MKE DOC. No. 3885-LOW-C-01-00288-02

Calculation Cover Sheet

Calc. No. 12-624-02-02

Contract No. 5057-06 **Discipline** MKES **No. of Sheets** 39 + App. A + B + C

Project

UMTRA - LOWMAN

Feature

EMBANKMENT DESIGN

Item

SLOPE STABILITY ANALYSIS

Sources of Data

1. MKE, "UMTRA Design Procedures Manual", July 1983. Revised Jan. 1988 (Rev. 6). MKE Doc. No. 4005-GEN-CR-01-00571-06
2. Siegel, Ronald A., "STABL User Manual"
   Carpenter, James R., "STABL5/PC STABL5 User Manual" Purdue University, School of Civil Engineering

Sources of Formulae & References

3. U.S. Department of Energy, "Conceptual Design Package for Stabilization of the Inactive Uranium Mill Tailings Site at Lowman, Idaho", May 1989. MKE Doc. No 5057-LOW-R-13-00063-00
4. MKE, "UMTRA-Lowman, Embankment Design, Material Properties Calc.", MKE Calc No. 12-624-01-00
5. Duncan, J.M., and Buchignani, A.L., "An Engineering Manual for Slope Stability Studies", UC Berkeley, Department of Civil Engineering, March 1975.

9102080294 910205
PDR WASTE
WM-43 PDR

Preliminary Calc. ☐ Final Calc. ☒ Supersedes Calc. No. ________

02	App C added	P. Y. LI	11/27/90	W Y Lin	11/27/90		[illegible]
01	34-39 App B	P. Y. LI	4/17/90	[illegible]	8/13/90		8-15-90
00	—	P. Y. LI	12/15/89	W Y Lin	[illegible]		[illegible]
Rev No	Revision	Calculation By	Date	Checked By	Date	Approved By	Date

Form 42-110

MORRISON-KNUDSEN ENGINEERS, INC.
A MORRISON KNUDSEN COMPANY

Sheet 1
Project UMTRA - LOW
Contract No. 5059-06
File No.
Feature Embankment Design
Designed PYL
Date 12/15/89
Item Slope Stability Analysis
Checked WYL
Date 2/5/90
Rev. △
PYL
7/17/90
K Lee
8/3/90

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A MORRISON KNUDSEN COMPANY

Sheet 2
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File No. ______
Feature Embankment Design
Designed PYL
Date 12/13/89
Item Slope Stability Analysis
Checked WYL.
Date 2/5/90

SUMMARY & CONCLUSION

Results of slope stability analysis are as follows:-

LOADING CONDITION	MIN. COMPUTED * FACTOR OF SAFETY	MIN. REQUIRED (a) FACTOR OF SAFETY
Short-term, Static	2.069 (3.9)(b)	1.3
Short-term, Seismic	1.103 (2.04)	1.1
Long-term, Static	4.098 (3.9)	1.5
Long-term, Seismic	1.599 (1.73)	1.1

The minimum calculated F.S. for each case exceeds the minimum required F.S. for the typical slope analysed herein. Therefore failure is not expected to occur.

* Failure surfaces for all cases occur in colluvium foundation soil.

(a) From UMTRA Design Manual (Ref 1)

(b) Infinite slope analysis

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PURPOSE:

The purpose of this calculation is to analyze the stability of the proposed tailings embankment. Short-term static, seismic (pseudo-static); and long-term static and seismic stability was evaluated

METHODOLOGY & ASSUMPTIONS

1. The analysis was performed using the Modified Janbu method for sliding surfaces. The computer program 'STABL5' (Ref. 2) was used to determine the factors of safety. For discription, coding procedures and assumptions associated with the program. see Ref 2

2. Potential sliding mechanism and locations were identified. as follow:

    i) Sliding block failure surface in radioactive sand
    ii) Sliding block failure surface in colluvium soil
    iii) Sliding block failure surface in Alluvium I soil (silty sand to clayey sand with gravel.)
    iv) Sliding block failure surface in Alluvium II soil (gravelly sand with cobbles and boulders)

    For ii-iv) 'BLOCK2' routine was used

    v) Irregular shaped failure surface through all soils and

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originating in the neighborhood of the embankment toe. The 'RANDOM' searching routine was used.

3. Loading conditions analyzed were: i) short-term, static; ii) short-term, seismic; iii) long-term, static; iv) long-term, seismic

4. It was assumed that ground-water table remained stable for all loading cases

5. For simplicity in coding and conservatism, it was assumed that the erosion protection layer and radon barrier cover (each 18" thick) were one material layer with soil parameters as those for radon barrier.

6. Shallow surface failure was analyzed using infinite slope method for cohesionless erosion protection layer.

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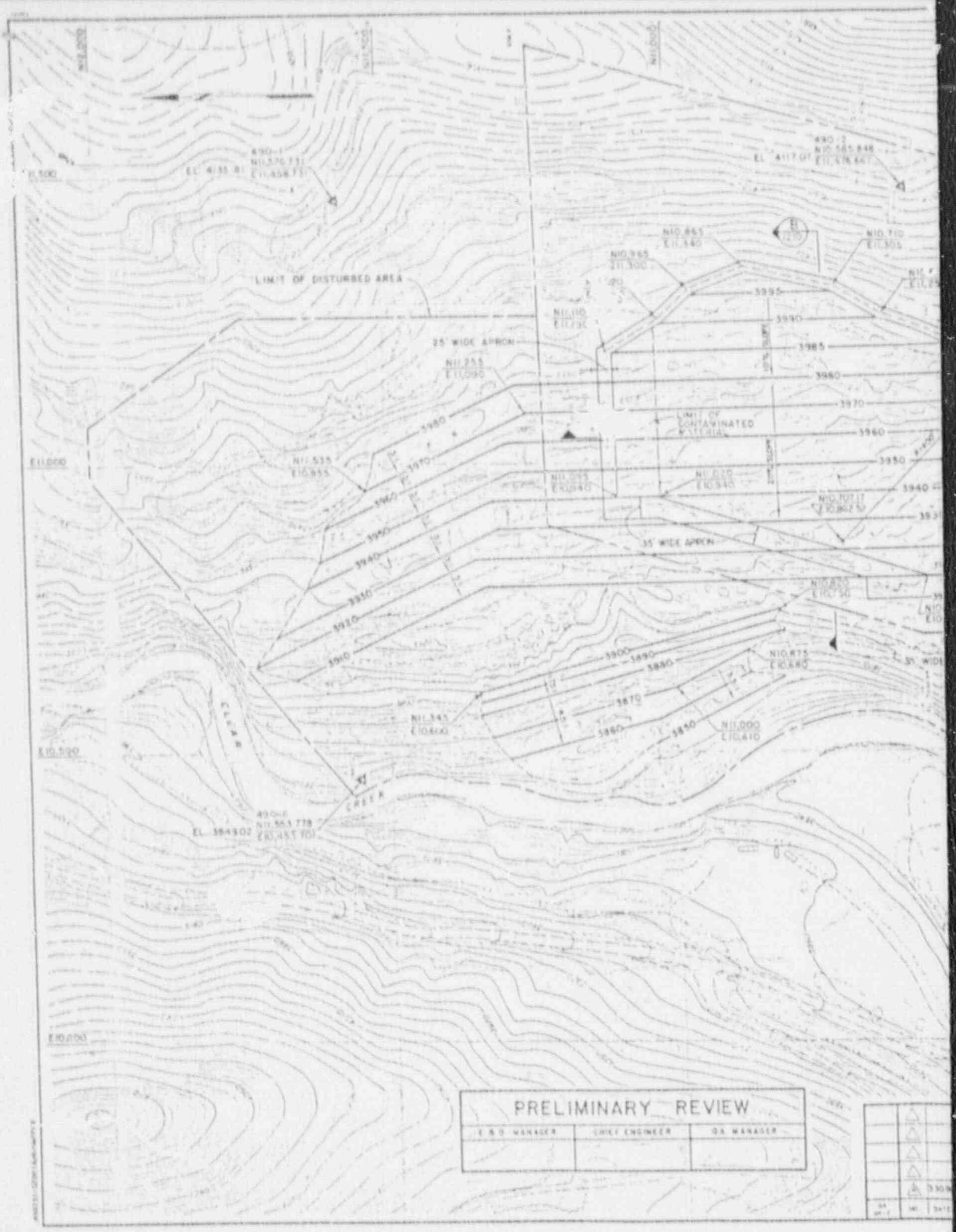
CROSS-SECTION FOR ANALYSIS

A typical cross-section of the proposed embankment with longest 5:1 slope (most critical) was analysed. The section were developed from the embankment plan (sh 7) and boring data (see Ref 3).

The groundwater elevations were also taken from Ref 3 (boring logs). It is assumed that groundwater elevations stay the same for all cases analysed.

The cross-section is presented on sh 6 .

Coordinat. system used in the analysis is also shown on sh 6 .



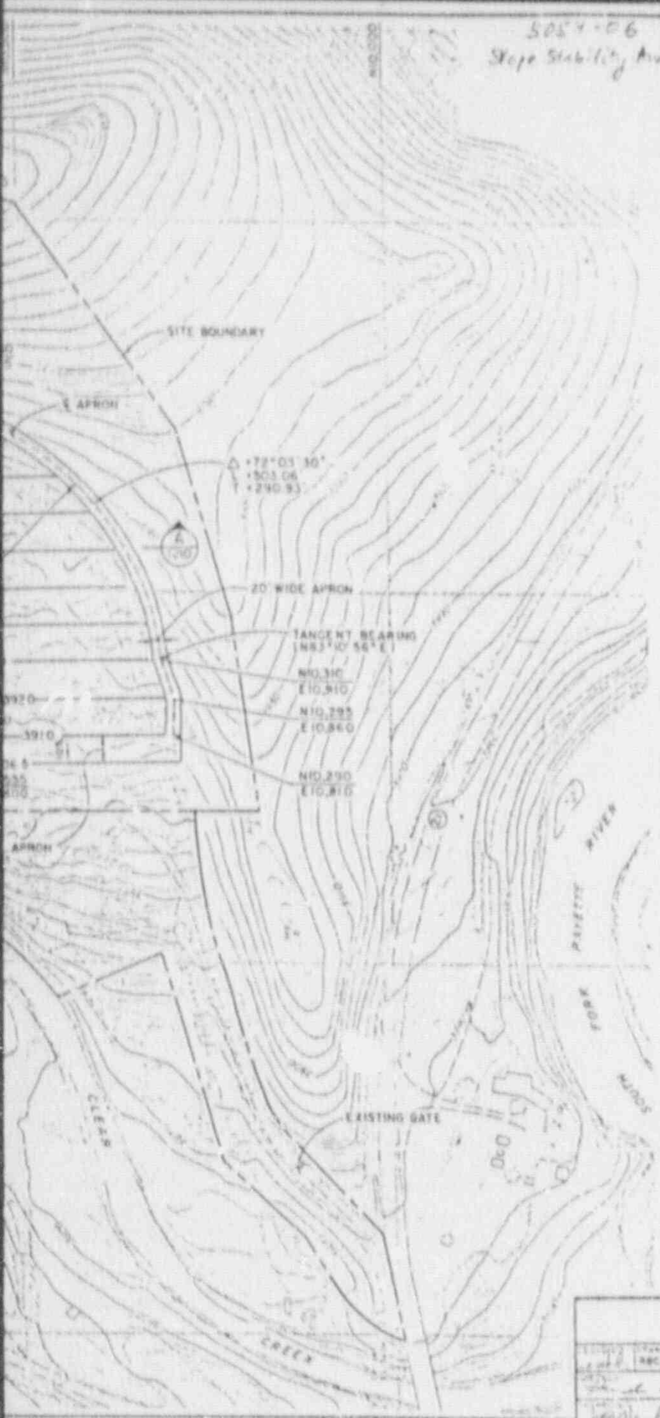
PRELIMINARY REVIEW

E.S.D. MANAGER	CHIEF ENGINEER	QA MANAGER

5054-06
Slope Stability Analysis

PYL 12/14/89
WYL 3/13/90

Sh. 7



NOTES:

1. THE SUBCONTRACTOR SHALL INCLUDE IN HIS WORK PLACING OF 38,000 CUBIC YARD OF CONTAMINATED MATERIAL FROM VICINITY PROPERTIES DELIVERED TO THE SITE BY OTHERS.

SI
APERTURE
CARD

Also Available On
Aperture Card

REFERENCE DRAWINGS:

LOW-PS-10-1203	SITE PLAN
LOW-PS-10-1204	CONSTRUCTION FACILITIES AND SITE DRAINAGE
LOW-PS-10-1208	CONTAMINATED MATERIAL EXCAVATION PLAN AND DEMOLITION
LOW-PS-10-1210	TAILINGS EMBANKMENT SECTIONS

LEGEND:

3910	EXISTING SITE FEATURES AND CONTOURS
3980	FINAL CONTOURS
N11,000	CONSTRUCTION GRID COORDINATE
21	STATE HIGHWAY
Δ 990-1	EXISTING SURVEY MONUMENT (BRASS CAP)
— - —	CONSTRUCTION SITE BOUNDARY

100 0 100 200
SCALE FEET

U. S. DEPARTMENT OF ENERGY
ALBUQUERQUE, NEW MEXICO

LOWMAN SITE
LOWMAN, IDAHO

FINAL GRADING PLAN AND RESTORATION

MORRISON-KNUDSEN ENGINEERS, INC.
UMTRA PROJECT

PROJECT NO. DE-AC04-83AL18796
DRAWING NO. LOW-PS-10-1209
REV. A

ISSUED FOR PRELIMINARY REVIEW
REVISIONS

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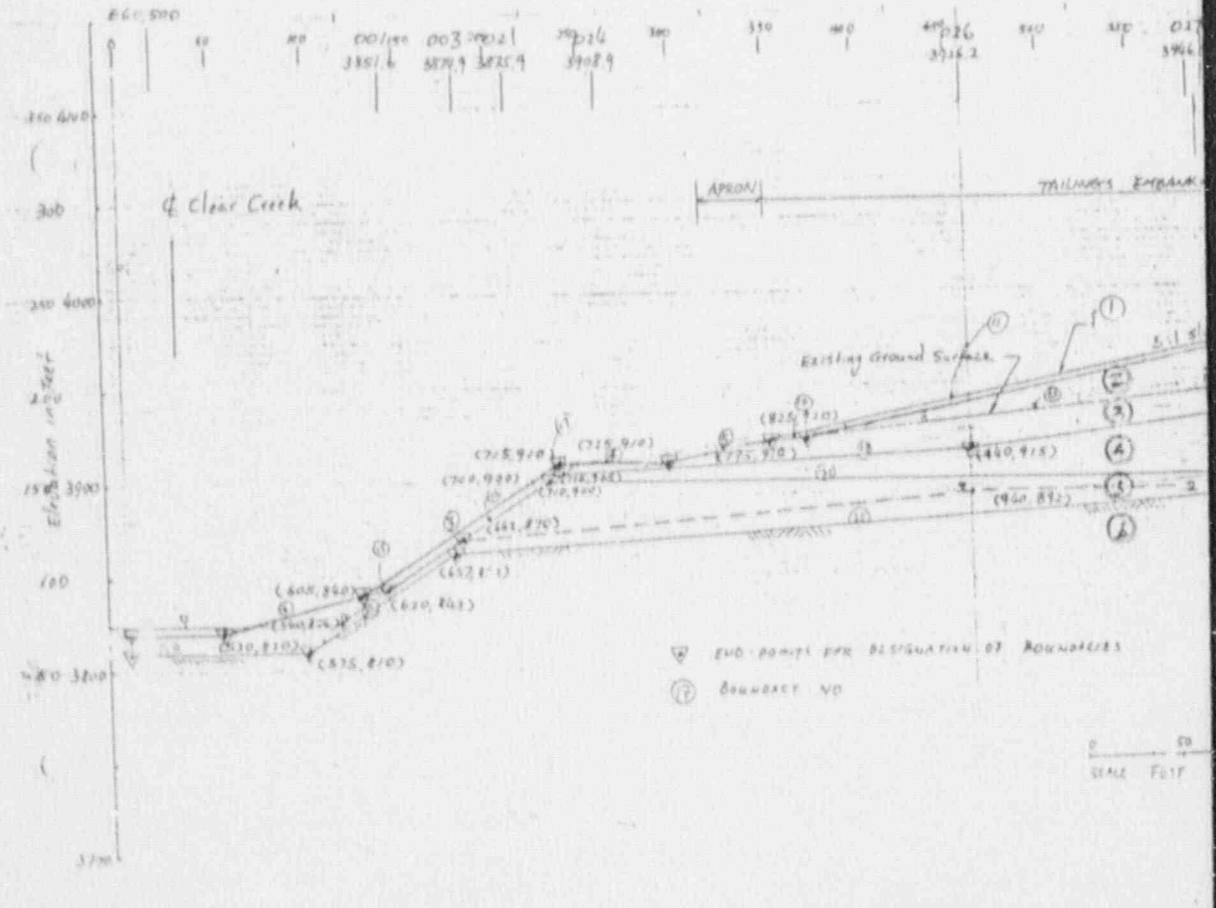
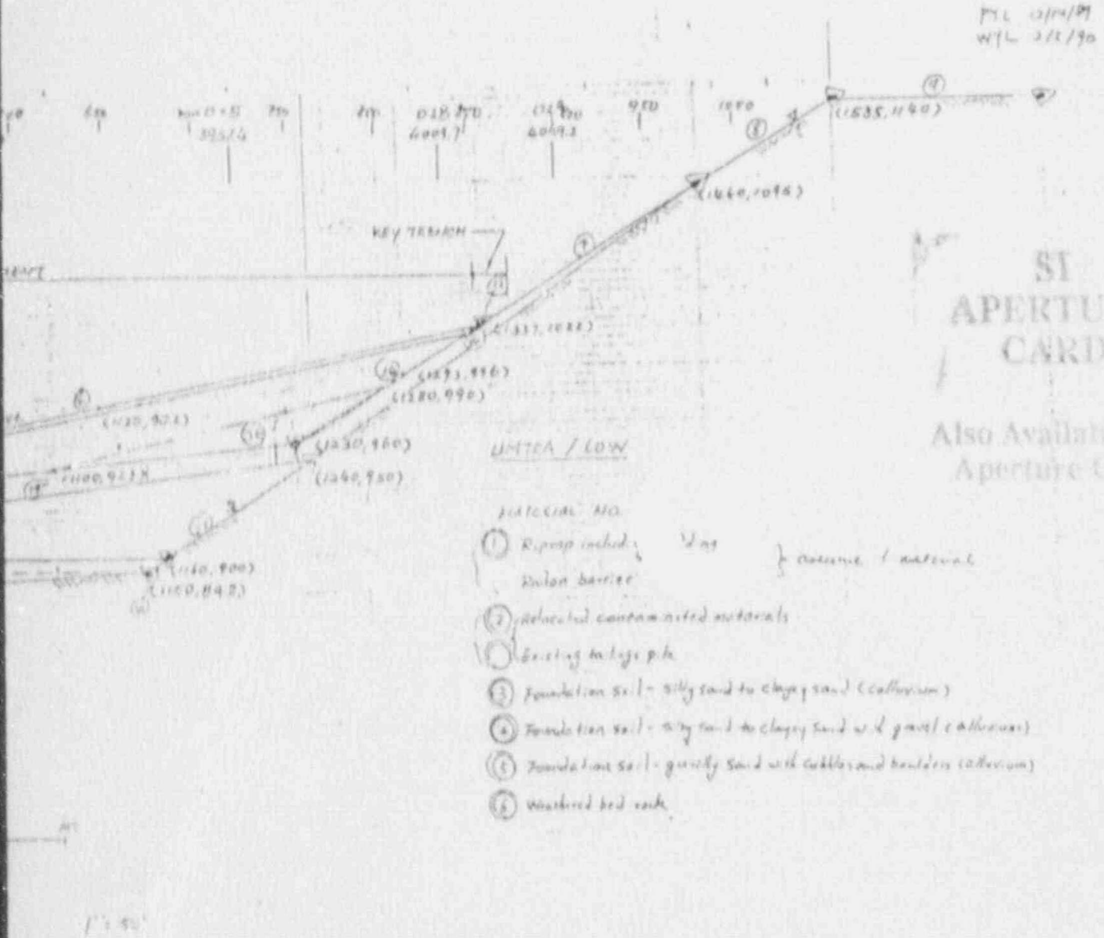

E60,500
0
50
100
001/150
3851.6
003
3870.9
002
3825.9
021
250
024
3908.9
300
350
400
450
026
3936.2
500
550
027
3946
350 4100
300
250 4000
150 3900
100
50 3800
3700
Elevation in feet
℄ Clear Creek
APRON
TAILINGS EMBANK
Existing Ground Surface
5:1 sl
(605,860)
(590,826)
(620,843)
(610,810)
(575,810)
(653,870)
(653,851)
(700,900)
(715,910)
(718,908)
(710,900)
(725,910)
(775,910)
(825,910)
(960,915)
(960,892)
①
②
③
④
⑤
⑥
END POINTS FOR DESIGNATION OF BOUNDARIES
⑰ BOUNDARY NO
0
50
SCALE FEET

2.6



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Project UMTRA - LOW
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SOIL PARAMETERS

Soil parameters used in analysis were taken from Ref. 4 (Material Properties Calc.). A reasonable degree of conservatism had also been incorporated. The input soil parameters required in 'STABL5' are short term static and pseudo-static strengths, long term static strengths, long term pseudo-static strengths and unit weights (both total and saturated). The parameters are presented in table on sh 9.

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SOIL PARAMETERS FOR SLOPE STABILITY ANALYSIS

LAYER NO.	I. SHORT TERM – STATIC			II SHORT TERM – PSEUDO STATIC			III LONG TERM – STATIC			IV LONG TERM – PSEUDO-STATIC		
	C (psf)	ϕ	γ_t (pcf) / γ_{sat}	C (psf)	ϕ	γ_t / γ_{sat}	C (psf)	ϕ	γ_t / γ_{sat}	C (psf)	ϕ	γ_t / γ_{sat}
① COVER LAYER	850	27°	130 / 135	850	27°	130 / 135	98	36°	130 / 135	250	21°	130 / 135
② RADIOACTIVE SAND	–	40°	144 / 155	–	40°	144 / 155	–	40°	144 / 155	–	40°	144 / 155
③ COLLUVIUM	350	17.5	122.5 / 130.5	350	17.5°	122.5 / 130.5	245	37°	122.5 / 130.5	750	27°	122.5 / 130.5
④ ALLUVIUM I	1460	32°	129.5 / 131	1460	32°	124.5 / 131	885	37°	124.5 / 131	1460	32°	124.5 / 131
⑤ ALLUVIUM II	1460	32°	124.5 / 131	1460	32°	124.5 / 131	885	37°	124.5 / 131	1460	32°	124.5 / 131
⑥ WEATHERED BEDROCK	–	45°	137 / 143.5	–	45°	137 / 143.5	–	45°	137 / 143.5	–	45°	137 / 143.5

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SEISMIC COEFFICIENTS

Horizontal seismic coefficients used in the analysis are:

Long term conditions : $K_h = 0.23$ g

Short term conditions : $K_h = 0.17$ g

These values are from Ref 3 p 6

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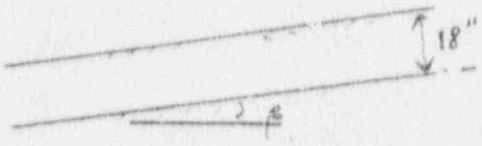
SHALLOW SURFACE FAILURE ANALYSIS

Factors of safety for linear failure surfaces occuring in the cohesionless erosion protection layer were computed for each loading condition using the infinite slope method as follows:-

A. SHORT-TERM & LONG-TERM, STATIC CONDITION

Erosion Protection Layer

$$F.S. = \frac{\tan \phi}{\tan \beta} \quad (\text{Ref } \underline{5})$$



$\tan \beta = 1/5$

$\phi = 38°$ (Ref $\underline{4}$)

$$\therefore F.S. = \frac{\tan 38°}{0.2} = \underline{\underline{3.9}}$$

B. SHORT-TERM, SEISMIC

$$F.S. = \frac{\left(1 - \frac{k_h}{g} \tan \beta\right) \tan \phi}{\tan \beta + \frac{k_h}{g}}$$

(see derivation on sh. 12)

$k_h = 0.17 g$ (Ref $\underline{3}$)

$\phi = 38°$

$$\therefore F.S. = \frac{(1 - (0.17)(0.2)) \tan 38°}{0.2 + 0.17}$$

$$= \underline{\underline{2.04}}$$

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C. LONG - TERM, SEISMIC

$$F.S. = \frac{(1 - \frac{k_h}{g} \tan\beta) \tan\phi'}{\tan\beta + \frac{k_h}{g}}$$

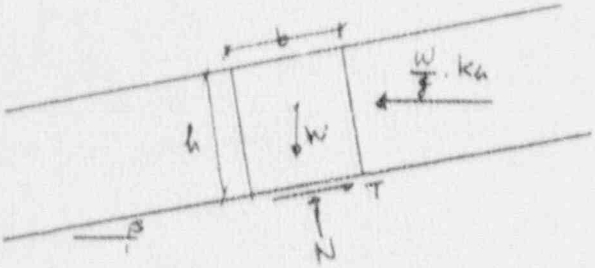
$$k_h = 0.23 g \quad (\text{Ref. } \underline{3})$$

$$\phi' = 38°$$

$$\therefore F.S. = \frac{[1 - (0.23)(0.2)] \tan 38}{0.2 + 0.23}$$

$$= \underline{\underline{1.73}}$$

Derivation



$$\Sigma F_\perp = 0 \qquad W\cos\beta + \frac{k_h}{g} W \cdot \sin\beta - N = 0$$

$$\Sigma F_\parallel = 0 \qquad T - W\sin\beta - \frac{k_h}{g} W\cos\beta = 0$$

$$T = \frac{N \cdot \tan\phi}{F.S}$$

$$\therefore F.S. = \frac{(W\cos\beta + \frac{k_h}{g} W\sin\beta) \tan\phi}{W\sin\beta + \frac{k_h}{g} W\cos\beta}$$

$$= \frac{(\cos\beta + \frac{k_h}{g} \sin\beta) \tan\phi}{\sin\beta + \frac{k_h}{g} \cos\theta}$$

$$= \frac{(1 - k_h/g \tan\beta) \tan\phi}{\tan\beta + k_h/g}$$

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Project UTTICA-LOW Contract No 5057-06 Sheet 13
Feature Embankment Designs Designed PYC File No
Item Slope Stability Analysis Checked WYL Date 12/14/89 Date 2/2/90

RESULTS OF 'STABLS' ANALYSIS

LOADING CONDITION	COMPUTED FACTOR OF SAFETY					MIN. REQUIRED FACTOR OF SAFETY	REMARKS
	FAILURE IN: SAND (a)	COLLUVIUM (a)	ALLUVIUM I (a) (c)	ALLUVIUM II (a) (c)	WHOLE SLOPE (b)		
SHORT TERM, STATIC	4.658	$\boxed{2.069}$	4.804	4.815	4.032	1.3	SAFE
SHORT TERM, SEISMIC	2.435	$\boxed{1.103}$	2.574	2.559	2.153	1.1	SAFE
LONG TERM, STATIC	4.504	$\boxed{4.098}$	5.154	5.231	4.322	1.5	SAFE
LONG TERM, SEISMIC	2.009	$\boxed{1.599}$	2.248	2.217	1.990	1.1	SAFE

Copies of 'STABLS' output with critical failure surfaces description and F.S. are attached as Appendix A.

Failure surfaces for all of the above cases were shown on sh. EE - 33.

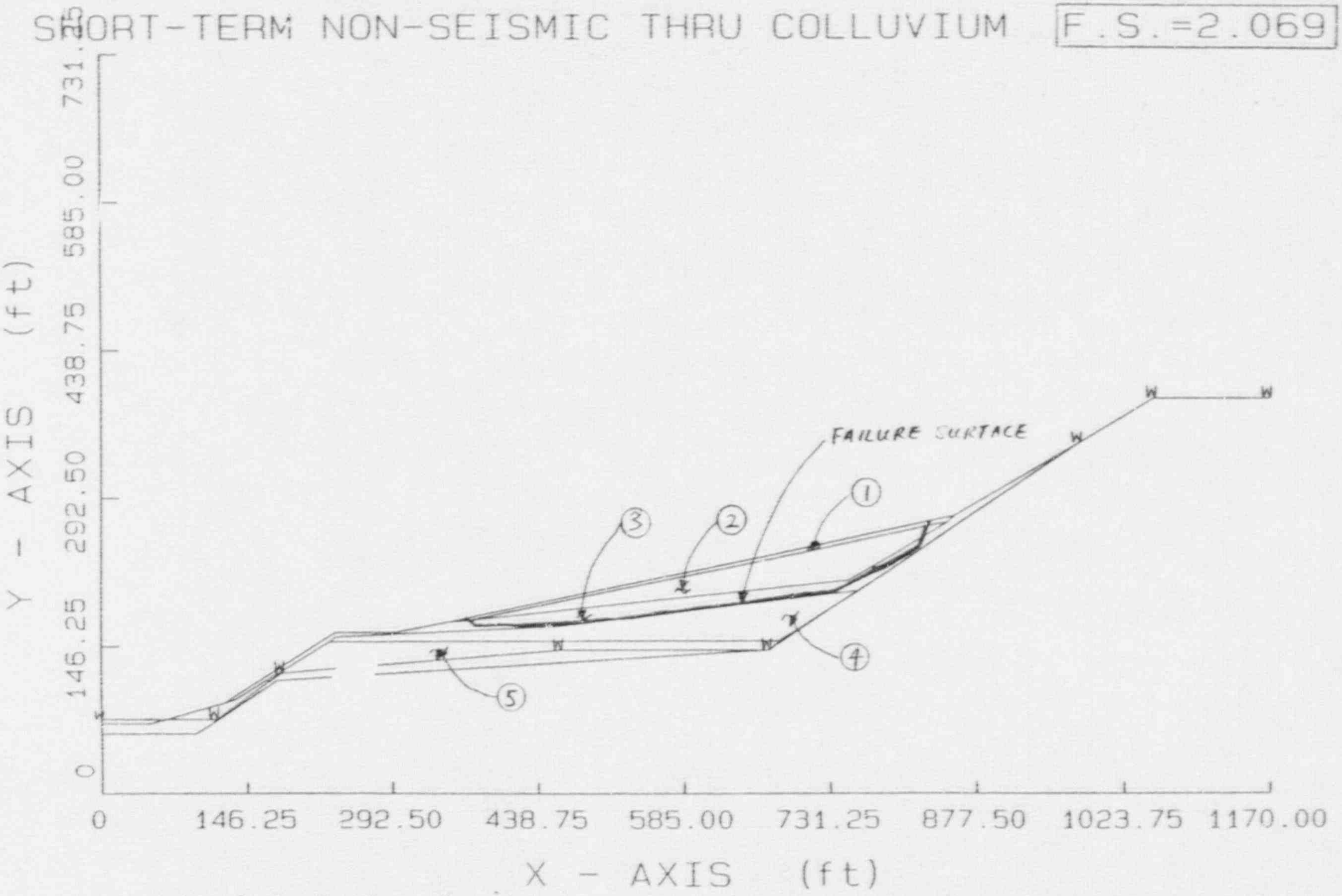
(a) Sliding Block failure surface analysis

(b) Irregular shaped failure surface analysis

(c) Distinction between Alluvium I and Alluvium II is described in Ref. 4 (Material Properties Calc)

MINIMUM

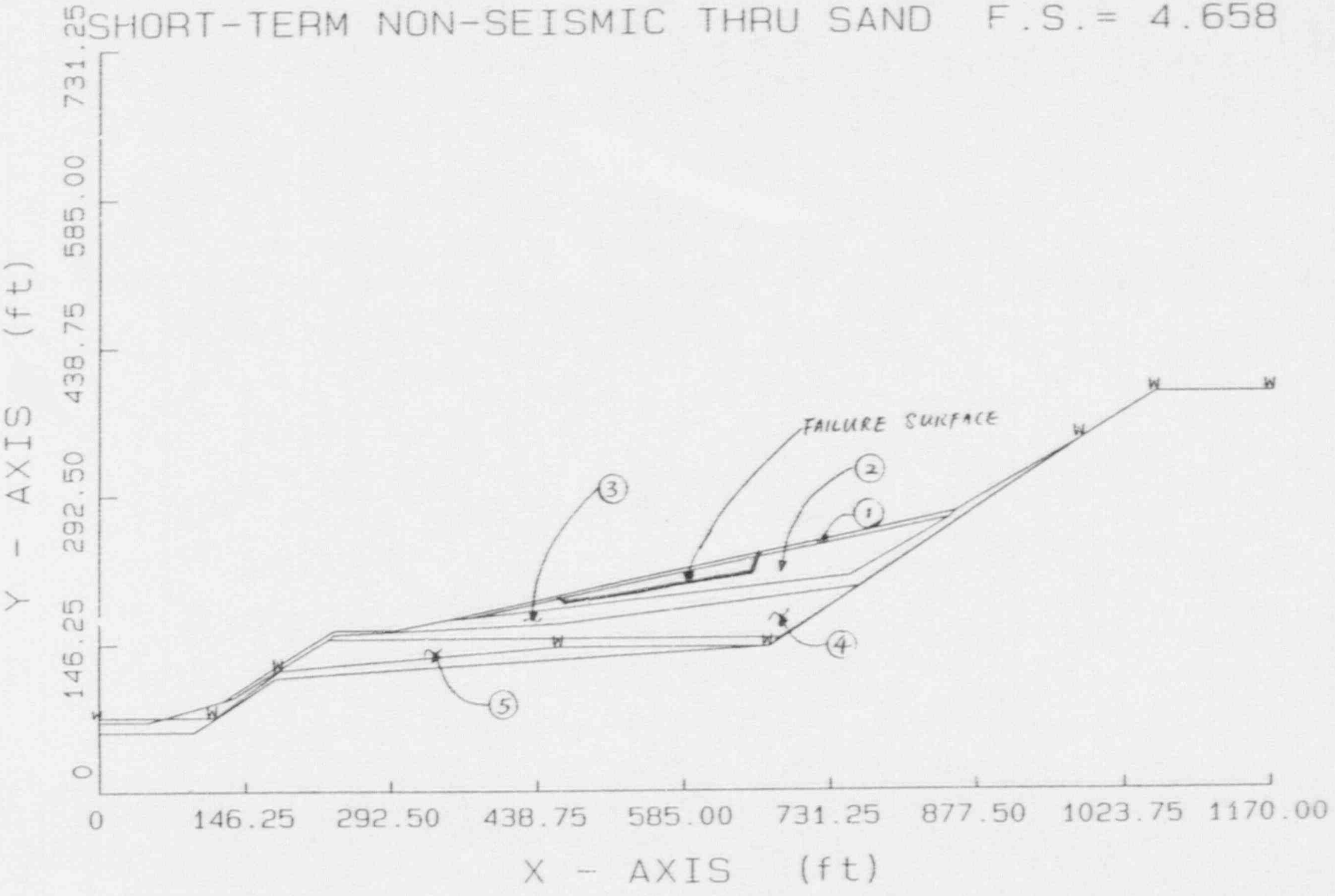
SHORT-TERM NON-SEISMIC THRU COLLUVIUM F.S.=2.069



see sh. 9 for layer description

UMTRA-LOW
5057-06
PYL 12/13/87
W.L. — [illegible]

sh. 14



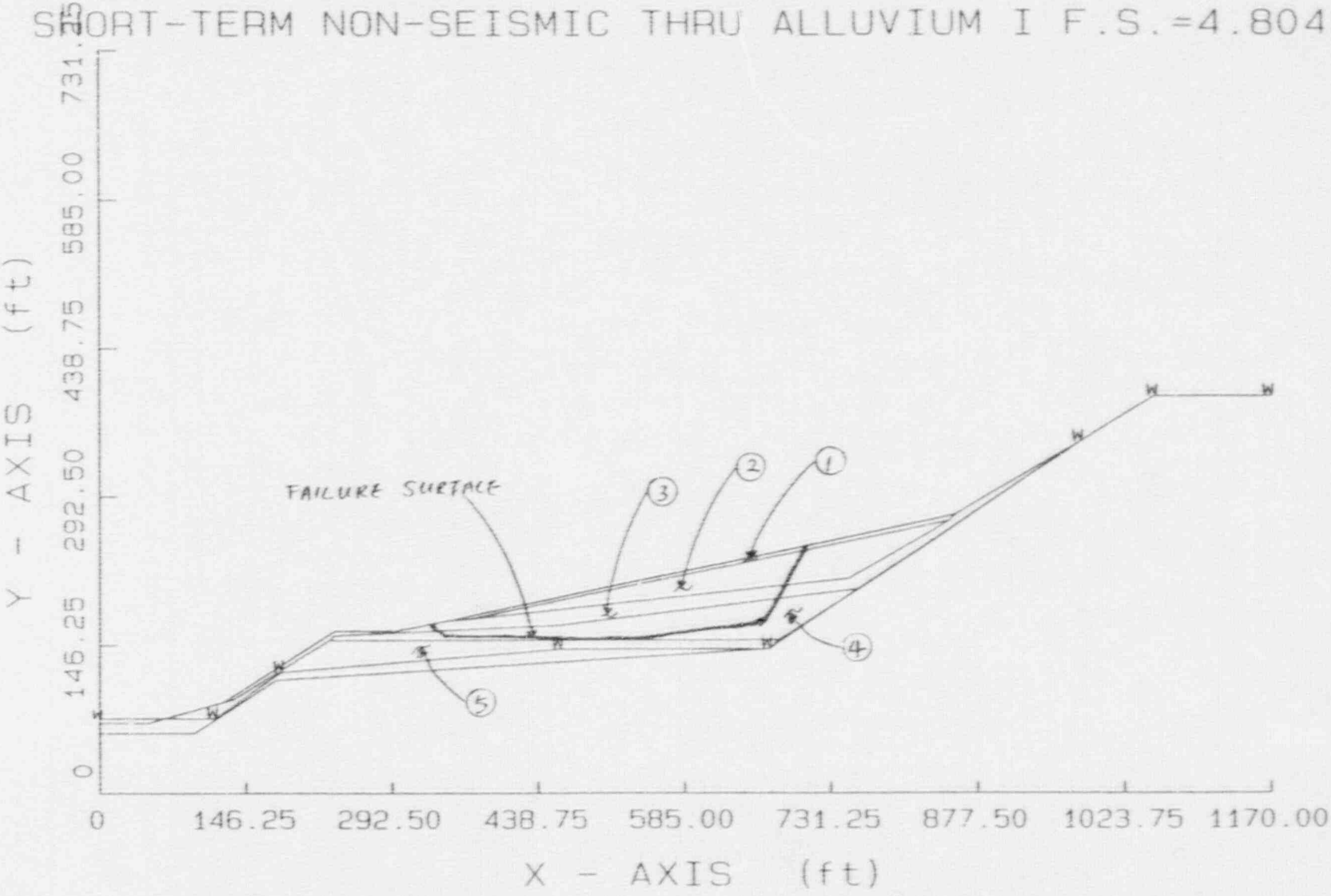
SHORT-TERM NON-SEISMIC THRU SAND F.S.= 4.658

UMTRA-LOW
5053-66
PYL 12/13/87
KY — 2/[illegible]

Sh. 15

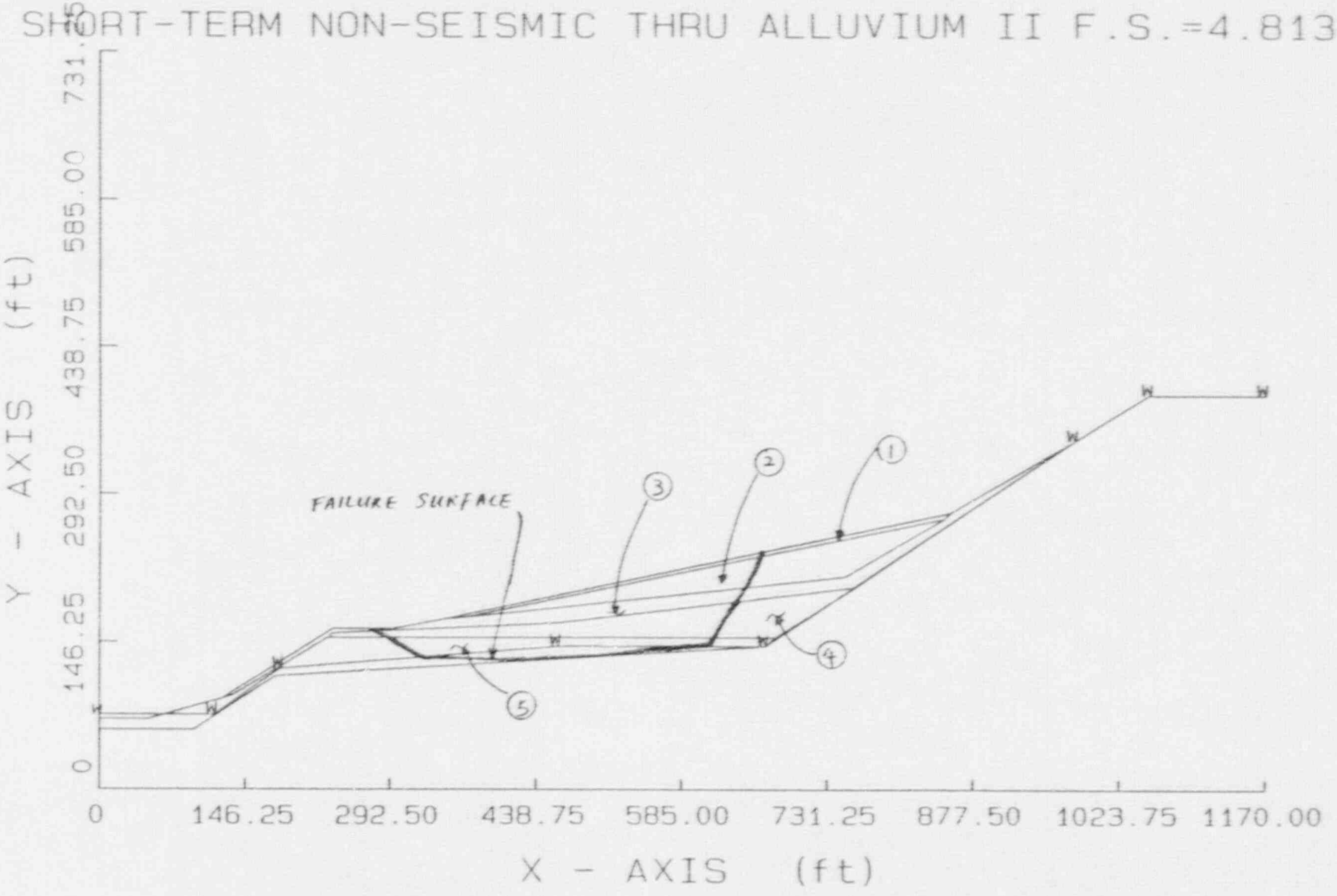
UMTRA-LOW
5057-06
PYL 12/10/89
WYL 2/5/91

Sh. 16



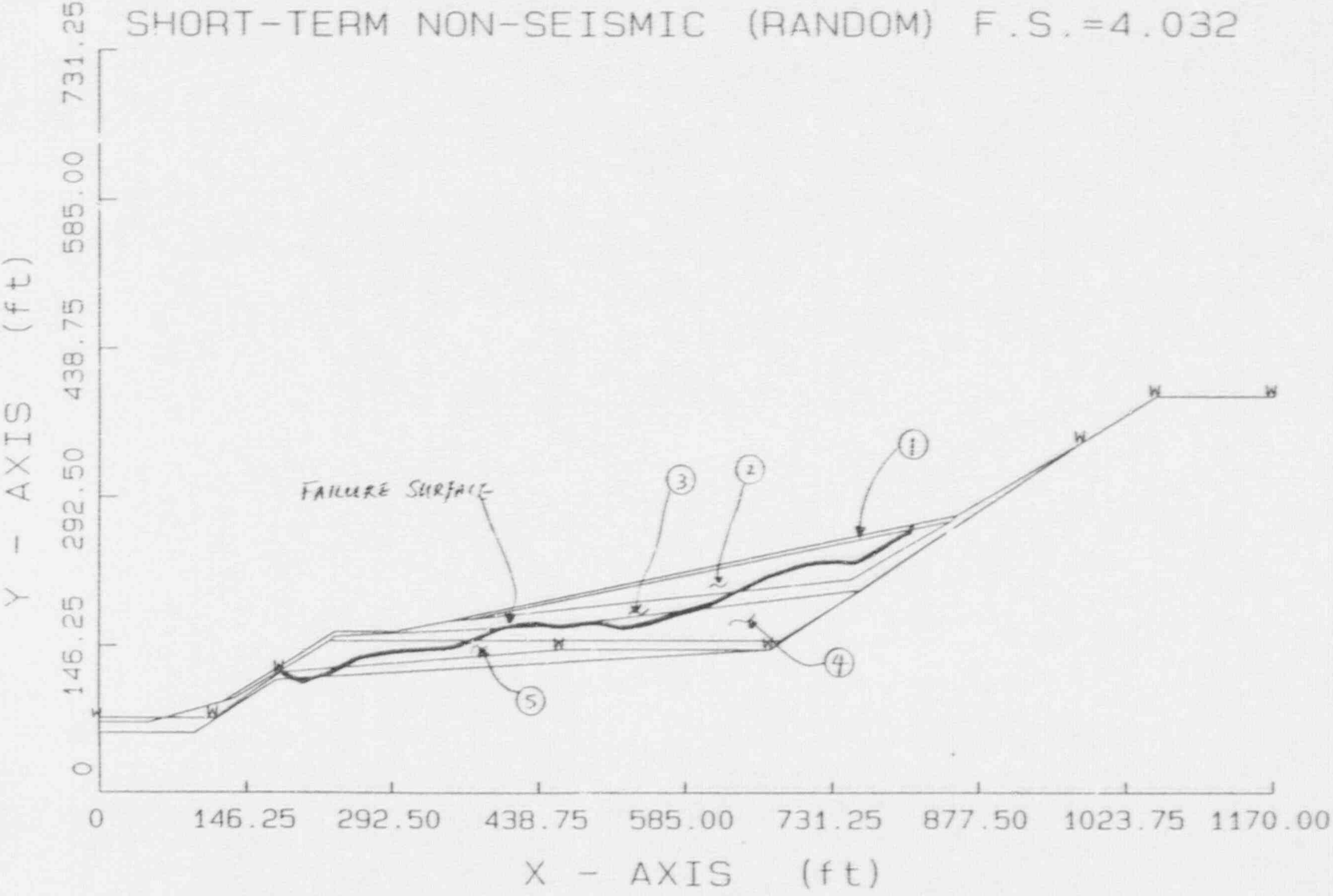
SHORT-TERM NON-SEISMIC THRU ALLUVIUM I F.S.=4.804

SHORT-TERM NON-SEISMIC THRU ALLUVIUM II F.S.=4.813



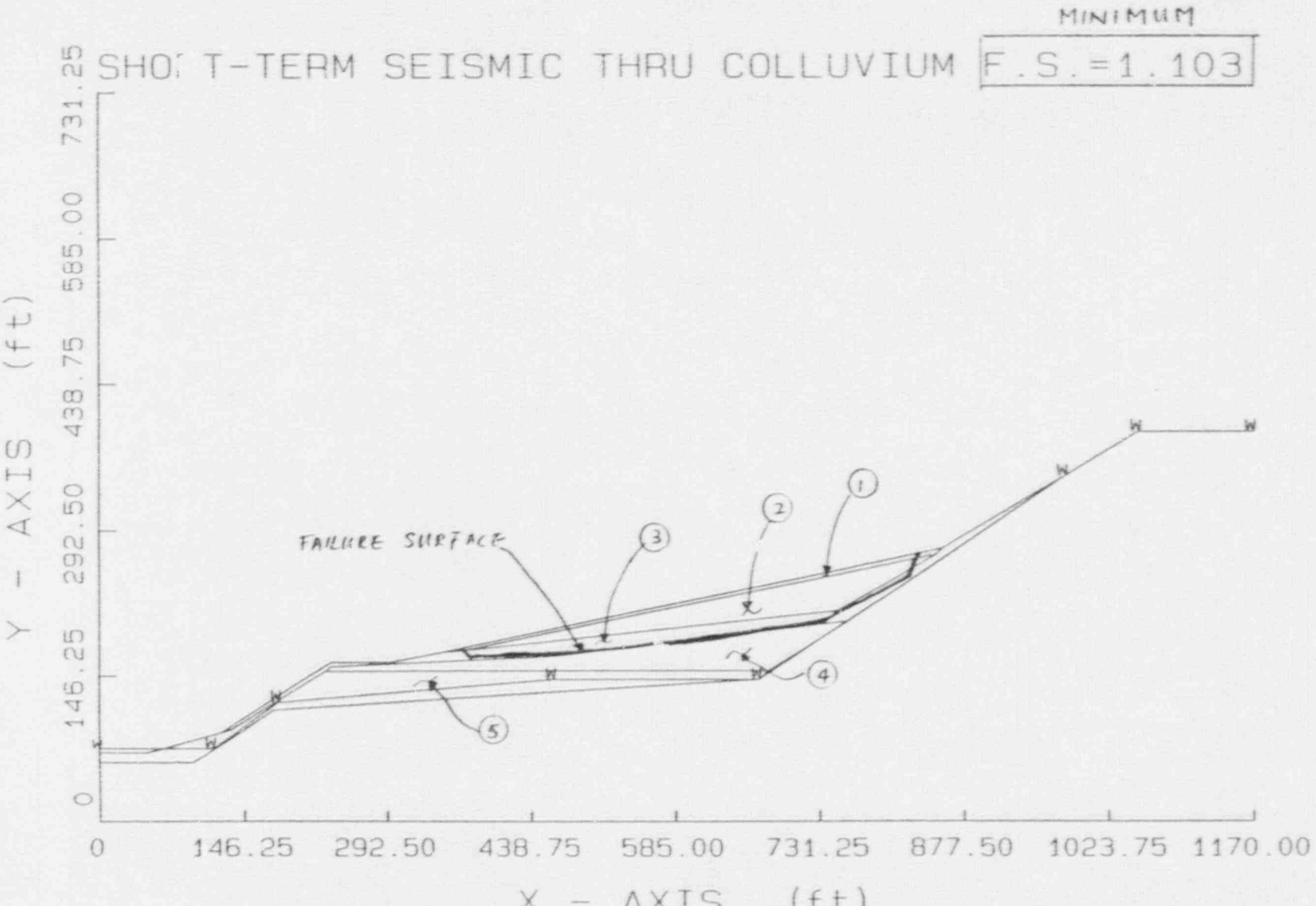
UMTRA-LOW
50537-06
PYL 12/13/89
WJL 3/2/90

Sh. 17



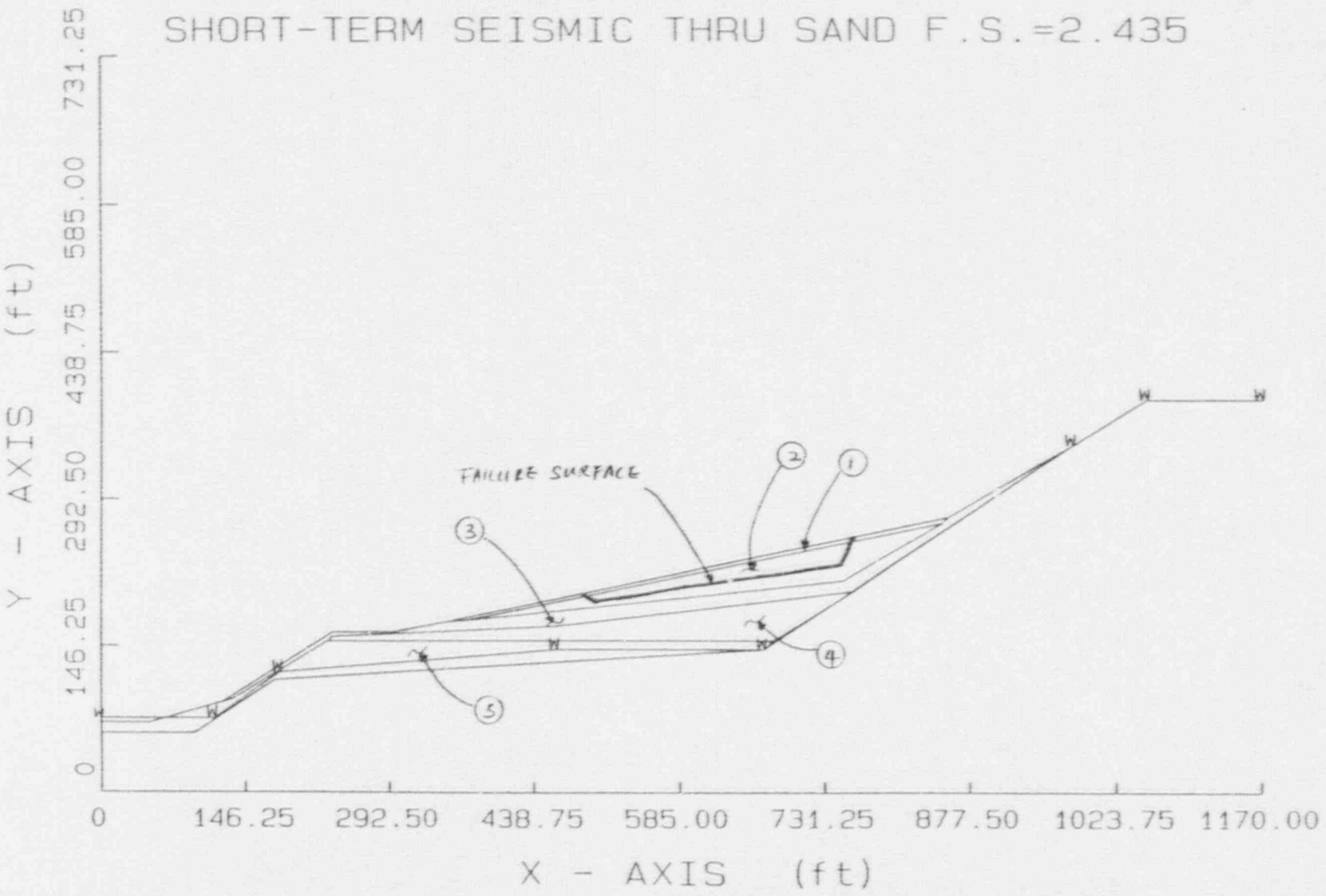
UMTRA-LOW
6057-06
PYL 12/13/89
W.Y. [illegible]

Sh. 18



UMTRA - LOW
5057-06
PYL 10/13/87
WYL 2/5/89

Sh. 19



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5357-06
PYL 12/13/89
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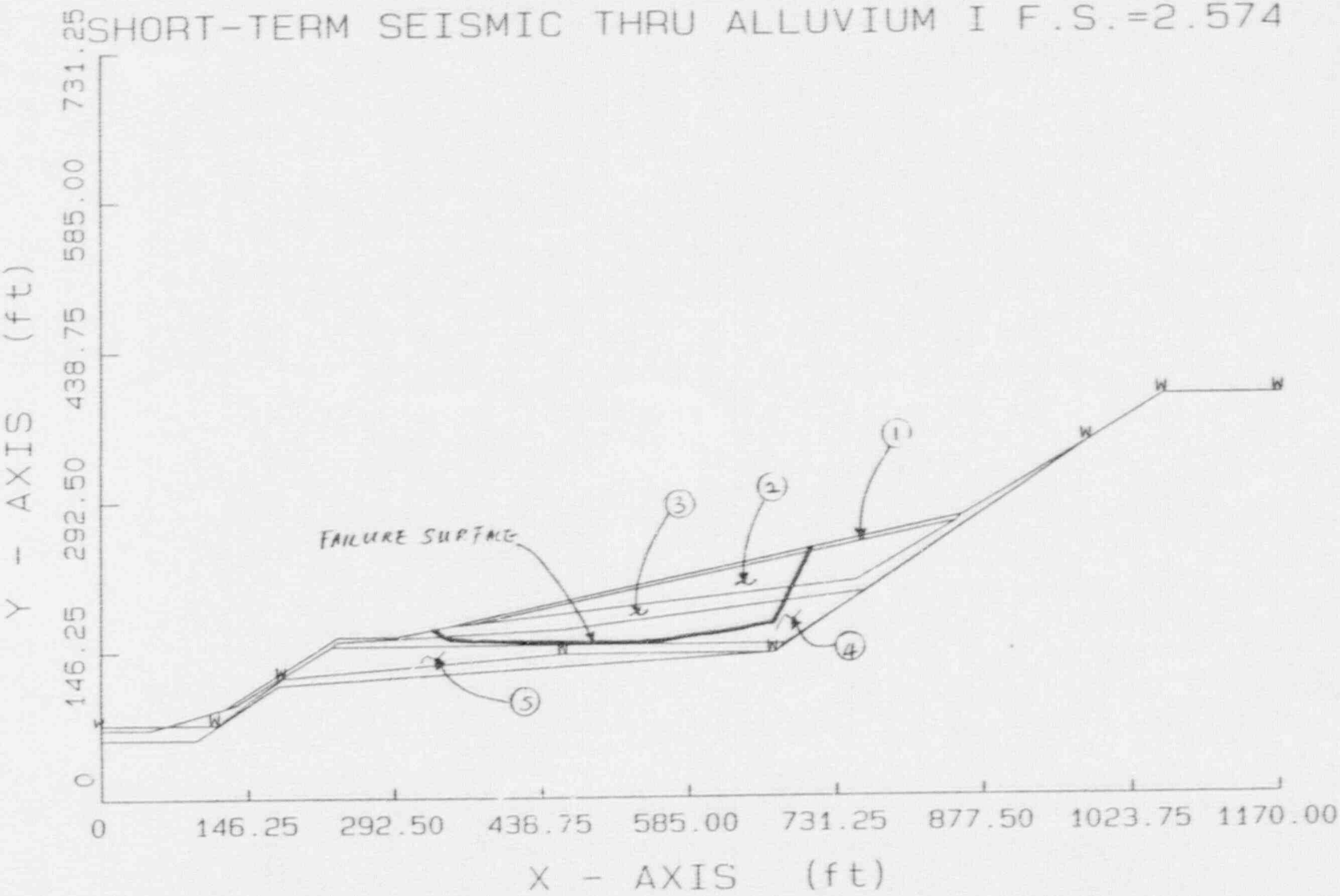
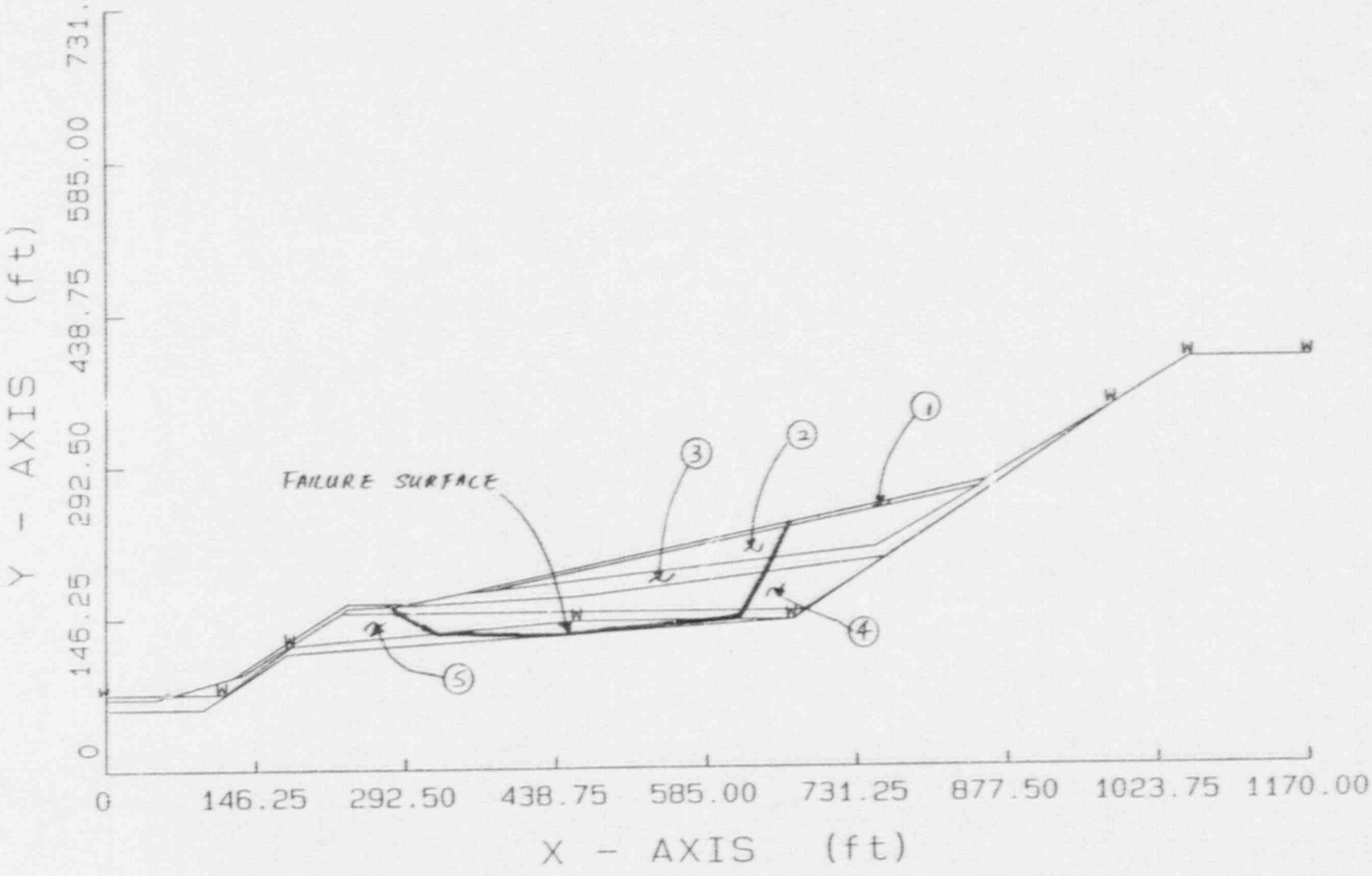
Sh. 20



UMTRA-LOW Sh. 21
S057-06
PYC 12/13/89
NYL 2/5/90

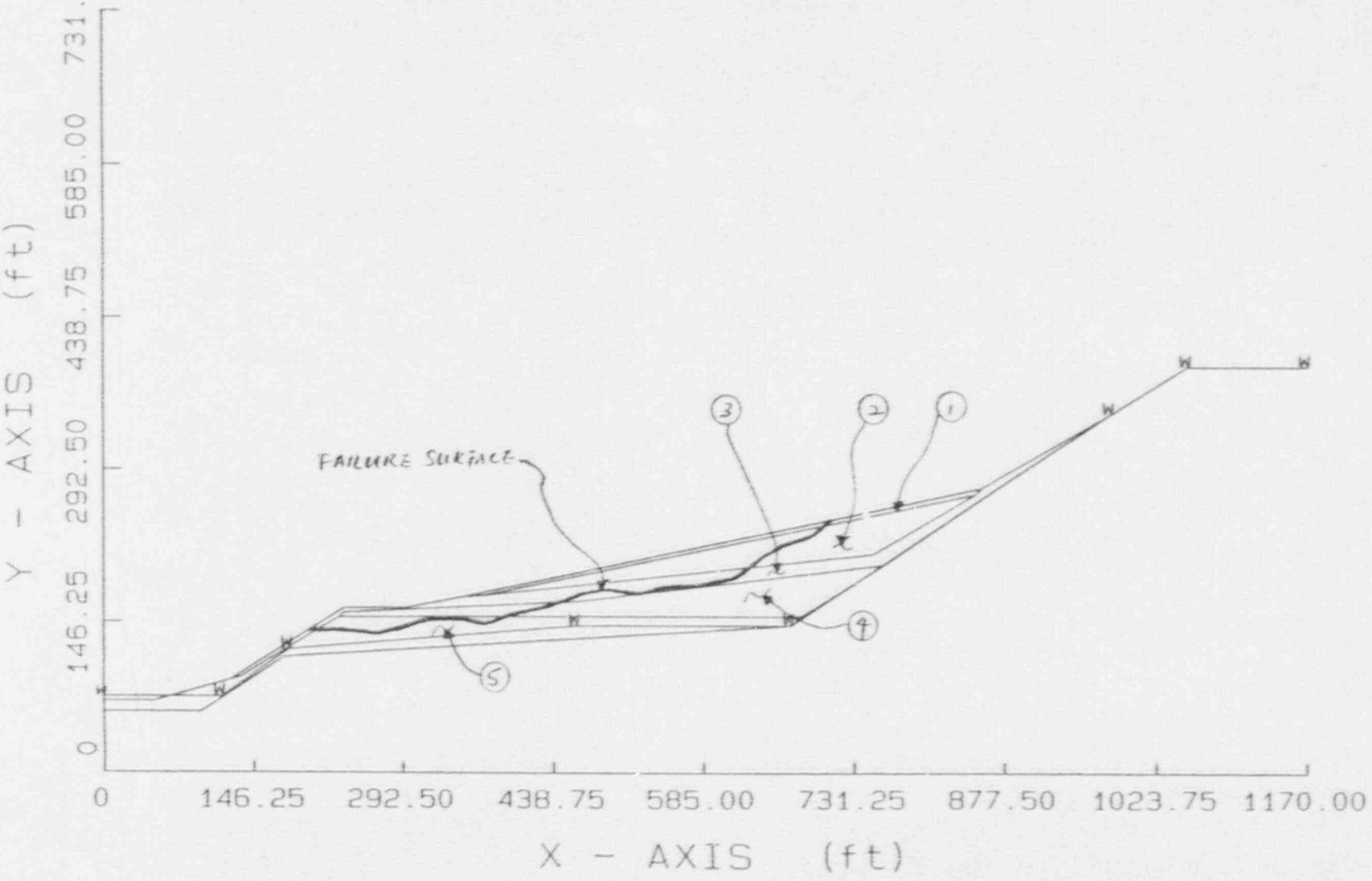
SHORT-TERM SEISMIC THRU ALLUVIUM II F.S.=2.559



UMTRA-LOW
5057-0.6
PTL 12/13/89
WL 2/12/90

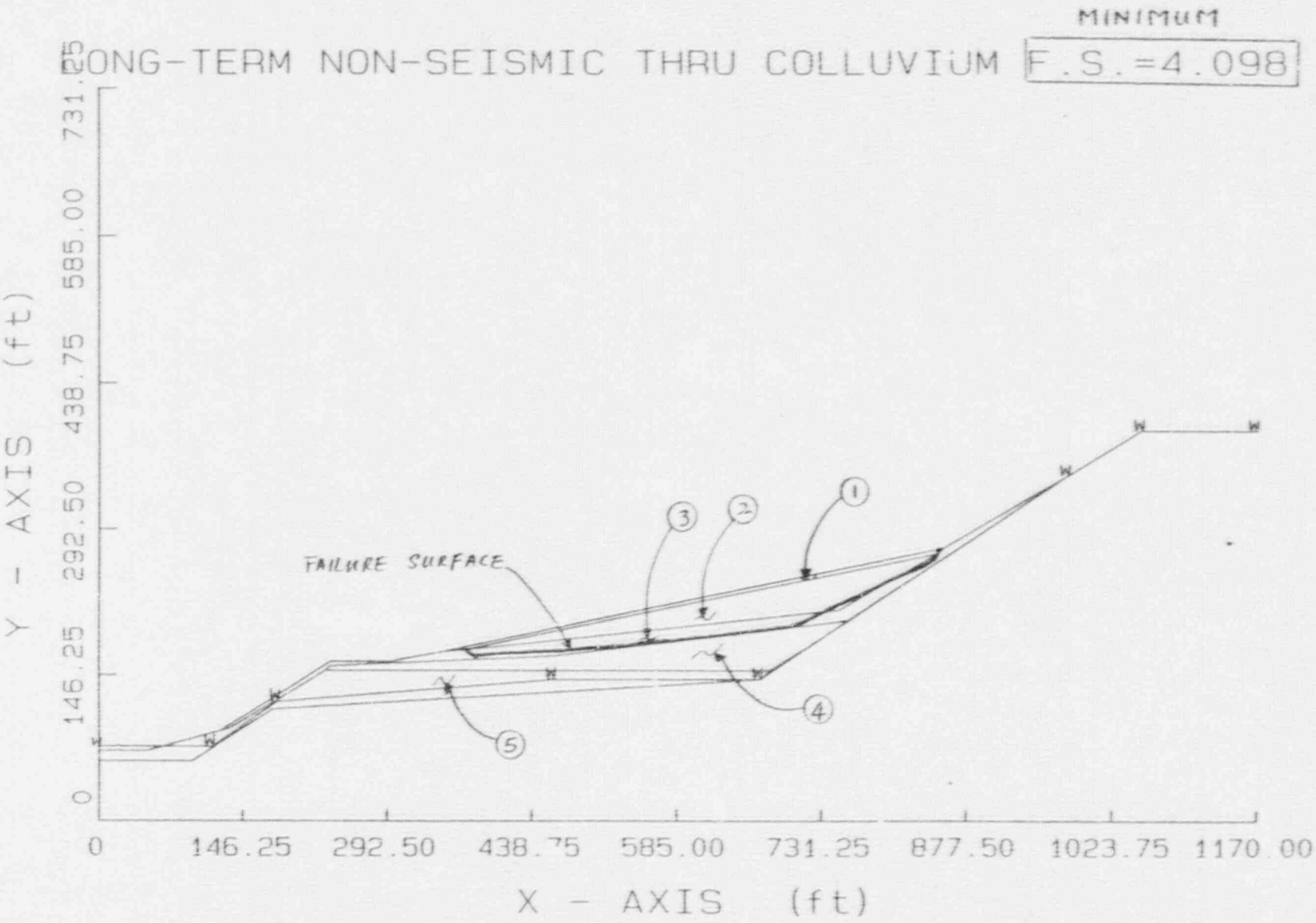
Sh. 22

SHORT-TERM SEISMIC (RANDOM) F.S.=2.153



UMTRA-LOW
5057-06
PYC 12/31/87
WYL 2/5/88

Sh. 23



UMTRA-LOW
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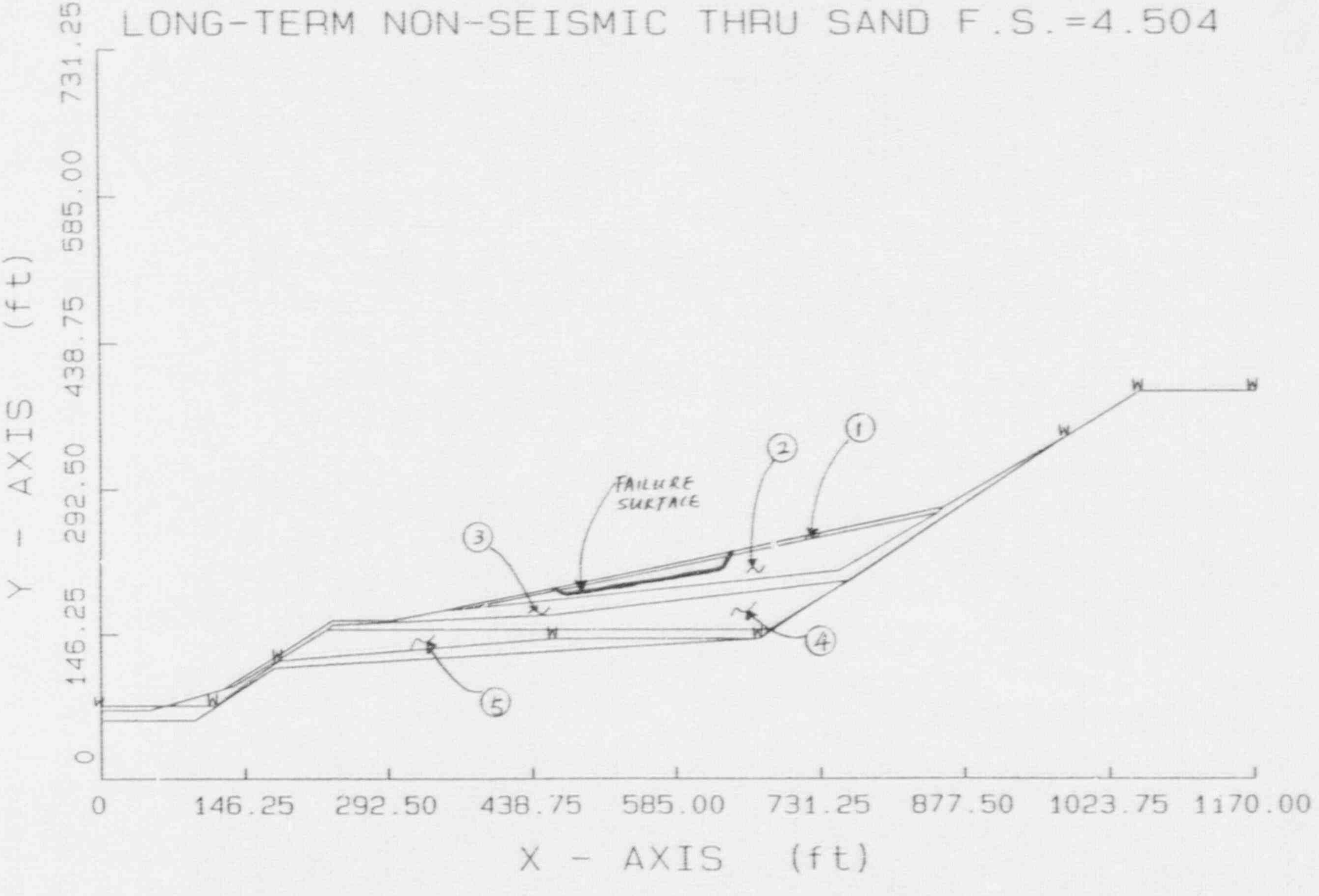
P-L 12/17/84
WYL 3/15/85

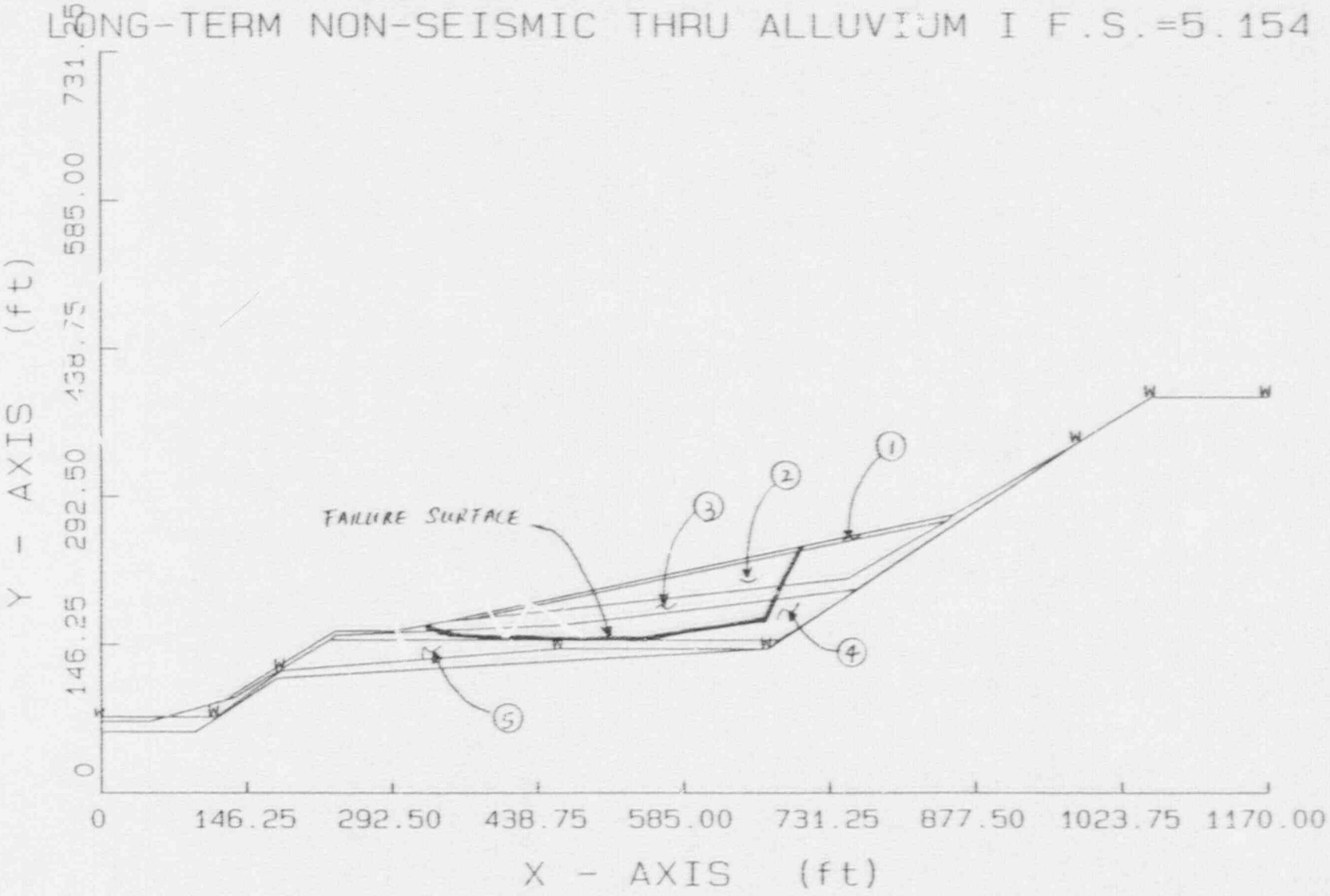
Sh. 24

LONG-TERM NON-SEISMIC THRU SAND F.S.=4.504



UMTRA-LCW
5057-06
PRL 12/13/84
3/13/85

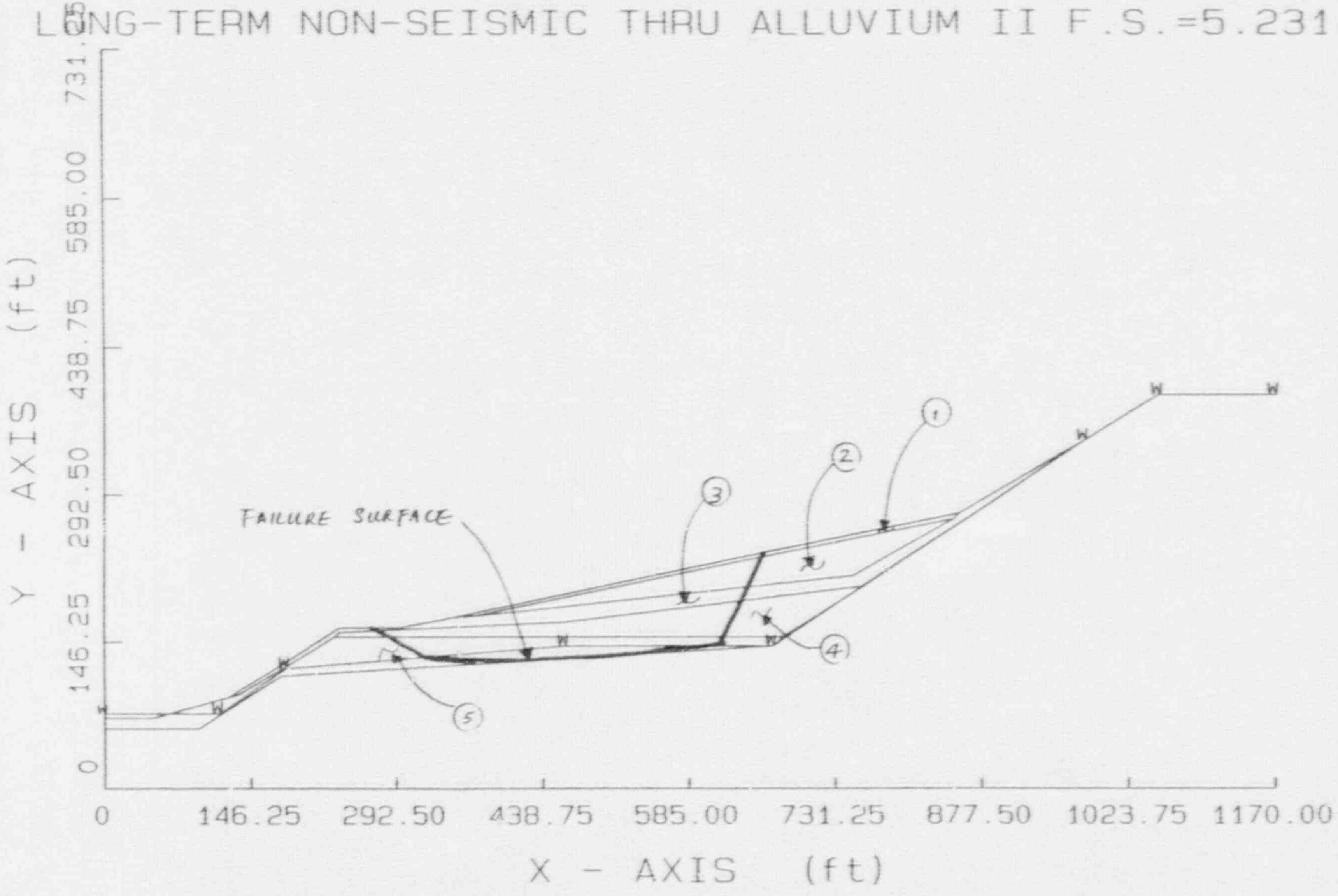
Sh. 25



LONG-TERM NON-SEISMIC THRU ALLUVIUM I F.S.=5.154

WATER-LOW
SOS 7-06
PYL 12/13/89
W/L = [illegible]

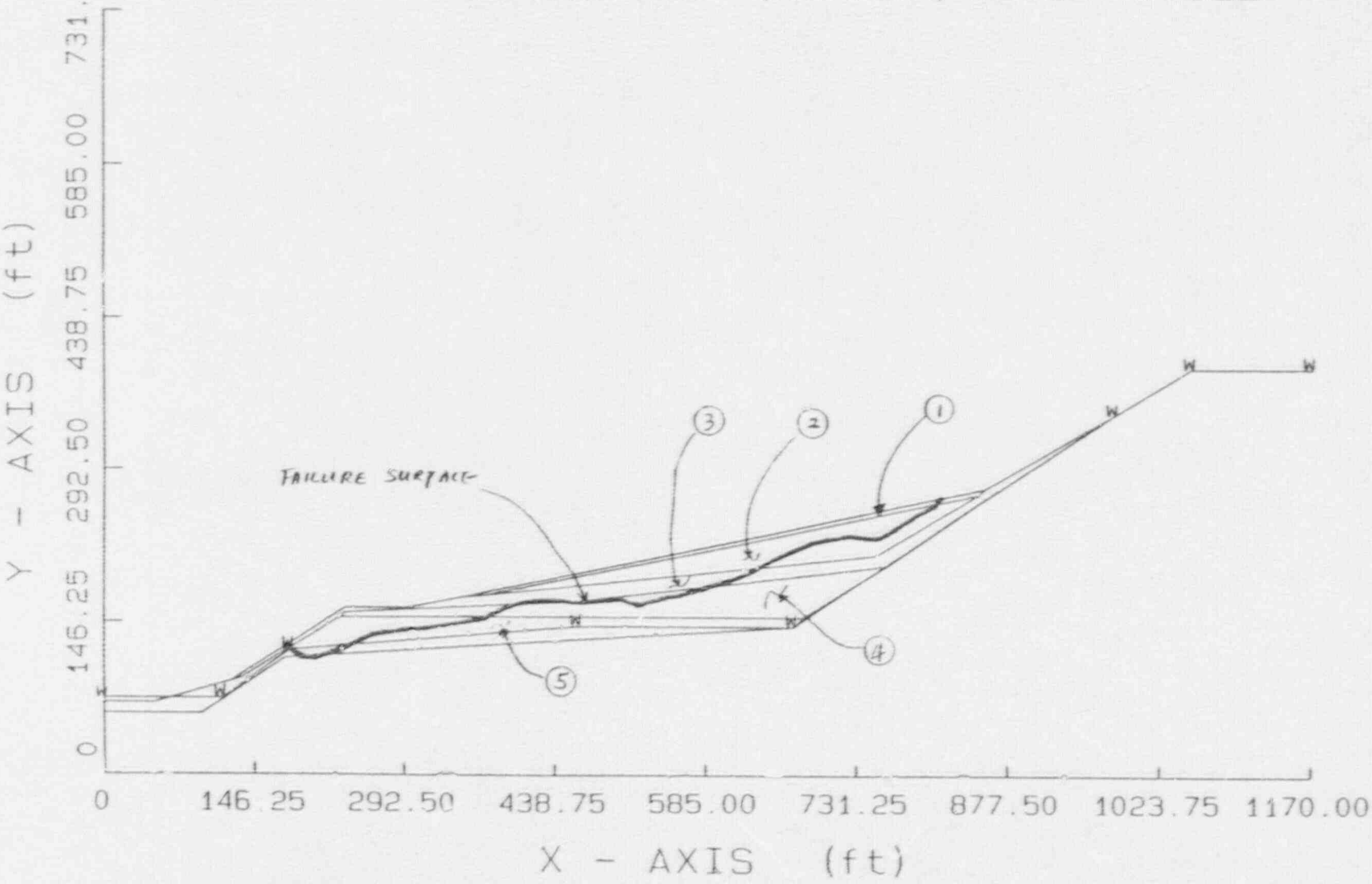
SL 26



LONG-TERM NON-SEISMIC THRU ALLUVIUM II F.S.=5.231

UMTRA-LOW Sh 27
5057.06
PKL 12/13/89
W/K [illegible]

LONG-TERM NON-SEISMIC (RANDOM) F.S.=4.322

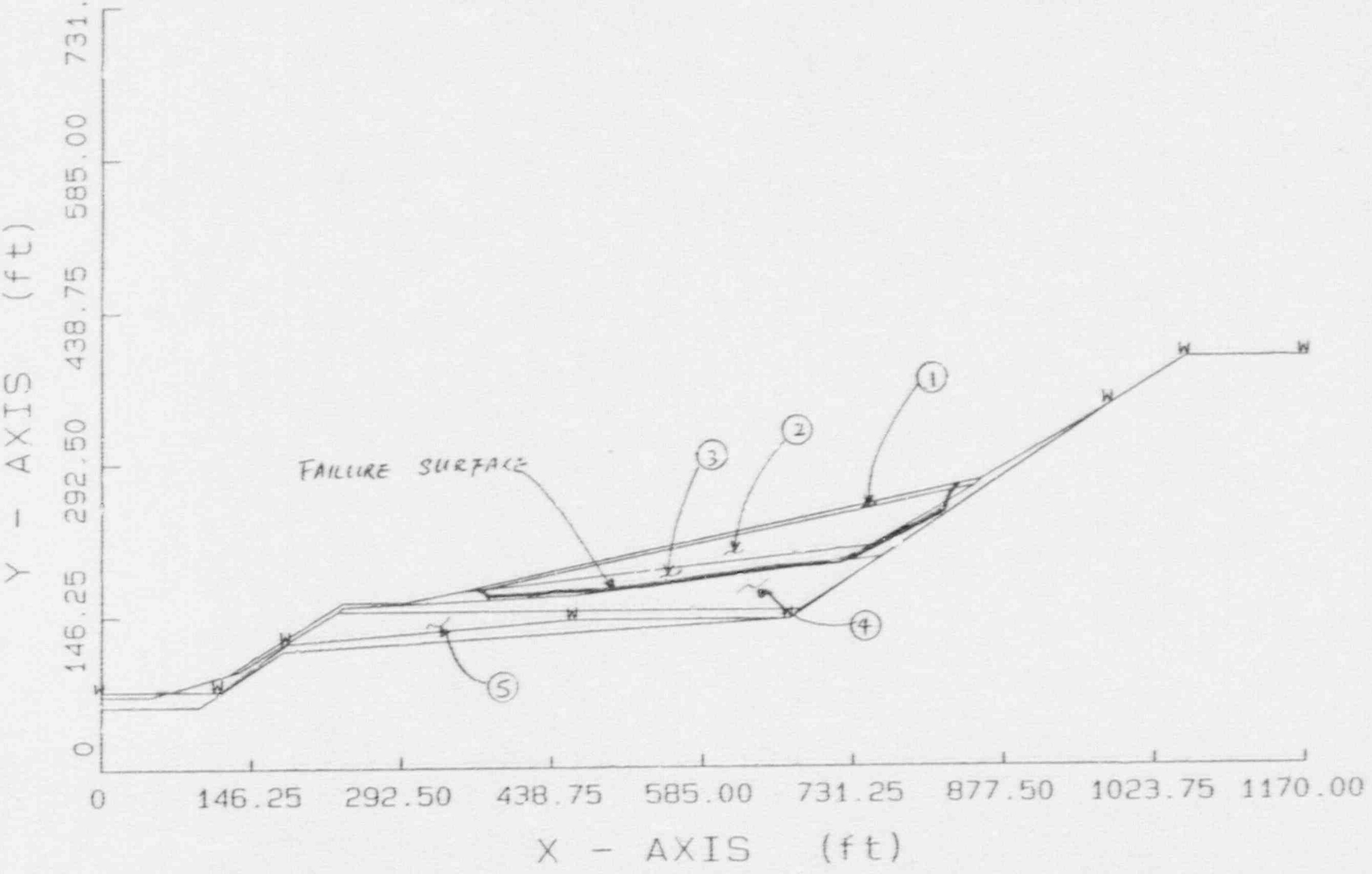


UMTRA-LOW
5059-02
PYL 12/13/89
WYL 2/12/90

Sh 28

LONG-TERM SEISMIC THRU COLLUVIUM

MINIMUM F.S.=1.599



ULTRA-LOW
CD57-06
PRL 12/3/79
WYL 2/1/80

Sh 29

UMTRA-LOW
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WYL 2/5/90

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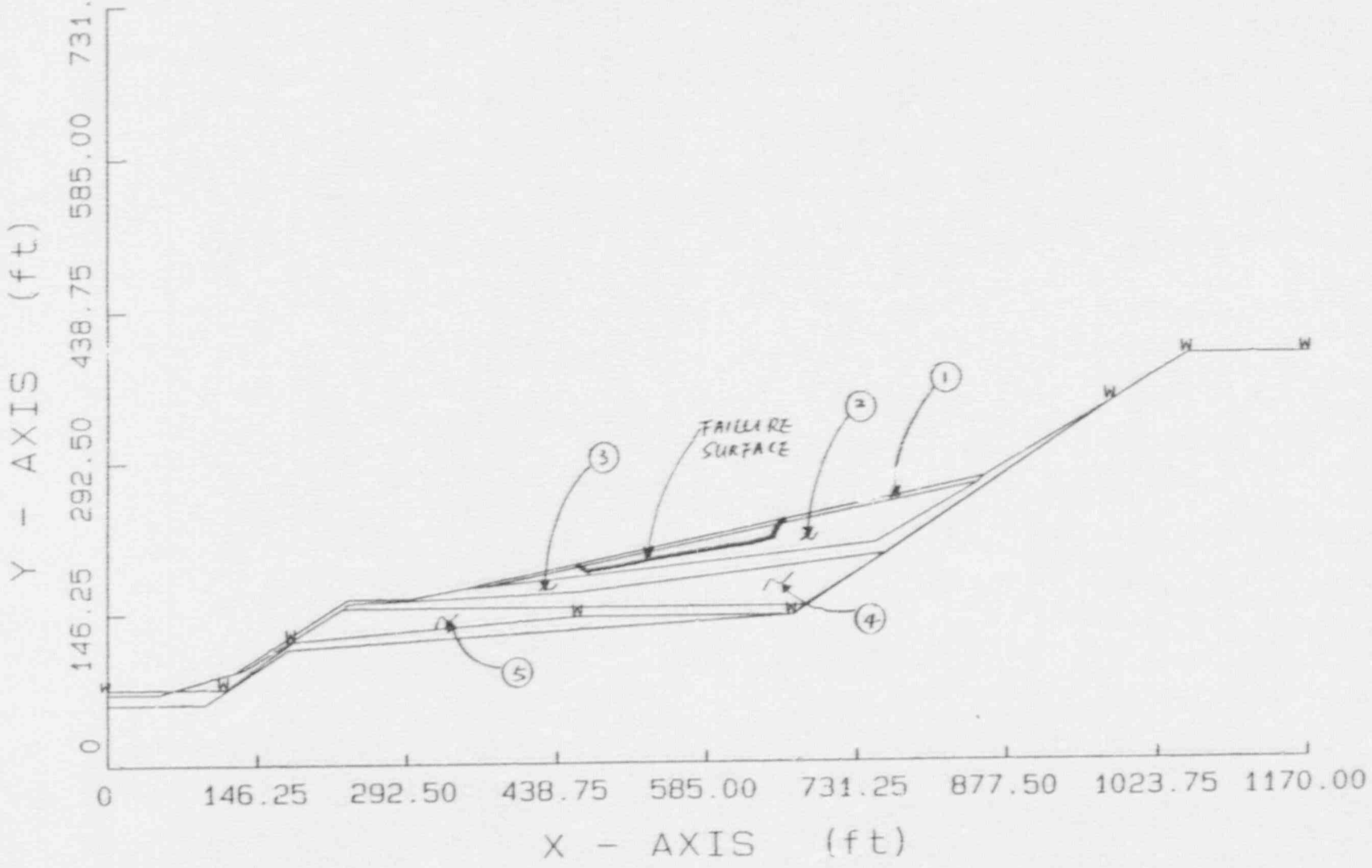
LONG-TERM SEISMIC THRU SAND F.S.=2.009



UMTRA-LOW
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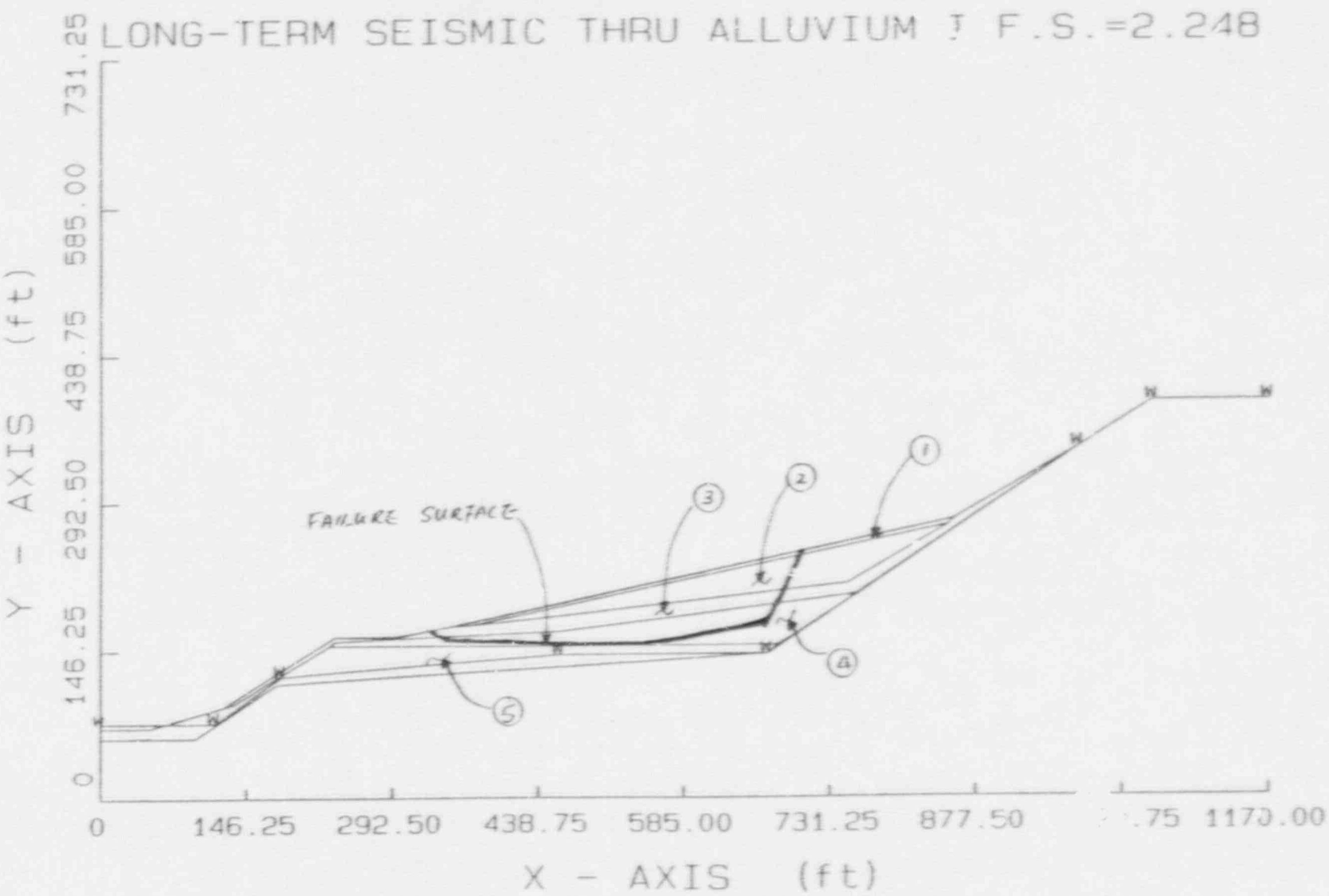
NYL 2/1/90

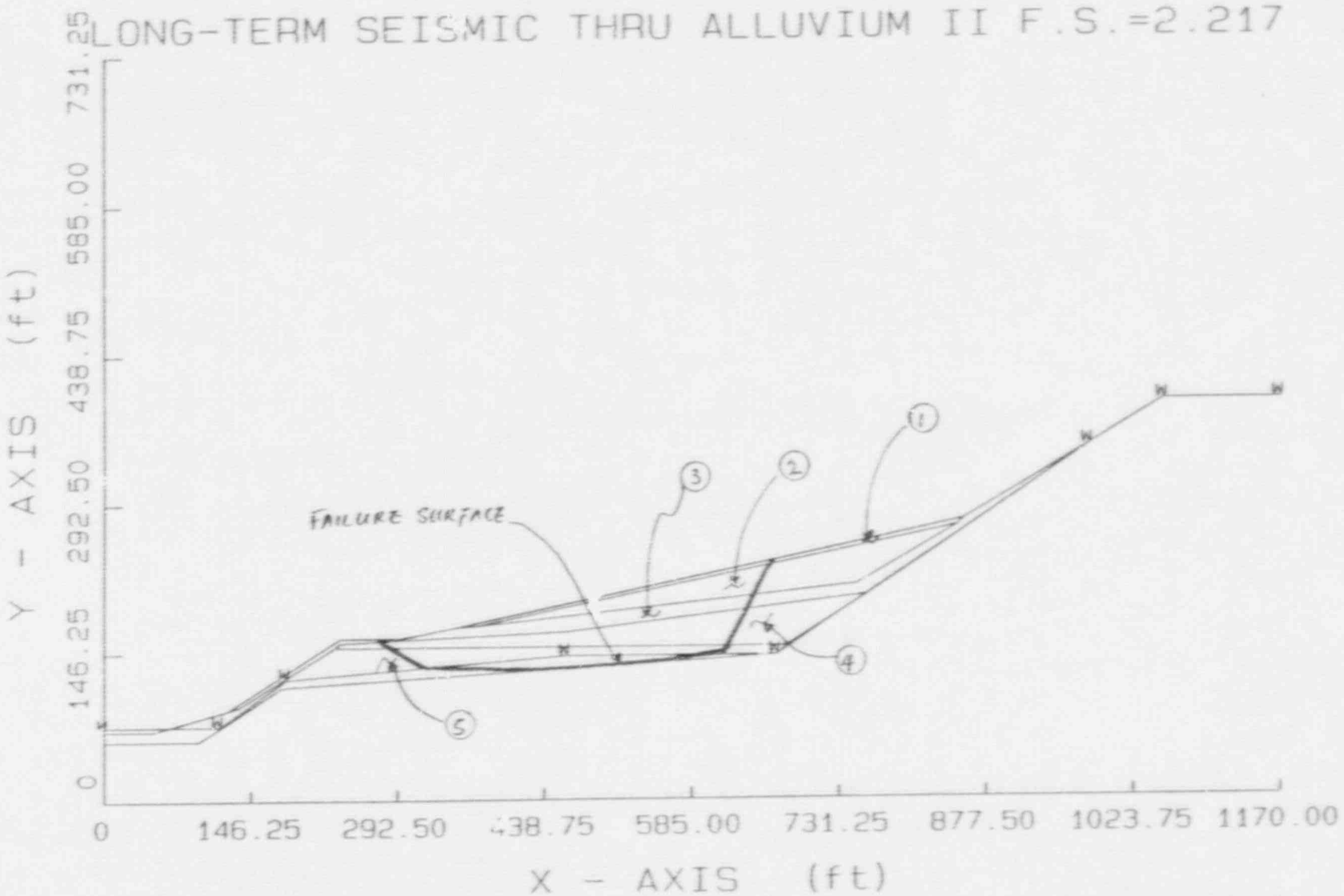
Sh. 31



LONG-TERM SEISMIC THRU ALLUVIUM ; F.S.=2.248

Sh. 32

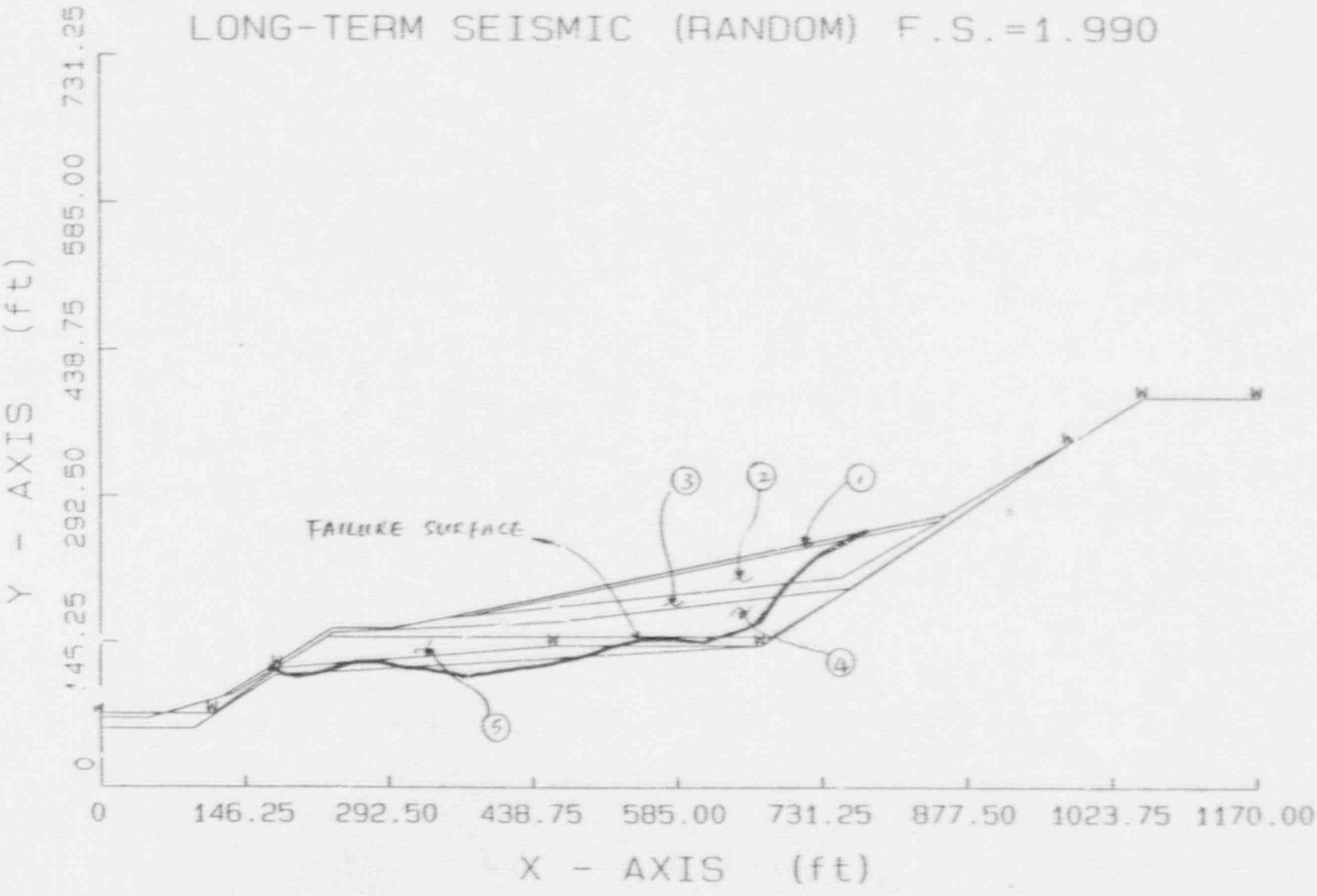
UMTRA-LOLO
#5057-06
PYL 12/13/89
WYL 2/5/90



LONG-TERM SEISMIC THRU ALLUVIUM II F.S.=2.217

UMTRA-LOW
5057-06
PYL 12/19/89
WYL 2/5/90

Sh. 33



MORRISON-KNUDSEN ENGINEERS, INC.
A MORRISON KNUDSEN COMPANY

Sheet 34

Project UMTRA / LOW
Contract No. 2888-VR
File No.
Feature Embankment Design
Designed PYL
Date 7/12/90
Item Slope Stability Analysis Rev △1
Checked KJee
Date 8/3/90

REVISION △1

Purpose: Two potential sliding surfaces were analyzed here in response to NRC's informal comments dated June, 1990.

1. Shallow Surface Failure in Colluvium Layer on Steep Slope above Disposal Cell:

A thin, partial layer of colluvium on the steep slope above the disposal cell was included in the model for the slope stability analysis (see sh. 6). It was based on the geotechnical profile, section A, developed from available boreholes in Ref 4. The F.S. against shallow surface failure for the 4 loading conditions were determined using 'STABL5'. The results were summarized below:-

i)	Short Term, Static	F.S = 2.513	>1.3	SAFE
ii)	Short Term, Seismic	F.S. = 1.902	>1.1	SAFE
iii)	Long Term, Static	F.S = 2.741	>1.5	SAFE
iv)	Long Term, Seismic	F.S. = 3.500	>1.1	SAFE

Failure Surfaces were shown on sh. 36-39.

'STABL5' output are attached as App. B.

Results of analysis show that this layer of colluvium is safe against shallow surface failure. Moreover, the effect of tree roots due to presence of trees helps to prevent ravelling of this layer.

MORRISON-KNUDSEN ENGINEERS, INC.
A MORRISON KNUDSEN COMPANY

Project UMTRA - LOW
Contract No. 3855-42
Sheet 35
File No.
Feature Embankment Design
Designed PRC
Date 7/17/90
Item Slope Stability Analysis Rev Δ
Checked K. Lee
Date 8/3/90

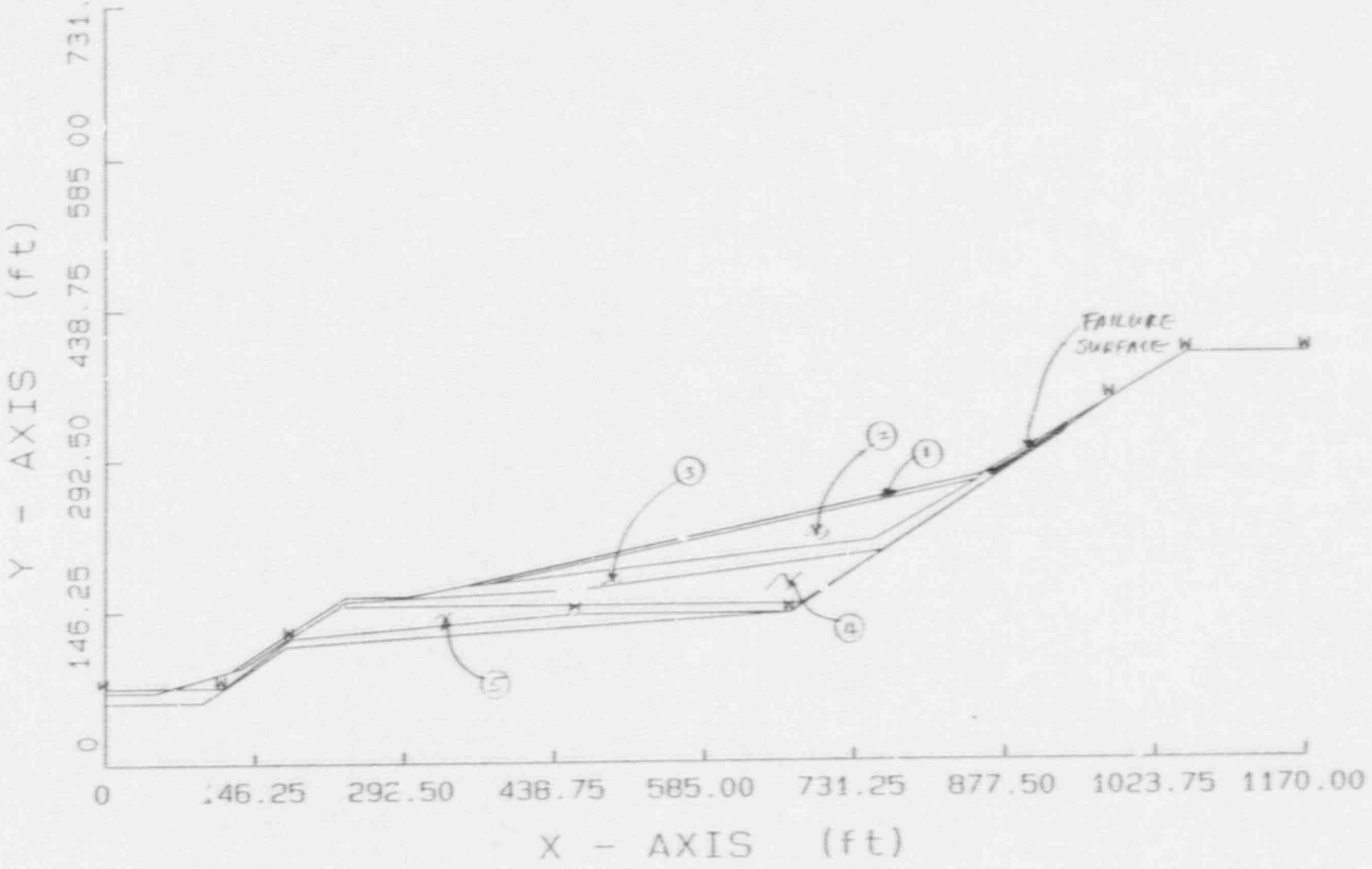
2. Potential Failure Surface through Alluvium on the Clear Creek Embankment at the Toe of the Tailings Cell.

The potential failure surface for the 4 loading conditions had been analyzed in the earlier calculation (Rev. C) (see sh. 3, pt. 2 (v)). The 'RANDOM' searching routine was used to search for critical surfaces terminating in the neighborhood of the toe (including through alluvium layer). The results had been presented on sh 13. F.S. for all 4 conditions exceed the required. Failure Surfaces had been presented on sh. 18, 23, 28 & 33.

UMTRA - LOW
Rev △ Slope Stability
PTL 7/17/90
Checked [illegible] 8/3/90

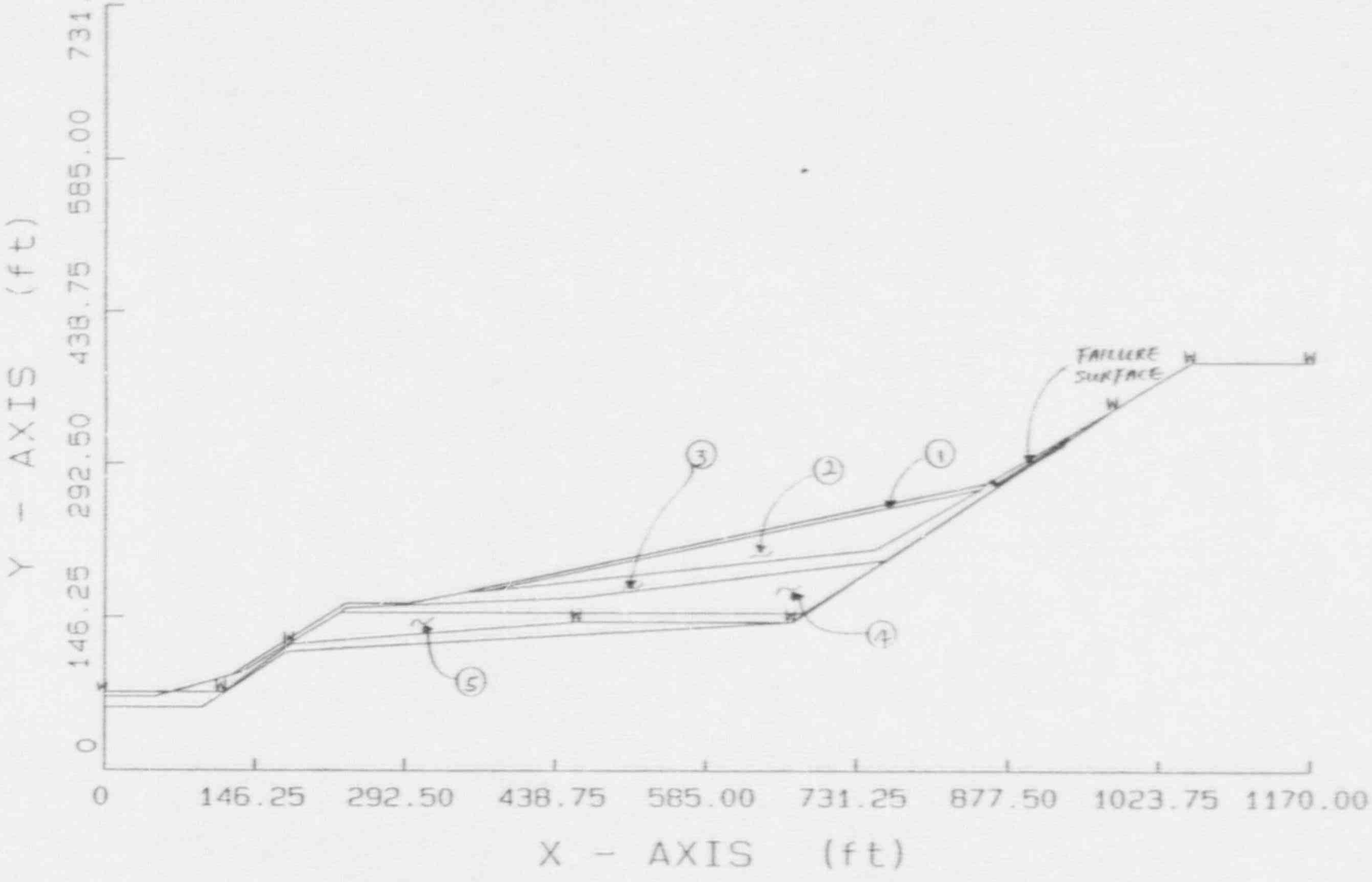
sh 36

SHORT TERM STATIC - INF. SL. - F.S.=2 513

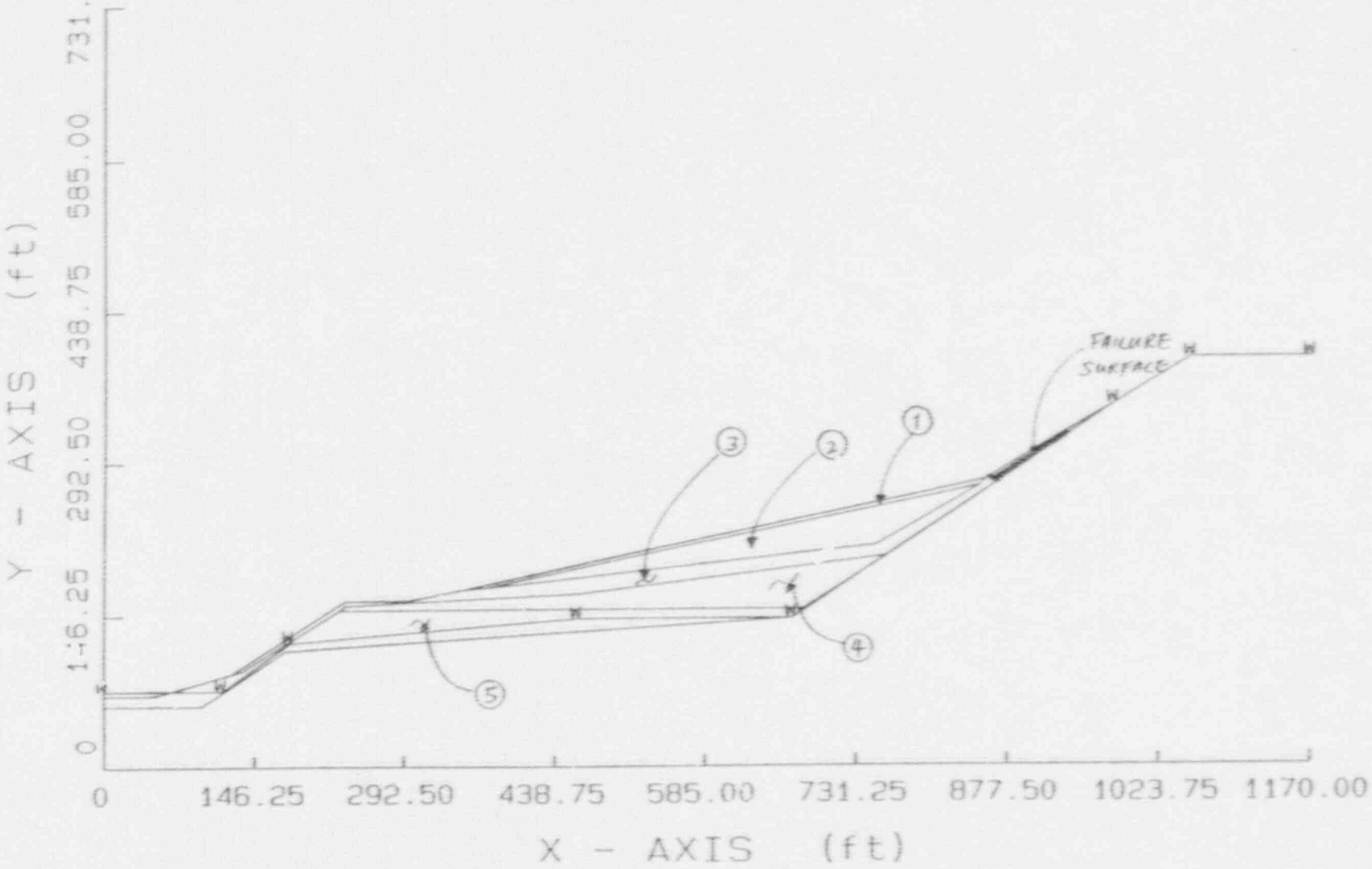


UMTRA-LCW Sh 37
Rev. (1) Slope Stability
PTL 7/10/90
Checked K.D.K. 8/3/90

SHORT TERM SEISMIC - INF. SL. - F.S.=1.902



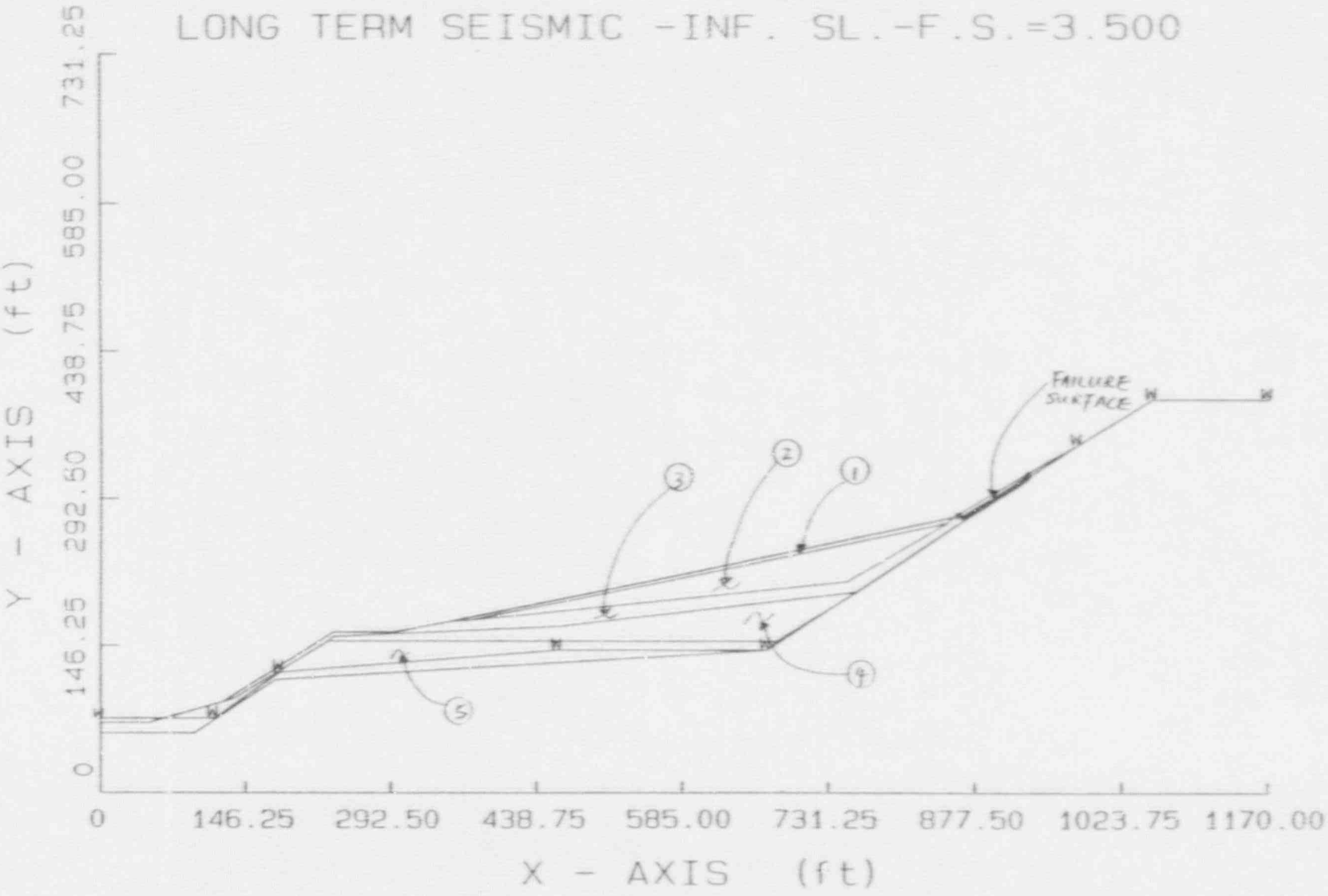
LONG TERM STATIC - INF. SL. - F.S.=2.741



UMTRA-LOW Sh 38
Rev Δ Slope Stability
DVL 7/18/90

Checked KLC 8/3/90

LONG TERM SEISMIC -INF. SL.-F.S.=3.500



UMTRA-GUN
Rev Δ slope stability
PYL 8/10/90
Checked K.Yee 8/3/90

Sh. 39

MORRISON-KNUDSEN ENGINEERS, INC.
A MORRISON KNUDSEN COMPANY

Sheet A-1
Project UMTRA-LOW
Contract No 5057.06
File No.
Feature Embankment Design
Designed PYL
Date 12/5/89
Item Slope Stability Analysis
Checked WYL
Date 2/5/90

APPENDIX A

'STABL5' OUTPUT

PYL 12/11/89
[illegible]

```
                         ** PCSTABL5 **

                               by
                        Purdue University

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


Run Date:
Time of Run:
Run By:                     PYL
Input Data Filename:        A:STNSC.DAT
Output Filename:            A:STNSD.OUT
Plotted Output Filename:    A:STNSD.PLT



PROBLEM DESCRIPTION   UMTRA-LOWMAN #1 SHORT TERM NON-SEIMIC-TH
                      RU SAND



BOUNDARY COORDINATES

     8 Top   Boundaries
    26 Total Boundaries


Boundary     X-Left     Y-Left     X-Right     Y-Right     Soil Type
   No.        (ft)       (ft)       (ft)        (ft)       Below Bnd

    1           .00      70.00       50.00       70.00         5
    2         50.00      70.00      125.00       90.00         5
    3        125.00      90.00      235.00      160.00         3
    4        235.00     160.00      295.00      160.00         3
    5        295.00     160.00      350.00      170.00         3
    6        350.00     170.00      855.00      273.00         1
    7        855.00     273.00      980.00      345.00         3
    8        980.00     345.00     1055.00      390.00         6
    9       1055.00     390.00     1170.00      390.00         6
   10        350.00     170.00      370.00      171.00         3
   11        370.00     171.00      850.00      268.00         2
   12        850.00     268.00      855.00      273.00         3
   13        370.00     171.00      750.00      210.00         3
   14        750.00     210.00      850.00      268.00         3
   15        125.00      90.00      135.00       94.00         5
   16        135.00      94.00      230.00      150.00         5
   17        230.00     150.00      235.00      155.00         4
   18        235.00     155.00      460.00      165.00         4
   19        460.00     165.00      760.00      200.00         4
   20        760.00     200.00      980.00      345.00         6
   21        230.00     150.00      680.00      150.00         5
   22        680.00     150.00      760.00      200.00         6
   23           .00      60.00       95.00       60.00         6
   24         95.00      60.00      177.00      113.00         6
```

PYL 12/12/89
WYL 2/[illegible]

```
        ***     5.324   ***



    Failure Surface Specified By 12 Coordinate Points


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

        1         272.50       160.00
        2         278.64       156.94
        3         292.56       150.00
        4         307.61       142.50
        5         447.19       130.10
        6         589.67       140.73
        7         594.[illegible]0       150.00
        8         607.68       176.85
        9         610.53       182.56
       10         617.43       196.39
       11         630.10       223.56
       12         632.13       227.54

        ***     5.362   ***



    Failure Surface Specified By 12 Coordinate Points


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

        1         210.21       144.22
        2         215.62       [illegible].52
        3         230.80       133.96
        4         470.04       132.87
        5         610.89       142.62
        6         614.57       150.00
        7         627.96       176.85
        8         632.06       185.07
        9         638.79       198.59
       10         651.47       225.78
       11         652.56       228.10
       12         654.61       232.13

        ***     5.390   ***


1

    Failure Surface Specified By 12 Coordinate Points


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

PYL 12/11/89
[illegible] - 2/[illegible]/90

```
2 Boxes Specified For Generation Of Central Block Base


Length Of Line Segments For Active And Passive Portions Of
Sliding Block Is  30.0


Box        X-Left     Y-Left    X-Right    Y-Right      Height
No.         (ft)       (ft)       (ft)       (ft)        (ft)

 1        460.00     186.00     520.00     193.00        5.00
 2        590.00     205.00     750.00     220.00       10.00


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  6 Coordinate Points
```

STNSC.Dat

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

    1        457.37      191.90
    2        461.35      189.46
    3        468.39      186.18
    4        650.42      214.81
    5        657.04      229.01
    6        659.57      233.14

        ***     4.658    ***


Failure Surface Specified By  6 Coordinate Points


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

    1        483.62      197.25
    2        487.66      194.78
    3        499.85      189.09
    4        720.58      221.21
    5        731.20      243.99
    6        733.83      248.29

        ***     4.671    ***


1
Failure Surface Specified By  6 Coordinate Points
```

PYL 12/12/29

W^v = [illegible]

```
3 Boxes Specified For Generation Of Central Block Base


Length Of Line Segments For Active And Passive Portions Of
Sliding Block Is  30.0


Box        X-Left     Y-Left     X-Right    Y-Right      Height
No.         (ft)       (ft)       (ft)       (ft)         (ft)

 1         230.00     130.00     330.00     135.00       25.00
 2         420.00     135.00     475.00     139.00       15.00
 3         510.00     138.00     620.00     145.00       10.00
1

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 14 Coordinate Points


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

    1        265.21      160.00
    2        271.94      156.64
    3        285.26      150.00
    4        296.87      144.21
    5        323.72      130.83
    6        435.85      128.94
    7        615.99      142.57
    8        619.70      150.00
    9        633.08      176.85
   10        637.50      185.71
   11        644.20      199.14
   12        656.88      226.33
   13        658.24      229.25
   14        660.30      233.29

      ***     5.231    ***


Failure Surface Specified By 13 Coordinate Points


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

    1        249.96      160.00
    2        257.94      156.02
    3        270.02      150.00
    4        292.62      138.73
    5        430.56      129.25
```

PTL 12/11/89
WYL 2/5/90

```
        1        487.44      198.03
        2        491.49      195.55
        3        500.73      191.24
        4        746.67      224.54
        5        758.29      249.47
        6        760.96      253.82


          ***      4.674    ***



   Failure Surface Specified By  6 Coordinate Points


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

        1        458.39      192.11
        2        462.37      189.67
        3        471.14      185.57
        4        721.51      218.93
        5        733.41      244.44
        6        736.04      248.74


          ***      4.677    ***


   Failure Surface Specified By  6 Coordinate Points


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

        1        462.38      192.92
        2        466.37      190.47
        3        473.78      187.02
        4        639.79      213.94
        5        645.76      226.73
        6        648.28      230.84


          ***      4.678    ***


1
   Failure Surface Specified By  6 Coordinate Points


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

        1        458.27      192.08
        2        462.25      189.64
        3        469.97      186.04
        4        633.39      212.82
```

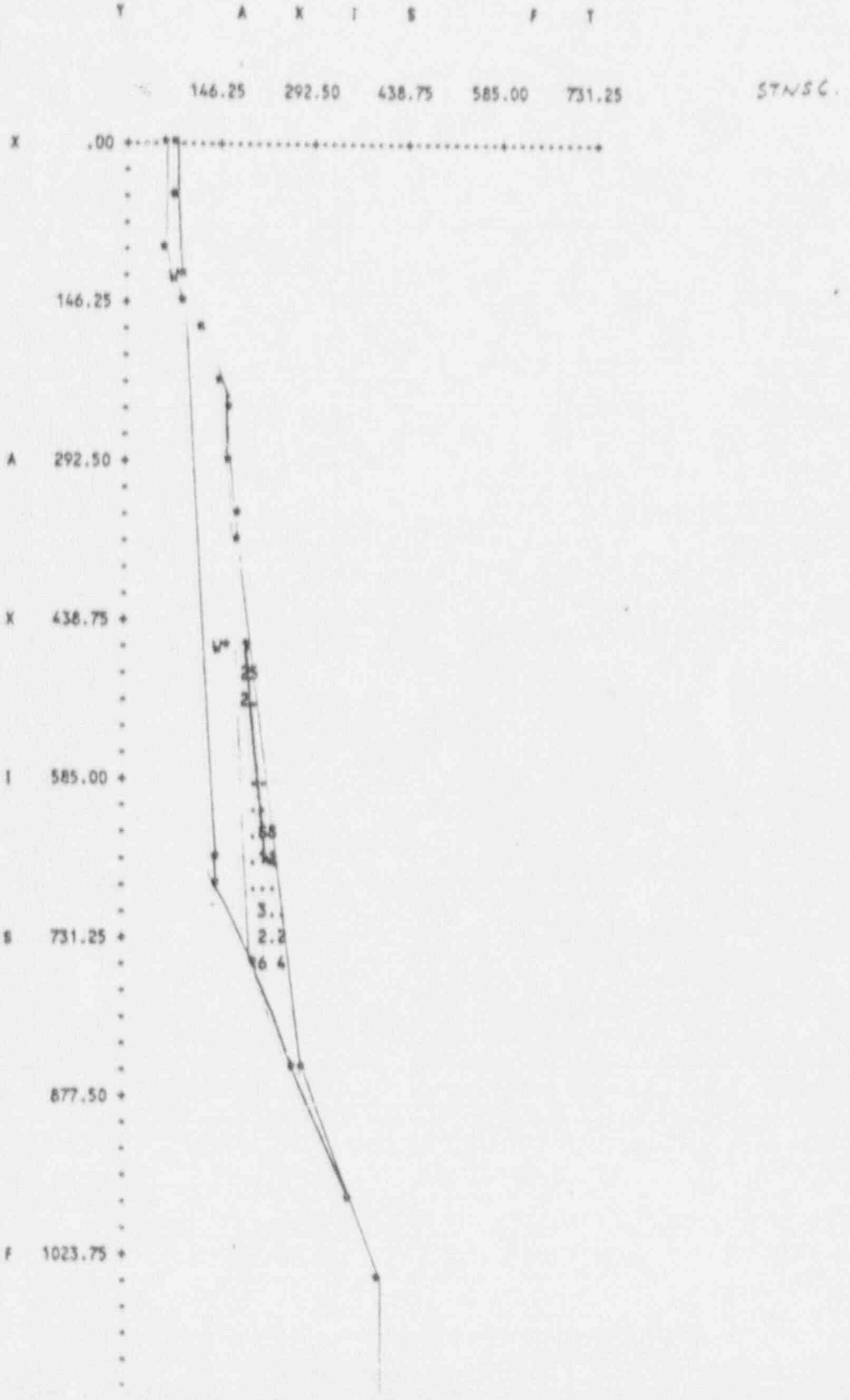
PYL 12/12/89
WYL 2/5/90

```
                    ** PCSTABL5 **

                          by
                   Purdue University


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


Run Date:
Time of Run:
Run By:                    PYL
Input Data Filename:       B:LTNSALL2.DAT
Output Filename:           B:LTNSALL2.OUT
Plotted Output Filename:   B:LTNSALL2.PLT



PROBLEM DESCRIPTION   UMTRA-LOWMAN #1 LONG TERM NON-SEIMIC-THR
                      U ALLUVIUM II



BOUNDARY COORDINATES

    8 Top   Boundaries
   26 Total Boundaries


Boundary    X-Left    Y-Left    X-Right    Y-Right    Soil Type
   No.       (ft)      (ft)      (ft)       (ft)      Below Bnd

    1          .00     70.00      50.00      70.00        5
    2        50.00     70.00     125.00      90.00        5
    3       125.00     90.00     235.00     160.00        3
    4       235.00    160.00     295.00     160.00        3
    5       295.00    160.00     350.00     170.00        3
    6       350.00    170.00     855.00     273.00        1
    7       855.00    273.00     980.00     345.00        3
    8       980.00    345.00    1055.00     390.00        6
    9      1055.00    390.00    1170.00     390.00        6
   10       350.00    170.00     370.00     171.00        3
   11       370.00    171.00     850.00     268.00        2
   12       850.00    268.00     855.00     273.00        3
   13       370.00    171.00     750.00     210.00        3
   14       750.00    210.00     850.00     268.00        3
   15       125.00     90.00     135.00      94.00        5
   16       135.00     94.00     230.00     150.00        5
   17       230.00    150.00     235.00     155.00        4
   18       235.00    155.00     460.00     165.00        4
   19       460.00    165.00     760.00     200.00        4
   20       760.00    200.00     980.00     345.00        6
   21       230.00    150.00     680.00     150.00        5
   22       680.00    150.00     760.00     200.00        6
   23          .00     60.00      95.00      60.00        6
   24        95.00     60.00     177.00     113.00        6
```

```
     3        509.05       190.91
     4        716.36       221.45
     5        726.42       243.03
     6        729.05       247.31

  ***     4.683    ***

1
```

PYL 12/11/89

[illegible]



PYL 12/12/89
WYL 2/2/90

```
     Failure Surface Specified By 10 Coordinate Points

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

         1         321.48       164.81
         2         332.47       159.33
         3         346.60       152.29
         4         469.86       152.27
         5         654.43       169.96
         6         663.82       188.78
         7         670.32       201.82
         8         683.00       229.01
         9         685.70       234.80
        10         687.79       238.89

             ***     5.212    ***


1
     Failure Surface Specified By 10 Coordinate Points

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

         1         323.05       165.10
         2         334.45       159.42
         3         352.19       150.58
         4         530.90       153.72
         5         633.49       168.25
         6         642.48       186.29
         7         649.14       199.65
         8         661.82       226.84
         9         663.43       230.30
        10         665.50       234.35

             ***     5.213    ***


     Failure Surface Specified By 10 Coordinate Points

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

         1         318.95       164.35
         2         329.30       159.19
         3         346.38       150.68
         4         546.46       154.00
         5         664.95       165.22
         6         677.49       190.37
         7         683.89       203.22
         8         696.57       230.40
         9         699.97       237.68
```

```
      25        177.00      113.00      680.00      142.00         6
      26        670.00      142.00      680.00      150.00         6


   ISOTROPIC SOIL PARAMETERS


     6 Type(s) of Soil


    Soil  Total  Saturated  Cohesion Friction   Pore   Pressure   Piez.
    Type Unit Wt. Unit Wt. Intercept   Angle  Pressure Constant Surface
     No.  (pcf)    (pcf)     (psf)     (deg)   Param.    (psf)     No.

      1   130.0    135.0     850.0     27.0     .00        .0       1
      2   144.0    155.0        .0     40.0     .00        .0       1
      3   122.5    130.5     350.0     17.5     .00        .0       1
      4   124.5    131.0    1460.0     32.0     .00        .0       1
      5   124.5    131.0    1460.0     32.0     .00        .0       1
      6   137.0    143.5        .0     45.0     .00        .0       1
1


    1 PIEZOMETRIC SURFACE(S) HAVE BEEN SPECIFIED


    Unit Weight of Water =  62.40


    Piezometric Surface No.  1 Specified by  8 Coordinate Points


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

         1           .00       75.00
         2        115.00       75.00
         3        182.00      120.00
         4        460.00      142.00
         5        670.00      142.00
         6        980.00      345.00
         7       1055.00      390.00
         8       1170.00      390.00
1


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


     The Active And Passive Portions Of The Sliding Surfaces
     Are Generated According To The Rankine Theory.


     100 Trial Surfaces Have Been Generated.
```

PYL 12/11/89
WYL 2/15/90

PKL 12/12/89
WVL 2/5/91

```
        10        690.24      239.40

             ***      5.160    ***


1

      Failure Surface Specified By 10 Coordinate Points


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

          1         327.62       165.93
          2         340.17       159.67
          3         351.31       154.12
          4         477.29       150.65
          5         675.56       169.31
          6         686.59       191.44
          7         692.93       204.14
          8         705.61       231.33
          9         709.46       239.60
         10         711.57       243.75

             ***      5.171    ***


      Failure Surface Specified By 10 Coordinate Points


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

          1         321.04       164.74
          2         331.93       159.31
          3         349.04       150.78
          4         548.79       151.90
          5         644.24       167.03
          6         654.54       187.70
          7         661.12       200.88
          8         673.79       228.07
          9         676.02       232.84
         10         678.10       236.92

             ***      5.189    ***


1

      Failure Surface Specified By 10 Coordinate Points


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

          1         312.93       163.26
```

PKL 12/11/89

NYL 2/2/90

```
     ***     2.085   ***



  Failure Surface Specified By 10 Coordinate Points


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

       1          393.85        178.94
       2          397.68        176.59
       3          602.52        174.34
       4          411.52        167.74
       5          525.24        179.29
       6          728.80        198.54
       7          833.66        255.05
       8          838.08        261.09
       9          840.40        266.06
      10          843.17        270.59

     ***     2.090   ***


  Failure Surface Specified By 10 Coordinate Points


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

       1          391.91        178.55
       2          395.74        176.20
       3          400.24        174.10
       4          411.72        165.68
       5          519.85        173.63
       6          731.13        198.78
       7          795.47        226.29
       8          808.34        243.84
       9          816.44        261.22
      10          819.19        265.70

     ***     2.109   ***


1
  Failure Surface Specified By 10 Coordinate Points


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

       1          395.05        179.19
       2          398.89        176.84
```

PYL 12/12/89
WY [illegible]

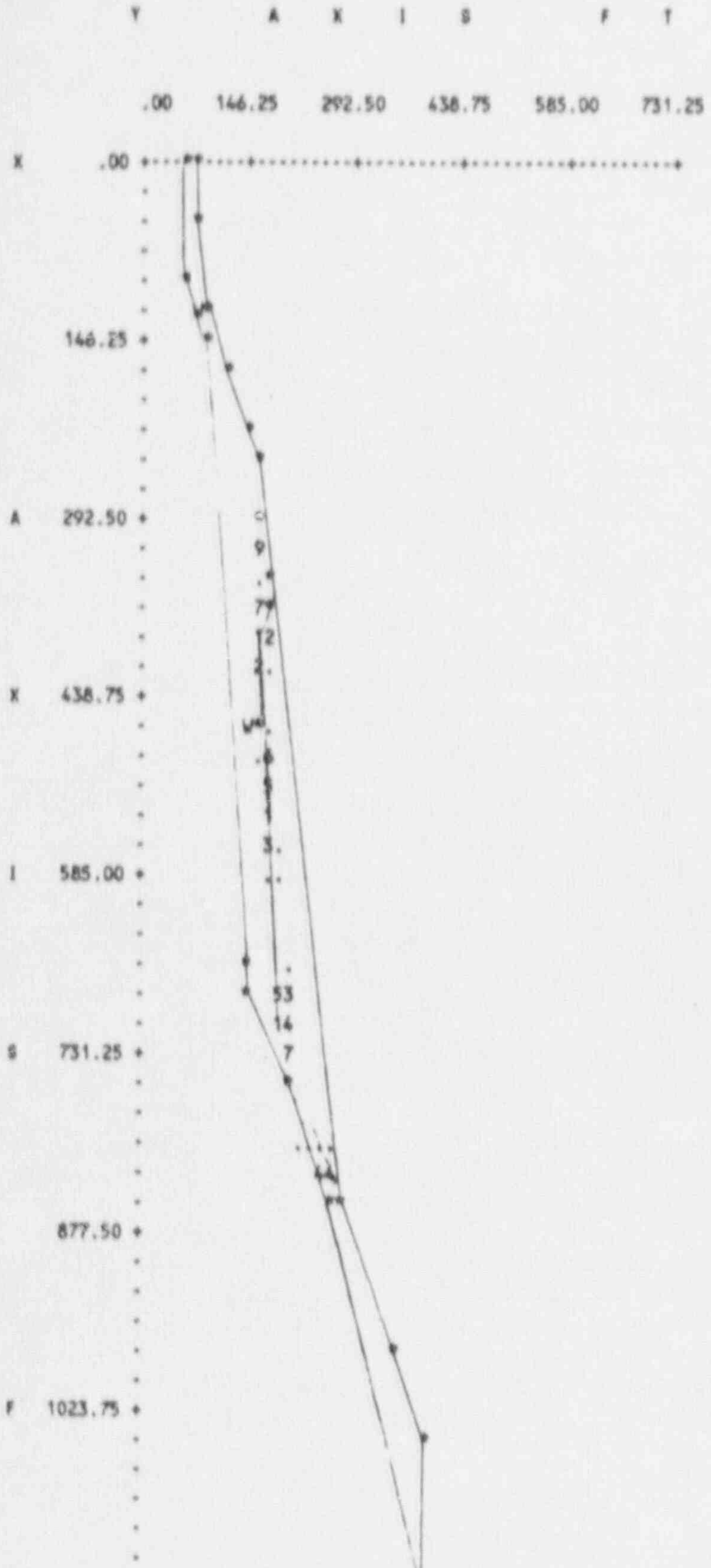
```
      25        177.00     113.00     670.00     142.00          6
      26        670.00     142.00     680.00     150.00          6
1


   ISOTROPIC SOIL PARAMETERS


    6 Type(s) of Soil


   Soil  Total  Saturated  Cohesion Friction   Pore    Pressure   Piez.
   Type Unit Wt. Unit Wt. Intercept   Angle  Pressure Constant Surface
    No.  (pcf)    (pcf)     (psf)     (deg)   Param.    (psf)     No.

     1   130.0    135.0      98.0     36.0     .00        .0       1
     2   144.0    155.0        .0     40.0     .00        .0       1
     3   122.5    130.5     245.0     37.0     .00        .0       1
     4   124.5    131.0     885.0     37.0     .00        .0       1
     5   124.5    131.0     885.0     37.0     .00        .0       1
     6   137.0    143.5        .0     45.0     .00        .0       1
1


   1 PIEZOMETRIC SURFACE(S) HAVE BEEN SPECIFIED


   Unit Weight of Water =  62.40


   Piezometric Surface No.  1 Specified by  8 Coordinate Points


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

       1           .00      75.00
       2        115.00      75.00
       3        182.00     120.00
       4        460.00     142.00
       5        670.00     142.00
       6        980.00     345.00
       7       1055.00     390.00
       8       1170.00     390.00
1


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


   The Active And Passive Portions Of The Sliding Surfaces
   Are Generated According To The Rankine Theory.


   100 Trial Surfaces Have Been Generated.
```

PYL 12/11/89
WYL 2/2/90

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

     1        332.19       166.76
     2        335.16       164.59
     3        472.97       173.94
     4        730.03       201.61
     5        813.44       238.65
     6        823.83       252.82
     7        828.93       263.74
     8        831.68       268.24

       ***     2.167     ***

1
 Failure Surface Specified By 10 Coordinate Points

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

     1        381.19       176.36
     2        385.00       174.03
     3        387.62       172.81
     4        400.00       163.73
     5        46[illegible].28       173.47
     6        731.67       202.37
     7        836.49       252.11
     8        846.76       266.12
     9        847.39       267.47
    10        850.18       272.02

       ***     2.177     ***


 Failure Surface Specified By  9 Coordinate Points

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

     1        357.09       171.45
     2        358.74       170.44
     3        365.04       165.82
     4        488.21       177.34
     5        735.64       203.37
     6        821.35       246.81
     7        827.19       254.77
     8        831.63       264.29
     9        834.39       268.80

       ***     2.206     ***
```

PYL 12/12/89
WL 2/5/90

1



1

PYL 12/11/89
WYL 2/5/90

```
                    ** PCSTABL5 **

                          by
                   Purdue University


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


Run Date:
Time of Run:
Run By:                      PYL
Input Data Filename:         A:STNSALL1.DAT
Output Filename:             A:STNSALLB.OUT
Plotted Output Filename:     A:STNSALLB.PLT



PROBLEM DESCRIPTION   UMTRA-LOWMAN #1 SHORT TERM NON-SEISMIC-TH
                      RU ALLUVIUM !



BOUNDARY COORDINATES

    8 Top   Boundaries
   26 Total Boundaries


Boundary     X-Left     Y-Left     X-Right     Y-Right     Soil Type
  No.         (ft)       (ft)       (ft)        (ft)       Below Bnd

   1            .00      70.00       50.00       70.00         5
   2          50.00      70.00      125.00       90.00         5
   3         125.00      90.00      235.00      160.00         3
   4         235.00     160.00      295.00      160.00         3
   5         295.00     160.00      350.00      170.00         3
   6         350.00     170.00      855.00      273.00         1
   7         855.00     273.00      980.00      345.00         3
   8         980.00     345.00     1055.00      390.00         6
   9        1055.00     390.00     1170.00      390.00         6
  10         350.00     170.00      370.00      171.00         3
  11         370.00     171.00      850.00      268.00         2
  12         850.00     268.00      855.00      273.00         3
  13         370.00     171.00      750.00      210.00         3
  14         750.00     210.00      850.00      268.00         3
  15         125.00      90.00      135.00       94.00         5
  16         135.00      94.00      230.00      150.00         5
  17         230.00     150.00      235.00      155.00         4
  18         235.00     155.00      460.00      165.00         4
  19         460.00     165.00      760.00      200.00         4
  20         760.00     200.00      980.00      345.00         6
  21         230.00     150.00      680.00      150.00         5
  22         680.00     150.00      760.00      200.00         6
  23            .00      60.00       95.00       60.00         6
  24          95.00      60.00      177.00      113.00         6
```

PYL 12/12/89

WVL 2/[illegible]/90

```
      3        395.64      173.63
      4        407.23      167.85
      5        523.83      173.90
      6        677.67      193.26
      7        823.70      248.86
      8        826.42      254.33
      9        831.01      264.16
     10        833.25      268.56


        ***     4.115    ***


   Failure Surface Specified By 10 Coordinate Points


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

      1        384.92      177.12
      2        389.28      174.90
      3        392.65      173.33
      4        403.91      167.72
      5        495.47      170.19
      6        708.16      198.17
      7        822.82      246.84
      8        826.60      254.43
      9        831.15      264.19
     10        833.40      268.59


        ***     4.119    ***


1
   Failure Surface Specified By  9 Coordinate Points


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

      1        361.53      172.35
      2        364.71      170.74
      3        376.56      164.83
      4        530.16      173.16
      5        732.77      199.54
      6        818.52      244.75
      7        822.02      251.77
      8        827.46      263.45
      9        829.70      267.84


        ***     4.120    ***


   Failure Surface Specified By 10 Coordinate Points
```

PYL 12/11/89
WYL 2/5/90

```
3 Boxes Specified For Generation Of Central Block Base

Length Of Line Segments For Active And Passive Portions Of
Sliding Block Is  30.0

Box        X-Left     Y-Left     X-Right     Y-Right      Height
No.         (ft)       (ft)       (ft)        (ft)         (ft)

 1         320.00     153.00     370.00      153.00        5.00
 2         460.00     153.00     550.00      155.00       10.00
 3         620.00     160.00     680.00      160.00       20.00

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 10 Coordinate Points
```

STNSALL1.OUT

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

    1        329.62      166.29
    2        338.74      159.61
    3        347.18      154.93
    4        535.60      150.98
    5        666.39      169.26
    6        678.14      190.45
    7        687.79      203.62
    8        700.47      230.80
    9        704.06      238.51
   10        706.46      242.74

        ***    4.804    ***

Failure Surface Specified By 10 Coordinate Points

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

    1        331.72      166.68
    2        341.21      159.72
    3        351.31      154.12
    4        477.29      150.65
    5        675.56      169.31
    6        687.91      191.59
    7        697.46      204.61
    8        710.13      231.80
    9        714.22      240.56
```

PYL 12/12/89

WPL 2/1/'90

```
4 Boxes Specified For Generation Of Central Block Base


Length Of Line Segments For Active And Passive Portions Of
Sliding Block Is  30.0


Box        X-Left     Y-Left     X-Right    Y-Right      Height
No.         (ft)       (ft)       (ft)       (ft)         (ft)


 1         320.00     162.00     420.00     167.00       5.00
 2         460.00     170.00     580.00     180.00      10.00
 3         670.00     195.00     740.00     204.00      10.00
 4         795.00     228.00     845.00     260.00       5.00
1

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  9 Coordinate Points


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


   1        365.66      173.19
   2        369.97      171.00
   3        380.27      160.86
   4        547.74      175.54
   5        706.93      195.10
   6        843.03      258.24
   7        847.04      266.28
   8        847.62      267.52
   9        849.88      271.96

       ***      4.098   ***


Failure Surface Specified By 10 Coordinate Points


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


   1        388.11      177.77
   2        392.48      175.54
   3        396.41      173.71
   4        409.18      167.34
   5        469.92      167.26
   6        700.91      195.66
   7        841.86      257.22
   8        846.11      265.74
   9        846.87      267.37
```

LTNSCOLL.DAT

PYL 12/11/89
WYL 2/4/90

```
        2         335.17        159.45
        3         349.23        151.66
        4         540.70        151.47
        5         648.22        166.80
        6         660.17        188.35
        7         670.03        201.79
        8         682.71        228.98
        9         685.39        234.73
       10         687.96        238.93


          ***     4.846   ***




     Failure Surface Specified By 10 Coordinate Points


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

        1         322.95        165.08
        2         330.89        159.26
        3         346.38        150.65
        4         546.46        154.00
        5         664.95        165.22
        6         678.99        190.55
        7         688.63        203.70
        8         701.31        230.89
        9         704.95        238.69
       10         707.55        242.93


          ***     4.879


1

     Failure Surface Specified By 10 Coordinate Points


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

        1         316.22        163.86
        2         322.97        158.91
        3         334.80        152.35
        4         530.55        151.96
        5         638.88        169.11
        6         648.81        187.03
        7         658.79        200.64
        8         671.47        227.83
        9         673.58        232.35
       10         676.13        236.52


          ***     4.881   ***
```

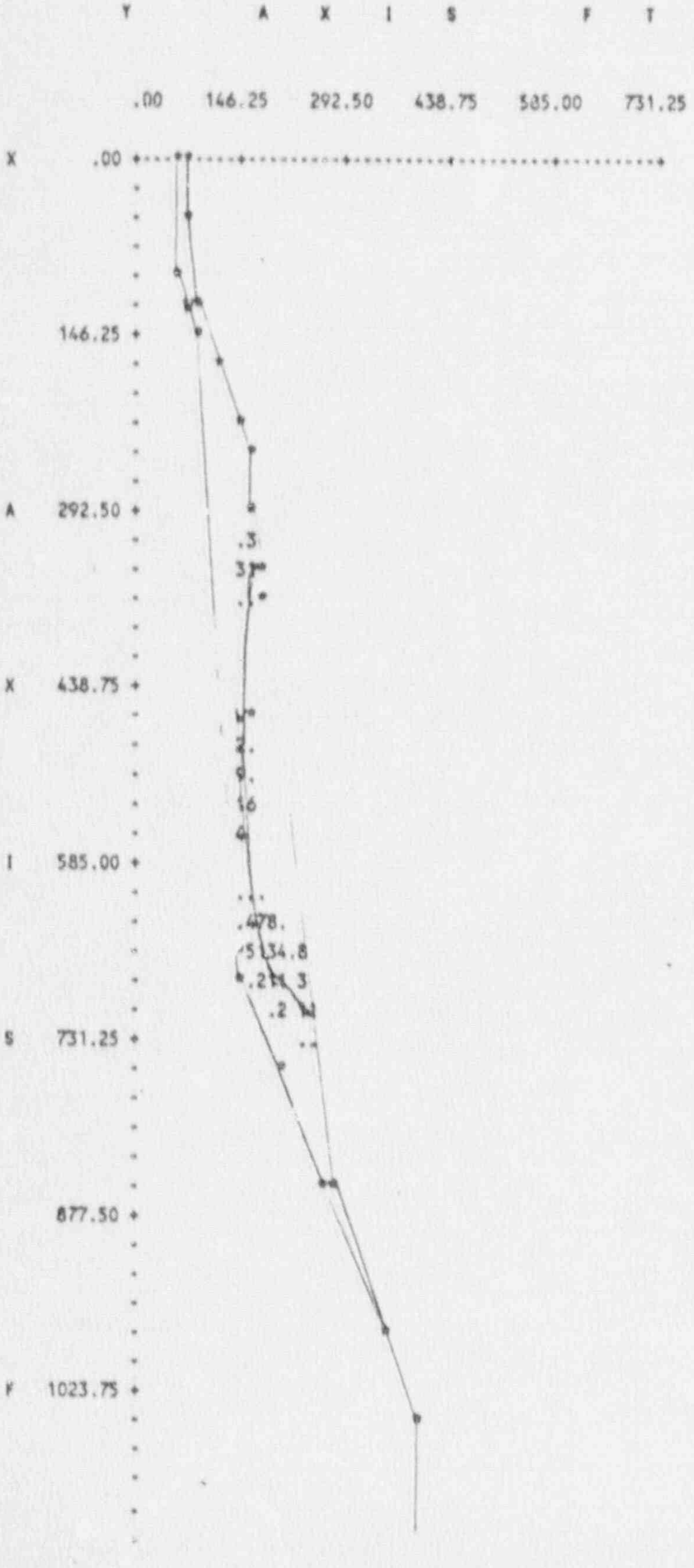
PYL 12/12/89
[illegible]

```
                    ** PCSTABL5 **

                          by
                   Purdue University

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


Run Date:
Time of Run:
Run By:                    PYL
Input Data Filename:       A:LTNSCOLL.DAT
Output Filename:           A:LTNSCOLL.OUT
Plotted Output Filename:   A:LTNSCOLL.PLT



PROBLEM DESCRIPTION   UMTRA-LOWMAN #1 LONG TERM NON-SEIMIC-THR
                      U COLLUVIUM



BOUNDARY COORDINATES

    8 Top   Boundaries
   26 Total Boundaries

Boundary     X-Left     Y-Left     X-Right    Y-Right    Soil Type
  No.         (ft)       (ft)       (ft)       (ft)      Below Bnd

    1           .00      70.00      50.00      70.00         5
    2         50.00      70.00     125.00      90.00         5
    3        125.00      90.00     235.00     160.00         3
    4        235.00     160.00     295.00     160.00         3
    5        295.00     160.00     350.00     170.00         3
    6        350.00     170.00     855.00     273.00         1
    7        855.00     273.00     980.00     345.00         3
    8        980.00     345.00    1055.00     390.00         6
    9       1055.00     390.00    1170.00     390.00         6
   10        350.00     170.00     370.00     171.00         3
   11        370.00     171.00     850.00     268.00         2
   12        850.00     268.00     855.00     273.00         [illegible]
   13        370.00     171.00     750.00     210.00         3
   14        750.00     210.00     850.00     268.00         3
   15        125.00      90.00     135.00      94.00         5
   16        135.00      94.00     230.00     150.00         5
   17        230.00     150.00     235.00     155.00         4
   18        235.00     155.00     460.00     165.00         4
   19        460.00     165.00     760.00     200.00         4
   20        760.00     200.00     980.00     345.00         6
   21        230.00     150.00     680.00     150.00         5
   22        680.00     150.00     760.00     200.00         6
   23           .00      60.00      95.00      60.00         6
   24         95.00      60.00     177.00     113.00         6
```

```
     10       692.92      239.94

       ***    4.890   ***

1
```

PYL 12/11/89
WYL 2/5/90

STN8 ALLI



PYL 12/12/89

WYL 2/5/90

```
       5        602.00       217.88
       6        603.99       221.80

         ***      4.562    ***


 Failure Surface Specified By  6 Coordinate Points


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

       1        491.54       198.87
       2        496.19       196.50
       3        510.40       189.87
       4        713.70       221.23
       5        723.60       242.46
       6        725.73       246.63

         ***      4.581    ***
```

PYL 12/11/89
WYL 2/5/90

```
      25        177.00     113.00     670.00     142.00        6
      26        670.00     142.00     680.00     150.00        6


  ISOTROPIC SOIL PARAMETERS


    6 Type(s) of Soil


  Soil   Total   Saturated  Cohesion Friction   Pore    Pressure   Piez.
  Type Unit Wt. Unit Wt. Intercept   Angle  Pressure Constant Surface
  No.   (pcf)    (pcf)     (psf)     (deg)   Param.    (psf)     No.

    1   130.0    135.0     850.0     27.0     .00        .0       1
    2   144.0    155.0        .0     40.0     .00        .0       1
    3   122.5    130.5     350.0     17.5     .00        .0       1
    4   124.5    131.0    1460.0     32.0     .00        .0       1
    5   124.5    131.0    1460.0     32.0     .00        .0       1
    6   137.0    143.5        .0     45.0     .00        .0       1
1


  1 PIEZOMETRIC SURFACE(S) HAVE BEEN SPECIFIED


  Unit Weight of Water =  62.40


  Piezometric Surface No.  1 Specified by  8 Coordinate Points


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

      1           .00       75.00
      2        115.00       75.00
      3        182.00      120.00
      4        460.00      142.00
      5        670.00      142.00
      6        980.00      345.00
      7       1055.00      390.00
      8       1170.00      390.00
1


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


  The Active And Passive Portions Of The Sliding Surfaces
  Are Generated According To The Rankine Theory.


  100 Trial Surfaces Have Been Generated.
```

PYL 12/12/89
2/5/90

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

        1        456.79      191.78
        2        461.35      189.46
        3        468.39      186.18
        4        650.42      214.81
        5        657.04      229.01
        6        659.09      233.04


         ***     4.506    ***



     Failure Surface Specified By  6 Coordinate Points


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

        1        471.53      194.79
        2        476.13      192.45
        3        481.63      189.88
        4        638.23      214.39
        5        643.80      226.33
        6        645.84      230.34


         ***     4.517    ***


1
     Failure Surface Specified By  6 Coordinate Points


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

        1        476.22      195.74
        2        480.82      193.40
        3        491.30      18[illegible].51
        4        605.26      211.08
        5        609.11      219.32
        6        611.11      223.26


         ***     4.517    ***



     Failure Surface Specified By  6 Coordinate Points


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

PYL 12/11/89
WYL 3/5/90

```
        6         611.86        149.13
        7         612.34        150.00
        8         626.88        176.24
        9         631.76        185.04
       10         641.93        198.91
       11         654.61        226.10
       12         555.85        228.77
       13         6[illegible].38        232.90

          ***      4.899    ***

1

     Failure Surface Specified By 13 Coordinate Points

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

        1         283.90        160.00
        2         287.54        157.33
        3         300.77        150.[illegible]
        4         311.61        143.[illegible]
        5         424.06        133.06
        6         609.55        145.79
        7         611.88        150.00
        8         626.42        176.24
        9         631.27        184.98
       10         641.45        198.86
       11         654.13        226.05
       12         655.34        228.66
       13         657.88        232.79

          ***      4.916    ***


     Failure Surface Specified By 13 Coordinate Points

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

        1         277.32        160.00
        2         281.33        157.06
        3         294.07        150.00
        4         307.61        142.50
        5         447.19        130.10
        6         589.67        140.73
        7         594.81        150.00
        8         609.36        176.24
        9         613.02        182.85
       10         623.40        197.01
       11         636.08        224.20
       12         636.38        224.83
       13         638.88        228.92
```

PYL 12/12/89
WYL 2/2/90

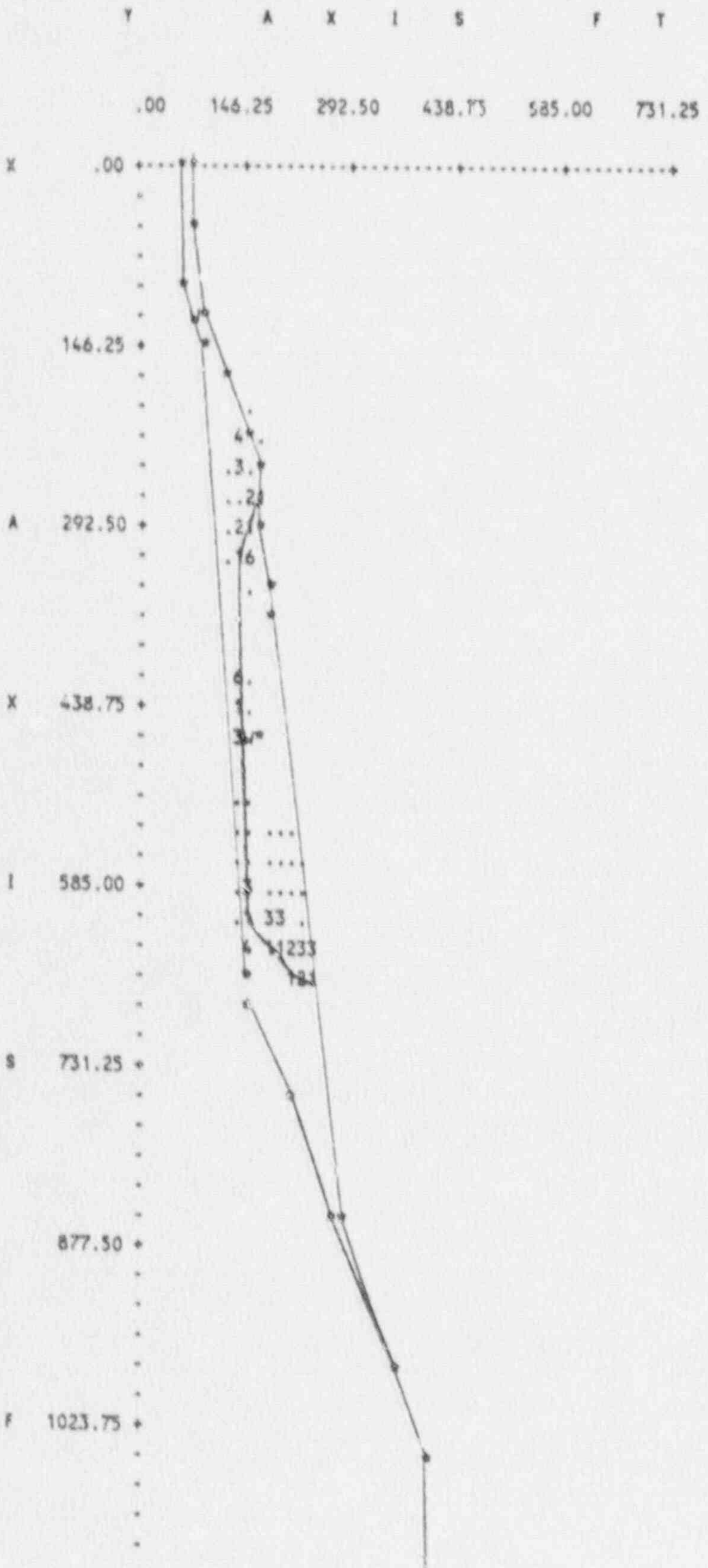
```
      25        177.00      113.00      670.00      142.00         6
      26        670.00      142.00      680.00      150.00         6
1


   ISOTROPIC SOIL PARAMETERS


    6 Type(s) of Soil


   Soil   Total   Saturated  Cohesion Friction   Pore    Pressure   Piez.
   Type Unit Wt. Unit Wt. Intercept   Angle  Pressure Constant Surface
    No.   (pcf)     (pcf)      (psf)     (deg)   Param.     (psf)      No.

     1   130.0     135.0       98.0      36.0     .00        .0        1
     2   144.0     155.0         .0      40.0     .00        .0        1
     3   122.5     130.5      245.0      37.0     .00        .0        1
     4   124.5     131.0      885.0      37.0     .00        .0        1
     5   124.5     131.0      885.0      37.0     .00        .0        1
     6   137.0     143.5         .0      45.0     .00        .0        1
1


   1 PIEZOMETRIC SURFACE(S) HAVE BEEN SPECIFIED


   Unit Weight of Water =  62.40


   Piezometric Surface No.  1 Specified by  8 Coordinate Points


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

       1            .00        75.00
       2         115.00        75.00
       3         182.00       120.00
       4         460.00       142.00
       5         670.00       142.00
       6         980.00       345.00
       7        1035.00       390.00
       8        1170.00       390.00
1


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


   The Active And Passive Portions Of The Sliding Surfaces
   Are Generated According To The Rankine Theory.


   100 Trial Surfaces Have Been Generated.
```

PYL 12/11/89
WJL 2/[illegible]/90

```
     1        211.85      145.27
     2        216.36      141.96
     3        230.80      133.96
     4        470.04      132.87
     5        610.89      142.62
     6        614.98      150.00
     7        629.53      176.24
     8        634.59      185.37
     9        644.72      199.20
    10        657.40      226.38
    11        658.79      229.36
    12        661.33      233.50

        ***      5.015    ***


Failure Surface Specified By 13 Coordinate Points


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

     1        254.26      160.00
     2        259.59      156.09
     3        270.58      150.00
     4        284.36      142.36
     5        466.20      13[illegible]
     6        595.04      1[illegible]
     7        596.13      15[illegible]
     8        610.6[illegible]      176.2[illegible]
     9        614.43      183.02
    10        624.80      197.15
    11        637.47      224.34
    12        637.84      225.[illegible]
    13        640.35      229.22

        ***      5.034    ***


1

Failure Surface Specified By 12 Coordinate Points


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

     1        [illegible]32.30      160.00
     2        [illegible]86.02      157.27
     3        299.13      150.00
     4        319.18      138.89
     5        424.55      129.98
     6        558.57      137.78
     7        565.35      150.00
     8        579.90      176.24
     9        581.52      179.18
```

```
  11     631.08     227.33

      ***    2.687    ***
```

PYL 12/12/79
WVC 2/5/80

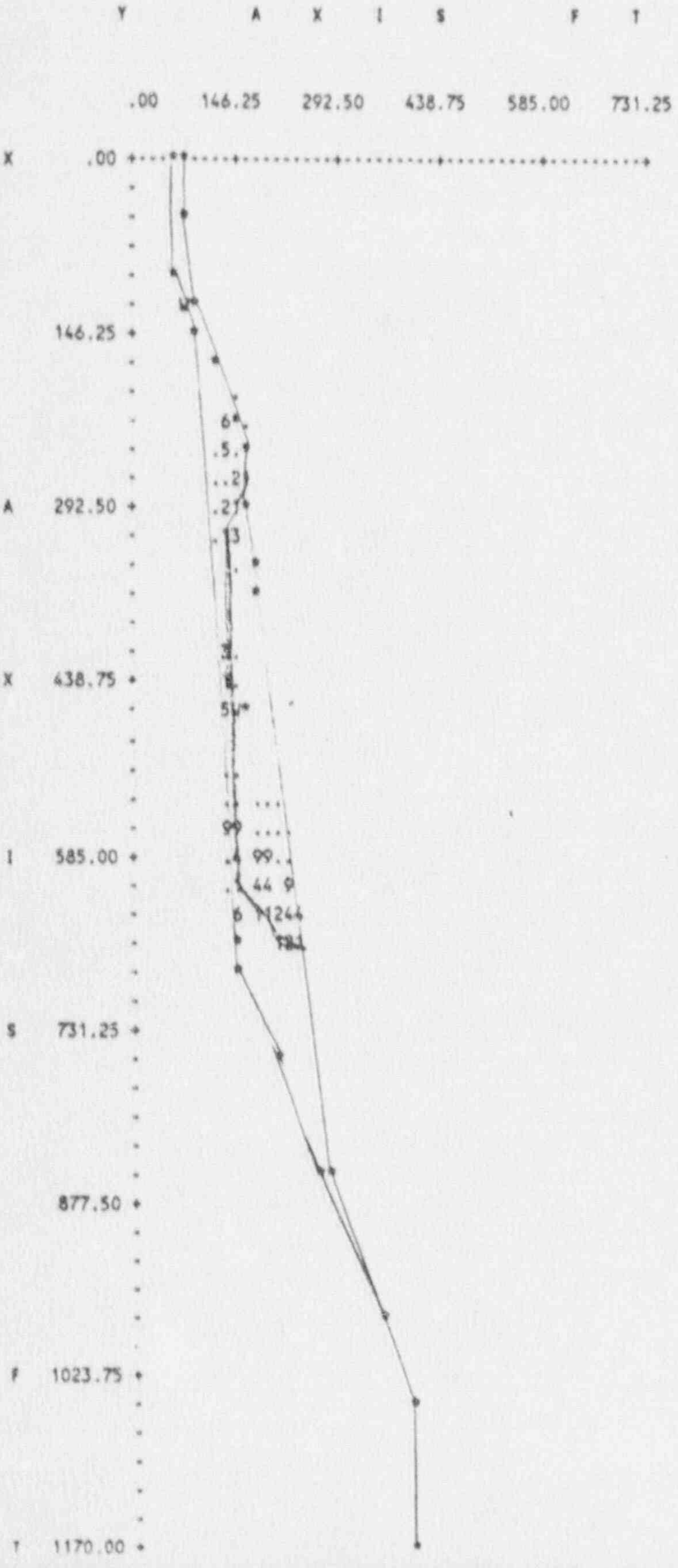


STSALL2.

```
   10        598.75      194.48
   11        610.46      219.59
   12        612.94      223.63

      ***     5.093   ***
```

PYL 12/11/89
WYL 2/2/90

STNSALL II.



PYL 12/12/89
[illegible]

```
1
    Failure Surface Specified By 13 Coordinate Points


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

        1        277.32      160.00
        2        281.33      157.06
        3        294.07      150.00
        4        307.61      142.50
        5        447.19      130.10
        6        589.67      140.73
        7        594.81      150.00
        8        609.36      176.24
        9        613.02      182.85
       10        623.40      197.01
       11        636.08      224.20
       12        636.38      224.83
       13        638.88      228.92

          ***     2.635    ***


    Failure Surface Specified By 13 Coordinate Points


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

        1        254.26      160.00
        2        259.59      156.09
        3        270.58      150.00
        4        284.36      142.36
        5        466.20      132.33
        6        595.04      148.04
        7        596.13      150.00
        8        610.68      176.24
        9        614.43      183.02
       10        624.80      197.15
       11        637.47      224.34
       12        637.84      225.13
       13        640.35      229.22

          ***     2.662    ***


1
    Failure Surface Specified By 13 Coordinate Points


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

PYL 12/12/89
WYL 2/5/90

```
     25        177.00     113.00     670.00     142.00        6
     26        670.00     142.00     680.00     150.00        6


ISOTROPIC SOIL PARAMETERS


  6 Type(s) of Soil


 Soil  Total   Saturated  Cohesion Friction   Pore    Pressure   Piez.
 Type Unit Wt. Unit Wt.  Intercept   Angle  Pressure Constant  Surface
  No.  (pcf)    (pcf)      (psf)     (deg)   Param.    (psf)      No.

   1   130.0    135.0     850.0     27.0      .00        .0        1
   2   144.0    155.0        .0     40.0      .00        .0        1
   3   122.5    130.5     350.0     17.5      .00        .0        1
   4   124.5    131.0    1460.0     32.0      .00        .0        1
   5   124.5    131.0    1460.0     32.0      .00        .0        1
   6   137.0    143.5        .0     45.0      .00        .0        1



 1 PIEZOMETRIC SURFACE(S) HAVE BEEN SPECIFIED


 Unit Weight of Water =  62.40


 Piezometric Surface No.  1 Specified by  8 Coordinate Points


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

     1          .00        75.00
     2       115.00        75.00
     3       182.00       120.00
     4       460.00       142.00
     5       670.00       142.00
     6       980.00       365.00
     7      1055.00       390.00
     8      1170.00       390.00


 A Horizontal Earthquake Loading Coefficient
 Of .170 Has Been Assigned

 A Vertical Earthquake Loading Coefficient
 Of .000 Has Been Assigned

 Cavitation Pressure =     .0 psf


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

PYL 12/12/89
WYL 2/5/90

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

   1       255.94     160.00
   2       261.17     156.16
   3       272.29     150.00
   4       292.62     138.73
   5       430.56     129.25
   6       611.86     149.13
   7       612.34     150.00
   8       626.88     176.24
   9       631.76     185.04
  10       641.93     198.91
  11       654.61     226.10
  12       655.85     228.77
  13       658.38     232.90

      ***     2.592    ***

1

   Failure Surface Specified By 12 Coordinate Points

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

   1       207.96     142.79
   2       212.53     139.58
   3       238.32     125.18
   4       457.42     130.79
   5       586.50     143.81
   6       589.94     150.00
   7       604.48     176.24
   8       607.81     182.24
   9       618.25     196.48
  10       630.92     223.67
  11       630.96     223.75
  12       633.45     227.31

      ***     2.593    ***

   Failure Surface Specified By 12 Coordinate Points

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

   1       215.76     147.76
   2       220.41     144.35
   3       231.19     138.37
   4       465.10     131.86
   5       618.19     142.97
```

PYL 12/12/89
WYL 2/5/90

```
      5        745.30      246.84
      6        747.95      251.17

        ***      2.435     ***


  Failure Surface Specified By  6 Coordinate Points

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

      1        458.39      192.11
      2        462.37      189.67
      3        471.14      185.57
      4        721.51      218.93
      5        733.41      244.44
      6        736.04      248.74

        ***      2.436     ***


  Failure Surface Specified by  6 Coordinate Points

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

      1        457.37      191.90
      2        461.35      189.46
      3        468.39      186.18
      4        650.42      214.81
      5        657.04      229.01
      6        659.57      233.14

        ***      2.436     ***

1
  Failure Surface Specified By  6 Coordinate Points

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

      1        483.62      197.25
      2        487.66      194.78
      3        499.85      189.09
               720.58      221.21
      5        731.20      243.99
      6        733.83      248.29
```

PYL 12/12/89
WYL 2/5/90

```
      25       177.00     113.00     670.00     142.00         6
      26       670.00     142.00     680.00     150.00         6
1


   ISOTROPIC SOIL PARAMETERS


    6 Type(s) of Soil


   Soil  Total  Saturated  Cohesion Friction   Pore    Pressure   Piez.
   Type Unit Wt. Unit Wt. Intercept   Angle  Pressure Constant  Surface
    No.  (pcf)    (pcf)     (psf)    (deg)   Param.    (psf)     No.

     1   130.0    135.0     850.0     27.0     .00         .0       1
     2   144.0    155.0        .0     40.0     .00         .0       1
     3   122.5    130.5     350.0     17.5     .00         .0       1
     4   124.5    131.0    1460.0     32.0     .00         .0       1
     5   124.5    131.0    1460.0     32.0     .00         .0       1
     6   137.0    143.5        .0     45.0     .00         .0       1
1


   1 PIEZOMETRIC SURFACE(S) HAVE BEEN SPECIFIED


   Unit Weight of Water =  62.40


   Piezometric Surface No.  1 Specified by  8 Coordinate Points


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

      1             .00       75.00
      2          115.00       75.00
      3          182.00      120.00
      4          460.00      142.00
      5          670.00      142.00
      6          980.00      345.00
      7         1055.00      390.00
      8         1170.00      390.00


   A Horizontal Earthquake Loading Coefficient
   Of .170 Has Been Assigned

   A Vertical Earthquake Loading Coefficient
   Of .000 Has Been Assigned

   Cavitation Pressure =      .0 psf


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

PYL 12/12/89
WYL 2/5/90

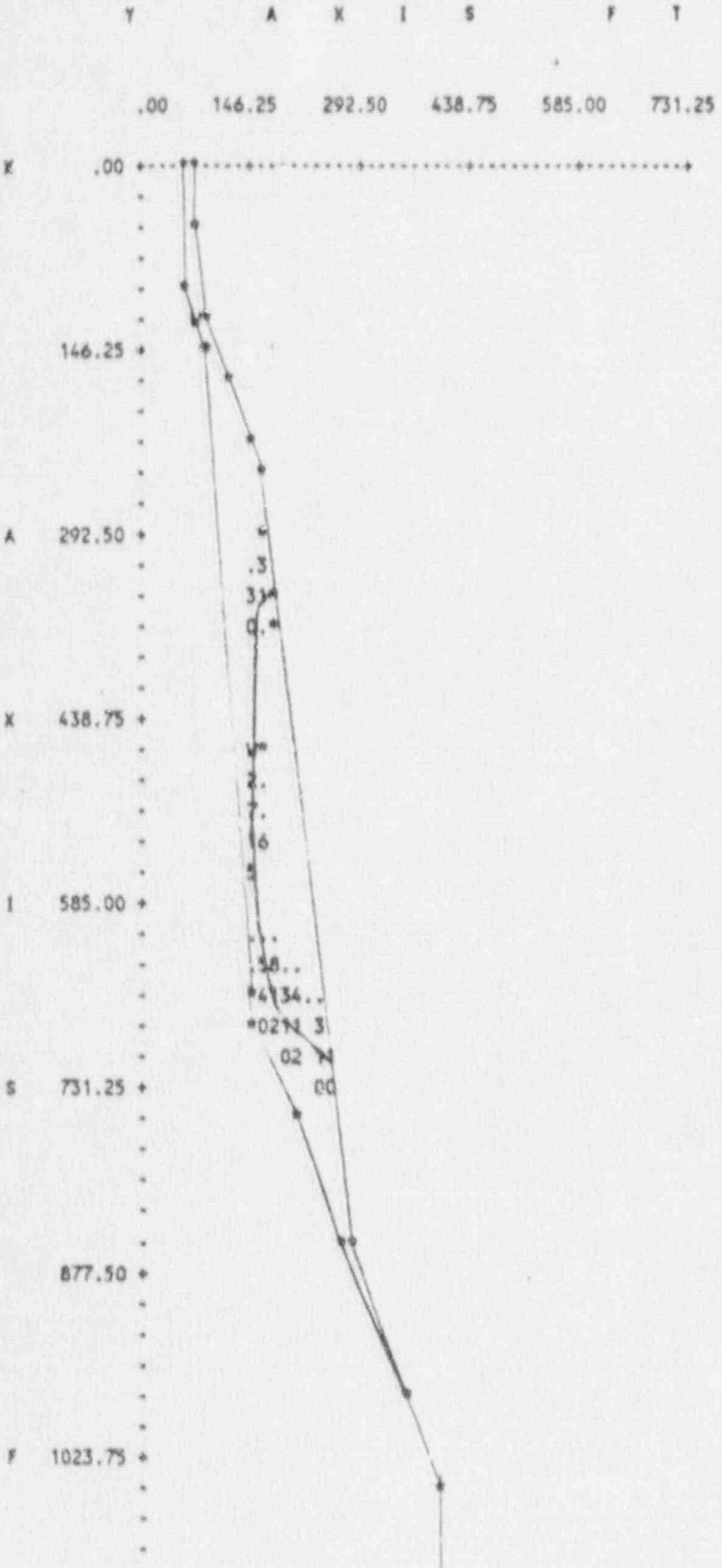
```
Failure Surface Specified By  6 Coordinate Points


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

        1        492.13      198.99
        2        496.19      196.50
        3        510.40      189.87
        4        713.70      221.23
        5        723.60      242.46
        6        726.22      246.73


         ***      2.441    ***


Failure Surface Specified By  6 Coordinate Points


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

        1        492.74      199.11
        2        496.80      196.62
        3        509.05      190.91
        4        716.36      221.45
        5        726.42      243.03
        6        729.05      247.31


         ***      2.444    ***
```

*** 2.625 ***

PYL 12/12/89

[illegible]

1



STSALL1.

1

PYL 12/12/89
WYL 2/5/90

```
                    ** PCSTABL5 **

                          by
                   Purdue University

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


Run Date:
Time of Run:
Run By:                     PYL
Input Data Filename:        A:STSCOLL.DAT
Output Filename:            A:STSCOLLB.OUT
Plotted Output Filename:    A:STSCOLLB.PLT



PROBLEM DESCRIPTION   UMTRA-LOWMAN #1 SHORT TERM SEIMIC-THRU C
                      OLLUVIUM



BOUNDARY COORDINATES

   8 Top   Boundaries
  26 Total Boundaries

Boundary     X-Left     Y-Left    X-Right    Y-Right    Soil Type
  No.         (ft)       (ft)       (ft)       (ft)     Below Bnd

   1            .00      70.00      50.00      70.00        5
   2          50.00      70.00     125.00      90.00        5
   3         125.00      90.00     235.00     160.00        3
   4         235.00     160.00     295.00     160.00        3
   5         295.00     160.00     350.00     170.00        3
   6         350.00     170.00     855.00     273.00        1
   7         855.00     273.00     980.00     345.00        3
   8         980.00     345.00    1055.00     390.00        6
   9        1055.00     390.00    1170.00     390.00        6
  10         350.00     170.00     370.00     171.00        3
  11         370.00     171.00     850.00     268.00        2
  12         850.00     268.00     855.00     273.00        3
  13         370.00     171.00     750.00     210.00        3
  14         750.00     210.00     850.00     268.00        3
  15         125.00      90.00     135.00      94.00        5
  16         135.00      94.00     230.00     150.00        5
  17         230.00     150.00     235.00     155.00        4
  18         235.00     155.00     460.00     165.00        4
  19         460.00     165.00     760.00     200.00        4
  20         760.00     200.00     980.00     345.00        6
  21         230.00     150.00     680.00     150.00        5
  22         680.00     150.00     760.00     200.00        6
  23            .00      60.00      95.00      60.00        6
  24          95.00      60.00     177.00     113.00        6
```

PYL 12/12/89

WL 2/5/90

```
     7        669.66      201.76
     8        682.34      228.94
     9        685.01      234.66
    10        687.58      238.85

       ***     2.620    ***


  Failure Surface Specified By 10 Coordinate Points

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

      1        316.22      163.86
      2        322.97      158.91
      3        334.80      152.35
      4        530.55      151.96
      5        638.88      169.11
      6        648.81      187.03
      7        658.79      200.64
      8        671.47      227.83
      9        673.58      232.35
     10        676.13      236.52

       ***     2.621    ***

1
  Failure Surface Specified By 10 Coordinate Points

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

      1        325.42      165.53
      2        333.79      159.39
      3        344.03      152.29
      4        469.86      152.27
      5        654.43      169.96
      6        664.94      188.91
      7        674.74      202.28
      8        687.42      229.47
      9        690.34      235.74
     10        692.92      239.94

       ***     2.622    ***


  Failure Surface Specified By 11 Coordinate Points

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

PYL 12/12/89
WYL 2/5/90

```
Specified.


The Active And Passive Portions Of The Sliding Surfaces
Are Generated According To The Rankine Theory.


100 Trial Surfaces Have Been Generated.


4 Boxes Specified For Generation Of Central Block Base


Length Of Line Segments For Active And Passive Portions Of
Sliding Block Is  30.0


Box        X-Left     Y-Left    X-Right     Y-Right       Height
No.         (ft)       (ft)       (ft)        (ft)          (ft)

 1         320.00     162.00     420.00      167.00         5.00
 2         460.00     170.00     580.00      180.00        10.00
 3         670.00     195.00     740.00      204.00        10.00
 4         795.00     228.00     845.00      260.00         5.00
1

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  9 Coordinate Points


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

    1         364.82      173.02
    2         368.26      170.91
    3         376.56      164.83
    4         530.16      173.16
    5         732.77      199.54
    6         818.52      244.75
    7         824.89      253.43
    8         829.77      263.91
    9         832.53      268.42

        ***     1.103    ***


Failure Surface Specified By  9 Coordinate Points


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

STSCOLL. DAT

PYL 12/12/89
WTL 2/5/90

```
           1        331.72       166.68
           2        341.21       159.72
           3        351.31       154.12
           4        477.29       150.65
           5        675.56       169.31
           6        687.91       191.59
           7        697.46       204.61
           8        710.13       231.80
           9        714.22       240.56
          10        716.83       244.82

              ***       2.579    ***


1
       Failure Surface Specified by 10 Coordinate Points


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

           1        321.13       164.75
           2        328.74       159.17
           3        339.32       153.30
           4        546.06       150.78
           5        656.02       168.69
           6        667.38       189.19
           7        677.16       202.52
           8        689.83       229.71
           9        692.88       236.25
          10        695.46       240.46

              ***       2.587    ***


       Failure Surface Specified By 10 Coordinate Points


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

           1        326.59       165.74
           2        335.17       159.45
           3        349.23       151.66
           4        540.70       151.47
           5        648.22       166.80
           6        660.17       188.35
           7        670.03       201.79
           8        682.71       228.98
           9        685.39       234.73
          10        687.96       238.93

              ***       2.600    ***
```

PYL 12/12/89
[illegible]

```
Failure Surface Specified By 10 Coordinate Points


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


       1        395.05       179.19
       2        398.89       176.84
       3        403.94       174.48
       4        411.91       168.63
       5        514.46       177.97
       6        733.45       209.02
       7        807.29       234.53
       8        818.39       249.67
       9        824.54       262.85
      10        827.29       267.35


          ***      1.125      ***



Failure Surface Specified By  9 Coordinate Points


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


       1        353.89       170.79
       2        354.79       170.24
       3        364.84       162.87
       4        493.60       173.00
       5        733.31       203.13
       6        809.54       235.57
       7        817.14       248.94
       8        823.53       262.65
       9        826.28       267.14


          ***      1.144      ***


1
Failure Surface Specified By  8 Coordinate Points


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


       1        332.19       166.76
       2        335.16       164.59
       3        472.77       173.94
       4        730.03       201.61
       5        813.44       238.65
       6        823.83       252.82
       7        828.93       263.74
       8        831.68       268.24
```

PYL 12/12/89
WYL 2 [illegible]

```
      25       177.00     113.00     670.00     142.00        6
      26       670.00     142.00     680.00     150.00        6
1


    ISOTROPIC SOIL PARAMETERS


     6 Type(s) of Soil


    Soil  Total  Saturated  Cohesion Friction   Pore    Pressure   Piez.
    Type Unit Wt. Unit Wt. Intercept   Angle  Pressure Constant  Surface
     No.  (pcf)    (pcf)     (psf)     (deg)   Param.    (psf)     No.

      1   130.0    135.0     850.0     27.0     .00        .0       1
      2   144.0    155.0        .0     40.0     .00        .0       1
      3   122.5    130.5     350.0     17.5     .00        .0       1
      4   124.5    131.0    1460.0     32.0     .00        .0       1
      5   124.5    131.0    1460 0     32.0     .00        .0       1
      6   137.0    143.5        .0     45.0     .00        .0       1
1


    1 PIEZOMETRIC SURFACE(S) HAVE BEEN SPECIFIED


    Unit Weight of Water =  62.40


    Piezometric Surface No.  1 Specified by  8 Coordinate Points


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

        1            .00        75.00
        2         115.00        75.00
        3         182.00       120.00
        4         460.00       142.00
        5         670.00       142.00
        6         980.00       345.00
        7        1055.00       390.00
        8        1170.00       390.00


    A Horizontal Earthquake Loading Coefficient
    Of .170 Has Been Assigned

     Vertical Earthquake Loading Coefficient
    Of .000 Has Been Assigned

    Cavitation Pressure =      .0 psf
1


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

PYL 12/12/89
WL 2/[illegible]/90

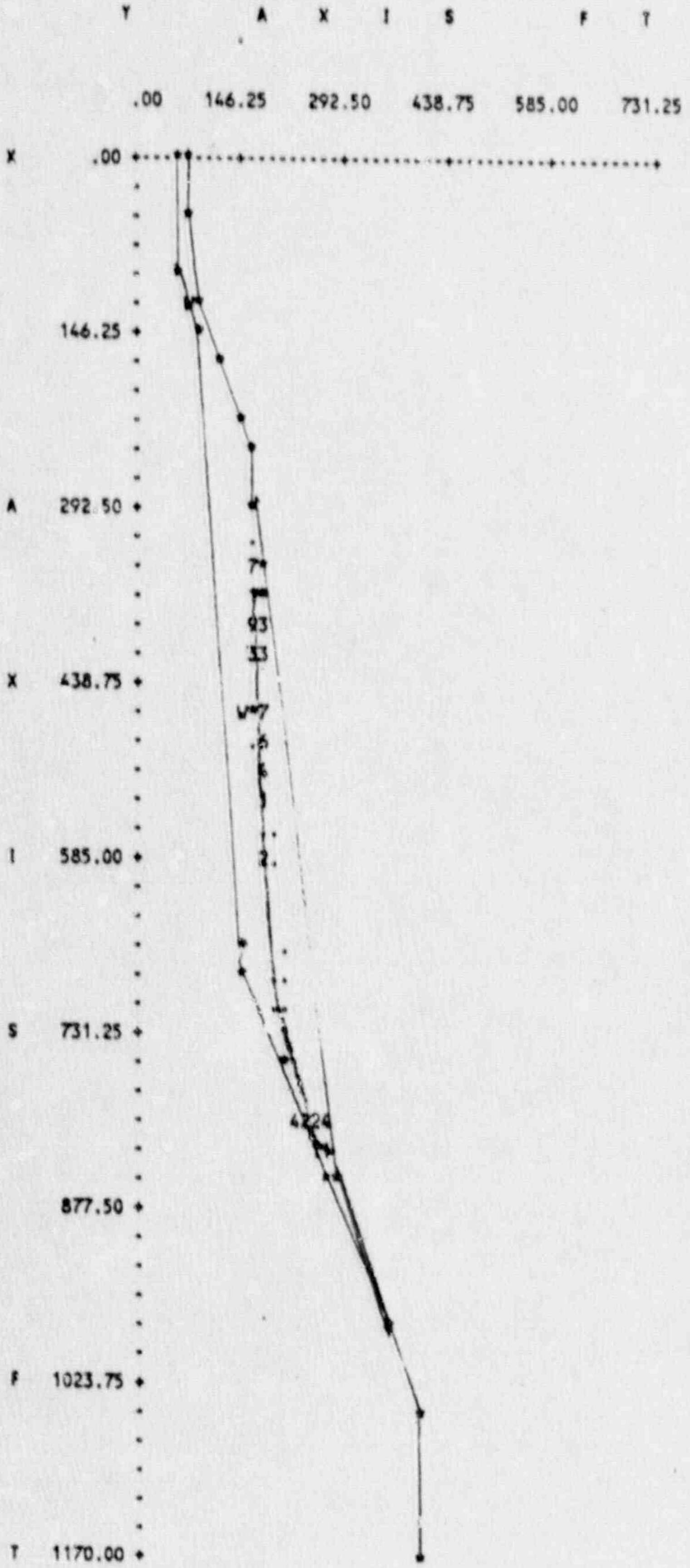
```
5        735.64      203.37
6        821.35      246.81
7        827.19      254.77
8        831.63      264.29
9        834.39      258.80


   ***     1.165   ***
```

Y 834.39 2[illegible]8.80

*** 1.165 ***

PYL 12/12/89
WYL 2/5/90

STSCELL



1

PYL 12/12/89
[illegible]

```
                    ** PCSTABL5 **

                          by
                   Purdue University


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


Run Date:
Time or Run:
Run By:                    PYL
Input Data Filename:       A:STSALL1.DAT
Output Filename:           A:STSALL1B.OUT
Plotted Output Filename:   A:STSALL1B.PLT



PROBLEM DESCRIPTION    UMTRA-LOWMAN #1 SHORT TERM SEIMIC-THRU A
                       LLUVIUM I



BOUNDARY COORDINATES

     8 Top   Boundaries
    26 Total Boundaries


Boundary     X-Left     Y-Left     X-Right     Y-Right     Soil Type
   No.        (ft)       (ft)       (ft)        (ft)       Below Bnd

    1           .00      70.00       50.00       70.00          5
    2         50.00      70.00      125.00       90.00          5
    3        125.00      90.00      235.00      160.00          1
    4        235.00     160.00      295.00      160.00          3
    5        295.00     160.00      350.00      170.00          3
    6        350.00     170.00      855.00      273.00          1
    7        855.00     273.00      980.00      345.00          3
    8        980.00     345.00     1055.00      390.00          6
    9       1055.00     390.00     1170.00      390.00          6
   10        350.00     170.00      370.00      171.00          3
   11        370.00     171.00      850.00      268.00          2
   12        850.00     268.00      855.00      273.00          3
   13        370.00     171.00      750.00      210.00          3
   14        750.00     210.00      850.00      268.00          3
   15        125.00      90.00      135.00       94.00          5
   16        135.00      94.00      230.00      150.00          5
   17        230.00     150.00      235.00      155.00          4
   18        235.00     155.00      460.00      165.00          4
   19        460.00     165.00      760.00      200.00          4
   20        760.00     200.00      980.00      345.00          6
   21        230.00     150.00      680.00      150.00          5
   22        680.00     150.00      760.00      200.00          6
   23           .00      60.00       95.00       60.00          6
   24         95.00      60.00      177.00      113.00          6
```

PYL 12/12/89
WYL 2/1/90

```
       ***    1.145   ***


  Failure Surface Specified By  9 Coordinate Points


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

       1         365.57       173.17
       2         369.18       170.96
       3         375.98       165.98
       4         546.33       180.15
       5         725.79       198.82
       6         833.07       252.04
       7         840.90       262.72
       8         842.67       266.52
       9         845.45       271.05

       ***    1.148   ***


1
  Failure Surface Specified By 10 Coordinate Points


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

       1         381.19       176.36
       2         385.00       174.03
       3         387.62       172.81
       4         400.00       163.73
       5         483.28       173.47
       6         731.67       202.37
       7         836.49       252.11
       8         846.76       266.12
       9         847.39       267.47
      10         850.18       272.02

       ***    1.155   ***


  Failure Surface Specified By  9 Coordinate Points


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

       1         357.09       171.45
       2         358.74       170.44
       3         365.04       165.82
       4         488.21       177.34
```

PYL 12/12/89
WYL 2/[illegible]/90

```
Specified.


The Active And Passive Portions Of The Sliding Surfaces
Are Generated According To The Rankine Theory.


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  30.0


Box       X-Left     Y-Left     X-Right    Y-Right      Height
No.        (ft)       (ft)       (ft)       (ft)         (ft)

 1        320.00     153.00     370.00     153.00        5.00
 2        460.00     155.00     550.00     155.00       10.00
 3        620.00     160.00     680.00     160.00       20.00


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 10 Coordinate Points


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

    1        329.62      166.29
    2        338.74      159.61
    3        347.18      154.93
    4        535.60      150.98
    5        666.39      169.26
    6        678.14      190.45
    7        687.79      203.62
    8        700.47      230.80
    9        704.06      238.51
   10        706.66      242.74

       ***     2.574    ***


Failure Surface Specified By 10 Coordinate Points


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

STEALL1.DAT

PYL 12/12/89
WYL 2/[illegible]/90

```
        1        358.74       171.78
        2        360.77       170.54
        3        370.51       163.40
        4        577.27       178.75
        5        730.72       201.09
        6        802.21       233.43
        7        810.96       245.36
        8        818.56       261.65
        9        821.30       266.13


           ***      1.105     ***



1

    Failure Surface Specified By 10 Coordinate Points


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

        1        393.85       178.94
        2        397.68       176.59
        3        402.52       174.34
        4        411.52       167.74
        5        525.24       179.29
        6        728.80       198.54
        7        833.66       255.05
        8        838.08       261.09
        9        840.40       266.06
       10        843.17       270.59


           ***      1.116     ***



    Failure Surface Specified By 10 Coordinate Points


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

        1        391.91       178.55
        2        395.74       176.20
        3        400.24       174.10
        4        411.72       165.68
        5        519.85       173.63
        6        731.13       198.78
        7        795.47       226.29
        8        808.34       243.84
        9        816.46       261.22
       10        819.19       265.70


           ***      1.117     ***
```

PYL 12/12/89

```
Failure Surface Specified By 10 Coordinate Points


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

    1         325.19      165.49
    2         333.52      159.38
    3         349.04      150.78
    4         548.79      151.90
    5         644.24      167.03
    6         655.77      187.84
    7         665.68      201.35
    8         678.36      228.54
    9         680.82      233.81
   10         683.38      238.00

        ***     2.601    ***


Failure Surface Specified By 10 Coordinate Points


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

    1         322.95      165.08
    2         330.89      159.26
    3         346.38      150.68
    4         546.46      154.00
    5         664.95      165.22
    6         678.99      190.55
    7         688.63      203.70
    8         701.31      230.89
    9         704.95      238.69
   10         707.55      242.93

        ***     2.612    ***


Failure Surface Specified By 10 Coordinate Points


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

    1         329.16      166.21
    2         338.20      159.59
    3         352.06      151.90
    4         513.45      150.24
    5         646.00      163.40
    6         659.81      188.31
```

PKL 12/12/89
[illegible]

```
      25       177.00     113.00     670.00     142.00         6
      26       670.00     142.00     680.00     150.00         6
1


    ISOTROPIC SOIL PARAMETERS


     6 Type(s) of Soil


    Soil  Total  Saturated  Cohesion Friction   Pore   Pressure  Piez.
    Type Unit Wt. Unit Wt. Intercept  Angle  Pressure Constant Surface
     No.  (pcf)    (pcf)     (psf)    (deg)   Param.    (psf)    No.

      1   130.0    135.0     850.0     27.0     .00        .0      1
      2   144.0    155.0        .0     40.0     .00        .0      1
      3   122.5    130.5     350.0     17.5     .00        .0      1
      4   124.5    131.0    1460.0     32.0     .00        .0      1
      5   124.5    131.0    1460.0     32.0     .00        .0      1
      6   137.0    143.5        .0     45.0     .00        .0      1
1


    1 PIEZOMETRIC SURFACE(S) HAVE BEEN SPECIFIED


    Unit Weight of Water =  62.40


    Piezometric Surface No.  1 Specified by  8 Coordinate Points


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

        1            .00       75.00
        2         115.00       75.00
        3         182.00      120.00
        4         460.00      142.00
        5         670.00      142.00
        6         980.00      345.00
        7        1055.00      390.00
        8        1170.00      390.00


    A Horizontal Earthquake Loading Coefficient
    Of .170 Has Been Assigned

    A Vertical Earthquake Loading Coefficient
    Of .000 Has Been Assigned

    Cavitation Pressure =      .0 psf


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

PYL 12/12/89

[illegible]

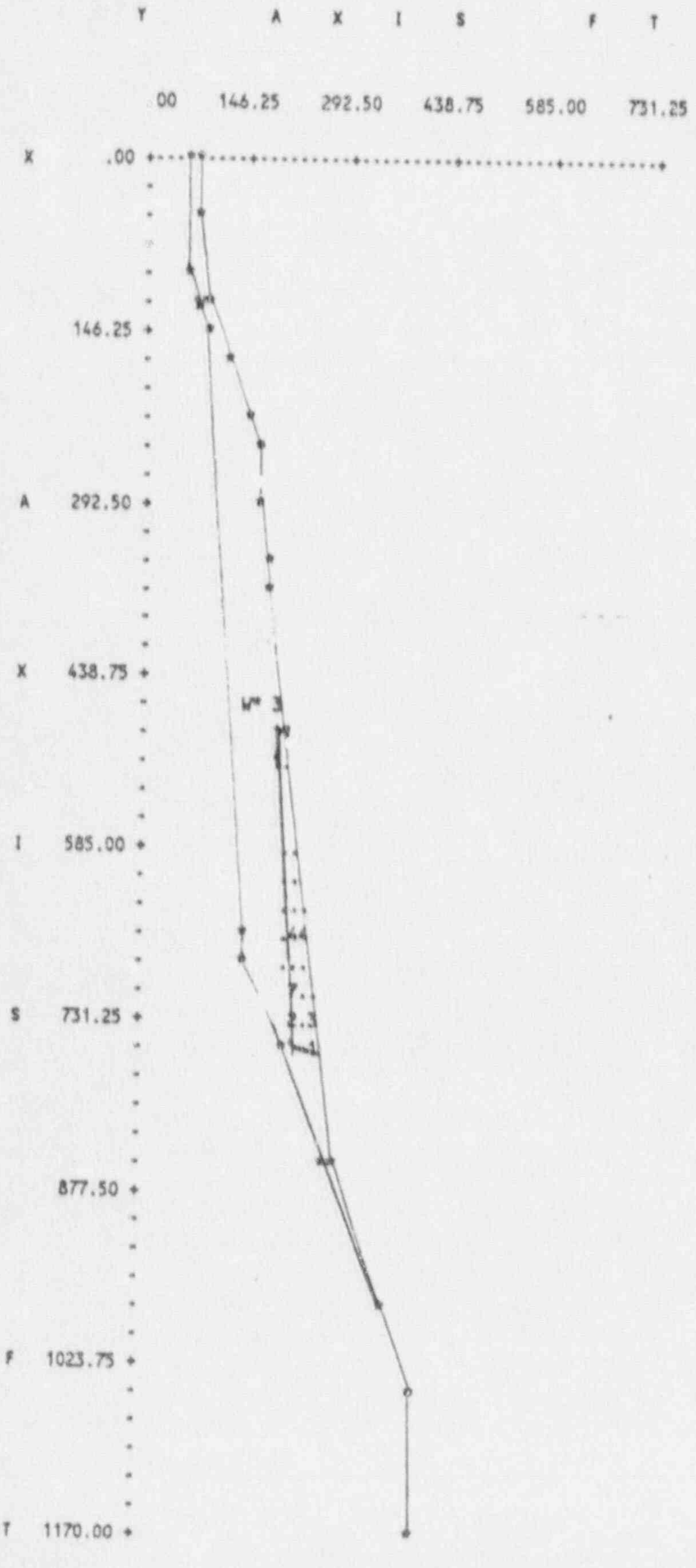
```
 1      341.27     168.41
 2      352.44     160.22
 3      366.86     152.23
 4      485.94     150.19
 5      677.81     155.64
 6      692.36     181.88
 7      698.42     192.82
 8      707.85     205.67
 9      720.53     232.86
10      725.14     242.77
11      727.77     247.05

   ***     2.625    ***
```

```
   5      726.42     243.03
   6      729.05     247.31

  ***     2.444    ***
```

PYL 12/12/89
WYL 2/5/90

1

STSSA.



PYL 12/12/89
WYL 2/5/90

```
                    ** PCSTABL5 **

                          by
                   Purdue University


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


Run Date:
Time of Run:
Run By:                     PYL
Input Data Filename:        B:STSALL2.DAT
Output Filename:            B:STSALL2.OUT
Plotted Output Filename:    B:STSALL2.PLT




PROBLEM DESCRIPTION    UMTRA-LOWMAN #1 SHORT TERM SEISMIC-THRU A
                       LLUVIUM II




BOUNDARY COORDINATES

   8 Top   Boundaries
  26 Total Boundaries


Boundary     X-Left     Y-Left    X-Right    Y-Right    Soil Type
   No.        (ft)       (ft)       (ft)       (ft)     Below Bnd

    1          .00      70.00      50.00      70.00         5
    2        50.00      70.00     125.00      90.00         5
    3       125.00      90.00     235.00     160.00         3
    4       235.00     160.00     295.00     160.00         3
    5       295.00     160.00     350.00     170.00         3
    6       350.00     170.00     355.00     273.00         1
    7       855.00     273.00     980.00     345.00         3
    8       980.00     345.00    1055.00     390.00         6
    9      1055.00     390.00    1170.00     390.00         6
   10       350.00     170.00     370.00     171.00         3
   11       370.00     171.00     850.00     268.00         2
   12       850.00     268.00     855.00     273.00         3
   13       370.00     171.00     750.00     210.00         3
   14       750.00     210.00     850.00     268.00         3
   15       125.00      90.00     135.00      94.00         5
   16       135.00      94.00     230.00     150.00         5
   17       230.00     150.00     235.00     155.00         4
   18       235.00     155.00     460.00     165.00         4
   19       460.00     165.00     760.00     200.00         4
   20       760.00     200.00     980.00     345.00         6
   21       230.00     150.00     680.00     150.00         5
   22       680.00     150.00     760.00     200.00         6
   23          .00      60.00      95.00      60.00         6
   24        95.00      60.00     177.00     113.00         6
```

PYL 12/12/89
WJL 2/5/90

```
        ***     2.437    ***


    Failure Surface Specified By  7 Coordinate Points


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

        1          453.99        191.21
        2          457.96        188.78
        3          464.41        185.77
        4          734.79        220.03
        5          747.47        247.22
        6          747.51        247.29
        7          750.16        251.62


        ***     2.437    ***


1

    Failure Surface Specified By  6 Coordinate Points


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

        1          479.51        196.41
        2          483.54        193.94
        3          496.05        188.11
        4          714.17        220.09
        5          724.70        242.68
        6          727.33        246.96


        ***     2.438    ***


    Failure Surface Specified By  6 Coordinate Points


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

        1          479.83        196.48
        2          483.86        194.01
        3          491.77        190.32
        4          736.51        222.52
        5          748.12        247.41
        6          750.77        251.74


        ***     2.441    ***
```

PYL 12/12/89
WYL 2/2/90

```
Specified.


The Active And Passive Portions Of The Sliding Surfaces
Are Generated According To The Rankine Theory.


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  30.0


Box      X-Left     Y-Left     X-Right     Y-Right       Height
No.       (ft)       (ft)       (ft)        (ft)          (ft)

 1       230.00     130.00     330.00      135.00        25.00
 2       420.00     135.00     475.00      139.00        15.00
 3       510.00     138.00     620.00      145.00        10.00


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 14 Coordinate Points


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

    1       272.47      160.00
    2       276.76      156.86
    3       289.13      150.00
    4       297.48      145.37
    5       323.72      130.83
    6       435.85      128.94
    7       615.99      142.57
    8       620.11      150.00
    9       634.66      176.24
   10       640.07      186.01
   11       650.15      199.75
   12       662.83      226.94
   13       664.49      230.51
   14       667.04      234.66


      ***     2.559     ***


Failure Surface Specified By 13 Coordinate Points
```

STSALL2.DAT

PYL 12/12/89
WYL 2/5/90

```
Specified.


The Active And Passive Portions Of The Sliding Surfaces
Are Generated According To The Rankine Theory.


100 Trial Surfaces Have Been Generated.


2 Boxes Specified For Generation Of Central Block Base


Length Of Line Segments For Active And Passive Portions Of
Sliding Block Is  30.0


Box         X-Left     Y-Left     X-Right    Y-Right      Height
No.          (ft)       (ft)       (ft)       (ft)         (ft)

 1          460.00     186.00     520.00     193.00        5.00
 2          590.00     205.00     750.00     220.00       10.00
1

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  6 Coordinate Points
```

STSC.DAT

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

    1       487.44     198.03
    2       491.49     195.55
    3       500.73     191.24
    4       746.67     224.54
    5       758.29     249.47
    6       760.96     253.82

       ***    2.433   ***


Failure Surface Specified By  6 Coordinate Points


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

    1       479.22     196.36
    2       483.25     193.89
    3       493.12     189.28
    4       733.86     222.30
```

```
    6         622.09       150.00
    7         636.64       176.24
    8         642.19       186.26
    9         652.24       199.97
   10         664.92       227.16
   11         666.69       230.96
   12         669.24       235.11

       ***      2.623    ***



Failure Surface Specified By 12 Coordinate Points


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

    1         211.85       145.27
    2         216.36       141.96
    3         230.80       133.96
    4         470.04       132.87
    5         610.89       142.62
    6         614.98       150.00
    7         629.53       176.24
    8         634.59       185.37
    9         644.72       199.20
   10         657.40       226.38
   11         658.79       229.36
   12         661.33       233.50

       ***      2.624    ***


Failure Surface Specified By 13 Coordinate Points


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

    1         283.90       160.00
    2         287.54       157.33
    3         300.77       150.00
    4         311.61       143.99
    5         424.04       133.06
    6         609.55       145.79
    7         611.88       150.00
    8         626.42       176.24
    9         631.27       184.98
   10         641.45       198.86
   11         654.13       226.05
   12         655.34       228.66
   13         657.88       232.79

       ***      2.624    ***
```

PYL 12/12/89
WYL 2/[illegible]

PYL 12/12/89
WYL 2/5/90

```
                    ** PCSTABL5 **

                         by
                  Purdue University


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


Run Date:
Time of Run:
Run By:                     PYL
Input Data Filename:        A:STSC.DAT
Output Filename:            A:STSD.OUT
Plotted Output Filename:    A:STSD.PLT



PROBLEM DESCRIPTION    UMTRA-LOWMAN #1 SHORT TERM SEIMIC-THRU S
                       AND



BOUNDARY COORDINATES

     8 Top   Boundaries
    26 Total Boundaries


Boundary     X-Left     Y-Left     X-Right     Y-Right     Soil Type
   No.        (ft)       (ft)       (ft)        (ft)       Below Bnd

    1           .00      70.00       50.00       70.00         5
    2         50.00      70.00      125.00       90.00         5
    3        125.00      90.00      235.00      160.00         3
    4        235.00     160.00      295.00      160.00         3
    5        295.00     160.00      350.00      170.00         3
    6        350.00     170.00      855.00      273.00         1
    7        855.00     273.00      980.00      345.00         3
    8        980.00     345.00     1055.00      390.00         6
    9       1055.00     390.00     1170.00      390.00         6
   10        350.00     170.00      370.00      171.00         3
   11        370.00     171.00      850.00      268.00         2
   12        850.00     268.00      855.00      273.00         3
   13        370.00     171.00      750.00      210.00         3
   14        750.00     210.00      850.00      268.00         3
   15        125.00      90.00      135.00       94.00         5
   16        135.00      94.00      230.00      150.00         5
   17        230.00     150.00      235.00      155.00         4
   18        235.00     155.00      460.00      165.00         4
   19        460.00     165.00      760.00      200.00         4
   20        760.00     200.00      980.00      345.00         6
   21        230.00     150.00      680.00      150.00         5
   22        680.00     150.00      760.00      200.00         6
   23           .00      60.00       95.00       60.00         6
   24         95.00      60.00      177.00      113.00         6
```

PYL 12/12/89

[illegible]

```
       1        218.93      149.77
       2        223.69      146.28
       3        224.78      145.68
       4        251.01      131.13
       5        461.82      132.66
       6        603.91      141.11
       7        608.84      150.00
       8        623.38      176.24
       9        628.02      184.60
      10        638.23      198.53
      11        650.91      225.72
      12        651.96      227.98
      13        654.49      232.10

          ***      2.671     ***


   Failure Surface Specified By 11 Coordinate Points


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

       1        214.21      146.77
       2        218.81      143.40
       3        239.74      131.80
       4        453.26      133.78
       5        585.48      145.82
       6        587.80      150.00
       7        602.35      176.24
       8        605.53      181.98
       9        615.99      196.25
      10        628.58      223.26
      11        631.08      227.33

          ***      2.687     ***
```

PKL 12/11/89
WYL 2/5/90

```
     10        592.25      193.81
     11        603.63      218.21
     12        606.10      222.23


        ***      5.058    ***


  Failure Surface Specified By 12 Coordinate Points


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

      1        267.45      160.00
      2        272.02      156.65
      3        284.01      150.00
      4        298.93      141.71
      5        432.77      130.19
      6        565.56      139.28
      7        571.50      150.00
      8        586.04      176.24
      9        588.10      179.94
     10        598.75      194.48
     11        610.46      219.59
     12        612.94      223.63


        ***      5.093    ***
```

PYL 12/12/89

[illegible]

```
                     ** PCSTABL5 **

                          by
                   Purdue University
1

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


Run Date:
Time of Run:
Run By:                     PYL
Input Data Filename:        A:LTNSSA.DAT
Output Filename:            A:LTNSSA.OUT
Plotted Output Filename:    A:LTNSSA.PLT



PROBLEM DESCRIPTION    UMTRA-LOWMAN #1 LONG TERM NON-SEIMIC-THR
                       U SAND



BOUNDARY COORDINATES

    8 Top   Boundaries
   26 Total Boundaries


Boundary     X-Left     Y-Left    X-Right    Y-Right    Soil Type
   No.        (ft)       (ft)       (ft)       (ft)     Below Bnd

    1           .00      70.00      50.00      70.00        5
    2         50.00      70.00     125.00      90.00        5
    3        125.00      90.00     235.00     160.00        3
    4        235.00     160.00     295.00     160.00        3
    5        295.00     160.00     350.00     170.00        3
    6        350.00     170.00     855.00     273.00        1
    7        855.00     273.00     980.00     345.00        3
    8        980.00     345.00    1055.00     390.00        6
    9       1055.00     390.00    1170.00     390.00        6
   10        350.00     170.00     370.00     171.00        3
   11        370.00     171.00     850.00     268.00        2
   12        850.00     268.00     855.00     273.00        3
   13        370.00     171.00     750.00     210.00        3
   14        750.00     210.00     850.00     268.00        3
   15        125.00      90.00     135.00      94.00        5
   16        135.00      94.00     230.00     150.00        5
   17        230.00     150.00     235.00     155.00        4
   18        235.00     155.00     460.00     165.00        4
   19        460.00     165.00     760.00     200.00        4
   20        760.00     200.00     980.00     345.00        6
   21        230.00     150.00     680.00     150.00        5
   22        680.00     150.00     760.00     200.00        6
   23           .00      60.00      95.00      60.00        6
   24         95.00      60.00     177.00     113.00        6
```

PYL 12/11/89
[illegible]

```
     ***     4.951    ***



   Failure Surface Specified By 12 Coordinate Points


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

       1         207.96       142.79
       2         212.33       139.58
       3         238.32       125.18
       4         457.42       130.79
       5         586.50       143.81
       6         589.94       150.00
       7         604.48       176.24
       8         607.81       182.24
       9         618.25       196.48
      10         630.92       223.67
      11         630.96       223.73
      12         633.45       227.81

     ***     4.984    ***



   Failure Surface Specified By 12 Coordinate Points


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

       1         215.76       147.76
       2         220.41       144.35
       3         231.19       138.37
       4         465.10       131.86
       5         618.19       142.97
       6         622.09       150.00
       7         636.64       176.24
       8         642.19       186.26
       9         652.24       199.97
      10         664.92       227.16
      11         666.69       230.96
      12         669.24       235.11

     ***     5.010    ***



1
   Failure Surface Specified By 12 Coordinate Points


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

PYL 12/12/89
WYL 2/[illegible]/90

```
2 Boxes Specified For Generation Of Central Block Base

Length Of Line Segments For Active And Passive Portions Of
Sliding Block Is  30.0

Box      X-Left    Y-Left    X-Right   Y-Right     Height
No.       (ft)      (ft)      (ft)      (ft)        (ft)

 1       460.00    186.00    520.00    193.00       5.00
 2       590.00    205.00    750.00    220.00      10.00

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  6 Coordinate Points

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

    1       457.69     191.97
    2       462.25     189.64
    3       469.97     186.04
    4       633.39     212.82
    5       639.26     225.41
    6       641.30     229.41

       ***     4.504   ***

Failure Surface Specified By  6 Coordinate Points

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

    1       461.80     192.80
    2       466.37     190.47
    3       473.78     187.02
    4       639.79     213.94
    5       645.76     226.73
    6       647.80     230.74

       ***     4.505   ***

1

Failure Surface Specified By  6 Coordinate Points
```

LONSCA DPT

PYL 12/11/89
WYL 2/5/90

```
3 Boxes Specified For Generation Of Central Block Base


Length Of Line Segments For Active And Passive Portions Of
Sliding Block Is  30.0


Box         X-Left      Y-Left      X-Right     Y-Right        Height
No.          (ft)        (ft)        (ft)        (ft)           (ft)

 1          230.00      130.00      330.00      135.00         25.00
 2          420.00      135.00      475.00      139.00         15.00
 3          510.00      138.00      620.00      145.00         10.00
1

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 14 Coordinate Points


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

   1        272.47      160.00
   2        276.76      156.86
   3        289.13      150.00
   4        297.48      145.37
   5        323.72      130.83
   6        435.85      128.94
   7        615.99      142.57
   8        620.11      150.00
   9        634.66      176.24
  10        640.07      '86.01
  11        650.15      199.75
  12        662.83      226.94
  13        664.49      230.51
  14        667.04      234.66

      ***     4.813     ***


Failure Surface Specified By 13 Coordinate Points


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

   1        255.94      160.00
   2        261.17      156.16
   3        272.29      150.00
   4        292.62      138.73
   5        430.56      129.25
```

STNSALL2 Out

PYL 12/12/89
WYL 2/15/90

```
         1       463.03      193.05
         2       467.60      190.72
         3       471.09      189.10
         4       645.11      214.37
         5       651.40      227.87
         6       653.45      231.89

      ***     4.534    ***


Failure Surface Specified By  6 Coordinate Points

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

         1       461.34      192.71
         2       465.90      190.38
         3       469.09      188.89
         4       607.29      209.48
         5       612.17      219.94
         6       614.10      223.88

      ***     4.544    ***


Failure Surface Specified By  6 Coordinate Points

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

         1       456.33      191.69
         2       460.88      189.37
         3       463.70      188.05
         4       617.92      210.36
         5       623.45      222.22
         6       625.47      226.19

      ***     4.545    ***

1
Failure Surface Specified By  6 Coordinate Points

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

         1       453.73      191.16
         2       458.28      188.84
         3       460.13      187.98
         4       597.14      207.47
```

PYL 12/11/89
WYL 2 [illegible] 90

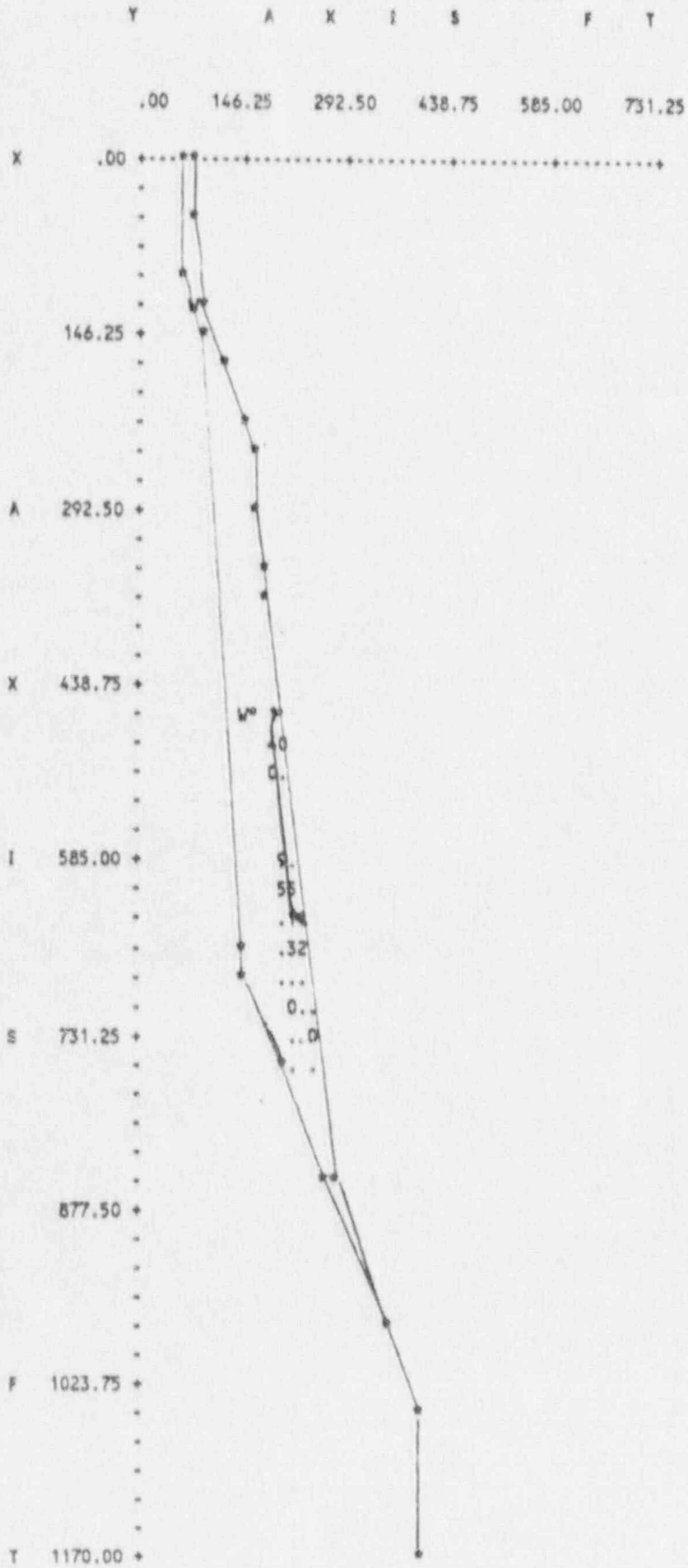
```
                    ** PCSTABL5 **

                          by
                   Purdue University


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


Run Date:
Time of Run:
Run By:                       PYL
Input Data Filename:          B:STNSALL2.DAT
Output Filename:              B:STNSALL2.OUT
Plotted Output Filename:      B:STNSALL2.PLT



PROBLEM DESCRIPTION   UMTRA-LOWMAN #1 SHORT TERM NON-SEIMIC-TH
                      RU ALLUVIUM II



BOUNDARY COORDINATES

    8 Top   Boundaries
   26 Total Boundaries


Boundary     X-Left     Y-Left     X-Right     Y-Right     Soil Type
  No.         (ft)       (ft)        (ft)        (ft)      Below Bnd

    1           .00      70.00       50.00       70.00         5
    2         50.00      70.00      125.00       90.00         5
    3        125.00      90.00      235.00      160.00         3
    4        235.00     160.00      295.00      160.00         3
    5        295.00     160.00      350.00      170.00         3
    6        350.00     170.00      855.00      273.00         1
    7        855.00     273.00      980.00      345.00         3
    8        980.00     345.00     1055.00      390.00         6
    9       1055.00     390.00     1170.00      390.00         6
   10        350.00     170.00      370.00      171.00         3
   11        370.00     171.00      850.00      268.00         2
   12        850.00     268.00      855.00      273.00         3
   13        370.00     171.00      750.00      210.00         3
   14        750.00     210.00      850.00      268.00         3
   15        125.00      90.00      135.00       94.00         5
   16        135.00      94.00      230.00      150.00         5
   17        230.00     150.00      235.00      155.00         4
   18        235.00     155.00      460.00      165.[illegible]   [illegible]
   19        460.00     165.00      760.00      200.[illegible]   [illegible]
   20        760.00     200.00      980.00      345.0[illegible]  [illegible]
   21        230.00     150.00      680.00      150.00         5
   22        680.00     150.00      760.00      200.00         6
   23           .00      60.00       95.00       60.00         6
   24         95.00      60.00      177.00      113.00         6
```

```
    0       163.13      640.63

   ***     4.581     ***
```

PYL 12/12/89

WYL 2/1/90

1



LTN254

1

PYL 12/11/89
WYL 2/5/90

```
   Failure Surface Specified By 10 Coordinate Points


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

       1          327.38        165.89
       2          336.10        159.49
       3          352.19        150.58
       4          530.90        153.72
       5          633.49        168.25
       6          643.56        186.41
       7          653.59        200.11
       8          666.27        227.30
       9          668.11        231.24
      10          670.66        235.40


         ***       4.887     ***


1

   Failure Surface Specified By 10 Coordinate Points


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

       1          329.16        166.21
       2          338.20        159.59
       3          352.06        151.90
       4          513.45        150.24
       5          646.00        163.40
       6          659.81        188.31
       7          669.66        201.76
       8          682.34        228.94
       9          685.01        234.66
      10          687.58        238.85


         ***       4.888     ***



   Failure Surface Specified By 10 Coordinate Points


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

       1          325.42        165.53
       2          333.79        159.39
       3          346.60        152.29
       4          469.86        152.27
       5          654.43        169.96
       6          664.94        188.91
       7          674.74        202.28
       8          687.42        229.47
       9          690.34        235.74
```

PYL 12/12/89
WJL 2/5/90

```
      25        177.00    113.00    670.00    142.00        6
      26        670.00    142.00    680.00    150.00        6


    ISOTROPIC SOIL PARAMETERS


     6 Type(*) of Soil


    Soil  Total  Saturated  Cohesion Friction   Pore    Pressure  Piez.
    Type Unit Wt. Unit Wt. Intercept   Angle  Pressure Constant Surface
     No.  (pcf)    (pcf)     (psf)     (deg)   Param.    (psf)    No.

       1  130.0    135.0      98.0     36.0     .00        .0       1
       2  144.0    155.0        .0     40.0     .00        .0       1
       3  122.5    130.5     245.0     37.0     .00        .0       1
       4  124.5    131.0     885.0     37.0     .00        .0       1
       5  124.5    131.0     885.0     37.0     .00        .0       1
       6  137.0    143.5        .0     45.0     .00        .0       1
1


    1 PIEZOMETRIC SURFACE(S) HAVE BEEN SPECIFIED


    Unit Weight of Water =  62.40


    Piezometric Surface No.  1 Specified by  8 Coordinate Points


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

        1           .00       75.00
        2        115.00       75.00
        3        182.00      120.00
        4        460.00      142.00
        5        670.00      142.00
        6        980.00      345.00
        7       1055.00      390.00
        8       1170.00      390.00
1


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


    The Active And Passive Portions Of The Sliding Surfaces
    Are Generated According To The Rankine Theory.


    100 Trial Surfaces Have Been Generated.
```

PYL 12/11/89
WYL 2/5/90

```
        10        716.83      244.82

             ***      4.817    ***


1
        Failure Surface Specified By 10 Coordinate Points


          Point       X-Surf       7-Surf
           No.         (ft)         (ft)

            1         321.13      164.75
            2         328.74      159.17
            3         339.32      153.30
            4         546.06      150.78
            5         656.02      168.69
            6         667.38      189.19
            7         677.16      202.52
            8         689.83      229.71
            9         692.88      236.25
           10         695.46      240.46

             ***      4.823    ***


        Failure Surface Specified By 10 Coordinate Points


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

            1         325.19      165.49
            2         333.52      159.38
            3         349.04      150.78
            4         548.79      151.90
            5         644.24      167.03
            6         655.77      187.84
            7         665.68      201.35
            8         678.36      228.54
            9         680.82      233.81
           10         683.38      238.00

             ***      4.846    ***


1
        Failure Surface Specified By 10 Coordinate Points


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

            1         326.59      165.74
```

PYL 12/12/89

WYL 2/5/90

```
    10        849.13     271.80


       ***      4.099    ***


1

   Failure Surface Specified By  9 Coordinate Points


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

       1        364.20      172.90
       2        368.11      170.91
       3        384.37      162.79
       4        554.53      176.60
       5        685.74      201.15
       6        841.18      256.20
       7        845.86      265.60
       8        846.67      267.53
       9        848.92      271.76


       ***      4.105    ***


   Failure Surface Specified By 10 Coordinate Points


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

       1        380.19      176.16
       2        384.54      173.94
       3        387.08      172.75
       4        398.24      167.19
       5        531.80      174.45
       6        710.76      200.21
       7        830.14      251.98
       8        833.30      258.31
       9        836.55      265.28
      10        838.79      269.69


       ***      4.108    ***


1

   Failure Surface Specified By 10 Coordinate Points


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

       1        387.45      177.64
       2        391.82      175.41
```

PKL 12/11/89
WYL 2/5/90

```
      25       177.00    113.00    670.00    142.00        6
      26       670.00    142.00    680.00    150.00        6
1


    ISOTROPIC SOIL PARAMETERS


     6 Type(s) of Soil


     Soil  Total  Saturated  Cohesion Friction   Pore   Pressure   Piez.
     Type Unit Wt. Unit Wt. Intercept   Angle  Pressure Constant Surface
      No.  (pcf)    (pcf)     (psf)     (deg)   Param.    (psf)     No.

       1   130.0    135.0     850.0     27.0     .00        .0       1
       2   144.0    155.0        .0     40.0     .00        .0       1
       3   122.5    130.5     330.0     17.5     .00        .0       1
       4   124.5    131.0    1460.0     32.0     .00        .0       1
       5   124.5    131.0    1460.0     32.0     .00        .0       1
       6   137.0    143.5        .0     45.0     .00        .0       1
1


     1 PIEZOMETRIC SURFACE(S) HAVE BEEN SPECIFIED


     Unit Weight of Water =  62.40


     Piezometric Surface No.  1 Specified by  8 Coordinate Points


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

         1           .00        75.00
         2        115.00        75.00
         3        182.00       120.00
         4        460.00       142.00
         5        670.00       142.00
         6        980.00       345.00
         7       1055.00       390.00
         8       1170.00       390.00
1


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


     The Active And Passive Portions Of The Sliding Surfaces
     Are Generated According To The Rankine Theory.


     100 Trial Surfaces Have Been Generated.
```

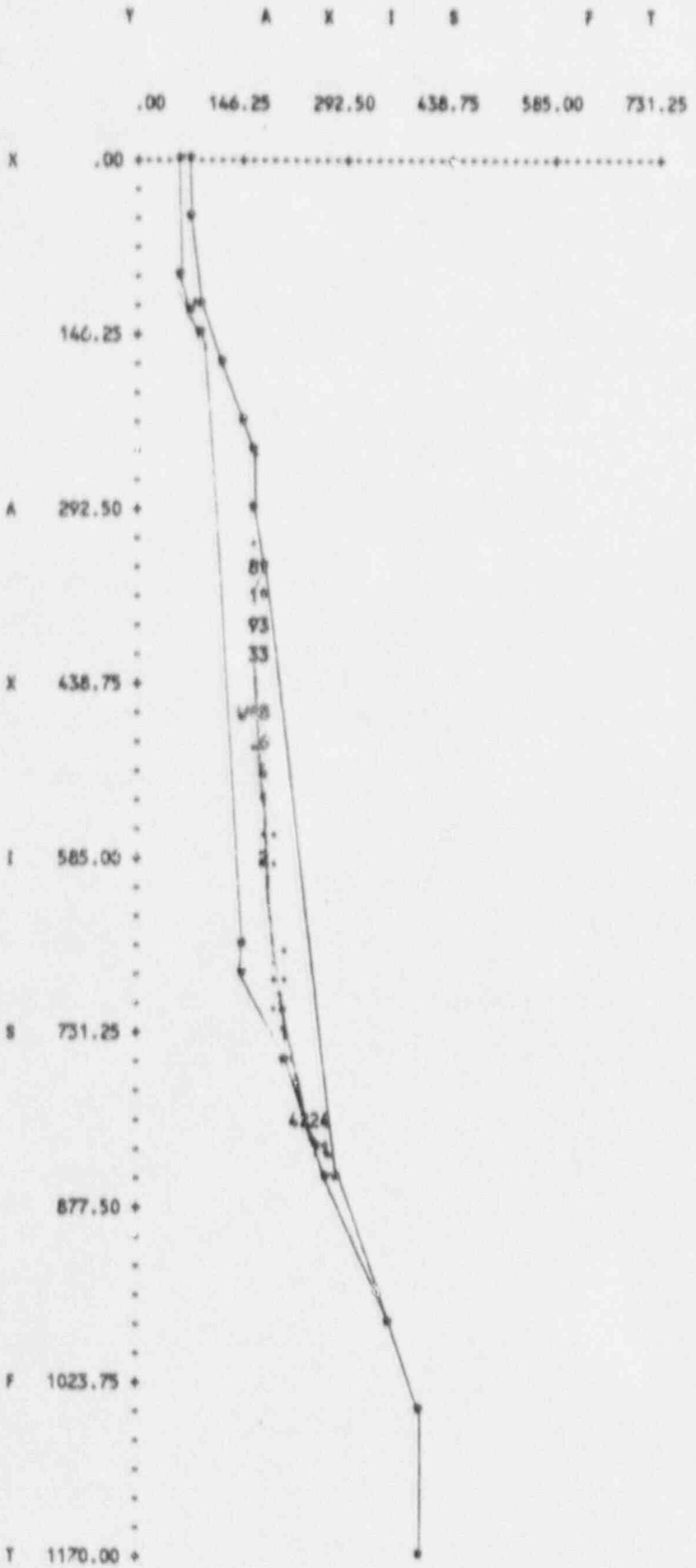
PYL 12/12/89

[illegible]

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

     1        377.65      175.64
     2        382.00      173.43
     3        384.10      172.45
     4        394.92      167.05
     5        503.44      170.74
     6        671.24      196.12
     7        829.26      249.97
     8        833.47      258.42
     9        836.69      265.31
    10        838.94      269.72

        ***      4.120    ***



Failure Surface Specified By  8 Coordinate Points

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

     1        321.08      164.76
     2        327.34      161.62
     3        568.60      180.50
     4        707.06      201.00
     5        840.79      259.20
     6        843.21      264.06
     7        844.53      266.90
     8        846.79      271.33

        ***      4.122    ***


Failure Surface Specified By  9 Coordinate Points

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

     1        352.85      170.58
     2        353.63      170.18
     3        363.67      165.18
     4        525.94      176.99
     5        719.37      201.68
     6        838.64      258.15
     7        840.92      262.73
     8        842.69      266.52
     9        844.94      270.95

        ***      4.122    ***
```

PYL 12/11/89
WYL 2/2'90

1



1

```
******************************************
******          - Illegal Command   ******
```

PYL 12/12/89
MYL 2/5/90

```
                    ** PCSTABL5 **

                          by
                   Purdue University

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


Run Date:
Time of Run:
Run By:
Input Data Filename:       A:LTNSALL1.DAT
Output Filename:           A:LTNSALL1.OUT
Plotted Output Filename:   A:LTNSALL1.PLT



PROBLEM DESCRIPTION    UMTRA-LOWMAN #1 LONG TERM NON-SEIMIC-THR
                       U ALLUVIUM 1



BOUNDARY COORDINATES

      8 Top   Boundaries
     26 Total Boundaries


Boundary    X-Left    Y-Left    X-Right    Y-Right    Soil Type
   No.       (ft)      (ft)      (ft)       (ft)      Below Bnd

    1          .00      70.00      50.00      70.00       5
    2        50.00      70.00     125.00      90.00       5
    3       125.00      90.00     235.00     160.00       3
    4       235.00     160.00     295.00     160.00       3
    5       295.00     160.00     350.00     170.00       3
    6       350.00     170.00     855.00     273.00       1
    7       855.00     273.00     980.00     345.00       3
    8       980.00     345.00    1055.00     390.00       6
    9      1055.00     390.00    1170.00     390.00       6
   10       350.00     170.00     370.00     171.00       3
   11       370.00     171.00     850.00     268.00       2
   12       850.00     268.00     855.00     273.00       3
   13       370.00     171.00     750.00     210.00       3
   14       750.00     210.00     850.00     268.00       3
   15       125.00      90.00     135.00      94.00       5
   16       135.00      94.00     230.00     150.00       5
   17       230.00     150.00     235.00     155.00       4
   18       235.00     155.00     460.00     165.00       4
   19       460.00     165.00     760.00     200.00       4
   20       760.00     200.00     980.00     345.00       6
   21       230.00     150.00     680.00     150.00       5
   22       680.00     150.00     760.00     200.00       6
   23          .00      60.00      95.00      60.00       6
   24        95.00      60.00     177.00     113.00       6
```

PYL 12/11/89

WYL 2/5/90

```
      3        403.94      174.48
      4        411.91      168.63
      5        514.46      177.97
      6        733.45      199.02
      7        807.29      234.53
      8        818.39      249.67
      9        824.54      262.85
     10        827.29      267.35

         ***     2.123    ***


    Failure Surface Specified By  9 Coordinate Points


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

      1        353.89      170.79
      2        354.79      170.24
      3        364.84      162.87
      4        493.60      173.00
      5        733.31      203.13
      6        809.54      238.57
      7        817.16      248.94
      8        823.53      262.65
      9        826.28      267.14

         ***     2.165    ***


1

    Failure Surface Specified By  9 Coordinate Points


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

      1        365.57      173.17
      2        369.18      170.96
      3        375.98      165.98
      4        546.33      180.15
      5        725.79      198.82
      6        833.07      252.04
      7        840.90      262.72
      8        842.67      266.52
      9        845.45      271.05

         ***     2.166    ***


    Failure Surface Specified By  8 Coordinate Points
```

PYL 12/12/89
WYL 2/5/90

```
3 Boxes Specified For Generation Of Central Block Base


Length Of Line Segments For Active And Passive Portions Of
Sliding Block Is  30.0


Box         X-Left      Y-Left      X-Right     Y-Right        Height
No.          (ft)        (ft)        (ft)        (ft)           (ft)

 1          320.00      153.00      370.00      153.00          5.00
 2          460.00      155.00      550.00      155.00         10.00
 3          620.00      160.00      680.00      160.00         20.00


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 10 Coordinate Points


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

     1         325.78       165.60
     2         337.87       159.57
     3         347.18       154.93
     4         535.60       150.98
     5         666.39       169.26
     6         676.88       190.30
     7         683.29       203.15
     8         695.97       230.34
     9         699.33       237.55
    10         701.43       241.68

        ***      5.154      ***


Failure Surface Specified By 10 Coordinate Points


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

     1         317.63       164.12
     2         327.66       159.12
     3         339.32       153.30
     4         546.06       150.78
     5         656.02       168.69
     6         666.17       189.05
     7         672.66       202.06
     8         685.33       229.25
     9         688.15       235.29
```

LTNSALL1.DAT

PYL 12/11/89
[illegible] 2/[illegible]/90

```
4 Boxes Specified For Generation Of Central Block Base


Length Of Line Segments For Active And Passive Portions Of
Sliding Block Is  30.0


Box        X-Left     Y-Left     X-Right    Y-Right       Height
No.         (ft)       (ft)       (ft)       (ft)          (ft)

 1         320.00     162.00     420.00     167.00         5.00
 2         460.00     170.00     580.00     180.00        10.00
 3         670.00     195.00     740.00     204.00        10.00
 4         795.00     228.00     845.00     260.00         5.00
1

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  9 Coordinate Points


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

    1        364.82      173.02
    2        368.26      170.91
    3        376.56      164.83
    4        530.16      173.16
    5        732.77      199.54
    6        818.52      244.75
    7        824.89      253.43
    8        829.77      263.91
    9        832.53      268.42

       ***     2.069   ***


Failure Surface Specified By  9 Coordinate Points


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

    1        358.74      171.78
    2        360.77      170.54
    3        370.51      163.40
    4        577.27      178.75
    5        730.72      201.09
    6        802.21      233.43
    7        810.96      245.36
    8        818.56      261.65
    9        821.30      266.13
```

STNSCOLL DAT

PYL 12/12/89

[illegible]

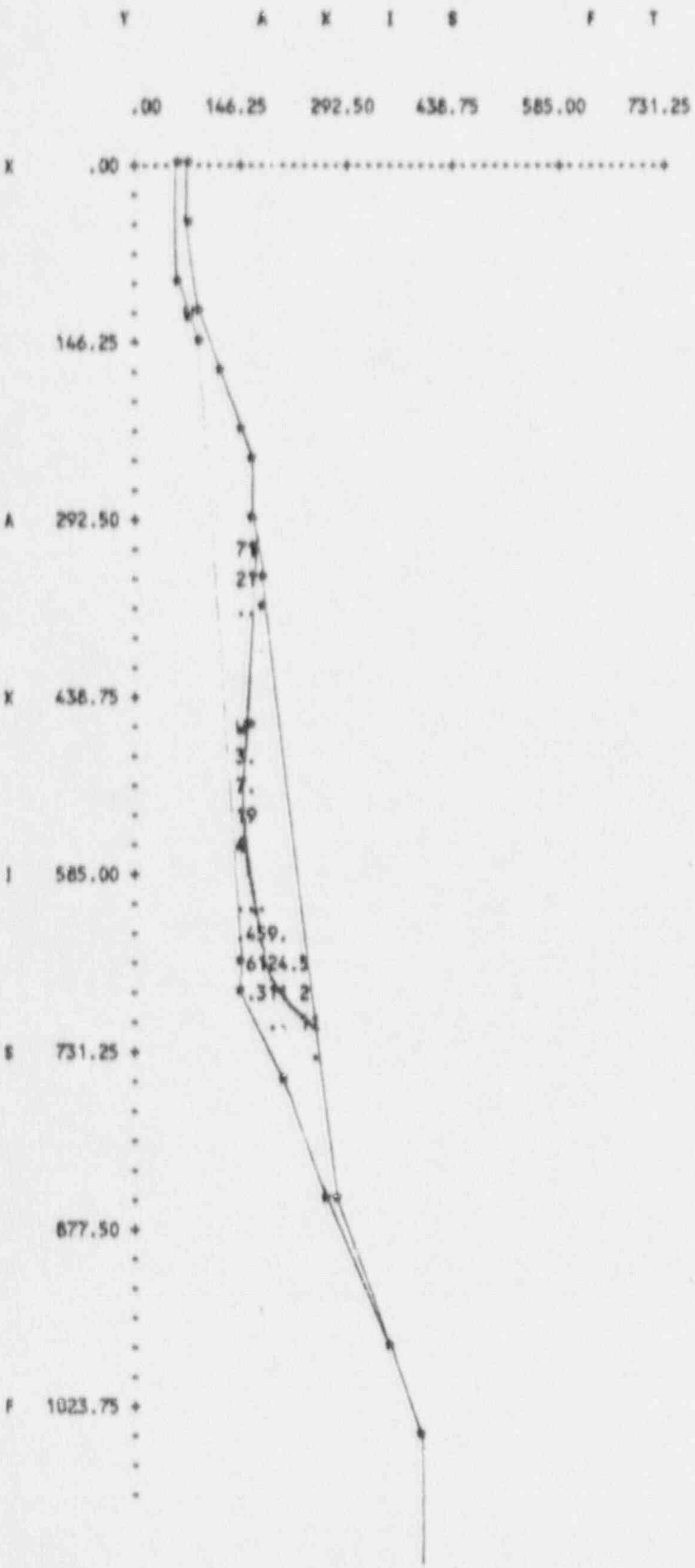
```
          2         321.76       158.86
          3         334.80       152.35
          4         530.55       151.96
          5         638.88       169.11
          6         647.75       186.90
          7         654.37       200.19
          8         667.05       227.37
          9         668.93       231.41
         10         671.00       235.47

               ***      5.193    ***


      Failure Surface Specified By 10 Coordinate Points


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

          1         322.48       165.00
          2         333.73       159.39
          3         349.23       151.66
          4         540.70       151.47
          5         648.22       166.80
          6         658.90       188.20
          7         665.44       201.32
          8         678.12       228.51
          9         680.56       233.76
         10         682.65       237.85

               ***      5.194    ***



      Failure Surface Specified By 10 Coordinate Points


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

          1         309.08       162.56
          2         316.94       158.64
          3         327.53       153.36
          4         516.75       150.47
          5         640.46       167.84
          6         650.10       187.18
          7         656.71       200.43
          8         669.38       227.61
          9         671.39       231.90
         10         673.46       235.97

               ***      5.212    ***
```

PYL 12/11/89
[illegible] 2/8/90

```
                    ** PCSTABL5 **

                          by
                   Purdue University

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


Run Date:
Time of Run:
Run By:                     PYL
Input Data Filename:        A:STNSCOLL.DAT
Output Filename:            A:STNSCOLB.OUT
Plotted Output Filename:    A:STNSCOLB.PLT



PROBLEM DESCRIPTION   UMTRA-LOWMAK #1 SHORT TERM NON-SEIMIC-TH
                      RU COLLUVIUM



BOUNDARY COORDINATES

    8 Top   Boundaries
   26 Total Boundaries


Boundary    X-Left     Y-Left    X-Right    Y-Right    Soil Type
  No.        (ft)       (ft)      (ft)       (ft)      Below Bnd

   1           .00      70.00      50.00      70.00        5
   2         50.00      70.00     125.00      90.00        5
   3        125.00      90.00     235.00     160.00        3
   4        235.00     160.00     295.00     160.00        3
   5        295.00     160.00     350.00     170.00        3
   6        350.00     170.00     855.00     273.00        1
   7        855.00     273.00     980.00     345.00        3
   8        980.00     345.00    1055.00     390.00        6
   9       1055.00     390.00    1170.00     390.00        6
  10        350.00     170.00     370.00     171.00        3
  11        370.00     171.00     850.00     268.00        2
  12        850.00     268.00     855.00     273.00        3
  13        370.00     171.00     750.00     210.00        3
  14        750.00     210.00     850.00     268.00        3
  15        125.00      90.00     135.00      94.00        5
  16        135.00      94.00     230.00     150.00        5
  17        230.00     150.00     235.00     155.00        4
  18        235.00     155.00     460.00     165.00        4
  19        460.00     165.00     760.00     200.00        4
  20        760.00     200.00     980.00     345.00        6
  21        230.00     150.00     680.00     150.00        5
  22        680.00     150.00     760.00     200.00        6
  23           .00      60.00      95.00      60.00        6
  24         95.00      60.00     177.00     113.00        6
```

```
10       702.07      241.81

   ***     5.237   ***

1
```

PYL 12/12/79
WYL 2/5/80



PYL 12/11/89
WYL 2/2/90

```
     5        639.26       225.41
     6        641.77       229.51

       ***      4.679    ***


Failure Surface Specified By  6 Coordinate Points


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

     1        492.74       199.11
     2        496.80       196.62
     3        509.05       190.91
     4        716.36       221.45
     5        726.42       243.03
     6        729.05       247.31

       ***      4.683    ***
```

PYL 14/12/89
WJL 2/15/90

```
      25       177.00     113.00     670.00     142.00        6
      26       670.00     142.00     680.00     150.00        6


   ISOTROPIC SOIL PARAMETERS


    6 Type(s) of Soil


   Soil  Total  Saturated  Cohesion Friction   Pore   Pressure   Piez.
   Type Unit Wt. Unit Wt. Intercept   Angle  Pressure Constant Surface
    No.  (pcf)    (pcf)     (psf)     (deg)   Param.    (psf)     No.

     1   130.0    135.0      98.0     36.0     .00        .0        1
     2   144.0    155.0        .0     40.0     .00        .0        1
     3   122.5    130.5     245.0     37.0     .00        .0        1
     4   124.5    131.0     885.0     37.0     .00        .0        1
     5   124.5    131.0     885.0     37.0     .00        .0        1
     6   137.0    143.5        .0     45.0     .00        .0        1
1


   1 PIEZOMETRIC SURFACE(S) HAVE BEEN SPECIFIED


   Unit Weight of Water =  62.40


   Piezometric Surface No.  1 Specified by  8 Coordinate Points


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

       1           .00       75.00
       2        115.00       75.00
       3        182.00      120.00
       4        460.00      142.00
       5        670.00      142.00
       6        980.00      345.00
       7       1055.00      390.00
       8       1170.00      390.00
1


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


   The Active And Passive Portions Of The Sliding Surfaces
   Are Generated According To The Rankine Theory.


   100 Trial Surfaces Have Been Generated.
```

PYL 12/11/89
[illegible] - 2/5/90

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

      1        479.51      196.41
      2        483.54      193.94
      3        496.05      188.11
      4        714.17      220.09
      5        724.70      242.68
      6        727.33      246.96

        ***      4.672    ***


  Failure Surface Specified By  6 Coordinate Points


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

      1        479.22      196.36
      2        483.25      193.89
      3        493.12      189.28
      4        733.86      222.30
      5        745.30      246.84
      6        747.95      251.17

        ***      4.673    ***


1

  Failure Surface Specified By  6 Coordinate Points


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

      1        492.13      198.99
      2        496.19      196.50
      3        510.40      189.87
      4        713.70      221.23
      5        723.60      242.46
      6        726.22      246.73

        ***      4.674    ***


  Failure Surface Specified By  6 Coordinate Points


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

PYL 12/12/89
WYL 2/2/90

```
     6        611.86       149.13
     7        612.29       150.00
     8        625.67       176.85
     9        629.63       184.79
    10        636.39       198.34
    11        649.07       225.53
    12        650.03       227.59
    13        652.08       231.61

       ***      5.282    ***


Failure Surface Specified By 13 Coordinate Points

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

     1        279.50       160.00
     2        285.07       157.23
     3        299.56       150.00
     4        311.61       143.99
     5        424.04       133.06
     6        609.55       145.79
     7        611.65       150.00
     8        625.03       176.85
     9        628.95       184.71
    10        635.71       198.27
    11        648.39       225.46
    12        649.32       227.45
    13        651.37       231.47

       ***      5.321    ***


Failure Surface Specified By 12 Coordinate Points

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

     1        205.78       141.40
     2        211.00       138.80
     3        211.47       138.56
     4        238.52       125.18
     5        457.42       130.79
     6        586.50       143.81
     7        589.59       150.00
     8        602.98       176.85
     9        605.53       181.98
    10        612.47       195.88
    11        624.88       222.51
    12        626.91       226.48
```

PYL 12/11/89
WV 2/2/90

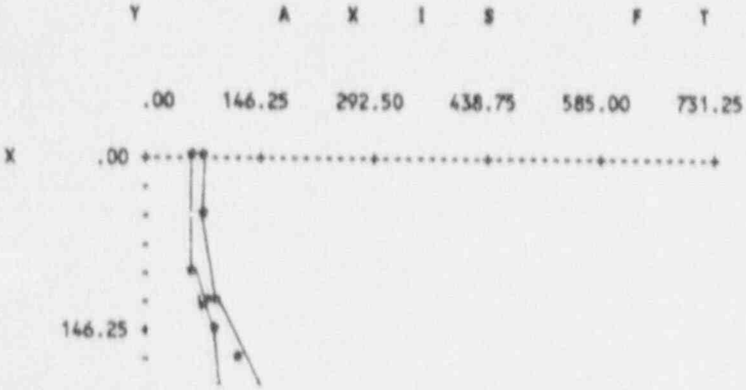
```
   25        177.00      113.00     670.00      142.00         6
   26        670.00      142.00     680.00      150.00         6
1


ISOTROPIC SOIL PARAMETERS


 6 Type(s) of Soil


Soil  Total  Saturated  Cohesion Friction   Pore    Pressure  Piez.
Type Unit Wt. Unit Wt. Intercept   Angle  Pressure Constant Surface
 No.  (pcf)    (pcf)     (psf)     (deg)   Param.    (psf)     No.

  1   130.0    135.0     850.0     27.0     .00        .0       1
  2   144.0    155.0        .0     40.0     .00        .0       1
  3   122.5    130.5     350.0     17.5     .00        .0       1
  4   124.5    131.0    1460.0     32.0     .00        .0       1
  5   124.5    131.0    1460.0     32.0     .00        .0       1
  6   137.0    143.5        .0     45.0     .00        .0       1
1


1 PIEZOMETRIC SURFACE(S) HAVE BEEN SPECIFIED


Unit Weight of Water =  62.40


Piezometric Surface No.  1 Specified by  8 Coordinate Points


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

    1            .00        75.00
    2         115.00        75.00
    3         182.00       120.00
    4         460.00       142.00
    5         670.00       142.00
    6         980.00       345.00
    7        1055.00       390.00
    8        1170.00       390.00
1


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


The Active And Passive Portions Of The Sliding Surfaces
Are Generated According To The Rankine Theory.


100 Trial Surfaces Have Been Generated.
```

PYL 12/2/89

```
    1        214.27      146.81
    2        219.86      144.02
    3        231.19      138.37
    4        465.10      131.86
    5        618.19      142.97
    6        621.70      150.00
    7        635.09      176.85
    8        639.63      185.96
    9        646.31      199.36
   10        658.99      226.55
   11        660.46      229.70
   12        662.52      233.74

      ***      5.392   ***


 Failure Surface Specified By 13 Coordinate Points


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

    1        248.98      160.00
    2        257.05      155.98
    3        269.04      150.00
    4        284.36      142.36
    5        466.20      132.33
    6        595.04      148.04
    7        596.02      150.00
    8        609.41      176.85
    9        612.36      182.78
   10        619.25      196.58
   11        631.92      223.77
   12        632.01      223.95
   13        634.04      227.93

      ***      5.408   ***


 Failure Surface Specified By 12 Coordinate Points


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

    1        276.84      160.00
    2        282.62      157.12
    3        296.89      150.00
    4        319.18      138.89
    5        424.55      129.98
    6        558.57      137.78
    7        564.67      150.00
    8        578.06      176.85
    9        579.07      178.89
   10        586.20      193.19
```

UMTRA - LOW B-26
Rev △ Slope Stability
PYL 7/17/90

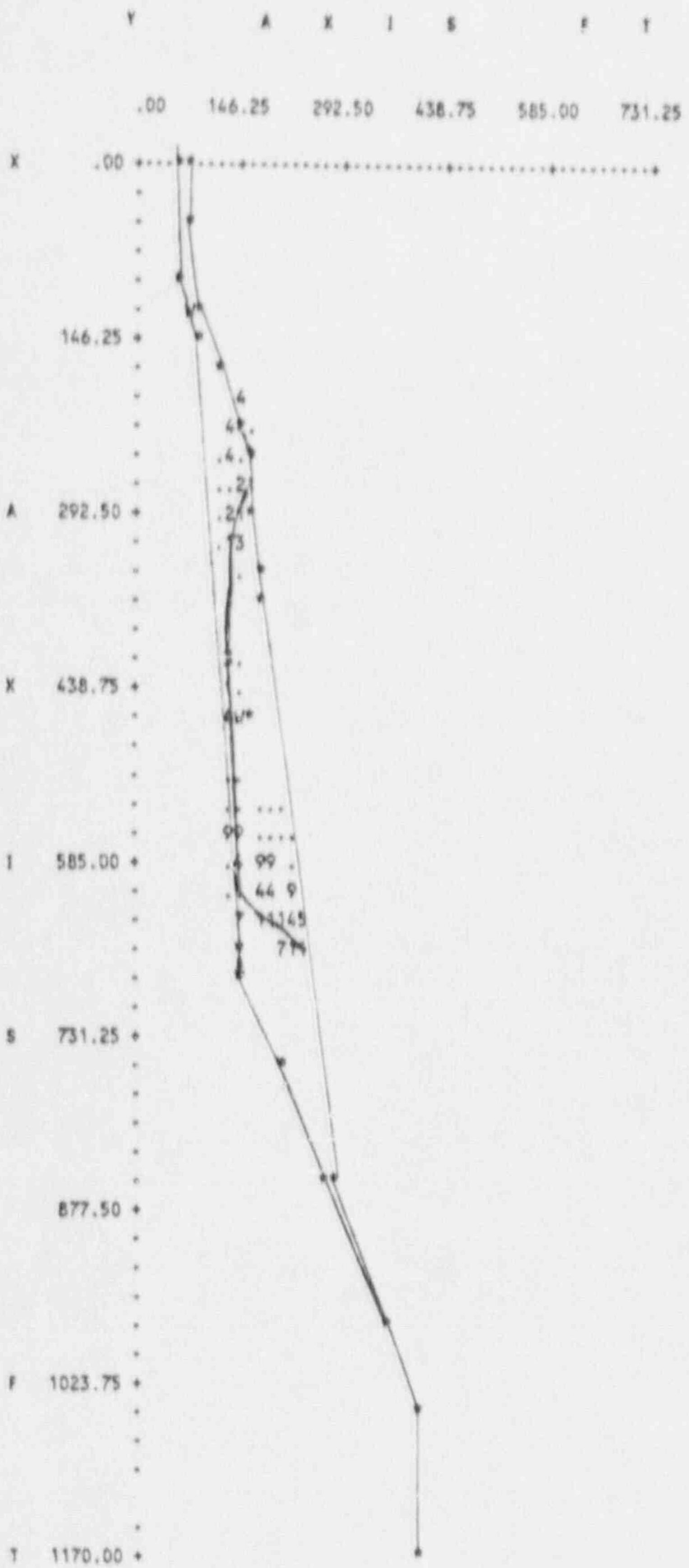
```
Failure Surface Specified By  4 Coordinate Points

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

    1        862.36      277.24
    2        867.19      274.28
    3        949.13      326.21
    4        950.10      327.78

      ***     3.852    ***

1

Failure Surface Specified By  4 Coordinate Points

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

    1        855.65      273.37
    2        860.32      270.51
    3        948.20      325.53
    4        949.28      327.31

      ***     3.861    ***

1

Failure Surface Specified By  4 Coordinate Points

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

    1        861.45      276.71
    2        866.02      273.91
    3        942.61      322.11
    4        943.89      324.20

      ***     3.866    ***

1
```



*** 5.494 ***

PYL 12/12/79
W'L 2/2/90

LTNEALL2,



8-11

UMTRA-LCW
Rev 0 Slope Stability
PLC 7/17/94
Checked K. Lee 8/3/94

```
Length Of Line Segments For Active And Passive Portions Of
Sliding Block Is  20.0

Box        X-Left     Y-Left     X-Right     Y-Right       Height
No.         (ft)       (ft)       (ft)        (ft)          (ft)

  1        860.00     270.00     900.00      295.00         2.00
  2        930.00     315.00     950.00      327.00         1.00
1

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  4 Coordinate Points

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

    1        859.08      275.35
    2        864.50      272.03
    3        930.13      314.79
    4        931.53      317.08

     ***     3.500     ***

Failure Surface Specified By  4 Coordinate Points

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

    1        864.19      278.29
    2        869.54      275.02
    3        942.18      322.39
    4        942.97      323.67

     ***     3.713     ***

1
Failure Surface Specified By  4 Coordinate Points

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

    1        863.28      277.77
    2        868.37      274.65
    3        935.66      318.30
    4        936.76      320.09

     ***     3.735     ***
```

PYL 12/14/89

WYL 2/5/90

```
1        26         670.00     142.00     680.00     150.00        6


          ISOTROPIC SOIL PARAMETERS

           6 Type(s) of Soil

           Soil  Total  Saturated  Cohesion Friction   Pore    Pressure   Piez.
           Type Unit Wt. Unit Wt. Intercept   Angle  Pressure Constant Surface
            No.  (pcf)    (pcf)     (psf)     (deg)   Param.   (psf)     No.

             1   130.0    135.0     250.0     21.0     .00       .0       1
             2   144.0    155.0        .0     40.0     .00       .0       1
             3   122.5    130.5     750.0     27.0     .00       .0       1
             4   124.5    131.0    1460.0     32.0     .00       .0       1
             5   124.5    131.0    1460.0     32.0     .00       .0       1
             6   137.0    143.5        .0     45.0     .00       .0       1


           1 PIEZOMETRIC SURFACE(S) HAVE BEEN SPECIFIED

           Unit Weight of Water =  62.40


           Piezometric Surface No.  1 Specified by  8 Coordinate Points

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

               1            .00         75.00
               2         115.00         75.00
               3         182.00        120.00
               4         460.00        142.00
               5         670.00        142.00
               6         980.00        345.00
               7        1055.00        390.00
               8        1170.00        390.00


          A Horizontal Earthquake Loading Coefficient
          Of .230 Has Been Assigned

          A Vertical Earthquake Loading Coefficient
          Of .000 Has Been Assigned

          Cavitation Pressure =      .0 psf


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

B-2

UMTRA-LOW
Rev Δ Slope stability
PYL 7/17/90
checked K Yoe 8/3/90

✓

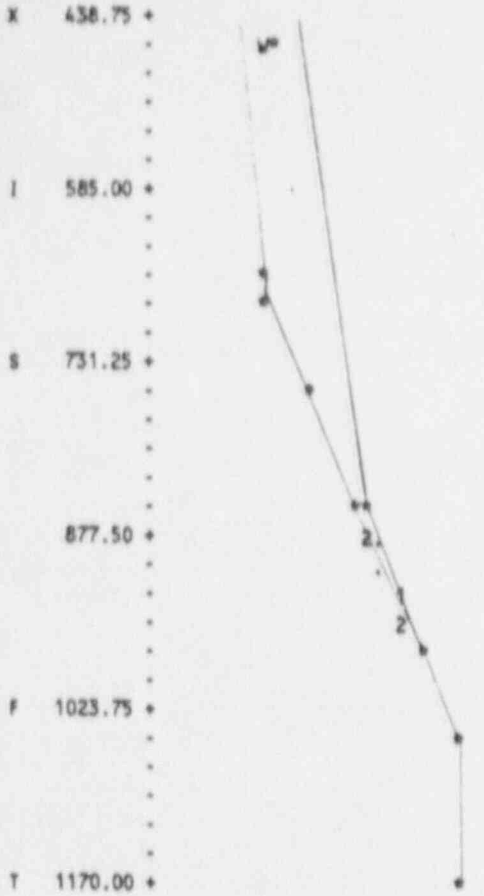
```
                       ** PCSTABL5 **

                             by
                       Purdue University

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


Run Date:
Time of Run:
Run By:                    PYL
Input Data Filename:       B:LTSI.DAT
Output Filename:           B:LTSI.OUT



PROBLEM DESCRIPTION   UMTRA-LOWMAN #1 LONG TERM SEIMIC-I.S.




BOUNDARY COORDINATES

     8 Top   Boundaries
    26 Total Boundaries


Boundary      X-Left     Y-Left     X-Right     Y-Right    Soil Type
   No.         (ft)       (ft)       (ft)        (ft)      Below Bnd

    1           .00      70.00       50.00       70.00         5
    2         50.00      70.00      125.00       90.00         5
    3        125.00      90.00      235.00      160.00         3
    4        235.00     160.00      295.00      160.00         3
    5        295.00     160.00      350.00      170.00         3
    6        350.00     170.00      855.00      273.00         1
    7        855.00     273.00      980.00      345.00         3
    8        980.00     345.00     1055.00      390.00         6
    9       1055.00     390.00     1170.00      390.00         6
   10        350.00     170.00      370.00      171.00         3
   11        370.00     171.00      850.00      268.00         2
   12        850.00     268.00      855.00      273.00         3
   13        370.00     171.00      750.00      210.00         3
   14        750.00     210.00      850.00      268.00         3
   15        125.00      90.00      135.00       94.00         5
   16        135.00      94.00      230.00      150.00         5
   17        230.00     150.00      235.00      155.00         6
   18        235.00     155.00      460.00      165.00         6
   19        460.00     165.00      760.00      200.00         6
   20        760.00     200.00      980.00      345.00         6
   21        230.00     150.00      680.00      150.00         5
   22        680.00     150.00      760.00      200.00         6
   23           .00      60.00       95.00       60.00         6
   24         95.00      60.00      177.00      113.00         6
   25        177.00     113.00      670.00      142.00         6
   26        670.00     142.00      680.00      150.00         6



ISOTROPIC SOIL PARAMETERS
```

✓

PKL 12/12/89
W [illegible]

```
        6          648.63       230.91

           ***       2.011     ***

1

     Failure Surface Specified By  6 Coordinate Points

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

            1          458.60       192.15
            2          462.25       189.64
            3          469.97       186.04
            4          633.39       212.82
            5          639.26       225.41
            6          642.13       229.58

           ***       2.011     ***


     Failure Surface Specified By  6 Coordinate Points

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

            1          472.45       194.97
            2          476.13       192.45
            3          481.63       189.88
            4          638.23       214.39
            5          643.80       226.33
            6          646.67       230.51

           ***       2.016     ***


     Failure Surface Specified By  6 Coordinate Points

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

            1          463.94       193.24
            2          467.60       190.72
            3          471.09       189.10
            4          645.11       214.37
            5          651.40       227.87
            6          654.28       232.06

           ***       2.018     ***
```

UMTRA 40W 8-18
Rev Δ Slope Stability
PYL 2/12/90



```
1

****************************************
******            - Illegal Command ******
****************************************


Legal Commands - PROFIL
                 LOADS
                 TIES
                 WATER
                 SURFAC
                 EXECUT
                 EQUAKE
                 SOIL
                 RANDOM
                 CIRCLE
                 CIRCL2
                 BLOCK
                 BLOCK2
                 LIMITS
                 ANISO
                 SURBIS
                 SPENCR
```

PKL 12/12/89
WVL [illegible] 90

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

    1          477.14        195.93
    2          480.82        193.40
    3          491.30        188.51
    4          605.26        211.03
    5          609.11        219.32
    6          611.93        223.42

       ***       2.035     ***


Failure Surface Specified By  6 Coordinate Points

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

    1          479.85        196.48
    2          483.54        193.94
    3          496.05        188.11
    4          714.17        220.09
    5          724.70        242.68
    6          727.70        247.04

       ***       2.036     ***
```

UMTRA - LOW B-
Rev △ Slope Stability
PYL 7/12/90

Checked K Lee 8/3/90

```
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  4 Coordinate Points


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

    1        858.50      275.02
    2        864.50      272.03
    3        930.13      314.79
    4        931.17      316.87

      ***      2.741    ***  ✓


Failure Surface Specified By  4 Coordinate Points


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

    1        863.62      277.97
    2        869.54      275.02
    3        942.18      322.39
    4        942.76      323.55

      ***      2.834    ***


1
Failure Surface Specified By  4 Coordinate Points


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

    1        862.74      277.46
    2        868.37      274.65
    3        935.66      318.30
    4        936.47      319.93

      ***      2.842    ***


Failure Surface Specified By  4 Coordinate Points


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

    1        856.14      273.66
    2        861.37      271.05
```

PYL 11/12/89
WYL 2/2/90

```
                          ** PCSTABL5 **

                               by
                        Purdue University

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


       Run Date:
       Time of Run:
       Run By:                       PYL
       Input Data Filename:          A:LTSCOLL.DAT
       Output Filename:              A:LTSCOLL2.OUT
       Plotted Output Filename:      NOHE



       PROBLEM DESCRIPTION    UMTRA-LOWMAN #1 LONG TERM SEIMIC-THRU CO
                              LLUVIUM



       BOUNDARY COORDINATES

          8 Top   Boundaries
         26 Total Boundaries


       Boundary     X-Left     Y-Left     X-Right     Y-Right    Soil Type
          No.        (ft)       (ft)        (ft)        (ft)     Below Bnd

           1          .00       70.00       50.00       70.00        5
           2        50.00       70.00      125.00       90.00        5
           3       125.00       90.00      235.00      160.00        3
           4       235.00      160.00      295.00      160.00        3
           5       295.00      160.00      350.00      170.00        3
           6       350.00      170.00      855.00      273.00        1
           7       855.00      273.00      980.00      345.00        3
           8       980.00      345.00     1055.00      390.00        6
           9      1055.00      390.00     1170.00      390.00        6
          10       350.00      170.00      370.00      171.00        3
          11       370.00      171.00      850.00      268.00        2
          12       850.00      268.00      855.00      273.00        3
          13       370.00      171.00      750.00      210.00        3
          14       750.00      210.00      850.00      268.00        3
          15       125.00       90.00      135.00       94.00        5
          16       135.00       94.00      230.00      150.00        5
          17       230.00      150.00      235.00      155.00        4
          18       235.00      155.00      460.00      165.00        4
          19       460.00      165.00      760.00      200.00        4
          20       760.00      200.00      980.00      345.00        6
          21       230.00      150.00      680.00      150.00        5
          22       680.00      150.00      760.00      200.00        6
          23          .00       60.00       95.00       60.00        6
          24        95.00       60.00      177.00      113.00        6
```

UMTRA-LOW Sh B-1"
Rev △ Slope Stability
PYL 7/17/90

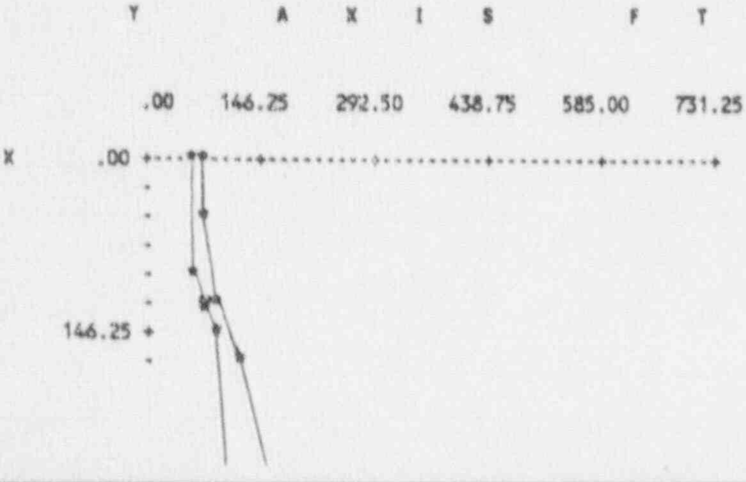
```
                    ** PCSTABL5 **

                          by
                   Purdue University
1

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


Run Date:
Time of Run:
Run By:                     PYL
Input Data Filename:        B:LTNSI.DAT
Output Filename:            B:LTNSI.OUT


PROBLEM DESCRIPTION   UMTRA-LOWMAN #1 LONG TERM NON-SEIMIC-I.S



BOUNDARY COORDINATES

    8 Top   Boundaries
   26 Total Boundaries

Boundary     X-Left     Y-Left    X-Right    Y-Right    Soil Type
   No.        (ft)       (ft)       (ft)       (ft)     Below Bnd

    1          .00      70.00      50.00      70.00         5
    2        50.00      70.00     125.00      90.00         5
    3       125.00      90.00     235.00     160.00         3
    4       235.00     160.00     295.00     160.00         3
    5       295.00     160.00     350.00     170.00         3
    6       350.00     170.00     855.00     273.00         1
    7       855.00     273.00     980.00     345.00         3
    8       980.00     345.00    1055.00     390.00         6
    9      1055.00     390.00    1170.00     390.00         6
   10       350.00     170.00     370.00     171.00         3
   11       370.00     171.00     850.00     268.00         2
   12       850.00     268.00     855.00     273.00         3
   13       370.00     171.00     750.00     210.00         3
   14       750.00     210.00     850.00     268.00         3
   15       125.00      90.00     135.00      94.00         5
   16       135.00      94.00     230.00     150.00         5
   17       230.00     150.00     235.00     155.00         4
   18       235.00     155.00     460.00     165.00         4
   19       460.00     165.00     760.00     200.00         4
   20       760.00     200.00     980.00     345.00         6
   21       230.00     150.00     680.00     150.00         5
   22       680.00     150.00     760.00     200.00         6
   23          .00      60.00      95.00      60.00         6
   24        95.00      60.00     177.00     113.00         6
   25       177.00     113.00     670.00     142.00         6
   26       670.00     142.00     680.00     150.00         6


ISOTROPIC SOIL PARAMETERS
```

PYL 12/12/89
WYL 2/5/90

```
Specified.

The Active And Passive Portions Of The Sliding Surfaces
Are Generated According To The Rankine Theory.

100 Trial Surfaces Have Been Generated.

4 Boxes Specified For Generation Of Central Block Base

Length Of Line Segments For Active And Passive Portions Of
Sliding Block Is  30.0

Box        X-Left     Y-Left     X-Right     Y-Right      Height
No.         (ft)       (ft)       (ft)        (ft)         (ft)

 1         320.00     162.00     420.00      167.00        5.00
 2         460.00     170.00     580.00      180.00       10.00
 3         670.00     195.00     740.00      204.00       10.00
 4         795.00     228.00     845.00      260.00        5.00

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  9 Coordinate Points

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

     1        363.86      172.83
     2        366.75      170.84
     3        376.56      164.83
     4        530.16      173.16
     5        732.77      199.54
     6        818.52      244.75
     7        823.26      252.49
     8        828.47      263.65
     9        831.61      268.23

       ***     1.599     ***

Failure Surface Specified By 10 Coordinate Points

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

UMTRA-LOW 36.13
Rev ∆ Slope Stability
PYL 7/17/90

```
Failure Surface Specified By  4 Coordinate Points

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

     1        862.81      277.50
     2        867.19      274.28
     3        949.13      326.21
     4        950.42      327.96

      ***      2.072    ***

1

Failure Surface Specified By  4 Coordinate Points

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

     1        856.08      273.62
     2        860.32      270.51
     3        948.20      325.53
     4        949.65      327.52

      ***      2.074    ***


Failure Surface Specified By  4 Coordinate Points

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

     1        861.87      276.96
     2        866.02      273.91
     3        942.61      322.11
     4        944.33      324.65

      ***      2.078    ***

1
```



PYL 12/12/89
WYL 2/5/90

```
1
          Failure Surface Specified By 10 Coordinate Points

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

               1           369.27        173.93
               2           372.73        171.55
               3           373.21        171.33
               4           380.66        166.76
               5           536.96        174.22
               6           711.58        195.58
               7           816.66        242.71
               8           822.32        251.95
               9           827.71        263.49
              10           830.86        268.08

                 ***        1.622     ***


          Failure Surface Specified By 10 Coordinate Points

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

               1           392.88        178.75
               2           396.39        176.33
               3           401.00        174.18
               4           411.12        167.74
               5           525.24        179.29
               6           728.80        198.54
               7           833.66        255.05
               8           836.95        260.43
               9           839.49        265.88
              10           842.66        270.48

                 ***        1.623     ***


          Failure Surface Specified By 10 Coordinate Points

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

               1           394.23        179.02
               2           397.74        176.61
               3           402.59        174.35
               4           411.91        168.63
               5           514.46        177.97
               6           733.45        199.02
               7           807.29        234.53
```

UMTRA - LOW Sh B >

Rev △ Slope Stability

PYL 7/17/90

checked 8/3/90

```
Length Of Line Segments For Active And Passive Portions Of
Sliding Block Is  20.0

Box      X-Left    Y-Left    X-Right    Y-Right    Height
No.       (ft)      (ft)      (ft)       (ft)       (ft)

 1       860.00    270.00    900.00     295.00     2.00
 2       930.00    315.00    950.00     327.00     1.00
1

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  4 Coordinate Points

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

    1       859.58     275.64
    2       864.50     272.03
    3       930.13     314.79
    4       932.01     317.36

       ***     1.902    ***  ✓

Failure Surface Specified By  4 Coordinate Points

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

    1       864.68     278.58
    2       869.34     275.02
    3       942.18     322.39
    4       943.23     323.82

       ***     2.008    ***

1

Failure Surface Specified By  4 Coordinate Points

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

    1       863.74     278.04
    2       868.37     274.65
    3       935.66     318.30
    4       937.13     320.31

       ***     2.0[illegible]    ***
```

PYL 12/12/89

WV – 2/5/90

```
          1          389.77          178.11
          2          393.27          175.70
          3          397.34          173.81
          4          409.76          166.19
          5          573.75          180.27
          6          707.88          196.38
          7          827.31          249.93
          8          831.98          257.55
          9          835.48          265.07
         10          838.64          269.66

            ***       1.642     ***

1
```

LTSCOLL.

UMTRA-LOW Sh B-
Rev Δ Slope Stability,
PYL 7/[illegible]/90
checked K. Kee 8/3/90

✓

```
                    ** PCSTABL5 **

                          by
                   Purdue University

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

Run Date:
Time of Run:
Run By:                    PYL
Input Data Filename:       B:STSI.DAT
Output Filename:           B:STSI.OUT


PROBLEM DESCRIPTION   UMTRA-LOWMAN #1 SHORT TERM SEIMIC-I.S.  ✓



BOUNDARY COORDINATES

    8 Top   Boundaries
   26 Total Boundaries


Boundary    X-Left    Y-Left    X-Right    Y-Right    Soil Type
   No.       (ft)      (ft)      (ft)       (ft)      Below Bnd

    1          .00     70.00      50.00      70.00        5
    2        50.00     70.00     125.00      90.00        5
    3       125.00     90.00     235.00     160.00        3
    4       235.00    160.00     295.00     160.00        3
    5       295.00    160.00     350.00     170.00        3
    6       350.00    170.00     855.00     273.00        1
    7       855.00    273.00     980.00     345.00        3
    8       980.00    345.00    1055.00     390.00        6
    9      1053.00    390.00    1170.00     390.00        6
   10       350.00    170.00     370.00     171.00        3
   11       370.00    171.00     850.00     268.00        2
   12       850.00    268.00     855.00     273.00        3
   13       370.00    171.00     750.00     210.00        3
   14       750.00    210.00     850.00     268.00        3
   15       125.00     90.00     133.00      94.00        5
   16       135.00     94.00     230.00     150.00        5
   17       230.00    150.00     235.00     155.00        4
   18       235.00    155.00     460.00     165.00        4
   19       460.00    165.00     760.00     200.00        4
   20       760.00    200.00     980.00     345.00        6
   21       230.00    150.00     680.00     150.00        5
   22       680.00    150.00     760.00     200.00        6
   23          .00     60.00      95.00      60.00        6
   24        95.00     60.00     177.00     113.00        6
   25       177.00    113.00     670.00     142.00        6
   26       670.00    142.00     680.00     150.00        6
1

ISOTROPIC SOIL PARAMETERS
```

PYL 12/12/89
WYL 2/5/90

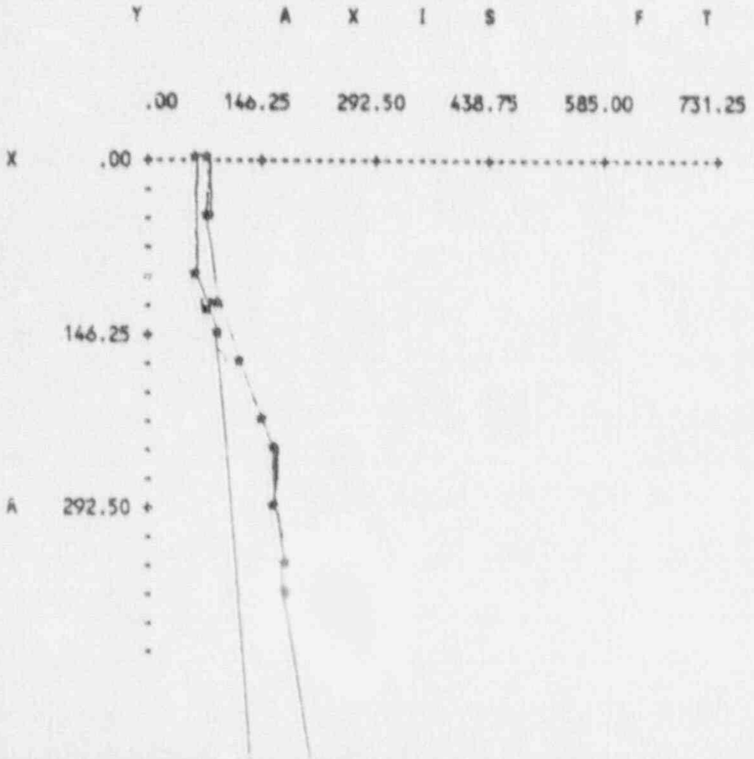
```
                         ** PCSTABL5 **

                               by
                        Purdue University

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

Run Date:
Time of Run:
Run By:                      PYL
Input Data Filename:         A:LTSALL1.DAT
Output Filename:             A:LTSALL1.OUT


PROBLEM DESCRIPTION    UMTRA-LOWMAN #1 LONG TERM SEIMIC-THRU AL
                       LUVIUM I


BOUNDARY COORDINATES

     8 Top   Boundaries
    26 Total Boundaries

Boundary     X-Left      Y-Left     X-Right     Y-Right    Soil Type
   No.        (ft)        (ft)       (ft)        (ft)      Below Bnd

    1           .00       70.00       50.00       70.00        5
    2         50.00       70.00      125.00       90.00        5
    3        125.00       90.00      235.00      160.00        3
    4        235.00      160.00      295.00      160.00        3
    5        295.00      160.00      350.00      170.00        3
    6        350.00      170.00      855.00      273.00        1
    7        855.00      273.00      980.00      345.00        3
    8        980.00      345.00     1055.00      390.00        6
    9       1055.00      390.00     1170.00      390.00        6
   10        350.00      170.00      370.00      171.00        3
   11        370.00      171.00      850.00      268.00        2
   12        850.00      268.00      855.00      273.00        3
   13        370.00      171.00      750.00      210.00        3
   14        750.00      210.00      850.00      268.00        3
   15        125.00       90.00      135.00       94.00        5
   16        135.00       94.00      230.00      150.00        5
   17        230.00      150.00      235.00      155.00        4
   18        235.00      155.00      460.00      165.00        4
   19        460.00      165.00      760.00      200.00        4
   20        760.00      200.00      980.00      345.00        6
   21        230.00      150.00      680.00      150.00        5
   22        680.00      150.00      760.00      200.00        6
   23           .00       60.00       95.00       60.00        6
   24         95.00       60.00      177.00      113.00        6
   25        177.00      113.00      670.00      142.00        6
```

UMTRA - LOW Sh. 8 :

Rev △1 Slope Stability

PYL 7/17/90

```
       3        949.13       326.21
       4        950.42       327.96

         ***      2.735    ***


1

      Failure Surface Specified By  4 Coordinate Points

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

          1         856.08       273.62
          2         860.32       270.51
          3         948.20       325.53
          4         949.65       327.52

         ***      2.738    ***


      Failure Surface Specified By  4 Coordinate Points

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

          1         861.87       276.96
          2         866.02       273.91
          3         942.61       322.11
          4         944.33       324.45

         ***      2.743    ***


1
```



PKL 12/12/89
[illegible]

```
The Active And Passive Portions Of The Sliding Surfaces
Are Generated According To The Rankine Theory.


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  30.0


Box          X-Left      Y-Left      X-Right     Y-Right       Height
No.           (ft)        (ft)        (ft)        (ft)          (ft)

 1           320.00      153.00      370.00      153.00         5.00
 2           460.00      155.00      550.00      155.00        10.00
 3           620.00      160.00      680.00      160.00        20.00


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 10 Coordinate Points


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

    1         328.24       166.04
    2         338.74       159.61
    3         347.18       154.93
    4         535.60       150.98
    5         666.39       169.26
    6         678.14       190.45
    7         686.10       203.44
    8         698.78       230.63
    9         702.28       238.15
   10         705.24       242.46

      ***      2.248    ***


Failure Surface Specified By 10 Coordinate Points


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

UMTRA-LOW Sh 5 1

Rev △ Slope Stability

PYL 2/17/90

Checked K.Kee 8/3/90

```
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  4 Coordinate Points

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

    1        859.58      275.64
    2        864.50      272.03
    3        930.13      314.79
    4        932.01      317.36

      ***     2.513    ***

Failure Surface Specified By  4 Coordinate Points

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

    1        864.68      278.58
    2        869.54      275.02
    3        942.18      322.39
    4        943.23      323.82

      ***     2.651    ***

1
Failure Surface Specified By  4 Coordinate Points

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

    1        863.74      278.04
    2        868.37      274.65
    3        935.66      318.30
    4        937.13      320.31

      ***     2.665    ***

Failure Surface Specified By  4 Coordinate Points

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

    1        869.53      281.37
    2        874.07      278.04
```

PYL 12/12/89
MYL 2/2/90

```
1
     Failure Surface Specified By 10 Coordinate Points

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

            1          323.93        165.26
            2          333.52        159.38
            3          349.04        150.78
            4          548.79        151.90
            5          644.24        167.03
            6          655.77        187.84
            7          663.94        201.17
            8          676.62        228.36
            9          678.99        233.44
           10          681.92        237.70

              ***       2.274    ***


     Failure Surface Specified By 10 Coordinate Points

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

            1          321.75        164.86
            2          330.89        159.26
            3          346.38        150.68
            4          546.46        154.00
            5          664.95        165.22
            6          678.99        190.55
            7          686.94        203.53
            8          699.62        230.72
            9          703.17        238.33
           10          706.13        242.64

              ***       2.277    ***


     Failure Surface Specified By 11 Coordinate Points

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

            1          339.58        168.10
            2          352.44        160.22
            3          366.86        152.23
            4          485.94        150.19
            5          677.81        155.64
            6          692.36        181.88
            7          698.42        192.82
```

UMTRA-LOW Sh. B-
3885-48
Rev. Δ Slope stability Analysis
PYL 7/17/90
checked K. Lee 8/3/90

```
                       ** PCSTABL5 **

                             by
                      Purdue University
1

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


    Run Date:
    Time of Run:
    Run By:                   PYL
    Input Data Filename:      B:STNSI.DAT
    Output Filename:          B:STNSI.OUT



    PROBLEM DESCRIPTION   UMTRA-LOWMAN #1 SHORT TERM NON-SEIMIC-I.
                          S.



    BOUNDARY COORDINATES

        8 Top   Boundaries
       26 Total Boundaries


    Boundary    X-Left    Y-Left    X-Right    Y-Right    Soil Type
       No.       (ft)      (ft)      (ft)       (ft)      Below Bnd

        1         .00      70.00      50.00      70.00        5
        2       50.00      70.00     125.00      90.00        5
        3      125.00      90.00     235.00     160.00        3
        4      235.00     160.00     295.00     160.00        3
        5      295.00     160.00     350.00     170.00        3
        6      350.00     170.00     855.00     273.00        1
        7      855.00     273.00     980.00     345.00        3
        8      980.00     345.00    1055.00     390.00        6
        9     1055.00     390.00    1170.00     390.00        6
       10      350.00     170.00     370.00     171.00        3
       11      370.00     171.00     850.00     268.00        2
       12      850.00     268.00     855.00     273.00        3
       13      370.00     171.00     750.00     210.00        3
       14      750.00     210.00     850.00     268.00        3
       15      125.00      90.00     135.00      94.00        5
       16      135.00      94.00     230.00     150.00        5
       17      230.00     150.00     235.00     155.00        4
       18      235.00     155.00     460.00     165.00        4
       19      460.00     165.00     760.00     200.00        4
       20      760.00     200.00     980.00     345.00        6
       21      230.00     150.00     680.00     150.00        5
       22      680.00     150.00     760.00     200.00        6
       23         .00      60.00      95.00      60.00        6
       24       95.00      60.00     177.00     113.00        6
       25      177.00     113.00     670.00     142.00        6
       26      670.00     142.00     680.00     150.00        6


   ISOTROPIC SOIL PARAMETERS
```

PKL 12/12/89
[illegible]

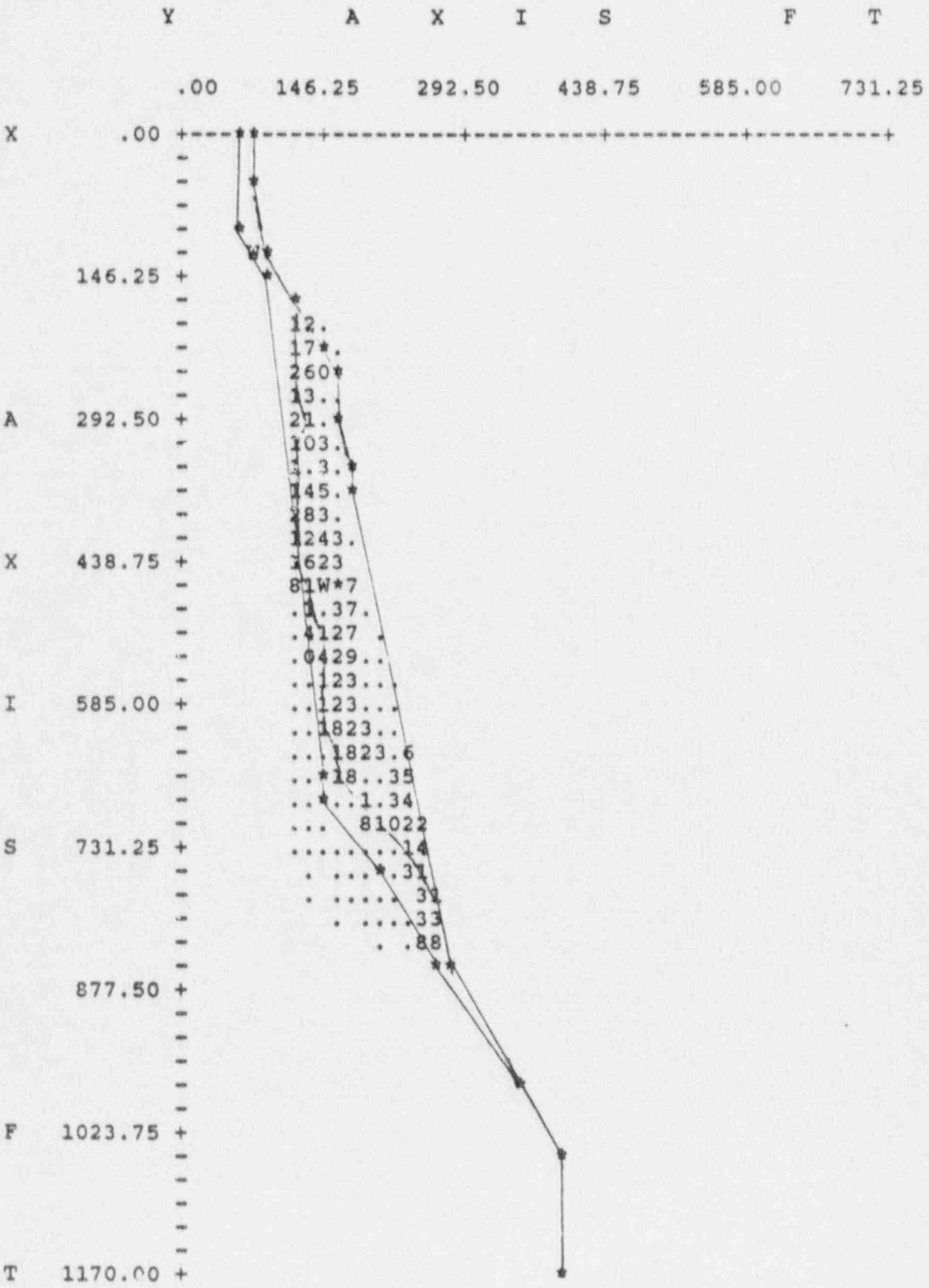
No.	(ft)	(ft)
1	315.20	163.67
2	322.97	158.91
3	334.80	152.35
4	530.55	151.96
5	638.88	169.11
6	648.81	187.03
7	657.04	200.46
8	669.72	227.65
9	671.74	231.98
10	674.65	236.22

*** 2.291 ***

1754111

PKL 12/13/89
WIL 2/5/90

*** 2.222 ***



PYL 12/12/89
WYL 2/5/90

```
                    ** PCSTABL5 **

                          by
                   Purdue University

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


Run Date:
Time of Run:
Run By:                     PYL
Input Data Filename:        A:LTSALL2.DAT
Output Filename:            A:LTSALL2.OUT


PROBLEM DESCRIPTION   UMTRA-LOWMAN #1 LONG TERM SEIMIC-THRU AL
                      LUVIUM II


BOUNDARY COORDINATES

    8 Top   Boundaries
   26 Total Boundaries

Boundary      X-Left      Y-Left      X-Right      Y-Right      Soil Type
  No.          (ft)        (ft)         (ft)         (ft)       Below Bnd

   1             .00       70.00        50.00        70.00          5
   2           50.00       70.00       125.00        90.00          5
   3          125.00       90.00       235.00       160.00          3
   4          235.00      160.00       295.00       160.00          3
   5          295.00      160.00       350.00       170.00          3
   6          350.00      170.00       855.00       273.00          1
   7          855.00      273.00       980.00       345.00          3
   8          980.00      345.00      1055.00       390.00          6
   9         1055.00      390.00      1170.00       390.00          6
  10          350.00      170.00       370.00       171.00          3
  11          370.00      171.00       850.00       268.00          2
  12          850.00      268.00       855.00       273.00          3
  13          370.00      171.00       750.00       210.00          3
  14          750.00      210.00       850.00       268.00          3
  15          125.00       90.00       135.00        94.00          5
  16          135.00       94.00       230.00       150.00          5
  17          230.00      150.00       235.00       155.00          4
  18          235.00      155.00       460.00       165.00          4
  19          460.00      165.00       760.00       200.00          4
  20          760.00      200.00       980.00       345.00          6
  21          230.00      150.00       680.00       150.00          5
  22          680.00      150.00       760.00       200.00          6
  23             .00       60.00        95.00        60.00          6
  24           95.00       60.00       177.00       113.00          6
  25          177.00      113.00       670.00       142.00          6
```

PKL 12/13/89
W[illegible] 2/5/90

```
     2         228.83       138.88
     3         258.56       134.87
     4         288.39       138.09
     5         316.75       147.86
     6         346.72       149.24
     7         376.39       144.81
     8         404.85       154.31
     9         434.37       159.64
    10         461.50       172.45
    11         491.25       176.32
    12         521.09       173.23
    13         550.72       177.91
    14         580.67       179.69
    15         609.93       186.31
    16         635.41       202.14
    17         660.17       219.08
    18         688.56       228.77
    19         709.42       243.31

       ***      2.176    ***


 Failure Surface Specified By 24 Coordinate Points

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

     1         213.33       146.21
     2         236.92       127.68
     3         261.82       110.93
     4         291.53       115.10
     5         321.52       115.62
     6         351.52       115.76
     7         378.46       128.97
     8         408.16       133.19
     9         436.91       124.62
    10         466.86       122.92
    11         494.35       134.95
    12         523.61       141.54
    13         550.46       154.92
    14         580.44       156.19
    15         610.34       158.57
    16         637.16       172.02
    17         667.15       172.81
    18         694.97       184.04
    19         709.63       210.21
    20         733.39       228.52
    21         762.61       235.30
    22         788.82       249.91
    23         818.73       252.18
    24         839.37       269.81

       ***      2.206    ***
```

PYL 12/12/89
YJL 2/5/90

```
The Active And Passive Portions Of The Sliding Surfaces
Are Generated According To The Rankine Theory.


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  30.0


Box        X-Left      Y-Left     X-Right     Y-Right       Height
No.         (ft)        (ft)        (ft)        (ft)         (ft)

 1         230.00      130.00      330.00      135.00        25.00
 2         420.00      135.00      475.00      139.00        15.00
 3         510.00      138.00      620.00      145.00        10.00


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 14 Coordinate Points


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

    1         271.63       160.00
    2         276.76       156.86
    3         289.13       150.00
    4         297.48       145.37
    5         323.72       130.83
    6         435.85       128.94
    7         615.99       142.57
    8         620.11       150.00
    9         634.66       176.24
   10         640.07       186.01
   11         648.38       199.57
   12         661.06       226.76
   13         662.64       230.14
   14         665.54       234.36

      ***      2.217     ***


Failure Surface Specified By 11 Coordinate Points
```

PYL 12/13/89
WVL 2/5/90

```
    16          611.83        188.12
    17          639.40        199.95
    18          666.77        212.23
    19          694.43        223.84
    20          724.18        227.73
    21          754.18        228.07
    22          780.52        242.42
    23          807.56        255.42
    24          811.54        264.14

        ***      2.054     ***


 Failure Surface Specified By 22 Coordinate Points

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

     1          191.67        132.42
     2          216.40        115.44
     3          246.34        113.52
     4          275.57        120.25
     5          304.98        114.34
     6          334.10        121.55
     7          363.94        124.72
     8          389.51        140.40
     9          418.40        148.49
    10          447.12        139.84
    11          476.35        133.08
    12          505.98        137.82
    13          535.94        139.37
    14          557.18        160.56
    15          585.01        171.74
    16          610.15        188.12
    17          639.73        193.13
    18          661.71        213.55
    19          684.07        223.55
    20          714.05        234.60
    21          740.17        249.35
    22          740.27        249.60

        ***      2.137     ***


1
 Failure Surface Specified By 19 Coordinate Points

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

     1          184.44        127.83
     2          210.02        112.15
     3          239.86        115.26
     4          266.78        128.52
```

PYL 12/12/89
WVL 2/5/90

```
          8        642.19       186.26
          9        650.48       199.79
         10        663.16       226.98
         11        664.84       230.58
         12        667.75       234.81

             ***     2.264    ***

1

      Failure Surface Specified By 12 Coordinate Points

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

          1        211.41       144.99
          2        216.36       141.96
          3        230.80       133.96
          4        470.04       132.87
          5        610.89       142.62
          6        614.98       150.00
          7        629.53       176.24
          8        634.59       185.37
          9        642.95       199.01
         10        655.63       226.20
         11        656.92       228.98
         12        659.81       233.19

             ***     2.265    ***


      Failure Surface Specified By 13 Coordinate Points

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

          1        283.19       160.00
          2        287.54       157.33
          3        300.77       150.00
          4        311.61       143.99
          5        424.04       133.06
          6        609.55       145.79
          7        611.88       150.00
          8        626.42       176.24
          9        631.27       184.98
         10        639.66       198.68
         11        652.34       225.87
         12        653.47       228.28
         13        656.36       232.48

             ***     2.278    ***
```

PYL 12/13/89
[illegible]

```
100 Trial Surfaces Have Been Generated.


 10 Surfaces Initiate From Each Of 10 Points Equally Spaced
Along The Ground Surface Between  X = 170.00 ft.
                             and  X = 235.00 ft.


Each Surface Terminates Between   X = 550.00 ft.
                            and   X = 850.00 ft.


Unless Further Limitations Were Imposed, The Minimum Elevation
At Which A Surface Extends Is  Y =110.00 ft.


30.00 ft. Line Segments Define Each Trial Failure Surface.

1

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 23 Coordinate Points


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

     1        170.00       118.64
     2        198.80       110.22
     3        228.30       115.63
     4        257.04       124.25
     5        287.04       124.38
     6        316.52       118.84
     7        346.49       117.44
     8        375.87       111.38
     9        405.53       115.91
    10        435.05       121.23
    11        464.81       125.07
    12        493.67       133.23
    13        522.44       141.76
    14        551.43       149.45
    15        581.43       149.04
    16        611.15       144.93
    17        639.35       155.17
    18        668.06       163.86
    19        684.60       188.89
    20        703.75       211.98
    21        726.55       231.47
    22        754.00       243.59
    23        778.71       257.44
```

1.990

PKL 12/12/89
WY = [illegible]

```
     2          259.59       156.09
     3          270.58       150.00
     4          284.36       142.36
     5          466.20       132.33
     6          595.04       148.04
     7          596.13       150.00
     8          610.68       176.24
     9          614.43       183.02
    10          622.98       196.96
    11          635.66       224.15
    12          635.93       224.74
    13          638.79       228.90

       ***      2.311    ***


 Failure Surface Specified By 13 Coordinate Points

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

     1          209.90       144.03
     2          214.79       141.04
     3          227.61       133.93
     4          253.85       119.39
     5          453.50       138.64
     6          601.87       145.13
     7          604.57       150.00
     8          619.11       176.24
     9          623.45       184.07
    10          631.91       197.88
    11          644.59       225.07
    12          645.32       226.64
    13          648.20       230.82

       ***      2.322    ***
```

LTSALL2

PYL 12/18/89
WYL 5/[illegible]/90

```
                         ** PCSTABL5 **

                              by
                       Purdue University

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


     Run Date:
     Time of Run:
     Run By:                        PYL
     Input Data Filename:           A:LTSRAN2.DAT
     Output Filename:               A:LTSRAN2.OUT



     PROBLEM DESCRIPTION    UMTRA-LOWMAN #1 LONG TERM SEIMIC-RANDOM
                             2


     BOUNDARY COORDINATES

        8 Top   Boundaries
       26 Total Boundaries

     Boundary     X-Left      Y-Left     X-Right     Y-Right     Soil Type
        No.        (ft)        (ft)        (ft)        (ft)      Below Bnd

         1          .00       70.00       50.00       70.00          5
         2        50.00       70.00      125.00       90.00          5
         3       125.00       90.00      235.00      160.00          3
         4       235.00      160.00      295.00      160.00          3
         5       295.00      160.00      350.00      170.00          3
         6       350.00      170.00      855.00      273.00          1
         7       855.00      273.00      980.00      345.00          3
         8       980.00      345.00     1055.00      390.00          6
         9      1055.00      390.00     1170.00      390.00          6
        10       350.00      170.00      370.00      171.00          3
        11       370.00      171.00      850.00      268.00          2
        12       850.00      268.00      855.00      273.00          3
        13       370.00      171.00      750.00      210.00          3
        14       750.00      210.00      850.00      268.00          3
        15       125.00       90.00      135.00       94.00          5
        16       135.00       94.00      230.00      150.00          5
        17       230.00      150.00      235.00      155.00          4
        18       235.00      155.00      460.00      165.00          4
        19       460.00      165.00      760.00      200.00          4
        20       760.00      200.00      980.00      345.00          6
        21       230.00      150.00      680.00      150.00          5
        22       680.00      150.00      760.00      200.00          6
        23          .00       60.00       95.00       60.00          6
        24        95.00       60.00      177.00      113.00          6
        25       177.00      113.00      670.00      142.00          6
```

PYL 12/12/89
[illegible]

```
                    ** PCSTABL5 **

                          by
                   Purdue University


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


Run Date:
Time of Run:
Run By:                      PYL
Input Data Filename:         A:STNSRAN2.DAT
Output Filename:             STNSRAN2.OUT



PROBLEM DESCRIPTION   UMTRA-LOWMAN #1 SHORT TERM NON-SEIMIC-RA
                      NDOM 2



BOUNDARY COORDINATES

     8 Top   Boundaries
    26 Total Boundaries


Boundary     X-Left      Y-Left     X-Right     Y-Right     Soil Type
  No.         (ft)        (ft)       (ft)        (ft)       Below Bnd

   1            .00       70.00       50.00       70.00         5
   2          50.00       70.00      125.00       90.00         5
   3         125.00       90.00      235.00      160.00         3
   4         235.00      160.00      295.00      160.00         3
   5         295.00      160.00      350.00      170.00         3
   6         350.00      170.00      855.00      273.00         1
   7         855.00      273.00      980.00      345.00         3
   8         980.00      345.00     1055.00      390.00         6
   9        1055.00      390.00     1170.00      390.00         6
  10         350.00      170.00      370.00      171.00         3
  11         370.00      171.00      850.00      268.00         2
  12         850.00      268.00      855.00      273.00         3
  13         370.00      171.00      750.00      210.00         3
  14         750.00      210.00      850.00      268.00         3
  15         125.00       90.00      135.00       94.00         5
  16         135.00       94.00      230.00      150.00         5
  17         230.00      150.00      235.00      155.00         4
  18         235.00      155.00      460.00      165.00         4
  19         460.00      165.00      760.00      200.00         4
  20         760.00      200.00      980.00      345.00         6
  21         230.00      150.00      680.00      150.00         5
  22         680.00      150.00      760.00      200.00         6
  23            .00       60.00       95.00       60.00         6
  24          95.00       60.00      177.00      113.00         6
  25         177.00      113.00      670.00      142.00         6
```

PYL 12/13/89

WYL 2/5/90

```
     6         [illegible]      148.11
     7         [illegible]      136.33
     8         [illegible]      150.31
     9         [illegible]      159.64
    10         [illegible]      164.11
    11         [illegible]      165.72
    12         [illegible]      162.56
    13         [illegible]      169.70
    14         [illegible]      172.75
    15         [illegible]      180.28
    16         [illegible]      193.95
    17         [illegible]      205.33
    18         [illegible]      210.91
    19         [illegible]      217.73

        ***     [illegible]    ***


  Failure Surface [illegible]cified By 19 Coordinate Points

   Point      [illegible]      Y-Surf
    No.                        (ft)

     1         [illegible]      137.02
     2         [illegible]      138.88
     3         [illegible]      134.87
     4         [illegible]      138.09
     5         [illegible]      147.86
     6         [illegible]      149.24
     7         [illegible]      114.81
     8         [illegible]      154.31
     9         [illegible]      159.64
    10         [illegible]      172.45
    11         [illegible]      176.32
    12         [illegible]      173.23
    13         [illegible]      177.91
    14         [illegible]      170.69
    15         [illegible]      196.31
    16         [illegible]      202.14
    17         [illegible]      210.08
    18         [illegible]      223.77
    19         [illegible]      243.31

        ***     [illegible]    ***
```

PYL 12/2/79
WYL 2/5/93

```
                         and   X = 850.00 ft.

      Unless Further Limitations Were Imposed, The Minimum Elevation
      At Which A Surface Extends Is  Y =110.00 ft.


      30.00 ft. Line Segments Define Each Trial Failure Surface.


1

      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 24 Coordinate Points

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

          1        177.22       123.23
          2        204.36       110.44
          3        233.07       119.12
          4        259.86       132.62
          5        289.48       137.43
          6        319.04       142.52
          7        348.99       144.20
          8        377.88       152.30
          9        405.66       163.63
         10        435.49       166.81
         11        465.39       164.44
         12        495.33       166.36
         13        525.22       163.72
         14        554.13       171.70
         15        582.80       180.56
         16        611.83       188.12
         17        639.40       199.95
         18        666.77       212.23
         19        694.43       223.84
         20        724.18       227.73
         21        754.18       228.07
         22        780.52       242.42
         23        807.56       255.42
         24        811.54       264.14

           ***        4.032       ***


      Failure Surface Specified By 19 Coordinate Points

        Point       X-Surf       Y-Surf
```

STNSKAN2.OUT

PYL 12/13/89
WYL 2/5/90

```
     18          [illegible]     203.16
     19          [illegible]     [illegible]
     20          [illegible]     [illegible]

         ***      4.727     ***


   Failure Surface Specified By 23 Coordinate Points

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

       1         [illegible]      118.64
       2          199.52          113.26
       3         [illegible]      120.68
       4         [illegible]      136.10
       5         [illegible]      139.56
       6         [illegible]      135.92
       7         [illegible]     [illegible]
       8         [illegible]      113.69
       9         [illegible]      123.65
      10         [illegible]     [illegible]
      11         [illegible]     [illegible]
      12         [illegible]     [illegible]
      13         [illegible]     [illegible]
      14         [illegible]     [illegible]
      15         [illegible]     [illegible]
      16         [illegible]     [illegible]
      17         [illegible]     [illegible]
      18         [illegible]     [illegible]
      19         [illegible]     [illegible]
      20         [illegible]     [illegible]
      21         [illegible]     [illegible]
      22         [illegible]     [illegible]
      23         [illegible]     [illegible]

         ***    [illegible]    ***

1
   Failure Surface Specified By 22 Coordinate Points

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

       1         [illegible]     [illegible]
       2         [illegible]      115.44
       3         [illegible]     [illegible]
       4         [illegible]      120.25
       5         [illegible]     [illegible]
       6         [illegible]     [illegible]
       7         [illegible]     [illegible]
       8         [illegible]     [illegible]
       9         [illegible]     [illegible]
```

PYL 12/12/89
WYL 2/5/90

```
Failure Surface Specified By 19 Coordinate Points

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

     1          206.11        141.62
     2          236.05        143.48
     3          265.78        139.46
     4          295.61        142.68
     5          323.97        152.46
     6          353.94        153.83
     7          383.61        149.41
     8          412.07        158.90
     9          441.59        164.24
    10          468.72        177.05
    11          498.47        180.92
    12          528.31        177.82
    13          557.94        182.51
    14          587.89        184.29
    15          617.15        190.90
    16          642.63        206.74
    17          667.39        223.68
    18          695.78        233.37
    19          710.31        243.49

       ***      4.273     ***

1
  Failure Surface Specified By 21 Coordinate Points

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

     1          184.44        127.83
     2          210.46        112.89
     3          240.40        110.95
     4          269.53        118.10
     5          299.53        117.67
     6          328.90        111.53
     7          358.88        110.50
     8          388.71        113.70
     9          415.72        126.75
    10          442.70        139.87
    11          472.30        144.72
    12          500.70        154.39
    13          529.41        163.10
    14          559.05        167.76
    15          588.90        164.77
    16          615.63        178.38
    17          643.48        189.55
    18          673.30        192.81
    19          699.96        206.57
```

PYL 12/13/89
[illegible]

```
No.           (ft)            (ft)

 1         [illegible]       118.64
 2         [illegible]       110.22
 3           223.30          115.63
 4         [illegible]       124.25
 5           267.04          124.38
 6           316.52          118.84
 7         [illegible]       117.44
 8         [illegible]       111.38
 9         [illegible]       115.91
10           435.03          121.23
11         [illegible]       125.07
12         [illegible]       133.23
13         [illegible]       141.76
14         [illegible]       149.45
15         [illegible]       149.04
16         [illegible]       144.93
17         [illegible]       155.17
18         [illegible]       163.86
19         [illegible]       188.89
20         [illegible]       211.98
21         [illegible]       231.47
22         [illegible]       243.59
23         [illegible]       257.44

     ***   [illegible]   ***

1
   Failure Surface Specified By 21 Coordinate Points

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

    1        [illegible]       127.83
    2        [illegible]       112.89
    3        [illegible]       110.95
    4        [illegible]       118.10
    5        [illegible]       117.67
    6        [illegible]       111.53
    7        [illegible]       110.50
    8        [illegible]       113.70
    9        [illegible]       126.75
   10        [illegible]       139.87
   11        [illegible]       144.72
   12        [illegible]       154.39
   13        [illegible]       163.10
   14        [illegible]       167.76
   15        [illegible]       164.77
   16        [illegible]       178.38
   17        [illegible]       189.55
   18        [illegible]       192.81
   19        [illegible]       206.57
   20        [illegible]       233.78
   21        [illegible]       [illegible]4.05
```

PKL 12/2/89
WYL 2/2/90

```
         15          585.01        171.74
         16          610.15        188.12
         17          639.73        193.13
         18          661.71        213.55
         19          681.07        233.55
         20          714.05        234.60
         21          740.17        249.35
         22          740.27        249.60

            ***      4.546     ***


      Failure Surface Specified By 23 Coordinate Points

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

          1          170.00        118.64
          2          199.52        113.26
          3          228.58        120.68
          4          254.32        136.10
          5          284.12        139.56
          6          313.89        135.92
          7          337.22        117.05
          8          367.03        113.69
          9          395.33        123.65
         10          425.27        125.48
         11          451.54        110.98
         12          481.38        114.05
         13          511.38        113.91
         14          533.78        133.87
         15          562.20        143.47
         16          588.22        158.41
         17          618.03        161.75
         18          641.12        180.90
         19          664.57        199.62
         20          694.56        198.98
         21          721.48        212.24
         22          733.81        239.58
         23          738.03        249.14

            ***      4.530     ***


      Failure Surface Specified By 20 Coordinate Points

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

          1          177.22        123.23
          2          204.91        111.69
          3          234.87        110.08
          4          262.50        121.76
```

PYL 12/13/89

```
       26        670.00     142.00     680.00     150.00         6
1
```

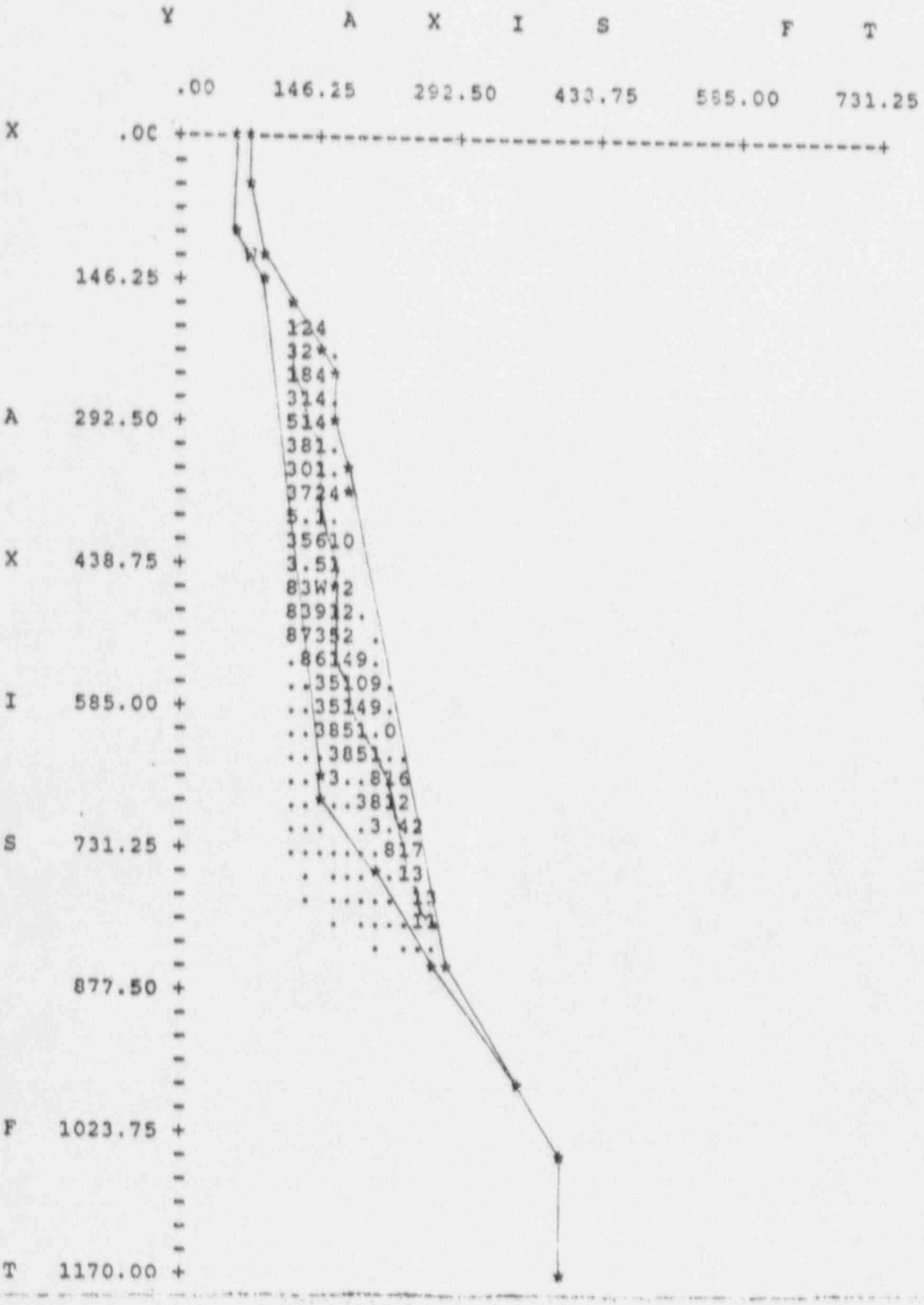
[illegible] 2/2/90

```
    ISOTROPIC SOIL PARAMETERS

      6 Type(s) of Soil

     Soil  Total  Saturated  Cohesion Friction   Pore   Pressure   Piez.
     Type Unit Wt. Unit Wt. Intercept   Angle  Pressure Constant  Surface
      No.  (pcf)    (pcf)     (psf)     (deg)   Param.    (psf)     No.

       1   130.0    135.0      98.0      36.0     .00        .0       1
       2   144.0    150.0        .0      40.0     .00        .0       1
       3   122.5    127.5     245.0      37.0     .00        .0       1
       4   124.5    131.0     885.0      37.0     .00        .0       1
       5   124.5    131.0     885.0      37.0     .00        .0       1
       6   137.0    142.5        .0      45.0     .00        .0       1
1

      1 PIEZOMETRIC SURFACE(S) HAVE BEEN SPECIFIED


      Unit Weight of Water =  62.40


      Piezometric Surface No.  1 Specified by  8 Coordinate Points


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

          1            .00       75.00
          2         115.00       75.00
          3         180.00      120.00
          4         460.00      142.00
          5         670.00      142.00
          6         980.00      345.00
          7        1055.00      390.00
          8        1170.00      390.00
1


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


       100 Trial Surfaces Have Been Generated.


        10 Surfaces Initiate From Each Of 10 Points Equally Spaced
       Along The Ground Surface Between  X = 170.00 ft.
                                   and  X = 235.00 ft.


       Each Surface Terminates Between   X = 550.00 ft.
```

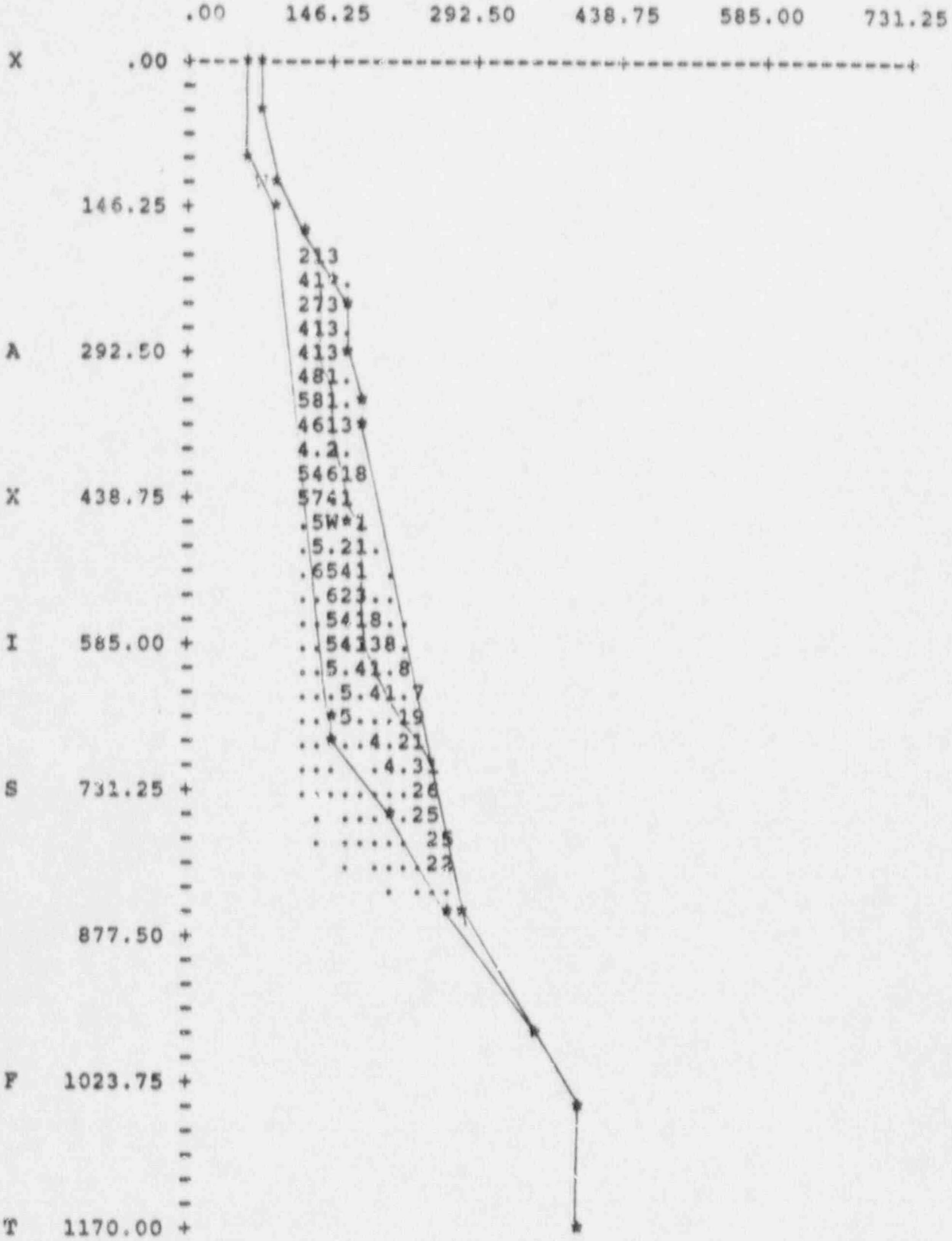
*** 4.678 ***

PYL 12/2/79
[illegible]
STUBRAVE

1



PYL 12/13/89
W[illegible] 2/[illegible]/89



1

```
****************************************************
******         - Illegal Command          ******
****************************************************
```

PTC 10/19/29

WPL 2/2/93

```
    26        670.00     142.00     680.00     150.00        6


  ISOTROPIC SOIL PARAMETERS

    6 Type(s) of Soil

   Soil  Total  Saturated  Cohesion Friction   Pore   Pressure   Piez.
   Type Unit Wt. Unit Wt. Intercept   Angle  Pressure Constant Surface
    No.  (pcf)    (pcf)     (psf)     (deg)   Param.    (psf)     No.

     1   130.0    135.0     850.0     27.0     .00       .0        1
     2   144.0    155.0        .0     40.0     .00       .0        1
     3   122.5    130.5     350.0     17.5     .00       .0        1
     4   124.5    131.0    1460.0     32.0     .00       .0        1
     5   124.5    131.0    1460.0     32.0     .00       .0        1
     6   137.0    143.5        .0     45.0     .00       .0        1


   1 PIEZOMETRIC SURFACE(S) HAVE BEEN SPECIFIED

   Unit Weight of Water =  62.40


   Piezometric Surface No.  1 Specified by  8 Coordinate Points

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

       1            .00        75.00
       2         115.00        75.00
       3         182.00       120.00
       4         460.00       142.00
       5         670.00       142.00
       6         980.00       345.00
       7        1055.00       390.00
       8        1170.00       390.00


   A Horizontal Earthquake Loading Coefficient
   Of .170 Has Been Assigned

   A Vertical Earthquake Loading Coefficient
   Of .000 Has Been Assigned

   Cavitation Pressure =      .0 psf


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

PYL 12/13/89
[illegible]

```
        2            206.97         127.15
        3            [illegible]    128.64
        4            264.13         117.87
        5            293.09         110.42
        6            323.99         110.06
        7            352.71         116.40
        8            383.30         115.79
        9            412.70         120.70
       10            437.35         138.09
       11            464.33         150.11
       12            494.61         153.78
       13            523.60         161.52
       14            552.71         165.63
       15            577.81         180.25
       16            605.40         182.82
       17            624.21         199.53
       18            640.39         228.95
       19            640.71         229.21

            ***      [illegible]    ***


     Failure Surface Specified By 18 Coordinate Points

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

        1          170.00         118.64
        2          199.71         122.80
        3          [illegible]    124.20
        4          257.33         112.33
        5          286.52         118.84
        6          310.41         132.14
        7          [illegible]    133.26
        8          372.12         140.43
        9          399.56         152.54
       10          [illegible]    170.56
       11          [illegible]    179.19
       12          482.58         179.71
       13          513.75         175.28
       14          542.25         171.87
       15          560.16         189.85
       16          594.56         198.91
       17          616.73         219.56
       18          617.08         224.62

           ***     [illegible]    ***

1
     Failure Surface Specified By 19 Coordinate Points

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

PTL 12/13/89
[illegible] 2/5/90

Failure Surface Specified By 24 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	177.22	123.23
2	204.36	110.44
3	233.07	119.12
4	259.86	132.62
5	289.48	137.43
6	319.04	142.52
7	348.99	144.20
8	377.88	152.30
9	405.66	163.63
10	435.49	166.81
11	465.39	164.44
12	495.33	166.36
13	525.22	163.72
14	554.13	171.70
15	[illegible]	180.56
16	[illegible]	188.12
17	[illegible]	199.95
18	[illegible]	212.23
19	[illegible]	223.84
20	[illegible]	227.73
21	[illegible]	228.07
22	[illegible]	242.42
23	[illegible]	255.42
24	811.04	264.14

*** [illegible] ***

Failure Surface Specified By 19 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	206.11	141.62
2	236.05	143.48
3	265.78	139.46
4	295.61	142.68
5	325.97	152.46
6	353.04	153.83
7	[illegible]	149.41
8	[illegible]	158.90
9	[illegible]	164.24
10	[illegible]	177.05
11	[illegible]	180.92
12	[illegible]	177.82
13	[illegible]	182.51
14	[illegible]	184.29
15	[illegible]	190.90
16	[illegible]	206.74

PYL 12/13/89
YL 2/15/90

```
      17          667.39        223.68
      18          690.78        233.37
      19          715.11        243.49

          ***       2.231     ***


    Failure Surface Specified By 21 Coordinate Points

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

       1          184.44        127.83
       2          210.46        112.89
       3          240.40        110.95
       4          269.33        118.10
       5          299.53        117.67
       6          328.90        111.53
       7          358.78        110.50
       8          388.71        113.70
       9          415.72        126.75
      10          442.70        139.87
      11          472.70        144.72
      12          501.70        154.39
      13          527.71        163.10
      14          553.75        167.76
      15          583.70        164.77
      16          613.73        178.38
      17          643.58        189.55
      18          673.70        192.81
      19          699.76        206.57
      20          713.77        233.78
      21          715.76        244.05

          ***       2.206     ***


1
    Failure Surface Specified By 23 Coordinate Points

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

       1          170.00        118.64
       2          198.70        110.22
       3          228.00        115.63
       4          257.04        124.25
       5          287.04        124.38
       6          316.52        118.84
       7          346.09        117.44
       8          375.57        111.38
       9          405.53        115.91
      10          435.75        121.23
      11          461.51        125.07
```

PYL 12/13/89

[illegible]

```
        12          493.67        133.23
        13          5[illegible]4        141.76
        14          551.[illegible]3        149.45
        15          581.[illegible]3        149.04
        16          611.15        144.93
        17          639.[illegible]5        155.17
        18          668.06        163.86
        19          684.60        188.89
        20          703.75        211.98
        21          726.[illegible]5        231.47
        22          754.00        243.59
        23          778.[illegible]1        257.44

            ***       2.[illegible]7     ***


     Failure Surface Specified By 22 Coordinate Points

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

         1          191.67         132.42
         2          216.[illegible]0         115.44
         3          2[illegible]4         113.52
         4          275.57         120.25
         5          304.08         114.34
         6          334.[illegible]0         121.55
         7          3[illegible]4         124.72
         8          38[illegible]1         140.40
         9          418.[illegible]0         148.49
        10          447.[illegible]2         139.84
        11          47[illegible]5         133.08
        12          50[illegible]8         137.82
        13          5[illegible]4         139.37
        14          557.[illegible]8         160.56
        15          5[illegible]1         171.74
        16          6[illegible]5         188.12
        17          6[illegible]3         193.13
        18          6[illegible]1         213.55
        19          68[illegible]7         233.55
        20          71[illegible]5         234.60
        21          740.[illegible]7         249.35
        22          740.[illegible]7         249.60

            ***       2.[illegible]2      ***


1
     Failure Surface Specified By 19 Coordinate Points

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

         1          177.[illegible]2         123.23
```

PTC 12/13/89
[illegible]

```
100 Trial Surfaces Have Been Generated.

 10 Surfaces Initiate From Each Of 10 Points Equally Spaced
Along The Ground Surface Between  X = 170.00 ft.
                              and  X = 235.00 ft.

Each Surface Terminates Between   X = 550.00 ft.
                             and   X = 850.00 ft.

Unless Further Limitations Were Imposed, The Minimum Elevation
At Which A Surface Extends Is  Y =110.00 ft.

30.00 ft. Line Segments Define Each Trial Failure Surface.

1

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 19 Coordinate Points

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

    1        198.89      137.02
    2        228.83      138.88
    3        258.56      134.87
    4        288.39      138.09
    5        316.75      147.86
    6        346.72      149.24
    7        376.39      144.81
    8        404.85      154.31
    9        434.37      159.64
   10        461.50      172.45
   11        491.25      176.32
   12        521.09      173.23
   13        550.72      177.91
   14        580.67      179.69
   15        609.93      186.31
   16        635.41      202.14
   17        660.17      219.08
   18        688.56      228.77
   19        700.42      243.31

       ***      2.153      ***
```

PYL 12/18/89

[illegible]

```
      1          184.14          127.83
      2          2[illegible]2       112.15
      3          239.86          115.26
      4          266.78          128.52
      5          29[illegible].[illegible]8        135.37
      6          325.50          140.75
      7          35[illegible]9       143.30
      8          38[illegible].21        140.00
      9          4[illegible]7       141.42
     10          44[illegible]8       148.26
     11          474.35          146.89
     12          50[illegible].35        146.56
     13          5[illegible].[illegible]5       146.64
     14          5[illegible].[illegible]2       155.77
     15          5[illegible]       159.42
     16          61[illegible].[illegible]4       177.23
     17          6[illegible].[illegible]4       199.41
     18          6[illegible]7       226.23
     19          6[illegible].[illegible]8       232.61

        ***      2.[illegible]6    ***


    Failure Surface Specified By 19 Coordinate Points

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

      1          18[illegible].[illegible]4       127.83
      2          21[illegible].[illegible]7       121.51
      3          2[illegible].[illegible]9       113.17
      4          27[illegible].[illegible]9       113.66
      5          30[illegible].[illegible]8       113.14
      6          33[illegible].[illegible]7       118.11
      7          3[illegible].[illegible]0       136.33
      8          38[illegible].[illegible]4       150.31
      9          41[illegible].[illegible]5       159.64
     10          4[illegible].[illegible]2       164.11
     11          47[illegible].[illegible]7       165.72
     12          50[illegible].[illegible]1       162.56
     13          52[illegible].[illegible]4       169.70
     14          55[illegible].[illegible]9       172.75
     15          58[illegible].[illegible]3       180.28
     16          61[illegible].[illegible]4       193.95
     17          6[illegible].[illegible]9       205.33
     18          66[illegible].[illegible]3       220.91
     19          6[illegible].[illegible]6       237.73

        ***      2.5[illegible]4    ***


          Y               AXIS               FT
```

PYL 12/14/89
WJ - 2/7/90

```
                         ** PCSTABL5 **

                               by
                        Purdue University

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


Run Date:
Time of Run:
Run By:                     PYL
Input Data Filename:        A:STSRAN2.DAT
Output Filename:            STSRAN2.OUT


PROBLEM DESCRIPTION   UMTRA-LOWMAN #1 SHORT TERM SEIMIC-RANDOM
                      2


BOUNDARY COORDINATES

   8 Top   Boundaries
  26 Total Boundaries

Boundary      X-Left      Y-Left     X-Right     Y-Right    Soil Type
   No.         (ft)        (ft)        (ft)        (ft)     Below Bnd

    1           .00       70.00       50.00       70.00         5
    2         50.00       70.00      125.00       90.00         5
    3        125.00       90.00      235.00      160.00         3
    4        235.00      160.00      295.00      160.00         3
    5        295.00      160.00      350.00      170.00         3
    6        350.00      170.00      855.00      273.00         1
    7        855.00      273.00      980.00      345.00         3
    8        980.00      345.00     1055.00      390.00         6
    9       1055.00      390.00     1170.00      390.00         6
   10        350.00      170.00      370.00      171.00         3
   11        370.00      171.00      850.00      268.00         2
   12        850.00      268.00      855.00      273.00         3
   13        370.00      171.00      750.00      210.00         3
   14        750.00      210.00      850.00      268.00         3
   15        125.00       90.00      135.00       94.00         5
   16        135.00       94.00      230.00      150.00         5
   17        230.00      150.00      235.00      155.00         4
   18        235.00      155.00      460.00      165.00         4
   19        460.00      165.00      760.00      200.00         4
   20        760.00      200.00      980.00      345.00         6
   21        230.00      150.00      680.00      150.00         5
   22        680.00      150.00      760.00      200.00         6
   23           .00       60.00       95.00       60.00         6
   24         95.00       60.00      177.00      113.00         6
   25        177.00      113.00      670.00      142.00         6
```

PYL 12/13/99
WYL 2/[illegible]

```
                        ** PCSTABL5 **

                              by
                       Purdue University

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


Run Date:
Time of Run:
Run By:                       PYL
Input Data Filename:          A:LTNSRAN2.DAT
Output Filename:              LTNSRAN2.OUT



PROBLEM DESCRIPTION   UMTRA-LOWMAN #1 LONG TERM NON-SEIMIC-RAN
                      DOM 2



BOUNDARY COORDINATES

    8 Top   Boundaries
   26 Total Boundaries

Boundary      X-Left      Y-Left     X-Right     Y-Right     Soil Type
   No.         (ft)        (ft)        (ft)        (ft)      Below Bnd

    1            .00       70.00       50.00       70.00         5
    2          50.00       70.00      125.00       90.00         5
    3         125.00       90.00      235.00      160.00         3
    4         235.00      160.00      295.00      160.00         3
    5         295.00      160.00      350.00      170.00         3
    6         350.00      170.00      855.00      273.00         1
    7         855.00      273.00      980.00      345.00         3
    8         980.00      345.00     1055.00      390.00         6
    9        1055.00      390.00     1170.00      390.00         6
   10         350.00      170.00      370.00      171.00         3
   11         370.00      171.00      850.00      268.00         2
   12         850.00      268.00      855.00      273.00         3
   13         370.00      171.00      750.00      210.00         3
   14         750.00      210.00      850.00      268.00         3
   15         125.00       90.00      135.00       94.00         5
   16         135.00       94.00      230.00      150.00         5
   17         230.00      150.00      235.00      155.00         4
   18         235.00      155.00      460.00      165.00         4
   19         460.00      165.00      760.00      200.00         4
   20         760.00      200.00      980.00      345.00         6
   21         230.00      150.00      680.00      150.00         5
   22         680.00      150.00      760.00      200.00         6
   23            .00       60.00       95.00       60.00         6
   24          95.00       60.00      177.00      113.00         6
   25         177.00      113.00      670.00      142.00         6
```

PYL 12/12/89
[illegible]

```
     5          289.27        135.31
     6          319.16        132.82
     7          343.68        115.53
     8          373.54        112.62
     9          403.52        113.76
    10          425.48        134.20
    11          455.06        139.19
    12          483.40        149.03
    13          510.33        162.26
    14          530.87        184.12
    15          557.45        198.04
    16          587.45        197.71
    17          617.44        197.14
    18          646.83        203.16
    19          663.38        228.18
    20          666.15        234.48

       ***       4.662     ***


Failure Surface Specified By 18 Coordinate Points

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

     1        170.00        118.64
     2        199.71        122.80
     3        229.68        124.20
     4        257.23        112.33
     5        286.52        118.84
     6        313.41        132.14
     7        343.39        133.26
     8        372.52        140.43
     9        399.96        152.54
    10        423.95        170.56
    11        452.68        179.19
    12        482.68        179.71
    13        512.35        175.28
    14        542.15        171.87
    15        566.16        189.85
    16        594.76        198.91
    17        616.53        219.56
    18        617.78        224.62

       ***       4.678     ***
```

PML 12/13/89
WYL 2/5/90

```
                    and   X = 850.00 ft.

Unless Further Limitations Were Imposed, The Minimum Elevation
At Which A Surface Extends Is  Y =110.00 ft.

30.00 ft. Line Segments Define Each Trial Failure Surface.



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 24 Coordinate Points

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

    1         177.2[illegible]        123.23
    2         20[illegible]           110.44
    3         2[illegible]            119.12
    4         2[illegible]            132.62
    5         2[illegible]            137.43
    6         310.01        142.52
    7         3[illegible]            144.20
    8         37[illegible]           152.30
    9         405.65        163.63
   10         4[illegible]            166.81
   11         4[illegible]            164.44
   12         4[illegible]            166.36
   13         5[illegible]            163.72
   14         5[illegible]            171.70
   15         5[illegible]            180.56
   16         6[illegible]            188.12
   17         6[illegible]            199.95
   18         6[illegible]            212.23
   19         6[illegible]            223.84
   20         7[illegible]            227.73
   21         7[illegible]            228.07
   22         7[illegible]            242.42
   23         8[illegible]            255.42
   24         8[illegible]            264.14

      ***      1.[illegible]      ***


Failure Surface Specified By 23 Coordinate Points

  Point        X-Surf        Y-Surf
```

PYL 12/12/89
WYL 2/5/92

```
       20        712.57       233.78
       21        713.06       244.05

           ***     4.316    ***


     Failure Surface Specified By 19 Coordinate Points

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

        1        184.44       127.83
        2        210.02       112.15
        3        239.86       115.26
        4        266.78       128.52
        5        295.98       135.37
        6        325.50       140.75
        7        355.39       143.30
        8        385.21       140.00
        9        415.17       141.42
       10        444.38       148.26
       11        474.35       146.89
       12        504.35       146.56
       13        534.35       146.64
       14        562.92       155.77
       15        592.70       159.42
       16        616.84       177.23
       17        637.04       199.41
       18        650.47       226.23
       19        656.98       232.61

           ***     4.532    ***


1
     Failure Surface Specified By 22 Coordinate Points

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

        1        191.67       132.42
        2        216.40       115.44
        3        246.34       113.52
        4        275.57       120.25
        5        304.98       114.34
        6        334.10       121.55
        7        363.94       124.72
        8        389.51       140.40
        9        418.40       148.49
       10        447.12       139.84
       11        476.35       133.08
       12        505.98       137.82
       13        535.94       139.37
       14        557.18       160.56
```

PYL 12/13/89

```
          ***      4.[illegible]     ***


      Failure Surface Specified By 19 Coordinate Points

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

          1           181.44          127.83
          2         [illegible]       112.15
          3         [illegible]       115.26
          4         [illegible]       128.52
          5         [illegible]       135.37
          6           325.50          140.75
          7           355.30          143.30
          8           385.21          140.00
          9           415.17          141.42
         10         [illegible]       148.26
         11         [illegible]       146.89
         12         [illegible]       146.56
         13         [illegible]     1[illegible]6.64
         14         [illegible]     1[illegible]5.77
         15         [illegible]     1[illegible]9.42
         16         [illegible]     1[illegible]7.23
         17         [illegible]     1[illegible]9.41
         18         [illegible]     2[illegible]6.23
         19         [illegible]     2[illegible]2.61

          ***      4.[illegible]     ***


      Failure Surface Specified By 20 Coordinate Points

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

          1         [illegible]       123.23
          2           201.91          111.69
          3         [illegible]       110.08
          4         [illegible]       121.76
          5         [illegible]       135.31
          6         [illegible]       132.82
          7         [illegible]     1[illegible]5.53
          8         [illegible]       112.62
          9         [illegible]       113.76
         10         [illegible]     1[illegible]4.20
         11         [illegible]     1[illegible]9.19
         12         [illegible]       149.03
         13         [illegible]     1[illegible]2.26
         14         [illegible]     1[illegible]4.12
         15         [illegible]     1[illegible]8.04
         16         [illegible]     1[illegible]7.71
         17         [illegible]     1[illegible]7.14
```

PYL 12/2/89
WYL 2/[illegible]/90

```
          No.         (ft)        (ft)

           1         198.89      137.02
           2         228.83      138.88
           3         258.56      134.87
           4         288.39      138.09
           5         316.75      147.86
           6         346.72      149.24
           7         376.39      144.81
           8         404.85      154.31
           9         434.37      159.64
          10         461.50      172.45
          11         491.25      176.32
          12         521.09      173.23
          13         550.72      177.91
          14         580.67      179.69
          15         609.93      186.31
          16         635.41      202.14
          17         660.17      219.08
          18         688.56      228.77
          19         709.42      243.31

             ***      4.105    ***


1
        Failure Surface Specified By 23 Coordinate Points

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

           1         170.00      118.64
           2         198.80      110.22
           3         228.30      115.63
           4         257.04      124.25
           5         287.04      124.38
           6         316.52      118.84
           7         346.49      117.44
           8         375.87      111.38
           9         405.53      115.91
          10         435.05      121.23
          11         464.81      125.07
          12         493.67      133.23
          13         522.44      141.76
          14         551.43      149.45
          15         581.43      149.04
          16         611.15      144.93
          17         639.35      155.17
          18         668.06      163.86
          19         684.60      188.89
          20         703.75      211.98
          21         726.55      231.47
          22         754.00      243.59
          23         778.71      257.44

             ***      4.246    ***
```

PYL 12/13/89
WYL 2/5/90

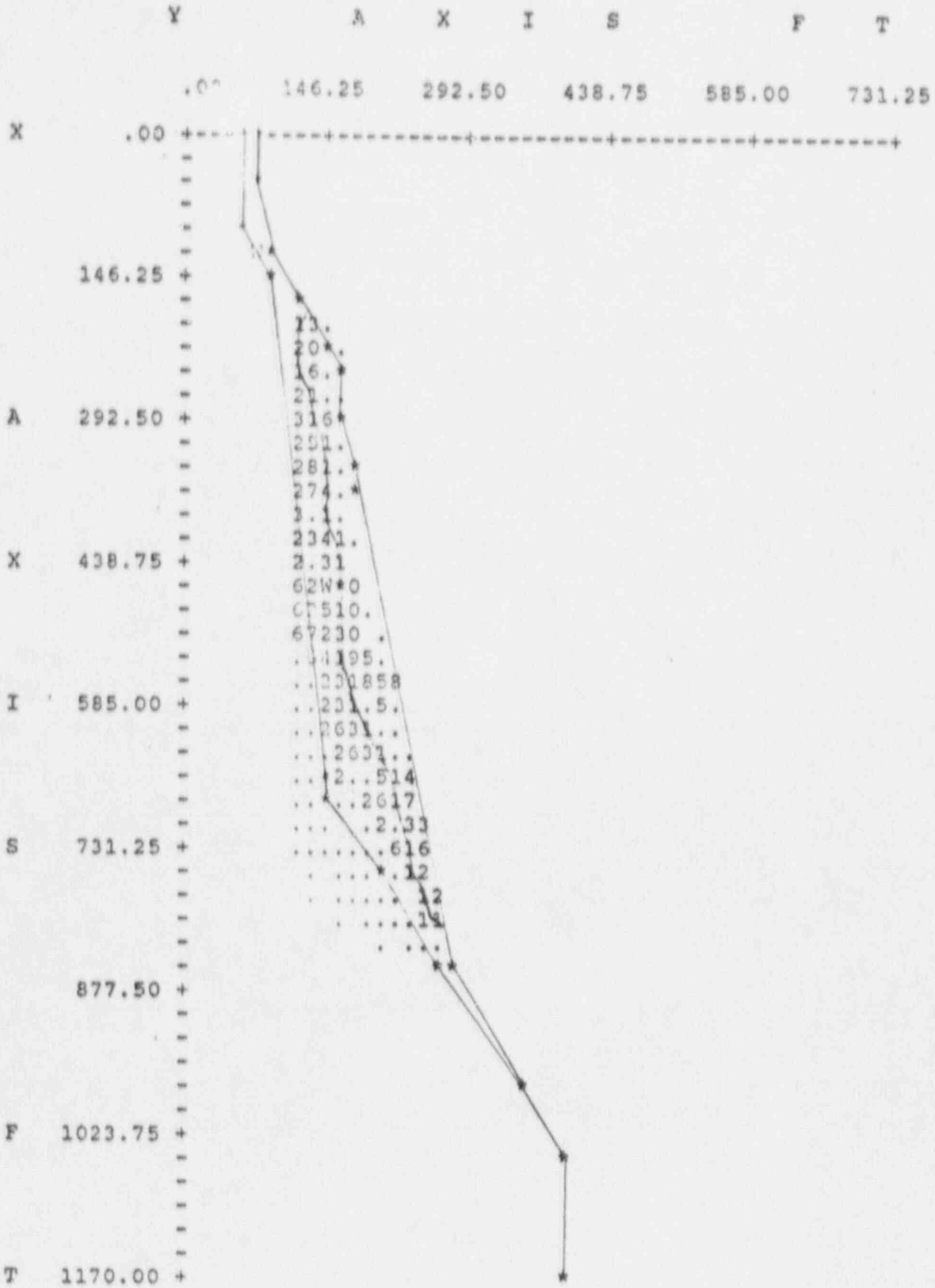
```
     10          [illegible]       139.84
     11          [illegible]       133.08
     12          [illegible]       137.82
     13          [illegible]       139.37
     14          [illegible]       160.56
     15          [illegible]       171.74
     16          [illegible]       188.12
     17          [illegible]       193.13
     18          [illegible]       203.55
     19          [illegible]       233.55
     20          [illegible]       234.60
     21          [illegible]       249.35
     22          [illegible]       249.60

          ***      [illegible]      ***


   Failure Surface Specified By 17 Coordinate Points

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

       1         [illegible]       118.64
       2         [illegible]       110.15
       3         [illegible]       113.12
       4         [illegible]       112.45
       5         [illegible]       105.75
       6         [illegible]       102.05
       7         [illegible]       106.67
       8         [illegible]       106.35
       9         [illegible]       108.47
      10         [illegible]       115.81
      11         [illegible]       120.63
      12         [illegible]       126.35
      13         [illegible]       133.96
      14         [illegible]       147.48
      15         [illegible]       166.76
      16         [illegible]       202.46
      17         [illegible]       214.29

          ***      4.[illegible]      ***


1
   Failure Surface Specified By 19 Coordinate Points

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

       1         [illegible]       127.83
       2         [illegible]       121.51
       3         [illegible]       113.17
       4         [illegible]       113.66
       5         [illegible]       113.14
```

PYL 12/2/89
[illegible]

```
         26         670.00     142.00     680.00     150.00        6
 1


         ISOTROPIC SOIL PARAMETERS


          6 Type(s) of Soil


          Soil   Total  Saturated  Cohesion Friction    Pore    Pressure   Piez.
          Type Unit Wt. Unit Wt.  Intercept   Angle   Pressure  Constant  Surface
           No.   (pcf)    (pcf)     (psf)     (deg)    Param.     (psf)     No.

            1    130.0    135.0      850.0     27.0      .00        .0       1
            2    144.0    155.0         .0     40.0      .00        .0       1
            3    122.5    130.5      350.0     17.5      .00        .0       1
            4    124.5    131.0     1460.0     32.0      .00        .0       1
            5    124.5    131.0     1460.0     32.0      .00        .0       1
            6    137.0    143.5         .0     45.0      .00        .0       1
 1


          1 PIEZOMETRIC SURFACE(S) HAVE BEEN SPECIFIED


          Unit Weight of Water =  62.40


          Piezometric Surface No.  1 Specified by  8 Coordinate Points


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

              1            .00        75.00
              2         115.00        75.00
              3         182.00       120.00
              4         460.00       142.00
              5         670.00       142.00
              6         980.00       345.00
              7        1055.00       390.00
              8        1170.00       390.00
 1


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


          100 Trial Surfaces Have Been Generated.


           10 Surfaces Initiate From Each Of 10 Points Equally Spaced
          Along The Ground Surface Between  X = 170.00 ft.
                                          and  X = 235.00 ft.


          Each Surface Terminates Between   X = 550.00 ft.
```

PYL 12/13/89
LTNSRMV2 WHL 2/2/90

1



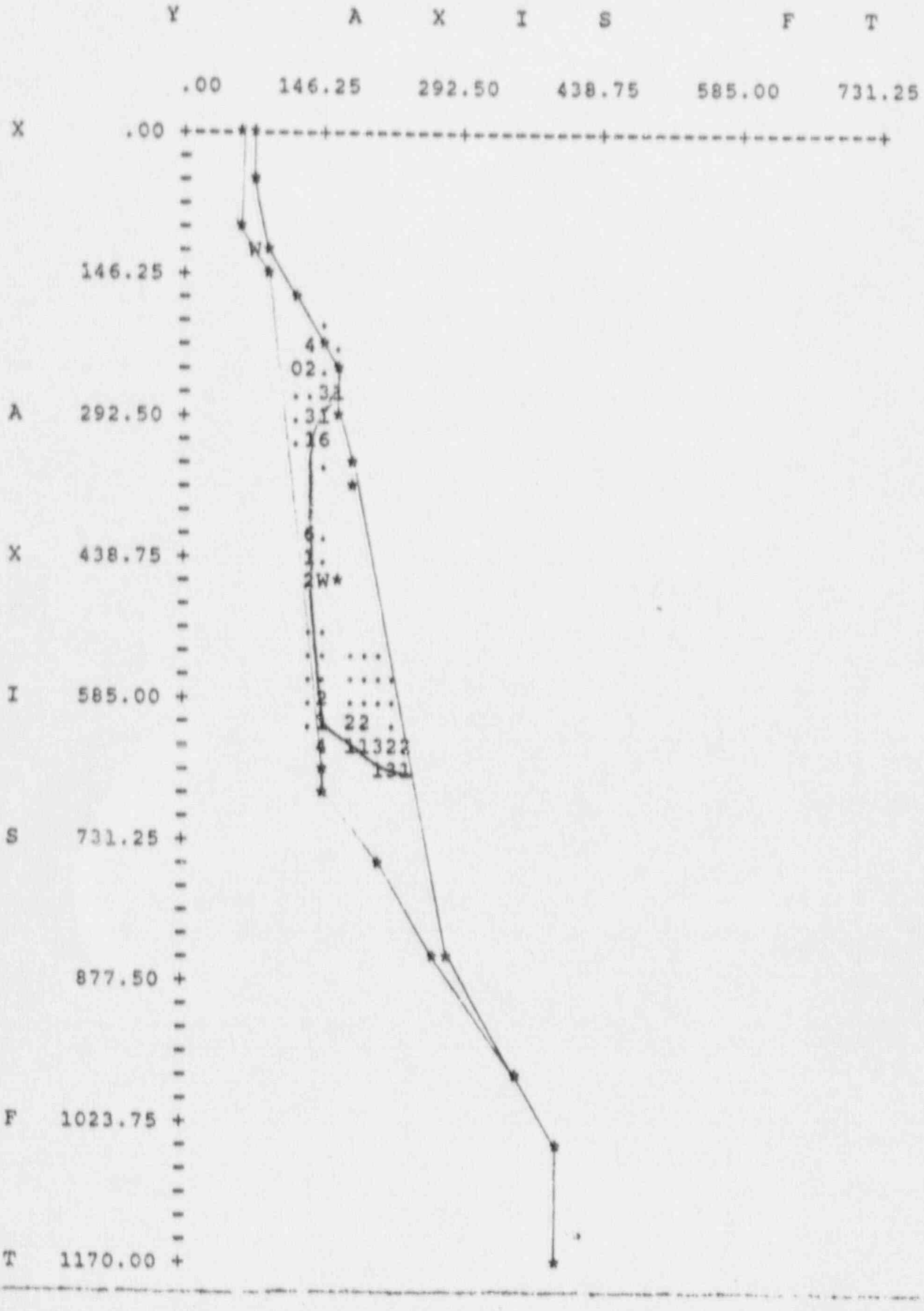
1

*** 2.322 ***

PYL 12/12/89
W L 2/8/90

LTSALL2

1



1

PYL 12/13/89
W' - 6 [illegible]

```
    26        670.00     142.00      680.00      150.00


ISOTROPIC SOIL PARAMETERS

 6 Type(s) of Soil

 Soil  Total  Saturated  Cohesion Friction   Pore    Pressure   Piez.
 Type Unit Wt. Unit Wt. Intercept  Angle   Pressure Constant Surface
  No.  (pcf)    (pcf)     (psf)    (deg)    Param.    (psf)    No.

   1   130.0    135.0     250.0     21.0     .00        .0      1
   2   144.0    155.0        .0     40.0     .00        .0      1
   3   122.5    130.5     750.0     27.0     .00        .0      1
   4   124.5    131.0    1460.0     32.0     .00        .0      1
   5   124.5    131.0    1460.0     32.0     .00        .0      1
   6   137.0    143.5        .0     45.0     .00        .0      1


 1 PIEZOMETRIC SURFACE(S) HAVE BEEN SPECIFIED

 Unit Weight of Water =  62.40


 Piezometric Surface No.  1 Specified by  8 Coordinate Points

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

     1          .00         75.00
     2       115.00         75.00
     3       182.00        120.00
     4       460.00        142.00
     5       670.00        142.00
     6       980.00        345.00
     7      1055.00        390.00
     8      1170.00        390.00


 A Horizontal Earthquake Loading Coefficient
 Of .230 Has Been Assigned

 A Vertical Earthquake Loading Coefficient
 Of .000 Has Been Assigned

 Cavitation Pressure =     .0 psf


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

PYL 12/12/89
WYL 2/2/90

```
1
           Failure Surface Specified By 13 Coordinate Points

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

                1           276.54         160.00
                2           281.33         157.06
                3           294.07         150.00
                4           307.61         142.50
                5           447.19         130.10
                6           589.67         140.73
                7           594.81         150.00
                8           609.36         176.24
                9           613.02         182.85
               10           621.58         196.82
               11           634.26         224.01
               12           634.47         224.44
               13           637.32         228.60

                   ***       2.287     ***


           Failure Surface Specified By 13 Coordinate Points

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

                1           218.47         149.48
                2           223.69         146.28
                3           224.78         145.68
                4           251.01         131.13
                5           461.82         132.66
                6           603.91         141.11
                7           608.84         150.00
                8           623.38         176.24
                9           628.02         184.60
               10           636.44         198.34
               11           649.12         225.53
               12           650.08         227.60
               13           652.96         231.79

                   ***       2.303     ***


1
           Failure Surface Specified By 13 Coordinate Points

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

                1           253.21         160.00
```

PYL 12/13/89

WYL 2/5/90

```
          ***     1.990     ***


      Failure Surface Specified By 21 Coordinate Points

          Point        X-Surf        Y-Surf
           Nc.          (ft)          (ft)

            1          184.44        127.83
            2          210.46        112.89
            3          240.40        110.95
            4          269.53        118.10
            5          299.53        117.67
            6          328.90        111.53
            7          358.88        110.50
            8          388.71        113.70
            9          415.72        126.75
           10          442.70        139.87
           11          472.30        144.72
           12          500.70        154.39
           13          529.41        163.10
           14          559.05        167.76
           15          588.90        164.77
           16          615.63        178.38
           17          643.48        189.55
           18          673.30        192.81
           19          699.96        206.57
           20          712.57        233.78
           21          713.06        244.05

          ***     2.033     ***


1
      Failure Surface Specified By 24 Coordinate Points

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

            1          177.22        123.23
            2          204.36        110.44
            3          233.07        119.12
            4          259.86        132.62
            5          289.48        137.43
            6          319.04        142.52
            7          348.99        144.20
            8          377.88        152.30
            9          405.66        163.63
           10          435.49        166.81
           11          465.39        164.44
           12          495.33        166.36
           13          525.22        163.72
           14          554.13        171.70
           15          582.80        180.56
```

PYL 12/12/89
N' - [illegible]

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

         1         207.53       142.52
         2         212.33       139.58
         3         238.32       125.18
         4         457.42       130.79
         5         586.50       143.81
         6         589.94       150.00
         7         604.48       176.24
         8         607.81       182.24
         9         616.42       196.29
        10         629.03       223.35
        11         631.88       227.49

            ***     2.237     ***


1
     Failure Surface Specified By 13 Coordinate Points

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

         1         254.91       160.00
         2         261.17       156.16
         3         272.29       150.00
         4         292.62       138.73
         5         430.56       129.25
         6         611.86       149.13
         7         612.34       150.00
         8         626.88       176.24
         9         631.76       185.04
        10         640.15       198.73
        11         657.82       225.91
        12         653.98       228.39
        13         656.86       232.59

            ***     2.247     ***


     Failure Surface Specified By 12 Coordinate Points

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

         1         215.31       147.47
         2         220.41       144.35
         3         231.19       138.37
         4         465.10       131.86
         5         618.19       142.97
         6         622.09       150.00
         7         636.64       176.24
```

PYL 12/13/89
WYL 2/5/90

```
         5        295.98       135.37
         6        325.50       140.75
         7        355.39       143.30
         8        385.21       140.00
         9        415.17       141.42
        10        444.38       148.26
        11        474.35       146.89
        12        504.35       146.56
        13        534.35       146.64
        14        562.92       155.77
        15        592.70       159.42
        16        616.84       177.23
        17        637.04       199.41
        18        650.47       226.23
        19        656.98       232.61

          ***      2.162    ***


     Failure Surface Specified By 19 Coordinate Points

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

         1        177.22       123.23
         2        206.97       127.15
         3        236.93       128.64
         4        264.93       117.87
         5        293.99       110.42
         6        323.99       110.06
         7        353.31       116.40
         8        383.30       115.79
         9        412.90       120.70
        10        437.35       138.09
        11        464.83       150.11
        12        494.61       153.78
        13        523.60       161.52
        14        553.31       165.63
        15        579.51       180.25
        16        609.40       182.82
        17        634.31       199.53
        18        640.19       228.95
        19        640.31       229.21

          ***      2.172    ***

1
     Failure Surface Specified By 19 Coordinate Points

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

         1        198.89       137.02
```

PYL 12/12/99

```
1        26         670.00      142.00      680.00      150.00         6


          ISOTROPIC SOIL PARAMETERS

           6 Type(s) of Soil

           Soil  Total  Saturated  Cohesion Friction   Pore   Pressure   Piez.
           Type Unit Wt. Unit Wt. Intercept  Angle  Pressure Constant Surface
            No.  (pcf)     (pcf)     (psf)    (deg)   Param.    (psf)     No.

             1   130.0     135.0     250.0     21.0     .00        .0      1
             2   144.0     155.0        .0     40.0     .00        .0      1
             3   122.5     130.5     750.0     27.0     .00        .0      1
             4   124.5     131.0    1460.0     32.0     .00        .0      1
             5   124.5     131.0    1460.0     32.0     .00        .0      1
             6   137.0     143.5        .0     45.0     .00        .0      1
1


           1 PIEZOMETRIC SURFACE(S) HAVE BEEN SPECIFIED

           Unit Weight of Water =  62.40


           Piezometric Surface No.  1 Specified by  8 Coordinate Points

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

               1             .00         75.00
               2          115.00         75.00
               3          182.00        120.00
               4          460.00        142.00
               5          670.00        142.00
               6          980.00        345.00
               7         1055.00        390.00
               8         1170.00        390.00


           A Horizontal Earthquake Loading Coefficient
           Of .230 Has Been Assigned

           A Vertical Earthquake Loading Coefficient
           Of .000 Has Been Assigned

           Cavitation Pressure =      .0 psf
1


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

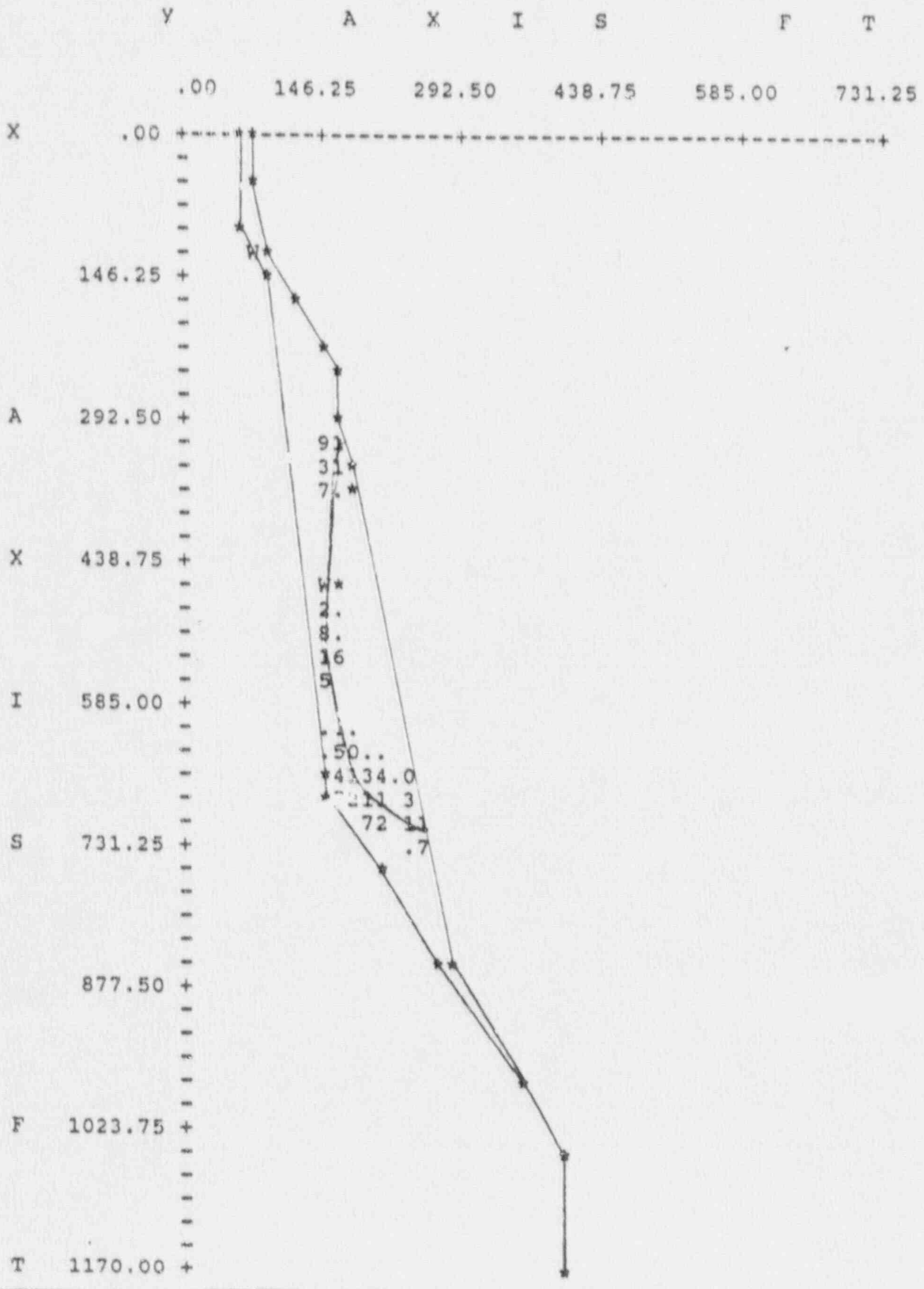
PKL 12/13/89
[illegible]

```
Failure Surface Specified By 19 Coordinate Points

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

    1        184.44      127.83
    2        213.77      121.51
    3        242.59      113.17
    4        272.59      113.66
    5        302.58      113.14
    6        332.17      118.11
    7        356.00      136.33
    8        382.54      150.31
    9        411.05      159.64
   10        440.72      164.11
   11        470.67      165.72
   12        500.51      162.56
   13        529.64      169.70
   14        559.49      172.75
   15        588.53      180.28
   16        615.24      193.95
   17        642.99      205.33
   18        668.63      220.91
   19        682.06      237.73

        ***     2.215    ***


Failure Surface Specified By 20 Coordinate Points

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

    1        220.56      150.81
    2        248.39      139.61
    3        278.16      135.91
    4        306.08      124.94
    5        335.18      117.65
    6        362.70      129.58
    7        392.16      135.26
    8        419.36      147.92
    9        448.92      153.03
   10        478.87      154.69
   11        508.15      148.12
   12        536.29      137.74
   13        564.67      147.46
   14        593.58      155.48
   15        621.55      166.34
   16        646.79      182.55
   17        673.00      197.15
   18        696.68      215.57
   19        721.88      231.85
   20        725.94      246.68
```

```
   10        674.65        236.22

        ***       2.291     ***
```

PYL 12/12/89
W'L 2/[illegible]/90

LTSALL1



MORRISON-KNUDSEN ENGINEERS, INC.
A MORRISON KNUDSEN COMPANY

Project: UMTRA - LOW
Feature: Embankment Design
Item: Slope Stability Analysis Rev △1
Sheet: B - 1
Contract No. 3885-48
File No.
Designed: PYL
Date: 7/12/90
Checked: K. Lee
Date: 8/3/90

Rev △1

APPENDIX B

'STABL5' OUTPUT

SHALLOW FAILURE SURFACE

PKL 12/7/89
W - 2/2/90

```
         8          706.19         205.50
         9          718.87         232.69
        10          723.41         242.42
        11          726.40         246.77

             ***        2.285     ***


     Failure Surface Specified By 10 Coordinate Points

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

         1          327.79         165.96
         2          338.20         159.59
         3          352.06         151.90
         4          513.45         150.24
         5          646.00         163.40
         6          659.81         188.31
         7          667.94         201.58
         8          680.62         228.77
         9          683.19         234.29
        10          686.12         238.56

             ***        2.289     ***


1
     Failure Surface Specified By 11 Coordinate Points

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

         1          306.50         162.09
         2          312.45         158.44
         3          324.16         151.95
         4          521.23          50.38
         5          661.73         161.88
         6          676.27         188.12
         7          677.52         190.38
         8          685.49         203.38
         9          698.17         230.57
        10          701.64         238.02
        11          704.60         242.33

             ***        2.290     ***


     Failure Surface Specified By 10 Coordinate Points

        Point        X-Surf         Y-Surf
```

UMTRA - LOW Sh B-3

Rev ① Slope stability / [illegible]

PYL 7/12/90

checked K. Lee 8/3/90

```
6 Type(s) of Soil

Soil  Total  Saturated  Cohesion Friction   Pore   Pressure   Piez.
Type Unit Wt. Unit Wt. Intercept  Angle  Pressure Constant Surface
 No.  (pcf)    (pcf)     (psf)    (deg)   Param.    (psf)     No.

  1   130.0    135.0     850.0    27.0     .00        .0       1
  2   144.0    155.0        .0    40.0     .00        .0       1
  3   122.5    130.5     350.0    17.5     .00        .0       1  ✓
  4   124.5    131.0    1460.0    32.0     .00        .0       1
  5   124.5    131.0    1460.0    32.0     .00        .0       1
  6   137.0    143.5        .0    45.0     .00        .0       1


1 PIEZOMETRIC SURFACE(S) HAVE BEEN SPECIFIED


Unit Weight of Water =  62.40


Piezometric Surface No.  1 Specified by  8 Coordinate Points


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

    1           .00       75.00
    2        115.00       75.00
    3        182.00      120.00
    4        460.00      142.00
    5        670.00      142.00
    6        980.00      345.00
    7       1055.00      390.00
    8       1170.00      390.00
1


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


The Active And Passive Portions Of The Sliding Surfaces
Are Generated According To The Rankine Theory.


100 Trial Surfaces Have Been Generated.


2 Boxes Specified For Generation Of Central Block Base


Length Of Line Segments For Active And Passive Portions Of
Sliding Block Is  20.0


Box         X-Left      Y-Left     X-Right    Y-Right       Height
No.          (ft)        (ft)        (ft)       (ft)         (ft)

 1          860.00      270.00      900.00     295.00        2.00
 2          930.00      315.00      950.00     327.00        1.00
1
```

PYL 12/12/89
W [illegible]

```
          1          330.28        166.41
          2          341.21        159.72
          3          351.31        154.12
          4          477.29        150.65
          5          675.56        169.31
          6          687.91        191.59
          7          695.78        204.44
          8          708.46        231.62
          9          712.46        240.2[illegible]
         10          715.44        244.5[illegible]

             ***      2.251    ***

1
       Failure Surface Specified By 10 Coordinate Points

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

          1          319.97        164.54
          2          328.74        159.17
          3          339.32        153.30
          4          546.06        150.78
          5          656.02        168.69
          6          667.38        189.19
          7          675.44        202.35
          8          688.12        229.54
          9          691.08        235.89
         10          694.02        240.17

             ***      2.258    ***

       Failure Surface Specified By 10 Coordinate Points

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

          1          325.29        165.51
          2          335.17        159.45
          3          349.23        151.66
          4          540.70        151.47
          5          648.22        166.80
          6          660.17        188.35
          7          668.30        201.62
          8          680.98        228.80
          9          683.57        234.37
         10          686.50        238.63

             ***      2.272    ***
```

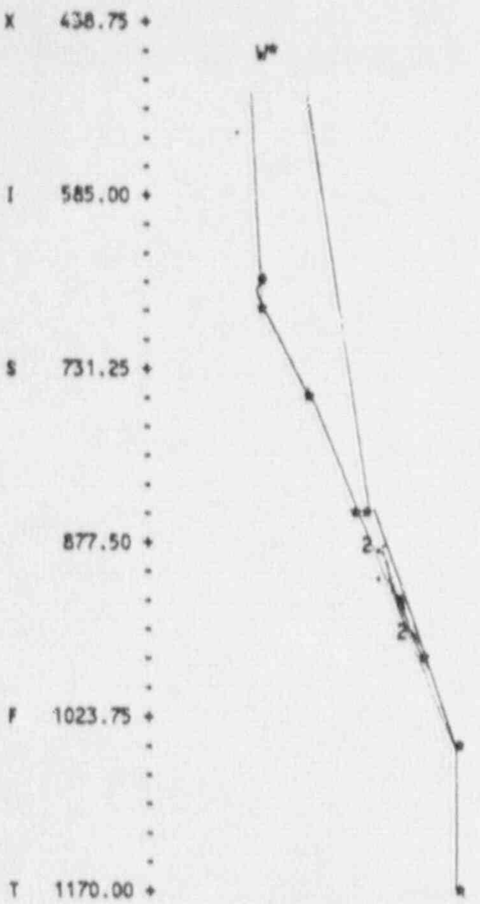
UMTRA-LOW SI.B-5
Rev △1 Slope Stability
PYL 7/17/90

```
          3        930.07      314.88
          4        931.80      317.24

        ***     2.699    ***


1
     Failure Surface Specified By  4 Coordinate Points

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

          1        857.08      274.20
          2        861.37      271.05
          3        946.07      324.22
          4        947.64      326.36

        ***     2.699    ***


     Failure Surface Specified By  4 Coordinate Points

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

          1        865.17      278.86
          2        869.58      275.63
          3        931.73      315.86
          4        933.43      318.18

        ***     2.715    ***


     Failure Surface Specified By  4 Coordinate Points

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

          1        862.69      277.43
          2        867.43      273.95
          3        946.44      325.02
          4        947.26      326.14

        ***     2.716    ***


     Failure Surface Specified By  4 Coordinate Points

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

          1        862.81      277.50
          2        867.19      274.28
```

PYL 12/12/89
W' - 2/5/90

```
        26       670.00     142.00     680.00     150.00        6
1

      ISOTROPIC SOIL PARAMETERS

        6 Type(s) of Soil

       Soil  Total  Saturated  Cohesion Friction    Pore   Pressure    Piez.
       Type Unit Wt. Unit Wt. Intercept   Angle  Pressure Constant  Surface
        No.  (pcf)    (pcf)     (psf)     (deg)   Param.    (psf)      No.

         1   130.0    135.0     250.0     21.0     .00        .0        1
         2   144.0    155.0        .0     40.0     .00        .0        1
         3   122.5    130.5     750.0     27.0     .00        .0        1
         4   124.5    131.0    1460.0     32.0     .00        .0        1
         5   124.5    131.0    1460.0     32.0     .00        .0        1
         6   137.0    143.5        .0     45.0     .00        .0        1
1

       1 PIEZOMETRIC SURFACE(S) HAVE BEEN SPECIFIED

       Unit Weight of Water =  62.40


       Piezometric Surface No.  1 Specified by  8 Coordinate Points

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

           1             .00         75.00
           2          115.00         75.00
           3          182.00        120.00
           4          460.00        142.00
           5          670.00        142.00
           6          980.00        345.00
           7         1055.00        390.00
           8         1170.00        390.00


       A Horizontal Earthquake Loading Coefficient
       Of .230 Has Been Assigned

       A Vertical Earthquake Loading Coefficient
       Of .000 Has Been Assigned

       Cavitation Pressure =      .0 psf
1

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

UMTRA-LOW Sh B-7
Rev Δ Slope Stability
PYL 7/17/90

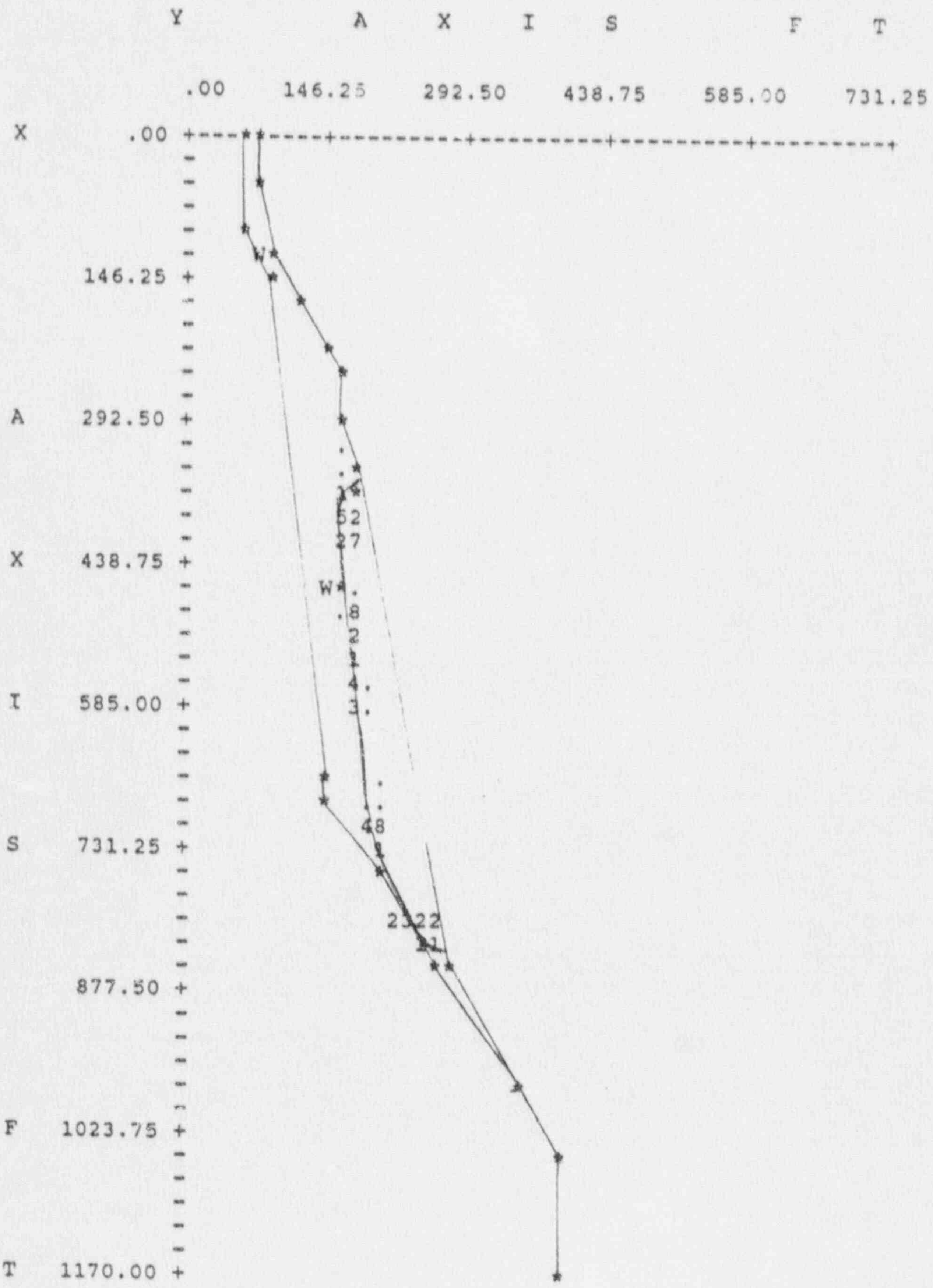


```
1
 ****************************************
 ******              - Illegal Command  ******
 ****************************************


 Legal Commands - PROFIL
                  LOADS
                  TIES
                  WATER
                  SURFAC
                  EXECUT
                  EQUAKE
                  SOIL
                  RANDOM
                  CIRCLE
                  CIRCL2
                  BLOCK
                  BLOCK2
                  LIMITS
                  ANISO
                  SURBIS
                  SPENCR
```

*** 1.642 ***

PYL 12/11/79
WYL 2/5/80
LTSCOLL.

1



1

UMTRA - LCW Sh B-9
Rev △ Slope Stability
PYL 7/17/90
Checked KCKee 8/3/90

```
6 Type(s) of Soil

Soil  Total  Saturated  Cohesion Friction   Pore    Pressure   Piez.
Type Unit Wt. Unit Wt. Intercept  Angle  Pressure Constant  Surface
 No.  (pcf)    (pcf)     (psf)    (deg)   Param.    (psf)     No.

  1   130.0    135.0     850.0    27.0     .00        .0       1
  2   144.0    155.0        .0    40.0     .00        .0       1
  3   122.5    130.5     350.0    17.5     .00        .0       1 ✓
  4   124.5    131.0    1460.0    32.0     .00        .0       1
  5   124.5    131.0    1460.0    32.0     .00        .0       1
  6   137.0    143.5        .0    45.0     .00        .0       1


1 PIEZOMETRIC SURFACE(S) HAVE BEEN SPECIFIED


Unit Weight of Water =  62.40


Piezometric Surface No.  1 Specified by  8 Coordinate Points


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

    1            .00      75.00
    2         115.00      75.00
    3         182.00     120.00
    4         460.00     142.00
    5         670.00     142.00
    6         980.00     340.00
    7        1055.00     390.00
    8        1170.00     390.00


A Horizontal Earthquake Loading Coefficient
Of .170 Has Been Assigned                      ✓

A Vertical Earthquake Loading Coefficient
Of .000 Has Been Assigned

Cavitation Pressure =     .0 psf


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


The Active And Passive Portions Of The Sliding Surfaces
Are Generated According To The Rankine Theory.


100 Trial Surfaces Have Been Generated.


2 Boxes Specified For Generation Of Central Block Base
```

PYL 12/12/89
[illegible]

```
        8         815.56       248.03
        9         822.26       262.39
       10         825.40       266.96

          ***      1.627    ***


     Failure Surface Specified By 10 Coordinate Points

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

        1         387.31       177.61
        2         390.81       175.21
        3         394.45       173.51
        4         403.91       167.72
        5         495.47       170.19
        6         708.16       198.17
        7         822.82       246.84
        8         827.95       255.21
        9         832.24       264.41
       10         835.39       269.00

          ***      1.639    ***

1
     Failure Surface Specified By 10 Coordinate Points

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

        1         385.96       177.34
        2         389.46       174.93
        3         392.86       173.35
        4         403.51       166.82
        5         506.25       171.52
        6         703.51       197.69
        7         799.18       230.36
        8         806.94       243.03
        9         815.32       260.99
       10         818.45       265.55

          ***      1.639    ***


     Failure Surface Specified By 10 Coordinate Points

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

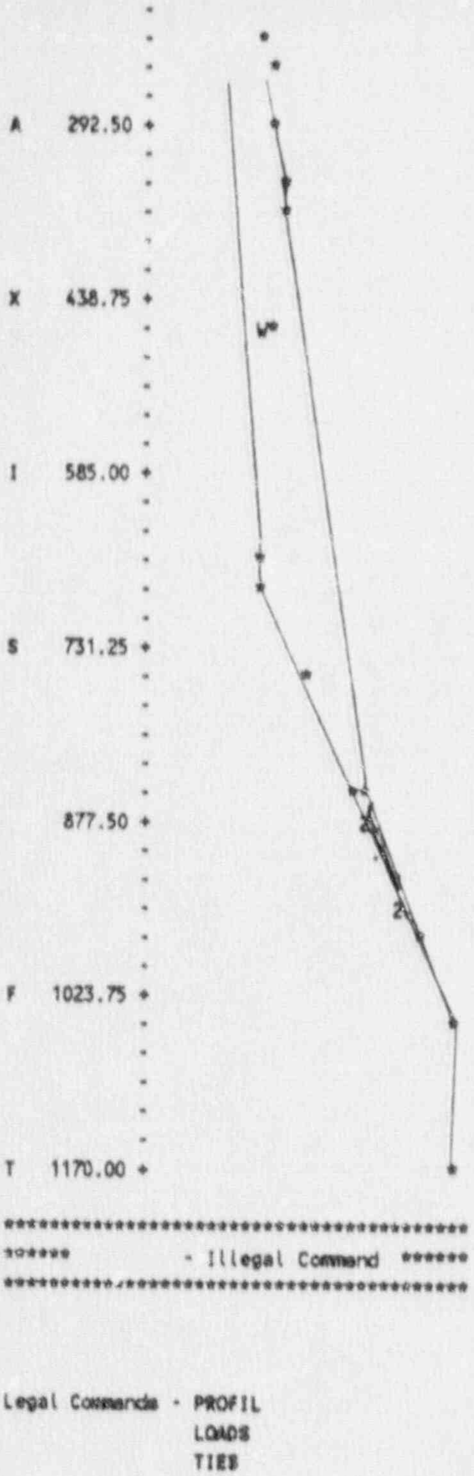
UMTRA-LCLU sh B-11
Rev △ Slope Stability
PYL 7/12/90

```
Failure Surface Specified By  4 Coordinate Points

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

     1        857.08      274.20
     2        861.37      271.05
     3        946.07      324.22
     4        947.64      326.36

       ***     2.044    ***


Failure Surface Specified By  4 Coordinate Points

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

     1        869.53      281.37
     2        874.07      278.04
     3        930.07      314.88
     4        931.80      317.24

       ***     2.045    ***


Failure Surface Specified By  4 Coordinate Points

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

     1        865.17      278.86
     2        869.58      275.63
     3        931.73      315.86
     4        933.43      318.18

       ***     2.057    ***


Failure Surface Specified By  4 Coordinate Points

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

     1        862.69      277.43
     2        867.43      273.95
     3        946.44      325.02
     4        947.26      326.14

       ***     2.058    ***
```

PYL 12/2/89
WYL 2/5/90

```
         1          390.59       178.28
         2          394.09       175.87
         3          398.30       173.90
         4          411.72       165.68
         5          519.85       173.63
         6          731.13       198.78
         7          795.47       226.29
         8          805.06       241.93
         9          813.80       260.69
        10          816.93       265.24

             ***      1.610     ***

1

     Failure Surface Specified By  9 Coordinate Points

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

         1          357.45       171.52
         2          359.00       170.45
         3          370.51       163.40
         4          577.27       178.75
         5          730.72       201.09
         6          802.21       233.43
         7          808.73       244.06
         8          816.76       261.28
         9          819.89       265.84

             ***      1.612     ***


     Failure Surface Specified By 10 Coordinate Points

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

         1          392.47       178.66
         2          395.98       176.25
         3          400.52       174.13
         4          410.55       167.99
         5          552.19       177.61
         6          717.18       197.34
         7          824.57       245.87
         8          831.59       257.32
         9          835.17       265.00
        10          838.33       269.60

             ***      1.621     ***
```

UMTRA-LOW Sh B-13
Cell △ Slope Stability
PYL 7/17/90



```
***************************************
******           - Illegal Command  ******
***************************************


Legal Commands - PROFIL
                 LOADS
                 TIES
                 WATER
                 SURFAC
                 EXECUT
                 EQUAKE
                 SOIL
                 RANDOM
                 CIRCLE
                 CIRCL2
                 BLOCK
                 BLOCK2
                 LIMITS
                 ANISO
                 SURBIS
                 SPENCR
```

PYL 12/12/89
WYL 2/5/90

```
      25        177.00      113.00      670.00      142.00           6
      26        670.00      142.00      680.00      150.00           6
1


          ISOTROPIC SOIL PARAMETERS

            6 Type(s) of Soil

           Soil  Total  Saturated  Cohesion Friction   Pore   Pressure   Piez.
           Type Unit Wt. Unit Wt. Intercept   Angle  Pressure Constant Surface
            No.  (pcf)    (pcf)     (psf)     (deg)   Param.    (psf)     No.

             1   130.0    135.0     250.0     21.0     .00        .0       1
             2   144.0    155.0        .0     40.0     .00        .0       1
             3   122.5    130.5     750.0     27.0     .00        .0       1
             4   124.5    131.0    1460.0     32.0     .00        .0       1
             5   124.5    131.0    1460.0     32.0     .00        .0       1
             6   137.0    143.5        .0     45.0     .00        .0       1
1


           1 PIEZOMETRIC SURFACE(S) HAVE BEEN SPECIFIED

           Unit Weight of Water =  62.40


           Piezometric Surface No.  1 Specified by  8 Coordinate Points

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

               1            .00        75.00
               2         115.00        75.00
               3         182.00       120.00
               4         460.00       142.00
               5         670.00       142.00
               6         980.00       345.00
               7        1055.00       390.00
               8        1170.00       390.00


           A Horizontal Earthquake Loading Coefficient
           Of .230 Has Been Assigned

           A Vertical Earthquake Loading Coefficient
           Of .000 Has Been Assigned

           Cavitation Pressure =      .0 psf


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

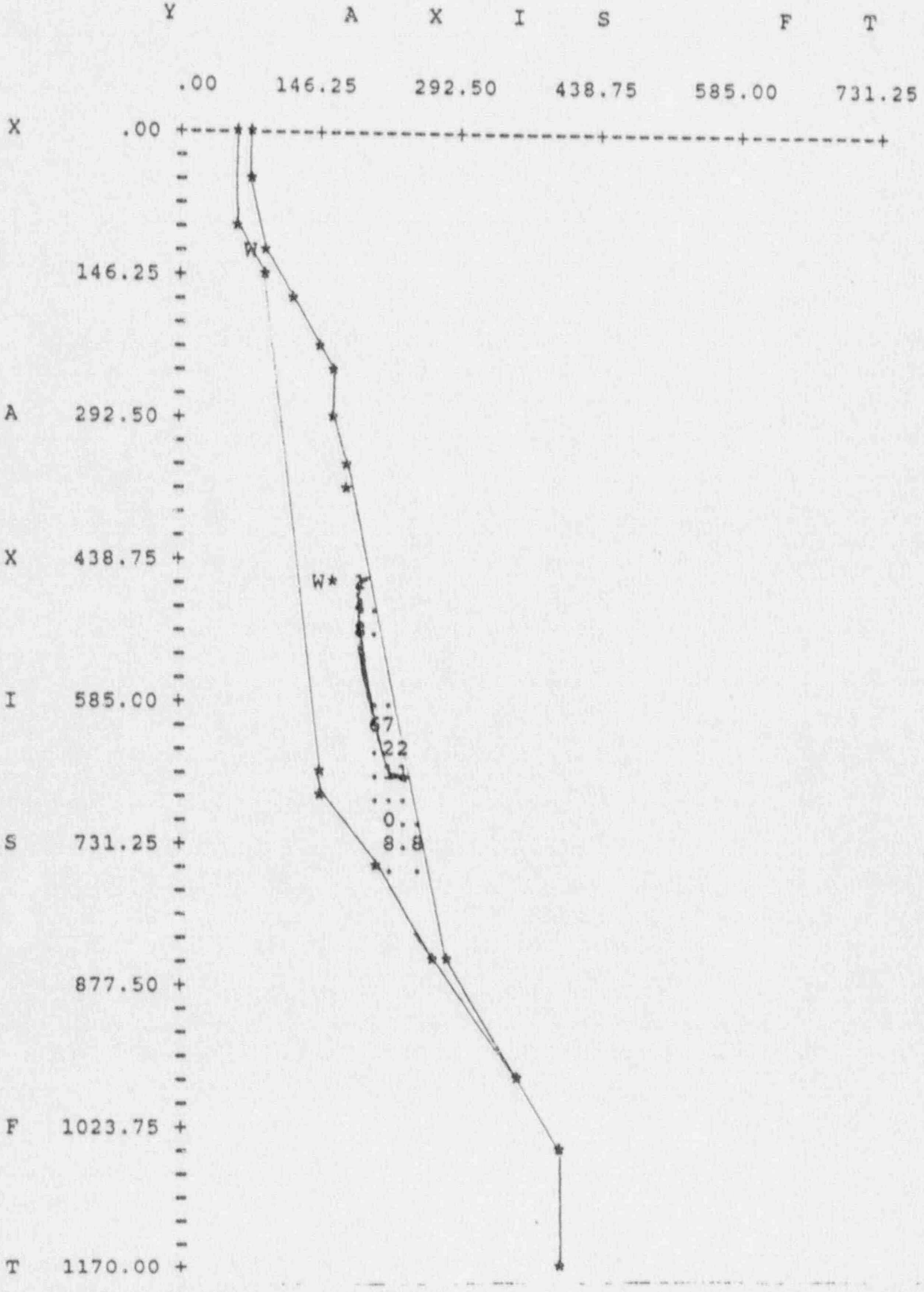
UMTRA-LOW B-15
Rev △ Slope Stability
PYL 7/17/90
Checked K. Cloe 8/3/90

```
 6 Type(s) of Soil

 Soil  Total  Saturated  Cohesion Friction   Pore   Pressure  Piez.
 Type Unit Wt. Unit Wt. Intercept  Angle  Pressure Constant Surface
  No   (pcf)    (pcf)     (psf)    (deg)   Param.    (psf)     No.

   1   130.0    135.0      98.0    36.0     .00        .0       1
   2   144.0    155.0        .0    40.0     .00        .0       1
   3   122.5    130.5     245.0    37.0     .00        .0       1 ✓
   4   124.5    131.0     885.0    37.0     .00        .0       1
   5   124.5    131.0     885.0    37.0     .00        .0       1
   6   137.0    143.5        .0    45.0     .00        .0       1


 1 PIEZOMETRIC SURFACE(S) HAVE BEEN SPECIFIED


 Unit Weight of Water =  62.40


 Piezometric Surface No.  1 Specified by  8 Coordinate Points

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

     1           .00       75.00
     2        115.00       75.00
     3        182.00      120.00
     4        460.00      142.00
     5        670.00      142.00
     6        980.00      345.00
     7       1055.00      390.00
     8       1170.00      390.00
1


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


 The Active And Passive Portions Of The Sliding Surfaces
 Are Generated According To The Rankine Theory.


 100 Trial Surfaces Have Been Generated.


 2 Boxes Specified For Generation Of Central Block Base


 Length Of Line Segments For Active And Passive Portions Of
 Sliding Block Is  20.0


 Box       X-Left     Y-Left     X-Right    Y-Right      Height
 No.        (ft)       (ft)       (ft)       (ft)         (ft)

  1        860.00     270.00     900.00     295.00        2.00
  2        930.00     315.00     950.00     327.00        1.00
1
```

```
5        724.70      242.68
6        727.70      247.04

    ***      2.036    ***
```

PYL 12/12/89
WYL 2/5/90

LTSSA.



UMTRA-LOW B47
Rev △ Slope Stability
PYL 7/17/90

```
       3         946.07       324.22
       4         946.93       325.95

          ***      2.851    ***

 1

      Failure Surface Specified By  4 Coordinate Points

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

             1         868.54        280.80
             2         874.07        278.04
             3         930.07        314.88
             4         931.03        316.79

          ***      2.872    ***


      Failure Surface Specified By  4 Coordinate Points

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

             1         861.65        276.83
             2         867.43        273.95
             3         946.44        325.02
             4         946.89        325.93

          ***      2.875    ***


      Failure Surface Specified By  4 Coordinate Points

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

             1         855.15        273.09
             2         860.32        270.51
             3         948.20        325.53
             4         949.00        327.16

          ***      2.876    ***


      Failure Surface Specified By  4 Coordinate Points

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

             1         864.21        278.31
             2         869.58        275.63
```

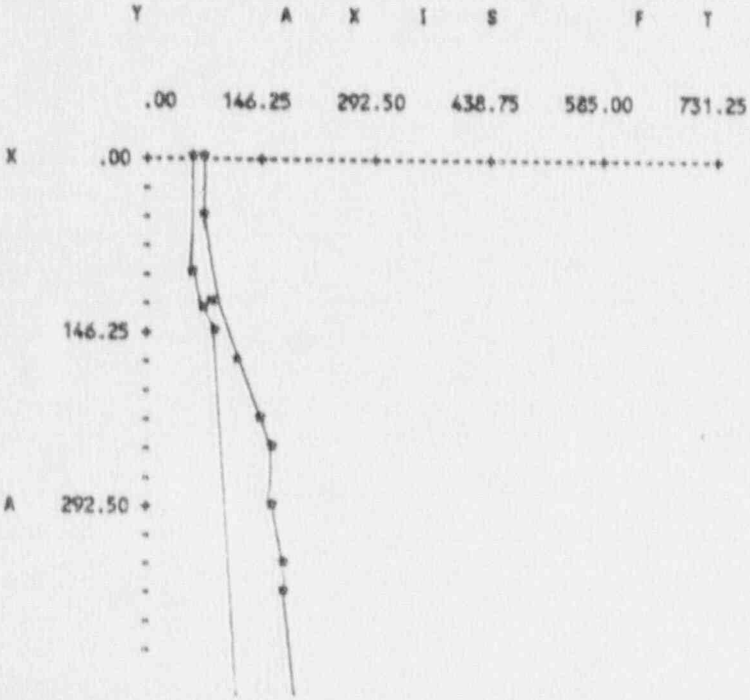
PYL 12/12/89
WY - 2/5/90

```
      Failure Surface Specified By  6 Coordinate Points

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

          1           457.24        191.87
          2           460.88        189.37
          3           463.70        188.05
          4           617.92        210.36
          5           623.45        222.22
          6           626.29        226.35

            ***       2.026    ***


1

      Failure Surface Specified By  6 Coordinate Points

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

          1           462.25        192.89
          2           465.90        190.38
          3           469.09        188.89
          4           607.29        209.48
          5           612.17        219.94
          6           615.00        224.05

            ***       2.029    ***

      Failure Surface Specified By  6 Coordinate Points

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

          1           483.96        197.32
          2           487.66        194.78
          3           499.85        189.09
          4           720.58        221.21
          5           731.20        243.99
          6           734.21        248.36

            ***       2.035    ***


1

      Failure Surface Specified By  6 Coordinate Points
```

UMTRA-LOW
Rev. Δ Slope Stability
PYL 7/17/90

B.19

```
        3         931.73       315.86
        4         932.67       317.74

            ***     2.876    ***


1

      Failure Surface Specified By  4 Coordinate Points

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

          1          861.85        276.94
          2          867.19        274.28
          3          969.13        326.21
          4          949.85        327.63

            ***     2.879    ***


      Failure Surface Specified By  6 Coordinate Points

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

          1          860.96        276.43
          2          866.02        273.91
          3          942.61        322.11
          4          943.56        324.01

            ***     2.883    ***
```



PYL 12/12/89
WYL 2/2/90

```
         The Active And Passive Portions Of The Sliding Surfaces
         Are Generated According To The Rankine Theory.


         100 Trial Surfaces Have Been Generated.


         2 Boxes Specified For Generation Of Central Block Base


         Length Of Line Segments For Active And Passive Portions Of
         Sliding Block Is  30.0

         Box         X-Left      Y-Left     X-Right     Y-Right       Height
         No.          (ft)        (ft)        (ft)        (ft)          (ft)

          1          460.00      186.00      520.00      193.00         5.00
          2          590.00      205.00      750.00      220.00        10.00
1

         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  6 Coordinate Points


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

             1        457.70       191.97
             2        461.35       189.46
             3        468.39       186.18
             4        650.42       214.81
             5        657.04       229.01
             6        659.93       233.21

               ***      2.009      ***


         Failure Surface Specified By  6 Coordinate Points


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

             1        462.71       192.99
             2        466.37       190.47
             3        473.78       187.02
             4        639.79       213.94
             5        645.76       226.73
```

UMTRA - LOW
Rev Δ Slope Stability
PYL 7/12/90

Checked K. Koe 8/3/90

```
 6 Type(s) of Soil


Soil  Total  Saturated  Cohesion Friction   Pore   Pressure  Piez.
Type Unit Wt. Unit Wt. Intercept   Angle  Pressure Constant Surface
 No.  (pcf)    (pcf)     (psf)     (deg)   Param.    (psf)     No.

   1  130.0    135.0     250.0     21.0     .00        .0       1
   2  144.0    155.0        .0     40.0     .00        .0       1
   3  122.5    130.5     750.0     27.0     .00        .0       1 ✓
   4  124.5    131.0    1460.0     32.0     .00        .0       1
   5  124.5    131.0    1460.0     32.0     .00        .0       1
   6  137.0    143.5        .0     45.0     .00        .0       1


1 PIEZOMETRIC SURFACE(S) HAVE BEEN SPECIFIED


Unit Weight of Water =  62.40


Piezometric Surface No.  1 Specified by  8 Coordinate Points


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

    1            .00        75.00
    2         115.00        75.00
    3         182.00       120.00
    4         460.00       142.00
    5         670.00       142.00
    6         980.00       345.00
    7        1055.00       390.00
    8        1170.00       390.00


A Horizontal Earthquake Loading Coefficient
Of .230 Has Been Assigned                          ✓

A Vertical Earthquake Loading Coefficient
Of .000 Has Been Assigned

Cavitation Pressure =      .0 psf


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


The Active And Passive Portions Of The Sliding Surfaces
Are Generated According To The Rankine Theory.


100 Trial Surfaces Have Been Generated.


2 Boxes Specified For Generation Of Central Block Base
```

PYL 12/12/89
NYL 2/5/90

```
                    ** PCSTABL5 **

                          by
                   Purdue University

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


Run Date:
Time of Run:
Run By:                      PYL
Input Data Filename:         A:LTSSA.DAT
Output Filename:             A:LTSSA2.OUT



PROBLEM DESCRIPTION    UMTRA-LOWMAN #1 LONG TERM SEIMIC-THRU SA
                       ND



BOUNDARY COORDINATES

   8 Top   Boundaries
  26 Total Boundaries

Boundary      X-Left      Y-Left     X-Right     Y-Right    Soil Type
   No.         (ft)        (ft)        (ft)        (ft)     Below Bnd

    1           .00       70.00       50.00       70.00        5
    2         50.00       70.00      125.00       90.00        5
    3        125.00       90.00      235.00      160.00        3
    4        235.00      160.00      295.00      160.00        3
    5        295.00      160.00      350.00      170.00        3
    6        350.00      170.00      855.00      273.00        1
    7        855.00      273.00      980.00      345.00        3
    8        980.00      345.00     1055.00      390.00        6
    9       1055.00      390.00     1170.00      390.00        6
   10        350.00      170.00      370.00      171.00        3
   11        370.00      171.00      850.00      268.00        2
   12        850.00      268.00      855.00      273.00        3
   13        370.00      171.00      750.00      210.00        3
   14        750.00      210.00      850.00      268.00        3
   15        125.00       90.00      135.00       94.00        5
   16        135.00       94.00      230.00      150.00        5
   17        230.00      150.00      235.00      155.00        4
   18        235.00      155.00      460.00      165.00        4
   19        460.00      165.00      760.00      200.00        4
   20        760.00      200.00      980.00      345.00        6
   21        230.00      150.00      680.00      150.00        5
   22        680.00      150.00      760.00      200.00        6
   23           .00       60.00       95.00       60.00        6
   24         95.00       60.00      177.00      113.00        6
   25        177.00      113.00      670.00      142.00        6
```

LIMTRA-LOW
Rev Δ Slope stability
PKL 8/12/92

```
Failure Surface Specified By  4 Coordinate Points

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

    1        869.07      281.11
    2        874.07      278.04
    3        930.07      314.88
    4        931.36      316.99

      ***     3.778   ***


Failure Surface Specified By  4 Coordinate Points

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

    1        856.64      273.95
    2        861.37      271.05
    3        946.07      324.22
    4        947.24      326.13

      ***     3.800   ***


Failure Surface Specified By  4 Coordinate Points

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

    1        864.73      278.60
    2        869.58      275.63
    3        931.73      315.86
    4        933.00      317.95

      ***     3.810   ***


Failure Surface Specified By  4 Coordinate Points

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

    1        862.21      277.15
    2        867.43      273.95
    3        946.44      325.02
    4        947.05      326.02

      ***     3.817   ***
```

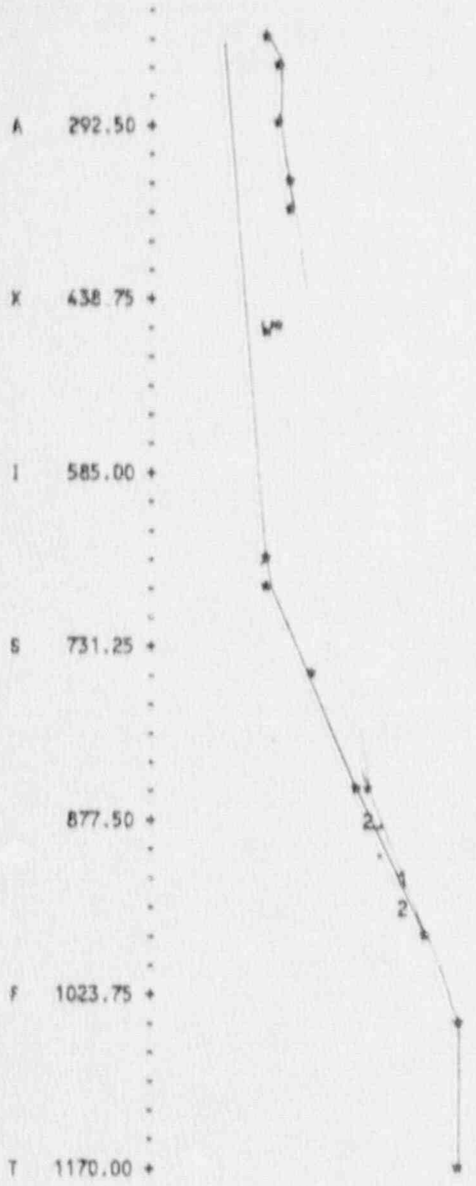
PKL 12/12/89

WY – [illegible]

```
      11        597.27      216.93
      12        599.27      220.84

          ***      5.467   ***


   Failure Surface Specified By 12 Coordinate Points


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

       1        262.28       160.00
       2        269.26       156.52
       3        282.34       150.00
       4        298.96       141.71
       5        432.77       130.19
       6        565.56       139.28
       7        570.90       150.00
       8        584.29       176.85
       9        585.69       179.66
      10        592.77       193.86
      11        604.18       218.32
      12        606.18       222.25

          ***      5.494   ***
```

B-22

UMTRA-LOW
Reed △ Slope Stability
PKL 2/12/90



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Sheet C i
Project UMTRA - LOW
Contract No. 3885-48
File No.
Feature Embankment Design
Designed PYL
Date 12/4/90
Item Rev ② Slope Stability , App C
Checked WYL
Date 12/5/90

REV ②

APPENDIX C

MORRISON-KNUDSEN ENGINEERS, INC.
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Project UMTRA - LOW
Feature Embankment Design
Item Slope Stability Analysis App. C
Contract No. 3885-48
Designed PYL
Checked WYL
Sheet C-1
File No.
Date 12/4/90
Date 12/5/90

I. PURPOSE & INTRODUCTION

This appendix C is added in response to NRC's informal comments on the validity of the strength parameters used for colluvium foundation material in slope stability analyses (See pl. 3 on attached NRC comments). Average of 2 UU test data (c = 350 psf, φ = 17°) have been used by the RAC for short-term seismic strength parameters for colluvium (For sample 023-4 c = 600 psf φ = 17°, for sample 025-6 c = 100 psf φ = 17.5°, Ref 4). Results of the slope stability analyses show that for short-term seismic case, the critical failure occurs in the colluvium layer and the computed Factor of safety is 1.10, equal to the minimum required based on the RAC's criteria. The TAC's minimum required FS is 1.0 (Ref. Technical Approach Document). To achieve that c must be at least 200 psf, with φ unchanged. (See PCSTABL5 printout attached). This c value is higher than the lower of the 2 test values (100 psf).

Nevertheless, the RAC believe that it is still valid and reasonable to use the previous average parameters for the material, rather than the lower values (from sample 025-6) which are considered unreasonably low. In fact, the average parameters used have already some degree of conservatism. The next section provides the justification for using the average parameters and their validity.

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Project: ULTRA-LOW
Feature: Embankment Design
Item: App. C
Contract No. 3885-48
Designed: PYL
Checked: WYL
Sheet: C-2
File No.
Date: 12/4/90
Date: 12/5/90

II JUSTIFICATION FOR USING THE AVERAGE PARAMETERS & THEIR VAL[illegible]

1. Undrained shear strength can often be correlated with the SPT N values:

For sample 023-4 depth 6'-9', N = 11 (Ref. 3 boreLogs)

For sample 025-6, depth 12'-15', N = 12

Based on the N - q_u (unconfined compressive strength) correlation as shown in sh. C8.

For N = 11, q_u = 0.8 tsf $S_u = \frac{q_u}{2}$ = 800 psf

12, q_u = 0.9 tsf. $S_u = \frac{q_u}{2}$ = 900 psf

Coulomb - Mohr criterion: $\tau = c + \sigma \tan\phi$

In total stress analyses, τ is also defined as $\tau = S_u$

$\therefore\ S_u = c + \sigma \tan\phi$

To back-figure c using the above equation for the 2 samples, using ϕ obtained from UU tests:

Sample 023-4 $\phi = 17°$ σ = 919 psf (*) $\Rightarrow$ c = 520 psf

025-6 $\phi = 17.5°$, σ = 1654 psf $\Rightarrow$ c = 380 psf

Therefore, c should probably be in the range of 380 - 520 psf with a ϕ value of about 17°. A c-value of 100 psf thus is unreasonably low. Using the average UU test value of c = 350 psf is considered reasonable and conservative.

(*) based on γ_t = 122.5 pcf for colluvium material. (Ref 4)

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Project UMTRA-LOW
Contract No. 3815-46
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Feature Embankment Design
Designed PTL
Date 12/4/90
Item App. C
Checked WYL
Date 12/5/90

2. <u>Failure criterion used in UU tests</u>

A conservative 4% strain failure criterion has been used (based on stress paths of CU tests) especially for sample C25-6 (see sh. C-11). Thus, the actual strength could be higher than that used in the analyses.

3. <u>Effect of degree of saturation on undrained shear strength</u>

Average degree of saturation for colluvium layer is 63.5% (Ref 4 Material Properties Calc p 10). Samples for UU tests were back saturated. Strength for partially saturated soil is often higher than that for fully saturated (Ref C-1). Thus, using strength parameters from saturated sample for partially saturated colluvium soil is conservative.

4. <u>Conservative construction of Mohr's envelope</u>

Mohr's envelope for UU test on sample C25-C6 were conservatively constructed using the largest circle at highest confining pressure and smallest circle at lowest confining pressure but ignoring the middle circle (see sh C-10) thus ending up with a very low cohesion intercept. Should the second and third circle be used instead, strength parameters, c intercept [illegible]. Thus, c of 100 psf is very conservative. And using just the parameters from this sample alone in analysis would be too unreasonably conservative.

Project: [illegible]-LOW
Feature: Embankment Design
Item: App. C

Contract No. 2855-41
Designed: PYL
Checked: WYL

Sheet: C-4
File No.
Date: 12/4/90
Date: 12/5/90

5. Overconsolidation of Colluvium foundation material

Results of consolidation tests on colluvium samples indicate that the colluvium layer is overconsolidated (Ref 4 Material Properties). For sample 627-05 @ depth 6'-9', OCR is about 14. The undrained strength S_u of the overconsolidated sample can be estimated using the correlation shown on sh. C-9

$$\text{At } OCR = 14 > 7 \quad \therefore B/A = OCR^{0.75} = 14^{0.75} \approx 7$$

$$7 = B/A = \frac{(S_u/p_o)_{OCR}}{(S_u/p_o)_{NC}}$$

$$\Rightarrow (S_u)_{OCR} = 7 \cdot p_o \cdot (S_u/p_o)_{NC}$$

$$\text{avg } (S_u/p_o)_{NC} \approx 0.23 \qquad (\text{sh C-9, C-7}) \text{ for P.I.} = 9$$

$$\therefore (S_u)_{OCR} = 7 \times 122.5 \text{ pcf} \times 7.5' \times 0.23 = \underline{\underline{1479 \text{ psf}}}$$

Assume this consolidation test sample also represents the colluvium material in other locations within the embankment area. Then compared with this value the lower value set of parameters for CIU tests (c = 100 psf; φ = 17.5°) appears to be unreasonably low.
$S_u = 454$ psf at 9' deep

Using the average values c = 350, φ = 15° would be more reasonable.

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Sheet C-5
Project UMTRP-LOW
Contract No. 2805-46
File No.
Feature Embankment Design
Designed PYL
Date 12/4/90
Item APP C
Checked WYL
Date 12/5/90

6. Sample Disturbance

Based on previous experience with UU tests, due to often sampling disturbances, the strength parameters obtained from the lab are often lower than actual in the field. Actual factor of safety against failure in colluvium is expected to be higher than 1.10.

III CONCLUSIONS

Based on engineering judgement and experience, considering the above points, the RAC believe that the average parameters from 2 UU test data are reasonable, realistic values, with reasonable degrees of conservatism, and are valid to use in slope stability analyses.

References

C-1. Bishop, A.W. & Bjerrum, L., "The Relevance of the Triaxial Test to the Solution of Stability Problems" Proceedings of the ASCE Research Conference on the Shear Strength of Cohesive Soils, Boulder, CO. 1960

C-2. Jamiolkowski, M et al, "New Developments in Field and Labratory Testing of Soils" Proceedings of the Eleventh ICSMFE, San Francisco, Vol 1 August 1985.

C.6

PYL 12/4/90

WYL 12/5/90

ATTACHMENT 2

IMPORTANT NOTICE

The attached comments or questions have resulted from the NRC's review of the Lowman draft Remedial Action Selection Report (RAS). Under streamlining agreement 3, the NRC is to provide verbal comments on the draft RAS at a site visit meeting. These informal comments are being provided to the DOE as a convenience, but should not be considered formally transmitted comments, nor shall they be considered as all encompassing. The NRC staff does not expect DOE to provide formal responses to the individual comments/questions, but to take these comments into account in the preparation of the final RAS.

C-7

PYL 12/4/90
WYL 12/5/90

Informal Review of Lowman, Idaho Draft RAP
Geotechnical Engineering

1. Section 3.2.2 of the Remedial Action Selection Report indicates that Figure 1 in Volume I of the Information for Bidders shows the location of test pits (21) and boreholes (9). The same section indicates that there are an additional 64 boreholes drilled to depths from 10 to 150 feet. Although these borings are associated with the contamination investigation, they provide important information (material descriptions, blow counts) and should be included on the borehole location plan.

2. All of the samples of the radioactive sands were collected from the top 2.5 feet of the piles. Evidence should be provided to demonstrate that these surface samples are representative of the entire depth of the piles.

* ③ The slope stability analysis (short-term with earthquake loading case) resulted in a factor of safety equal to the minimum allowable. The failure surface occurs in the foundation colluvium. The colluvium layer strength parameters used in the analysis are based on an average of only two UU tests. In order to obtain a better basis for the strength parameters for this critical layer, consideration should be given to performance of additional laboratory strength tests.

4. The model for the slope stability analysis included a thin, partial layer of colluvium on the steep slope above the disposal cell. What is the basis for the characterization of the thickness and extent of this layer? What are the results of a shallow surface failure analysis applied to this layer? If the results indicate potential for failure, what would be the impact to the disposal cell, i.e., ditch clogging, cover disruption?

5. The slope stability analysis does not appear to have considered a potential failure surface through the alluvium on the Clear Creek embankment at the toe of the tailings cell. This case should be analyzed.

6. The Remedial Action Plan documentation contains no discussion relative to the protection of the radon barrier from the effects of frost degradation. Discussion on the potential for damage due to frost should be provided.

7! Typos:

- Remedial Action Selection Report, Table 3.1; Data for the in situ tailings, relocated tailings and radon barrier are all under the wrong columns and the unit weight data is missing.

- Remedial Action Selection Report, Section 3.3.5; Paragraph 1 reference to Section 3.2.2 should be 3.3.3. Paragraph 5 reference to Detail 1 should be Detail 3.

- Calculations, Volume II, 12-624-01-00 Material Properties, Summary of Colluvial Test Results; Sample 027-5 classification is wrong - GC should be SC.

C-8

PYL 12/4/90
WVL 12/5/90

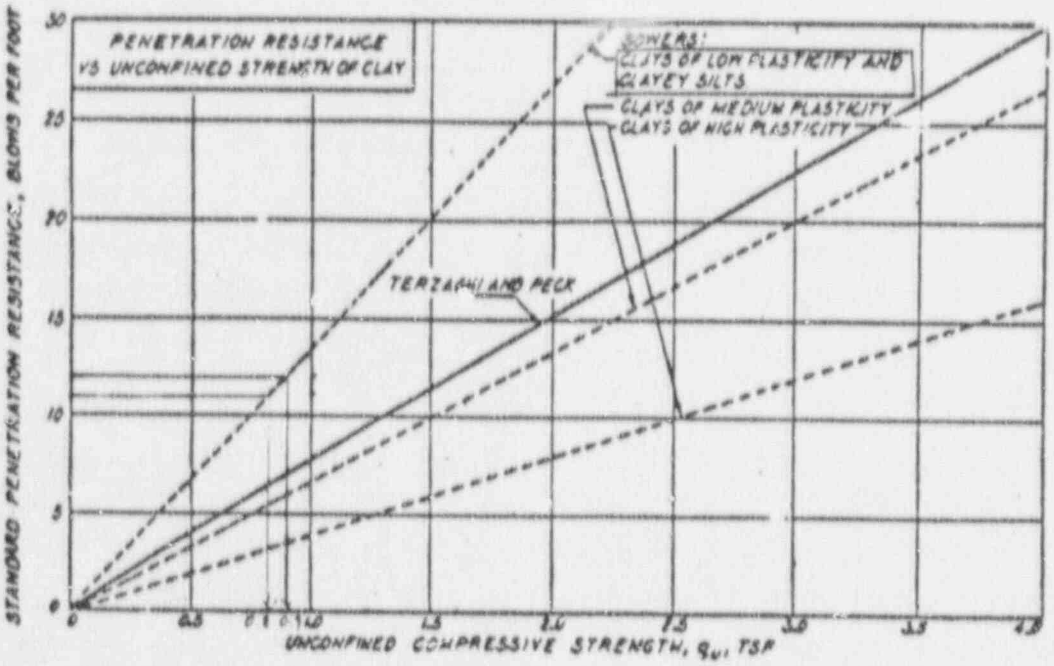

Fig. 47. Correlation Between Standard Penetration Resistance and Unconfined Compressive Strength for Clay (After DM-7).

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Feature Embankment Design
Item App. C

Contract No. 3515-48
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Checked WYL

Sheet C 9
File No.
Date 12/4/90
Date 12/5/90

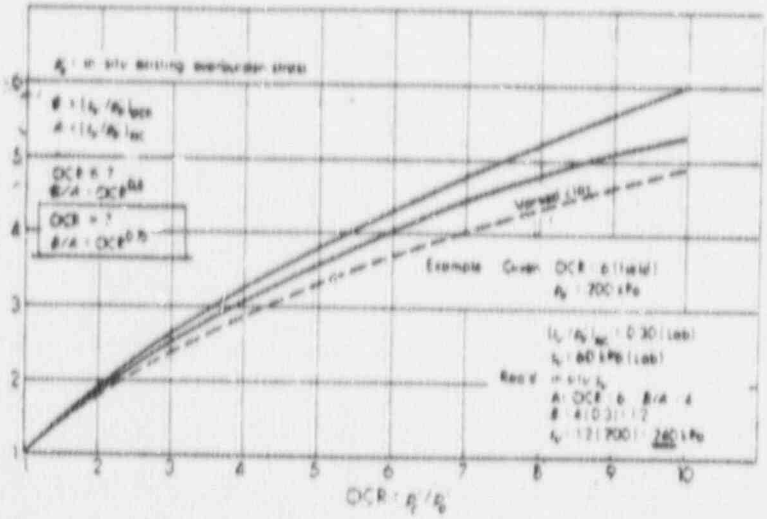


Figure 2-18 Normalized plot to obtain the ratio of undrained shear strength at some preconsolidation pressure to a normally consolidated value for several OCR [*After Ladd et al. (1977)*]

From Ref [C-3] Bowles J. E., "Foundation Analyses and Design" Third Edition McGraw-Hill Inc.

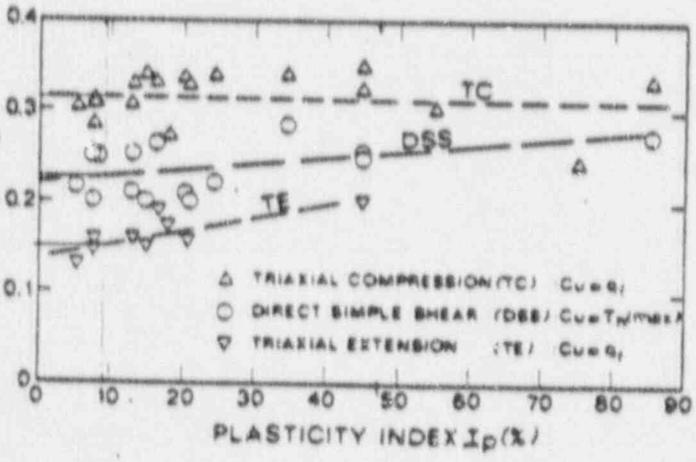


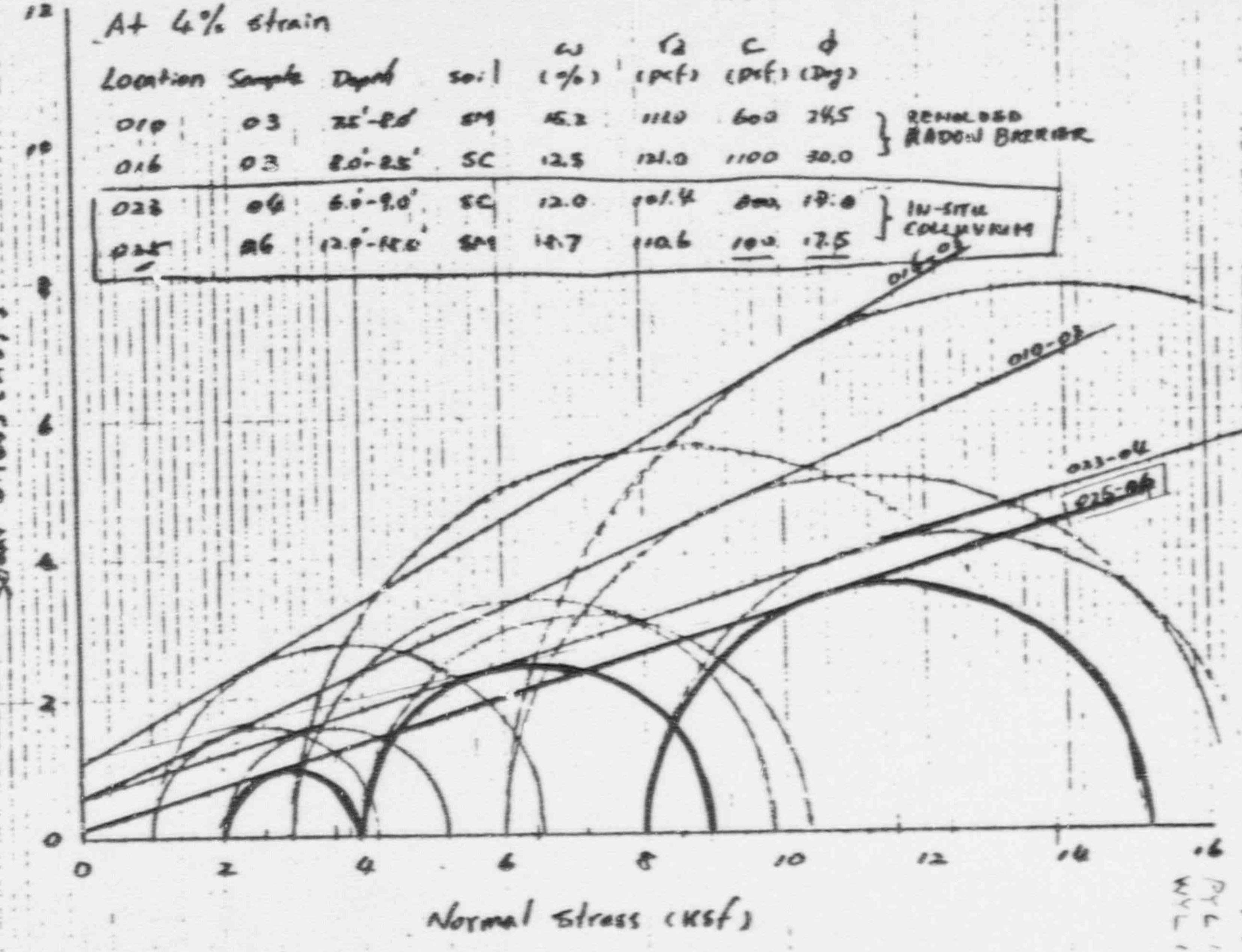
Fig.21: Undrained Strength Anisotropy from CK_oU, Tests Performed on Normally Consolidated Clays [Data from Lefebvre et al. (1983), Vaid and Campanella (1974) and Various Publications by MIT and NGI].

From Ref [C-2]

TX TEST RESULT SUMMARY

At 4% strain

Location	Sample	Depth	soil	ω (%)	γd (pcf)	c (psf)	φ (Deg)	
010	03	7.5'-8.0'	SM	15.2	111.0	600	24.5	REMOLDED RADON BARRIER
016	03	8.0'-8.5'	SC	12.5	121.0	1100	30.0	
023	04	6.0'-9.0'	SC	12.0	101.4	800	17.0	IN-SITU COLLUVIUM
025	06	12.0'-14.0'	SM	14.7	110.6	100	17.5	



~~WYL 12/4/90~~ 5628
~~CEK PYL 12/4/90~~
PYL 12/4/90
WYL 12/5/90

C-10

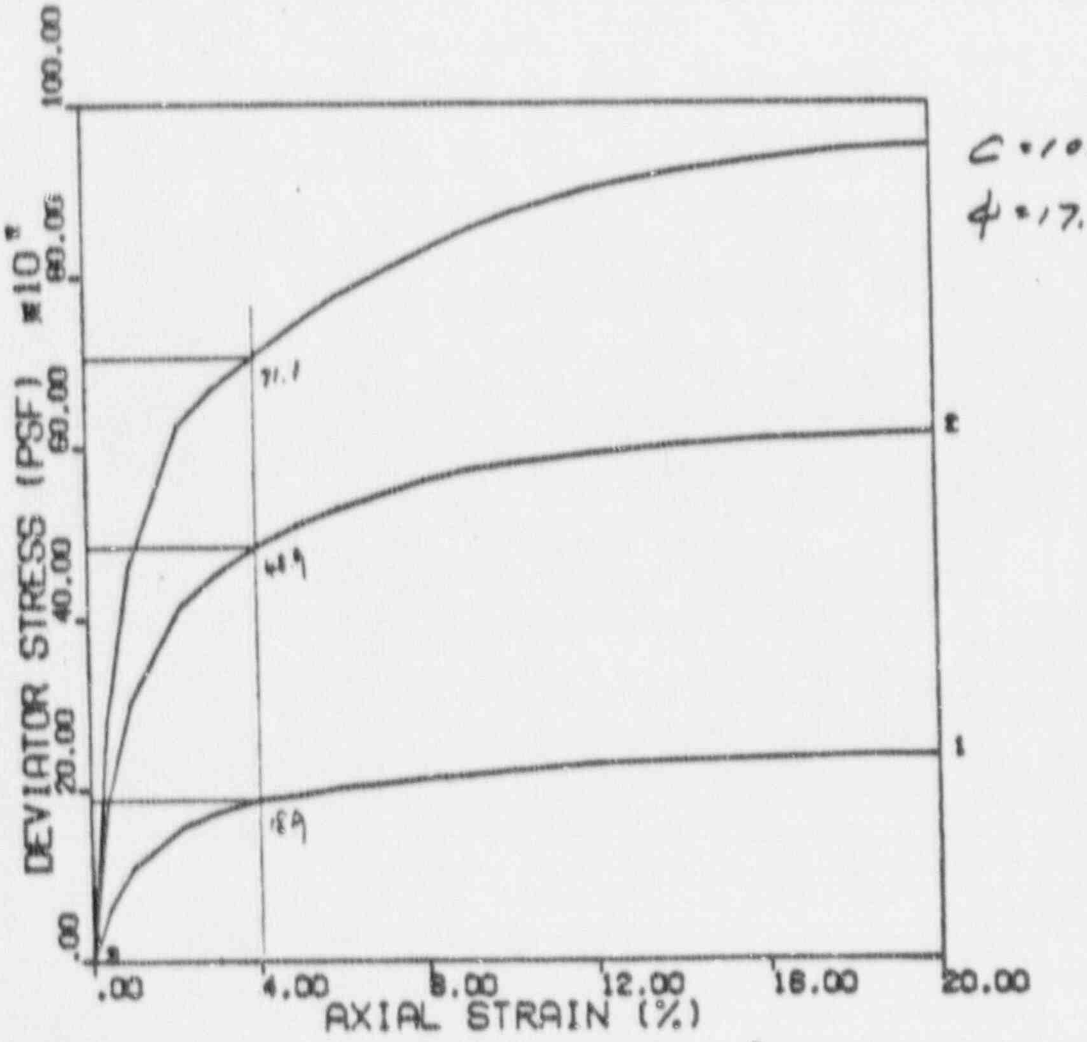
~~WQ Lowhmaley~~ ~~ckd PPC 11/6/89~~ C-11
PPC 12/6/90
WJL 12/2/90

TRIAXIAL 'Q' TEST

6/17/88 LOWMAN

	TEST/STAGE 1	TEST/STAGE 2	TEST/STAGE 3
LOCATION ID:	025	025	. 025
SAMPLE ID:	08	08	08
DEPTH INTERVAL(FT):	12.0 - 15.0	12.0 - 15.0	12.0 - 15.0
INITIAL DRY DENSITY(PCF):	110.8	114.2	114.1
INITIAL MOISTURE CONTENT(%):	15.7	14.2	14.8
CELL CONFINING PRESSURE(PSF):	1858.	4000.	8000.
UNIFIED SOIL CLASSIFICATION:	SM	SM	SM

IN-SITU COLLUVIUM



c = 100 psf
φ = 17.5°

FIGURE D.4.3.D
TRIAXIAL 'Q' TEST

From Ref 1

~~[illegible]~~ [illegible]

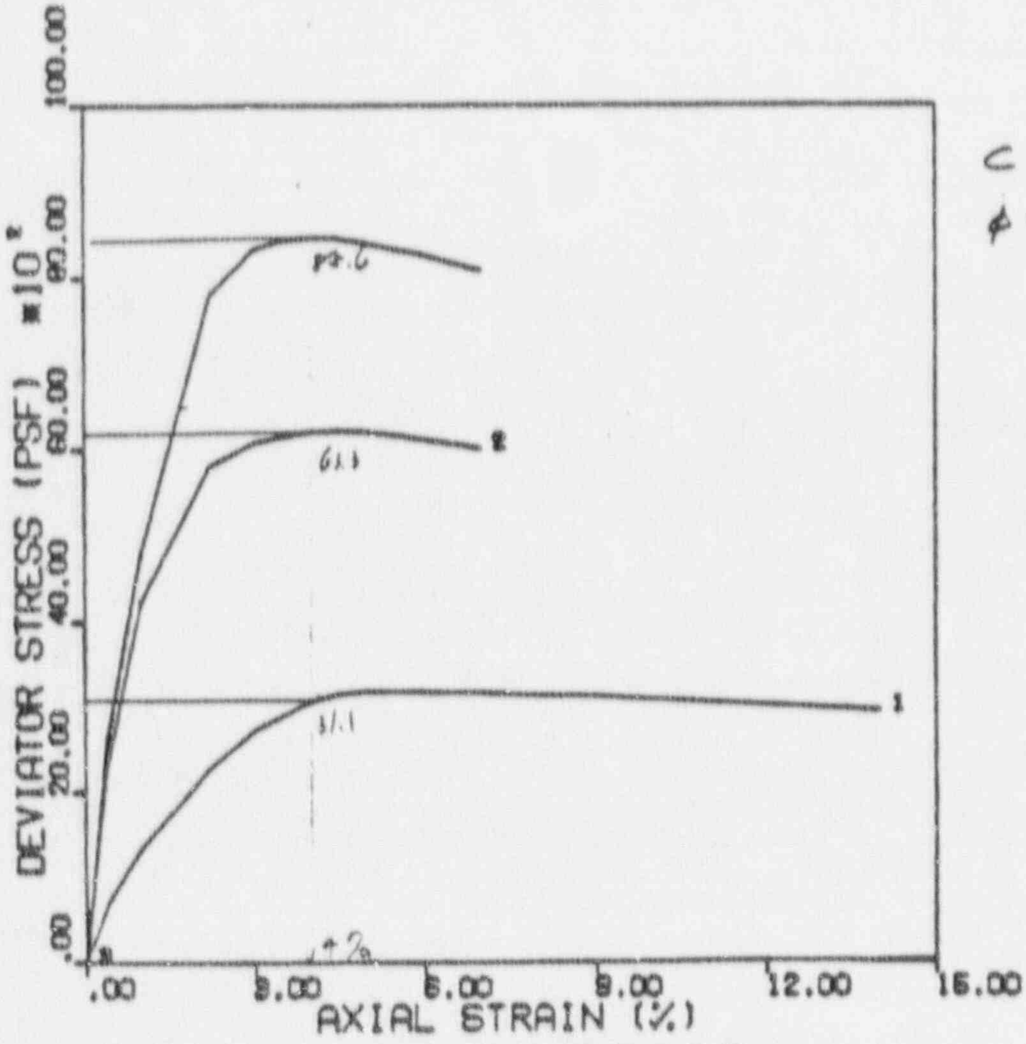
PYL 12/4/90 C.12
WYL 12/5/90

TRIAXIAL 'Q' TEST

6/17/88 LOWMAN

	TEST/STAGE 1	TEST/STAGE 2	TEST/STAGE 3
LOCATION ID:	029	029	029
SAMPLE ID:	04	04	04
DEPTH INTERVAL(FT):	8.0 - 9.0	8.0 - 9.0	8.0 - 9.0
INITIAL DRY DENSITY(PCF):	101.4	105.9	118.0
INITIAL MOISTURE CONTENT(%):	12.0	12.2	12.8
CELL CONFINING PRESSURE(PSF):	2002.	4008.	8008.
UNIFIED SOIL CLASSIFICATION:	SC	SC	SC

IN-SITU COLLUVIUM



c = 600 psf
φ = 17.°

FIGURE D.4.3.C
TRIAXIAL 'Q' TEST

From Ref 1

C.13

PYL 12/4/90
WVL 12/5/90

C φ
200 12.5

```
                    ** PCSTABL5 **

                          by
                   Purdue University

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


Run Date:
Time of Run:
Run By:                    PYL
Input Data Filename:       A:STSCOLL.DAT
Output Filename:           A:STSCOLLB.DAT



PROBLEM DESCRIPTION   UMTRA-LOWMAN #1 SHORT TERM SEIMIC-THRU C
                      OLLUVIUM



BOUNDARY COORDINATES

     8 Top   Boundaries
    26 Total Boundaries


Boundary      X-Left      Y-Left     X-Right     Y-Right    Soil Type
   No.         (ft)        (ft)        (ft)        (ft)     Below Bnd

     1           .00       70.00       50.00       70.00        5
     2         50.00       70.00      125.00       90.00        5
     3        125.00       90.00      235.00      160.00        3
     4        235.00      160.00      295.00      160.00        3
     5        295.00      160.00      350.00      170.00        3
     6        350.00      170.00      855.00      273.00        1
     7        855.00      273.00      980.00      345.00        3
     8        980.00      345.00     1055.00      390.00        6
     9       1055.00      390.00     1170.00      390.00        6
    10        350.00      170.00      370.00      171.00        3
    11        370.00      171.00      850.00      268.00        2
    12        850.00      268.00      855.00      273.00        3
    13        370.00      171.00      750.00      210.00        3
    14        750.00      210.00      850.00      268.00        3
    15        125.00       90.00      135.00       94.00        5
    16        135.00       94.00      230.00      150.00        5
    17        230.00      150.00      235.00      155.00        4
    18        235.00      155.00      460.00      165.00        4
    19        460.00      165.00      760.00      200.00        4
    20        760.00      200.00      980.00      345.00        6
    21        230.00      150.00      680.00      150.00        5
    22        680.00      150.00      760.00      200.00        6
    23           .00       60.00       95.00       60.00        6
    24         95.00       60.00      177.00      113.00        6
    25        177.00      113.00      670.00      142.00        6
    26        670.00      142.00      680.00      150.00        6


ISOTROPIC SOIL PARAMETERS
```

PYL 12/4/90
WYL 12/5/90

```
6 Type(s) of Soil

Soil  Total   Saturated  Cohesion Friction   Pore    Pressure   Piez.
Type Unit Wt. Unit Wt.  Intercept   Angle  Pressure  Constant  Surface
 No.  (pcf)    (pcf)      (psf)     (deg)   Param.    (psf)     No.

  1   130.0    135.0     850.0     27.0     .00        .0        1
  2   144.0    155.0        .0     40.0     .00        .0        1
  3   122.5    130.5     200.0     17.5     .00        .0        1
  4   124.5    131.0    1460.0     32.0     .00        .0        1
  5   124.5    131.0    1460.0     32.0     .00        .0        1
  6   137.0    143.5        .0     45.0     .00        .0        1
1


1 PIEZOMETRIC SURFACE(S) HAVE BEEN SPECIFIED


Unit Weight of Water =  62.40


Piezometric Surface No.  1 Specified by  8 Coordinate Points


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

    1            .00       75.00
    2         115.00       75.00
    3         182.00      120.00
    4         460.00      142.00
    5         670.00      142.00
    6         980.00      345.00
    7        1055.00      390.00
    8        1170.00      390.00


A Horizontal Earthquake Loading Coefficient
Of .170 Has Been Assigned

A Vertical Earthquake Loading Coefficient
Of .000 Has Been Assigned

Cavitation Pressure =      .0 psf
1


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


The Active And Passive Portions Of The Sliding Surfaces
Are Generated According To The Rankine Theory.


100 Trial Surfaces Have Been Generated.


4 Boxes Specified For Generation Of Central Block Base
```

PYL 12/4/90
WL 12/5/90

```
Length Of Line Segments For Active And Passive Portions Of
Sliding Block Is  30.0

Box        X-Left     Y-Left     X-Right    Y-Right      Height
No.         (ft)       (ft)       (ft)       (ft)         (ft)

 1        320.00     162.00     420.00     167.00        5.00
 2        460.00     170.00     580.00     180.00       10.00
 3        670.00     195.00     740.00     204.00       10.00
 4        795.00     228.00     845.00     260.00        5.00
1

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  9 Coordinate Points

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

    1        364.82      173.02
    2        368.26      170.91
    3        376.56      164.83
    4        530.16      173.16
    5        732.77      199.54
    6        818.52      244.75
    7        824.89      253.43
    8        829.77      263.91
    9        832.53      268.42

       ***     1.004    ***


Failure Surface Specified By  9 Coordinate Points

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

    1        358.74      171.78
    2        360.77      170.54
    3        370.51      163.40
    4        577.27      178.75
    5        730.72      201.09
    6        802.21      233.43
    7        810.96      245.36
    8        818.56      261.65
    9        821.30      266.13

       ***     1.005    ***

1

Failure Surface Specified By 10 Coordinate Points
```

PYL 12/4/90
WYL 12/4/90

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

   1        393.85      178.96
   2        397.68      176.59
   3        402.52      174.34
   4        411.52      167.74
   5        525.24      179.29
   6        728.80      198.54
   7        833.66      255.05
   8        838.08      261.09
   9        840.40      266.06
  10        843.17      270.59

      ***     1.013   ***


Failure Surface Specified By 10 Coordinate Points

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

   1        391.91      178.55
   2        395.74      176.20
   3        400.24      174.10
   4        411.72      165.68
   5        519.85      173.63
   6        731.13      198.78
   7        795.47      226.29
   8        808.34      243.84
   9        816.44      261.22
  10        819.19      265.70

      ***     1.023   ***


Failure Surface Specified By 10 Coordinate Points

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

   1        395.05      179.19
   2        398.89      176.84
   3        403.94      174.48
   4        411.91      168.63
   5        514.46      177.97
   6        733.45      199.02
   7        807.29      234.53
   8        818.39      249.67
   9        824.54      262.85
  10        827.29      267.35

      ***     1.026   ***


Failure Surface Specified By  8 Coordinate Points
```

DYL 12/4/90

WYL 12/5/90

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

   1        332.19      166.76
   2        335.16      164.59
   3        472.97      173.94
   4        730.03      201.61
   5        813.44      238.65
   6        823.83      252.82
   7        828.93      263.74
   8        831.68      268.24

      ***     1.030    ***


Failure Surface Specified By  9 Coordinate Points

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

   1        353.89      170.79
   2        354.79      170.24
   3        364.84      162.87
   4        493.60      173.00
   5        733.31      203.13
   6        809.54      238.57
   7        817.14      248.94
   8        823.53      262.65
   9        826.28      267.14

      ***     1.038    ***


Failure Surface Specified By  9 Coordinate Points

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

   1        365.57      173.17
   2        369.18      170.96
   3        375.98      165.98
   4        546.33      180.15
   5        725.79      198.82
   6        833.07      252.04
   7        840.90      262.72
   8        842.67      266.52
   9        845.45      271.05

      ***     1.042    ***


Failure Surface Specified By 10 Coordinate Points
```

PYL 12/4/90
WYL 12/5/90

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

     1        381.19      176.36
     2        385.00      174.03
     3        387.62      172.81
     4        400.00      163.73
     5        483.28      173.47
     6        731.67      202.37
     7        836.49      252.11
     8        846.76      266.12
     9        847.39      267.47
    10        850.18      272.02

      ***     1.049   ***


 Failure Surface Specified By  9 Coordinate Points

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

     1        357.09      171.45
     2        358.74      170.44
     3        365.04      165.82
     4        488.21      177.34
     5        735.64      203.37
     6        821.35      246.81
     7        827.19      254.77
     8        831.63      264.29
     9        834.39      268.80

      ***     1.051   ***
```

```
           Y            A     X     I     S            F     T

            .00    146.25    292.50    438.75    585.00    731.25

X       .00 +---**----+---------+---------+---------+---------+
            .
            .    *
            .
            .   *
            .    W*
     146.25 +     *
            .       *
            .
            .         *
            .          *
            .
A    292.50 +          *
            .          .
            .          6*
            .          1*
            .          93
            .          33
X    438.75 +
```

C-19

PYL 12/4/90

WYL 12/5/90

```
               .           W*6
               .            .7
               .             4
               .             1
               .             ..
 I     585.00  +             2.
               .
               .
               .           *    .
               .           *  ..
               .              ..
 $     731.25  +               1
               .               *
               .
               .                4224
               .                   11
               .                    **
       877.50  +
               .
               .
               .
               .                           *
               .
 F    1023.75  +
               .                              *
               .
               .
               .
               .
 T    1170.00  +                              *
1
************************************************
******             - Illegal Command      ******
************************************************


Legal Commands - PROFIL
                    LOADS
                    TIES
                    WATER
                    SURFAC
                    EXECUT
                    EQUAKE
                    SOIL
                    RANDOM
                    CIRCLE
                    CIRCL2
                    BLOCK
                    BLOCK2
                    LIMITS
                    ANISO
                    SURBIS
                    SPENCR
```

ENGINEERS
AND
CONSTRUCTORS

MK-FERGUSON COMPANY
A MORRISON KNUDSEN COMPANY

HEADQUARTERS OFFICE
ONE ERIEVIEW PLAZA
CLEVELAND, OHIO U.S.A. 44114
PHONE (216) 523-5600 TELEX 985547

REPLY TO: MK-FERGUSON COMPANY
REMEDIAL ACTION
CONTRACTOR-UMTRA PROJECT
P.O. BOX 9136
ALBUQUERQUE, NEW MEXICO U.S.A. 87119

January 17, 1991

91-3050-044

Mr. Mark L. Matthews
Project Manager
U.S. Department of Energy
Uranium Mill Tailings Remedial Action Project Office
First National Bank Building
5301 Central Avenue N.E.
Suite 1700
Albuquerque, New Mexico 87108

SUBJECT: Lowman Soil Test Data

REFERENCE: Contract No. DE-AC04-83AL18796

Dear Mr. Matthews:

Enclosed please find a copy of the PSI Geotechnical Investigation Report for radon barrier material testing. Also included are soil test result summary sheets, which list results of the recently performed testing and data from earlier testing by the TAC. The latest results show the material to have a higher gravel content and a lower fines content than the previous data indicated. Therefore, we propose to change the specifications for radon barrier material to require soils with a minimum of 15% by weight passing the No. 200 sieve and a maximum of 35% by weight retained on the No. 4 sieve.

These enclosures are being transmitted to Ray Bennett at the TAC, so we can obtain concurrence on this specification change as soon as possible.

If you have any questions, please contact Charles Spencer or Rob Cooney of my staff at 766-3093.

Sincerely,

MK-Ferguson Company

William C. Zebuch
for
J. G. Oldham
Project Director

JGO/REC/CRS/slb
cc: R. Bennett - TAC/UMTRA (w/enc.)
P. Mann - DOE/UMTRA (w/o enc.)

3940B

REV. △ RADON BARRIER ADDITIONAL DATA
(REMOLDED COLLUVIUM)

SUMMARY OF

Job No 3885-48

Project Name UMTRA - LOWMAN

Hole or Trench Number	Sample Number	Depth		Laboratory Classification	Mechanical Analysis			Atterberg Limits		Specific Gravity G	Natural		Cor
		From	To		Gravel	Sand	Fines	LL	PI		w %	γd	Test
TP-1	A	3.0	5.0'	SM-SC	24	56	20	24	5		3.7		D698
	B	7.0'	9.0'	SM	30	53	17	NP	NP	2.66	10.0		D698
TP-2		3.0'	5.0'	SM-SC	30	36	34	25	6	2.64	11.1		D698
TP-3		5.0	7.0'	SM	32	39	29	NP	NP		9.4		D698
TP-4	A	3.0'	5.0'	SM	29	53	18	NP	NP		3.0		D698
	B	7.0'	9.0'	SM	37	46	17	NP	NP	2.64	4.8		D698

FOR INFORMATION ONLY

* Visual Classification

SP = Standard Proctor
MP = Modified Proctor
S = Special - See Test

TC = Triaxial Compression
UC = Unconfined Compression
DS = Direct Shear

UU = Unconsolidated Undrained
CU = Consolidated Undrained
CD = Consolidated Drained

C = Capillary Moisture

* 4

SOIL TEST RESULTS

Feature Embankment Design Material Properties

Date PTL 1/14/91

npaction		Shear Strength UU					Permeability		Consolidation			Notes	ORGANIC CONTENT
Optimum		Test	Initial		C	φ							
w	γ_d (pcf)		w/γ_d	w/γ_f			w/γ_d	k (cm/sec)	C	C	R		
.3	122.3						(95% Compaction)						
.0	121.1	95%	14.0/115		* (see Sh. —)		14/115	4.54×10^{-6}				C (95% Compaction)	
							(95% Compaction)						
.5	121.0	95%	12.5/114.9		″		12.5/114.9	1.93×10^{-6}				C (95% Compaction)	0.32%
.5	121.5	95%	12.5/115.4		″		12.5/115.4	2.06×10^{-6}				C (95% Compaction)	0
3	120.5												
5	119.5												

% strain was used as failure criteria

SI APERTURE CARD

Also Available On Aperture Card

9102080294-03

Ⓕ RADON BARRIER
(REMOLDED COLLUVIUM)

SUMMARY OF S

Job No 5057-06

Project Name UMTRA - LOWMAN

Hole or Trench Number	Sample Number	Depth		Laboratory Classification	Mechanical Analysis			Atterberg Limits		Specific Gravity G	Natural		Comp	
		From	To		Gravel	Sand	Fines	LL	PI		w %	γ_d	Test	
NOTE	:	INDEX PROPERTIES OF RADON BARRIER												
		SAME AS COLLUVIUM FOUNDATION SOIL												
010	3	7.5	8.0	CL									D698	1
016	3	8.0	8.5	SC									D698	1
			No. of TESTS											
			AVG.											
			S.D.											

FOR INFORMATION ONLY

* Visual Classification

SP = Standard Proctor
MP = Modified Proctor
S = Special - See Text

TC = Triaxial Compression
UC = Unconfined Compression
DS = Direct Shear

UU = Unconsolidated Undrained
CU = Consolidated Undrained
CD = Consolidated Drained

sh. 15

ckd WYL 1/5/90

SOIL TEST RESULTS

Feature Embankment Design Material Properties

PYL

Date 12/8/89

action			Shear Strength C/U/H φ U U				Permeability		Consolidation (Compressibility)				
ptimum		Compaction Test	W) Initial	C	C/φ	C'/φ'	W₀/γd	k (cm/sec)	Cv cm²/sec	Cαε	K̄ (KSF)	D (tsf)	Notes
	γ_d (pcf)		γd	φ									
.0	117.0	95%	15.3/111.0	600/24.5°	0/17.0	197./32.0	(95% compaction) 15.3/83.0	1.4×10^{-6}				56	C (91% compaction)
40	127.0	95%	12.5/121.0	1100/30.0	500/25.0	0/40.5	12.6/120.0	2.0×10^{-5}				21	C (91% compaction)
2	2							2				2	
2.0	122.0	95%		850/27.0°	250/21°	98/36°		1.1×10^{-5}				38	
.8	7.1							1.3×10^{-5}				25	

Ⓑ FOUNDATION SOIL - COLLUVIUM

SUMMA

Job No 5057-06

Project Name UMTRA-

Hole or Trench Number	Sample Number	Depth		Laboratory Classification	Mechanical Analysis			Atterberg Limits		Specific Gravity G	Nat
		From	To		Gravel	Sand	Fines	LL	PI		W %
001	2	3.5	4.0	SM/SC	9	65	26				10.5
004	1	1.0	1.5	SC							13.8
005	1	2.0	2.5	SM							13.5
010	1	1.0	1.5	SM							18.1
	3	7.5	8.0	ML/CL	4	43	53	28	6	2.66	15.2
011	1	2.0	2.5	SM							9.1
	5	11.5	12.0	SM/SC	10	69	21				11.6
016	3	8.0	8.5	SC	0	78	22	30	10	2.63	12.5
023	2	3.0	4.5	SM/SC				29	7		14.3
u	4	6.0	9.0	SC	5	66	29	30	10	2.70	12.0
025 u	6	12.0	15.0	SM/SC	4	66	30	25	5	2.67	15.7
u	8	16.5	19.5	SM/SC	5	72	23	30	10	2.65	11.3
	11	24.0	25.5	SM/SC							11.6
	15	36.0	37.5	SM/SC							11.7
	17	44.0	45.5	SM/SC	27	57	16				13.6
026	4	4.5	6.0	SM	0	57	43				14.8
u	6	8.5	10.5	SM	4	67	29	NP	NP	2.68	17.9
027	4	4.5	6.0								15.1
u	5	6.0	9.0	GC	2	51	47	36	16	2.68	14.6
028	4	4.5	6.0	SM/SC	0	86	14				4.6
029	2	1.5	3.0	SM/SC	3	77	20				3.9
			NO. OF TESTS		←	13	→	(Fn plastic soil only.)	7	7	21
			AVG.	SM/SC	5	66	29	30	9	2.67	12.6

RY OF SOIL TEST RESULTS

LOWMAN

Feature

ural	Compaction			Shear Strength UU CIU/Hφ					Permeability		Consolidation		
γ_d	Test	Optimum		Test	Initial		C	φ	w / γ_d	k (cm/sec)	C_v (cm²/sec)	C_c C_r C_a	K (KSF)
		w	γ_d (pcf)		w	c / γφ							
	D698	14.0	117.0										
	D698	10.0	127.0										
101.4					12.9/101.4	600/17.0							
					15.7/110.6	100/17.5							
116.1					11.3/116.1		400/37.5	490/37.8	11.1/109.7	8.14×10^{-5}			
					17.9/106.8		1109/18.0	0/37.8					
									14.6/1199	1.3×10^{-6}	see sh 5	0.072 0.010 varies	13.0
2		2				2				2			
108.8		12	122.0			350/17.0	750/27.5	745/37.8		4.1×10^{-5}			

9102080294-05

FOR INFORMATION ONLY

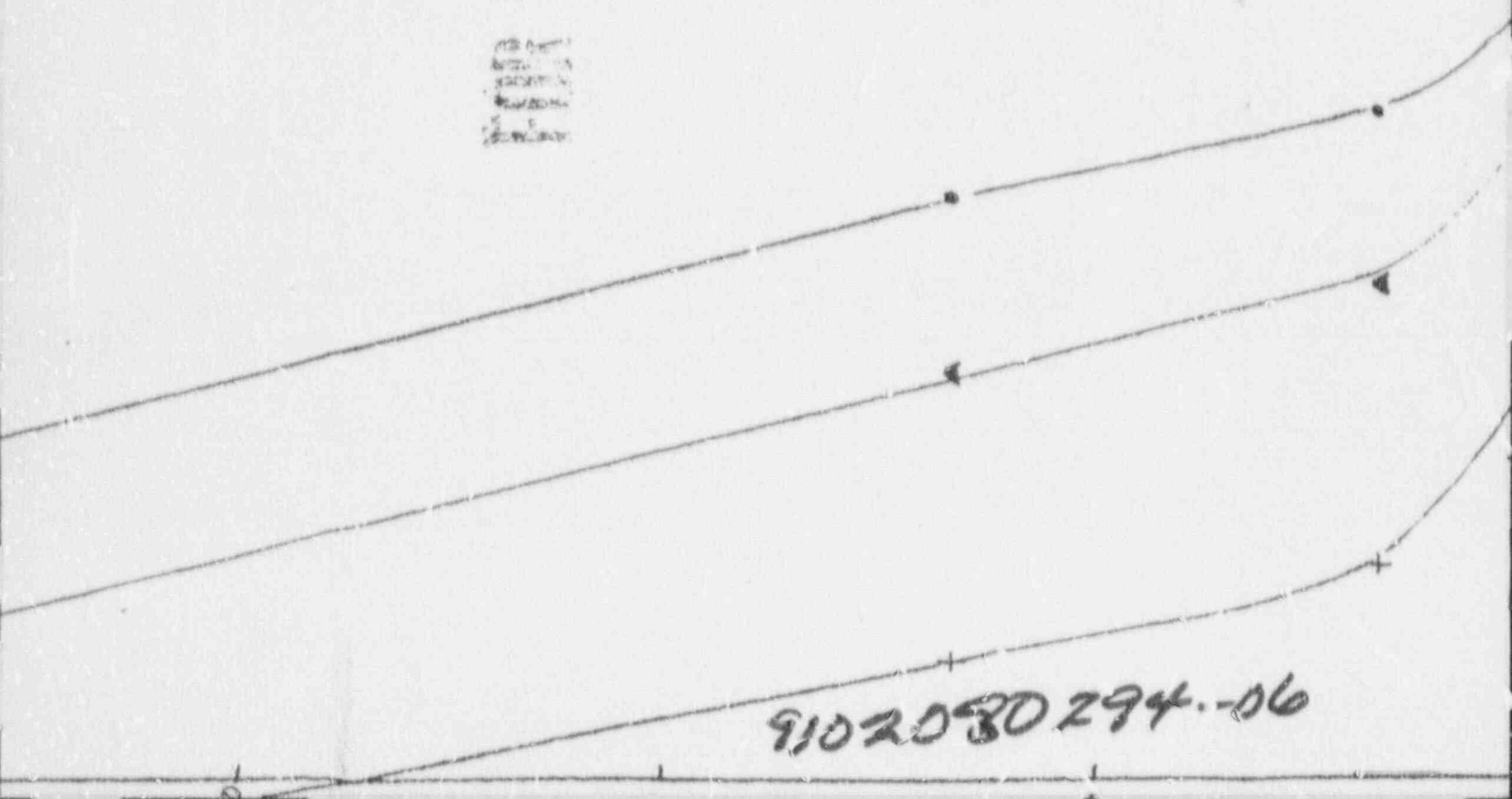
EV. △ ADDITIONAL CAPILLARY MOISTURE TEST RESULTS FOR RADON BARRIER MATERIAL

	I.D.	Depth	γ_d (pcf)	Comp.	Fine (<#200)
+	TP-1B	7'-9'	115	95%	17%
●	TP-2	3'-5'	114.9	95%	34%
▲	TP-3	5'-7'	115.4	95%	29%

DATA FROM REF. __

SI
APERTURE
CARD

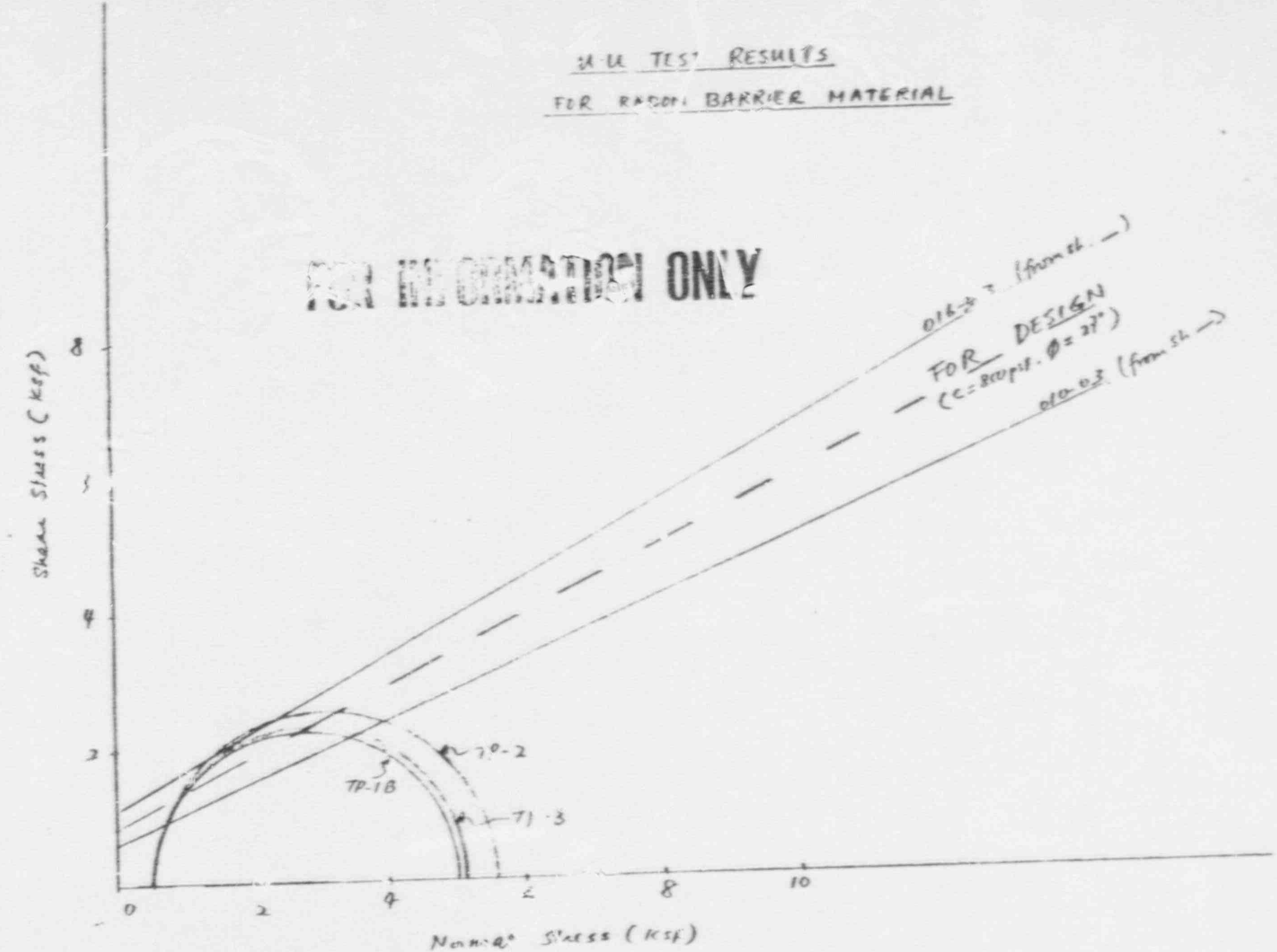
Also Available On
Aperture Card



9102080294-06

U-U TEST RESULTS
FOR RADON BARRIER MATERIAL

FOR INFORMATION ONLY



Mkes Doc. No.
3885-LOW-R-09-00594-00

GEOTECHNICAL INVESTIGATION
UMTRA PROJECT - LOWMAN

performed for;
MK - FERGUSON COMPANY
POST OFFICE BOX 9136
ALBUQUERQUE, NEW MEXICO 87119

ATTENTION: MR. JOHN SINGLETON

PSI FILE NUMBER
355-00118

Professional Service Industries, Inc.
230 SOUTH COLE ROAD
BOISE, IDAHO 83709
(208) 376-4748

psi Professional Service Industries, Inc.

TESTED FOR: MK-FERGUSON COMPANY
P.O. Box 9136
Albuquerque, NM 87119

Attention: Mr. John Singleton

PROJECT: LOWMAN, IDAHO

DATE: December 21, 1990

OUR REPORT NO. 355-00118-001 Pg. 1 of 46

REMARKS: Attached is our inspectors report, the test pit logs and all requested laboratory test results. It is noted that locations were described and staked by our client. The capillary moisture, triaxial shear and triaxial permeability were performed by Dames and Moore Inc., Salt Lake City, Ut. All other tests were performed by Professional Service Industries, Inc.

We appreciate this opportunity to be of service. If you have any questions please give our office a call.

Very truly yours,
PROFESSIONAL SERVICE INDUSTRIES, INC.

Bob J. Arnold

Bob J. Arnold, P.E.
Division Manager

Professional Service Industries, Inc.

TESTED FOR MK-FERGUSON COMPANY
P.O. Box 9136
Albuquerque, NM 87119

Attention: Mr. John Singleton

PROJECT LOWMAN, IDAHO

DATE December 21, 1990

OUR REPORT NO 355-00118-001 Pg. 2 of 46

REMARKS: Kevin Sagez-Project Inspector

I left the lab at 6:10 a.m. for Lowman, Idaho and arrived at the meeting point at South Fork Lodge at 7:50 a.m. Upon arrival the backhoe operator Gerry Rail from Gillingham Construction was already there. The operator was in having coffee. At 8:05 a.m. I met with John Singleton of MK-Ferguson to discuss the job and to review radiation safety procedures. At 8:30 a.m. the operator started reviewing safety procedures.

At 10:00 a.m. John and I examined the site and talked about how to handle the soil. A representative from Chen-Northern was with us at the time to check for contamination. At approx. 11:00 a.m. we started the first hole examination depth 3'-5'. Contaminated soil was removed first and placed to the right of the hole, when soil was found to be safe we proceed placing good soil to the left onto plastic sheets. Over all four holes were tested and examined. Four of the test pits were to depths 3'-5' and two pits TP1 and TP4 were extended to a depth of 7'-9'.

Soils were the result of the weathering soft granite producing a granitic sand-soil.

We returned to the lodge to check and discuss what tests needed to be performed. At 2:00 p.m. I left the lodge to return to the Boise lab. I returned with 12, five gallon buckets for further testing. On the following day six buckets were prepared and mailed to Rogers and Associates for further testing.
Nothing follows

Respectfully submitted,
PROESSIONAL SERVICE INDUSTRIES, INC.

TEST PIT LOGS

TP-1

Depth: 3'-5' & 7'-9
Location: N11812, E10969

0	——— Surface ———
	organic soil, dark brown.
2"	
	Brown, weak fine granular, and weak subangular blocky sandy loam.
16"	
	Weathering of granite into sand.
42"	
	Sample: color value is 4, chroma is 3, 10 YR brown.
90"	
	Sample: color value is 5, chroma is 4, 10 YR yellow brown. Increasing larger rounded weather granite with depth.
108"	—End of Excavation—

TP-2

Depth: 3'-5'
Location: N11450, E1076

0"	—Surface—
	Black Uranium contamination and organic soil.
2"	
	Dark brown, weak fine granular and weak subangular blocky sandy loam.
6"	
	Blocky sandy loam.
50"	
	Sample: color value is 4, chroma is 2, hue 7.5 YR brown. Brown to light brown, massive and single grain gravelly sand 30 to 35 % fine gravel. Evidence of larger weathering granite below.
60"	—End of Excavation—

TP-3

Depth: 5'-7'
Location: N11149, E10800

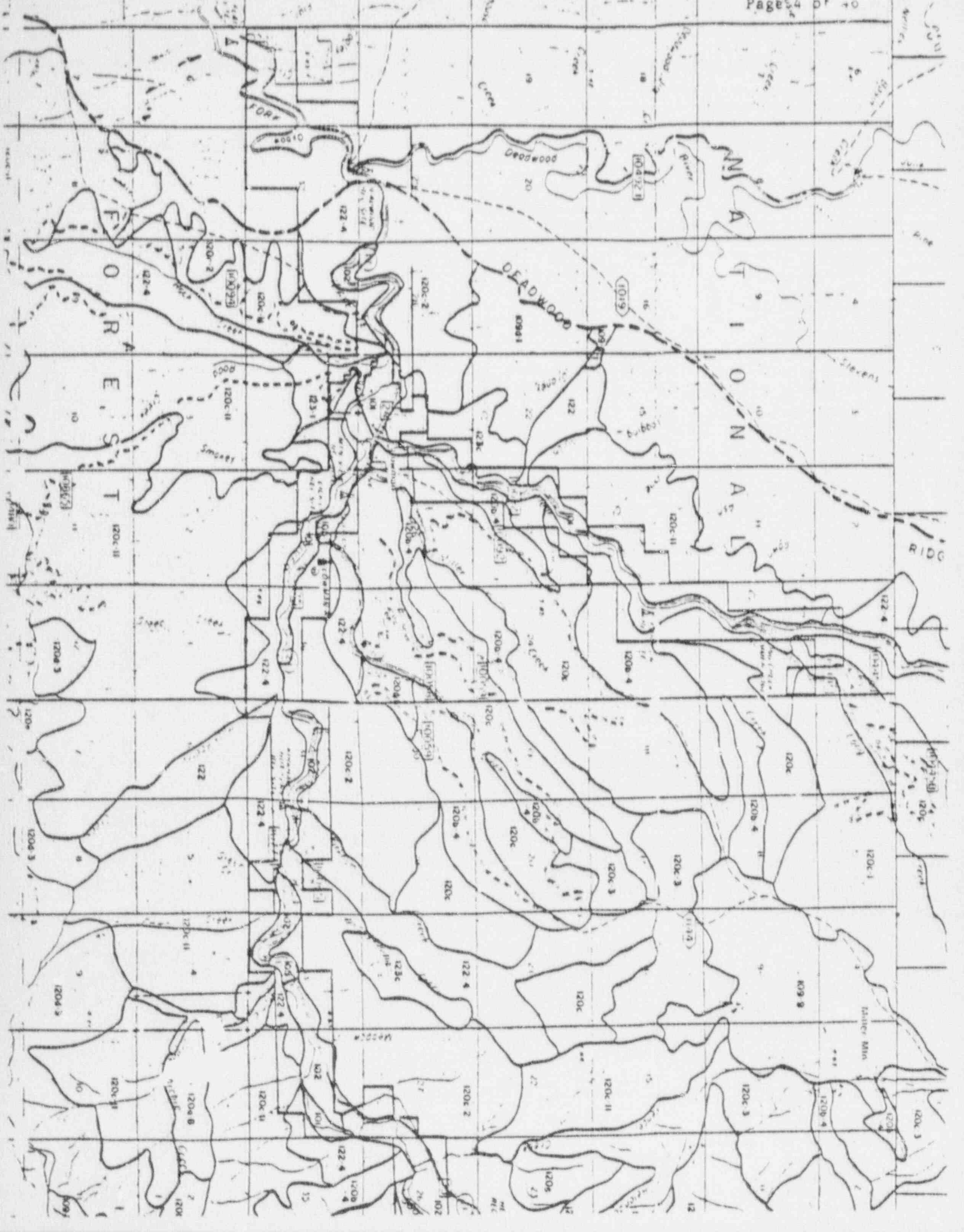
0"	—Surface—
	Clean contaminated quartz sand.
3"	
	Original organic zone.
5"	
	Dark brown silty loam.
7"	
	Brown sandy silt increasing in sand and red coloration with depth.
62"	
	Sample Increase in the size of rounded weathering granite and red iron staining with depth.
84"	—End of Excavation—

TP-4

Depth: 3'-7' & 7'-9'
Location: N11312, E11058

0"	—Surface—
	Organic soil, dark brown.
2"	
	SAME AS TP-1
55"	
	Sample: color value is 5, chroma is 6, 10 YR yellow brown.
100"	
	Sample: color value is 5, chroma is 4, 10 YR yellow brown.
108"	—End of Excavation—

Note: Color values are from Munsell's Soil Color Charts.


NATIONAL
FOREST
DEADWOOD
RIDGE
Deadwood
River
Fork
Smokey
Stevens
1019
122-4
120c-2
120c-11
120c
120b-4
120c-3
120a-3
120a-8
122
123c
109-8
Wagon
Miller Mtn

TESTED FOR:
MK-FERGUSON COMPANY
P.O. Box 9136
Albuquerque, NM 87119

PROJECT:
LOWMAN, IDAHO

Attention: Mr. John Singleton

December 21, 1990

PSI Project #:355-00118-001

Page 5 of 46

REMARKS TP-1A @ Depth 3'-5'

I. Particle Size Analysis with Hydrometer (ASTM D-422).

Sieve Size	Percent Passing
2.0"	100
1.5"	95
1.0"	92
3/4"	90
1/2"	87
3/8"	85
#4	76
#8	66
#16	53
#30	40
#50	30
#100	24
#200	20
1 Min.	20
2 Min.	17
5 Min.	15
15 Min.	12
30 Min.	11
60 Min.	10
250 Min.	8

II. Atterberg Limits (ASTM D-4318)

Liquid Limit	24
Plastic Limit	19
Plastic Index	5

III. Natural Moisture Content (ASTM D-2216)

Moisture %	3.7

Respectfully submitted;
PROFESSIONAL SERVICE INDUSTRIES, INC.

Professional Service Industries, Inc.

REPORT OF MOISTURE DENSITY RELATIONSHIP OF SOIL

TESTED FOR: MK-FERGUSON COMPANY
P.O. Box 9136
Albuquerque, NM 87119

PROJECT: LOWMAN, IDAHO

Attention: Mr. John Singleton

DATE: December 21, 1990

OUR REPORT NO.: 355-00118-001 Pg. 6 of 46

TEST DATA

Sieve Size	Percent Passing

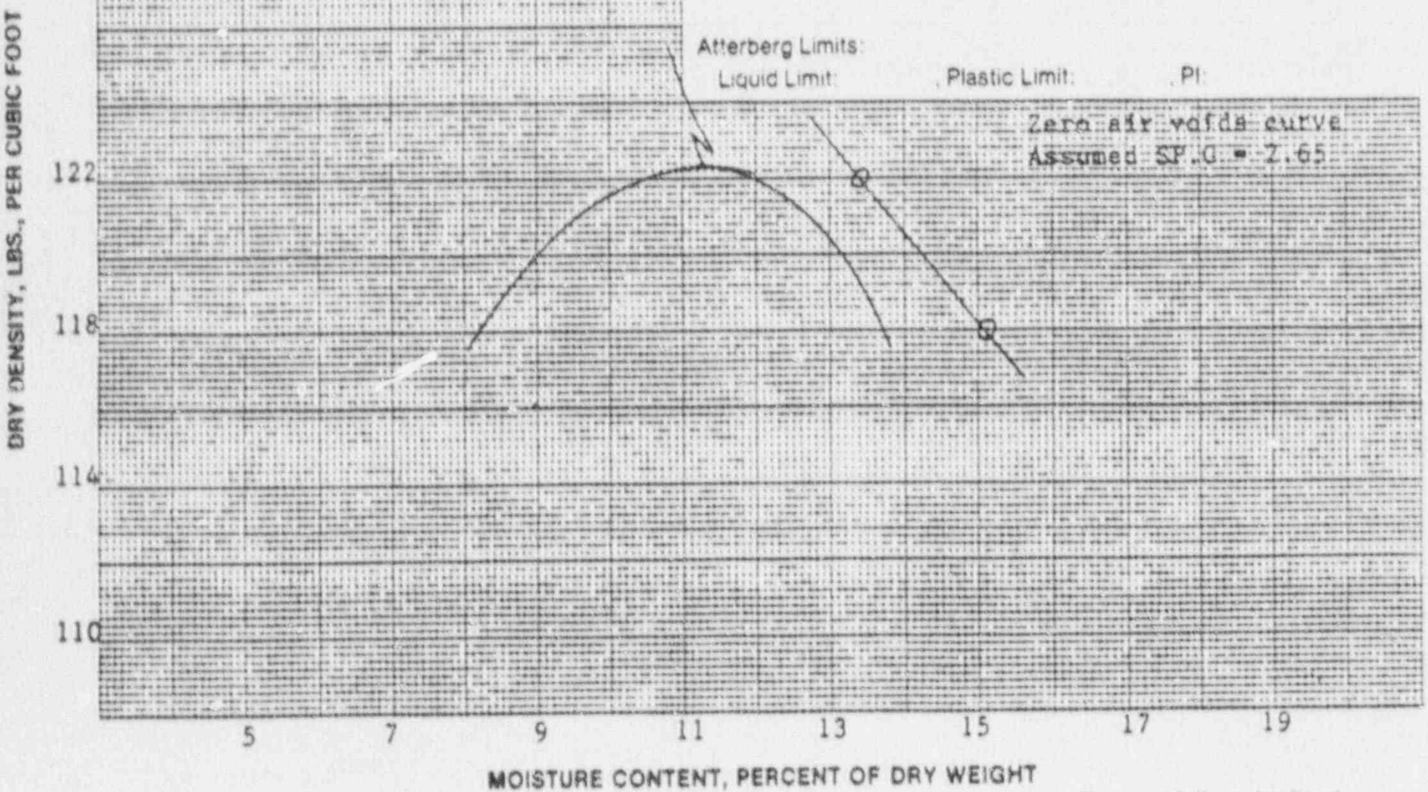
Visual Classification: Sand with gravel and silt

Sample Source: TP-1A 3-5'

Method of Test: ASTM D698 Method D

Test Results:
Maximum Dry Density: 122.3 lbs/ft³
Optimum Moisture Content: 11.3 %

Atterberg Limits:
Liquid Limit: , Plastic Limit: , PI:



Respectfully submitted,
Professional Service Industries, Inc.

TESTED FOR:
MK-FERGUSON COMPANY
P.O. Box 9136
Albuquerque, NM 87119

PROJECT:
LOWMAN, IDAHO

Attention: Mr. John Singleton

December 21, 1990

PSI Project #:355-00118-001

REMARKS TP-1B @ Depth 7'-9'

I. Particle Size Analysis with Hydrometer (ASTM D-422).

Sieve Size	Percent Passing
2.0"	100
1.5"	93
1.0"	88
3/4"	85
1/2"	81
3/8"	79
#4	70
#8	59
#16	45
#30	37
#50	30
#100	22
#200	17
1 Min.	17
2 Min.	15
5 Min.	10
15 Min.	9
30 Min.	8
60 Min.	6
250 Min.	5

II. Atterberg Limits (ASTM D-4318)

Liquid Limit	NP
Plastic Limit	NP
Plastic Index	NP

III. Natural Moisture Content (ASTM D-2216)

Moisture % 10.0

Respectfully submitted;
PROFESSIONAL SERVICE INDUSTRIES, INC.

psi Professional Service Industries, Inc.

REPORT OF MOISTURE DENSITY RELATIONSHIP OF SOIL

TESTED FOR: MK-FERGUSON COMPANY
P.O. Box 9136
Albquerque, NM 87119

PROJECT: LOWMAN, IDAHO

Attention: Mr. John Singleton

DATE: December 21, 1990

OUR REPORT NO.: 355-00118-001 Pg. 8 of 46

TEST DATA

Visual Classification: Sand with gravel and silt

Sample Source: TP-1B 7-9'

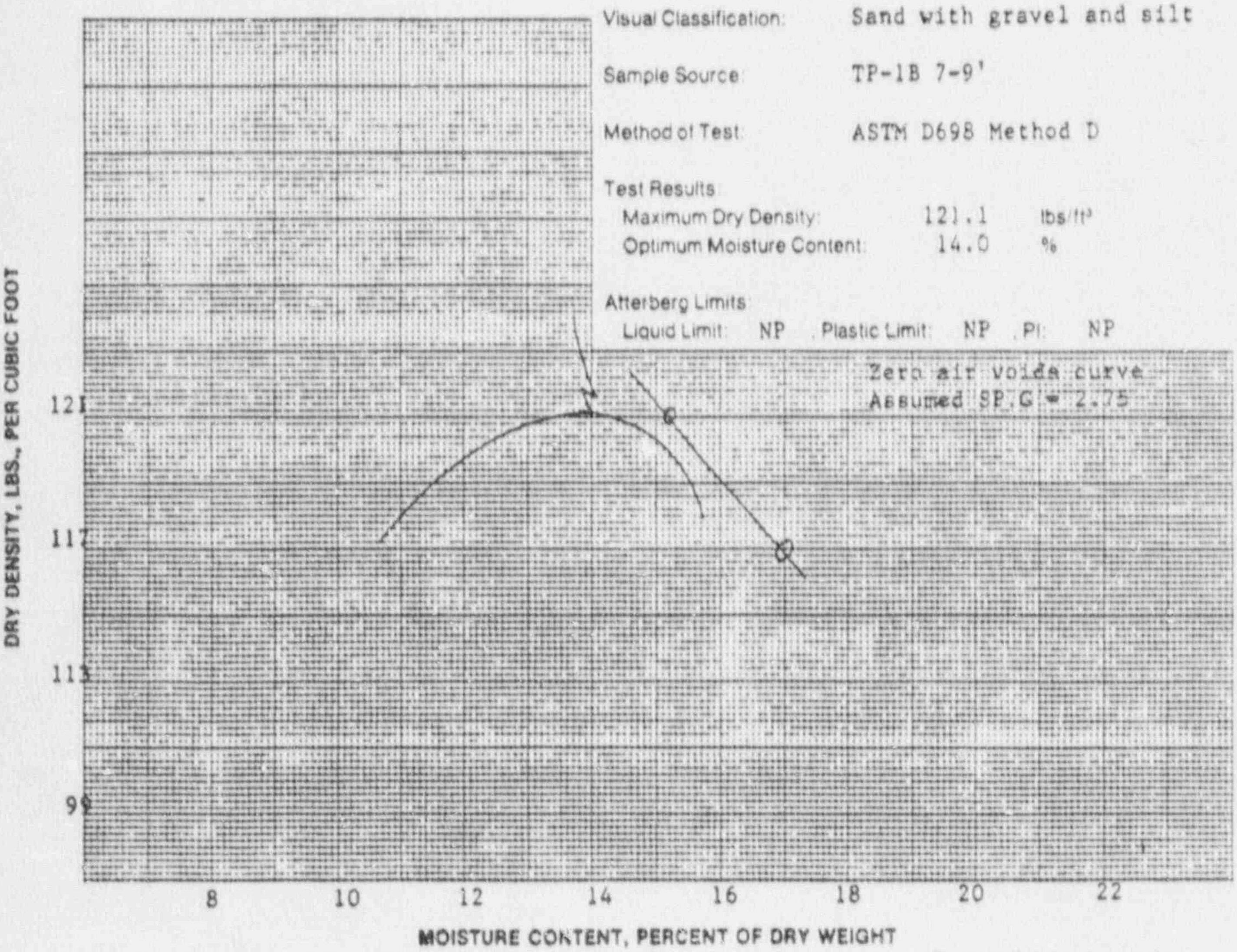
Method of Test: ASTM D698 Method D

Test Results:

Maximum Dry Density:	121.1	lbs/ft³
Optimum Moisture Content:	14.0	%

Atterberg Limits:

Liquid Limit: NP , Plastic Limit: NP , PI: NP



SPECIFIC GRAVITY OF SOIL (ASTM D-854)

G = 2.66

Respectfully submitted,
Professional Service Industries, Inc.

CAPILLARY - MOISTURE RELATIONS

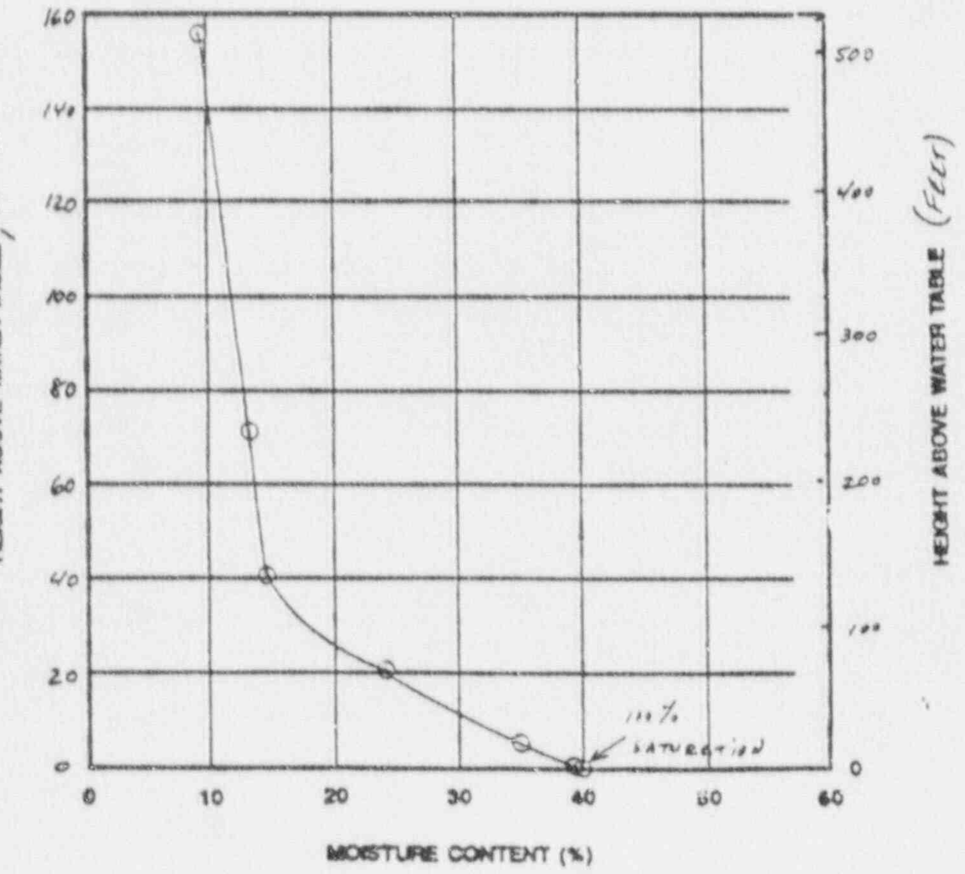
ASTM - D 31.

Location: UNKNOWN
Depth: 7-9'
Identification: 95% MDD at OMC
Initial moisture content: 14.0% %
Initial dry unit weight: 1.842 g/cm³ 115.0 lb/ft³; Porosity: %
Specific gravity:
Sample No: TP-1B
Date: START 12/3 - END 12/10
Soil type: Si F-C SANDY CLAY
Sample type:
Remarks: MDD = 121.1 @ 14.0% OMC
A = 3.142 in²
H = 0.40 in

(1) Tension. BAR	*	**	0.1	0.5	2.0	4.0	7.0	15.0
(2) Container number METERS =	-	-	1	5.2	20.7	41.3	72	155
(3) Wt of container and ring + wet sample, g (W_{cws})	47.7	50.5	50.4	49.5	47.3	45.3	45.0	44.2
(4) Wt of container and ring + dry sample, g (W_{cd})	42.3	=	=	=	=	=	=	=
(5) Wt of moisture, g (W_w), (3 - 4)	5.4	8.2	8.1	7.2	5.0	3.0	2.7	1.9
(6) Wt of container and ring g (W_c)	4.3	=	=	=	=	=	=	=
(7) Wt of dry sample, g (W_s) (4 - 6)	37.9	=	=	=	=	=	=	=
(8) Moisture content, % (w) (5 ÷ 7) × 100	14.2	21.6	21.4	18.9	13.2	7.9	7.1	5.0
(9) Unit wt of dry sample (γ_d)	1.842	=	=	=	=	=	=	=
(10) Moisture content, volume percent (w_v) (8 × 9)	26.2	39.8	39.4	34.8	24.3	14.6	13.1	9.2

* INITIAL

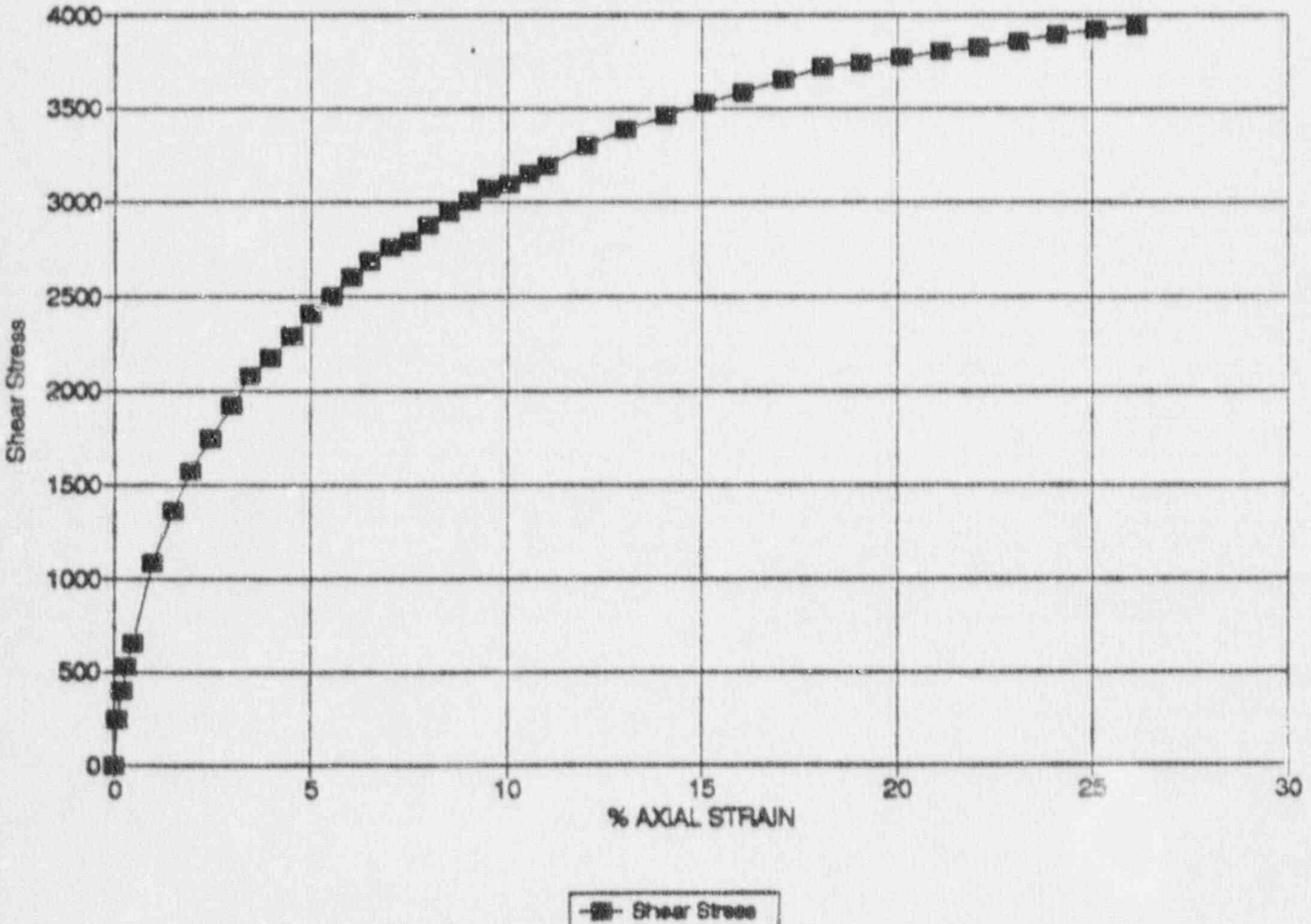
** 24 HR SOAK



Dames & Moore

FILE ORIGINAL BY JO DATE 1/28/87 CHECKED BY DATE 12/10

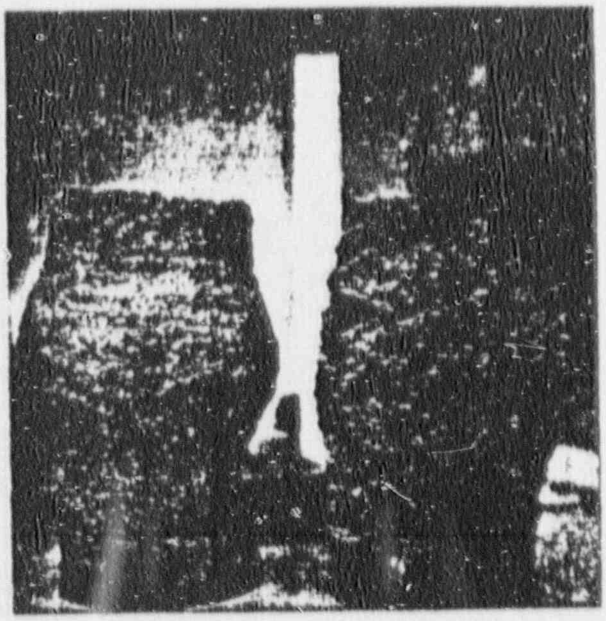
TRIAXIAL UNCONSOLIDATED UNDRAINED-Sat
Boring TB-1 Sample Remold 7-9 feet



```
Triaxial UnConsolidated Undrained - Saturated


                                 Boring  TP-1B
Height  I 4.971                  REMOLD 95 % MDD at OMC
Area I    4.449                  7-9 feet

Confining Pressure                 504

LOAD RANGE           0.000 /%

                     Initial Final
Percent Moisture        14.0  15.6
Wet Density  pcf     131.1 137.7
Dry Density  pcf     115.0 119.1

          AXIAL
         DEFLECT HEIGHT
    %     dial   change              S1-S3    S1-S3/2
  LOAD     in.     in.      E %       psf       Psf
    0.0  0.000    0.000   0.00          0          0
    490  0.005    0.005   0.10        490        245
    790  0.010    0.010   0.20        788        394
   1050  0.015    0.015   0.30       1047        523
   1300  0.025    0.025   0.50       1293        647
   2180  0.050    0.050   1.01       2158       1079
   2750  0.075    0.075   1.51       2709       1354
   3210  0.100    0.100   2.01       3145       1573
   3580  0.125    0.125   2.51       3490       1745
   3960  0.150    0.150   3.02       3841       1920
   4300  0.175    0.175   3.52       4149       2074
   4530  0.200    0.200   4.02       4348       2174
   4800  0.225    0.225   4.53       4583       2291
   5070  0.250    0.250   5.03       4815       2408
   5290  0.275    0.275   5.53       4997       2499
   5530  0.300    0.300   6.04       5196       2598
   5730  0.325    0.325   6.54       5355       2678
   5930  0.350    0.350   7.04       5512       2756
   6040  0.375    0.375   7.54       5584       2792
   6250  0.400    0.400   8.05       5747       2874
   6440  0.425    0.425   8.55       5889       2945
   6600  0.450    0.450   9.05       6003       3001
   6770  0.475    0.475   9.56       6123       3062
   6890  0.500    0.500  10.06       6197       3098
   7040  0.525    0.525  10.56       6296       3148
   7170  0.550    0.550  11.06       6377       3188
   7500  0.600    0.600  12.07       6595       3297
   7770  0.650    0.650  13.08       6754       3377
   8040  0.700    0.700  14.08       6908       3454
   8310  0.750    0.750  15.09       7056       3528
   8540  0.800    0.800  16.09       7166       3583
   8800  0.850    0.850  17.10       7295       3648
   9080  0.900    0.900  18.11       7436       3718
   9250  0.950    0.950  19.11       7482       3741
```

```
 9440   1.000     1.000 20.12       7541       3770
 9650   1.050     1.050 21.12       7612       3806
 9830   1.100     1.100 22.13       7655       3827
10040   1.150     1.150 23.13       7717       3859
10270   1.200     1.200 24.14       7791       3895
10470   1.250     1.250 25.15       7837       3919
10670   1.300     1.300 26.15       7880       3940
```

Dames & Moore



WU/SAT

TRIAXIAL TEST DATA SHEET
LOW PRESSURE-ENGLISH

Owner PSI

Job # 5077

Location UNK

Boring # TP-1B

Sample # REMOLD 95% MDD at OMC

Depth 7-9'

Deflecting Speed 0.10 in/Hr [✓ Min]

Lateral Pressure 3.5 ~~PSF~~ [✓ PSI] 504

Saturated ☒ Field Moisture ☐

Set-Up 11/28/90 Tested FEL (162 Office)

Soil Type BR Si F-C SANDY CLAY

MDD = 121.1 at 14.0%

		Initial	Final	
Weight soil & dish no.				
Dry weight soil & dish				
Net loss of moisture				
Weight of dish only				
Net weight of dry soil				
Moisture, % of dry weight		14.0	15.6	
Wt. solids + moisture	W_0	789.1	799.9	gms.
$W_0 \div 454$	W_0'			lbs.
Weight solids	W_s	692.2		gms.
Wet density $W_0' \div V_0'$		131.1	137.7	pcf
Dry density		115.0	119.1	pcf
Net diameter	D_0	2.416		in.
Area (0.785 D_0^2)	A_0	4.582	4.449	sq. in
Height	H_0	5.00	4.971	in.
Volume $(A_0H_0) \div 1728$	V_0'			cu. ft
Volume $(A_0H_0) \times 16.4$	V_0	375.73	362.70	cc
Specific gravity of solids	G_s			
Volume of solids $W_s \div G_s$	V_s			cc
$(V_0 - V_s) \div V_s$	e_i			
I burette reading				cc
Burette reading under pressure				cc
$(V_p - V_s) \div V_s$	e_p			

Dames & Moore

SATURATION DATA

PROJECT: PSI NO.: 5077 LOCATION: UNK.

Boring No.: TP-1B Sample: Remold Depth: 7.9' (ft./m.) Set up: PEL 11 / 28 / 90

σ3 = 3.5 psi = 504 psf Type of Test: CU-SAT Cell No.: ______ Dial No.: ______

DATE	TIME		CHAMBER PRESSURE (PSI)	49 2.5 51.5 BACK PRESSURE (PSI)	EXTERNAL BURETTE OR DIAL RDG. (CC)/(IN.)	PORE PRESSURE (PSI)	Δ	B
	CLOSED	OPEN						
11/28/90	1421	1422	0/10	0 9/9 closed	84.42 / 69.56	0.0 / 4.1		
	1501	1502	10/40	0 39/39 closed	69.33 / 57.97	9.0 / 21.1	12 1/10	
	1545	1546	40/50	0 49/49 closed	60.54 / 58.85	39.0 / 47.3		
	0746		50/60	closed	59.68 / 58.36	49.0 / 59.0		1.00
			60/52.5	closed	/ 59.19	/		
					/	/		
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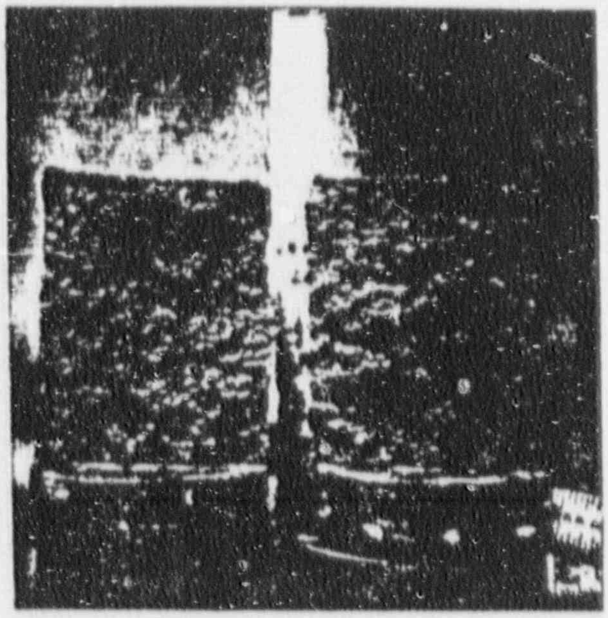
Dames & Moore

BACK - PRESSURE
PERMEABILITY TEST DATA

Owner P S Σ.
Job # 5461-025-5077
Location UNK
Boring # TP-1B
Sample # 96% MOD REMOLD
Depth 7-9'

Deflecting Speed 0 in/Hr/Min
Lateral Pressure 3.5 PSF [✓ PSI]
Saturated ☒ Field Moisture ☐
Set-Up ERR Tested 12/1/90 (162 Office)
Soil Type BC SILTY F-C SANDY CLAY



		Initial	Final	
Weight soil & dish no				
Dry weight soil & dish				
Net loss of moisture				
Weight of dish only				
Net weight of dry soil				
Moisture, % of dry weight		14.0	14.2	
Wt. solids + moisture	W_0	473.5	474.5	gms
W_0 – 454	W_0'			lbs
Weight solids	W_s	415.4		gms
Wet density W_0' · V_0'		131.1	140.0	pcf
Dry density		115.0	122.6	pcf
Net diameter	D_0	2.416		in.
Area (0.785 D_0^2)	A_0	4.582	4.308	sq in
Height	H_0	3.00	2.994	in.
Volume (A_0H_0) – 1728	V_0'			cu. ft
Volume (A_0H_0) x 16.4	V_0	225.44	211.54	cc
Specific gravity of solids	G_s			
Volume of solids W_s – G_s	V_s			cc
(V_0–V_s) – V_s	e_i			
Initial burette reading				cc
Burette reading under pressure				cc
(V_p – V_s) – V_s	e_p			

$K_{AV} = 4.54 \times 10^{-6}$ cm/s

Dames & Moore

SATURATION DATA

PROJECT: P. S. I NO.: 5077 LOCATION: UNR.

Boring No.: TP-1B Sample: Remold Depth: 7-9' (ft./m.) Set up: / /

σ_3 = 3.5 psi = psf Type of Test: PBp Cell No.: Dial No.:

DATE	TIME		CHAMBER PRESSURE (PSI)	39 3.5 42.5 BACK PRESSURE (PSI)	EXTERNAL BURETTE OR DIAL RDG. (CC)/(IN.)	PORE PRESSURE (PSI)	Δ	B
	CLOSED	OPEN						
12/1/90	1227	1228	0/10	0 9.9 closed	0.0 / 6.5	0.0 / 5.5		.55
	1317	1318	10/40	0 39/39 closed	6.6 / 12.9	9.0 / 22.4	13.4/30	
	1414		40/50	closed	11.9 / 13.0	35.0 / 48.9		B .97
			50/42.5	closed	13.0 / 12.7	/		
					/	/		
12/1/90	1416	0	42.5	0 39/39	12.3 /	/		
	1615				16.9 /	/		
	0955				22.1 /	/		

Page 2 of 4

PERMEABILITY TEST BY BACK PRESSURE
CONSTANT HEAD (Pbp)

PROJECT: P.S. I NO.: 5077 LOCATION: UNK

Boring No.: TP-1B Sample No.: Remold 95% Depth 7-9' (ft.)(m.) Tested by: EEL 12 / 2 / 90

DATE	TIME	ELAPSED TIME (MIN)	CHAMBER PRESSURE (PSI)	h_1 BACK PRESS 1 (PSI)	h_2 BACK PRESS 2 (PSI) $h_1 - h_2 = h$	EXTERNAL BURETTE OR DIAL RDG. (CC)/(IN.)	INTERNAL BURETTE (CC)	Q (cc)	ΔQ (cc)
12/2/90	0957	0	42.5	39	30	23.1	17.3		
	1009						9.5		
	1013						7.0		
	1020						2.6		
	1022	0	42.5	39	30	23.1	22.5		
	1026					23.1	19.7		
	1044						7.6		
	1047						5.6		
	1051						3.0		
	1052					23.1	40.0		
	1058	0	42.5	39	30	23.1	22.8		
	1111					23.1	13.8		
	1128	17					2.2		
	1130	0	42.5	39	30	23.1	23.8		
	1134	4					20.6		
	1144	10				23.1	18.8		
	1157	13					5.2		

$\Delta p = 9$

$\bar{\sigma}_D = 3.5\,psi$

$$K_{20^\circ C} = \frac{QL}{t\ h\ A} \times \frac{U_T}{U_{20^\circ C}}$$

SEE 4 OF 4.

$Q =$ $=$ cc

$h =$ (70.1) $=$ cm

$L =$ cm

$U_T = .931$ ($23°C$)

$t =$ min. (60) $=$ sec

$A =$ cm²

$K_{20^\circ C} =$ ———— $\times .931 =$

3 OF 4

PERMEABILITY TEST BY BACK PRESSURE CONSTANT-HEAD

Professional Service Indusries 5461-025-5077

Sample Number TP-1B
Depth 7-9 feet Remold 95% Mdd at omc

	Initial	Final
Wet Density pcf	131.1	140.0
Dry density pcf	115.0	122.6
% Moisture	14.0	14.2

Height Initial	3.000	
Diameter Initial	2.416	
Area Initial	4.582	
Volume Initial	225.44	
Initial dial	1.084	
Final dial	1.09	
Initial cc/in res	0	
Final cc/in res.	23.1	
Height Final	2.994	7.605 cm
Diameter Final	2.343	
Area Final	4.308	27.817 cm^2
Volume Final	211.54	
Height change	-0.006	
cc/in reser.	0.008	
Volume change	-23.100	
Cell Change	9.2	
Net Volume Change	-13.900	
h= T/B PREss. diff	9	630.90 cm

573.5	Wet soil and dish
515.4	Dry soil and dish
100	dish only
473.5	Ws Initial
474.5	Final Ws
415.4	Weight solids

Standard Water .005 N CaSO4

Hydraulic Gradient
82.96

Elapsed Time minutes	cc's	K cm/sec
17.0	11.60	4.59E-06
4.0	2.70	4.54E-06
10.0	6.80	4.57E-06
13.0	8.60	4.45E-06

K Average = 4.54E-06 cm/s

psi Professional Service Industries, Inc.

TESTED FOR:
MK-FERGUSON COMPANY
P.O. Box 9136
Albuquerque, NM 87119

PROJECT:
LOWMAN, IDAHO

Attention: Mr. John Singleton

December 21, 1990

PSI Project #:355-00118-001

Page 19 of 46

REMARKS TP-2 @ Depth 3'-5'

I. Particle Size Analysis with Hydrometer (ASTM D-422).

Sieve Size	Percent Passing
2.0"	100
1.5"	96
1.0"	93
3/4"	91
1/2"	87
3/8"	83
#4	70
#8	72
#16	70
#30	58
#50	48
#100	41
#200	34
1 Min.	29
2 Min.	24
5 Min.	21
15 Min.	17
30 Min.	16
60 Min.	14
250 Min.	10

II. Atterberg Limits (ASTM D-4318)

Liquid Limit	25
Plastic Limit	19
Plastic Index	6

III. Natural Moisture Content (ASTM D-2216)

Moisture % 11.1

Respectfully submitted;
PROFESSIONAL SERVICE INDUSTRIES, INC.

psi Professional Service Industries, Inc.

REPORT OF MOISTURE DENSITY RELATIONSHIP OF SOIL

TESTED FOR: MK-FERGUSON COMPANY
P.O. Box 9136
Albuqueruqe, NM 87119

Attention: Mr. John Singleton

PROJECT: LOWMAN, IDAHO

DATE: December 21, 1990

OUR REPORT NO.: 355-00118-001 Pg. 20 of 46

TEST DATA

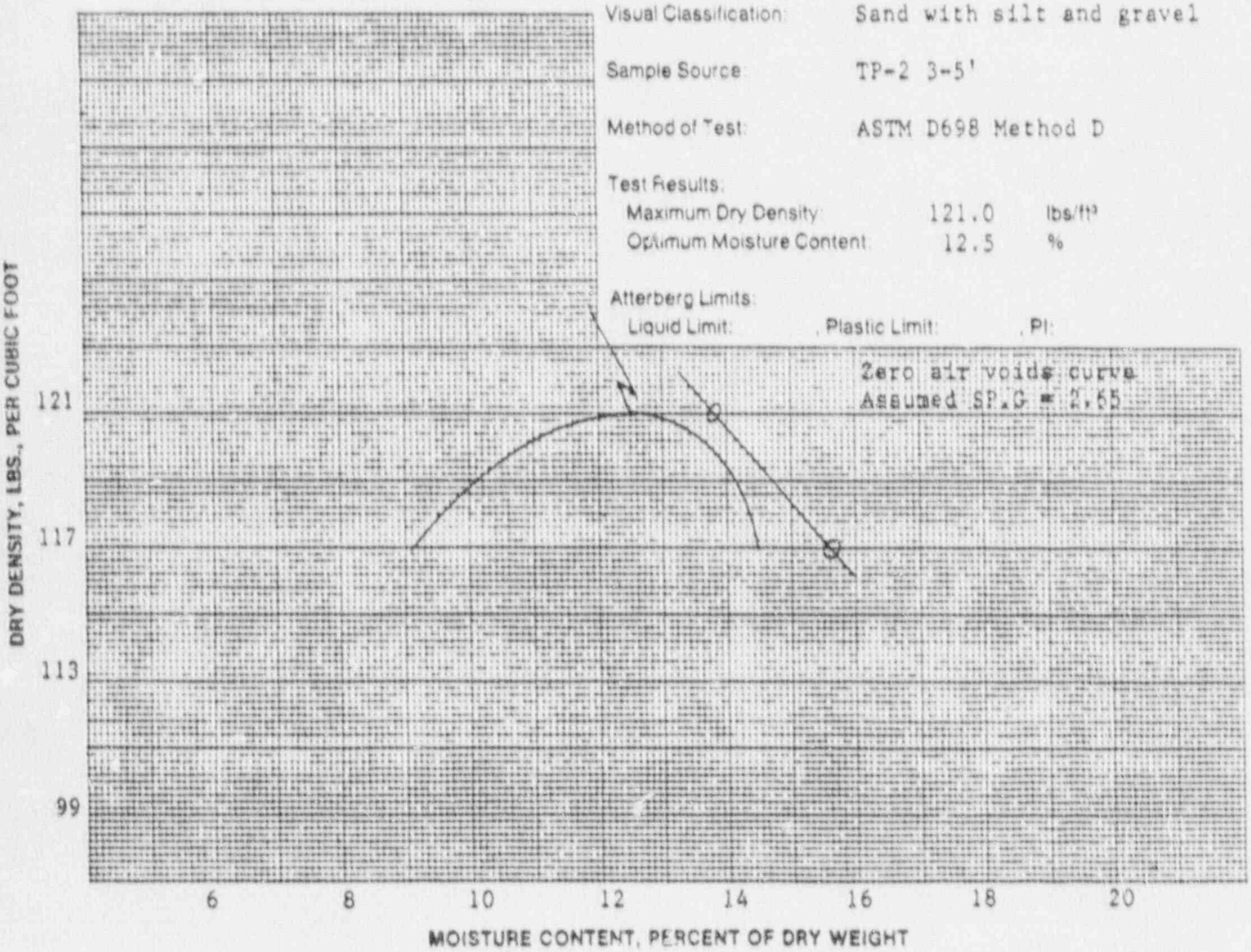
Visual Classification: Sand with silt and gravel

Sample Source: TP-2 3-5'

Method of Test: ASTM D698 Method D

Test Results:
Maximum Dry Density: 121.0 lbs/ft³
Optimum Moisture Content: 12.5 %

Atterberg Limits:
Liquid Limit: , Plastic Limit: , PI:



SPECIFIC GRAVITY OF SOIL (ASTM D-854)

G = 2.64

Respectfully submitted,
Professional Service Industries, Inc.

psi Professional Service Industries, Inc.

ANALYTICAL REPORT

Tested For: PROFESSIONAL SERVICE INDUSTRIES, INC.
254 S. Cole Road
Boise, Idaho 83709

Project: Chemical Analysis

Lab # 12093 and 12094

ATTN: Bob Arnold

Date: December 11, 1990

Report #214-03154-01

****

Date Received: December 5, 1990
Sample Identification: Two soil samples labeled below.
Methodology Employed: EPA Methods for Chemical Analysis of Water and Waste
Analyst: CM 12/11/90, 1233

	Results	Performed by
Sample ID: TP2; lab #12093		
Walkley Black TOC, %	0.32	CM 12/11/90, 1223
Sample ID: TP3; lab #12094		
Walkley Black TOC, %	0.29	CM 12/11/90, 1223

Q.A. DATA

	Mdl	Blank	Orig	Dup	Rpd %	Amount Spiked	Spike Rec. %
Walkley Black TOC	-	--	0.32	0.23	20.7	--	---

DATA REVIEW AND CERTIFICATION

The information given in this analytical report has been reviewed and is certified to have been prepared according to the methods cited herein.

Anita Abbott 12/11/90

Respectfully submitted,
PROFESSIONAL SERVICE INDUSTRIES, INC.

CAPILLARY - MOISTURE RELATIONS

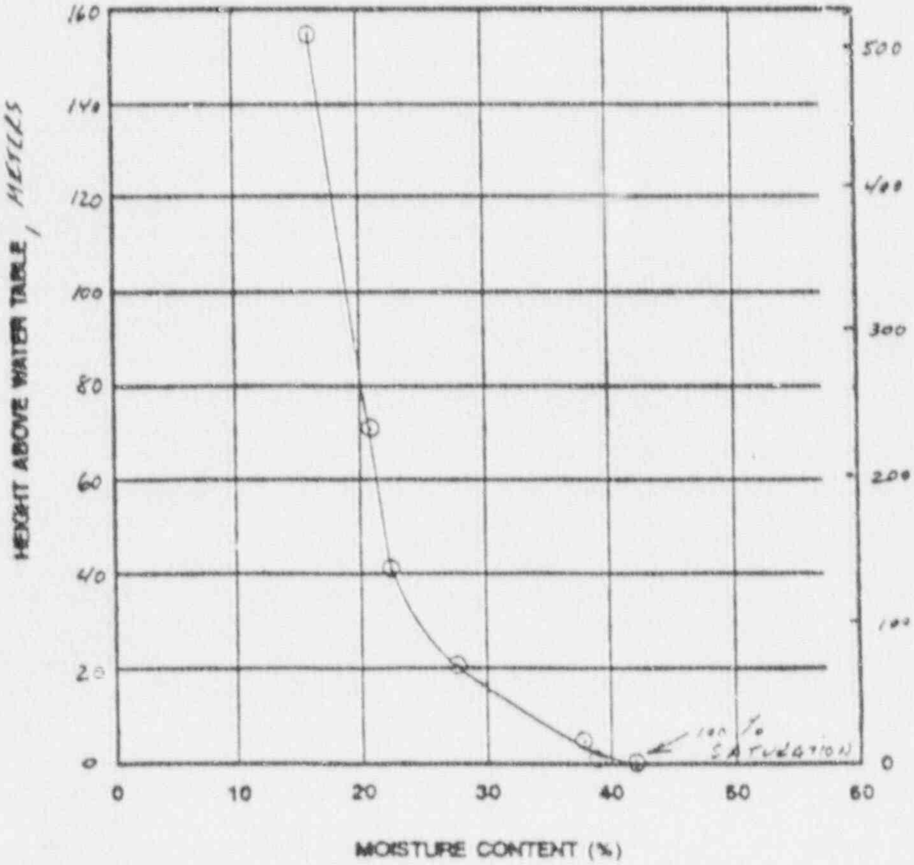
ASTM - D3152

Location: UNKNOWN
Sample No: TP-2
Depth: 3-5'
Date: START 12/3 - END 12/10
Identification: 95% MDD at OMC
Soil type: SANDY GRAY SILT
Initial moisture content: %
Sample type: BULK
Initial dry unit weight: 1.841 g/cm³: 114.9 lb/ft³; Porosity: %
Specific gravity:
Remarks: MDD = 121.0 at 12.5%
A = 3.142 in²
H = 0.40 in

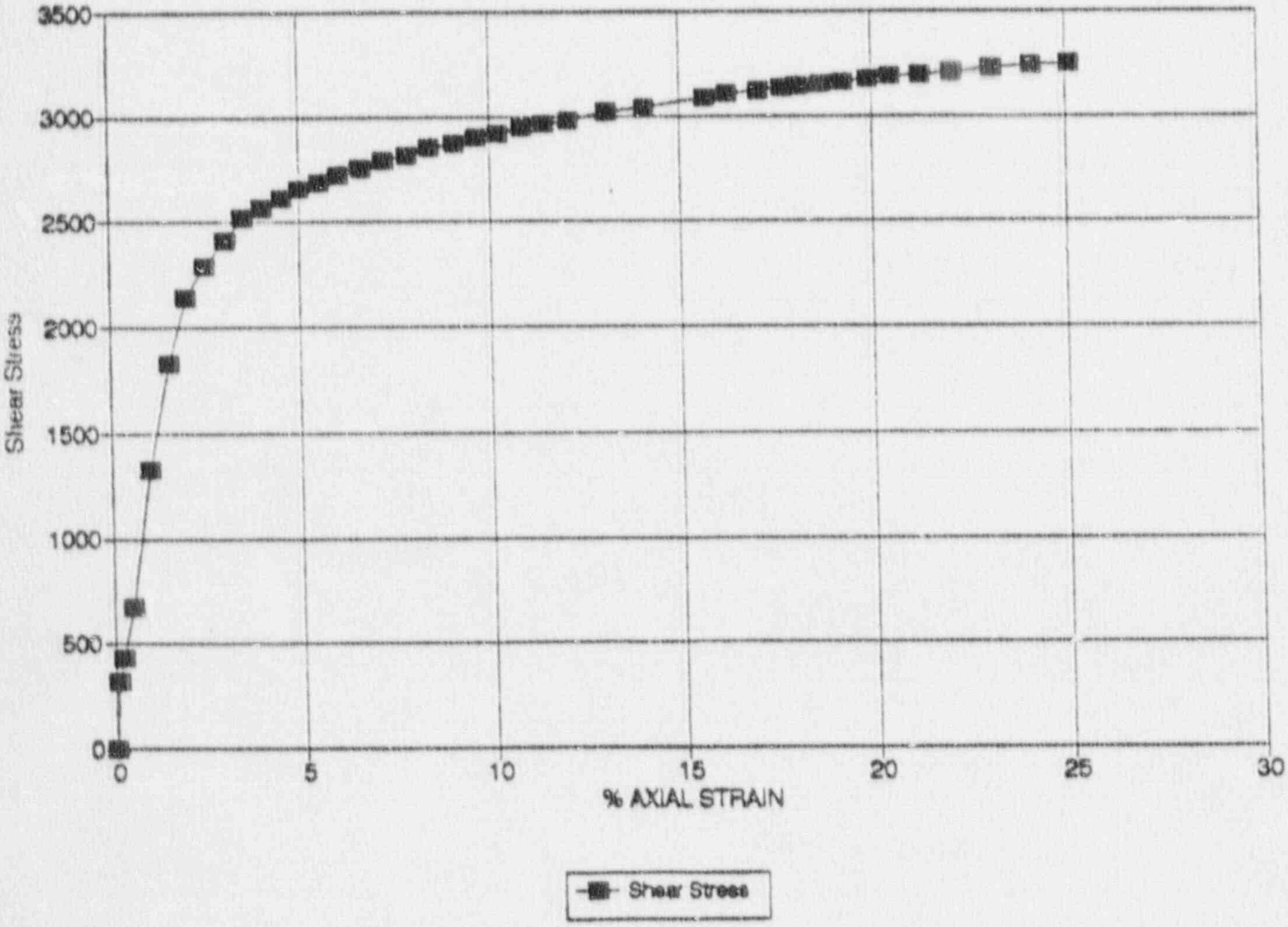
(1) Tension, BAR	*	**	0.1	0.5	2.0	4.0	7.0	15.0
(2) Container number METERS =	-	-	1	5.2	20.7	41.3	72	155
(3) Wt of container and ring + wet sample, g (W_{cww})	46.7	50.5	49.9	49.7	47.6	46.5	46.2	45.2
(4) Wt of container and ring + dry sample, g (W_{cd})	41.9	=	=	=	=	=	=	=
(5) Wt of moisture, g (W_w), (3 - 4)	4.8	8.6	8.0	7.8	5.7	4.6	4.3	3.3
(6) Wt of container and ring g (W_c)	4.0	=	=	=	=	=	=	=
(7) Wt of dry sample, g (W_d) (4 - 6)	37.9	=	=	=	=	=	=	=
(8) Moisture content, % (w) (5 ÷ 7) × 100	12.7	22.7	21.1	20.6	15.0	12.1	11.3	8.7
(9) Unit wt of dry sample (γ_d)	1.84	=	=	=	=	=	=	=
(10) Moisture content, volume percent (w_v) (8 × 9)	23.4	41.8	38.8	37.9	27.6	22.3	20.8	16.0

* INITIAL

** 24 HR SOAK



Dames & Moore



TRIAXIAL UNCONSOLIDATED UNDRAINED-Sat
Boring TP-2 3-5 feet Remold 95% MDD

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Triaxial UnConsolidated Undrained - Saturated


                              Boring  TP-2
Height  14.9745               REMOLD 95 % MDD at OMC
Area I    4.553               3-5 feet

Confining Pressure              504

LOAD RANGE              0.000 /%

                    Initial Final
Percent Moisture      12.5  16.5
Wet Density  pcf     129.3 135.5
Dry Density  pcf     114.9 116.3

           AXIAL
          DEFLECT HEIGHT
   %       dial   change             S1-S3    S1-S3/2
  LOAD      in.     in.      E %      psf       Psf
     0.0  0.000    0.000   0.00          0          0
     640  0.005    0.005   0.10        639        320
     870  0.010    0.010   0.20        868        434
    1360  0.025    0.025   0.50       1353        677
    2680  0.050    0.050   1.01       2653       1327
    3710  0.075    0.075   1.51       3654       1827
    4370  0.100    0.100   2.01       4282       2141
    4700  0.125    0.125   2.51       4582       2291
    4980  0.150    0.150   3.02       4830       2415
    5230  0.175    0.175   3.52       5046       2523
    5350  0.200    0.200   4.02       5135       2567
    5480  0.225    0.225   4.52       5232       2616
    5590  0.250    0.250   5.03       5309       2655
    5690  0.275    0.275   5.53       5375       2688
    5790  0.300    0.300   6.03       5441       2720
    5910  0.330    0.330   6.63       5518       2759
    6010  0.360    0.360   7.24       5575       2788
    6110  0.390    0.390   7.84       5631       2815
    6220  0.420    0.420   8.44       5695       2847
    6310  0.450    0.450   9.05       5739       2870
    6410  0.480    0.480   9.65       5791       2896
    6500  0.510    0.510  10.25       5834       2917
    6610  0.540    0.540  10.86       5892       2946
    6700  0.570    0.570  11.46       5932       2966
    6780  0.600    0.600  12.06       5962       2981
    6940  0.650    0.650  13.07       6033       3017
    7080  0.700    0.700  14.07       6084       3042
    7320  0.780    0.780  15.68       6172       3086
    7420  0.810    0.810  16.28       6212       3106
    7520  0.850    0.850  17.09       6235       3118
    7610  0.880    0.880  17.69       6264       3132
    7660  0.900    0.900  18.09       6274       3137
    7750  0.930    0.930  18.70       6301       3151
    7830  0.960    0.960  19.30       6319       3159
```

7920	0.990	0.990	19.90	6344	3172
8020	1.020	1.020	20.50	6376	3188
8110	1.060	1.060	21.31	6382	3191
8240	1.100	1.100	22.11	6418	3209
8390	1.150	1.150	23.12	6450	3225
8540	1.200	1.200	24.12	6480	3240
8680	1.250	1.250	25.13	6499	3249

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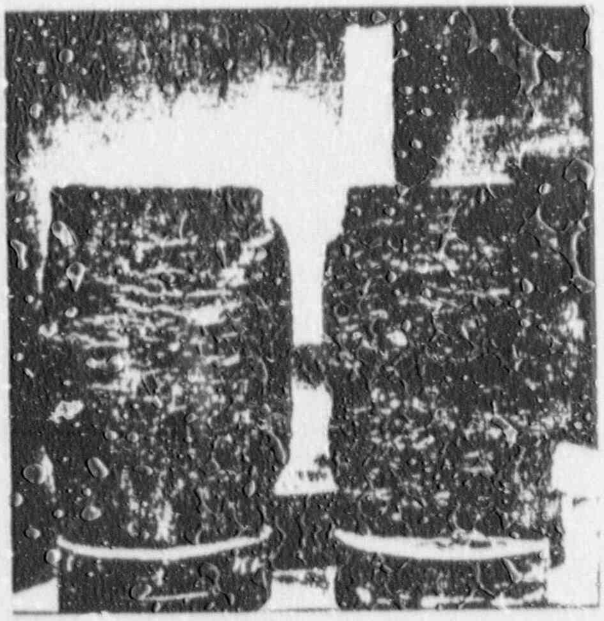
UU/SAT

TRIAXIAL TEST DATA SHEET
LOW PRESSURE-ENGLISH



Owner PSI

Job # 5461-025-5077

Location UNK

Boring # TP-2

Sample # REMOLD 95% MDD

Depth 3-5'

Deflecting Speed 0.10 in/Hr/Min

Lateral Pressure 3.5 PSF/PSI — 504

Saturated ☒ Field Moisture ☐

Set-Up 12/2/90 Tested EE&L (1620 ft/cd)

Soil Type BR F-CO SANDY CLAYEY SILT

		Initial	Final	
Weight soil & dish no.				
Dry weight soil & dish				
Net loss of moisture				
Weight of dish only				
Net weight of dry soil				
Moisture, % of dry weight		12.5	16.5	
Wt. solids + moisture	W_0	778.3	806.1	gms.
W_0 ÷ 454	W_0'			lbs.
Weight solids	W_s	691.5		gms
Wet density W_0' ÷ V_0'		129.3	125.5	pcf
Dry density		114.9	116.3	pcf
Net diameter	D_0	2.416		in.
Area (0.785 D_0^2)	A_0	4.582	4.583	sq. in
Height	H_0	5.00	4.995	in.
Volume (A_0H_0) ÷ 1728	V_0'			cu. ft
Volume (A_0H_0) x 16.4	V_0	375.73	371.43	cc
Specific gravity of solids	G_s			
Volume of solids W_s ÷ G_s	V_s			cc
(V_0−V_s) ÷ V_s	e_i			
Initial burette reading				cc
Burette reading under pressure				cc
(V_p − V_s) ÷ V_s	e_p			

Dames & Moore

SATURATION DATA

PROJECT: P&I NO.: 5077 LOCATION: UNK

Boring No.: TP-3 Sample: Remold Depth: 3-5' (ft./m.) Set up: EEL 12/2/90

σ_3 = 3.5 psi / 504 psf Type of Test: Tr UU Cell No.: Dial No.:

DATE	TIME		CHAMBER PRESSURE (PSI)	45/35/25 BACK PRESSURE (PSI)	EXTERNAL BURETTE OR DIAL RDG. (CC)/(IN.)	PORE PRESSURE (PSI)	Δ	B
	CLOSED	OPEN						
12/2/90	1053	1054	0/10	0 9/9 closed	78.80 / 72.40	0.0 / 2.0		.20
	1126	1127	10/40	0 39/39 closed	71.48 / 62.57	9.0 / 15.1	6.1/30	
	1144	1145	40/50	0 49/49 closed	63.03 / 62.11	39.0 / 45.7		.67
	1155	1156	50/60	0 59/59 closed	64.02 / 62.38	49.0 / 58.3		.93
12/3	0646		63/70	closed	63.67 /	57.0 / 68.9		.9
			70/66.5		/ 63.30	/		

Dames & Moore

BACK - PRESSURE
PERMEABILITY TEST DATA

Owner PSI
Job # 5461-025-5077
Location UNKNOWN
Boring # TP-2
Sample # REMOLD – 95% MDD at OMC
Depth 3-5'

Deflecting Speed 0 in/Hr Min
Lateral Pressure 3.5 PSF [✓ PSI]
Saturated ☒ Field Moisture ☐
Set-Up 12/4/90 Tested RRL (165 Office)
Soil Type Br F-C SANDY CLAYEY SILT
MDD = 121.0 at 12.5'

		Initial	Final	
Weight soil & dish no.				
Dry weight soil & dish				
Net loss of moisture				
Weight of dish only				
Net weight of dry soil				
Moisture, % of dry weight		12.5	15.1	
Wt. solids + moisture	W_0	466.9	455.9	gms.
W_0 ÷ 454	W_0'			lbs.
Weight solids	W_s	415.0		gms.
Wet density $W_0' \div V_0'$		129.3	131.7	pcf
Dry density		114.6	112.5	pcf
Net diameter	D_0	2.416		in.
Area (0.785 D_0^2)	A_0	4.582	4.647	sq. in
Height	H_0	3.00	2.989	in.
Volume (A_0H_0) ÷ 1728	V_0'	.22544	.23026	cu ft
Volume (A_0H_0) x 16.4	V_e			cc
Specific gravity of solids	G_s			
Volume of solids W_s ÷ G_s	V_s			cc
$(V_0 - V_s) \div V_s$	e_i			
Initial burette reading				cc
Burette reading under pressure				cc
$(V_p - V_s) \div V_s$	e_p			

$K_{20} = 1.73 \times 10^{-6}$ cm/s

Dames & Moore

SATURATION DATA

PROJECT: D.S.I NO.: 5461-025-5077 LOCATION: UNK

Boring No.: TP-2 Sample: Remold 95% Depth: 3-5' (ft./m.) Set up: EGL 12/4/90

σ_3 = 3.5 psi = ______ psf Type of Test: PBP Cell No.: ______ Dial No.: ______

DATE	TIME		69 35 CHAMBER PRESSURE (PSI)	BACK PRESSURE (PSI)	EXTERNAL BURETTE OR DIAL RDG. (CC)/(IN.)	PORE PRESSURE (PSI)	Δ	B
	CLOSED	OPEN						
12/4/90	0829	0830	0/10	0 9/9 closed	396 / .386	0.0 / 1.1		.11
	0849	0850	10/40	0 39/39 closed	383 / .352	9.0 / 10.5		
	0944	0945	40/50	0 49/49 closed	.357 / .351	39.0 / 46.7		
	1038	1039	50/60	0 59/59 closed	352 / .34	49.0 / 57.		
	1328	1329	60/70	0 69/69 closed	346 / .342	54.0 / 68.2		.92
	1642		70/80	closed	.346 / .338	69.0 / 78.7		97
			80 72.5		/ .341	/		
12/4	1641		72.5	0 69/69	341 /	/		
12/5	0600				338 /	/		

Page 2 of 4

PERMEABILITY TEST BY BACK PRESSURE
CONSTANT HEAD (Pbp)

PROJECT: P. S. I NO.: 5461-025-5077 LOCATION: UNK.

Boring No.: TP-2 Sample No.: Remold 95% Depth 2.5' (ft.)(m.) Tested by: ___ 12/5/90

DATE	TIME	ELAPSED TIME (MIN)	CHAMBER PRESSURE (PSI)	h_1 BACK PRESS 1 (PSI)	h_2 BACK PRESS 2 (PSI) $h_1 - h_2 = h$	EXTERNAL BURETTE OR DIAL RDG. (CC)/(IN.)	INTERNAL BURETTE (CC)	Q (cc)	ΔQ (cc)
12/5/90	0606	0	72.5	69	60	.338	21.3		
	0638					.337	9.7		
	0735					.336	+0.0		
	0738	0	72.5	69	60	.336	23.7		
	0755						19.2		
	0810						16.3		
	0841						10.6		
	0847						9.2		
	0922						+0.0		
	0923	0	72.5	69	60	.337	22.9		
	0926						21.9		
	1025	59					4.8		
	1030	5					3.4		
	1035	5					2.1		
	1056	0	72.5	69	60	.337	23.0		
	1154	58					6.0		

$\Delta p = 9$ psi

$\bar{\sigma}_3 = 35$ psi

SEE 4 OF 4.

$$K_{20^\circ C} = \frac{QL}{t\ h\ A} \times \frac{u_T}{u_{20^\circ C}}$$

Q = = cc

h = (70.1) = cm

L = cm

u_T = .931 (23°C)

t = min. (60) = sec

A = cm²

$K_{20^\circ C}$ = ________ x .931 =

3 of 4

```
        PERMEABILITY TEST BY BACK PRESSURE CONSTANT-HEAD

  Professional Service Indusries  5461-025-5077

  Sample Number  TP-2
  Depth  3-5 feet    Remold 95% Mdd at omc


                      Initial   Final
  Wet Density   pcf    129.3    131.7
  Dry density   pcf    114.9    112.5
        % Moisture      12.5     17.1

   Height Initial      3.000              566.9 Wet soil and dish
   Diameter Initial    2.416                515 Dry soil and dish
   Area Initial        4.582                100 dish only
   Volume Initial     225.44              466.9 Ws Initial
   Initial dial        0.227              485.9 Final Ws
   Final dial          0.238              415.0 Weight solids
   Initial cc/in res  -0.396
   Final cc/in res.   -0.337

   Height Final        2.989    7.592 cm
   Diameter Final      2.446
   Area Final          4.697   30.330 cm^2
   Volume Final       230.26

  Height change       -0.011
  cc/in reser.         0.008
  Volume change       -7.375
  Cell Change           12.2
  Net Volume Change    4.825
  h= T/B PREss. diff       9   630.90 cm

  Standard Water  .005 N CaSO4           Elapsed
                                          Time                     K
  Hydraulic Gradient                     minutes  cc's          cm/sec
            83.10
                                           59.0  17.10         1.78E-06
                                            5.0   1.40         1.72E-06
                                            5.0   1.30         1.60E-06
                                           58.0  17.00         1.80E-06


                      K Average =  1.73E-06 cm/s
```

TESTED FOR:
MK-FERGUSON COMPANY
P.O. Box 9136
Albuquerque, NM 87119

PROJECT:
LOWMAN, IDAHO

Attention: Mr. John Singleton

December 21, 1990

PSI Project #:355-00118-001

REMARKS TP-3 @ Depth 5'-7'

I. Particle Size Analysis with Hydrometer (ASTM D-422).

Sieve Size	Percent Passing
2.0"	100
1.5"	93
1.0"	89
3/4"	85
1/2"	85
3/8"	82
#4	68
#8	66
#16	64
#30	53
#50	42
#100	35
#200	29
1 Min.	26
2 Min.	20
5 Min.	18
15 Min.	15
30 Min.	13
60 Min.	11
250 Min.	8

II. Atterberg Limits (ASTM D-4318)

Liquid Limit	NP
Plastic Limit	NP
Plastic Index	NP

III. Natural Moisture Content (ASTM D-2216)

Moisture % 9.4

Respectfully submitted;
PROFESSIONAL SERVICE INDUSTRIES, INC.

psi Professional Service Industries, Inc.

REPORT OF MOISTURE DENSITY RELATIONSHIP OF SOIL

TESTED FOR: MK-FERGUSON COMPANY
P.O. Box 9136
Albquuerque, NM 87119

PROJECT: LOWMAN, IDAHO

Attention: Mr. John Singleton

DATE: December 21, 1990

OUR REPORT NO.: 355-00118-001 Pg. 33 of 46

TEST DATA

Visual Classification: Sand with gravel and silt

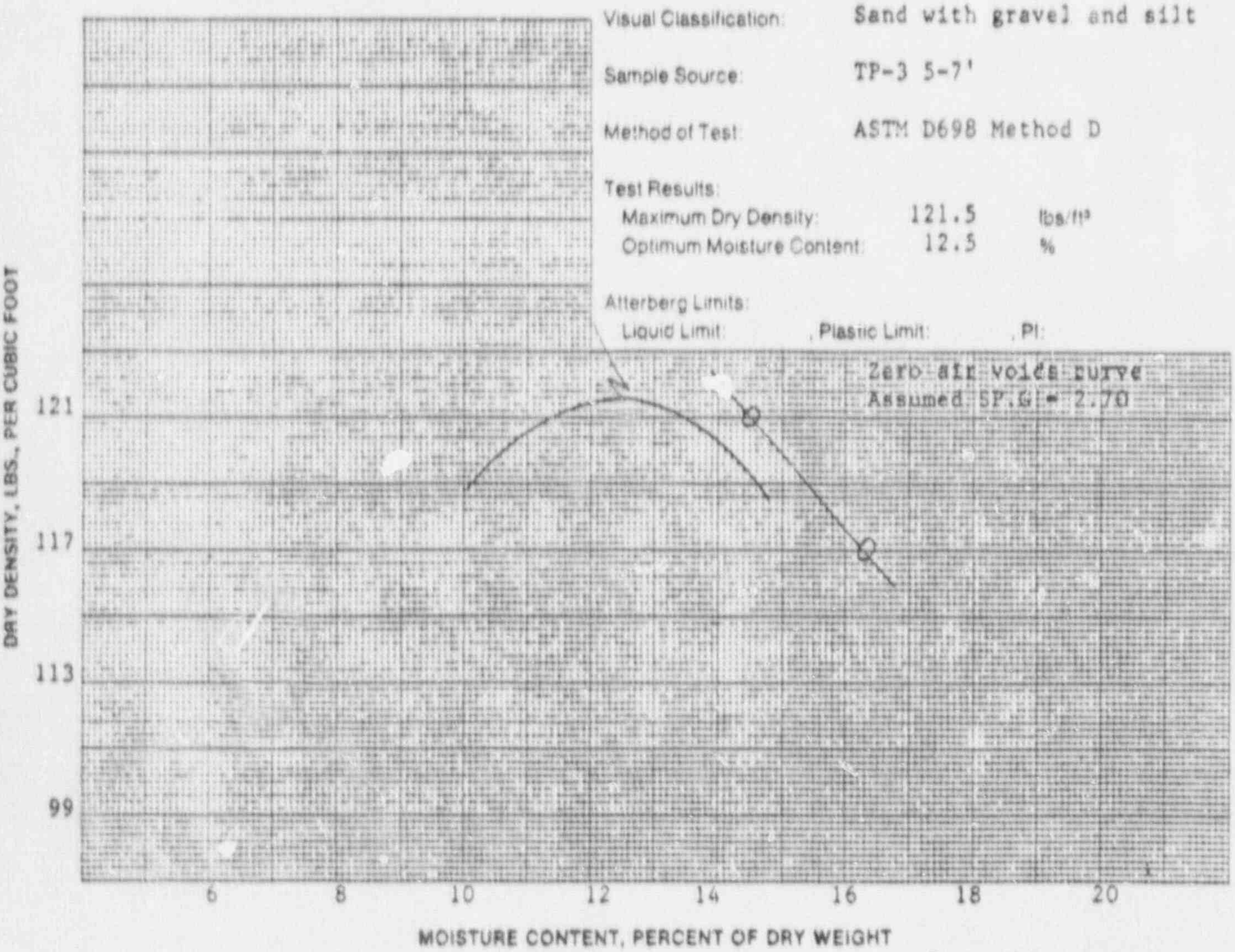
Sample Source: TP-3 5-7'

Method of Test: ASTM D698 Method D

Test Results:

Maximum Dry Density:	121.5	lbs/ft³
Optimum Moisture Content:	12.5	%

Atterberg Limits:
Liquid Limit: , Plastic Limit: , PI:



Respectfully submitted,
Professional Service Industries, Inc.

CAPILLARY - MOISTURE RELATIONS

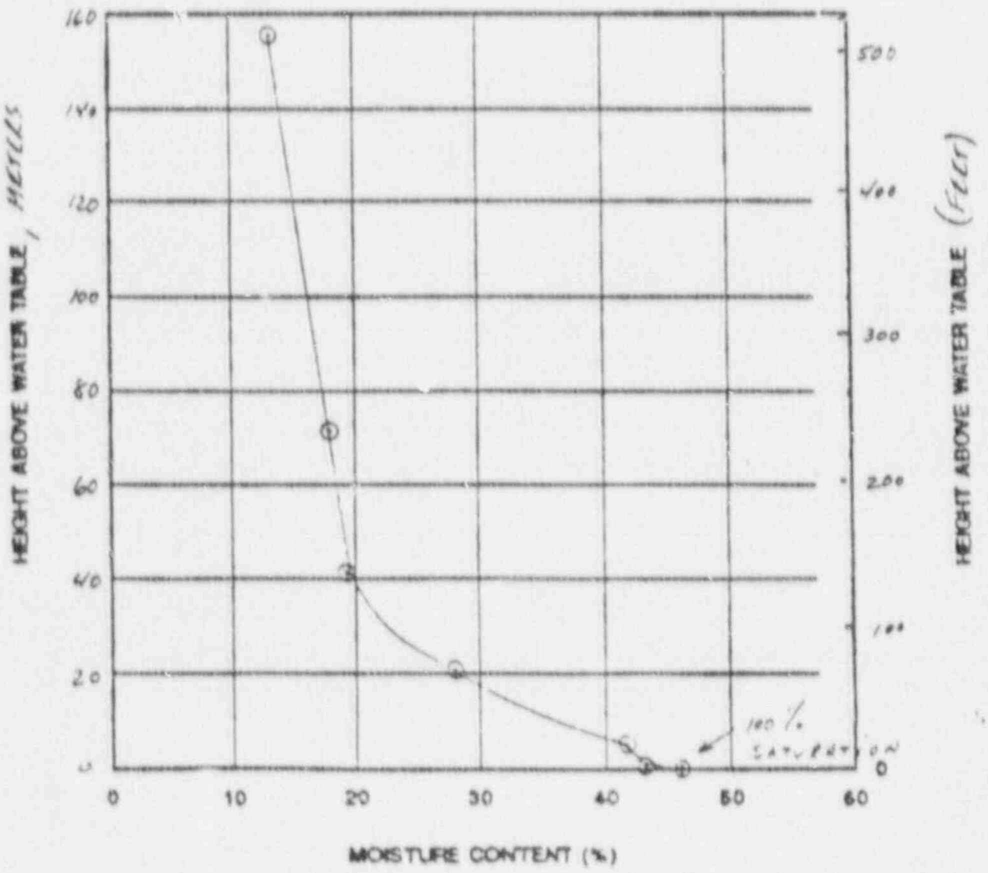
ASTM - D 3152

Location: UNKNOWN
Sample No: TP- 1
Depth: 5-7'
Date: START 12/2 - END 12/10
Identification: 95 % MDD at OMC
Soil type: CLAYEY, C SANDY SILT
Initial moisture content: 12.5 %
Sample type:
Initial dry unit weight: 1.848 g/cm³: 115.4 lb/ft³: Porosity: %
Specific gravity:
Remarks: MDD = 121.5 at 12.5%
A = 3.142 IN²
H = 0.4 IN

(1) Tension, BAR	*	**	0.1	0.5	2.0	4.0	7.0	15.0
(2) Container number METERS =	-	-	1	5.2	20.7	41.3	72	155
(3) Wt of container and ring + wet sample, g (W_{cws})	47.1	51.8	51.2	50.8	48.0	46.3	46.0	45.0
(4) Wt of container and ring + dry sample, g (W_{cs})	42.3							
(5) Wt of moisture, g (W_w), (3 − 4)	4.8	9.5	8.9	8.5	5.7	4.0	3.7	2.7
(6) Wt of container and ring g (W_c)	4.3	=	=	=	=	=	=	=
(7) Wt of dry sample, g (W_s) (4 − 6)	38.0	=	=	=	=	=	=	=
(8) Moisture content, % (w) (5 ÷ 7) × 100	12.6	25.4	23.4	22.4	15.0	10.5	9.7	7.1
(9) Unit wt of dry sample (γ_d)	1.847							
(10) Moisture content, volume percent (w_v) (8 × 9)	23.3	46.	43.2	41.4	27.7	19.4	17.9	13.1

* INITIAL

** 24 HR SOAK



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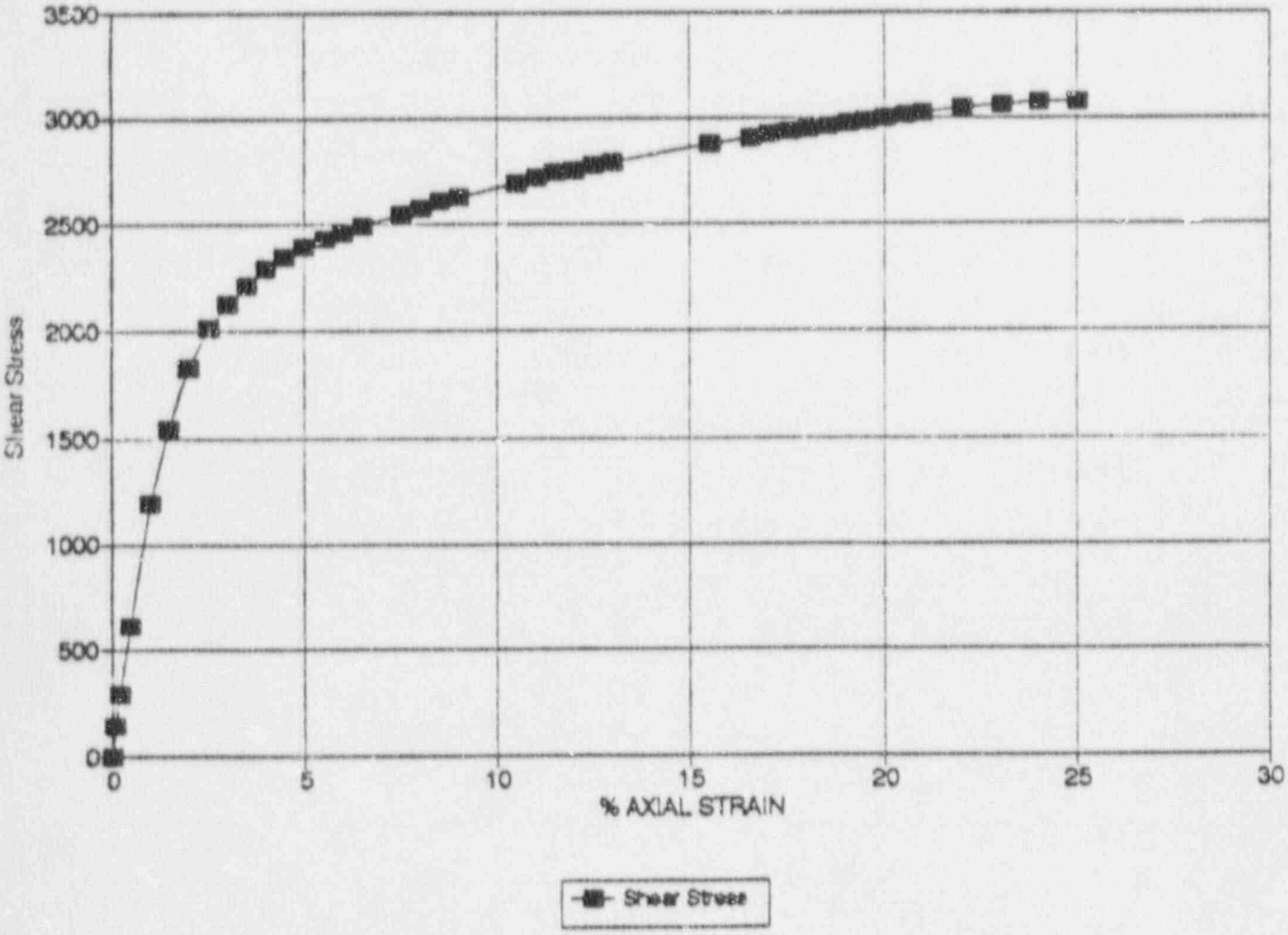
BY JO DATE [illegible] CHECKED BY PK DATE 12/10

TRIAXIAL UNCONSOLIDATED UNDRAINED-Sat
Boring TP-3 Remold 95% MDD 5-7 feet



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Triaxial UnConsolidated Undrained - Saturated


                              Boring  TP-3
Height  I 4.986               REMOLD 95 % MDD at OMC
Area I    4.455               5-7 feet

Confining Pressure              504

LOAD RANGE           0.000 /%

                    Initial Final
Percent Moisture      12.5  15.4
Wet Density  pcf     129.8 137.3
Dry Density  pcf     115.4 119.0

         AXIAL
        DEFLECT HEIGHT
   %     dial   change              S1-S3   S1-S3/2
  LOAD    in.    in.      E %        psf      Psf
     0.0 0.000   0.000   0.00          0        0
     290 0.005   0.005   0.10        290      145
     590 0.010   0.010   0.20        589      294
    1240 0.025   0.025   0.50       1234      617
    2410 0.050   0.050   1.00       2386     1193
    3130 0.075   0.075   1.50       3083     1541
    3730 0.100   0.100   2.01       3655     1828
    4130 0.125   0.125   2.51       4026     2013
    4390 0.150   0.150   3.01       4258     2129
    4580 0.175   0.175   3.51       4419     2210
    4770 0.200   0.200   4.01       4579     2289
    4910 0.225   0.225   4.51       4688     2344
    5040 0.250   0.250   5.01       4787     2394
    5150 0.275   0.275   5.52       4866     2433
    5240 0.300   0.300   6.02       4925     2462
    5340 0.325   0.325   6.52       4992     2496
    5510 0.375   0.375   7.52       5096     2548
    5600 0.400   0.400   8.02       5151     2575
    5700 0.425   0.425   8.52       5214     2607
    5780 0.450   0.450   9.03       5258     2629
    6030 0.525   0.525  10.53       5395     2698
    6120 0.550   0.550  11.03       5445     2722
    6200 0.575   0.575  11.53       5485     2742
    6260 0.600   0.600  12.03       5507     2753
    6350 0.625   0.625  12.54       5554     2777
    6410 0.650   0.650  13.04       5574     2787
    6810 0.775   0.775  15.54       5751     2876
    6960 0.825   0.825  16.55       5808     2904
    7050 0.850   0.850  17.05       5848     2924
    7120 0.875   0.875  17.55       5871     2935
    7180 0.900   0.900  18.05       5884     2942
    7260 0.925   0.925  18.55       5913     2957
    7340 0.950   0.950  19.05       5941     2971
    7420 0.975   0.975  19.55       5969     2985
```

7510	1.000	1.000	20.06	6004	3002
7580	1.025	1.025	20.56	6022	3011
7650	1.050	1.050	21.06	6039	3019
7810	1.100	1.100	22.06	6087	3043
7950	1.150	1.150	23.06	6116	3058
8100	1.200	1.200	24.07	6151	3075
8200	1.250	1.250	25.07	6144	3072

Dames & Moore

TRIAXIAL TEST DATA SHEET
LOW PRESSURE-ENGLISH

Owner P. S. I.

Job # 5461-025-5077

Location UNK

Boring # TP-3

Sample # REMOLD 95% MOD

Depth 5-7'

Deflecting Speed 0.10 in/Hr [✓ MIN]

Lateral Pressure 35 PSF [✓ PSI] — 504

Saturated ☒ Field Moisture ☐

Set-Up 11/27/90 Tested PRL (LAZ Office)

Soil Type BR CLAYEY F-C SANDY SILT

		Initial	Final	
Weight soil & dish no.				
Dry weight soil & dish				
Net loss of moisture				
Weight of dish only				
Net weight of dry soil				
Moisture, % of dry weight		12.5	15.4	
Wt. solids + moisture	W_0	781.2	801.6	gms.
W_0 ÷ 454	W_0'			lbs.
Weight solids	W_s	694.5		gms.
Wet density $W_0' \div V_0'$		129.8	137.3	pcf
Dry density		115.4	119.0	pcf
Net diameter	D_0	2.416		in.
Area $(0.785\ D_0^2)$	A_0	4.582	4.457	sq. in
Height	H_0	5.0	4.986	in.
Volume $(A_0H_0) \div 1728$	V_0'			cu. ft.
Volume $(A_0H_0) \times 16.4$	V_0	375.73	364.32	cc
Specific gravity of solids	G_s			
Volume of solids $W_s \div G_s$	V_s			cc
$(V_0 - V_s) \div V_s$	e_i			
Initial burette reading				cc
Burette reading under pressure				cc
$(V_p - V_s) \div V_s$	e_p			

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SATURATION DATA

PROJECT: P.S.I NO.: 5077 LOCATION: UNK.

Boring No.: TP-3 Sample: Remold Depth: 5.7' (ft./m.) Set up: Ecl 11 / 27 / 90

σ3 = 35 psi = ______ psf Type of Test: 4U-SAT Cell No.: ______ Dial No.: ______

DATE	TIME		CHAMBER PRESSURE (PSI)	69.5/2 BACK PRESSURE (PSI)	EXTERNAL BURETTE OR DIAL RDG. (CC)/(IN.)	PORE PRESSURE (PSI)	Δ	B
	CLOSED	OPEN						
11/27/90	1147	1148	0/10	0 9/9 CLOSED	66.86 / 56.47	0.0 / 2.2		.22
	1310	1311	10/40	0 39/39 CLOSED	56.09 / 44.90	9.0 / 19.7	10.7/30	
	1420	1421	40/50	0 49/49 CLOSED	47.19 / 45.36	39.0 / 46.7		.77
	1524	1525	50/60	0 59/59 CLOSED	45.12 / 44.28	49.0 / 57.4		.84
	1628	1629	60/70	0 61/69 CLOSED	44.84 / -	59.0 / 68.4		.94
11/28	0809		70/80	CLOSED	41.91 /	69.0 / 79.0		1.00
			80/72.5	CLOSED	42.84 / 43.25	/		
					/	/		
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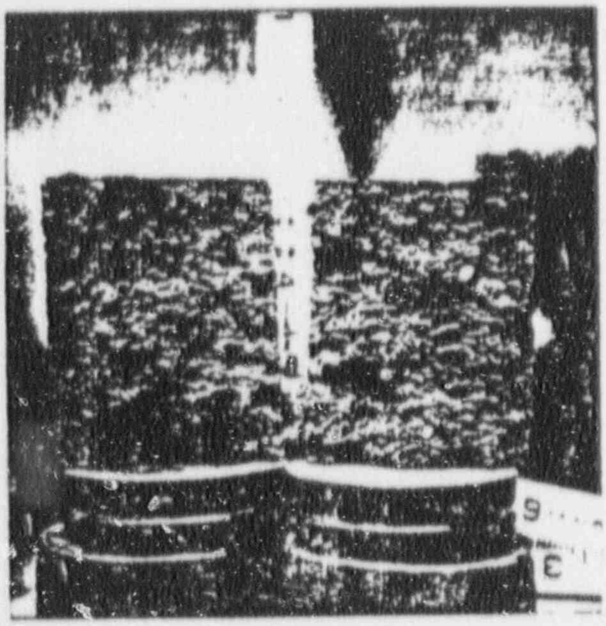
BACK - PRESSURE
PERMEABILITY TEST DATA

Owner PSI
Job # 5461-025-5077
Location UNK.
Boring # TP-2
Sample # REMOLD - 95% MOD at OMC
Depth 5.7'

Deflecting Speed ~~0~~ in/Hr Min
Lateral Pressure 3.5 PSF [✓ PSI]
Saturated ☒ Field Moisture ☐
Set-Up 11/23/90 Tested PGC (EZ Office)
Soil Type BR CLAYEY F-C SANDY SILT



		Initial	Final	
Weight soil & dish no.				
Dry weight soil & dish				
Net loss of moisture				
Weight of dish only				
Net weight of dry soil				
Moisture, % of dry weight		12.5	14.8	
Wt. solids + moisture	W_0	468.3	478.5	gms.
W_0 - 454	W_0'			lbs.
Weight solids	W_s	416.7		gms.
Wet density $W_0' - V_0'$		129.3	135.7	pcf
Dry density		115.4	118.2	pcf
Net diameter	D_0	2.416		in
Area (0.785 D_0^2)	A_0	4.582	4.477	sq. in
Height	H_0	3.00	2.998	in
Volume (A_0H_0) - 1728	V_0'			cu. ft
Volume (A_0H_0) x 16.4	V_0	225.44	220.14	cc
Specific gravity of solids	G_s			
Volume of solids $W_s - G_s$	V_s			cc
$(V_0-V_s) - V_s$	e_i			
Initial burette reading				cc
Burette reading under pressure				cc
$(V_p - V_s) - V_s$	e_p			

K_{AI} = 2.53 x 10^{-6} cm/s

Dames & Moore

SATURATION DATA

PROJECT: P. S. I. NO.: 5077 LOCATION: UNK

Boring No.: TP-3 Sample: Remold 95% Depth: 5-7' (ft./m.) Set up: SBL 11 / 23 / 90

σ3 = 3.5 psi = 504 psf Type of Test: PBP Cell No.: ____ Dial No.: ____

DATE	TIME		CHAMBER PRESSURE (PSI)	BACK PRESSURE (PSI)	EXTERNAL BURETTE OR DIAL RDG. (CC)/(IN.)	PORE PRESSURE (PSI)	Δ	B
	CLOSED	OPEN						
11/23/90	1004	1005	0/10	0 9/9 closed	0.0 / 5.7	0.0 / 1.6		.16
	1135	1136	10/40	0 34/29 closed	5.1 / 12.2	9.0 / 23.4	14.4/30	
11/24	0748		40/50	0 [illegible] closed	12.2 / 13.1	29.0 / 48.0		3 98
			50/42.5	closed	/ 12.6	/		
					/	/		
11/24	0750	0	42.5	0 34/34	12.6 /	/		
	0824				13.1 /	/		
	1027				13.4 /	/		
	1315				13.5 /	/		
	0802				14.0 /	/		
					/	/		
					/	/		
					/	/		
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Page 2 of 4

PERMEABILITY TEST BY BACK PRESSURE
CONSTANT HEAD (Pbp)

PROJECT: P. S. I. NO.: 5077 LOCATION: UNK.

Boring No.: TP-3 Sample No.: Remold 95% Depth 5.7' (ft.)(m.) Tested by: EOK 11 / 25 26 70

DATE	TIME	ELAPSED TIME (MIN)	CHAMBER PRESSURE (PSI)	h_1 BACK PRESS 1 (PSI)	h_2 BACK PRESS 2 (PSI) $h_1 - h_2 = h$	EXTERNAL BURETTE OR DIAL RDG. (CC)/(IN.)	INTERNAL BURETTE (CC)	Q (cc)	ΔQ (cc)
11/25 90	0835	0	42.5	39	35	14.0	22.9		
	0810						22.0		
	0837					14.2	17.9		
	0837						14.9		
	1028					14.4	1.9		
11/26	0632	0	42.5	39	35	14.5	22.9		
	0708						17.2		
	0715						15.5		
	0722						13.2		
	0747						11.0		
	0839						4.2		
	0815	12				14.5	1.4		
11/29	0901	0	42.5	39	35	14.5	22.8		
	0935	34					17.0		
	0948	13				14.5	15.8		
	1046	58					7.3		

ΔP = 4 psi

$\bar{\sigma}_3 = 3.5$ psi

$$K_{20°C} = \frac{Q\,L}{t\;h\;A} \times \frac{u_T}{u_{20°C}}$$

$Q =$ = cc

$h =$ (70.1) = cm

$L =$ cm

$u_T = .931$ (23°C)

$t =$ min. (60) = sec

$A =$ cm²

$K_{20°C} =$ ———— $\times .931 =$

SEE 4 OF 4.

3 OF 4

PERMEABILITY TEST BY BACK PRESSURF CONSTANT-HEAD

Professional Service Indusries 5461-025-5077

Sample Number TP-3
Depth 5-7 feet Remold 95% Mdd at omc

		Initial	Final
Wet Density	pcf	129.8	135.7
Dry density	pcf	115.4	118.2
% Moisture		12.5	14.8

Height Initial	3.000		568.8	Wet soil and dish
Diameter Initial	2.416		516.7	Dry soil and dish
Area Initial	4.582		100	dish only
Volume Initial	225.44		468.8	Ws Initial
Initial dial	1.062		478.5	Final Ws
Final dial	1.064		416.7	Weight solids
Initial cc/in res	0			
Final cc/in res.	14.5			
Height Final	2.998	7.615 cm		
Diameter Final	2.388			
Area Final	4.477	28.909 cm^2		
Volume Final	220.14			
Height change	-0.002			
cc/in reser.	0.008			
Volume change	-14.500			
Cell Change	9.2			
Net Volume Change	-5.300			
h= T/B PREss. diff	4	280.40 cm		

Standard Water .005 N CaSO4

Hydraulic Gradient
36.82

Elapsed Time minutes	cc's	K cm/sec
22.0	2.80	1.86E-06
34.0	5.20	2.23E-06
13.0	1.80	2.02E-06
58.0	8.50	2.14E-06

K Average = 2.06E-06 cm/s

TESTED FOR:
MK-FERGUSON COMPANY
P.O. Box 9136
Albuquerque, NM 87119

PROJECT:
LOWMAN, IDAHO

Attention: Mr. John Singleton

December 21, 1990

PSI Project #:355-00118-001

REMARKS

TP-4A @ Depth 3'-5'

I. Particle Size Analysis with Hydrometer (ASTM D-422).

Sieve Size	Percent Passing
2.0"	100
1.5"	91
1.0"	86
3/4"	85
1/2"	83
3/8"	82
#4	71
#8	61
#16	50
#30	38
#50	28
#100	21
#200	18
1 Min.	17
2 Min.	15
5 Min.	14
15 Min.	12
30 Min.	11
60 Min.	10
250 Min.	8

II. Atterberg Limits (ASTM D-4318)

Liquid Limit	NP
Plastic Limit	NP
Plastic Index	NP

III. Natural Moisture Content (ASTM D-2216)

Moisture % 3.0

Respectfully submitted;
PROFESSIONAL SERVICE INDUSTRIES, INC.

psi Professional Service Industries, Inc.

REPORT OF MOISTURE DENSITY RELATIONSHIP OF SOIL

TESTED FOR: MK-FERGUSON COMPANY
P.O. Box 9136
Albuquerque, NM 87119

PROJECT: LOWMAN, IDAHO

Attention: Mr. John Singleton

DATE: December 21, 1990

OUR REPORT NO.: 355-00118-001 Pg. 45 of 46

TEST DATA

Visual Classification: Sand with gravel and silt

Sample Source: TP-4A 3-5'

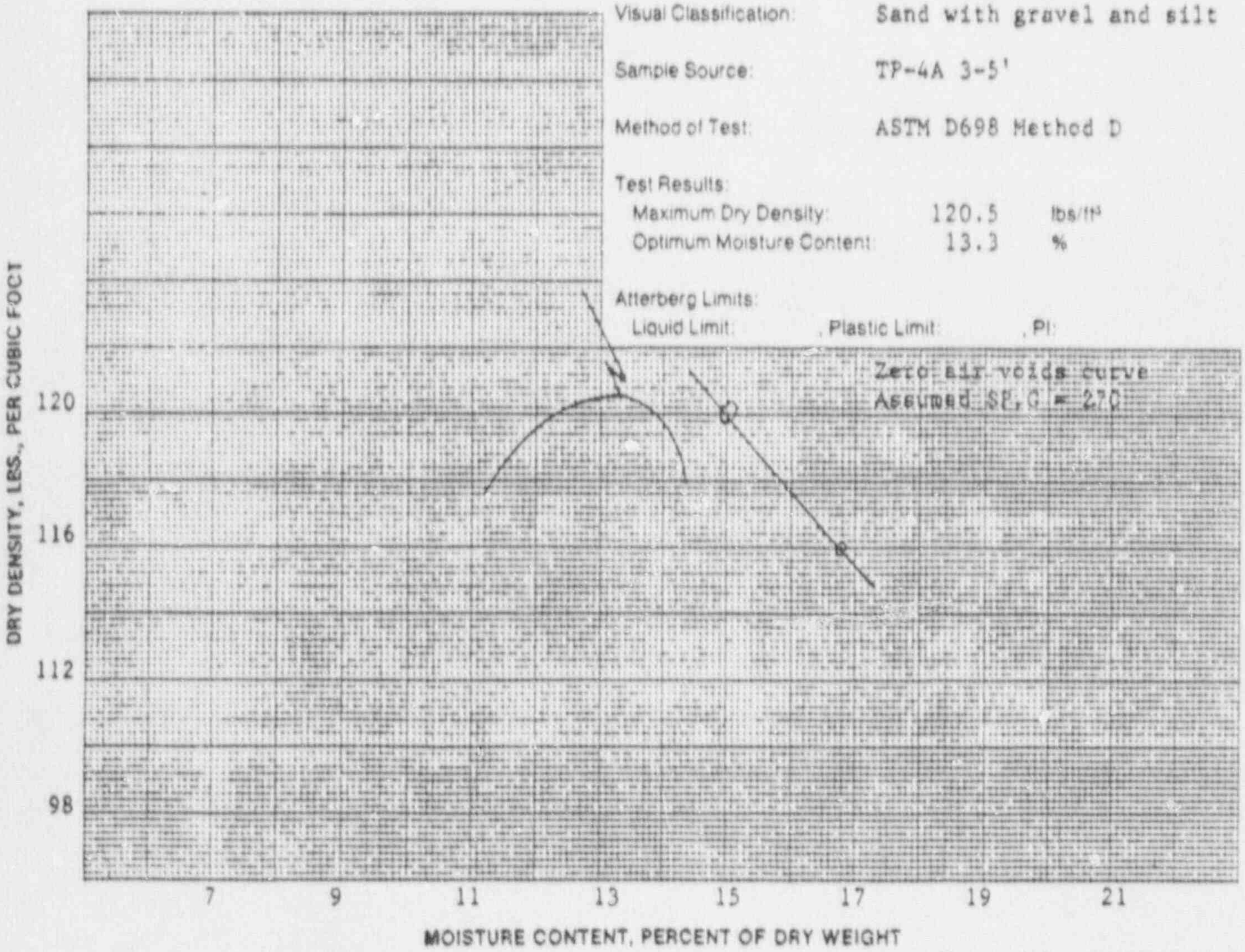
Method of Test: ASTM D698 Method D

Test Results:

Maximum Dry Density:	120.5	lbs/ft³
Optimum Moisture Content:	13.3	%

Atterberg Limits:

Liquid Limit: , Plastic Limit: , PI:



Respectfully submitted,
Professional Service Industries, Inc.

TESTED FOR:
MK-FERGUSON COMPANY
P.O. Box 9136
Albuquerque, NM 87119

PROJECT:
LOWMAN, IDAHO

Attention: Mr. John Singleton

December 21, 1990

PSI Project #:355-00118-001

REMARKS TP-4B @ Depth 7'-9'

I. Particle Size Analysis with Hydrometer (ASTM D-422).

Sieve Size	Percent Passing
2.0"	100
1.5"	80
1.0"	74
3/4"	72
1/2"	70
3/8"	69
#4	63
#8	60
#16	57
#30	43
#50	30
#100	22
#200	17
1 Min.	14
2 Min.	13
5 Min.	12
15 Min.	11
30 Min.	9
60 Min.	8
250 Min.	6

II. Atterberg Limits (ASTM D-4318)

Liquid Limit	NP
Plastic Limit	NP
Plastic Index	NP

III. Natural Moisture Content (ASTM D-2216)

Moisture %	4.8

Respectfully submitted,
PROFESSIONAL SERVICE INDUSTRIES, INC.

psi Professional Service Industries, Inc.

REPORT OF MOISTURE DENSITY RELATIONSHIP OF SOIL

TESTED FOR: MK-FERGUSON COMPANY
P.O. Box 9136
Albuquerque, NM 87119

PROJECT: LOWMAN, IDAHO

Attention: Mr. John Singleton

DATE: December 21, 1990

OUR REPORT NO.: 355-00118-001 Pg. 46 of 46

TEST DATA

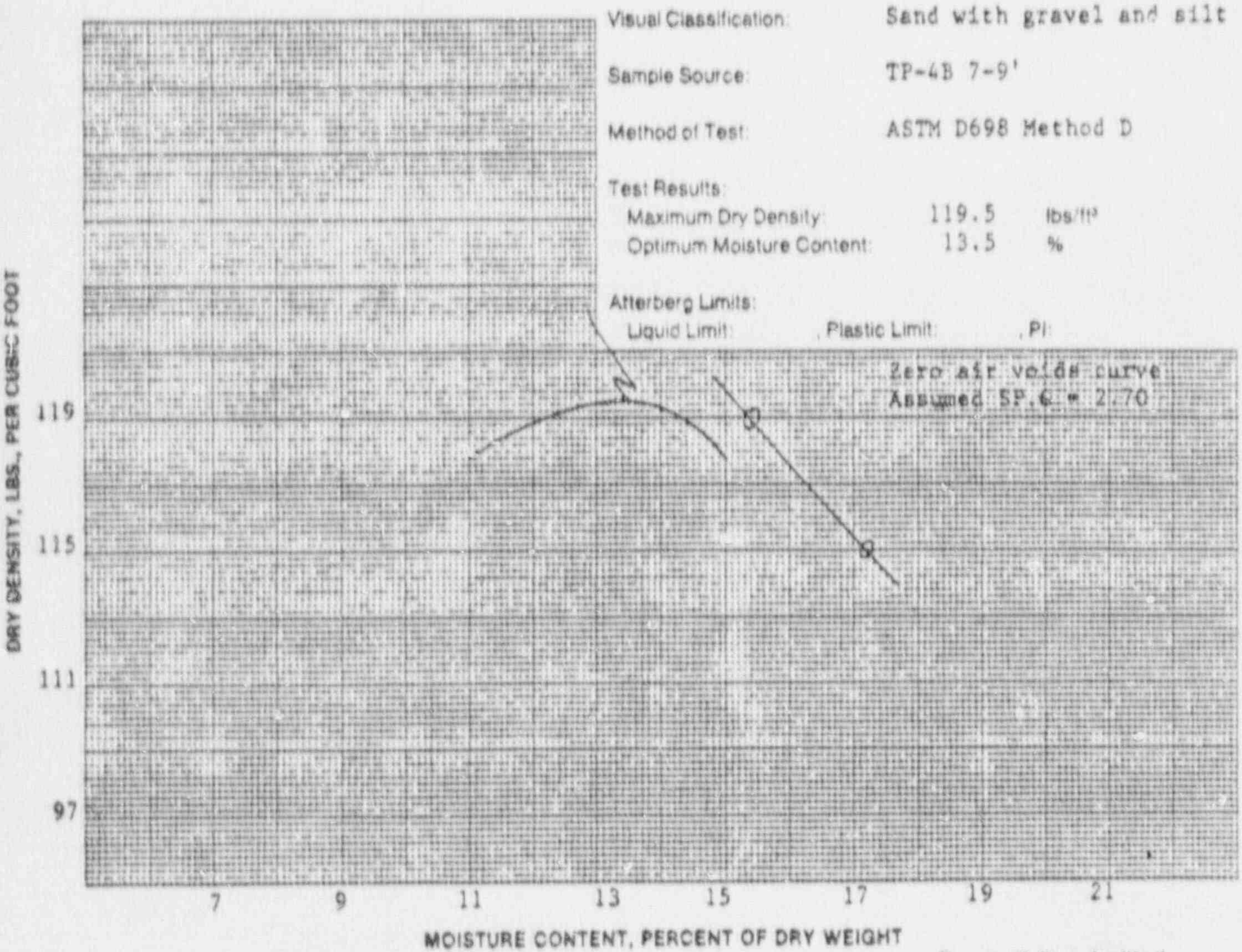
Visual Classification: Sand with gravel and silt

Sample Source: TP-4B 7-9'

Method of Test: ASTM D698 Method D

Test Results:
Maximum Dry Density: 119.5 lbs/ft³
Optimum Moisture Content: 13.5 %

Atterberg Limits:
Liquid Limit: , Plastic Limit: , PI:



Respectfully submitted,
Professional Service Industries, Inc.

SPECIFIC GRAVITY OF SOIL (ASTM D-854)

G = 2.64

RIPRAP EVALUATION

PREFORMED FOR

MK-FERGUSON COMPANY
C/O SOUTH FORK LODGE
HIGHWAY 21
LOWMAN, IDAHO 83637

PROJECT

SAMPLING AND TESTING SERVICES
LOWMAN, IDAHO
P.O. # 3050-511-10133

PROJECT # 355-00084

DATE OF REPORT

OCTOBER 10, 1990

Professional Service Industries, Inc.
230 SOUTH COLE ROAD
BOISE, IDAHO 83709
(208) 376-4748

Professional Service Industries, Inc.

Tested for:
MK-FERGUSON COMPANY
c/o South Fork Lodge
Highway 21
Lowman, Idaho 83637

Project:
SAMPLING AND TESTING SERVICES
Lowman, Idaho
P.O. # 3050-511-10133

Attention: Mr. John Singleton
Project Manager

Date: October 10, 1990 PSI File Number: 355-00084-013 Pg 1/15

FINAL REPORT

On August 23, 1990 your personnel delivered two riprap samples to our laboratory. Sample number one was described as coming from the "Fulfer Source" and sample two was described as coming from the "Stanley Source". Each sample consisted of three or four small boulders between one quarter and one half cubic foot in volume. Each sample contained pieces that are geologically different from each other. Samples are provided within this report show the different materials.

The tests requested include Specific Gravity, Percent Absorption, Sodium Sulfate Soundness, Los Angeles Abrasion, Schmidt Hammer and Splitting Tensile Strength. Petrographic examination of the materials are also required. On August 24, 1990 Mr. Bob Heneks with MK-Ferguson in San Francisco provided written information concerning the required testing methods.

Individual test procedures and results are as follows:

TEST NUMBER ONE AND TWO SPECIFIC GRAVITY & ABSORPTION TESTS

Test was performed in accordance with ASTM C-127, Standard Test Method for Specific Gravity of Coarse Aggregate. Samples consisted of crushed, two inch minus composite materials representing all materials delivered. Test results are as follows:

TEST METHOD	FULFER SOURCE	STANLEY SOURCE
Specific Gravity		
Bulk, SSD	2.58	2.61
Bulk	2.51	2.59
Apparent	2.70	2.65
Absorption		
Percent	2.8 %	0.9 %

Professional Service Industries, Inc.

Tested for:
MK-FERGUSON COMPANY
c/o South Fork Lodge
Highway 21
Lowman, Idaho 83637

Project:
SAMPLING AND TESTING SERVICES
Lowman, Idaho
P.O. # 3050-511-10133

Attention: Mr. John Singleton
Project Manager

Date: October 10, 1990 PSI File Number: 355-00084-013 Pg 2/15

TEST NUMBER THREE SODIUM SULFATE SOUNDNESS

Test was performed in accordance with ASTM C-88, Standard Test Method for Soundness of Aggregate Using Sodium Sulfate. Samples consisted of crushed two inch minus composite materials representing all materials delivered. Only aggregate larger than a number four sieve was tested. The original grading used in the calculations is that indicated by the test method. Test Results are as follows:

PULFER SOURCE

TEST DATA REPORT

Sieve Size	Initial Weights	Original Grading(%)	Percent Loss	Weighted Percent Loss
2.0"-1.5"	1848.8	40.0	0.0	0.00
1.5"-1.0"	994.3	33.0	1.8	0.59
1.0"-3/4"	503.9			
3/4"-1/2"	671.9	21.0	0.0	0.00
1/2"-3/8"	299.6			
3/8"-No.4	299.6	6.0	17.8	1.07
		TOTAL PERCENT LOSS		1.66

QUANTITATIVE EXAMINATION

Sieve Size	Splitting #	Splitting %	Crumbling #	Crumbling %	Flaking #	Flaking %	Number of Particles
2.0"-1.5"	-	-	-	-	20	100	23
1.5"-3/4"	-	-	-	-	63	100	63

Tested for:
MK-FERGUSON COMPANY
c/o South Fork Lodge
Highway 21
Lowman, Idaho 3637

Project:
SAMPLING AND TESTING SERVICES
Lowman, Idaho
P.O. # 3050-511-10133

Attention: Mr. John Singleton
Project Manager

Date: October 10, 1990 PSI File Number: 355-00084-013 Pg 3/15

TEST NUMBER THREE SODIUM SULFATE SOUNDNESS (continued)

Test was performed in accordance with ASTM C-88, Standard Test Method for Soundness of Aggregate Using Sodium Sulfate. Samples consisted of crushed two inch minus composite materials representing all materials delivered. Only aggregate larger than a number four sieve was tested. The original grading used in the calculations is that indicated by the test method. Test Results are as follows:

STANLEY SOURCE

TEST DATA REPORT

Sieve Size	Initial Weights	Original Grading(%)	Percent Loss	Weighted Percent Loss
2.0"-1.5"	1748.0	42.0	2.5	1.05
1.5"-1.0" 1.0"-3/4"	950.0 500.0	33.0	0.0	0.00
3/4"-1/2" 1/2"-3/8"	670.0 335.0	18.0	0.0	0.00
3/8"-No.4	300.0	7.0	4.8	0.34

TOTAL PERCENT LOSS 1.39

QUANTITATIVE EXAMINATION

Sieve	Splitting		Crumbling		Flaking		Number of
Size	#	%	#	%	#	%	Particles
2.0"-1.5"	3	16	-	-	19	100	19
1.5"-3/4"	2	9	-	-	23	100	23

PSI Professional Service Industries, Inc.

Tested for:
MK-FERGUSON COMPANY
c/o South Fork Lodge
Highway 21
Lowman, Idaho 83637

Project:
SAMPLING AND TESTING SERVICES
Lowman, Idaho
P.O. # 3050-511-10133

Attention: Mr. John Singleton
Project Manager

Date: October 10, 1990 PSI File Number: 355-00084-013 Pg 4/15

TEST NUMBER FOUR LOS ANGELES ABRASION TEST

The test was performed in accordance with ASTM C-131, Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine. Samples consisted of crushed, one and one half inch minus composite samples representing all materials delivered. Grading " A " was used for both sample sources. As instructed by information provided by the client the method was altered to include 100 revolutions of the Los Angeles Machine. Test results are as follows:

DESCRIPTION	FULFER SOURCE	STANLEY SOURCE
Grading " A "		
Percent Loss (100 Revolutions)	9.9 %	6.4 %

Professional Service Industries, Inc.

Tested for:
MK-FERGUSON COMPANY
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Highway 21
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Project:
SAMPLING AND TESTING SERVICES
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P.O. # 3050-511-10133

Attention: Mr. John Singleton
Project Manager

Date: October 10, 1990 PSI File Number: 355-00094-013 Pg 5/15

TEST NUMBER FIVE SCHMIDT HAMMER TEST

Test was performed in general accordance with Part Three, Suggested Method for Determination of the Schmidt Rebound Hardness. This method is from a book titled, "Rock Characterization Testing and Monitoring", published by the International Society for Rock Mechanics. This reference was provided by our client. The test was performed on selected individual geologic pieces of each sample. Each piece was held rigid by clamping in our Forney Compression Testing Machine. Rock pieces were shaped and cracked in a manner that made performing the test on flat surfaces with six centimeters of crack free material in all directions was not always possible. Each of the twenty recorded readings on each rock are shown below. These values were averaged to determine each sample sources test result. It is noted that a Type N Schmidt Hammer was used for this test. The test anvil and sample test values obtained were proportionately adjusted to a Type L Hammer. Test results are as follows:

FULFER SOURCE

Rock 1-F		Rock 2-F		Rock 3-F	
29	38	18	24	19	26
30	38	21	24	22	26
30	38	21	25	22	26
31	39	22	26	22	27
32	39	22	27	22	30
34	40	22	29	23	30
35	41	23	29	24	30
35	43	23	29	24	32
36	44	23	29	24	32
37	46	24	29	26	38
AVG	41		27		30

FULFER SOURCE AVERAGE
SCHMIDT REBOUND INDEX 33

STANLEY SOURCE

Rock 1-S		Rock 2-S	
35	54	45	54
37	55	45	54
37	55	47	56
41	55	47	56
43	55	52	56
44	56	52	60
52	56	52	63
52	59	52	63
53	64	54	66
53	65	54	66
AVG	57		59

STANLEY SOURCE AVERAGE
SCHMIDT REBOUND INDEX 58

Tested for:
MK-FERGUSON COMPANY
c/o South Fork Lodge
Highway 21
Lowman, Idaho 83637

Project:
SAMPLING AND TESTING SERVICES
Lowman, Idaho
P.O. # 3050-511-10133

Attention: Mr. John Singleton
Project Manager

Date: October 10, 1990 PSI File Number: 355-00084-013 Pg 6/15

TEST NUMBER SIX SPLITTING TENSILE STRENGTH TEST

Test was performed in general accordance with Part Two, Suggested Method for Determining Indirect Tensile Strength by the Brazil Test. This method is from a book titled, "Rock Characterization Testing and Monitoring", published by the International Society for Rock Mechanics. This test was performed on core samples cut from the individual rock samples delivered to our laboratory. The size of the pieces and the internal cracks made it impossible to recover the ten core samples suggested in the test method. An electric coring machine with a diamond impregnated core bit was used to remove core samples from the delivered rock samples. Removed cores were then cut to proper thickness using a diamond impregnated rock saw. Samples were tested in an apparatus similar to that shown in the test method. The load was applied using a Forney Model FT-0040-DR compression testing machine. All samples were oven dry at the time of testing. Loading rate was modified to cause failure in one to three minutes as requested by our client. Test results on each rock sample are provided. These values were averaged for each geology and then averaged again for each sample source. Orientation of the axis of loading with respect to bedding planes, foliation, etc. is not known since these cores were taken from delivered quarry samples. It is noted that the orientation of the axis was varied on different samples from the same core. Test results are as follows:

FULFER SOURCE

Sample	Diameter(in)	Thickness(in)	Load(lbs)	Tensile Strength
F-1-A	2.68	1.19	6600	1370
B	2.68	1.31	7100	1290
			Rock Average	1330 PSI
F-2-A	2.67	1.38	5950	1030 PSI
F-3-A	2.67	1.28	3650	680
B	2.67	1.28	4150	770
C	2.66	1.27	3950	740
			Rock Average	730 PSI

FULFER SOURCE AVERAGE SPLITTING TENSILE STRENGTH 1030 PSI

Tested for:
MK-FERGUSON COMPANY
c/o South Fork Lodge
Highway 21
Lowman, Idaho 83637

Project:
SAMPLING AND TESTING SERVICES
Lowman, Idaho
P.O. # 3050-511-10133

Attention: Mr. John Singleton
Project Manager

Date: October 10, 1990 PSI File Number: 355-00084-013 Pg 7/15

TEST NUMBER SIX SPLITTING TENSILE STRENGTH TEST (continued)

STANLEY SOURCE

Sample	Diameter(in)	Thickness(in)	Load(lbs)	Tensile Strength
1-S-A	2.68	1.38	8000	1380
B	2.68	1.21	6100	1200
			Rock Average	1290 PSI
1-S-C	2.67	1.08	4200	930
D	2.67	1.20	3600	720
			Rock Average	825 PSI
2-S-A	2.20	1.09	5850	1550
B	2.68	1.09	9550	2080
			Rock Average	1815 PSI

STANLEY SOURCE AVERAGE SPLITTING TENSILE STRENGTH 1310 PSI

Tested for:
MK-FERGUSON COMPANY
c/o South Fork Lodge
Highway 21
Lowman, Idaho 83637

Project:
SAMPLING AND TESTING SERVICES
Lowman, Idaho
P.O. # 3050-511-10133

Attention: Mr. John Singleton
Project Manager

Date: October 10, 1990 PSI File Number: 355-00084-013 Pg 8/15

PETROGRAPHIC EXAMINATION

Petrographic examination of each delivered geology was performed by Mr. Kevin Sagez of our staff. Mr. Sagez possesses a Bachelors of Science Degree in Geology. He will complete his Masters Degree in Geology in May 1991. Mr. Sagez's evaluations are as follows:

Sample F-1 Fulfer Source

Hand Specimen Examination: This is a grayish black, fine grained, intergranular, Hypocrystalline rock composed of plagioclase, olivine and a large quantity of mafic minerals.
Thin Section Evaluation: Minerals visible in the thin section include Plagioclase, hornblende, olivine and minor pyroxenes. Under plane polarized light the anhedral hornblende is is pleochroic from green to brown and samples exhibit the 124/56 degree cleavage angles. Twinning is also common. Olivine is typically rounded and anhedral, showing signs of perlithic fracture pattern. Subhedral plagioclase crystals are commonly twinned but no zoning. The pyroxenes are anhedral crystals. A visual estimation of minerals is 70 percent Plagioclase and 30 percent hornblende, olivine and pyroxene. Name is Andesite Basalt.

Sample F-2 Fulfer Source

Hand Specimen Examination: This is a grayish black, medium grained, intergranular-hypocrystalline, Phanertic rock composed of plagioclase, olivine and a large quantity of mafic minerals. Prominent iron oxide staining is present on weathered surfaces.
Thin Section Evaluation: Minerals visible in the thin section include Plagioclase, hornblende, olivine and minor pyroxenes. Under plane polarized light the anhedral hornblende is is pleochroic from green to brown and samples exhibit the 124/56 degree cleavage angles. Twinning is also common. Olivine is largely dominate and is typically rounded and anhedral, showing signs of perlithic fracture. Large subhedral plagioclase and olivine crystals lay within a background field of elongate subhedral plagioclase lathes. The pyroxenes are anhedral crystals. A visual estimation of minerals is 65 percent Plagioclase and 35 percent hornblende, olivine and pyroxene. Name is Andesite Basalt.

Tested for:
MK-FERGUSON COMPANY
c/o South Fork Lodge
Highway 21
Lowman, Idaho 83637

Project:
SAMPLING AND TESTING SERVICES
Lowman, Idaho
P.O. # 3050-511-10133

Attention: Mr. John Singleton
Project Manager

Date: October 10, 1990 PSI File Number: 355-00034-013 Pg 9/15

PETROGRAPHIC EXAMINATION (continued)

Sample F-3 Fulfer Source

Hand Specimen Examination: This is a grayish black, highly vesicular, porphyritic lava with phenocrysts of medium grained plagioclase and olivine in a porous, aphanitic groundmass.
Thin Section Evaluation: The thin section contains approximately 50 percent rounded voids that represent cross sections of vesicles. The minerals visible in the thin section include Plagioclase, hornblende, olivine and orthopyroxene. Under plane polarized light the hornblende is pleochroic from green to brown and samples exhibiting the 124/56 degree cleavage angles are present along with signs of alterations. Subhedral orthopyroxene displays the effect of pleochroism, ranging from clear to light pink. Small amounts of olivine indicate the normal perlithic fracture pattern. Plagioclase crystals are commonly twinned and display an internal alteration or recrystalization. A visual estimation of minerals is 75 percent Plagioclase and 25 percent hornblende, olivine and pyroxene. Name is Andesite Basalt.

Tested for:
MK-FERGUSON COMPANY
c/o South Fork Lodge
Highway 21
Lowman, Idaho 83637

Project:
SAMPLING AND TESTING SERVICES
Lowman, Idaho
P.O. # 3050-511-10133

Attention: Mr. John Singleton
Project Manager

Date: October 10, 1990 PSI File Number: 355-00084-013 Pg 10/15

PETROGRAPHIC EXAMINATION (continued)

Sample S-1 Stanley Source

Hand Specimen Examination: This is a medium grained, porphyritic, intergranular-hypocrystalline, microlite rock. Crystals of plagioclase, olivine and some mafic minerals are easily recognized.
Thin Section Evaluation: Minerals visible in the thin section include Plagioclase, hornblende, olivine and orthopyroxenes. Under plane polarized light hornblende is is pleochroic from green to brown and samples exhibit the 124/56 degree cleavage angles. Twinning is also common. Hornblende crystals range from anhedral to subhedral. Olivine is typically rounded and subhedral, showing signs of perlithic fracture and simple zoning. Subhedral plagioclase crystals are commonly twinned and show simple to complex zoning. The elongate subhedral orthopyroxenes appear as clear crystals. Some of the mafic minerals show signs of alteration in the thin section. A visual estimation of minerals is 70 percent Plagioclase and 30 percent hornblende, olivine and pyroxene. Name is Andesite Basalt.

Sample S-2 Stanley Source

Hand Specimen Examination: This is a pink, medium grained, phaneritic, microlite rock. Minerals visible in the hand specimen include plagioclase and cryptocrystalline quartz. Oxidation is visible as a clay alteration of the plagioclase.
Thin Section Evaluation: Minerals visible in the thin section include Quartz, potassium-feldspar, and cryptocrystalline quartz. Sericite and at least one type of opaque mineral are present. Deformed grains are sutured and concavo-convex along contacts. Grains are not equal granular. A visual estimation of minerals is 90 percent quartz and 10 percent plagioclase, potassium-feldspar, and cryptocrystalline quartz. Name is quartzolite.

Professional Service Industries, Inc.

Tested for:
MK-FERGUSON COMPANY
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Highway 21
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Project:
SAMPLING AND TESTING SERVICES
Lowman, Idaho
P.O. # 3050-511-10133

Attention: Mr. John Singleton
Project Manager

Date: October 10, 1990 PSI File Number: 355-00084-013 Pg 11/15

ROCK QUALITY SCORING CRITERIA

For this project rock quality is determined based up on a scoring criteria provided by the client. This scoring criteria is shown on Table 02278-A which has been included in this report as page number ten. Based upon the petrographic evaluations, the weighting factors for Igneous Rock have been used. Scores for each source are as follows:

FULFER SOURCE

Test	Test Result	Weight Factor	Raw Score	Weighted Score
Specific Gravity	2.70	9.0	9.0	81.0
Percent Absorption	2.8	2.0	1.4	2.8
% Loss Sodium Sulfate Soundness	1.66	11.0	9.6	105.6
Percent Abrasion	9.9	1.0	5.1	5.1
Schmidt Hammer	33	3.0	4.1	12.4
Splitting Tensile Strength (PSI)	1030	10.0	8.2	81.5
			SCORE TOTAL	288.4

The total possible score for an Igneous Weighting factor is 360. The Fulfer Source scored 288.4 which is 80 percent of possible.

FULFER SOURCE ROCK QUALITY SCORE

80

Tested for:
MK-FERGUSON COMPANY
c/o South Fork Lodge
Highway 21
Lowman, Idaho 83637

Project:
SAMPLING AND TESTING SERVICES
Lowman, Idaho
P.O. # 3050-511-10133

Attention: Mr. John Singleton
Project Manager

Date: October 10, 1990 PSI File Number: 355-00084-013 Pg 12/15

ROCK QUALITY SCORING CRITERIA (continued)

STANLEY SOURCE

Test	Test Result	Weight Factor	Raw Score	Weighted Score
Specific Gravity	2.65	9.0	8.0	72.0
Percent Absorption	0.9	2.0	0.6	11.2
% Loss Sodium Sulfate Soundness	1.39	11.0	9.8	107.8
Percent Abrasion	6.4	1.0	7.2	7.2
Schmidt Hammer	58	3.0	7.7	23.0
Splitting Tensile Strength (PSI)	1310	10.0	9.6	96.0
			SCORE TOTAL	317.0

The total possible score for an Igneous Weighting factor is 360. The Stanley Source scored 317 which is 88 percent of possible.

STANLEY SOURCE ROCK QUALITY SCORE

88

Professional Service Industries, Inc.

Tested for:
MK-FERGUSON COMPANY
c/o South Fork Lodge
Highway 21
Lowman, Idaho 83637

Project:
SAMPLING AND TESTING SERVICES
Lowman, Idaho
P.O. # 3050-511-10133

Attention: Mr. John Singleton
Project Manager

Date: October 10, 1990 PSI File Number: 355-00084-013 Pg 13/15

This completes all requested testing and reporting for this Riprap Evaluation Project.

Based upon the test data reproted herein, we obtained a ROCK QUALITY SCORE of 80 on the Fulfer Source and 88 on the Stanley Source.

Thank-you for retaining Professional Service Industries, Inc. Should you have any questions please let me know.

Respectfully submitted;
PROFESSIONAL SERVICE INDUSTRIES, INC.

Bob J. Arnold, P.E.
Division Manager

6345
BOB J ARNOLD

TABLE 02276-A
ROCK QUALITY SCORING CRITERIA

	Weighting Factor			Score										
	Limestone	Sandstone	Igneous	10	9	8	7	6	5	4	3	2	1	0
Specific Gravity	12	5	9	2.75	2.70	2.65	2.60	2.55	2.50	2.45	2.40	2.35	2.30	<2.3
Absorption (%)	13	5	2	0.1	0.3	0.5	0.67	0.83	1.0	1.5	2.0	2.5	3.0	>3.0
Sodium Sulfate (%)*	4	3	11	1	3	5	6.7	8.3	10	12.5	15	20	25	>25
Abrasion (%)**	1	8	1	1	3	5	6.7	8.3	10	12.5	15	20	25	>25
Schmidt Hammer	11	13	3	70	65	60	54	47	40	32	24	16	8	<8
Splitting Tensile Strength (psi)	5	4	10	1400	1200	1000	833	666	500	400	300	200	100	<100

Note: Any rock to be used must be qualitatively rated at least "fair" in a petrographic examination conducted by a geologist experienced in petrographic analysis.

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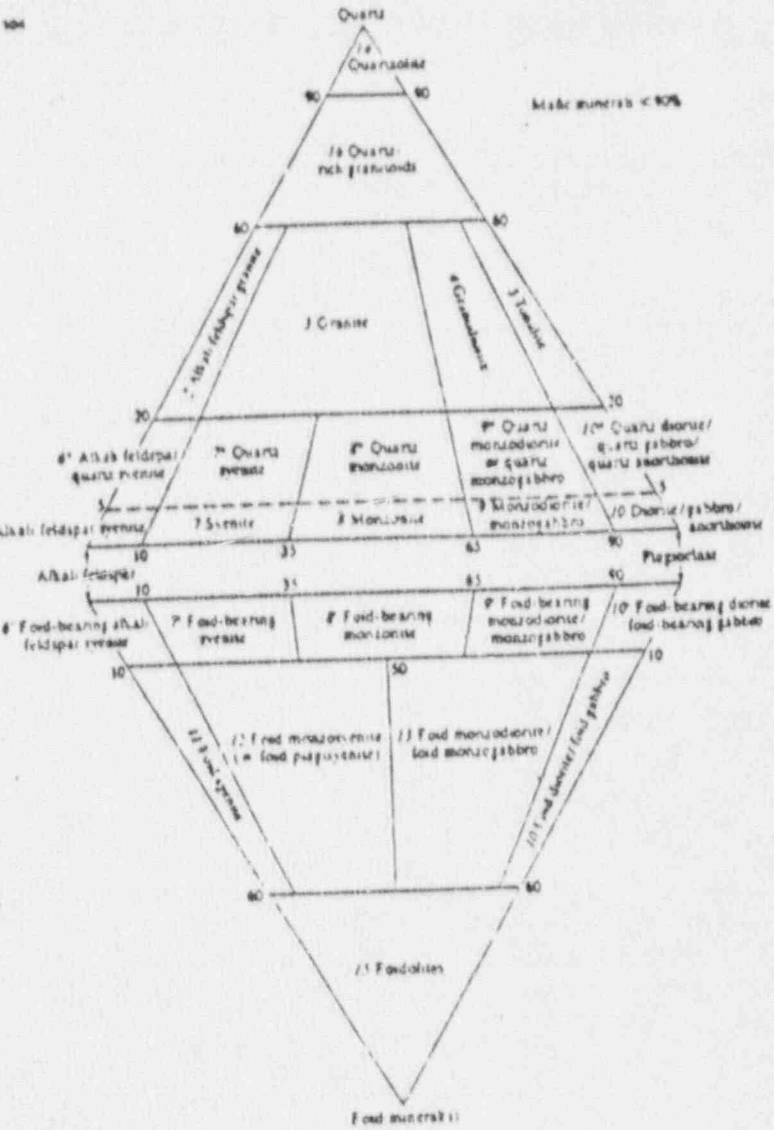
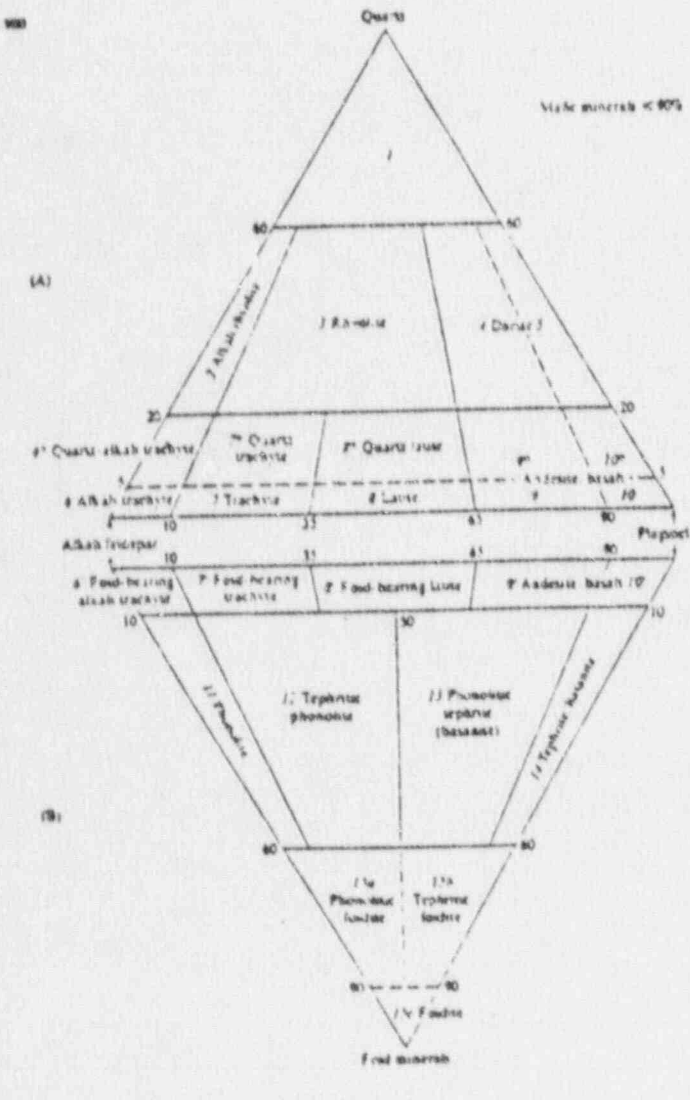
* 5 cycles
** 100 revolutions


504
(A)
Quartz
1a Quartzolite
90
90
Mafic minerals < 90%
1b Quartz-rich granitoids
60
60
2 Alkali feldspar granite
3 Granite
4 Granodiorite
5 Tonalite
20
20
6* Alkali feldspar quartz syenite
7* Quartz syenite
8* Quartz monzonite
9* Quartz monzodiorite or quartz monzogabbro
10* Quartz diorite/ quartz gabbro/ quartz anorthosite
5
5
6 Alkali feldspar syenite
7 Syenite
8 Monzonite
9 Monzodiorite/ monzogabbro
10 Diorite/gabbro/ anorthosite
10
35
65
90
Alkali feldspar
Plagioclase
10
35
65
90
6' Foid-bearing alkali feldspar syenite
7' Foid-bearing syenite
8' Foid-bearing monzonite
9' Foid-bearing monzodiorite/ monzogabbro
10' Foid-bearing diorite/ foid-bearing gabbro
10
10
50
11 Foid syenite
12 Foid monzosyenite (= foid plagisyenite)
13 Foid monzodiorite/ foid monzogabbro
14 Foid diorite/ foid gabbro
60
60
15 Foidolites
Foid minerals


500
Quartz
Mafic minerals < 90%
1
60
60
(A)
2 Alkali rhyolite
3 Rhyolite
4 Dacite
5
20
20
6* Quartz alkali trachyte
7* Quartz trachyte
8* Quartz latite
9*
10*
Andesite basalt
5
5
6 Alkali trachyte
7 Trachyte
8 Latite
9
10
10
35
65
90
Alkali feldspar
Plagioclase
10
35
65
90
6' Foid-bearing alkali trachyte
7' Foid-bearing trachyte
8' Foid-bearing latite
9' Andesite basalt 10'
10
10
50
11 Phonolite
12 Tephritic phonolite
13 Phonolitic tephrite (basanite)
14 Tephrite basanite
(B)
60
60
15a Phonolitic foidite
15b Tephritic foidite
90
90
15c Foidite
Foid minerals

MKES Doc. No.
3885-LOW-R-09-00579-00

RECEIVED · MKE
DEC 27 1990
UMTRA · S.F.

Note: This source, Stanley, is a different source than the Stanley source reported in the October 10, 1990 report.

RIPRAP EVALUATION

PREFORMED FOR

MK-FERGUSON COMPANY
P.O. BOX 9136
ALBUQUERQUE, NM 87119

PROJECT

SAMPLING AND TESTING SERVICES
LOWMAN, IDAHO
P.O. # 3050-511-10133

PROJECT # 355-00084

DATE OF REPORT

NOVEMBER 30, 1990

Professional Service Industries, Inc.
230 SOUTH COLE ROAD
BOISE, IDAHO 83709
(208) 376-4748

Professional Service Industries, Inc.

Tested for:
MK-FERGUSON COMPANY
P.O. Box 9136
Albuquerque, NM 87119

Project:
SAMPLING AND TESTING SERVICES
Lowman, Idaho
P.O. # 3050-511-10133

Attention: Mr. John Singleton
Project Manager

Date: November 30, 1990 PSI File Number: 355-00084-014 Pg 1/10

FINAL REPORT

On October 25, 1990 your personnel delivered one riprap sample to our laboratory. The sample was described as coming from the "Stanley Source". The sample consisted of ten to fifteen small boulders between one quarter and one half cubic foot in volume. The sample contained pieces that appear geologically similar to each other. Samples are provided with this report.

The tests requested include Specific Gravity, Percent Absorption, Sodium Sulfate Soundness, Los Angeles Abrasion, Schmidt Hammer and Splitting Tensile Strength. Petrographic examination of the materials are also required.
Individual test procedures and results are as follows:

TEST NUMBER ONE AND TWO SPECIFIC GRAVITY & ABSORPTION TESTS

Test was performed in accordance with ASTM C-127, Standard Test Method for Specific Gravity of Coarse Aggregate. Samples consisted of crushed, two inch minus composite materials representing all materials delivered. Test results are as follows:

TEST METHOD	
Specific Gravity	
Bulk, SSD	2.75
Bulk	2.77
Apparent	2.80
Absorption	
Percent	0.68%

Tested for:
MK-FERGUSON COMPANY
P.O. Box 9136
Albuquerque, NM 87119

Project:
SAMPLING AND TESTING SERVICES
Lowman, Idaho
P.O. # 3050-511-10133

Attention: Mr. John Singleton
Project Manager

Date: November 30, 1990 PSI File Number: 355-00084-014 Pg 2/10

TEST NUMBER THREE SODIUM SULFATE SOUNDNESS

Test was performed in accordance with ASTM C-88, Standard Test Method for Soundness of Aggregate Using Sodium Sulfate. Samples consisted of crushed 1.5 inch minus composite materials representing all materials delivered. Only aggregate larger than a number four sieve was tested. The original grading used in the calculations is that indicated by the test method. Test Results are as follows:

TEST DATA REPORT

Sieve Size	Initial Weights	Original Grading(%)	Percent Loss	Weighted Percent Loss
1.5"-1.0"	1008.3	53.3	1.2	0.64
1.0"-3/4"	521.6			
3/4"-1/2"	683.8	35.3	2.9	1.02
1/2"-3/8"	328.5			
3/8"-No.4	327.5	11.4	0.2	0.02
		TOTAL PERCENT LOSS		1.68

QUANTITATIVE EXAMINATION

Sieve Size	Splitting		Crumbling		Flaking		Number of Particles
	#	%	#	%	#	%	
1.5"-3/4"	-	-	-	-	4	7	58

Tested for:
MK-FERGUSON COMPANY
P.O. Box 9136
Albuquerque, NM 87119

Project:
SAMPLING AND TESTING SERVICES
Lowman, Idaho
P.O. # 3050-511-10133

Attention: Mr. John Singleton
Project Manager

Date: November 30, 1990 PSI File Number: 355-00084-014 Pg 3/10

TEST NUMBER FOUR LOS ANGELES ABRASION TEST

The test was performed in accordance with ASTM C-131, Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine. Samples consisted of crushed, one and one half inch minus composite samples representing all materials delivered. Grading " A " was used. As instructed by information provided by the client the method was altered to include 100 revolutions of the Los Angeles Machine. Test results are as follows:

DESCRIPTION

Grading " A "

Percent Loss (100 Revolutions)	4.4%

PSI Professional Service Industries, Inc.

Tested for:
MK-FERGUSON COMPANY
P.O. Box 9136
Albuquerque, NM 87119

Project:
SAMPLING AND TESTING SERVICES
Lowman, Idaho
P.O. # 3050-511-10133

Attention: Mr. John Singleton
Project Manager

Date: November 30, 1990 PSI File Number: 355-00084-014 Pg 4/10

TEST NUMBER FIVE SCHMIDT HAMMER TEST

Test was performed in general accordance with Part Three, Suggested Method for Determination of the Schmidt Rebound Hardness. This method is from a book titled, "Rock Characterization Testing and Monitoring", published by the International Society for Rock Mechanics. This reference was provided by our client. The test was performed on two selected individual geologic pieces of the sample. Each piece was held rigid by clamping in our Forney Compression Testing Machine. Rock pieces were shaped and cracked in a manner that made performing the test on flat surfaces with six centimeters of crack free material in all directions not always possible. Each of the twenty recorded readings on each rock are shown below. The highest ten of these values were averaged to determine each sample sources test result. It is noted that a Type N Schmidt Hammer was used for this test. The test anvil and sample test values obtained were proportionately adjusted to a Type L Hammer. Test results are as follows:

Rock 1		Rock 2	
48	52	42	53
49	53	48	53
49	54	49	45
50	54	50	54
50	54	50	54
50	55	50	55
50	55	50	55
51	55	51	56
51	55	52	58
52	56	52	59
AVG	54		55

SCHMIDT REBOUND INDEX 55

Tested for:
MK-FERGUSON COMPANY
P.O. Box 9136
Albuquerque, NM 87119

Project:
SAMPLING AND TESTING SERVICES
Lowman, Idaho
P.O. # 3050-511-10133

Attention: Mr. John Singleton
Project Manager

Date: November 30, 1990 PSI File Number: 355-00084-014 Pg 5/10

TEST NUMBER SIX SPLITTING TENSILE STRENGTH TEST

Test was performed in general accordance with Part Two, Suggested Method for Determining Indirect Tensile Strength by the Brazil Test. This method is from a book titled, "Rock Characterization Testing and Monitoring", published by the International Society for Rock Mechanics. This test was performed on core samples cut from the individual rock samples delivered to our laboratory. The size of the pieces and the internal cracks made it impossible to recover the ten core samples suggested in the test method. An electric coring machine with a diamond impregnated core bit was used to remove core samples from the delivered rock samples. Removed cores were then cut to proper thickness using a diamond impregnated rock saw. Samples were tested in an apparatus similar to that shown in the test method. The load was applied using a Forney Model FT-0040-DR compression testing machine. All samples were oven dry at the time of testing. Loading rate was modified to cause failure in one to three minutes as requested by our client. Orientation of the axis of loading with respect to bedding planes, foliation, etc. is not known since these cores were taken from delivered quarry samples. It is noted that the orientation of the axis was varied on different samples from the same core. Test results are as follows:

Sample	Diameter(in)	Thickness(in)	Load(lbs)	Tensile Strength
1	2.76	1.19	12,350	2390
2	2.77	1.31	12,700	2330
3*	2.78	1.31	11,000	1920
4*	2.79	1.38	10,150	1680
5*	2.27	1.23	10,600	1980
6*	2.78	1.37	9,350	1563
7*	2.79	1.20	9,000	1710
8*	2.79	1.22	11,400	2130
			Average	1950 PSI

*Indicates that test sample contaied a facture visible to naked eye.

Professional Service Industries, Inc.

Tested for:
MK-FERGUSON COMPANY
P.O. Box 9136
Albuquerque NM, 87119

Project:
SAMPLING AND TESTING SERVICES
Lowman, Idaho
P.O. # 3050-511-10133

Attention: Mr. John Singleton
Project Manager

Date: November 30, 1990 PSI File Number: 355-00084-014 Pg 6/10

PETROGRAPHIC EXAMINATION

Petrographic examination of each delivered geology was performed by Mr. Kevin Sagez of our staff. Mr. Sagez possesses a Bachelors of Science Degree in Geology. He will complete his Masters Degree in Geology in May 1991. Mr. Sagez's evaluations are as follows:

Hand Specimen Examination: This is a grayish black, fine grained, intergranular, Hypocrystalline rock composed of plagioclase, olivine and a large quantity of mafic minerals.
Thin Section Evaluation: Minerals visible in the thin section include Plagioclase, hornblende, olivine and minor pyroxenes. Under plane polarized light the anhedral hornblende is is pleochroic from green to brown and samples exhibit the 124/56 degree cleavage angles. Twinning is also common. Olivine is typically rounded and anhedral, showing signs of perlithic fracture pattern. Subhedral plagioclase crystals are commonly twinned but no zoning. The pyroxenes are anhedral crystals. A visual estimation of minerals is 70 percent Plagioclase and 30 percent hornblende, olivine and pyroxene. Name is Andesite Basalt.

Professional Service Industries, Inc.

Tested for:
MK-FERGUSON COMPANY
P.O. Box 91[illegible]6
Albuquerque, NM 87119

Project:
SAMPLING AND TESTING SERVICES
Lowman, Idaho
P.O. # 3050-511-10133

Attention: Mr. John Singleton
Project Manager

Date: November 30, 1990 PSI File Number: 355-00084-014 Pg 7/10

ROCK QUALITY SCORING CRITERIA

For this project rock quality is determined based up on a scoring criteria provided by the client. This scoring criteria is shown on Table 02278-A which has been included in this report as page number ten. Based upon the petrographic evaluations, the weighting factors for Igneous Rock have been used. Scores for each source are as follows:

Test	Test Result	Weight Factor	Raw Score	Weighted Score
Specific Gravity	2.80	9.0	10.0	90.0
Percent Absorption	0.68	2.0	6.9	13.8
% Loss Sodium Sulfate Soundness	1.68	11.0	9.7	106.7
Percent Abrasion	4.4	1.0	8.3	8.3
Schmidt Hammer	55	3.0	7.2	21.6
Splitting Tensile Strength (PSI)	1950	10.0	10.0	100.0
			SCORE TOTAL	340.4

The total possible score for an Igneous Weighting factor is 360. This source scored 340.4 which is 95 percent of possible.

ROCK QUALITY SCORE

95

PSI Professional Service Industries, Inc.

Tested for:
MK-FERGUSON COMPANY
P.O. Box 9136
Albuquerque, NM 87119

Project:
SAMPLING AND TESTING SERVICES
Lowman, Idaho
P.O. # 3050-511-10133

Attention: Mr. John Singleton
Project Manager

Date: November 30, 1990 PSI File Number: 355-00084-014 Pg 8/10

This completes all requested testing and reporting for this Riprap Evaluation Project.

Based upon the test data reproted herein, we obtained a ROCK QUALITY SCORE 95 on this Source.

Thank-you for retaining Professional Service Industries, Inc. Should you have any questions please let me know.

Respectfully submitted;
PROFESSIONAL SERVICE INDUSTRIES, INC.

Bob J. Arnold
Bob J. Arnold, P.E.
Division Manager

TABLE 02276-A
ROCK QUALITY SCORING CRITERIA

	Weighting Factor			Score										
	Lime-stone	Sand-stone	Igne-ous	10	9	8	7	6	5	4	3	2	1	0
Specific Gravity	12	5	9	2.75	2.70	2.65	2.60	2.55	2.50	2.45	2.40	2.35	2.30	<2.3
Absorption (%)	13	5	2	0.1	0.3	0.5	0.67	0.83	1.0	1.5	2.0	2.5	3.0	>3.0
Sodium Sulfate (%)*	4	3	11	1	3	5	6.7	8.3	10	12.5	15	20	25	>25
Abrasion (%)**	1	8	1	1	3	5	6.7	8.3	10	12.5	15	20	25	>25
Schmidt Hammer	11	13	3	70	65	60	54	47	40	32	24	16	8	<8
Splitting Tensile Strength (psi)	5	4	10	1400	1200	1000	833	666	500	400	300	200	100	<100

Note: Any rock to be used must be qualitatively rated at least "fair" in a petrographic examination conducted by a geologist experienced in petrographic analysis.

---

* 5 cycles
** 100 revolutions

Pg. 10 OF 10
355-00084-013