	650.00	143.00	1
45	650.00	143.00	732.00	138.50	1
46	732.00	138.50	945.00	220.00	1

ISOTROPIC SOIL PARAMETERS

3 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	90.0	118.0	0.0	26.0	0.00	0.0	1
2	55.0	55.0	0.0	15.0	0.00	0.0	1
3	80.0	80.0	0.0	25.0	0.00	0.0	1

A Critical Failure Surface Searching Method, Using A Random Technique For Generating Sliding Block Surfaces, Has Been Specified.

100 Trial Surfaces Have Been Generated.

6 Boxes Specified For Generation Of Central Block Base

Length Of Line Segments For Active And Passive Portions Of Sliding Block Is 5.0

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height
1	292.50	142.63	318.00	143.13	0.25
2	318.10	143.13	334.00	147.13	0.25
3	334.10	147.13	350.00	143.13	0.25
4	428.00	139.63	485.00	138.13	0.25
5	619.10	143.13	634.00	147.13	0.25
6	634.10	147.13	650.00	143.13	0.25

Following Are Displayed The Ten Most Critical Of The Trial Failure Surfaces Examined. They Are Ordered - Most Critical First.

* * Safety Factors Are Calculated By The Modified Janbu Method * *

Failure Surface Specified By 25 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	294.92	144.83
2	297.73	142.85
3	322.13	144.15
4	348.28	143.59
5	482.91	138.11
6	620.03	143.27
7	642.57	145.02
8	646.10	148.56
9	647.99	153.19
10	651.13	157.08
11	652.16	161.97
12	655.41	165.77
13	658.77	169.48
14	661.98	173.31
15	662.12	178.31
16	664.33	182.80
17	665.09	187.74
18	668.49	191.41
19	670.94	195.76
20	672.49	200.52
21	675.54	204.48
22	677.07	209.24
23	680.05	213.25
24	682.98	217.30
25	684.72	220.00

*** 2.730 ***

Failure Surface Specified By 26 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	293.77	143.87
2	295.58	142.72
3	319.14	143.52
4	335.45	146.85
5	450.61	139.07
6	633.56	146.97
7	642.44	144.95
8	645.88	148.57
9	649.31	152.22
10	652.63	155.95
11	655.39	160.12
12	658.92	163.66
13	662.38	167.27
14	664.08	171.97
15	666.23	176.49
16	668.76	180.80
17	672.19	184.44
18	675.41	188.26
19	677.19	192.93
20	679.53	197.35
21	683.07	200.89
22	684.61	205.65
23	687.46	209.75
24	688.22	214.70
25	691.36	218.59
26	691.72	220.00

*** 3.033 ***

Failure Surface Specified By 25 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	293.15	143.35
2	297.64	142.84
3	327.35	145.44
4	343.38	144.89
5	445.09	139.17
6	627.66	145.36
7	634.13	147.20
8	635.84	151.90
9	638.81	155.93
10	642.21	159.59
11	645.31	163.51
12	648.74	167.15
13	651.90	171.02
14	654.96	174.98
15	656.89	179.59
16	660.14	183.39
17	662.87	187.58
18	666.35	191.17
19	668.62	195.63
20	669.66	200.52
21	671.83	205.02
22	675.28	208.64
23	675.88	213.60
24	678.41	217.91
25	679.73	220.00

*** 3.035 ***

Failure Surface Specified By 27 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	296.11	145.82
2	299.43	143.41

3	304.41	142.96
4	325.61	145.02
5	335.68	146.63
6	453.10	139.04
7	624.17	144.53
8	640.34	145.53
9	643.86	149.09
10	647.39	152.63
11	649.58	157.12
12	653.05	160.72
13	656.41	164.42
14	659.25	168.54
15	662.65	172.21
16	665.37	176.40
17	667.54	180.91
18	670.41	185.00
19	673.48	188.95
20	676.74	192.74
21	680.27	196.28
22	681.94	200.99
23	682.42	205.97
24	685.74	209.70
25	689.20	213.32
26	692.71	216.87
27	694.49	220.00

*** 3.038 ***

Failure Surface Specified By 26 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	292.48	142.80
2	293.03	142.65
3	321.87	144.12
4	334.29	147.18
5	481.55	138.10
6	624.50	144.56
7	640.08	145.60
8	640.95	150.52
9	644.24	154.30
10	646.68	158.66
11	650.16	162.25
12	653.70	165.78
13	656.62	169.84
14	659.85	173.66
15	663.37	177.21
16	666.00	181.46
17	668.44	185.82
18	671.59	189.71
19	674.75	193.58
20	678.10	197.29
21	680.99	201.38
22	683.94	205.41
23	685.59	210.13
24	686.38	215.07
25	687.63	219.91
26	687.70	220.00

*** 3.048 ***

Failure Surface Specified By 25 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	292.50	142.81

2	292.83	142.56
3	324.73	144.86
4	348.08	143.72
5	484.66	138.13
6	620.66	143.63
7	638.96	145.84
8	641.13	150.35
9	644.64	153.91
10	646.02	158.71
11	648.28	163.17
12	651.76	166.77
13	655.24	170.35
14	655.89	175.31
15	658.85	179.34
16	662.38	182.89
17	665.85	186.48
18	669.08	190.29
19	671.49	194.68
20	674.96	198.28
21	675.73	203.22
22	677.25	207.98
23	678.17	212.90
24	681.63	216.51
25	685.04	220.00

*** 3.053 ***

Failure Surface Specified By 26 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	293.86	143.94
2	297.31	142.61
3	322.15	144.24
4	341.87	145.12
5	476.97	138.42
6	620.37	143.57
7	644.20	144.59
8	646.66	148.95
9	649.87	152.78
10	651.89	157.36
11	655.34	160.97
12	658.81	164.57
13	660.74	169.19
14	664.25	172.74
15	667.72	176.35
16	670.92	180.18
17	673.71	184.33
18	676.55	188.45
19	679.51	192.48
20	680.43	197.40
21	683.33	201.47
22	685.71	205.86
23	687.27	210.61
24	689.98	214.82
25	693.17	218.67
26	694.40	220.00

*** 3.067 ***

Failure Surface Specified By 25 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	294.97	144.87

2	297.05	142.83
3	321.92	144.12
4	343.07	144.76
5	477.50	138.36
6	628.36	145.59
7	634.79	146.89
8	636.59	151.56
9	639.32	155.75
10	642.72	159.41
11	644.39	164.12
12	645.85	168.90
13	649.38	172.44
14	652.66	176.22
15	655.89	180.03
16	659.10	183.87
17	662.28	187.73
18	665.64	191.42
19	668.17	195.74
20	671.67	199.31
21	675.08	202.97
22	676.49	207.76
23	679.86	211.45
24	680.74	216.38
25	683.65	220.00

*** 3.078 ***

Failure Surface Specified By 28 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	299.55	148.69
2	299.88	148.46
3	303.88	145.46
4	308.19	142.92
5	331.13	146.53
6	347.84	143.64
7	461.76	138.74
8	628.00	145.43
9	637.66	146.28
10	640.95	150.05
11	643.66	154.25
12	647.20	157.79
13	650.72	161.33
14	654.24	164.88
15	657.66	168.53
16	659.78	173.06
17	661.31	177.82
18	662.88	182.57
19	666.00	186.47
20	669.51	190.04
21	672.70	193.89
22	676.18	197.48
23	677.69	202.25
24	681.20	205.81
25	683.90	210.02
26	684.40	214.99
27	687.86	218.61
28	688.97	220.00

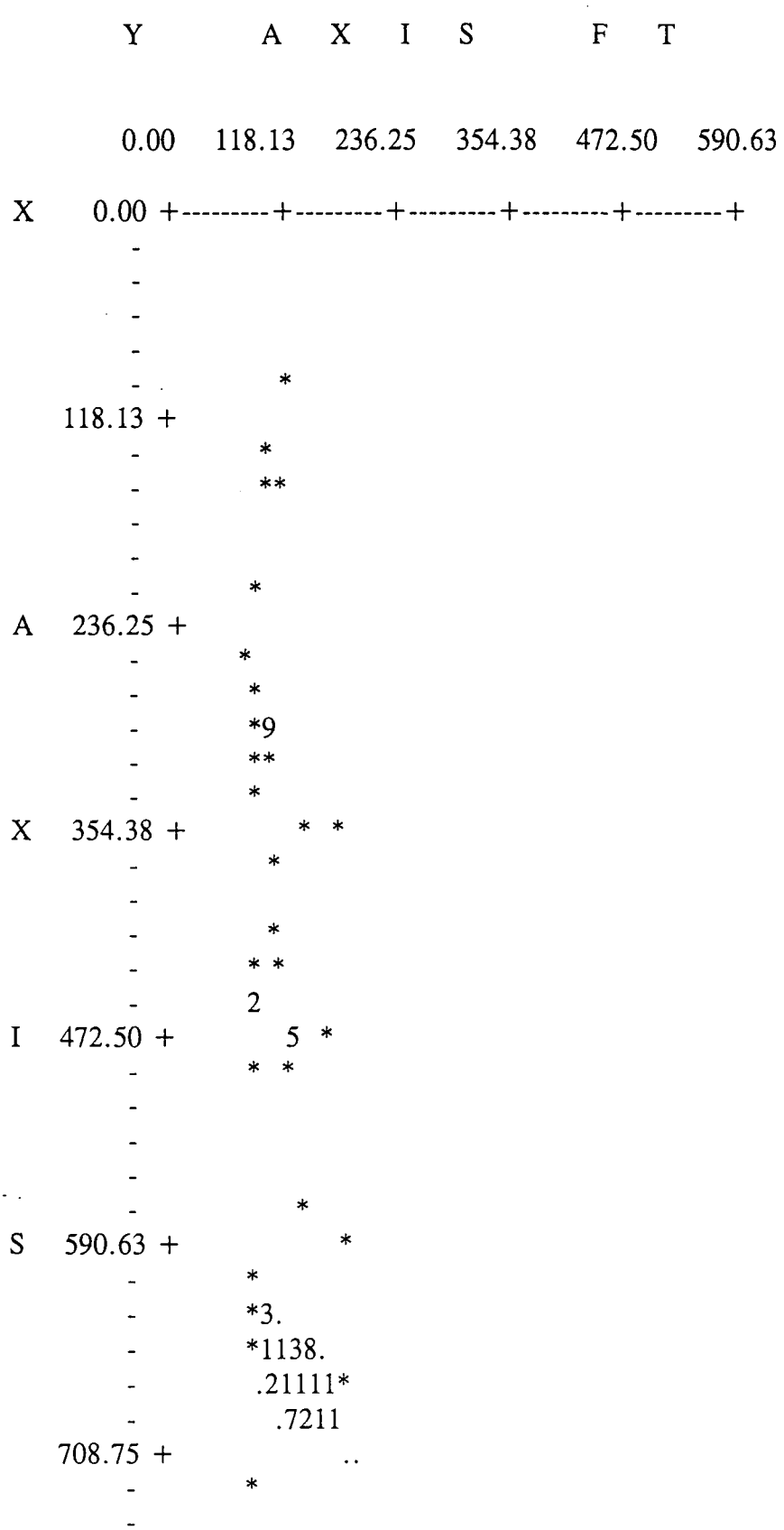
*** 3.079 ***

Failure Surface Specified By 28 Coordinate Points

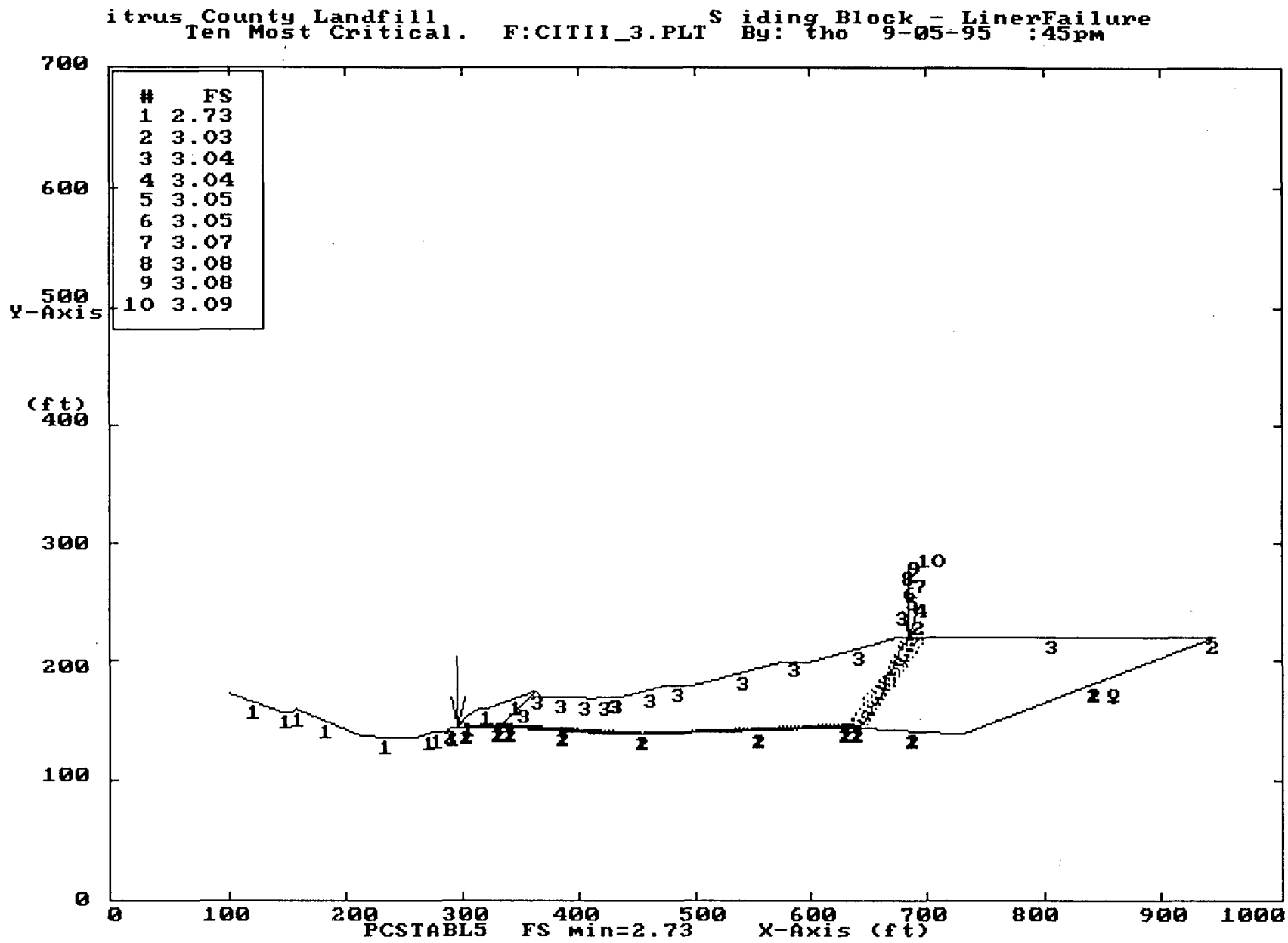
Point No.	X-Surf (ft)	Y-Surf (ft)

1	298.96	148.20
2	300.70	146.55
3	304.57	143.39
4	309.56	142.99
5	319.44	143.51
6	338.51	146.07
7	461.70	138.67
8	620.89	143.58
9	645.35	144.22
10	648.54	148.08
11	651.28	152.25
12	654.40	156.16
13	655.99	160.90
14	659.00	164.89
15	661.59	169.17
16	665.02	172.81
17	668.43	176.47
18	671.89	180.08
19	673.07	184.94
20	675.65	189.22
21	678.99	192.94
22	682.20	196.77
23	685.71	200.33
24	689.12	203.99
25	691.17	208.55
26	693.26	213.09
27	696.77	216.65
28	697.18	220.00

*** 3.090 ***


Y A X I S F T
0.00 118.13 236.25 354.38 472.50 590.63
X 0.00
118.13
A 236.25
X 354.38
I 472.50
S 590.63
708.75

-
-
-
F 826.88 +
-
-
-
-
-
T 945.00 + *


itrus County Landfill S iding Block - LinerFailure
Ten Most Critical. F:CITII_3.PLT By: tho 9-05-95 :45pm
FS
1 2.73
2 3.03
3 3.04
4 3.04
5 3.05
6 3.05
7 3.07
8 3.08
9 3.08
10 3.09
Y-Axis
(ft)
700
600
500
400
300
200
100
0
0
100
200
300
400
500
600
700
800
900
1000
PCSTABL5 FS min=2.73 X-Axis (ft)

STATION 16+00
FINAL
CONDITIONS

--Slope Stability Analysis--
Simplified Janbu, Simplified Bishop
or Spencer's Method of Slices

Run Date: 09-05-95
Time of Run: 4:58pm
Run By: tho
Input Data Filename: F:CITII_4.IN
Output Filename: F:CITII_4.OUT
Plotted Output Filename: F:CITII_4.PLT

PROBLEM DESCRIPTION Citrus County Landfill S
liding Block - LinerFailure

BOUNDARY COORDINATES

24 Top Boundaries
43 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	100.00	172.00	145.00	176.00	1
2	145.00	176.00	154.00	175.50	1
3	154.00	175.50	156.00	160.00	1
4	156.00	160.00	215.00	139.00	1
5	215.00	139.00	225.00	137.00	1
6	225.00	137.00	235.00	138.00	1
7	235.00	138.00	241.00	140.00	1
8	241.00	140.00	272.00	140.00	1
9	272.00	140.00	312.00	152.00	1
10	312.00	152.00	325.00	153.00	1
11	325.00	153.00	360.00	174.00	1
12	360.00	174.00	362.00	172.00	1
13	362.00	172.00	364.00	170.00	3
14	364.00	170.00	385.00	170.00	3

15	385.00	170.00	390.00	173.00	3
16	390.00	173.00	405.00	166.00	3
17	405.00	166.00	425.00	167.00	3
18	425.00	167.00	476.00	180.00	3
19	476.00	180.00	500.00	180.00	3
20	500.00	180.00	576.00	200.00	3
21	576.00	200.00	600.00	200.00	3
22	600.00	200.00	676.00	220.00	3
23	676.00	220.00	944.75	220.00	3
24	944.75	220.00	945.00	220.00	2
25	300.00	143.25	318.00	143.25	2
26	318.00	143.25	334.00	147.25	2
27	334.00	147.25	362.00	172.00	3
28	334.00	147.25	350.00	143.25	2
29	350.00	143.25	483.00	139.25	2
30	483.00	139.25	618.00	143.25	2
31	618.00	143.25	635.00	147.25	2
32	635.00	147.25	650.00	143.25	2
33	650.00	143.25	783.00	139.25	2
34	783.00	139.25	944.75	220.00	2
35	300.00	143.00	318.00	143.00	1
36	318.00	143.00	334.00	147.00	1
37	334.00	147.00	350.00	143.00	1
38	350.00	143.00	483.00	139.00	1
39	483.00	139.00	618.00	143.00	1
40	618.00	143.00	635.00	147.00	1
41	635.00	147.00	650.00	143.00	1
42	650.00	143.00	783.00	139.00	1
43	783.00	139.00	945.00	220.00	1

ISOTROPIC SOIL PARAMETERS

3 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	90.0	118.0	0.0	26.0	0.00	0.0	1
2	55.0	55.0	0.0	15.0	0.00	0.0	1
3	80.0	80.0	0.0	25.0	0.00	0.0	1

A Critical Failure Surface Searching Method, Using A Random Technique For Generating Sliding Block Surfaces, Has Been Specified.

100 Trial Surfaces Have Been Generated.

7 Boxes Specified For Generation Of Central Block Base

Length Of Line Segments For Active And Passive Portions Of Sliding Block Is 5.0

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height
1	300.00	143.13	318.00	143.13	0.25
2	318.10	143.13	334.00	147.13	0.25
3	334.10	147.13	350.00	143.13	0.25
4	350.10	143.13	483.00	139.13	0.25
5	483.10	139.13	618.00	143.13	0.25
6	618.10	143.13	635.00	147.13	0.25
7	635.10	147.13	650.00	143.13	0.25

Following Are Displayed The Ten Most Critical Of The Trial Failure Surfaces Examined. They Are Ordered - Most Critical First.

* * Safety Factors Are Calculated By The Modified Janbu Method * *

Failure Surface Specified By 28 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	300.25	148.48
2	302.39	146.34
3	306.16	143.05
4	321.73	144.15
5	343.56	144.70
6	471.15	139.46
7	536.35	140.60
8	618.36	143.28
9	642.42	145.08
10	644.68	149.54
11	647.82	153.43
12	650.63	157.57
13	652.48	162.21
14	654.99	166.54
15	657.95	170.57
16	661.11	174.44
17	663.42	178.88
18	666.94	182.43
19	670.44	186.00
20	672.62	190.50
21	675.35	194.69
22	676.45	199.56
23	679.92	203.16
24	683.42	206.74
25	686.90	210.33
26	688.96	214.88
27	692.23	218.66
28	693.12	220.00

*** 2.607 ***

Failure Surface Specified By 28 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	301.29	148.79
2	304.81	145.47
3	309.22	143.12
4	326.98	145.35
5	337.95	146.05
6	387.37	142.05
7	502.42	139.67
8	618.93	143.20
9	649.50	143.18
10	652.40	147.26
11	655.83	150.89
12	657.64	155.55
13	661.17	159.09
14	664.29	163.00
15	667.70	166.65
16	671.19	170.24
17	674.65	173.85
18	677.53	177.94
19	677.85	182.93
20	680.29	187.29
21	683.26	191.31
22	686.11	195.42
23	689.54	199.06
24	690.65	203.93
25	693.19	208.24
26	696.65	211.85
27	698.80	216.36
28	700.60	220.00

*** 2.680 ***

Failure Surface Specified By 29 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	305.17	149.95
2	306.02	149.39
3	310.17	146.61
4	313.77	143.14
5	320.04	143.74
6	344.63	144.52
7	480.40	139.17
8	539.67	140.80
9	619.34	143.37
10	646.81	144.04
11	650.31	147.61
12	650.60	152.60
13	652.18	157.34
14	655.37	161.20
15	658.34	165.22
16	661.69	168.93
17	662.88	173.79
18	666.41	177.33
19	669.40	181.34
20	670.86	186.12
21	673.81	190.16
22	677.00	194.01
23	678.10	198.89
24	681.37	202.67
25	684.54	206.54
26	688.07	210.07
27	691.04	214.09
28	693.64	218.37
29	695.05	220.00

*** 2.841 ***

Failure Surface Specified By 28 Coordinate Points

Point	X-Surf	Y-Surf

No.	(ft)	(ft)
1	300.92	148.68
2	303.43	146.41
3	307.18	143.10
4	320.71	143.83
5	339.13	145.84
6	426.31	140.92
7	537.73	140.66
8	618.60	143.15
9	641.29	145.44
10	644.80	149.00
11	645.91	153.88
12	649.42	157.43
13	649.45	162.43
14	652.87	166.08
15	656.15	169.85
16	659.59	173.48
17	663.10	177.04
18	665.95	181.15
19	668.77	185.28
20	672.01	189.09
21	675.27	192.87
22	677.33	197.43
23	680.80	201.03
24	684.14	204.75
25	687.26	208.66
26	689.87	212.92
27	693.40	216.47
28	694.66	220.00

*** 2.872 ***

Failure Surface Specified By 29 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	298.90	148.07
2	302.35	147.45
3	307.19	146.20
4	311.14	143.13
5	327.81	145.45
6	342.87	144.86
7	437.86	140.37
8	605.31	142.86
9	618.22	143.12
10	641.54	145.37
11	644.82	149.14
12	647.27	153.50
13	650.75	157.09
14	654.28	160.63
15	657.21	164.68
16	660.43	168.51
17	663.95	172.06
18	666.59	176.31
19	669.03	180.67
20	672.18	184.55
21	675.34	188.43
22	678.69	192.14
23	681.57	196.22
24	684.52	200.26
25	686.17	204.98
26	686.97	209.92
27	688.22	214.76
28	691.45	218.57
29	692.88	220.00

*** 2.895 ***

Failure Surface Specified By 28 Coordinate Points

Point	X-Surf	Y-Surf

No.	(ft)	(ft)
1	290.99	145.70
2	291.48	145.44
3	296.37	144.37
4	301.20	143.10
5	328.94	145.83
6	338.75	145.90
7	482.08	139.08
8	567.73	141.54
9	631.43	146.35
10	647.34	143.86
11	650.11	148.03
12	651.29	152.89
13	654.64	156.61
14	656.10	161.39
15	658.54	165.75
16	661.02	170.10
17	662.88	174.74
18	666.40	178.28
19	668.80	182.67
20	670.09	187.50
21	670.33	192.49
22	673.76	196.13
23	677.06	199.89
24	680.36	203.64
25	681.94	208.38
26	682.44	213.36
27	685.53	217.29
28	686.54	220.00

*** 2.916 ***

Failure Surface Specified By 28 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	295.05	146.91
2	296.91	146.51
3	300.70	143.25
4	319.24	143.50
5	335.20	146.75
6	466.44	139.69
7	494.42	139.47
8	618.75	143.37
9	647.51	143.91
10	651.03	147.46
11	654.43	151.13
12	657.38	155.17
13	660.04	159.40
14	662.70	163.64
15	666.24	167.17
16	669.68	170.80
17	671.91	175.27
18	672.02	180.27
19	675.52	183.84
20	678.82	187.60
21	679.44	192.56
22	682.90	196.18
23	686.24	199.89
24	689.04	204.04
25	692.53	207.61
26	693.66	212.48
27	697.08	216.13
28	699.38	220.00

*** 2.926 ***

Failure Surface Specified By 26 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)

1	295.93	147.18
2	297.43	145.71
3	301.78	143.25
4	323.20	144.51
5	349.38	143.30
6	481.40	139.21
7	499.33	139.60
8	632.07	146.34
9	639.96	145.82
10	643.18	149.64
11	646.33	153.53
12	649.87	157.07
13	653.09	160.89
14	653.97	165.81
15	655.02	170.70
16	655.93	175.62
17	658.60	179.85
18	660.41	184.51
19	662.33	189.12
20	663.07	194.07
21	665.94	198.16
22	668.27	202.59
23	670.38	207.12
24	671.47	212.00
25	672.28	216.93
26	674.59	219.63

*** 2.937 ***

Failure Surface Specified By 27 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	296.94	147.48
2	300.03	144.99
3	304.69	143.18
4	325.62	145.06
5	339.47	145.89
6	376.50	142.22
7	503.25	139.65
8	618.67	143.23
9	641.73	145.29
10	641.92	150.29
11	642.78	155.21
12	646.32	158.75
13	647.80	163.53
14	650.61	167.66
15	652.05	172.45
16	654.03	177.04
17	657.16	180.94
18	658.90	185.63
19	660.60	190.33
20	663.48	194.42
21	664.33	199.35
22	667.19	203.45
23	669.97	207.61
24	673.47	211.17
25	677.00	214.72
26	679.95	218.75
27	680.32	220.00

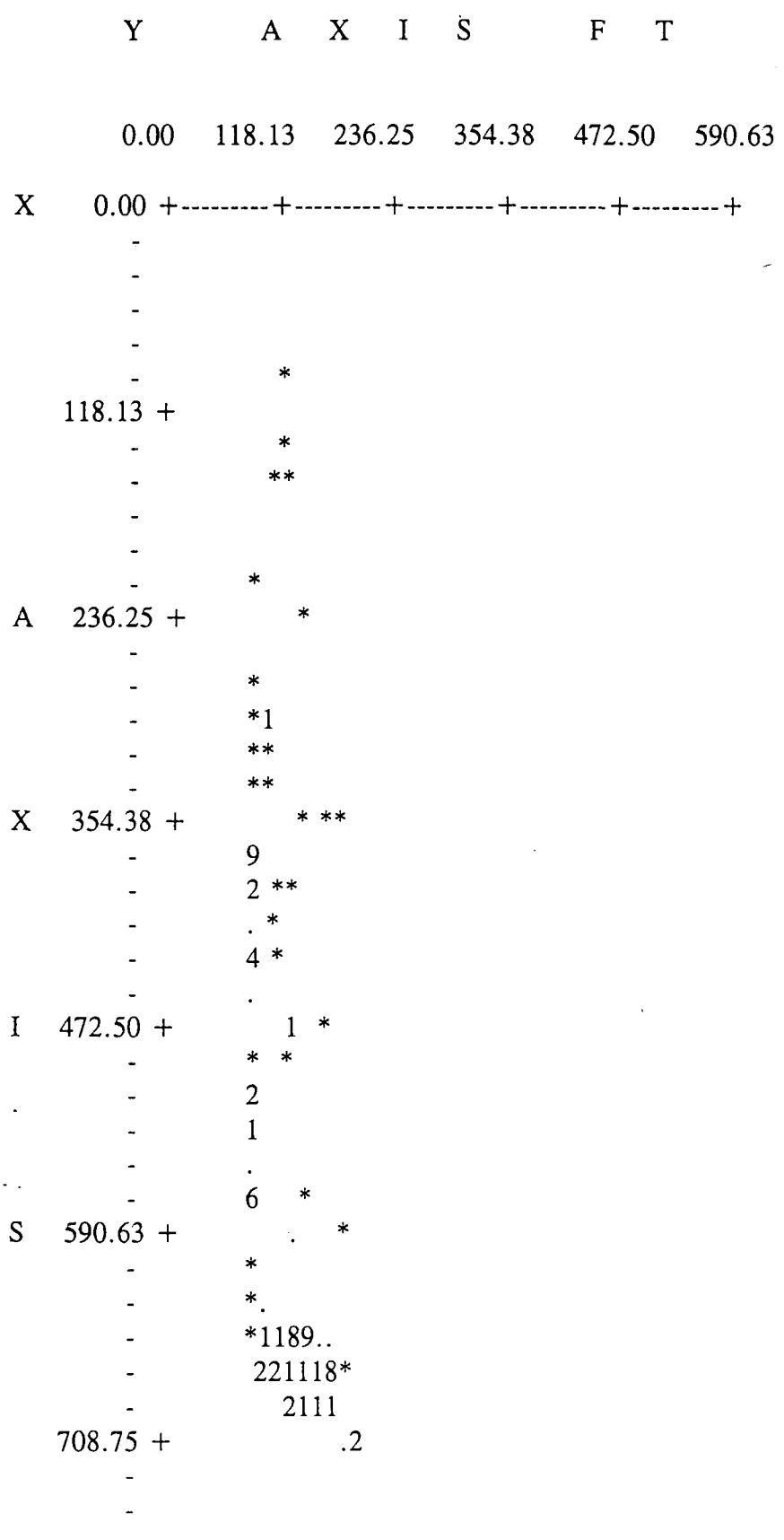
*** 2.938 ***

Failure Surface Specified By 28 Coordinate Points

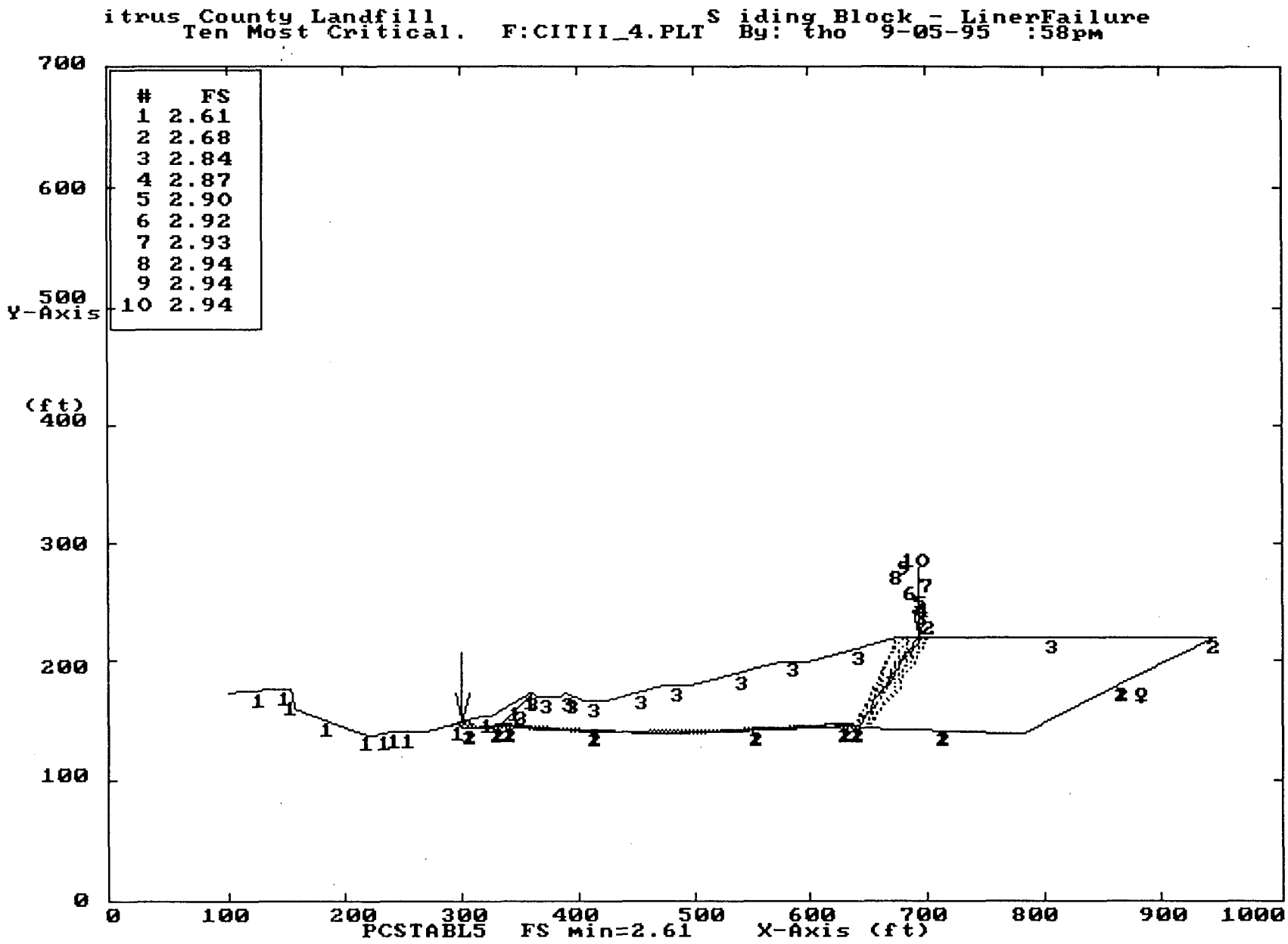
Point No.	X-Surf (ft)	Y-Surf (ft)

1	303.26	149.38
2	304.13	149.02
3	308.41	146.44
4	312.23	143.21
5	323.46	144.55
6	349.36	143.21
7	402.07	141.68
8	513.39	140.11
9	631.69	146.30
10	638.43	146.25
11	641.96	149.79
12	643.87	154.41
13	646.68	158.54
14	649.68	162.54
15	653.19	166.11
16	655.14	170.71
17	656.27	175.58
18	659.76	179.16
19	662.70	183.20
20	666.23	186.74
21	669.37	190.64
22	671.92	194.94
23	673.08	199.80
24	675.82	203.98
25	677.11	208.81
26	679.94	212.94
27	683.47	216.47
28	684.35	220.00

*** 2.944 ***


Y A X I S F T
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118.13
A 236.25
X 354.38
I 472.50
S 590.63
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T 945.00 + *


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Ten Most Critical. F:CITII_4.PLT By: tho 9-05-95 :58pm
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4 2.87
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